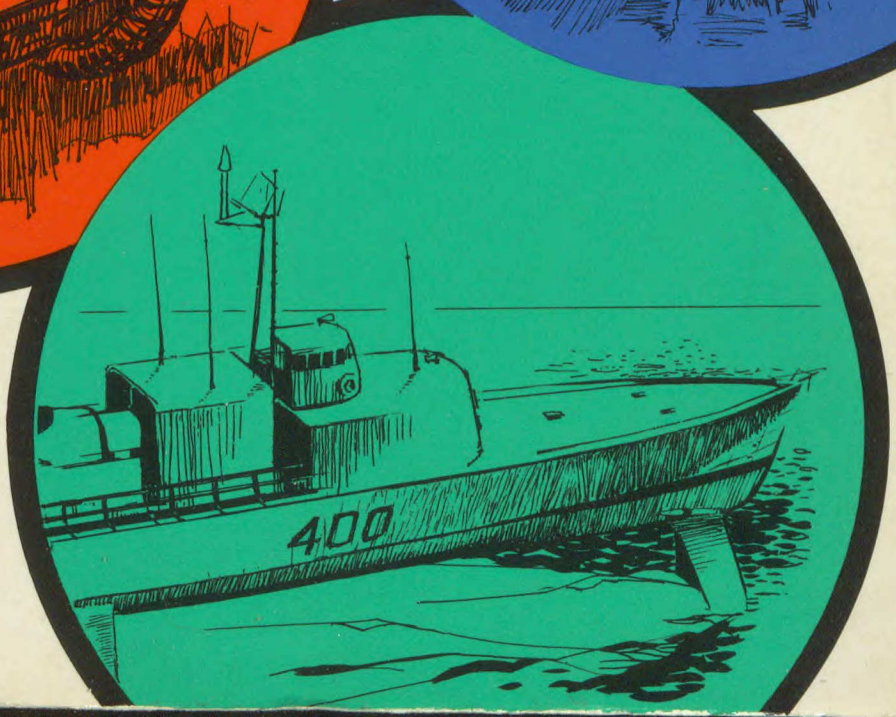


Reference

CANADIAN DEFENCE COMMODITIES

DEPARTMENT OF DEFENCE
TRADE & SERVICES
JUN 18 1970



DEPARTMENT OF INDUSTRY
TRADE & COMMERCE

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**CANADIAN
DEFENCE
COMMODITIES**

SECOND EDITION — FEBRUARY, 1970

**QUEEN'S PRINTER FOR CANADA
OTTAWA, 1970**

CANADIAN DEFENCE COMMODITIES

*Canada-United States
Defence Production Sharing*

② DEPARTMENT OF INDUSTRY, TRADE & COMMERCE
OTTAWA • 1970 • CANADA

Printed by
THE ALGER PRESS LIMITED
Oshawa, Ontario

Ref
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CANADIAN DEFENCE COMMODITIES

This book has been published by the Government of Canada to assist U.S. procurement officials to find Canadian sources for defence items.

Under the Defence Production Sharing arrangements between the United States and Canada, U.S. defence buyers may consider Canadian industry as equivalent in all respect to domestic sources of supply for U.S. defence development and production requirements.

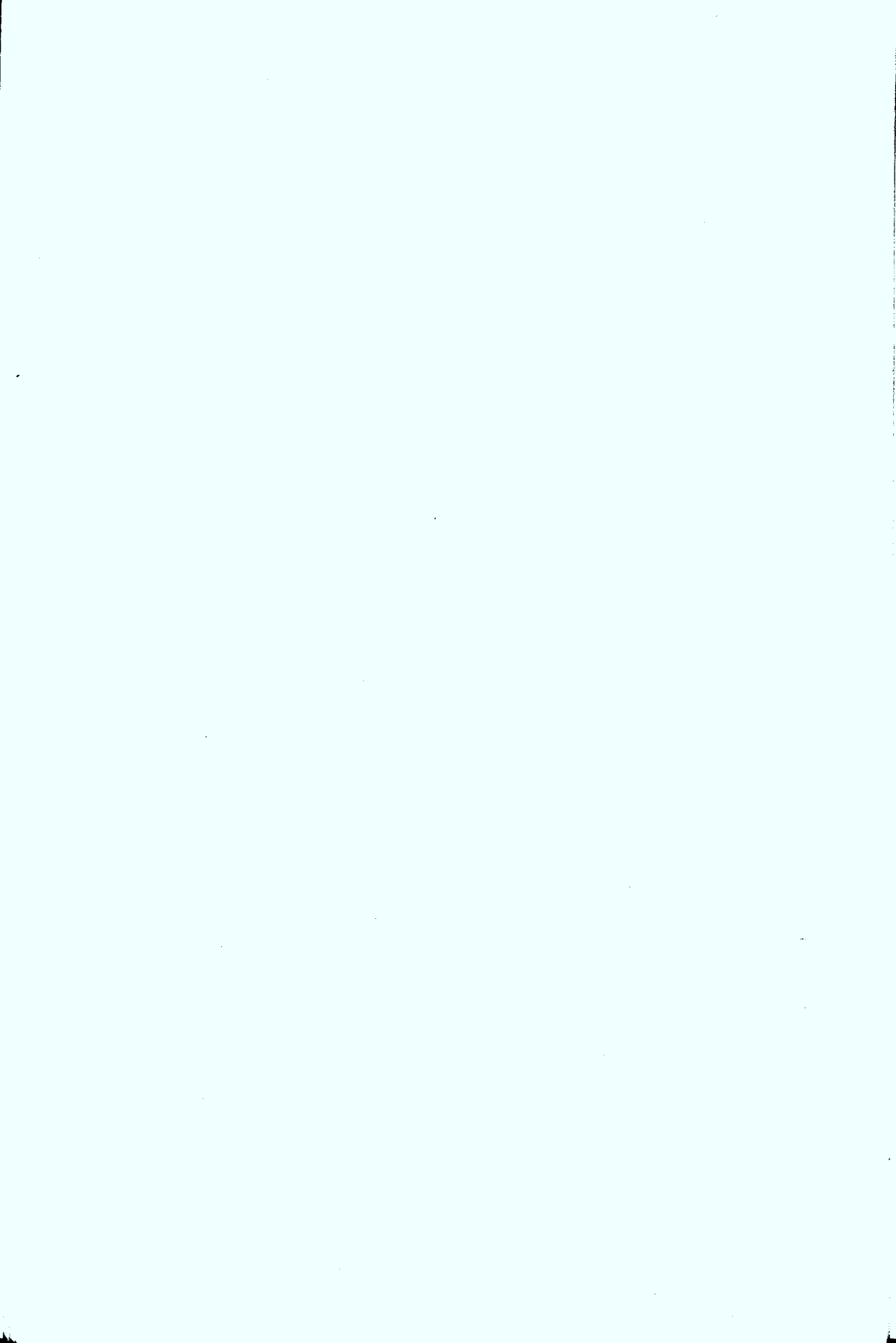
There are no "Buy-American Act" restrictions on Canadian supplies entering the U.S. when bought for defence use. The majority of products listed herein are free of U.S. duty. Details of duty-free-entry procedures and all other aspects of Production Sharing are detailed in the Production Sharing Handbook which is available from the nearest Canadian Government representative listed on pages XI and XII. Alternatively, copies are available free of charge from:

Chief, U.S. Market Development Division
International Defence Programs Branch
Department of Industry, Trade & Commerce
112 Kent Street
Ottawa 4, Ontario, Canada

A quick reference to the most common questions asked about production sharing procedures will be found on pages VI to IX.

This book does not pretend to be a complete catalogue of all Canadian defence products and capabilities. You are urged to discuss specific requirements with the nearest Canadian Government representative.

Section "A" of this book adopts the format of the Federal Supply Classification numerical index. The yellow pages, Section "B" covers those areas not included in the FSC system and the Illustrated Section demonstrates products and facility capabilities. The blue pages, Section "C" provides a generic description of the activities of the companies as well as a cross reference for detailed information.



HAVE YOU WONDERED ABOUT BUYING DEFENCE GOODS FROM CANADA —

Some of the questions asked most frequently by executives in U.S. defense industry are answered here:

1. Q. What advantages will I find in Canadian sources?

A. Apart from the military, economic, and political considerations of mutual benefit to both countries covered in U.S. Department of Defense Armed Services Procurement Regulation (ASPR) 6-501, you have open to you a large number of new sources from which to select a company that can offer you the best quality, delivery and price. Over 400 Canadian firms have been successful in obtaining defence prime and subcontracts on a straight competitive basis.

2. Q. Don't I have to "Buy American" in my defence work?

A. No. The Defense Department has waived the Buy American Act for Canadian materials and supplies used in defence material. Canadian goods are considered domestic for purposes of the "Buy American" clause in your defence contract. Regulations covering this are outlined in ASPR Clause 6-103.5 and in paragraph (a) (iii) of the clause "Buy American Act (May 1964)" (ASPR 6-104.5) in the prime contract.

3. Q. Do I have to pay duty to import Canadian items?

A. Only in rare cases. The great majority of Canadian products, when imported into the United States for defence use, are entitled to be free of U.S. customs duties. The items eligible for duty-free entry, as agreed between the two governments, are set out by Federal Supply Class. An up-to-date list is in the companion to this book, the "Production Sharing Handbook". All components of listed items and spare parts, whether or not they are themselves listed, are also eligible for duty-free entry.

4. Q. What procedures would I encounter in placing orders with Canadian firms.

A. The only additional requirement, when thinking of buying in Canada, is that you should ensure ASPR Clause 6-605.2 "Duty-Free Entry — Canadian Supplies" is in the prime contract in order to have any first-tier subcontract or lower-tier subcontract eligible for duty-free entry. This clause is included in most prime contracts automatically, but during pre-contractual negotiations, you should advise the DOD contracting officer of the possibility of your buying from Canada and ask for inclusion of the "Canadian" clause. This will not penalize you nor render you unresponsive, and it may save you money.

The contract number of the military prime contract (which must contain ASPR Clause 6-605.2) is to be shown on your purchase order placed with a Canadian supplier. The procedures that the Canadian suppliers must follow to have duty-free entry forms executed by U.S. Department of Defense officials are outlined in ASPR Clause 6-605.2.

5. Q. How can I locate sources in Canada?

A. This book lists some of the sources and provides basic information on individual firms. We urge you to use the field liaison officers and trade commissioners, listed on page XI to obtain more specific information on sources.

6. Q. How do Canadian firms quote?

A. They quote the same as U.S. firms — that is in U.S. dollars, f.o.b. destination or f.o.b. origin if you so request.

7. Q. How do Canadian firms differ from those in the United States?

A. Canadian industry is very similar to your own. They have good management, have maintained a state-of-the-art technical competence and have updated their production facilities. They are able to meet today's competition for price, quality and delivery and they accept the same terms, conditions and penalties as your own firms.

8. Q. Are Canadians familiar with MIL specifications?

A. Yes. MIL specifications are widely used throughout Canada, and Canadian military requirements are frequently based on MIL specifications. Canadian firms receive Quality Assurance approvals based on nearly identical requirements to those in the United States.

9. Q. My contract requires military source inspection. How can I buy important parts from Canada and yet meet that requirement?

A. An agreement between the United States and Canada provides for each country's military inspectors to inspect on behalf of the other, at no extra charge. Your resident military inspector can easily arrange for source inspection at your Canadian supplier's plant by the Quality Assurance Branch of Canada's Department of National Defence.

10. Q. I must use only parts which are Qualified Products to the appropriate MIL specification. Could a Canadian firm become qualified?

A. Yes. A U.S.-Canada agreement on reciprocal qualification provides for U.S. military agencies to accept Canadian products qualified in Canada, if the specifications are the same.

- 11. Q. I've heard of something called Canadian Commercial Corporation. If I buy from Canada, do I become involved with it?**
- A. The Canadian Commercial Corporation is an agency of the Canadian Government which exists to accept contracts for Canadian supplies and services, when other countries wish to buy them on a government-to-government basis. By U.S.-Canada agreement, all purchases by DOD agencies of Canadian material are made through the Corporation which accepts the U.S. defence contract and subcontracts completely to a mutually acceptable Canadian supplier. The Corporation is operated by the Department of Supply and Services, which is the procurement agency for the Canadian government. It buys for the U.S. military agencies in the same way as when buying for the Canadian Government. Defence subcontracts, from a U.S. company to a Canadian company do not involve the Corporation and, contractually, are a commercial undertaking. The CCC can, however, when requested by the Military Departments, arrange for subcontract audits at no charge, and similar matters.
- 12. Q. Do Canadian firms make regular "vendor" calls to U.S. industry?**
- A. Many Canadian firms do visit U.S. firms on a regular basis, either by using their sales or technical staff or by appointing a manufacturer's representative. However some of our most successful companies in terms of producing quality items at a competitive price maintain their leadership by low overheads. These overheads are as a result of smaller staffs who tend to visit on request only which is to your advantage both in your cost and your time. We suggest that you let the field officer or trade commissioner located near your area know of your buying requirements and he will arrange to have qualified Canadian companies, including smaller ones, visit your firm.
- 13. Q. If I have any difficulties in dealing with Canadian firms, such as a technical problem, or delinquent delivery, how do I deal with it?**
- A. The same as you would with any U.S. vendor. The fact that the company is located in Canada does not make it any more difficult to deal with a particular problem. We, of course, hope that you won't have any problems, but if you do and are not certain how to deal with it, our field staff will be pleased to offer advice.
- 14. Q. Aren't Canadian firms just too far away to make it feasible to use them?**
- A. Ninety percent of Canadian industry is located within one hundred miles of the U.S.-Canada border. You may find that some Canadian sources are closer to you than your current U.S. sources. You might also refer to the map on page X.
- 15. Q. Can I assume that the firms listed in this book are endorsed by the Canadian Government?**
- A. All the firms listed in the "Canadian Defence Commodities" book are considered to be reputable, but they have not been given any special "seal of approval" by the Canadian Government.

16. Q. Are there any problems with Customs in shipping bid set packages, including drawings and specifications, into Canada?

A. Not if the packages are properly marked. See page 79 of the 4th (1967) edition of the "Production Sharing Handbook".

17. Q. May I deal with Canada on matters which have a military classification?

A. Yes, within the provisions of U.S. national policy. The subject of classification, security, and the transmission of classified data is discussed at length in the "Production Sharing Handbook". This subject is too difficult to deal with in a short answer.

18. Q. I have government contracts that aren't defence, from NASA, FAA, AEC and others. Can I buy from Canadian firms on this work too?

A. Only for your NASA work. NASA has waived the Buy American Act for Canadian supplies, but U.S. duty must generally be paid. The Buy American Act prohibits you from using Canadian goods on contracts from any other Federal department or agency.

19. Q. How can I find out more?

A. Contact the nearest office listed on page XI or write or phone:

Chief

U.S. Market Development Division

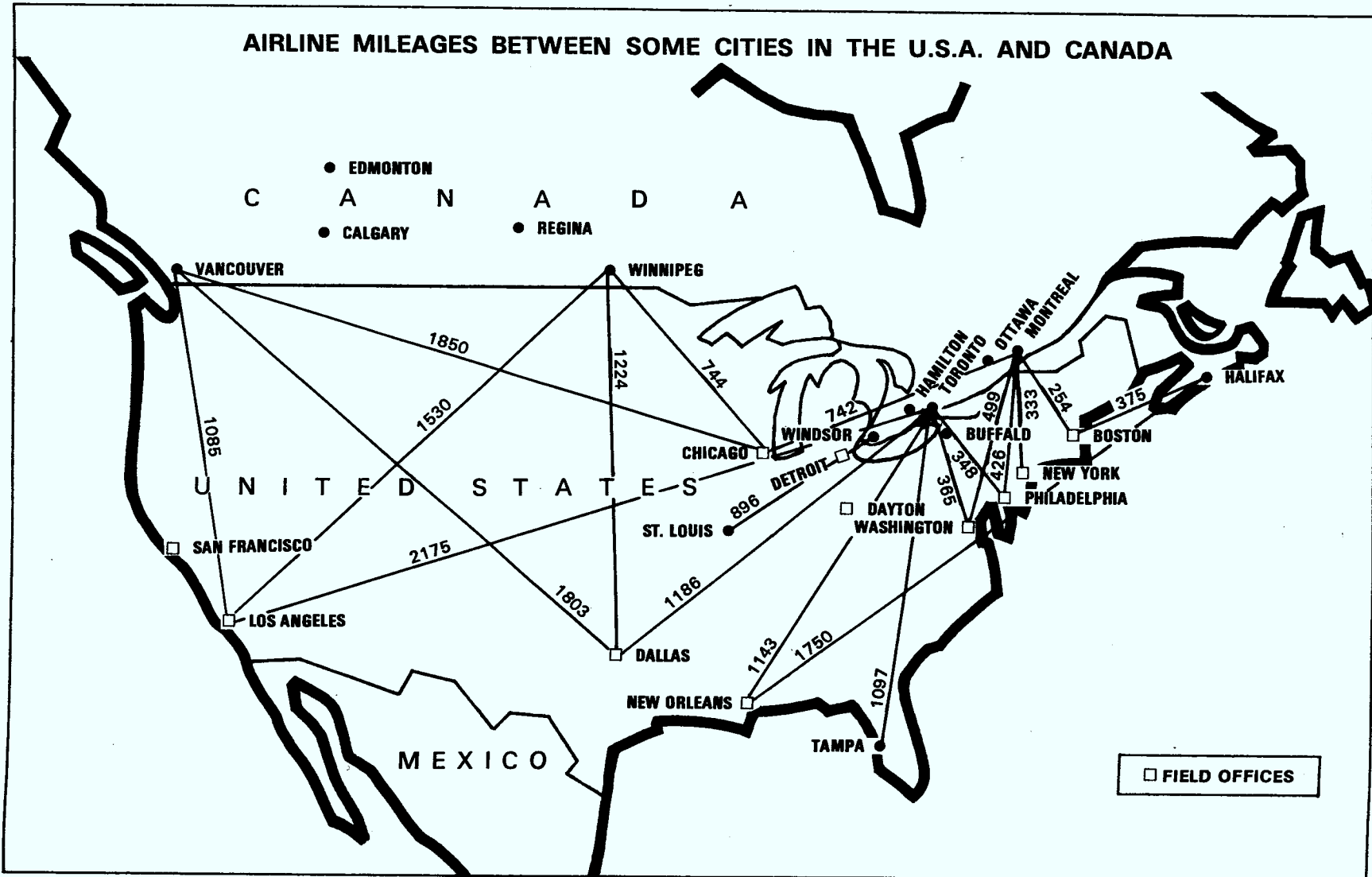
International Defence Programs Branch

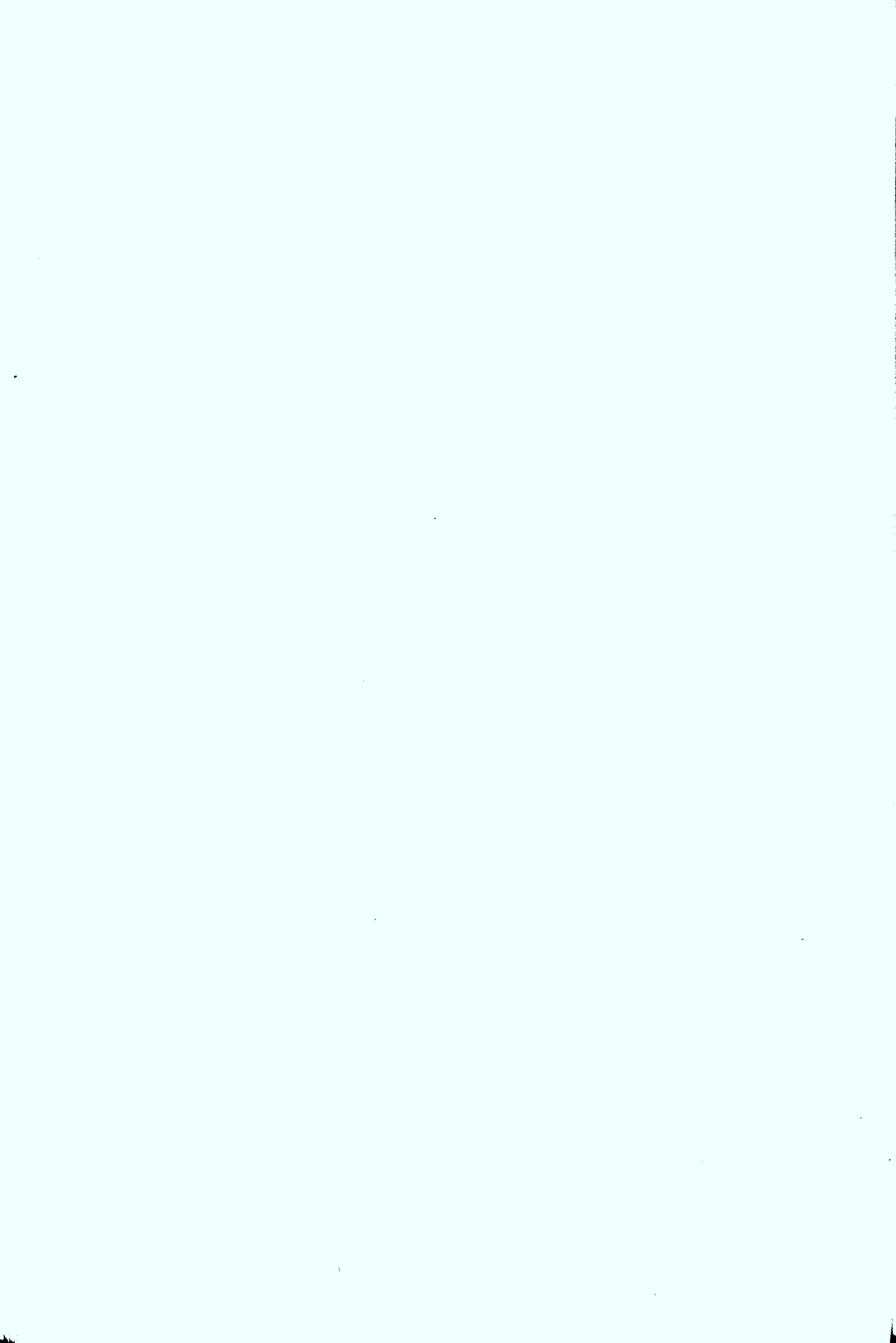
Department of Industry, Trade and Commerce

Ottawa 4, Ontario, Canada

613: 992-3456

AIRLINE MILEAGES BETWEEN SOME CITIES IN THE U.S.A. AND CANADA





CANADIAN PRODUCTION SHARING OFFICES IN THE U.S.

	Area Code	Telephone Number
WASHINGTON, D.C.		
Mr. F. T. Jackman	202	483-5505
Director & Counsellor (Defence Production)		
P.O. Box 4897		
Cleveland Park Station		
Washington, D.C. 20008		
 BOSTON, MASS.		
Mr. J. S. Vincent	617	274-9096
Canadian Liaison Officer (Defence Production)		
ESKZ/Building 1618/Stop #27		
c/o L. G. Hanscom Field		
Bedford, Massachusetts. 01730		
 CHICAGO, ILL.		
Mr. Z. W. Burianyk	312	427-1031
Consul & Trade Commissioner		
Canadian Consulate General		
310 South Michigan Ave., Suite 2000		
Chicago, Ill. 60604		
 DALLAS, TEXAS		
Mr. John A. Langley	214	742-8031
Consul & Assistant Trade Commissioner		
Canadian Consulate		
2100 Adolphus Tower		
1412 Main Street		
Dallas, Texas. 75202		
 DAYTON, OHIO		
Mr. A. E. Johnston	513	255-4382
Canadian Liaison Officer (Defence Production)		-4537
MCL/DDP		-4492
Wright Patterson Air Force Base		
Ohio. 45433		
 DETROIT, MICHIGAN		
Mr. John Morris	313	264-1100
Canadian Liaison Officer (Defence Production)		Ext. 2527
c/o Michigan Army Missile Plant		
38111 Van Dyke Avenue		
Warren, Michigan. 48090		

LOS ANGELES, CALIFORNIA

Mr. T. J. B. Robinson 213 796-0471
Canadian Liaison Officer (Defence Production) Ext. 597-598
Defense Contract Administration Services District
125 South Grand Avenue
Pasadena, California. 91109

NEW ORLEANS, LOUISIANA

Mr. Warren Maybee 504 525-2136
Consul & Assistant Trade Commissioner
Canadian Consulate General
2110 International Trade Mart
No. 2 Canal Street
New Orleans, Louisiana. 70130

NEW YORK, NEW YORK

Mr. W. G. Roberts 212 586-2400
Consul & Trade Commissioner Ext. 22
Canadian Consulate General
680 Fifth Avenue
New York, N.Y. 10019

PHILADELPHIA, PENNSYLVANIA

Mr. R. J. Rushka 215 271-3810
Canadian Liaison Officer (Defence Production)
Defense Personnel Support Center
Philadelphia, Pa. 19101
2800 South 20th Street

SECTION "A"

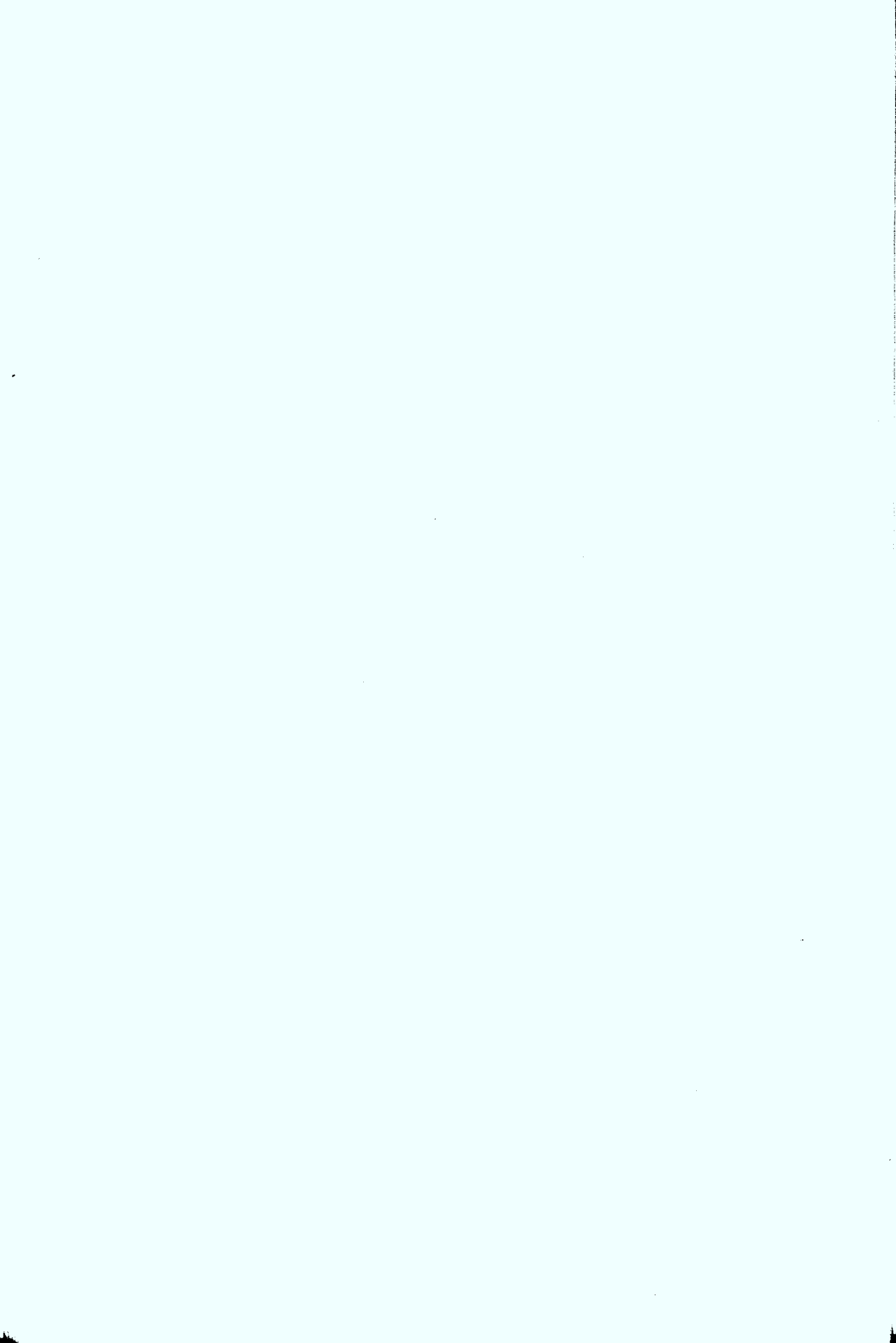


TABLE OF CONTENTS

ALPHABETICAL INDEX TO SECTION "A"

Section "A" (white pages)

INDEX OF COMMODITIES:	GROUP	PAGE
Weapons	10	A-1
Nuclear Ordnance	11	A-4
Fire Control Equipment	12	A-5
Ammunition and Explosives	13	A-8
Guided Missiles	14	A-18
Aircraft; and Airframe Structural Components	15	A-20
Aircraft Components and Accessories	16	A-22
Aircraft Launching, Landing, and Ground Handling Equipment ..	17	A-26
Space Vehicles	18	A-28
Ships, Small Craft, Pontoons, and Floating Docks	19	A-29
Ship and Marine Equipment	20	A-33
Railway Equipment	22	A-37
Motor Vehicles, Trailers, and Cycles	23	A-39
Tractors	24	A-41
Vehicular Equipment Components	25	A-42
Tires and Tubes	26	A-45
Engines, Turbines, and Components	28	A-46
Engine Accessories	29	A-49
Mechanical Power Transmission Equipment	30	A-52
Bearings	31	A-54
Woodworking Machinery and Equipment	32	A-56
Metalworking Machinery	34	A-57
Service and Trade Equipment	35	A-62
Special Industry Machinery	36	A-63
Construction, Mining, Excavating, and Highway		
Maintenance Equipment	38	A-66
Materials Handling Equipment	39	A-70
Rope, Cable, Chain, and Fittings	40	A-74
Refrigeration and Air Conditioning Equipment	41	A-75
Fire Fighting, Rescue, and Safety Equipment	42	A-77
Pumps and Compressors	43	A-79
Furnace, Steam Plant, and Drying Equipment;		
and Nuclear Reactors	44	A-81
Plumbing, Heating, and Sanitation Equipment	45	A-84
Water Purification and Sewage Treatment Equipment	46	A-86
Pipe, Tubing, Hose, and Fittings	47	A-87
Valves	48	A-90
Maintenance and Repair Shop Equipment	49	A-92
Hand Tools	51	A-94
Measuring Tools	52	A-97
Hardware and Abrasives	53	A-98
Prefabricated Structures and Scaffolding	54	A-102
Lumber, Millwork, Plywood, and Veneer	55	A-105

	GROUP	PAGE
Construction and Building Materials	56	A-106
Communication, Detection, and Coherent Radiation Equipment ..	58	A-109
Electrical and Electronic Equipment Components	59	A-125
Electric Wire, and Power Distribution Equipment	61	A-138
Lighting Fixtures and Lamps	62	A-145
Alarm and Signal System	63	A-146
Medical, Dental, and Veterinary Equipment and Supplies	65	A-147
Instruments and Laboratory Equipment	66	A-149
Photographic Equipment	67	A-156
Chemicals and Chemical Products	68	A-157
Training Aids and Devices	69	A-160
Furniture	71	A-162
Household and Commercial Furnishings and Appliances	72	A-164
Food Preparation and Serving Equipment	73	A-165
Office Machines, Visible Record Equipment, and Data Processing Equipment	74	A-166
Office Supplies and Devices	75	A-166
Books, Maps, and Other Publications	76	A-167
Recreational and Athletic Equipment	78	A-167
Cleaning Equipment and Supplies	79	A-167
Brushes, Paints, Sealers, and Adhesives	80	A-168
Containers, Packaging, and Packing Supplies	81	A-169
Textiles, Leather, and Furs	83	A-173
Clothing, Individual Equipment, and Insignia	84	A-174
Fuels, Lubricants, Oils, and Waxes	91	A-175
Nonmetallic Fabricated Materials	93	A-176
Metal Bars, Sheets, and Shapes	95	A-178
Ores, Minerals, and Their Primary Products	96	A-181
Miscellaneous	99	A-182

Section "B" (yellow pages)

INDEX OF SERVICES:

Aerial Surveying, Mapping and Services	B-3
Antenna, Antenna Farm And Surface Installations	B-4
Castings	B-4
Consulting and Design Services	B-6
Defence System Management	B-8
Forgings	B-9
Machining	B-10
Radioactive Materials, Instrumentation And Power Plants	B-13
Reliability Studies	B-14
Repair And Overhaul	B-14
Miscellaneous Services	B-15
Special Arctic Products	B-16

ILLUSTRATIONS

Section "C" (blue pages)

INDEX OF COMPANIES	
---------------------------------	--

ALPHABETICAL INDEX

TO

SECTION "A"

Nomenclature	F.S.C. Code No.	Page
Abrasive Materials	5350	A-101
Abrasives, Disks and Stones	5345	A-101
Accelerometers, Flight	6610	A-149
Actuators, Hydraulic	1650	A-23
Adhesives	8040	A-168
Aerial Pick-up and Delivery Equipment	1670	A-24
Aerial Surveying & Services	Yellow Pages	B-3
Aiming Circles	1290	A-7
Air Circulators, Non-industrial	4140	A-76
Air Conditioning Equipment, Aircraft	1660	A-23
Air Conditioning Plants and Components	4130	A-75
Air Conditioning Units and Accessories	4120	A-75
Air Purification Equipment	4460	A-83
Aircraft Accessories and Components	1680	A-24
Aircraft Brake Systems	1630	A-22
Aircraft, Fixed Wing	1510	A-20
Aircraft Launching Equipment	1720	A-26
Airframe, Structural Components	1560	A-20
Alarm Systems, Fire & Access	6350	A-146
Alarm Systems, Shipboard	6320	A-146
Altimeter Sets, Electronic	6610	A-149
Aluminum dip brazing	Yellow Pages	B-15
Ammunition & Components, through 30 mm	1305	A-8
Ammunition & Components, over 30 mm up to 75 mm	1310	A-8
Ammunition & Components, 75 mm through 125 mm	1315	A-9
Ammunition & Components, over 125 mm	1320	A-10
Ammunition, Miscellaneous	1395	A-17
Amplifiers, Communications, Radar, ASW, IR and Related Activities	58	A-109
Amplifiers, Electrical Control Equipment	6110	A-139
Analyzers, Electrical & Electronic Measuring & Testing	6625	A-150

Nomenclature	F.S.C. Code No.	Page
Antenna, Antenna Farm, & Surface Installations	Yellow Pages	B-4
Antennas and Related Equipment	5985	A-134
Architectural Metal Products	5670	A-107
Arctic Products	Yellow Pages	B-16
Arresters, Lightning	5920	A-127
Arresting Equipment, Aircraft	1710	A-26
Atlases	7640	A-167
Attenuators	5905	A-125
Autoclave bonding	Yellow Pages	B-15
Automatic Pilot Mechanisms	6615	A-149
Automatic Screw Machine Products	Yellow Pages	B-10
Axles, Vehicular	2530	A-43
Bags	8105	A-169
Bags, Duffle & Sleeping	8465	A-175
Bags, Household & Commercial	7240	A-164
Bags, Shipping	8105	A-169
Ballasts and Starters	6250	A-145
Barges, Cargo	1930	A-30
Barges, Special Purpose	1935	A-31
Barrier & Barricade Equipment, Aircraft	1710	A-26
Barriers, Grease & Waterproof	8135	A-171
Baskets, Wire	7290	A-164
Baskets, Wire, Waste Paper	7520	A-166
Bathythermograph Equipment	6655	A-153
Batteries, Primary & Components	6135	A-142
Batteries, Secondary, Components & Accessories	6140	A-143
Beacons, Marine	5825	A-114
Beacons, Radar	5840	A-118
Beacons, Radar, Airborne	5841	A-120
Beacons, Receivers & Transmitters	5825	A-114
Beacon Sets, Sonar	5845	A-121
Bearings, Anti-Friction, Unmounted	3110	A-54
Bearings, Mounted	3130	A-54
Bearings, Plain, Unmounted	3120	A-54
Belting & Accessories	3030	A-53
Belts, Drive	3030	A-53
Belts, Fan	3030	A-53

Nomenclature	F.S.C. Code No.	Page
Berets	8405	A-174
Binoculars	1240	A-5
Bins	7125	A-162
Biologicals	6505	A-147
Blanker, Interference, Radar	5840	A-118
Blanker, Interference, Radar, Airborne	5841	A-119
Blocks and Tackle	3940	A-71
Blowers, Industrial	4450	A-83
Boards, Plotting	5825	A-114
Boards, Plotting, Fire Control, Electrical & Mechanical	1220	A-5
Boards, Plotting, Navigation	6605	A-149
Boards, Printed Circuit	5999	A-136
Boats, Small Craft	1940	A-31
Boilers, Industrial	4410	A-81
Bolts	5306	A-98
Bombs & Components	1325	A-10
Bomb Sight Systems	1230	A-5
Books	7610	A-167
Bottles	8125	A-171
Boxes	8115	A-169
Boxes, Ammunition	8140	A-171
Boxes, Tool	5140	A-96
Brake Components, Vehicular	2530	A-43
Brake Systems, Aircraft	1630	A-22
Brazing, Aluminum Dip	Yellow Pages	B-15
Brazing Supplies, Miscellaneous	3439	A-59
Bridges, Fixed and Floating	5420	A-102
Brushes, Contact, Electrical	5977	A-134
Buckets, Crane & Concrete	3815	A-66
Buildings, Prefabricated and Portable	5410	A-102
Buoys	2050	A-35
Burners, Propane, Gas & Oil	4530	A-85
Cabinets	7125	A-162
Cable Assemblies, Communications	5995	A-135
Cable and Wire, Electrical	6145	A-143
Cameras, Motion Picture	6710	A-156
Cameras, Still Picture	6720	A-156

Nomenclature	F.S.C. Code No.	Page
Camouflage and Deception Equipment	1080	A-3
Cans	8110	A-169
Canteens	8465	A-175
Canvas Equipment, Items and Accessories	8465	A-175
Capacitors	5910	A-125
Caps, Men's	8405	A-174
Caps, Women's	8410	A-174
Capstans	3950	A-71
Capstans, Marine	2030	A-34
Carbon-Graphite Products	9620	A-181
Carbons, Arc	5977	A-134
Cargo Tie Down Equipment	1670	A-24
Cargo Vessels	1915	A-29
Cartons	8115	A-169
Cases, Metal & Plastic, Fire Control	1290	A-7
Cases, Tool	5140	A-96
Castings	Yellow Pages	B-4
Cavities, Tuned	58	A-109
Chain	4010	A-74
Chain, Transmission	3020	A-52
Charts	7640	A-167
Charts & Graphs	7530	A-166
Chassis, Electronic	58	A-109
Chemical Agents, Military	1365	A-15
Chemical & Pharmaceutical Manufacturing Machinery	3650	A-64
Chemical Specialities	6850	A-158
Chemical Weapons and Equipment	1040	A-3
Chemicals	6810	A-157
Chokes	5950	A-130
Circuit Breakers	5925	A-127
Circuits	5915	A-126
Cleaning Compounds	7930	A-167
Cleaning Kits, Ordnance	1005	A-1
Cloth, Packaging	7510	A-166
Clothing, Flight, and Accessories	8475	A-175
Clothing, Special Purpose	8415	A-174
Coats, Men's	8405	A-174
Coats, Women's	8410	A-174

Nomenclature	F.S.C. Code No.	Page
Coils, Electric	5950	A-130
Collets	5136	A-96
Collimators	1240	A-5
Communication Equipment, Infra-Red	5850	A-122
Communication Equipment, Miscellaneous	5895	A-123
Communication Equipment, Radio	5820	A-111
Communication Equipment, Radio, Airborne	5821	A-112
Compasses, Navigation	6605	A-149
Compressors	4310	A-79
Computers, Aircraft Gunnery	1270	A-6
Computers, Ballistic Data	1220	A-5
Computers, Combat Information	5895	A-123
Computers, Data Processing	7440	A-166
Computers, Depth Charge Release	1220	A-5
Computers, Guided Missile	1430	A-18
Computers, Mechanical	6605	A-149
Computers, Navigational	6605	A-149
Computers, Navigational, Airborne	5826	A-115
Computers, Navigational, Non-Airborne	5825	A-114
Computers, Radar Tracking	5840	A-118
Computers, Sonar Data	5845	A-121
Concrete Forms	5440	A-103
Condensers, Steam	4420	A-81
Connectors, Electrical	5935	A-128
Consoles, Control, Marine	2030	A-34
Consoles, Electric	58	A-109
Construction Equipment, Miscellaneous	3895	A-68
Construction Materials, Miscellaneous	5680	A-107
Consulting & Design Services	Yellow Pages	B-6
Containers	8115	A-169
Containers, Household & Commercial	7240	A-164
Containers, Special, Ammunition	8140	A-171
Controls	58	A-109
Controls & Control Systems, Electrical	6110	A-139
Controls, Deck Machinery	2030	A-34
Controls, Marine, Propulsion	2010	A-33
Controls, Slewing	5999	A-136
Converters	58	A-109

Nomenclature	F.S.C. Code No.	Page
Converters, Electrical, Non-Rotating	6130	A-142
Converters, Electrical, Rotating	6125	A-141
Conveyors	3910	A-70
Cooking, Baking & Warming Equipment, Food	7310	A-165
Cooling System Components, Engine	2930	A-50
Cooling System Components, Engine, Aircraft	2935	A-50
Cord Assemblies, Communications	5995	A-135
Cordage	4020	A-74
Cores, Electric	5950	A-130
Counter Measure Sets	5895	A-123
Couplings, Fluid & Shaft	3010	A-52
Covers & Cases, Fabric, Fire Control	1290	A-7
Covers, Fabric, Aircraft	1680	A-24
Covers, Fabric, Ordnance	10	A-1
Crane and Crane-Shovel Attachments	3815	A-66
Cranes	3950	A-71
Cranes and Crane-Shovels	3810	A-66
Crates	8115	A-169
Cryptologic Equipment	5810	A-110
Crystals, Quartz	5955	A-131
Crystals, Rectifying	5960	A-131
Cutlery and Flatware	7340	A-165
Cutting Equipment, Heat	3433	A-59
Cutting & Forming Tools for Secondary Metalworking Machinery	3456	A-61
Cutting Tools for Machine Tools	3455	A-60
Cylinders, Gas	8120	A-170
Data Processing Systems	7440	A-166
Decals	7690	A-167
Deck Machinery	2030	A-34
Decoders	58	A-109
Decontaminating Equipment	4230	A-77
Degaussing Equipment	1075	A-3
De-icing System Components, Aircraft	1650	A-23
Delay Line Sets	5820	A-111
Demolition Material	1375	A-16
Dental Instruments	6520	A-147

Nomenclature	F.S.C. Code No.	Page
Depth Charge Explosive Components	1361	A-15
Depth Charge Inert Components	1360	A-15
Derricks	3950	A-71
Design Services	Yellow Pages	B-6
Detectors, Audio & Video	58	A-109
Detectors, Electrical & Electronic Measuring & Testing	6625	A-150
Detectors, Hazard	6665	A-153
Dials	5355	A-101
Dials & Scales, Plastic, Navigation	6605	A-149
Diaphragms, Optical	1240	A-5
Dies, Hand & Machine	5136	A-96
Dies, Machine	3456	A-61
Direction Finder Sets	5826	A-115
Discriminators	58	A-109
Disinfectants	6840	A-158
Display Boards, Combat Information	5895	A-123
Distillation Equipment, Water	4620	A-86
Distribution Equipment, Electric	6110	A-139
Diving Equipment, Marine	4220	A-77
Docks, Floating	1945	A-31
Doors, Marine	2040	A-34
Doors, Metal	5670	A-107
Drafting Equipment	6675	A-154
Dredges	1955	A-32
Driers, Electric, Gas & Oil	4440	A-82
Drill Bits	5133	A-96
Drones	1550	A-20
Drugs	6505	A-147
Drums, Metal & Fibre	8110	A-169
Dry Cleaning Equipment	3510	A-62
Drydocks, Floating	1950	A-32
Dunnage Bags & Mattresses	3990	A-72
Dust Collectors	4460	A-83
Earth Boring Equipment	3820	A-66
Edge-lit Panels	5999	A-136
Electric Power and Distribution Equipment, Miscellaneous ..	6150	A-144
Electrical Components, Miscellaneous	5999	A-136

Nomenclature	F.S.C. Code No.	Page
Electrical Hardware and Supplies	5975	A-133
Electrical System Components, Engine, Aircraft	2925	A-50
Electro-Chemical & Discharge Machining	Yellow Pages	B-10
Electro-Magnetic Equipment, Airborne	6655	A-153
Electrodes, Electrical	5977	A-134
Electronic Components, Miscellaneous	5999	A-136
Elevators	3960	A-72
Engine Accessories, Aircraft, Miscellaneous	2995	A-51
Engine Accessories, Non-Aircraft, Miscellaneous	2990	A-51
Engines and Components, Diesel	2815	A-46
Engines and Components, Gasoline Reciprocating	2805	A-46
Engines and Components, Gasoline Reciprocating, Aircraft ..	2810	A-46
Engines and Components, Jet	2835	A-47
Engines and Components, Jet Aircraft	2840	A-48
Engines, Steam	2820	A-47
Equalizers, Receiver Gain	58	A-109
Erasers, Magnetic, Sound Recording	5835	A-118
Escalators	3960	A-72
Evaporators	4440	A-82
Explosives	13	A-8
Extrusions	Yellow Pages	B-15
Eye Pieces & Assemblies, Optical	1240	A-5
Fan Assemblies, Vehicle	2930	A-50
Fans, Industrial	4450	A-83
Fans, Non-industrial	4140	A-76
Fastening Devices	5325	A-99
Fencing	5660	A-106
Films, Plastic, Household and Commercial	7240	A-164
Filter Equipment, Safety	4240	A-78
Filters, Engine, Air and Oil	2940	A-51
Filters, Engine, Aircraft	2945	A-51
Filters, Fuel, Non-A/C	2910	A-49
Filters, Gas & Fluid	4330	A-80
Filters, Optical	1240	A-5
Filters, Pressure	4330	A-80
Filters, Wire Mesh	3650	A-64
Filters and Networks	5915	A-126

Nomenclature	F.S.C. Code No.	Page
Fire Control Designating & Indicating Equipment	1260	A-6
Fire Control Equipment, Miscellaneous	1290	A-7
Fire Control Test Equipment	4931	A-93
Fire Control Radar Equipment, Non-Airborne	1285	A-7
Fire Control Sonar Equipment	1287	A-7
Fire Control Systems, Complete	1230	A-5
Fire Control Transmitting & Receiving Equipment, Non-Airborne	1265	A-6
Fire Detection, Infra-Red	6665	A-153
Fire Fighting Equipment	4210	A-77
Fittings, Hose, Pipe & Tube	4730	A-88
Fixtures, Production	3465	A-62
Flags	8345	A-173
Flares	1370	A-15
Flasks	8120	A-170
Floats, Aircraft	1630	A-22
Footwear, Men's	8430	A-174
Footwear, Women's	8435	A-174
Forgings	Yellow Pages	B-9
Forms, Record	7530	A-166
Frequency Converters	58	A-109
Frequency Converter-Transmitters	58	A-109
Frequency Dividers	58	A-109
Frequency Doublers	58	A-109
Frequency Multipliers	58	A-109
Fuel Dispensing Equipment	4930	A-93
Fuel System Components, Engine	2910	A-49
Fuel System Components, Engine, Aircraft	2915	A-49
Fuels, Liquid Propellant	9135	A-175
Fungicides	6840	A-158
Furnaces	4430	A-82
Furniture and Fixtures, Miscellaneous	7195	A-163
Furniture, Hospital	6530	A-147
Furniture, Marine, Custom, Steel & Wood	2090	A-36
Furniture, Office	7110	A-162
Fuse Setters	1290	A-7
Fuses, Ammunition	13	A-8
Fuses, Electrical	5920	A-127

Nomenclature	F.S.C. Code No.	Page
Galley Equipment	4510	A-84
Galley Equipment, Aircraft	1680	A-24
Gas Generating Equipment	3655	A-64
Gases: Compressed and Liquefied	6830	A-158
Gasket Materials	5330	A-99
Gates	5660	A-106
Gauges, Electrical & Electronic Measuring & Testing	6625	A-150
Gauges, Inspection & Precision	5220	A-97
Gauges, Measuring	5210	A-97
Gear Boxes	3010	A-52
Gears	3020	A-52
Generators & Generator Sets, Electrical	6115	A-140
Generators, Multi-Type	58	A-109
Generators, Pulse	58	A-109
Generators, Pulse Sweep	58	A-109
Generators, Signal	5895	A-123
Generators, Sweep	58	A-109
Gliders	1540	A-20
Graders, Road, Motorized	3805	A-66
Graphs & Charts	7530	A-166
Grenades & Components	1330	A-11
Ground Servicing Equipment, Aircraft	1730	A-26
Guided Missile Components	1420	A-18
Guided Missile Handling & Servicing Equipment	1450	A-19
Guided Missile Maintenance, Repair & Checkout Equipment	4935	A-93
Guided Missile Remote Control Systems	1430	A-18
Guided Missiles	1410	A-18
Guns & Accessories, through 30 mm	1005	A-1
Guns & Accessories, over 30 mm up to 75 mm	1010	A-1
Guns & Accessories, 75 mm through 125 mm	1015	A-2
Gun Components, over 125 mm through 150 mm	1020	A-2
Gun Components, over 150 mm through 200 mm	1025	A-3
Gyro Components, Airborne	6615	A-149
Hand Tools, Edged, Non-powered	5110	A-94
Hand Tools, Non-edged, Non-powered	5120	A-94
Hand Tools, Power Driven	5130	A-95
Handsets, Communication	5965	A-132

Nomenclature	F.S.C. Code No.	Page
Hangars, Shipboard	5410	A-102
Hardware, Marine	2040	A-34
Hardware, Miscellaneous	5340	A-100
Harness Assemblies, Communications	5995	A-135
Headsets	5965	A-132
Heat Exchangers	4420	A-81
Heaters, Propane, Gas & Oil	4530	A-85
Heaters, Space	4520	A-84
Heaters, Water, Domestic	4520	A-84
Heating Equipment	4520	A-84
Heating Equipment, Aircraft	1660	A-23
Heating Equipment, Miscellaneous	4540	A-85
Helmets & Hoods, Safety & Rescue	4240	A-77
Herbicides	6840	A-158
Hoists	3950	A-71
Homing Sets, Radio	5825	A-114
Homing Sets, Radio, Airborne	5826	A-116
Hoods, Cold Weather	8405	A-174
Hose, Flexible	4720	A-88
Hospital Equipment, Utensils and Supplies	6530	A-147
Huts, Prefabricated	5410	A-102
Hydraphones	5845	A-121
Hydraulic and Pneumatic Presses, Power Driven	3442	A-60
Hydraulic Systems & Components, Aircraft	1650	A-23
Incendiary Mixtures	1365	A-15
Indicators	58	A-109
Indicators, Crash-Position, A/C	6695	A-155
Indicators, Digital Display	7440	A-166
Indicators, Electrical & Electronic Measuring & Testing	6625	A-150
Infra-Red Communication Equipment	5850	A-122
Infra-Red Equipment, Night Vision	5855	A-122
Insecticides	6840	A-158
Instruments, Astronomical	6655	A-153
Instruments, Chemical Analysis	6630	A-151
Instruments, Dental	6520	A-147
Instruments, Electrical & Electronic Properties Measuring & Testing	6625	A-150

Nomenclature	F.S.C. Code No.	Page
Instruments, Flight	6610	A-149
Instruments, Gas Flow	6680	A-154
Instruments, Geophysical	6655	A-153
Instruments, Hazard-detecting	6665	A-153
Instruments, Liquid	6680	A-154
Instruments, Liquid Level	6680	A-154
Instruments, Mechanical Motion Measuring	6680	A-154
Instruments, Medical and Surgical	6515	A-147
Instruments, Meteorological	6660	A-153
Instruments, Miscellaneous	6695	A-155
Instruments, Navigational	6605	A-149
Instruments, Optical	6650	A-153
Instruments, Pressure	6685	A-155
Instruments, Temperature	6685	A-155
Instruments, Time Measuring	6645	A-152
Insulation Materials	5640	A-106
Insulation, Sound & Thermal	5640	A-106
Insulators & Insulating Materials, Electrical	5970	A-132
Intercommunication and Public Address Systems	5830	A-117
Intercommunication Systems, Airborne	5831	A-117
Interrogation Sets	5825	A-114
Intervalometers	6645	A-152
Inverters, Rotary	6125	A-141
Inverters, Static	6130	A-142
Jacks & Boxes, Electrical	5935	A-128
Jigs	3465	A-162
Keyers, Frequency Shift	5805	A-109
Keyers, Telephone & Telegraph	5805	A-109
Keys	5315	A-99
Kilns	4430	A-82
Kitchen Equipment and Appliances	7320	A-165
Kitchen Hand Tools and Utensils	7330	A-165
Knobs	5355	A-101
Laboratory Equipment	6640	A-152
Ladders	5440	A-103
Lampholders	6250	A-145

Nomenclature	F.S.C. Code No.	Page
Lamps, Electric	6240	A-145
Land Mines & Components	1345	A-13
Landing Gear, Aircraft	1620	A-22
Landing Systems, Helicopter, Shipboard	1710	A-26
Lasers & Components	5860	A-123
Lathes	3416	A-57
Launchers, Depth Charge	1045	A-3
Launchers, Guided Missile	1440	A-19
Launchers, Pypotechnic	1055	A-3
Launchers, Rocket	1055	A-3
Launchers, Torpedo	1045	A-3
Launching Equipment, Aircraft	1720	A-26
Laundry Equipment	3510	A-62
Lehrs	4430	A-82
Lenses, Optical	6760	A-156
Lenses, Optical, Fire Control	1240	A-5
Lifesaving Equipment, Marine	4220	A-77
Light-Gun, Radar Target	5840	A-118
Light-Gun, Radar Target, Airborne	5841	A-120
Lighters, Cargo	1930	A-30
Lighters, Special Purpose	1935	A-31
Lighting Equipment, Electric, Portable and Hand	6230	A-145
Lighting Fixtures, Electric, Indoor and Outdoor	6210	A-145
Lightning Arresters	5920	A-127
Lights, Aiming	1290	A-7
Lockers	7125	A-162
Locomotive Accessories and Components	2240	A-37
Locomotives	2210	A-37
Logging Machinery	3695	A-64
Lubrication Equipment	4930	A-93
Luggage	8460	A-174
Lumber and Materials	5510	A-105
Machine, Pulping, Document Destruction	9999	A-182
Machine Tool Accessories	3460	A-61
Machine Tools, Miscellaneous	3419	A-57
Machinery, Industrial, Special	3695	A-64
Machinery, Pulp and Paper	3615	A-63

Nomenclature	F.S.C. Code No.	Page
Machinery, Rubber Working	3620	A-64
Machines, Drilling	3413	A-57
Machines, Grinding	3415	A-57
Machines, Milling	3417	A-57
Machines, Woodworking	3220	A-56
Machining	Yellow Pages	B-10
Magnetometers	6655	A-153
Maintenance Equipment, Aircraft	4920	A-92
Maintenance Kits, Ordnance	1005	A-1
Maintenance & Repair Shop Specialized Equipment, Miscellaneous	4940	A-93
Maintenance & Repair Shop, Motor Vehicle	4910	A-92
Map Displays, Navigation	5826	A-116
Maps	7640	A-167
Marine Hardware	2040	A-34
Markers, Adhesive	7690	A-167
Masks, Safety and Rescue	4240	A-77
Materials Handling Equipment, Miscellaneous	3990	A-72
Materials Handling Equipment, Non-Propelled	3920	A-70
Medical Equipment	6515	A-147
Megaphones, Electronic	5830	A-117
Megaphones, Electronic, Airborne	5831	A-117
Mess Kits	7360	A-165
Metal, Additive Materials	9630	A-181
Metal, Alloys	9630	A-181
Metal, Bars, Iron & Steel	9510	A-178
Metal, Bars, Non-Ferrous, Base	9530	A-179
Metal, Base, Non-Ferrous	9530	A-179
Metal, Base, Non-Ferrous, Intermediate Forms	9650	A-181
Metal, Billets, Ferrous	9640	A-181
Metal Finishing Equipment	3426	A-58
Metal, Foil, Non-Ferrous	9535	A-179
Metal Heat Treating Equipment	3424	A-58
Metal, Ingots, Iron & Steel	9640	A-181
Metal, Pigs, Iron & Steel	9640	A-181
Metal, Plate, Iron & Steel	9515	A-178
Metal, Plate, Non-Ferrous	9535	A-179
Metal, Rods, Iron & Steel	9510	A-178

Nomenclature	F.S.C. Code No.	Page
Metal, Rods, Non-Ferrous, Base	9530	A-179
Metal, Sheet, Iron & Steel	9515	A-178
Metal, Sheet, Non-Ferrous	9535	A-179
Metal, Sheet, Precious Metal	9545	A-180
Metal, Strip, Iron & Steel	9515	A-178
Metal, Strip, Non-Ferrous	9535	A-179
Metal, Structural Shapes, Ferrous	9520	A-179
Metal, Structural Shapes, Non-Ferrous	9540	A-180
Meteorological Instruments & Apparatus	6660	A-153
Meters, Electrical & Electronic Measuring & Testing	6625	A-150
Microphones	5965	A-132
Mine Sweeping Equipment	1075	A-3
Mine, Underwater, Explosive Components	1351	A-14
Mine, Underwater, Inert Components	1350	A-14
Mining Equipment	3820	A-66
Mirrors, Optical	1240	A-5
Modulators	58	A-109
Monitors, Hazard	6665	A-153
Mortuary Equipment	9930	A-182
Motor Vehicles, Passenger	2310	A-39
Motors, Electrical	6105	A-138
Mounts, Optical Instrument	1240	A-6
Multiplexers, Telephone & Telegraph	5805	A-109
Multiplexers, Teletype & Facsimile	5815	A-110
Nails	5315	A-99
Navigation Equipment, Radio	5825	A-114
Navigation Equipment, Radio, Airborne	5826	A-115
Nets, Cargo	1670	A-24
Networks and Filters	5915	A-126
Night Vision Equipment	5855	A-122
Nuclear Instrumentation & Plants	Yellow Pages	B-13
Nuclear Materials	Yellow Pages	B-13
Nuts	5310	A-98
Oils and Greases: Cutting, Lubricating & Hydraulic	9150	A-175
Ores	9610	A-181
Oscillators	58	A-109

Nomenclature	Code No. F.S.C.	Page
Ovens	4430	A-82
Oxygen Systems, Aircraft	1660	A-23
Packages, Ammunition	8140	A-171
Packaging and Packing Materials	8135	A-171
Packboards	8465	A-175
Packing Seals, Etc.	5330	A-99
Paint Spray Equipment & Accessories	4940	A-93
Paints	8010	A-168
Pallets	8115	A-169
Pallets & Pallet Racks	3990	A-72
Pamphlets	7610	A-167
Panels, Control & Distribution	6110	A-139
Panels, Edgelit	5999	A-136
Panels, Electric	6110	A-139
Panels, Patching, Communication	58	A-109
Paper, Building	5640	A-106
Paper, Creped, Packaging	7510	A-166
Paper and Paperboard	9310	A-176
Parachutes	1670	A-24
Parkas, Arctic	8415	A-174
Paving Breakers, Etc.	3820	A-66
Pennants	8345	A-173
Petroleum Production and Distribution Equipment	3835	A-68
Photographic Developing Equipment	6740	A-156
Photographic Equipment and Accessories	6760	A-156
Photographic Finishing Equipment	6740	A-156
Photographic Supplies	6750	A-156
Piezoelectric	5955	A-131
Pins	5315	A-99
Pipe & Tube	4710	A-87
Planers	3418	A-57
Planing Mill Machinery	3210	A-56
Plastic Fabricated Materials	9330	A-176
Plate Bending Rolls	3441	A-59
Plates, Identification	7690	A-167
Plotting Systems, Navigation	6605	A-149
Plumbing Equipment, Miscellaneous	4540	A-85
Plumbing Fixtures and Accessories	4510	A-84

Nomenclature	F.S.C. Code No.	Page
Pointers	5355	A-101
Polishing Compounds	7930	A-167
Pontoons	1945	A-31
Posts, Aiming	1290	A-7
Potentiometers	5905	A-125
Power Supplies	58	A-109
Power Transmission Equipment, Miscellaneous	3040	A-53
Preservative and Sealing Compounds	8030	A-168
Presses, Manual	3444	A-60
Presses, Mechanical, Power Driven	3443	A-60
Pressure and Vacuum Filters	4330	A-80
Pressure Vessels	8120	A-170
Pressurizing Equipment, Aircraft	1660	A-23
Primers, Ammunition	1390	A-16
Primers, Wood	8010	A-168
Printed Circuit Boards	5999	A-136
Prisms	1240	A-6
Probes, Radiac	6665	A-153
Propellants	13	A-8
Propellants, Liquid	9135	A-175
Propulsion Components, Marine	2010	A-33
Public Address Systems	5830	A-117
Public Address Systems, Airborne	5831	A-117
Pulleys	3020	A-52
Pumps, Fuel	2910	A-49
Pumps, Fuel, Aircraft	2915	A-49
Pumps, Hydraulic, Aircraft	1650	A-23
Pumps, Power and Hand	4320	A-79
Pumps, Vacuum	4310	A-79
Pumps, Water, Vehicle	2930	A-50
Punching Machines	3445	A-60
Purification Equipment, Water	4610	A-86
Pyrotechnics	1370	A-15
Racks	7125	A-162
Radar Equipment	5840	A-118
Radar Equipment, Airborne	5841	A-119

Nomenclature	F.S.C. Code No.	Page
Radar Mapping	5840	A-118
Radar Mapping, Airborne	5841	A-120
Radar, Missile Tracking	5840	A-118
Radar, Missile Tracking, Airborne	5841	A-120
Radar Sets	5840	A-118
Radar Sets, Airborne	5841	A-120
Radar, Target Alarm	5840	A-118
Radar, Target Alarm, Airborne	5841	A-120
Radar, Terrain Clearance	5841	A-120
Radiator Cores	2930	A-50
Radioactive Materials	Yellow Pages	B-13
Radio-Telephones	5820	A-111
Radomes, Platforms & Structures, non-airborne	5985	A-134
Rail Car Accessories and Components	2240	A-37
Rail Cars	2220	A-37
Railroad Construction and Maintenance Equipment	2230	A-37
Range Finders	1240	A-6
Ranging Equipment, Optical	1240	A-5
Reactors, Nuclear	4470	A-83
Reagents	6505	A-147
Receiver-Transmitter, Loran	5825	A-114
Receivers	58	A-109
Recorder-Reproducer, Tape, Sound	5835	A-118
Recorders, Digital	7440	A-166
Recorders, Flight Data	6605	A-149
Recording Equipment, Sound	5835	A-118
Rectifying Equipment, Electrical	6130	A-142
Reels and Spools	8130	A-171
Reflectors, Antenna	5985	A-134
Refractories	9350	A-177
Refrigeration Plants and Components	4130	A-75
Refrigeration Units and Accessories	4110	A-75
Regulators, Electric	6110	A-139
Relays	5945	A-129
Reliability Studies	Yellow Pages	B-14
Repair & Overhaul	Yellow Pages	B-14
Repair Shop Equipment, Aircraft	4920	A-92

Nomenclature	F.S.C. Code No.	Page
Repellent, Rain, Windscreen	6850	A-159
Repellent, Rain, Windscreen, Aircraft	1680	A-24
Replenishment Systems, Marine, Underway	2020	A-33
Rescue Equipment	4240	A-77
Resins	8030	A-168
Resistors	5905	A-125
Resolvers and Synchros	5990	A-135
Reticles & Assemblies & Projectors	1240	A-6
Rigging & Rigging Gear, Marine	2020	A-33
Rigging and Slings	3940	A-71
Rock Drilling Equipment	3820	A-66
Rocket Ammunition	1340	A-12
Rocket Components	1340	A-12
Rockets	1340	A-12
Rolling Mills	3422	A-58
Roofing Materials	5650	A-106
Rope	4020	A-74
Rubber Fabricated Materials	9320	A-176
Rudders & Components, Marine	2040	A-34
Safety Equipment	4240	A-77
Sanitation Equipment, Miscellaneous	4540	A-85
Sawmill Machinery	3210	A-56
Scaffolding Equipment	5440	A-103
Scales, Cathode Ray Tube	5841	A-120
Scales & Fans, Fire Control	1220	A-5
Screening, Metal	5335	A-100
Screens, Wire Mesh	3650	A-64
Screw Machine Products	Yellow Pages	B-10
Screws	5305	A-98
Sealers, Wood, Etc.	8010	A-168
Sealing and Preservative Compounds	8030	A-168
Seats, Ejection, Aircraft	1680	A-24
Semi-Conductors & Hardware	5961	A-132
Separators, Liquid	4330	A-80
Sewage Treatment Equipment	4630	A-86
Shearing Machines	3445	A-60
Shelters, Prefabricated	5410	A-102

Nomenclature	F.S.C. Code No.	Page
Shelving	7125	A-162
Ship and Marine Equipment, Miscellaneous	2090	A-36
Ships, Combat	1905	A-29
Ships, Fishing	1920	A-30
Ships, Landing	1905	A-29
Ships, Special Service	1925	A-30
Ships, Transport, Passenger and Troop	1910	A-29
Shocks, Vehicular	2540	A-44
Shoe Repair Equipment	3520	A-62
Shrink Fitting Equipment, Metal	3449	A-60
Siding Materials	5650	A-106
Sighting Equipment, Optical	1240	A-5
Sights, Bore	1240	A-6
Sights, Computing, Fire Control	1220	A-5
Sights, Mechanical	1240	A-6
Sightunits	1240	A-6
Signal Systems, Alarm & Fire	6350	A-146
Signal Systems, Shipboard	6320	A-146
Signals, Distress, Illumination & Smoke	1370	A-15
Signals, Railroad	6330	A-146
Simulators, Counter Measure, Signal	58	A-109
Skis, Aircraft	1630	A-22
Skis, Helicopter	1680	A-24
Sleds, Material Handling and Quarters	3920	A-70
Slings and Rigging	3940	A-71
Snow Clearing Equipment	3825	A-68
Snow Plows, Vehicle Mounted	3830	A-68
Snowshoes	8465	A-175
Soldering Supplies, Miscellaneous	3439	A-59
Solenoids	5945	A-129
Solid Fuels, Guided Missile	1337	A-12
Sonar Detection and Ranging	5845	A-121
Sonar Domes	5845	A-121
Sonar Equipment	5845	A-121
Sound Equipment, Underwater	5845	A-121
Sound Reproducing Equipment	5835	A-118
Speakers, Radio	5965	A-132
Spools and Reels	8130	A-171

Nomenclature	F.S.C. Code No.	Page
Spotting Instruments, Optical	1240	A-6
Spray Equipment, Helicopter	1680	A-24
Spreaders, Aggregate, Salt & Sand	3830	A-68
Sprockets	3020	A-52
Standards, Electrical & Electronic Measuring & Testing	6625	A-150
Starters and Ballasts	6250	A-145
Steering Components, Vehicular	2530	A-43
Strainers, Engine, Air and Oil	2940	A-51
Strainers, Engine, Aircraft	2945	A-51
Structures, Prefabricated, Miscellaneous	5450	A-104
Studs	5307	A-98
Suits, Fire Rescue	4240	A-78
Surgical Equipment	6515	A-147
Switchboards, Communications	5805	A-109
Switchboards, Marine & Power	6110	A-139
Switches	5930	A-127
Synchros and Resolvers	5990	A-135
Systems Management	Yellow Pages	B-8
Tackle and Blocks	3940	A-71
Tanker Vessels	1915	A-29
Tanks, Aircraft, Fuel & Oil	1560	A-20
Tanks, Non-Corrosive	3650	A-64
Tanks, Pressure & Gases	8120	A-170
Tanks, Rubber, Fuel	2910	A-49
Tanks, Rubber, Fuel, Aircraft	2915	A-49
Tanks, Storage	5430	A-103
Tape Readers & Re-winders	5835	A-118
Tape Reproducers, Recorders & Scanners	5821	A-113
Taps & Dies	5136	A-96
Telegraph Equipment	5805	A-109
Telemetry Systems	58	A-109
Telephone Equipment	5805	A-109
Telephones, Field	5805	A-109
Telescopes	1240	A-6
Teletype Equipment	5805	A-109
Television Equipment, Non-airborne	5820	A-111
Television Systems	5820	A-111

Nomenclature	F.S.C. Code No.	Page
Templates	3465	A-62
Terminal Strips	5940	A-129
Terminals	5940	A-129
Testers, Electrical & Electronic Measuring & Testing	6625	A-150
Testing Equipment, Physical Properties	6635	A-152
Thinners	8010	A-168
Tire Rebuilding and Repair Materials	2640	A-45
Tires, Pneumatic, Aircraft	2620	A-45
Tires, Pneumatic, Non-aircraft	2610	A-45
Tires, Solid and Cushion	2630	A-45
Toboggans	3920	A-70
Tool Kits	5180	A-96
Tools, Measuring, Craftsmen's	5210	A-97
Torpedo Explosive Components	1356	A-15
Torpedo Inert Components	1355	A-14
Torque Converters and Speed Changers	3010	A-52
Tote Boxes	5140	A-96
Tower Structures, Prefabricated	5445	A-104
Towing, Bathythermograph	2030	A-34
Track Components, Vehicular	2530	A-43
Tractor Attachments	3830	A-68
Tractors, Full Track, Low Speed	2410	A-41
Tractors, Muskeg & Arctic	2410	A-41
Tractors, Snow Clearance	2320	A-39
Tractors, Track Laying, High Speed	2430	A-41
Tractors, Warehouse, Self-propelled	3930	A-71
Traffic Control Systems	6310	A-146
Trailers	2330	A-40
Trailers, Specialized, Airfield	1740	A-27
Training Aids	6910	A-160
Training Devices	6930	A-160
Training Devices, Armament	6920	A-160
Training Devices, Communication	6940	A-161
Transformers	5950	A-130
Transformers: Distribution and Power Station	6120	A-141
Transformers, Telephone & Telegraph	5805	A-109
Transistors	5960	A-131
Transmission Components, Vehicular	2520	A-43

Nomenclature	F.S.C. Code No.	Page
Transmissions	3010	A-52
Transmitters	58	A-109
Trousers, Arctic	8405	A-174
Truck Attachments	3830	A-68
Trucks, Hand, Material Handling	3920	A-70
Trucks, Refuel	2320	A-39
Trucks, Refuse	2320	A-39
Trucks, Specialized, Airfield	1740	A-27
Trucks, Warehouse, Self-propelled	3930	A-71
Trucks, Water	2320	A-39
Tube & Pipe	4710	A-87
Tubes, Electron	5960	A-131
Tubes, Metal	8110	A-169
Tubes, Metal, Shipping	8140	A-171
Tubes, Pneumatic, Aircraft	2620	A-45
Tubes, Pneumatic, Non-aircraft	2610	A-45
Tubing, Flexible	4720	A-88
Turbines and Components, Gas	2835	A-47
Turbines and Components, Gas, Aircraft	2840	A-48
Turbines and Components, Steam	2825	A-47
Turntables, Radar	5840	A-118
Twine	4020	A-74
Vacuum System Components, Aircraft	1650	A-23
Valves, Non-powered incl. Nuclear & Marine	4820	A-90
Valves, Powered, incl. Nuclear & Marine	4810	A-90
Varnishes	8010	A-168
Vehicle Components, Body, Cab & Frame	2510	A-42
Vehicle Components, Miscellaneous	2590	A-44
Vehicles, Arctic	2320	A-39
Vehicles, Furniture and Accessories	2540	A-44
Vehicles, Muskeg	2320	A-39
Vehicles, Tracked, Snow	2320	A-39
Vehicular Lights and Fixtures	6220	A-145
Wallboard	5640	A-106
Warheads, Depth Charge	1361	A-15
Warheads, Guided Missile	1336	A-12
Warheads, Torpedo	1356	A-15

Nomenclature	F.S.C. Code No.	Page
Warning Devices, Railroad	6330	A-146
Washers and Spacers	5310	A-98
Waveguides and Related Equipment	5985	A-134
Weapons, Miscellaneous	1095	A-4
Web Equipment, Items and Accessories	8465	A-175
Welding Equipment	3433	A-59
Welding Equipment, Electric Arc	3431	A-58
Welding Equipment, Electric Resistance	3432	A-59
Welding Supplies, Miscellaneous	3439	A-59
Wheel Systems, Aircraft	1630	A-22
Wheels, Telephone, Dials	5805	A-109
Wheels, Vehicular	2530	A-43
Winches	3950	A-71
Winches, Aircraft	1680	A-24
Winches, Marine	2030	A-34
Windlasses	3950	A-71
Windlasses, Marine	2030	A-34
Windows, Marine	2040	A-35
Wire Assemblies, Communications	5995	A-135
Wire and Cable, Electrical	6145	A-143
Wire, Non-Electrical, Ferrous	9505	A-178
Wire, Non-Electrical, Non-Ferrous	9525	A-179
Wire, Precious Metal	9545	A-180
Wire Rope	4010	A-74
X-Ray Equipment and Supplies	6525	A-147
Zippers	5325	A-99

Section "A"
GROUP 10
WEAPONS

1005 GUNS, THROUGH 30 MM

1. Adapters, gun-mount.
2. Bags, fabric.
3. Barrel forgings.
4. Bayonet scabbards.
5. Bayonets.
6. Bipods, machine gun.
7. Bipod, legs.
8. Bipods, rifle.
9. Bipod yokes.
10. Covers, canvas.
11. Fore ends, rifle, fibreglass.
12. Grips, pistol, plastic.
13. Kits, cleaning.

Atlas Steels Co.
3.17.

B.I.R. Precision Products
23.

Wm. Bartlett & Sons Ltd.
2.10.

Canada Cycle & Motor Co. Ltd.
4.6.7.8.

Canadian Arsenals Ltd. (Small Arms
Div.)
6.7.8.9.15.16.18.19.22.23.26.

Canadian Car (Pacific) Ltd.
9.

Canadian General Electric (Plastics)
11.12.

Deloro Stellite
24.

14. Launchers, grenade.
15. Machine carbines.
16. Machine guns.
17. Ordnance forgings.
18. Pistols.
19. Rifles.
20. Rods, cleaning.
21. Sights, rifle, grenade launcher.
22. Small arms ancillaries.
23. Small arms components.
24. Stellite barrel-liners.
25. Stock gun, shoulder, fibreglass.
26. Weapons complete.

W. R. Elliott Ltd.
14.20.21.22.23.

K. K. Precision Parts Ltd.
20.23.

Metro Engineering Co. Ltd.
1.5.13.14.20.21.22.23.

Precision Small Parts Ltd.
23.

SIDO Limited
23.

Somerville Industries Ltd.
11.12.25.

Universal Die & Tool Mfg. Ltd.
1.5.13.14.20.21.22.23.

S. E. Woods (Canvass Div.)
10.

W. C. Wood Co. Ltd.
7.23.

1010 GUNS, OVER 30 MM UP TO 75 MM

1. Bags, fabric.
2. Barrel forgings.
3. Covers, canvas.
4. Gun mounts.
5. Gun shields.

Atlas Steels Co.
2.6.

BLH—Bertram Ltd.
4.5.

Wm. Bartlett & Sons Ltd.
1.3.

CAE Machinery Ltd.
5.

Curtis-Hoover Ltd.
7.

Davie Shipbuilding Ltd.
5.7.

6. Ordnance forgings.
 7. Power drives, hydraulic.
 8. Rammers.
 9. Recoil mechanisms.
 10. Recuperator mechanisms.
- Hamilton Gear & Machine Co.
7.
- Koehring-Waterous Ltd.
4.
- MLW-Worthington Ltd.
4.5.
- National Steel Car Corp. Ltd.
4.5.
- Otis Elevator Co. Ltd.
4.8.9.10.
- S. E. Woods (Canvass Div.)
1.3.

1015-1020

1015 GUNS, 75 MM THROUGH 125 MM

1. Bags, fabric.
2. Barrel forgings.
3. Baseplates, mortar, fabricated.
4. Cannons, 81 mm. mortar.
5. Covers, canvas.
6. Gun mounts.
7. Gun mounts, power driven.
8. Gun shields.

Atlas Steels Co.

2.11.

BLH-Bertram Ltd.

6.8.

Wm. Bartlett & Sons Ltd.

1.5.

CAE Machinery Ltd.

6.8.

Canadian Car (Pacific) Ltd.

4.10.

Curtis-Hoover Ltd.

3.12.

Davie Shipbuilding Ltd.

8.12.

W. R. Elliott Ltd.

10.

Hamilton Gear & Machine Co.

12.

K.K. Precision Parts Ltd.

10.

9. Gun shields, fibreglass.
10. Modification kits, mortar.
11. Ordnance forgings.
12. Power devices, hydraulic.
13. Rammers.
14. Recoil mechanisms.
15. Recuperator mechanisms.
16. Sub calibre components.

Koehring-Waterous Ltd.

6.7.

MLW-Worthington Ltd.

7.8.

Metro Engineering Co. Ltd.

3.10.16.

National Steel Car Corp. Ltd.

6.7.8.

Otis Elevator Co. Ltd.

6.13.14.15.

S. E. Woods (Canvass Div.)

5.

Uniroyal Ltd.

9.

Universal Die & Tool Mfg. Ltd.

3.10.16.

Victory Conveyor & Machine Reg'd.

16.

1020 GUNS, OVER 125 MM THROUGH 150 MM

1. Bags, fabric.
2. Bipod yokes.
3. Covers, canvas.
4. Forgings, barrel.
5. Forgings, ordnance.
6. Gun mounts.
7. Gun shields.

Atlas Steels Co.

4.5.

BLH-Bertram Ltd.

6.7.

Wm. Bartlett & Sons Ltd.

1.3.

CAE Machinery Ltd.

6.7.

Canadian Car (Pacific) Ltd.

2.9.

Curtis-Hoover Ltd.

10.

Davie Shipbuilding Ltd.

7.10.

W. R. Elliott Ltd.

9.

8. Gun shields, fibreglass.
9. Modification kits, mortar.
10. Power drives, hydraulic.
11. Rammers.
12. Recoil mechanisms.
13. Recuperator mechanisms.

Hamilton Gear & Machine Co.

10.

Koehring-Waterous Ltd.

6.

MLW-Worthington Ltd.

7.10.11.

National Steel Car Corp. Ltd.

6.7.11.

Otis Elevator Co. Ltd.

6.11.12.13.

S. E. Wood (Canvass Div.)

3.

Uniroyal Ltd.

8.

1025 GUNS, OVER 150 MM THROUGH 200 MM

1. Bags, fabric.
2. Covers, canvas.
3. Mounts.
4. Power drives, hydraulic.

Wm. Bartlett & Sons Ltd.

1.2.

Davie Shipbuilding Ltd.

4.

5. Rammers.
6. Recoil mechanisms.
7. Recuperator mechanisms.

Otis Elevator Co. Ltd.

3.5.6.7.

S. E. Woods (Canvass Div.)

2.

1040 CHEMICAL WEAPONS AND EQUIPMENT

1. Mixing and transfer kits, thickened fuel.

Keene of Canada Corp. Ltd.

1045 LAUNCHERS, TORPEDO AND DEPTH CHARGE

1. Covers, canvas.
2. Covers, fabric.
3. Launchers, depth charge.

Wm. Bartlett & Son Ltd.

1.2.

Bata Engineering.

3.

Burrard Dry Dock Co. Ltd.

3.4.5.

Canadian Vickers Ltd.

3.4.5.

Davie Shipbuilding Ltd.

3.4.5.

4. Launchers, torpedo.
5. Torpedo tubes.

Fleet Manufacturing Ltd.

3.4.

John T. Hepburn Ltd.

3.4.

MLW-Worthington Ltd.

3.4.

National Steel Car Corp. Ltd.

3.4.

S. E. Woods (Canvass Div.)

1.

1055 LAUNCHERS, ROCKET AND PYROTECHNIC

1. Covers, canvas.
2. Covers, fabric.

BLH-Bertram Ltd.

3.

Wm. Bartlett & Son Ltd.

1.2.

Bata Engineering

3.

3. Launchers, rocket.
4. Launchers, rocket, aircraft.

John T. Hepburn Ltd.

3.

T.S.M. Industries Ltd.

4.

S. E. Wood (Canvass Div.)

1.

1075 DEGAUSSING AND MINE SWEEPING EQUIPMENT

1. Controls.

Bogue Electric of Canada Ltd.

1.

2. Degaussing cable.

Canada Wire & Cable Co. Ltd.

2.

1080 CAMOUFLAGE AND DECEPTION EQUIPMENT

1. Bags, camouflage.

A.I.M. Steel Ltd.

2.

Wm. Bartlett & Son Ltd.

1.

2. Wire, camouflage netting.

S. E. Wood (Canvass Div.)

1.

1095-1190

1095 MISCELLANEOUS WEAPONS

- 1. Grips, knife, combat, synthetic.
- 2. Grips, pistol, synthetic.
- 3. Knives, combat.

Auto Specialties Mfg. Co. (Canada) Ltd.

4.

Beach Foundry Ltd.

4.

Canada Cycle & Motor Co. Ltd.

5.

Canadian Steel Foundries

4.

Fabricated Steel Products.

4.

K.K. Precision Parts Ltd.

4.

4. Racks, bomb, aircraft.

5. Scabbards, bayonet.

Somerville Industries Ltd.

1.2.

Universal Die & Tool Mfg. Ltd.

3.

Vicom Ltd.

4.

Western Tools & Industries Ltd.

4.

W. C. Wood Co. Ltd.

4.

GROUP 11

NUCLEAR ORDNANCE

1190 SPECIALIZED TEST AND HANDLING EQUIPMENT, NUCLEAR ORDNANCE

1. Handling equipment.

Canadian Car Fort William

1.

Canadian Vickers Ltd.

1.

GROUP 12

FIRE CONTROL EQUIPMENT

1210 FIRE CONTROL DIRECTORS

Canadian General Electric (D & SP)
 Canadian Marconi Co.
 Computing Devices of Canada Ltd.

Ernst Leitz Ltd.
 Sperry Gyroscope of Canada

1220 FIRE CONTROL COMPUTING SIGHTS AND DEVICES

1. Computer groups, ballistic data.
2. Computer sets, ballistic.
3. Computers, air release point.
4. Computers, ballistic.
5. Computers, barrage release time.
6. Computers, depth charge release time.
7. Computers, gun direction.

Aviation Electric Ltd.

10.

Canadian General Electric (D&SP).
 1.2.4.5.6.7.8.12.

Canadian Marconi Co.
 3.

Computing Devices of Canada Ltd.
 7.10.11.12.

8. Controls computers.
9. Fans, scale protractor graphical firing.
10. Plotting boards, electronic.
11. Plotting boards, mechanical.
12. Scales, graphical firing.
13. Sights, head, computing auto.

Marsland Engineering Ltd.

10.

O.&W. Electronics Ltd.
 9.

Stanley Mfg. Co. Ltd.
 9.11.12.

1230 FIRE CONTROL SYSTEMS, COMPLETE

1. Bombsight systems.
2. Fire control systems, airborne.
3. Fire control systems, anti-aircraft.

CAE Industries Ltd.

1.2.3.4.5.

Canadian General Electric (D&SP)
 1.2.3.4.5.

Canadian Westinghouse (Elec. & Def.
 Prod.)
 2.3.4.5.

4. Fire control systems, ground.
5. Fire control systems, shipborne.

Computing Devices of Canada Ltd.
 1.2.4.5.

Ferranti-Packard Ltd.

1.

RCA Ltd.
 2.5.

1240 OPTICAL SIGHTING AND RANGING EQUIPMENT

1. Aiming circle.
2. Binoculars.
3. Cases, sightunit.
4. Clamps, prism mounting.
5. Collimators.
6. Collimators, infinity aiming reference.
7. Covers, fire control instrument.
8. Cross hairs, reticle.
9. Diaphragms, iris.

10. Diaphragms, iris, optical instrument.
11. Eyeguards, binocular.
12. Eyeguards, optical instrument.
13. Eye-piece assemblies, optical instrument.
14. Eyeshields, optical instrument.
15. Filters.
16. Filters, light, optical instrument.
17. Filters, light, telescopic instrument.
18. Holders, optical element.

1240-1270

1240 OPTICAL SIGHTING AND RANGING EQUIPMENT (conc.)

- | | |
|---|------------------------------------|
| 19. Lenses. | 35. Reticles. |
| 20. Lenses, binocular, fire control. | 36. Reticles, image projectors. |
| 21. Lenses, optical instrument. | 37. Reticles, optical instrument. |
| 22. Lenses, telescope. | 38. Reticles, telescope. |
| 23. Mirrors. | 39. Sighting systems. |
| 24. Mirrors, optical instrument. | 40. Sights, bore, optical. |
| 25. Mounts. | 41. Sights, mechanical. |
| 26. Mounts, tank periscope. | 42. Sights, optical. |
| 27. Mounts, telescope. | 43. Sights, telescopic. |
| 28. Prisms. | 44. Sightunits. |
| 29. Prisms, optical instrument. | 45. Spotting instruments, optical. |
| 30. Prisms, optical instrument, mounted. | 46. Telescopes. |
| 31. Projectors, reticle image. | 47. Telescopes, azimuth. |
| 32. Range finders. | 48. Telescopes, panoramic. |
| 33. Range finders, fire control. | |
| 34. Reticle assemblies, optical instrument. | |

Canadian Arsenals Ltd. (Small Arms Div.)

25.26.27.41.

Canadian General Electric (D&SP)

39.

W. R. Elliott Ltd.

3.41.

General Metallic Parts Ltd.

25.41.

Ernst Leitz Canada Ltd.

1.2.4.5.6.8.9.10.11.12.13.14.15.16.17.18.

19.20.21.22.23.24.25.28.29.30.31.32.33.

34.35.36.37.38.39.40.41.42.43.44.45.46.

47.48.

S. E. Woods (Canvass Div.)

7.

1250 FIRE CONTROL STABILIZING MECHANISMS

Aviation Electric Ltd.

Canadian General Electric (D&SP)

Canadian Marconi Co.

1260 FIRE CONTROL DESIGNATING AND INDICATING EQUIPMENT

1. Synchro systems, fire control.

Canadian Westinghouse (Elec. & Def.

Prod.)

1265 FIRE CONTROL TRANSMITTING AND RECEIVING EQUIPMENT, EXCEPT AIRBORNE

Canadian General Electric (D&SP)

Canadian Westinghouse (Elec. & Def.

Prod.)

Northern Electric Co. Ltd.

RCA Ltd.

Raytheon Canada Ltd.

1270 AIRCRAFT GUNNERY FIRE CONTROL COMPONENTS

1. Computer groups, ballistics data.

Canadian General Electric (D&SP)

1285 FIRE CONTROL RADAR EQUIPMENT, EXCEPT AIRBORNE

1. Fire control, anti-aircraft, radar.
2. Fire control groups.
3. Fire control sets.
4. Fire control sets, trailer mounted.

CAE Industries Ltd.
1.4.5.6.7.

Canadian General Electric (D&SP)
1.2.3.4.5.6.7.

Canadian Westinghouse (Elec. & Def.
Prod.)
1.2.3.4.5.6.7.

Northern Electric Co. Ltd.
4.5.6.7.

5. Receiver-transmitters, radar.
6. Receiving sets, radar.
7. Transmitters, radar.

Philips Electronics Industries Ltd.
5.

RCA Ltd.
2.3.5.6.7.

Raytheon Canada Ltd.
5.6.7.

1287 FIRE CONTROL SONAR EQUIPMENT

1. Systems, integrated shipborne, ASW.

Computing Devices of Canada Ltd.
1.

1290 MISCELLANEOUS FIRE CONTROL EQUIPMENT

1. Aiming circles.
2. Cases, aiming circle.
3. Cases, canvas.
4. Cases, fuse setter.
5. Cases, multi-application.
6. Filters.
7. Fuse setters.

Wm Bartlett & Son Ltd.
3.

Computing Devices of Canada Ltd.
13.

W. R. Elliott Ltd.
2.4.5.7.8.9.11.12.14.

General Metallic Parts Ltd.
7.9.11.14.

K.K. Precision Parts Ltd.
2.4.

8. Lights, aiming post.
9. Post, aiming.
10. Projectors.
11. Quadrants.
12. Sights, air lookout.
13. Sound ranging sets.
14. Tripods, instrument.

Ernst Leitz Canada Ltd.
1.6.7.10.11.

Metro Engineering Co. Ltd.
7.9.11.14.

Stanley Mfg. Co. Ltd.
13.

Universal Die & Tool Mfg. Ltd.
7.9.11.12.14.

S. E. Woods (Canvass Div.)
3.

GROUP 13

AMMUNITION AND EXPLOSIVES

1305 AMMUNITION, THROUGH 30 MM

1. Ammunition.
2. Cartridge cases, brass and steel.
3. Cartridge cases, small arms.
4. Cartridge clips.
5. Cartridge clips, plastic.
6. Cartridge links.

Canadian Arsenals Ltd. (Filling Div.)
1.11.12.

Canadian General Electric (Plastics)
5.

Canadian Industries Ltd.
1.3.7.8.9.10.11.12.

7. Cartridges, small arms.
8. Charges.
9. Powders, rifle, double base.
10. Powders, rifle, single base.
11. Primers.
12. Tracer.

N. Slater Co.
6.

Valcartier Industries Inc.
1.2.3.4.5.6.7.11.

1310 AMMUNITION, OVER 30 MM UP TO 75 MM

1. Ammunition.
2. Ammunition, drill, inert.
3. Cartridges, artillery assy. and filling (30 mm to 4")
4. Cases, cartridge, brass.
5. Charges.
6. Clips, cartridge.
7. Components, metal.
8. Components, plastic.

Advanced Extrusions Ltd.
1.9.

B.I.R. Precision Products.
7.

Barber Die Casting Co. Ltd.
6.9.

Bristol Aerospace (1968) Ltd.
9.

Canada Cycle & Motor Co. Ltd.
2.7.9.15.

Canadian Arsenals Ltd. (Filling Div.)
1.2.3.16.

Canadian Filters Ltd.
9.

Canadian General Electric (Plastics)
8.

Canadian Industries Ltd.
5.11.12.13.14.

Eastern Die Casting Inc.
7.

Fenn-Dor Plastics Ltd.
8.

General Impact Extrusions
1.2.7.8.9.10.

Harrington Tool & Die Co. Ltd.
6.7.

9. Fin assemblies.
10. Forgings, artillery shell.
11. Powders, cannon, double base.
12. Powders, cannon, nitroguanidine base.
13. Powders, cannon, single base.
14. Propellants, extruded.
15. Tracer, projectile, empty.
16. Tracer, projectile, filled.

Industrial Machining Ltd.
2.7.9.

Ingersoll Machine & Tool Co. Ltd.
7.10.

Mansfield-Denman General Ltd.
8.

National Steel Car Corp. Ltd.
2.6.10.

W. H. Olsen Mfg. Co. Ltd.
2.7.9.

Precision Small Parts Ltd.
7.

R.J. Stampings Co. Ltd.
6.7.

Rollit Products Ltd.
2.7.

Technodyne Co. Ltd.
2.7.

Triplex Engineering Co. Ltd.
7.

Valcartier Industries Inc.
4.6.7.8.

Victory Conveyor & Machine Reg'd.
7.

Xyno-matic Plastics Ltd.
8.

1315 AMMUNITION, 75 MM THROUGH 125 MM

- | | |
|---------------------------------------|---|
| 1. Ammunition. | 11. Powders, cannon, nitroguanidine base. |
| 2. Cartridge cases, brass and steel. | 12. Powders, cannon, single base. |
| 3. Cartridges, dummy. | 13. Powder, mortar, sheet. |
| 4. Charge, propelling. | 14. Projectiles, cast. |
| 5. Components, metal. | 15. Projectiles, underwater. |
| 6. Components, plastic. | 16. Propellants, extrudes. |
| 7. Drill, dummy and inert. | 17. Sintered components. |
| 8. Fin assemblies. | 18. Tracer, projectile, empty. |
| 9. Forgings artillery shell. | 19. Tracer, projectile, filled. |
| 10. Powders, cannon, double base. | |
| Advanced Dynamics Corp. Ltd. | International Malleable Iron Co. Ltd. |
| 1. | 14. |
| B.I.R. Precision Products. | Keene of Canada Corp. Ltd. |
| 5. | 7. |
| Barber Die Castings Co. Ltd. | Mansfield Denman General Ltd. |
| 5.8. | 6. |
| Bristol Aerospace 1968 Ltd. | Marsland Engineering Ltd. |
| 8. | 5. |
| Canada Cycle & Motor Co. Ltd. | National Steel Car Corp. Ltd. |
| 5.8.18. | 9. |
| Canadian Acme Screw & Gear | W. H. Olsen Mfg. Co. Ltd. |
| 5.8. | 5.8. |
| Canadian Arsenals Ltd. (Filling Div.) | Precision Small Parts Ltd. |
| 1.4.7.15.19. | 5. |
| Canadian Filters Ltd. | R.J. Stampings Co. Ltd. |
| 8. | 5. |
| Canadian General Electric (Plastics) | Rollit Products Ltd. |
| 6. | 3.5.7. |
| Canadian Industries Ltd. | Sinterings Ltd. |
| 4.10.11.12.13.16. | 17. |
| Eastern Die Castings Inc. | Technodyne Co. Ltd. |
| 5.14. | 5.8. |
| Fenn-Dor Plastics Ltd. | Triplex Engineering Co. Ltd. |
| 6. | 5. |
| General Impact Extrusions | Valcartier Industries Inc. |
| 3.5.6.8.9. | 2.5. |
| Industrial Machining Ltd. | Victory Conveyor & Machine Reg'd. |
| 5.8. | 5. |
| Ingersoll Machine & Tool Co. Ltd. | Xyno-matic Plastics Ltd. |
| 5.9. | 6. |

1320-1325

1320 AMMUNITION, OVER 125 MM

1. Ammunition.
2. Cartridges, dummy.
3. Charge propelling.
4. Components, metal.
5. Components, plastic.
6. Forgings artillery shell.

Canadian Arsenals Ltd. (Filling Div.)
1.3.11.

Canadian General Electric (Plastics)
5.

Canadian Industries Ltd.
3.7.8.9.11.

Fenn-Dor Plastics Ltd.
5.

General Impact Extrusions.
2.4.5.

Industrial Machining Ltd.
4.

Mansfield-Denman General Ltd.
5.

National Steel Car Corp. Ltd.
6.

7. Powders, cannon, double base.
8. Powders, cannon, nitroguanidine base.
9. Powders, cannon, single base.
10. Sintered components.
11. Tracer.

W. H. Olsen Mfg. Co. Ltd.
4.

Rollit Products Ltd.
2.4.

Sinterings Ltd.
10.

Technodyne Co. Ltd.
4.

Valcartier Industries Ltd.
4.

Victory Conveyor & Machine Reg'd.
4.

W. C. Wood Co. Ltd.
2.4.

Xyno-matic Plastics Ltd.
5.

1325 BOMBS

1. Bomb, assy. and filling.
2. Bomb, cluster, inert.
3. Bomb components, cast iron.
4. Bomb, demolition.
5. Bomb, drill.
6. Bomb, (empty components).
7. Bomb, general purpose.
8. Bomb, practice (cast iron).
9. Bomb, practice, fabricated.
10. Components, plastic.

Advanced Dynamics Corp. Ltd.
7.11.

Atlas Steels Co.
12.

Auto Specialties Mfg. Co.
2.3.4.5.6.7.8.9.11.18.19.

Barber Die Casting Co. Ltd.
11.18.19.

Beach Foundry Ltd.
2.3.4.5.7.8.9.11.14.18.19.

Brantford Precision Ltd.
3.6.

Bristol Aerospace 1968 Ltd.
10.11.

Canada Cycle & Motor Co. Ltd.
11.

Canada Forgings Ltd.
12.

11. Fin assemblies.
12. Forged components.
13. Fuses, ammunition.
14. Fuses, bomb, tall.
15. High explosives.
16. Igniters, bomb.
17. Primers.
18. Vane, arming.
19. Vane, assemblies.

Canadian Arsenals Ltd. (Filling Div.)
1.4.13.14.16.17.

Canadian Filters Ltd.
8.11.

Canadian General Electric (Plastics)
10.

Canadian Industries Ltd.
15.

Canadian Steel Foundries
2.3.4.5.7.8.9.11.18.19.

Canon Ltd. (Foundry Div.)
3.8.

ETF Tools Ltd.
12.

Enamel & Heating Products Ltd.
3.6.7.8.9.11.

Fabricated Steel Products.
9.11.

1325 BOMBS (conc.)

Fenn-Dor Plastics Ltd.
10.
General Impact Extrusions
5.6.9.10.11.12.14.18.
Heroux Ltd.
11.
Industrial Machining Ltd.
3.5.6.9.11.18.19.
International Malleable Iron Co. Ltd.
5.7.8.
K.K. Precision Parts Ltd.
6.
Mansfield-Denman General Ltd.
10.
Metro Engineering Co. Ltd.
5.6.8.9.
W. H. Olsen Mfg. Co. Ltd.
3.5.6.9.11.18.19.
R.J. Stamping Co. Ltd.
11.

Renfrew Aircraft & Engineering Ltd.
6.11.
Rollit Products Ltd.
6.
N. Slater Co.
12.
T.S.M. Industries Ltd.
9.11.
Valcartier Industries Ltd.
17.
Victory Conveyor & Machine Reg'd.
6.
The W. C. Wood Co. Ltd.
9.11.
Western Tools & Industries Ltd.
11.
Xyno-matic Plastics Ltd.
10.

1330 GRENADES

1. Bodies, grenade, hand practice.
2. Fin assemblies, practice, rifle.
3. Fin assemblies, rifle.
4. Forged components.
5. Fuses, amm.
6. Grenade, empty components.

Advanced Extrusions Ltd.
6.
Atlas Steels Co.
4.
Auto Specialties Mfg. Co.
1.2.3.
Barber Die Casting Co. Ltd.
2.3.
Beach Foundry Ltd.
1.2.3.
Bristol Aerospace 1968 Ltd.
2.3.
Canada Cycle & Motor Co. Ltd.
2.3.
Canadian Arsenals Ltd. (Filling Div.)
5.7.8.9.12.
Canadian General Electric (Plastics)
11.
Canadian Industries Ltd.
6.7.8.9.10.11.
Canadian Steel Foundries.
2.3.6.

7. Grenades, hand.
8. Grenades, incendiary.
9. Grenades, smoke.
10. High explosives.
11. Plastic components.
12. Rifle.

ETF Tools Ltd.
4.
Fenn-Dor Plastics Ltd.
11.
General Impact Extrusions
1.2.4.6.11.
Hand Chemical Industries Ltd.
6.7.8.9.11.12.
Industrial Machining Ltd.
1.2.3.
K.K. Precision Parts Ltd.
6.
Mansfield-Denman General Ltd.
11.
Metro Engineering Co. Ltd.
1.2.3.4.
W. H. Olsen Mfg. Co. Ltd.
1.2.3.6.
Westeel-Rosco Ltd.
2.3.

1336-1340

1336 GUIDED MISSILE WARHEADS AND EXPLOSIVE COMPONENTS

1. Fuses, (incl. proximity).
2. Fuses, inert.
3. High explosives.

Advanced Extrusions Ltd.

4.

B.I.R. Precision Products

4.

Bristol Aerospace 1968 Ltd.

2.6.

Canadian Arsenals Ltd. (Filling Div.)

1.

Canadian Industries Ltd.

3.6.

General Impact Extrusions

4.

Heroux Limited

4.

Metro Engineering Co. Ltd.

4.

4. Metal components.
5. Sintered components.
6. Solid propellants.

Precision Small Parts Ltd.

4.

Sido Ltd.

4.

Sinterings Ltd.

5.

Technodyne Co. Ltd.

2.4.

Triplex Engineering Co. Ltd.

4.

Victory Conveyor & Machine Reg'd.

4.

W. C. Wood Co. Ltd.

4.

1337 GUIDED MISSILE AND SPACE VEHICLE EXPLOSIVE PROPULSION UNITS SOLID FUEL: AND COMPONENTS

1. Explosives.
2. Ignitors.

Bristol Aerospace 1968 Ltd.

3.

Canadian Arsenals Ltd. (Filling Div.)

2.

3. Solid propellants.

Canadian Industries Ltd.

1.3.

1340 ROCKETS AND ROCKET AMMUNITION

1. Components, metal.
2. Components, plastic.
3. Covers, canvas.
4. Drill, rocket bodies.
5. Drill, rocket motor assys.
6. Fins and fin assemblies.
7. Forged components.
8. Fuses, (incl. proximity).
9. Fuses, rocket, inert.

Advanced Extrusions Ltd.

15.

B.I.R. Precision Products.

1.15.

Barber Die Casting Co. Ltd.

6.15.

Wm. Bartlett & Son Ltd.

3.

Bata Engineering.

15.

Brantford Precision Ltd.

1.15.

10. High explosives.
11. Igniters, rocket motor.
12. Propellants, disc.
13. Rockets and ammunition (empty comps.)
14. Rockets, complete.
15. Rockets, metal parts.
16. Sintered components.
17. Solid propellants.

Bristol Aerospace 1968 Ltd.

1.2.6.12.14.15.17.

Canada Cycle & Motor Co. Ltd.

1.4.5.6.15.

Canadian Arsenals Ltd. (Filling Div.)

8.10.14.

Canadian Flight Equipment Co.

1.

Canadian General Electric (Plastics)

2.

Canadian Industries Ltd.

10.11.12.17.

1340 ROCKETS AND ROCKET AMMUNITION (conc.)

Canadian Vickers Ltd. 4.5.6.13.15.	Precision Small Parts Ltd. 1.15.
Chrysler Canada Ltd. 1.4.5.6.7.15.	Reil Industrial Enterprises 1.
ETF Tools Ltd. 7.	Rollit Products Ltd. 9.15.
Fabricated Steel Products 1.6.13.15.	Sido Ltd. 1.15.
Fenn-Dor Plastics Ltd. 2.	Sinterings Ltd. 16.
Free-Piston Development Co. Ltd. 1.	T.S.M. Industries Ltd. 13.15.
General Impact Extrusions 1.2.4.5.6.7.13.15.	Technodyne Co. Ltd. 1.15.
General Metallic Parts Ltd. 15.	Triplex Engineering Co. Ltd. 1.15.
Heroux Ltd. 6.15.	Tywood Industries Ltd. 2.
Industrial Machining Ltd. 4.5.6.13.15.	Vicom Ltd. 6.7.13.15.
Ingersoll Machine & Tool Co. Ltd. 1.15.	Victory Conveyor & Machine Reg'd. 1.
K.K. Precision Parts Ltd. 1.15.	W. C. Wood Co. Ltd. 1.4.6.15.
Metro Engineering Co. Ltd. 1.5.6.	S. E. Woods (Canvass Div.) 3.
W. H. Olsen Mfg. Co. Ltd. 4.5.6.13.15.	

1345 LAND MINES

1. Components, metal.	5. High explosives.
2. Components, plastic.	6. Mines.
3. Fuses.	7. Mines (empty components).
4. Fuses and primers, inert.	
Advanced Extrusions Ltd. 1.	K.K. Precision Parts Ltd. 1.
B.I.R. Precision Products 1.4.	Mansfield-Denman General Ltd. 2.
Bristol Aerospace 1968 Ltd. 2.	Metro Engineering Co. Ltd. 1.4.
Canadian Arsenals Ltd. (Filling Div.) 3.4.5.6.	Northwest Industries Ltd. 2.
Canadian General Electric (Plastics) 2.	Precision Small Parts Ltd. 1.
Canadian Industries Ltd. 5.	R.J. Stamping Co. Ltd. 7.
Fabricated Steel Products 1.7.	Rollit Products Ltd. 1.4.
Fenn-Dor Plastics Ltd. 2.	SIDO Ltd. 1.
General Impact Extrusions 1.2.7.	N. Slater Co. 1.

1345-1355

1345 LAND MINES (conc.)

Triplex Engineering Co. Ltd.
1.4.
Victory Conveyor & Machine Reg'd.
1.
Wallaceburg Brass Ltd.
1.4.

W. C. Wood Co. Ltd.
1.7.
Xyno-matic Plastics Ltd.
2.

1350 UNDERWATER MINE INERT COMPONENTS

1. Components, plastic.
2. Components, metal.
Advanced Extrusions Ltd.
2.
B.I.R. Precision Products
2.
Bristol Aerospace 1968 Ltd.
1.2.3.
Canadian Arsenals Ltd. (Filling Div.)
3.
Canadian Flight Equipment Co.
2.
Canadian General Electric (Plastics)
1.
Fenn-Dor Plastics Ltd.
1.
Fleet Manufacturing Ltd.
2.
General Impact Extrusions
2.

3. Projectiles, underwater.
General Metallic Parts Ltd.
2.
Mansfield-Denman General Ltd.
1.
Metro Engineering Co. Ltd.
2.
Northwest Industries Ltd.
1.
Precision Small Parts Ltd.
1.
SIDO Ltd.
2.
Triplex Engineering Co. Ltd.
2.
W. C. Wood Co. Ltd.
2.
Xyno-matic Plastics Ltd.
1.

1351 UNDERWATER MINE EXPLOSIVE COMPONENTS

1. Explosives
Canadian Arsenals Ltd. (Filling Div.)
1.2.

2. Signal underwater sound.
Canadian Industries Ltd.
1.

1355 TORPEDO INERT COMPONENTS

1. Components, plastic.
2. Torpedo depth control units.
Advanced Extrusions Ltd.
3.
B.I.R. Precision Products Ltd.
3.
Brantford Precision Ltd.
3.
Bristol Aerospace 1968 Ltd.
1.3.4.
Canadian Arsenals Ltd. (Filling Div.)
4.
Canadian Flight Equipment Co.
3.
Canadian General Electric (Plastics)
1.

3. Torpedo components, inert, metal.
4. Torpedo warheads.
Fabricated Steel Products
3.
Fenn-Dor Plastics Ltd.
3.
Free-Piston Development Co. Ltd.
3.
General Impact Extrusions
3.
Heroux Ltd.
3.
K.K. Precision Parts Ltd.
3.
Mansfield-Denman General Ltd.
1.

1355 TORPEDO INERT COMPONENTS (conc.)

Marsland Engineering Ltd.
2.
Metro Engineering Co. Ltd.
3.
Northwest Industries Ltd.
1.
W. H. Olsen Mfg. Co. Ltd.
3.
Precision Small Parts Ltd.
3.
Reil Industrial Enterprises
3.
Rollit Products Ltd.
3.

SIDO Ltd.
3.
Tywood Industries Ltd.
1.
Vicom Ltd.
3.
Victory Conveyor Machine Reg'd.
3.
Western Tools & Industries Ltd.
3.
Xyno-matic Plastics Ltd.
1.

1356 TORPEDO EXPLOSIVE COMPONENTS

1. Fuses, (incl. proximity).
2. High explosives.

Canadian Arsenals Ltd. (Filling Div.)
1.2.3

3. Torpedo warheads.

Canadian Industries Ltd.
2.

1360 DEPTH CHARGE INERT COMPONENTS

Advanced Extrusions Ltd.
B.I.R. Precision Products
Canadian Flight Equipment Co.
Fairey Canada Ltd.
General Impact Extrusions
K.K. Precision Parts Ltd.

Metro Engineering Co. Ltd.
Precision Small Parts Ltd.
Rollit Products Ltd.
SIDO Ltd.
Triplex Engineering Co. Ltd.
Vicom Ltd.

1361 DEPTH CHARGE EXPLOSIVE COMPONENTS

1. High explosives.

Canadian Arsenals Ltd. (Filling Div.)
1.2.

2. Warheads.

Canadian Industries Ltd.
1.

1365 MILITARY CHEMICAL AGENTS

1. Incendiary mixtures.

Canadian Arsenals Ltd. (Filling Div.)
1.

Canadian Industries Ltd.
1.

1370 PYROTECHNICS

1. Fireworks.
2. Flares, aircraft.
3. Flares, identification.
4. Flares, mixtures.
5. Flares, parachute.
6. Fuses.
7. Igniters, pyrotechnic.
8. Incendiary filling.
Canadian Arsenals Ltd. (Filling Div.)
2.3.4.5.6.7.8.9.10.13.14.16.
Canadian Industries Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.

9. Markers, location marine.
10. Photoflash cartridges.
11. Pistol, rocket, signals.
12. Signals, distress.
13. Signals, illumination.
14. Signals, smoke.
15. Simulators, flash.
16. Tracer.
Hand Chemical Industries Ltd.
1.2.3.4.5.6.7.9.11.12.13.14.15.

1375-1390

1375 DEMOLITION MATERIAL

1. Anchoring devices.
2. Blasting agents.
3. Cable cutters.
4. Chargers, cartridge.
5. Cord, igniter.
6. Detonators.
7. Ejectors, seat, aircraft.
8. Explosive kits.
9. Fuses.
10. Fuses, cord and detonators.
11. HMX.
12. HMX/TNT (OCTOLS).
13. Initiating compounds.

Canadian Arsenals Ltd. (Filling Div.)

1.3.4.5.6.7.8.9.10.13.18.19.

Canadian Industries Ltd.

5.6.9.11.12.13.15.16.17.20.

21.22.23.24.25.26.

Canadian Safety Fuse Co.

5.9.

Donald Ropes & Wire Cloth Ltd.

14.

14. Mats, blasting wire rope.
15. Nitrocellulose (wood pulp).
16. Nitroglycerine.
17. Plastic explosive (RDX base).
18. Propellant, actuated devices.
19. Propellants, solid.
20. Propellants, sticks, M7.
21. RDX.
22. RDX Comp. CH-6.
23. RDX/Wax compositions.
24. Styphnic acid, refined.
25. Tetryl.
26. TNT.

Du Pont of Canada Ltd.

2.16.

Greening Industries Ltd.

14.

Wire Rope Industries of Canada Ltd.

14.

1376 BULK EXPLOSIVES

1. Barium styphnate.
2. Dextronated lead azide.
3. Dinitroresorcinol basic.
4. HMX
5. HMX/TNT (OCTOLS).
6. Lead 2.4.

Canadian Arsenals Ltd. (Filling Div.)

1.2.3.6.7.8.9.10.11.

7. Lead azide.
8. Lead styphnate, basic.
9. Lead styphnate, normal.
10. Normal lead 4.6., dinitroresorcinol.
11. RDX base, plastic explosive.
12. Silver azide.

Canadian Industries Ltd.

4.5.11.

1377 CARTRIDGE & PROPELLANT ACTUATED DEVICES & COMPONENTS

1. Delay compositions.
 2. Ejectors, seat, aircraft.
- Canadian Arsenals Ltd. (Filling Div.)
- 1.2.3.
- Canadian Flight Equipment
- 2.

3. Propellant actuated devices.

Canadian Industries Ltd.

3.

Bristol Aerospace (1968) Ltd.

3.

1390 FUSES AND PRIMERS

1. Components, plastic.
2. Fuses, base detonating, self-destroying.
3. Fuses, (incl. proximity).
4. Fuses, inert.
5. Fuses, mechanical time, inert.
6. Fuses, super-quick, inert.

B.I.R. Precision Products.

4.8.

Barber Die Casting Co. Ltd.

8.

7. Fuses, point detonating, inert.
8. Fuses and primers, empty components.
9. Fuses, proximity, practice, empty.
10. Pins & strikers, sintered.
11. Primers, electric.
12. Primers percussion.

Canadian Acme Screw & Gear Ltd.

4.8.9.

Canadian Arsenals Ltd. (Filling Div.)

2.3.7.11.12.

1390 FUSES AND PRIMERS (conc.)

Canadian Flight Equipment Co.
4.
Canadian General Electric (Plastics).
1.
Canadian Industries Ltd.
12.
Fenn-Dor Plastics Ltd.
1.
Fisher Gauge Works Ltd.
8.
General Time Canada Ltd.
(Westclox Div.)
2.5.6.7.9.
Mansfield-Denman General Ltd.
1.
Marsland Engineering Ltd.
6.7
Metro Engineering Co. Ltd.
4.8.

Precision Small Parts Ltd.
8.
Rollit Products Ltd.
5.7.9.
Sinterings Ltd.
10.
Technodyne Co. Ltd.
4.8.
Triplex Engineering Co. Ltd.
4.8.
Valcartier Industries Ltd.
1.11.12.
Vicom Ltd.
8.
Xyno-matic Plastics Ltd.
1.

1395 MISCELLANEOUS AMMUNITION

1. Ammunition shapes.
2. Ammunition shapes, aluminum,
1 oz. - 10 lbs.
3. Ammunition shapes, bronze,
1 oz. - 15 lbs.

Advanced Dynamics Corp. Ltd.
1.8.
Advanced Extrusions Ltd.
8.
Atlas Steels Co.
6.
B.I.R. Precision Products.
1.4.8.
Barber Die Casting Co. Ltd.
4.
Barnard Foundations Ltd.
2.3.
Canadian Acme Screw & Gear Ltd.
4.
Canadian Flight Equipment Co.
1.
Canadian General Electric (Plastic)
7.
ETF Tools Ltd.
6.
Fenn-Dor Plastics Ltd.
7.
Free-Piston Development Co. Ltd.
4.8.

4. Blanks, discs, cups, rotating bands.
5. Cases, cartridge.
6. Forged components.
7. Plastic components.
8. Shell components.

General Impact Extrusions
1.4.5.6.7.8.
Industrial Machining Ltd.
1.4.8.
Mansfield-Denman General Ltd.
7.
Metro Engineering Co. Ltd.
1.4.8.
Montebello Metal Ltd.
5.
N. Slater Co.
6.
R.J. Stampings Co. Ltd.
4.
Rollit Products Ltd.
4.8.
Technodyne Co. Ltd.
8.
Valcartier Industries Ltd.
4.5.8.
Wallaceburg Brass Ltd.
1.
W. C. Wood Co. Ltd.
4.

GROUP 14

GUIDED MISSILES

1410 GUIDED MISSILES

Bristol Aerospace 1968 Ltd.
 Canadair Ltd.

Computing Devices of Canada Ltd.

1420 GUIDED MISSILE COMPONENTS

1. Components & assemblies.
2. Gyro components.
3. Gyro mechanisms.

Abex Industries of Canada Ltd.
 2.4.

Aero Machining Ltd.
 1.

Aero Mechanic Ltd.
 1.

Aviation Electric Ltd.
 1.2.3.4.

B.I.R. Precision Products Ltd.
 1.2.3.4.

Bata Engineering Ltd.
 1.

Brantford Precision Ltd.
 1.

Bristol Aerospace 1968 Ltd.
 1.4.

Canada Forgings Ltd.
 1.4.

Canadair Ltd.
 1.4.

Canadian Flight Equipment Co.
 4.

Computing Devices of Canada Ltd.
 1.4.6.

Dowty Equipment of Canada Ltd.
 4.

W. R. Elliott Ltd.
 1.

Fleet Mfg. Ltd.
 1.4.

4. Hydraulic components.
5. Seals, metallic, static & dynamic.
6. Systems, guidance.

Free-Piston Development Co. Ltd.
 1.

Garrett Manufacturing Ltd.
 1.

General Metallic Parts Ltd.
 1.2.4.

Harrington Tool & Die Co. Ltd.
 1.

Heroux Ltd.
 4.

Joly Engineering Ltd.
 1.

K.K. Precision Parts Ltd.
 1.

Leavens Bros. Ltd.
 1.

Litton Systems (Canada) Ltd.
 2.

Metro Engineering Co. Ltd.
 1.4.

Modern Machine Industry Ltd.
 1.

Reil Industrial Enterprises Ltd.
 1.

SIDO Ltd.
 2.

Spar Aerospace Products Ltd.
 1.2.4.

Strite Industries Ltd.
 2.4.5.

1430 GUIDED MISSILE REMOTE CONTROL SYSTEMS

1. Coder, radar, guided missile.
2. Computer groups, guided missile.

Canadair Ltd.
 1.2.

Canadian General Electric (D & SP)
 1.

3. Systems, guidance.

Canadian Westinghouse
 (Elec. & Def. Prod.)
 1.2.

1430 GUIDED MISSILE REMOTE CONTROL SYSTEMS (conc.)

Computing Devices of Canada Ltd. 1.2.3.	RCA Ltd. 1.2.
Garrett Manufacturing Ltd. 2.	Raytheon Canada Ltd. 1.2.
ITT Canada Ltd. 1.	Stewart-Warner Corp. Ltd. 1.
Northern Electric Co. Ltd. 1.	

1440 LAUNCHERS, GUIDED MISSILE

Aero Machining Ltd.	Davie Shipbuilding Ltd.
Bata Engineering Ltd.	Dynamic Industries Inc.
Bristol Aerospace 1968 Ltd.	Fleet Manufacturing Ltd.
Canadair Ltd.	Leavens Bros. Ltd.
Canadian Vickers Ltd.	Orenda Ltd.
Computing Devices of Canada Ltd.	

1450 GUIDED MISSILE HANDLING AND SERVICING EQUIPMENT

1. Covers, canvas, protective.	3. Structural components.
2. Launchers, light gas guns.	
Wm. Bartlett & Son Ltd. 1.	Canadian Vickers Industries Ltd. 3.
Canadair Ltd. 3.	Computing Devices of Canada Ltd. 2.
Canadian Car (Fort William) 3.	S. E. Woods (Canvass Div.) 1.
Canadian Trailmobile Ltd. 3.	

GROUP 15

AIRCRAFT: AND AIRFRAME STRUCTURAL COMPONENTS

1510 AIRCRAFT, FIXED WING

1. Aircraft civil.

Canadair Ltd.

1.2.

De Havilland Aircraft of Canada

1.2.

2. Aircraft military.

Douglas Aircraft Canada Ltd.

1.2.

1540 GLIDERS

De Havilland Aircraft of Canada

1550 DRONES

Canadair Ltd.

1560 AIRFRAME STRUCTURAL COMPONENTS

1. Ailerons.

2. Canopies, bubbles, blisters-plastic.

3. Controls, hydraulic.

4. Doors, landing gear.

5. Doors, various.

6. Elevators.

7. Engine mounts.

8. Fabricated assemblies.

9. Flaps, wing.

10. Fuselage sections.

11. Parts, DC3 & DC47.

12. Plastic components.

13. Rescue booms.

14. Sculptured parts.

15. Spar caps, machined.

16. Spars.

17. Structural components, honeycomb.

18. Tanks, bladder type.

19. Tanks, fuel and lubricating oil.

20. Tanks, rubber, fuel, self seal.

21. Tubular parts and assemblies.

22. Wing sections.

Aircraft Industries of Canada

1.4.5.6.7.8.9.10.11.17.19.21.22.

Abex Industries of Canada Ltd.

3.8.14.

Aero Machining Ltd.

4.14.16

Albon Welding & Mechanical

Works Ltd.

8.

B.I.R. Precision Products.

8.14.

Bata Engineering Ltd.

14.

Boeing of Canada Ltd.

8.13.21.

Brantford Precision Ltd.

8.14.21.

Bristol Aerospace 1968 Ltd.

5.7.8.10.12.19.21.

Canada Forgings Ltd.

4.7.10.17.

Canadair Ltd.

1.4.5.6.7.8.9.10.14.21.22.

Canadian Car (Fort William).

1.2.3.4.6.7.8.9.10.12.14.

16.18.19.21.22.

Canadian General Electric (Plastics).

12.

De Havilland Aircraft of Canada.

1.3.4.5.6.7.8.9.10.14.16.21.22.

Douglas Aircraft Canada Ltd.

1.6.9.16.17.22.

Enamel & Heating Products Ltd.

8.19.21.

Fairey Canada Ltd.

1.3.5.6.7.8.10.12.19.21.

Fenn-Dor Plastics Ltd.

12.

Field Aviation Co. Ltd.

8.12.21.

Fleet Manufacturing Ltd.

1.2.4.5.6.7.8.9.10.12.14.16.17.19.22.

1560 AIRFRAME STRUCTURAL COMPONENTS (conc.)

General Metallic Parts Ltd. 7.14.	Plastal Manufacturing Ltd. 2.12.
Harrington Tool & Die Co. Ltd. 8.	Polyfiber Ltd. 12.
Heroux Ltd. 3.8.14.16.	Rollit Products Ltd. 8.21.
Hussman Refrigerator Co. Ltd. 19.	Somerville Industries Ltd. 12.
Ilines Machine Products Ltd. 14.16.	Technodyne Co. Ltd. 14.
LaSalle Engineering Ltd. 8.21.	Tywood Industries Ltd. 12.
Leavens Bros. Ltd. 1.4.5.6.7.8.9.10.14.19.21.22.	Uniroyal Ltd. 12.18.20.
Lefebvre Freres Ltd. 7.	Universal Die & Tool Mfg. Ltd. 15.
Leigh Instruments Ltd. 2.12.	Vicom Ltd. 16.
Metro Engineering Co. Ltd. 8.21.	Western Tools & Industries Ltd. 5.7.8.10.21.
Modern Machine Industry Ltd. 21.	Westhill Industries Ltd. 8.14.
Northwest Industries Ltd. 1.4.5.6.8.9.10.11.12.19.21.22.	Williams Machines Ltd. 14.21.
O. & W. Electronics Ltd. 2.12.	

GROUP 16

AIRCRAFT COMPONENTS AND ACCESSORIES

1620 AIRCRAFT LANDING GEAR COMPONENTS

1. Systems and components.

Abex Industries of Canada Ltd.

1.

Canadair Ltd.

1.

Canadian Vickers Ltd.

1.

De Havilland Aircraft of Canada.

1.

Dowty Equipment of Canada Ltd.

1.

Enamel & Heating Products Ltd.

1.

Heroux Ltd.

1.

Reil Industrial Enterprises.

1.

Spar Aerospace Ltd.

1.

1630 AIRCRAFT WHEEL AND BRAKE SYSTEMS

1. Brakes.

2. Cylinders, brake.

3. Fittings.

4. Floats, A/C landing.

5. Hydraulic systems.

Abex Industries of Canada Ltd.

1.2.3.5.7.8.

Aero Machining Ltd.

8.

Aero Mechanic Ltd.

1.3.

Aviation Electric Ltd.

1.2.

B.I.R. Precision Products.

3.

Boeing of Canada Ltd.

3.6.

Bristol Aerospace 1968 Ltd.

4.6.

Canadian Aircraft Products Ltd.

4.

Canadian Flight Equipment Co.

3.5.6.

Canadian Vickers Ltd.

9.

Dowty Equipment of Canada Ltd.

1.2.3.5.7.8.9.

Enamel & Heating Products Ltd.

4.

Fleet Manufacturing Ltd.

4.6.

6. Skis.

7. Struts, retractable.

8. Valves, hydraulics.

9. Wheels.

Fluid Power Ltd.

2.5.

Free-Piston Development Co. Ltd.

3.

General Metallic Parts Ltd.

1.3.

Godfrey Engineering Co. Ltd.

8.

Heroux Ltd.

2.5.7.8.

Joly Engineering Ltd.

1.3.

Metro Engineering Co. Ltd.

1.3.

Modern Machine Industry Ltd.

3.

Rollit Products Ltd.

3.

Technodyne Co. Ltd.

1.3.

Vicom Ltd.

3.

Williams Machines Ltd.

3.

1650 AIRCRAFT HYDRAULIC, VACUUM, AND DE-ICING SYSTEM COMPONENTS

1. Accumulators, air.
2. Actuators, hydraulic.
3. De-icing system components.
4. Filters, fluid, de-icing.
5. Fittings, hydraulic.
6. Hydraulic systems.
7. Ice detection and de-icer control systems.

Abex Industries of Canada Ltd.
2.5.6.8.10.11.12.14.

Aero Machining Ltd.
2.5.

Aero Mechanic Ltd.
6.

Aircraft Appliances & Equipment.
4.

Aro of Canada Ltd.
10.

Aviation Electric Ltd.
6.7.

Boeing of Canada Ltd.
5.9.

Bristol Aerospace 1968 Ltd.
1.

Canadian Flight Equipment Co.
2.5.14.

Davie Shipbuilding Ltd.
1.

Dowty Equipment of Canada Ltd.
2.3.6.11.14.

Fairey Canada Ltd.
2.14.

Fluid Power Ltd.
2.6.

8. Motors, hydraulic.
9. Pistons, actuator.
10. Pumps, de-icing, aircraft.
11. Pumps, hydraulic.
12. Systems, flight control.
13. Vacuum systems.
14. Valves, hydraulic.

Garrett Manufacturing Ltd.
3.7.

Godfrey Engineering Co. Ltd.
13.

B. F. Goodrich Canada Ltd.
3.

Heroux Ltd.
2.5.6.11.12.14.

Joly Engineering Ltd.
5.

Metro Engineering Co. Ltd.
2.5.14.

National Steel Car Corp. Ltd.
1.

Reil Industrial Enterprises Ltd.
13.

Spar Aerospace Ltd.
2.6.14.

Technodyne Co. Ltd.
2.

Weatherhead Co. of Canada Ltd.
5.

Westhill Industries Ltd.
2.

1660 AIRCRAFT AIR CONDITIONING, HEATING AND PRESSURIZING EQUIPMENT

1. Air conditioning.
2. Air temperature control systems.
3. Cowlings, helicopter, winter.
4. Heaters, helicopter.
5. Heating systems.

Air Conditioning Engineering
1.

Aro of Canada Ltd.
6.7.8.9.

Boeing of Canada Ltd.
3.9.

Dominion Helicopters Ltd.
3.4.

6. Masks, oxygen.
7. Oxygen systems.
8. Pressurizing systems.
9. Valves, oxygen systems.

Garrett Manufacturing Ltd.
2.

Godfrey Engineering Co. Ltd.
1.5.8.

Joy Mfg. Co. (Canada) Ltd.
1.2.

Uniroyal Ltd.
6.

1670-1680

1670 PARACHUTES AND AERIAL PICK UP, DELIVERY AND CARGO TIE DOWN EQUIPMENT

1. Assemblies, tie-down, cargo.
2. Bags, canvas, cargo.
3. Harnesses, personnel, lap & shoulder.
4. Nets, cargo, helicopter.
5. Pallets, aircraft.

Wm. Bartlett & Son Ltd.

2.

Canadian Flight Equipment Co.

1.

De Havilland Aircraft of Canada

1.8.10.

Dominion Helicopters.

9.

Enamel & Heating Products Ltd.

1.

Fabricated Steel Products

9.

6. Parachutes, A/C, de-acceleration.
7. Parachutes, personnel, multi-type.
8. Platforms, cargo, aerial delivery.
9. Racks, cargo, helicopters.
10. Sled, aerial cargo delivery.

Flight Line Quality Products Ltd.

1.

Irvin Air Chute Ltd.

1.3.4.6.7.8.

Magline of Canada Ltd.

5.

Tri-Service Fabricating Ltd.

5.

S. E. Woods (Canvass Div.)

2.

1680 MISCELLANEOUS AIRCRAFT ACCESSORIES AND COMPONENTS

1. Actuators, electro-mechanical, linear.
2. Blankets, insulation thermal.
3. Bomb and tank pylon assemblies.
4. Cargo containers.
5. Covers, aircraft, fabric.
6. Fire extinguishers.
7. Galleys, aircraft.
8. Guides, extruded, metal.
9. Guides, extruded, plastic.
10. Harness, safety A/C.
11. Hinges, extruded.
12. Line stringing, aerial.
13. Lift systems, aerial.
14. Racks, ejector, stores, propellant actuated.

Abex Industries of Canada Ltd.

1.16.

Aero Machining Ltd.

1.3.11.19.

Albon Welding & Mechanical Works Ltd.

20.

Aviation Electric Ltd.

1.16.

Wm. Bartlett & Son Ltd.

5.23.

Boeing & Son Ltd.

2.17.19.21.

Bristol Aerospace 1968 Ltd.

3.5.16.19.

15. Rain repellents, windscreen.
16. Regulators, pressure air.
17. Rescue booms.
18. Seats, aircraft, ejection.
19. Seats and benches, aircraft.
20. Seats, fabric.
21. Skis, helicopter.
22. Spray equipment, helicopter.
23. Strapes, litter, web.
24. Systems for handling, air transporting & erecting of equipment or structures by helicopter.
25. Winches

Canadair Ltd.

3.

Canadian Aircraft Products Ltd.

19.

Canadian Car (Fort William)

19.

Canadian Flight Equipment Co.

5.9.18.19.

Central Dynamics Ltd.

1.16.

De Havilland Aircraft of Canada

3.

Douglas Aircraft Co. Canada Ltd.

7.

Dowty Equipment of Canada Ltd.

1.25.

1680 MISCELLANEOUS AIRCRAFT ACCESSORIES AND COMPONENTS (conc.)

W. R. Elliott Ltd.	Irvin Air Chute Ltd.
1.	10.
Enamel & Heating Products Ltd.	Metro Engineering Co. Ltd.
19.	8.11.19.
Fairey Canada Ltd.	Modern Machine Industry Ltd.
3.	8.
Field Aviation Co. Ltd.	Okanagan Helicopters Ltd.
18.25.	12.13.22.24.
Flag Fire Equipment Ltd.	Pyrene Mfg. Co. of Canada Ltd.
6.	6.
Fleet Manufacturing Ltd.	Ross-Smith (1969) Ltd.
3.4.18.	5.20.
Flight Line Quality Products Ltd.	T.S.M. Industries Ltd.
20.	14.
General Metallic Parts Ltd.	H. I. Thompson Co. of Canada Ltd.
1.	2.
Godfrey Engineering Co. Ltd.	Universal Die & Tool Mfg. Ltd.
16.25.	8.11.20.
John T. Hepburn Ltd.	Williams Machines Ltd.
25.	20.
Heroux Ltd.	W. C. Wood Co. Ltd.
1.11.	7.
Frank W. Horner Ltd.	
15.	

GROUP 17

AIRCRAFT LAUNCHING, LANDING, AND GROUND HANDLING EQUIPMENT

1710 AIRCRAFT ARRESTING, BARRIER AND BARRICADE EQUIPMENT

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Barriers, aircraft arresting. 2. Cables, arresting. <p>Donald Ropes & Wire Cloth Ltd.
1.2.</p> <p>Fairey Canada Ltd.
3.</p> | <ul style="list-style-type: none"> 3. Helicopter, landing system, shipboard. <p>John T. Hepburn
3.</p> <p>Heroux Ltd.
1.</p> |
|---|---|

1720 AIRCRAFT LAUNCHING EQUIPMENT

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Catapults. 2. Launching cables. <p>Canadian Arsenals Ltd.
(Small Arms Div.)
3.</p> | <ul style="list-style-type: none"> 3. Terminals, cable. <p>Canadian Flight Equipment Co.
1.</p> <p>Donald Ropes & Wire Cloth Ltd.
2.</p> |
|--|---|

1730 AIRCRAFT GROUND SERVICING EQUIPMENT

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Bags, pneumatic aircraft lifting. 2. Beaching equipment. 3. Belt loaders, mobile. 4. Booms, self-propelled. 5. Chocks, wheel. 6. Covers, canvas, A/C engine. 7. Covers, canvas, A/C wing. 8. Cranes, aircraft engine. 9. Energizers. 10. Jacks, hydraulic. 11. Ladders, maintenance. 12. Ladders, boarding. 13. Pallet loaders. <p>Aerometals Ltd.
11.12.</p> <p>Aircraft Appliances & Equipment
9.</p> <p>Albon Welding & Mechanical
Works Ltd.
14.17.18.19.20.21.</p> <p>Aro of Canada Ltd.
18.</p> <p>Wm. Bartlett & Son Ltd.
1.6.7.</p> <p>Bata Engineering
21.</p> <p>Boeing of Canada Ltd.
11.12.14.17.20.21.</p> | <ul style="list-style-type: none"> 14. Platforms. 15. Platforms, hydraulic. 16. Refuelling equipment. 17. Servicing equipment, helicopter. 18. Servicing equipment various. 19. Stands, engine, maintenance and handling. 20. Stands, handling and maintenance, various. 21. Towbars, aircraft. 22. Vehicles, cargo, high lift. 23. Vehicles, commissary, high lift. <p>Bogue Electric of Canada Ltd.
9.18.19.20.</p> <p>Bristol Aerospace 1968 Ltd.
18.20.</p> <p>Canadair Ltd.
18.20.</p> <p>Canadian Car (Fort William)
2.5.18.20.</p> <p>De Havilland Aircraft of Canada
18.20.21.</p> <p>Dominion Helicopters Ltd.
17.</p> <p>Douglas Aircraft of Canada
11.</p> |
|--|---|

1730 AIRCRAFT GROUND SERVICING EQUIPMENT (cont.)

Dowty Equipment of Canada Ltd. 10.	Metro Engineering Co. Ltd. 19.20.
Dynamic Industries Inc. 8.14.19.20	Molsen Industries Ltd. 14.
Elco-Wood Industries Ltd. 4.5.14.15.	H. K. Morrison & Sons 5.21.
Enamel & Heating Products Ltd. 5.11.12.14.18.19.20.21.	Northwest Industries Ltd. 5.11.12.18.19.20.21.
Fairey Canada Ltd. 18.20.21.	Powertronic Equipment Ltd. 9.
Field Aviation Co. Ltd. 18.20.	Renfrew Aircraft & Engineering Ltd. 5.12.14.16.21.
Fleet Manufacturing Ltd. 5.18.21.	Reynolds Extrusion Co. Ltd. 11.12.
Free-Piston Development Co. Ltd. 19.20.	Ross-Smith Ltd. 6.7.
Godfrey Engineering Co. Ltd. 9.19.	Rousseau Controls Ltd. 10.
B. F. Goodrich Canada Ltd. 1.	Tri-Service Fabricating Ltd. 5.11.12.14.15.19.20.21.
Harrington Tool & Die Co. Ltd. 19.20.	Truck Engineering Ltd. 4.14.15.
Hassan Steel Fabricators Ltd. 19.20.	Uniroyal Ltd. 1.
James United Steel Ltd. 11.12.14.15.	Vicom Ltd. 11.12.19.20.21.
LaSalle Engineering Ltd. 5.14.20.21.	Victory Conveyor & Machine Reg'd. 19.20.
Lefebvre Freres Ltd. 19.20.21.	Western Tools & Industries Ltd. 5.11.12.14.
Magline of Canada Ltd. 11.12.14.	Williams Machines Ltd. 21.
Maritime Industries Ltd. 3.4.13.22.23.	S. E. Woods (Canvass Div.) 6.7.
Master Mechanical Mfg. Ltd. 18.19.20.	Yarrows Ltd. 14.
Matthew Moody Division 19.20.	

1740 AIRFIELD SPECIALIZED TRUCKS AND TRAILERS

1. Airfield flushers.	6. Tractors, special design.
2. Airfield sweepers.	7. Trailers, aircraft cargo.
3. Dollies.	8. Trailers, bomb, dolly type.
4. Refuellers, aircraft.	9. Trailers, rocket.
5. Tractors, electric, custom.	10. Trailers, special design.
Albon Welding & Mechanical Works 8.9.10.	Canadian Car (Fort William) 3.7.8.
ATCO Industries Ltd. 7.10.	Canadian Trailmobile Ltd. 10.
Boeing of Canada Ltd. 3.	Douglas Aircraft of Canada 3.10.

1740-1850

1740 AIRFIELD SPECIALIZED TRUCKS AND TRAILERS (conc.)

Elco-Wood Industries Ltd.
1.2.5.6.10.

Electric & Gas Welding Co. Ltd.
1.4.

Fabricated Steel Products
3.9

Fleet Manufacturing Ltd.
3.8.9.10.

James Howden & Parsons of Canada
10.

James United Steel Ltd.
10.

LaSalle Engineering Ltd.
3.

Magline of Canada Ltd.
3.7.10.

Matthew Moody Division
3.7.10.

H. K. Morrison & Sons
8.

Renfrew Aircraft & Engineering Ltd.
3.

Technodyne Co. Ltd.
3.10.

Tri-Service Fabricating Ltd.
3.8.9.10.

Truck Engineering Ltd.
10.

Victory Conveyor & Machine Reg'd.
8.9.

Western Tools & Industries Ltd.
10.

Williams Machines Ltd.
3.

GROUP 18

SPACE VEHICLES

1850 SPACE VEHICLE HANDLING AND SERVICING EQUIPMENT

1. Trailers, special.

Canadian Car (Fort William)
1.2.

Canadian Trailmobile Ltd.
1.

2. Trucks, special.

Canadian Vickers Ltd.
1.2.

Truck Engineering Ltd.
1.2.

GROUP 19

SHIPS, SMALL CRAFT, PONTOONS
AND FLOATING DOCKS

1905 COMBAT SHIPS AND LANDING VESSELS

1. Combat vessels.

Burrard Dry Dock Co. Ltd.

1.2.

Canadian Vickers Ltd.

2.

Davie Shipbuilding Ltd.

1.2.

Dominion Bridge Co. Ltd.

2.

Ferguson Industries Ltd.

1.2.

Halifax Shipyards

1.2.

Kingston Shipyards

1.2.

2. Landing craft.

Marine Industries Ltd.

1.2.

Matsumoto Shipyards Ltd.

2.

Port Arthur Shipbuilding

2.

Port Weller Dry Docks Ltd.

2.

Russel Brothers Ltd.

2.

Saint John Shipbuilding & Dry Dock

1.2.

Yarrows Ltd.

1.2.

1910 TRANSPORT VESSELS, PASSENGER AND TROOP

Burrard Dry Dock Co. Ltd.

Davie Shipbuilding Ltd.

Ferguson Industries Ltd.

Halifax Shipyards

Kingston Shipyards

Marine Industries Ltd.

Port Arthur Shipbuilding

Port Weller Dry Docks Ltd.

Saint John Shipbuilding & Dry Dock

1915 CARGO AND TANKER VESSELS

1. Cargo.

Burrard Dry Dock Co. Ltd.

1.

Canadian Vickers Ltd.

1.2.

Davie Shipbuilding Ltd.

1.2.

Ferguson Industries Ltd.

1.2.

Halifax Shipyards

1.2.

Kingston Shipyards

1.2.

2. Tankers.

Marine Industries Ltd.

1.2.

Port Arthur Shipbuilding

1.2.

Port Weller Dry Docks Ltd.

1.2.

Russel Brothers Ltd.

1.

Saint John Shipbuilding & Dry Dock

1.2.

Yarrows Ltd.

1.

1920-1930

1920 FISHING VESSELS

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Davie Shipbuilding Ltd.
Ferguson Industries Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.

Matsumoto Shipyards Ltd.
Port Arthur Shipbuilding
Port Weller Dry Docks Ltd.
Russel Brothers Ltd.
Saint John Shipbuilding & Dry Dock
Star Shipyard (Mercer's) Ltd.

1925 SPECIAL SERVICE VESSELS

1. Tenders.

2. Tugs.

Burrard Dry Dock Co. Ltd.
1.2.3.
Davie Shipbuilding Ltd.
1.2.3.
Ferguson Industries Ltd.
1.2.
Halifax Shipyards
1.2.3.
Kingston Shipyards
1.2.3.
Marine Industries Ltd.
1.2.3.

3. Vessels, special service.

Matsumoto Shipyards Ltd.
1.2.
Port Arthur Shipbuilding
1.3.
Port Weller Dry Docks Ltd.
1.2.3.
Russel Brothers Ltd.
1.2.3.
Saint John Shipbuilding & Dry Dock
1.2.3.
Star Shipyards (Mercer's) Ltd.
1.2.3.

1930 BARGES AND LIGHTERS, CARGO

1. Barges, cargo.

2. Lighters, cargo.

Burrard Dry Dock Co. Ltd.
1.2.
Canadian Vickers Ltd.
1.2.
Canron Ltd. (Structural Div.)
1.
Davie Shipbuilding Ltd.
1.2.
Dominion Bridge Co. Ltd.
1.
Ferguson Industries Ltd.
1.2.3.
Halifax Shipyards
1.2.3.
Kingston Shipyards
1.2.3.
Lunenburg Foundry & Engineering Ltd.
1.2.3.

3. Scows.

Marine Industries Ltd.
1.2.
National Steel Car Corp. Ltd.
1.
Port Arthur Shipbuilding
1.2.3.
Port Weller Dry Docks Ltd.
1.3.
Russel Brothers Ltd.
1.2.3.
Saint John Shipbuilding & Dry Dock
1.2.3.
Star Shipyard (Mercer's) Ltd.
1.
Yarrows Ltd.
2.

1935 BARGES AND LIGHTERS, SPECIAL PURPOSE**1. Barges.**

Burrard Dry Dock Co. Ltd.
1.2.
Canadian Vickers Ltd.
1.2.
Canron Ltd. (Structural Div.)
1.
Davie Shipbuilding Ltd.
1.2.
Dominion Bridge Co. Ltd.
1.
Ferguson Industries Ltd.
1.2.
Halifax Shipyards
1.2.
Kingston Shipyards
1.2.

2. Lighters.

Lunenburg Foundry & Engineering Ltd.
1.2.
Marine Industries Ltd.
1.2.
National Steel Car Corp. Ltd.
1.
Port Arthur Shipbuilding
1.2.
Port Weller Dry Docks Ltd.
1.2.
Russel Brothers Ltd.
1.2.
Saint John Shipbuilding & Dry Dock
1.2.
Yarrows Ltd.
1.2.

1940 SMALL CRAFT

- 1. Boats, aluminum.**
- 2. Boats, rubber, inflatable.**
- 3. Hulls, steel.**

Aluminum Co. of Canada
1.
Burrard Dry Dock Co. Ltd.
3.4.5.
Canadian Vickers Ltd.
3.5.
Davie Shipbuilding Ltd.
3.5.
Fabricated Steel Products
1.
Ferguson Industries Ltd.
1.3.5.
Halifax Shipyards
3.5.
Kingston Shipyards
3.5.
Lunenburg Foundry & Engineering Ltd.
3.

- 4. Hulls, wooden.**
- 5. Ships, small, coastal, custom.**

Marine Industries Ltd.
3.5.
Matsumoto Shipyards Ltd.
1.3.4.5.
Port Arthur Shipbuilding
3.5.
Port Weller Dry Docks Ltd.
3.5.
Russel Brothers Ltd.
1.3.5.
Saint John Shipbuilding & Dry Dock
3.5.
Star Shipyard (Mercer's) Ltd.
3.5.
Uniroyal Ltd.
2.
Yarrows Ltd.
3.5.

1945 PONTOONS AND FLOATING DOCKS**1. Floating docks.**

Burrard Dry Dock Co. Ltd.
1.
Canadian Vickers Ltd.
1.
Davie Shipbuilding Ltd.
1.

2. Pontoons, rubber.

Dominion Bridge Co. Ltd.
1.
Foresteel Industries Ltd.
1.
Halifax Shipyards
1.

1945-1955

1945 PONTOONS AND FLOATING DOCKS (conc.)

Kingston Shipyards
1.
Marine Industries Ltd.
1.
Matsumoto Shipyards Ltd.
1.
Port Arthur Shipbuilding
1.
Port Weller Dry Docks Ltd.
1.

Russel Brothers Ltd.
1.
Saint John Shipbuilding & Dry Dock
1.
Saskatchewan Steel Fabricators Ltd.
1.
Uniroyal Ltd.
2.
Yarrows Ltd.
1.

1950 FLOATING DRYDOCKS

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Davie Shipbuilding Ltd.
Dominion Bridge Co. Ltd.
Halifax Shipyards

Kingston Shipyards
Marine Industries Ltd.
Port Arthur Shipbuilding
Port Weller Dry Docks Ltd.
Yarrows Ltd.

1955 DREDGES

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Davie Shipbuilding Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.

Port Arthur Shipbuilding
Port Weller Dry Docks Ltd.
Russel Brothers Ltd.
Saint John Shipbuilding & Dry Dock
Yarrows Ltd.

GROUP 20

SHIP AND MARINE EQUIPMENT

2010 SHIP AND BOAT PROPULSION COMPONENTS

1. Blades, propellor.
2. Controls, mechanical, propulsion.
3. Controls, mechanical, shaft.
4. Controls, mechanical, winch.
5. Controls, pneumatic, propulsion.
6. Controls, pneumatic, shaft.
7. Controls, pneumatic, winch.
8. Controls, servo, propellor.
9. Couplings, shaft, marine.

Black Clawson-Kennedy Ltd.
1.9.10.12.13.

Burrard Dry Dock Co. Ltd.
14.

Computing Devices of Canada Ltd.
17.

Crucible Steel of Canada Ltd.
16.18.

Davie Shipbuilding Ltd.
9.12.14.16.

Dowty Equipment Ltd.
11.

Ferguson Industries Ltd.
9.12.14.18.

Garrett Manufacturing (Marine Div.)
8.

Industrial Machining Ltd.
9.14.16.

Kingston Shipyards
9.12.14.16.17.

J. Kobelt Mfg. Co.
2.3.4.5.6.7.

10. Hubs, propellor.
11. Hydro-jet propulsion devices.
12. Liners, shaft, propulsion.
13. Propellers, new and reconditioned.
14. Propulsion components.
15. Seals, shaft.
16. Shafting, propulsion.
17. Steering, automatic.
18. Tailshaft.

Lefebvre Freres Ltd.
9.15.

Lunenburg Foundry & Engineering Ltd.
9.13.

Metro Engineering Co. Ltd.
9.14.

Modern Machine Industry Ltd.
9.15.16.

Port Weller Dry Docks Ltd.
14.

Progressive Engineering Works Ltd.
12.16.

Railway Equip.
9.14.16.18.

Russel Brothers Ltd.
14.16.18.

Star Shipyard (Mercers')
16.18.

Syntron (Canada) Ltd.
15.

Yarrows Ltd.
9.12.14.

2020 RIGGING AND RIGGING GEAR

1. Booms, cargo.
2. Booms, cargo, retractable.
3. Masts.

Burrard Dry Dock Co. Ltd.
1.3.

Canadian Vickers Ltd.
1.3.

Davie Shipbuilding Ltd.
1.3.5.

Dominion Bridge Co. Ltd.
1.

Donald Ropes & Wire Cloth Ltd.
5.

4. Replenishment equipment, underway.
5. Stays, boom, wire rope.

Ferguson Industries Ltd.
1.3.

Garrett Mfg. Ltd. (Marine Div.)
2.4.

Greening Industries Ltd.
5.

Matsumoto Shipyards Ltd.
1.3.

Peacock Brothers Ltd.
2.4.

2020-2040

2020 RIGGING AND RIGGING GEAR (conc.)

Port Arthur Shipbuilding
1.3.
Port Weller Dry Docks Ltd.
1.3.
Russel Brothers Ltd.
1.3.

Saint John Shipbuilding & Dry Dock
1.3.
Yarrows Ltd.
1.3.

2030 DECK MACHINERY

1. Capstans.
2. Consoles, ship, control.
3. Consoles, ship, engine, control.
4. Controls, steering, hydraulic.
5. Davits.
6. Hoists, anchor.
7. Hydraulic motors & controls.

BLH-Bertram Ltd.
6.12.13.
Baldrive Co.
7.
Black Clawson-Kennedy Ltd.
12.
CAE Machinery Ltd.
10.12.
Canadian Vickers Ltd.
10.
Capilano Engineering Ltd.
4.8.
Dominion Bridge Co. Ltd.
5.
Dowty Equipment Ltd.
12.
Fleet Mfg. Ltd.
11.12.
Fluid Power Ltd.
7.
Garrett Mfg. Ltd. (Marine Div.)
2.3.6.11.12.13.
Halifax Shipyards
5.

8. Rudder angle indicators.
9. Sliding padeyes & kingposts.
10. Steering gear.
11. Towed body equipment.
12. Winches.
13. Windlasses.

John T. Hepburn Ltd.
1.6.11.12.13.
J. Kobelt
2.3.
Lefebvre Freres Ltd.
6.12.
Lunenburg Foundry & Engineering Ltd.
1.10.12.13.
Peacock Bros. Ltd.
9.
Progressive Engineering Works Ltd.
1.6.12.13.
Russel Brothers Ltd.
5.10.12.
Star Shipyard (Mercers') Ltd.
1.
J. Swann (1963) Ltd.
1.6.7.11.12.13.
Technodyne Co. Ltd.
3.10.
Yarrows Ltd.
5.

2040 MARINE HARDWARE AND HULL ITEMS

1. Air scoops.
2. Anchors.
3. Bars, crate.
4. Cleats.
5. Covers, multi-use.
6. Doors, bow fairing.
7. Doors, bow, landing craft.
8. Doors, metal, marine.
9. Doors, sliding.
10. Doors, watertight.

11. Fenders, boat.
12. Fenders, dock.
13. Hangers, door, sliding.
14. Hatches.
15. Ladders.
16. Lights, navigation.
17. Plates, multi-purpose.
18. Portlights.
19. Rudders.
20. Rudder posts.

2040 MARINE HARDWARE AND HULL ITEMS (*conc.*)

21. Rudder, stocks.

22. Scuttles.

23. Shackles, buoy.

24. Smokestacks.

25. Stanchions & Rails.

26. Struts.

Wm. Bartlett & Son Ltd.

5.

Beclawat (Canada) Ltd.

8.9.10.13.18.30.31.32.

Black Clawson-Kennedy Ltd.

10.

Burrard Dry Dock Co. Ltd.

1.3.4.6.7.8.14.15.17.21.24.28.29.

Canadian Vickers Ltd.

1.5.6.7.8.10.14.15.17.24.26.28.29.

Davie Shipbuilding Ltd.

1.5.6.7.8.14.15.17.24.28.29.

Dominion Bridge Co. Ltd.

5.19.24.

Drummond Welding & Steel Works.

24.

Ferguson Industries Ltd.

1.5.6.7.8.10.14.15.17.29.

Foresteel Industries Ltd.

5.15.24.29.

B.F. Goodrich Canada Ltd.

11.12.

Halifax Shipyards

1.5.6.7.8.14.15.16.17.24.28.29.

Haruni Metal Products

8.9.10.14.15.22.25.

Hassan Steel Fabricators Ltd.

24.

John T. Hepburn Ltd.

6.7.

James Howden & Parsons of Canada

10.

Kingston Shipyards

6.7.

27. Stuffing tubes, marine.

28. Ventilators, multi-purpose.

29. Windows, aluminum.

30. Windows, brass, & stainless.

31. Windows, blast resistant.

32. Windows, heated, electrical.

Lunenburg Foundry & Engineering Ltd.

1.5.8.14.15.17.29.

Marine Industries Ltd.

2.20.24.

Matsumoto Shipyards Ltd.

1.5.6.7.8.14.15.17.24.29.

Metro Engineering Co. Ltd.

15.27.

Port Weller Dry Docks Ltd.

1.5.6.14.15.17.19.21.24.28.29.

K.K. Precision Parts Ltd.

27.

Progressive Engineering Works Ltd.

2.

Railway Equipment

19.21.23.

Ross-Smith (1969) Ltd.

5.12.

Russel Brothers Ltd.

1.5.8.14.15.17.24.29.

Saint John Shipbuilding & Dry Dock

1.3.4.5.6.7.8.10.14.15.17.19.24.28.29.

Saskatchewan Steel Fabricators Ltd.

5.8.15.24.29.

Standard Products (Canada)

30.

Star Shipyard (Mercers') Ltd.

19.21.

Uniroyal Ltd.

11.12.

Victoria Machinery Depot Co. Ltd.

2.5.8.10.14.15.17.19.20.21.24.27.

Yarrows Ltd.

1.5.6.7.8.10.14.15.17.19.24.28.29.

2050 BUOYS

1. Buoys, steel.

2. Deepwater moored buoy.

Bristol Aerospace 1968 Ltd.

3.

Burrard Dry Dock Co. Ltd.

1.

Canadian General Electric (Plastics)

3.

3. Plastic.

Canadian Vickers Ltd.

1.

Davie Shipbuilding Ltd.

1.

Dominion Bridge Co. Ltd.

1.

2050-2090

2050 BUOYS (conc.)

Drummond Welding & Steel Works

1.

E.M.I. Electronics

2.

Ferguson Industries Ltd.

1.

Foresteel Industries

1.

Halifax Shipyards

1.

James Howden & Parsons of Canada

1.

James United Steel Ltd.

1.2.

Kingston Shipyards

1.

Lunenburg Foundry & Engineering Ltd.

1.

Marine Industries Ltd.

1.

Matsumoto Shipyards

1.

Northwest Industries Ltd.

1.

Port Arthur Shipbuilding

1.

Port Weller Dry Docks Ltd.

1.

Railway Equipment

1.

Russel Brothers Ltd.

1.

Saint John Shipbuilding & Dry Dock

1.2.

Tywood Industries

3.

Uniroyal Ltd.

3.

Victoria Machinery Depot Co. Ltd.

1.

Yarrows Ltd.

1.

2090 MISCELLANEOUS SHIP AND MARINE EQUIPMENT

1. Cabinets and lockers.
2. Furniture, marine, custom built, steel.
3. Furniture, marine, custom built, wood.
4. Kits, repair, inflatable craft.

Abercorn Aero Ltd.

4.

Aerometals Ltd.

5.

Albon Welding & Mechanical Works
Ltd.

1.2.5.

Burrard Dry Dock Co. Ltd.

1.2.3.

Canadian Vickers Ltd.

1.2.5.

Capilano Engineering Ltd.

8.

Enamel & Heating Products Ltd.

1.

Ferguson Industries Ltd.

1.2.3.5.6.

Flight Line Quality Products Ltd.

7.

Halifax Shipyards

1.2.3.

Haruni Metal Products

1.3.5.

Hassan Steel Fabricators Ltd.

1.

5. Ladders, metal.

6. Ladders, wood.

7. Seats, fabric.

8. Wheels, steering.

Imperial School Desk Ltd.

2.3.7.

James United Steel Ltd.

5.

Magline of Canada Ltd.

5.

Matsumoto Shipyards Ltd.

1.2.3.

The Pedlar People Ltd.

1.

Port Arthur Shipbuilding

5.

Ross-Smith (1969) Ltd.

7.

Saint John Shipbuilding & Dry Dock

1.3.5.6.

Uniroyal Ltd.

4.

Westeel-Rosco Ltd.

1.

Western Tools & Industries Ltd.

1.5.

Yarrows Ltd.

1.2.

GROUP 22

RAILWAY EQUIPMENT

2210 LOCOMOTIVES

1. Diesel electric.
2. Electric.

Canadian General Electric (Ind. App.)
1.

3. Steam.

MLW-Worthington Ltd.
1.2.3.

2220 RAIL CARS

Davie Shipbuilding Ltd.
Joy Mfg. Co. (Canada) Ltd.
Marine Industries Ltd.

National Steel Car Corp. Ltd.
Railway Equipment.

2230 RIGHT-OF-WAY CONSTRUCTION AND MAINTENANCE EQUIPMENT, RAILROAD

1. Car pullers.
2. Chisels, R/R track.
3. Jacks, track.
4. Mauls, R/R spike.
5. Rail bolters.
6. Rail drillers.

Albon Welding & Mechanical Works
Ltd.
8.9.11.

Black Clawson-Kennedy Ltd.
1.

Canron Ltd. (Railway Div.)
1.3.5.6.7.8.9.11.

ETF Tools Ltd.
2.4.

7. Rail lubricators.
8. Spike pullers.
9. Tie tampers.
10. Track components.
11. Track liners.

Halifax Shipyards.
10.

Joy Mfg. Co. (Canada) Ltd.
1.11.

National Steel Car Corp. Ltd.
3.5.6.7.8.9.11.

Railway Equipment
3.5.6.7.8.9.11.

2240 LOCOMOTIVE AND RAIL CAR ACCESSORIES AND COMPONENTS

1. Axles, railway car.
2. Brakes, emergency, freight car.
3. Bellows, connector, car.
4. Car seats and chairs.
5. Doors, sliding.
6. Hangars and guides, doors, sliding.
7. Plastic seats.
8. Lubricators, freight car journal.

Albon Welding & Mechanical Works
Ltd.

4.10.

Wm. Bartlett & Son Ltd.
3.11.

Beclawat (Canada) Ltd.
2.5.6.13.14.15.

Canadian Flight Equipment Co.
4.

Canadian General Electric (Plastics)
9.

9. Rail car components.
10. Seat adjusters.
11. Tunnels, canvas, air supported.
12. Wheels, railway car.
13. Windows, escape.
14. Windows, fixed.
15. Windows, opening.

Canadian Vickers.
9.

Modern Machine Industry Ltd.
9.

National Steel Car Corp. Ltd.
4.9.12.

Polyfiber Ltd.
7.

Railway Equipment
1.8.9.

Standard Products (Canada)
15.

2250

2250 TRACK MATERIALS, RAILROAD

- 1. Anchors, rail.**
- 2. Guard rails.**
- 3. Frogs.**
- 4. Plates, tie, standard rail.**

Abex Industries (Joliette Div.)
2.3.7.

Canron Ltd. (Railway Div.)
6.8.

Eaton Automotive Canada Ltd.
1.

- 5. Rails, standard, heavy.**
- 6. Snow blowers.**
- 7. Switches.**
- 8. Tie renewers.**

Railway Equipment
4.5.

The Steel Co. of Canada Ltd.
4.5.

Western Canada Steel Ltd.
8.

GROUP 23

MOTOR VEHICLES, TRAILERS, AND CYCLES

2310 PASSENGER MOTOR VEHICLES

1. Buses and coaches.
2. Buses, school.
3. Buses, inter-city.

Bombardier Snowmobile.
4.

Canadair Ltd.
1.

Canadian Vickers.
1.

4. Snowmobiles.
5. Station wagons.

Chrysler Canada Ltd.
5.

Van Wilson Ltd.
2.3.

Western Flyer Coach Ltd.
1.2.3.

2320 TRUCKS AND TRUCK TRACTORS

1. Ambulances.
2. Carriers, full track.
3. Muskeg and arctic tractors.
4. Refuellers.
5. Refuse collectors.
6. Snow blowers.
7. Snowscooters, high speed.
8. Tractors, crane carrying.

Atlas Hoist & Body Inc.
5.12.

Bombardier Snowmobile Ltd.
2.3.7.10.

Canadair Ltd.
2.3.

Canadian Car (Fort William)
9.

Chrysler Canada Ltd.
11.14.15.

Elco-Wood Industries.
1.5.13.

Electric & Gas Welding Co. Ltd.
4.10.13.

Flextrack-Nodwell Ltd.
2.3.8.

9. Tractors, skidders.
10. Tractors, snow clearance.
11. Trucks, crane.
12. Trucks, on and off highway.
13. Trucks, tank.
14. Trucks, tractor.
15. Trucks, utility.

Foremost Tracked Vehicles Ltd.
2.3.8.

Go-Tract Systems Ltd.
2.3.7.8.10.

MLW-Worthington Ltd.
2.

National Steel Car Corp. Ltd.
2.

Orenda Ltd.
2.

Richardson Road Machinery Ltd.
6.

Truck Engineering Ltd.
4.15.

White Motor Co. of Canada Ltd.
12.14.15.

2330

2330 TRAILERS

1. Chassis, trailer.
2. Trailers, acid.
3. Trailers, aircraft recovery.
4. Trailers, cable.
5. Trailers, camper.
6. Trailers, dump, hydraulic.
7. Trailers, food products, bulk.
8. Trailers, hopper.
9. Trailers, livestock.
10. Trailers, living quarters.
11. Trailers, logging.
12. Trailers, low bed.
13. Trailers, low bed, tilt platform.
14. Trailers, passenger.
15. Trailers, pneumatic wheel, up to 8 ton capacity.

ATCO Industries Ltd.

9.14.20.22.28.29.

Bombardier Snowmobile Ltd.

20.24.

Canadian Car (Fort William)

10.21.28.

Canadian Trailmobile Ltd.

1.4.6.10.12.18.20.21.22.28.

Fabricated Steel Products

1.

Flextrack-Nodwell Ltd.

24.25.

Go-Tract Systems Ltd.

1.2.4.11.19.20.22.24.

James Howden & Parsons of Canada

20.

James United Steel Ltd.

2.3.7.11.

16. Trailers, pole to 80 ft.
17. Trailers, radar, 4 wheel.
18. Trailers, refrigerated.
19. Trailers, refueller.
20. Trailers, special design.
21. Trailers, stake.
22. Trailers, tank.
23. Trailers, tank recovery.
24. Trailers, tracked, arctic.
25. Trailers, tracked, mobile camp.
26. Trailers, trombone to 60 ft.
27. Trailers, utility, fiberglass.
28. Trailers, van.
29. Trailers, warehouse.

Matthew Moody Division

29.

National Steel Car Corp. Ltd.

20.

W. H. Olsen Mfg. Co. Ltd.

5.20.22.

Otaco Ltd.

15.

Polyfiber Ltd.

27.

Truck Engineering Ltd.

2.3.4.6.7.8.10.11.12.13.16.17.18.19.

20.22.23.26.

Western Tools & Industries Ltd.

20.

GROUP 24

TRACTORS

2410 TRACTORS, FULL TRACK LOW SPEED

1. Tractors.
2. Tractors, muskeg and arctic.

Bombardier Snowmobile Ltd.

2.

Flextrack-Nodwell Ltd.

1.2.

Foremost Tracked Vehicles Ltd.

1.2.

3. Transporters, tracked, muskeg and arctic.

Go-Tract Systems Ltd.

3.

Valcartier Industries Ltd.

2.

2430 TRACTORS, TRACK LAYING, HIGH SPEED

1. Snowmobiles.
2. Tractors.
3. Tractors, muskeg and arctic.

Bombardier Snowmobile Ltd.

1.2.3.

Flextrack-Nodwell Ltd.

1.2.3.

Foremost Tracked Vehicles Ltd.

2.3.

4. Transporters, tracked, muskeg and arctic.

Go-Tract Systems Ltd.

4.

Outboard Marine Corp.

1.

GROUP 25

VEHICULAR EQUIPMENT COMPONENTS

2510 VEHICULAR CAB, BODY, AND FRAME STRUCTURAL COMPONENTS

1. Bodies, refuse collection.
2. Bumpers.
3. Cabs, complete.
4. Couplers, trailers and truck.
5. Cowl assemblies.
6. Curtains, canvass.
7. Door hinges.
8. Doors, sliding.
9. Dump bodies.
10. Fenders, truck.
11. Grills and screens, protective.
12. Hangers and guides, sliding door.
13. Hinges.
14. Hooks and pintles.
15. King pins, trailer.
16. Plastic components.
17. Seats, fabric.
18. Springs, body.
19. Spring hangers.
20. Stabilizer bars.
21. Stake bodies.
22. Struts.
23. Support gear, trailer.
24. Tail gates.
25. Torsion bars.
26. Trailers, special design.
27. Van bodies.
28. Vehicle frames.
29. Vehicular components.
30. Wheels, fifth.
31. Windows, blast resistant.
32. Windows, escape.
33. Windows, fixed.
34. Windows, opening.
35. Windshields, adjustable.
36. Wooden body racks.

ATCO Industries Ltd.
5.27.

Albon Welding & Mechanical Works
Ltd.
26.29.

Atlas Hoist & Body Inc.
1.9.

Auto Specialties Mfg. Co.
7.19.28.

Wm. Bartlett & Son Ltd.
6.

Beclawat (Canada) Ltd.
8.12.31.32.33.34.35.

Canadian Car (Fort William)
21.26.27.

Canadian General Electric (Plastics)
16.

Canadian Trailmobile Ltd.
1.3.10.21.24.26.27.28.36.

Canadian Vickers Industries Ltd.
3.

Chrysler Canada Ltd.
3.

Diemakers Ltd.
13.

Dynamic Industries Inc.
9.27.

Eastern Steel Products Co.
9.

Eaton Automotive Canada Ltd.
16.

Elco-Wood Industries Ltd.
1.9.21.24.26.27.28.29.36.

Fenn-Dor Plastics Ltd.
16.

Hassan Steel Fabricators Ltd.
2.10.20.22.24.25.

Holland Hitch of Canada Ltd.
4.14.15.23.30.

James Howden & Parsons of Canada.
19.26.

Johnson Wire Products Ltd.
11.

Robert Mitchel Co. Ltd.
8.9.28.29.

W. H. Olsen Mfg. Co. Ltd.
9.21.27.28.

Otaco Ltd.
18.19.

Polyfiber Ltd.
3.5.16.27.

Ross-Smith (1969) Ltd.
17.

Russel Brothers Ltd.
28.29.

R.J. Stampings Co. Ltd.
5.10.

2510 VEHICULAR CAB, BODY, AND FRAME STRUCTURAL COMPONENTS (conc.)

Standard Products (Canada). 34.	Valcartier Industries. 2.16.29.
Uniroyal Ltd. 16.	Van-Wilson Ltd. 27.
Universal Die & Tool Mfg. Ltd. 7.13.	Zettel Manufacturing Ltd. 2.3.7.19.20.22.24.

2520 VEHICULAR POWER TRANSMISSION COMPONENTS

1. Axles, front and rear driven.	10. Motors, hydraulic.
2. Axle housings.	11. Power take-offs.
3. Axles, trailing.	12. Shafts.
4. Clutches.	13. Shifts, electric.
5. Differentials.	14. Transmissions.
6. Filters.	15. Transmissions, hydraulic.
7. Forks, clutch.	16. Transmissions, multi-speed.
8. Hubs, clutch.	17. Universal joints.
9. Motors, axle, shift.	
Allanson Mfg. Corp. Ltd. 9.	Ingersoll Machine & Tool Co. Ltd. 3.
Aro of Canada Ltd. 6.	Keene of Canada Corp. Ltd. 6.
Auto Specialties Mfg. Co. 7.	Long Mfg. Co. 4.
Canadian Acme Screw & Gear Ltd. 5.11.12.14.17.	PurOlator Products (Canada) Ltd. 6.
Dowty Equipment Ltd. 10.15.	Rex Cahin Belt (Canada) Ltd. 17.
Eaton Automotive Canada Ltd. 1.13.14.15.16.	Sinterings Ltd. 8.
Elco-Wood Industries 3.	Technodyne Co. Ltd. 17.
Hayes-Dana Ltd. 1.4.11.12.14.17.	Truck Engineering Ltd. 3.
Holmes Foundry Ltd. 2.	

2530 VEHICULAR BRAKE, STEERING AXLE, WHEEL AND TRACK COMPONENTS

1. Automobile hub caps.	13. Steering housings.
2. Axles and components.	14. Tank treads, rubber.
3. Axles, trailing.	15. Tire, bogie wheel.
4. Brake components.	16. Tracklayers-traction assist device.
5. Brake drums.	17. Tractor pads, steel.
6. Brake shoes.	18. Wheel rims.
7. Brake spiders.	19. Wheels, cast.
8. Hubs, wheel.	20. Wheels, disc.
9. Liners, brake and gear shift.	21. Wheels, rubber covered.
10. Sprocket rims.	22. Wheels, trailer, pneumatic.
11. Steering columns, energy absorbing.	23. Wheels, wagon, pneumatic.
12. Steering components.	24. Wheels, wheelbarrow, pneumatic.
Auto Specialties Mfg. Co. 1.6.7.9.13.	Canadian Acme Screw and Gear Ltd. 2.12.13.

2530-2590

2530 VEHICULAR BRAKE, STEERING AXLE, WHEEL AND TRACK COMPONENTS (conc.)

Canadian Trailmobile Ltd. 3.	Kelsey-Hayes Canada Ltd. 2.4.5.6.7.8.10.17.18.19.21.22.23.24.
Eaton Automotive Canada Ltd. 11.12.	Mansfield-Denman General Ltd. 14.
Flextrack-Nodwell Ltd. 12.14.	Modern Machine Industry Ltd. 2.4.
Fluid Power Ltd. 12.	Otaco Ltd. 1.2.22.23.24.
Foremost Tracked Vehicles 12.14.	Standard Products (Canada) 12.13.14.
Free-Piston Development Co. Ltd. 2.4.12.	Thompson Products Ltd. 12.
Hayes-Dana Ltd. 6.	Uniroyal Ltd. 14.15.21.
Holmes Foundry Ltd. 1.7.	Zettel Manufacturing Ltd. 1.4.13.
Ingersoll Machine & Tool Co. Ltd. 2.4.6.12.	

2540 VEHICULAR FURNITURE AND ACCESSORIES

1. Directional signal kits.	6. Repellants, rain, windscreen.
2. Heaters, vehicle, interior.	7. Rubber components.
3. Lighting accessories.	8. Shock absorbers.
4. Mirrors.	9. Ventilating systems.
5. Plastic components.	
Canadian Acme Screw & Gear 8.	Frank W. Horner Ltd. 6.
Canadian General Electric (Plastics) 5.	Perfection Automotive Ltd. 3.4.
James B. Carter Ltd. 2.	Polyfiber Ltd. 5.
Eaton Automotive Canada Ltd. 2.9.	Standard Products Ltd. 7.
Fenn-Dor Plastics Ltd. 5.	Tridon Mfg. Ltd. 1.
Gabriel of Canada Ltd. 9.	Uniroyal Ltd. 5.

2590 MISCELLANEOUS VEHICULAR COMPONENTS

1. Cable assemblies, electric.	3. Rubber tractor treads.
2. Hoist units, vehicular body hydraulic.	4. Winches, vehicle.
Abex Industries Ltd. (Elec. Div.) 1.	Eastern Steel Products. 2.
Canadian Acme Screw & Gear Ltd. 4.	Joy Manufacturing Co. 1.
Canadian Trailmobile Ltd. 2.	Uniroyal Ltd. 3.

GROUP 26

TIRES AND TUBES

2610 TIRES AND TUBES, PNEUMATIC, EXCEPT AIRCRAFT**1. Tires.**

Dunlop Canada Ltd.

1.2.

B.F. Goodrich Canada Ltd.

1.2.

2. Tubes.

Uniroyal Ltd.

1.2.

2620 TIRES AND TUBES, PNEUMATIC, AIRCRAFT**1. Tires.**

B.F. Goodrich Canada Ltd.

1.2.

2. Tubes.

Uniroyal Ltd.

1.2.

2630 TIRES, SOLID AND CUSHION**1. Rubber tractor treads.**

B.F. Goodrich Canada Ltd.

1.2.

2. Tires, solid and pneumatic non-aircraft.

Uniroyal Ltd.

1.2.

2640 TIRE REBUILDING AND TIRE AND TUBE REPAIR MATERIALS

Dunlop Canada Ltd.

B.F. Goodrich Canada Ltd.

National Rubber Co. Ltd.

Uniroyal Ltd.

GROUP 28

ENGINES, TURBINES, AND COMPONENTS

2805 GASOLINE RECIPROCATING ENGINES, EXCEPT AIRCRAFT, AND COMPONENTS

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Engines, diesel, marine, air cooled. 2. Engines, diesel, marine, liquid cooled. 3. Engines, light, 2 stroke. 4. Gaskets and packing. 5. Gasoline engines, and components. | <ul style="list-style-type: none"> 6. Motors, outboard. 7. Motors, marine, stern drive. 8. Rocker arms. 9. Rods, connecting. 10. Valves and components. |
|--|--|

Chrysler Canada Ltd.

5.

Cummins Eastern Canada Ltd.

2.

Deloro Stellite

10.

Deutz Diesel (Canada) Ltd.

1.2.

Hassan Steel Fabricators Ltd.

4.

Holmes Foundry Ltd.

8.

Lunenburg Foundry & Engineering Ltd.

2.3.

Onan Generators Canada Ltd.

5.

Outboard Marine Corp.

3.6.7.

Thompson Products Ltd.

9.10.

Uniroyal Ltd.

4.

White Motor Co. of Canada.

5.

2810 GASOLINE RECIPROCATING ENGINES, AIRCRAFT: AND COMPONENTS

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Gaskets and packing. 2. Pistons, valves, etc. | <ul style="list-style-type: none"> 3. Spares for R985, R1340, R1830, R2000, R2800 and R4360 Engines. |
|---|---|

Hassan Steel Fabricators Ltd.

1.

Uniroyal Ltd.

1.

United Aircraft of Canada Ltd.

1.2.3.

2815 DIESEL ENGINES AND COMPONENTS

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Diesel engines, and components. 2. Gaskets and packings. | <ul style="list-style-type: none"> 3. Valve components. 4. Valves and valve inserts. |
|--|--|

Canadian Car (Pacific) Ltd.

1.

Canadian Vickers Ltd.

1.

Cummins Eastern Canada Ltd.

1.

Deloro Stellite

3.4.

Hassan Steel Fabricators Ltd.

2.

MLW-Worthington Ltd.

1.

Onan Generators Canada Ltd.

1.

Uniroyal Ltd.

2.

White Motor Co. Canada Ltd.

1.

2820 STEAM ENGINES, RECIPROCATING: AND COMPONENTS**1. Engines, steam, marine.**

Babcock & Wilcox Canada Ltd.

1.2.

Canadian Vickers Ltd.

1.

James Howden & Parsons of Canada

1.2.

2. Engines, steam, stationary.

MLW-Worthington Ltd.

1.2.

Progressive Engineering Works Ltd.

1.

2825 STEAM TURBINES AND COMPONENTS**1. Cooling systems, turbo-generators.****2. Pumps, turbine steam.****3. Turbines, auxiliary.****4. Turbines, auxiliary generator.****5. Turbines, blower.****6. Turbines, compressor.****7. Turbines, electric generator.****8. Turbines, electric, propulsion.****9. Turbines, fan.****10. Turbines, geared, propulsion.****11. Turbines, hydraulic.****12. Turbines, marine.**

Babcock & Wilcox Canada Ltd.

2.18.

Canadian Vickers Ltd.

12.

Canadian Westinghouse (Apparatus)

4.7.8.10.12.13.14.15.17.19.20.21.22.23.

Dominion Engineering Works Ltd.

11.

13. Turbines, marine auxiliary.**14. Turbines, marine, electric propulsion.****15. Turbines, marine, geared propulsion.****16. Turbines, mechanical.****17. Turbines, propulsion.****18. Turbines, steam.****19. Turbines, steam, electrical generating.****20. Turbines, steam, electrical propulsion.****21. Turbines, steam geared.****22. Turbines, steam, non-condensing.****23. Turbines, steam, power units.**

James Howden & Parsons of Canada

3.5.6.9.16.18.

Keeprite Products Ltd.

1.

Peacock Bros. Ltd.

2.16.

2830 WATER TURBINES & WATER WHEELS & COMPONENTS**1. Cooling equipment for turbo-generators.**

Keeprite Products Ltd.

1.

2835 GAS TURBINES AND JET ENGINES, EXCEPT AIRCRAFT, AND COMPONENTS**1. Afterburners.****2. Blades, compressors.****3. Blades, turbines.****4. Engines, complete.****5. Flame tubes.**

Bristol Aerospace 1968 Ltd.

1.5.

Canadian Westinghouse (Apparatus)

8.

Deloro Stellite

2.3.7.9.

Dowty Equipment Ltd.

6.

Orenda Ltd.

1.2.3.4.7.8.9.

6. Hydro-jet devices.**7. Shields, turbine blade.****8. Turbines, gas.****9. Wheels, turbine.**

Renfrew Aircraft & Engineering Ltd.

5.

United Aircraft of Canada Ltd.

4.

Walbar Machine Products of Canada

Ltd.

2.3.5.8.

Vicom Ltd.

5.

2840-2895

2840 GAS TURBINES AND JET ENGINES, AIRCRAFT: AND COMPONENTS

1. Afterburners.

2. Blades, gas turbine.

3. Components.

4. Discs.

5. Exhaust components.

6. Flame tubes.

Aviation Electric Ltd.

1.3.

Wm. Bartlett & Son Ltd.

8.

Brantford Precision Ltd.

3.

Bristol Aerospace 1968 Ltd.

1.3.5.6.

Free-Piston Development Co. Ltd.

3.

General Metallic Parts Ltd.

3.

Heroux Ltd.

3.

Ilines Machine Products Ltd.

3.

Metro Engineering Co. Ltd.

3.

7. Gas turbines.

8. Insulation blankets and heatshields.

9. Jet engines.

10. Seals, turbine.

11. Vanes, compressor.

Orenda Ltd.

1.2.3.7.9.11.

Preci-Tools Ltd.

3.

Renfrew Aircraft & Engineering Ltd.

3.6.

Rolls-Royce of Canada Ltd.

3.7.9.

T.S.M. Industries Ltd.

3.

H. I. Thompson Co. of Canada Ltd.

8.

United Aircraft of Canada Ltd.

3.7.9.

Vicom Ltd.

3.4.

Walbar Machine Products of Canada Ltd.

2.3.4.6.10.11.

2895 MISCELLANEOUS ENGINES AND COMPONENTS

1. Hydro-jet devices.

Dowty Equipment Ltd.

1.

GROUP 29

ENGINE ACCESSORIES

2910 ENGINES FUEL SYSTEM COMPONENTS, NON-AIRCRAFT

1. Carburetor air temp. control systems.
2. Filters, air.
3. Filters, air, micronic.
4. Filters, fuel.
5. Filters, hydraulic fluid.

Abex Industries of Canada Ltd.
8.10.

Aircraft Appliances & Equipment
4.6.7.8.

Canadian Acme Screw & Gear Ltd.
8.

Canadian Filters Ltd.
1.

Deloro Stellite
10.

Hayes-Dana Ltd.
8.

Heroux Ltd.
10.

6. Filters, metal.
7. Fuel filter assemblies.
8. Pumps, fuel.
9. Tanks, rubber, fuel.
10. Valves and pistons.

Keene of Canada Corp. Ltd.
4.

Kralinator Filters Ltd.
4.6.7.

Lucas-Rotax Ltd.
8.10.

PurOlator Products (Canada) Ltd.
2.3.4.5.6.7.

Thompson Products Ltd.
10.

Spar Aerospace
10.

Uniroyal Ltd.
9.

2915 ENGINE FUEL SYSTEM COMPONENTS, AIRCRAFT

1. Actuators, elec-mech.
2. Filters, fuel.
3. Fuel line assemblies.
4. Hose assemblies.

Abex Industries of Canada Ltd.
1.5.

Aircraft Appliances & Equipment
2.5.

Aircraft Industries of Canada Ltd.
3.4.

Aviation Electric Ltd.
5.7.

Canadian Acme Screw & Gear Ltd.
5.

Dowty Equipment of Canada Ltd.
5.

W. R. Elliott Ltd.
1.

5. Pumps, fuel.
6. Tanks, rubber, fuel.
7. Valves, fuel pump.

Field Aviation Co. Ltd.
3.

Heroux Ltd.
1.

K.K. Precision Parts Ltd.
3.

Lucas-Rotax Ltd.
5.7.

PurOlator Products (Canada) Ltd.
2.

Uniroyal Ltd.
6.

Weatherhead Co. of Canada Ltd.
4.

2920-2935

2920 ENGINE ELECTRICAL SYSTEM COMPONENTS NON-AIRCRAFT

- | | |
|----------------------------|----------------------------------|
| 1. Covers, heating. | 4. Regulators, generator. |
| 2. Generators. | 5. Solenoids. |
| 3. Ignition coils. | 6. Starter motors. |
| Allanson Mfg. Corp. Ltd. | Hayes-Dana Ltd. |
| 2.4.6. | 2.4.5.6. |
| Wm. Bartlett & Son Ltd. | Outboard Marine Corp. |
| 1. | 3. |

2925 ENGINES ELECTRICAL SYSTEM COMPONENTS, AIRCRAFT

- | | |
|-------------------------------------|--|
| 1. Cable assemblies, engine. | 4. Regulators. |
| 2. Collus. | 5. Solenoids, high temperature. |
| 3. Magnetos. | 6. Starters. |
| Abex Industries Ltd. (Elec. Div.) | Central Dynamics Ltd. |
| 1.5. | 1. |
| Aircraft Appliances & Equipment | Douglas Aircraft Canada |
| 4.6. | 1. |
| Aircraft Industries of Canada Ltd. | Fairey Canada Ltd. |
| 1. | 1. |
| Aviation Electric Ltd. | Northwest Industries Ltd. |
| 1.2.3.4.6. | 1. |
| Canadian Car (Fort William) | |
| 1. | |

2930 ENGINE COOLING SYSTEM COMPONENTS, NON-AIRCRAFT

- | | |
|---|--|
| 1. Coolers, bearing. | 7. Hose lines, rubber. |
| 2. Coolers, oil. | 8. Radiator cores. |
| 3. Cooling systems. | 9. Radiator hose clamps. |
| 4. Fan blade assemblies. | 10. Water pumps. |
| 5. Fan blade assemblies, variable pitch. | 11. Waterpump shaft assemblies. |
| 6. Hose lines, armoured. | |
| Allanson Mfg. Corp. Ltd. | Keeprite Products Ltd. |
| 10. | 1.2.3. |
| Canadian Filters Ltd. | Long Mfg. Co. |
| 4.5. | 2.8. |
| Fag Bearings Mfg. Ltd. | Tridon Mfg. Co. Ltd. |
| 11. | 9. |
| Hayes-Dana Ltd. | Uniroyal Ltd. |
| 10. | 7. |
| Heatex Ltd. | Weatherhead Co. of Canada Ltd. |
| 8. | 6.7. |

2935 ENGINE COOLING SYSTEM COMPONENTS, AIRCRAFT

- | | |
|------------------------------------|--------------------------------|
| 1. Filters, fluid pressure. | 3. Hose lines, rubber. |
| 2. Hose lines, armoured. | 4. Radiators. |
| Aircraft Appliances & Equipment | Uniroyal Ltd. |
| 1. | 3. |
| Heatex Ltd. | Weatherhead Co. of Canada Ltd. |
| 4. | 2.3. |
| Rollit Products Ltd. | |
| 3. | |

2940 ENGINE AIR AND OIL FILTERS, STRAINERS AND CLEANERS, NON-AIRCRAFT

1. Filters, air and oil.
2. Filters, fluid, pressure.

Aircraft Appliances & Equipment
1.2.3.4.
Canadian Filters Ltd.
3.
Kenne of Canada Corp. Ltd.
1.2.4.

3. Filters, metal.
4. Strainers, oil, engine.

Kralinator Filters Ltd.
1.2.3.
PurOlator Products (Canada) Ltd.
1.2.3.4.
Sinterings Ltd.
3.

2945 ENGINE AIR AND OIL FILTERS, STRAINERS, AND CLEANERS, AIRCRAFT

Aircraft Appliances & Equipment
Douglas Engineering Co. Ltd.

Fairey Canada Ltd.
PurOlator Products (Canada) Ltd.

2990 MISCELLANEOUS ENGINE ACCESSORIES, NON-AIRCRAFT

1. Blankets, heating, battery, electric.
2. Heaters, battery.
3. Heaters, engine, electric.

Canadian Acme Screw & Gear Ltd.
4.
International Parts (Canada) Ltd.
4.5.
James B. Carter Ltd.
1.2.3.

4. Mufflers.
5. Pipes, exhaust.

Muffler Corp. of Canada
4.
Perfection Automotive Products Ltd.
4.

2995 MISCELLANEOUS ENGINE ACCESSORIES, AIRCRAFT

1. Accumulators hydraulic.
2. Blankets, insulation, thermal.
3. Pumps, hydraulic.

Abex Industries of Canada Ltd.
3.5.
Aircraft Appliances & Equipment.
4.
Aviation Electric Ltd.
3.
Dowty Equipment of Canada Ltd.
1.3.5.
Heroux Ltd.
3.5.

4. Starters, engine, turbine.
5. Valves, hydraulic.

Orenda Ltd.
1.4.
Spar Aerospace Ltd.
3.4.
The H. I. Thompson Co.
2.
United Aircraft of Canada Ltd.
4.

GROUP 30

MECHANICAL POWER TRANSMISSION EQUIPMENT

3010 TORQUE CONVERTERS AND SPEED CHANGERS

1. Actuators.
2. Couplings.
3. Couplings, fluid.
4. Couplings, shaft.
5. Couplings, shaft, flexible.
6. Gear boxes.
7. Gear box assemblies.
8. Power transmission equipment.

Aero Mechanic Ltd.

6.

Aviation Electric Ltd.

1.6.7.8.11.13.

Black Clawson-Kennedy Ltd.

2.4.10.11.

Canadian Acme Screw & Gear Ltd.

2.4.6.7.11.13.14.16.

Canron Ltd. (Mechanical Div.)

6.7.10.11.

Dominion Engineering Works Ltd.

2.4.5.6.7.10.11.

Dominion Road Machinery Co. Ltd.

13.14.15.

Dowty Equipment of Canada Ltd.

1.8.12.13.

Fluid Power Ltd.

1.3.

Forano Ltd.

2.4.6.7.8.9.10.11.

Hamilton Gear & Machine Co.

5.7.10.11.12.

Hayes Steel Products Ltd.

8.16.

9. Reducers, worm gear.

10. Speed increasers.

11. Speed reducers.

12. Torque converters.

13. Transmissions.

14. Transmissions, multi-application.

15. Transmissions, split torque.

16. Universal joints.

Heroux Ltd.

2.4.6.

Joly Engineering Ltd.

6.

Lefebvre Freres Ltd.

6.11.

Magna Electronics

6.7.9.10.11.13.14.15.16.

Metro Engineering Co. Ltd.

6.

Modern Machine Industries Ltd.

4.6.7.

Progressive Engineering Works Ltd.

5.7.

Reliance Electric & Engineering

1.8.11.13.

Rex Chainbelt (Canada) Ltd.

2.4.5.8.11.

Sido Ltd.

4.

Spar Aerospace

6.7.10.11.13.14.

W. C. Wood Co. Ltd.

8.

3020 GEARS, PULLEYS, SPROCKETS AND TRANSMISSION CHAIN

1. Chain, transmission sprocket.
2. Drives, roller chain.
3. Drives, silent chain.
4. Gears, bevel.
5. Gear blanks.
6. Gears, cut and cast tooth.
7. Gears, herringbone.
8. Gears, large and medium.
9. Gears, medium.
10. Gears, precision.
11. Gears, precision inst.

12. Gears, small.
13. Gears, spiral and hypoid.
14. Gears, spur, helical.
15. Idlers, belt, conveyor.
16. Pillow blocks.
17. Pulleys.
18. Ring gears.
19. Shafting.
20. Sheaves.
21. Sprockets.
22. Take-ups.

3020 GEARS, PULLEYS, SPROCKETS AND TRANSMISSION CHAIN (conc.)

Aero Mechanic Ltd. 16.17.19.20.	Joly Engineering Ltd. 9.11.12.
Aerometals Ltd. 20.	K.K. Precision Parts Ltd. 4.5.17.19.21.
BLH-Bertram Ltd. 5.	Lefebvre Freres Ltd. 5.19.
Black Clawson-Kennedy Ltd. 5.6.8.9.14.17.18.	Leigh Instruments Ltd. 10.12.
CAE Machinery Ltd. 8.17.	Magna Electronics Ltd. 4.6.7.10.11.12.13.14.
Canadian Acme Screw & Gear Ltd. 4.5.6.8.9.12.13.14.18.21.	Marsland Engineering Ltd. 4.10.11.12.14.
Canadian General Electric (Meter & Inst.) 9.10.12.	Modern Machine Industry Ltd. 4.5.6.7.8.13.14.19.
Canron Ltd. (Mechanical Div.) 4.6.7.8.9.10.	Monorail Industries Ltd. 4.5.17.20.21.
Curtis Hoover Ltd. 4.7.9.12.14.18.19.21.	Progressive Engineering Works Ltd. 1.9.17.20.21.
Dominion Bridge Co. Ltd. 20.	Rex Chainbelt (Canada) Ltd. 1.17.21.
Dominion Engineering Works Ltd. 4.6.7.8.9.14.18.	SIDO Ltd. 1.5.6.9.10.11.12.14.19.21.22.
Forano Ltd. 1.2.3.6.7.8.9.12.14.15.16.17.18.19.20. 21.22.	Sinterings Ltd. 4.5.10.17.18.21.
General Metallic Parts Ltd. 16.19.21.	Spar Aerospace 4.7.8.9.10.13.14.18.
Hamilton Gear Machine Co. 4.7.13.14.21.	Standard-Modern Tool Co. Ltd. 5.9.
James United Steel Ltd. 8.9.15.17.18.19.20.21.22.	Victoria Machinery Depot Co. Ltd. 1.5.6.12.15.16.17.18.19.20.21.22.
	Williams Machines Ltd. 4.7.8.14.21.

3030 BELTING, DRIVE BELTS, FAN BELTS, AND ACCESSORIES

1. Belts, all types.	4. Belting, transmission.
2. Belts, conveyor.	5. V-Belts.
3. Belts, fan.	
Dunlop Canada Ltd. 1.2.3.	B.F. Goodrich Canada Ltd. 1.2.3.4.5.
Forano Ltd. 5.	Uniroyal Ltd. 1.2.3.4.5.

3040 MISCELLANEOUS POWER TRANSMISSION EQUIPMENT

Aero Mechanic	Modern Machine Industry Ltd.
Forano Ltd.	Rex Chainbelt (Canada) Ltd.
James United Steel Ltd.	SIDO Ltd.
Lefebvre Freres Ltd.	Victoria Machinery Depot Ltd.

GROUP 31

BEARINGS

3110 BEARINGS, ANTI-FRICTION, UNMOUNTED

1. Bearings, annular, motor generator.
2. Bearings, ball, annular.
3. Bearings, ball, angular contact.
4. Bearings, cam or roller follower.
5. Bearings, cylindrical roller.
6. Bearings, journal spherical or needle.
7. Bearings, tapered.
8. Bearings, thrust, ball or roller.
9. Bearings, unground ball or thrust.
10. Locknuts, bearing.
11. Lockwashers, bearing.

Canadian SKF Co. Ltd.

1.2.3.4.5.6.7.8.9.10.11.

Canadian Timken Ltd.

7.

Fag Bearings Mfg. Ltd.

1.2.3.

Sido Ltd.

10.11.

3120 BEARINGS, PLAIN, UNMOUNTED

1. Bearings, blank, sleeve.
2. Bearings, ferrous.
3. Bearings, ferrous, self-lubricating.
4. Bearings, non-ferrous.
5. Bearings, non-ferrous, self-lubricating.
6. Bearings, nylon.
7. Bearings, plain, flanged.
8. Bearings, plain, self-aligning.
9. Bearings, plastic.
10. Bearings, plain, spherical.
11. Bearings, sleeve.
12. Bearings, split.
13. Bearings, thrust, washer type.
14. Bushings.
15. Bushings, Bronze.
16. Washers, precision, thrust.

Boeing of Canada Ltd.

1.7.11.12.14.15.

Canadian Bronze Co. Ltd.

15.

Canadian SKF Co. Ltd.

2.4.8.10.11.16.

Canadian Timken Ltd.

2.

Clevite Ltd.

1.2.3.4.5.7.8.9.10.11.12.13.14.15.

Harrington Tool & Die Co. Ltd.

14.15.

K.K. Precision Parts Ltd.

1.7.11.14.15.

Lefebvre Freres Ltd.

14.15.

Metro Engineering Co. Ltd.

14.15.

Progressive Engineering Works Ltd.

1.12.

Rollit Products Ltd.

6.7.8.11.12.14.15.16.

SIDO Ltd.

1.2.4.7.14.15.16.

Sinterings Ltd.

12.

Union Screen Plate Co.

1.7.13.14.15.

Valcartier Industries Ltd.

14.15.

Xyno-matic Plastics Ltd.

6.

3130 BEARINGS, MOUNTED

1. Bearings, air.
2. Bearings, anti-friction, mounted.
3. Bearings, anti-friction, unmounted.
4. Bearings, babbitt.
5. Bearings, ball, flange.
6. Bearings, ball, take-up.
7. Bearings, cylindrical.
8. Bearings, journal, freight car.
9. Bearings, liquid.
10. Bearings, locomotive suspension.

3130 BEARINGS, MOUNTED (conc.)

- 11. Bearings, roller.**
- 12. Bearings, roller, pillow block.**
- 13. Cartridge blocks.**
- 14. Flange blocks.**

Black Clawson-Kennedy Ltd.

2.

Boeing of Canada Ltd.

13.

Canadian Bronze (Central Div.)

8.10.

Canadian SKF Co. Ltd.

5.6.7.10.13.

Canadian Timken Ltd.

2.3.11.

- 15. Pillow blocks.**
- 16. Take-ups.**
- 17. Take-up blocks.**
- 18. Seals, bearing.**

Devtek Ltd.

1.8.

Forano Ltd.

2.3.5.6.7.9.10.

Progressive Engineering Works Ltd.

13.

Rex Chainbelt (Canada) Ltd.

2.4.10.11.12.13.14.15.16.17.18.

Rollit Products Ltd.

7.

GROUP 32

WOODWORKING MACHINERY AND EQUIPMENT

3210 SAWMILL AND PLANING MILL MACHINERY

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Auto feeders. 2. Band saws and re-saws. 3. Barking drums. 4. Burners for shavings, sawdust, slabs. 5. Chippers, chip screens and chip handling equipment. 6. Circular saw frames. 7. Conveyors, transfer, chain and belt. 8. Cranes, cant. 9. Edgers. 10. Friction feeds. 11. Log carriage equipment. | <ul style="list-style-type: none"> 12. Log deck equipment. 13. Log hauls. 14. Lumber stacking equipment. 15. Metal detectors. 16. Planer and matchers. 17. Presses, bark. 18. Sawmill machinery. 19. Saw sharpening equipment and tools. 20. Trimmers. 21. Trimmer transfer tables. |
|--|---|

Black Clawson-Kennedy Ltd.

5.

CAE Machinery Ltd.

2.4.5.6.9.10.11.12.13.14.15.16.
18.19.20.21.

Forano Ltd.

2.4.5.6.9.10.11.13.14.15.16.19.20.

Horton Steel Works Ltd.

3.17.

James United Steel Ltd.

7.8.11.17.18.19.

Progressive Engineering Works Ltd.

1.7.8.9.12.13.14.20.21.

Victoria Machinery Co. Ltd.

7.11.18.

3220 WOODWORKING MACHINES

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Dowel machines. 2. Jointers. 3. Planers, surface. 4. Saws, band. | <ul style="list-style-type: none"> 5. Saws, circular. 6. Shapers. 7. Tenoners. |
|--|---|

Black Clawson-Kennedy Ltd.

6.

Jos. Poitras & Fils Ltd.

1.2.3.4.5.6.7.

3230 TOOLS AND ATTACHMENTS FOR WOODWORKING MACHINERY

- 1. Knives, woodworking.

Jos. Poitras & Fils Ltd.

1.

GROUP 34

METALWORKING MACHINERY

3413 DRILLING MACHINES

Aro of Canada Ltd.
Preci-Tools Ltd.

Standard-Modern Tool Co. Ltd.
Williams Machines Ltd.

3415 GRINDING MACHINES

1. Grinders, carbide bit.
The Craig Bit Co. Ltd.
1.2.

2. Machines, grinding, drill rod.

3416 LATHES

1. Lathes, bench.
2. Lathes, engine.
3. Lathes, gap.

Preci-Tools Ltd.
1.2.5.

4. Lathes, geared head.
5. Lathes, profiling.

Standard-Modern Tool Co. Ltd.
1.2.3.4.5.

3417 MILLING MACHINES

1. Contour.
2. Horizontal.
3. Milling heads, hydraulic.
4. Milling machines, turret, ram.

Ex-Cell-O Corp. (Canada) Ltd.
4.
Fritz Werner Ltd.
2.5.7.

5. Numerically controlled.
6. Planer.
7. Universal.

Williams Machines Ltd.
1.3.4.6.

3418 PLANERS AND SHAPERS

1. Double housing.

Williams Machines Ltd.
1.2.

2. Open side.

3419 MISCELLANEOUS MACHINE TOOLS

1. Indexing Machines.
2. Lathes, special purpose.
3. Shapers.

American Can Co. of Canada
3.
Carron Ltd. (Mechanical Div.)
4.

4. Special purpose custom machines.
5. Tapping machines, hydraulic.

Cochrane Tool & Design Ltd.
4.
Ex-Cell-O Corp. (Canada) Ltd.
5.

3419-3431

3419 MISCELLANEOUS MACHINE TOOLS (conc.)

General Metallic Parts 4.	Preci-Tools Ltd. 2.
Harrington Tool & Die Co. Ltd. 2.4.	Progressive Welder (Canada) Ltd. 4.
John T. Hepburn 2.3.	Standard-Modern Tool Co. Ltd. 4.
Lefebvre Freres Ltd. 3.	Sheridan Controls Ltd. 4.
Master Mechanical Mfg. 2.3.4.	Williams Machines Ltd. 1.4.

3422 ROLLING MILLS AND DRAWING MACHINES

Canron Ltd. (Mechanical Division)
Dominion Engineering Works Ltd.
BLH-Bertram Ltd.

3424 METAL HEAT TREATING EQUIPMENT

- | | |
|-----------------------------|---|
| 1. Annealing equipment. | 6. Forges, rivet. |
| 2. Carburizing equipment. | 7. Furnaces, heat treating, gas, oil
& electric. |
| 3. Cyaniding equipment. | 8. Tempering equipment. |
| 4. Forges, gas, coal & oil. | |
| 5. Forges, portable. | |

Wayne Forge Ltd.
1.2.3.4.5.6.7.8.

3426 METAL FINISHING EQUIPMENT

- | | |
|--|------------------------------|
| 1. Anodes, graphite, electrolytic
processes. | 5. Tanks, degreasing. |
| 2. Baskets, degreasing. | 6. Tanks, dip. |
| 3. Baskets, dip. | 7. Tanks, immersion, heated. |
| 4. Cathodes, carbon & graphite,
electrolytic processes. | 8. Tanks, plating. |

Hassan Steel Fabricators Ltd.
3.6.
Johnson Wire Products Ltd.
2.3.

Union Carbide Canada Ltd.
1.4.
Wayne Forge Ltd.
5.7.8.

3431 ELECTRIC ARC WELDING EQUIPMENT

- | | |
|--|---|
| 1. Arc welders. | 4. Welding machines, pressure, special. |
| 2. Automatic. | 5. Welding machines, semi-automatic
arc. |
| 3. Plasma surfacing, cutting
equipment. | 6. Welding sets, inert gas, shielded. |

Canadian Liquid Air
1.2.3.5.6.

Powertronic Equipment Ltd.
1.

Standard-Modern Tool Co. Ltd.
2.
Union Carbide (Canada) Ltd.
1.2.3.4.5.6.

3432 ELECTRIC RESISTANCE WELDING EQUIPMENT

1. Automatic.

Lefebvre Freres Ltd.
Progressive Welder (Canada) Ltd.

Standard-Modern Tool Co. Ltd.
Union Carbide (Canada) Ltd.

3433 GAS WELDING, HEAT CUTTING, AND METALIZING EQUIPMENT

1. Cutting equipment, electric.
2. Cutting machines, oxy-fuel gas.
3. Tips.
4. Torches.

Canadian Liquid Air
1.2.3.4.5.6.

5. Welding and cutting outfits.
6. Welding equipment, inert gas, shielded.

Union Carbide (Canada) Ltd.
1.2.3.4.5.6.

3436 WELDING POSITIONERS & MANIPULATORS

Magna Electronics.

3439 MISCELLANEOUS WELDING, SOLDERING, AND BRAZING SUPPLIES AND ACCESSORIES

1. Cable, arc welding.
2. Electrodes.
3. Electrodes, tungsten.
4. Electrode welding equipment, consumable.
5. Fluxes.
6. Holders, clamps, connectors, electrodes.
7. Hose, welding and cutting.
8. Nozzles, cutting, scarfing and lancing.
9. Power for cutting, scarfing and lancing.
10. Power-cutting, scarfing and lancing equipment.

Canadian Liquid Air
2.4.5.6.8.9.10.12.16.17.18.19.
20.21.22.23.

Deloro Stellite
2.12.23.

Electrovert Mfg. Co.
13.14.

Handy & Harman of Canada Ltd.
5.15.

11. Powder dispensers.
12. Rods.
13. Solder coating equipment.
14. Soldering equipment, wave.
15. Solder, silver.
16. Soldering irons, air acetylene and LP gas.
17. Supplies, electric and gas welding.
18. Torches, heating.
19. Torches, soldering (Air-acetylene).
20. Torches, welding and cutting, oxy-fuel gas, air acetylene & LP gas.
21. Torches, welding, inert gas shielded.
22. Welding compositions and fluxes.
23. Welding wire and rods.

Johnson Matthey & Mallory Ltd.
3.5.6.15.

The Steel Co. of Canada Ltd.
2.12.

Union Carbide Canada Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.16.17.18.
19.20.21.22.23.

3441 BENDING AND FORMING MACHINES

1. Plate bending rolls.

Forano Ltd.
Tycos Tool & Die Co. Ltd.

3442-3455

3442 HYDRAULIC AND PNEUMATIC PRESSES, POWER DRIVEN

- | | |
|-----------------------------------|---|
| 1. Presses. | 4. Presses, metal forming and extrusion. |
| 2. Presses, extrusion. | |
| 3. Presses, hydraulic. | |
| Burrard Dry Dock Co. Ltd. | Fluid Power Ltd. |
| 3. | 1.3.4. |
| Canron Ltd. (Mechanical Division) | John T. Hepburn |
| 1.2.3.4. | 1.2.3.4. |
| Canadian Car (Pacific) Ltd. | Progressive Welder (Canada) Ltd. |
| 3. | 3. |
| Davie Shipbuilding Ltd. | Williams Machines Ltd. |
| 1.2. | 3. |
| Dominion Engineering Works. | |
| 1.3.4. | |

3443 MECHANICAL PRESSES, POWER DRIVEN

- | | |
|-----------------------------------|-------------------------|
| American Can Co. of Canada | James United Steel Ltd. |
| Canron Ltd. (Mechanical Division) | Preci-Tools Ltd. |

3444 MANUAL PRESSES

Fluid Power Ltd.

3445 PUNCHING AND SHEARING MACHINES

- | | |
|-------------------------------------|------------------------------|
| 1. Plate shears, hydraulic. | 3. Punching machines. |
| 2. Plate shears, mechanical. | |
| Canron Ltd. (Mechanical Div.) | |
| 1.2.3. | |

3449 MISCELLANEOUS SECONDARY METAL FORMING AND CUTTING MACHINES

- 1. Shrink-fitting equipment.**
Canadian Liquid Air
Union Carbide Canada Ltd.

3455 CUTTING TOOLS FOR MACHINE TOOLS

- | | |
|---|--|
| 1. Blades, bandsaw, metal cutting. | 6. Cutters mill, multi-types. |
| 2. Broachers. | 7. Cutting tools, high speed. |
| 3. Burrs, tungsten carbide. | 8. Cutting tools, stellite. |
| 4. Cutters, fly. | 9. Reamer sets. |
| 5. Cutters, gear. | 10. Tools, cutting, tungsten carbide. |
| Canadian General Electric (Carboloy). | Colonial Tool Co. |
| 3.9. | 1.2.4.5.6.7. |
| Canadian Tap & Die Co. Ltd. | Deloro Stellite. |
| 6. | 8. |

3456 CUTTING AND FORMING TOOLS FOR SECONDARY METAL-WORKING MACHINERY

1. Blanks.
2. Dies.
3. Dies, carbide, laminated.
4. Dies, draw.
5. Dies, fitters.
6. Dies, progressive.

American Can Co. of Canada Ltd.
2.3.4.5.6.7.8.9.10.11.12.

Canadian Car (Fort William).
1.11.12.

Canadian General Electric (Carboloy).
4.8.10

Cochrane Tool & Design Ltd.
2.

Electrical Mfg. Co. Ltd.
9.

Harrington Tool & Die Co. Ltd.
1.2.4.5.7.8.11.12.

Hassan Steel Fabricators Ltd.
7.

Master Mechanical Manufacturing Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.

Metro Engineering Co. Ltd.
1.2.4.5.7.8.11.

Monorail Industries Ltd.
1.2.6.7.9.11.12.

Plymouth Tool & Stamping Ltd.
3.6.8.

7. Dies, punching.
8. Dies, specialties.
9. Dies, stamping.
10. Dies, tungsten carbide.
11. Forming.
12. Piercing.

Portland Tool & Machine Ltd.
2.

Preci-Tools Ltd.
2.6.7.9.12.

Premier Tool & Die Ltd.
7.

Progressive Engineering Works Ltd.
2.

R. J. Stampings Co. Ltd.
1.2.4.6.7.9.11.12.

Standard-Modern Tool Co. Ltd.
1.2.4.6.7.8.9.11.12.

Tycos Tool & Die Co. Ltd.
7.8.9.10.11.12.

Uniroyal Ltd.
1.7.11.

Valcartier Industries Ltd.
1.2.4.5.6.7.9.11.12.

Western Tools & Industries Ltd.
1.7.11.12.

Zettel Manufacturing Ltd.
1.2.4.5.6.7.11.12.

3460 MACHINE TOOL ACCESSORIES

1. Controls, tracer, lathe.
2. Controls, tracer, mill.
3. Holders, tungsten carbide.
4. Inserts, drill chuck.
5. Inserts, tungsten carbide.

Canadian General Electric (Carboloy)
3.5.6.

Deloro Stellite.
4.

Mimik Ltd.
1.2.

6. Mandrels, tungsten carbide.
7. Pilots, counterbore.
8. Pilots, countersink.
9. Tables, milling.

Semtec Ltd.
7.8.

Standard-Modern Tool Co. Ltd.
9.

3465-3520

3465 PRODUCTION JIGS, FIXTURES AND TEMPLATES

Advanced Dynamics Corp. Ltd.	Imperial Tool & Die Ltd.
Aero Machining Ltd.	Lefebvre Freres Ltd.
Aero Mechanic Ltd.	Master Mechanical Manufacturing Ltd.
American Can Co. of Canada	Metro Engineering Co.
Bata Engineering.	Monorail Industries Ltd.
Boeing of Canada Ltd.	Plymouth Tool & Stamping Ltd.
Brantford Precision Ltd.	Portland Tool & Machine Ltd.
Bristol Aerospace 1968 Ltd.	Progressive Welder (Canada) Ltd.
Canadair Ltd.	Renfrew Aircraft & Engineering Ltd.
Canadian Car (Fort William).	Semtec Ltd.
Canadian Flight Equipment Co.	Sheridan Controls Ltd.
Cochrane Tool & Design Ltd.	SIDO Ltd.
Curtis Hoover Ltd.	Standard-Modern Tool Co. Ltd.
Diemakers Ltd.	TSM Industries Ltd.
Douglas Aircraft Canada	Uniroyal Ltd.
Enamel & Heating Products Ltd.	Universal Die & Tool Mfg. Ltd.
Ex-Cell-O Corp. (Canada) Ltd.	Valcartier Industries Ltd.
Fleet Manufacturing Ltd.	Vicom Ltd.
General Metallic Parts Ltd.	Fritz Werner Ltd.
Harrington Tool & Die Co. Ltd.	Williams Machines Ltd.
Heroux Ltd.	Zettel Manufacturing Ltd.
Ilines Machine Products Ltd.	

GROUP 35

SERVICE AND TRADE EQUIPMENT

3510 LAUNDRY & DRY CLEANING EQUIPMENT

- | | |
|---|---|
| 1. Garment racks & trucks. | 3. Trucks, laundry & dry cleaning. |
| 2. Liners & bags, laundry truck. | |
| Haruni Metal Products. | Ross-Smith (1969) Ltd. |
| 1. | 2. |
| Matthew Moody Division. | |
| 1.3. | |

3520 SHOE REPAIRING EQUIPMENT

- 1. Machines, riveting, for shoes.**
Valcartier Industries Ltd.
1.

GROUP 36

SPECIAL INDUSTRY MACHINERY

3615 PULP AND PAPER INDUSTRIES MACHINERY

1. Burrs, pulpstone.
2. Chipping & screening equipment.
3. Coverings, reinforced plastic.
4. De-barking machinery.
5. Filters & screens, wire mesh.
6. Load aligners, pulpwood.
7. Lubrication systems, pulp & paper machinery.
8. Paper converting.
9. Pipe & tank linings.

BLH-Bertram Ltd.

14.

Beach Foundry Ltd. (Fleck Div.)

7.10.14.

Black Clawson-Kennedy Ltd.

1.2.8.10.11.14.

Burrard Dry Dock Co. Ltd.

10.11.13.14.

CAE Machinery Ltd.

2.4.10.

Canadian Car (Pacific) Ltd.

10.

Canadian General Electric (Plastic)

3.

Canadian Vickers Ltd.

10.14.

Canron Ltd. (Mechanical Div.)

5.10.14.

Davie Shipbuilding Ltd.

10.11.14.

Devtek Ltd.

8.

Dominion Engineering Works Ltd.

10.14.

Drummond Welding & Steel
Works Ltd.

15.

Ferro Metal Ltd.

15.

Forano Ltd.

2.4.12.

Foresteel Industries Ltd.

15.

Fromson Heat Transfer Ltd.

10.14

Harrington Tool & Die Co. Ltd.

8.14.

10. Pulp & paper industry machinery.

11. Pulp & paper mills.

12. Pulpwood handling & slashing
systems.

13. Rolls, rubber covered.

14. Special industrial machinery.

15. Tanks custom designed,
non-corrosive.

16. Tree harvester, pulpwood.

John T. Hepburn Ltd.

10.14.

Heroux Ltd.

10.

James Howden & Parsons of Canada

10.

International Rubber & Plastics

13.

James United Steel Ltd.

2.5.10.14.15.

Johnson Wire Products Ltd.

5.

Koehring-Waterous Ltd.

6.12.16.

Lefebvre Freres Ltd.

3.

MLW-Worthington Ltd.

10.14.

Master Mechanical Mfg. Ltd.

14.

Northwest Industries Ltd.

9.

Port Arthur Shipbuilding

3.4.5.9.10.14.15.

Progressive Engineering Works Ltd.

10.14.

Union Screen Plate Co. Ltd.

10.

Uniroyal Ltd.

3.9.13.

Victoria Machinery Depot Co. Ltd.

2.10.11.15.

Wayne Forge Ltd.

14.

3620-3695

3620 RUBBER AND PLASTICS WORKING MACHINERY

Canron Ltd. (Mechanical Div.)	James United Steel Ltd.
Dominion Engineering Works Ltd.	Uniroyal Ltd.
Fluid Power Ltd.	Williams Machines Ltd.

3650 CHEMICAL AND PHARMACEUTICAL PRODUCTS MANUFACTURING MACHINERY

1. Chemical industry equipment.	3. Tanks, custom designed, non-corrosive.
2. Filters & screens, wire mesh.	
Drummond Welding & Steel Works Ltd.	James United Steel Ltd.
3.	1.2.3.
Ferro Metal Ltd.	Johnson Wire Products Ltd.
3.	2.
Foresteel Industries Ltd.	Technodyne Co. Ltd.
3.	1.
Foster Wheeler Ltd.	Wayne Forge Ltd.
1.	1.

3655 GAS GENERATING AND DISPENSING SYSTEMS, FIXED OR MOBILE

1. Converters, liquified gas.	4. Pumps, liquified gas.
2. Generators acetylene.	5. Purification equipment, liquified gas.
3. Plants, liquified air, oxygen and nitrogen.	6. Vaporizers, liquified gas.
Canadian Liquid Air	Union Carbide Canada Ltd.
1.3.5.6.	1.2.3.4.5.6.
James United Steel Ltd.	
1.4.5.6.	

3695 MISCELLANEOUS SPECIAL INDUSTRY MACHINERY

1. Autoclaves, industrial.	10. Machinery, special, packaging.
2. Autoclaves, metal coating.	11. Meshes & screens.
3. Automatic powder fillers & compressors, 30 & 50 mm shells.	12. Mining industry.
4. Chain saws, power.	13. Moulding machines, injection, plastic.
5. Drying equipment, microwave.	14. Pressure vessels.
6. Encapsulation equipment, turbine blade.	15. Skidders, log and pulp.
7. Loaders, mobile, log & lumber.	16. Special purpose machinery.
8. Machine, forming, sealing, loading for plastic bandoliers.	17. Specialized logging equipment.
9. Machine, vacuum principle loading for explosive powders.	18. Steel mill equipment.
Advanced Dynamics Corp. Ltd.	Burrard Dry Dock Co. Ltd.
10.	16.17.18.
BLH-Bertram Ltd.	CAE Machinery Ltd.
12.16.18.	12.16.17.18.
Black Clawson-Kennedy Ltd.	Canadian Vickers Ltd.
17.	1.2.17.

3695 MISCELLANEOUS SPECIAL INDUSTRY MACHINERY (conc.)

- Canron Ltd. (Mechanical Div.)
 16.18.
 Cochrane Tool & Design Ltd.
 16.
 Curtis Hoover Ltd.
 16.
 Davie Shipbuilding Ltd.
 1.14.
 Delamere & Williams Co. Ltd.
 3.8.9.
 Devtek Ltd.
 5.
 Dominion Bridge Co. Ltd.
 1.7.12.18.
 Dominion Engineering Works Ltd.
 12.16.18.
 Donald Ropes & Wire Cloth Ltd.
 11.
 Dowty Equipment Ltd.
 12.18.
 Ex-Cell-O Corp. (Canada) Ltd.
 10.
 Fisher Gauge Works Ltd.
 6.
 Forano Ltd.
 7.12.15.16.17.
 Foresteel Industries Ltd.
 1.
 Fromson Heat Transfer Ltd.
 1.12.16.
 Greening Industries Ltd.
 11.
 Harrington Tool & Die Co. Ltd.
 10.16.
 John T. Hepburn
 16.18.
 Heroux Ltd.
 10.
 Horton Steel Works Ltd.
 10.
 James United Steel Ltd.
 10.11.12.16.
 Johnson Wire Products Ltd.
 11.
 Kingston Shipyards
 1.
 Lefebvre Freres Ltd.
 12.16.
 MLW-Worthington Ltd.
 1.16.18.
 Marine Industries Ltd.
 2.
 Master Mechanical Manufacturing Ltd.
 16.
 Matthew Moody Division
 16.
 Napanee Industries Ltd.
 16.
 National Steel Car Corp. Ltd.
 18.
 Outboard Marine Corp.
 4.
 Pioneer Saws Ltd.
 4.
 Port Arthur Shipbuilding
 1.18.
 Portland Tool & Machine Ltd.
 16.
 Progressive Engineering Works Ltd.
 18.
 T. S. Simms & Co. Ltd. (Mach. Div.)
 16.
 Standard-Modern Tool Co. Ltd.
 10.16.
 Technodyne Co. Ltd.
 10.16.
 Timberjack Machines Ltd.
 15.
 The Toronto Iron Works
 1.
 Tycos Tool & Die Co. Ltd.
 16.
 Wayne Forge Ltd.
 16.18.
 Williams Machines Ltd.
 13.16.
 Yarrows Ltd.
 17.

GROUP 38

CONSTRUCTION, MINING EXCAVATING AND HIGHWAY MAINTENANCE EQUIPMENT

3805 EARTH MOVING AND EXCAVATING EQUIPMENT

1. **Controllers, slope, grader.**
2. **Excavators, multi-purpose.**

BLH-Bertram Ltd.

3.

Beach Foundry Ltd. (Fleck Div.)

3.

Dominion Engineering Works Ltd.

2.

3. **Graders, road, motorized.**
4. **Scrapers.**

Dominion Road Machinery Co. Ltd.

3.

Mimik Ltd.

1.

Richardson Road Machinery

4.

3810 CRANES AND CRANE-SHOVELS

1. **Cranes, crawler.**
2. **Cranes, hydraulic, mobile.**

BLH-Bertram Ltd.

2.

Dominion Engineering Works Ltd.

1.3.

3. **Structural components.**

Dynamic Industries Inc.

2.

Koehring Waterous Ltd.

1.2.

3815 CRANE AND CRANE — SHOVEL ATTACHMENTS

1. **Back-hoes.**
2. **Buckets, clam shell.**
3. **Buckets, concrete.**
4. **Buckets, drag line.**

Abex Industries (Joliette Div.)

1.4.6.7.8.

Aerometals Ltd.

3.

CAE Machinery Ltd.

8.

5. **Pile driver attachments.**
6. **Shovel dippers.**
7. **Rollers and Sheaves.**
8. **Teeth, bucket.**

Dominion Engineering Works Ltd.

1.2.4.5.

Hassan Steel Fabricators Ltd.

3.4.

Irving Industries.

8.

3820 MINING, ROCK DRILLING, EARTH BORING, AND RELATED EQUIPMENT

1. **Asbestos working equipment.**
2. **Augers, earth, trailer-mounted.**
3. **Bits, carbide.**
4. **Bits, copperhead.**
5. **Bits, diamond.**
6. **Bits, drill.**
7. **Bits, reamer.**
8. **Bits, steel detachable.**
9. **Bits, tungsten carbide.**
10. **Blocks, knock-off.**
11. **Breakers, paving.**
12. **Breakers, paving, chisel 3".**
13. **Breakers, paving, narrow chisel.**
14. **Cages, mine.**
15. **Cars, mine.**
16. **Chisels, digging.**
17. **Chisels, paving breaking.**

18. **Chisels, tungsten, carbide.**
19. **Column arms, universal.**
20. **Couplings, drill rod.**
21. **Crusher, jaws.**
22. **Cutters, asphalt.**
23. **Diamond impregnated products.**
24. **Drill bits, diamond.**
25. **Drill, hollow.**
26. **Drill rod, solid.**
27. **Drills, core, diamond.**
28. **Drills, feed leg.**
29. **Drills, hammer, overburden.**
30. **Drills, rock.**
31. **Drills rod, rock drill.**
32. **Drills, sinker.**
33. **Drilling accessories.**
34. **Drilling machinery, slim-hole.**

3820 MINING, ROCK DRILLING, EARTH BORING, AND RELATED EQUIPMENT
 (conc.)

35. Drilling machines.
 36. Gravel plants.
 37. Grouser bars.
 38. Loading pockets, mine.
 39. Liners, iron, chute.
 40. Liners, iron, grinding.
 41. Liners, iron, mill.
 42. Machinery, mining.
 43. Moll points, paving breaker.
 44. Moils, tungsten carbide.
 45. Picks, paving breaker.
 46. Pulverizers.
 47. Pumps, drill.
 48. Rock crushers.
 49. Rock washers.
 50. Rods, bit.
 51. Rods, chisel.
 52. Rods, drill, extension.
 53. Rods, tamping tool, paving breaker.
- Abex Industries (Joliette Div.)
 21.37.39.40.41.
 Atlas Steels Co.
 25.26.
 BLH-Bertram Ltd.
 42.48.56.
 Babcock & Wilcox Canada Ltd.
 46.
 Wm. Bartlett & Son Ltd.
 1.
 Becker Drilling (Alberta) Ltd.
 29.
 Boyles Bros, Drilling Co. Ltd.
 23.24.33.35.47.55.64.65.71.
 Brunner & Lay (Canada) Ltd.
 6.17.31.43.45.53.60.63.70.
 CAE Machinery Ltd.
 21.37.39.40.41.56.
 Canadian Allis-Chalmers Ltd.
 48.56.
 Canadian Longyear Ltd.
 5.27.34.55.58.65.66.
 Canadian Timken Ltd.
 3.9.
 Canadian Vickers Ltd.
 48.49.56.
 Canron Ltd. (Foundry Div.)
 15.39.40.41.
 Combustion Engineering-Superheater
 46.
 The Craig Bit Co. Ltd.
 3.4.7.8.9.10.12.13.16.18.19.20.
 22.30.44.50.51.52.59.62.69.72.
 Delro Industries Ltd.
 24.54.
54. Saws, concrete, diamond.
 55. Saws, diamond.
 56. Screens, vibrating.
 57. Skips mine.
 58. Soil sampling equipment.
 59. Spades, clay.
 60. Spades, paving breaker.
 61. Stoppers.
 62. Striking bars.
 63. Tamping tools, paving breaker.
 64. Tools, diamond dressing.
 65. Tools, diamond masonry.
 66. Tools, soil sampling.
 67. Trainloaders.
 68. Turntables.
 69. Wedges, frost.
 70. Wedges, paving breaker.
 71. Wheels, diamond.
 72. Wrenches, pull.
- Dominion Engineering Works Ltd.
 42.
 Donald Ropes & Wire Cloth Ltd.
 56.
 Foster Wheeler Ltd.
 46.
 Forano Ltd.
 6.7.8.10.36.
 Gardner-Denver Co. (Canada) Ltd.
 11.28.32.61.
 Greening Industries Ltd.
 56.
 John T. Hepburn Ltd.
 15.
 Industrial Machining Ltd.
 22.43.60.
 James United Steel Ltd.
 1.15.39.40.41.42.56.
 Joy Mfg. Co. (Canada) Ltd.
 15.21.36.42.48.
 Lefebvre Freres Ltd.
 12.
 Metro Engineering Co. Ltd.
 6.17.31.43.45.53.60.63.70.
 Railway Equipment
 15.
 Syntron Canada Ltd.
 42.56.
 Truck Engineering Ltd.
 2.
 Vicom Ltd.
 35.
 Wabi Iron Works Ltd.
 14.15.38.39.40.41.42.57.67.68.

3825-3895

3825 ROAD CLEARING AND CLEANING EQUIPMENT

1. Snow blowers.
2. Snow drags.

Atlas Hoist & Body Inc.
3.

Dominion Road Machinery Co.
3.

Eastern Steel Products Co.
1.3.

3. Snow plows.

Elco-Wood Industries Ltd.
1.2.3.

Forano Ltd.
1.

Richardson Road Machinery Co. Ltd.
1.2.3.

3830 TRUCK AND TRACTOR ATTACHMENTS

1. Platforms hydraulic, truck or trailer mounted.
2. Pole setting equipment.
3. Scrapers, grading & excavating.
4. Snow plows, multi-vehicle mounting.
5. Spreaders, aggregate, truck mounting.

Beach Foundry Ltd. (Fleck Div.)
3.

Canadian Trailmobile Ltd.
1.5.

Curtis Hoover Ltd.
6.7.

Dynamic Industries Inc.
4.

Eastern Steel Products Co.
1.4.5.6.7.

6. Spreaders, salt.
7. Spreaders, sand.
8. Tailgates, hydraulic.
9. Winches, tractor.

Elco-Wood Industries Ltd.
1.4.5.6.7.8.

Hassan Steel Fabricators Ltd.
3.

Lefebvre Freres Ltd.
9.

Truck Engineering Ltd.
1.2.

3835 PETROLEUM PRODUCTION AND DISTRIBUTION EQUIPMENT

1. Anchors, pipe line.

Progressive Engineering Works Ltd.
1.2.

2. Pipeline equip. sets (landing).

3895 MISCELLANEOUS CONSTRUCTION EQUIPMENT

1. Apron feeders.
2. Asphalt spreader screws.
3. Batching plant.
4. Belts, conveyors, aggregate.
5. Concrete carts.
6. Concrete mixers.
7. Controllers, grade & slope, road paving.

Burrard Dry Dock Co. Ltd.
6.

Davie Shipbuilding Ltd.
11.

Deloro Stellite
2.

8. Expansion joints, rubber.
9. Feeders, vibrator.
10. Hoppers.
11. Kettles, asphalt, tar and pitch.
12. Plaster & mortar mixers.
13. Reciprocating feeders.
14. Rotary table feeders.
15. Travelling water screens.

Drummond Welding & Steel Works Ltd.

10.

Forano Ltd.
1.13.

3895 MISCELLANEOUS CONSTRUCTION EQUIPMENT (conc.)

Foresteel Industries Ltd. 10.	National Steel Car Corp. Ltd. 11.
B. F. Goodrich Canada Ltd. 8.	Port Arthur Shipbuilding 11.
Hassan Steel Fabricators Ltd. 10.	Rex Chainbelt (Canada) Ltd. 1.2.3.6.12.14.15.
James United Steel Ltd. 9.10.11.14.	Syntron (Canada) Ltd. 1.9.
Lefebvre Freres Ltd. 9.13.	Uniroyal Ltd. 8.
London Concrete Machinery Co. 5.	Victoria Machinery Depot Co. Ltd. 3.10.11.
Matthew Moody Division 5.6.12.	Yarrows Ltd. 6.
Mimik Ltd. 7.	

GROUP 39

MATERIALS HANDLING EQUIPMENT

3910 CONVEYORS

1. Conveyors, belt.
2. Conveyors, carrier, vibrating.
3. Conveyors, chain.
4. Conveyors, custom built.

Beach Foundry Ltd. (Fleck Div.)

4.

CAE Machinery Ltd.

4.

Dynamic Industries Inc.

4.

Forano Ltd.

1.4.6.7.8.

James Howden & Parsons of Canada

4.

James United Steel Ltd.

1.3.4.7.8.

Joy Mfg. Co. (Canada) Ltd.

1.

Leavens Bros. Ltd.

4.

Master Mechanical Mfg. Ltd.

4.

5. Conveyors, oscillating.
6. Conveyors, portable.
7. Elevators, bucket.
8. Screw, conveyor.

Metro Engineering Co. Ltd.

4.

Robert Mitchel Co. Ltd.

4.5.8.

Port Arthur Shipbuilding

1.

Progressive Engineering Works Ltd.

3.

Rex Chainbelt (Canada) Ltd.

1.2.3.4.5.7.

Syntron (Canada) Ltd.

2.5.

Uniroyal Ltd.

1.

Victory Conveyor & Machine Reg'd.

1.2.3.4.5.6.

Westeel-Rosco Ltd.

7.

3920 MATERIALS HANDLING EQUIPMENT, NONSELF-PROPELLED

1. Bulk material handling equip.
2. Casters.
3. Hampers, truck, fabric.
4. Dollies, hand.
5. Sleds, cargo 10 and 20 ton.
6. Sleds, living facilities.
7. Sleds, magnesium and aluminum.
8. Sleds, messing facilities.
9. Sleds, personnel.
10. Sleds, personnel, reinforced plastic.

ATCO Industries Ltd.

6.7.8.9.

Aerometals Ltd.

4.16.

Canadian Liquid Air.

15.

Dynamic Industries Ltd.

3.

Fabricated Steel Products

1.4.16.18.

B.F. Goodrich Canada Ltd.

17.

11. Toboggans, aluminum.
12. Toboggans, reinforced plastic.
13. Toboggans, magnesium.
14. Trailers.
15. Trucks dolly, for compressed gas cylinders.
16. Truck, hand, 2-wheeled.
17. Truck, rubberlined, material handling.
18. Trucks, factory.

Hassan Steel Fabricators Ltd.

14.

James United Steel Ltd.

1.

Leavens Bros. Ltd.

4.

Magline of Canada Ltd.

7.11.13.16.18.

Matthew Moody Div.

4.15.16.18.

Otaco Ltd.

5.6.8.9.14.

3920 MATERIALS HANDLING EQUIPMENT, NONSELF-PROPELLED (conc.)

Stewart-Warner Corp. Ltd.	Union Carbide Canada Ltd.
2.	15.
Syntron (Canada) Ltd.	Uniroyal Ltd.
1.	17.
J. J. Turner Co. Ltd.	Victory Conveyor & Machine Reg'd.
3.	3.4.18.
Tywood Industries Ltd.	Yarrows Ltd.
10.12.	1.16.18.

3930 WAREHOUSE TRUCKS AND TRACTORS, SELF-PROPELLED

Burrard Dry Dock Co. Ltd.	Otis Elevator Co. Ltd.
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3940 BLOCKS, TACKLE, RIGGING AND SLINGS

1. Hoists.	5. Slings and wire rope assemblies.
2. Slings.	6. Tackle blocks, rigging all types and sizes.
3. Slings, nylon.	
4. Slings, synthetic rope.	
A.I.M. Steel Ltd.	Greening Industries Ltd.
1.2.	5.
Canada Wire & Cable Co. Ltd.	Molson Industries Ltd.
5.	2.
Columbus McKinnon Ltd.	Port Arthur Shipbuilding
3.	2.5.6.
Davie Shipbuilding Ltd.	Ross-Smith (1969) Ltd.
1.2.5.6.	2.
Dominion Chain Co. Ltd.	Wire Rope Industries of Canada Ltd.
2.5.	2.4.5.
Donald Rope & Wire Cloth Ltd.	Wrights Canadian Ropes Ltd.
5.	5.

3950 WINCHES, HOISTS, CRANES AND DERRICKS

1. Bridge cranes.	12. Hoists, chain.
2. Capstans.	13. Hoists, electric.
3. Cranes, all types.	14. Hoists, mine.
4. Cranes, bridges, gantry etc.	15. Hoisting units.
5. Cranes, floating 100-300 tons.	16. Hoists, wire rope.
6. Cranes, hatch cover.	17. Replenishment systems, underway.
7. Cranes, overhead, travelling.	18. Winches.
8. Derricks.	19. Winches, bathythermograph.
9. Derricks, hydraulic, rotating and boom extending.	20. Winches, drum, power operated.
10. Derricks, pole-setting.	21. Winches, hydraulic.
11. Hoists.	22. Windlasses.
A.I.M. Steel Ltd.	BLH-Bertram Ltd.
1.3.7.	14.16.
Aro of Canada Ltd.	Black Clawson-Kennedy Ltd.
12.	18.
Atlas Hoists & Body Inc.	Burrard Dry Dock Co. Ltd.
15.	5.8.

3950 WINCHES, HOISTS, CRANES AND DERRICKS (conc.)

- | | |
|--|--|
| CAE Machinery Ltd.
1.2.3.11.12.20. | Garrett Mfg. Ltd. (Marine Div.)
6.17.18.20. |
| Canadian Acme Screw & Gear Ltd.
18. | John T. Hepburn Ltd.
1.2.3.4.7.8.9.18.19.20.21.22. |
| Canadian Trailmobile Ltd.
15. | Lefebvre Freres Ltd.
18. |
| Canadian Vickers Ltd.
2.18.22. | London Concrete Machinery Co.
11.18. |
| Canron Ltd. (Structural Div.)
4. | Lunenburg Foundry & Engineering Ltd.
11.18.22. |
| Columbus McKinnon Ltd.
12.16. | Marine Industries Ltd.
5.18. |
| Davie Shipbuilding Ltd.
2.4.7.16.18.22. | Matthew Moody Division
11.12.13. |
| Dominion Bridge Co. Ltd.
1.3.8.18.20. | Progressive Engineering Works Ltd.
2.7.12.16.20.22. |
| Dominion Engineering Works Ltd.
7. | Railway Equipment
1.2.3.4.5.7.11.15.16.18.20.21.22. |
| Dowty Equipment of Canada Ltd.
2.7.18.21. | Russel Brothers Ltd.
16.18.20.21.22. |
| Elco-Wood Industries Ltd.
3.9.10.15. | J. Swann (1963) Ltd.
2.18.19.22. |
| Fleet Mfg. Ltd.
19.20.21. | Truck Engineering Ltd.
9.10. |
| Fluid Power Ltd.
11. | Yarrows Ltd.
8. |
| Forano Ltd.
18.20. | |

3960 ELEVATORS AND ESCALATORS

1. Dumb waiters.
2. Elevators.

John T. Hepburn
2.3.
Otis Elevator Co. Ltd.
2.3.

3. Escalators.

Victory Conveyor & Machine Reg'd.
1.

3990 MISCELLANEOUS MATERIALS HANDLING EQUIPMENT

1. Bulk material handling equipment.
2. Dockboards.
3. Dunnage bags, inflatable.
4. Dunnage, mattresses, pneumatic.
5. Factory skids.
6. Mobile loading ramps.
7. Pallets, plastic, reinforced.

A.I.M. Steel Ltd.
8.
Aerometals Ltd.
2.6.
Wm. Bartlett & Son Ltd.
3.4.

8. Pallets, steel, material handling.
9. Portable bridges.
10. Racks, cantilever.
11. Racks, pallet.
12. Shakers, rail car.
13. Slotted angle.

Beach Foundry Ltd. (Fleck Div.)
1.
Canadian General Electric (Plastics)
7.
Canron Ltd. (Structural Div.)
1.9.

3990 MISCELLANEOUS MATERIALS HANDLING EQUIPMENT (conc.)

Dominion Bridge Co. Ltd.

1.

Elco-Wood Industries Ltd.

1.8.

Fabricated Steel Products Ltd.

1.5.8.

Forano Ltd.

1.

B.F. Goodrich Canada Ltd.

1.3.4.

Hassan Steel Fabricators Ltd.

5.8.

James United Steel Ltd.

1.

Lockwell & Forge Products Ltd.

2.6.8.

Magline of Canada Ltd.

2.6.8.

Matthew Moody Division

1.5.

National Steel Car Corp. Ltd.

8.

Rex Chainbelt (Canada) Ltd.

1.

Syntron (Canada) Ltd.

1.12.

Tri-Service Fabricating Ltd.

8.

Uniroyal Ltd.

3.4.

Westeel-Rosco Ltd.

5.8.10.11.13.

Western Tools & Industries Ltd.

5.8.

Yarrows Ltd.

8.

GROUP 40

ROPE, CABLE, CHAIN, AND FITTINGS

4010 CHAIN AND WIRE ROPE

1. Assemblies, chain.
2. Assemblies, synthetic rope.
3. Assemblies, wire rope.
4. Bridge cable.
5. Chain, cast.
6. Chain and chain assemblies.
7. Chain, multi-type.

Wm. Bartlett & Son Ltd.

2.

Canada Wire & Cable Co. Ltd.
3.11.12.

Columbus McKinnon Ltd.
1.6.7.9.12.13.

Dominion Chain Co. Ltd.
1.6.7.9.12.

Donald Ropes & Wire Cloth Ltd.
3.4.11.12.

8. Guy wires.
9. Links, chain, detachable and connecting.
10. Roller chains.
11. Rope.
12. Slings.
13. Steel chains.

General Wire & Cable Co. Ltd.
8.11.

Greening Industries Ltd.
3.4.11.12.

Rex Chainbelt (Canada) Ltd.
5.10.13.

Wire Rope Industries of Canada Ltd.
2.3.4.8.11.12.

Wrights Canadian Ropes Ltd.
4.8.11.12.

4020 FIBRE ROPE, CORDAGE & TWINE

1. Rope, manilla.
2. Rope, nylon.
3. Rope, polyethelene.
4. Rope, polypropylene.
5. Rope, sisal.

Brantford Cordage Co.
1.2.3.4.5.6.7.8.9.

6. Rope, terylene.
7. Twine, baler, hay.
8. Twine, bluder.
9. Twine, packaging, sisal.

4030 FITTINGS FOR ROPE, CABLE, AND CHAIN

1. Terminals, wire rope.
2. Terminals, wire rope, pre-stressed concrete.

Canadian Arsenals Ltd.
1.2.

GROUP 41

REFRIGERATION AND AIR CONDITIONING
EQUIPMENT

4110 SELF-CONTAINED REFRIGERATION UNITS AND ACCESSORIES

1. Freezing and preservation
equipment, biological.

Air Conditioning Engineering

2.

Canadian Liquid Air

1.2.

Galt Equipment Ltd.

2.

2. Refrigeration units.

Hussman Refrigeration Co. Ltd.

2.

Union Carbide Canada Ltd.

1.2.

The W. C. Wood Co. Ltd.

2.

4120 SELF-CONTAINED AIR CONDITIONING UNITS AND ACCESSORIES

1. Coolers, air evaporating.

2. Industrial air conditioners.

Air Conditioning Engineering

1.2.3.

Galt Equipment Ltd.

2.3.

Garrett Manufacturing Ltd.

1.

Godfrey Engineering Co. Ltd.

2.3.

James Howden & Parsons of Canada

2.3.

3. Marine air conditioners.

Hussman Refrigerator Co. Ltd.

1.

Joy Mfg. Co. (Canada) Ltd.

2.

The W.C. Wood Co. Ltd.

1.2.3.

Yarrows Ltd.

2.3.

4130 REFRIGERATION AND AIR CONDITIONING PLANTS AND COMPONENTS

1. Air conditioning components.

2. Blankets, insulation.

3. Coils, cooling.

4. Doors.

5. Doors, R.R.

6. Frozen food storage.

Air Conditioning Engineering

1.9.10.

Wm. Bartlett & Son Ltd.

2.

Canadian Liquid Air

7.8.

Galt Equipment Ltd.

1.7.8.9.

Hussman Refrigerator Co. Ltd.

1.4.6.9.10.11.

7. Refrigerant system, transport
vehicles.

8. Refrigerating equipment.

9. Refrigeration systems.

10. Refrigeration units, condensing.

11. Walk-in coolers.

Keeprite Products Ltd.

3.

National Steel Car Corp. Ltd.

5.

Union Carbide Canada Ltd.

7.8.

The W. C. Wood Co. Ltd.

1.6.9.10.

Yarrows Ltd.

11.

4140

4140 FANS AND AIR CIRCULATORS, NON-INDUSTRIAL

1. Fan assemblies, centrifugal.
2. Fans, axial.
3. Fans, centrifugal
4. Fans, circulating, radial discharge.
5. Fans, evacuator, solids.
6. Fans, exhaust
7. Fans, explosive hazard.

Air Conditioning Engineering

1.2.3.4.5.6.7.8.9.10.11.12.

Wm. Bartlett & Son Ltd.

13.

Bogue Electric of Canada Ltd.

1.2.3.10.

8. Fans, tube, axial.
9. Fans, vane, axial.
10. Fans, ventilating, propeller.
11. Impellers, fan, axial.
12. Impellers fan, centrifugal.
13. Tubing, fabrics, air conditioning.

DeVilbiss Canada Ltd.

6.7.

James Howden & Parsons of Canada

2.3.6.8.9.11.12.

Joy Mfg. Co. (Canada) Ltd.

1.2.3.4.6.8.9.10.11.12.

GROUP 42

FIRE FIGHTING, RESCUE AND SAFETY
EQUIPMENT

4210 FIRE FIGHTING EQUIPMENT

1. Carbon dioxide systems.
2. Charges, fire extinguisher.
3. Extinguishers, fire, foam.
4. Extinguishers, fire, soda-acid.
5. Extinguishers, fire, water.
6. Extinguishers, fire, wheeled & portable.
7. Fire detectors, infra-red.
8. Foam, liquid, mechanical.
10. Foam, mechanical liquid, 3 and 6%.
11. Foam systems.
12. Ladders, fire, aluminum.
13. Platforms, hydraulic, truck or trailer mounted.
14. Pumps, fire, diesel, air-cooled.
15. Pumps, fire, diesel, liquid-cooled.
16. Pumps, fire, front mount.
17. Pumps, fire portable.
18. Trailers, fire pumper.
19. Trucks, fire.
20. Trucks, fire, crash.
21. Trucks, fire fighting, tracked.

Coulter Copper & Brass Co. Ltd.
3.4.5.

Deutz Diesel (Canada) Ltd.
13.14.

Elco-Wood Industries Ltd.
12.

Electric & Gas Welding Co. Ltd.
18.

Flag Fire Equipment Ltd.
2.3.4.5.16.

Flextrack-Nodwell Ltd.
20.

Go-Tract Systems Ltd.
20.

Laurentian Concentrates
8.

Magline of Canada Ltd.
11.

Pyrene Mfg. Co. of Canada Ltd.
1.2.3.4.5.6.9.10.12.18.19.20.

Reynolds Extrusion Co. Ltd.
11.

Spar Aerospace Products Ltd.
7.

Pierre Thibault Canada Ltd.
11.12.14.15.16.18.19.

Walter Kidde & Co. of Canada
3.6.

4220 MARINE LIFESAVING AND DIVING EQUIPMENT

1. Cushions, life saving.
2. Diving equipment, scuba.
3. Life preservers, inflatable.
4. Life preservers, non-inflatable.
5. Life rafts, inflatable.
6. Life rafts, plastic.
7. Regulators, scuba.
8. Suits, diving, wet.
9. Suits, diving, seamless, constant volume.

Abercorn Aero Ltd.
3.5.6.

International Rubber & Plastics Corp.
2.3.4.7.8.9.

Tapatco Ltd.
1.4.

J. J. Turner Co. Ltd.
1.4.

Uniroyal Ltd.
3.5.

4230 DECONTAMINATING AND IMPREGNATING EQUIPMENT

1. Decontaminating apparatus, portable.

Metro Engineering Co. Ltd.

Universal Die & Tool Mfg. Ltd.

4240 SAFETY AND RESCUE EQUIPMENT

1. Arm protectors, industrial.
2. Aural protectors, sound.
3. Babbitting helmets.
4. Babbitting masks.
5. Bags, lineman's gloves.
6. Belts, safety, industrial.
7. Curtains, fire.
8. Dust hoods, industrial.
9. Dust hood-respirator combinations.
10. Ear protectors, welders'.
11. Enamellers' hoods.
12. Eyeshields, respirator.

4240 SAFETY AND RESCUE EQUIPMENT (conc.)

- | | |
|---|--|
| 13. Facepieces, gas mask. | 33. Knee pads, industrial. |
| 14. Faceshields, industrial. | 34. Lenses, goggle, industrial. |
| 15. Fans, centrifugal, gas filter. | 35. Lenses, helmet, welders'. |
| 16. Filter units, gas-particulate. | 36. Masks, gas. |
| 17. Filters, wire mesh, particulate. | 37. Masks, oxygen. |
| 18. Finger guards, industrial. | 38. Nets, safety, non-buoyant. |
| 19. Foot guards, over-the-shoe type. | 39. Nosepieces, oxygen mask. |
| 20. Gloves, welding. | 40. Paint hoods. |
| 21. Goggles, industrial. | 41. Respirators, air filtering. |
| 22. Guards, shin. | 42. Respirators, industrial. |
| 23. Harnesses, safety industrial. | 43. Safety goggles, industrial. |
| 24. Headbands, goggle, industrial safety type. | 44. Shields, arc viewing, hand held. |
| 25. Helmets, metal melters'. | 45. Spectacles, industrial. |
| 26. Helmets, plastic. | 46. Suits, fire fighting, integrated oxygen and/or air conditioning. |
| 27. Helmets, welders'. | 47. Suits, safety, heat protective, integrated oxygen and/or air conditioning. |
| 28. Hoods, abrasive cleaning. | 48. Visors, faceshield, industrial. |
| 29. Hoods, fabric. | |
| 30. Hoods, paint spraying. | |
| 31. Impellers, fan, centrifugal. | |
| 32. Installation kits, gas-particulate filter units, armored vehicle. | |
| | |
| Aro of Canada Ltd. | Joy Mfg. Co. (Canada) Ltd. |
| 2.12.39.42.46.47. | 15.31. |
| Wm. Bartlett & Son Ltd. | Safety Supply Co. |
| 1.7.29. | 1.2.3.4.5.6.7.8.9.10.11.12. |
| Canadian General Electric (Plastics) | 14.18.19.21.22.23.24.25.27. |
| 26. | 28.29.30.33.34.35.37.38.40. |
| Dunlop Canada Ltd. | 41.42.43.44.45.48. |
| 36. | Union Carbide Canada Ltd. |
| W. R. Elliott Ltd. | 20.21.27. |
| 16.32 | Uniroyal Ltd. |
| International Rubber & Plastics | 13.36.39. |
| 8.9.12.13.14.35.36.37. | |
| Johnson Wire Products Ltd. | |
| 17. | |

GROUP 43

PUMPS AND COMPRESSORS

4310 COMPRESSORS AND VACUUM PUMPS

1. Components, plastic.
2. Compressors, air.
3. Compressors, reciprocating, air, portable.
4. Compressors, rotary.
5. Coolers, compressor.
6. Cyclone cones.
7. Filters, air.

Aro of Canada Ltd.

11.

Canadian Allis-Chalmers Ltd.

4.8.

Canadian General Electric (Plastics)

1.

Cummins Eastern

2.9.

Deloro Stellite.

6.

Deutz Diesel (Canada) Ltd.

9.10.

DeVilbiss (Canada) Ltd.

2.3.

Free-Piston Development Co. Ltd.

2.3.

Gardner-Denver Co. (Canada) Ltd.

2.3.4.11.

8. Pumps.
9. Pumps & air compressors, marine, air-cooled.
10. Pumps & air compressors, marine, liquid-cooled.
11. Pumps, vacuum.
12. Tanks, pressure.

Gilbarco Canada Ltd.

2.

James Howden & Parsons of Canada.

2.12.

James United Steel Ltd.

1.6.11.

Joy Mfg. Co. (Canada) Ltd.

2.3.4.8.

Keeprite Products Ltd.

5.

M. L. W. Worthington Ltd.

2.3.9.11.

Peacock Brothers Ltd.

9.10.11.

PurOlator Products (Canada) Ltd.

7.

4320 POWER AND HAND PUMPS

1. Motors, hydraulic.
2. Pumps, boiler feed.
3. Pumps, centrifugal.
4. Pumps, diaphragm.
5. Pumps, fire, diesel, air-cooled.
6. Pumps, fire, diesel, liquid-cooled.
7. Pumps, gasoline dispensing.
8. Pumps, hydraulic.
9. Pumps, hydraulic, winches, windlasses, etc.
10. Pumps, magnetic, packless.
11. Pumps, peripheral coolant.

Aero Tool Works Ltd.

20.

Aro of Canada Ltd.

14.15.

Aviation Electric Ltd.

8.18.9.

Babcock & Wilcox Canada Ltd.

2.3.8.11.13.15.16.18.19.

Baldrive Co. Ltd.

1.

12. Pumps, piston.
13. Pumps, reciprocating.
14. Pumps, rotary, hand, multiapplication.
15. Pumps, rotary, power driven.
16. Pumps, sump.
17. Pumps, valve.
18. Pumps, variable delivery.
19. Pumps, vertical turbine.
20. Pumps, water supply system.
21. Rams, hydraulic.
22. Water supply systems, automatic.

Black Clawson-Kennedy Ltd.

3.

Canadian Acme Screw & Gear Ltd.

8.9.

Canadian Allis-Chalmers Ltd.

3.16.20.

Canadian Trailmobile Ltd.

9.

Canadian Vickers Ltd.

3.19.

4320-4330**4320 POWER AND HAND PUMPS (conc.)**

Canron Ltd. (Pipe Div.) 22.	Keene of Canada Corp. Ltd. 7.
Chemical Projects Ltd. 10.	London Concrete Machinery Co. 3.
Cummins Eastern. 6.	Lucas-Rotex Ltd. 3.12.17.
Curtis Hoover Ltd. 13.21.	MLW-Worthington Ltd. 2.3.13.19.20.
Deutz Diesel (Canada) Ltd. 5.6.	Metro Engineering Co. Ltd. 3.4.
Dowty Equipment of Canada Ltd. 1.6.8.15.18.21.	Molson Industries Ltd. 16.
Elco-Wood Industries Ltd. 8.21.	Monorail Industries Ltd. 6.
Fluid Power Ltd. 21.	Otaco Ltd. 16.22.
Gilbarco Canada Ltd. 3.7.	Peacock Brothers Ltd. 2.3.5.6.
Godfrey Engineering Co. Ltd. 2.3.4.8.13.18.19.	J. Swann (1963) Ltd. 9.
Harrington Tool & Die Co. Ltd. 3.4.	

4330 CENTRIFUGES, SEPARATORS, AND PRESSURE & VACUUM FILTERS

1. Filters, air and oil.	4. Purifiers, oil.
2. Filters, fluid, pressure.	5. Separators.
3. Filters (metal).	
Aircraft Appliances & Equipment. 2.3.4.5.	Keene of Canada Corp. Ltd. 1.2.4.5.
Aro of Canada Ltd. 2.	Kralinator Filters Ltd. 1.4.
Canadian Filters Ltd. 2.	PurOlator Products (Canada) Ltd. 1.2.3.

GROUP 44

FURNACE, STEAM PLANT, AND DRYING
EQUIPMENT AND NUCLEAR REACTORS

4410 INDUSTRIAL BOILERS

1. Boilers, auxiliary.
2. Boilers, bent tube.
3. Boilers, donkey.
4. Boilers, double furnace.
5. Boilers, double pass.
6. Boilers, double uptake.
7. Boilers, fire tube.
8. Boilers, forced circulation.
9. Boilers, heating.
10. Boilers, hot water.
11. Boilers, industrial.
12. Boilers, main.
13. Boilers, marine.
14. Boilers, package.
15. Boilers, portable.
16. Boilers, saturated.
17. Boilers, sectional header.
18. Boilers, single uptake.
19. Boilers, steam.
20. Boilers, straight tube.
21. Boilers, waste heat.
22. Boilers, water tube.
23. Burner tips.
24. Feeders, boiler, water.
25. Heaters, water, coal.
26. Heaters, water, electric.
27. Heaters, water, gas.
28. Heaters, water, low pressure.
29. Heaters, water, oil.
30. Heaters, water, steam/hot water.
31. Injectors and ejectors.
32. Preheaters, air.
33. Superheaters.
34. Valves, boiler feed water reg.

Aero Tool Works Ltd.

2.6.

Babcock & Wilcox Canada Ltd.

1.2.9.10.11.13.14.19.21.22.30.32.33.

Burrard Dry Dock Co. Ltd.

28.

Canadian General Electric (C.M.H.D.)

26.30.

Canadian Valve Co. Ltd.

34.

Canadian Vickers Ltd.

2.8.11.14.19.22.

Combustion Engineering-Superheater.

1.2.10.11.12.13.14.17.19.21.22.32.33.

Davie Shipbuilding Ltd.

11.

Deloro Stellite.

23.

Dominion Bridge Co. Ltd.

1.2.5.7.8.9.10.12.13.14.15.16.19.

20.21.22.33.

Enamel & Heating Products Ltd.

19.

Foster Wheeler Ltd.

2.8.10.11.12.13.14.19.21.22.31.33.

Gilbarco Canada Ltd.

29.

Hassan Steel Fabricators Ltd.

1.4.5.6.12.13.18.19.24.30.34.

James Howden & Parsons of Canada.

32.

Lucas-Rotax Ltd.

23.

Molson Industries Ltd.

25.26.27.29.31.

Napanee Industries Ltd.

1.3.5.7.8.11.12.13.14.15.16.21.24.

28.30.

Port Arthur Shipbuilding

1.3.4.7.8.9.10.11.12.13.19.

Technodyne Co. Ltd.

23.

The Toronto Iron Works Ltd.

14.22.

Volcano Ltd.

1.2.7.8.9.10.12.14.19.20.22.27.28.

29.30.

Wayne Forge Ltd.

9.26.27.29.

4420 HEAT EXCHANGERS AND STEAM CONDENSERS

1. Aftercoolers.
2. Condensers, evaporative.
3. Condensers, steam jet.
4. Condensers, steam, surface.
5. Condensers, surface.
6. Coolers, fin type.
7. Coolers, industrial fluids.
8. Coolers, thermo-electric.

4420-4440

4420 HEAT EXCHANGERS AND STEAM CONDENSERS (conc.)

- 9. Heat Exchangers.
- 10. Heaters, feedwater.
- 11. Intercoolers.

Air Conditioning Engineering.
2.6.7.8.9.
Babcock & Wilcox Canada Ltd.
2.3.4.5.9.13.
Burrard Dry Dock Co. Ltd.
4.5.7.8.9.10.
Canadian Liquid Air Ltd.
9.
Canadian Vickers Ltd.
9.
Combustion Engineering-Superheater.
13.
Coulter Copper & Brass Co. Ltd.
9.
Davie Shipbuilding Ltd.
3.9.
Dominion Bridge Co. Ltd.
3.
Ferro Metal Ltd.
9.

- 12. Oil coolers.
- 13. Superheaters, marine.

Foster Wheeler Ltd.
2.4.5.9.10.13.
Fromson Heat Transfer Ltd.
1.2.7.8.9.11.12.
James Howden & Parsons of Canada.
6.9.
Keeprite Products Ltd.
9.11.12.
MLW-Worthington Limited.
2.4.5.9.10.
Molson Industries Ltd.
3.
Napanee Industries Ltd.
10.
Peacock Brothers Ltd.
4.5.9.10.12.
The Toronto Iron Works Ltd.
9.
Victoria Machinery Depot Co. Ltd.
2.9.10.

4430 INDUSTRIAL FURNACES, KILNS, LEHRS, AND OVENS

- 1. Burner tips.
- 2. Crucibles.
- 3. Drying, electric, gas & oil.
- 4. Electrodes, electric furnace.
- 5. Kilns.

Canadian Allis-Chalmers Ltd.
5.
Davie Shipbuilding Ltd.
5.
DeVilbiss Canada Ltd.
3.
Deloro Stellite
1.
Dominion Bridge Co. Ltd.
5.
Foresteel Industries Ltd.
5.
Marine Industries Ltd.
5.
Port Arthur Shipbuilding.
5.

- 6. Lehers.
- 7. Ovens.
- 8. Soft metal melting.
- 9. Tinning.

Saint John Shipbuilding & Dry Dock.
5.
Saskatchewan Steel Fabricators Ltd.
5.
The Toronto Iron Works Ltd.
5.
Union Carbide Canada Ltd.
4.
Victoria Machinery Depot Co. Ltd.
3.5.
Volcano Ltd.
5.
Wayne Forge Ltd.
2.3.5.6.7.8.9.

4440 DRIERS, DEHYDRATORS, AND ANHYDRATORS**1. Driers, electric, gas & oil.**

Air Conditioning Engineering.
2.
Burrard Dry Dock Co. Ltd.
2.
Combustion Engineering-Superheater.
2.
Coulter Copper & Brass Co. Ltd.
2.
Dominion Bridge Co. Ltd.
2.

2. Evaporators.

Foster Wheeler Ltd.
2.
Horton Steel Works Ltd.
2.
The Toronto Iron Works Ltd.
2.
Victoria Machinery Depot Co. Ltd.
2.
Wayne Forge Ltd.
1.

4450 INDUSTRIAL FAN AND BLOWER EQUIPMENT**1. Blowers, industrial.**

Air Conditioning Engineering.
1.2.
Bogue Electric of Canada Ltd.
1.2.
DeVilbiss Canada Ltd.
2.

2. Fans, industrial.

Godfrey Engineering Co. Ltd.
1.
James Howden & Parsons of Canada.
1.2.
Joy Mfg. Co. (Canada) Ltd.
1.2.

4460 AIR PURIFICATION EQUIPMENT**1. Dust collectors.**

Air Conditioning Engineering.
1.
Foster Wheeler Ltd.
1.
James Howden & Parsons of Canada.
1.

2. Dust collectors, cyclone.

Joy Mfg. Co. (Canada) Ltd.
2.
Yarrows Ltd.
2.

4470 NUCLEAR REACTORS

Babcock & Wilcox Canada Ltd.
Canadian General Electric (Nuclear System)
Canadian Vickers Ltd.
Canadian Westinghouse (Atomic Power)

Combustion Engineering-Superheater.
Davie Shipbuilding Ltd.
Dominion Bridge Co. Ltd.
Victoria Machinery Depot Co. Ltd.

GROUP 45
PLUMBING, HEATING, AND SANITATION
EQUIPMENT

4510 PLUMBING FIXTURES AND ACCESSORIES

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Brass goods. 2. Enamelled ware. 3. Faucets. 4. Galley equipment, stainless steel, custom. 5. Shower heads. 6. Sinks, galley. <p>Barnard Foundries Ltd.
3.5.10.11.</p> <p>Emco Ltd.
1.2.6.7.9.12.</p> <p>Ferguson Industries Ltd.
4.6.</p> | <ul style="list-style-type: none"> 7. Stems, die cast. 8. Tubs, laundry, fibreglass. 9. Units, cathodic protection. 10. Valves, flush. 11. Valves, stop. 12. Vitreous ware. <p>Halifax Shipyards.
4.6.</p> <p>W. H. Olson Mfg. Co. Ltd.
8.</p> <p>Wallaceburg Brass Ltd.
1.</p> |
|---|---|

4520 SPACE HEATING EQUIPMENT AND DOMESTIC WATER HEATERS

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Boilers. 2. Boilers, heating, low pressure. 3. Boilers, hot water. 4. Boilers, steam. 5. Furnaces, forced air. 6. Furnaces, hot air. 7. Heaters, air. 8. Heaters, electric, water. 9. Heaters, gas, water. <p>Aero Tool Works Ltd.
8.17.</p> <p>Air Conditioning Engineering.
7.11.13.</p> <p>Beach Foundry Ltd.
5.</p> <p>Canadian General Electric (C.M.H.D.)
7.8.12.13.</p> <p>Canadian Vickers Ltd.
2.3.4.</p> <p>James B. Cartier Ltd.
10.</p> <p>Coulter Copper & Brass Co. Ltd.
16.</p> <p>Davie Shipbuilding Ltd.
16.</p> <p>Dominion Bridge Co. Ltd.
1.2.3.4.18.</p> <p>Drummond Welding & Steel Works Ltd.
16.18.</p> <p>Enamel & Heating Products Ltd.
5.6.7.8.9.11.14.15.17.</p> | <ul style="list-style-type: none"> 10. Heaters, immersion. 11. Heaters, oil, water. 12. Heaters, portable, electric. 13. Heaters, space, electric. 14. Heaters, space, gas burning. 15. Heaters, space, oil burning. 16. Tanks, hot water. 17. Tanks, hot water, glass lined. 18. Tanks, steel. <p>Fabricated Steel Products Ltd.
18.</p> <p>Ferguson Industries Ltd.
18.</p> <p>Ferro Metal Ltd.
13.16.</p> <p>Findlays Ltd.
5.7.14.15.</p> <p>Foster Wheeler Ltd.
1.2.4.7.14.15.</p> <p>Gilbarco Canada Ltd.
3.5.6.11.17.</p> <p>Hassan Steel Fabricators Ltd.
2.16.</p> <p>Lunenburg Foundry & Engineering Ltd.
6.</p> <p>Marine Industries Ltd.
9.11.18.</p> <p>Molson Industries Ltd.
6.9.11.</p> |
|---|---|

4520 SPACE HEATING EQUIPMENT AND DOMESTIC WATER HEATERS (conc.)

Napanee Industries Ltd.
1.3.4.9.11.16.

W. H. Olsen Mfg. Co. Ltd.
5.

Port Arthur Shipbuilding.
1.2.3.4.16.18.

Saskatchewan Steel Fabricators Ltd.
18.

Victoria Machinery Depot Co. Ltd.
16.18.

Volcano Ltd.
1.2.3.4.9.11.

Wayne Forge Ltd.
2.7.8.9.11.14.15.

Yarrows Ltd.
16.

4530 FUEL BURNING EQUIPMENT UNITS

1. Boilers, gas.
2. Burners, crude oil.
3. Burners, fuel oil.
4. Burners, gas.
5. Burners, heating.

Aero Tool Works Ltd.
3.4.

Babcock & Wilcox Canada Ltd.
2.3.4.7.8.9.10.

Combustion Engineering-Superheater.
3.4.7.

Foster Wheeler Ltd.
1.7.8.9.10.

Gilbarco Canada Ltd.
3.5.

6. Burners, propane.
7. Stokers, all types.
8. Stokers, coal.
9. Stokers, spreader.
10. Stokers, underfeed.

James Howden & Parsons of Canada.
2.8.

Molson Industries Ltd.
3.4.5.

Napanee Industries Ltd.
3.4.

Volcano Ltd.
1.10.

Wayne Forge Ltd.
3.4.5.6.

4540 MISCELLANEOUS PLUMBING, HEATING AND SANITATION EQUIPMENT

1. Heaters, immersion.

James B. Carter Ltd.
1.

Combustion Engineering-Superheater.
2.

2. Incinerators.

James Howden & Parsons of Canada.
2.

Yarrows Ltd.
2.

GROUP 46

**WATER PURIFICATION AND SEWAGE TREATMENT
EQUIPMENT**

4610 WATER PURIFICATION EQUIPMENT

1. Filters, water purification.

Wm. Bartlett & Son Ltd.

Keene of Canada Corp. Ltd.

Bogue Electric of Canada Ltd.

4620 WATER DISTILLATION EQUIPMENT, MARINE AND INDUSTRIAL

1. Distillation units.

Bogue Electric of Canada Ltd.

Peacock Brothers Ltd.

1.

1.

Coulter Copper & Brass Co. Ltd.

1.

4630 SEWAGE TREATMENT EQUIPMENT

1. Sanitation equipment.

2. Sewage treatment plant, land.

Ferguson Industries Ltd.

1.2.3.

International Rubber & Plastics

4.

3. Sewage treatment plant, marine.

4. Splargers, plastic.

Rex Chain Belt (Canada) Ltd.

1.

GROUP 47

PIPE, TUBING, HOSE AND FITTINGS

4710 PIPE AND TUBE

1. Centricast tubing, bronze, iron, steel.
2. Fittings, pipe, ABS.
3. Magnesium pipe and tube, extruded.
4. Pipe, asbestos — bonded.
5. Pipe, cast, iron.
6. Pipe, copper.
7. Pipe, corrugated steel.
8. Pipe, drain, ABS.
9. Pipe, drain, P.V.C.
10. Pipe, drainage, copper.
11. Pipe, ductile iron.
12. Pipe, perforated.
13. Pipe, plastic.
14. Pipe, pressure, concrete.
15. Pipe & tube, aluminum, extruded & drawn.
16. Pipe & tube, brass.
17. Pipe & tube, bronze.
18. Pipe & tube, pipeline.
19. Pipe & tube fittings, steam.
20. Pipe lining, rubber.
21. Pipe, vent, ABS.
22. Pipe, vent, P.V.C.
23. Pipe, waste, ABS.
24. Pipe, waste, copper.
25. Pipe, waste, P.V.C.
26. Pipes & fittings of graphite.
27. Pipes, K.D., plate.
28. Plastic pipe & tubing.
29. Stainless steel pipe.
30. Stainless steel tube.
31. Steel pipe & tube.
32. Steel, welded, corrosion resistant.
33. Titanium, seamless & welded.
34. Tube, cold rolled, welded.
35. Tube, copper.
36. Tube, & duct, plastic re-inforced.
37. Tube, welded, aluminized.
38. Tube, welded, pre-galvanized.

Aluminum Co. of Canada
15.

Anaconda American Brass Ltd.
6.10.16.17.24.35.

Armco Drainage & Metal Products
4.7.12.15.31.

Associated Tube Industries Ltd.
29.30.31.

Atlas Steel
30.

Atlas Titanium Ltd.
33.

Wm. Bartlett & Son Ltd.
36.

Black Clawson-Kennedy Ltd.
1.

Canadian General Electric (Plastics)
8.13.22.25.28.36.

Canron Ltd. (Pipe Div.)
5.11.14.

Davie Shipbuilding Ltd.
18.

Dominion Magnesium Ltd.
3.

Du Pont of Canada Ltd.
13.28.

B.F. Goodrich Canada Ltd.
13.20.28.

Imperial Eastman Corp. (Canada) Ltd.
13.28.

International Parts (Canada) Ltd.
34.37.38.

Robert Mitchell Co. Ltd.
29.30.

Molson Industries Ltd.
5.9.

Noranda Copper Mills Ltd.
6.14.16.17.27.35.

Northwest Industries Ltd.
13.28.36.

The Pedlar People Ltd.
7.

Polyfiber Ltd.
36.

Reynolds Extrusion Co. Ltd.
15.

Scepter Mfg. Co. Ltd.
8.22.25.

The Steel Co. of Canada Ltd.
5.19.29.32.

Stemac Ltd.
33.

The Toronto Iron Works Ltd.
31.32.

Tridon Manufacturing Ltd.
2.12.13.21.23.28.

4710-4730

4710 PIPE AND TUBE (conc.)

Union Carbide Canada Ltd.
26.
Uniroyal (1966) Ltd.
20.

Victoria Machinery Depot Co. Ltd.
31.32.
Westeel-Rosco Ltd.
7.27.

4720 HOSE AND TUBING FLEXIBLE

1. Hose assemblies, fabric re-inforced, multiapplication.
2. Hose assemblies, wire re-inforced, multiapplication.
3. Hose, flexible, metal.
4. Hose, floating, marine to marine & marine to shore applications.

DeVilbiss Canada Ltd.
1.
Dowty Equipment Ltd.
3.7.
Dunlop Canada Ltd.
1.2.5.8.
B.F. Goodrich Canada Ltd.
5.8.
Imperial Eastman Corp. (Canada) Ltd.
1.2.

5. Hose, rubber.
6. Hose, welding and cutting.
7. Tubing, flexible, coiled metal, H.P.
8. Tubing, rubber.

International Rubber & Plastics
5.8.
Union Carbide Canada Ltd.
6.
Uniroyal Ltd.
1.2.3.4.5.8.
Weatherhead Co. of Canada Ltd.
1.

4730 FITTINGS AND SPECIALITIES: HOSE, PIPE, AND TUBE

1. Adapters, pipe.
2. Caps, tube.
3. Clamps, hose, metallic.
4. Clamps, hose, plastic.
5. Clamps, plastic, pipes.
6. Couplings, hose.
7. Couplings, hose, high pressure.
8. Couplings, quick-disconnect.
9. Couplings, self-sealed.
10. Fittings, brass & bronze.
11. Fittings, cast iron.

Advanced Extrusions Ltd.
12.
Armco Drainage & Metal Products
14.
Aro of Canada Ltd.
6.8.9.
Canadian Acme Screw & Gear Ltd.
10.12.13.14.
Canadian General Electric (Plastics)
16.
Canron Ltd. (Mechanical Div.)
10.11.14.18.19.
Canron Ltd. (Pipe Div.)
11.15.

12. Fittings, hose.
13. Fittings, hydraulic.
14. Fittings, pipe.
15. Fittings, pipe, concrete.
16. Fittings, pipe, P.V.C.
17. Fittings, pipe, titanium.
18. Flanges.
19. Joints, expansion pipe.
20. Strainers, water & Petroleum.
21. Traps, steam.

Coulter Copper & Brass Co. Ltd.
10.12.
Curtis Hoover Ltd.
18.
DeVilbiss Canada Ltd.
6.8.9.
Emco Ltd.
3.14.
General Impact Extrusions
2.
Heroux Ltd.
7.
Imperial Eastman Corp. (Canada) Ltd.
1.6.7.8.12.13.

4730 FITTINGS AND SPECIALTIES: HOSE, PIPE, AND TUBE (conc.)

International Malleable Iron Co. Ltd.
10.

Joy Mfg. Co. (Canada) Ltd.
3.6.12.

K.K. Precision Parts Ltd.
10.12.13.14.

Lefebvre Freres Ltd.
8.

Metro Engineering Co. Ltd.
1.3.5.6.7.8.9.10.11.12.13.14.18.

Molson Industries Ltd.
11.19.

Neptune Meters Ltd.
20.

Progressive Engineering Works Ltd.
18.

Rollit Products Ltd.
12.14.18.

Scepter Mfg. Co. Ltd.
16.

SIDO Ltd.
10.

The Steel Co. of Canada Ltd.
14.

Stemac Ltd.
17.

Tridon Mfg. Ltd.
3.4.5.18.

Union Screen Plate Co. Ltd.
6.

Velan Engineering Ltd.
21.

Weatherhead Co. of Canada Ltd.
1.3.5.6.7.8.10.12.13.14.

GROUP 48

VALVES

4810 VALVES, POWERED

1. Butterfly.
2. Electric.
3. Electro-hydraulic.
4. Hydraulic.
5. Nuclear applications.
6. Penstock.

Abex Industries of Canada Ltd.

3.4.

Aro of Canada Ltd.

2.3.4.

Black Clawson-Kennedy Ltd.

10.

Canada Forgings Ltd.

11.

Canadian Car (Pacific) Ltd.

4.6.

Canadian Valve

4.7.

Canadian Vickers Ltd.

1.6.

Canron Ltd. (Mechanical Div.)

1.2.3.4.

7. Pneumatic.
8. Servo, hydraulic.
9. Tracer, hydraulic, multi-axis.
10. Tracer hydraulic, single axis.
11. Valve body forgings.

Davie Shipbuilding Ltd.

1.6.

Dominion Engineering Works Ltd.

1.3.4.5.6.

Dowty Equipment of Canada Ltd.

3.4.

Elco-Wood Industries Ltd.

4.

Heroux Ltd.

3.4.

James Howden & Parsons of Canada

1.

Mimik Ltd.

8.9.10.

Technodyne Co. Ltd.

1.5.

4820 VALVES, NON-POWERED

1. Angle.
2. Ball.
3. Butterfly.
4. Check.
5. Cryogenic applications.
6. Diaphragm.
7. Disc.
8. Gate.
9. Globe.
10. High pressure, forged, special purpose.
11. Hydraulic.

Abex Industries of Canada Ltd.

11.

Aro of Canada Ltd.

11.

Aviation Electric Ltd.

8.15.

Black Clawson-Kennedy Ltd.

2.3.11.17.18.

Canada Forgings Ltd.

22.

Canadair Ltd.

2.

12. Marine types.
13. Nuclear applications.
14. Pressure, reducing.
15. Pressure, regulating.
16. Relief.
17. Rubber lined.
18. Stainless steel.
19. Stainless steel, zero dead volume.
20. Taper, plug type.
21. Vacuum breakers.
22. Valve body forgings.

Canadian Car (Pacific) Ltd.

11.

Canadian Valve Co. Ltd.

4.6.9.12.14.15.16.21.

Canron (Mechanical Div.)

1.2.3.4.5.6.7.8.9.10.11.12.

14.15.16.18.22.

Chemical Projects Ltd.

5.6.19.

Curtis Hoover Ltd.

4.8.

4820 VALVES, NON-POWERED (conc.)

Davie Shipbuilding Ltd.

3.

Dominion Engineering Works Ltd.

3.4.11.

Dowty Equipment Ltd.

4.7.9.11.15.

Heroux Ltd.

11.

James Howden & Parsons of Canada

3.6.

Imperial Eastman Corp. (Canada) Ltd.

2.4.6.

Joy Mfg. Co. (Canada) Ltd.

1.4.7.8.15.

Marsland Engineering Ltd.

20.

Technodyne Co. Ltd.

2.8.10.12.13.

Velan Engineering Ltd.

1.2.4.5.8.9.10.13.18.

GROUP 49

MAINTENANCE AND REPAIR SHOP EQUIPMENT

4910 MOTOR VEHICLE MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Actuators, hydraulic.
2. Cranes, garage.
3. Lifts, one end.
4. Jacks, garage.

Auto Specialties Mfg. Co. Ltd.
2.3.4.5.6.

Champlain Power Products Ltd.
7.

5. Jacks, transmission.
6. Stands, garage.
7. Stands, test.

Elco-Wood Ltd.

1.

Rousseau Controls Ltd.
1.

4920 AIRCRAFT MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Avionic ground equipment.
2. Fixtures.
3. Fuel system test stands.
4. Pilot, leakage rate test stands.
5. Rigging fixtures.
6. Signal generators.
7. Stands.

Abex Industries of Canada Ltd.
8.14.

Aro of Canada Ltd.
9.10.

Aviation Electric Ltd.
3.8.10.11.14.

BLH-Bertram Ltd.
2.5.7.10.

Boeing of Canada Ltd.
2.5.7.10.

Canadair Ltd.
2.5.7.

Canadian Vickers Ltd.
13.

Champlain Power Products Ltd.
10.

Curtis Hoover Ltd.
2.7.

De Havilland Aircraft of Canada
3.4.5.7.8.10.13.

Dowty Equipment of Canada Ltd.
12.14.

Fabricated Steel Products
13.

Fairey Canada Ltd.
5.10.

Field Aviation Co. Ltd.
2.10.

Garrett Manufacturing Ltd.
4.6.9.10.

8. Test sets, hydraulic components.
9. Test sets, pneumatic.
10. Test stands.
11. Test stands, auto-pilot.
12. Test stands, damper systems.
13. Test stands, engine.
14. Test stands, hydraulic systems.

Godfrey Engineering Co. Ltd.
10.14.

Harrington Tool & Die Co. Ltd.
2.5.7.

Heroux Ltd.
7.8.14.

Leavens Bros. Ltd.
3.5.7.8.10.13.14.

Lefebvre Freres Ltd.
2.5.7.10.

Leigh Instruments Ltd.
1.

Master Mechanical Mfg. Ltd.
2.3.

Metro Engineering Co. Ltd.
2.5.7.10.13.

The Pedlar People Ltd.
7.

Rousseau Controls Ltd.
3.

Technodyne Co. Ltd.
2.

Tri-Service Fabricating Ltd.
10.13.

Weatherhead Co. of Canada Ltd.
8.

Williams Machines Ltd.
2.7.

4930 LUBRICATION AND FUEL DISPENSING EQUIPMENT

1. Fueling system, multi-application.
2. Lubricating equipment.

Aro of Canada Ltd.

2.

Canadian Acme Screw & Gear Ltd.

4.

3. Lubricating units, power operated.
4. Nozzles, fuel.

Keene of Canada Corp. Ltd.

1.2.3.

Stewart-Warner Corp. Ltd.

2.

4931 FIRE CONTROL MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Fire control test sets.

CAE Industries Ltd.

1.

4933 WEAPONS MAINTENANCE & REPAIR SHOP SPECIALIZED EQUIPMENT.

Canadian Arsenals Limited.

4935 GUIDED MISSILE MAINTENANCE, REPAIR, AND CHECKOUT SPECIALIZED EQUIPMENT

1. Panels, test, electric.

Northern Electric Co. Ltd.

1.

4940 MISCELLANEOUS MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Agitators, liquid.
2. Booths, spraying.
3. Paint cups.
4. Paint pumps.
5. Paint spray equipment.
6. Paint spray guns.

Aro of Canada Ltd.

5.6.

BLH-Bertram Ltd.

9.

Wm. Bartlett & Son Ltd.

2.

DeVilbiss Canada Ltd.

2.3.4.5.6.7.8.

7. Paint spray regulators.
8. Paint tanks.
9. Presses, wheel, railroad.
10. Tanks, dip.
11. Winding machines, coil.

Hassan Steel Fabricators Ltd.

10.

Progressive Engineering Works Ltd.

1.

Standard-Modern Tool Co. Ltd.

11.

GROUP 51

HAND TOOLS

5110 HAND TOOLS, EDGED, NON-POWERED

1. Chisels, cape.
 2. Chisels, cold.
 3. Chisels, diamond point.
 4. Chisels, framing.
 5. Chisels, rivet buster.
 6. Chisels, round nose.
 7. Cutters, tubing.
 8. Die sets.
 9. Dies, dimpling.
- Canadian Tap & Die Co. Ltd.
8.9.10.
- Cochrane Tool & Design Ltd.
10.
- Deloro Stellite
11.16.
- Diemakers Ltd.
8.10.
- E.T.F. Tools Ltd.
1.2.3.4.5.6.7.12.13.14.17.18.
- Harrington Tool & Die Co. Ltd.
8.10.

10. Dies, metal stamping.
11. Drills.
12. Drills, bull points.
13. Drills, star.
14. Knives, draw.
15. Metal stamping, hand.
16. Reamers.
17. Snips, compound, leverage.
18. Snips, tinner's.

- Hassan Steel Fabricators Ltd.
15.
- Imperial Tool & Die Ltd.
10.
- Premier Tool & Die Ltd.
9.10.
- Standard-Modern Tool Co. Ltd.
10.
- Valcartier Industries Ltd.
10.
- Zettel Manufacturing Ltd.
8.9.10.

5120 HAND TOOLS, NON-EDGED, NON-POWERED

1. Anvils, steel.
2. Bars, pinch.
3. Bars, wrecking.
4. Cable grips, pulling & supporting.
5. Crimpers.
6. Cutters, pipe.
7. Extractors, bolt.
8. Extractors, tap.
9. Flaring tools, hand.
10. Hammer, -21-639-3769.
11. Hammers, hand; ball peen.
12. Hammers, hand; blacksmith.
13. Hammers, hand; bricklayers.
14. Hammers, hand; drilling.
15. Hammers, hand; electricians.
16. Hammers, hand; farriers.
17. Hammers, hand; nail.
18. Hammers, hand; prospectors.
19. Hammers, hand; riveting.
20. Hammers, hand; scaling.
21. Hammers, hand; sledge.
22. Hammers, hand; tanners.
23. Jacks, hydraulic.
24. Jacks, screw.
25. Mallets, rubber.
26. Pliers, curved needle nose.
27. Pliers, duck-billed.

28. Pliers, fence, tool.
29. Pliers, flat nose.
30. Pliers, insulated, electricians.
31. Pliers, linemans, insulated, side & nose cutting.
32. Pliers, long needle nose.
33. Pliers, rib joints.
34. Pliers, round-nose.
35. Pliers, side & end cutting.
36. Pliers, slip joint, angle nose.
37. Pliers, slip joint, regular.
38. Pliers, slip joint, thin nose.
39. Pliers, thin nose, side cutter.
40. Pullers, bearing & wheel.
41. Pullers, railway spike.
42. Punches, centre.
43. Punches, lining-up.
44. Punches, pin.
45. Punches, prick.
46. Punches, solid.
47. Scratch awls.
48. Screwdriver, -21-102-8887.
49. Screwdriver, -21-105-2428.
50. Screwdriver, -00-189-2316.
51. Screwdriver, -00-224-7375.
52. Screwdriver, -00-227-7356.
53. Screwdriver, -00-234-8912.

5120 HAND TOOLS, NON-EDGED, NON-POWERED (conc.)

- 54. Screwdriver, -00-236-2127.
- 55. Screwdriver, -00-237-8172.
- 56. Screwdriver, -00-237-8173.
- 57. Screwdriver, -00-278-1282.
- 58. Screwdriver, -00-278-1283.
- 59. Screwdriver, -21-596-0866.
- 60. Screwdriver, -00-596-8502.
- 61. Screwdriver, -21-639-3155.
- 62. Screwdriver, -21-639-3156.
- 63. Screwdriver, -21-639-3289.
- 64. Screwdriver, -21-639-3769.
- 65. Screwdriver, -21-807-6087.
- 66. Screwdriver, -21-808-5189.
- 67. Screwdriver, -21-814-2552.
- 68. Sets, nail.
- 69. Sets, rivet.
- 70. Spoons, tire changing.
- 71. Stretchers, wire.

Auto Specialties Mfg. Ltd.
23.24.

Burndy Canada Ltd.
5.

Canadian Tap & Die Co. Ltd.
7.8.88.

Geo Cluthe Mfg. Co. Ltd.
10.48.49.50.51.52.53.54.55.56.57.
58.59.60.61.62.63.64.65.66.67.75.
76.

The Craig Bit Co. Ltd.
85.

Delro Industries Ltd.
40.

Dowty Equipment of Canada Ltd.
23.

- 72. Threaders, pipe.
- 73. Vises, machinist.
- 74. Vises, pipe.
- 75. Wrench, -00-277-1801.
- 76. Wrench, -00-277-1802.
- 77. Wrench, sets, hexagon.
- 78. Wrench, sets, pocket.
- 79. Wrenches, box.
- 80. Wrenches, box & open end.
- 81. Wrenches, double box.
- 82. Wrenches, forged, adjustable.
- 83. Wrenches, open end.
- 84. Wrenches, pipe.
- 85. Wrenches, pneumatic.
- 86. Wrenches, square drive.
- 87. Wrenches, stillson pattern.
- 88. Wrenches, tap.

E.T.F. Tools Ltd.

2.3.6.9.11.12.13.14.15.16.17.18.19.
20.21.22.26.27.28.29.30.31.32.33.34.
35.36.37.38.39.40.41.42.43.44.45.46.
47.68.69.70.71.73.74.77.78.79.80.81.
82.83.84.86.87.

Harrington Tool & Die Co. Ltd.
23.24.72.

International Rubber & Plastics
25.

Matthew Moody Division
1.

N. Slater Co.
4.

5130 HAND TOOLS, POWER DRIVEN

- 1. Crimpers, power-driven.
- 2. Drills.
- 3. Rotary tool kits, pneumatic.
- 4. Saws, chain.

Aro of Canada Ltd.
3.7.

Burndy Canada Ltd.
1.

Colonial Tool Co.
5.

Delro Industries Ltd.
6.

- 5. Tool blanks, power hammer.
- 6. Wheels, grinding, diamond.
- 7. Wrenches, impact, pneumatic.

Joy Mfg. Co. (Canada) Ltd.
2.3.7.

Master Mechanical Mfg. Ltd.
1.

Outboard Marine Corp. of Canada
4.

Premier Tool & Die Ltd.
5.

5133-5180

5133 DRILL BITS, COUNTERBORES AND COUNTERSINKS: HAND & MACHINE

1. Drill blanks.
2. Drills, carbide tipped.
3. Drills, rock.

Canadian General Electric (Carboloy)
4.
Joy Mfg. Co. (Canada) Ltd.
1.3.5.

4. Drills, tungsten carbide.
5. Drills, twist.

Thompson Products Ltd.
2.3.

5136 TAPS, DIES AND COLLETS: HAND AND MACHINE

1. Collets.
2. Dies.
3. Dies, chaser, hand.
4. Dies, dimpling.
5. Dies, forgings.

BLH-Bertram Ltd.
2.6.7.10.
Canadian General Electric (Carboloy)
9.
Canadian Tap & Die Co. Ltd.
1.2.10.
Cochrane Tool & Design Ltd.
6.
Deloro Stellite
2.5.6.7.

6. Dies, metal punching.
7. Dies, pressing.
8. Dies, thread cutting.
9. Dies, tungsten carbide.
10. Taps.

Harrington Tool & Die Co. Ltd.
2.4.5.6.7.8.10.
Premier Tool & Die Ltd.
3.8.
Standard-Modern Tool Co. Ltd.
6.7.
Zettel Mfg. Ltd.
4.6.7.

5140 TOOL AND HARDWARE BOXES

1. Boxes, tool, portable.
2. Cases, socket wrench set.
3. Chests, mechanics.
4. Tote boxes.

Albon Welding & Mechanical Works
Ltd.
1.4.6.
Canadian General Electric (Plastics)
5.7.
ETF Tools Ltd.
1.2.3.4.
Fabricated Steel Products Ltd.
4.6.
Hassan Steel Fabricators Ltd.
1.4.6.8.

5. Tote boxes, plastic.
6. Tote pans.
7. Tote pans, plastic.
8. Trailers, tool.

Locweld & Forge Products Ltd.
1.4.6.
McGuire Mfg. Co. Ltd.
1.3.4.6.
Metro Engineering Co. Ltd.
1.4.6.
Union Carbide Canada Ltd.
5.7.
Westeel-Rosco Ltd.
1.3.4.6.

5180 SETS, KITS, AND OUTFITS OF HAND TOOLS

1. Toolkits, metal workers.

Delro Industries Ltd.
2.

2. Tools, forming, diamond.

Premier Tool & Die Ltd.
1.

GROUP 52

MEASURING TOOLS

5210 MEASURING TOOLS, CRAFTSMEN'S

1. Gauges, angle.
2. Gauges, bit.
3. Gauges, centre.
4. Gauges, chamfering.
5. Gauges, cylinder.
6. Gauges, draw.
7. Gauges, fillet and radius.
8. Gauges, fixtures.
9. Gauges, gap setting.

American Can Co. Ltd.
10.12.13.

BLH-Bertram Ltd.
1.2.3.4.5.6.7.8.9.10.11.
15.16.17.

Canadian Arsenals Ltd. (Filling Div.)
8.10.12.13.15.17.

Canadian Arsenals Ltd. (Small Arms
Div.)

8.10.12.13.15.17.

The Craig Bit Co. Ltd.
14.

10. Gauges, inspection special.
11. Gauges, marking.
12. Gauges, plug, go and no go.
13. Gauges, ring, go and no go.
14. Gauges, sharpening, rock bits.
15. Gauges, small hole.
16. Gauges, surface.
17. Gauges, taper.

Harrington Tool & Die Co. Ltd.
5.6.8.10.12.13.

Master Mechanical Mfg. Ltd.
10.12.13.

Semtec Ltd.
1.15.

Standard-Modern Tool Co. Ltd.
8.

T.S.M. Industries Ltd.
12.13.

Valcartier Industries Ltd.
8.10.12.13.15.17.

5220 INSPECTION GAUGES AND PRECISION LAYOUT TOOLS

1. Flush pins.
2. Gauges, fixtures.
3. Gauges, inspection, special.
4. Gauges, length, go and no go.
5. Gauges, length, fixed.
6. Gauges, members, go and no go.
7. Gauges, plug, go and no go.
8. Gauges, plug, plain cylindrical.
9. Gauges, plug and ring, go and no go.

American Can Co. Ltd.
2.3.4.5.6.7.8.9.11.12.13.14.15.16.

BLH-Bertram Ltd.
2.3.4.5.6.7.8.9.10.11.12.16.

Canadian Arsenals Ltd. (Filling Div.)
1.2.3.5.7.8.16.17.

Canadian Arsenals Ltd. (Small Arms
Div.)

1.2.3.5.7.8.16.17.18.

Colonial Tool Co.
1.2.3.7.8.13.14.15.16.

Harrington Tool & Die Co. Ltd.
2.3.4.5.6.7.8.9.10.11.12.16.

10. Gauges, plug, thread.
11. Gauges, ring, go and no go.
12. Gauges, ring, plain.
13. Gauges, snap, adjustable.
14. Gauges, snap, fixed.
15. Gauges, snap, go and no go.
16. Gauges, taper, plug.
17. Gauges, taper, ring, go and no go.
18. Gauges, thread, go and no go.

Master Mechanical Mfg. Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.

Semtec Ltd.
1.2.3.7.8.13.14.15.16.

Standard-Modern Tool Co. Ltd.
1.2.3.14.15.

T.S.M. Industries Ltd.
2.3.4.5.

Valcartier Industries Inc.
2.3.4.7.8.16.17.

GROUP 53

HARDWARE AND ABRASIVES

5305 SCREWS

1. Screws.

B.I.R. Precision Products

1.

Canada I.T.W.

1.

Canadian Acme Screw & Gear Ltd.

1.

Eaton Automotive Canada Ltd.

2.

K.K. Precision Parts Ltd.

1.

Precision Small Parts Ltd.

1.

2. Screw & Washer assemblies.

Rollit Products Ltd.

1.

Shakeproof/Fastex

1.

SIDO Ltd.

1.

The Steel Co. of Canada Ltd.

1.

Triplex Engineering Co. Ltd.

1.

Whitehouse Fastenings Ltd.

1.

5306 BOLTS

1. Bolts.

Canada I.T.W.

1.2.

Canadian Acme Screw & Gear Ltd.

1.2.

K.K. Precision Parts Ltd.

1.2.

Metro Engineering Co. Ltd.

1.2.

Precision Small Parts Ltd.

1.2.

Rollit Products Ltd.

1.

Shakeproof/Fastex

1.2.

2. Nuts.

SIDO Ltd.

1.2.

N. Slater Co.

1.2.

The Steel Co. of Canada Ltd.

1.2.

Triplex Engineering Co. Ltd.

1.2.

Western Canada Steel Ltd.

1.2.

Whitehouse Fastenings Ltd.

1.2.

5307 STUDS

B.I.R. Precision Products

Canadian Acme Screw & Gear Ltd.

K.K. Precision Parts Ltd.

Metro Engineering Co. Ltd.

Precision Small Parts Ltd.

Progressive Engineering Works Ltd.

Rollit Products Ltd.

SIDO Ltd.

The Steel Co. of Canada Ltd.

Triplex Engineering Co. Ltd.

Weatherhead Co. of Canada Ltd.

Western Canada Steel Ltd.

Whitehouse Fastenings Ltd.

5310 NUTS AND WASHERS

1. Burrs, tungsten carbide.

2. Lock nuts.

3. Nuts and washers.

4. Washers, plastic.

5310-5330

5310 NUTS AND WASHERS (conc.)

B.I.R. Precision Products
3.4.
Canada I.T.W.
2.3.
Canadian Acme Screw & Gear Ltd.
2.3.
Canadian General Electric (Carboly)
1.
International Rubber & Plastics
4.
Rollit Products Ltd.
2.3.
Shakeproof/Fastex
2.3.

SIDO Ltd.
2.3.
N. Slater Co.
2.3.
The Steel Co. of Canada Ltd.
2.3.
Triplex Engineering Co. Ltd.
2.
Western Canada Steel Ltd.
3.
Whitehouse Fastenings Ltd.
2.3.
Xyno-matic Plastics Ltd.
4.

5315 NAILS, KEYS, AND PINS

- 1. Keys.
- 2. Nails.

Metro Engineering Co. Ltd.
3.
Precision Small Parts Ltd.
3.
Rollit Products Ltd.
3.

- 3. Pins, all types.

SIDO Ltd.
3.
The Steel Co. of Canada Ltd.
2.
Whitehouse Fastenings Ltd.
1.2.3.

5325 FASTENING DEVICES

- 1. Fasteners, blind hole.
- 2. Fasteners, nylon filament.
- 3. Fasteners, snap.
- 4. Grommets, metallic.

Canada I.T.W.
1.3.
B.F. Goodrich Canada Ltd.
5.6.
Hassan Steel Fabricators Ltd.
4.
International Rubber & Plastics
5.6.
Lightning Fasteners Co. Ltd.
2.7.

- 5. Grommets, plastic.
- 6. Grommets, rubber.
- 7. Zippers to spec. US-VF106B.

The Ontario Rubber Co.
6.
SIDO Ltd.
1.
Shakeproof/Fastex
1.3.
Standard Products (Canada) Ltd.
6.

5330 PACKING AND GASKET MATERIALS

- 1. Gaskets, plastic.
- 2. Gaskets, rubber.
- 3. "O" Rings.
- 4. Packing and gaskets.

Chicago Rawhide Products Ltd.
1.2.4.6.
Dowty Equipment Ltd.
6.

- 5. Packing and seals, mechanical, graphite.
- 6. Seals, rubber.

B.F. Goodrich Canada Ltd.
1.2.6.
Hassan Steel Fabricators Ltd.
4.

5330 PACKING AND GASKET MATERIALS (conc.)

International Rubber & Plastics
1.6.
Mansfield-Denman General Ltd.
6.
The Ontario Rubber Co.
2.6.
Precision Rubber Products
1.2.3.6.

Standard Products (Canada)
6.
Union Carbide Canada Ltd.
5.
Uniroyal Ltd.
1.4.6.

5335 METAL SCREENING

1. Cloth, steel wire.
2. Filters, wire mesh.
3. Metal, expanded.
4. Metal, mesh.

Donald Ropes & Wire Cloth Ltd.
1.4.6.
Greening Industries Ltd.
1.4.6.7.
Johnson Wire Products Ltd.
1.2.4.6.

5. Screen plates, slotted, perforated & conically drilled.
 6. Screens.
 7. Welded fabric.
- The Pedlar People Ltd.
3.
Union Screen Plate Co. Ltd.
5.

5340 MISCELLANEOUS HARDWARE.

1. Bolts.
2. Bumpers, rubber.
3. Bushing blanks, multiapplication.
4. Castors, metal wheel.
5. Castors, plastic wheel.
6. Catches, flush, stainless.
7. Die cast items.
8. Hinges.
9. Knobs.

Wallace Barnes Co. Ltd.
14.15.16.
Wm. Bartlett & Son Ltd.
17.
Canadian General Electric (Plastics)
5.
Champlain Power Products Ltd.
13.
Dominion Lock Co. Ltd.
7.11.
Eastern Die Casting Inc.
11.
B.F. Goodrich Canada Ltd.
2.12.
Harrington Tool & Die Co. Ltd.
3.
Haruni Metal Products
6.
International Rubber & Plastics
5.12.

10. Locks, luggage.
11. Locks & lock sets.
12. Mountings, rubber.
13. Seals, shaft.
14. Springs, coil.
15. Springs, flat.
16. Springs, multiapplication.
17. Straps, webbing, multi-application.

Mansfield-Denman Co. Ltd.
4.
Matthew Moody Division
4.
Rollit Products Ltd.
1.9.
Security Hardware Co.
11.
SIDO Ltd.
1.9.
N. Slater Co.
1.
The Steel Co. of Canada Ltd.
1.
Uniroyal Ltd.
2.12.
Universal Die & Tool Mfg. Ltd.
8.
W. C. Wood Co. Ltd.
8.9.10.

5345-5355

5345 DISKS AND STONES, ABRASIVE

1. Wheels, grinding.

Boyles Bros. Drilling Co. Ltd.

1.2.

Canadian Carborundum Co. Ltd.

1.

2. Wheels, grinding, diamond.

Delro Industries Ltd.

2.

5350 ABRASIVE MATERIALS

1. Abrasives, fine alumina.

2. Abrasives, resistant coatings.

3. Alumina, fused.

Aluminum Co. of Canada

1.

Canadian Carborundum Co. Ltd.

5.

4. Corundum, synthetic.

5. Silicon Carbide, KT.

Norton Research Corp. (Canada)

3.5.

Union Carbide Canada Ltd.

1.2.4.

5355 KNOBS AND POINTERS

1. Dials.

2. Dials, control.

3. Dials, digital, read out.

4. Dials, knob, lock.

5. Dials, scale, multiapplication.

Amphenol Canada Ltd.

3.6.

Beckman Instruments (Helipot Div.)

1.

Graphico Precision Works Ltd.

9.

6. Dials, vernier.

7. Knobs & dials.

8. Knobs & pointers, ceramic.

9. Panels, edge light, multi-application.

Hamilton Porcelains Ltd.

8.

O. & W. Electronics Ltd.

1.2.4.5.7.9.

SIDO Ltd.

1.2.7.

GROUP 54

PREFABRICATED STRUCTURES AND SCAFFOLDING

5410 PREFABRICATED AND PORTABLE BUILDINGS

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Building frames, all types. 2. Buildings, aluminum, prefab. 3. Bunk houses. 4. Control towers, airport, portable. 5. Hangars, helicopter, shipboard. 6. Huts, prefabricated plastic. 7. Living units. | <ul style="list-style-type: none"> 8. Offices. 9. Shelters and bldgs. prefab. steel. 10. Shelters, antenna, reinf. plastic, radar-meteorological. 11. Shelters, arctic, prefab. 12. Shelters, re-inforced plastic. |
|--|---|

Armco Drainage & Metal Products
1.9.12.

ATCO Industries Ltd.
1.2.5.6.9.10.11.12.

Wm. Bartlett & Son Ltd.
10.12.

Burrard Dry Dock Co. Ltd.
5.

Canadair Ltd.
4.

Canadian Bridge Div.
1.9.11.

Canadian General Electric (Plastics)
11.

Canron Ltd. (Structural Div.)
1.

Dominion Aluminum Fabricating Ltd.
2.5.11.

Dynamic Industries Inc.
1.9.

Fleet Manufacturing Ltd.
10.12.

Klassen Homes Ltd.
1.3.7.8.

Magline of Canada Ltd.
11.

Polyfiber Ltd.
12.

Somerville Industries Ltd.
6.12.

Uniroyal Ltd.
6.10.12.

Westeel-Rosco Ltd.
9.11.

Yarrows Ltd.
2.

5420 BRIDGES, FIXED AND FLOATING

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Bridge deck, steel. 2. Bridges (complete units). 3. Bridges, conversion equipment. 4. Bridges, floating. 5. Bridges, pontoon. | <ul style="list-style-type: none"> 6. Bridges, railway, highways, permanent and portable. 7. Floats, rubber, inflatable. 8. Guardrails, bridge. 9. Pontoons, rubber, inflatable. |
|--|--|

A.I.M. Steel Ltd.
2.3.4.5.6.

Armco Drainage & Metal Products
1.8.

Burrard Dry Dock Co. Ltd.
5.

Canadian Bridge Div.
2.6.

Canron Ltd. (Structural Div.)
6.

Dominion Bridge Co. Ltd.
2.3.6.

Dynamic Industries Inc.
2.3.

B.F. Goodrich Canada Ltd.
7.9.

Halifax Shipyards
5.

Matsumoto Shipyards Ltd.
5.

Port Arthur Shipbuilding
1.2.5.6.8.

Port Weller Dry Docks Ltd.
1.5.

Saskatchewan Steel Fabricators Ltd.
2.6.

Uniroyal Ltd.
7.9.

Yarrows Ltd.
2.5.6.

5430-5440

5430 STORAGE TANKS

1. Liners, tank.

2. Metal.

3. Plastic.

4. Tanks, liquid storage.

5. Tanks, rubber, collapsible.

Babcock & Wilcox Canada Ltd.

2.4.

Burrard Dry Dock Co. Ltd.

2.4.8.9.10.

Canadian General Electric (Plastics)

2.

Canron Ltd. (Structural Div.).

8.

Combustion Engineering-Superheater Ltd.

2.4.

Davie Shipbuilding Ltd.

2.4.8.10.

Dominion Bridge Co. Ltd.

2.4.8.10.

Drummond Welding & Steel Works

2.4.8.9.10.

Dynamic Industries Inc.

8.9.10.

Eastern Steel Products

4.8.

Elco-Wood Industries Ltd.

2.8.

Enamel & Heating Products Ltd.

2.4.

Fabricated Steel Products Ltd.

2.8.9.

Ferguson Industries Ltd.

2.4.8.9.10.

Foresteel Industries Ltd.

2.4.8.10.

Foster-Wheeler Ltd.

2.4.8.

Hassan Steel Fabricators Ltd.

4.8.10.

Horton Steel Works Ltd.

2.4.8.10.

International Rubber & Plastics

5.7.

James Howden & Parsons of Canada

2.4.8.10.

6. Tanks, rubber, storage.

7. Tanks, rubber, transportable.

8. Tanks, storage, steel.

9. Tanks, storage, unassembled.

10. Tanks, underground storage.

James United Steel Ltd.

2.4.8.10.

Keene of Canada Corp. Ltd.

4.

Kingston Shipyards

2.4.8.10.

Marine Industries Ltd.

2.4.8.10.

Matsumoto Shipyards Ltd.

2.8.9.10.

Napanee Industries Ltd.

2.4.10.

National Steel Car Corp. Ltd.

2.8.10.

Northwest Industries Ltd.

3.4.8.10.

Polyfiber Ltd.

3.

Port Arthur Shipbuilding.

2.3.4.8.9.10.

Port Weller Dry Docks Ltd.

4.8.9.

Saskatchewan Steel Fabricators Ltd.

2.4.8.10.

The Toronto Iron Works Ltd.

4.8.9.10.

Truck Engineering Ltd.

2.8.

Uniroyal Ltd.

1.5.6.7.

Victoria Machinery Depot Co. Ltd.

2.4.8.10.

Westeel-Rosco Ltd.

2.4.8.10.

The W. C. Wood Co. Ltd.

2.4.8.9.10.

Yarrows Ltd.

2.4.8.9.10.

5440 SCAFFOLDING EQUIPMENT AND CONCRETE FORMS.

1. Forms, concrete.

2. Ladders, extension, aluminum.

3. Ladders, extension, magnesium.

4. Ladders, metallic.

5. Scaffolding, steel.

6. Staging, aluminum.

5440 SCAFFOLDING EQUIPMENT AND CONCRETE FORMS (conc.)

Dominion Bridge Co. Ltd.	Metro Engineering Co. Ltd.
5.	1.4.
Foresteel Industries Ltd.	Molson Industries Ltd.
1.4.	1.5.
Locweld & Forge Products Ltd.	Reynolds Extrusion Co. Ltd.
1.4.	2.4.6.
Magline of Canada Ltd.	Saskatchewan Steel Fabricators Ltd.
3.4.	1.4.
Matthew Moody Division	Sonoco Products of Canada Ltd.
4.	1.

5445 PREFABRICATED TOWER STRUCTURES

1. Towers, antenna.	4. Towers, communication, multi-type.
2. Towers, antenna, re-inforced plastic.	5. Towers, microwave.
3. Towers, antenna supports.	6. Towers, sub-stations.
A.I.M. Steel Ltd.	Horton Steel Works Ltd.
Albon Welding and Mechanical Works Ltd.	Locweld & Forge Products Ltd.
Canron Ltd. (Structural Div.)	Napanee Industries Ltd.
Davie Shipbuilding Ltd.	Saskatchewan Steel Fabricators Ltd.
Dominion Bridge Co. Ltd.	Tri-Service Fabricating Ltd.
Drummond Welding & Steel Works Ltd.	Tywood Industries Ltd.
Dynamic Industries Inc.	Yarrows Ltd.

5450 MISCELLANEOUS PREFABRICATED STRUCTURES

1. Penstocks.	4. Tramway towers and related equipment.
2. Sluice gates.	5. Wind tunnels.
3. Towers, fractionating.	Dynamic Industries Inc.
Burrard Dry Dock Co. Ltd.	2.4.
2.3.5.	Foresteel Industries Ltd.
Canadian Bridge Div.	1.2.4.
2.	Locweld & Forge Products Ltd.
Canadian Vickers Ltd.	2.4.
2.	Port Arthur Shipbuilding.
Canron Ltd. (Structural Div.)	2.
2.4.	Port Weller Dry Docks Ltd.
Coulter Copper & Brass Co. Ltd.	2.
3.	Saskatchewan Steel Fabricators Ltd.
Dominion Bridge Co. Ltd.	2.
2.5.	

GROUP 55

LUMBER, MILLWORK, PLYWOOD, AND VENEER

5510 LUMBER AND RELATED BASIC WOOD MATERIALS

- | | |
|---|----------------------------------|
| 1. Logs. | 6. Poles, wood. |
| 2. Lumber, moulding & trim, Douglas Fir. | 7. Roof decking, Cedar. |
| 3. Lumber, moulding & trim, Hemlock. | 8. Shingles & shanks. |
| 4. Piles, wood. | 9. Timbers, Douglas Fir. |
| 5. Plywood, Douglas Fir. | 10. Timbers, Hemlock. |

Arnott-Smith Export Ltd.
1.2.3.4.5.6.7.8.9.10.

GROUP 56

CONSTRUCTION AND BUILDING MATERIALS

5640 WALLBOARD, BUILDING PAPER, AND THERMAL INSULATION MATERIALS

1. Asbestos fibre sheets.
2. Film backed — re-inforced with glass or rayon filaments.
3. Films, construction.
4. Insulating materials.
5. Insulating materials, glass fibre.
6. Insulation blocks, thermal.
7. Insulation sheets, thermal.
8. Millboard, asbestos.
9. Panels, metal, ceiling, acoustical.
10. Paper, building.
11. Pipe covering, thermal.
12. Sheathing, asbestos cement.
13. Sound deadening coating.
14. Sound deadening pads.
15. Tile, acoustical.
16. Wallboard, asbestos cement.
17. Wallboard, composition, fibreboard.
18. Wallboard, composition, laminated.
19. Wallboard, composition, non-laminated.
20. Wall panel, steel.

Acme Asbestos Ltd.
1.4.7.8.10.11.12.15.16.17.18.19.

H. L. Blachford Ltd.
13.14.

Canadian Technical Tape Ltd.
2.

Dupont of Canada Ltd.
3.

B.F. Goodrich Canada Ltd.
4.11.14.

Holmes Insulations Ltd.
4.5.6.7.9.11.14.

H. I. Thompson Co. of Canada Ltd.
7.

Union Carbide Canada Ltd.
3.

Uniroyal Ltd.
4.7.

Westeel-Rosco Ltd.
20.

5650 ROOFING AND SIDING MATERIALS

1. Roofing, asphalt and asbestos prepared.
2. Roofing and siding, metal.
3. Roofing and siding materials, asbestos.
4. Siding, asbestos cement.

Acme Asbestos Ltd.
1.3.4.
General Wire & Cable Co. Ltd.
2.

The Pedlar People Ltd.
2.
Westeel-Rosco Ltd.
2.

5660 FENCING, FENCES, AND GATES

1. Barbed wire.
2. Fence, chainlink.
3. Fencing.
4. Gates, wire.
5. Guy, stranded.
6. Screens, security.
7. Wire fencing.

A.I.M. Steel Ltd.
3.7.
Greening Industries Ltd.
6.
Johnson Wire Products Ltd.
4.6.
Saskatchewan Steel Fabricators Ltd.
3.

The Steel Co. of Canada Ltd.
1.2.3.4.5.7.
Wire Rope Industries of Canada Ltd.
2.4.7.
Wrights' Canadian Ropes Ltd.
1.2.

5670 ARCHITECTURAL AND RELATED METAL PRODUCTS

1. Curtain, wall.
2. Doors, aluminum.
3. Doors, aluminum & glass, sliding.
4. Doors, aluminum & glass, swinging.
5. Doors, fire.
6. Doors, metal, rolling.
7. Doors, metal, sliding.
8. Doors, metal, swinging.
9. Doors, steel.
10. Doors, wire mesh.
11. Flooring, open steel.
12. Frames, magnesium and aluminum.
13. Frames, aluminum.
14. Frames, steel.

Armco Drainage & Metal Products
11.15.

Beclawat (Canada) Ltd.
7.12.13.28.

Dominion Aluminum Fabricating
23.

Dominion Bridge Co. Ltd.
15.25.

Eastern Steel Products Co.
6.9.

Greening Industries Ltd.
10.16.17.18.25.

Haruni Metal Products
2.7.8.9.11.14.15.25.26.

Hassan Steel Fabricators Ltd.
1.14.19.25.26.27.

Johnson Wire Products Ltd.
10.16.17.18.22.

Kingston Shipyards
6.7.8.

15. Grating, steel.
16. Grills, decorative wire mesh.
17. Grills, wire mesh.
18. Guards, window, wire mesh.
19. Panels, metal.
20. Panels, porcelain, enamel.
21. Partitions, steel.
22. Partitions, wire mesh.
23. Raflings, aluminum.
24. Sashes, aluminum.
25. Stairs, steel.
26. Treads, steel.
27. Troughs, steel.
28. Windows, blast resistant.

Locweld & Forge Products Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.13.14.
15.18.19.21.22.25.26.27.28.

Magline of Canada Ltd.
12.

National Steel Car Corp. Ltd.
9.

W. H. Olsen Mfg. Co. Ltd.
9.

Reynolds Extrusion Co. Ltd.
2.7.12.13.24.

Tri-Service Fabricating Ltd.
13.14.22.25.

Westeel-Rosco Ltd.
19.20.21.26.27.

Western Tools & Industries Ltd.
1.9.14.15.17.25.

Yarrows Ltd.
6.7.8.

5680 MISCELLANEOUS CONSTRUCTION MATERIALS

1. Bars, steel, reinforcing.
2. Concrete inserts, fasteners.
3. Corner, beads.
4. Covers, hatch, steel.
5. Covers, manhole.
6. Culverts, metal.
7. Eavestroughing.
8. Forms, steel.
9. Hoods, steel.
10. Hook bolt tie bars.

Cannon Ltd. (Foundry Div.)
5.18.

Dominion Bridge Co. Ltd.
1.

Electrovert Ltd.
2.16.

11. Kick plates.
12. Laths, metal.
13. Load transfer assemblies.
14. Metal, drywall components.
15. Metal, expanded.
16. Metal framing, adjustable.
17. Ties, bar reinforcing, plastic.
18. Tunnel liner.
19. Welded wire fabric.
20. Wire & stand for prestressed concrete.

Enamel & Heating Products Ltd.
1.

Greening Industries Ltd.
19.

Hassan Steel Fabricators Ltd.
4.5.8.9.11.

5680 MISCELLANEOUS CONSTRUCTION MATERIALS (conc.)

International Rubber & Plastics
17.

Locweld & Forge Products Ltd.
2.4.8.11.12.

The Pedlar People Ltd.
3.7.12.14.15.

The Steel Co. of Canada Ltd.
1.10.13.19.20.

Westeel-Rosco Ltd.
6.12.14.18.

Western Tools & Industries Ltd.
11.

GROUP 58

COMMUNICATION, DETECTION, AND COHERENT
RADIATION EQUIPMENT

5805 TELEPHONE AND TELEGRAPH EQUIPMENT

1. Amplifiers, audio.
2. Amplifiers, direct current.
3. Amplifiers, power supply.
4. Attenuators, fixed and variable.
5. Carrier equipment, telephone and telegraph.
6. Case, telephone.
7. Console, message routing, automatic terminal.
8. Converters, frequency shift.
9. Dials, telephone.
10. Equalizers, telephone line.
11. Finger wheels, telephone, dials.
12. Frequency supplies, telephone.
13. Indicators, frequency separation.
14. Keyers, frequency shift.
15. Keyers, telephone and telegraph.
16. Modems, telegraph and telephone.
17. Monitoring sets, telephone.
18. Multiplexers.
19. Oscillators.
20. Oscillators, audio frequency.
21. Oscillators, power supply.
22. Oscillators, radio frequency.
23. Panels, patching, communications.
24. Receiver-transmitter, telephone.
25. Regulators, audio level, telephone.
26. Regulators, audio wire.
27. Relay, racks, telephone.
28. Repeaters, telegraph and telephone.
29. Scramblers, audio signal.
30. Switchboards, communications.
31. Switchboards, patching.
32. Switchboards, telephone and telegraph.
33. Systems, control board, telephone.
34. Telephone circuits, jack boards.
35. Telephone circuits, line equalizers.
36. Telephone circuits, line jack.
37. Telephone circuits, trunk signalling.
38. Telephone systems.
39. Telephones, cradle.
40. Telephones, field.
41. Telephones, handset.
42. Telephones, pedestal.
43. Telephones, wall type.
44. Transformers, audio frequency.
45. Transformers, telephone.

Automatic Electric (Canada) Ltd.
9.11.12.23.24.25.27.28.30.31.32.33.34.
36.38.39.41.42.43.45.

Aviation Electric Ltd.
3.

Bayly Engineering Ltd.
12.28.31.34.35.36.37.43.45.

CAE Industries Ltd.
13.

Canadian General Electric (D&SP)
5.10.12.16.19.22.23.27.34.

Canadian Marconi Co.
29.

Canadian Westinghouse (Elec. & Def.
Prod.)
2.3.44.

Collins Radio Co. of Canada Ltd.
6.14.16.18.

Computer Metal Reg'd
6.

Computing Devices of Canada
7.

ITT Canada Ltd.
5.45.

George Kelk Ltd.
2.3.

Lenkurt Electric Co. of Canada
1.3.5.10.12.16.17.18.19.20.21.22.24.
25.27.28.34.35.37.44.45.

Magline of Canada Ltd.
6.

Marsland Engineering Ltd.
1.40.

Measurement Engineering Ltd.
1.3.23.27.29.30.31.32.

R. H. Nichols Co. Ltd.
14.

Northern Electric Co. Ltd.
5.8.9.10.11.12.13.16.17.18.20.21.22.
23.24.26.27.28.29.30.31.32.33.38.39.
42.43.45.

Northern Radio Mfg. Co. Ltd.
1.5.8.14.15.16.18.20.23.28.30.

O. & W. Electronics Ltd.
9.

Philips Electronics Industries
1.14.15.20.23.30.31.35.36.37.38.

5805 TELEPHONE AND TELEGRAPH EQUIPMENT (conc.)

Powertronic Equipment Ltd.
23.31.
RCA Ltd.
1.3.4.5.8.18.19.20.21.22.25.29.33.
Radio Engineering Products
1.6.8.14.15.16.18.23.24.26.27.
29.30.31.39.40.

Raytheon Canada Ltd.
1.23.24.
T.M.C. (Canada) Ltd.
1.5.8.14.15.18.19.22.23.24.29.30.
Topping Electronics Ltd.
8.

5810 COMMUNICATIONS SECURITY EQUIPMENT AND COMPONENTS**1. Coders, audio frequency.**

CAE Industries Ltd.
1.
International Systcoms Ltd.
1.2.
Litton Systems (Canada) Ltd.
1.
Northern Electric Co. Ltd.
2.

2. Indicators, code, teletype.

Northern Radio Mfg. Co. Ltd.
2.
RCA Ltd.
1.
Raytheon Canada Ltd.
1.

5815 TELETYPE AND FACSIMILE EQUIPMENT

1. Amplifiers, audio.
2. Amplifiers, direct current.
3. Amplifiers, power supply.
4. Chassis.
5. Control, transmitter teletype.
6. Converters, frequency shift.
7. Generator, digital format, automatic.
8. Indicators, frequency separation.

Bayly Engineering Ltd.
9.
CAE Industries Ltd.
8.
Canadian Westinghouse (Elec. & Def.
Prod.)
2.3.
Collins Radio Co. of Canada Ltd.
6.10.
Computer Metal Reg'd
4.
Computing Devices of Canada Ltd.
7.14.
Electro-Vox Inc.
4.
Lenkurt Electric Co. of Canada Ltd.
1.4.10.
Robert Mitchel Co. Ltd.
4.

9. Monitor, teletype signal.
10. Multiplexers.
11. Oscillators, audio frequency.
12. Oscillators, power supply.
13. Selector switches, teletype code actuated.
14. Teletype facsimile.

Northern Electric Co. Ltd.
6.8.10.11.12.13.
Northern Radio Mfg. Co. Ltd.
1.5.6.9.10.11.
Philips Electronics Industries Ltd.
11.
Presentey Engineering Products Ltd.
5.
RCA Ltd.
1.3.6.10.11.12.
Radio Engineering Products.
1.6.10.
Raytheon Canada Ltd.
4.
Sangamo Co. Ltd.
6.
T.M.C. (Canada) Ltd.
4.6.10.

**5820 RADIO AND TELEVISION COMMUNICATION EQUIPMENT,
EXCEPT AIRBORNE**

1. Amplifiers, direct current.
2. Amplifiers, parametric.
3. Amplifiers, power supplies.
4. Amplifiers, radio and audio frequency.
5. Amplifiers, system.
6. Analysers, non-airborne.
7. Analysers, telemetric data.
8. Cavities, tuned.
9. Chassis, electronic assembly.
10. Consoles, electronic.
11. Controls, remote.
12. Controls, telemetric data.
13. Converters, single side band.
14. Co-ordinate data systems.
15. Couplers, keyer.
16. Decoders, audio frequency.
17. Decoders, pulse.
18. Decoders, video.
19. Delay line sets.
20. Detectors, audio frequency.
21. Detectors, video signal.
22. Discriminators.
23. Discriminators, elec. freq. telemetering systems.
24. Discriminators, power supply.
25. Echo boxes.
26. Equalizers, receiver gain.
27. Frequency control groups.
28. Frequency converters.
29. Frequency converters, transmitters.
30. Frequency dividers.
31. Frequency doublers.
32. Frequency multipliers.
33. Generators, multi-type.
34. Generators, pulse.
35. Generators, pulse sweep.
36. Generators, sweep.
37. Indicators, azimuth and panoramic.
38. Indicators, control group.
39. Indicators, frequency channel.
40. Indicators, panoramic.
41. Indicators, video.
42. Installations, microwave and scatter.
43. Keyers, frequency shift.
44. Limiters, elec. noise.
45. Mixer stages frequency.
46. Modulation eliminators.
47. Modulator, oscillators.
48. Modulator, power supplies.
49. Modulator, radio transmitters.
50. Modulator, receivers.
51. Monitor, error voltage.
52. Monitor, phase.
53. Oscillators, audio.
54. Oscillators, power supplies.
55. Oscillators, radio frequency.
56. Panels, indicators.
57. Panels, patching, communication.
58. Power supplies.
59. Pulse analyser groups.
60. Pulse controlled reciprocating compressor.
61. Pulse form restorer groups.
62. Radio-telephone, mobile.
63. Radio-telephone, portable.
64. Receivers, radio.
65. Receiver-transmitters, radio.
66. Receiving sets, panoramic data.
67. Receiving sets, telemetric data.
68. Recorders, radio frequency.
69. Repeaters, radio.
70. Restorers, pulse form.
71. Routing equipment, automatic.
72. Selector control, sub-assemblies.
73. Telemetering systems.
74. Television sets.
75. Television systems, closed circuit.
76. Transmitters, radio.
77. Transmitters, single band.
78. Tuners, radio frequency.

Automatic Electric Ltd.
75.

Bayly Engineering Ltd.
19.22.

Beaconing Optical & Precision Materials
4.8.9.25.37.39.64.65.77.78.

CAE Industries Ltd.
1.3.9.20.23.24.27.28.29.30.31.32.33.35.
37.39.45.46.47.48.49.50.59.61.

Canadian General Electric (D&SP)
10.42.57.58.

Canadian General Electric (Meter &
Inst.)
73.

Canadian Marconi Co.
4.34.35.36.58.62.63.64.65.69.76.78.

Canadian Westinghouse (Elec. & Def.
Prod.)
1.3.7.9.10.12.23.34.38.41.42.58.67.76.

Central Dynamics Ltd.
3.4.5.58.

5820-5821

**5820 RADIO AND TELEVISION COMMUNICATION EQUIPMENT
EXCEPT AIRBORNE (conc.)**

Computer Metal Reg'd
9.10.
Collins Radio Co. of Canada Ltd.
3.4.5.8.9.11.13.20.22.27.28.29.30.31.
32.42.43.45.49.50.54.55.62.63.64.65.
67.73.76.77.78.
Computing Devices of Canada Ltd.
71.
Croven Ltd.
55.
Desitron Co. Ltd.
8.22.25.
Electro-Vox Inc.
9.
Ferranti Packard Ltd.
12.58.
Fleet Manufacturing Ltd.
10.
Garrett Manufacturing Ltd.
58.
General Precision Industries Ltd.
64.
ITT Canada Ltd.
30.31.32.49.50.76.
Instronics Ltd.
4.58.
International Systcoms Ltd.
4.9.11.16.17.20.62.63.64.65.69.76.77.
George Kelk Ltd.
73.
Lenkurt Electric Co. of Canada Ltd.
3.4.8.28.32.42.45.54.55.58.64.69.73.76.
Magna Electronics
9.10.12.56.57.
Marsland Engineering Ltd.
4.9.
Measurement Engineering Ltd.
3.4.9.10.11.49.50.57.58.72.77.
Milltronics Ltd.
10.56.
Robert Mitchell Co. Ltd.
9.10.

R. H. Nichols Co. Ltd.
5.9.11.12.72.73.
Northern Electric Co. Ltd.
1.2.3.6.8.10.14.15.16.17.18.20.21.23.
24.25.27.28.29.30.31.32.34.35.36.37.38.
39.40.41.44.45.46.47.48.49.51.52.53.54.
55.56.57.58.65.66.68.69.70.75.76.78.
Northern Radio Mfg. Co. Ltd.
4.9.10.11.12.43.53.57.58.71.72.73.
O. & W. Electronics Ltd.
56.
Philips Electronics Industries Ltd.
4.5.9.11.15.34.47.50.53.55.56.57.65.
73.74.76.78.
Presentey Engineering Products Ltd.
5.60.
RCA Ltd.
2.6.7.9.10.15.22.25.26.27.28.29.32.
34.35.45.47.49.53.54.55.56.64.65.67.
69.72.74.75.76.78.
Raytheon Canada Ltd.
2.4.7.9.10.37.42.45.48.50.58.65.
67.75.76.77.78.
C. R. Snelgrove Co. Ltd.
27.
Spar Aerospace Products Ltd.
58.
Sperry Gyroscope Ottawa Ltd.
3.4.9.10.56.
Spilsbury & Tindall Ltd.
62.63.64.65.67.69.73.76.
Syntron (Canada) Ltd.
58.
T.M.C. (Canada) Ltd.
4.10.11.13.20.22.27.28.29.30.31.32.
43.47.48.49.50.55.57.58.62.63.64.
65.76.77.78.
Topping Electronics Ltd.
9.15.27.28.30.31.32.43.45.49.53.
55.63.64.78.
Valeriotte Electronics Ltd.
4.

5821 RADIO AND TELEVISION COMMUNICATION EQUIPMENT, AIRBORNE

1. Amplifiers, audio and radio freq.
2. Amplifiers, direct current.
3. Amplifiers, parametric.
4. Amplifiers, power supply.
5. Analysers, telemetric data airborne.
6. Cavities, tuned.
7. Chassis, electronic assembly.
8. Computers, airborne.
9. Consoles, electronic.
10. Controls, remote.
11. Controls, telemetric systems.
12. Co-ordinate data systems.
13. Couplers, keyer.
14. Decoders, audio frequency.
15. Decoders, pulse.
16. Decoders, video.

5821 RADIO AND TELEVISION COMMUNICATION EQUIPMENT, AIRBORNE (conc.)

17. Detectors, audio, frequency.
18. Detectors, video signal.
19. Discriminators, frequency.
20. Discriminators, power supply.
21. Discriminators, telemetering systems.
22. Echo boxes.
23. Equalizers, receiver gain.
24. Frequency converter transmitter.
25. Frequency converters.
26. Frequency control groups.
27. Frequency dividers.
28. Frequency doublers.
29. Frequency multipliers.
30. Generators, multi-type.
31. Generators, pulse.
32. Generators, pulse sweep.
33. Generators, sweep.
34. Indicators, azimuth and panoramic.
35. Indicators, control groups.
36. Indicators, frequency channel.
37. Indicators, panoramic.
38. Indicators, video.
39. Installations, microwave and scatter.
40. Keyers, frequency shift.
41. Limiters, electrical noise.
42. Mixer stages, frequency.
43. Modulation eliminators.
44. Modulator, oscillators.
45. Modulator, power supplies.
46. Modulator, radio transmitters.
47. Modulator, receivers.
48. Monitor error voltage.
49. Monitor phase.
50. Oscillators, audio.
51. Oscillators, power supply.
52. Oscillators, radio frequency.
53. Panels, indicator.
54. Panels patching communications.
55. Power supplies.
56. Pulse analyser groups.
57. Pulse forms restorer groups.
58. Receiver sets, radio.
59. Receiver-transmitters, radio.
60. Receiving sets, telemetric data.
61. Receiving sets, television.
62. Recorder set, sound.
63. Recorders, radio frequency.
64. Repeaters, radio.
65. Restorers, pulse form.
66. Selector control assys.
67. Tape reproducers/recorders.
68. Tape reproducers/scanners.
69. Telemetering systems.
70. Transmitters, radio.
71. Tuners, radio frequency.

Aviation Electric Ltd.

9.

Bayly Engineering Ltd.

54.

Beaconing Optical & Precision Materials

1.6.7.10.22.36.50.58.71.

Bogue Electric of Canada Ltd.

25.

Bristol Aerospace 1968 Ltd.

7.8.69.

CAE Industries Ltd.

2.4.7.17.19.20.24.25.26.27.28.29.

30.34.36.42.43.44.45.46.47.56.57.

Canadian General Electric (D&SP)

8.55.

Canadian Marconi Co. Ltd.

1.7.8.30.31.32.33.36.55.58.59.64.70.71.

Canadian Westinghouse (Elec. & Def.

Prod.)

1.2.3.4.5.7.8.21.31.35.39.55.60.70.

Collins Radio Co. of Canada Ltd.

1.4.6.7.10.17.24.25.26.27.28.29.35.36.

42.44.45.46.47.51.52.55.58.59.70.71.

Computer Metal Reg'd

7.9.

Computing Devices of Canada Ltd.

8.9.36.69.70.

Croven Ltd.

52.

Desitron Company Ltd.

6.22.

Electro-Vox Inc.

7.

Ferranti Packard Ltd.

11.55.

Garrett Manufacturing Ltd.

55.70.

General Precision Industries Ltd.

58.

ITT Canada Ltd.

46.

International Systcoms Ltd.

1.7.14.15.16.30.44.50.52.58.59.64.70.

George Kelk Ltd.

69.

Magna Electronics

6.7.9.53.54.

Marsland Engineering Ltd.

1.7.55.71.

Measurement Engineering Ltd.

9.58.70.

Robert Mitchell Co. Ltd.

7.9.

5821 RADIO AND TELEVISION COMMUNICATION EQUIPMENT, AIRBORNE (conc.)

- | | |
|---|---|
| Northern Electric Co. Ltd.
2.3.4.5.6.9.12.13.14.15.16.17.18.19.
20.22.24.25.26.27.28.29.31.32.33.34.
35.36.37.38.41.42.43.44.45.47.48.49.50.
51.52.53.54.55.58.59.60.63.65.70.71. | Raytheon Canada Ltd.
1.5.7.9.46.49. |
| O. & W. Electronics Ltd.
53. | Sangamo Co. Ltd.
55. |
| Philips Electronics Industries Ltd.
1.7.46.70.71. | Spar Aerospace Products Ltd.
55. |
| Presentey Engineering Products Ltd.
62.67.68. | Sperry Gyroscope Ottawa Ltd.
1.4.7.9.35.50.52.53.66. |
| RCA Ltd.
2.3.4.5.6.7.9.11.13.17.18.19.20.22.
23.24.25.26.27.28.29.31.32.42.43.47.50.
51.52.53.54.58.59.60.61.66.70.71. | Spilsbury & Tindall Ltd.
7.9.10.39.54.55.58.59.60.64.70.
Topping Electronics Ltd.
1.7.13.24.26.27.28.29.40.42.47.
50.51.58.60.71. |
| | Valeriot Electronics Ltd.
1. |

5825 RADIO NAVIGATION EQUIPMENT, EXCEPT AIRBORNE

- | | |
|---|---|
| 1. Amplifiers, audio and radio frequency. | 34. Indicators, flight command, azimuth-distance. |
| 2. Amplifiers, direct current. | 35. Indicators, frequency channel. |
| 3. Amplifiers, power supply. | 36. Indicators, video. |
| 4. Beacon sets, radio. | 37. Interrogator sets. |
| 5. Blanker, interference, radar. | 38. Limiters, electrical noise. |
| 6. Boards, plotting. | 39. Mixer stages, frequency. |
| 7. Cavities, tuned. | 40. Modulator, eliminators. |
| 8. Coders, audio frequency. | 41. Modulator, oscillators. |
| 9. Coders, radio beacon. | 42. Modulators, power supplies. |
| 10. Computers, navigational. | 43. Modulator, radio transmitters. |
| 11. Consoles, electronic. | 44. Modulator, receivers. |
| 12. Converter, group signal data. | 45. Monitor, error voltage. |
| 13. Converters, analogue to digital. | 46. Monitor, phase. |
| 14. Co-ordinate data systems. | 47. Monitor, radio frequency. |
| 15. Couplers, keyer. | 48. Oscillators, audio. |
| 16. Detectors, video signal. | 49. Oscillators, power supply. |
| 17. Direction finder sets. | 50. Oscillators, radio frequency. |
| 18. Echo boxes. | 51. Panels, indicator. |
| 19. Equalizers, receiver gain. | 52. Panels, patching, communication. |
| 20. Frequency control groups. | 53. Power supplies. |
| 21. Frequency converter, transmitters. | 54. Pulse analyser groups. |
| 22. Frequency converters. | 55. Radio beacons, marine. |
| 23. Frequency dividers. | 56. Receivers, loran. |
| 24. Frequency doublers. | 57. Receivers-transmitters, loran. |
| 25. Frequency multipliers. | 58. Receivers-transmitters, radio. |
| 26. Generators, multi-type. | 59. Receiving sets, panoramic data. |
| 27. Generators, pulse. | 60. Selector control sub-assy. |
| 28. Generators, pulse, sweep. | 61. Simulators. |
| 29. Generators, sweep. | 62. Transmitters. |
| 30. Homing sets, radio beacon. | 63. Transmitters, beacon. |
| 31. Homing sets, radio, non-airborne. | 64. Transmitters, radio. |
| 32. Indicators, azimuth and panoramic. | 65. Tuners, radio frequency. |
| 33. Indicators, control groups. | |

5825 RADIO NAVIGATION EQUIPMENT, EXCEPT AIRBORNE (conc.)

- | | |
|--|---|
| Aviation Electric Ltd.
6.10. | Marsland Engineering Ltd.
1.11. |
| CAE Industries Ltd.
2.3.4.14.15.16.20.21.22.23.24.25.
26.30.31.32.34.35.39.40.41.42.43.44.
45.54. | Measurement Engineering Ltd.
1.2.3.4.11.47.52.62.64. |
| Canadian General Electric (D&SP)
4.11.53. | Robert Mitchell Co. Ltd.
11. |
| Canadian Marconi Co.
1.4.9.10.17.26.27.28.29.30.31.53.
58.62.64.65. | Northern Electric Co. Ltd.
2.3.7.14.15.17.20.21.22.23.24.25.27.
28.29.30.31.32.33.35.36.37.38.39.40.
41.42.44.45.46.48.49.50.51.52.53.58.
59.62.65. |
| Canadian Research Institute
13. | O. & W. Electronics Ltd.
51. |
| Canadian Westinghouse (Elec. & Def.
Prod.)
1.2.3.27.31.33.36.53.64. | Philips Electronics Industries Ltd.
1.4.9.11.15.27.43.48.50.52.53.64.65. |
| Computer Metal Reg'd
11. | RCA Ltd.
2.3.4.5.7.8.9.12.14.16.18.19.20.21.
22.23.24.25.27.28.30.31.39.40.48.49.
50.51.52.57.58.60.63.65. |
| Computing Devices of Canada Ltd.
10.17. | Raytheon Canada Ltd.
1.4.8.9.11.31.37.39.43.53.58.61.62.
63.65. |
| Croven Ltd.
50. | Sangamo Co. Ltd.
53. |
| Desitron Company Ltd.
7.18. | Spar Aerospace Products Ltd.
53. |
| E.M.I. Electronics
4. | Sperry Gyroscope Ottawa Ltd.
1.3.10.11.27.33.35.48.50.51.60.61. |
| Ferranti Packard Ltd.
53. | Spilsbury & Tindall Ltd.
1.4.9.11.17.30.31.43.44.48.50.53.56.
57.58.62.64. |
| Fleet Manufacturing Ltd.
11. | Stewart-Warner Corp. Ltd.
9. |
| Garrett Manufacturing Ltd.
53.55. | Syntron (Canada) Ltd.
53. |
| General Precision Industries Ltd.
17. | Topping Electronics Ltd.
1.4.11.20.22.23.24.25.44.47.48.49.
50.63. |
| ITT Canada Ltd.
64. | Valeriotte Electronics Ltd.
1. |
| International Systcoms Ltd.
1.8.9.11.26.30.48.58.62.64. | |
| Leigh Instruments Ltd.
4.34.43.63. | |
| Litton Systems (Canada) Ltd.
10.64. | |

5826 RADIO NAVIGATION EQUIPMENT, AIRBORNE

- | | |
|---|--------------------------------------|
| 1. Altimeter sets, electronic. | 9. Consoles, electronic. |
| 2. Amplifiers, audio and radio frequency. | 10. Controls, navigational computer. |
| 3. Amplifiers, direct current. | 11. Converter, group signal data. |
| 4. Amplifiers, power supply. | 12. Co-ordinate data systems. |
| 5. Blanker interference, radar. | 13. Couplers, keyer. |
| 6. Cavities, tuned. | 14. Detectors, video signal. |
| 7. Coders, audio frequency. | 15. Direction finder sets. |
| 8. Computers. | 16. Displays, cathode ray. |

5826 RADIO NAVIGATION EQUIPMENT, AIRBORNE (cont.)

17. Displays, moving map.
 18. Echo boxes.
 19. Equalizers, receiver gain.
 20. Frequency control groups.
 21. Frequency converter transmitters.
 22. Frequency converters.
 23. Frequency dividers.
 24. Frequency doublers.
 25. Frequency multipliers.
 26. Generators, multi-type.
 27. Generators, pulse.
 28. Generators, pulse, sweep.
 29. Generators, sweep.
 30. Homing sets, radio.
 31. Indicators, azimuth and panoramic.
 32. Indicators, control groups.
 33. Indicators, flight command azimuth distance.
 34. Indicators, frequency channel.
 35. Indicators, radio range.
 36. Indicators, video.
 37. Interrogator sets.
 38. Limiters, electrical noise.
 39. Mixer stages, frequency.
 40. Modulator, eliminators.
 41. Modulator, oscillators.
 42. Modulator, power supplies.
 43. Modulator, radio transmitters.
 44. Modulator, receivers.
 45. Monitor error voltage.
 46. Monitor phase.
 47. Navigation computer systems.
 48. Oscillators, audio.
 49. Oscillators, power supply.
 50. Oscillators, radio frequency.
 51. Panels, indicator.
 52. Panels, patching, communication.
 53. Power supplies.
 54. Pulse, analyser groups.
 55. Radio beacons.
 56. Receivers, loran.
 57. Receiver-transmitter, loran.
 58. Receiver-transmitters, radio.
 59. Receiving sets, panoramic data.
 60. Selectors, control sub-assemblies.
 61. Simulators.
 62. Transmitters.
 63. Tuners, radio frequency.
- Aviation Electric Ltd.
10.33.47.
- CAE Industries Ltd.
1.3.4.8.12.14.20.21.22.23.24.25.26.30.
33.34.35.39.40.41.42.43.44.45.54.55.
- Canadian General Electric (D&SP)
53.
- Canadian Marconi Co.
1.2.8.10.17.26.27.28.29.30.41.47.
53.58.61.62.63.
- Canadian Westinghouse (Elec. & Def.
Prod.)
2.3.4.8.27.30.32.36.53.62.
- Collins Radio Co. of Canada Ltd.
15.30.34.56.58.62.
- Computer Metal Reg'd.
9.
- Computing Devices of Canada Ltd.
8.10.16.17.31.32.33.47.61.
- Croven Ltd.
50.
- Desitron Co. Ltd.
6.18.
- E.M.I. Electronics
55.
- Ferranti Packard Ltd.
53.
- Fleet Manufacturing Ltd.
9.
- Garrett Manufacturing Ltd.
53.55.62.
- ITT Canada Ltd.
62.
- International Systcoms Ltd.
2.7.55.62.
- Leigh Instruments Ltd.
1.10.32.33.47.55.62.
- Litton Systems (Canada) Ltd.
1.3.8.10.
- Marsland Engineering Ltd.
2.
- Northern Electric Co. Ltd.
3.4.6.12.13.15.20.21.22.23.24.25.27.28.
29.30.31.32.34.35.36.37.38.39.40.41.42.
44.45.46.48.49.50.51.52.53.58.59.62.63.
- O. & W. Electronics Ltd.
51.
- Philips Electronics Industries Ltd.
2.27.43.48.50.62.63.
- RCA Ltd.
3.4.5.6.11.12.13.14.15.18.19.20.21.22.
23.24.25.27.28.30.39.40.44.48.49.50.
51.52.56.57.58.60.62.63.

5826 RADIO NAVIGATION EQUIPMENT, AIRBORNE (conc.)

Raytheon Canada Ltd.
2.7.9.39.41.43.

Sangamo Co. Ltd.
53.

Spar Aerospace Products Ltd.
30.

Sperry Gyroscope Ottawa Ltd.
2.4.9.26.31.32.34.47.48.50.51.61.

Topping Electronics Ltd.
2.9.20.22.23.24.25.44.48.50.55.

Valeriotte Electronics Ltd.
2.

5830 INTERCOMMUNICATION AND PUBLIC ADDRESS SYSTEMS, EXCEPT AIRBORNE

1. Amplifiers, audio.
2. Amplifiers, direct current.
3. Amplifiers, power supply.
4. Consoles.
5. Frequency multipliers.
6. Intercom systems.

Bayly Engineering Ltd.
5.

Canadian Marconi Co.
6.10.

Central Dynamics Ltd.
1.3.10.

Computer Metal Reg'd
4.

Electro-Vox Inc.
1.3.4.5.6.7.8.10.

Fleet Manufacturing Ltd.
4.

Marsland Engineering Ltd.
1.3.6.10.11.

Measurement Engineering Ltd.
1.3.4.8.10.

7. Intercommunication sets.
8. Megaphones, electronic.
9. Panels, indicator.
10. Public address systems.
11. Selector control sub-assemblies.

Milltronics Ltd.
4.9.

Northern Electric Co. Ltd.
3.7.9.10.

O. & W. Electronics Ltd.
9.

RCA Ltd.
2.7.10.11.

Radio Engineering Products
1.

Raytheon Canada Ltd.
1.4.

Sperry Gyroscope Ottawa Ltd.
1.3.4.9.11.

5831 INTERCOMMUNICATION AND PUBLIC ADDRESS SYSTEMS, AIRBORNE

1. Amplifiers, audio and radio frequency.
2. Amplifiers, direct current.
3. Amplifiers, power supply.
4. Consoles.
5. Intercom systems.

Canadian Marconi Co.
5.9.

Collins Radio Co. of Canada Ltd.
1.3.5.6.

Computer Metal Reg'd
4.

Fleet Manufacturing Ltd.
4.

Marsland Engineering Ltd.
1.3.5.6.8.9.

Measurement Engineering Ltd.
4.

6. Intercommunication sets.
7. Megaphones, electronic.
8. Panels, indicator.
9. Public address systems.
10. Selector control sub-assemblies.

Northern Electric Co. Ltd.
3.6.8.9.

O. & W. Electronics Ltd.
8.

RCA Ltd.
2.6.9.10.

Raytheon Canada Ltd.
1.4.

Sperry Gyroscope Ottawa Ltd.
1.3.4.8.10.

Topping Electronics Ltd.
7.

5835 SOUND RECORDING AND REPRODUCING EQUIPMENT

1. Amplifiers, power supply.
2. Amplifiers, transistorized, audio.
3. Erasers, magnetic.
4. Power supplies.
5. Recorder, reproducer, tape.

Leigh Instruments Ltd.

2.5.

Lenkurt Electric Co. of Canada Ltd.

1.4.

Marsland Engineering Ltd.

2.4.6.

Northern Electric Co. Ltd.

1.4.

Presentey Engineering Products Ltd.

5.6.8.

6. Reproducer, sound.
7. Rewinders, recording tape, sound.
8. Scanner-Reproducer, magnetic tape.
9. Tape readers, high speed.

RCA Ltd.

3.7.

Sangamo Co. Ltd.

4.

Syntron (Canada) Ltd.

4.

T.M.C. (Canada) Ltd.

1.4.

5840 RADAR EQUIPMENT, EXCEPT AIRBORNE

1. Amplifiers, audio.
2. Amplifiers, direct current.
3. Amplifiers, parametric.
4. Amplifiers, power supply.
5. Blanker, interference, radar.
6. Cavities, tuned.
7. Coders, audio frequency.
8. Computers, radar.
9. Consoles, electronic.
10. Controls, remote operation.
11. Converters, group signal data.
12. Converters, video.
13. Co-ordinate data systems.
14. Couplers.
15. Data analysis controls.
16. Decoders.
17. Decoders, audio frequency.
18. Decoders, pulse.
19. Decoders, video.
20. Delay lines.
21. Detectors.
22. Detectors, radio frequency.
23. Detectors, video signal.
24. Discriminators.
25. Display boards, radar set data.
26. Echo boxes.
27. Equalizers, receiver gain.
28. Frequency converters.
29. Frequency converters, transmitters.
30. Frequency dividers.
31. Frequency doublers.
32. Frequency multipliers.
33. Generators, electronic marker.
34. Generators, multi-type.
35. Generators, pulse.
36. Generators, pulse sweep.
37. Generators, sweep.
38. Indicators, azimuth.
39. Indicators, azimuth and panoramic.
40. Indicators, control groups.
41. Indicators, frequency channel.
42. Indicators, intratarget data.
43. Indicators, panoramic.
44. Indicators, triadic display.
45. Indicators, video.
46. Installations, microwave & scatter.
47. Interference blanker groups.
48. Light-guns, radar target.
49. Mixer stages, frequency.
50. Modulator, oscillators.
51. Modulator, power supplies.
52. Modulators, radar.
53. Modulators, receivers.
54. Monitors, co-ordinate data.
55. Moving targets, indicator groups.
56. Oscillators, audio frequency.
57. Oscillators, power supply.
58. Oscillators, radio frequency.
59. Panels, indicator.
60. Power supplies.
61. Pulse, analyser groups.
62. Pulse, form restorer groups.
63. Radar beacons.
64. Radar, course directing.
65. Radar, mapping.
66. Radar, missile tracking.
67. Radar sets.
68. Radar set control groups.
69. Radar target alarm groups.
70. Radar tracking, computing groups.
71. Receiver-transmitters, radar.
72. Receiving sets, radar.
73. Recorders, radio frequency.
74. Restorers, pulse form.
75. Scanners, light generating.
76. Selectors, trigger, video signal.

5840 RADAR EQUIPMENT, EXCEPT AIRBORNE (conc.)

77. Simulators.
 78. Simulators, radar target.
 79. Target discriminator groups.
 80. Transmitters.

Beaconing Optical & Precision Materials
 10.11.26.38.42.67.71.72.81.82.83.

Bogue Electric of Canada Ltd.
 28.60.

CAE Industries Ltd.
 5.7.12.13.22.23.28.29.30.31.32.34.38.39.
 41.49.50.51.52.53.54.55.61.62.64.65.66.
 67.68.69.70.72.78.79.81.

Canadian General Electric (D&SP)
 3.4.5.8.9.10.11.12.13.15.16.17.18.19.
 21.22.23.24.28.29.30.31.32.33.34.35.36.
 37.38.39.40.41.42.43.44.45.46.47.49.50.
 51.52.53.54.55.56.57.58.59.61.62.63.65.
 66.67.68.69.70.71.72.73.74.76.77.78.79.
 80.81.82.

Canadian Marconi Co.
 1.33.34.35.36.37.60.64.67.68.70.71.72.
 81.82.

Canadian Westinghouse (Elec. & Def.
 Prod.)
 2.4.8.9.15.25.37.40.45.46.52.55.60.
 66.67.68.70.71.72.78.79.80.81.

Computer Metal Reg'd.
 9.

Croven Ltd.
 58.

Desitron Co. Ltd.
 6.14.24.26.

E.M.I. Electronics
 63.

W. R. Elliott Ltd.
 83.

Ferranti Packard Ltd.
 10.20.25.55.60.

Fleet Manufacturing Ltd.
 9.83.

ITT Canada Ltd.
 52.67.81.

Marsland Engineering Ltd.
 14.35.84.

81. Transmitters, co-ordinate data radar.
 82. Tuners, radio frequency.
 83. Turntables, radar set.
 84. Turntables, gear drives.

Microwave Devices Inc.
 14.

Milltronics Ltd.
 59.

Northern Electric Co. Ltd.
 2.3.4.5.6.13.15.17.18.19.26.28.29.30.
 31.32.33.35.36.37.38.39.40.41.43.45.
 48.49.51.53.54.55.56.57.58.59.60.65.67.
 69.70.71.72.73.74.77.79.80.81.82.

R. H. Nichols Co. Ltd.
 59.60.

O. & W. Electronics Ltd.
 59.

Philips Electronics Industries Ltd.
 33.34.35.

RCA Ltd.
 2.3.4.6.7.12.13.14.16.21.24.26.27.28.
 29.30.31.32.33.35.36.47.48.49.52.53.
 55.56.57.58.59.66.67.68.69.70.72.75.76.
 78.79.80.81.82.

Raytheon Canada Ltd.
 5.7.8.9.12.16.18.19.25.35.38.47.48.49.
 52.53.65.67.68.70.71.72.78.79.81.

Sangamo Co. Ltd.
 60.

Spar Aerospace Products Ltd.
 60.

Sperry Gyroscope Ottawa Ltd.
 1.4.9.10.34.38.40.41.56.58.59.78.

Stewart-Warner Corp. Ltd.
 20.

Syntron (Canada) Ltd.
 60.

Topping Electronics Ltd.
 1.9.

Valeriotte Electronics Ltd.
 1.

5841 RADAR EQUIPMENT, AIRBORNE

1. Amplifiers, audio.
 2. Amplifiers, direct current.
 3. Amplifiers, parametric.
 4. Amplifiers, power supply.
 5. Blanker, interference, radar.
 6. Cavities, tuned.
 7. Coders audio frequency.

8. Computers, airborne.
 9. Consoles, electronic.
 10. Converters, group signal data.
 11. Converters, video.
 12. Co-ordinate data systems.
 13. Couplers.
 14. Data analysis controls.

5841 RADAR EQUIPMENT, AIRBORNE (conc.)

15. Decoders, audio frequency.
 16. Decoders, pulse.
 17. Decoders, video.
 18. Delay lines.
 19. Detectors, radio frequency.
 20. Detectors, video signal.
 21. Discriminators.
 22. Display boards, radar set data.
 23. Display, plotting boards.
 24. Echo boxes.
 25. Equalizers, receiver gain.
 26. Frequency converters.
 27. Frequency converters transmitters.
 28. Frequency dividers.
 29. Frequency doublers.
 30. Frequency multipliers.
 31. Generators, electronic marker.
 32. Generators, multi-type.
 33. Generators, pulse.
 34. Generators, pulse sweep.
 35. Generators, sweep.
 36. Indicators, azimuth.
 37. Indicators, azimuth and panoramic.
 38. Indicators, azimuth, range, bearing.
 39. Indicators, control groups.
 40. Indicators, flight command, azimuth distance.
 41. Indicators, frequency channel.
 42. Indicators, panoramic.
 43. Indicators, video.
 44. Installations, microwave and scatter.
 45. Interference, blanker groups.
 46. Isolators, radio frequency reflection.
 47. Light-guns, radar target.
 48. Mixer stages, frequency.
 49. Modulator, oscillators.
 50. Modulator, power supplies.
 51. Modulator, radar.
 52. Modulator, receivers.
 53. Monitors, co-ordinate data.
 54. Moving targets indicator groups.
 55. Oscillators, audio frequency.
 56. Oscillators, power supply.
 57. Oscillators, radio frequency.
 58. Panels, indicator.
 59. Power supplies.
 60. Pulse analyser groups.
 61. Pulse form restorer groups.
 62. Radar beacons.
 63. Radar course directing.
 64. Radar mapping.
 65. Radar, missile tracking.
 66. Radar sets.
 67. Radar set control groups.
 68. Radar target alarm groups.
 69. Radar terrain clearance sets.
 70. Receiving sets, radar.
 71. Recorders, radio frequency.
 72. Restorers, pulse form.
 73. Scales, cathode ray tube.
 74. Scanners, light generating.
 75. Selectors, trigger, video signal.
 76. Simulators.
 77. Simulators, radar target.
 78. Target discriminator groups.
 79. Transmitters.
 80. Transmitters, co-ordinate data, radar.
- CAE Industries Ltd.
5.7.8.11.12.19.20.26.27.28.29.30.32.
36.40.41.48.49.50.51.52.53.54.60.61.
63.65.66.68.70.77.78.79.
- Canadian General Electric (D & SP)
3.4.5.8.9.10.11.12.14.15.16.17.19.20.
21.26.27.28.29.30.31.32.33.34.36.37.
38.39.40.43.45.48.49.50.51.52.54.55.
56.57.60.61.63.65.67.68.71.72.73.75.
76.80.
- Canadian Marconi Co.
1.8.18.31.32.33.34.35.38.55.56.59.
63.66.67.69.70.79.80.
- Canadian Westinghouse (Elec. & Def.
Prod.)
2.8.9.14.18.21.22.23.28.29.30.31.32.33.
34.35.36.38.39.43.44.49.50.51.52.54.55.
56.57.58.59.64.66.67.69.70.73.77.78.79.
80.
- Computer Metal Reg'd.
9.
- Croven Ltd.
57.
- Desitron Co. Ltd.
6.13.21.24.46.
- E.M.I. Electronics
62.
- Ferranti Packard Ltd.
18.54.59.
- Fleet Manufacturing Ltd.
9.
- ITT Canada Ltd.
51.63.64.66.79.
- Leigh Instruments Ltd.
8.14.39.40.62.79.
- Litton Systems (Canada) Ltd.
7.
- Marsland Engineering Ltd.
13.
- Microwave Devices Inc.
13.

5841 RADAR EQUIPMENT, AIRBORNE (conc.)

Northern Electric Co. Ltd.
 2.3.4.5.6.12.14.15.16.17.24.26.27.28.
 29.30.31.32.33.34.35.36.37.39.41.42.
 43.47.48.50.52.53.54.55.56.57.58.59.
 64.66.67.68.70.71.72.75.78.79.80.
 O. & W. Electronics Ltd.
 58.
 Philips Electronic Industries Ltd.
 31.32.33.
 RCA Ltd.
 2.3.4.6.7.8.10.12.13.15.16.17.19.21.
 24.25.26.27.28.29.30.31.32.33.34.45.47.
 48.51.52.54.55.56.57.58.65.66.67.68.
 70.74.75.77.78.79.80.
 Raytheon Canada Ltd.
 9.11.17.22.47.48.66.67.68.70.78.

Sangamo Co. Ltd.
 59.
 Spar Aerospace Products Ltd.
 59.64.
 Sperry Gyroscope Ottawa Ltd.
 1.4.8.9.22.32.38.55.57.58.77.
 Stewart-Warner Corp. of Canada Ltd.
 18.
 Topping Electronics Ltd.
 1.
 Valeriotte Electronics Ltd.
 1.

5845 UNDERWATER SOUND EQUIPMENT

1. Amplifiers, power supply.
2. Beacon sets, sonar.
3. Computers, sonar data.
4. Depth recorders.
5. Domes sonar.
6. Extension search coil, underwater mine.
7. Frequency converters.
8. Frequency dividers.
9. Generators, electronic marker.
10. Generators, pulse.
11. Generators, pulse sweep.
12. Hydrophones.
13. Indicator panels, sonar.
14. Indicators, remote.
15. Mixer stages, frequency.
16. Modulators, sonar.
17. Oscillators, audio frequency.

Almax Ceramic Industries Ltd.
 12.
 Bogue Electric of Canada Ltd.
 5.7.19.
 CAE Industries Ltd.
 6.7.8.20.
 Canadian General Electric (D & SP)
 3.19.23.24.25.26.28.32.33.
 Canadian Marconi Co.
 9.10.11.34.
 Canadian Westinghouse (Elec. & Def.
 Prod.)
 2.3.9.13.16.19.20.23.25.29.32.33.
 Computing Devices of Canada Ltd.
 3.26.27.31.32.
 Croven Ltd.
 17.

18. Oscillators, power supply.
19. Power supplies.
20. Receiving sets, sonar.
21. Restorers, pulse form.
22. Scanners, light generating.
23. Sonar detection, ranging.
24. Sonar, hull outfitting.
25. Sonar electronic equipment.
26. Sonar equipment.
27. Sonar equipment, data processing.
28. Sonar RX-TX.
29. Sonar transducers.
30. Sonobuoys.
31. Telephone equipment, underwater.
32. Transmitters, sonar.
33. Transmitters-receivers, sonar.
34. Tuners, radio frequency.

Davie Shipbuilding Ltd.
 24.
 Dominion Bridge Co. Ltd.
 30.
 E.M.I. Electronics
 25.26.29.30.32.33.
 Fleet Manufacturing Ltd.
 5.24.26.
 Garrett Manufacturing Ltd.
 19.31.
 Gulton Industries (Canada) Ltd.
 12.
 John T. Hepburn Ltd.
 23.
 Marsland Engineering Ltd.
 4.5.23.24.25.26.

5845-5855

5845 UNDERWATER SOUND EQUIPMENT (conc.)

Northern Elertric Co. Ltd. 1.17.18.21.34.	Spar Aerospace Products Ltd. 19.
RCA Ltd. 10.11.15.17.22.	Sparton of Canada Ltd. 25.30.
Raytheon Canada Ltd. 1.4.14.19.26.31.	Syntron (Canada) Ltd. 19.
Sangamo Co. Ltd. 19.	Tywood Industries Ltd. 5.

5850 VISIBLE AND INVISIBLE LIGHT COMMUNICATION EQUIPMENT.

1. Homing sets, infra-red.	4. Modulator, power supplies.
2. Infra-red systems.	5. Optical systems, infra-red receiver.
3. Modulator, oscillators.	6. Receiver-transmitter, I.R.
Canadian General Electric (D & SP) 2.3.4.6.	RCA Ltd. 6.
Computing Devices of Canada Ltd. 2.	Spar Aerospace Products Ltd. 1.2.6.
Ernst Leitz Canada Ltd. 5.	

5855 NIGHT VISION EQUIPMENT, EMITTED AND REFLECTED RADIATION

1. Barrels, condenser, lens.	18. Detecting sets, I.R.
2. Bezels, infra-red filter.	19. Doublet assemblies, objective.
3. Binoculars, driver's, infra-red, helmet mounted.	20. Eyepiece assemblies.
4. Binoculars, image intensifier.	21. Filters, infra-red.
5. Binoculars, image intensifier, driving.	22. Lenses, eyepiece.
6. Binoculars, infra-red handheld.	23. Lenses, objective.
7. Binoculars, infra-red, helmet mounted.	24. Lenses, retainer, objective.
8. Binoculars, night vision.	25. Lenses, reticle.
9. Cell assemblies, reticle objective, passive sight.	26. Lens and prism assemblies, reticle projector.
10. Cells, eccentric.	27. Lens-filters, infra-red.
11. Cells, eyepiece.	28. Mirrors, reticle projector.
12. Cells, lens.	29. Modulator-receivers, I.R.
13. Cells, reticle, objective, passive sight.	30. Objective lens assemblies.
14. Collimators, handheld infra-red binocular.	31. Periscopes, tank driving, infra-red.
15. Collimators, helmet mounted infra-red binocular.	32. Projector reticle assemblies.
16. Collimators, image intensifier binocular.	33. Range finders, infra-red system.
17. Collimators, image intensifier goggles.	34. Receiver-transmitter, I.R.
Canadian General Electric (D & SP) 18.29.34.	35. Sights, night vision.
Computing Devices of Canada Ltd. 18.	36. Sniperscopes, infra-red.
Ernst Leitz Canada Ltd. 1.2.3.4.5.6.7.8.9.10.11.12.13.14. 15.16.17.19.20.21.22.23.24.25.26.27. 28.30.31.32.33.35.36.37.38.	37. Starlight scopes.
	38. Weapon sights, infra-red.
	RCA Ltd. 34.
	Spar Aerospace Products Ltd. 18.29.

5860 STIMULATED COHERENT RADIATION DEVICES, COMPONENTS, AND ACCESSORIES

1. Exciters, laser.
2. Infra-red optics (synthetic sapphire).
3. Infra-red systems.

Canadian General Electric (D & SP)
2.3.

Computing Devices of Canada Ltd.
2.3.

Ernst Leitz Canada Ltd.
1.4.5.

4. Lasers, gas.
5. Modulators, laser.

Spar Aerospace Products Ltd.
3.

Union Carbide Canada Ltd.
1.2.

5895 MISCELLANEOUS COMMUNICATION EQUIPMENT

1. Amplifiers, audio and radio frequency.
2. Amplifiers, direct current.
3. Amplifiers, power supply.
4. Cavities, tuned.
5. Chaff.
6. Chassis, electrical assembly.
7. Coder-decoder interrogator set.
8. Communication systems.
9. Computer controls, combat information.
10. Computers, electronic.
11. Consoles, electronic.
12. Controls, remote, multi-application.
13. Converters, group signal data.
14. Countermeasures sets.
15. Countermeasures, training signal.
16. Couplers, keyer.
17. Data analysis controls.
18. Data display groups.
19. Direction finder sets.
20. Display boards combat information.
21. Distance measuring sets.
22. Echo boxes.
23. Equalizers, receiver gain.
24. Filter diplexers & multicouplers.
25. Frequency control groups.
26. Frequency converters.
27. Frequency converters, transmitters.
28. Frequency dividers.
29. Frequency doublers.
30. Frequency multipliers.
31. Generators, interference.
32. Generators, multi-type.
33. Generators, pulse.
34. Generators, pulse sweep.
35. Generators, signal.
36. Generators, sweep.
37. Indicators, azimuth and panoramic.
38. Indicators, control groups.

Bayly Engineering Ltd.
1.

Beaconing Optical & Precision Materials
1.4.6.8.12.22.35.39.75.76.

39. Indicators, frequency channel.
40. Indicators, panoramic.
41. Indicators, video.
42. Interrogator sets.
43. Interrogator-transponder sets.
44. Limiters, electrical noise.
45. Mixer stages, frequency.
46. Modulation eliminators.
47. Modulator, oscillators.
48. Modulator, power supplies.
49. Modulator, radio transmitter.
50. Modulator, receivers.
51. Monitor, error voltage.
52. Monitor, phase.
53. Oscillators, audio frequency.
54. Oscillators, multi-application.
55. Oscillators, power supply.
56. Oscillators, radio frequency.
57. Panels, indicator.
58. Panels, patching antenna.
59. Panels, patching communication.
60. Power supplies.
61. Power supplies, D.C.
62. Pulse, analyser groups.
63. Receiver sets, countermeasure.
64. Receiver-transmitters, radio.
65. Receiving sets, panoramic data.
66. Receiving sets, radio.
67. Recorders, radio frequency.
68. Recorders, signal data.
69. Reflectors, antenna.
70. Selector control sub-assemblies.
71. Servo amplifiers.
72. Simulators-countermeasures signals.
73. Transmitters, countermeasure.
74. Transmitters, countermeasure, training.
75. Transmitters, radio.
76. Tuners, radio frequency.
77. Vainstors, Si. C.

Bogue Electric of Canada Ltd.
60.

Bristol Aerospace 1968 Ltd.
69.

5895 MISCELLANEOUS COMMUNICATION EQUIPMENT (conc.)

- CAE Industries Ltd.
2.3.8.11.18.22.25.26.27.28.29.30.32.
37.42.46.47.48.49.50.52.62.73.74.
- Canada Foils Ltd.
5.
- Canadian General Electric (D & SP)
1.3.7.9.11.12.14.15.17.18.19.31.33.34.
35.36.37.38.41.42.45.47.48.49.50.51.52.
55.56.59.60.62.63.64.66.67.72.73.74.76.
- Canadian General Electric (Plastics)
69.
- Canadian Marconi Co.
1.7.8.25.31.32.33.34.35.36.37.64.
66.71.75.76.
- Canadian Vickers Ltd.
69.
- Canadian Westinghouse (Elec. & Def.
Prod.)
1.2.3.18.20.31.34.38.41.42.43.47.48.
50.57.60.63.72.75.
- Central Dynamics Ltd.
1.3.
- Collins Radio Co. of Canada Ltd.
1.4.8.43.66.75.
- Computer Metal Reg'd.
6.11.
- Computing Devices of Canada Ltd.
9.10.11.17.18.20.67.68.71.
- Croven Ltd.
56.
- Desitron Co. Ltd.
4.22.
- E.M.I. Electronics
8.
- Electro-Vox Inc.
6.
- Ferranti Packard Ltd.
17.18.20.60.
- Fleet Manufacturing Ltd.
11.69.
- Garrett Manufacturing Ltd.
60.
- General Precision Industries Ltd.
19.63.66.
- ITT Canada Ltd.
1.14.19.21.42.
- International Systcoms Ltd.
1.6.7.8.54.56.64.66.75.
- Johnson Wire Products
69.
- Leigh Instruments Ltd.
17.18.38.68.75.
- Lenkurt Electric Co. of Canada Ltd.
1.3.4.8.12.26.29.30.47.49.54.60.
64.66.75.
- Marsland Engineering Ltd.
1.6.60.61.68.71.76.
- Measurement Engineering Ltd.
1.3.6.11.60.
- Milltronics Ltd.
11.
- Robert Mitchell Co. Ltd.
6.11.
- R. H. Nichols Co. Ltd.
1.6.12.18.56.59.
- Northern Electric Co. Ltd.
1.3.4.8.11.15.18.19.22.23.25.26.27.
28.29.30.31.32.33.34.35.36.37.38.39.
40.41.42.43.44.45.46.47.48.50.52.53.
55.56.57.59.60.63.64.65.67.68.73.76.
- Northern Radio Mfg. Co. Ltd.
1.6.7.53.60.61.
- Norton Research Corp.
77.
- Philips Electronics Industries Ltd.
1.6.8.11.32.33.47.53.56.59.64.66.75.76.
- RCA Ltd.
1.2.3.4.11.13.16.18.19.22.23.25.26.27.
28.29.30.31.33.34.36.42.43.45.46.50.53.
54.55.56.57.63.64.69.70.72.75.76.
- Radio Engineering Products
1.8.24.59.
- Raytheon Canada Ltd.
1.7.11.14.15.18.38.41.43.60.72.
- Sangamo Co. Ltd.
60.
- Sinclair Radio Labs. Ltd.
24.
- Spar Aerospace Products Ltd.
60.
- Sperry Gyroscope Ottawa Ltd.
1.3.6.11.32.37.38.39.53.56.57.72.
- Stark Electronic Instruments Ltd.
57.
- Stewart-Warner Corp. Ltd.
7.42.43.
- Syntron (Canada) Ltd.
60.
- T.M.C. (Canada) Ltd.
1.8.11.47.48.49.50.56.58.59.60.63.64.
66.73.75.
- Topping Electronics Ltd.
1.6.25.26.28.29.30.35.45.50.53.56.66.
- Valeriotte Electronics Ltd.
1.
- Western Tools & Industries Ltd.
20.

GROUP 59

ELECTRICAL AND ELECTRONIC EQUIPMENT
COMPONENTS

5905 RESISTORS

1. Attenuators, fixed.
2. Attenuators, variable.
3. Micro-electronic devices, thin & thick film.
4. Potentiometers.
5. Potentiometers, precision measuring.
6. Potentiometers, sub-miniature.
7. Potentiometers, trimming.
8. Potentiometers, wirewound, linear and non-linear.
9. Precision trimmers.
10. Resistors, fixed, composition.
11. Resistors, fixed, deposited film, high stability.
12. Resistors, fixed, deposited film VHF.
13. Resistors, fixed film, high megohm (hermetically sealed) (MIL-R-14293)
14. Resistors, fixed film, insulated (MIL-R-22684)
15. Resistors, fixed film, insulated, established reliability (MIL-R-39017)
16. Resistors, fixed film, power type.
17. Resistors, fixed, wirewound.
18. Resistors, fixed, wirewound, power type.
19. Resistors, power, metal oxide.
20. Resistors, standards, high accuracy.
21. Resistors, variable, composition.
22. Resistors, variable, wirewound, low operating temperature.
23. Resistors, variable, wirewound, power type.
24. Resistors, wirewound MIL-R-26C.

Brimark Electronics Ltd.

1.2.

Amphenol Canada Ltd.

5.7.

Beckman Instruments Inc. (Helipot Div.)

6.7.8.

Bourns (Canada) Ltd.

4.5.6.7.8.

Canada Precision Devices Ltd.

4.6.8.

Canadian General Electric (Ind. App.)

18.

Canadian Research Institute

20.

Constanta Co. of Canada Ltd.

11.12.13.

Dale Electronics Canada Ltd.

6.9.13.14.15.16.17.18.24.

Garrett Manufacturing Ltd.

3.

Guildline Instruments Ltd.

5.

IRC Resistors

4.5.6.7.8.9.10.11.12.14.16.17.18.21.

23.

Marsland Engineering Ltd.

17.18.22.23.24.

Microwave Devices Inc.

1.2.

Northern Electric Co. Ltd.

11.17.

Precision Electronic Components Ltd.

9.20.

Sigma Instruments (Canada) Ltd.

4.5.11.17.

Welwyn Canada Ltd.

1.10.11.12.13.14.15.16.19.

5910 CAPACITORS

1. Attenuators, fixed and variable.
2. Capacitors, by-pass.
3. Capacitors, circuit board, mylar.
4. Capacitors, coupling.
5. Capacitors, electrolytic, dry.
6. Capacitors, energy storage.
7. Capacitors, fixed, ceramic, dielectric.
8. Capacitors, fixed, epoxy dipped for printed circuit.
9. Capacitors, fixed, film, tubular.
10. Capacitors, fixed, mica, dielectric.
11. Capacitors, fixed, mylar wrap.
12. Capacitors, fixed, paper, dielectric.
13. Capacitors, fixed, paper, tubular.

5910-5915

5910 CAPACITORS (conc.)

- 14. Capacitors, high frequency.**
- 15. Capacitors, power.**
- 16. Capacitors, tantalum.**
- 17. Capacitors, variable.**

Aerovox Canada Ltd.
5.7.9.12.13.
Allanson Mfg. Corp.
15.
Brimark Electronics Ltd.
1.
Canadian General Electric
2.4.5.16.
Canadian Westinghouse (Distribution
Apparatus)
4.6.14.15.
Capacitors of Canada Ltd.
3.8.9.11.13.

- 18. Capacitors, variable, ceramic, dielectric.**
- 19. Capacitors, variable, tuning.**

Erie Technological Products Ltd.
7.10.16.18.
Hammond Mfg. Co. Ltd.
17.19.
I.T.E. Circuit Breaker (East. Power
Devices)
15.
Johnson Matthey & Mallory Ltd.
5.16.
Northern Electric Co. Ltd.
1.10.12.19.
Sprague-TCC (Canada) Ltd.
5.16.

5915 FILTERS AND NETWORKS

- 1. Circuits, logic, computer.**
- 2. Circuits, potted, sub-assemblies.**
- 3. Circuits, symbol, generating.**
- 4. Discriminators.**
- 5. Filter diplexers & multi-couplers.**
- 6. Filters.**
- 7. Filters, antenna.**
- 8. Filters, band elimination.**
- 9. Filters, band pass.**
- 10. Filters, electric wave LCN.**
- 11. Filters, high pass.**
- 12. Filters, I.F.**
- 13. Filters, microwave.**

Andrew Antenna Co. Ltd.
5.7.13.16.18.
Bayly Engineering Ltd.
7.8.9.11.13.14.15.16.19.24.25.26.
CAE Industries Ltd.
20.21.22.23.24.25.
Canadian Marconi Co.
6.7.8.9.10.11.12.13.14.15.16.17.
18.19.20.21.22.23.24.25.26.
Canadian Westinghouse (Elec. & Def.
Prod.)
7.13.17.18.20.21.22.23.24.25.
Collins Radio Co. of Canada Ltd.
7.9.11.12.
Computing Devices of Canada Ltd.
1.2.3.19.
Desitron Company Ltd.
4.7.13.17.
Electronic Craftsman Ltd.
7.

- 14. Filters, radio interference.**
- 15. Filters, tone.**
- 16. Filters, UHF & VHF.**
- 17. Filters, variable.**
- 18. Filters, waveguide.**
- 19. Networks.**
- 20. Networks, hybrid circuit.**
- 21. Networks, impedance matching.**
- 22. Networks, line balancing.**
- 23. Networks, phase changing.**
- 24. Networks, pulse delay.**
- 25. Networks, pulse forming.**
- 26. Networks, temperature compensating.**

Erie Technological Products Ltd.
6.14.
Nytronics of Canada Ltd.
7.8.9.11.12.15.21.24.25.
Ferritronics Ltd.
4.5.6.8.9.10.11.12.14.15.19.22.23.24.
25.26.
Garrett Manufacturing Ltd.
20.
ITT Canada Ltd.
19.
Lenkurt Electric Co. of Canada Ltd.
2.4.5.6.7.9.11.12.13.15.16.19.20.21.
22.23.24.25.26.
Microwave Devices Inc.
7.9.13.17.18.21.23.
Northern Electric Co. Ltd.
7.8.9.11.13.16.17.18.20.21.22.23.
24.25.26.

5915 FILTERS AND NETWORKS (conc.)

RCA Ltd.
4.7.8.9.13.16.18.19.
Radio Engineering Products
4.5.6.7.8.9.11.12.19.20.21.22.
Sinclair Radio Laboratories Ltd.
5.6.7.8.9.10.11.13.14.16.17.18.19.
20.21.22.23.
C. R. Snelgrove Co. Ltd.
3.4.6.7.8.9.12.19.26.

Stewart-Warner Corp. Ltd.
19.
T.M.C. (Canada) Ltd.
6.7.8.9.11.12.19.
Valeriotte Electronics Ltd.
16.

5920 FUSES AND LIGHTNING ARRESTORS

1. Boxes, fuse.
2. Fuseholders.
3. Fuses.
Canadian General Electric (Distribution
& Specialty Trans.)
3.4.5.
Canadian Westinghouse (Distribution
Apparatus)
3.5.
Dominion Cutout Ltd.
2.3.4.
Electrical Mfg. Co. Ltd.
2.3.4.

4. Fuses, link.
5. Lightning arrestors.
6. Protectors, telephone.
I-T-E Circuit Breaker (Bulldog Electric)
3.
I-T-E Circuit Breaker (East. Power
Devices)
3.
Northern Electric Co. Ltd.
1.6.
S & C Electric Canada Ltd.
5.

5925 CIRCUIT BREAKERS

1. Circuit breakers
2. Circuit breakers up to 5000 V.
Bogue Electric of Canada Ltd.
1.
Canadian General Electric (Ind. App.)
1.3.
Canadian Westinghouse (Distribution
Apparatus)
1.2.4.
Canadian Westinghouse (Switchgear &
Control)
1.3.
Dominion Cutout Ltd.
3.
Electrical Mfg. Co. Ltd.
1.2.

3. Distribution cutouts (up to 15 KV)
4. Distribution cutouts (up to 27 KV)
I-T-E Circuit Breaker (Bulldog Electric)
1.
I-T-E Circuit Breaker (East. Power
Devices)
1.2.
Klockner-Moeller Canada Ltd.
1.
S & C Electric Canada Ltd.
3.
Societe Nucletron Inc.
3.

5930 SWITCHES

1. Boxes, switch.
2. Switches, air.
3. Switches, coaxial.
4. Switches, crossbar.
5. Switches, cut out.
6. Switches, door, interlock.
7. Switches, fuse, disconnect.

8. Switches, indicator, illuminated.
9. Switches, infinite heat.
10. Switches, key.
11. Switches, landing gear.
12. Switches, miniature.
13. Switches, pressure.
14. Switches, printed circuit.

5930-5935

5930 SWITCHES (conc.)

- 15. Switches, push-button.**
- 16. Switches, rotary.**
- 17. Switches, sensitive, push-button.**
- 18. Switches, slide.**
- 19. Switches, sub-miniature.**

Aircraft Appliances & Equipment.
13.
Amphenol Canada Ltd.
3.
Andrew Antenna Co. Ltd.
3.4.
Automatic Electric (Canada) Ltd.
10.15.16.
Canadian General Electric (Ind. App.)
8.12.16.17.20.
Canadian Precision Devices Ltd.
16.
Dominion Cutout Ltd.
2.5.7.
Electrical Mfg. Co. Ltd.
1.16.
I-T-E Circuit Breaker (Bulldog Electric)
6.7.

- 20. Switches, temperature.**
- 21. Switches, thumbwheel.**
- 22. Switches, toggle.**
- 23. Switches, transfer, automatic.**

I-T-E Circuit Breaker (East. Power
Devices)
2.6.7.16.20.
Klockner-Moeller Canada Ltd.
13.15.16.23.
Licon
11.12.
Northern Electric Co. Ltd.
4.10.16.
Oak-Hart Mfg. (Canada) Ltd.
5.9.14.15.16.18.19.21.22.
Pass & Seymour.
6.8.10.22.
Societe Nucletron Inc.
2.

5935 CONNECTORS, ELECTRICAL

- 1. Adapters, plug.**
- 2. Connector assemblies.**
- 3. Connector clamps.**
- 4. Connector, coaxial.**
- 5. Connectors, multi-application.**
- 6. Connectors, power.**
- 7. Connectors, quick coupling.**

Amphenol Canada Ltd.
1.2.5.6.7.
Automatic Electric (Canada) Ltd.
11.12.13.
Bayly Engineering Ltd.
10.12.
Burndy Canada Ltd.
2.3.4.7.8.13.
Dominion Cutout Ltd.
2.6.
Eastern Die Casting Inc.
9.13.
I-T-E Circuit Breaker (Bulldog Electric)
5.6.9.
I-T-E Circuit Breaker (East. Power
Devices)
3.5.6.9.

- 8. Contacts, electrical.**
- 9. Electrical fittings.**
- 10. Jack boxes, telephone.**
- 11. Jacks, assemblies, telephone.**
- 12. Jacks, telephone.**
- 13. Receptacle & plug connector assys.**

ITT Cannon Electric Canada Ltd.
2.3.5.6.7.8.
Johnson Matthey & Mallory Ltd.
8.
Joy Mfg. Co. (Canada) Ltd.
2.5.6.7.13.
Lenkurt Electric Co. of Canada Ltd.
11.
Measurement Engineering Ltd.
10.
Metro Engineering Co. Ltd.
1.2.5.7.8.
Northern Electric Co. Ltd.
4.12.
Pass & Seymour
1.5.6.7.13.

5935 CONNECTORS, ELECTRICAL (conc.)

Radio Engineering Products
1.2.13.
Rollit Products Ltd.
5.8.
Sido Ltd.
1.2.3.

Societe Nucletron Inc.
6.
Triplex Engineering Co. Ltd.
1.2.5.7.8.

5940 LUGS, TERMINALS, AND TERMINAL STRIPS

1. Boards, terminal.
2. Boxes, terminal, multi-application.
3. Cables, battery.
4. Terminal blocks, boards & strips.
5. Terminals.

Aero Mechanic Ltd.
8.
Avionics Ltd.
4.
B.I.R. Precision Products
7.8.
Bedard-Girard Ltd.
2.
Burndy Canada Ltd.
5.7.
Canada I.T.W.
5.
Canadian General Electric (Ind. App.)
4.
B.F. Goodrich Canada Ltd.
3.
Graphico Precision Works Ltd.
1.
I-T-E Circuit Breaker (Bulldog Electric)
9.

6. Terminals, clip type.
7. Terminals, insulated.
8. Terminals, turret type.
9. Wire grips.

Joly Engineering Ltd.
8.
Metro Engineering Co. Ltd.
8.
Northern Electric Co. Ltd.
4.
O & W Electronics Ltd.
4.
Precision Small Parts Ltd.
7.8.
Quality Hermetics Ltd.
7.
Rollit Products Ltd.
4.5.6.
Sido Ltd.
5.7.8.
Space Circuits Ltd.
4.

5945 RELAYS, CONTACTORS, AND SOLENOIDS

1. Actuators, electro magnetic.
2. Adapters, antenna to transmitter.
3. Coaxial cable to waveguide, multi-application.
4. Protective relaying.
5. Relays, armature.
6. Relays, armature, sub-miniature.

Aircraft Appliances & Equipment
4.11.12.
Automatic Electric (Canada) Ltd.
5.7.9.11.
Automatic Winding Corp. Ltd.
12.
Aviation Electric Ltd.
5.6.11.12.
Bach-Simpson Ltd.
8.

7. Relays, hermetically sealed.
8. Relays, meter.
9. Relays, multi-application.
10. Relays, power.
11. Relays, special purpose.
12. Solenoids, electrical.

Canadian General Electric (Ind. App.)
4.10.12.
Canadian Research Institute
8.
Canadian Westinghouse (Switchgear & Control)
4.10.
Central Dynamics Ltd.
1.

5945-5950

5945 RELAYS, CONTACTORS AND SOLENOIDS (conc.)

Electronic Craftsman Ltd.

12.

Hammond Mfg. Co. Ltd.

12.

Klockner-Moeller Canada Ltd.

5.10.

Marsland Engineering Ltd.

1.6.12.

Microwave Devices Inc.

3.

Northern Electric Co. Ltd.

3.6.12.

RCA Ltd.

12.

Struthers-Dunn Relays

1.4.5.6.7.9.10.11.

5950 COILS AND TRANSFORMERS

1. Amplifiers, magnetic.

2. Attenuators, fixed.

3. Attenuators, variable.

4. Chokes.

5. Chokes, audio.

6. Chokes, R.F.

7. Chokes, sub-miniature.

8. Coils, electrical.

9. Coils, relay.

10. Coils, sub-miniature.

11. Coils, telecommunication.

12. Coils, toroid.

13. Coils & transformers.

14. Coils, transformers, RF, IF, LF.

15. Cores, laminated, magnetic.

16. Cores, toroidal.

17. Cores, wound.

18. Discriminators, leading, phasing

(Trans. & R.F. Lines)

19. Filters, R.F.

Abex Industries of Canada Ltd.

Elec. Div.

4.5.6.7.9.10.12.13.14.19.21.26.31.

Automatic Electric (Canada) Ltd.

4.13.34.35.37.

Automatic Winding Corp. Ltd.

4.5.6.7.8.9.10.11.13.14.17.19.21.

22.23.

Bayly Engineering Ltd.

1.8.11.14.22.29.36.

Bogue Electric of Canada Ltd.

34.

Brimark Electronics Ltd.

2.3.

Canadian General Electric (Ind. App.)

34.

Canadian General Electric (Distribution
& Specialty Trans.)

27.30.

Canadian General Electric (Meter &
Inst.)

8.9.

20. Goniometers.

21. Inductors.

22. Inductors, audio filter.

23. Inductors, filter.

24. Metering units.

25. Plate.

26. Pulse.

27. Regulators, step voltage.

28. Transformer shields.

29. Transformers, audio.

30. Transformers, distribution up to
500 kva.

31. Transformers, ferrite.

32. Transformers, frequency.

33. Transformers, multi-type.

34. Transformers, power.

35. Transformers, power, isolation.

36. Transformers, reactor.

37. Transformers, telephone.

Canadian Marconi Co.

4.5.6.14.19.22.23.29.34.35.

Canadian Westinghouse (Apparatus)

27.34.

Canadian Westinghouse (Distribution
Apparatus)

13.34.

Canadian Westinghouse (Elec. & Def.
Prod.)

1.

Canadian Westinghouse (Lamp Division)

35.

Canadian Westinghouse (Switchgear &
Control)

3.4.8.9.

EL-MET-Parts Ltd.

15.16.17.28.

Electronic Craftsman Ltd.

4.5.6.7.8.9.10.11.13.14.19.21.22.23.

25.26.29.31.33.34.35.36.37.

Ferranti Packard Ltd.

24.27.30.33.34.

5950 COILS AND TRANSFORMERS (conc.)

Ferritronics Ltd.
4.6.7.10.11.13.14.19.21.22.23.26.31.37.
General Precision Industries Ltd.
20.
Hammond Mfg. Co. Ltd.
1.2.4.5.6.8.10.11.12.13.14.21.22.
23.25.26.29.30.31.32.33.34.35.36.37.
I-T-E Circuit Breaker (East. Power
Devices)
30.34.
ITT Canada Ltd.
14.
Lenkurt Electric Co. of Canada Ltd.
8.11.12.14.19.21.23.29.31.37.
Marsland Engineering
4.5.7.8.10.12.13.21.22.25.27.29.
32.33.34.35.37.
Milltronics Ltd.
1.

Moloney Electric Co. of Canada Ltd.
4.13.24.25.26.27.29.30.34.36.
Northern Electric Co. Ltd.
2.3.8.9.11.14.18.22.29.32.
Nytronics of Canada
4.6.7.8.9.10.11.12.13.14.19.
21.23.26.31.
Philips Electronics Industries Ltd.
11.
Polygon Services Ltd.
1.4.13.21.23.26.29.32.34.35.36.
RCA Ltd.
2.3.8.14.20.21.22.23.29.32.33.34.36.
Reliance Electric & Engineering Ltd.
30.
T.M.C. (Canada) Ltd.
11.12.13.14.19.22.32.
Valeriotte Electronics Ltd.
4.14.29.32.34.

5955 PIEZOELECTRIC CRYSTALS

1. Crystal ovens, piezo.
2. Crystals, quartz.
3. Glass enclosure.

Almax Ceramic Industries Ltd.
5.
Crown Ltd.
1.2.
Gulton Industries (Canada) Ltd.
5.
Northern Electric Co. Ltd.
2.3.4.

4. Metal enclosure.
5. Piezoelectric ceramics.

Philips Electronics Industries Ltd.
2.3.
C. R. Snelgrove Co. Ltd.
1.2.
Spilsbury & Tindall Ltd.
2.4.
T.M.C. (Canada) Ltd.
1.

5960 ELECTRON TUBES AND ASSOCIATED HARDWARE

1. Cathode ray tube envelope.
2. Cells, photo-electric.
3. Diodes, germanium.
4. Diodes, microwave, mixer & detector.
5. Diodes, silicon & silicon power.
6. Diodes, zener.
7. Geiger tubes.
8. Ionization chambers.
9. Instrument and picture type.
10. Power sources, microwave, solid state.
11. Reactor transformers.
12. Rectifiers, selenium.

Canadian Admiral Corp. Ltd.
8.
Canadian General Electric (L & ETD)
1.3.5.6.9.13.14.16.18.20.21.24.
Canadian Marconi Co.
10.20.24.

13. Thyratrons.
14. Transmitting.
15. Transistors, germanium.
16. Transistors, silicon.
17. Transistors, silicon power.
18. Transistors, switching.
19. Tubes, backward wave oscillators.
20. Tubes, cathode assy.
21. Tubes, electron.
22. Tubes, klystron.
23. Tubes, magnetrons.
24. Tubes, rectifying & receiving.
25. Tubes, travelling wave.

Canadian Westinghouse (Electronic
Tube)
7.9.13.14.20.21.22.23.24.25.
Ferranti Packard Ltd.
2.

5960-5970

5960 ELECTRON TUBES AND ASSOCIATED HARDWARE (conc.)

- | | |
|---|--|
| IRC Resistors
12. | Raytheon Canada Ltd.
11.13.14.19.21.22.23.25. |
| Northern Electric Co. Ltd.
3.5.6.15.16.18.24. | Sylvania Electric (Canada) Ltd.
21.24. |
| Philips Electronics Industries Ltd.
3.9.20.21. | Syntron (Canada) Ltd.
5.12. |
| RCA Ltd.
3.4.5.15.16.17.18.21.24. | Varian Associates of Canada Ltd.
21.22.23.25. |

5961 SEMI-CONDUCTOR DEVICES AND ASSOCIATED HARDWARE

- | | |
|--|--|
| 1. Cells, photoconductive, cadmium selenide. | 6. Semi-conductors, drums. |
| 2. Cells, photoconductive, cadmium sulphide. | 7. Semi-conductors, germanium. |
| 3. Cells, silicon, photovoltaic. | 8. Semi-conductors, matched. |
| 4. Holders, semi-conductor devices. | 9. Semi-conductors, materials. |
| 5. Semi-conductors, diodes. | 10. Semi-conductors, rectifiers. |
| Canadian General Electric (Ind. App.)
5.10. | 11. Semi-conductors, silicon. |
| Canadian General Electric (L & ETD)
5.7.8.10.11.12. | 12. Semi-conductors, transistors. |
| National Semi-conductors Ltd.
1.2.3. | Philips Electronics Industries Ltd.
5.10. |
| Northern Electric Co. Ltd.
5.7.8.11.12. | Quality Hermetics Ltd.
6.9. |
| Northern Research Corp. (Canada)
9. | RCA Ltd.
4.5.12. |

5965 HEADSETS, HANDSETS, MICROPHONES AND SPEAKERS

- | | |
|---|---|
| 1. Adapters. | 6. Loudspeakers. |
| 2. Earphone assemblies. | 7. Microphones, carbon. |
| 3. Handsets, telephone. | 8. Microphones, crystal. |
| 4. Headbands, headset. | 9. Microphones, dynamic. |
| 5. Headsets. | 10. Microphones, ribbon. |
| Amphenol Canada Ltd.
1. | Northern Electric Co. Ltd.
2.3.4.5.6.7.8.9.10. |
| Automotive Electric (Canada) Ltd.
2.3.5.7. | Radio Engineering Products
2.3.7. |
| Marsland Engineering Ltd.
6.9. | |

5970 ELECTRICAL INSULATORS AND INSULATING MATERIALS

- | | |
|--|--------------------------------------|
| 1. Film & tubing, polyethylene. | 4. Insulators, porcelain. |
| 2. Insulators, ceramic. | 5. Tapes, insulation, rubber. |
| 3. Insulators, plastic. | |
| Almax Ceramic Industries Ltd.
2. | O & W Electronics Ltd.
3. |
| Canadian Industries Ltd.
1. | Space Circuits Ltd.
3. |
| Canadian Porcelain Co. Ltd.
2.4. | Union Carbide Canada Ltd.
1. |
| Canadian Technical Tape Ltd.
1. | Uniroyal Ltd.
5. |
| Hamilton Porcelains Ltd.
2. | |

5975 ELECTRICAL HARDWARE AND SUPPLIES

1. Anchor rods.
 2. Bolts, double arming.
 3. Bolts & nuts.
 4. Boxes, shore connection.
 5. Braces, cross arm.
 6. Cabinets, electrical equipment.
 7. Cases, fabric, carrying & protective.
 8. Clamps, cable.
 9. Clevises.
 10. Conduit, metallic.
 11. Conduit, P.V.C.
 12. Conduit, fittings, electric, metallic.
 13. Connectors, ground rods.
 14. Drive hooks.
 15. Eyebolts.
 16. Ferrules.
 17. Fetter drive screws.
 18. Ground rods.
 19. Guy clamps.
 20. Guy hooks.
 21. Hardware, poleline.
 22. Insulator pins.
 23. Junction box assemblies.
 24. Outlet boxes.
 25. Pole steps.
 26. Poles, steel, sectional.
 27. Power supplies.
 28. Racks, electrical equipment.
 29. Sleeves connectors, ground rods.
 30. Splicing sleeves, electrical conductors.
 31. Sub-station equipment.
- Amphenol Canada Ltd.
12.23.24.
- Barnard Foundries Ltd.
21.
- Bogue Electric of Canada Ltd.
6.27.
- Burndy Canada Ltd.
8.13.28.29.30.
- Canadian General Electric (CMHD)
10.
- Canadian General Electric (Plastics)
11.
- Computer Metal Reg'd.
6.28.
- Cummins Eastern
27.
- Dynamic Industries Ltd.
21.
- Eastern Die Casting Inc.
4.8.12.13.16.19.24.
- Electrovert Ltd.
8.28.
- Fleet Manufacturing Ltd.
6.
- Garrett Manufacturing Ltd.
27.
- Graphico Precision Works Ltd.
6.29.
- Hammond Mfg. Co. Ltd.
6.23.28.
- Hussman Refrigerator Co. Ltd.
6.28.
- I-T-E Circuit Breaker (Bulldog Electric)
6.
- I-T-E Circuit Breaker (East. Power Devices)
8.28.
- ITT Canada Ltd.
6.23.
- Lacal Industries Ltd.
1.3.5.8.9.13.15.16.18.19.20.21.25.26.
28.31.
- Lenkurt Electric Co. of Canada Ltd.
28.
- Locweld & Forge Products Ltd.
1.2.3.4.5.15.18.21.28.
- Measurement Engineering Ltd.
6.23.27.28.
- R. H. Nichols Co. Ltd.
27.
- Renfrew Aircraft & Engineering Ltd.
6.
- Renfrew Electric (Custom Components)
6.23.28.
- Reynolds Extrusion Co. Ltd.
10.
- Rollit Products Ltd.
13.
- Ross Smith (1969) Ltd.
7.
- Scepter Mfg. Co. Ltd.
11.
- Sido Ltd.
3.15.16.
- N. Slater Co.
1.2.3.5.8.13.14.15.17.18.19.20.21.22.
25.29.30.
- The Steel Co. of Canada Ltd.
1.2.3.5.8.14.15.16.17.18.19.20.21.22.25.
- T.M.C. (Canada) Ltd.
6.28.
- Westeel Rosco Ltd.
6.
- Western Canada Steel
20.

5977-5985

5977 ELECTRICAL CONTACT BRUSHES AND ELECTRODES

1. Brushes.

Union Carbide Canada Ltd.
1.2.

2. Carbons, arc light, spectroscopic, photographic.

5985 ANTENNAS, WAVEGUIDES, AND RELATED EQUIPMENT

1. Adaptors, antenna.
2. Antennas, HF.
3. Antennas, microwave.
4. Antennas, multi-application.
5. Antennas, radar.
6. Antennas, scatter.
7. Antennas, whip.
8. Attenuators, fixed & variable.
9. Couplers, antenna.
10. Couplers, directional.
11. Couplers, radio frequency.
12. Discriminators, loading-phasing.
13. Drive mechanisms.
14. Filter diplexers & multi-couplers.
15. Horns, waveguide.
16. Lines, radio frequency transmission.
17. Masts, antenna.
18. Networks, antenna, matching.

A.I.M. Steel Ltd.
20.
Aero Mechanic Ltd.
13.
Albon Welding & Mechanical Works
17.20.21.
Andrew Antenna Co. Ltd.
2.3.4.6.9.10.11.14.15.16.17.18.
23.24.26.29.34.
Amphenol Canada Ltd.
1.16.
Bayly Engineering Ltd.
7.10.
Brimark Electronics Ltd.
8.10.15.27.29.34.
Bristol Aerospace 1968 Ltd.
3.5.6.34.
Burrard Dry Dock Co. Ltd.
17.21.
CAE Industries Ltd.
4.12.
Canadian Bridge Works Ltd.
21.26.
Canadian General Electric (D & SP)
5.7.15.31.
Canadian General Electric (Plastics)
23.
Canadian Marconi Co.
15.34.

19. Panels, patching, antenna.
20. Platforms, radome.
21. Radar structures.
22. Radomes, inflatable.
23. Radomes, plastic.
24. Reflectors, antenna, microwave.
25. Reflector sections, mesh, antenna.
26. Scatter structures.
27. Seals, radio frequency transmission line waveguide.
28. Selectors, antenna.
29. Switches, waveguide.
30. Tilt mechanisms.
31. Tuners, radio frequency.
32. Tuners, transmission line.
33. Tuners, waveguide.
34. Waveguide and accessories.

Canadian Westinghouse (Elec & Def
Prod)
4.5.12.
Canron Ltd. (Mechanical Div.)
5.
Canron Ltd. (Structural Div.)
3.5.6.
Collins Radio Co. of Canada Ltd.
2.10.
Computing Devices of Canada Ltd.
17.
Desitron Co. Ltd.
2.10.15.29.33.34.
Dynamic Industries Inc.
26.
W. R. Elliott Ltd.
13.
Fleet Manufacturing Ltd.
3.4.5.6.13.15.20.21.23.24.25.30.
Foresteel Industries Ltd.
20.
General Metallic Parts Ltd.
13.
International Systems Ltd.
3.4.7.
Johnson Wire Products Ltd.
25.
Joly Engineering Ltd.
13.

5985 ANTENNAS, WAVEGUIDES, AND RELATED EQUIPMENT (conc.)

Lenkurt Electric Co. of Canada Ltd. 4.	Saskatchewan Steel Fabricators Ltd. 20.
Locweld & Forge Products Ltd. 17.20.21.	Sinclair Radio Laboratories Ltd. 14.18.
Marsland Engineering Ltd. 9.13.30.34.	Spar Aerospace Products Ltd. 4.7.13.17.23.
Microwave Devices Inc. 2.10.16.33.34.	Spilsbury & Tindall 1.3.4.7.9.10.11.14.17.18.19.
Northern Electric Co. Ltd. 8.9.10.11.15.16.19.28.29.31.32.33.34.	T.M.C. (Canada) Ltd. 2.4.7.9.11.18.19.28.32.
Philips Electronics Industries Ltd. 2.9.11.31.	Technological Co. Ltd. 13.17.21.
Polyfiber Ltd. 23.	Tywood Industries Ltd. 17.23.
RCA Ltd. 2.4.9.10.11.12.15.16.19.28.29.34.	Uniroyal Ltd. 22.
Radio Engineering Products 4.14.17.18.	Valeriotte Electronics Ltd. 4.
Reliance Electric & Engineering 13.	

5990 SYNCHROS AND RESOLVERS

Aviation Electric Ltd.	Novatronics Ltd.
Bowmar Canada Ltd.	RCA Ltd.
Ferranti Packard Ltd.	

5995 CABLE, CORD, AND WIRE ASSEMBLIES: COMMUNICATION EQUIPMENT

1. Cable assemblies.
2. Harness assemblies.

Abex Industries of Canada Ltd.
(Elec. Div.)
1.2.3.
Aircraft Industries of Canada
1.2.3.
Amphenol Canada Ltd.
1.2.3.
Aviation Electric Ltd.
1.2.3.
Bayly Engineering Ltd.
3.
CAE Industries Ltd.
1.
Carriere Technical Industries
1.2.3.
Computing Devices of Canada
1.2.3.
Fabricon Mfg. Ltd.
1.

3. Harnesses, cable.

Joy Manufacturing Co. (Canada) Ltd.
1.
Lenkurt Electric Co. of Canada Ltd.
1.2.
Litton Systems (Canada) Ltd.
1.2.
Marsland Engineering Ltd.
1.2.
Measurement Engineering Ltd.
1.2.
Ni-Sil Cables Ltd.
1.
R. H. Nichols Co. Ltd.
2.3.
Northern Electric Co. Ltd.
1.
Northwest Industries Ltd.
1.2.

5995-5999

5995 CABLE, CORD, AND WIRE ASSEMBLIES: COMMUNICATION EQUIPMENT (conc.)

Radio Engineering Products
1.
Space Circuits Ltd.
3.
Sperry Gyroscope Ottawa Ltd.
1.2.3.

Syntron (Canada) Ltd.
1.3.4.
T.M.C. (Canada) Ltd.
1.2.3.
Valeriotte Electronics Ltd.
1.3.

5999 MISCELLANEOUS ELECTRICAL AND ELECTRONIC COMPONENTS

1. Boards, printed circuit, multi-laminated.
2. Chassis, electronic assy.
3. Chokes, D.C.
4. Chokes, power frequency.
5. Chokes, radio frequency.
6. Circuits, integrated, thin film.
7. Circuits, telemetry, high "G".
8. Components, plastic.

Abex Industries of Canada Ltd.
(Elec. Div.)
5.10.
Almax Ceramic Industries Ltd.
14.
Amphenol Canada Ltd.
10.
Automatic Winding Corp.
5.
Aviation Electric Ltd.
2.10.
Avionics Ltd.
1.
Bayly Engineering Ltd.
5.
Bristol Aerospace Ltd.
2.
CAE Industries Ltd.
2.10.
Canada Precision Devices Ltd.
9.15.
Canadian General Electric (D&SP)
1.2.
Canadian General Electric (Meter & Inst.)
11.12.14.
Canadian Marconi Co.
1.6.
Canadian Westinghouse (Elec & Def Prod)
2.6.
Carriere Technical Industries
10.
Central Dynamics Ltd.
10.

9. Controls, slewing.
10. Harnesses, cable.
11. Keepers, magnet.
12. Magnets.
13. Panels, edgelit, multi-application.
14. Permanent magnets.
15. Potentiometers, switch.
16. Resonators, magnetostriction.

Champlain Power Products Ltd.
12.
Computer Metal Reg'd.
2.
Computing Devices of Canada Ltd.
1.6.7.
Fenn-Dor Plastics Ltd.
8.
Ferranti Packard Ltd.
1.
Garrett Mfg. Ltd.
6.
Graphico Precision Works Ltd.
1.2.13.
Hammond Mfg. Co. Ltd.
2.3.4.5.
Indiana Steel Products Co. Ltd.
14.
George Kelk Ltd.
2.
Lenkurt Electric Co. of Canada Ltd.
1.5.10.
Lightning Circuits
1.
Lightning Fastener Co. Ltd.
1.
Magna Electronics
2.
Marsland Engineering Ltd.
2.
Measurement Engineering Ltd.
2.
Robert Mitchell Co. Ltd.
2.

5999 MISCELLANEOUS ELECTRICAL AND ELECTRONIC COMPONENTS (conc.)

McGuire Mfg. Co. Ltd.	Renfrew Electric (Custom Components)
2.	10.
R. H. Nichols Co. Ltd.	Space Circuits Ltd.
1.2.10.	1.
Northern Electric Co. Ltd.	Sperry Gyroscope Ottawa Ltd.
1.5.10.16.	1.2.10.13.
Nytronics of Canada Ltd.	Stewart-Warner Corp. Ltd.
5.	5.
O & W Electronics Ltd.	T.M.C. (Canada) Ltd.
1.13.	5.
Philips Electronics Industries Ltd.	Topping Electronics Ltd.
1.2.	2.
RCA Ltd.	Trench Electric Ltd.
1.2.3.4.5.16.	4.
Raytheon Canada Ltd.	Valeriotte Electronics Ltd.
2.	5.
Renfrew Aircraft & Engineering Ltd.	
2.	

GROUP 61

ELECTRIC WIRE, AND POWER AND DISTRIBUTION
EQUIPMENT

6105 MOTORS, ELECTRICAL (Alternating Current)

FHP RATINGS (CEMA FRAME 66 &
SMALLER)

SINGLE PHASE

1. SP & C — O & E — 1/3 HP & under.
2. SP & C — O & E — over 1/3 HP & under 1 HP.
3. SP & C — O & E — 1 HP & up.
4. Repulsion — O & E — (all).

POLYPHASE INDUCTION

5. O & E — 1/3 HP & under.
6. O & E — Over 1/3 HP & under 1 HP.
7. O & E — 1 HP & up.

INTEGRAL HP RATINGS

(CEMA FRAME 140 & UP)

SINGLE PHASE

8. SP & C — O — 5 HP & under.
9. SP & C — O — Over 5 HP.
10. SP & C — E — 5 HP & under.
11. SP & C — E — Over 5 HP.
12. Repulsion — O & E — (all).

POLYPHASE INDUCTION

13. SC — O — 5 HP & under.
14. SC — O — Over 5 HP & up to 25 HP.

NOTE: SP — Split Phase
E — Enclosed
C — Capacitance
SC — Squirrel Cage

Bogue Electric of Canada Ltd.
20.21.23.24.25.26.27.28.

Canadian General Electric (Industrial
Apparatus Dept.)

1.2.3.5.6.7.8.10.13.14.15.16.17.18.
19.20.21.22.23.24.25.28.29.30.

Canadian Westinghouse (Apparatus)
6.7.8.9.10.11.13.14.15.16.17.18.19.
20.21.22.23.24.25.28.29.30.

6105 MOTORS, ELECTRICAL (Direct Current)

OPEN & ENCLOSED, EXCEPT FOR
TRANSPORTATION

1. 1/3 HP & under (except miniature).
2. Over 1/3 HP & under 1 HP.
3. 1 HP & up to 5 HP.
4. Over 5 HP & up to 25 HP.

15. SC — O — Over 25 HP & up to 100 HP.
16. SC — O — Over 100 HP & up to 200 HP.
17. SC — E — 5 HP & under.
18. SC — E — Over 5 HP & up to 25 HP.
19. SC — E — Over 25 HP & up to 100 HP.
20. SC — E — Over 100 HP & up to 200 HP.
21. SC — O & E — Over 200 HP & up to 1000 HP.
22. SC — O & E — Over 1000 HP.
23. WR — O & E — 25 HP & under.
24. WR — O & E — Over 25 HP & up to 100 HP.
25. WR — O & E — Over 100 HP.

SYNCHRONOUS

26. O & E — Under 25 HP.
27. O & E — Over 25 HP & up to 100 HP.
28. O & E — Over 100 HP & up to 500 HP.
29. O & E — Over 500 HP & up to 2000 HP.
30. O & E — Over 2000 HP.

O — Open
WR — Wound Rotor

Canron Ltd. (Elec. Div.)

1.2.3.5.6.7.8.9.10.11.13.14.15.16.17.18.
19.20.21.22.23.24.25.26.27.28.29.30.

Reliance Electric & Engineering
16.20.22.25.

Sangamo Co. Ltd.

1.2.3.4.5.6.7.8.10.12.13.14.15.16.17.
18.19.20.

6105 MOTORS, ELECTRICAL (DIRECT CURRENT) (conc.)

OPEN & ENCLOSED — TRANSPORTATION (RAILWAY & VEHICLE)

9. 1/3 HP & under (except miniature).
10. Over 1/3 HP & up to 5 HP.

Bogue Electric of Canada Ltd.
1.2.3.4.5.6.9.10.11.
Canron Ltd. (Elec. Div.)
3.4.5.6.7.10.11.
Canadian General Electric (Ind. App.)
4.5.6.7.8.11.

11. Over 5 HP.

Canadian Westinghouse (Apparatus)
3.4.5.6.7.8.11.
Reliance Electric & Engineering
5.6.7.
Sangamo Co. Ltd.
1.2.3.4.5.9.10.11.

6105 MOTORS, ELECTRICAL (Servo, Etc.)

1. Hysteresis, 08, 10, 11.
2. Inertially Damped, 08's, 10's, 11's.
3. Servo, 05's.
4. Servo, 8's, 10's, & 11's.
5. Servo, 15's, 18's.

Bowmar Canada Ltd.
2.4.5.6.7.
Canron Ltd. (Elec. Div.)
7.

6. Stepper, 05's, 08's, 10's, 11's, 15's, 23's.
7. Tacho-generators, 08's, 10's, 11's, 15's, 18's.

Novatronics Ltd.
1.2.3.4.5.6.7.

6105 MOTORS, ELECTRICAL (Parts)

1. Bases, motor mounts.
2. Bearing guides, plastic.

Canadian General Electric (Plastics)
2.3.4.

Canron Ltd. (Elec. Div.)
1.

Progressive Engineering Works Ltd.
1.

3. Brush holders, plastic.
4. Fans, plastic.

Reliance Electric & Engineering
1.
Sangamo Co. Ltd.
1.

6110 ELECTRICAL CONTROL EQUIPMENT

1. Amplifiers, electronic control.
2. Amplifiers, electronic control, multi-application.
3. Brakes, electric.
4. Clutches, electric.
5. Control equipment, engine, automatic.
6. Control systems, electric generator.
7. Controls, auto pilot.
8. Controls, data analysis.
9. Controls, gyro.
10. Controls, liquid level, auto.
11. Controls, motor, electric.
12. Controls, multi-application.
13. Controls, remote, multi-application.

Aviation Electric Ltd.
2.9.10.11.16.24.
Bedard-Girard Ltd.
5.6.11.13.14.16.17.19.20.25.26.27.

14. Distribution equipment, high voltage.
15. Distribution equipment up to 600 V.
16. Panels, control and indicator.
17. Panels, control, light, navigation.
18. Panels, power bus, circuit.
19. Panels, power distribution.
20. Panels, protection, electrical, breaker systems.
21. Regulators, current.
22. Regulators, frequency.
23. Regulators, voltage.
24. Servo-mechanisms.
25. Switchboards, marine.
26. Switchboards, power.
27. Switchgear groups, power.

Bogue Electric of Canada Ltd.
23.26.
CAE Industries Ltd.
13.

6110-6115**6110 ELECTRICAL CONTROL EQUIPMENT (conc.)**

- | | |
|---|--|
| Canadian Allis-Chalmers Ltd.
11.16.27. | Lenkurt Electric Co. of Canada Ltd.
13. |
| Canadian Flight Equipment Co.
3.4.12. | Litton Systems (Canada) Ltd.
2. |
| Canadian General Electric (Ind. App.)
5.6.8.11.13.16.20.26. | Marsland Engineering Ltd.
24. |
| Canadian Westinghouse (Distribution
App.)
14.25. | Measurement Engineering Ltd.
24. |
| Canadian Westinghouse (Elec. & Def.
Prod.).
2. | Milltronics Ltd.
1.2.11. |
| Canadian Westinghouse (Switchgear
& Control)
5.6.10.11.13.14.15.16.18.19.20.
23.26.27. | R. H. Nichols Co. Ltd.
1.5.6.10.12.13.16.19.20.23.26. |
| Canron Ltd. (Elec. Div.)
23.26. | Northern Electric Co. Ltd.
11.16.23. |
| Champlain Power Products Ltd.
12. | Novatronics Ltd
4.24. |
| Dominion Cutout Ltd.
15. | O. & W. Electronics Ltd.
16. |
| Electrical Mfg. Co. Ltd.
6.7.14.16.18.19.20.26.27. | Polygon Services Ltd.
11.23. |
| W. R. Elliott Ltd.
24. | Powerlite Devices Ltd.
14.27. |
| Ferranti Packard Ltd.
13. | Powertronic Equipment Ltd.
5.6.11.23.26. |
| Garrett Manufacturing Ltd.
1.2.13.19.21.22.23.24. | Raytheon Canada Ltd.
1.21.22.23.24. |
| General Metallic Parts Ltd.
24. | Reliance Electric & Engineering
6.11.16. |
| I-T-E Circuit Breaker (Bulldog Elec.)
15.16.18.19.20.26. | Sigma Instruments (Canada) Ltd.
13. |
| I-T-E- Circuit Breaker (East. Power
Devices)
15.18.19.20.26.27. | Societe Nucletron Inc.
14.18.19.27. |
| George Kelk Ltd.
1.13.23. | Stark Electronic Instruments Ltd.
23. |
| Klockner-Moeller Canada Ltd.
11. | Syntron (Canada) Ltd.
13. |
| Leigh Instruments Ltd.
2.8.16.17. | Topping Electronics Ltd.
11.13. |
| | Yarrows Ltd.
18.19.20.25.26. |

6115 GENERATORS AND GENERATOR SETS, ELECTRICAL

- | | |
|--|--|
| 1. Alternators. | 6. Generating sets, uninterrupted power. |
| 2. Generating sets, diesel. | 7. Generators, alternating current. |
| 3. Generating sets, diesel, air-cooled,
from 3 to 192.5 kw. | 8. Generators, direct current. |
| 4. Generating sets, diesel, liquid-cooled
up to 2500 kw. | 9. Power packs, hydraulic. |
| 5. Generating sets, gasoline. | 10. Power plants, electric. |
| | 11. Turbines, gas, electrical generation. |
| | 12. Variable voltage D.C. drives. |

6115 GENERATORS AND GENERATOR SETS. ELECTRICAL (conc.)

Aircraft Appliances & Equipment 2.5	MLW-Worthington Ltd. 2.10.
Allanson Mfg. Corp. Ltd. 8.	Mechron Engineering Prod. Ltd. 5.
Bogue Electric of Canada Ltd. 1.2.5.7.8.10.11.	Onan Generators Canada Ltd. 2.5.10.
Canadian General Electric (Ind. App.) 2.5.10.	Orenda Ltd. 2.11.
Canadian Westinghouse (Apparatus) 1.7.8.11	Polygon Services Ltd. 5.10.
Canron Ltd. (Elec. Div.) 1.7.8.12.	Powertronic Equipment Ltd. 7.8.10.
Cummins Eastern 2.3.4.6.10.	Reliance Electric & Engineering 12.
Deutz Diesel (Canada) Ltd. 3.4.	Sangamo Co. Ltd. 1.7.8.10.
Garrett Manufacturing Ltd. (Marine Div.) 9.11.	

6120 TRANSFORMERS, DISTRIBUTION AND POWER STATION

1. Coolers, air, type OFP.	6. Oil, distribution.
2. Coolers, water, types OFW & ONW.	7. Oil, power.
3. Dry, distribution.	8. Regulators, step voltage.
4. Dry, power.	9. Transformers.
5. Metering units.	
Bogue Electric of Canada Ltd. 9.	Ferranti Packard Ltd. 3.4.5.6.7.8.9.
Canadian General Electric (Dist. & Specialty Trans.) 3.4.6.7.8.9.	I-T-E Circuit Breaker (East. Power Devices) 3.4.9.
Canadian Westinghouse (Apparatus) 7.8.9.	Keeprite Products Ltd. 1.2.
Canadian Westinghouse (Distribution Apparatus) 3.4.6.7.8.9.	Moloney Electric Co. of Canada Ltd. 3.4.5.6.7.8.9.
Canadian Westinghouse (Switchgear & Control) 4.7.	Polygon Services Ltd. 3.4.9.
	Reliance Electric & Engineering 3.4.6.

6125 CONVERTERS, ELECTRICAL, ROTATING

1. Converters.	3. Inverters, rotary.
2. Generator sets, electrical.	4. Motor-converters.
Aircraft Appliances & Equipment 2.	Powertronic Equipment Ltd. 2.
Bogue Electric of Canada Ltd. 1.2.	Reliance Electric & Engineering 2.
Canadian General Electric (Ind. App.) 2.3.4.	Sangamo Co. Ltd. 1.2.3.4.
MLW-Worthington Ltd. 2.	

6130 CONVERTERS, ELECTRICAL, NON-ROTATING

1. Battery chargers.
2. Inverters.
3. Power supplies, D.C.
4. Power supplies, electronic.
5. Power supplies, multi-application.

Aircraft Appliances & Equipment
1.4.9.

Allanson Mfg. Corp. Ltd.
1.4.9.

Aviation Electric Ltd.
5.

Beckman Instruments (Helipot Div.)
4.

Bogue Electric of Canada Ltd.
1.2.4.5.9.

CAE Industries Ltd.
4.6.8.

Canadian General Electric (Ind. App.)
2.4.6.

Canadian Research Institute
4.

Canadian Westinghouse (Switchgear
& Control)
2.6.7.8.9.

Collins Radio Co. of Canada Ltd.
4.

ESB Canada Ltd. (Battery Div.)
1.2.9.

Ferranti Packard Ltd.
4.

Garrett Manufacturing Ltd.
(Marine Div.)
1.2.4.5.7.9.

I-T-E- Circuit Breaker (East. Power
Devices)
7.

6. Rectifiers, metallic.
7. Rectifiers, semi-conductor.
8. Rectifiers, tube type.
9. Transformer rectifiers.

International Systcoms Ltd.
1.3.4.5.

Lenkurt Electric Co. of Canada Ltd.
4.

Litton Systems (Canada) Ltd.
4.

Marsland Engineering Ltd.
1.3.4.

Measurement Engineering Ltd.
1.5.

R. H. Nichols Co. Ltd.
1.4.9.

Northern Electric Co. Ltd.
4.8.

Polygon Services Ltd.
1.5.6.7.9.

Powertronic Equipment Ltd.
1.4.5.9.

RCA Co. Ltd.
4.5.

Sangamo Co. Ltd.
4.7.8.

Spar Aerospace Products Ltd.
2.4.5.

Stark Electronics Instruments Ltd.
1.4.

Syntron (Canada) Ltd.
2.3.4.5.6.7.9.

T.M.C. (Canada) Ltd.
4.5.

6135 BATTERIES, PRIMARY

1. Alkallne manganese dioxide.
2. Battery assemblies.
3. Batteries, air depolarized.
4. Batteries, dry.
5. Batteries, flashlight.
6. Batteries, water-activated.
7. Caps, battery.
8. Carbon zinc.

Canadian General Electric (Carboloy)
14.

Canadian General Electric (Plastics)
7.

Clevite Burgess I.td.
2.4.5.6.8.9.12.

E.S.B. Canada Ltd. (Ray-O-Vac Div.)
2.4.5.6.8.9.12.13.14.16.

9. Cells, dry.
10. High & low rate.
11. High & low temperature.
12. Magnesium, silver chloride.
13. Mercury.
14. Nickel cadmium.
15. Signal cells, (copper oxide).
16. Silver oxide.

Gould-National Batteries Ltd.
2.

Mallory Battery Co. of Canada Ltd.
1.10.11.13.

Union Carbide Canada Ltd.
1.2.3.4.5.8.9.13.15.16.

6140 BATTERIES, SECONDARY

1. Assemblies.
2. Assemblies, contact, battery.
3. Assemblies, electrode, battery.
4. Battery covers.
5. Battery filters, gravity.
6. Battery filters, syringe.
7. Boxes, battery.
8. Caps, battery.
9. Cases, battery.
10. Cells, rechargeable.

ESB Canada Ltd. (Battery Div.)
1.4.5.6.9.10.12.13.14.15.16.17.19.

Globelite Batteries Ltd.
14.

Hassan Steel Fabricators Ltd.
7.

11. Contacts, battery.
12. Counter electromotive batteries.
13. Jars, battery.
14. Lead-acid.
15. Plates, battery.
16. Rechargeable.
17. Separators.
18. Sets, battery.
19. Storage, alkaline.

Mansfield-Denman General Ltd.
4.7.

Surette Battery Ltd.
1.2.3.4.8.9.11.13.14.17.18.

6145 WIRE AND CABLE, ELECTRICAL

1. Braid, copper.
2. Cable, armoured, flexible.
3. Cable, coaxial, radio frequency (RG series).
4. Cable, electric, buoyant.
5. Cable, electric, shipboard.
6. Cable, electric, ultra light, assault.
7. Cable, hydrophone.
8. Cable, ignition.
9. Cable, ignition shielded.
10. Cable, magneto.
11. Cable, microphone.
12. Cable, multi-core, communication.
13. Cable, power.
14. Cable, power, electrical shielded.
15. Cable, radio frequency.
16. Cable, spark plug.

Abex Industries of Canada Ltd.
(Elec. Div.)

31.

Amphenol Canada Ltd.
3.

Andrew Antenna Co. Ltd.
3.15.

Canada Wire & Cable Co. Ltd.
1.2.3.4.5.6.8.9.10.12.13.14.15.16.
17.18.19.20.21.22.23.24.25.26.27.
28.29.30.31

Canadian General Electric (Ind. App.)
3.4.5.13.15.21.22.24.25.31.

Fabricon Manufacturing Ltd.
3.13.

Federal Wire & Cable Co. Ltd.
5.13.14.15.17.21.23.25.30.31.

General Wire & Cable Co. Ltd.
1.3.4.5.6.8.9.11.12.13.14.15.16.17.
18.19.21.22.23.24.25.27.28.29.30.

17. Cable, special purpose.
18. Cable, subterranean.
19. Cable, switchboard.
20. Cable, variable depth sonar.
21. Cord, electrical.
22. Lampcord.
23. Wire, antenna.
24. Wire, braid.
25. Wire, electrical.
26. Wire, fuse.
27. Wire, hookup.
28. Wire, hookup, shielded.
29. Wire, ignition.
30. Wire, insulated.
31. Wire, magnet.
32. Wire, resistance, bare.
33. Wire, teflon.

Greening Industries Ltd.
32.

Ni-Sil Cable Ltd.
1.3.5.10.11.12.17.24.27.28.30.33.

Northern Electric Co. Ltd.
3.11.12.13.14.18.19.21.22.24.25.

Phillips Cables Co. Ltd.
1.3.5.7.9.10.11.12.13.14.15.16.17.
18.19.21.22.23.24.25.26.27.28.29.30.31.

Pirelli Cables Ltd.
1.5.13.14.15.17.18.21.22.24.25.30.31.

The Steel Co. of Canada Ltd.
25.

Universal Wire & Cable Co. Ltd.
31.

6150

6150 MISCELLANEOUS ELECTRIC POWER AND DISTRIBUTION EQUIPMENT

- 1. Assemblies, multi-outlet.
- 2. Bus duct systems.
- 3. Bus, isolated phase.
- 4. Bus, non-segregated phase.
- 5. Cable assemblies.

Canadian General Electric (CMHD)

5.

Canadian Westinghouse (Switchgear
& Control)

2.4.

Fenn-Dor Plastics Ltd.

9.

I-T-E Circuit Breaker (Bulldog
Electric)

1.2.6.7.8.

I-T-E Circuit Breaker (East. Power
Devices)

3.4.

6. Duct, cable.

7. Duct, industrial trolley.

8. Duct, lighting.

9. Plastic components.

Joy Mfg. Co. (Canada) Ltd.

5.

R. H. Nichols Co. Ltd.

5.

Phillips Cables Co. Ltd.

5.

Pirelli Cables Ltd.

5.

Societe Nucletron Inc.

3.

GROUP 62

LIGHTING FIXTURES AND LAMPS

6210 INDOOR AND OUTDOOR ELECTRIC LIGHTING FIXTURES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Airport lighting equipment. 2. Beacons, flashing. 3. Buoys, flashing. 4. Dimmers. 5. Fixtures, aircraft. 6. Fixtures, marine. 7. Fixtures, railroad. | <ul style="list-style-type: none"> 8. Floodlighting. 9. Industrial lighting. 10. Light standards. 11. Lighting fixtures (outdoor). 12. Lighting sets, emergency. 13. Street lighting. 14. Towers, lighting, mobile. |
|---|--|

Beaconing Optical & Precision Materials
5.6.7.

Canadian General Electric (CMHD)
1.4.5.6.8.10.11.12.13.

Canadian Westinghouse (Lighting Div.)
1.5.6.7.8.9.13.

Dominion Aluminum Fabricating Ltd.
10.

Joy Mfg. Co. (Canada) Ltd.
1.

Maritime Industries Ltd.
14.

Powerlite Devices Ltd.
8.10.11.13.

6220 ELECTRIC VEHICULAR LIGHTS AND FIXTURES

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Bulbs, automotive. | <ul style="list-style-type: none"> 2. Lamps, automotive. |
|---|---|

Union Carbide Canada Ltd.
1.2.

6230 ELECTRIC PORTABLE AND HAND LIGHTING EQUIPMENT

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Flashlights. 2. Lanterns. | <ul style="list-style-type: none"> 3. Torches, safety. |
|---|---|

Union Carbide Canada Ltd.
1.2.3.

6240 ELECTRIC LAMPS

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Exciter. 2. Flood. 3. Fluorescent. 4. Glow. 5. Heat. 6. Incandescent. 7. Infra-red. 8. Mercury vapor. 9. Miniature. 10. Neon. | <ul style="list-style-type: none"> 11. Photoflash. 12. Photoflood. 13. Pilot. 14. Projection. 15. Quartz helogen. 16. Sealed beam. 17. Spot. 18. Sun. 19. Switchboard. 20. Ultraviolet. |
|---|---|

Canadian General Electric (L&ETD)
1.2.3.4.5.6.7.8.9.11.12.13.14.16.17.19.

Canadian Westinghouse (Lamp Div.)
1.2.3.4.5.6.7.8.9.10.11.12.13.14.
16.17.18.19.20.

Northern Electric Co. Ltd.
19.

Oak-Hart Mfg. (Canada) Ltd.
13.

Sylvania Electric (Canada) Ltd.
2.3.5.6.8.11.12.14.15.17.18.20.

Union Carbide Canada Ltd.
9.

6250 BALLASTS, LAMP HOLDERS, AND STARTERS

Allanson Mfg. Corp. Ltd.
Canadian General Electric (CMHD)
Canadian General Electric (Dist. &
Specialty Trans.)

Canadian Westinghouse (Lighting Div.)
Sylvania Electric (Canada) Ltd.

GROUP 63**ALARM AND SIGNAL SYSTEMS****6310 TRAFFIC AND TRANSIT SIGNAL SYSTEMS****1. Traffic control equipment.**

Bedard Girard Ltd.

Canadian General Electric (CMHD)

Canadian Westinghouse (Lighting Div.)

Computing Devices of Canada Ltd.

ITT Canada Ltd.

Measurement Engineering Ltd.

R. H. Nichols Co. Ltd.

Topping Electronics Ltd.

6320 SHIPBOARD ALARM AND SIGNAL SYSTEMS

Bedard-Girard

Canadian General Electric (CMHD)

Canadian Westinghouse (Elec & Def
Prod)

Computing Devices of Canada Ltd.

Edwards of Canada

ITT Canada Ltd.

Mairland Engineering Ltd.

Measurement Engineering Ltd.

R. H. Nichols Co. Ltd.

Topping Electronics Ltd.

Walter Kidde & Co. of Canada

6330 RAILROAD SIGNAL AND WARNING DEVICES

Bedard-Girard Ltd.

Canadian General Electric (CMHD)

Canadian Westinghouse (Lighting Div.)

Computing Devices of Canada Ltd.

ITT Canada Ltd.

Measurement Engineering Ltd.

Topping Electronics Ltd.

6350 MISCELLANEOUS ALARM AND SIGNAL SYSTEMS**1. Access Control Systems.****2. Annunciators.****3. Fire alarm systems.**

Bedard-Girard Ltd.

1.

Canadian Marconi Co.

4.

Computing Devices of Canada Ltd.

6.

Edwards of Canada

2.3.5.

Measurement Engineering Ltd.

5.

R. H. Nichols Co. Ltd.

2.

4. Siesmic Intruder Alarms.**5. Smoke detection system.****6. Systems, fire detector, infra-red.**

Northern Electric Co. Ltd.

2.3.5.

Pyrene Mfg. Co. of Canada Ltd.

3.5.

Security Hardware Co.

1.

Topping Electronics Ltd.

2.

Walter Kidde & Co. of Canada

2.3.5.

GROUP 65

MEDICAL, DENTAL, AND VETERINARY EQUIPMENT
AND SUPPLIES

6505 DRUGS, BIOLOGICALS, AND OFFICIAL REAGENTS

- | | |
|----------------------|--------------------------------|
| 1. Acetic acid. | 6. Normal butyl alcohol. |
| 2. Acetic anhydride. | 7. Pharmaceutical specialties. |
| 3. Acetone. | 8. Propylene glycols. |
| 4. Formaldehyde. | 9. Vitamins, formulated. |
| 5. Isobutyl alcohol. | |

Canadian Chemical Co. Ltd.
1.2.3.4.5.6.8.

Cyanamid of Canada Ltd.
7.9.

Frank W. Horner Ltd.
7.9.

6515 MEDICAL AND SURGICAL INSTRUMENTS, EQUIPMENT AND SUPPLIES

- | | |
|------------------------------------|---------------------------------------|
| 1. Atomizers. | 7. Oxygen therapy equipment. |
| 2. Gloves, obstetrical, rubber. | 8. Pneumotoxic guide X-ray localizer. |
| 3. Gloves, post mortem, rubber. | 9. Straps, webbing. |
| 4. Gloves, surgeon. | 10. Universal tele-stereotoxic guide. |
| 5. Masks, oxygen, safety & rescue. | 11. Vascular suturing instrument. |
| 6. Nebulizers. | |

Canadian Liquid Air Ltd.
7.

Wm. Bartlett & Son Ltd.
9.

DeVilbiss (Canada) Ltd.
1.6.

Howmet of Canada Ltd.
2.3.4.

International Rubber & Plastics
5.

Preci-Tools Ltd.
8.10.11.

Union Carbide Canada Ltd.
7.

Uniroyal Ltd.
5.

6520 DENTAL INSTRUMENTS, EQUIPMENT, AND SUPPLIES

- | | |
|-------------------|--------------------------------|
| 1. Burrs, dental. | 3. Instrument, dental packing. |
| 2. Dental metal. | |

Beavers Dental Products Ltd.
1.

Deloro Stellite
2.

Syntron (Canada) Ltd.
3.

6525 X-RAY EQUIPMENT, AND SUPPLIES: MEDICAL, DENTAL, VETERINARY

- | | |
|-----------------------------------|-------------------------|
| 1. Probes, radioisotope, tracing. | 2. Radiography sources. |
|-----------------------------------|-------------------------|

Atomic Energy of Canada Ltd.
2.

Simtec Ltd.
1.

6530 HOSPITAL FURNITURE, EQUIPMENT, UTENSILS, AND SUPPLIES

- | | |
|-----------------------------------|----------------------------------|
| 1. Cabinets, hospital, all types. | 5. Lockers, medical. |
| 2. Cabinets, lockers, metal. | 6. Straps, webbing. |
| 3. Cabinets, medical. | 7. Tape, auto-clave, indicating. |
| 4. Litters, hospital sheet metal. | |

6530

6530 HOSPITAL FURNITURE, EQUIPMENT, UTENSILS AND SUPPLIES (conc.)

Wm. Bartlett & Son Ltd.

6.

Canadian Technical Tape

7.

Dynamic Industries Inc.

4.

Haruni Metal Products

1.2.3.

Hussman Refrigerator Co. Ltd.

3.4.

The Pedlar People Ltd.

1.

Westeel-Rosco Ltd.

1.2.5.

Yarrows Ltd.

2.

GROUP 66

INSTRUMENTS AND LABORATORY EQUIPMENT

6605 NAVIGATIONAL INSTRUMENTS

1. Boards, plotting.
2. Charts, dials, scales on plastic.
3. Compasses, gyro.
4. Compasses, magnetic.
5. Compasses, pilots.
6. Computers, electronic.
7. Computers, mechanical.

Aviation Electric Ltd.

1.4.5.6.7.9.

Computing Devices of Canada Ltd.

6.7.9.10.13.14.

Garrett Manufacturing Ltd.

7.

Leigh Instruments Ltd.

8.11.

Litton Systems (Canada) Ltd.

3.6.

8. Indicators, track position.
9. Plotting system, navigational.
10. Plotting system, tactical.
11. Recorders, flight data.
12. Recorders, range.
13. Systems, heading, central.
14. Systems, synchronous, astro-compass.

Marsland Engineering Ltd.

1.9.10.12.

O. & W. Electronics Ltd.

1.2.7.

Sperry Gyroscope of Ottawa Ltd.

5.6.9.10.

Stanley Mfg. Co. Ltd.

1.2.6.

6610 FLIGHT INSTRUMENTS

1. Accelerometers.
2. Altimeter sets, electronic.
3. Altimeters, servoed.

Aviation Electric Ltd.

1.4.

CAE Industries Ltd.

2.

Canadian Marconi Co.

2.

4. Flight instruments A/C.

5. Indicators, horizontal.

6. Instruments, navigation.

Computing Devices of Canada Ltd.

4.5.

Leigh Instruments Ltd.

2.3.4.6.

Litton Systems (Canada) Ltd.

1.4.

6615 AUTOMATIC PILOT MECHANISMS AND AIRBORNE GYRO COMPONENTS

1. Auto pilot.
2. Controls, directional gyro.
3. Gyros.
4. Gyro components.

Aero Mechanic Ltd.

4.6.8.

Aviation Electric Ltd.

4.

B.I.R. Precision Products

4.

CAE Industries Ltd.

5.

DeHavilland Aircraft of Canada

6.7.

Ferranti Packard Ltd.

3.

5. Gyroscope displacement.

6. Rudder controls.

7. Selectors, heading.

8. Servos.

General Metallic Parts Ltd.

4.

Joly Engineering Ltd.

1.4.

Leigh Instruments Ltd.

7.

Litton Systems (Canada) Ltd.

1.2.4.

Reil Industrial Enterprises Ltd.

4.

6625 ELECTRICAL AND ELECTRONIC PROPERTIES MEASURING AND TESTING INSTRUMENTS

1. Absorber, radio frequency.
 2. Ammeters.
 3. Amplifiers, audio.
 4. Amplifiers, nuclear, spectrometry.
 5. Analysers, spectrum.
 6. Analysers, video integrating.
 7. Battery chargers.
 8. Bridges, capacitance.
 9. Bridges, resistance.
 10. Bridges, testing.
 11. Calibrators, aircraft instrument.
 12. Calibrators, radio range.
 13. Comparators, resistance and voltage.
 14. Current balance apparatus.
 15. Delay line sets.
 16. Detector, contamination in liquids.
 17. Detector, fire, infra-red.
 18. Detectors, radio frequency interference.
 19. Diodes.
 20. Electrical standard sets.
 21. Electrical test instruments.
 22. Evaluation programmers.
 23. Evaluation sets and evaluators.
 24. Frequency meters.
 25. Galvanometers.
 26. Gauges, electron beam thickness.
 27. Gauges, electron single-scatter density.
 28. Generators, pulse.
 29. Generators, signal and noise.
 30. Impulse noise.
 31. Indicators, antenna radiation.
 32. Indicators, channel alignment.
 33. Indicators, counter type, digital display.
 34. Indicators, distortion.
 35. Indicators, phase sequence.
 36. Indicators, pulse analyser.
 37. Indicators, radio frequency.
 38. Inductors, standard fixed.
 39. Inductors, standard, variable.
 40. Instruments, testing.
 41. Ionosphere sounding equipment.
 42. Magnetometer, rotating coil.
 43. Meters, electrical, indicating.
 44. Microammeters.
 45. Milliameters.
 46. Monitors, audio frequency.
 47. Monitors, course.
 48. Monitors, radio frequency.
 49. Multimeters.
 50. Multipliers, electrical instruments.
 51. Ohmmeters.
 52. Oscilloscopes.
 53. Panels, monitor, electrical.
 54. Panels, test, electrical.
 55. Plotters, electric field.
 56. Plotters, magnetic field.
 57. Pre-amplifiers, nuclear spectrometry.
 58. Probes, electron beam, wind tunnel diagnostics.
 59. Propagation frequency.
 60. Pumping systems, high vacuum.
 61. Recorder sets, radiation pattern, radio frequency.
 62. Servo test sets.
 63. Shunts, measuring.
 64. Simulators, antenna position.
 65. Slotted line waveguides.
 66. Spectrometers, electron beam probe.
 67. Standards, frequency.
 68. Standards, resistance.
 69. Standards, time.
 70. Standards, voltage.
 71. Test sets, electrical, meter.
 72. Test sets, inverters.
 73. Test sets, microwave transmission.
 74. Test sets, phase rotation.
 75. Telemetry sets, power.
 76. Transducers.
 77. Transducers, supersonic test.
 78. Voltmeters.
 79. Voltmeters, digital.
 80. Voltmeters, recording.
 81. Volt-ammeters, panel aircraft.
 82. Wattmeters.
 83. Waveform converter groups.
 84. Waveform synthesizers.
 85. Wavemeter.
- Abex Industries Ltd. (Elec. Div.)
38.
- Aircraft Appliances & Equipment
7.72.74.
- Almax Ceramic Industries Ltd.
76.
- Amphenol Canada Ltd.
67.69.
- Aviation Electric Ltd.
76.
- Bach-Simpson Ltd.
2.21.24.25.29.33.37.40.43.44.45.49.50.
51.52.63.71.78.79.80.81.82.85.
- Bayly Engineering Ltd.
1.15.29.34.40.50.85.
- Beaconing Optical & Precision
Materials
24.29.33.37.54.
- CAE Industries Ltd.
33.46.47.48.79.

6625 ELECTRICAL AND ELECTRONIC PROPERTIES MEASURING AND TESTING INSTRUMENTS (conc.)

Canadian General Electric (D&SP)
19.

Canadian General Electric (Meter & Inst.)
2.24.43.44.45.78.80.82.

Canadian Research Institute
2.9.10.25.40.43.51.72.78.82.

Canadian Westinghouse (Elec. & Def. Prod.)
32.

Canadian Westinghouse (Switchgear & Control)
2.19.24.43.44.45.63.76.78.80.82.

Desitron Co. Ltd.
65.

E.M.I. Electronics
41.

Electrical Mfg. Co. Ltd.
43.53.54.

Ferranti Packard Ltd.
15.33.43.82.

Garrett Manufacturing Ltd.
7.54.62.72.

Guildline Instruments Ltd.
8.9.10.13.20.21.25.40.63.68.70.

Keene of Canada Corp. Ltd.
16.

George Kelk Ltd.
55.

Leigh Instruments Ltd.
7.11.33.40.

Litton Systems (Canada) Ltd.
43.82.

Marsland Engineering Ltd.
7.

Measurement Engineering Ltd.
3.7.24.37.40.47.53.71.76.82.

Microwave Devices Inc.
1.65.

Milltronics Ltd.
53.

R. H. Nichols Co. Ltd.
7.53.54.75.76.

Northern Electric Co. Ltd.
5.6.18.22.23.29.30.31.32.34.35.36.45,
46.47.48.53.55.56.83.84.85.

Novatronics Ltd.
8.9.29.33.62.

Nytronics of Canada
15.38.39.

Ontario Research Foundation
26.27.58.60.66.

Philips Electronics Industries Ltd.
12.28.41.69.

Powertronic Equipment Ltd.
11.53.54.

RCA Ltd.
5.6.14.18.29.31.32.33.37.48.52.
54.59.61.62.64.65.73.84.85.

Reliance Electric & Engineering Ltd.
40.

Sigma Instruments (Canada) Ltd.
9.10.

Simtec Ltd.
4.57.

Spar Aerospace Products Ltd.
17.41.42.72.77.

Sperry Gyroscope Ottawa Ltd.
3.11.21.22.23.32.33.37.40.53.64.

Stark Electronic Instruments Ltd.
2.21.24.29.43.44.45.49.51.52.54.71.

Stewart-Warner Corp. Ltd.
15.

T.M.C. (Canada) Ltd.
5.20.21.37.46.48.84.

Topping Electronics Ltd.
24.29.

6630 CHEMICAL ANALYSIS INSTRUMENTS

1. Absorbents, molecular sieves.

2. Analyser, gaseous fluoride, automatic.

3. Controllers.

4. Mass spectrometer, gas chromatograph and trace gas analyser inlets.

Barringer Research Ltd.
6.7.

Canadian Research Institute
3.5.

Chemical Projects Ltd.
4.

5. Meters, PH.

6. Soil and water geochemical kits.

7. Spectrometers, mercury.

Leigh Instruments Ltd.
2.

McPhar Geophysics Ltd.
6.

Union Carbide Canada Ltd.
1.

6635-6645

6635 PHYSICAL PROPERTIES TESTING EQUIPMENT

1. Cold treating machines.
2. Non-destructive testing machines wire rope.
3. Sonoscopes, non-destructive, inspection concrete.
4. Units for determination of thermodynamic properties of multi-component systems.

Chemical Projects Ltd.

4.

McPhar Geophysics Ltd.

2.3.

Union Carbide Canada Ltd.

1.

6640 LABORATORY EQUIPMENT AND SUPPLIES

1. Absorbers, graphite.
2. Agitators, liquids.
3. Ampoules.
4. Apparatus, platinum.
5. Apparatus, vacuum & extraction.
6. Burettes, borosilicate.
7. Catalyst carriers (Chemically loaded molecular sieves).
8. Chemical equipment of graphite.
9. Columns, chromatography.
10. Columns & Heads, distilling & fractioning.
11. Condensers.
12. Flasks, Dewar.
13. Glassware, general & custom.
14. Infra-red cell cooling equipment.
15. Irradiators, gammacell, research.
16. Pipettes.
17. Plants, pilot, custom, skid mounted.
18. Pumps of graphite.
19. Pumps, high vacuum.
20. Rich/lean ratio equipment.
21. Seals, glass to metal.
22. Spinners, flask.
23. Tubes, connecting.
24. Tubes, culture.
25. Tubes, custom.
26. Vaporizers, cryogenic.
27. Vials, serum.

Atomic Energy of Canada Ltd.

15.

Canadian Liquid Air Ltd.

26.

Canadian Research Institute

2.

Chemical Projects Ltd.

17.

The O. H. Johns Glass Co. Ltd.

3.5.6.9.10.11.12.13.16.21.22.23.

24.25.27.

Johnson Matthey & Mallory

4.

Ontario Research Foundation

19.20.

Union Carbide Canada Ltd.

1.7.8.14.18.26.

6645 TIME MEASURING INSTRUMENTS

1. Intervalometers, rocket firing.
2. Intervalometers, stores dropping.
3. Programmer, time, semi-automatic.
4. Timers, precision.

Aviation Electric Ltd.

4.

Leigh Instruments Ltd.

2.

Marsland Engineering Ltd.

1.3.

Philips Electronics Industries Ltd.

3.4.

Presentey Engineering Products Ltd.

3.

6650 OPTICAL INSTRUMENTS

1. Binoculars.
2. Clinometers.
3. Diaphragms.
4. Filters.
5. Lenses.
6. Mirrors.
7. Mounts.

Canadian Research Institute
12.

8. Objectives.
9. Optical spotting instruments.
10. Prisms.
11. Projectors.
12. Spectrophotometer, atomic absorption.
13. Telescopes.

Ernst Leitz Canada Ltd.
1.2.3.4.5.6.7.8.9.10.11.13.

6655 GEOPHYSICAL AND ASTRONOMICAL INSTRUMENTS

1. Airborne electromagnetic equipment.
2. Bathythermograph sets.
3. Bathythermograph winches and controls.
4. Geophysical instruments.
5. Indicators, magnetic variation.
6. Induced polarization equipment.
7. Magnetometers.

Barringer Research Ltd.
1.4.7.8.9.10.12.

Canadian Research Institute
4.

Canadian Vickers Ltd.
14.

Computing Devices of Canada Ltd.
1.13.

E.M.I. Electronics
2.

8. Magnetometers, airborne.
9. Magnetometers, oceanographic.
10. Magnetometers, portable.
11. Self-potential equipment.
12. Spectrometers, airborne, gamma ray.
13. Systems, synchronous, astro-compass.
14. Towed body equipment and controls.

Fleet Manufacturing Ltd.
14.

George Kelk Ltd.
4.

McPhar Geophysics Ltd.
1.4.5.6.7.9.11.

J. Swann (1963) Ltd.
3.14.

6660 METEOROLOGICAL INSTRUMENTS AND APPARATUS

1. Anemometers.
2. Computers, RVR.
3. Mesometeorological data systems, automatic.
4. Meteorological balloons.

Aviation Electric Ltd.
5.

CAE Industries Ltd.
5.6.9.

Champlain Power Products Ltd.
7.

Garrett Manufacturing Ltd.
3.

5. Rawin sets.
6. Receiving sets, radiosonde.
7. Recorders, temperature, portable.
8. Transmissometers.
9. Transmitting sets, radiosonde.

George Kelk Ltd.
9.

Howmet of Canada Ltd.
4.

Marsland Engineering Ltd.
1.2.8.

RCA Ltd.
5.

6665 HAZARD-DETECTING INSTRUMENTS AND APPARATUS

1. Air pollution monitor.
2. Analyzer, gaseous fluoride, automatic.
3. Detector sets, mine.
4. Detectors, alpha particle.
5. Detectors, mercury.
6. Detectors, neutron, pulse shape, discrimination.
7. Detectors, radiation.

8. Monitoring sets.
9. Monitors, air, hydrogen sulphide.
10. Monitors, air, sulphur dioxide.
11. Probes, radiac.
12. Radiac sets.
13. Recorders magnetic distortion.
14. Spectrometers, gamma ray.
15. Systems, fire detection, infra-red.

6665-6680

6665 HAZARD-DETECTING INSTRUMENTS AND APPARATUS (conc.)

Barringer Research Ltd. 5.	Measurement Engineering Ltd. 1.8.12.
CAE Industries Ltd. 12.	Milltronics Ltd. 12.
Canadian Admiral Corp. Ltd. 12.	R. H. Nichols Co. Ltd. 12.
Canadian Research Institute 9.10.	Ontario Research Foundation 1.
Computing Devices of Canada Ltd. 12.13.15.	Presentey Engineering Products Ltd. 1.13.
Conuclear Ltd. 6.11.	RCA Ltd. 3.4.7.8.11.12.14.
Leigh Instruments Ltd. 2.	Simtec Ltd. 7.
Marsland Engineering Ltd. 8.	Spar Aerospace Products Ltd. 15.

6675 DRAFTING, SURVEYING AND MAPPING INSTRUMENTS

- | | |
|---|-------------------------------|
| 1. Boards, drafting. | 3. Machines, drafting. |
| 2. Furniture, drafting room,
wood/steel. | 4. Tables, drafting. |
| | 5. Tables, tracing. |

Straube Industries Ltd.
1.2.3.4.5.

6680 LIQUID AND GAS FLOW, LIQUID LEVEL, AND MECHANICAL MOTION MEASURING INSTRUMENTS

- | | |
|---|------------------------------------|
| 1. Carbon dioxide, ethylene, argon,
helium, propane. | 7. Meters, fluid, velocity. |
| 2. Controls, rate flow, liquid. | 8. Recorders. |
| 3. Flowmeters, gas. | 9. Regulators, oxygen. |
| 4. Flowmeters, liquid. | 10. Regulators, pressure. |
| 5. Fuel metering controls. | 11. Speedometer cable. |
| 6. Gauges, level, liquid. | 12. Thermostats, bi-metal. |
| | 13. Thermostats, hydraulic. |
-
- | | |
|---------------------------------------|--|
| Aro of Canada Ltd.
8.9. | Molson Industries Ltd.
6. |
| Canadian Liquid Air Ltd.
1.3.9.10. | Neptune Meters Ltd.
1.3.4.5. |
| Champlain Power Products Ltd.
7. | Oak-Hart Mfg. (Canada) Ltd.
12.13. |
| General Wire & Cable Co. Ltd.
11. | Sigma Instruments (Canada) Ltd.
4.7. |
| Gulton Industries (Canada) Ltd.
7. | Stewart-Warner Corp. Ltd.
10. |
| Keene of Canada Corp. Ltd.
4. | Taylor Instrument Companies Ltd.
1.2.3.5.6.7. |
| Marsland Engineering Ltd.
3.7. | Union Carbide Canada Ltd.
1.3.8.9. |
| Measurement Engineering Ltd.
6.7. | |

6685 PRESSURE, TEMPERATURE, AND HUMIDITY MEASURING AND CONTROLLING INSTRUMENTS

1. Controllers, indicating, temperature.
2. Indicators.
3. Indicators, altitude, barometric.
4. Indicators, pressure.
5. Indicators, temperature.
6. Pyrometers, immersion.
7. Pyrometers, optical.

Aviation Electric Ltd.
4.14.

Bach-Simpson Ltd.
1.

Canada Wire & Cable Co. Ltd.
12.

Canadian Research Institute
1.2.11.

Central Dynamics Ltd.
11.

Garrett Manufacturing Ltd.
1.

8. Pyrometers, radiation.
9. Pyrometers, surface.
10. Recorders, temperature.
11. Thermocouples.
12. Thermocouples, lead wire.
13. Thermometers, recording.
14. Transmitters, pressure.

Gulton Industries (Canada) Ltd.
1.2.10.11.13.

Leigh Instruments Ltd.
3.

Measurement Engineering Ltd.
13.

Sigma Instruments (Canada) Ltd.
1.2.5.6.7.8.9.10.11.12.13.

Taylor Instrument Companies Ltd.
1.2.4.10.11.12.13.14.

6695 COMBINATION AND MISCELLANEOUS INSTRUMENTS

1. Indicators, crash position, A/C

Leigh Instruments Ltd.
1.

2. Rods, synthetic sapphire.

Union Carbide Canada Ltd.
2.

GROUP 67

PHOTOGRAPHIC EQUIPMENT

6710 CAMERAS, MOTION PICTURE

- 1. Cameras, aircraft.
- 2. Cameras, gun.

Canadian Westinghouse (Elec. & Def.
Prod.)

4.

Computing Devices of Canada Ltd.
1.2.4.

- 3. Mirrors, photographic.
- 4. Photo reconnaissance systems.

Ernst Leitz Canada Ltd.
1.2.3.4.

6720 CAMERAS, STILL PICTURE

- 1. Cameras, aircraft.

Ernst Leitz Canada Ltd.

- 2. Cameras, still picture.

6740 PHOTOGRAPHIC DEVELOPING AND FINISHING EQUIPMENT

- 1. Automatic systems.

Devtek Limited

6750 PHOTOGRAPHIC SUPPLIES

- 1. Acetic acid.

Canadian Chemical Co. Ltd.

1.

Canadian General Electric (L&ETD)

2.

- 2. Photoflash lamps.

Sylvania Electric (Canada) Ltd.

2.

6760 PHOTOGRAPHIC EQUIPMENT AND ACCESSORIES

- 1. Adapters, lens.

- 2. Filters.

- 3. Lenses, multi-type.

- 4. Lenses, telephoto.

Canadian Technical Tape

7.

- 5. Lenses, wide angle.

- 6. Mounts.

- 7. Tape, splicing, film.

Ernst Leitz Canada Ltd.

1.2.3.4.5.6.

GROUP 68

CHEMICALS AND CHEMICAL PRODUCTS

6810 CHEMICALS

1. Acetate, flake, cellulose.
2. Acetate methyl amyl.
3. Acetate normal butyl.
4. Acetate normal propyl.
5. Acetone.
6. Acetylene, black.
7. Acid, acetic.
8. Acid, adipic.
9. Acid, hydrochloric.
10. Acid, nitric.
11. Acid, sulphuric.
12. Acrylonitrile—butadiene copolymers (Nitril Rubbers).
13. Acrylonitrile—butadiene latex.
14. Acrylonitrile—butadiene—styrene (ABS).
15. Alcohol isobutyl.
16. Alcohol normal butyl.
17. Alcohol normal propyl.
18. Aluminum oxide, crude.
19. Amines.
20. Ammonia anhydrous.
21. Ammonium nitrate.
22. Ammonium phosphate.
23. Ammonium sulphate.
24. Aniline oil.
25. Anhydride acetic.
26. Benzol.
27. Bisphenol.
28. Breeze coke.
29. Burnt lime.
30. Butadiene—styrene vinyl pyridine latex.
31. Calcium carbide.
32. Carboxylated styrene—butadiene latex.
33. Caustic soda (50% solution).
34. Chemicals, industrial.
35. Chemicals, rubber activators and stabilizers.
36. Chlorate, potassium.
37. Chlorate, sodium.
38. Coal tar.
39. Cyanide.
40. Cyclohexane.
41. Deuterium.
42. Dipentaerythritol.
43. Diphenylamine.
44. Dipropylene glycol.
45. Engineering plastics.
46. Ethyl acetate.
47. Ethylene dichloride.
48. Ethylene glycols.
49. Flotation reagents.
50. Formaldehyde.
51. Glycol ethers.
52. Hexylene glycol.
53. Isobutylene—isoprene copolymers (Butyl Rubbers).
54. Isophorone.
55. Limestone.
56. Melamine crystal.
57. Metallurgical coke.
58. Methanol.
59. Methyl isobutyl carbinol.
60. Methyl isobutyl ketone.
61. Naphtha, hi-flash.
62. Naphthalene.
63. Nitric acid.
64. Nitrobenzene.
65. Nitroguanadine.
66. Octuate aluminium.
67. Pentaerythritol.
68. Peroxide, hydrogen.
69. Phenol.
70. Phosphorous, red amorphous.
71. Phosphorous, yellow.
72. Polybutadiene.
73. Polyethelene glycol.
74. Polyglycol ethers.
75. Polyvinyl acetate.
76. Polyvinyl chloride.
77. Stearate aluminium.
78. Stearate barium.
79. Stearate calcium.
80. Stearate magnesium.
81. Stearate zinc.
82. Styrene—butadiene copolymers (SBR).
83. Styrene—butadiene latices.
84. Sulphur.
85. Toluol.
86. Trans—polyisoprene (Synthetic Balata).
87. Urea.
88. Vinyl acetate.
89. Vinyl chloride.
90. Xanthates.
91. Zinc laurate.

Aluminum Co. of Canada
18.34.

H. L. Blachford Ltd.
66.77.78.79.80.81.91.

6810-6850**6810 CHEMICALS (conc.)**

Canadian Carborundum Co. Ltd.
18.

Canadian Chemical Co. Ltd.
1.2.3.4.5.7.9.15.16.17.19.25.33.
34.44.49.50.58.59.60.67.90.

Canadian Industries Ltd.
9.10.11.20.21.22.23.33.34.58.63.68.87.

Cyanamid of Canada Ltd.
21.31.39.56.65.87.

Dow Chemical of Canada Ltd.
20.33.48.

Du Pont of Canada Ltd.
8.9.10.68.

Electric Reduction Co. Ltd.
36.37.70.71.

Polymer Corporation Ltd.
12.13.14.30.32.35.45.53.72.82.83.86.

Shawinigan Chemicals Ltd.
3.5.6.7.9.16.25.27.31.34.40.42.45.46.
47.50.52.54.60.67.69.75.76.84.88.89.

The Steel Co. of Canada Ltd.
23.26.28.29.38.55.57.61.62.85.

Stohler Isotope Chemicals.
41.

Union Carbide Canada Ltd.
19.31.48.51.73.74.

Uniroyal Ltd.
24.34.35.43.45.64.

6830 GASES: COMPRESSED AND LIQUEFIED

1. Acetylene.
2. Ammonia.
3. Argon.
4. Carbon dioxide, welding grade.
5. Chlorine.
6. Chlorofluorohydrocarbons.
7. Compressed air.
8. Gas, liquefied.
9. Gases, medical.

Canadian Industries Ltd.
2.5.18.

Canadian Liquid Air Ltd.
1.3.7.8.9.10.11.12.13.14.15.16.17.

10. Gases, rare.
11. Helium.
12. Hydrogen.
13. Nitrogen.
14. Oxygen.
15. Oxygen, breathing.
16. Oxygen, medical.
17. Refrigerants, liquid gas.
18. Sulphur dioxide.

Du Pont of Canada Ltd.
6.

Union Carbide Canada Ltd.
1.3.4.7.8.9.10.11.12.13.14.15.16.17.

6840 PEST CONTROL AGENTS AND DISINFECTANTS

1. Disinfectants.
2. Disinfectant, cleaning.
3. Fungicides.

Canadian Industries Ltd.
3.4.5.

Cartier Chemical Co. Ltd.
1.2.5.

4. Herbicides.
5. Insecticides.

Uniroyal Ltd.
3.4.5.

6850 MISCELLANEOUS CHEMICAL SPECIALTIES

1. Accelerators, rubber and plastic.
2. Anti-freeze.
3. Automotive anti-stall additives.
4. Brake fluids.
5. Carbon removers.
6. Carbons, activated.
7. Cement curing compounds.
8. Chemicals, refined, photographic.

9. Compound cleaning, radiator.
10. De-icing fluids.
11. Dies, fluorescent inspection.
12. Dry cleaning chemicals.
13. Epoxy resins and hardeners.
14. Metal cleaners.
15. Oil absorbents.
16. Penetrants.

6850 MISCELLANEOUS CHEMICAL SPECIALTIES (conc.)

- 17. Powders, plastic moulding.**
- 18. Preservative chemicals.**
- 19. Repellent, rain, windscreen.**
- 20. Safety solvents.**

Ardrox Ltd.

5.11.14.16.

Canadian Industries Ltd.

19.23.

Cartier Chemical Co. Ltd.

7.14.15.16.20.22.23.

Dow Chemical of Canada Ltd.

4.12.14.17.18.

Du Pont of Canada Ltd.

17.

- 21. Solvent, windshield washing.**

- 22. Specialties.**

- 23. Wallwashing compounds.**

B.F. Goodrich Canada Ltd.

10.

Frank W. Horner

19.

Union Carbide Canada Ltd.

1.2.3.4.6.8.9.10.13.21.

Uniroyal Ltd.

1.7.13.18.

GROUP 69

TRAINING AIDS AND DEVICES

6910 TRAINING AIDS

1. Models, water tank.
2. Models, wind tunnel.
3. Models, scale, military equip.
4. Radiac training equipment.
5. Signal, sonar, simulated.
6. Simulators, flight.

Aviation Electric Ltd.
9.10.

CAE Industries Ltd.
6.9.10.

Canadair Ltd.
9.10.

Computing Devices of Canada Ltd.
1.2.8.9.10.

E.M.I. Electronics
4.

Fleet Manufacturing Ltd.
9.10.11.

Lockwood Survey Corp. Ltd.
1.7.

7. Slides, flight simulator.
8. Trainers, navigation.
9. Training devices, electrical.
10. Training devices, electronic.
11. Training systems, sectionalized.

Marsland Engineering Ltd.
5.9.10.

Measurement Engineering Ltd.
9.10.

R. H. Nichols Co. Ltd.
9.10.

O. & W. Electronics Ltd.
1.2.3.

Philips Electronics Industries Ltd.
9.10.

RCA Ltd.
4.9.10.

Stark Electronic Instruments Ltd.
9.10.

6920 ARMAMENT TRAINING DEVICES

1. Recorders, target drone, miss-distance.
2. Targets, sleeves, aerial tow.

Aviation Electric Ltd.
4.

Canadair Ltd.
3.

Computing Devices of Canada Ltd.
1.

ITT Canada Ltd.
4.

3. Targets, holding mechanism, train-fire.
4. Training devices, electric.

Plastal Manufacturing Ltd.
2.

Universal Die & Tool Mfg. Ltd.
3.

S. E. Woods (Canvass Div.)
2.

6930 OPERATIONAL TRAINING DEVICES

1. Simulator analyser groups.
2. Simulators, flight.

Aviation Electric Ltd.
4.

CAE Industries Ltd.
2.3.4.

Canadair Ltd.
4.

Computing Devices of Canada Ltd.
3.

3. Simulators, navigational control.
4. Training devices, electrical.

Marsland Engineering Ltd.
4.

Measurement Engineering Ltd.
4.

RCA Ltd.
1.4.

6940 COMMUNICATION TRAINING DEVICES**1. Simulators, navigation aids.****2. Simulators, radar signal.**

Aviation Electric Ltd.

1.

CAE Industries Ltd.

1.3.4.

Canadian Westinghouse (Elec. & Def.
Prod.)

3.

Computing Devices of Canada Ltd.

2.

3. Sonar target signal generators.**4. Training devices, electric.**

Marsland Engineering Ltd.

3.

Measurement Engineering Ltd.

1.

RCA Ltd.

1.3.4.

GROUP 71

FURNITURE

7110 OFFICE FURNITURE

1. Custom built, wood.
2. Shelving, modulator, steel.

Imperial School Desks Ltd.

1.3.

Saint John Shipbuilding & Dry Dock

1.

3. Tubular equipment.

Westeel-Rosco Ltd.

2.

7125 CABINETS, LOCKERS, BINS AND SHELVING

1. Cabinets and bins.
2. Cabinets, key.
3. Cabinets, liberty card.
4. Cabinets and lockers, metal.
5. Cabinets, map.
6. Cabinets, plastic.
7. Cabinets, shelving.
8. Cabinets, small part storage.

Burrard Dry Dock Co. Ltd.

1.2.3.4.5.7.8.9.11.12.13.14.15.

Canadian General Electric (Plastics)

6.

Canadian Vickers Ltd.

1.2.3.4.5.9.

Computer Metal Reg'd.

1.2.4.8.11.12.

Dynamic Industries Inc.

4.

Electrical Mfg. Co. Ltd.

1.2.3.4.5.7.8.9.12.14.

Enamel & Heating Products Ltd.

1.2.4.9.12.

Fabricated Steel Products Ltd.

11.12.13.14.15.

Ferguson Industries Ltd.

1.2.3.4.5.7.8.9.11.12.13.14.

Foresteel Industries Ltd.

1.11.12.13.14.

Halifax Shipyards

3.4.5.9.10.

Haruni Metal Products

2.8.12.14.

Hassan Steel Fabricators Ltd.

1.2.3.5.7.8.9.11.12.13.14.

9. Cabinets, storage.
10. Cabinets, wooden.
11. Racks, stacking.
12. Shelving, steel.
13. Stock bins.
14. Stock and storage racks.
15. Trucks, shelf and bin.

Hussman Refrigerator Co. Ltd.

9.12.

Imperial School Desks Ltd.

1.4.7.8.9.10.

Matthew Moody Division

15.

McGuire Manufacturing Co. Ltd.

1.7.8.12.13.14.

The Pedlar People Ltd.

1.4.7.8.9.12.13.14.

Polyfiber Ltd.

6.

Port Arthur Shipbuilding

1.7.8.9.10.

Saint John Shipbuilding & Dry Dock

1.3.4.5.9.10.

Westeel-Rosco Ltd.

1.2.3.4.5.7.8.9.12.13.

Western Tools & Industries Ltd.

1.7.8.9.

The W. C. Wood Co. Ltd.

12.13.

Yarrows Ltd.

1.2.3.4.5.7.8.9.11.12.13.14.

7195 MISCELLANEOUS FURNITURE AND FIXTURES**1. Custom built, steel.****2. Custom built, wood.**

Fabricated Steel Products Ltd.

1.3.

Ferguson Industries Ltd.

3.

Halifax Shipyards

2.

Haruni Metal Products

1.3.

Imperial School Desks Ltd.

1.2.

3. Work benches and tables.

The Pedlar People Ltd.

3.

Port Arthur Shipbuilding

2.3.

Saint John Shipbuilding & Dry Dock

2.

The Steel Co. of Canada Ltd.

1.3.

GROUP 72

**HOUSEHOLD AND COMMERCIAL FURNISHINGS
AND APPLIANCES**

7230 DRAPERIES, AWNINGS AND SHADES

- 1. Awnings, fabric.
- 2. Canopies, fabric.

- 3. Shades, fabric.

Wm. Bartlett & Son Ltd.
1.2.3.

7240 HOUSEHOLD AND COMMERCIAL UTILITY CONTAINERS

- 1. Bags, dry cleaning.
- 2. Bags, household.
- 3. Bags, laundry.
- 4. Bags, refuse.

- 5. Films, plastic, household.
- 6. "Jerry" cans, plastic.
- 7. Liners, hampers, clothes.
- 8. Pails, plastic.

International Rubber & Plastics
8.
Ross-Smith (1969) Ltd.
3.7.

Scepter Mfg. Co. Ltd.
6.8.
Union Carbide Canada Ltd.
1.2.4.5.

**7290 MISCELLANEOUS HOUSEHOLD AND COMMERCIAL FURNISHINGS AND
APPLIANCES**

- 1. Baskets, wire, hand.

- 2. Humidifiers, power-drum type.

Gilbarco Canada Ltd.
2.

Johnson Wire Products Ltd.
1.

GROUP 73

FOOD COOKING, BAKING AND WARMING
EQUIPMENT

7310 FOOD COOKING, BAKING AND WARMING EQUIPMENT

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Galley equipment, marine. 2. Hot drink equipment. 3. Ranges, coal and wood. <p>Beach Foundry Ltd.
4.5.</p> <p>Enamel & Heating Products Ltd.
4.5.</p> <p>Findlays Ltd.
2.3.</p> | <ul style="list-style-type: none"> 4. Ranges, electric. 5. Ranges, gas. 6. Trucks, food serving. <p>Haruni Metal Products
6.</p> <p>Illines Machine Products Ltd .
1.</p> |
|--|--|

7320 KITCHEN EQUIPMENT AND APPLIANCES

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Baskets, dishwashing. 2. Baskets, food handling. 3. Baskets, tableware. 4. Cabinets, delivery and storage. 5. Carts, produce. 6. Carts, tray. <p>Fabricated Steel Products Ltd.
7.8.</p> <p>Fenn-Dor Plastics Ltd.
9.10.</p> <p>Haruni Metal Products
5.6.</p> | <ul style="list-style-type: none"> 7. Racks, food handling, etc. 8. Racks, stacking. 9. Trays, plastic, food handling. 10. Trays, plastic, food serving. 11. Trays, refrigerator. 12. Trucks, refrigerator. <p>International Rubber & Plastics Corp.
1.</p> <p>Johnson Wire Products Ltd.
1.2.3.11.</p> <p>Matthew Moody Division
4.5.6.7.8.11.12.</p> |
|--|--|

7330 KITCHEN HAND TOOLS AND UTENSILS

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Baskets, cutlery. 2. Baskets, cutlery, sterilization. 3. Baskets, frying. <p>Capilano Engineering Ltd.
4.</p> <p>Coulter Copper & Brass Co. Ltd.
5.</p> | <ul style="list-style-type: none"> 4. Containers, plastic, deep-freeze. 5. Cooking kettles, stainless. 6. Pans, bakery. <p>Johnson Wire Products Ltd.
1.2.3.</p> <p>Matthew Moody Division
6.</p> |
|--|--|

7340 CUTLERY AND FLATWARE

- 1. Stainless steel.
- Universal Die & Tool Mfg. Ltd.

7350 TABLEWARE

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Tableware, melamine. <p>Cyanamid of Canada Ltd.
1.</p> <p>Glenn S. Woolley & Co. Ltd.
1.2.</p> | <ul style="list-style-type: none"> 2. Tableware, plastic. <p>International Rubber & Plastics
2.</p> |
|---|--|

7360 SETS, KITS, AND OUTFITS: FOOD PREPARATION AND SERVING

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Cups, disposable. 2. Dinnerware, "In-Flight", disposable. <p>Capilano Engineering Ltd.
1.2.</p> | <ul style="list-style-type: none"> 3. Mess kits. <p>W. C. Wood Co. Ltd.
3.</p> |
|---|---|

GROUP 74**OFFICE MACHINES, VISIBLE RECORD EQUIPMENT,
AND DATA PROCESSING EQUIPMENT****7440 AUTOMATIC DATA PROCESSING SYSTEMS: INDUSTRIAL, SCIENTIFIC,
AND OFFICE TYPES**

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Computers, digital. 2. Computers, electronic. 3. Consoles, electronic. 4. Converters, digital-to-analogue. 5. Cores, memory array units. 6. Data analysis controls. | <ul style="list-style-type: none"> 7. Data processing. 8. Digital converters, groups. 9. Indicators, digital, display. 10. Memory systems. 11. Recorders, digital, read-out. |
|---|---|

Amphenol Canada Ltd.
9.

Aviation Electric Ltd.
7.

Bach-Simpson Ltd.
11.

CAE Industries Ltd.
8.

Canadian General Electric (D&SP)
2.7.

Canadian Marconi Co.
9.

Canadian Research Institute
4.

Canadian Westinghouse (Elec. & Def.
Prod.)
3.6.8.9.

Computing Devices of Canada Ltd.
1.2.3.4.5.6.7.9.10.

Ferranti Packard Ltd.
2.5.7.8.9.10.

Instronics Ltd.
7.8.

Marsland Engineering Ltd.
1.5.

Milltronics Ltd.
2.

R. H. Nichols Co. Ltd.
3.4.6.7.8.

Northern Electric Co. Ltd.
6.9.

Presentey Engineering Products Ltd.
4.7.

RCA Ltd.
2.5.8.10.

Raytheon Canada Ltd.
8.

7460 VISIBLE RECORD EQUIPMENT

Triona Products Ltd.

GROUP 75**OFFICE SUPPLIES AND DEVICES****7510 OFFICE SUPPLIES**

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Cellulose, transparent and coloured. 2. Cloth, coloured for packaging. <p>Canadian Technical Tape Ltd.
1.2.3.</p> | <ul style="list-style-type: none"> 3. Paper, creped for mashing. <p>Du Pont of Canada Ltd.
1.</p> |
|---|--|

7520 OFFICE DEVICES, ACCESSORIES

- 1. Baskets, waste paper.
- Johnson Wire Products Ltd.
1.

7530 STATIONERY AND RECORD FORMS

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Charts, recording. 2. Paper, cross section. <p>Canadian Charts & Supplies Ltd.
1.2.3.</p> | <ul style="list-style-type: none"> 3. Paper, graph. <p>Novatronics Ltd.
4.</p> |
|---|---|

GROUP 76**BOOKS, MAPS, AND OTHER PUBLICATIONS****7610 BOOKS AND PAMPHLETS**

1. Maintenance manuals.
2. Operating instructions.

Aircraft Industries of Canada Ltd.
1.2.3.4.
Aro of Canada Ltd.
1.2.3.4.
Aviation Electric Ltd.
1.2.3.4.
Canadair Ltd.
3.4.
Canadian Marconi Co.
1.2.3.4.

3. Parts lists.
4. Technical publications.

Computing Devices of Canada Ltd.
1.2.3.4.
Dowty Equipment of Canada Ltd.
1.2.3.4.
ITT Canada Ltd.
1.2.3.4.
Northwest Industries Ltd.
1.2.3.4.
United Aircraft of Canada Ltd.
1.2.3.4.

7640 MAPS, ATLASES, CHARTS AND GLOBES

1. Maps and charts from aerial survey.

Aero Photo Inc.
1.
Canadian Aero Service Ltd.
1.2.
General Photogrammetric Services Ltd.
1.2.

2. Maps and charts printed.

Lockwood Survey Corp. Ltd.
1.2.
McElhanney Surveying & Engineering
1.2.
Spartan Air Services Ltd.
1.2.

7690 MISCELLANEOUS PRINTED MATTER

1. Decals.

Beaver Decalcomania Co. Ltd.
1.

GROUP 78**RECREATIONAL AND ATHLETIC EQUIPMENT****7830 RECREATIONAL AND GYMNASIUM EQUIPMENT**

1. Curtains, dividing.
2. Mats, canvas, gymnasium.

Wm. Bartlett & Son Ltd.
1.2.3.

3. Trampolines.

S. E. Woods (Canvass Div.)
2.

GROUP 79**CLEANING EQUIPMENT AND SUPPLIES****7930 CLEANING AND POLISHING COMPOUNDS AND PREPARATIONS**

1. Cleaner, auto.
2. Polish, auto.

Union Carbide Canada Ltd.
1.2.

GROUP 80

BRUSHES, PAINTS, SEALERS, AND ADHESIVES

8010 PAINTS, DOPES, VARNISHES AND RELATED PRODUCTS

- | | |
|--------------------------|----------------------------|
| 1. Fluorescent coatings. | 8. Sealers, rubber. |
| 2. Lacquers. | 9. Thinners. |
| 3. Masonry block filler. | 10. Varnishes. |
| 4. Metal primers. | 11. Varnishes, insulating. |
| 5. Paints. | 12. Wire enamels. |
| 6. Removers, paint. | 13. Wood primers. |
| 7. Sealers, plastic. | |

Ardrox Limited.

6.

Canadian General Electric (Chem. Mat.)

11.12.

Canadian Industries Ltd.

1.2.3.4.5.8.9.10.11.13.

Cartier Chemicals Co. Ltd.

7.10.

Du Pont of Canada Ltd.

5.

B.F. Goodrich Canada Ltd.

7.8.

Uniroyal Ltd.

7.8.

8030 PRESERVATIVE AND SEALING COMPOUNDS

- | | |
|------------------------------------|--|
| 1. Alkyd resins. | 11. Epoxy sealants. |
| 2. Cement, waterproof. | 12. Polyester resins. |
| 3. Cloth, flameproof for ducts. | 13. Preservative, wood, pentachlorophenol. |
| 4. Coatings. | 14. Putty. |
| 5. Coatings, aluminum oxide. | 15. Resin, plastic. |
| 6. Coatings, aluminum, protective. | 16. Resins, phenolic and epoxy. |
| 7. Coatings, tungsten carbide. | 17. Tape, leak indicating. |
| 8. Compounds, mildew resistant. | 18. Urethane coatings. |
| 9. Compounds, sealing. | |
| 10. Epoxy cements. | |

H. L. Blachford Ltd.

2.4.10.11.

Canadian General Electric (Chem. Mat.)

1.12.

Canadian Industries Ltd.

1.4.6.9.18.

Canadian Technical Tape Ltd.

3.

Cartier Chemicals Co. Ltd.

4.6.13.

Champlain Power Products Ltd.

17.

Dow Chemical of Canada Ltd.

13.

Du Pont of Canada Ltd.

15.

B.F. Goodrich Canada Ltd.

4.9.11.15.

Leigh Instruments Ltd.

10.11.15.18.

The Steel Co. of Canada Ltd.

14.

Union Carbide Canada Ltd.

5.7.10.11.15.16.

Uniroyal Ltd.

4.8.9.12.15.18.

8040 ADHESIVES

- | | |
|---------------------------|--------------------------------|
| 1. Cement, rubber. | 4. Natural rubber base. |
| 2. Contact types. | 5. Resins, phenolic and epoxy. |
| 3. Flexible, waterproof. | 6. Synthetic rubber base. |
| Dunlop Canada Ltd. | Union Carbide Canada Ltd. |
| 2.4.6. | 5. |
| B.F. Goodrich Canada Ltd. | Uniroyal Ltd. |
| 1.3. | 1.4.5.6. |

GROUP 81

CONTAINERS, PACKAGING, AND PACKING
SUPPLIES

8105 BAGS AND SACKS

1. Bags, burlap.
2. Bags, cotton.
3. Bags, fabric.
4. Bags, jute.
5. Bags, packaged product.
6. Bags, paper, kraft.

Bartlett and Son Ltd.

3.

The Brantford Cordage Co.

9.12.

Du Pont of Canada Ltd.

9.12.

7. Bags, plastic, refuse.
8. Bags, polyethylene, dry cleaning.
9. Bags, woven, polyolefin.
10. Casings, food.
11. Sandbags.
12. Sandbags, woven polyolefin.

E. B. Eddy Co.

6.

Montreal Jute Industries Ltd.

1.2.4.11.

Union Carbide Canada Ltd.

5.7.8.10.

8110 DRUMS AND CANS

1. Aluminum.
2. Cans, fibre.
3. Containers, fibre.
4. Covers, fibre.
5. Covers, metal drum.
6. Drums, combination, plastic, steel and fibre for liquids.

Advanced Extrusions Ltd.

10.11.

Dominion Aluminum Fabricating Ltd.

1.8.10.11.

General Impact Extrusions

1.10.11.

Hassan Steel Fabricators Ltd.

5.8.11.

International Cooperage Co. of Canada

2.4.6.7.8.9.

7. Drums, fibre.
8. Drums, metal.
9. Drums, steel lined, food.
10. Tubes, metal, collapsible.
11. Tubes, metal, non-collapsible.

Montebello Metal Ltd.

1.10.11.

Renfrew Aircraft & Engineering Ltd.

1.5.8.

Sonoco Products Co. Ltd.

3.4.7.

R. J. Stampings Co. Ltd.

5.

8115 BOXES, CARTONS, AND CRATES

1. Boxes, aluminum.
2. Boxes, cartons, crates.
3. Boxes, fibreboard.
4. Boxes, metal shipping.
5. Boxes, plastic, insulated.
6. Boxes, plastic, small parts.
7. Boxes, plywood.
8. Boxes, wood.
9. Boxes, wood, wirebound.
10. Cases, beverage, plastic.

Albon Welding and Mechanical Works
Ltd.

1.4.11.

11. Container assemblies.
12. Containers, engine.
13. Containers, food.
14. Containers, wire, shipping.
15. Crates, export.
16. Crates, wood.
17. Kegs.
18. Pallets.
19. Shooks.
20. Tubings, jute.

ATCO Industries Ltd.

7.

8115-8120**8115 BOXES, CARTONS, AND CRATES (conc.)**

Bathurst Containers Ltd. 2.3.7.8.9.15.16.	Magline of Canada Ltd. 1.4.
Canadian General Electric (Plastics) 5.6.	McGuire Manufacturing Co. Ltd. 1.4.
Dominion Aluminum Fabricating Ltd. 1.	Montreal Jute Industries Ltd. 20.
Du Pont of Canada Ltd. 6.10.11.13.	Plastal Manufacturing Ltd. 5.6.
Dynamic Industries Inc. 4.	Polyfiber Ltd. 5.
Enamel & Heating Products Ltd. 1.	Renfrew Aircraft & Engineering Ltd. 1.4.11.
Fabricated Steel Projects Ltd. 1.4.5.	Somerville Industries Ltd. 5.6.
General Impact Extrusions 1.13.	Thompson Wood Products Ltd. 3.8.15.16.18.19.
Greening Industries Ltd. 14.	Tri-Service Fabricating Ltd. 1.12.
International Cooperaage Co. of Canada 9.17.18.19.	Union Carbide Canada Ltd. 6.10.13.
Livingstone Industries Ltd. 2.7.8.11.15.16.19.	

8120 COMMERCIAL AND INDUSTRIAL GAS CYLINDERS

1. Cylinders, acetylene.	8. Pressure vessels ond components.
2. Cylinders, compressed gas and components.	9. Tanks, liquid gas.
3. Cylinders, liquid gas.	10. Tanks, liquid receivers.
4. Cylinders, LP gas.	11. Tanks, pressure.
5. Flasks, steel.	12. Tanks, shipping, dry ice.
6. Flasks, steel, compressed.	13. Tanks, storage.
7. Manifolds, oxygen, acetylene, argon, nitrogen, helium and fuel gas.	14. Tanks, storing, dry ice.
	15. Tanks, various (small).
	16. Valves, high pressure.
Aro of Canada Ltd. 8.	Fromson Heat Transfer Ltd. 11.
Bristol Aerospace 1968 Ltd. 8.	Hassan Steel Fabricators Ltd. 8.9.11.12.14.
Canadian Liquid Air Ltd. 7.8.9.10.11.	James Howden & Parsons of Canada 8.11.
Canadian Vickers Ltd. 6.8.11.	James United Steel Ltd. 8.9.10.11.13.15.
Davie Shipbuilding Ltd. 8.9.12.13.	Hussman Refrigerator Co. Ltd. 8.10.15.
Dominion Bridge Co. Ltd. 8.9.	Keene of Canada Corp. Ltd. 8.11.
Drummond Welding & Steel Works Ltd. 8.13.	Kingston Shipyards 5.8.10.15.
Ferro Metal Ltd. 8.13.	MLW-Worthington Limited 8.
Foresteel Industries Ltd. 8.9.11.13.	Marine Industries Ltd. 6.8.
Foster Wheeler Ltd. 8.	Napanee Industries Ltd. 8.11.

8120 COMMERCIAL AND INDUSTRIAL GAS CYLINDERS (conc.)

National Steel Car Corp. Ltd.
5.

Railway Equipment
8.

Saskatchewan Steel Fabricators Ltd.
9.13.15.

Union Carbide Canada Ltd.
1.2.3.4.5.7.9.11.16.

Victoria Machinery Depot Co. Ltd.
8.9.10.11.13.15.

The Wabi Iron Works
2.

8125 BOTTLES AND JARS

1. Bottles, polyethylene.
2. Carboys, combination, plastic, fibre and steel.

International Cooperage Co. of Canada
2.

Union Carbide Canada Ltd.
1.3.

3. Carboys, polyethylene.

Valcartier Industries Inc.
1.

8130 REELS AND SPOOLS

1. Reels fibre.
2. Reels, metal.

Albon Welding & Mechanical Works
Ltd.

2.
Canadian General Electric (Plastics)

3.
International Cooperage Co. of Canada
1.3.

3. Reels, plastic.
4. Spools fibre.

Sonoco Products Co. Ltd.
1.4.

R. J. Stampings Co. Ltd.
2.

Zettel Manufacturing Ltd.
2.

8135 PACKAGING AND PACKING BULK MATERIALS

1. Acetate fibre.
2. Barriers, aluminum foil.
3. Barriers, grease proof.
4. Barriers, waterproof.
5. Cellulose, transparent and coloured.
6. Cloth, coloured for packaging.
7. Films, packaging.
8. Paper, creped for mashing.

Canadian Technical Tape Ltd.
1.5.6.8.9.10.11.13.

Dow Chemical of Canada Ltd.
2.3.4.7.

Du Pont of Canada Ltd.
12.

E.B. Eddy Co.
8.9.14.

9. Paper, flat for packaging.
10. Paper, volatile corrosion, inhibitor treated.
11. Paper, wrapping, plastic coated.
12. Strapping, nylon.
13. Tape, pressure sensitive.
14. Tubes, paper.

International Cooperage Co. of Canada
2.3.4.

Shawinigan Chemicals Ltd.
7.

Union Carbide Canada Ltd.
7.

8140 AMMUNITION BOXES, PACKAGES, AND SPECIAL CONTAINERS

1. Ammunition boxes, plastic.
2. Ammunition boxes, steel.
3. Ammunition containers.
4. Ammunition containers, fibre wound.
5. Boxes, ammunition, wood.
6. Containers, collapsible.
7. Containers, engine, shipping.

8. Containers, plastic.
9. Liners, cases, foam.
10. Steel boxes and containers.
11. Tubes, metal, shipping, collapsible.
12. Tubes, metal, shipping, non-collapsible.

8140

8140 AMMUNITION BOXES, PACKAGES, AND SPECIAL CONTAINERS (conc.)

Advanced Extrusions Ltd. 11.12.	International Rubber and Plastics 1.8.
Albon Welding & Mechanical Works Ltd. 6.10.	Livingstone Industries Ltd. 5.7.
ATCO Industriel Ltd. 6.10.	Robert Mitchell Co. Ltd. 2.10.
Bathurst Containers Ltd. 5.	Montebello Metal Ltd. 11.12.
Canadian General Electric (Plastics) 1.8.	McGuire Manufacturing Co. Ltd. 2.10.
Canron Ltd. (Structural Div.) 6.10.	National Steel Car Corp. Ltd. 10.
Dominion Aluminum Fabricating Ltd. 6.	Polyfiber Ltd. 1.
Du Pont of Canada Ltd. 1.8.	Renfrew Aircraft & Engineering Ltd. 10.
Dynamic Industries Inc. 7.10.	St. Lawrence Mfg. Co. 9.
Elco-Wood Industries Ltd. 7.10.	Somerville Industries Ltd. 1.8.
Enamel & Heating Products Ltd. 2.10.11.12.	Sonoco Products Co. Ltd. 4.7.
Fabricated Steel Products Ltd. 2.10.	Thompson Wood Products Ltd. 5.
General Impact Extrusions 8.11.12.	Union Carbide Canada Ltd. 8.
B.F. Goodrich Canada Ltd. 6.	Uniroyal Ltd. 9.
Hassan Steel Fabrications Ltd. 3.	Westeel-Rosco Ltd. 10.
Hussman Refrigerator Co. Ltd. 10.	Western Tools & Industries Ltd. 2.10.

GROUP 83

**TEXTILES, LEATHER, FURS, APPAREL AND SHOE
FINDINGS, TENTS, AND FLAGS**

8305 TEXTILE FABRICS

1. Cotton, braided & woven.
2. Fabrics, special products.
3. Filter cloth.

Bay Mills Ltd.
3.6.

Wm. Bartlett & Son Ltd.
2.

4. Harnesses, webbing.
5. Nylon, braided & woven.
6. Screen, insect, glass fabric.

Granby Elastic & Textiles Ltd.
1.5.

Ross-Smith (1969) Ltd.
4.

8335 SHOE FINDINGS AND SOLING MATERIALS

1. Insoles, thermal, woven.

International Rubber & Plastics Corp.
1.

8340 TENTS AND TARPAULINS

1. Covers, multi-application.
2. Pegs, tent, magnesium.
3. Poles, tent, telescopic.
4. Tarpaulins.

Wm. Bartlett & Son Ltd.
1.5.

Magline of Canada Ltd.
2.3.

Ross-Smith (1969) Ltd.
1.4.

5. Tents, canvas.
6. Tents, canvas, arctic.
7. Weatherlines, adjustable.

J. J. Turner Co. Ltd.
7.

S. E. Woods (Canvass Div.)
5.6.7.

8345 FLAGS AND PENNANTS

1. Cones, wind direction.

Wm. Barlett & Son Ltd.
1.2.

J. J. Turner Co. Ltd.
2.

2. Panels, signal, ground to air.

S. E. Woods (Canvass Div.)
1.

GROUP 84

CLOTHING, INDIVIDUAL EQUIPMENT,
AND INSIGNIA

8405 OUTWEAR, MEN'S

1. Berets.
2. Coats, outer, arctic.

Dorothea Knitting Mills Ltd.
1.3.

3. Hoods, cold weather.
4. Trousers, outer, arctic.

S. E. Woods (Sportswear Ltd.)
2.3.4.

8410 OUTWEAR, WOMEN'S

1. Berets.
2. Coats, outer, arctic.

Dorothea Knitting Mills Ltd.
1.3.

3. Hoods, cold weather.
4. Trousers, outer, arctic.

S. E. Woods (Sportswear Ltd.)
2.3.4.

8415 CLOTHING, SPECIAL PURPOSE

1. Clothing, arctic.
2. Gloves, household, rubber.
3. Gloves, industrial, rubber.
4. Gloves, veterinary, rubber.
5. Helmets, plastic.
6. Insoles, plastic, thermal.
7. Parkas.

Aro of Canada Ltd.
9.10.
Canadian General Electric (Plastics)
5.
Howmet of Canada Ltd.
2.3.4.
International Rubber & Plastics Ltd.
6.

8. Pressure breathing waistcoats.
9. Suits, fire fighting with integrated oxygen and/or air conditioning.
10. Suits, safety, heat protective, with integrated oxygen and/or air conditioning.

Irvin Air Chute Ltd.
8.
Polyfiber Ltd.
5.
Somerville Industries Ltd.
5.
S. E. Woods (Sportswear Ltd.)
1.7.

8430 FOOTWEAR, MEN'S

1. Heels, plastic & rubber.

International Rubber & Plastics Corp.
1.2.

2. Insoles, plastic, thermal.

8435 FOOTWEAR, WOMEN'S

1. Heels, plastic & rubber.

International Rubber & Plastics Corp.
1.2.

2. Insoles, plastic, thermal.

8460 LUGGAGE

1. Cases, canvas, multi-application.

Wm. Bartlett & Son Ltd.
1.

S. E. Woods (Canvas Div.)
1.

8465 INDIVIDUAL EQUIPMENT

1. Bags, duffe.
2. Bags, sleeping.
3. Belts, ammunition.
4. Belts, pistol.
5. Canteens, plastic.
6. Containers, fabric utility.

Aerometals Ltd.

11.

Wm. Bartlett & Son Ltd.

1.6.12.

Canadian General Electric (Plastics)

5.

International Rubber & Plastics Corp.

5.

Magline of Canada Ltd.

11.

7. Haversacks, respirator.
8. Mattresses, pneumatic.
9. Packboards.
10. Packsacks.
11. Snowshoes, magnesium.
12. Web equipment.

J. J. Turner Co. Ltd.

2.

Uniroyal Ltd.

8.

S. E. Woods (Canvass Div.)

1.3.4.6.7.9.10.

S. E. Woods (Sportswear) Ltd.

2.

8475 SPECIALIZED FLIGHT CLOTHING AND ACCESSORIES

1. Anti "G" suits.

Irvin Air Chute Ltd.

1.

GROUP 91**FUELS, LUBRICANTS, OILS, AND WAXES****9135 LIQUID PROPELLANT FUELS AND OXIDIZERS: CHEMICAL BASE**

1. Propellant, nitrogen aerosol.

Canadian Liquid Air Ltd.

1.

Union Carbide Canada Ltd.

1.

9150 OILS AND GREASES: CUTTING, LUBRICATING AND HYDRAULIC

1. Anti-friction compound.

Union Carbide Canada Ltd.

1.2.

2. Automotive brake fluid.

GROUP 93

NON-METALLIC FABRICATED MATERIALS

9310 PAPER AND PAPERBOARD

E. B. Eddy Co.

9320 RUBBER FABRICATED MATERIALS

1. Belting, conveyor.
2. Extruded shapes.
3. Extrusion, rubber.
4. Fabrication, rubber and silicone.
5. Matting.
6. Moulded shapes.

Dunlop Canada Ltd.
1.3.4.

B. F. Goodrich Canada Ltd.
1.2.3.5.6.7.8.9.10.

International Rubber & Plastics Corp.
4.6.

Mansfield-Denman General Ltd.
3.6.10.

7. Rubber coated fabrics.
8. Rubber foam sheets.
9. Rubber sheets.
10. Rubber sponge materials.
11. Rubber stripping.

The Ontario Rubber Co.
6.11.

Standard Products (Canada)
2.3.4.6.10.11.

Thompson-Gordon Ltd.
2.3.6.9.11.

Uniroyal Ltd.
1.4.6.7.8.9.10.

9330 PLASTICS FABRICATED MATERIALS

1. Blow-mouldings.
2. Fabricated plastic sections and assemblies.
3. Mouldings, acrylic.
4. Mouldings, delrin.
5. Mouldings, nylon.
6. Mouldings, polycarbonate.
7. Mouldings, polypropylene.
8. Mouldings, polystyrene.
9. Nylon resins.
10. Phenolic compounds.
11. Phenolic and epoxy laminates.
12. Phenolic moulded shapes.
13. Phenolic resins.

The Brantford Cordage Co.
24.

Bristol Aerospace 1968 Ltd.
2.18.

Canadair Ltd.
11.

Canadian Car (Fort William)
8.18.

Canadian General Electric (Plastics)
1.2.8.11.15.18.

Canadian Industries Ltd.
14.19.20.21.22.

Cyanamid of Canada Ltd.
12.17.18.

14. Plastic coated fabrics.
15. Plastic extruded shapes.
16. Plastic injection moulding.
17. Plastic laminates.
18. Plastic moulded shapes.
19. Plastic sheet.
20. Polyethylene film.
21. Polyethylene film and tubing.
22. Polyethylene resins.
23. Polymers cardeplex.
24. Sheeting, plastic polyallomer.
25. Transparent cellulose film.
26. Urethane foam.

Du Pont of Canada Ltd.
9.20.22.25.

Fenn-Dor Plastics Ltd.
16.

Fleet Manufacturing Ltd.
2.17.18.26.

B. F. Goodrich Canada Ltd.
14.15.18.26.

Graphico Precision Works Ltd.
2.

Hand Chemical Industries Ltd.
7.8.16.

International Rubber & Plastics Corp.
3.4.5.6.7.8.16.18.

9330 PLASTICS FABRICATED MATERIALS (conc.)

Kingston Shipyards 18.	Space Circuits Ltd. 2.11.
Mansfield-Denman General Ltd. 15.18.	Sperry Gyroscope of Ottawa Ltd. 3.4.5.6.7.10.16.18.26.
Northwest Industries Ltd. 2.11.14.18.	Tywood Industries Ltd. 2.
O. & W. Electronics Ltd. 2.11.	Union Carbide Canada Ltd. 2.9.10.11.13.15.17.18.19.20.21.22.23.
Plastal Manufacturing Ltd. 2.18.	Uniroyal Ltd. 2.14.19.22.26.
Polyfiber Ltd. 2.8.15.18.	Valcartier Industries Inc. 1.2.7.8.16.18.
Scepter Mfg. Co. Ltd. 15.16.18.	Valeriot Electronics Ltd. 2.18.
Shawinigan Chemicals Ltd. 14.17.19.	Glenn S. Woolley & Co. Ltd. 18.
Somerville Industries Ltd. 2.11.15.18.	Xyno-matic Plastics Ltd. 2.3.4.5.6.7.18.

9340 GLASS FABRICATED MATERIALS**1. Mats, re-inforcing, fibrous glass.**

Bay Mills Ltd.
1.

9350 REFRACTORIES AND FIRE SURFACING MATERIALS**1. Borides.****2. Bricks, refractory, carbon and graphite.****3. Carbides.****4. Cement, refractory.**

Hamilton Porcelains Ltd.

5.

Norton Research Corp. (Canada)

1.3.6.7.8.

5. Ceramics.**6. Magnesia, fused.****7. Nitrides.****8. Silicides.**

Union Carbide Canada Ltd.

2.4.

GROUP 95

METAL BARS, SHEETS, AND SHAPES

9505 WIRE, NON-ELECTRICAL, IRON AND STEEL

- 1. Wire, barbed.
- 2. Wire, cloth.
- 3. Wire, fencing.
- 4. Wire, galvanized.

A.I.M. Steel Ltd.
3.
Atlas Steels Co.
5.
Donald Ropes & Wire Cloth Ltd.
2.

- 5. Wire, high alloy.
- 6. Wire, steel, H.C.
- 7. Wire, steel, L.C.
- 8. Wire, tinned steel.

Greening Industries Ltd.
2.4.6.7.8.
The Steel Co. of Canada Ltd.
1.3.4.6.7.8.
Union Carbide Canada Ltd.
5.

9510 BARS AND RODS, IRON AND STEEL

- 1. Bars, re-inforcing.
- 2. Bars, round.
- 3. Bars, spring steel.
- 4. Bars, square.
- 5. Bars, steel, alloy.
- 6. Bars, steel, carbon.
- 7. Bars, steel, stainless.

Atlas Steels Co.
2.4.5.6.7.11.12.
Deloro Stellite
13.
Dominion Bridge Co. Ltd.
1.2.4.6.8.9.
Railway Equipment
1.2.4.5.6.7.

- 8. Half ovals.
- 9. Half rounds.
- 10. Hexagons.
- 11. High speed steels.
- 12. Rods, drill.
- 13. Rods, stellite.
- 14. Special sections.

The Steel Co. of Canada Ltd.
1.2.3.4.5.6.8.9.10.
Union Carbide Canada Ltd.
5.
Western Canada Steel Ltd.
1.2.4.5.6.7.14.

9515 PLATE, SHEET, AND STRIP: IRON AND STEEL

- 1. Abrasion resistant.
- 2. Boiler.
- 3. Carbon.
- 4. Circles.
- 5. Cold rolled carbon.
- 6. Firebox.
- 7. Flange.
- 8. Galvanized.
- 9. Galvanized wiped coat for painting.
- 10. Hot rolled carbon.
- 11. Low alloy high-tensile.
- 12. Metal, expanded.
- 13. Perforated sheet metal.
- 14. Plate, tunnel liner, steel.
- 15. Plate and strip.
- 16. Plates, black, steel.
- 17. Plates, blue, steel.

Armco Drainage & Metal Products
14.25.

- 18. Porcelain, enamelling.
- 19. Prepainted.
- 20. Sheet & strip, steel cold-rolled.
- 21. Sheet & strip, steel, galvanized.
- 22. Sheet & strip, steel, hot-rolled.
- 23. Sheet & strip, steel, silicon, electrical.
- 24. Sheet, zinc coated, carbon steel.
- 25. Sheets, steel.
- 26. Sheets, steel, aircraft.
- 27. Sheets, steel, "Haynes" alloys.
- 28. Sheets, steel, high alloy.
- 29. Ship.
- 30. Special grades.
- 31. Stainless.
- 32. Structural.
- 33. Tin plate, electrolytic & hot dipped.

Atlas Steels Ltd.
15.31.

9515 PLATE, SHEET, AND STRIP: IRON AND STEEL (conc.)

Crucible Steel of Canada Ltd.
28.31.

Dominion Foundries & Steel Ltd.
16.17.21.22.23.24.33.

Donald Ropes & Wire Cloth Ltd.
13.

Greening Industries Ltd.
13.

Napanee Industries Ltd.
13.

The Pedlar People Ltd.
12.

The Steel Co. of Canada Ltd.
1.2.3.4.5.6.7.8.9.10.11.15.18.19.
20.29.30.32.

Union Carbide Canada Ltd.
26.27.28.

The Union Screen Plate Co. Ltd.
13.

Westeel-Rosco Ltd.
14.18.25.

Western Canada Steel Ltd.
3.5.10.14.

9520 STRUCTURAL SHAPES, IRON AND STEEL**1. Angles.**

Dominion Foundries & Steel Ltd.
2.

2. Sections.

The Steel Co. of Canada Ltd.
1.2.

9525 WIRE, NON-ELECTRICAL, NON-FERROUS BASE METAL**1. Aluminum.****2. Brass, bronze, copper, flat.****3. Brass, bronze, copper, round.**

Aluminum Co. of Canada
1.

Anaconda American Brass Ltd.
2.3.

Canada Wire & Cable Co. Ltd.
2.3.

4. Inconel.**5. Monel.****6. Nickel.**

Greening Industries Ltd.
1.2.3.4.5.6.

Noranda Copper Mills Ltd.
2.3.

9530 BARS AND RODS, NON-FERROUS BASE METAL**1. Aluminum.****2. Aluminum extrusions.****3. Brass.****4. Bronze.**

Aluminum Co. of Canada Ltd.
1.2.

Anaconda American Brass Ltd.
3.4.5.

Atlas Titanium Ltd.
7.

5. Copper and alloys.**6. Magnesium.****7. Titanium.**

Dominion Magnesium Ltd.
6.

Noranda Copper Mills Ltd.
3.4.5.

Reynolds Extrusion Co. Ltd.
1.2.

9535 PLATE, SHEET, STRIP AND FOIL: NON-FERROUS BASE METAL**1. Aluminum.****2. Aluminum, re-draw rod.****3. Brass strip (small arms cartridge cases).****4. Bronze.****5. Cobalt strip.****6. Copper.**

Aluminum Co. of Canada Ltd.
1.7.

7. Foil, aluminum.**8. Foil, lead.****9. Nickel, strip.****10. Perforated sheet metal.****11. Titanium.****12. Zinc.****13. Zinc and zinc copper titanium alloy.**

Anaconda American Brass Ltd.
3.4.6.

9535-9545

9535 PLATE, SHEET, STRIP AND FOIL NON-FERROUS BASE METAL (conc.)

Atlas Titanium Ltd.
11.

Canada Foils Ltd.
7.8.

Clevite Burgess Ltd.
12.13.

Donald Ropes & Wire Cloth Ltd.
10.

Greening Industries Ltd.
10.

Napanee Industries Ltd.
10.

Noranda Copper Mills Ltd.
3.4.6.

Reynolds Extrusion Co. Ltd.
2.

Sherritt Gordon Mines Ltd.
5.9.

9540 STRUCTURAL SHAPES, NON-FERROUS BASE METAL

1. Aluminum.
2. Bronze.

Aluminum Co. of Canada Ltd.
1.

Anaconda American Brass Ltd.
2.3.

3. Copper.
4. Magnesium.

Dominion Magnesium Ltd.
4.

Reynolds Extrusion Co. Ltd.
1.

9545 PLATE, SHEET, STRIP, FOIL, AND WIRE: PRECIOUS METAL

1. Platinum.
2. Sheets, gold.
3. Sheets, silver.

Handy & Harman of Canada Ltd.
1.2.3.4.5.

4. Wire, gold.
5. Wire, silver.

Johnson Matthey & Mallory Ltd.
1.2.3.4.5.

GROUP 96

ORES, MINERALS, AND THEIR PRIMARY PRODUCTS

9610 ORES

1. Radioactive metal ores.

Atomic Energy of Canada Ltd.

9620 MINERALS, NATURAL AND SYNTHETIC

1. Carbon graphite products.

Union Carbide Canada Ltd.

9630 ADDITIVE METAL MATERIALS AND MASTER ALLOYS

- | | |
|-------------------------------|---|
| 1. Barium, | 18. Manganese metal. |
| 2. Calcium. | 19. Metal molybdenum. |
| 3. Calcium—manganese silicon. | 20. Metal powders (spherical). |
| 4. Calcium—silicon. | 21. Metal tungsten. |
| 5. Chromium metal. | 22. Molybdenum disilicide. |
| 6. Ferroalloys. | 23. Molybdenum single crystal, powder. |
| 7. Ferroboron. | 24. Silicon metal. |
| 8. Ferrochrome. | 25. Strontium. |
| 9. Ferrocolumbium. | 26. Tantalum, single crystals. |
| 10. Ferromanganese. | 27. Thorium. |
| 11. Ferromolybdenum. | 28. Thorium-magnesium. |
| 12. Ferrosilicon. | 29. Titanium carbide. |
| 13. Ferrotantalum. | 30. Titanium monoxide. |
| 14. Ferrotitanium. | 31. Titanium sesquioxide. |
| 15. Ferrotungsten. | 32. Tungsten powder and single crystal. |
| 16. Ferrovanadium. | 33. Zirconium alloy. |
| 17. Magnesium nickel. | 34. Zirconium copper. |

Dominion Magnesium Ltd.

1.2.17.25.27.28.34.

Geo-Met Reactors Ltd.

9.11.14.15.16.19.21.

Union Carbide Canada Ltd.

3.4.5.6.7.8.9.10.12.13.14.15.16.18.20.

22.23.24.26.29.30.31.32.33.

9640 IRON AND STEEL PRIMARY AND SEMIFINISHED PRODUCTS

- | | |
|-------------|---------------|
| 1. Billets. | 3. Pigs—iron. |
| 2. Ingots. | |

The Steel Co. of Canada Ltd.

1.2.3.

Western Canada Steel Ltd.

2.

9650 NON-FERROUS BASE METAL REFINERY AND INTERMEDIATE FORMS

- | | |
|-----------------------|------------------------|
| 1. Aluminum ingot. | 7. Copper. |
| 2. Brass. | 8. Magnesium billets. |
| 3. Bronze. | 9. Magnesium ingots. |
| 4. Cobalt briquettes. | 10. Nickel briquettes. |
| 5. Cobalt powders. | 11. Nickel powders. |
| 6. Cobalt strip. | 12. Nickel strip. |

Aluminum Co. of Canada Ltd.

1.

Anaconda American Brass Ltd.

2.3.7.

Dominion Magnesium Ltd.

8.9.

Sherritt Gordon Mines Ltd.

4.5.6.10.11.12.

GROUP 99

MISCELLANEOUS

9905 SIGNS, ADVERTISING DISPLAYS, AND IDENTIFICATION PLATES

1. Plates, designation.

3. Plates, instruction.

2. Plates, identification.

Beaver Decalcomania Co. Ltd.

Yarrows Ltd.

1.2.3.

2.

O. & W. Electronics Ltd.

1.2.3.

9930 MEMORIAL, CEMETARIAL AND MORTUARY EQUIPMENT AND SUPPLIES

1. Pouches, burial.

Wm. Bartlett & Son Ltd.

J. J. Turner Co. Ltd.

1.

1.

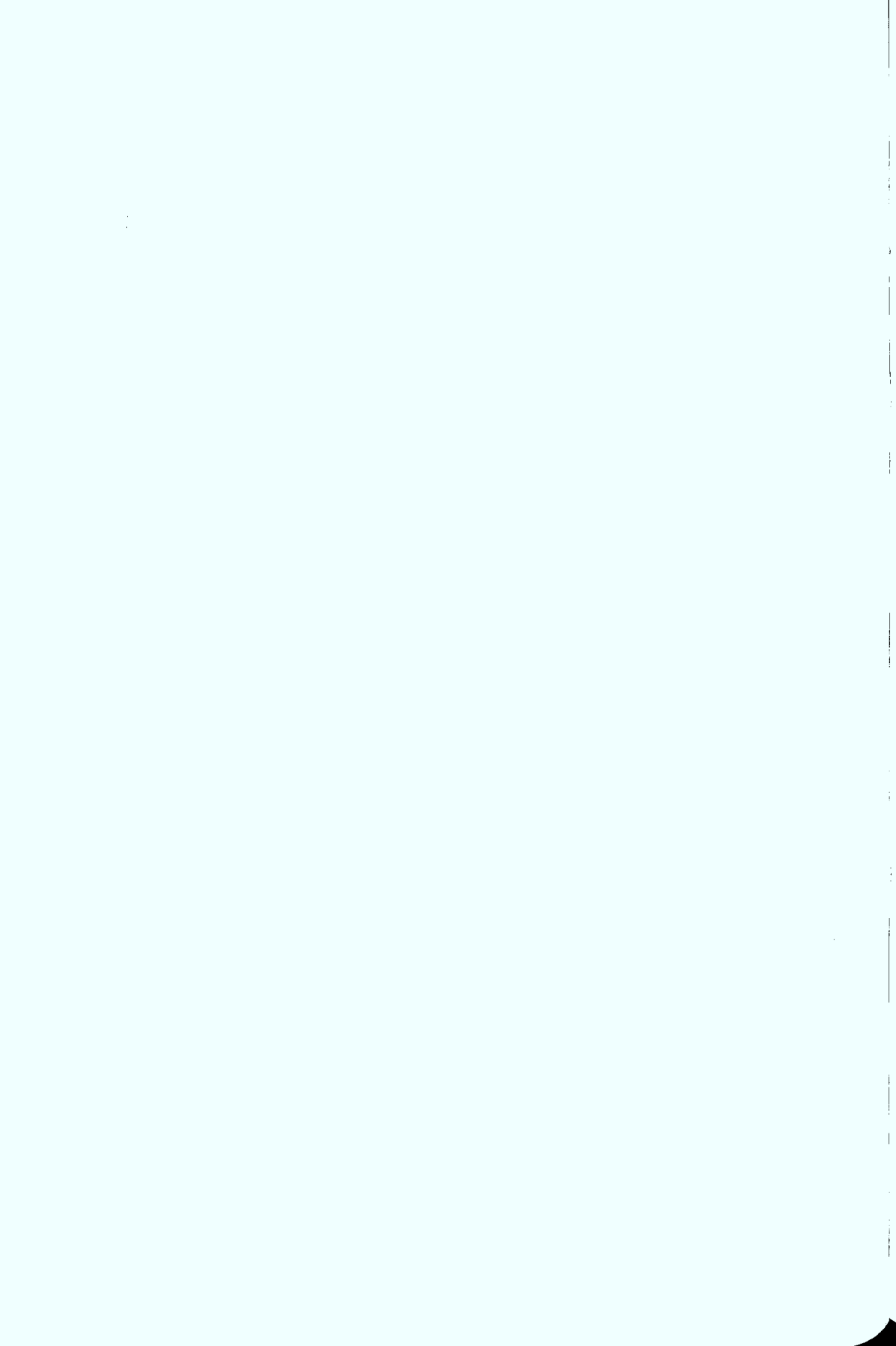
9999 MISCELLANEOUS ITEMS

**1. Pulping machines, document
destruction.**

Black Clawson-Kennedy Ltd.

1.

SECTION
“B”
INDEX OF SERVICES



AERIAL SURVEYING, MAPPING AND SERVICES

Because much of Canada's great wealth in natural resources lies to the north of the populated areas the science of aerial surveying and mapping has been developed to a very high degree. In such varied fields as the search for minerals, taking inventory of forest resources, mapping, air photo interpretation and measuring distances, Canadian companies have gained wide experience and have developed the most modern of techniques. Canadian aerial surveyors have worked over the five continents at the request of many countries who realized that proven experience and equipment would resolve their sometimes unique and always varied problems.

AERIAL SURVEYING, MAPPING AND SERVICES

1. Aerial photography.
2. Air photo interpretation.
3. Airborne distance measuring.
4. Airborne geophysics.
5. Computer mapping.
6. Control surveys.
7. Forest inventory and forest engineering.
8. Geodetic surveys.
9. Geological and geophysical surveys.
10. Instrument designs.
11. Land-use surveys.
12. Magnetometer surveys.
13. Photogrammetric plotting and map production.
14. Relief models.

Aero Photo Inc.
1.2.6.7.8.11.12.13.

Barringer Research Ltd.
4.12.

Canadian Aero Service Ltd.
1.2.3.4.5.6.7.9.11.13.14.

General Photogrammetric Services
1.2.4.5.6.7.8.9.11.12.13.

Leigh Instruments Ltd.
10.

Lockwood Survey Corp. Ltd.
1.2.3.4.5.6.7.9.10.11.

McElhanney Surveying & Engineering Ltd.
1.2.3.6.7.8.11.13.

Okanagan Helicopters Ltd.
1.4.6.7.9.11.

Spartan Air Services Ltd.
1.2.3.4.5.6.7.9.11.13.14.

Survair Ltd.
1.2.3.4.6.8.9.11.12.13.

Terra Surveys Ltd.
1.2.3.4.6.8.9.11.12.

ANTENNA, ANTENNA FARM AND SURFACE INSTALLATIONS

1. Antenna farms.
2. Microwave, scatter.
3. Radar.

A.I.M. Steel Ltd.
1.5.

Andrew Antenna Co. Ltd.
1.5.6.

Acres Intertel Ltd.
1.2.3.4.5.6.

CAE Industries Ltd.
1.2.3.4.

Canadian Bridge Div.
1.5.

Canadian General Electric (D&SP)
1.3.4.

Canadian Marconi Co.
1.2.3.4.

Canadian Westinghouse (Elec. & Def. Prod.)
1.2.3.4.5.

Canron Ltd. (Structural Div.)
1.2.3.4.5.

Computing Devices of Canada Ltd.
4.

4. Radio, navigational aid sites.
5. Steel towers, antenna.
6. Telecon cable systems.

Dominion Bridge Co. Ltd.
5.

E.M.I. Electronics
1.2.3.4.5.

ITT Canada Ltd.
1.2.3.4.

Leigh Instruments Ltd.
3.4.

Lenkurt Electric Co. of Canada Ltd.
2.

Locweld & Forge Products Ltd.
5.

Northern Electric Co. Ltd.
1.2.3.4.6.

RCA Ltd.
2.4.

Raytheon Canada Ltd.
2.3.4.

CASTINGS

1. Aluminum.
2. Aluminum, die casting.
3. Aluminum, permanent mould.
4. Brass.
5. Brass, die casting.
6. Brass, permanent mould.
7. Bronze.
8. Bronze, die casting.
9. Bronze, permanent mould.
10. Carbon steel.
11. Copper.
12. Copper, permanent mould.
13. Domite, cm.
14. Grey-iron.
15. Investment, lost wax, ferrous.
16. Investment, lost wax, non-ferrous.
17. Iron.
18. Iron, armoured.
19. Iron, ductile.

Abex Industries (Joliette Div.)
10.17.26.31.33.

Aluminum Foundry & Pattern Works
1.7.

Auto Specialties Mfg. Co.
21.

Babcock & Wilcox Canada Ltd.
3.16.

20. Iron, malleable.
21. Iron, malleable, pearlitic.
22. Iron, nodular.
23. Magnesium.
24. Magnesium, die casting.
25. Magnesium, permanent mould.
26. Manganese, steel.
27. Meehanite.
28. Monel.
29. Ni-resist, up to 500 lbs.
30. Ni-resist, up to 8000 lbs.
31. Steel.
32. Steel, up to 150 tons.
33. Steel, high alloy.
34. Steel, stainless.
35. Steel, stainless up to 3000 lbs.
36. Zinc.
37. Zinc, die casting.
38. Zinc, die casting, miniature.

Barber Die Casting Co. Ltd.
2.5.24.37.

Beach Foundry Ltd.
14.19.29.

Black Clawson-Kennedy Ltd.
4.7.10.14.17.19.22.29.30.31.33.34.35.

CAE Machinery Ltd.
10.17.26.27.31.34.

CASTINGS (conc.)

Canadian Bronze Co. Ltd.
1.3.4.6.7.9.11.12.

Canadian Bronze (Central Div.)
1.3.7.9.

Canadian General Electric (Meter & Inst.)
2.

Canadian Marconi Co.
15.16.

Canadian Steel Foundries
18.19.27.31.32.34.

Canron Ltd. (Foundry Div.)
13.14.17.19.20.30.31.33.

Cercast Inc.
1.4.7.11.16.

Chrysler Canada Ltd.
1.14.

Coulter Copper & Brass Co. Ltd.
1.4.7.11.

Deloro Stellite
15.16.31.34.

Designed Precision Castings
15.16.

Dominion Engineering Works Ltd.
14.17.19.27.

Dominion Foundries & Steel Ltd.
32.33.34.

Dominion Lock Co. Ltd.
1.4.5.7.8.36.37.

Enamel & Heating Products Ltd.
14.

Findlays Ltd.
14.

Fisher Gauge Works Ltd.
38.

Forano Ltd.
14.19.30.

Haley Industries Ltd.
1.3.23.25.

John T. Hepburn Ltd.
14.17.19.27.

Holmes Foundry Ltd.
14.19.22.

Indiana Steel Products Co. Ltd.
33.35.

Industrial Fine Castings Ltd.
3.9.15.16.

International Malleable Iron Co. Ltd.
14.20.21.

Johnson Matthey & Mallory Ltd.
1.4.7.11.

Kelsey-Hayes Canada Ltd.
14.17.

Local Industries Ltd.
1.4.7.11.

Lightning Fastener Co. Ltd.
38.

Lunenburg Foundry & Engineering Ltd.
1.4.7.14.

Neptune Meters Ltd.
1.4.7.11.

Otaco Ltd.
14.19.31.

Outboard Marine Corp.
2.24.

Port Arthur Shipbuilding
1.4.7.14.17.19.29.30.

Preston Foundries Ltd.
14.19.27.

Progressive Engineering Works Ltd.
14.33.

N. Slater Co.
1.

Supreme Precision Castings Ltd.
1.4.7.11.15.16.27.31.34.

The Union Screen Plate Co. Ltd.
1.4.7.11.

Vestshell Inc.
10.15.26.27.28.31.33.34.

Victoria Machinery Depot Co. Ltd.
1.4.7.10.14.31.33.

The Wabi Iron Works Ltd.
17.19.

Wallaceburg Brass Ltd.
2.5.8.

Western Canada Steel Ltd.
31.

CONSULTING AND DESIGN SERVICES

1. Aerial engineering, survey and construction techniques.
 2. Aerodynamic.
 3. Aircraft, interiors and structural mods.
 4. Airports fire and crash equipment.
 5. Analysis, automation and control.
 6. Analysis, communications networks.
 7. Analysis, electromagnetic interference.
 8. Analysis, radio propagation.
 9. Arctic ground transportation equipment.
 10. Cargo handling systems.
 11. Cells, photoelectric.
 12. Ceramic, inorganic materials.
 13. Clothing, special, woven, thermal.
 14. Chemical engineering.
 15. Communications.
 16. Computers.
 17. Control systems, electric.
 18. Control systems, hydraulic.
 19. Control systems shipboard.
 20. Controls, flight, powered.
 21. Cryogenics.
 22. Diving equipment, scuba.
 23. Docking facilities.
 24. Drying equipment, film, microwave.
 25. Electrical power, distribution and control.
 26. Electronic.
 27. Fire control equipment and systems, optical-mechanical.
 28. Explosive devices and powders.
 29. Fluidic devices and systems.
 30. Fuel systems, marine boiler.
 31. Housing systems, air and surface transportable.
 32. Helicopter-aerial construction techniques and services.
 33. Hydraulics, (Pumps, etc.)
 34. Landing gear, aircraft.
 35. Landing gear, helicopter.
 36. Lasers.
 37. Laser communications.
 38. Lenses, air reconnaissance, etc.
 39. Life support equipment.
 40. Machines and tools.
 41. Magnesium product development.
 42. Marine.
 43. Material handling.
 44. Mechanical.
 45. Metallurgical.
 46. Mining installations.
 47. Navigation equipment.
 48. Nuclear particle detection.
 49. Operational research.
 50. Optics.
 51. Optical systems.
 52. Parachute equipment.
 53. Plasma physics.
 54. Plastics.
 55. Pulp and paper machinery.
 56. Radioisotope employment.
 57. Replenishment systems, shipboard.
 58. Resource development, planning and engineering.
 59. Rubber and plastics.
 60. Seals, metallic, static and dynamic.
 61. Semi-conductor research.
 62. Sights and sighting systems, optical-mechanical.
 63. Sonar, mechanical.
 64. Structural steel.
 65. Systems, actuation.
 66. Structures, air transportable.
 67. Systems design, electrical circuit.
 68. Systems, electro mechanical.
 69. Systems engineering and analysis, digital computer.
 70. Systems engineering and analysis, digital information.
 71. Systems engineering and analysis, micro-wave.
 72. Systems engineering and analysis, radio.
 73. Systems engineering and analysis, satellite.
 74. Systems engineering and analysis, scatter.
 75. Transportation logistics.
 76. Vehicles, tracked.
 77. Weapons, small arms, including ancillaries and ordnance gauges.
 78. Window systems.
- Abex Industries (Aerospace Div.)
20.34.35.65.68.
- Acres Intertel Ltd.
4.6.7.8.11.15.47.49.69.70.71.72.73.74.
- Advanced Dynamics Corp. Ltd.
40.44.
- Andrew Antenna Co. Ltd.
8.15.26.74.
- Atco Industries Ltd.
44.
- Atco Research & Development
10.31.66.
- Atlantic Aviation of Canada Ltd.
3.
- Atomic Energy of Canada Ltd.
56.
- Aviation Electric Ltd.
16.26.29.47.68.
- Barringer Research Ltd.
26.
- Beach Foundry Ltd. (Fleck Div.)
43.44.55.
- Beclawat (Canada) Ltd.
78.

CONSULTING AND DESIGN SERVICES (cont'd)

Bedard-Gerard Ltd.
25.
Boeing of Canada Ltd.
2.
Bombardier Snowmobile Ltd.
9.
Bristol Aerospace 1968 Ltd.
28.
CAE Industries Ltd.
15.26.
Canadair Ltd.
2.9.44.76.
Canadian Arsenals Ltd. (Filling Div.)
28.
Canadian Arsenals Ltd. (Small Arms Div.)
77.
Canadian Bridge Div.
64.
Canadian General Electric (D&SP)
15.26.44.
Canadian General Electric (Plastics)
54.
Canadian Industries Ltd.
14.
Canadian Marconi Co.
15.16.26.47.
Canadian Research Institute
26.
Canadian Vickers Ltd.
42.44.
Canadian Westinghouse (Elect. & Def. Prod.)
15.26.42.44.
Canron Ltd. (Foundry Div.)
45.
Chemical Projects Ltd.
14.21.
Collins Radio Co. of Canada Ltd.
71.72.
Computing Devices of Canada Ltd.
2.15.16.26.42.44.47.69.70.
Cope Tool Design Co. Ltd.
40.
De Havilland Aircraft of Canada
2.42.
Demers, Gordon Ltd.
5.15.16.26.47.49.69.70.
Devtek Ltd.
24.
Douglas Aircraft Canada
40.
Dowty Equipment
34.35.
E.M.I. Electronics
15.26.47.
Fleet Manufacturing Ltd.
18.44.63.
Flextrac-Nodwell
76.
Forano Ltd.
44.45.
Garrett Manufacturing Ltd.
16.19.26.42.57.
Geo-Met Reactors Ltd.
45.
Go-Tract Ltd.
9.76.
B.F. Goodrich Canada Ltd.
42.44.54.59.
Heroux Ltd.
33.34.
Indesco Ltd.
4.15.23.40.43.46.54.
Instronics Ltd.
11.15.26.47.
International Rubber & Plastics Corp.
13.22.
Irvin Air Chute Ltd.
39.54.
James United Steel Ltd.
40.43.44.46.47.54.55.
George Kelk Ltd.
26.68.69.70.
Leigh Instruments Ltd.
1.2.5.11.15.26.47.70.71.
Ernst Leitz Canada Ltd.
27.36.38.50.51.62.
Lenkurt Electric Co. of Canada Ltd.
6.8.15.26.71.72.74.
Lockwood Survey Corp. Ltd.
1.58.
Lucas-Rotax Ltd.
18.30.33.
Magline of Canada Ltd.
41.43.
Master Mechanical Manufacturing Ltd.
40.43.44.
National Semiconductors Ltd.
11.
R. H. Nichols Co. Ltd.
26.
Northern Electric Co. Ltd.
15.26.47.
Northwest Industries Ltd.
54.
Norton Research Corp. (Canada)
12.
Okanagan Helicopters Ltd.
32.

CONSULTING AND DESIGN SERVICES (conc.)

Omicron Data Systems 5.6.8.11.15.26.49.69.70.72.	V. W. Ruskin & Associates Engineering 15.44.
Orenda Ltd. 16.44.45.76.	Somerville Industries Ltd. 4.54.
Philips Electronics Industries Ltd. 15.	Spar Aerospace Products Ltd. 15.26.44.72.
Polyfiber Ltd. 54.	Standard-Modern Tool Co. Ltd. 40.44.
Polymer Corp. Ltd. 59.	Strite Industries Ltd. 60.
Presentey Engineering Products Ltd. 26.44.	Syntron (Canada) Ltd. 17.67.
Pyrene Mfg. Co. Canada Ltd. 4.	T.M.C. (Canada) Ltd. 15.26.
RCA Ltd. 15.16.26.37.48.53.62.	Unica Research Co. Ltd. 75.
Raytheon Canada Ltd. 15.26.47.	Uniroyal Ltd. 14.42.43.54.59.
Rolls-Royce of Canada Ltd. 44.	Victory Conveyor & Machine Reg'd. 43.

DEFENCE SYSTEM MANAGEMENT

Acres Intertel Ltd.	Canadian Westinghouse (Elec. & Def. Prod.)
Advanced Dynamics Corp. Ltd.	Computing Devices of Canada Ltd.
Aviation Electric Ltd.	Leigh Instruments Ltd.
Bristol Aerospace 1968 Ltd.	Northern Electric Co. Ltd.
Canadair Ltd.	RCA Ltd.
Canadian General Electric (D&SP)	Spar Aerospace Products Ltd.
Canadian Marconi Co.	

FORGINGS

1. Aircraft.
2. Aluminum.
3. Artillery, shell.
4. Automotive.
5. Barrels, ordnance.
6. Brass.
7. Bronze.
8. Cold formed.
9. Copper.
10. Mining and construction.
11. Monel metal.

Atlas Steels Co.

4.17.18.19.

Canada Forgings Ltd.

1.3.4.6.9.10.11.12.13.15.16.17.18.21.

Crucible Steel of Canada Ltd.

17.

Dominion Chain Co. Ltd.

17.

Dominion Forge Ltd.

4.8.17.20.

Johnson Matthey & Mallory Ltd.

6.7.

Lacal Industries Ltd.

1.2.6.7.15.17.20.

12. Ordnance.
13. Railroad.
14. Shell, armour piercing.
15. Stainless.
16. Steam traps.
17. Steel.
18. Titanium.
19. Titanium alloys.
20. Upset.
21. Valve bodies.

National Steel Car Corp. Ltd.

3.17.

Railway Equipment.

5.8.13.17.20.

N. Slater Co.

6.17.20.

The Steel Co. of Canada Ltd.

17.

Thompson Products Ltd.

4.8.14.17.20.

Wallaceburg Brass Ltd.

2.6.7.

Welland Forge Ltd.

2.4.6.7.17.20.

MACHINING

1. Aircraft components.
2. Electrical discharge machining.
3. Electro-chemical machining.
4. General.
 - a) Light.
 - b) Medium.
 - c) Light and medium.
 - d) Medium and heavy.
 - e) Light, medium and heavy.
5. Numerically controlled.
 - a) Drilling.

Abex Industries Ltd. (Elec. Div.)
1.2.4(c).6.7.

Advanced Dynamics Corp. Ltd.
1.4(c).6.

Aero Machining Ltd.
1.4(a.b.)7.

Aero Mechanic Ltd.
1.4(c).7.

Aircraft Appliances & Equipment
1.2.4(c).7.

Aviation Electric Ltd.
1.2.4(c).7.

ASM Corporation Ltd.
5(b).

Abex Industries of Canada Ltd.
(Aerospace Div.)
5(a.c.h.)

Babcock & Wilcox Canada Ltd.
4(d).

Bata Engineering
1.4(c).6.7.

Beach Foundry Ltd. (Fleck Div.)
4(d).

Beaconing Optical & Precision Materials
4(a).7.

Black Clawson-Kennedy Ltd.
4(d).

Boeing of Canada Ltd.
1.4(c).7.

Brantford Precision Ltd.
5(d).

Bristol Aerospace 1968 Ltd.
1.2.4(a.b.)7.

Burrard Dry Dock Co. Ltd.
4(e).

C.A.E. Industries
5(a).

CAE Machinery Ltd.
4(e).

Canadair Ltd.
5(a.c.d.e.f.)

Canadian Aircraft Products Ltd.
5(e).

- b) Jig borer.
 - c) Lathe.
 - d) Machining center.
 - e) Milling.
 - f) Profiler.
 - g) Punch press.
 - h) Vertical and horizontal boring.
6. Ordnance quality and experience.
 7. Precision.
 8. Screw machine products.

Canadian Arsenals Ltd. (Filling Div.)
4(c).6.7.

Canadian Arsenals Ltd. (Small Arms Div.)
4(c).6.7.

Canadian Bridge Div.
4(d).

Canadian Bronze Co. Ltd.
4(d).

Canadian Bronze (Central Div.)
4(c).

Canadian Flight Equipment Co.
1.4(c).6.7.

Canadian General Electric (Ind. APP.)
4(c).6.7.

Canadian Marconi Co.
3.

Canadian Steel Foundries
4(d).

Canadian Vickers Ltd.
4(e).6.

Canadian Westinghouse Co. Ltd.
5(a.d.e.g.)

Canron Ltd. (Elec. Div.)
5(c.d.)

Central Dynamics Ltd.
1.4(a).7.

Collins Radio of Canada Ltd.
5(a).

Computing Devices of Canada Ltd.
4(a.b.)7.

Curtis Hoover Ltd.
1.4(c).

Davie Shipbuilding Ltd.
4(d).

The deHavilland Aircraft of Canada Ltd.
5(c.d.e.f.)

Diemarkers Ltd.
4(c).

Dominion Engineering Works Ltd.
5(b.c.d.e.)

Douglas Aircraft Canada
1.4(d).

ERRATA

MACHINING

The following additions should be made to pages B-10, 11 and 12. Each of the noted companies are already listed on these pages.

ADD:

Aircraft Appliances & Equipment Limited 5.(b.c.d.)	Fleet Manufacturing Limited 5.(d.e.)
Bata Engineering Division of Bata Shoe Company 5.(a.c.)	Godfrey Engineering Company Limited 5.(d.)
Beaconing, Optical & Precision Materials Company Limited 5.(a.c.e.)	Harrington Tool & Die Company Limited 5.(d.)
Bristol Aerospace (1968) Limited 5.(a.b.c.e.h.)	Heroux Limited 5.(c.d.)
Canadian Arsenals Limited (Small Arms) 5.(d.)	Ilines Machine Products Limited 5.(e.)
Canadian Bronze Company Limited 5.(e.)	Joly Engineering Limited 5.(d.e.)
Canadian Flight Equipment Company Limited 5.(a.c.)	K.K. Precision Parts Limited 5.(e.)
Canadian General Electric Company Limited 5.(c.d.g.)	LaSalle Engineering Limited 5.(e.)
Canadian Marconi Company 5.(b.d.e.)	Marsland Engineering Limited 5.(c.f.)
Canadian Vickers Industries Limited 5.(a.c.d.h.)	Orenda Limited 5.(a.b.e.)
Central Dynamics Limited 5.(a.)	Otis Elevator Company Limited 5.(c.)
Computing Devices of Canada Limited 5.(b.e.)	Preci-Tools Limited 5.(a.b.d.)
Douglas Aircraft Company of Canada Limited 5.(a.d.e.f.)	Rolls-Royce of Canada Limited 5.(d.e.)
Dowty Equipment of Canada Limited 5.(e.)	Spar Aerospace Products Limited 5.(a.b.d.e.)
W. R. Elliott Limited 5.(e.)	Standard Modern Tool Company Limited 5.(a.c.)
Ex-Cello Corp. of Canada Limited 5.(a.e.)	T.S.M. Industries 5.(e.d.)
	Uniroyal (1966) Limited 5.(d.)
	United Aircraft (Canada) Limited 5.(a.b.c.d.e.)
	Westhill Industries Limited 5.(e.f.)

MACHINING (cont'd)

Dowty Equipment Ltd.
1.4(c).7.

Elco-Wood Industries Ltd.
4(c).

W. R. Elliott Ltd.
1.4(c).6.7.

Enamel & Heating Products Ltd.
1.4(c).7.

Ex-Cell-O Corp. (Canada) Ltd.
4(c).

Fairey Canada Ltd.
1.4(c).7.

Ferguson Industries Ltd.
4(d).

Ferranti-Packard Electric Ltd.
5(e).

Fleet Manufacturing Co.
1.4(c).

Fluid Power Ltd.
5(d).

Forano Ltd.
4(d).

Foster Wheeler Ltd.
4(d).

Free-Piston Development Co. Ltd.
4(c).

Fromson Heat Transfer Ltd.
5(a).

Gardner-Denver Co. (Canada) Ltd.
5(a).

General Deep Hole Boring & Turning Co.
4(c).

General Impact Extrusions (Mfg.) Ltd.
5(c).

General Metallic Parts Ltd.
1.4(c).7.

General Precision Industries Ltd.
4(a).7.8.

Godfrey Engineering Co. Ltd.
1.4(c).

Harrington Tool & Die Co. Ltd.
1.4(c).6.7.

Hartford Tooling
2.

John T. Hepburn Ltd.
4(d).

Heroux Ltd.
1.4(c).6.7.

Hochelaga Tool & Die Limited
2.

Holland Hitch of Canada Ltd.
5(d).

Horton Steel Works Ltd.
5(d).

Ilines Machine Products Ltd.
7.

Industrial Machining Ltd.
4(d).

Ingersoll Machine & Tool Co. Ltd.
4(c).

James United Steel Ltd.
4(c).

Joly Engineering Ltd.
1.4(c).6.7.

Joy Manufacturing Co. (Canada) Ltd.
5(a.c.)

K.K. Precision Parts Ltd.
1.4(c).7.

Kelsey-Hayes Canada Ltd.
4(b).

Kingston Shipyards
4(d).

LCS Metals Ltd.
4(c).

LaSalle Engineering Ltd.
1.4(c).6.7.

Lefebvre Freres Ltd.
1.4(c).7.

Leigh Instruments Ltd.
1.4(a).7.

Lightning Fastener Co. Ltd.
5(d).

Linamar Machinery Ltd.
4(c).5(d).6.

Lucas-Rotax Ltd.
5(a.c.d.e.)

MLW-Worthington Ltd.
5(a.d.)

Magna Electronics
5(e).

Marine Industries Ltd.
4(d).

Marsland Engineering Ltd.
4(a.b.c.).6.7.

Master Mechanical Mfg. Ltd.
4(e).7.

Metro Engineering Co. Ltd.
5(b.d.)

Robert Mitchell Co. Ltd.
5(g).

Modern Machine Industry Ltd.
5(a.e.)

Novatronics Ltd.
4(c).7.

Northern Electric Co. Ltd. (Montreal)
5(a.f.g.)

Northern Electric Co. Ltd. (Belleville)
5(a).

MACHINING (conc.)

Northwest Industries Ltd.
5(d.e.)

Orenda Ltd.
1.2.4(c).7.

Otaco Ltd.
4(c).

Otis Elevator Co. Ltd.
4(e).6.7.

Peacock Brothers Ltd.
4(d).

Port Arthur Shipbuilding
4(d).

Preci-Tools Ltd.
1.4(c).7.

Precision Small Parts Ltd.
4(a).6.7.

Premier Metal Housing Ltd.
5(g).

Progressive Engineering Works Ltd.
4(b).

Railway Equipment
4(d).

Renfrew Aircraft & Engineering Ltd.
1.4(b).

Rex Chain Belt (Canada) Ltd.
4(b).

Rollit Products Ltd.
4(c).6.8.

Rolls-Royce of Canada Ltd.
2.

SIDO Ltd.
1.6.7.

Semtec Ltd.
2.7.

Sheridan Controls Ltd.
1.4(a.b.)

T. S. Simms & Co. Ltd.
4(b).

Spar Aerospace Products Ltd.
1.7.

Standard-Modern Tool Co. Ltd.
1.4(c).6.7.

Strite Industries Ltd.
5(e.f.).

T.S.M. Industries Ltd.
1.4(c).7.

Thompson Products Ltd.
4(b).

Triplex Engineering Co. Ltd.
4(c).8.

Uniroyal Ltd.
4(d).

United Aircraft of Canada Limited
2.3.

Universal Die & Tool Mfg. Ltd.
1.4(c).6.7.

Velan Engineering Ltd.
5(a.c.d.)

Vickers-Sperry of Canada Ltd.
5(a.b.)

Victoria Machinery Depot Co. Ltd.
4(d).

Victory Conveyor & Machine Reg'd.
1.4(c).6.

Walbar Machine Products
2.3.4(a).7.

Wallaceburg Brass Ltd.
4(c).

Weatherhead Co. of Canada Ltd.
4(c).

Western Tools & Industries Ltd.
1.4(c).

Westhill Industries Ltd.
1.4(c).7.

W. C. Wood Co. Ltd.
4(c).

Yarrows Ltd.
4(d).

RADIOACTIVE MATERIALS, INSTRUMENTATION AND POWER PLANTS

1. Cobalt 60.
2. Control systems, automatic.
3. Coolant systems.
4. Gamma irradiation facilities.
5. Instrumentation.
6. Irradiation services.
7. Isotope teletherapy equipment.
8. Neutron sources.
9. Nuclear fuels.

Atomic Energy of Canada Ltd.
1.4.6.7.8.13.14.

Aviation Electric Ltd.
5.17.

Canadian Admiral Corp. Ltd.
5.11.12.

Canadian General Electric (Carboloy)
9.

Canadian General Electric (Nuclear System)
9.10.13.

Canadian Vickers Ltd.
13.

Canadian Westinghouse (Atomic Power)
9.13.

Combustion Engineering-Superheater
10.13.

Computing Devices of Canada Ltd.
2.11.

Davie Shipbuilding Ltd.
10.

Dominion Bridge Co. Ltd.
10.13.

10. Nuclear plant components.
11. Radiac detectors.
12. Radiation meters.
13. Reactors.
14. Reactor produced isotopes.
15. Thoria, fused.
16. Urania, fused.
17. Valves.

Foster Wheeler Ltd.
10.13.

General Deep Hole Boring & Turning Co.
10.

Leigh Instruments Ltd.
2.5.

Marsland Engineering Ltd.
5.12.

R. H. Nichols Co. Ltd.
5.

Norton Research Corp. (Canada) Ltd.
15.16.

Orenda Ltd.
3.5.10.

Spar Aerospace Products Ltd.
5.10.

Velan Engineering Ltd.
17.

Victoria Machinery Depot Co. Ltd.
10.13.

RELIABILITY STUDIES

Aviation Electric Ltd.
Canadian Westinghouse (Elec. & Def. Prod.)
Computing Devices of Canada Ltd.

Leigh Instruments Ltd.
Northern Electric Co. Ltd.
RCA Ltd.

REPAIR AND OVERHAUL

1. Aircraft
2. Boost controls, aircraft.
3. Calibration
 - a) electric instruments.
 - b) electronic instruments.
 - c) laboratory instruments.
4. Carburetors, aircraft.
5. Communications equipment, aircraft.
6. Computers.
7. Controls, flight, powered.
8. Conversion, aircraft.
9. Conversion, interior, aircraft.
10. Electrical.
11. Electronic.
12. Engine, aircraft.
13. Engines, gas turbine.
14. Flight instruments, aircraft.
15. Floats, aircraft.

Abex Industries Ltd. (Aerospace Div.)
7.18.21.31.32.

Aircraft Appliances & Equipment
10.14.21.25 .

Aircraft Industries of Canada Ltd.
1.5.8.9.10.12.15.17.20.21.22.25.

Aviation Electric Ltd.
4.10.11.14.16.21.22.

Black Clawson-Kennedy Ltd.
2.8.28.

Boeing of Canada Ltd.
15.17.18.20.

Bowmar Canada Ltd.
23.24.

Bristol Aerospace 1968 Ltd.
14.17.21.

Bristol Aerospace (1968) Ltd. (Montreal Div.)
2.4.12.16.17.22.

CAE Industries Ltd.
10.11.

Canada Precision Devices Ltd.
10.11.

Canadair Ltd.
1.8.9.12.21.22.

16. Fuel injection systems, aircraft.
17. Gear boxes.
18. Landing gear, aircraft.
19. Life support equipment.
20. Helicopter.
21. Hydraulics, aircraft.
22. Ignition systems, aircraft.
23. Motors, servo.
24. Motors, stepper.
25. Navigation systems, aircraft.
26. Platforms, aerial.
27. Propeller, aircraft.
28. Propeller, marine.
29. Seats, aircraft.
30. Systems, actuation.
31. Systems, hydro-mechanical.
32. Systems, weapon delivery, airborne.
33. Trailers including frame.

Canadian Aircraft Products Ltd.
15.

Canadian Allis Chalmers Ltd.
10.

Canadian Flight Equipment
29.

Canadian Marconi Co.
11.25.

Canadian Research Institute
3(a.b.c)10.11.

Canadian Westinghouse (Elec. & Def. Prod.)
5.10.11.

Carriere Technical Industries
7.10.11.14.21.30.

Computing Devices of Canada Ltd.
5.11.14.25.

De Havilland Aircraft of Canada
1.8.11.12.27.

Devtek Ltd.
11.

Dominion Helicopters Ltd.
20.

Dowty Equipment of Canada Ltd.
21.

REPAIR AND OVERHAUL (conc.)

Fairey Canada Ltd.
1.8.10.12.20.21.

Field Aviation Co. Ltd.
1.12.

Garrett Manufacturing Ltd.
10.11.14.

Godfrey Engineering Co. Ltd.
21.

Heroux Ltd.
21.

Instronics Ltd.
3(a.b.c.)5.6.10.11.

Irvin Air Chute Ltd.
19.

Leigh Instruments Ltd.
5.10.11.14.25.

Litton Systems (Canada) Ltd.
6.11.25.33.

Lucas-Rotax Ltd.
16.

Northwest Industries Ltd.
1.8.9.12.14.21.22.

Okanagan Helicopters Ltd.
20.

Orenda Ltd.
13.

Renfrew Aircraft & Engineering Co. Ltd.
12.22.

Rolls-Royce of Canada Ltd.
12.13.

Spar Aerospace Products Ltd.
3(a.b.c.)4.10.11.12.14.21.25.

Sperry Gyroscope Ottawa Ltd.
10.11.14.

Truck Engineering Ltd.
26.33.

United Aircraft of Canada Ltd.
12.20.27.

MISCELLANEOUS SERVICES

1. Aluminum Dip Brazing.

2. Autoclave Bonding.

3. Extrusions.

Abex Industries of Canada Limited
5.

Aluminum Co. of Canada Ltd.
3.

Bristol Aerospace Limited
4.5.

Canadair Limited
2.5.

Canadian Vac-Hyde Processing Ltd.
4.

Douglas Aircraft Co. of Canada Limited
2.5.

Enamel & Heating Products Limited
2.

Fleet Manufacturing Limited
2.5.

General Impact Extrusions (Mfg.) Ltd.
3.

Magna Electronics
1.

Montebello Metal Ltd.
3.

4. Heat Treatment.

5. Welding (Resistance).

Montreal Metal Heat Treating Co. Limited
4.

Northwest Industries Limited
2.

Orenda Limited
4.5.

Renfrew Aircraft & Engineering Ltd.
5.

Reynolds Extrusions Co. Ltd.
3.

Rolls-Royce of Canada Limited
5.

Spar Aerospace Products Ltd.
4.

Steel Treaters of Quebec
4.

STEMAC Ltd.
5.

United Aircraft of Canada Limited
4.5.

Williams Machines Ltd.
4.

SPECIAL ARCTIC PRODUCTS

As might be expected in a country with a winter climate such as Northern Canada's there are firms producing products with a special application for Arctic and Sub-Arctic use. Everest expeditions have availed themselves of these products and facilities.

These products include such diversified items as snowknives for the production of snow shelters to face creams to protect against sun and wind burn so common in Arctic regions. In the transportation field they may range from magnesium snow shoes to completely mobile trailer camps with a multitude of applications. Dry goods products vary from sleeping bags to nose-hangars for aircraft.

Due to the great diversification of products it is suggested that any requirements of this nature should be referred directly to this department where the specialized knowledge for such equipments can be best applied.

ILLUSTRATIONS

The illustrated section of this book has been included to give you some insight into some of the equipments now being designed, developed and produced in Canada. The not so obvious use of this section is to be found if a deeper evaluation of each item is made for then you will become aware of the engineering available, the production facilities and laboratory back-up so vital to a modern industrial complex.

It is hoped that this illustrated section will serve to demonstrate that Canada possesses the proven competence in resourceful production skills to meet your requirements.



INDEX OF ILLUSTRATIONS

	PAGE
Aircraft, Components and Services	
1. The Twin Otter	I-8
2. Canadair CL-215 – Amphibious Utility Transport	I-10
3. DHC 5 “Buffalo”	I-12
4. DHC 4 “Caribou”	I-14
5. Canadair CL-41A Tutor	I-16
6. Canadair CL-41G Tactical Trainer	I-16
7. Canadair CF-5	I-18
8. Canadair CL-84	I-20
9. The PT6 Turbine Engine	I-22
10. The JT15D	I-24
11. Gas Turbine Engine Components and Assemblies	I-26
12. DHC-4 Main and Nose Landing Gears	I-27
13. DHC-5 Main and Nose Landing Gears	I-28
14. Main Landing Gear for Tutor Aircraft	I-30
15. Helicopter Landing Gear UH-2	I-30
16. Helicopter Landing Gear CH-47	I-32
17. Aircraft Landing Gear CL-84	I-33
18. Two Position Nose Landing Gear CF-5	I-34
19. Flap Actuator/Control	I-34
20. Actuation Systems for Variable Geometry Airplanes	I-36
21. Hydro-Mechanical Systems	I-38
22. Airborne Fuel System Units	I-42
23. Aircraft Rubber Fuel Tanks	I-44
24. Helicopter Services and Construction Techniques	I-46
25. Parachute Systems	I-50
Aircraft Accessories and Simulators	
1. Intervalometers	I-51
2. Mobile Automatic Test Set	I-52
3. Pressure-Temperature Test Set – TTU-205B/E	I-54
4. PRD Programmable Pneumatic Signal Generator	I-56
5. Pneumatic Signal Generator – A/11	I-58
6. Flight Data Recorder System	I-60
7. Crash Position Indicator	I-62
8. Downed Aircraft Locator	I-64
9. Automatic Permanent Magnetic Compensator	I-66
10. The 9-Term Compensator	I-68

	PAGE
11. Servo Repeater Amplifier	I-70
12. Servoed Altitude Indicators	I-72
13. Foliage Penetrating Radar Altimeter	I-74
14. Aircraft Simulators	I-76
 Aircraft Navigation & Fire Control Systems	
1. Navigation System – AN/ASN-503	I-78
2. Supersonics Doppler Sensors – AN/APN 189	I-80
3. V/Stol Doppler Sensors – AN/APN 172/173	I-82
4. Tactical Aircraft Navigation System	I-84
5. Airborne Inertial Navigation Systems	I-86
6. Projected Map Display	I-88
7. Direction Finder – MF/HF	I-90
8. Automatic Master Heading Control	I-92
9. Automatic Direction Finder Receiver – AN/ARN-89	I-94
10. Altitude and Heading Reference System	I-96
11. Attack System – LCAS-5	I-98
12. Weapon Release Computer Set (AN/ASQ-91)	I-100
 Aerospace & Satellite Communications	
1. Satellite Communications	I-102
2. Satellite Communications – Earth Stations	I-106
3. STEM	I-108
4. High “G” Electronics	I-110
5. High “G” Technology	I-112
6. Black Brant Research Rockets	I-114
 Communications	
1. Auxiliary Transceiver – 718B-8D UHF	I-116
2. Radio Receiver Type AN/ARR-501	I-118
3. High Power Transmitter Amplifiers	I-120
4. Low Noise Parametric Amplifiers	I-122
5. UHF Transceiver AN/PRC-66	I-124
6. UHF Transceiver AN/PRC-75	I-126
7. FM 2-Way Mobile Radios	I-128
8. Portable HF-SSB Transceiver	I-130
9. Single Sideband Communications Receivers	I-132
10. HF Single Sideband Transceiver & Transmitter	I-134
11. Solid State SSB Portable Transceiver	I-136
12. Coaxial Cable Transmission System – 46C	I-138

	PAGE
13. Message-Format Generating Equipment	I-140
14. Telepath Communications & Data Control Equipment	I-142
15. Micro-Electronic Situation Display	I-144
16. Alpha-Numeric Display – Wand 600	I-146
17. Mobile Radar System	I-148
18. Military Punched Tape Reader	I-150
19. Radio Relay Equipment – AN/GRC-103	I-152
20. Integrated Telecommunication System – MCS 6900	I-154
21. Field Telephone Set M262A (TA 5012/TTC)	I-156
22. Telephone and Telegraph Multiplex Terminal	I-158
23. Test Set, Teletypewriter TS*5082/UGM	I-160
24. Sound Ranging Central – AN/GYK-501	I-162
25. Antenna Control System	I-164
26. Active Aperiodic Loop Receiving Antenna Array	I-166
27. Signal Processing Applied Research Program	I-167
 Electronic Equipment & Components	
1. Airborne IR Forest Fire Mapping & Detection System	I-168
2. Oriented Caesium Magnetometer (AN/ASQ-501)	I-170
3. Fluid Velocity Meter	I-172
4. Custance Sudorimeter	I-173
5. H.F. Sounding System	I-174
6. Infra-red Spotting Device	I-176
7. Solid State Power Conditioning Devices	I-178
8. Static Inverters	I-182
9. Reflection Meter – CG-6	I-184
10. Precision Tracking Controls	I-186
11. Stepper Motors	I-188
12. Electromagnetic Indicators	I-190
13. Multi-Layer – Printed Circuit Boards	I-192
14. Printed Circuit Boards & Edge-Lighted Panels	I-194
15. Millimeter Reflex Klystrons	I-196
16. Tower Lighting Transformer	I-198
17. Photoelectric Cells	I-199
 Irradiation Equipment	
1. Sterilization Plant – Cobalt 60	I-200
2. The Gammabeam 650	I-202
3. Irradiation Equipment	I-204

Marine Equipment incl. Electronic Items

1. Naval Ship Design and Construction	I-206
2. Hydrofoil Ship Design and Construction	I-208
3. Towing Machines	I-210
4. Marine Winches	I-212
5. Winch Systems	I-214
6. Automatically Moored Buoy – Type MB 2500	I-216
7. Helicopter Haul Down Systems	I-218
8. Telescopic Hangars	I-220
9. Underway Replenishment of Ships	I-222
10. Oceanographic Magnetometer Systems	I-224
11. V D S – Variable Depth Sonar (504)	I-226
12. Transistorized Marine Radar – LN55	I-228
13. Transistorized Marine Radar – LN66	I-230
14. Submarine Signal Simulator (S.S.S.)	I-232
15. X-Y Plotting Table, Submarine (Model M450A)	I-234
16. Plotting System, Naval Shipboard, Mk NC2	I-236
17. Emergency Radio Beacon	I-238
18. Life-Raft	I-240

Mechanical Features and Facilities

1. Custom Machine Shops	I-242
2. Fluidic Devices and Systems	I-246
3. Microwave Film Dryer	I-250
4. Automatic Straight-Line Tinning and Reflowing Apparatus	I-252
5. Forged Steel Valves and Steam Traps	I-254
6. Right Angle Drive Gear Boxes	I-256
7. Hydrostatic Transmissions	I-257
8. Precision Investment Castings	I-258
9. Gearing	I-259
10. Impact Extrusion Components	I-260
11. Diffusion Furnace Actuator	I-262

Navigation and Surveillance

1. Navigation Systems LNS 101 and LNS 102	I-264
2. Canadair CL-89 (AN/USD-501)	I-268
3. Surveillance Systems	I-270

	PAGE
NBC Equipments and Simulators	
1. Detecting Set, Radar Signals "Micradet" – AN/PSS-502	I-272
2. Radiation Detection Systems Airborne AN/ADR 501	I-274
3. Radiation Survey Training System RST 8500	I-276
Optics and Systems	
1. Optical Design	I-278
2. Optical-Mechanical Fire Control	I-280
3. Internal Immersion Lenses for Submersibles	I-284
4. Lenses for Air Reconnaissance Cameras	I-286
5. Photo Reconnaissance Systems	I-288
Ordnance Items and Services	
1. Smoke Generator, Coloured, A/C	I-289
2. Mine Anti-Personnel Non-Metallic C3A1 (M25)	I-290
3. Mine Anti-Personnel Non-Metallic Practice C41A	I-290
4. Fuse Assemblies and Precision Metal Parts	I-292
5. Canadian Arsenals Ltd. (Small Arms Division)	I-293
6. Canadian Arsenals Ltd. (Filling Division)	I-298
Vehicles	
1. Military, Wheeled, General Utility	I-302
2. Military, Tracked, General Utility	I-304
3. Airfield Safety & Service Vehicles	I-306
4. Tracked Off-Road Carriers	I-314
5. Construction Types	I-322
6. Service & Maintenance Types	I-324
Miscellaneous	
1. Floater Hose	I-326
2. Refrigeration & Heating Unit	I-328
3. Rain Repellants for Windshields	I-330
4. Military Air-Lift Buildings	I-331
5. Applied Chemical Foams	I-332

THE TWIN OTTER

The Twin Otter, latest de Havilland Canada STOL aircraft to enter military service is operating in the livery of nine military forces. Designed for dependable operation with a minimum of ground support, the Twin Otter brings a new standard of performance to the light transport role. Folding seats permit the 20 passenger cabin to be quickly converted to provide 364 cubic feet of cargo space. For casualty evacuation nine litters and five seats can be accommodated. Available on wheels skis or floats, this aircraft offers unsurpassed versatility.

As a short-haul airliner the Twin Otter has won wide acclaim and is used on high frequency scheduled services from some of the busiest airports in North America.

Outstanding STOL (short take-off and landing) performance is a feature of the Twin Otter, which can take off at maximum weight of 12,500 lb. (5660 kg) with a ground run of only 700 feet (213 m) and clear a 50 foot (15 m) obstacle in 1,200 feet (366 m). With a payload of 3,350 lb. (1520 kg) the Twin Otter has a range of 650 nautical miles with 45 minutes fuel reserve. Maximum payload is 5,250 lb. (2381 kg), cruising speed 175 knots.

Powerplants are United Aircraft of Canada PT6A-27 gas turbines each rated at 620 shp at temperatures up to 91°F (33°C).

The Twin Otter is certified in the normal category (CAR-3) by the Canadian Department of Transport (Aircraft Type Approval A-82) and the United States Federal Aviation Administration (Type Certificate A9-EA). In addition the Series 300 meets the U.S. Special Federal Aviation Regulation No. 23 which establishes additional airworthiness standards for emergency evacuation, systems design and aircraft operation.

SPECIFICATIONS

Dimensions

Wing Span	65 ft. (19.81 m.)	Main Wheel Track	12.5 ft. (3.81 m.)
Length	51.8 ft. (15.77 m.)	Wheel Base	14.8 ft. (4.49 m.)
Height	18.6 ft. (5.66 m.)	Propeller Ground Clearance	4.5 ft. (1.37 m.)

Weights

Maximum Takeoff	12,500 lb. (5,660 kg.)	Fuel Capacity—Standard	2,457 lb. (1,112 kg.)
Maximum Landing	12,300 lb. (5,570 kg.)	—With	
Basic (20 Seat "Commuter")	6,750 lb. (3,060 kg.)	Wing Tanks ..	3,057 lb. (1,385 kg.)
		Wing Loading	29.8 lb./sq.ft. (14.5 kg./sq.m.)

Performance at Maximum Weight

		STOL CAPABILITY	
Takeoff Distance (Sea Level, ISA)	Ground Run	860 ft. (262 m.)	700 ft. (213 m.)
	Distance over 50 ft. ...	1,500 ft. (457 m.)	1,200 ft. (366 m.)
Landing Distance (Sea Level, ISA)	Ground Run	950 ft. (290 m.)	515 ft. (157 m.)
	Distance over 50 ft. ...	1,940 ft. (591 m.)	1,050 ft. (320 m.)
Stalling Speed (Power Off)	Flaps Retracted	74 knots EAS (137 km./hr.)	
	Flaps Extended	58 knots EAS (108 km./hr.)	
Rate of Climb (Sea Level, ISA)	Two Engines	1,600 ft./min. (488 m./min.)	
	One Engine	340 ft./min. (103 m./min.)	
Service Ceiling (R/C = 100ft./min., ISA)	Two Engines	26,700 ft. (8,140 m.)	
	One Engine	11,600 ft. (3,540 m.)	
Maximum Cruise Speed (ISA)	Sea Level	160 knots TAS (296 km./hr.)	
	5,000 ft. (1,524 m.) ...	167 knots TAS (309 km./hr.)	
	10,000 ft. (3,048 m.) ...	175 knots TAS (324 km./hr.)	

	Range	Payload
Maximum Range (ISA, 45 min. fuel reserve, 1 crew, 100 lb. radio)		
Standard Tanks	40 NM (75 km.)	5,250 lb. (2,380 kg.)
	650 NM (1,200 km.)	3,350 lb. (1,520 kg.)
With Wing Tanks	850 NM (1,575 km.)	2,600 lb. (1,180 kg.)

The Twin Otter on the facing page is in the markings of the Argentine Army. Argentina is one of seven countries which use the Twin Otter in the para-military role. The Argentine Navy and Air Force also employ Twin Otters in this role.



CANADAIR CL-215 AMPHIBIOUS UTILITY TRANSPORT

CL-215 WATER BOMBER is the first aircraft to be designed specifically to protect valuable forest areas against the ravages of fire. The size and performance of the CL-215 have been dictated by the requirements of fire protection authorities in Canada and other countries, where forest resources are valued highly and where fire is regarded as a foe of the national economy.

Devastation of forest regions due to fire is of concern in a number of countries. The growing cycle of a tree is lengthy, taking upwards of 80 years to develop an area of merchantable timber, the loss of which can mean permanent depression for a locality. With small towns developing on the fringes of large forest areas, fire control assumes a more urgent meaning and water bombing is the most effective control yet devised.

Simplicity of operation and maintainability are prime features in the CL-215 design. As a water bomber it can carry 1200 Imp. gallons (1440 U.S. gallons). With water tanks removed there is unobstructed cargo space allowing loads of 7800 lbs. Structural provision is made for the addition of further windows and doors which would meet the FAR25 requirements for a passenger aircraft capable of carrying 35 passengers.

Although designed primarily as a water bomber, the CL-215 can be employed to advantage as a land or water based passenger and/or cargo transport aircraft. There are many areas where the capability to operate from stretches of water is desirable: countries abounding in lakes or rivers; islands with considerable resident or tourist populations. Accommodating 30 passengers the CL-215 has a range of 700 miles, and operating costs comparable to other new aircraft of this size.

Performance

Cruising speed, normal power	185 m.p.h. (297 km/hr.)
Take-off distance to 50 ft. (15.2 m)	
at 35,000 lb. (15,876 kg)	water, 2,070 ft. (631 m)
41,500 lb. (18,824 kg)	land, 2,640 ft. (805 m)
Landing distance from 50 ft. (15.2 m)	water, 2,825 ft. (861 m)
at 33,400 lb. (15,150 kg)	land, 2,200 ft. (671 m)
Max. take-off weight	41,500 lb. (18,824 kg)
Max. Landing weight	33,400 lb. (15,150 kg)
Zero fuel weight	37,000 lb. (16,783 kg)
Operating weight empty	25,000 lb. (11,340 kg)
Maximum payload	12,000 lb. (5,443 kg)
Max. Fuel load	6,500 lb. (2,950 kg)
Manoeuvre factors	+ 3.25 g;—1 g.



DHC 5 "BUFFALO"

The DHC-5 Buffalo has been specifically developed to fill the operational requirement for a STOL (short take-off and landing) aircraft capable of handling short to medium range transport support operations and of operating from rough, improvised airstrips. The Buffalo was designed from the outset to perform sustained operations in harsh tactical environments.

Capable of carrying 7 tons of cargo or 41 fully equipped troops the Buffalo requires a ground run of only 800 feet (244 m) for take-off at a full gross weight of 41,000 lb. (18,598 kg.). Take-off distance over a 50 ft. (15 m) obstacle is 1,260 feet (384 m), landing distance 1,170 feet (357 m). The interaction of automatic lift-dumping spoilers with the reverse pitch propellers and wheel brakes ensure a controlled short ground roll regardless of surface condition.

Power plants in the Buffalo are General Electric CT64-820-1 propeller turbines each rated at 3060 eshp. The provision of an extra low pitch stop on the propellers, together with the superior capabilities of the free turbine for quick power acceleration or deceleration provides the thrust control necessary for precise, steep approach to confined land areas. Outstanding low-speed handling characteristics make this aircraft ideal for accurate air dropping of troops or supplies.

The large rear doors and lower ramp facilitate the loading of wheeled vehicles or bulky cargo and permit the delivery of palletized cargo using the LAPES (Low Altitude Parachute Extraction) technique.

The Buffalo has a cruising speed of 245 knots and a maximum range of 1,930 nautical miles.

BUFFALO—GENERAL DATA

Dimensions (1)			Weights (2)	
Wing Span	96 ft.	(29.26 m.)	Maximum Take-off	41,000 lb. (18,598 kg.)
Length	77.4 ft.	(23.59 m.)		
Height	28.75 ft.	(8.8 m.)	Maximum Landing	39,100 lb. (17,736 kg.)
Main Wheel Track	30.5 ft.	(9.30 m.)		
Wheel Base	28 ft.	(8.53 m.)	Basic, with crew of 2	22,900 lb. (10,390 kg.)
Propeller Ground Clearance	40 in.	(1.01 m.)	Maximum Fuel Capacity	13,556 lb. (6,490 kg.)
Takeoff weight			41,000 lb.	(18,598 kg.)
Landing weight			39,100 lb.	(17,736 kg.)
STOL takeoff distance to 50 ft. (firm dry sod)			1260 ft.	(384 m.)
STOL landing distance from 50 ft. (firm dry sod)			1170 ft.	(357 m.)
Rate of climb — two engines at NRP			2080 ft./min.	(634 m. min.)
Rate of climb — one engine at MP			695 ft./min.	(212 m. min.)
Service ceiling — two engines at NRP			31,500 ft.	(9601 m.)
Service ceiling — one engine at MP			17,000 ft.	(5182 m.)
Cruise speed (10,000 ft.)				
NRP			245 kt.	(454 km. hr.)
80% NRP			224 kt.	(415 km. hr.)
52% NRP			181 kt.	(335 km. hr.)
Maximum Payload			14,100 lb.	(6396 kg.)
Range with maximum payload			450 nm.	(834 km.)
Range with 8000 lb. payload			1390 nm.	(2576 km.)
Range with 4000 lb. payload			1910 nm.	(3539 km.)
Range with zero payload			1930 nm.	(3576 km.)

This BUFFALO carries Canadian Forces Markings.



DHC 4 "CARIBOU"

The DHC-4 Caribou is now in its eleventh year of continuous production. This aircraft was the first of the DHC twin engine STOLs and is the last piston-powered DHC design still in production. Well proved by many years of service in some of the world's most difficult terrain the Caribou offers exceptional STOL performance from improvised airstrips.

The Caribou is designed to carry out aerial supply dropping, transportation of men and materials, and casualty evacuation. In troop transport configuration it carries 32 fully equipped combat troops in quickly folding seats. As an air ambulance it can accommodate 22 litters.

Large rear loading doors provide access to the 1,150 cubic foot (32.5 cu. m) cabin and can be opened in flight for dropping paratroops or supplies. The lower ramp facilitates rapid loading of wheeled vehicles or bulky cargo.

At a maximum weight of 28,500 lb. (12,928 kg) the Caribou has a payload of 8,620 lb. (3,910 kg) and requires a take-off ground run of only 725 feet (220 m). Take-off distance over a 50 ft. (15 m) obstacle is 1,185 ft. (361 m); landing distance 1,235 ft. (376 m).

Powered by dependable Pratt and Whitney R2000 engines each rated at 1,450 bhp the Caribou has a cruising speed of 158 knots.

General

Gross Weight	28,500 lb.	12,928 kg
Basic Weight	17,630 lb.	7997 kg
Wing Span	95 ft. 7½ in.	29.15 m
Overall Length	72 ft. 7 in.	22.12 m
Overall Height	31 ft. 9 in.	9.67 m
Wing Area	912 sq. ft.	84.7 sq. m
Wing Loading	31.25 psf	153 kg/sq. m
Wing Aspect Ratio	10.0	

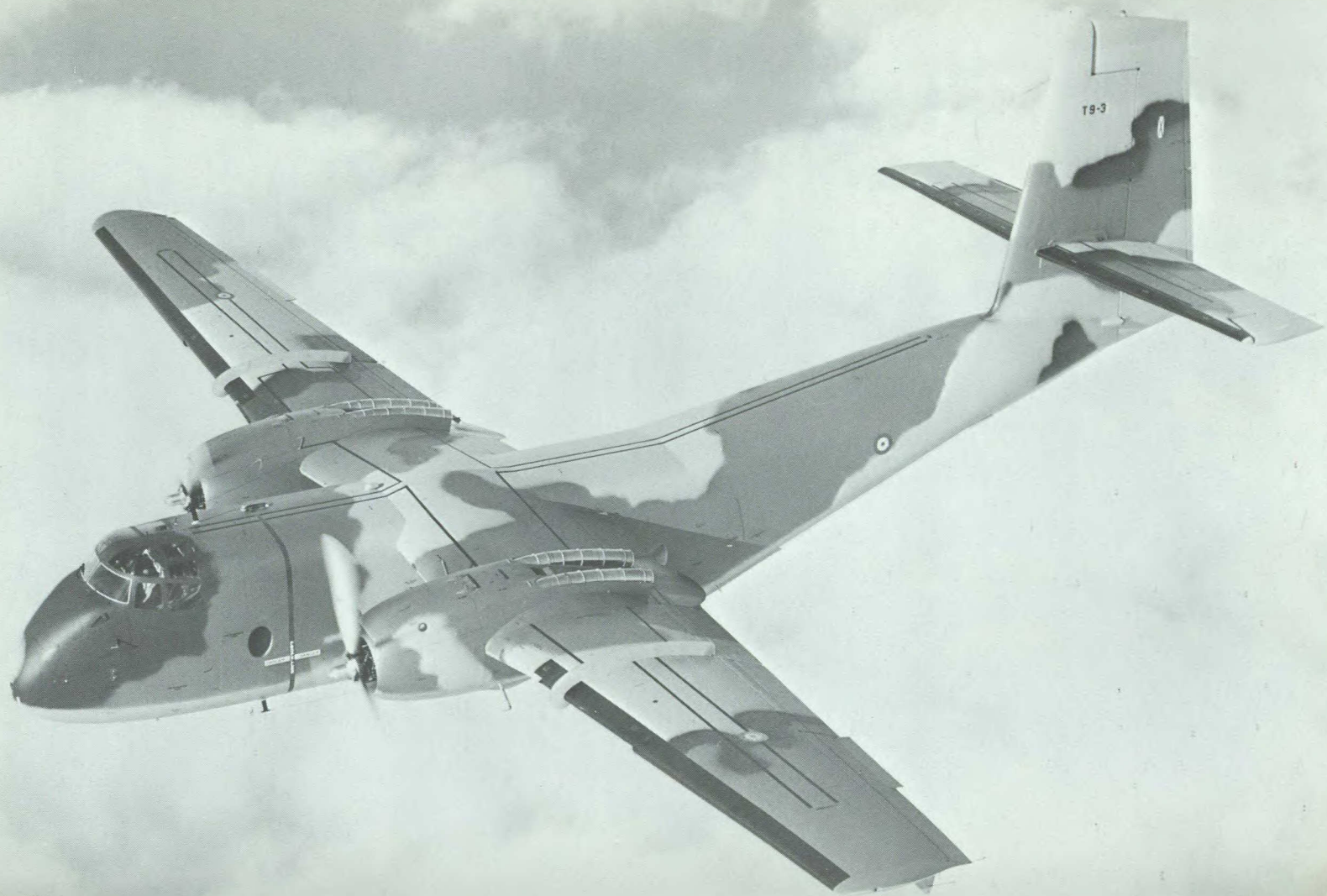
Cabin Dimensions

Length	28 ft. 9 in.	8.76 m
Width (max.)	87 in.	221 cm
Width (at floor)	73.5 in.	186.7 cm
Height (on center line)	75 in.	190.5 cm
Cabin Capacity	1150 cu. ft.	32.5 cu. m
Max. Floor Loading	200 lb./sq. ft.	976.4 kg/sq. m

Doors

Loading Doors	Width	73.5 in.	186.7 cm
	Height	75 in.	190.5 cm
Side Doors (2)	Width	30 in.	76.2 cm
	Height	55 in.	139.7 cm
Crew Hatch	Width	25 in.	63.5 cm
	Height	29 in.	73.7 cm

The Caribou on the facing page is shown in the livery of the Spanish Air Force.



CANADAIR CL-41A TUTOR

Complete pilot training from first flight through to operational level is practical with the CL-41A Tutor, now in service with the Royal Canadian Air Force, Training Command and the Royal Malaysian Air Force. The aircraft has a performance that ranges from 80 to 488 mph (129 to 785 km/hr.), thereby providing good slow flight characteristics for the new student and high speed training for the advanced student. The service ceiling of 43,200 ft. (13,167m) provides ample range for training and operational flying. The side-by-side seating arrangement permits excellent visual instruction techniques between the instructor and student.

Construction features of the CL-41A include a very robust airframe structure designed for long service life; a spacious, pressurized and airconditioned cockpit; very good harmony of flying controls throughout the wide speed-range; wide-track undercarriage with nose wheel steering; and superior cockpit visibility.

The CL-41A is considered to be an excellent basic and/or advanced jet trainer for both military and civil pilots.

CANADAIR CL-41G TACTICAL TRAINER

The CL-41G has been developed from the CL-41A Tutor. As an operational trainer or counter-insurgency aircraft, the CL-41G is capable of multi-mission versatility maintaining the very good construction features of the Tutor trainer mentioned above. The CL-41G can carry a 3,500 lb. (1587.6 kg) load of ordnance stores on two underfuselage mountings and four under-wing hardpoints. Various mixes of stores can be mounted, including 250 and 500 lb. (113.4 & 226.8 kg) bombs, G. E. Minigun six-barrel machine gun pods, 500 and 750 lb. (226.8 & 340.2 kg) napalm bombs, and a variety of air-to-surface rockets.

High aircraft utilization rates are achieved as a result of the special attention that was given in designing the aircraft to ease of servicing and maintenance. There are over 50 panels provided for access to the airframe and engine, and the major portion of flight control runs, hydraulic lines and electrical cables are easily reached in a large trough in the bottom of the fuselage. The G.E. J85-CAN 40 engine, common to both the CL-41A and 41G is widely used in civil and military aircraft.

Growth potential for the CL-41G includes additional fuel tanks for increased range, pod mounted reconnaissance equipment, and increased flexibility through multi-purpose armament hardpoints.

Facing page shows one of the CL-41G's now in service with the Royal Malaysian Air Force.



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CANADAIR CF-5

Canadair is manufacturing 115 CF-5s for the Canadian Armed Forces and 105 for the Royal Netherlands Air Force. The CF-5 incorporates many improvements on the basic F-5 which is already in service with the Air Forces of ten Free World Nations and had been proven in operations by the U.S.A.F. The F-5 was designed for tactical support, interdiction and interceptor roles and to these, the CF-5 now adds both a high and low level photo reconnaissance capability.

CF-5 Improvement

Improved Take-Off Performance.
Alternative Quick-Change Reconnaissance
Nose.
In-Flight Refuelling Capability.
Arrestor Hook.
Inlet Anti-Icing.

Strengthened Windshield.
Jettisonable Pylons.
Improved Navigation/Radio Facilities.
Lead-Computing Sight.
87% Increase in Electrical Generating
Capacity.

In addition, provision is made in all production CF-5s for fitment of armour protection, JATO facilities, a doppler radar and navigation computer, depending on customer's requirements.

Performance

The increased power available from the General Electric J.85-15 engines, combined with auxiliary intake doors on the rear fuselage and a two-position nose undercarriage giving a 3° increase in angle of attack, produces an improvement in take-off run of between 15% to 25% depending upon load. The additional power also increases the rate of climb and gives the CF-5 a supersonic dash speed at low altitude in level flight.

Weapon Delivery

The CF-5 carries an external payload of 6,200 lbs. — nearly half its own weight. With a mix of missiles, bombs, rockets and napalm, in addition to its internal armament of two 20 mm. cannon, the CF-5 is an ideal vehicle for close support tasks, armed reconnaissance sorties or interceptor missions. The two-seat version of the CF-5, designated CF-5D, retains the key features of the CF-5A — rapid acceleration to supersonic speeds, high rate of climb, manoeuvrability and has the same external load carrying capability. In addition to its function in the training role therefore, the CF-5D is equally effective as an operational aircraft except for the absence of the internally fitted cannon armament.

Photo-Recce Capability

The quick-change alternative recce nose section of the CF-5 uses groups of three Vinten 70mm. cameras to provide forward and side-oblique photography in the low level recce role, or a horizon-to-horizon tri-camera fit for high level photography.

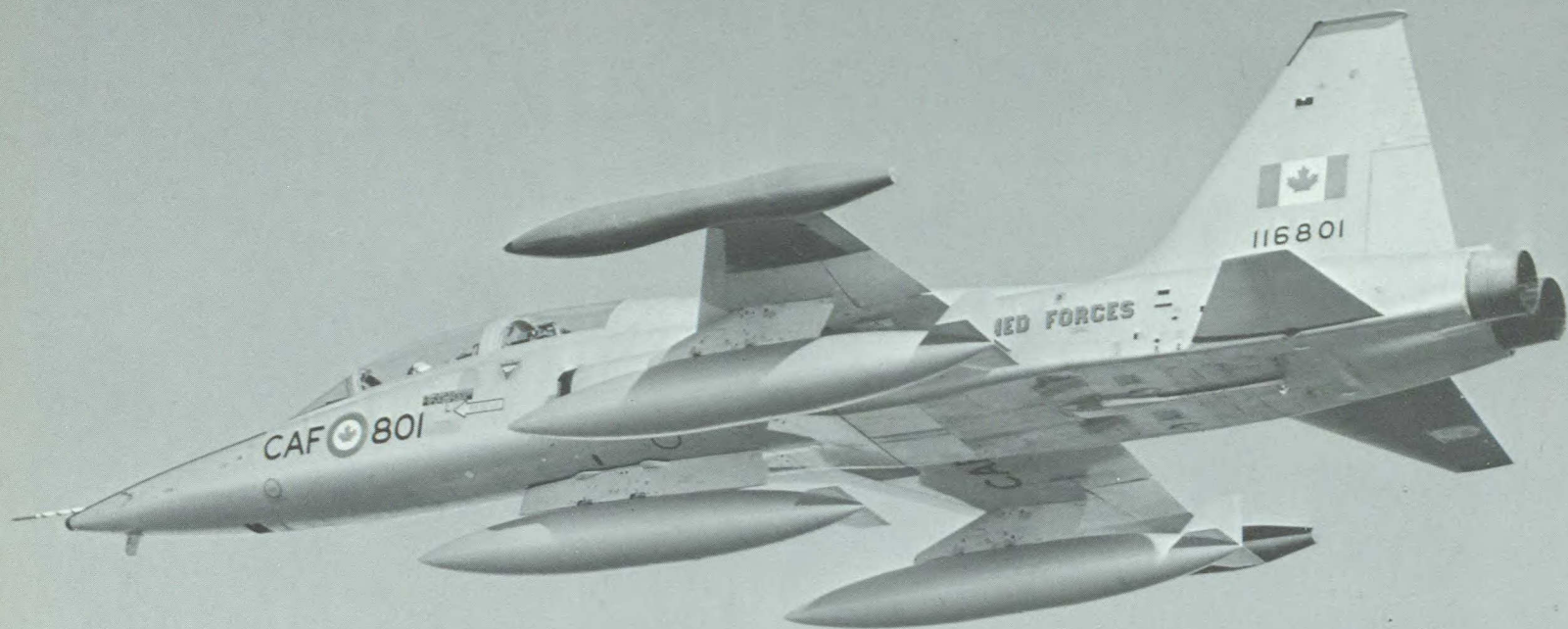
Economy

In addition to excellent responsive handling qualities and potent armament capability, cost effectiveness from factory to flight line to weapon delivery has been a constant factor in both the F-5 and the CF-5. The aircraft's light weight and economical fuel consumption reduce operating costs. Specially designed ease-of-maintenance features, the use of relatively unsophisticated components, and the ground level accessibility of all systems reduce maintenance costs.

Flight Safety

Hand in hand with twin-engine reliability and safety is outstanding single-engine performance, thus effectively reducing the attrition rate. Dual fuel, hydraulic, and electrical systems, plus armour protection of vital areas, also enhance the combat reliability of the aircraft. Both hydraulic systems provide power to the dual flight control system — each continually backing up the other — another safety feature.

The CF-5 combines the capabilities and performance normally associated with larger and more complex aircraft, with the rugged strength necessary for the low level tactical role and for operating from semi-prepared forward airstrips. With a low operating cost and many ease-of-maintenance and safety features, the CF-5 is a weapon system ideally suited to the constantly changing requirements of an increasingly complex cost and defence environment.



CANADAIR CL-84

The CL-84 is being developed as a highly versatile vehicle with the potential of fulfilling a wide variety of roles that otherwise require the use of both fixed and rotary-wing aircraft. Its military applications are expected to comprise combat support, personnel and cargo transport, reconnaissance, search and rescue, helicopter escort, and communications, from both land bases and aircraft carriers.

Performance flexibility of this order is made possible by the novel "tilt-wing" design of the CL-84 which allows the aircraft to take off vertically and hover like a helicopter, yet fly forward like an airplane at speeds up to 350 m.p.h. (563 km/hr). With the wing tilted between the vertical and horizontal, the CL-84 will have impressive performance and manoeuvrability at very low speeds and outstanding short take-off and landing (STOL) capabilities.

Although this aircraft is designed for vertical, STOL, and fixed-wing flight, the pilot's primary cockpit controls consist of the standard aeroplane rudder pedals, stick, and single throttle (power lever) which incorporates the wing-tilt switch. (There is no requirement for a collective pitch lever). Because of this simplicity, an experienced pilot will be able to devote virtually his full attention to his operational task rather than to flying the aircraft.

Commercial developments of the Canadair CL-84 would substantially reduce total travel time for passenger transportation between city-centres 100 to 500 miles (161 to 805 km) apart. Also, because such aircraft can operate independent of normal runways, they have considerable potential for survey, exploration and general transport work in undeveloped areas.

Evaluation models for the Canadian Armed Forces are now in production at Canadair.





THE PT6 TURBINE ENGINE

The PT6, designed and produced by United Aircraft of Canada Limited, is a lightweight free turbine engine designed for use in both fixed and rotary aircraft. In the western world, it is the leading seller of its class.

The current production models are available in turbo-prop and turboshaft versions in the 500 to 1100 SHP power range. A total of 4500 engines had been ordered by the end of 1969 and more than 3300 engines have been delivered.

At that time there were 78 different applications of which 27 were certified airborne applications. Powered aircraft, flown by 600 different operators in 53 different countries, had logged almost 3,000,000 flying hours by the end of 1969. Time between overhauls was 2500 hours, with hightime TBO at 3,500 hours. Customers in the commuter airline business are achieving a high time utilization rate of 325 hours per month. The PT6 is also achieving a premature removal rate of 1 per 6250 hours and an in-flight shutdown rate of 1 per 25,000 hours.

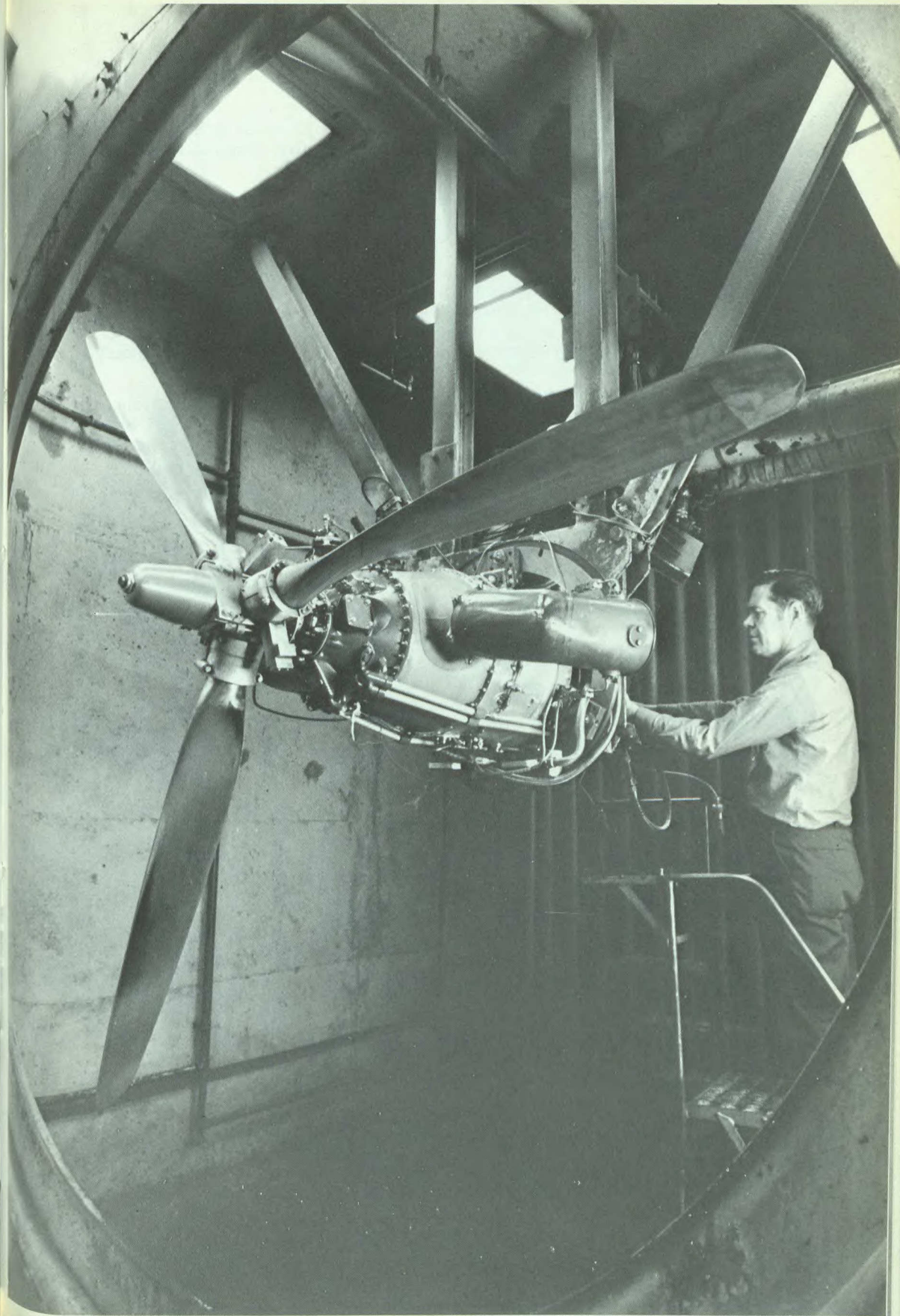
Many new applications were under consideration. Major contract awards will result in new and more powerful models to go into production starting in early 1970, while the current basic models will remain available as long as demand exists. Following are the expected PT6 program highlights during 1970:

Accelerated penetration of the commuter airline market mainly with the Beech Model 99 Commuter Liner and the de Havilland of Canada Twin Otter. Other PT6-powered installations designed for the commuter market are expected to be available in the next few years.

The PT6T-3, whose military designation is T400-CP-400, is an 1800 SHP powerplant, consisting of two 900 SHP PT6 engines side by side and driving a single output shaft through a combining gearbox. Intended for helicopter application, the PT6T-3 offers twin-engine reliability. It has been selected to power Bell Helicopter Company's commercial Model 212. The T400 version will power the UH-1N helicopter for the Canadian Armed Forces and the USAF. These aircraft are twinned versions of the Bell Huey helicopters ordered for the U.S. Marines. It is intended to develop the PT6T-3 to 2400 SHP by 1972. Production will start in early 1970.

The ST6L-73 is a 900 SHP turboshaft version of the PT6, designed to power the Hamilton Standard Auxiliary Power Unit for the Lockheed Model L-1011 TriStar jetliner. This is the first application of the PT6 in an on-board auxiliary power unit. Intensive development has taken place through 1969 on the ST6L-73 and production deliveries will begin in early 1970.

The PT6 engine has been developed through about 55,000 hours of test cell running. Development continues at a brisk pace in support of the engines already delivered and in anticipation of future requirements for more power and more efficient performance.



THE JT15D

The JT15D engine under development at UACL is an advanced technology turbofan in the 2000-2500 lbs. thrust category, for executive, commuter and other light transport aircraft of the 1970s.

Its first two applications are the Cessna Citation and the Sud-Nord 600 Corvette, France's newest business aircraft. The eight-place twin jet Corvette is scheduled to be certified by the end of 1970. Civil certification of the Cessna Citation is also expected in 1970.

First flight of an aircraft powered by JT15Ds took place on September 15, 1969, at the Cessna facility in Wichita, Kansas. Flight test work started in August 1968 with the JT15D in an external flight pod attached to the underside of a CF-100, a twin engine jet fighter acquired by the company from the Canadian Armed Forces. Engine tests were undertaken to 42,000 feet and Mach 0.8.

All phases of the JT15D development were on schedule. Eight experimental JT15D engines acquired more than 2400 hours of test bed running prior to first flight of the Cessna Citation. The high time engine accumulated more than 600 hours.

Three consecutive unofficial 150 hour civil endurance tests were carried out on one engine for a total test time of 450 hours. This engine showed excellent mechanical integrity and hot end life. Also prior to first flight, more than 4000 hours of component rig test time were completed.

The engine was flight tested for more than 70 hours, including flights to 42,000 ft. MACH 0.8 in a CF-100 aircraft. Engine handling, relight and altitude performance are satisfactory.

The outstanding features of the JT15D are:

- Take-off thrust 2200 lbs. with an SFC of 0.504. The dry engine-weight is 480 lbs. It measures 60 inches in overall length with a maximum diameter of 27 inches.

- A minimum number of aerodynamic components to give low cost, simplicity, ease of maintenance.

- A high bypass ratio for high static and climb thrust, and a low noise level.

- No compressor inlet guide vanes for good FOD tolerance, no blade anti-icing, low noise levels.

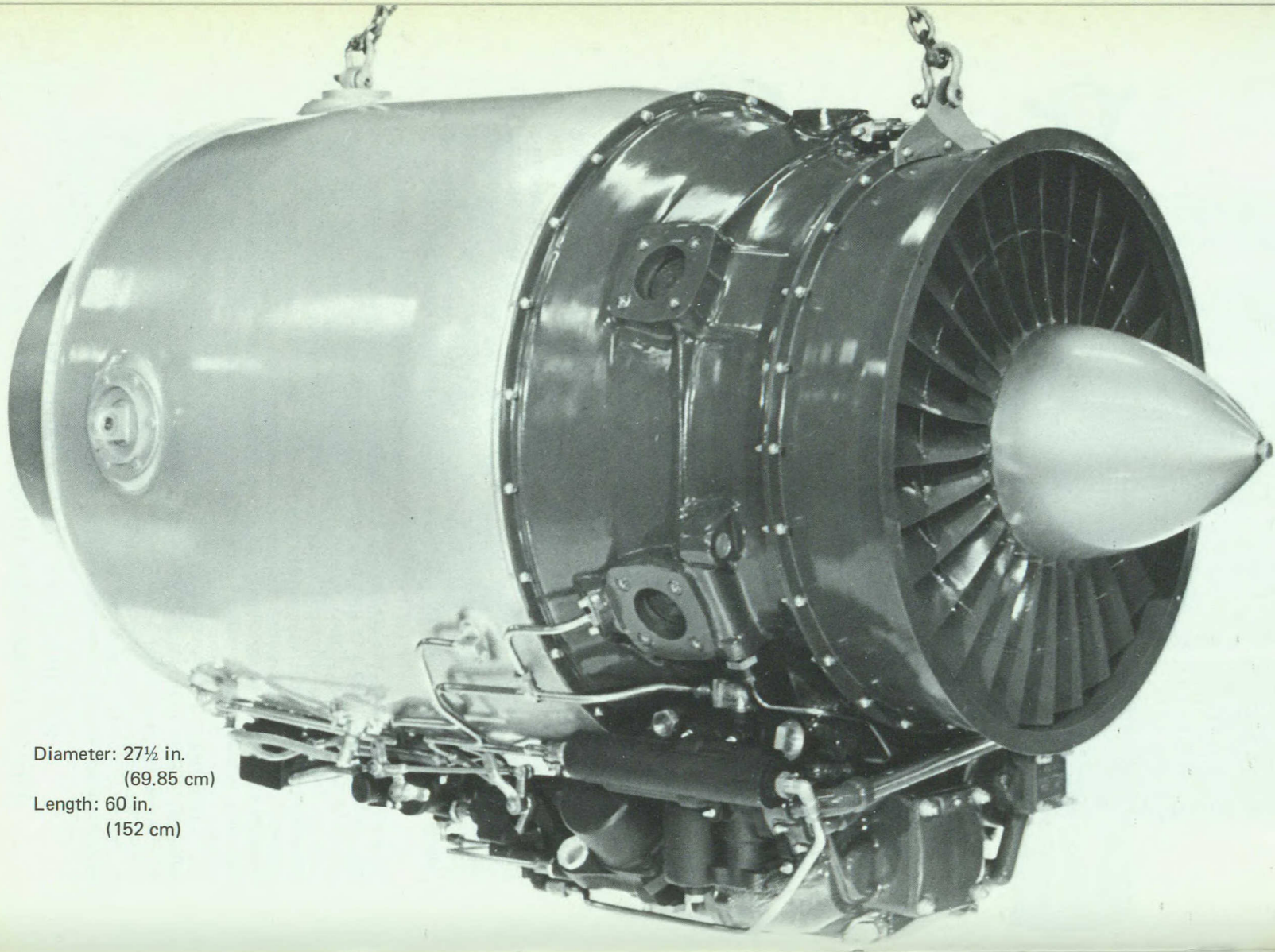
- Conventional turbine temperatures giving high TBO's and low maintenance costs.

- Compressor bleed air, accessory power extraction, integral oil tank, ease of starting and low approach thrust.

- Low engine plus fuel weight at 2 to 3 hours endurance compared to pure jets.

- A good growth potential.

Production deliveries will begin in early 1971.



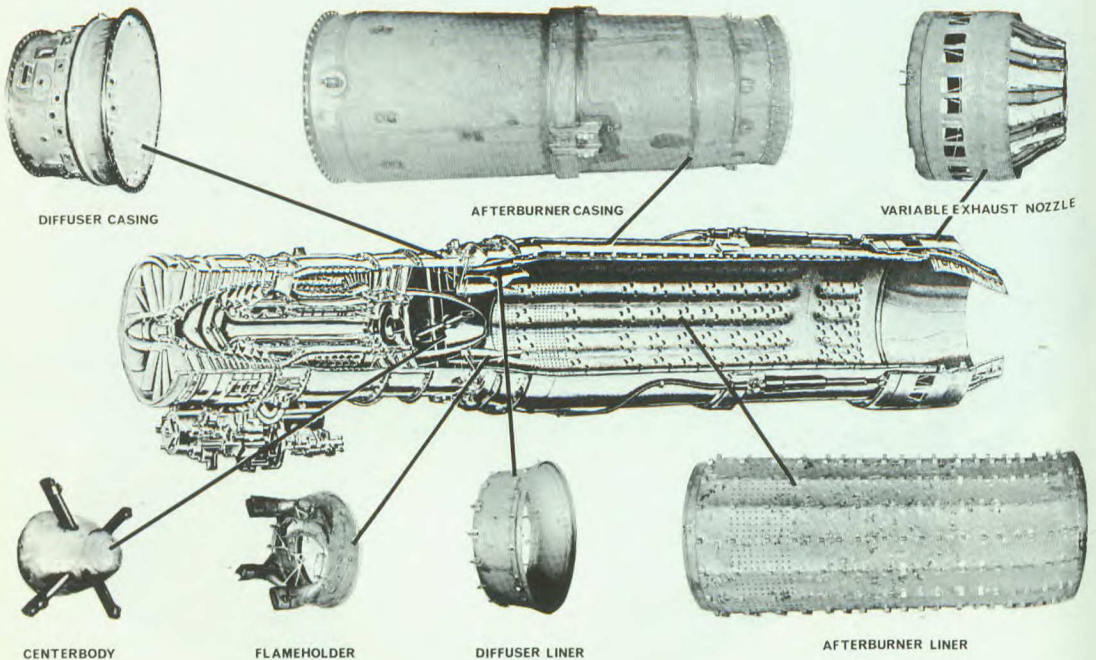
Diameter: $27\frac{1}{2}$ in.
(69.85 cm)
Length: 60 in.
(152 cm)

GAS TURBINE ENGINE COMPONENTS AND ASSEMBLIES

The fabrication of complex precision gas turbine engine components and assemblies is one of the major lines of specialization at the Bristol Aerospace plant in Winnipeg. This facility has been supplying components of the types illustrated in the adjoining photograph to the leading aero-engine companies in North America for many years, and is fully equipped with a range of the most modern machine tools required for production to the close tolerances demanded in this field.

Most of the items produced are in the "hot" section of the engines, from the combustion chamber to the exit nozzle, these being the components requiring special alloys capable of withstanding continuous exposure to elevated temperatures. Many of the materials used in these applications require special forming, machining, welding and heat treatment techniques, for which the Winnipeg facilities are well equipped. Government approved quality control laboratories equipped with the latest range of metallurgical inspection and test equipment support the production programs and ensure adherence to the strictest standards imposed by military and commercial specifications.

The Bristol plant includes extensive tool design building and proving facilities, enabling new engine programs to be handled from the prototype stage through to quantity production. In recent years the economies which can accrue to engine operators through overhaul and repair of "hot" end components and assemblies, compared with the cost of the extensive replacement programs previously considered necessary, have led to substantial growth of R and D work for these items. This work is of a specialized nature, by virtue of the materials and techniques involved, and the Winnipeg facility is engaged in domestic and export R & D programs for both components and assemblies, including complete engine afterburners.



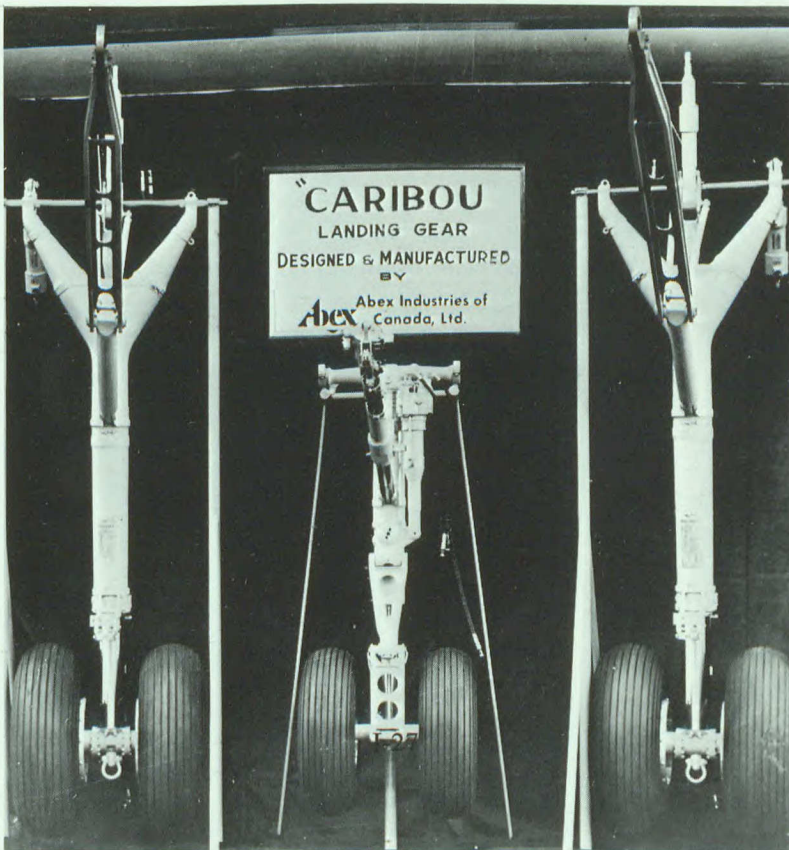
DHC-4 MAIN AND NOSE LANDING GEARS

The main and nose landing gear for the DHC-4 are designed and manufactured by Abex Industries of Canada Limited, Aerospace Division.

The main gear assembly comprises the shock strut, drag strut, shortening mechanism, and retraction actuator. The shock strut is designed for rough field operation and provides a stable platform during loading operations. The strut is a two stage oleo-pneumatic arrangement with an overload relief device which prevents high transient loads being transmitted to the wing. The entire shock strut assembly is housed in a capsule tube which slides inside the outer housing thus enabling the gear to be shortened during the retraction cycle. The drag strut is a structural member and has provisions for connecting the stabilizer rods to the shortening mechanism.

The nose gear assembly consists of the shock strut, drag strut and steering actuator. The shock strut is a two stage oleo-pneumatic device and it is designed for rough field operation and provides a stable platform during loading operations.

The drag strut is a double acting hydraulic actuator incorporating an integral locking device in the extended and retracted positions. The drag strut functions as a retraction actuator for raising and lowering the gear and also provides a mechanical uplock and downlock for the gear assembly. Normal operation of the drag strut is achieved using the hydraulic system pressure and emergency provisions are incorporated in the unit to permit the gear to be unlocked, lowered and locked in the down position in the event of system failure.



DHC-5 MAIN AND NOSE LANDING GEARS

The nose and main landing gears for the DHC-5 are designed and manufactured by Abex Industries of Canada Ltd., Aerospace Division.

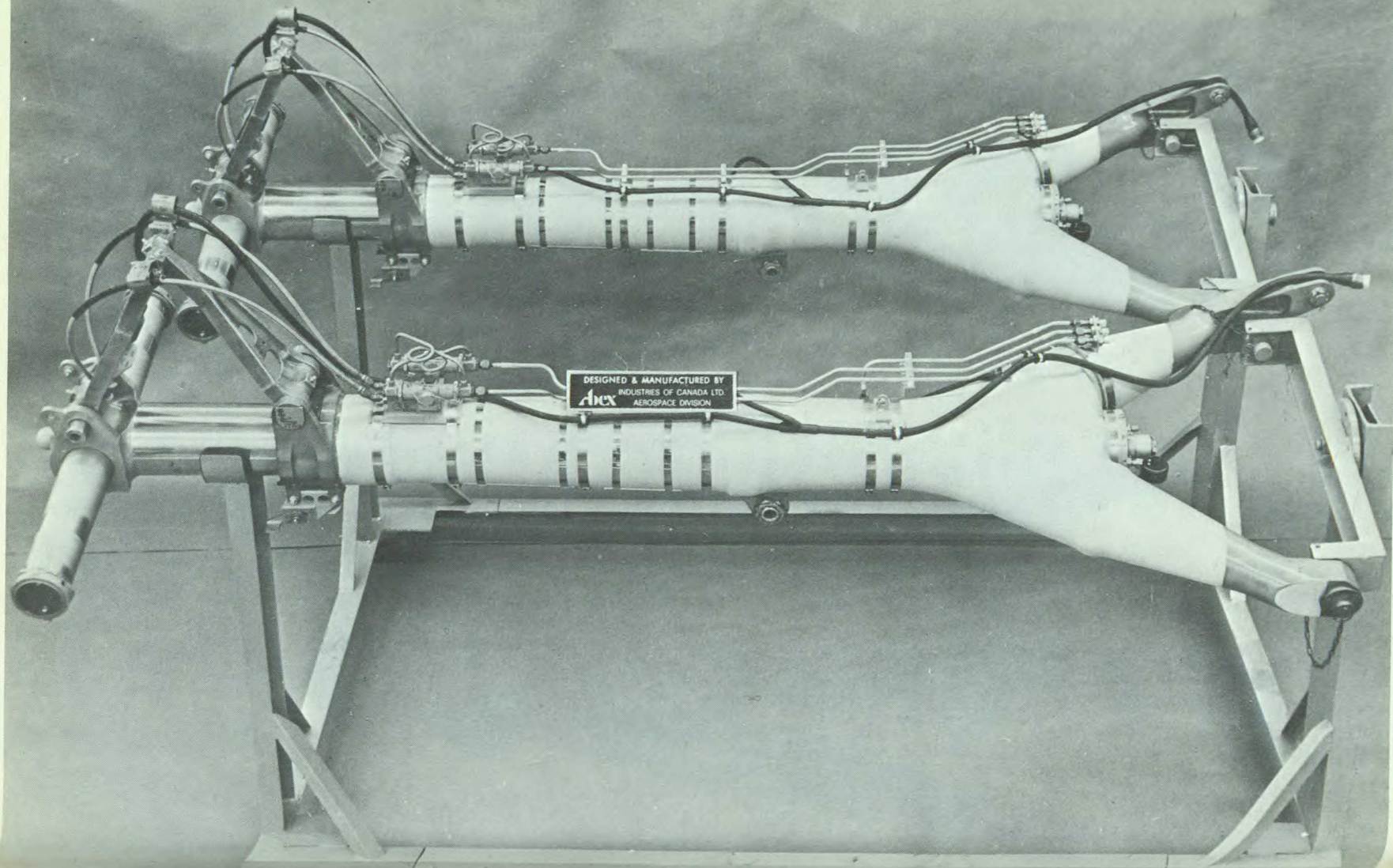
The main gear assembly represents an advance in STOL rough field operational capability, the design concept having been proven in the DHC-4. The general arrangement of the gear is similar to the DHC-4 except that there is no shortening function. The basic gear comprises the shock strut, drag strut and retraction actuator.

The shock strut is a two stage oleo-pneumatic arrangement with an improved overload relief device. The drag strut is a self-cracking strut incorporating an in-line mechanical locking device. An integral spring-biased hydraulic actuator provides the means for unlocking and cracking the strut and also ensures the positive locking of the gear in the down position. A double acting hydraulic actuator with snubbers at each end of the stroke raises and lowers the gear.

Nose Gear Assembly

The nose gear assembly comprises the shock strut, drag strut, and steering actuator.

The shock strut is a two stage oleo-pneumatic device designed for rough field operation and provides a stable platform during loading operations. The drag strut is a double acting hydraulic actuator incorporating an internal locking device in the extended and retracted positions. The drag strut functions as a retraction actuator for raising and lowering the gear and also provides a mechanical uplock and downlock. Normal operation of the drag strut is achieved by the use of system pressure and emergency provisions are incorporated in the unit to permit the gear to be unlocked, lowered and locked in the down position in the event of system failure. The steering actuator is a balanced area linear actuator which operates a bell-crank arrangement to provide the necessary torque to steer the nose gear. The steering actuator has a steering valve, back pressure reservoir and shimmy damper valves.



DESIGNED & MANUFACTURED BY
abex
INDUSTRIES OF CANADA LTD.
AEROSPACE DIVISION

MAIN LANDING GEAR FOR TUTOR AIRCRAFT

The main landing gear for the RCAF CL41A Tutor jet trainer was designed and is currently produced by Dowty Equipment of Canada for Canadair Limited, Montreal.

Of simple design, the gear incorporates a conventional type air/oil shock absorption element. Main components comprise an anodized aluminum alloy main outer cylinder, a steel cylinder assembly, and steel torque links which are mounted between the main outer fitting and the sliding cylinder assembly. The wheel axle component and the sliding cylinder are machined from a single forging.

Air under pressure is contained in the bore of the sliding cylinder, while the bore of the main outer fitting is filled with hydraulic fluid. A floating piston separates the air from the fluid. In operation, the sliding cylinder telescopes into the main outer cylinder. Movement between these cylinders causes fluid to be forced through a valve in the piston head of the sliding cylinder to damp impact shocks. At the same time, air below the separator piston is further compressed; it is this 'air cushion' upon which the aircraft rides during take-off and landing runs and taxiing.

Salient characteristics: *Weight* 51.3 lb. approx. (23.3 kg); *Temperature range* -65° to 275° F. (-18 C to $+135$ C); *Fluid* MIL—H—5606.

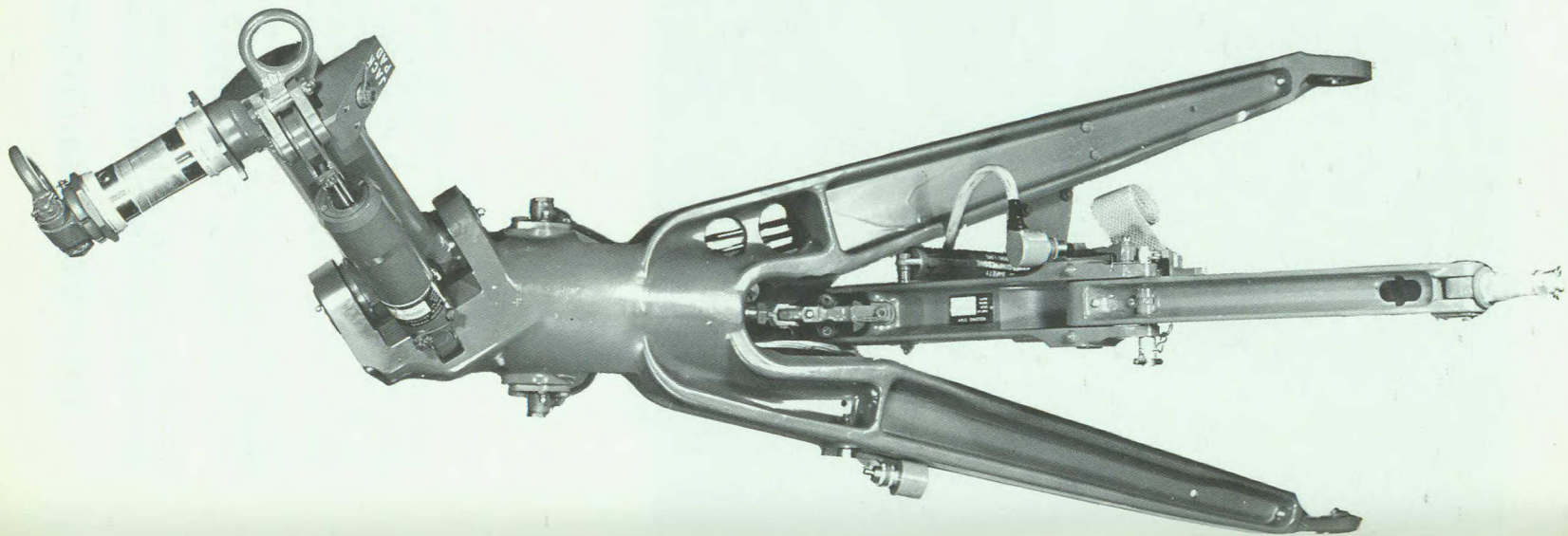
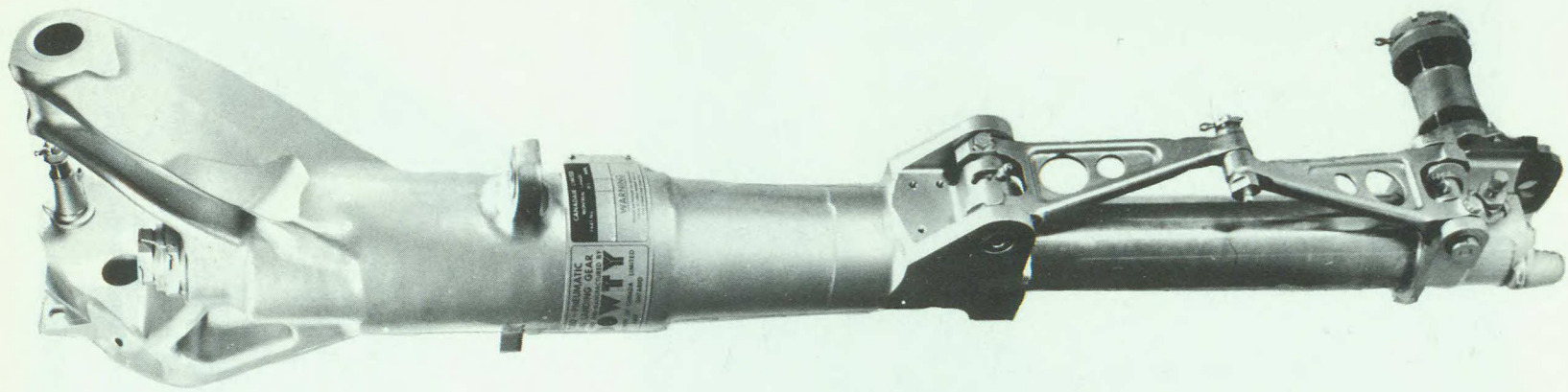
HELICOPTER LANDING GEAR—UH-2

The wheeled main landing gear used on the Navy model UH-2 Helicopter was designed, developed and produced by Dowty Equipment of Canada Limited for Kaman Aircraft Corporation, Bloomfield, Connecticut.

Constructed predominantly of aluminum alloy, anodized, with a link and axle member machined from one steel forging, the gear is fully retractable. Compact, yet readily serviced, the gear is attached to aircraft pick-ups at the main 'Y' member extremities and at the drag strut swivel. Extension and retraction is accomplished by means of a hydraulic actuator housed within the bore of the main member. An internal claw-type lock within the actuator locks the gear upon full extension; an uplatch affixed to the aircraft fuselage contains the gear in its retracted position. A spring-box is incorporated to assist normal extension of the gear and to ensure emergency full extension. Operational shocks imposed on the gear are absorbed by a Dowty 'Liquid Spring' shock absorber mounted between the link and axle member and the main 'Y' member.

Aircraft towing and tie-down eyes are embodied.

Salient characteristics: *Weight* $92\frac{1}{2}$ lb. approx. (42 kg); *Temperature range* -65° F to 160° F. (-18 C to $+71.1$ C); *Fluid* MIL—H—5606.

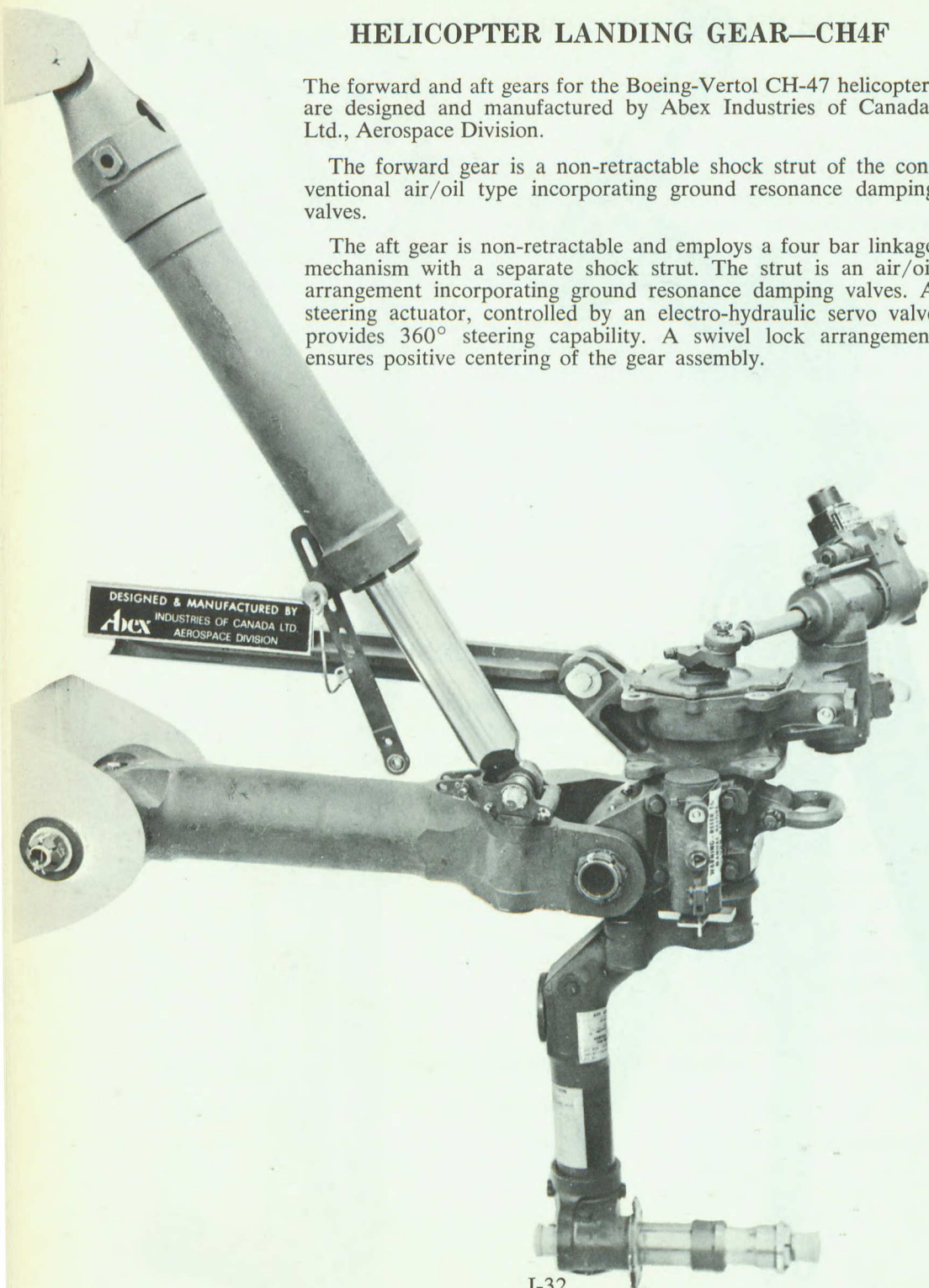


HELICOPTER LANDING GEAR—CH4F

The forward and aft gears for the Boeing-Vertol CH-47 helicopter, are designed and manufactured by Abex Industries of Canada, Ltd., Aerospace Division.

The forward gear is a non-retractable shock strut of the conventional air/oil type incorporating ground resonance damping valves.

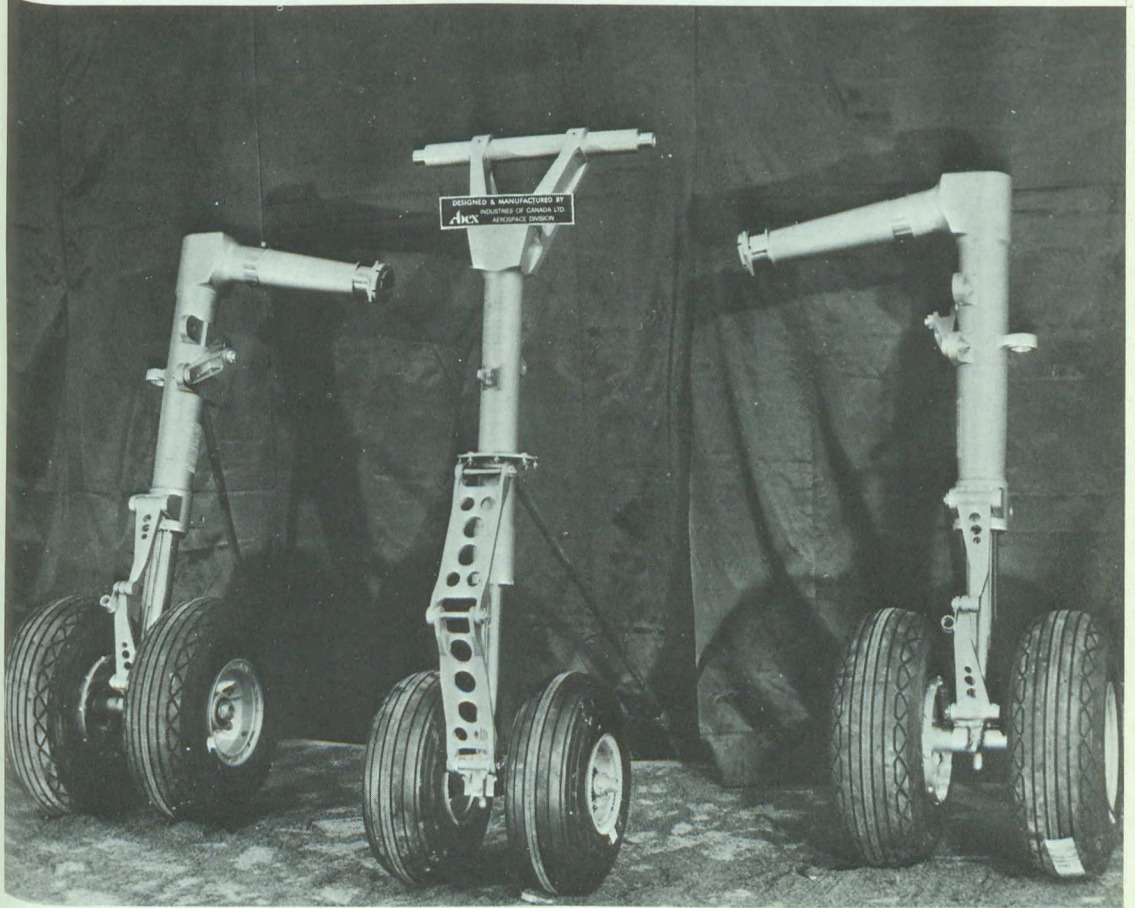
The aft gear is non-retractable and employs a four bar linkage mechanism with a separate shock strut. The strut is an air/oil arrangement incorporating ground resonance damping valves. A steering actuator, controlled by an electro-hydraulic servo valve provides 360° steering capability. A swivel lock arrangement ensures positive centering of the gear assembly.



AIRCRAFT LANDING GEAR—CL-84

The CL-84 main and nose landing gears are designed and manufactured by Abex Industries of Canada Ltd., Aerospace Division.

The shock struts are of the conventional air/oil type. The nose gear has provisions for castoring through 360° and is fitted with a shimmy damper to ensure adequate damping during taxiing and take off.



TWO POSITION NOSE LANDING GEAR

The nose landing gear for the Northrop/Norair F-5 Jet Fighter is designed by Dowty Equipment of Canada Limited. The gear is currently in production for both Northrop and Canadair Limited, Montreal. The latter is constructing the Canadian version of the aircraft, the CF-5A. The first landing gears were delivered in August, 1967.

The landing gear incorporates a wheel fork and axle assembly attached to an oleo-pneumatic shock absorber which telescopes together with an auxiliary outer tube in the nose gear main housing. A design feature of the gear is a lengthening device which enables the pilot to lift the aircraft nose and increase the aircraft angle of attack, thus increasing the take-off distance. The lengthening device, in essence an hydraulic actuator, consists of a piston on the auxiliary tube which acts in the bore of the gear main housing under normal aircraft system hydraulic pressure. An internal splined tube prevents rotation when the gear is being shortened for stowage after take-off.

Torque arms connect the wheel fork assembly to a steering collar on the gear main housing and a quick-release pin is provided at the torque arm knee-joint to allow for towing of the aircraft. Provision for a nose wheel steering actuator attachment is made by a lug on the steering collar. An internal centering mechanism maintains the nose wheel fore and aft when off the ground.

The landing gear main housing is manufactured from aluminum alloy and the remaining component parts, including the torque arms, are steel.

Design Characteristics	Length fully extended: 51.50 in. (130.81 cm.)
Weight 73 lbs. (33 kg.)	Length shortened for stowage: 40.00 in. (101.60 cm.)

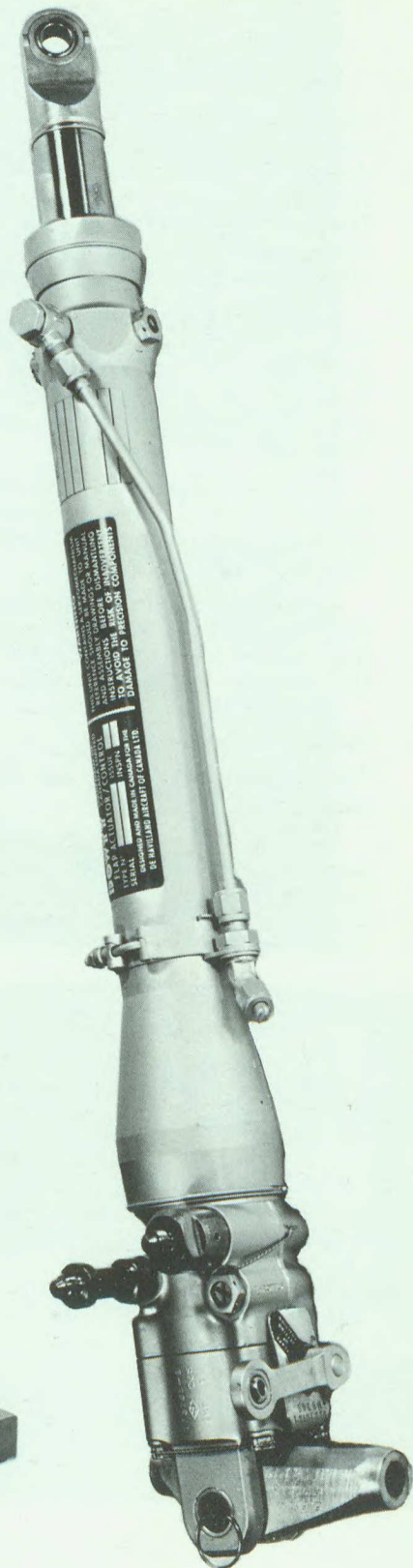
FLAP ACTUATOR/CONTROL

Designed and manufactured by Dowty Equipment of Canada for the operation and control of the De Havilland Caribou wing flaps, this unit comprises a double-acting hydraulic actuator and a spool type control valve with an interconnecting mechanism to cancel the selected flow path when the desired actuator traverse has been reached. Other elements embodied include an internal lock which sustains the actuator in its close state, an inlet filter and check valve, a rotary shut-off valve and a pressure relief valve.

Control is normally effected through push-pull linkage from the cockpit control to the external lever of the actuator. Upon selection of the desired degree of traverse, hydraulic pressure to the locked actuator causes the lock to disengage and permit piston movement. A spiralled rod connected to the rotary shutoff valve is rotated by the moving piston until the flow of pressure fluid is stopped. In this condition the actuator piston travel is also stopped. Return fluid flows through a drilling down the centre of the spiralled rod and to return line via the control valve.

Characteristics of this mode:

Weight	20 lb. (9 Kg.)
Maximum output force	
—Retraction	2310 lb. at 3000 p.s.i.
—Extension	7620 lb. at 3000 p.s.i.
No-load operating time	
—Extension	20/25 secs.
—Retraction	35/40 secs.
Input power requirement	3000 p.s.i. working pressure
Shaft stroke	12.29 inches maximum (31.2 cm)
Temperature Range	-65°F to + 160°F (-18C to + 71.1C)
Fluid	Hydraulic oil to Specification MIL-H-5606.



ACTUATION SYSTEMS FOR VARIABLE GEOMETRY AIRPLANES

Abex Industries' experience in the design, development, manufacture and qualification of actuation systems for variable geometry airplanes commenced with the design and production of the Wing Tilt Actuator and the Flap Actuator for the XC 142. In addition has designed the Wing Tilt Actuator for the Canadair CL 84 Dynavert. Where the actuators are of the Ball Screw type. Further, the design, development and manufacture of the Wing Sweep Actuation System for the F-111 Airplane has established Abex Aerospace as a leader in this field.

In the F-111 the system consists of a control mechanism, two ACME screw actuators each having an hydraulic motor and reduction gear box. The actuator gear boxes are connected by a synchronizing shaft which permits either motor to drive both actuators. The pilot operates the Wing Sweep system by a pistol grip type sliding lever which supplies inputs to the position control mechanism and controls the actuator position.

The structural load carrying members of the actuator, which transmit a 510,000 lb. barricade load, are constructed of D6AC steel heated to a minimum of 220,000 psi. The gears, of particular geometry, are also manufactured in D6AC and have nitrided teeth.

Actuator back lash is limited to 0.020 inches inclusive of the teflon impregnated cotton fabric lined nut. The operating load is approximately 50,000 lb. and each hydraulic motor supplies 38 H.P. The actuator has a stroke of 31 inches and a fully extended length of 87 inches.

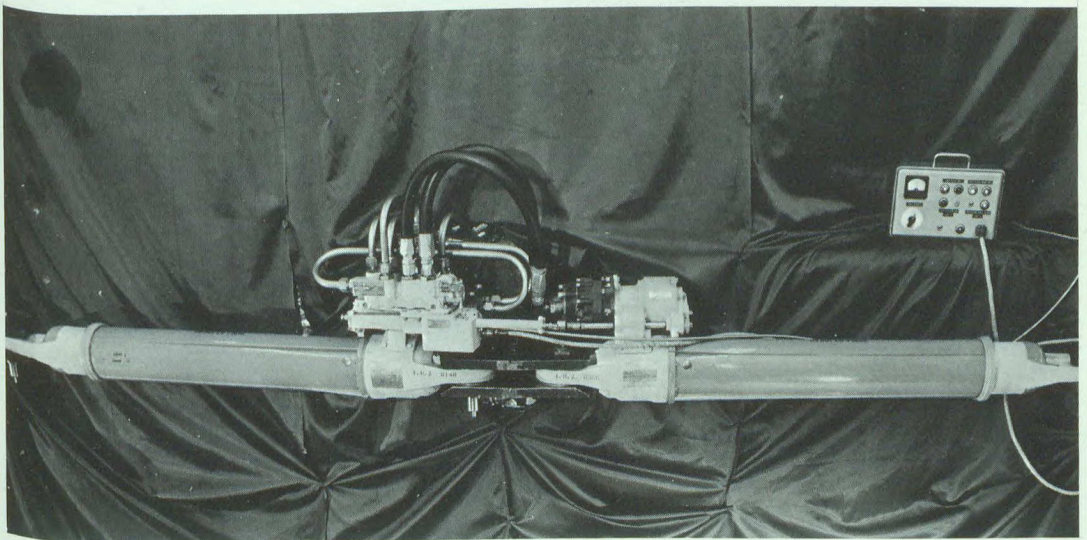
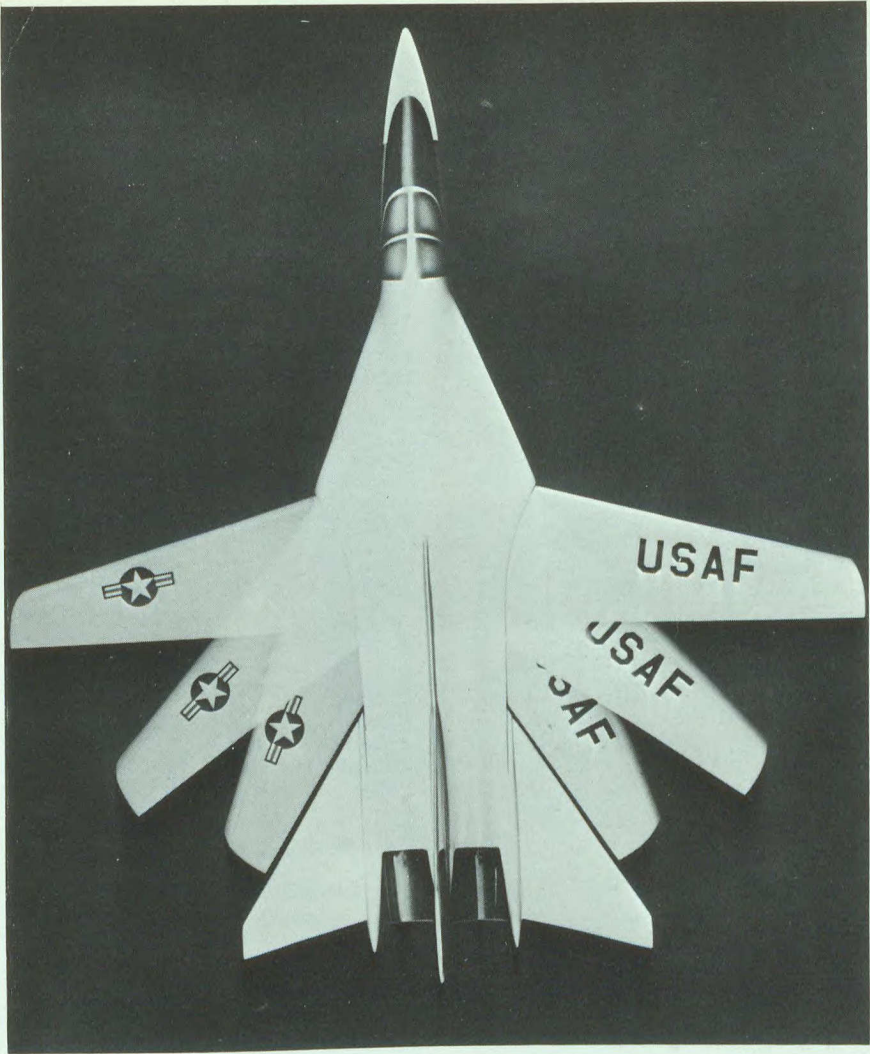
Spoiler Actuation Systems

The Lockheed C141 has one Abex Aerospace Spoiler Actuator system in each wing.

In response to pilot and aileron inputs during flight and landing gear touch down input, the system actuates inboard and outboard spoiler panels. Each system accepts manual and electrical signals, the position control being a mechanical loop. The system has two tandem cylinders of 33,000 lb. output capacity and a control manifold.

The system performs the undermentioned functions.

- 1) actuator speed control
- 2) synchronization of inboard and outboard spoilers
- 3) synchronization of wing to wing spoiler operation
- 4) automatic spoiler closure in the event of wing to wing assymetry
- 5) permits pilot hydraulic selection
- 6) permits continued operation in the event of servo valve failure
- 7) provides overload protection on spoiler panels
- 8) provides signal information to pilot



HYDRO-MECHANICAL SYSTEMS

Heroux Limited is proud of the part it played in landing man on the moon. The Primary Land Gear Strut (main cylinder) together with many of the secondary support struts on the Lunar Module landed on the moon by Apollo 11, were manufactured by Heroux. The contract was won competitively and was based on Heroux's ability to perform to the extremely difficult specifications. Special types of equipment had to be developed by the company's tool designers to ensure quality parts for the total contract for 15 vehicles.

For over 27 years the company has been producing a wide range of machined parts for the aerospace industry. Production facilities are housed in two plants with a total floor area of 180,000 sq. feet (16,722 sq.m.). These plants are equipped to handle all sizes and shapes of precision machined parts. Special milling, profilers, lathes, honing and gear cutting machines are used. A bank of four Milwaukee Matic tape control (N/C) are used as well as a tape controlled automatic chucker. Three automatic lathes are in use. Parts are manufactured for aerospace, atomic energy, shipbuilding, pulp and paper and many other types of industry.

The design team has experience in the design development and manufacture of landing gears, aero and industrial electro-hydraulic, hydraulic, hydro-mechanical and electro-mechanical systems and servos. The nose landing gear for the De Havilland DHC6 Twin Otter (Page I-8) was designed, developed and manufactured here as well as the nose and main landing gears for the CL-215 Canadair Water Bomber (Page I-10). Actuators and servos used on the CL-84 (Page I-20) and CL-215 are other products from the design and manufacturing team.

The company maintains one of the largest and most complete electro-plating and metal finishing facilities in Canada. This facility holds approvals from most of the major aircraft manufacturers in North America as well as approvals from applicable government agencies and many air carriers.

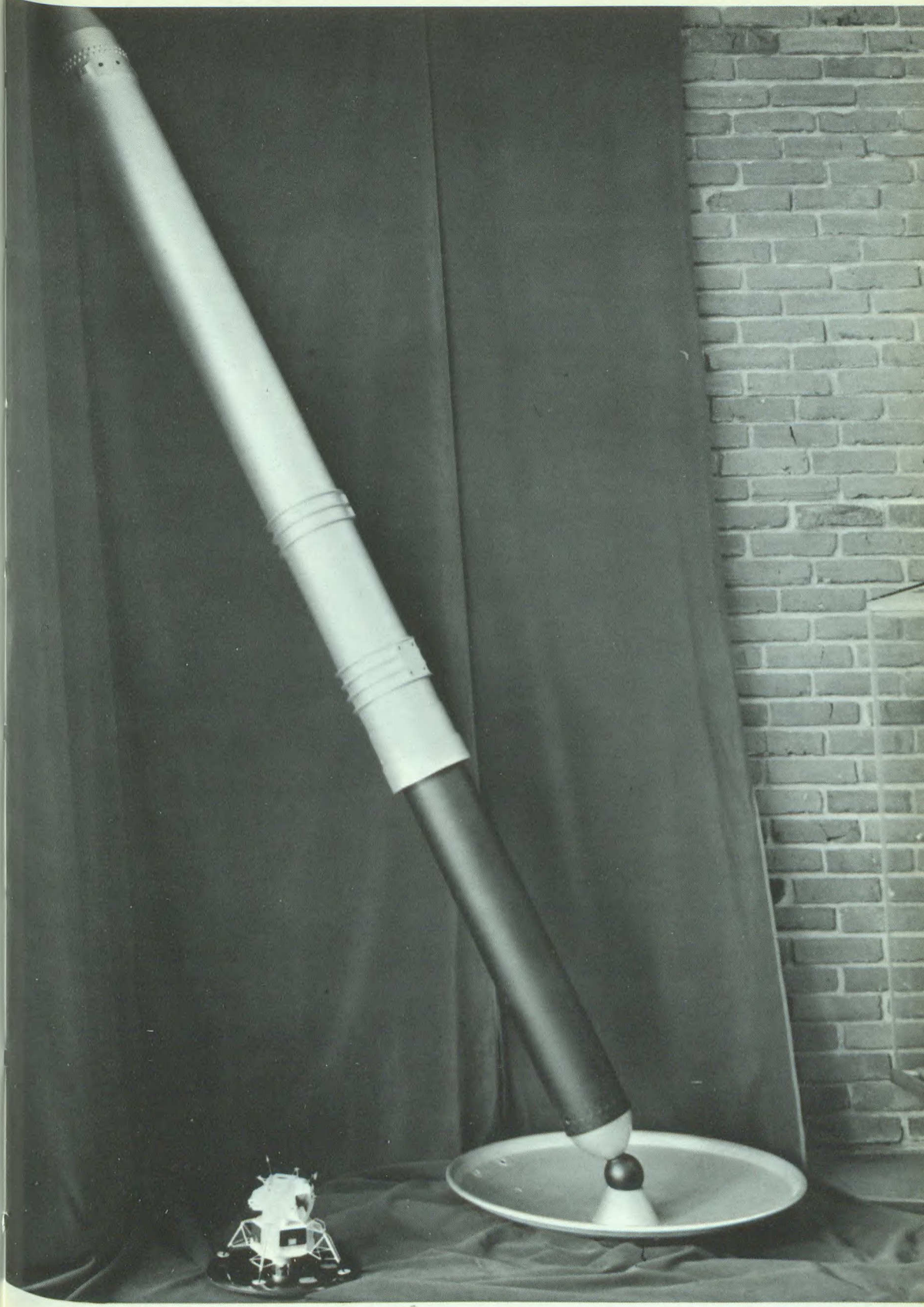
The Repair and Overhaul facilities at Heroux are considered to be as sanitary and modern as any in North America. Four separate "clean rooms" are maintained for the following functions:

1. Assembly of Production items (landing gears — servos — actuators etc.).
2. Repair and Overhaul of Hydraulic components (Canadian Armed Forces — Air Lines and Private Operators).
3. Repair and Overhaul of Fan Jet Falcon Business Jets and Alouette helicopter hydraulic components (Metric System).
4. Manufacture of Spool and Sleeve Assemblies.

These clean rooms are class 100 with air filtration to less than three microns and subsequent use of Vertical Laminar Flow work benches filters the air to .36 microns. Hydraulic fluid is filtered to one micron absolute and maintained at a temperature of 70°F to 110°F by means of refrigeration.

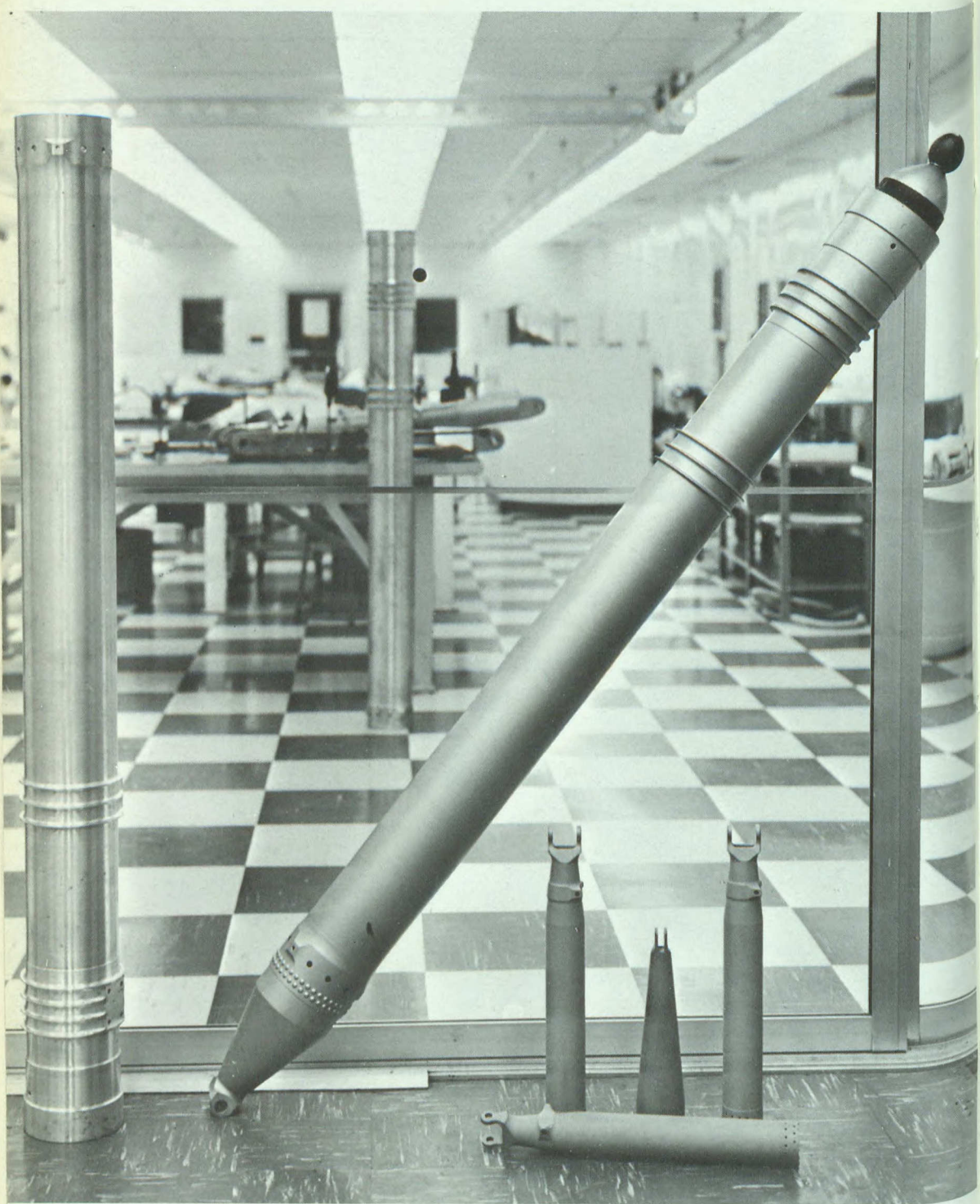
Structural components, shown on Page I-41, have been made for General Dynamics — Grumman — Boeing — United Aircraft — Sikorsky — De Havilland of Canada — Canadair — Douglas of Canada and Douglas (Santa Monica) — Curtiss Wright — Northrop — Bell Helicopter — Republic — Vertol Division of Boeing — Bristol Aero Industries as well as many sub-contractors to primes, such as Entwistle — Menasco (L1011) — General Electric and others.

Quality Control is founded on the concept of total quality control. Each phase of the manufacturing process from the purchase of material and components through fabrication and assembly, to shipping of the finished product is carefully monitored by the Quality Control Department. Fabricated parts are inspected to exacting standards and each minor assembly is tested as a unit prior to being incorporated into a larger unit. Thus performance is checked to meet the most stringent standards at all levels of manufacturing. Quality Control policy and procedures are certified to the Department of National Defence DND/1015 and exceed the requirements of MIL-Q-9858A for the manufacture of airframe aero engine and hydraulic components. The Canadian Armed Forces maintain a detachment at the plant for in-house inspection services. Heroux's Quality Control and Quality Assurance capability has been exemplified by "Zero Defects" and "Gold Rotor" awards from General Dynamics and Bell Helicopter respectively.



A LEM leg with a representative landing pad at the base. A model LEM is shown in the left foreground.

HYDRO-MECHANICAL SYSTEMS (cont'd)



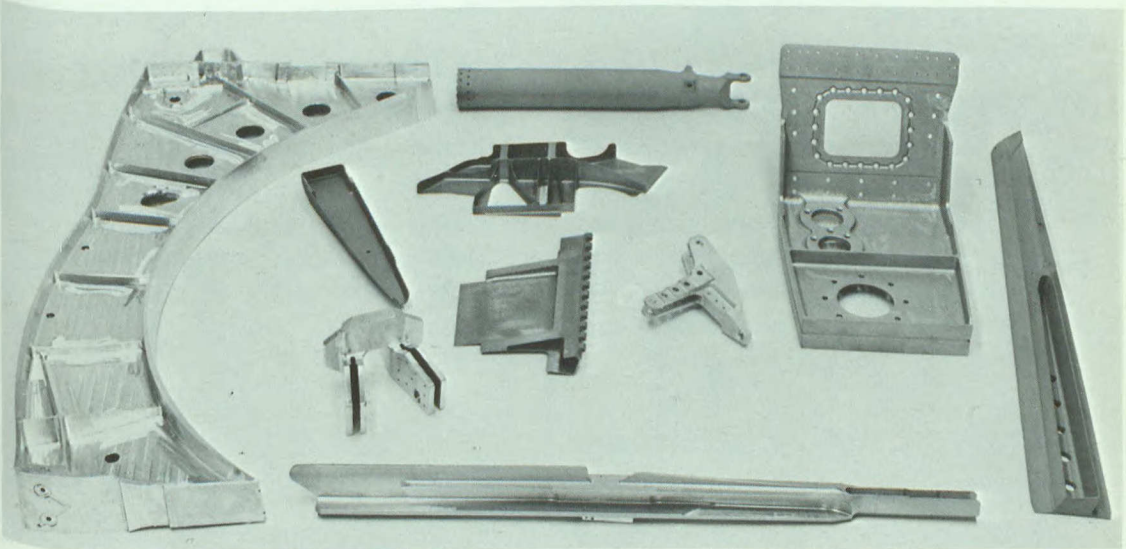
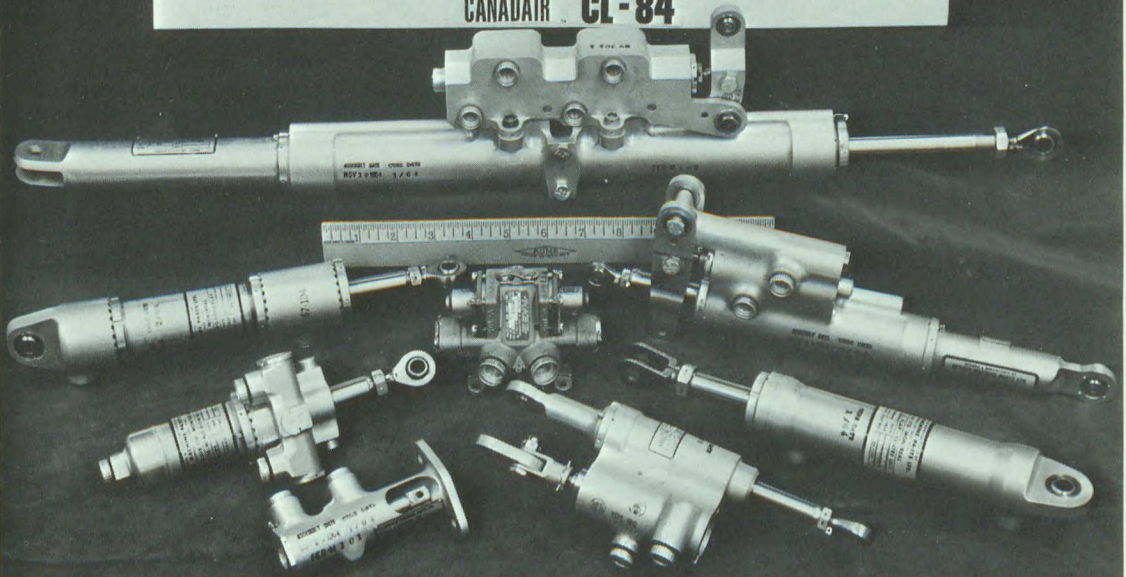
Further views of the LEM leg and the smaller retracting struts. One of the clean rooms provides background.

HYDRO-MECHANICAL SYSTEMS (cont'd)

DESIGNED & MANUFACTURED BY HEROUX MACHINE PARTS LTD.

**FLIGHT CONTROL SERVOS
VALVES & ACTUATORS**

FOR
CANADAIR CL-84



A selection of contoured parts produced by Heroux.

AIRBORNE FUEL SYSTEM UNITS

Airborne fuel system units must be light, compact and capable of operating under a wide range of environmental conditions without undergoing a change in output characteristic for a given set of input signals.

A typical example of an aircraft fuel system unit is shown on the opposite page.

This is a multi-purpose unit incorporating starter flow control, flow divider, pressure raising valve, shut-off cock, bypass and automatic manifold dump valve. It was designed and manufactured by Lucas-Rotax Limited for the United Aircraft JT15D turbofan engine. Specifically designed for small gas turbine engines, the unit weighs four pounds and operates under the following conditions.

Temperature Range:

The unit is self-compensating for changes in fuel viscosity over the temperature range of -60°F to 300°F . (-51°C to 149°C)

Pressure Conditions:

Maximum acting pressure 1150 psig. Normal inlet pressure 800 psig. Maximum by-pass pressure 150 psig. Test pressure 2000 psig. Maximum compressor delivery pressure 200 psig.

Flow Range:

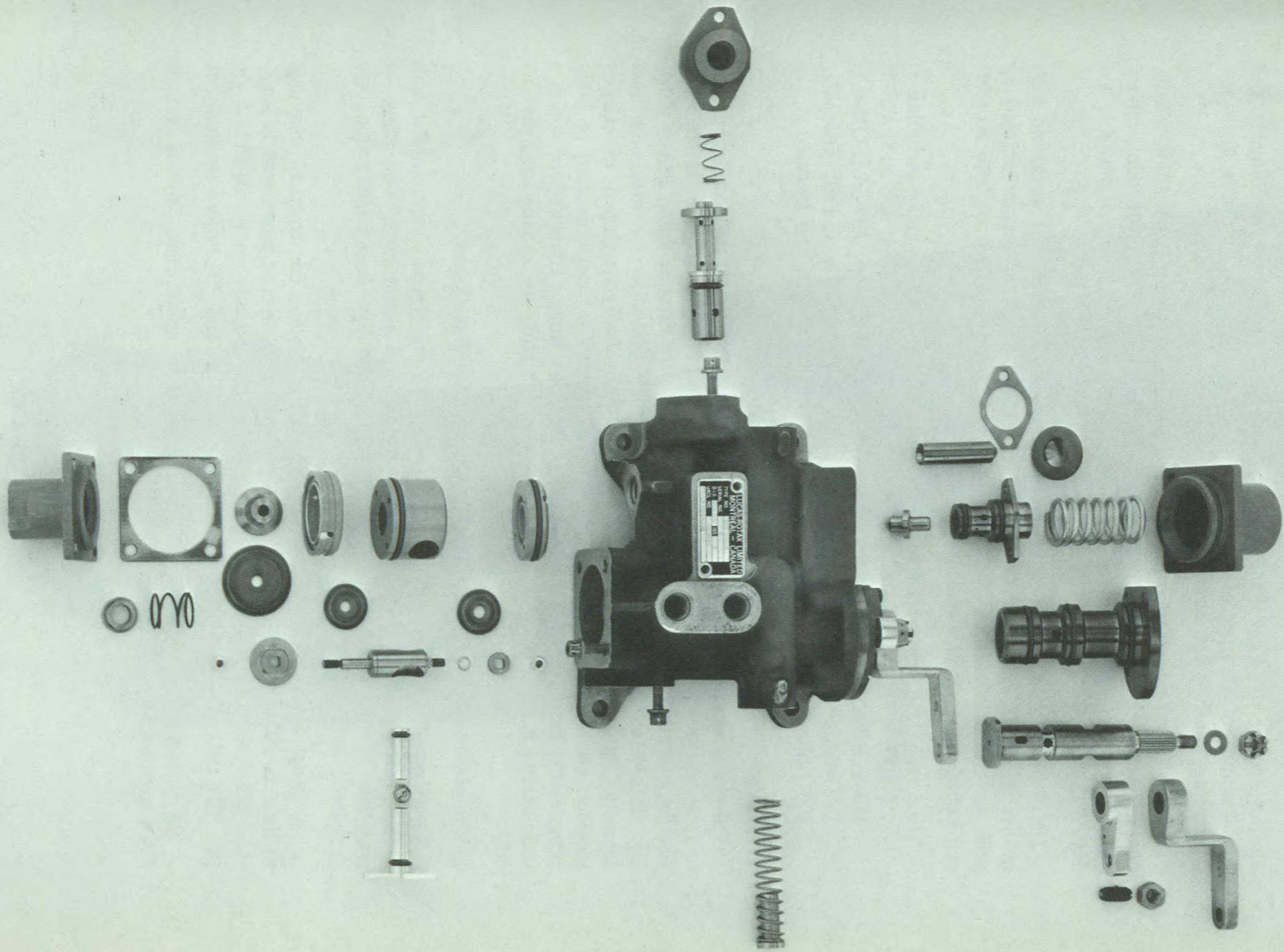
Maximum inlet flow, 1700 pph with pressure drop being adjustable to suit requirements. Starting flow from 90 pph at 50 psi to 160 pph at 175 psi with the output to the primary nozzles being held proportional to the compressor delivery pressure during starting.

The unit is fabricated from an aluminum casting with stainless steel and aluminum valves.

The first batch of prototype units have been manufactured and test bed and flight tested on the engine.

Design of the unit is such that with minor modification it can be adapted to a wide range of small engine sizes.

In keeping with current trends in aircraft control systems, automatic functions are a feature of the design which reduces the pilot's work. Minimum pressure, flow division, manifold fuel dumping and starting flow schedule are all controlled automatically.



AIRCRAFT RUBBER FUEL TANKS

The importance of "Leak Proof" fuel containers is recognized by designers and manufacturers of all types of Aircraft. Pilots, too, appreciate the extra assurance of knowing that their fuel is securely stored.

Rubber Fuel Tanks have provided this assurance for many years. Light-weight, flexible, easy-to-install and tested over many thousands of hours of flight, rubber tanks have been established as the most reliable Fuel Containers available today.

UNIROYAL Ltd. has been in this business since 1942. Hard work and high quality standards, backed up by many years of experience and expert engineering skills have established this Company as a leading manufacturer of both Aircraft and Vehicle rubber fuel containers.

Their tanks are being used in most military aircraft flying today including — CF-100; CF-104; CL-28; CL-41; CL-44; CL-66; CL-84; CL-215; CF-5; NF-5; F-5A/B; F-86; F-104D/G; T-33; T-37B; T-38; A7; AH-56A; OH-6A; OV-10A; UH-1D; UH-12E; CH-46; CH-47; CH-53; C-130; DO-28D; FH-1100; Caribou; Otter; Twin Otter; Buffalo; Beaver; and Harvard.

They are also used in vehicles LVTP-5; T-97 and CL-91.

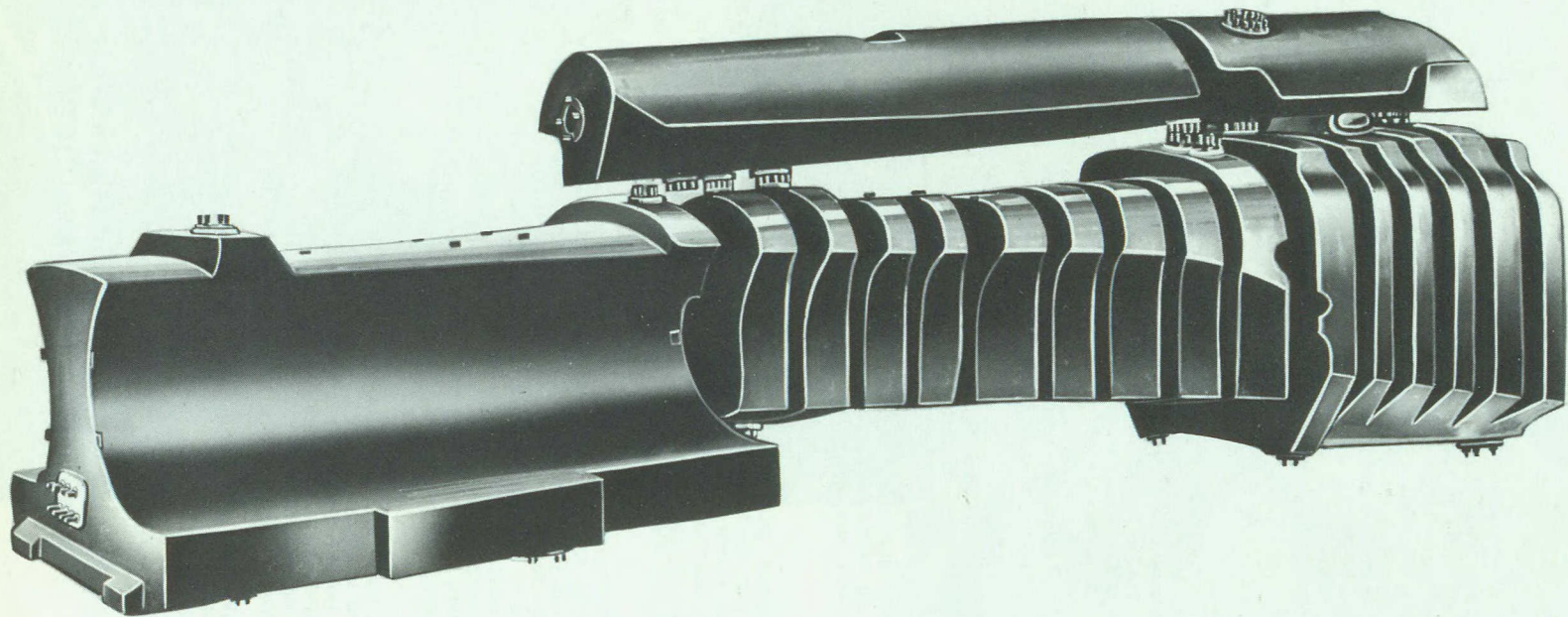
The shape and size of these tanks is practically unlimited for they can be tailored to fit almost any shape of Aircraft Structure, using stringers and ribs as supports. The flexibility of the bladder type materials allows for extreme fluted shapes utilizing all available interior aircraft space thereby providing for maximum fuel capacity. Fittings and connections are either individually developed, or existing type are utilized. Tight seals are achieved by using "O" rings, gaskets, or plain compression fittings. Tanks are held in position by using "Hangers", of which a wide variety is available. An average of five or six tanks are usually used per aircraft.

The photo on the right illustrates a group of typical Fuel Tanks.

Construction consists of alternate layers of strong Nylon Fabric coated with special grades of synthetic rubber to prevent fuel penetration. The range of materials is very expensive and both Bladder and Self Seal constructions are available.

The range extends from the flexible light-weight bladder construction, weighing, as little as 102 pounds per sq. ft. (46.3 gm. per .092 m²) of panel wall to semi-rigid self-sealing constructions, weighing up to 1.15 pounds per sq. ft. (521.6 gm per .029 m²) which provides protection against .30 and .50 calibre ammunition.

All constructions are produced and qualified to appropriate Military and/or FAA specifications.



HELICOPTER SERVICES AND CONSTRUCTION TECHNIQUES

Okanagan Helicopters Ltd., a Canadian corporate company, which is owned and controlled by Canadian Shareholders was founded in 1947 with its initial market in spraying Okanagan Valley orchards. When mining and oil exploration increased in the northern reaches of British Columbia as well as into the Yukon and the Northwest Territories the company expanded to meet the demands for the transportation of men and materials.

By 1956 they were operating Sikorsky S55 and S58 models as well as Bells on operations which were strung from Vancouver to Newfoundland and north into the Arctic Islands. As Okanagan continued to acquire northern and remote operational experience they soon were offering unique services which brought about the award of a support contract to the radar sites of the USAF at Goose Bay in Labrador. By 1960 expansion included fourteen bases in British Columbia, additional ones in Alberta and one at Montreal to serve eastern Canada.

In 1965 Okanagan was awarded an offshore drilling contract by Shell Oil Company of England and purchased an S61N for that work, flying this helicopter from the factory in Stratford, Connecticut, to London, England. This was the first commercial ferry flight of a helicopter across the North Atlantic unescorted. For this operation the company's pilots were now trained for instrument flying on twin-engine helicopters as well. As a result, of this operation, they were awarded a contract to service Shell's drilling rig now operating off the west coast of Vancouver Island, and now bases a 204B at Tofino, making daily flights to the rig. A further contract has been awarded to service the Shell rig scheduled for erection in the Atlantic off the coast of Cape Breton Island in the summer of 1969, using a twin engine Sikorsky S61.

The construction of powerline transmission towers has now become routine work. Where the larger towers are being built section by section the Bell 204B is usually used with the left door removed so the pilot can watch his work while he flies from the left position. A record was established by one company pilot when he set 68 towers in one day using a 204B. The Sikorsky S61A has also been used in tower construction and the S58's have seen continuous duty in stringing powerlines by mileage rates which force ground operations into economic obsolescence.

History of the Air Borne Control Technique

In this system, the helicopter serves both as an aerial platform above ground points on which a geodetic position is desired and as a transportation medium for ground support crews. In position, the craft serves as a target for angle measurements from one or more ground stations and as the 'remote' station for the electronic distance-measuring equipment. The system involves measurement of directions and distances from a few strategically located ground stations to the helicopter. Accurate hovering is facilitated by a specially designed 'hoversight', which establishes the vertical for the pilot allowing him to plumb the craft directly over the ground point.

The helicopter hovers high enough to be optically visible and produce a good distance measuring signal, yet as low as is practical for accurate hovering. A special plumblines device is used to measure the hovering height. On signal from the pilot that he is over the targeted point, horizontal and vertical angle readings are made to a high intensity rotating beacon on the helicopter from the theodolites at the occupied ground stations. At the same time, distance measurements are made electronically by the hydrodist, an instrument similar to the telurometer. In addition to the pilot, the airborne team includes an engineer to operate the distance measuring instrument, to determine helicopter height, to verify the identification of the ground points and to record pertinent data.

Research and Design Projects

OKALS Aerial Line Stringer

The OKALS Aerial Line Stringer is a device of simple construction and operation which permits the unreeling of cables, ropes or wires by aerial means. The stringer is designed to handle conventional reels with the line wound on by machine or by hand, thus eliminating any special winding procedures. The device has been thoroughly flight tested and has been successfully used on various construction projects in British Columbia and overseas. At the present time two sizes are in use, the Series 1000 which will handle reels of a gross weight of up to 1000 lbs., and the Series 4000 which is designed for use with reels with a gross weight of up to 4000 lbs. Stringing speeds of up to 50 mph have been obtained when laying polypropylene hauling ropes, and up to 20 mph with plastic insulated telephone cables and power conductors. See bottom illustration Page I-47.

Monsoon Bucket



OKALS Aerial Line Stinger



Multiple Hook System (Carousel)

A multiple hook system has been designed for the carrying of multiple loads to utilize on a per-flight basis the optimum lifting capacity of the helicopter. It is a circular arrangement of six helicopter cargo hooks suspended by lanyards from the helicopter's own main cargo hook, and is used mainly in the supply of powerline, microwave and pipeline construction staging points, exploration-survey camps, ground-based forest firefighting crews, oil and gas field installations, disaster and rescue areas and control points.

Operation of each of the multiple hooks is through the selector switches, indicator lights and single firing button on the pilot's control console. The hooks can be released in sequenced order or in any order required and the complete assembly can be instantly jettisoned if required. Each hook has a rated capacity of 2000 lbs. and the complete assembly is rated for 4000 lbs. with the whole, including umbilical wiring weighing 120 lbs. Larger units are under development. *See bottom illustration Page I-49.*

Aerial Spray Equipment (HUSS — Helicopter Underslung Spray System)

This is the first major innovation in development of helicopter liquid spray gear in almost 20 years.

It is based on the principle of suspending the entire spraying function liquid tank, pump, motor and booms — from the helicopter's cargo hook as an independently powered, self-contained unit directionally stable in forward flight. There can be no possibility of a center of gravity shift.

One of the greatest advantages of the HUSS system is that all mechanical components of the spray unit can be tested, serviced or repaired, without grounding the helicopter.

Electrical circuitry can be installed in about 10-15 minutes. There are no struts, stays, pumps, plumbing or booms to be attached to the helicopter, or that have to be taken off before the machine can be used for other purposes.

A HUSS unit is instantly jettisonable in the event of an air emergency. Chemical corrosion and fire hazard are eliminated. Landing for tank refilling is eliminated as the helicopter works from an emptied unit to a full one. An ideal operating combination is three HUSS units, two helicopters.

Empty weight is only 105 pounds (47.6 kg) and tank capacity in this model is 70 Imp. gallons (318 lit.). Larger HUSS units are under development. *See top illustration Page I-49.*

Monsoon Bucket

The Monsoon bucket is one of the most useful, versatile pieces of auxiliary equipment ever developed for the light helicopter.

Its primary purpose is to convert any helicopter into an "instant" water bomber for swift containment and suppression of lightning strikes and spot fires in forested or bush areas.

Its principal feature is that it can be refilled in 10 seconds with water from the sea or any lake, stream, swamp, reservoir, swimming pool or open-topped tank — without the helicopter having to land. Where such water sources are available it does away entirely with the need for cumbersome ground support equipment, such as pumps, hoses and tank trucks, etc.

The Monsoon bucket has won acceptance as an indispensable aid to forest fire prevention and control by government Forest Service crews in British Columbia, Alberta and some U.S. states, including Alaska.

Suspended from the helicopter's cargo hook — and therefore instantly jettisonable, if required — it also does double duty as a tool and equipment carrier (pumps, hoses, hand tools, etc.) for immediate use by ground firefighters flying to the scene of an outbreak in the helicopter. Then the aircraft goes into service as a water bomber to support the men on the ground. *See top illustration Page I-47.*

Mechanical Features

The Monsoon bucket is basically a standard 45 Imp. gallon (205 lit.) steel oil or gas drum, with its top cut out. A solenoid-operated dump valve and wooden stand assembly (available in kit form with lanyards and wiring) is fitted to the barrel bottom. Opening of the dump valve (adjustable) is controlled from a switch on the pilot's cyclic stick, and closing by contact of the valve gate with the surface of the water. A counterweight is fitted to the top rim of the drum or barrel to ensure speedy tipping and filling (10 seconds maximum). Positive closing of the valve gate is by a simple spring-loaded latch. A standard steel drum can be converted to a Monsoon bucket in about four man-hours. No special tools or equipment are required.

Aerial Spray Equipment
(HUSS)



Multiple Hook System
(Carousel)

PARACHUTE SYSTEMS

Irvin Air Chute Ltd. has recently concluded development of several Aerospace Products of considerable significance as outlined below:

Irvin 'Variable Porosity Ribbon' Deceleration Parachute

The Irvin Variable Porosity ribbon parachute is a further development of the standard ribbon type, and is adaptable to any aircraft deceleration system presently employing standard (FIST) ribbon, Ring Slot, Cruciform or other deceleration parachutes.

The amount of air allowed to flow through a ribbon type parachute canopy is controlled by the spacing of the concentric (horizontal) ribbons. In the Irvin Variable Porosity canopy, the ribbon spacing decreases progressively from the skirt to the vent while ribbon strengths are also adjusted to suit the particular application. Distribution of the ribbons in this manner increases the efficiency and strength towards the crown of the canopy, which is the primary source of drag.

Advantages:

- Reduced Maintenance Costs.
- Greater Drag Efficiency.
- Lower Opening Shock.
- Reduced Probability of Damage.
- Higher Emergency Landing Speed Capability.
- Fail-Safe Ribbon Construction.

Systems In Service Use Include:

Model ID-86-101

Northrop F-5 aircraft decelerator;

Diameter of canopy: 14.55 ft. (4.4 m) *Service life rating:* 75 streams

Deployment speed rating: emergency max. 190 knots.

Model ID-86-102

Lockheed F-104 aircraft decelerator;

Diameter of canopy: 16.2 ft. (4.9 m) *Service life rating:* 75 streams

Deployment speed rating: emergency max. 200 knots.

Irvin "Zero-Zero" Parachute System

Irvin has developed a ZERO-ZERO modification kit which, when installed in a standard back type parachute, permits safe ejection under zero speed/zero altitude conditions.

Features include:

MK-10A Barometric Release

A proven altitude sensing/time delay device.

Drogue Gun

Instant fire type: develops 240 ft./lb. energy.

Automatic Safety/Arming Cable

Provides automatic "Safety on/Safety off" feature.

Connect/Disconnect Device

Automatically connects missile on firing; disconnects missile after deployment.

High/Low Speed Deployment Bag

Rapid deployment at low speed; controlled deployment at high speed. Operational Sequence In Automatic Mode:

1. Seat/man separation pulls MK10A Release Safety/Arming Cable.
2. MK10A provides time delay and altitude selection.
3. MK10A fires and actuates drogue gun.
4. Drogue gun missile extracts ripcord pins, activates connect/disconnect device and forcibly deploys the pilot chute and main chute.
5. Connect/disconnect and missile fall away.
6. Controlled deployment and inflation follow.

This system can be retro-fitted economically to almost any back style parachute type and through its simplicity and positive action affords the pilot remarkable reliability and performance under the most adverse conditions.

Irvin Seat Survival Containers

These low-cost, rigid, fiberglass Survival Seat Packs are designed for use in aircraft equipped with ejection seats. The interior of the Pack provides space for survival equipment, while the top surface is shaped to receive a seated aircrew member and engineered to minimize possible injury on ejection.

Four nylon flaps on the underside of the pack form the closure, and are held in position by manual ripcord and pin method. Two adjustable side straps, attached to the cone plate during closing of the flaps, emerge through channels inside the Pack. Quick connector, quick release fittings at the end of the side straps provide the means of attaching the Survival Seat Pack to the harness of a back type parachute. A drop line is provided with an accessory container permanently attached at the end. Provision is also made for attachment of a life raft to the drop-line in a manner to permit automatic inflation during parachute descent.

The following types are currently available:

Model ID-52-137 — CF-5 Aircraft with Norair Ejection Seat.

Model ID-52-135 — CL-41 (Tutor) Aircraft with Weber Ejection Seat.

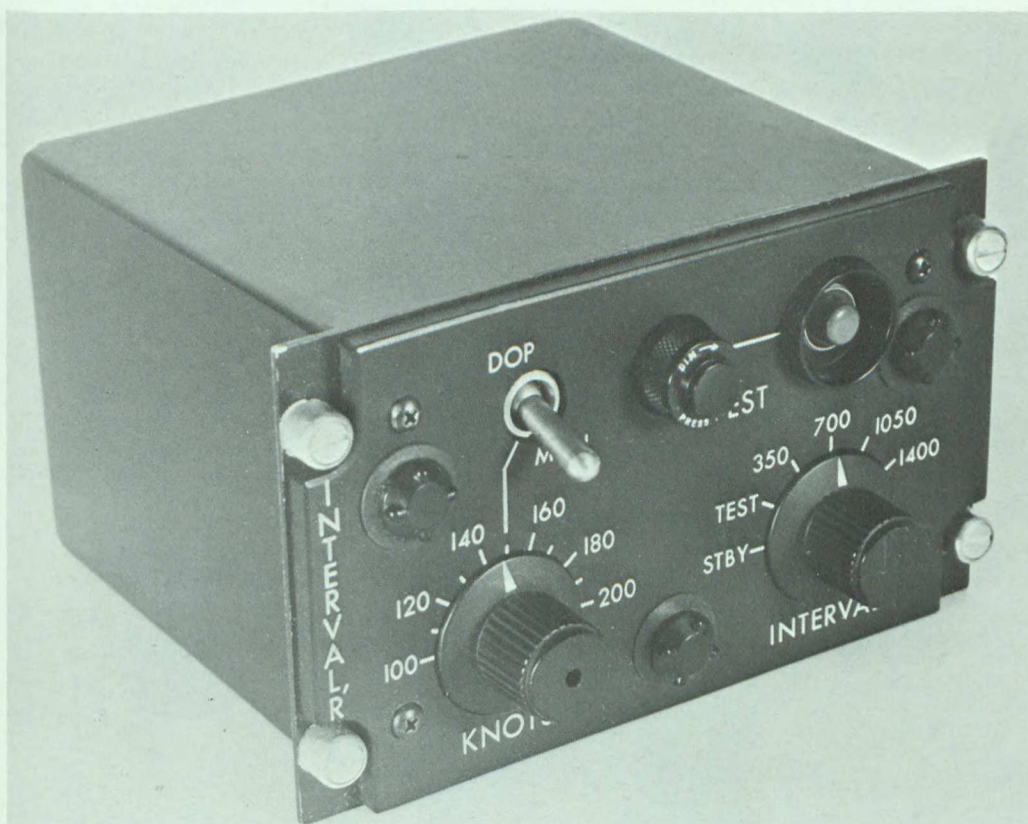
Model ID-52-139 — T-33 Aircraft with Lockheed MK3 Ejection Seat.

INTERVALOMETERS

Designed to trigger Sonobuoy drops to achieve a high degree of spacing accuracy between buoys. Intervals of 350, 700, 1050, & 1400 feet (106.7, 213.4, 320 & 426.7m) can be selected, with aircraft ground speeds of 100 to 200 knots. The first drop pulse is initiated by the operator, the second pulse, on the same wire, is provided by the intervalometer at the precise instant calculated within the unit. This equipment was designed and developed by Leigh Instruments Limited and 40 units are now in use by the Canadian Armed Forces.

FEATURES

- Doppler or Manual groundspeed selection
- Self Test functions provided
- Solid State switching — no relays
- Illuminated panel
- Safe: a drop pulse can only be initiated from an external trigger source, not from controls on the unit itself.
- Accurate — tolerance of ± 14 feet (4.3m) between buoys at any speed or interval setting.



MOBILE AUTOMATIC TEST SET

Developed by the engineering division of Litton Systems (Canada) Limited, the Mobile Automatic Test Set (MATS) is Litton's approach to a rapid maintenance capability employing minimum skill levels for inertial navigation systems at squadron and base shop level. The MATS performs a complete and automatic checkout of inertial navigation systems in aircraft on the flight-line or in the base test laboratory with a minimum of skill and judgement required from the operator. In addition to establishing the serviceability or unserviceability of the system under test, the MATS provides precise information on the nature, location and remedy of a fault, to the extent of isolating a particular module or sub-assembly.

In addition to eliminating unnecessary removals of the guidance system, the MATS makes actual flights checks unnecessary after a malfunction has been corrected by doing a pre-flight confidence check itself.

In the MATS, emphasis has been placed on the convenient grouping of operating controls and displays and on the accessibility of components for easy maintenance. The Test Set is mounted on a chassis having an air-bag suspension to reduce shock loads and is fitted with a tow bar and brakes to assist moving with a tractor. Controls and displays are protected from rain by a hinged shield that can be clamped at any desired angle.

The MATS uses a programmed tape in conjunction with a photo block reader to perform automatic tests. The tape test programs used by Litton MATS can be used for any portion of the inertial navigation system without modification. It is not necessary to change tapes for various types of tests. Additional spare tapes can be punched in the field using inexpensive equipment. Program modification, if required, can be performed with ease. The unit uses relay matrices to select the signals to be tested, their tolerances, and the fault indicator readout instructions. The signal is then compared to an internal reference signal. If the signal is not within specified limits the automatic program is inhibited and the fault indicator readout is energized to indicate the source of the malfunction. A programmed self-test is included to enable the operator to test the MATS immediately, thereby verifying the integrity of the MATS.

Litton MATS vehicles are currently in use with the RCAF, RNLAF, RDAF and USN.

Litton Canada has produced over 1000 major units of Aerospace Ground Equipment in addition to MATS. This covers manual and automatic test equipment for flight line, base service lab, depot, and factory applications.



PRESSURE-TEMPERATURE TEST SET—TTU-205B/E

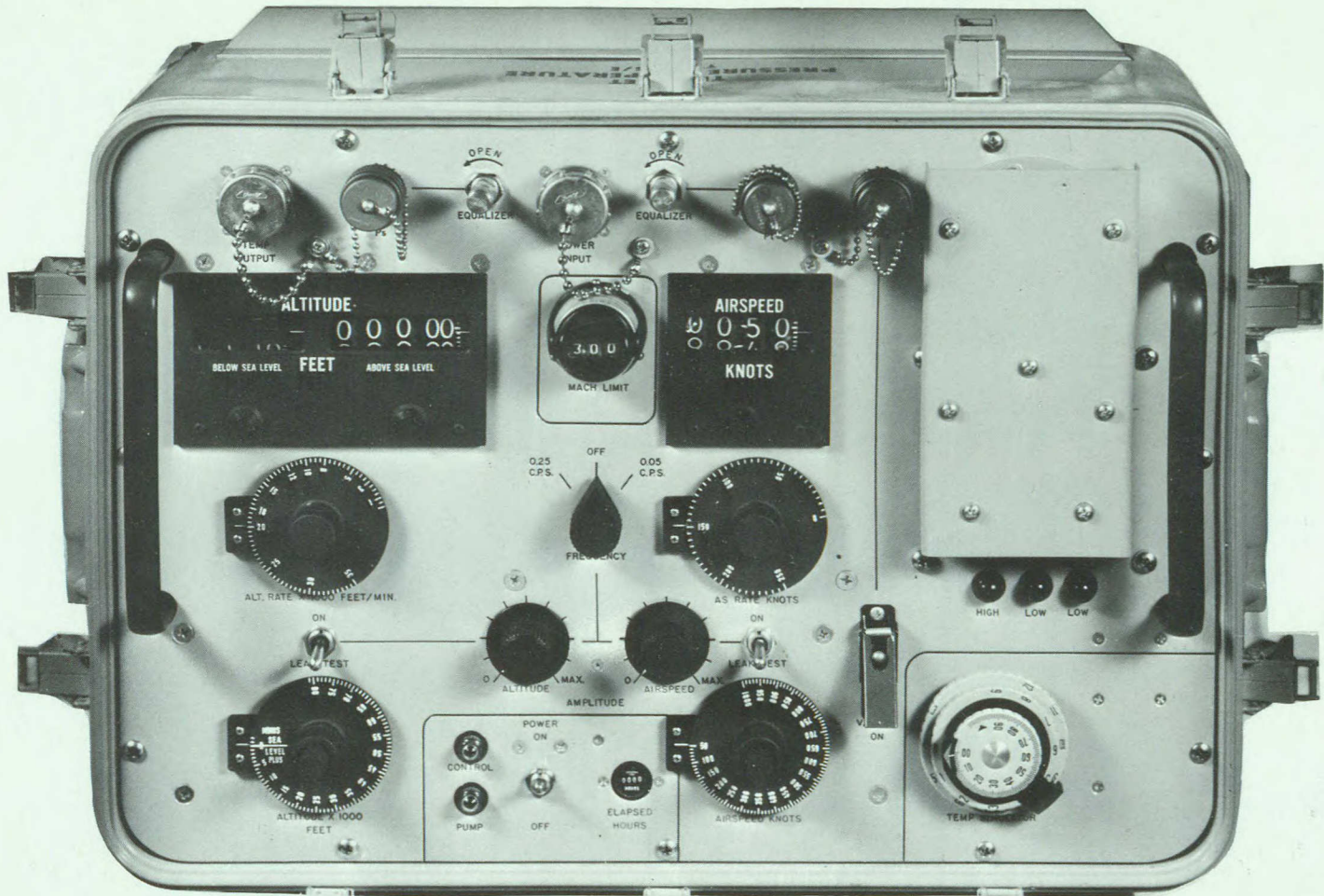
This test set is a Flight Line and Maintenance Depot Level Portable Pneumatic Test Set capable of testing the new Altitude Reporting System Computers (AIMS) now being introduced in military and commercial aircraft. The set is now in production at Garrett Manufacturing Limited where such equipments have been developed and produced to meet the needs of ever increasing complex aircraft systems and is being delivered in quantity to the U.S.A.F. and U.S. Navy. It is designed to meet the requirements of the new U.S.A.F. designation TTU-205B/E, MIL-T-38191D and it provides: plus or minus 18 feet (5.5 m) accuracy at sea level; .15 percent accuracy to 60,000 feet (18,288 m); .2 percent accuracy from 60,000 feet to 80,000 feet (18,288 to 24,384 m); plus or minus 2 knots accuracy at 50 knots increasing to plus or minus 1.5 knots from 100 to 1,000 knots; controllable altitude slew rates from 0 to 35,000 feet/minute (10,668 m) altitude; controllable airspeed slew rate from 0 to 250 knots. This unit is an improved version of the earlier TTU-205/E Test Set, MIL-T-38191A which is fully qualified and is also in service with the U.S.A.F. for checkout of flight instruments on aircraft such as F111, F4, C141 and CF5. All these units provide direct digital readout of altitude and airspeed without correction cards to the accuracies stated.

Applications: Checkout of flight instruments on the flight line — Leakage test of aircraft flight instrument pneumatic system — Checkout of the Central Air Data Computer on the flight line — Pneumatic excitation of auto pilot and navigational system on the flight line — Calibration and service of Central Air Data Computer on the bench — Pneumatic supply (airspeed and altitude for aircraft automatic systems test units).

Specification — TTU-205B/E

PERFORMANCE FIGURES TTU-205B/E PRESSURE-TEMPERATURE TEST SET LATEST VERSION, DESIGNATED PART NUMBER 607330-8

ALTITUDE RANGE	-1,000 to 80,000 feet (305 to 24,384 m)
ALTITUDE ACCURACY	± 18 feet (5.5 m) or .15% of indicated altitude to 60,000 feet (18,288 m) increasing linearly to 160 feet (49 m) at 80,000 feet (24,384 m).
ALTITUDE SLEW RATE	Ramp controllable 0 to 35,000 feet (0-10,166 gm) per minute. Accuracy $\pm 5\%$.
AIRSPPEED RANGE	50 to 1,000 knots.
AIRSPPEED ACCURACY	± 2 knots at 50 knots, ± 1.5 knots at 100 to 1,000 knots.
AIRSPPEED SLEW RATE	Airspeed ramp 0 to 250 knots per minute controllable. Accuracy $\pm 5\%$.
MODULATION	Modulation 0.05 and 0.25 cps. either or both Ps and Pt.
TOTAL TEMPERATURE	30 to 130 ohms. Accuracy $\pm 0.1\%$.
MACH LIMIT	.8 to 3.0 mach.



PRD PROGRAMMABLE PNEUMATIC SIGNAL GENERATOR

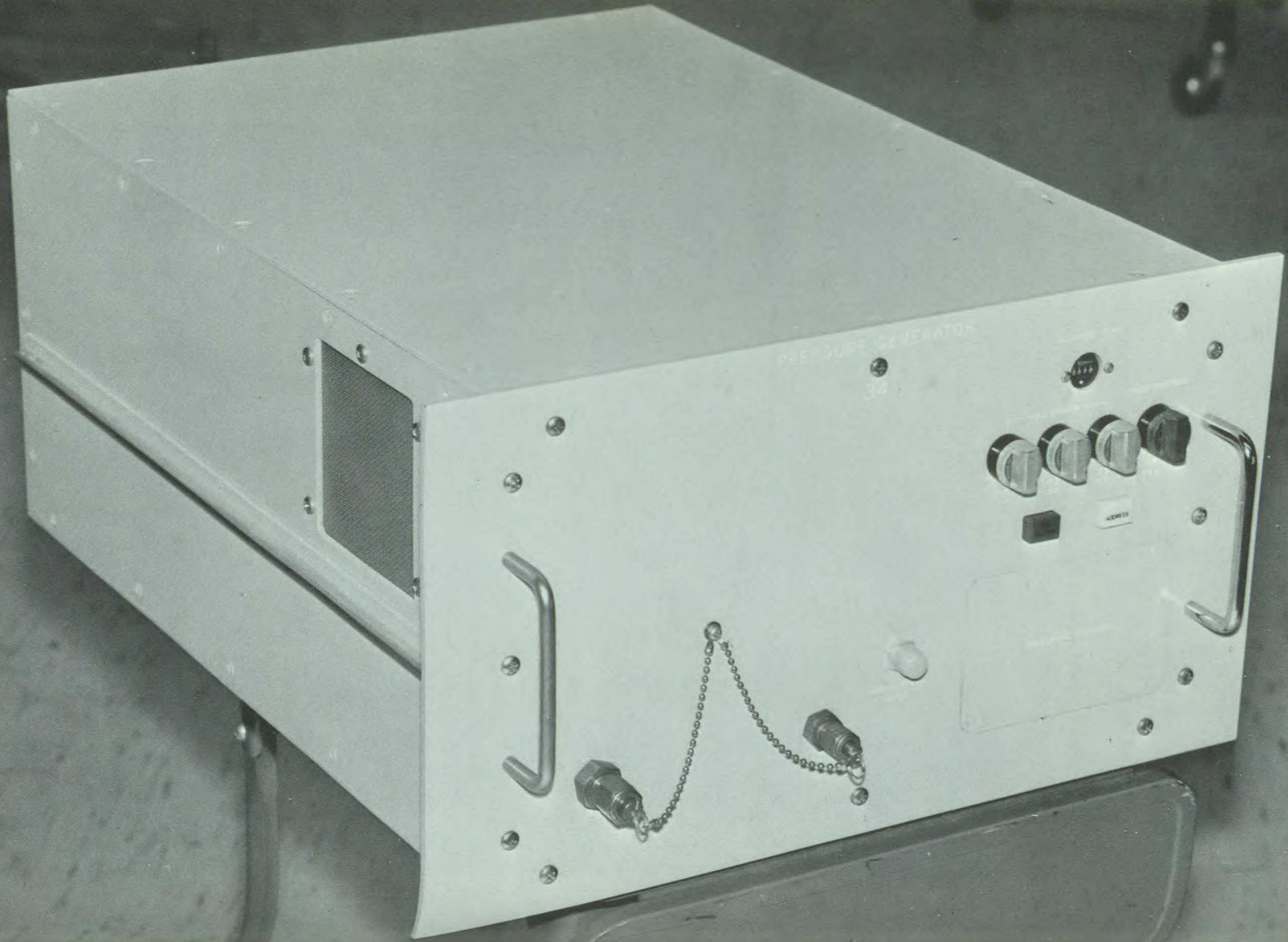
The Pneumatic Signal Generator is a completely programmable module capable of accepting input commands directly from a digital computer. This unit is being used as the pneumatic signal generator for the new U.S. Navy Avionics System test unit referred to as VAST (Versatile Avionics Shop Tester). Similar equipment will be used by Sud Aviation with the French-British Concorde. The module includes logic control circuits, an analogue drive servo system and a pneumatic block. The unit is capable of translating 2 digit BCD inputs into analogue signals.

These are in turn translated into mechanical output controlling electro-mechanical sensors. The pneumatic block then generates pressures representative of altitude and airspeed. The unit is also capable of generating altitude ramp rates and altitude pressure modulation as required. The module is designed to provide a number of separate points in altitude and airspeed from 1,000 feet (304 m) below sea level to 90,000 feet (27,432 m) altitude and from 50 knots to 1,000 knots. Up to 100 points in both altitude and airspeed can be provided by this unit. Ramp rates are provided at 2,000, 5,000, 15,000, and 30,000 feet/minute (762, 1524, 3048 and 6096 m).

Applications: Flight Instruments – Engine Pressure Ration (EPR) – Overspeed sensors – Airspeed undercarriage warning systems – Oxygen mask control equipment – Cabin pressurization Control Systems – Pitch Trim Compensators – Rudder Throw Limiters – Air Data Warning Switches – Flight Recorder Sensors – Autopilot Systems – System Leakage Checks – Air Data Computing Systems.

Specifications:

SIZE:	19" wide (panel) x 10.5" high x 20" deep (47 x 26.9 x 51 cm)
WEIGHT:	90 lbs. (41 kg)
ALTITUDE CHANNEL (Ps)	
INPUT:	2 digit B.C.D.
OUTPUT: Range:	-1000 ft. to 90,000 ft. (-304 m. to 27,432 m.) programmable in 1000 ft. (304 m.) increments.
Accuracy:	$\pm 0.005''$ Hg. from -1000 ft. to +30,000 ft. (-304 to 6096 m.) $\pm 0.010''$ Hg. from 30,000 ft. to 90,000 ft. (6096 to 27,432 m.)
	Programmable Sinusoidal
Modulation:	0.1 c.p.s. to 0.5 c.p.s.
Working Volume:	5 to 250 cu. ins.
AIRSPEED CHANNEL (Pt)	
INPUT:	2 digit B.C.D.
OUTPUT: Range:	50 knots to 1,000 knots
Accuracy:	2.0 knots at 50 knots decreasing to 0.75 knots at 150 knots. Linear at 0.75 knots to 1,000 knots.
Ramp Rate:	200 knots/min.
Working Volume:	5-250 cu. ins.



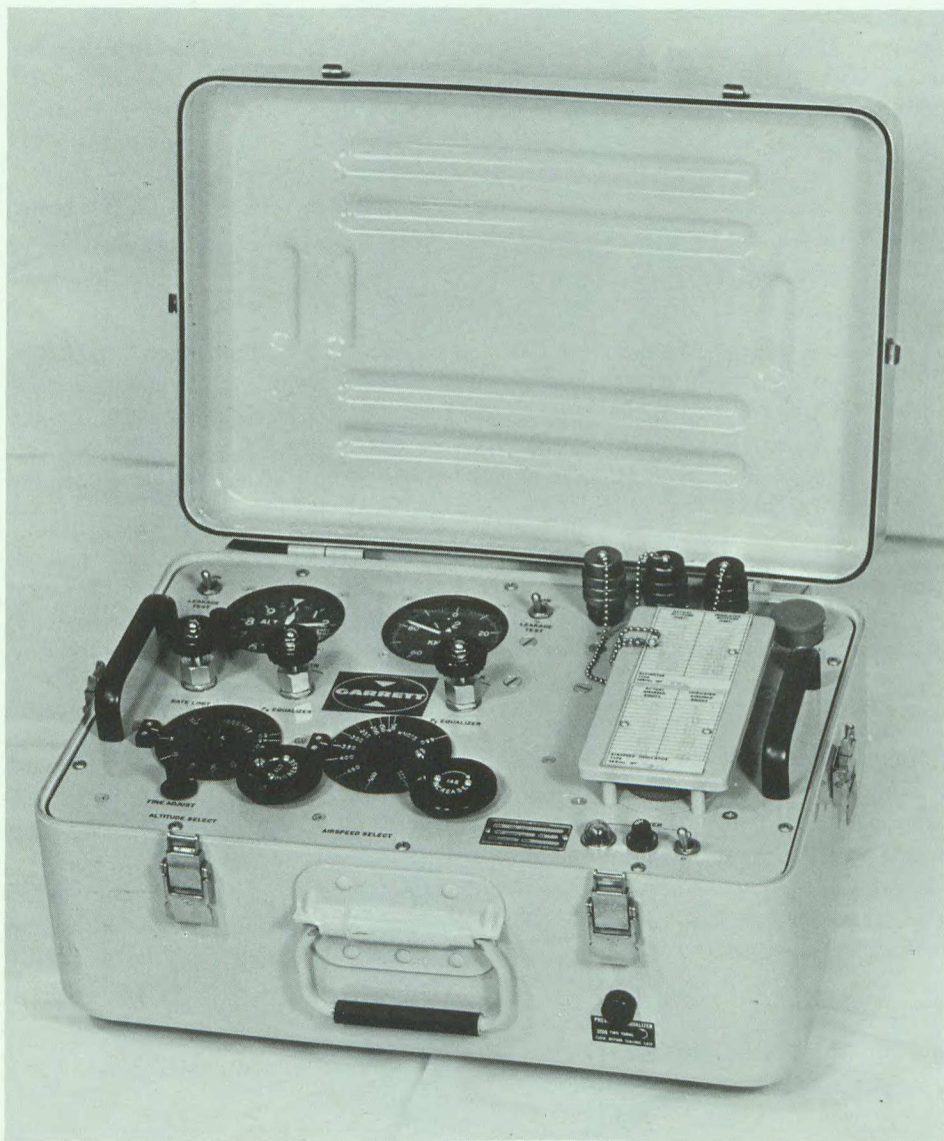
A/11 PNEUMATIC SIGNAL GENERATOR

The A/11 Pneumatic Signal Generator is designed to provide pressure and vacuum signals suitable for checking out aircraft systems such as pitot-static flight instruments, mach trim, autopilot, engine pressure ratio transducers, etc. It has an airspeed range from 50 to 650 knots and an altitude range of 100 feet to 50,000 feet (30.5-15,240 m). Airspeed and altitudes are controlled through independent channels preventing undesirable interaction when either one requires a new setting. Every possible safety feature is included in the unit such as negative Qc protection, positive Qc protection, absolute pressure relief, rate of climb limited to 6,000 feet (1827 m) per minute or as specified, fail safe if power failure occurs protecting aircraft system from sudden change. The unit is lightweight, 35 lbs. (15.9 kg.) and in addition to aircraft checks, it can be used for bench checks of flight instruments or components requiring accurate pressure/vacuum inputs.

Application: Satisfies the Pneumatic requirements of all commercial aircraft presently in service (Boeing 707, 720, 727; Douglas DC-8, DC-9) — Simulates the flight envelopes of all new commercial aircraft — Exceeds the tolerance requirements and flight envelopes for AIMS (Altitude Reporting System) Types 1 and 11 (Type III requirements are covered by the Garrett Manufacturing Limited TTU-205B/E) — Exceeds the test requirement of F.A.A. Regulation F.A.R. 91.70 Part 43, Appendix E (Static Pressure Systems and Altimeter Instruments).

Specifications:

SIZE:	Without lid 14½ x 20½ x 7 inches (36.8 x 52 x 17.8 cm.) with lid 14½ x 20½ x 9½ inches (36.8 x 52 x 24 cm.)
WEIGHT:	Complete with lid 35 pounds (15.9 kg.)
READOUTS:	Altitude: -1000 to +50,000 feet (-305 to 15,240 m) Airspeed: 50 to 650 knots (I.A.S.) Rate of Climb: 0 to ±6,000 feet/minute (Optional) (0 to ±1827 m per m)
READABILITY:	Altitude: 5 feet (1.52 m)
SENSITIVITY:	Airspeed: ½ knot better than 0.001 in. Hg. over entire altitude and airspeed range.
ACCURACY:	Altitude: ±25 feet (7.6 m) at sea level to ±70 feet (21.3 m) at 50,000 feet (15,240 m). Airspeed: ±2 knots over entire range
VACUUM:	Separate Vacuum/Source 25.0" Hg. (mini- mum)
POWER REQUIREMENTS:	115 V, 400 cps, single phase, 250 VA approx.
ENVIRONMENTAL CONDITIONS:	—Designed to comply with all applicable sections of MIL-T-21200D. —No warm up time required.



FLIGHT DATA RECORDER SYSTEM

The basic Flight Data Recorder System as shown in the photograph consists of a Flight Identification Unit, a Recorder Electronics Unit, and a tape cassette in a crash-proofed package, (in this case an F104 CPI Airfoil*. The heart of the system is the Recorder Electronics Unit, a standard $\frac{3}{8}$ ATR short, containing solid state circuitry mounted on printed circuit boards. With 32, 64 or 128 channels per second capacity, the unit accepts aircraft signals from existing instrumentation, or from special transducers, conditions them to a basic 0-5 Vdc range, multiplexes them, and converts them to a Pulse Code Modulation (PCM) type format for recording on the tape cassette. The Flight Identification Unit allows the aircrew to insert Flight Identification and other pertinent data on the tape. The tape cassette shown contains a half-hour duration tape stored as an endless loop, together with the necessary erase, record and read heads, and an integral drive motor.

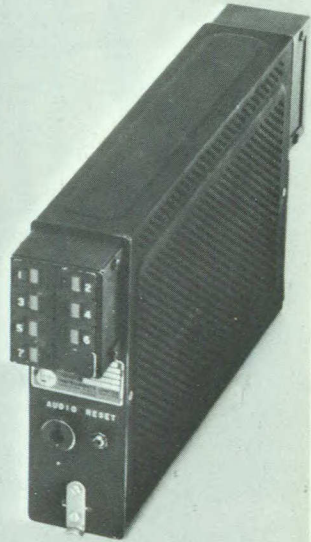
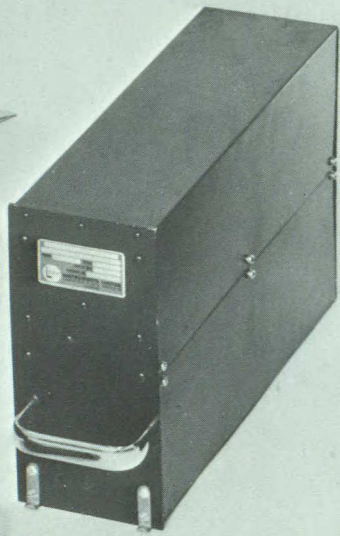
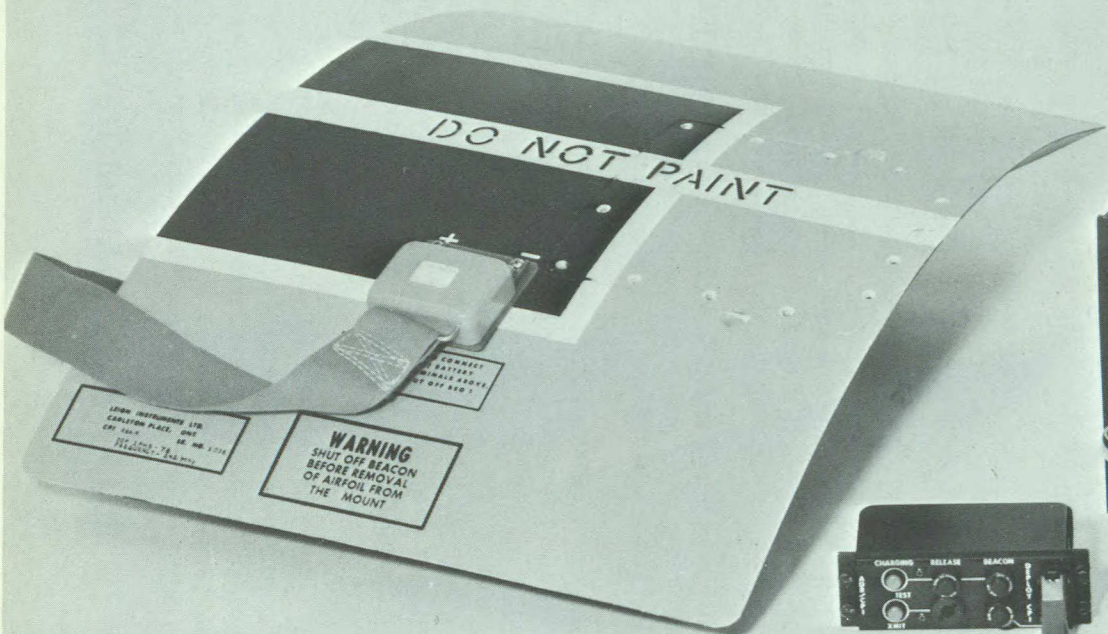
Variations of this basic system have been designed and produced by Leigh Instruments Limited to meet specific customer requirements. Fleet installation of Leigh recording systems has been carried out on the CC106 aircraft for the Canadian Armed Forces, and is being carried out on the DC8 and DC9 aircraft for Air Canada. Prototype systems have been or are now under evaluation for the USAF (C141, C133), the USN (P3) and the CAF and WGAF (F104).

Depending upon the requirements of the customer, the variations may include: additional Recorder Electronics Units to provide greater aircraft signal capacity, voice recording units, voice warning units, tape cassettes of greater capacity, either without crash-proofing, a Quick Access tape recorder for maintenance use, and an aircraft mounted Hard Copy Printer.

Leigh Instruments Limited also designs and manufactures Data Playback Systems for reading the Flight Data Recorder tapes on the ground. These Ground Playback Units will accept serial or parallel data from the recorders selected and will output both voice and data. The replayed data is presented in analog form onto ultra-violet sensitive paper, but can also output digital data suitable for direct entry into a computer. If required, data can also be played out in paper punch or teletype form. The facility is available, through a suitable additional formatter, to transmit the replayed data in teleprinter format along voice quality lines.

The Flight Data Recording Systems produced by Leigh Instruments Limited are designed to meet MIL-E-5400 for airborne equipment, MIL-E-4158 for Ground Equipment and MIL-T-21200 for Test Equipment.

CPI—Crash Position Indicator (see page I-62)



CRASH POSITION INDICATOR

The Crash Position Indicator developed and manufactured by Leigh Instruments Limited is a radio transmitter encased in a plastic airfoil package, which is released from an aircraft on pilot command, or automatically in a crash situation, follows a tumbling, speed-reducing flight path to the ground, and transmits for more than 48 hours a distress frequency signal discernible at ranges in excess of 60-80 miles.

The solid-state radio transmitter is encapsulated in polyurethane foam and has a minimum rated output power of 250 milliwatts. The basic transmitter design comprises a crystal-controlled 243 Megahertz oscillator, a swept tone-modulator circuit, and a final amplifier. Modified versions include a Combat Beacon which remains quiescent after release until a coded interrogator signal is received. The battery power supply and the parallel-plate antenna, which has an omni-directional radiation pattern, are also encased within the airfoil package.

Leigh's unique, aerodynamically-designed airfoils are made of polyurethane foam, with a fibre glass covering where additional structural strength is necessary. They are produced in a variety of shapes to match particular aircraft installations.

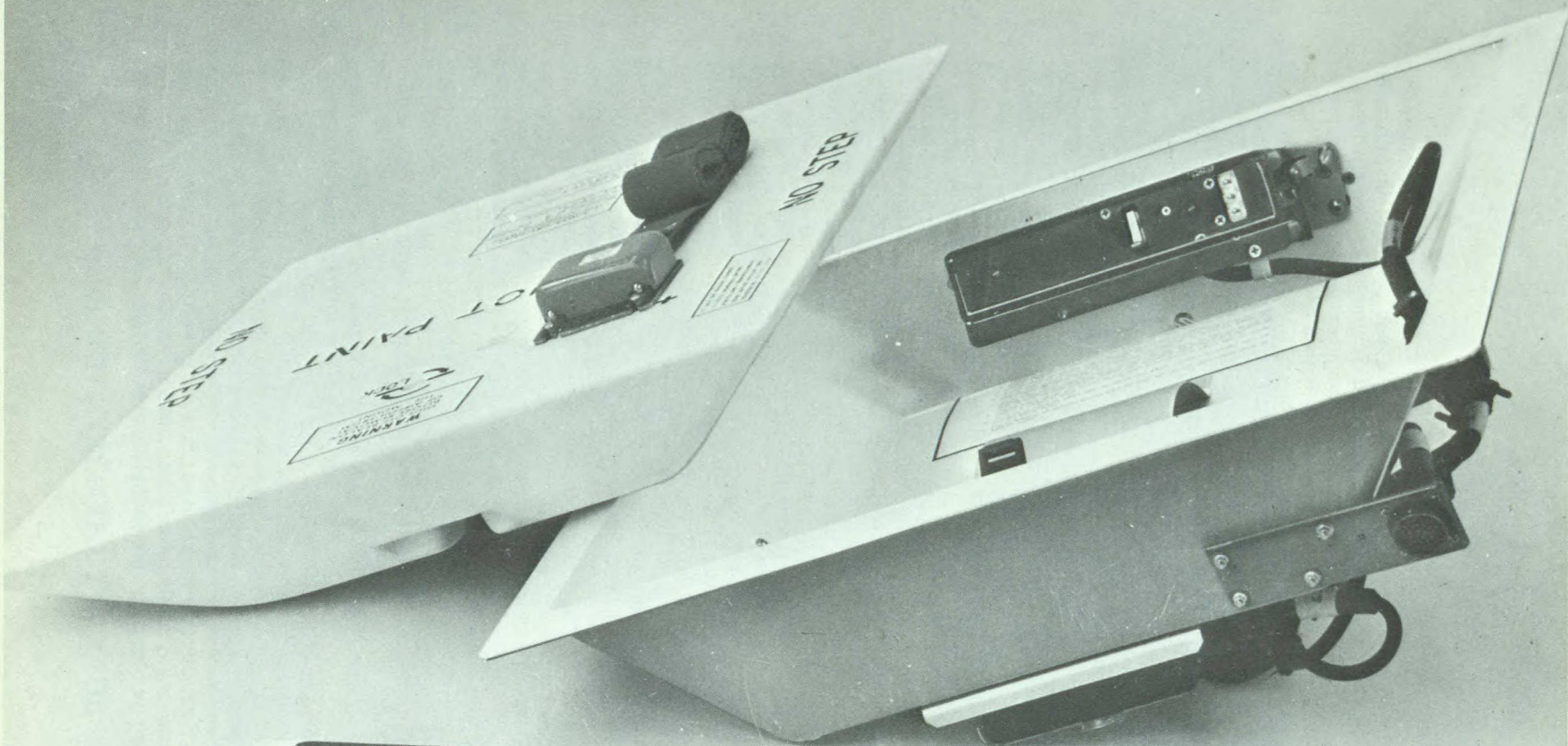
For a high speed, high performance aircraft the airfoil is mounted in a tray built into the aircraft structure the exterior surface of the airfoil being shaped to the contours of the aircraft skin. Installations of this type have been designed for the following aircraft and are in service in the CAF and USAF C5, C9A, C130 (shown in the photograph), C133, C135, VC137, C141.

An externally-mounted airfoil shape designed for low speed aircraft has been fitted to the C124 and C10 aircraft in service with the USAF. A helicopter version has been produced and is now being marketed.

The Cockpit Control Unit, a standard, panel-mounted unit, allows the pilot to check the CPI transmitter operation, the CPI battery-charging circuits and whether the airfoil is properly mounted or has been removed, and a wire-locked switch is provided for manual release of the airfoil. Automatic release in the event of a crash is triggered by frangible switches located in sensitive areas, such as the wing tips and the nose, or if the aircraft lands in water, by a hydrostatic switch.

The Leigh Crash Position Indicator has proved its effectiveness in actual crash situations, as well as in extensive tests such as those conducted for the USAF between 1962 and 1964, following which the equipment was catalogued as USAF Inventory Item AN/URT 26 (V).

A light aircraft version of the Crash Position Indicator, which works on the same principle but requires no aircraft wiring or aircraft structural changes, has been designed and is being marketed under the name DAPI (Downed Aircraft Position Indicator).



DOWNED AIRCRAFT LOCATOR

Garrett Manufacturing Limited have developed a downed aircraft beacon consisting of three principal components: a main case containing the transmitter and batteries, and two antenna assemblies containing the antennas and matching networks. The antenna assemblies are connected to the main case by coaxial cables. The beacon, on impact with the ground, is automatically turned on and commences transmission of a signal which can be received at a range of up to 200 miles (322 Km).

Operating Frequencies: — The beacon uses the military emergency frequency of 243 MHz and the civil of 121.5 MHz thus providing a common media of co-operation for both military and civil flying.

Power Output — The power output of a VHF beacon need only be sufficient so that the range is horizon-limited rather than power-limited; no significant advantage is gained by exceeding this level therefore average power output of 225 milliwatts is adequate to meet this condition, and is the level specified by the U.S. Federal Aviation Agency. In this beacon, higher level of approximately 300 milliwatts is used to allow for random orientation of the antenna system and power output is provided at each of the two output frequencies.

Transmit Duty Cycle — There is a choice between continuous operation of the transmitter, and operating at some reduced duty cycle with periodic ON-OFF keying. The latter scheme has a significant advantage in reduced average power consumption, and hence reduced weight of power supply. This technique has certain restrictions, however; the "ON" period must be long enough to be compatible with the time — averaging properties of the human ear, and with the characteristics of direction finding equipment; and the "OFF" period must be short enough to preclude uncertainty in fixing the locations, with regard to the speed of the search aircraft. The system proposed by EUROCAE meets these requirements using a one-in-three duty cycle, with an "ON" period of 0.8 seconds and an "OFF" period of 1.6 seconds.

Modulation — the signal is 100% amplitude modulated by an audio tone sweeping downward over the range 1600 to 600 Hz at a rate of 2.5 sweeps per second. The modulating waveform is essentially square wave.

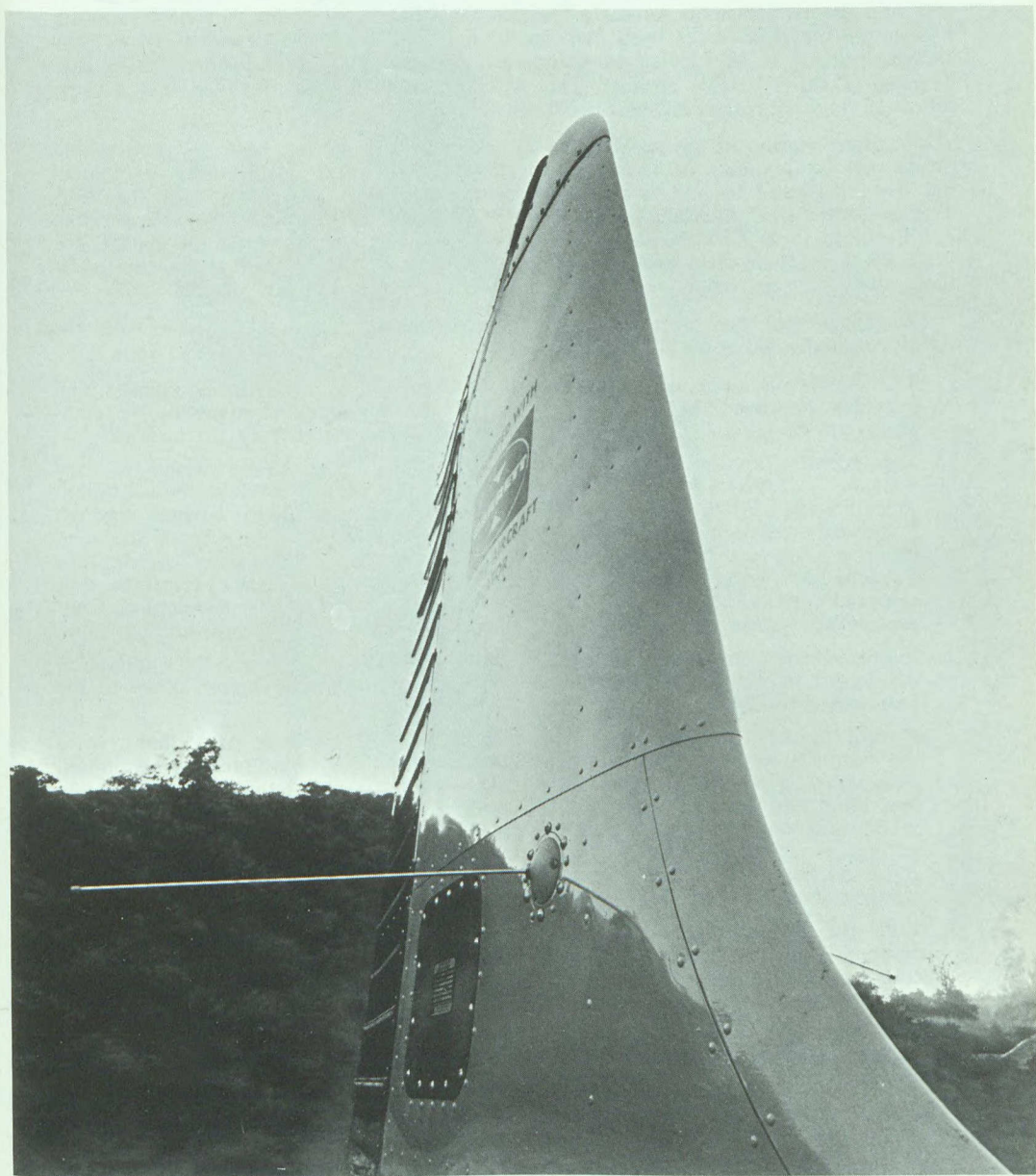
Antenna System — Dual opposed antennas are used, fed into anti-phase. In normal operation, the available power on both frequencies is divided equally between the two antennas. If one antenna is broken off, at least half of the available power is fed to the remaining antenna. A DC path is provided between the antenna rods and the airframe to prevent static build-up.

Power Supply — The beacon operates from a source of nominal 12 volts D.C. This source normally consists of eight size D manganese-alkaline cells. As an optional alternative at low temperatures, provision is made for the use of 8 size D sealed nickel-cadmium cells. It is possible to float charge these cells in flight.

Operating Life — The operating life of the beacon to the half-power point is nominally 48 hours after one year from the installation of fresh batteries. A somewhat reduced operating life is permissible at extremely low temperatures, but not less than 24 hours at -40°C using rechargeable batteries.

Switching — The beacon shall be provided with both automatic and manual switching. An automatic inertia switch shall operate and remain operated after being subjected to a steady-state rearward acceleration of 4.5G or to a transient acceleration equivalent to a sudden velocity change of 3 feet per second. A manual ON-OFF switch, normally located in the cockpit of the aircraft, with a shield to guard against accidental operation, shall be wired in parallel with the inertia switch. A second manual switch, to permit the inertia switch to be reset, shall be provided in a position accessible from the exterior of the aircraft.

Compatibility or mounting problems should be discussed with Garrett whose experience in this field and with this equipment covers many aircraft types and operating situations.



AUTOMATIC PERMANENT MAGNETIC COMPENSATOR (APMC)

The APMC was designed and developed by the Electronics Division of CAE Industries Ltd. to improve Magnetic Anomaly Detection (MAD) performance of ASW aircraft. Production quantities have been manufactured and delivered to Canadian Forces and the equipment is in service in Canadian Argus (CL-28), Neptune (P2V), and Tracker (CS2F-2) ASW aircraft. The APMC has been fully qualified and satisfies all of the requirements of RCAF Specification RAD-1-18.

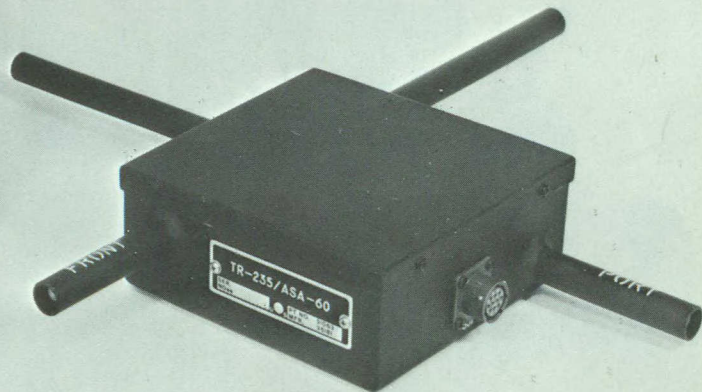
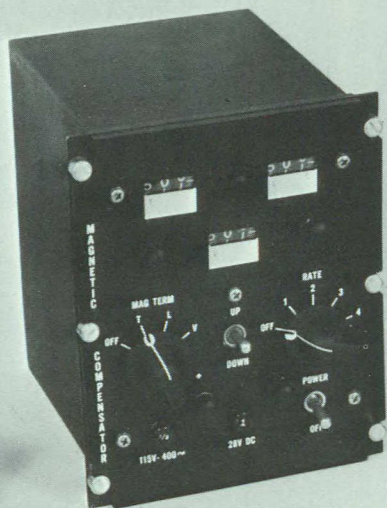
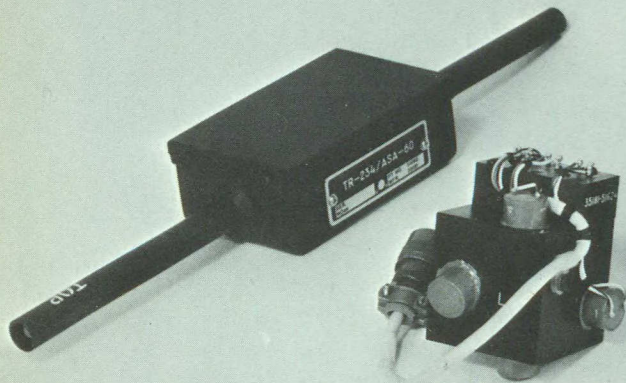
The latest version of the APMC is fully transistorized and has been designed to and meets the requirements of USN Specification MIL-C-81328 (WP). This equipment has been delivered to and is in service with the Royal Dutch Navy for the S2-A Trackers, the Royal Australian Navy in their S2-E Trackers, and the Royal Australian Air Force in their P2-V Neptunes. The U.S. Navy has also procured the APMC for their P2-V Neptune fleet and a substantial portion of the equipment on this order has already been delivered.

The advantages and improved MAD performance which are possible with the APMC are indicated in the following notes:

1. The APMC is used with AN/ASQ-8 or AN/ASQ-10A MAD equipment and provides improved MAD performance by the optimum elimination, or compensation, of permanent magnetic field interference generated by the aircraft.
2. The APMC replaces "Magnetic Compensator" CN-191/ASQ-8 which is used with the AN/ASQ-8 and AN/ASQ-10A for manual permanent field compensation. The CN-191/ASQ-8 provides for the manual adjustment of current through 3 mutually perpendicular coils located near the MAD detecting head, so as to generate an equal and opposite magnetic field to that produced by the aircraft. Cancellation of the permanent magnetic interference from the aircraft is thus achieved. The APMC does this automatically, decreases the time required to compensate by approximately 80% and achieves much improved compensation.
3. Improved compensation results in improved detecting ranges since the elimination of aircraft interference allows for identification of submarine signals down to the basic sensitivity of the AN/ASQ-8 and the AN/ASQ-10A.
4. Present practice in ASW Forces is to re-compensate on each ASW flight, since the aircraft's permanent magnetic field changes with time. Using manual techniques, with the CN-191/ASQ-8, permanent field recompensation requires approximately one hour and consists of flying the aircraft on cardinal headings while doing $\pm 10^\circ$ rolls and $\pm 5^\circ$ pitches. The operator must plot a graph of compensator settings vs. MAD manoeuvre signals in order to determine the best setting. These sustained manoeuvres can lessen the efficiency of the operator resulting in poor compensation.
5. With the APMC the operator merely has to actuate the equipment and the compensation is achieved automatically. No plotting of data is required and compensation time is reduced by at least 80%. Optimum compensation is assured which results in maximum detection range.
6. Considering the number of ASW missions which may be flown in one year and further considering the cost per flying hour of ASW aircraft, it can be readily shown that use of the APMC represents a considerable cost saving.

Also, manual compensation requires extended manoeuvring over a magnetically quiet area, usually at 10,000 ft. (3048 m) altitude. The APMC can be used at operational altitudes over almost any area. Since an aircraft's permanent magnetic field changes with time, the APMC allows for convenient and rapid recompensation, so that maximum MAD range is assured at all times.

7. The APMC is the same size and exactly fits into the space now occupied by the CN-191/ASQ-8. Installation is quick and convenient and cabling additions are minor.



THE 9-TERM COMPENSATOR (9-TC)

The APMC was developed to compensate for interference generated by an aircraft's permanent magnetic field. There are two other sources of magnetic interference which require compensation on MAD equipped aircraft. Induced fields are caused by the ferromagnetic materials of an aircraft being magnetized as the aircraft moves through the earth's magnetic field and eddy-current fields are caused by currents created in control surfaces and fuselage as the aircraft moves through the earth's field. The 9-TC is an advanced compensator which was developed by the Electronics Division of CAE Industries Ltd. to eliminate interference from all permanent, induced and eddy-current field sources.

Before the development of the 9-TC, induced and eddy-current field were compensated for by the design of fixed permalloy strip configurations mounted near the MAD detector and by fixed coils also installed close to the detector. The strips and coils were designed to create equal and opposite induced and eddy-current fields to those generated by the aircraft. These fixed compensators require custom design for each aircraft type, involving lengthy experimental flying, and do not cater for changes in induced and eddy-current sources during the life of the aircraft. Also, they require close tolerance hardware to be installed close to the MAD detector, normally in the non-magnetic (fiberglass) MAD boom. Furthermore fixed compensation systems are not capable of providing adequate compensation levels for new, more sensitive, MAD systems.

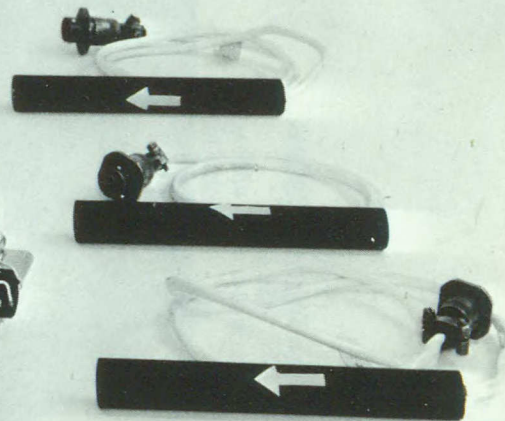
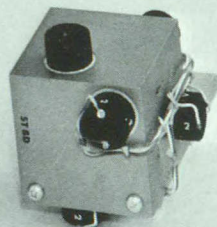
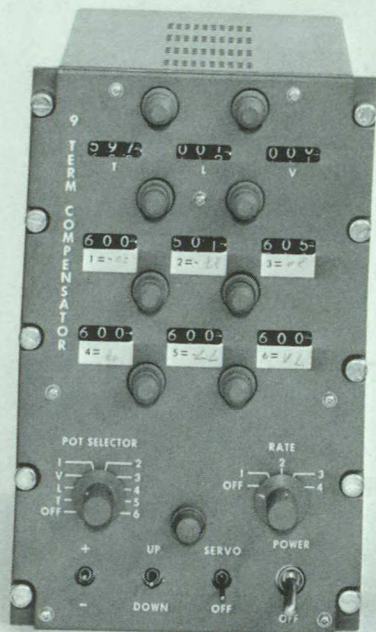
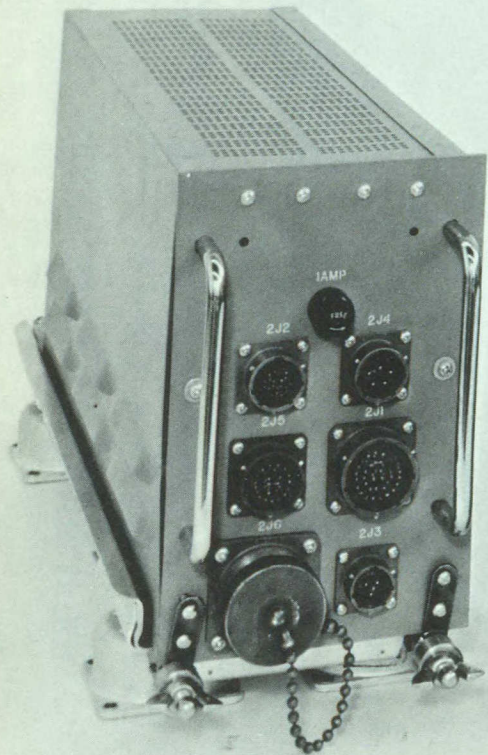
The 9-TC has the following advantages:

1. The CAE 9 Term Compensator (AN/ASA-65) provides automatic compensation for aircraft generated manoeuvre interference signals.
2. By minimizing unwanted interference signals, the CAE 9-TC substantially improves MAD detection range, especially during tactical and turbulent flight conditions.
3. This equipment compensates all significant permanent, induced and eddy-current interference fields in approximately 30 to 45 minutes. Permanent terms can be trimmed up on each flight in about five minutes, compared to close to one hour for manual compensation systems.
4. The automatic nature of the 9-TC, together with simple operating procedures, eliminates the requirement for specialized operator training. Comprehensive tests have shown that experience is not a necessity in achieving satisfactory compensation levels with the CAE 9-TC.
5. The CAE 9-TC is compatible with all existing magnetometer systems in present use. Accommodation for the varying compensation requirements of different aircraft types is conveniently accomplished by means of internal patch connectors.
6. The CAE 9-TC, designed to satisfy the requirements of applicable military specifications using state-of-the-art techniques, has a demonstrated M.T.B.F. of more than 1000 hours. The use of completely solid-state circuitry has resulted in a total system weight of less than 30 lbs. (13.6 Kg.).

Production quantities have been manufactured and delivered to the Royal Air Force for its newest ASW aircraft, the Hawker Siddeley HS-801 "Nimrod". The 9-Term Compensator is also presently being manufactured and delivered to the U.S. Navy for use in the "ANEW" P-3C Orion ASW aircraft. The 9-TC has also been ordered by several geophysical exploration companies for use in compensating aircraft conducting airborne magnetic exploration and survey work.

SPECIFICATIONS

Compensation Figure of Merit:	Consistently below one gamma.
Maximum Compensation Fields:	50 gamma on each of aircraft's Transverse, Longitudinal and Vertical axes.
Interference Field Reduction:	To 1/100th of original value.
Compensation Time:	Less than 30 seconds manoeuvre time for each term compensated.
Residual Interference Signals:	0.01 gamma or Magnetometer System internal noise, whichever is greater.
Military Specification Compliance:	Meets requirements of MIL-C-81461.
Environmental:	Meets requirements of MIL-E-5422.
Radio Frequency Interference:	Meets requirements of MIL-1-6181 and WR-101.
Operating Temperature Range:	-54°C to + 71°C.
Storage Temperature Range:	-62°C to + 85°C.
Power Requirements:	115 Volt 400 Hz, 100 VA 28V (DC or AC), 10 VA (for Panel Lamps only).
Reliability:	Meets specified MTBF 1000 Hours.



SERVO REPEATER AMPLIFIER

The Leigh Servo Repeater Amplifier is designed to meet the need for accurate, reliable, and compact servo retransmission from a low power synchro source to a number of isolated high power torque receivers or control transformers.

The unit consists of a repeat servo using a high impedance control transformer and a transistor amplifier of unique design. The servo drives up to six, size 11 high-power synchro transmitters, all of which can be separately excited, and which can, in turn, drive up to 24 high torque synchro receivers. The constructional features of the unit are:

- Rugged construction -- can be either shock mounted or mounted directly to aircraft structure.
- Rubber gasketed for effective dust sealing
- Uses all stainless steel Leigh gearhead
- MIL approved parts used throughout
- Meets design requirements of MIL-E/5400, Class II equipment.

The unit is available in five different configurations to meet different requirements, and the company is capable of high volume production. Over 1000 units have been supplied to the Canadian Armed Services.

Complete qualification testing has been performed to MIL-E/5272, including vibration, shock, temperature -65° to $+160^{\circ}\text{F}$ (-54°C to $+71^{\circ}\text{C}$), sand and dust, rain, salt spray, humidity and radio interference.

The unit compatible with C-2, J-2, N-1 gyros and can drive indicators such as DRMI-1D416, MN97H and AN/ARN501 Tacan. It can also be used for multiple bearing and heading displays for navigation systems and other repeater applications.

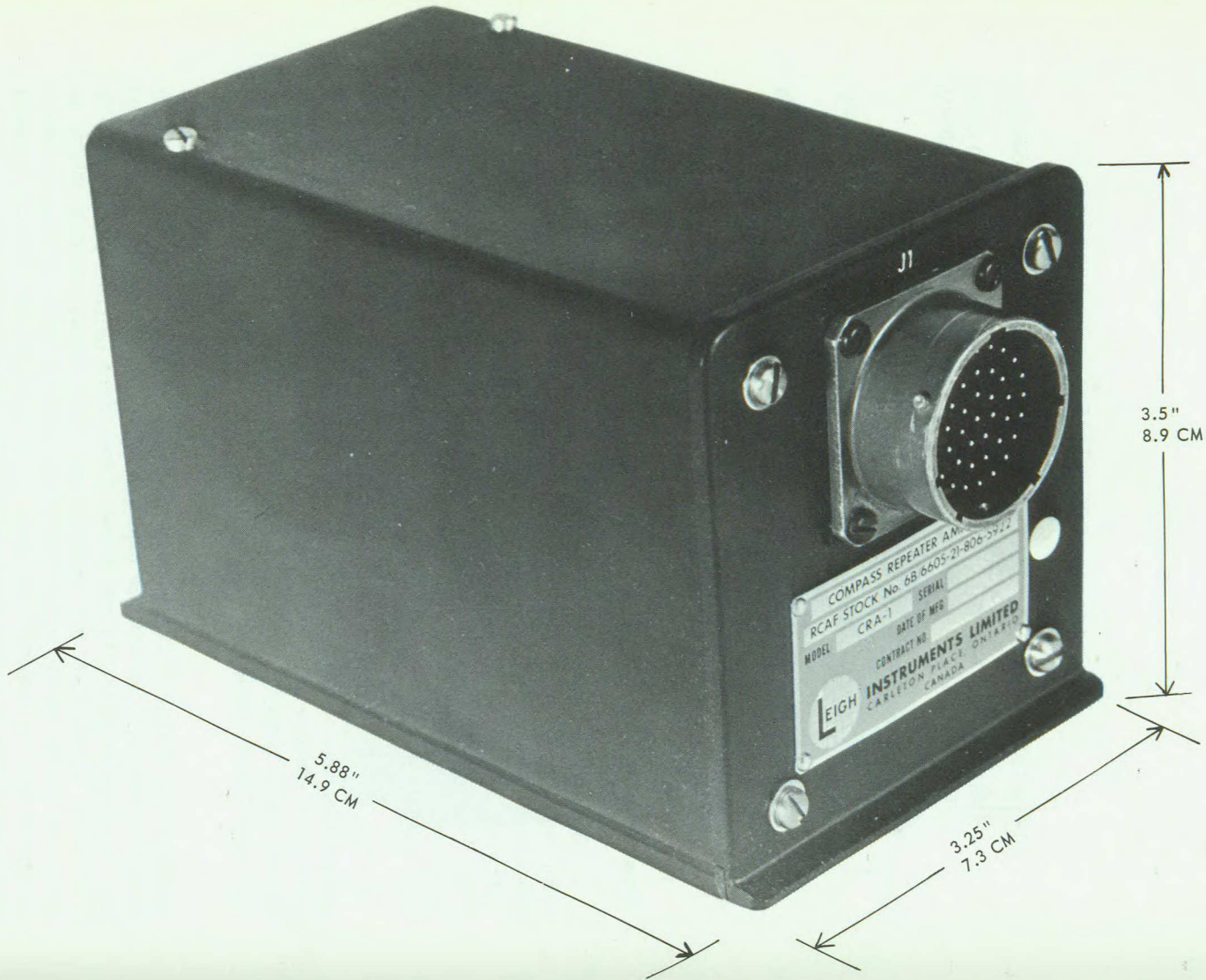
Specification (Standard Unit)

INPUT CT IMPEDANCE	$Z_{ro} 800 + j2900$ Optional - 2 extra size 11 transmitters and $Z_{ro} 115 + j470$ 1 size 10 standard or clutched synchro $Z_{rss} 890 + j350$ Overall Accuracy ± 20 minutes maximum under all conditions
FOLLOW UP RATE	30 degrees/sec.
OPTIONAL	60 degrees/sec.
OUTPUTS	4 size 11 torque Power (not including synchro excitations) transmitters 26V 400 cps 10VA Optional 115V 400 cps
STATOR VOLTAGE	11.8V

Output unit torque gradient 5700 mg.mm/deg.

Weight (less mounting tray) 2.3 lbs.
(1.04 kg)

Weight (mounting tray only) 0.5 lbs.
(.226 kg)



SERVOED ALTITUDE INDICATORS

The Servo-Pneumatic Altimeter, designed and manufactured by Leigh Instruments Limited, normally operates in the servo mode from standard air data or altitude computers which provide a standard three wire synchro signal. Should an aircraft or system electrical failure occur, the altimeter will automatically revert to a mechanical mode (STBY) which uses a unique internal altitude mechanism. The combination counter-drum and pointer display provides an unambiguous altitude indication correct to ± 20 ft. (6 M) (servo mode) or 0.5% ± 30 ft. (9 M) (STBY mode).

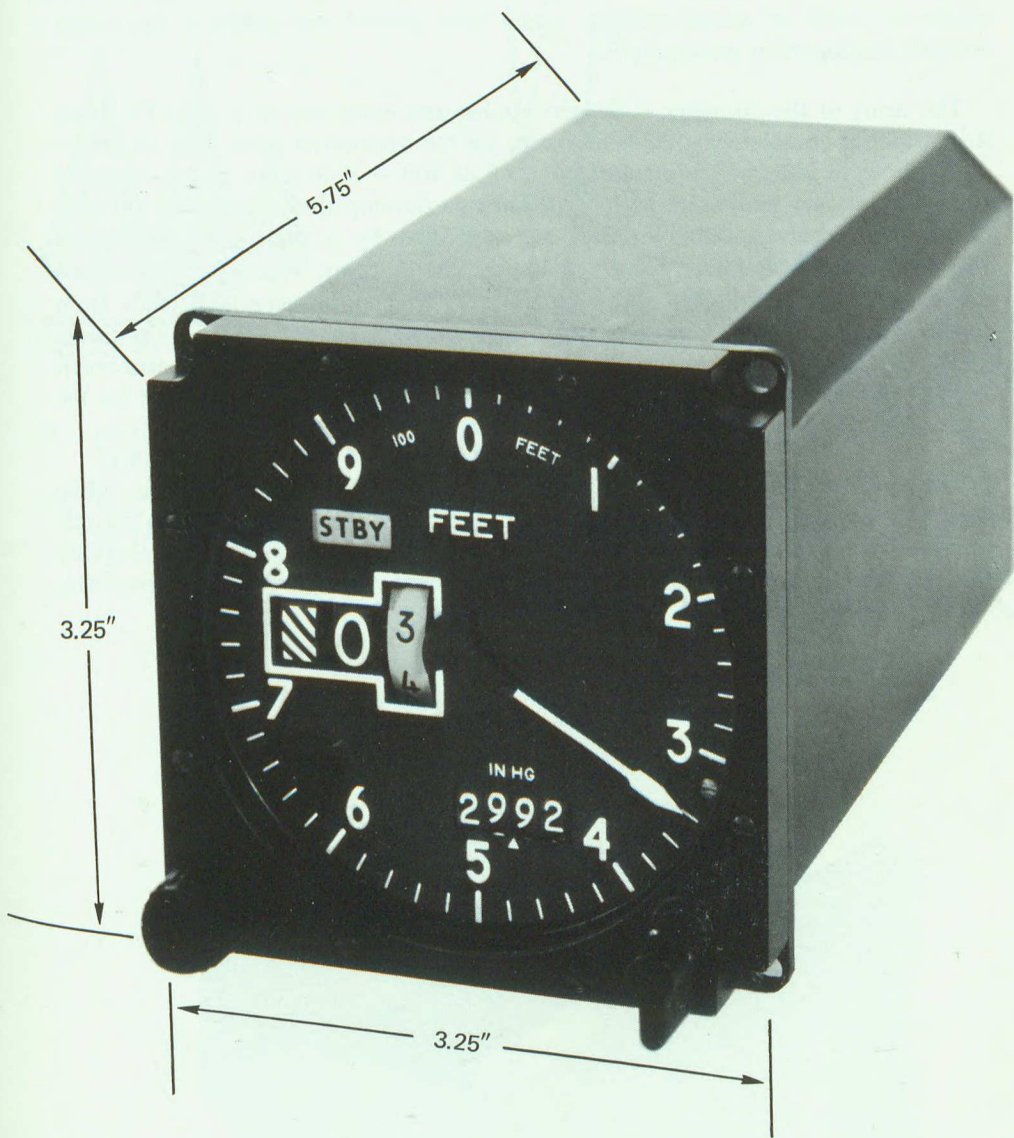
Two manual controls are provided: a standard barometer setting knob with a four digit counter-type display; and a STBY-RESET switch which permits manual control of the mode of operation of the altimeter in addition to the automatic control of servo-to-STBY mode switching. A flag indicates when the altimeter is in the STBY mode.

The servo mode circuitry consists of a control transformer and a high gain, integrated circuit, servo amplifier of advanced design which excites the servo motor control winding. The altimeter contains an integral power supply circuit, and a failure warning system which operates the servo-to-STBY mode switch. The STBY altitude mechanism is fully temperature compensated and consists of dual opposing capsular elements which respond to variations in pressure altitude to provide a high torque output drive to operate the low friction counter-pointer display.

Negotiations are presently underway to provide this equipment to the Canadian Armed Forces.

SPECIFICATIONS

Range – 1,000 to 80,000 ft. (305 to 24,384 m)	Lighting MIL-L-25467
Accuracy – 0.5% + 30 ft. (9 m) (STBY) + 20 ft. (6 m) (servoed)	Power 10VA, 115 VAC 400 Hz
Weight – 3.25 lbs. (1.5 Kg) Static Connection AND 10050-6	Connector – MIL-C-26500 (MS24264M-7-24PN)
Synchro – 360° = 10,000 ft. (3048 m)	Case – MS33556 or ARINC 408



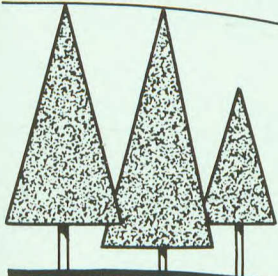
FOLIAGE PENETRATING RADAR ALTIMETER

Unlike conventional radar and laser altimeters, the instrument developed and manufactured by Leigh Instruments Limited measures ground-to-aircraft height accurately through forest cover. Tested in use over tropical rain forests as well as Canada's northern coniferous woods, prototype units have given measurements accurate to $\pm 1\%$ of actual reading, which have proved invaluable in the rapid, accurate scaling of air photographs.

The heart of the altimeter is the electronics unit contained in a $\frac{3}{4}$ ATR Long Box, which is completely solid state except for the transmitter tube, 2Kw pk Gaussian pulses are generated at a selectable PRF of 400 – 2000 p.p.s. and transmitted from the flat, stripline, "sandwich"-type antenna developed especially for this altimeter. The received "echo" pulses are amplified by a high gain, wide-band logarithmic video amplifier fed by a square law detector. A unique timing and measuring circuit employing pulse by pulse AGC suppresses echo signals from forest foliage and allows an accurate measurement from the peak of the transmitter pulse to the peak of the ground echo signal to be made. This measurement is converted into a Digital Readout for the camera, and an Analog Readout for the Pilot's Indicator, or, with Fiducial Marking, for a Chart Recorder.

The Foliage Penetrating Radar Altimeter, which is now in production, while designed originally for forestry survey work, and under active consideration for this purpose by several air survey users, has potential usefulness wherever the capability for accurate ground-to-aircraft height measurement through foliage is required.

AVERAGE
FOLIAGE LEVEL



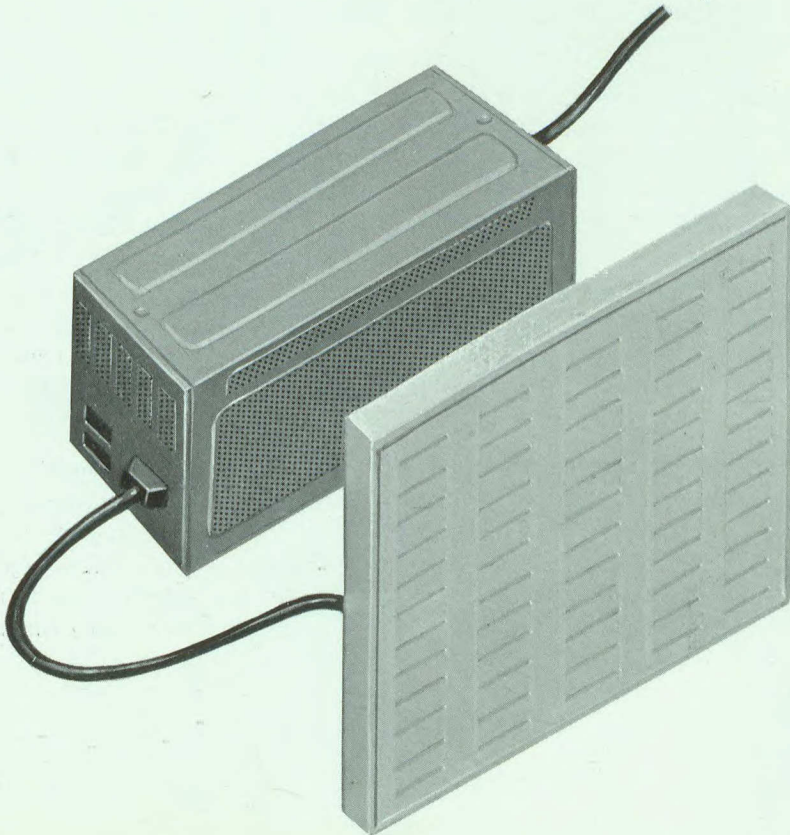
GROUND LEVEL



H_1 HEIGHT MEASURED WITH
CONVENTIONAL RADAR ALTIMETER

H_2 ACCURATE GROUND/AIRCRAFT HEIGHT
WITH LEIGH RADAR ALTIMETER

CAMERA
PILOT'S INDICATOR
CHART RECORDER



AIRCRAFT SIMULATORS

The Electronics Division of CAE Industries Ltd., Montreal has achieved a position of world leadership in the development and manufacture of flight, weapons, ASW and radar simulators.

Since 1952 CAE has developed a total of eighty military simulators, including thirty-two F-104 Super-Starfighter simulators which are being used to train pilots by the RCAF, USAF and the Air Forces of West Germany, Netherlands, Belgium, Italy, Norway and Denmark.

The simulators weighing more than 25 tons each, reproduce for a pilot in a ground-based classroom the physical and visual sensations he would experience in flight, thus training him in all procedures and operations from checkout and takeoff to landing, including flight, engines, radar, combat tactics, missile launching and bomb attacks.

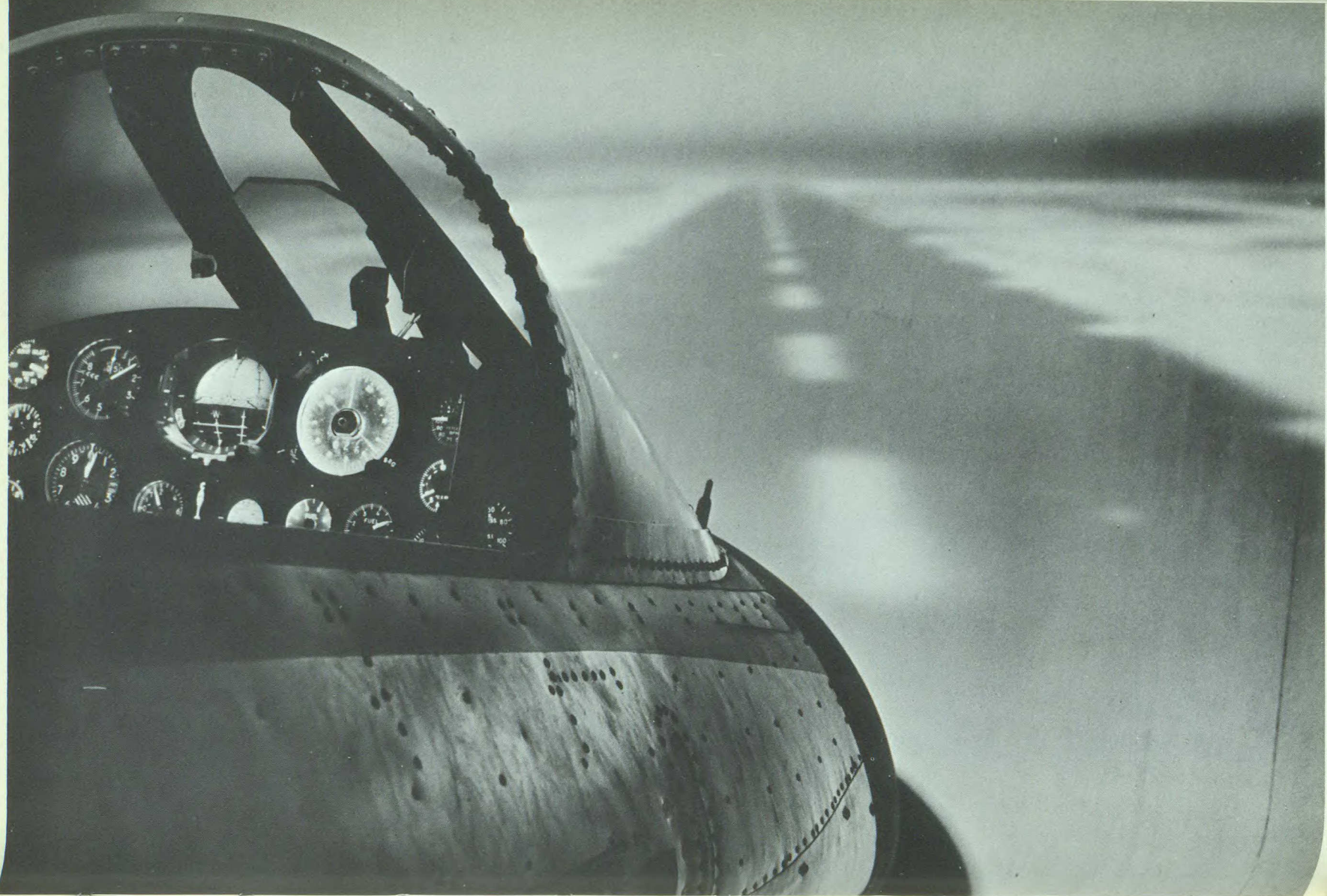
Each simulator includes an exact replica of the aircraft cockpit complete with all instruments for control of flight, engines, navigation, radar and weapons. The cockpit rolls and pitches like the actual aircraft and, by means of a unique visual simulation system developed by CAE, the pilot trainee in the cockpit is able to see the horizon and representative targets on the ground as he "flies" the simulator. The visual system also represents airport runways so that the trainee may maintain visual contact during takeoff and landing exercises.

Due to the wide spread use of the F-104 Simulator, it has been chosen as an example of one of the types of simulators produced by CAE.

CAE are capable and ready to meet simulator requirements with respect to other aircraft or equipments.

In addition to its military simulators, CAE has delivered or is currently developing 14 commercial jet simulators for nine international airlines and one major aircraft manufacturer. Douglas DC-8 and DC-9 simulators have been ordered from CAE by Canadian Pacific Airlines, Air Canada, Swissair, KLM Royal Dutch Airlines, Iberia, Union de Transports Aériens and Air New Zealand. British Overseas Airways Corporation, Air India and a consortium consisting of KLM, Swissair and SAS Scandinavian Airways Systems have ordered Boeing 747 flight simulators from CAE, while the Lockheed-California Company chose CAE to develop and manufacture the first L-1011 flight simulator. These latter simulators will have CAE's unique six-degree motion system to provide real-life motion cues to the pilots.

All recent CAE simulators employ third-generation digital computers using silicon monolithic integrated circuits throughout and an all-core memory. CAE-developed flight instructor aids provide hard copy read-out of training exercises for post-flight performance evaluation. A cine-optical visual system providing true-life views for take-off and landing exercises down to Category 2 and Category 3 is available with new CAE simulators or for application to existing simulators.



AN/ASN-503 NAVIGATION SYSTEM

The AN/ASN 503 Navigation System by Canadian Marconi Co., is a highly versatile, lightweight and reliable airborne integrated avionics package specifically designed for use in transport and tactical aircraft where the requirement is for a track oriented navigation system.

The AN/ASN 503 consisting of the AN/APN 508 Doppler Sensor, the AN/ASN 502 Navigation Computer and PT-5019/ASN 503 Roller Map Display, provides a comprehensive navigational capability independent of ground stations. Ground-speed, drift angle and absolute altitude are measured continuously by the Doppler sensor regardless of weather conditions while the accuracy specified below is maintained independent of terrain through the use of beam intersection techniques in conjunction with a track-stabilized antenna.

The groundspeed and drift angle outputs of the Doppler sensor are used to compute along and across track distance which is displayed on the control indicator. The computer also accepts inputs from the air data computer to provide a back-up navigation capability.

Aircraft present position is displayed continuously on the roller map display, which uses Standard Aeronautical charts with scales of 1:500,000 and 1:250,000.

All units of the AN/ASN 503 Navigation System incorporate built-in test equipment (BITE) which isolates system faults to the line replaceable unit without use of external test equipment. Further isolation of faults to the individual module is performed using standard test equipment. As all units of the AN/ASN 503 are of modular construction, maintenance costs are low due to the ease with which faulty modules can be detected and replaced.

The individual elements of the AN/ASN 503 can be used independently. The AN/APN 508 Doppler Sensor can be used alone to provide outputs of groundspeed, drift angle and altitude or to drive another navigation computer. The AN/AYA 502 Navigation Computer will interface with other CMC Doppler sensors and in addition will operate in an Air Data mode. Similarly the PT-5019 Roller Map Display can be used with other computers.

Principle features of the tactical aircraft navigation system AN/ASN 503 are listed below.

Performance Data

<i>Temperature Range</i>	-55°F to + 125°F. (-48°C to + 52°C)
<i>Sensor Range</i>	40 - 45,000 ft. (12.4 m. to 13,716 m.)
<i>Altimeter Range</i>	40 - 2,500 ft. (12.4 m. to 762 m.)
<i>Automatic Acquisition</i>	30 secs. maximum.
<i>Reflectivity</i>	All terrain and sea states down to GPL2. Automatic compensation for sea bias.
<i>Warm-up time</i>	Nil
<i>Groundspeed range</i>	100 to 1000 knots
<i>Drift Angle</i>	±20°
<i>Pitch stabilisation limits</i>	±15°

Displayed Outputs

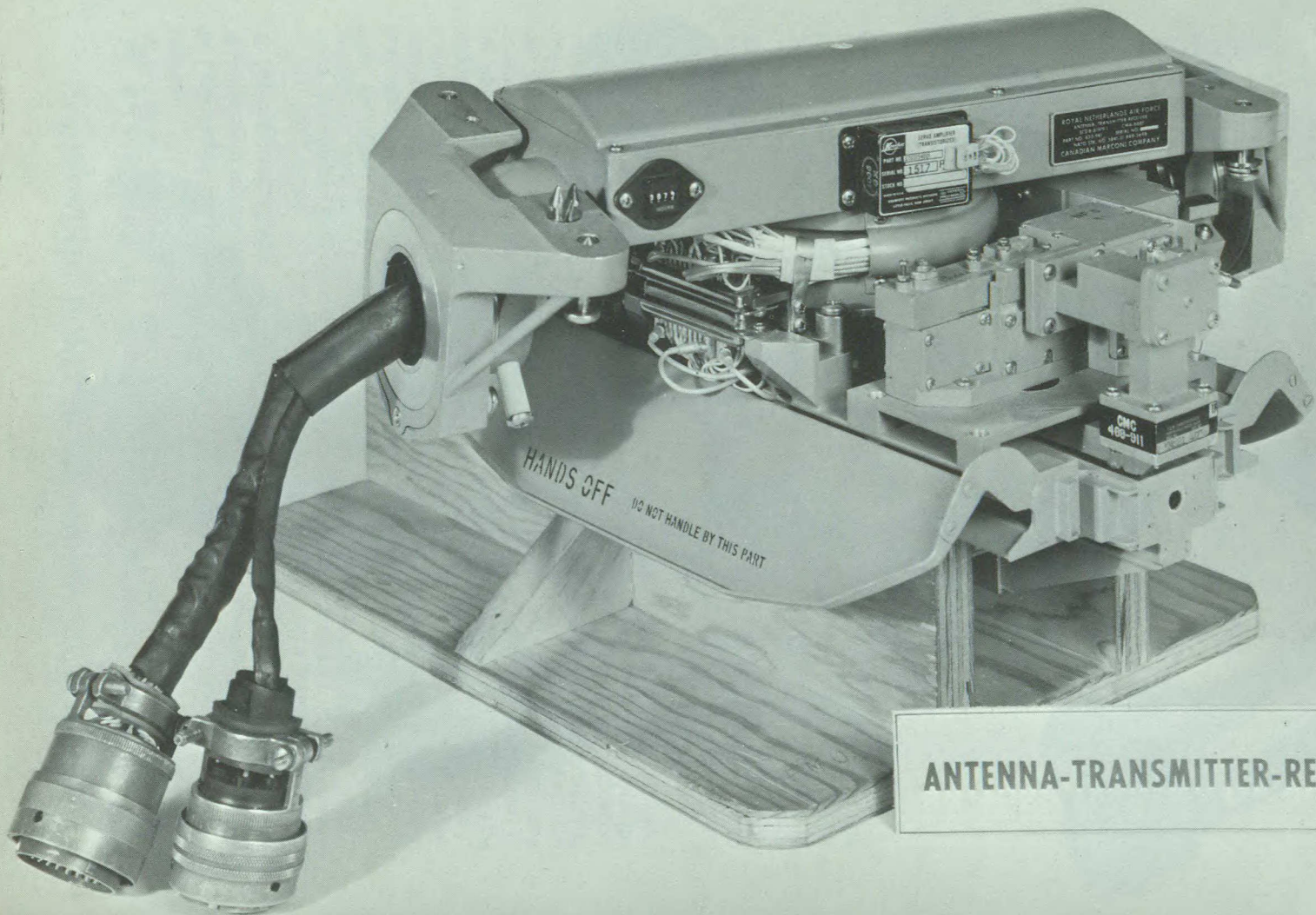
<i>Track Angle</i>	0-359.9°, Resolution .1°
<i>Distance to go</i>	0-999 nm. Resolution 1 nm.
<i>Distance cross track</i>	+ 99.9 nm. Resolution .1 nm.
<i>Groundspeed</i>	100 - 1000 knots Resolution 1 knot
<i>Drift Angle</i>	±20°
<i>Altitude</i>	40 - 2,500 ft. (12.4 m. to 762 m.)

Output Accuracy

<i>Distance along Track</i>	0.2% of distance flown
<i>Distance across Track</i>	0.31% of distance flown
<i>Groundspeed</i>	0.14% of indicated value
<i>Drift Angle</i>	0.13 degrees
<i>Altitude</i>	± (4% + 2 ft. (61 cm.))

System Electrical Characteristics

<i>Primary Power</i>	115 VAC 400 Hz. (1φ) 430 VA max.
<i>Transmitter Output Power</i>	500 mW nominal
<i>Frequency</i>	13,325 ± 25 MHz
<i>Modulation</i>	FM/CW



ANTENNA-TRANSMITTER-RECEIVER

SUPERSONIC DOPPLER SENSORS—AN/APN 189

One of Canadian Marconi Company's latest third generation Dopplers the AN/APN-189 is specifically for supersonic aircraft. This Doppler Sensor is characterized by:

- Low weight and volume
- High accuracy and reliability
- Inertial compatibility
- Built-In-Test Equipment
- Ease of field maintenance

The light weight, 45 lbs. (20.4 Kg) AN/APN-189, like all Canadian Marconi's third generation Dopplers is completely solid state, extensively utilizes microelectronics, and uses the beam intersection technique to obviate sea bias errors. The AN/APN-189 also representative of previous generations of CMC Dopplers, featuring FM/CW modulation, track-stabilized antenna, and the Carrier Dispersal altimeter technique; these features have become trade marks of all CMC Dopplers. Other attributes incorporated in this supersonic Doppler sensor are automatic acquisition over the entire groundspeed range, a continuous data validity check, an operator initiated system self test and Built-In-Test Equipment (BITE). This combination of self test and BITE permits a failure to be detected and isolated to the line replaceable unit (LRU) without the aid of test equipment. Further fault isolation down to the module level is accomplished with this self contained test capabilities in conjunction with standard test equipment. Since the AN/APN-189 is of modular construction a faulty module can be quickly detected and replaced, and the system verified for service. This ease of maintenance combined with the inherent high reliability of the AN/APN-189 results in a minimal cost of ownership.

The AN/APN-189 family of Doppler sensors is designed to operate at horizontal and vertical speeds of Mach 2.9 and Mach 1.8 respectively at altitudes up to 65,000 feet (19,812 m). Optional intergral altimetry is available, which will measure altitude up to 30,000 feet (9,144 m) with an accuracy in the order of 2%. The highly accurate outputs (0.1% for groundspeed drift angle), which can be encoded for use in digital computers, have been optimized to provide Doppler Inertial system compatibility. Salient features of this new supersonic Doppler are listed below:

Performance Data

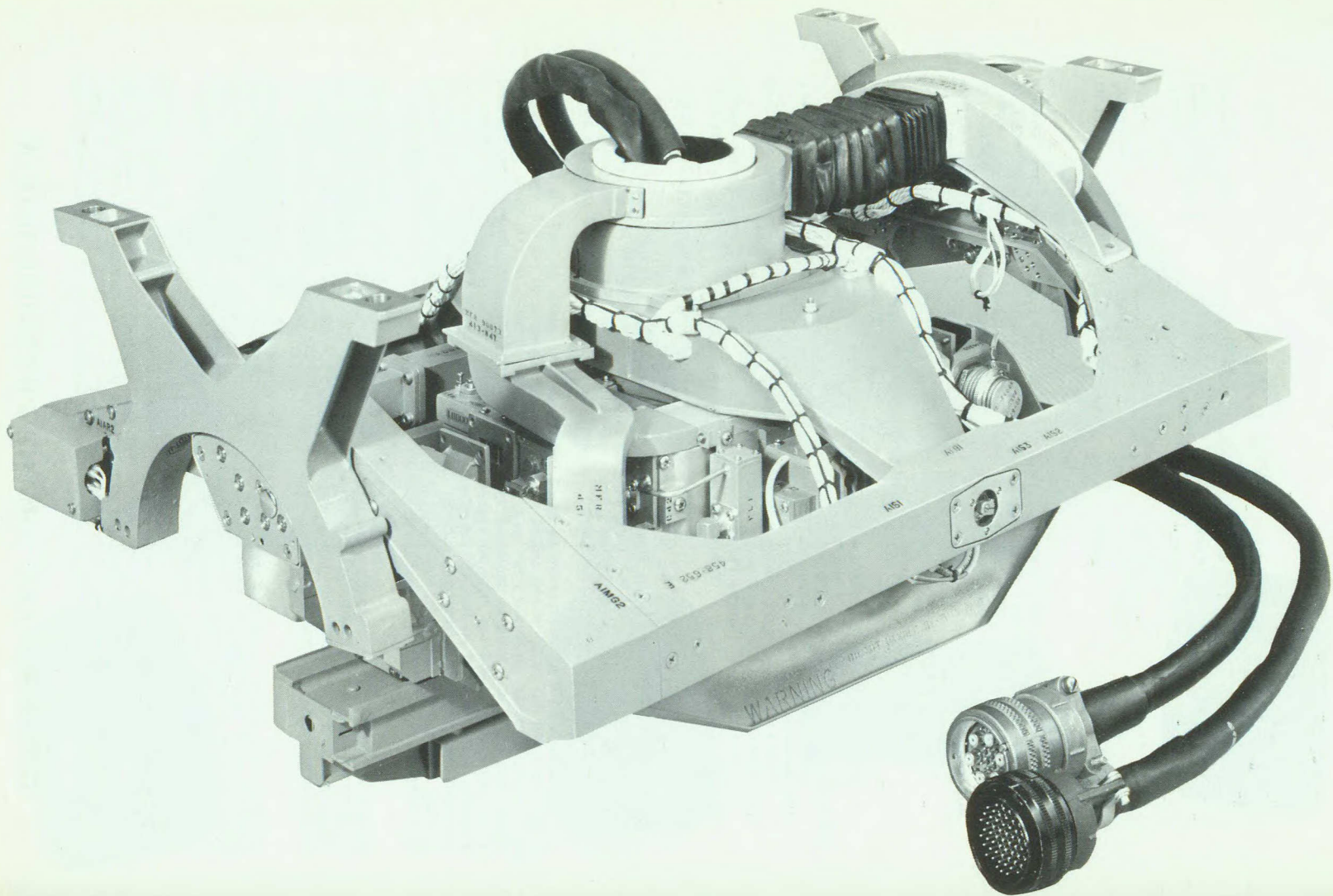
<i>Temperature Range</i>	-65° to +160°F. (-53.8° to 71°C)
<i>Sensor Range</i>	50 - 65,000 ft. (15.2 to 19,812m)
<i>Automatic Acquisition</i>	Within 10 seconds
<i>Reflectivity</i>	All terrain and sea states down to Beaufort 1.
<i>MTBF</i>	Automatic compensation for sea bias. 1000 hrs.

Antenna Stabilization

<i>Gimball Limits</i>	Pitch $\pm 20^\circ$ to -15°
<i>Gimbal Limits</i>	Roll $\pm 35^\circ$
	Drift 20° right or left
<i>Attitude Rate</i>	Pitch $\pm 25^\circ/\text{sec.}$
	Roll $\pm 50^\circ/\text{sec.}$
	Drift $\pm 25^\circ/\text{sec.}$

System Electrical Characteristics

<i>Input Power</i>	115 V AC 1 ϕ 400 Hz 200 VA max.
<i>Transmitter Output Power</i>	900 mW
<i>Transmitter Output Frequency</i>	13.325 \pm 10 MHz
<i>Modulation</i>	FM/CW



V/STOL DOPPLER SENSORS—AV/APN 172/173

The proven features of the Canadian Marconi Company general purpose Doppler Sensor, which is described on page I-xx, have been combined with the latest advances in electronics techniques and components in a third generation of helicopter Doppler sensors represented by the AN/APN-172 and AN/APN-173. The two sensors are similar except that the AN/APN-172 is designed to interface with a digital computer while the AN/APN-173 is designed to interface with an analog computer.

Wide use of micro-electronics and the use of a completely solid state microwave source have resulted in large weight savings and improved reliability. The weight of the AN/APN-172 is only 36 pounds (16.3 kg) and that of the AN/APN-173, including all of the units shown in the illustration is 42.8 pounds (19.4 kg). The calculated Mean Time Between Failures for the two systems is in excess of 1200 hours.

Each sensor contains two main units, A Receiver-Transmitter-Antenna and a Signal Data Converter. The Receiver-Transmitter-Antenna generates and transmits 150 mw of microwave energy at a frequency of 13,325 MHz. The reflected energy is processed and fed at an intermediate frequency to the second unit, the signal Data Converter where further processing yields outputs corresponding to aircraft velocity and altitude.

The performance of the AN/APN-172 and AN/APN-173 is automatically monitored by means of a tracker monitor, and a memory signal is generated immediately a usable Doppler signal is lost. In addition Built-In-Test-Equipment (BITE) continuously monitors the operation of every module in the system and if a fault develops the appropriate BITE indicator operates. A feature of these indicators is that they retain indication after the power is switched off so that the fault indication is available to maintenance personnel as an aid in rapid fault finding. The BITE module also contains circuitry for a "Test on Command" feature that can be initiated on the ground or in flight. During this test proper operation of the navigation set is indicated by the ground speed and drift angle going to pre-determined values.

The altimeter portion of these sensors uses the carrier dispersion principle used in previous CMC Dopplers. It permits measurement of aircraft height above terrain with an accuracy of ± 2 feet (.6 m) $\pm 2\%$ over the range of 2 to 3000 feet (.6 to 914.4 m). The validity of the altimeter output is continuously monitored using the lock-check principle.

The AN/APN-172 provides the following outputs:

OUTPUT	FORM	RANGE	SCALE FACTOR
<i>Heading Velocity</i>	Digital	-50 to +250 k	0.140 k/bit
	Analog DCV	-50 to +50 k	5 microamps/knot
<i>Drift Velocity</i>	Digital	-100 to +100 k	0.140 k/bit
	Analog DCV	-50 to +50 k	5 microamps/knot
<i>Vertical Velocity</i>	Digital	± 5000 ft/min	4.9 ft/min/bit
	Analog DCV	± 5000 ft/min	0.2 microamps/ft/min
<i>Altitude</i>	Digital	2 to 3000 ft	1.40 ft/bit
	Analog DCV	2 to 3000 ft	3 millivolts/ft

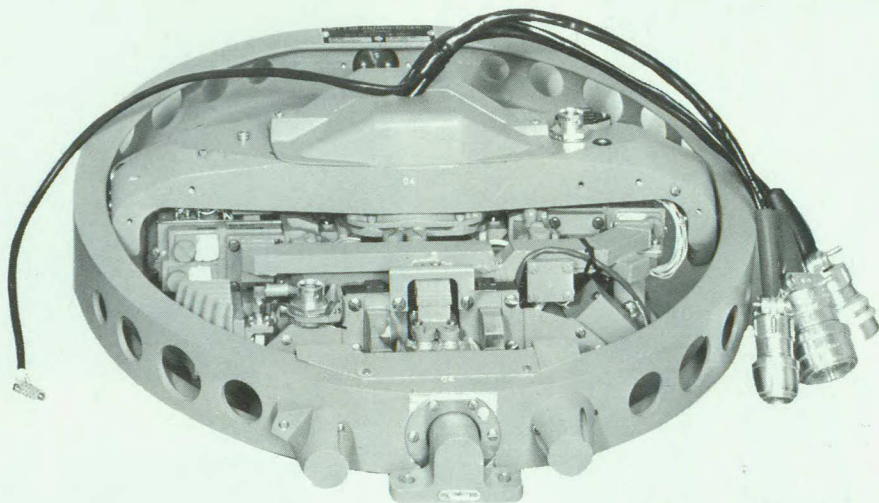
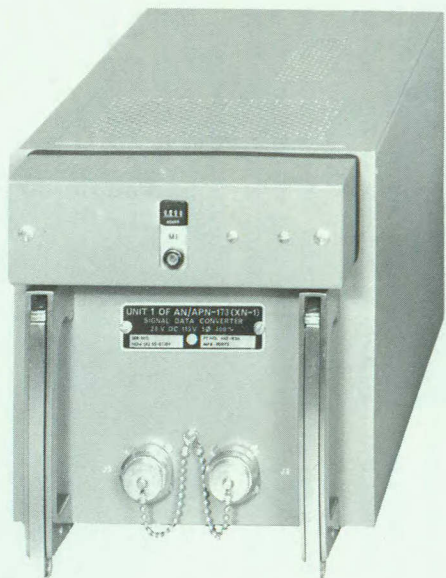
The AN/APN-173 provides the following outputs:

ELECTRICAL

OUTPUT	FORM	RANGE	SCALE FACTOR
<i>Groundspeed</i>	Pulse Train	-50 to +250 k	As required
<i>Heading Velocity</i>	400 Hz voltage	-50 to +250 k	30 mvrms/k
<i>Drift Velocity</i>	400 Hz voltage	-100 to +100 k	30 mvrms/k
<i>Vertical Velocity</i>	400 Hz voltage	± 5000 ft/min	1.5 mvrms/ft/min

VISUAL

OUTPUT	TYPE OF DISPLAY	RANGE	RESOLUTION
<i>Groundspeed</i>	Counter	-50 to +250 k	1 knot
<i>Drift Angle</i>	Pointer & Dial	180° left to	1°
		180° right	
	Pointer & Dial	2 to 2500 ft	5 ft
<i>Altitude</i>	Horizontal & Vertical Bars	± 40 k	2 k
<i>Heading Velocity</i>			
<i>Drift Velocity</i>			
<i>Vertical Velocity</i>	Pointer & Linear Scale	± 1000 ft/min	50 ft/min



TACTICAL AIRCRAFT NAVIGATION SYSTEM

The CMA-712 navigation system, designed and produced by Canadian Marconi Company is a highly versatile, lightweight and reliable airborne integrated avionics package specifically designed for use in transport and tactical aircraft where the requirement is for a track orientated navigation system.

The CMA-712, consisting of the CMA-668F Doppler sensor, the CMA-703 navigation computer and CMA-704 roller map display, provides a comprehensive navigational capability independent of ground stations. Groundspeed, drift angle and absolute altitude are measured continuously by the Doppler sensor regardless of weather conditions while the accuracy specified below is maintained independently of terrain through the use of beam intersection techniques in conjunction with a track-stabilised antenna.

The groundspeed and drift angle outputs of the Doppler sensor are used to compute along and across track distance which is display on the control indicator. The computer also accepts inputs from the air data computer to provide a back-up navigation capability.

Aircraft present position is displayed continuously on the roller may display, which uses standard Aeronautical charts with scales of 1:500,000 and 1:250,000.

All units of the CMA-712 navigation system incorporate built-in test equipment (BITE) which isolates system faults to the line replaceable unit without use of external test equipment. Further isolation of faults to the individual module is performed using standard test equipment. As all units of the CMA-712 are of modular construction, maintenance costs are low due to the ease with which faulty modules can be detected and replaced.

Principle features of the tactical aircraft navigation system CMA-712 are listed below:

PERFORMANCE DATA

<i>Temperature Range</i>	-55°F to +125°F (-48° to 52°C).
<i>Sensor Range</i>	40 - 45,000 ft. (12 to 13,716 m).
<i>Altimeter Range</i>	40 - 2,500 ft. (12 to 762 m).
<i>Automatic Acquisition</i>	30 secs. maximum.
<i>Reflectivity</i>	All terrain and sea states down to GPL2. Automatic compensation for sea bias.
<i>Warm-up time</i>	Nil.
<i>Groundspeed range</i>	100 to 1000 knots.
<i>Drift Angle</i>	±20°
<i>Pitch stabilisation limits</i>	±15°

DISPLAYED OUTPUTS

<i>Track Angle</i>	0-359.9°, Resolution .1°
<i>Distance to go</i>	0-999 nm Resolution 1 nm
<i>Distance cross track</i>	+99.9 nm Resolution .1 nm
<i>Groundspeed</i>	100 - 1000 knots Resolution 1 knot
<i>Drift Angle</i>	±20°
<i>Altitude</i>	40 - 2,500 ft. (12 to 762 m)

OUTPUT ACCURACY

<i>Distance along Track</i>	0.2% of distance flown
<i>Distance across Track</i>	0.31% of distance flown
<i>Groundspeed</i>	0.14% of indicated value
<i>Drift Angle</i>	0.13 degrees
<i>Altitude</i>	±(4% +2 ft. [.6 m])

SYSTEM ELECTRICAL CHARACTERISTICS

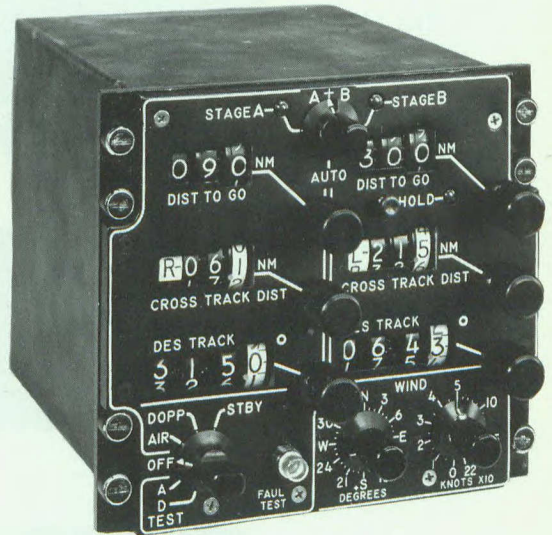
<i>Primary Power</i>	115 VAC 400 Hz(1 ϕ) 430 VA max.
<i>Transmitter Output Power</i>	500 mW nominal
<i>Frequency</i>	13,325 ±25 MHz.
<i>Modulation</i>	FM/CW



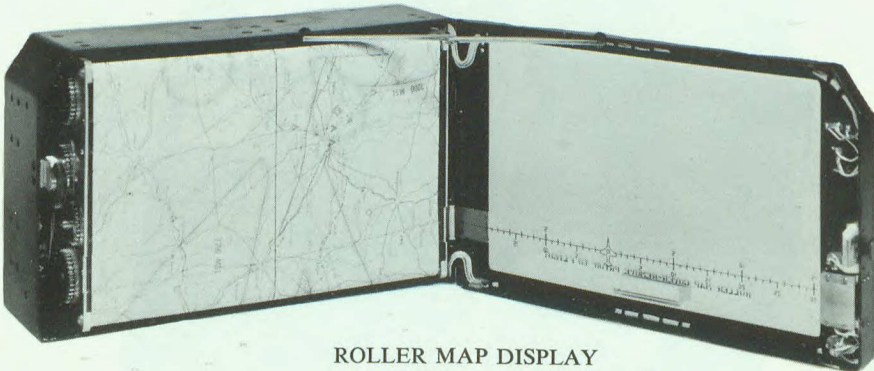
G/S & D/A INDICATOR



ALTITUDE INDICATOR



CONTROL INDICATOR



ROLLER MAP DISPLAY

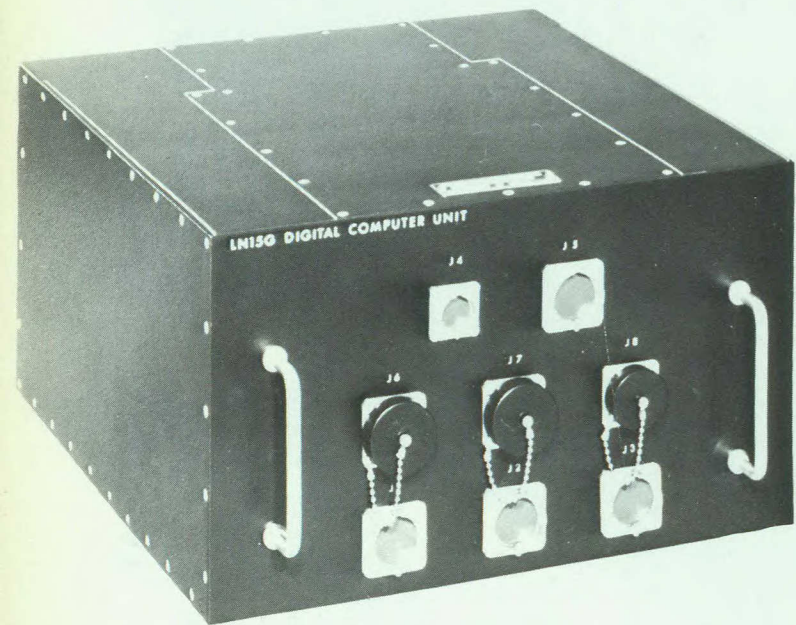
AIRBORNE INERTIAL NAVIGATION SYSTEMS

Litton Systems (Canada) Limited has produced over 2000 airborne inertial navigation systems in Canada since its inception in early 1960. Initially, production was devoted entirely to the Litton LN-3 systems for the F-104 Starfighter aircraft flown by the Canadian Air Force and various European NATO airforces. Litton Canada has since produced or has in production LN-12 systems for the USAF F-4 Phantom aircraft; LN-14 systems for the USAF F-111 aircraft and LN-15 systems flown in various other aircraft.

Litton inertial navigation systems are self-contained, fully automatic, lightweight inertial systems that continuously and instantaneously supply basic information on the aircraft's velocity, position and attitude during flight. These systems impose no restrictions on an aircraft's manoeuvrability; cannot be jammed by foreign transmissions; are unaffected by adverse weather conditions, and transmit no external signals that can be detected from outside the aircraft.

The LN-3, LN-12 and LN-14 systems use analog computers while the LN-15, the latest Litton inertial system in production uses a digital computer. In the LN-15 system, the application of advanced techniques at all levels of design, development and packaging has made possible the realization of a portable unit which combines accuracy and versatility with the ruggedness required for equipment operating in a combat environment.

The Litton LN-15 system has a multiple alignment capability that allows it to be aligned on the ground, in the air or at sea. These systems have comprehensive Self-Test and Built-In Gyro Calibration which eliminates the requirements for the types of test equipment traditionally required on a flight line or carrier flight deck.



PROJECTED MAP DISPLAY

Computing Devices of Canada Limited, has developed and is producing a new device which revolutionizes the display of navigation information to aircraft pilots, both civil and military.

The projected Map Display (PMD) is a dynamic, pictorial display of aircraft position and progress relative to the environment of interest whether topographical or aeronautical. The PMD was developed initially to meet the requirements of the pilot of low-level, military tactical aircraft who must be continuously aware of the relation between his current flight path and the surrounding and approaching terrain.

The PMD has been in continuous development since 1962. Two generations of flyable prototype systems were built and flight evaluated by six different military services in three tactical fighters and three helicopters. It is now in quantity production for the U.S. Navy A-7E Corsair II attack fighter. Production contracts for military helicopter programs are also expected during 1969.

The PMD consists basically of a fixed aircraft symbol presented against a full colour moving map image which is back-projected from a roll of 35 mm film. The film is driven in two axes, north-south and east-west, and simultaneously oriented to either present aircraft ground track or north. In addition to the map picture there are peripheral displays of aircraft track direction, range and bearing to a selected navigation destination and steering error.

The display can be used to look ahead to destination with automatic return to current position upon command. Use of the HOLD and SLEW controls allows the pilot to quickly and easily up-date either navigation position or destination storage without any necessity for numerical coordinate setting.

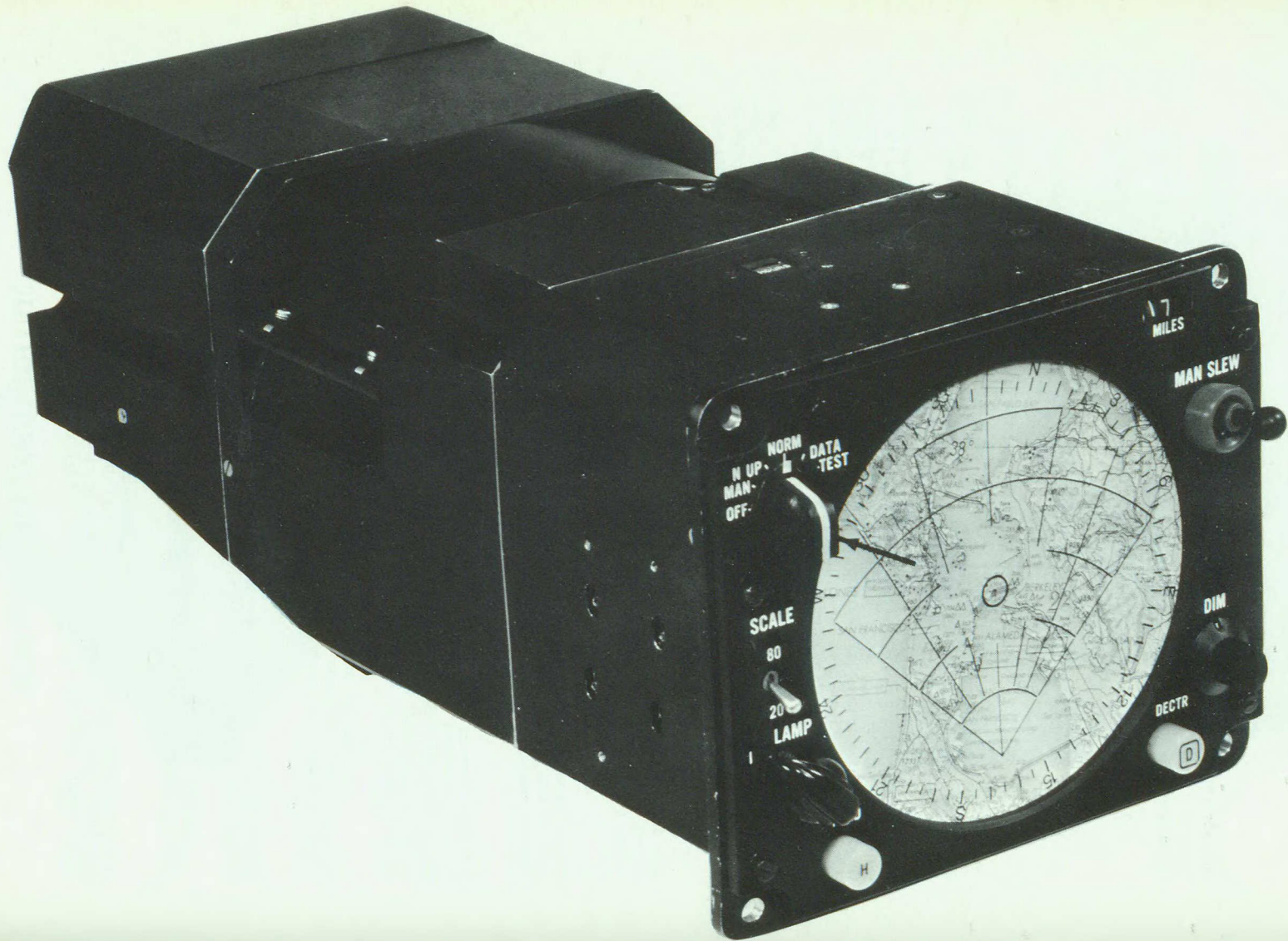
The high-light performance features of the PMD are: very large storage capacity — more than *220 square feet (20 sq. m) of original paper maps plus 200 discrete data plates for instant recall, sufficient brightness to allow clear viewing in full sunlight or 10,000 foot candles ambient without any necessity for a hood, and resolution capability of 4.5 lines per mm which allows easy readability of six point type at 30 inches (76 cm.) viewing distance.

The PMD measures 6.2 x 7.4 x 15.6 inches (15.7 x 18.7 x 39.4 cm.) and weighs 21 lbs. (9.5 kg.).

Projected Map Systems (PMS) are available in three basic configurations:

- (a) The PMS-4 system interfaces the PMD with a central general purpose digital navigation computer.
- (b) The PMS-5 system interfaces the PMD with primary navigation sensors; dropper, inertial or air data; and performs navigation computations of position and steering information.
- (c) The PMS-6 system interfaces the PMD with either ground-based, VOR-DME or hyperbolic, or self-contained sensors and performs area navigation calculations for civil or military air transport application within the civil airways system.

*e.g. An area of 1000 x 1000 nautical miles can be stored at two map scales of 1:500,000 and 1:2,000,000.



MF/HF DIRECTION FINDER

General Precision Industries Ltd., of Montreal, has designed this direction finder which covers the frequency band from 60 KHz to 30.0 Mhz in a continuous manner, using one receiver and one antenna. It provides instantaneous indication of the bearing of a received signal in the form of a trace on the face of a Cathode Ray Tube.

The discrimination between the actual bearing and its 180 degree reciprocal is done simply by depressing a push-button switch located on the front panel of the receiver.

The overall frequency coverage is divided into six ranges. Range selection is by push-button control, and the tuning of the receiver to the required frequency is done rapidly by a two-speed manual drive.

The receiver consists of two frequency-gauged radio channels, accurately matched for gain and phase. The frequency of the signal, to which the receiver is tuned, is read off a scale-and-pointer combination with an accuracy of ± 5 KHz at 30 Mhz.

For some applications it might be necessary to know the frequency of the received signal with a much higher accuracy, or else to keep unattended watch on a frequency of specific interest. For this purpose the receiver can be made to operate in the digital mode, by fitting a special counter in the upper part of the cabinet. In this case the tuning accuracy is within ± 50 cps up to 30 Mhz and the stability is such that the tuning frequency remains within these limits for indefinite periods of time.

All IF and LF stages are transistorized. To facilitate servicing the receiver, circuitry is accommodated in readily replaceable modules of standard size and the set may be used in either the land or maritime environment as a fixed or mobile installation. A naval version, the Direction Finder, AN/SRD-501, is in service with the Royal Canadian Navy.

A complete mobile set consists of the receiver, a light-weight (approx. 40 lbs.) waterproof and dustproof antenna and a set of interconnecting cables. The remarkable feature of this antenna is that it covers the whole frequency span from 60 KHz to 30.0 Mhz with a high sensitivity.

In this configuration the set can be used as a land-roving unit mounted in a vehicle, in which case the antenna is located atop a retractable mast, permanently mounted on the vehicle. A suitable converter is added to feed the set directly from the 12V battery of the vehicle.

The set is admirably suited for fixed DF stations whose main purpose is to pin-point accurately the location of the source of received signals by triangulation. These stations usually feature an antenna array of the Adcock type consisting of 4 or 8 vertical elements arranged on the periphery of a circle. To get a high sensitivity at low frequency, two such arrays are used with frequency coverages of 0.25 Mhz to 1.5 Mhz and 1.5 Mhz to 30.0 Mhz respectively.

At least two such stations installed at a suitable distance and connected by a communication link are necessary to take triangulation fixes on received transmissions.

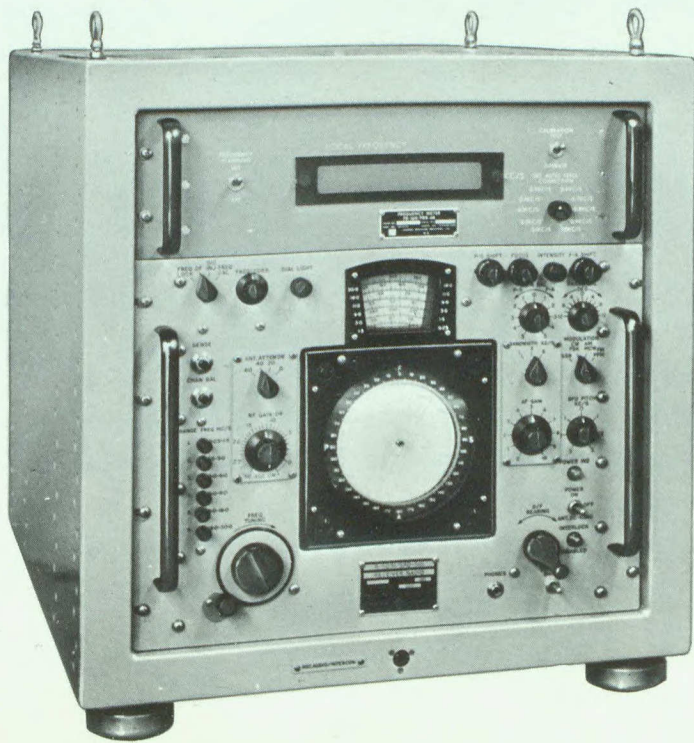
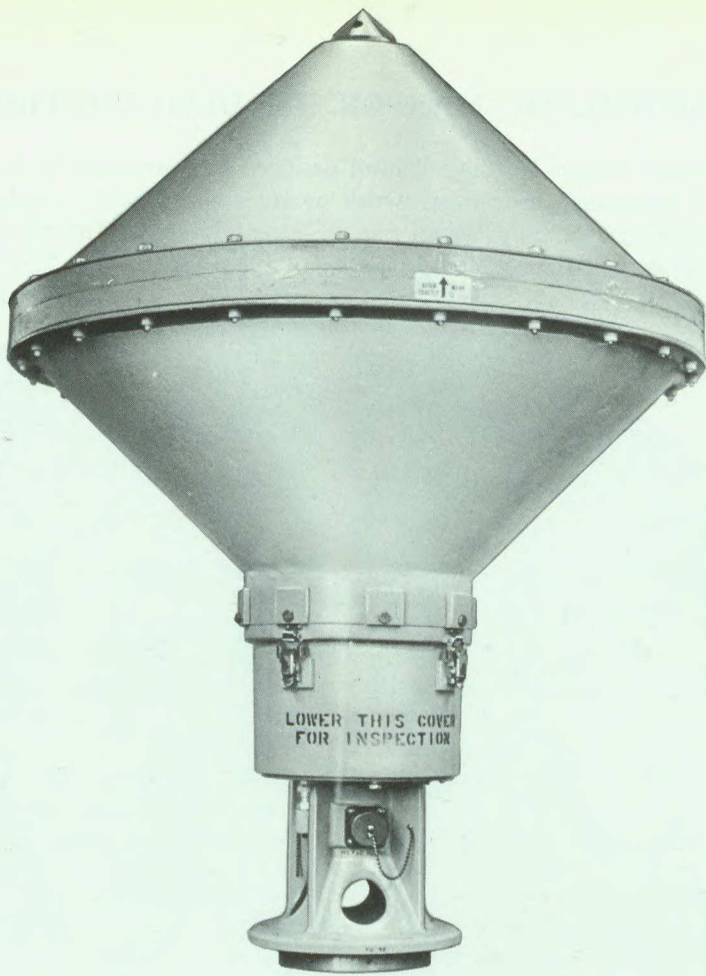
The direction finder includes the following features:

Instrumental accuracy $\pm 1^\circ$ for 20 db $\frac{S + N}{N}$ ratio on vertically polarized fields.

Azimuth display — instantaneous diametrical trace on 5" CRT.

Sense determination — quadrant outline superposition on depressing SENSE push-button.

Edge-illuminated scale, rotating alidade, manually operated and coupled with a synchro-transmitter for remote indication of azimuth.



AUTOMATIC MASTER HEADING CONTROL

The Automatic Master Heading Control designed and produced by Leigh Instruments is a navigator's instrument which provides simultaneous displays of grid, magnetic and true aircraft heading at all times. Integral with this display are smaller displays of variation and grivation (grid variation).

Convergency and command azimuth are separately displayed on the True Heading Dial. The instrument enables continuous monitoring of the standby gyro.

The navigator may control the navigation system heading reference and update it as required. Using the AMHC, he may correct both main and standby gyros, select either as primary sensors, update convergency, variation or grivation.

Command azimuth bearing can be set in on a three digit counter.

The control function can be carried out without upsetting the pilot's magnetic heading reference.

The AMHC accepts inputs of grid heading, convergency and magnetic slaving. Its outputs are Magnetic Heading, Grid Heading, True Heading, Convergency and Relative Bearing.

Grid Heading is accepted from the standby gyro and Leigh Instruments' Compass Repeater Amplifier which is fed by the main gyro. This provides separate headings which are converted into Magnetic or True as required by the aircraft.

The AMHC enables the navigator to correct gyro heading without disturbing the pilot's magnetic reference by torquing variation equal and opposite to the grid correction for cases where the magnetic sensor is operating.

Convergency is accepted as an M transmission and retransmitted as a synchro signal.

FEATURES

- Gives aircraft global heading capability.
- Simplifies Polar Navigation.
- Allows full pilot control of the magnetic reference and provides navigator control of the gyros.
- Enables primary heading system to be either True, Magnetic or Grid, depending on conditions.
- Standby or Main Gyro can be selected as primary heading sensor.
- Provides continuous monitoring of secondary system.
- Provides immediate indication of the need for corrective action.
- Automatic, accurate initial alignment.
- Automatic and continuous variation computation and display.



MASTER GYRO

CONVERGENCY

MASTER HEADING

FAST ALIGN

COMMAND AZ

SLEW



20-1

AUTOMATIC DIRECTION FINDER RECEIVER AN/ARN-89

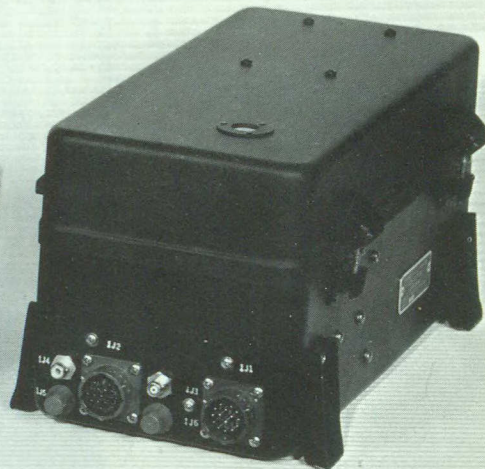
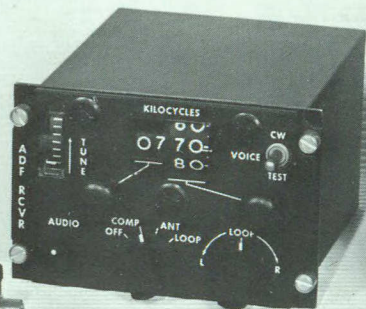
This lightweight automatic m.f. direction finder designed and produced by EMI Electronics, is suitable for both military and commercial fixed and rotary wing airplanes. Modular construction of major circuit blocks allows rapid fault location and speedy replacement of faulty parts.

The receiver provides crystal controlled station selection with the added benefit of continuous vernier tuning instead of incremental switching. The frequency coverage is 100 KHz to 3 MHz with an effective servo bandwidth of 2 Hz. Bearing accuracy at 25 micro volts per meter is ± 2 degrees. The speed of rotation is 30 degrees per second from 175 degrees offset making it particularly suitable for rapid manoeuvring aircraft and helicopters.

The loop antenna and sense antenna have pre-amplifiers to match the 50 ohm impedance of the coaxial feeder cables. This allows both antennas to be located at any distance from the receiver without compensation.

An internal 'confidence check' enables the operator to confirm that the system is functioning correctly by pressing a 'test' switch.

An internal 400 Hz power supply has adequate capacity to operate two remote magnetic indicators. Total power requirement for the system is 1 amp at 28 volts d.c. The complete system including interconnecting cables weighs 13 lbs. (6 kg).



ATTITUDE AND HEADING REFERENCE SYSTEM

Through the use of long-life inertial instruments of simplified design, Litton Systems (Canada) Limited has produced an Attitude and Heading Reference System of unusually high reliability. The technology used in the design of this system is of the highest order and has been achieved through the production of over 2000 inertial systems.

The system features:

- 2 - Two degree of freedom gyros
- 4 gimbals
- 3 accelerometers
- A pendulous vertical $\pm .06$ degrees
- Earth rate, coriolis and transport corrections
- Free gyro or slaved heading

The platform consists of 4 gimbals — Outer Roll, Pitch, Inner Roll and Azimuth with the latter being the inner gimbal. Each gimbal carries a dc torque motor and a synchro. The stable element (azimuth gimbal) carries three accelerometers and two, two degree of freedom gyros. The accelerometers are aligned with the NS(Y) and EW(X) axes. The gyro spin axes, both horizontal, are aligned with the X and Y axes, the first being sensitive to motion about the Y and Z axes, the second about the X and Z axes. The redundant Z axis is caged to the gyro case.

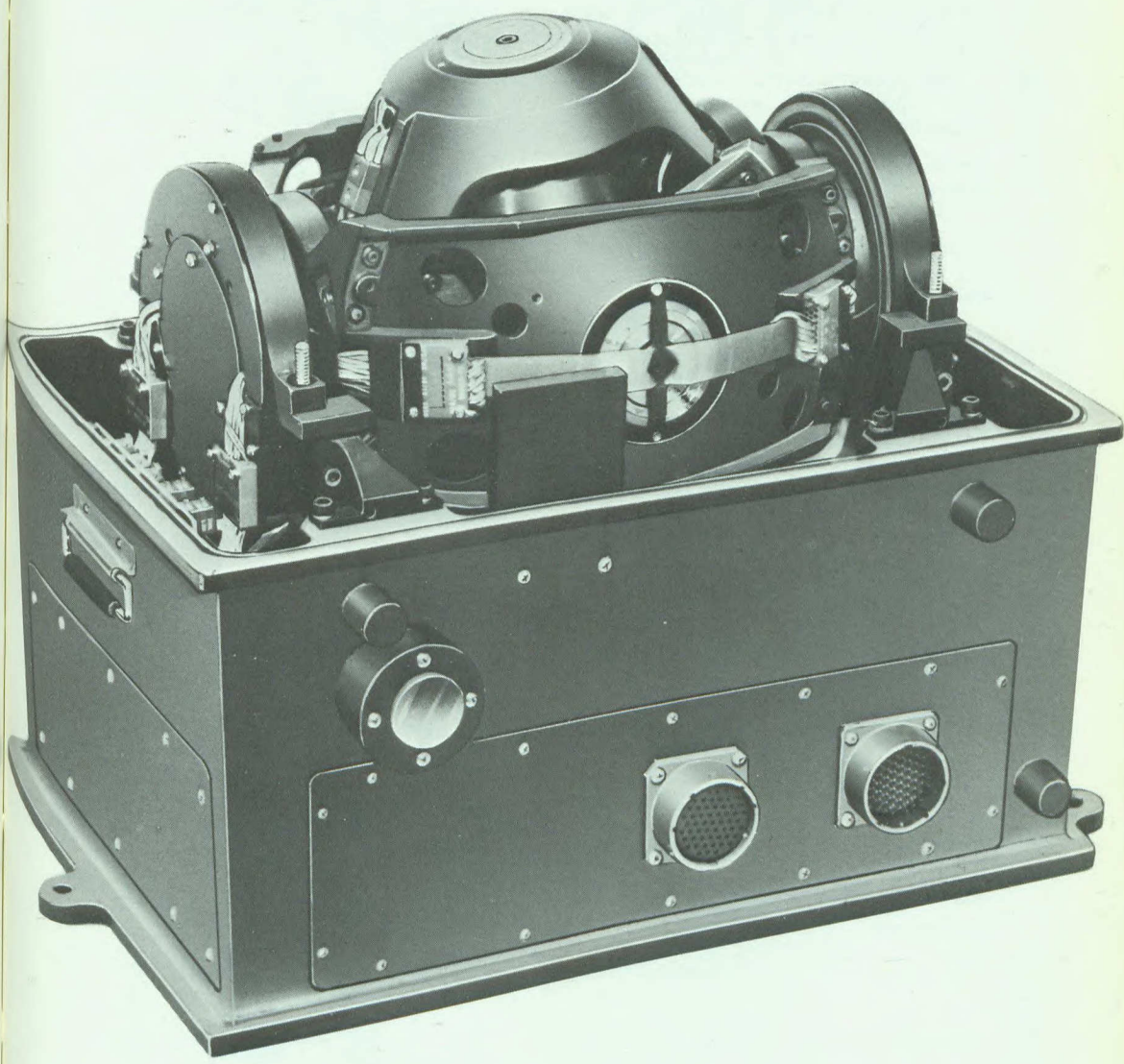
Each gyro has two pick-offs and two torque motors. The pick-offs sense angular displacement between the spin axis and the case and the torque motors when excited cause the gyro to precess in a controlled manner. A resolver on the azimuth shaft resolves the outputs of the X and Y pick-offs into roll and pitch error signals for application to the platform torquers. Two mercury switches parallel to the X and Y axes are normally closed and open when subjected to accelerations exceeding 0.1 g.

In addition to the gimbal structure the platform contains all the necessary electronics to make it a completely self-contained unit. These consist of four servo amplifiers to control the gimbals, temperature control circuits and heaters to maintain the floated gyros and accelerometers at the proper operating temperatures, a power supply to produce the gyro spin supply and excitation for the pick-offs and synchros, and mode switching relays.

The platform also contains the circuitry needed to slave the platform to the magnetic compass and to compute corrections for earth rates, transport rates and coriolis acceleration. Its main component is a follow-up servo which produces a shaft position representing the azimuth output of the platform. The same shaft carries a second control transformer fed from the flux valve, and sine cosine potentiometers which resolve vehicle velocity into NS and EW components. The remaining components are scaling resistors, summing amplifiers and two pulse width modulation multipliers.

Physical Characteristics

SIZE:	8.4 x 12.6 x 13.6 inches 21.4 x 32 x 34.5 cm
WEIGHT:	24.9 lbs. 11.3 kg
POWER:	200 W 2 KW During Warm-up



ATTACK SYSTEM—LCAS-5

The LCAS-5 is an attack system for airborne tactical support. The system, an Aided Visual configuration, has been designed by Litton Systems (Canada) Limited to provide the most effective bombing system for those aircraft not requiring or unable to afford inertial navigation capability.

Since the LCAS-5 consists of sub-systems which represent the present state-of-the-art, no extensive engineering tasks are required except for the re-packaging necessary to adapt the hardware to a particular aircraft.

The primary factors which determined the design of the individual subsystems were simplicity of operation, performance, accuracy, delivery mode flexibility, reliability, ease of maintenance and cost.

System Characteristics

Modes:

Computed Release	Distometer
Laydown	Pitch Angle, Altitude or Slant Range
Dive Laydown	

Operational Ranges

Altitude: 2000 to 25,000 feet (610 to 7620 m).

Speed: 300 to 800 knots.

Dive Angle: -45 to +20 degrees (at release).

A major factor in the development of the bombing computer mechanization is correction for the weapon ballistics. Through the use of computer simulation programs Litton has adopted an approximate ballistic solution which utilizes curve fitting techniques to derive a Cb factor which is used to modify the gravity term. Error analysis and optimization programs have indicated that a single value of Cb for each weapon, introduced impact errors of less than 30 feet for low to medium drag weapons.

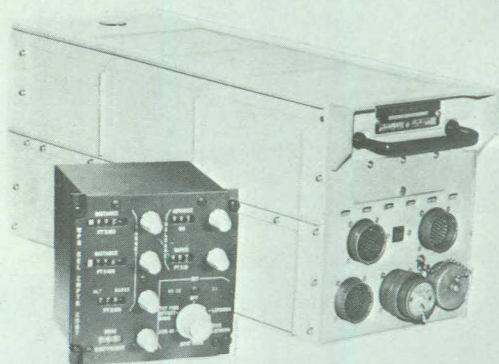
Subsystem Characteristics

Attitude and Heading Reference	ACCURACY	OPTIONAL FUNCTION	COMMENTS
	0.06°	Pitch, Roll, Heading Display, Auto Pilot Inputs	Latest Inertial Technology
Air Data Computer	2.5 ft./sec. 76 cm./sec.	Altitude, Mach No., I.S.S., h°	Proven Performance
Optical Sight	2 mr.	Heads up Display	Pitch Stabilized
Laser Rangefinder	10 ft. (3.5 m)		Most Accurate Ranging
Bombing Computer	75 ft. (22.9 m)		AN/ASQ-91 Technology

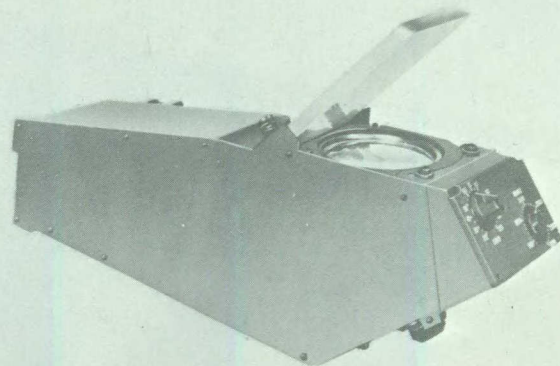
Sub-System Physical Characteristics

SUB-SYSTEM	SIZE	WEIGHT	POWER
Laser	Dia. 8.8 in. (22.5 cm.) Length 20.5 in. (52 cm.)	49.8 lbs. 22.6 kg.	200 W Standby 700 W Max. 1 sec. AVG. Duration
Air Data Computer	5.9 x 5.9 x 10.8 in. 15 x 15 x 27.5 cm.	15 lbs. 6.8 kg.	50 W
Bombing Computer	6.9 x 8.3 x 9.8 in. 17.5 x 21 x 25 cm.	19.8 lbs. 9 kg.	100 W
Attitude Reference System	8.4 x 12.6 x 13.5 in. 21.4 x 32 x 34.5 cm.	25 lbs. 11.3 kg.	200 W (2 KW)
Sight	3.9 x 6 x 10.6 in. 10.1 x 15.3 x 27.1 cm.	7.9 lbs. 3.6 kg.	During Warm-Up)

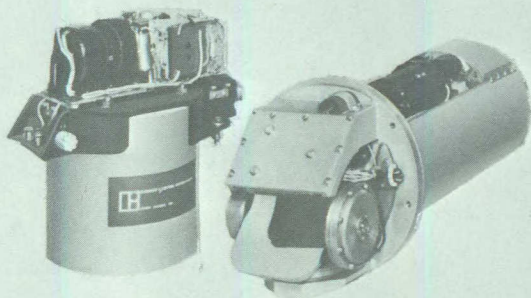
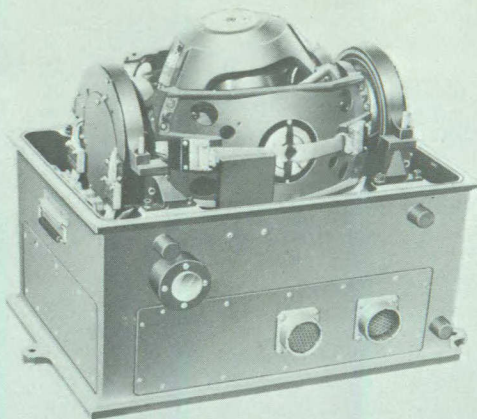
BOMBING COMPUTER



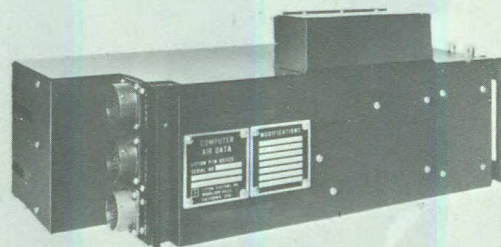
OPTICAL GUNSIGHT



ATTITUDE REFERENCE SYSTEM



LASER



AIR DATA COMPUTER

WEAPON RELEASE COMPUTER SET (AN/ASQ-91)

Manufactured in Canada by Litton Systems (Canada) Limited, the AN/ASQ-91 Weapon Release Computer Set is an analog weapon's delivery system designed to enhance the combat effectiveness of the McDonnell F-4D/E aircraft. Compatibility of the weapons release computer set with the LN-12A Inertial Navigation Set used in the F-4C aircraft may be achieved through substitution of the LN-12D Output Signal Distribution Unit. The weapons release computer set provides range calculations and automatic weapons release signals for the laydown, dive-laydown, dive-toss and off-set bombing modes of operation. Steering signals and range-to-target information are supplied for use in the target-finding and off-set bombing modes. Manoeuvre commands and the release signal are provided for successful delivery of the AGM-45 missile. Either low-drag or high-drag bombs may be used through proper adjustment of the weapons release computer control panel drag coefficient control. Maximum use of F-4D/E aircraft inertial navigation set output signals and electronic components and mode-sharing of weapons release computer set components has achieved substantial reductions in size, weight, and cost of the equipment.

The Litton computer set consists of:

- The **Ballistic Computer** unit which contains all of the analog circuitry required to solve the bombing problem for each mode of computer set operation;
- The **Cursor Control Panel** which incorporates two thumbwheel controls for adjusting the position of the long-track and cross-track cursors on the radar screen during the target finding and off-set bombing modes;
- The **Weapons Release Computer Control Panel** which contains controls and switches for mode selection, built-in test operation, and insertion of various range, altitude, time and ballistic information.

SATELLITE COMMUNICATIONS

Canadian industry is in the forefront of countries providing earth stations and satellite for space communications. RCA Limited in Montreal built each of the two earth stations that comprise Canada's satellite communications terminal facilities at Mill Village, Nova Scotia, for handling Canada's trans-Atlantic commercial satellite communications service.

The first station, completed in 1965, uses an 85 ft. (26 m) diameter radome-enclosed antenna and is equipped to handle the transmission and reception of single sideband in addition to the FM mode. The single sideband facilities are available for cooperative international experiments.

The second station, completed in early 1969, uses a 97 ft. (29.6 m) diameter exposed antenna system fitted with a special reflector heating system to remove snow and ice during inclement weather conditions such as are experienced on Canada's east coast. The antenna is of the king post type of configuration, weighs 275 tons (249 metric), and mounts on a pyramid-shaped concrete tower 38 feet (11.6 m) high with walls 2½ feet (76 cm) thick. This station, with a communications capability of 1200 voice circuits for both transmission and reception, is able to receive multi-message communications from up to 10 countries simultaneously.

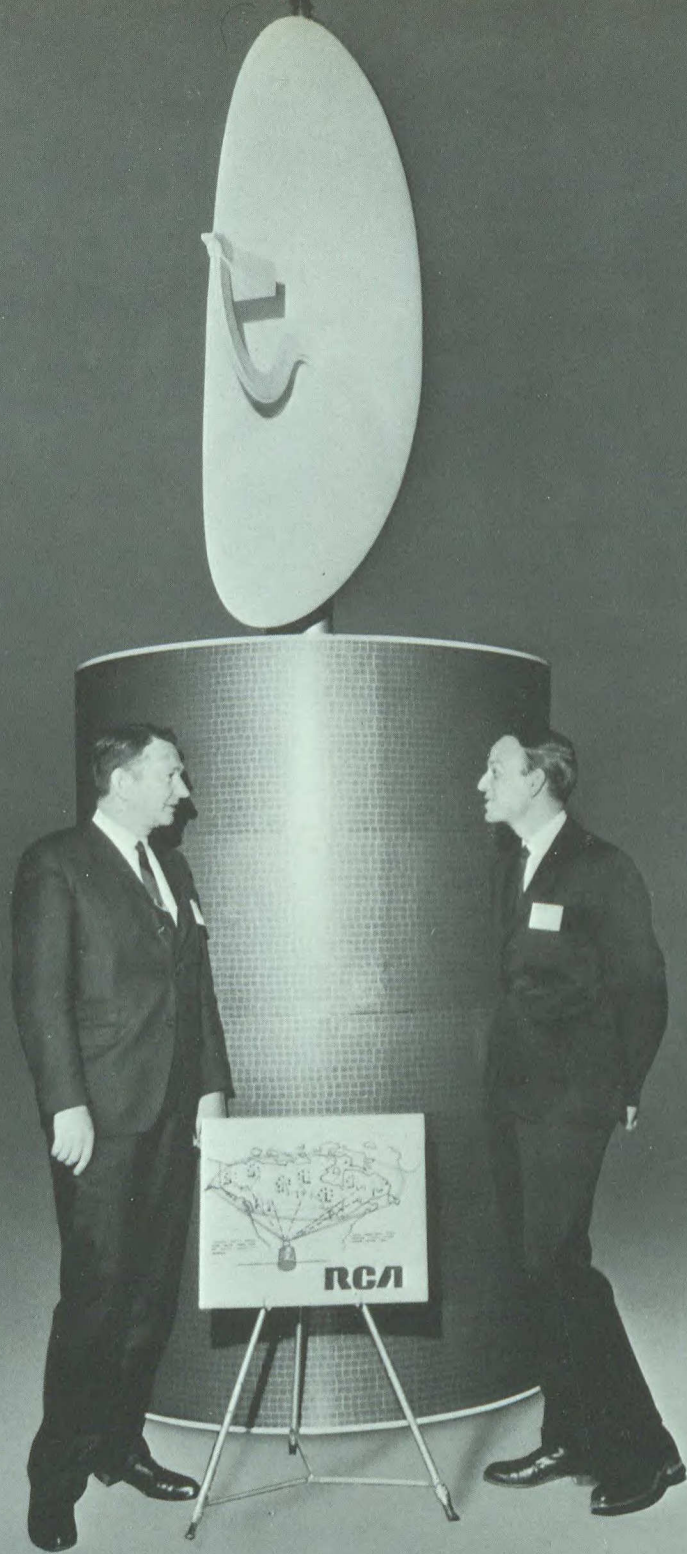
For other member countries of the Intelsat global satellite communications system, RCA Limited sells complete earth stations managed on a turnkey basis including the provision of buildings, diesel-electric power, and microwave communications link to connect with the national telecommunications network. The company has furnished major earth station subsystems for stations in Argentina, Brazil, Panama, Morocco, Thailand and Australia and a complete station for the Government of India. The Indian station, located at Poona, 120 miles south east of Bombay, will operate with the Atlantic Intelsat satellite to permit direct communications service with Europe, Middle East and Africa.

Domestic Satellite Communications

In 1969, Canada commenced planning on the world's first domestic satellite communications system using geo-stationary satellites. The system, owned by Telesat Canada, is scheduled to go into commercial operation in the early 1970's and will consist initially of a satellite in a synchronous orbit above the Pacific Ocean, about 105° W. Long., 22,300 above the equator, and 3 basic types of ground stations. Large ground stations with limited steerability antennas with diameter of approximately 60 feet (18.4 m) will be used for heavy route transmission and reception of television and telephone and located at major population centres. Smaller, light route stations will be used by small telephony users in remote locations for multiple access to the satellite and equipped additionally for television reception. The largest group of stations would be used for TV reception only, serving areas not served by a terrestrial TV link.

The satellite for the system will be a mechanically despun antenna, a capacity of 6 TV channels or equivalent voice circuits, an in-orbit weight of approximately 500 lbs. (228 kg), and will be launched by NASA from Kennedy Eastern Test Range, Cape Kennedy, using a thrust augmented Thor Delta vehicle. RCA Limited, with experience in 7 spacecraft programs starting with the pioneer RELAY communications satellite in 1961, is the prime contractor for the program definition phase of the satellite program that precedes the production phase.

TRW Inc., Aerospace Products and Northern Electric Company Limited are participating with RCA Limited in the program definition phase of the spacecraft portion of the Canadian domestic satellite system.



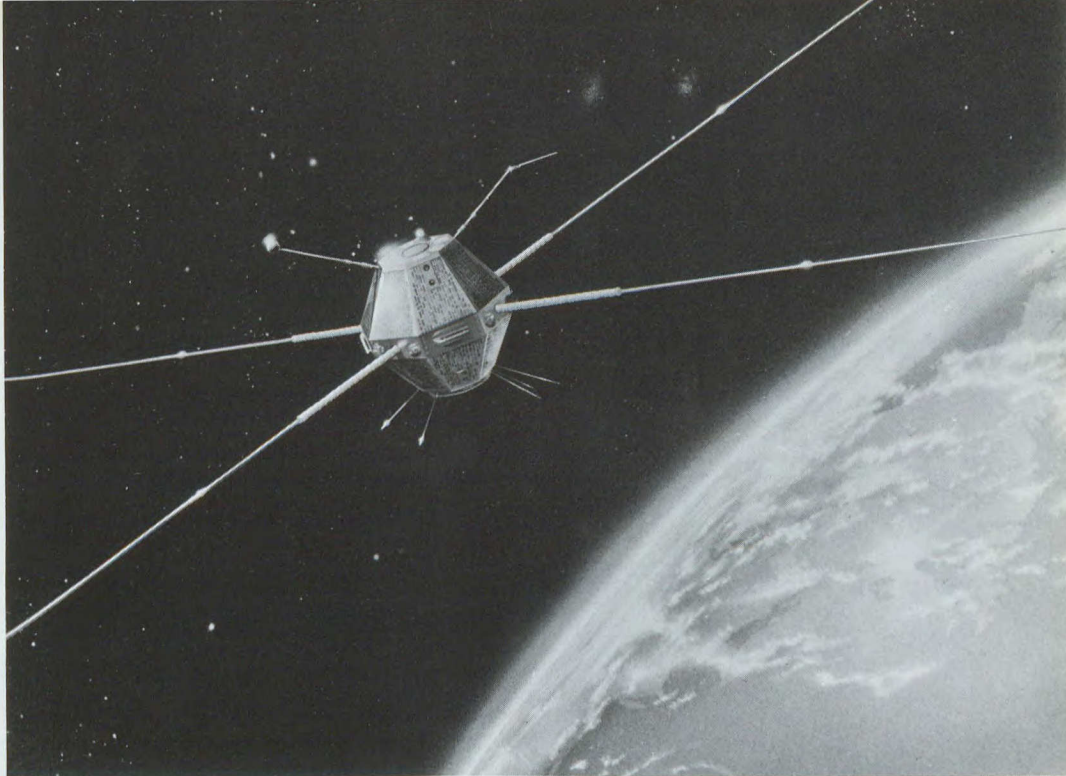
A full-sized model of the proposed spacecraft for the Canadian domestic satellite system.

Canada has a great need for a satellite system to illuminate with wideband telecommunications its vast territory of 3.6 million square miles. Wideband microwave systems, of which Canada has over 10,000 miles (16,093 km), mostly in its southern reaches, cannot compete with satellite distribution for such an area, most of which is sparsely populated and with climatic conditions unfavorable to terrestrial systems. It is a need that is foreseen will persist for a very long time into the future, notwithstanding continued growth of high capacity, reliable and low cost microwave terrestrial systems, and of cable and waveguide systems. These systems will complement not compete in the growth towards an integrated communications service of greater coverage, capacity, speed, flexibility and reliability.

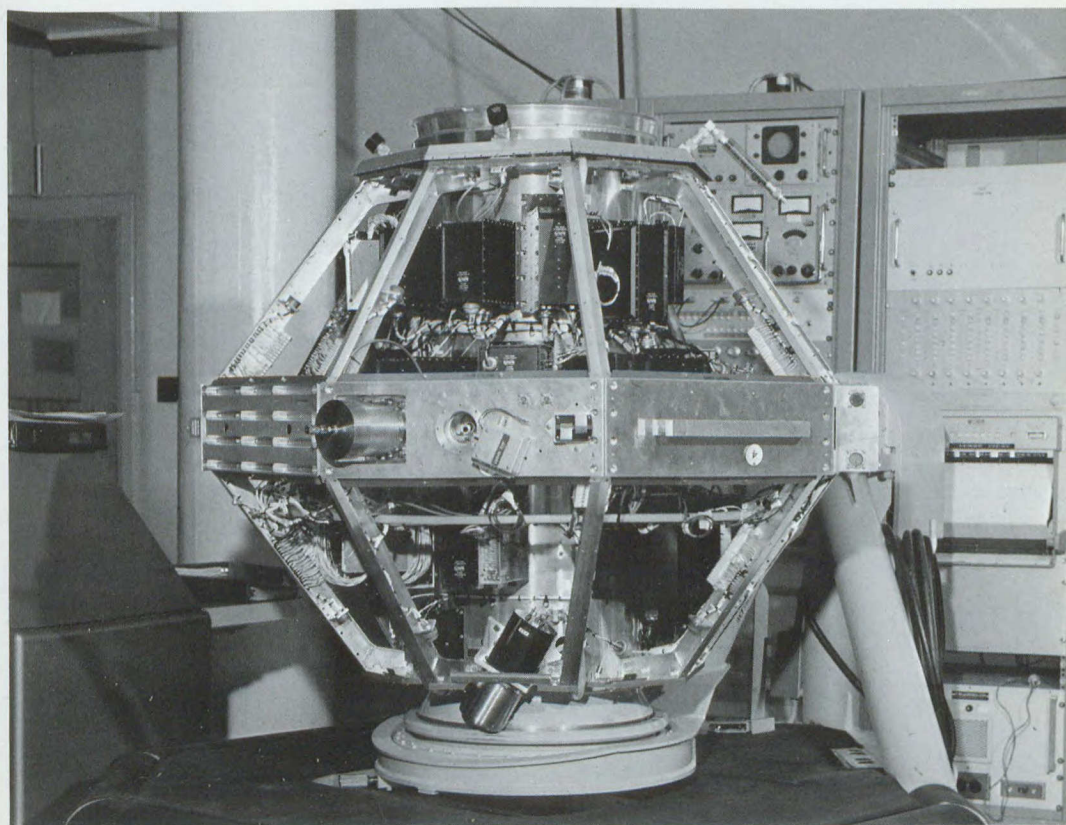
Regional satellite systems are being planned for several other countries of the world. The experienced Canadian industry team of specialists in domestic satellite communications arising from the implementation of the Canadian system, will be available for technological co-operation with other countries towards realization of their domestic satellite requirements. Low cost and reliable small earth station designs for transmit-receive and receive only will be available for application to other regional systems. In addition, the Canadian 6 TV channel satellite, or subsystems thereof, may be applied to other systems.

Canada's east coast satellite communications terminal facility at Mill Village, Nova Scotia for trans-Atlantic satellite service. In the background is the radome enclosed antenna of the initial station. The new, 97' (29.6m) fully steerable antenna system in the foreground weighs 275 tons (249 metric) and is mounted on a concrete tower 38' (9.1m) high.





ISIS "A" Scientific Satellite launched in January 1969 from Kennedy West Test Range. Built by RCA Limited, the ISIS "A" is the third in a series of Canadian satellites for ionospheric measurements. This vehicle weighs 500 lbs. (227 kg) and contains 10 scientific experiments.



The "ISIS A" satellite, one of series of Canadian experiments, under construction at RCA.

SATELLITE COMMUNICATIONS—EARTH STATIONS

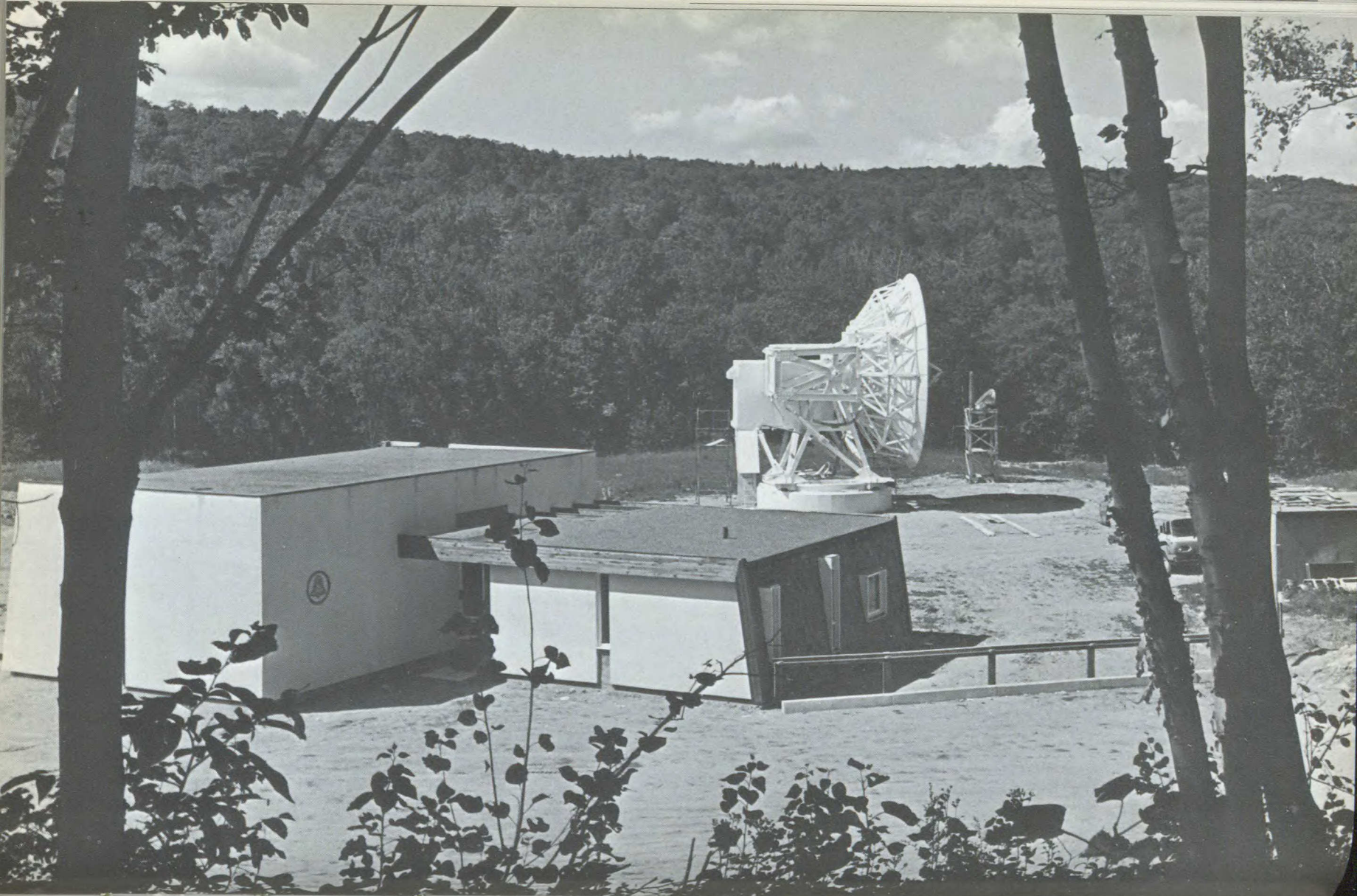
In helping to solve Canada's specialized telecommunications problems and those of other countries, the Aerospace Communications Laboratory of Northern Electric Company, Limited, has gained considerable experience in the design and development of advanced types of tracking antennas, satellite earth stations and associated subsystem components. Northern Electric is in a position to offer this complete communications earth station capability, backed up by systems engineering personnel and an elaborate manufacturing network to meet individual customer needs.

An example of this capability is typified by a 30-foot (9.1 m) precision satellite tracking antenna, completed for the Canadian Defence Research Telecommunications Establishment (DRTE). The antenna design is unique in that it operates without radome protection in the severe Canadian climate. It can move its 52,000 pound (23,600 kg) dish rapidly and accurately enough to track an aircraft flying at 40,000 feet (12,000 m) at the speed of sound, while its electronic capabilities allow transmit and receive operation in the 4, 8, 15 and 30 GHz bands. The equipment hut remains level throughout its elevation range by the action of a horn reflector feed configuration which passes into the equipment hut through the elevation bearing.

Another feature of the antenna structure is the high degree of surface accuracy. The centre 10 feet of the main dish is a one piece machined portion of a paraboloid, which is supported by a 10 foot (3.05 m) diameter cylindrical trunnion. The outer part of the dish is made up of 24 petals of 2 inch (50.8 mm) aluminum honeycomb construction, supported on backup frame sectors. The overall surface accuracy is 0.222 inches r.m.s., including effects of 40 m.p.h. (64.4 km) wind, ¼ inch (6.4 mm) of ice, thermal expansion, inertia, and static tolerance.

Northern Electric has also designed a range of satellite earth stations for use in domestic communications systems. The first of these stations, an ARCOM-type remote transit-receive earth terminal intended for use in the Canadian North, has recently been completed for Bell Canada, and is presently operating experimentally at Bouchette, Quebec, 70 miles north of Ottawa, through the facilities of a synchronous satellite. The ARCOM (for ARCTic COMMUNICATIONS) earth terminal is designed to operate with several other terminals in a multiple access network providing voice communications between various Arctic terminals and a southern network station. It can also receive up to two colour television channels which are transmitted by the southern terminal.

Since the ARCOM station will operate with a synchronous satellite, this eliminates the need for elaborate tracking mechanisms. A sub-reflector scanning technique steers the antenna beam ± 0.6 degrees, sufficient to track the daily excursions of the satellite in its synchronous orbit. The design of the station is such that it can be erected in remote locations, operate in high winds, extreme cold and heavy icing conditions, and still maintain a high degree of reliability. An elevation-over-azimuth-mounted 30-foot diameter paraboloid is used as the main dish, operating without radome protection. All communications facilities are housed on the antenna in an equipment hut. One of the most significant features is that the station is designed for unattended operation, with very little maintenance.



STEM

Spar Aerospace Products Ltd., has designed and manufactured a whole family of devices known as Storable Tubular Extendible Members (STEM). These devices have been used successfully as antennas, actuators and gravity gradient stabilization booms on satellites, spacecraft and also on ground installations. The tubular elements are formed of strip metal, heat-treated into a circular section in such a manner that the edges of the material overlap, thus providing the tubular element with a strength almost equivalent to that of a seamless tube of the same diameter and wall thickness. The elements, when retracted, are stored in a strained, flattened condition by winding them onto a drum. As the circular element is retracted it is smoothly transformed into the flattened condition by passing it through a suitable guidance system.

The wide range of STEM devices produced by Spar vary in length from one to one thousand feet (.3 to 304 m). Beryllium copper, stainless steel and titanium have been used to form the antenna elements. Both motorized and self-extending STEMs have been embodied in over one hundred different designs with varying extension rates and tube sizes. STEMs have been successfully employed in many aerospace, military and ground applications. On spacecraft they include antennas, directional arrays, solar panel actuators, unfurlable boom structures for sensor deployment, de-spin and attitude control, such as for gravity gradient satellite orientation. Over three hundred and fifty STEMs have been successfully launched on key scientific satellites, space probes and manned spacecraft programs.

Spar Aerospace Products is responsible for the sounder antennas of the Canadian series of Alouette and ISIS satellites. ISIS 1, launched in January 1969, deployed four STEM antennas measuring 240 feet and 62 feet, tip to tip, to probe the upper levels of the ionosphere. Similar extendible devices were also employed in all the Gemini spacecraft, Apollo, Mercury, OGO, GEOS, ATS and DODGE, to name but a few. These products have been procured on a world-wide basis including the United States, Europe and Japan.

In response to an acknowledged ground environmental need for masts and antennas with a high degree of extendibility, minimum space storability and light weight, Spar undertook a development program to design a line of deployable devices. These include a lightweight push-pull antenna for a portable manpack transceiver, vehicular mounted masts of 1 $\frac{3}{8}$ and 3 $\frac{1}{8}$ inch diameter STEM element, an ultra-lightweight tripod employing the push-pull technique, an air-droppable antenna device which extends under its own coiled energy upon impact, and a diffusion furnace actuator where withdrawal speeds must be accurately maintained and where installation space is at a premium.

Continual development at Spar has resulted in substantial product improvements. The BI-STEM principle allows a reduction in package size of over 50% and the interlocked BI-STEM provides deployable structures exhibiting an improvement in torsional strength of over 1,000 times that achievable with earlier STEM devices. These latest developments have led to flight-proven hardware with the same excellent reliability demonstrated previously by STEM devices in hundreds of operational flights.



HIGH "G" ELECTRONICS

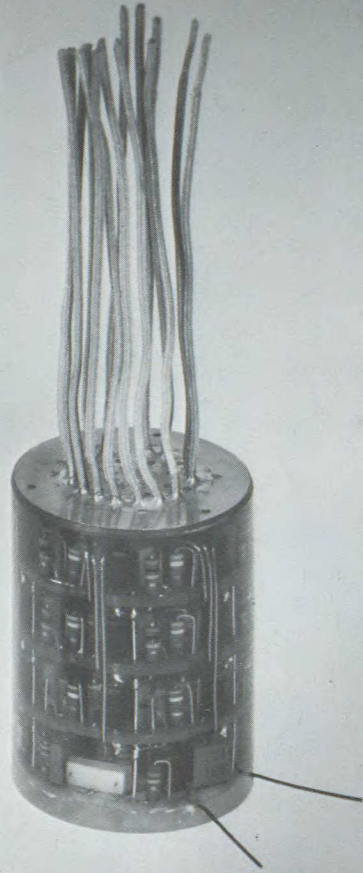
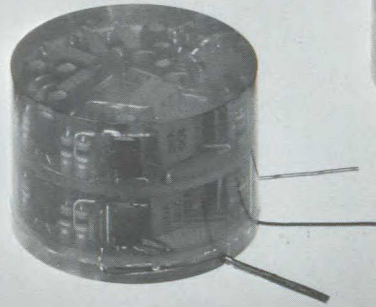
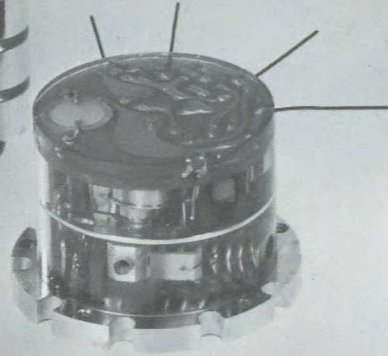
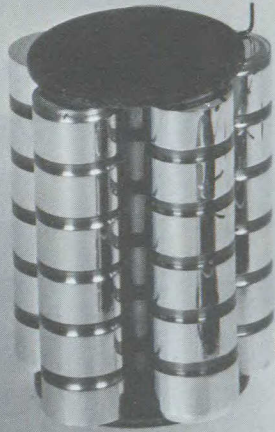
Computing Devices of Canada Limited has been engaged in aerophysics research since 1956. One of the major activities is the development of electronic systems for operation in high 'g' environments.

The 'Space Age' has brought increased requirements for the application of high g telemetry systems. Sensors, power supplies, voltage regulators, frequency modulators, sub-carrier oscillators, multi-channel commutators and transmitters have been developed at the company. High g telemetry units are being marketed for applications in data transmission systems for models launched in free-flight ballistic ranges, gun-launched meteorological and upper-atmosphere probes, hard-landing space probes and for fuse environmental testing in projectiles impacting on hard targets.

Solid state telemetry systems with 219-257 MHz FM transmitters operating at power levels have been designed and packaged to operate in a 30,000 g environment. These systems are available now for high g telemetry applications. The transmitters are assembled from selected components which have passed laboratory screening tests, and operational tests.

The frequency stability of the transmitter under long pulse high g loads is maintained with ± 5 kHz from the carrier frequency. Other specifications are as follows:

Modulation sensitivity	100 kHz/V
Modulation bandwidth	d.c. to 50 kHz
Temperature range	0 to 60°C
Dimensions	1-3/4 dia. x 1-1/18 long (44.5 x 26.8 mm)
Input power	18V and 50 mA max. d.c.
Battery Pack	Zinc — silver button cells rechargeable



HIGH "G" TECHNOLOGY

The components which are illustrated are a high altitude guidance system for the Martlet IV vehicle and were designed and developed by Aviation Electric Limited. These include sun sensors, infra-red telescopes and potted electronic moulds, the low cost optical instruments and their solid state electronic circuits identify earth-line and sun-line to within a fraction of a degree. Coupled through electronic logic modules to fast-acting nitrogen valves, these instruments are used to process the roll-axis of the spinning vehicle onto its pre-determined course.

Many of these components found their early development phases associated with the HARP programme where the equipment was produced to operate at 10,000 g.

Horizon Sensing is accomplished through use of two infra-red telescopes mounted rigidly to the vehicle which scan from space to earth to space as the vehicle spins. Each of these telescopes has a field of view of approximately 1° and their 'look' angles are symmetrically displaced by 30° either side of a plane perpendicular to the vehicle roll axis and in a plane containing the roll axis. The sensing element is a strengthened bolometer bridge and as the field of view of the telescope crosses the earth a voltage pulse is generated whose time base is indicative of the time required for the telescope to sweep across the surface of the earth.

Sun Sensing is accomplished through use of photovoltaic cells placed in a specially shaped cavity with reflecting and shielding surfaces arranged to give a voltage output pulse once during each vehicle rotation. The amplitude of this pulse is proportional to the angle between the sun line and a reference plane normally taken to be perpendicular to the vehicle roll axis. The auxiliary and rear sun sensors are used to provide all-round coverage so that if the vehicle should tumble or be oriented so that the sun falls outside the field of view of the main sun sensor, attitude information can be obtained and the vehicle can initiate emergency pitch-out or yaw-out manoeuvres.

Spin Rate Sensing is accomplished through use of a mass spring accelerometer which features pneumatic plus frictional damping and a specially constructed potentiometer pick-off. It is mounted with its sensitive axis at right angles to the roll axis of the missile with the seismic mass located at a radius of 6 inches (15.2 cm) from the missile centre line. At this radius the nominal spin speed produces a radical acceleration of 15.3 g. The accelerometer is provided with limit switches to activate the roll jets whenever the spin rate is below 4.4 rps or above 5.6 rps. Between these limits the actual accelerometer resistance is used by the logic circuits to compensate for variation in sampling frequency (spin speed).

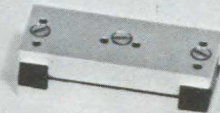
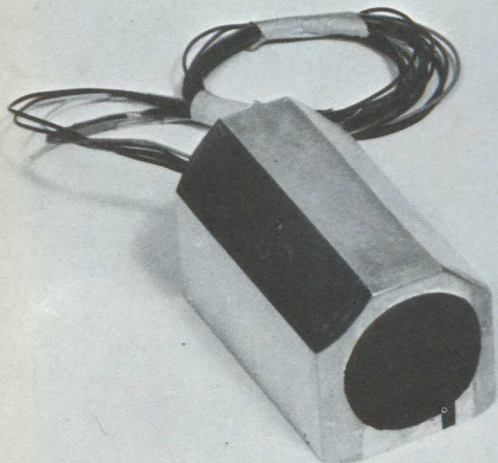
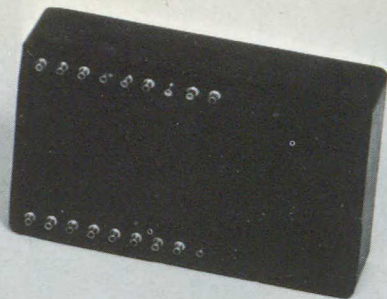
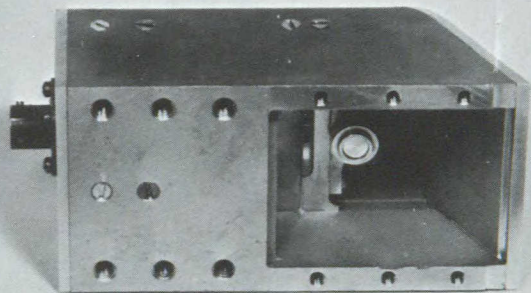
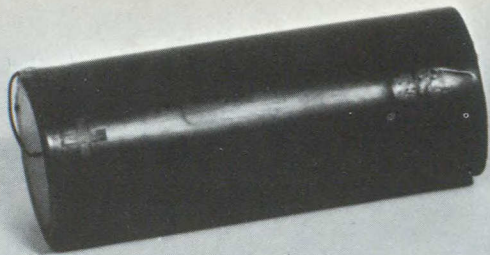
The Reaction Control Equipment consists of four valve/nozzle combination units, a fill valve, an explosive cutter valve and a pressure regulator in addition to the nitrogen storage tank and associated plumbing.

Computation and switching logic is supplied by solid state circuitry which is potted in a mixture of fine sand and epoxy resin.

An intermittent fluid release valve has also been developed in conjunction with HARP. As a part of the program, air currents at altitudes of up to 400,000 feet (121,920 m) are studied by releasing a stream of reactive liquid, in this case TMA — trimethyl aluminum, and observing the distortion of the resultant trail over a period of 15-30 minutes. Both continuous and interrupted trails are used—the interrupted trail having the advantage of vertical as well as horizontal wind shear determination plus an extension of the altitude range over which observations can be made with any one shot.

The valve design incorporates a bistable fluid amplifier which uses the TMA as both a power and a control source. The fluid element alternatively switches the TMA flow into a storage volume and then to atmosphere, while the fluid in the storage volume is being dumped overboard. The valve is completely self-contained, requiring no power supply, exterior control, or even a start signal. It is screwed into the rear of the vehicle and automatically begins releasing an intermittent stream when the high pressure TMA is admitted. A spool valve controlled by a pure fluid element operates to ensure complete cut-off of the TMA flow and also serves to keep the flame from the burning TMA from working back into the valve components during the cut-off portion of the cycle. Because of the requirement for complete cut-off, use of a vented fluid element was not practical.

The complete valve is of cylindrical shape, 4 inches (10.2 cm) in diameter by 3 inches (7.6 cm) long and weighs 3 lb. (1.4 kg).



BLACK BRANT RESEARCH ROCKETS

The Black Brant research rockets have been especially developed for those wishing to conduct experiments in the upper atmosphere. The Black Brant rocket family comprises four (4) rocket systems capable of lifting scientific packages of 23-227 kg. (50-500 lbs.) to altitudes between 160-998 km. (100-620 miles).

Bristol Aerospace, responsible for the development of these rockets, has participated in their launching from such varied ranges as the Pacific Missile Range, Eglin Air Force Base, the NASA Wallops Island Range, the Churchill Research Range (Canada), ESRANGE (Sweden), and Natal (Brazil).

The principal characteristics of the Black Brant rockets and their associated instruments are as follows.

The Black Brant III, the smallest of the family, 250 mm (10 inches) in diameter by 5.5 meters (18.06 feet) in length. With a nominal thrust of 4900 kg. (10,800 lbs.) it can lift a scientific load of 23 kg. (50 lbs.) to an altitude of 177 km. (110 miles). This single stage solid propellant rocket of simple construction has excellent performance compared with competing two stage rockets used for this altitude range.

The Black Brant IV is a two stage solid propellant rocket capable of lifting a scientific load of 23 kg. (50 lbs.) to an altitude of 998 km. (620 miles). This rocket results from the installation of a Black Brant III motor on a Black Brant V-A rocket. Its length, under these conditions, is 11.3 meters (37 feet). Its characteristics are reliability and simplicity.

The Black Brant V-A is a solid propellant rocket of 431 mm. (17 inches) in diameter and 7.6 meters (25 feet) in length, with a nominal thrust of 11,340 kg. (25,000 lbs.). It can carry a scientific payload of 136 kg. (300 lbs.) to an altitude of 184 km. (115 miles).

The Black Brant V-B is a very advanced rocket, using an advanced solid propellant, 431 mm. (17 inches) in diameter and 7.6 meters (25 feet) in length, capable of carrying a scientific payload of 136 kg. (300 lbs.) to an altitude of 384 km. (240 miles).

The Black Brant vehicles, designed and developed for the use of the scientific community, have numerous applications in Canada, U.S.A. and Europe.

As well as the Black Brant rockets, Bristol produces a complete range of telemetry instruments, and equipment for measuring flight characteristics, in the Winnipeg plant. Bristol is also equipped to manufacture, integrate and test scientific payloads, prepare them for launching and provide data reduction.

Present developments now nearing completion are as follows:

1. The uprating of the Black Brant III to give a performance of 22.8 kg. (50 pounds) payload to an altitude of 192 km. (120 miles).
2. The creation of the Black Brant IV-B, the result of combining the uprated Black Brant III with the V-A. Performance will be a payload of 31.8 kg. (70 pounds) to 1200 km. (750 miles).
3. Engineering the V-B to a four fin configuration called the Black Brant V-C. This will allow the vehicle to be launched from the existing towers at Wallops Island and White Sands Missile Range (New Mexico).



UHF AUXILIARY TRANSCEIVER—718B-8D

The Collins 718B-8D UHF Auxiliary Transceiver is designed to supplement the primary UHF transceiver in aircraft. It is a completely solid-state unit for operation in the 225-300 MHz band. Most applications are as an emergency radio on 243 MHz. In the event of loss of primary UHF the 718B-8D is activated to assist return to base, rescue and location of downed aircraft. Switching can be provided to automatically turn on the 718B-8D when the pilot ejects.

Up to five channels, crystal-controlled can be implemented in any 2 MHz spectrum within the 225-300 MHz frequency band. At least one other channel besides 243 MHz is usually provided for preflight testing to avoid interference on the emergency channel.

The transceiver is fully compatible with UHF ADF systems such as the ARA-25, 48 and 50. Homing can be accomplished on the 718B-8D while leaving the main UHF clear for other mission requirements.

Transmitter power output is nominally 3 watts. 28 VDC power input only is required. The 914Y-1 control unit is available for use when control over channel selection, squelch and volume are required. A 313H-3A control is also available to provide wider selection of modes i.e. ADF, interphone, rec, T/R and off. Additional audio input lines are provided to the 718B-8D to permit its use as an interphone amplifier in limited installations.

The 718B-8D is hard-mounted on the aircraft frame. Two choices of mounting configurations are available by rotating the radio 90° on the base plate. External connections are made by means of a coaxial connector and two multiple pin connectors on the side of the unit. Transmitter operation is controlled by a P.T.T. switch.

The transmitter and receiver circuits are separate except for antenna and control relays. Operation is possible only 100 milliseconds after power application.

The Collins 718B-8D is in production now for the Canadian and Netherlands F-5A being built in Canada as well as the Belgian Mirage V aircraft. Limited numbers have been used for application in experimental programs.

718B-8D SPECIFICATIONS

General Characteristics:

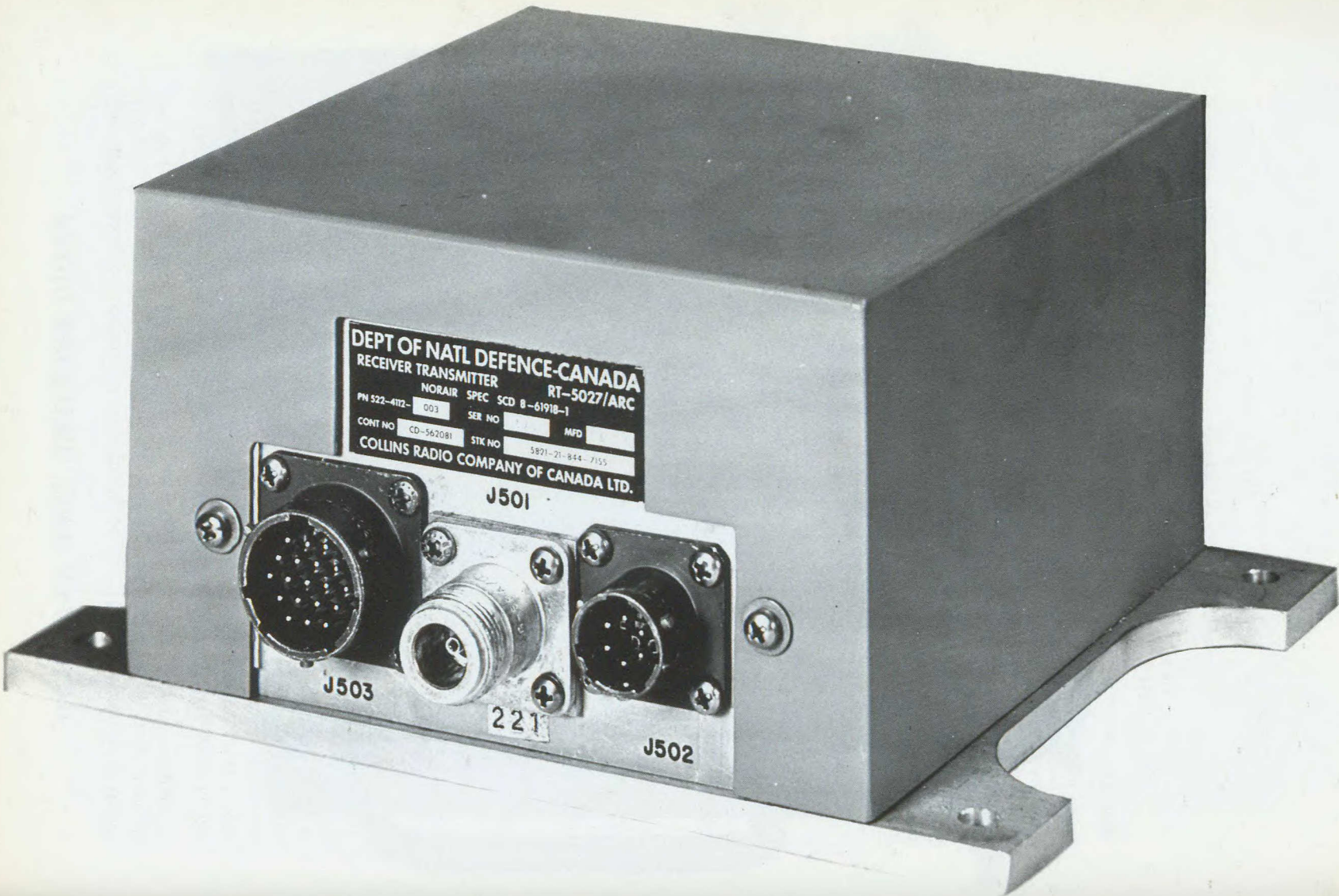
Frequency Range:	225-300 MHz
Channels:	5 channels within a 2 MHz segment
Frequency Stability:	±10 kHz
Warm-up Time:	100 milliseconds (instant on)
Antenna Impedance:	50 ohms
Power Consumption:	10 watts receive, 35 watts transmit (maximum with 30% modulation)
Size: 718B-8D:	5-1/8" W, 3-3/16" H, 6-3/4" D (13.11 cm W, 81. cm H, 17.15 cm D)
313H-3A:	5-3/4" W, 2-1/4" H, 2-13/32" D (14.61 cm, W, 5.72 cm H, 6.1 cm D)
914Y-1:	2-15/32" W, 2-15/32" H, 4-1/16" D (6.3 cm W, 6.3 cm H, 10.3 cm D)
Weight: 718B-8D:	4.1 lbs. (1.85 kg)
313H-3A	1.1 lbs. (0.5 kg)
914Y-1	0.7 lb. (0.32 kg)
Lighting:	Integral, aviation white or red, 5 or 28 v
Environmental Conditions:	MIL-E-5400 Class II
Reliability:	Predicted MTBF 3500 hrs.
Service:	Continuous duty with transmit-receive duty cycle of 5:10 minutes

Receiver Characteristics:

Sensitivity:	4 uv signal (open circuit modulated 30% at 1,000 Hz shall produce a 10 db S+N/N ratio with at least 50 mw audio power)
Distortion:	Less than 10%
Audio Bandwidth:	300-4,000 Hz, +1 to -3 db of 1,000 Hz reference
Audio Power:	250 mw at 1,000 uv RF modulated 30% with 1,000 Hz
Audio Output Impedance:	9.5, 150 and 600 ohms
AVC Characteristics:	±3 db from 10-100,000 uv (open circuit) of the audio output for a 1,000 uv signal)
Selectivity:	6 db bandwidth, 45 kHz minimum; 60 db bandwidth, 200 kHz maximum

Transmitter Characteristics:

RF Power:	3 watts nominal
Modulation Capability:	At least 95% on negative peaks and 60% on positive peaks.
Microphone:	5-8 ohms dynamic; or 150 ohm carbon (no dc bias supplied)



DEPT OF NATL DEFENCE-CANADA
RECEIVER TRANSMITTER RT-5027/ARC
NORAIR SPEC SCD 8-61918-1
PN 522-4172-003 SER NO MFD
CONT NO CD-562081 STK NO 5821-21-844-7155
COLLINS RADIO COMPANY OF CANADA LTD.

J501

J503

221

J502

RADIO RECEIVER TYPE AN/ARR-501

Completely designed, developed and produced by Topping Electronics Radio Receiver Type AN/ARR-501 is a solid-state, high-performance, four-channel, low-frequency receiver for airborne use utilizing a self-contained power supply.

The receiver is designed for reception of frequency shift (F1) signals in the frequency band of 70 to 150 KHz. The four preset channels are crystal controlled. The receiver accepts signals from two antenna loops, which are mutually at right angles, and suitably combines the input from these loops to provide an effectively omnidirectional antenna pattern. The outputs of the receiver are a keyed d.c. switch suitable for operation of a teleprinter; and a keyed 1 KHz tone, for operation of special telegraph equipment. A front panel jack provides an audio output of keyed 1 KHz tone for monitoring purposes.

Operation is from nominal 28 vdc aircraft power sources. At temperatures above 10°C (50°F), the current drain is approximately 0.25 amperes. Below 10°C, ovens operate and the drain varies, as high as 1.25 amperes.

Radio Receiver AN/ARR-501 is an extremely reliable equipment and is presently in service with the Royal Canadian Air Force.

Reliability is achieved, in the main, by employing components that are in accordance with Military Specifications and by applying special reliability tests to all phases of design. Such reliability tests were conducted to Military Specifications and no failures occurred during double-life testing of the equipment (3 failures are permitted by MIL SPECS).

Another outstanding feature of the Receiver is its sensitivity. Good readable copy is obtainable with a signal strength of 2 microvolts per metre using a low-profile, flush-mounted loop antenna. Using a special low-profile, flush-mounted loop antenna, readable copy is obtainable with 0.07 microvolts per metre.

Characteristics

FREQUENCY RANGE:	70 to 150 Kc/s
NUMBER OF PRESET FREQUENCIES:	Four.
SENSITIVITY:	With an input of 0.5 v. (measured across a 5 ohm resistor connected in series with the antenna and antenna input terminal) the output is actuated with an error rate not greater than 1×10^{-5} when connected to the keyed direct current output of the receiver.
SELECTIVITY:	Bandwidth of IF output at 3 db points not less than 120 c/s and at 60 db points not more than 1000 c/s.
OSCILLATOR CONTROL:	Crystal — 100B2132 for 85 Kc/s to 100 Kc/s tolerance $\pm 0.02\%$. CR37/U for 90 Kc/s to 165 Kc/s tolerance $\pm 0.02\%$. Temperature maintained at $15 \pm 1^\circ\text{C}$ ($59 \pm 1.8\text{F}$) by thermostat controlled heater when ambient falls below 15°C (59F).
OUTPUT:	3 Speeds — 60 to 64, 66 to 75, 100 to 107 words per minute.
OPERATING TEMPERATURE:	-40°C to $+55^\circ\text{C}$ (-40°F to $+131^\circ\text{F}$).
ALTITUDE:	Sea Level to 30,000 feet (9,144 m).
OVERLOAD PROTECTION:	Fuse, current rating 2.5A.
INPUT VOLTAGE AND POWER:	28 VDC, 35 Watts Maximum.

ROYAL CANADIAN AIR FORCE
RECEIVER, RADIO
R-5041/ARR-501
PART No. 8001895 SERIAL No. 1
MFD 1965 CONTRACT No. CD JAWOJK
REF No. 10821-251-640-1404
TOPPING ELECTRONICS LTD.

CHANNEL

2 3 4

TELEGRAPH SP.
WPM
66-71
50
BAUDS

64
45-45

100-107
75

MARK HIGH

MARK LOW

OFF

FUSE

2.5A SPARE

PHONES

TOPPING

HIGH POWER TRANSMITTER AMPLIFIERS

The Northern Electric Company Limited has designed and manufactured several types of high power amplifiers for use in scatter radio systems, single sideband HF communication, radar and satellite ground stations. The illustration on the opposite page shows a 3 kilowatt, 9 GHz liquid-cooled klystron amplifier, designed for use in radio propagation work. Similar transmitters have been designed specifically for application to satellite ground stations.

A typical equipment configuration is to mount the power amplifier in a separate package on the antenna; the power supply and the heat exchanger are designed for remote placement, and a performance monitor panel is provided for inclusion in an operator's control console.

Typical Characteristics and Performance

Power amplifier tube — klystron, Model VA-925C

Operating frequency — 7.90 to 8.40 GHz (one klystron)

Nominal output power — 10 KW (C.W.)

Drive output for full output — 20 mW

Bandwidth — 30 MHz (at power levels from 100 watts to 10 kW)

Phase linearity — ± 10 degrees (over ± 10 MHz band at power levels from 100 watts to 10 kW)

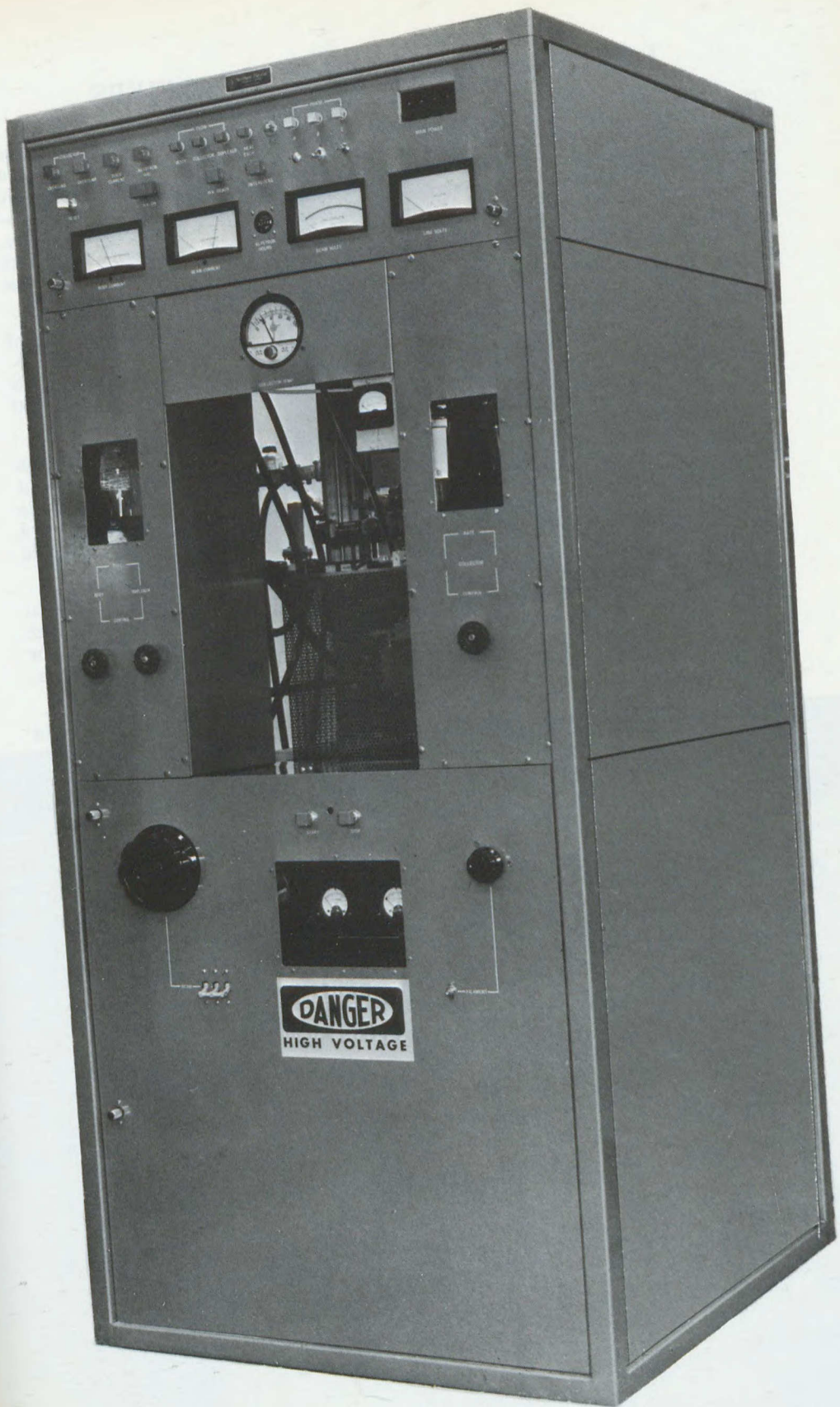
Unwanted phase modulation — less than 1 degree RMS

Harmonic output — more than 60 dB below carrier level

Spurious response — more than 60 dB below carrier level.

The amplifier will work into a load VSWR of 1.2:1 or less. The equipment is fully protected against arcs, overloads, failures or improper turn-on or turn-off sequences. The operator is provided with a monitor panel giving reverse and forward power output levels, equipment status indication, audible fault alarm, output power control and beam power ON-OFF.

Northern Electric's high power transmitter amplifiers are available as single units or in a dual redundant form complete with waveguide change-over switches and dummy loads. In the latter configuration they meet the extremely high availability requirements of military ground station equipment.



LOW NOISE PARAMETRIC AMPLIFIERS

The Northern Electric Company, Limited has designed and developed a wide range of low noise parametric amplifiers for use in troposcatter communication systems, military search radars and satellite communications systems. Parametric amplifiers are used wherever a small signal is to be amplified with low noise contribution. Eight different types of amplifiers have been manufactured to date, accounting for over 1,000 units in use throughout the world. Northern's amplifiers have been used by USAF, NATO forces, CNT, A.T.&T., Bell Canada and the British Columbia Telephone Company.

Parametric amplifiers designed by Northern Electric are available in a variety of configurations and feature typical noise figures ranging from 1.8 to 2.5 dB depending on the type of amplifier. Operating frequencies of the various models cover the 755 MHz to 4.2 GHz range, with a bandwidth from 10 MHz to 500 MHz.

Mechanically, the amplifiers are completely self-contained and are available in a variety of configurations ranging from standard rack mounted models to pull-out rotatable drawer units. Simple temperature compensating circuits maintain stable amplifier performance over severe environmental conditions. All amplifiers are designed to meet very rigid military specifications and are unconditionally stable with any combination of source and load impedance.

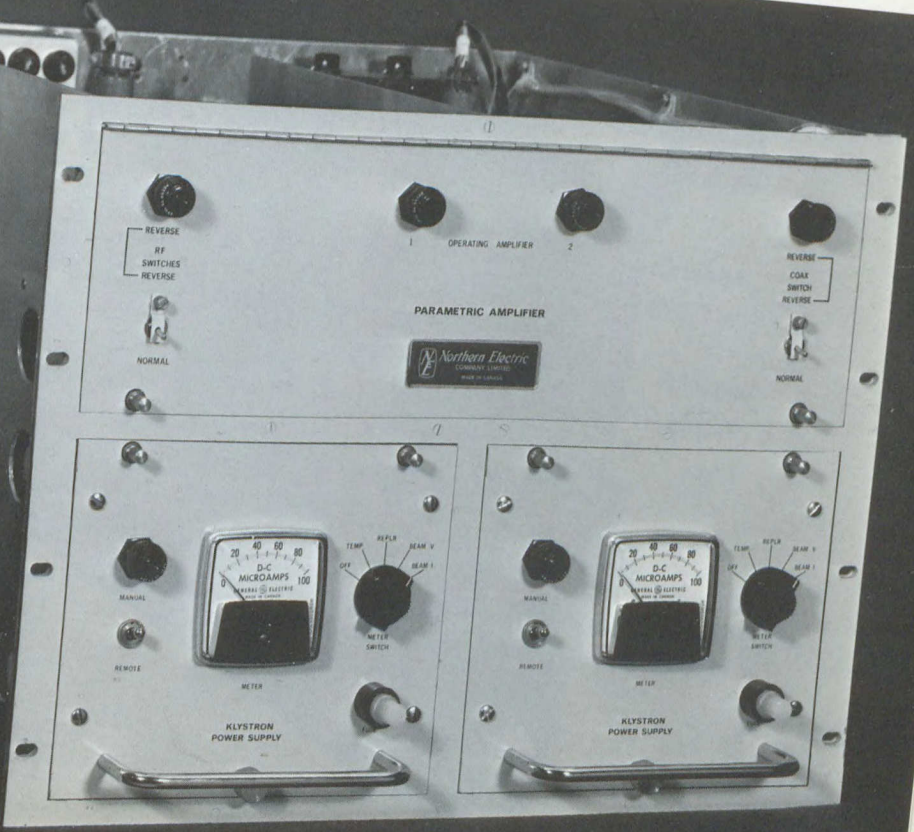
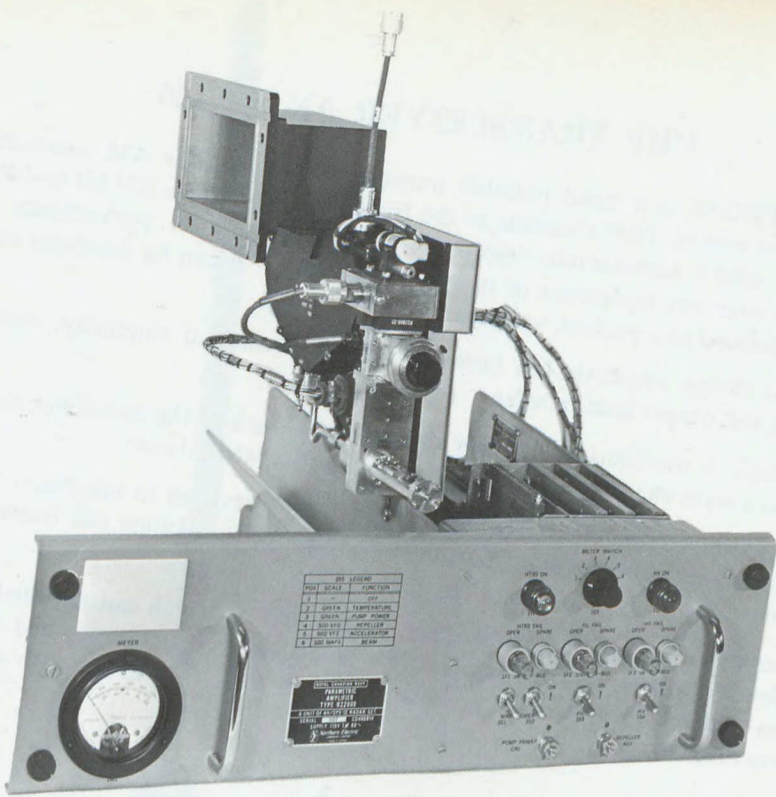
One application is in search radars where the parametric amplifier is used to improve the range performance without increasing the transmitter power. The amplifier (shown in the upper photograph on the opposite page) was designed for the Royal Canadian Navy in conjunction with their ship-based search radar, SPS-12, and is installed as a modification kit.

The latest model of parametric amplifier is a wideband version for use in unattended ground terminals of a satellite communications system. Operating at room temperature with high performance, the three-stage amplifier (shown in lower photograph on the opposite page) covers the complete band from 3.7 GHz to 4.2 GHz with 100 percent redundancy provided by automatic switching. No refrigeration is required to obtain a typical noise figure of 150°K (1.8 dB) pumped from a single 26 GHz klystron.

The QAL 1A parametric amplifier is completely self-contained and consists of two identical amplifiers, which include tunnel diode amplifiers, RF switches, automatic switching circuitry, indicators and manual controls. A failure of pump power causes the standby unit to be switched-in automatically. Provision is made for remote switching to override the automatic system. Modular construction has been used throughout. Parametric amplifiers can be supplied without redundant configuration, two-stage tunnel diodes, or automatic switching.

SPECIFICATIONS: *Model: R22800. Typical noise figure: 1.8 dB. Gain: 18 dB ± 2 dB. Bandwidth: 10 MHz (3 dB). Operating Frequency: 1.250 to 1.350 GHz. Input-Output VSWR: Linearity: -35 dBm. Klystron Frequency: 10.6 GHz. Power Supply: Regulated Solid State Silicon. Primary Power: 115V ±10% Operating Environmental Temperature: 0° to 50°C. Military Specification: MIL-E-16400. Weight: 50 lbs. (22.7 kg).*

Model: QAL 1A. Typical noise figure: 1.8 dB. Overall Gain: 51 dB ± 2 dB. Parametric amplifier gain: 28 dB ± 2 dB. Tunnel diode amplifier gain: 23 dB ± 1 dB. Bandwidth: 500 MHz (2 dB). Operating Frequency: 3.7 GHz to 4.2 GHz. Input-Output VSWR: 1.25:1 Klystron Frequency: 26 GHz. Power Supply: 117V, single phase, 50 or 60 Hz. Operating Environmental Temperature: 32° to 104°F (0°C to 40°C). Weight: 70 lbs. (31.7 kg).



UHF TRANSCEIVER AN/PRC-66

The AN/PRC-66 is a small portable transceiver that provides AM communication on any one of 3500 channels in the frequency range from 225.00 to 399.95 MHz. It offers considerable improvement in weight, size, performance and reliability over any equipment of its type in use today. It can be handheld during use, or operated as a packset, vehicular or airborne unit.

Special design emphasis has been placed on mechanical simplicity, electrical shielding and proper heat transfer.

The radio is modularized for easy maintenance. Each of the functional modules plug into a main chassis, which also forms part of the external case.

Low power consumption and high efficiency have resulted in maximum battery life. Either rechargeable nickel cadmium or throw-away alkaline cell batteries are available.

Accessories include the flexible fixed length antenna which can be tilted in any direction to provide vertical polarization, H250 handset, back mounted carrying harness and transit case. Battery charger and module fixtures are also available for easy maintenance.

Specifications

Frequency Range	225.00-399.95 MHz Guard channel 243.0 (optional)
Channels	3500 spaced 50 kHz
Tx Power Output	2 watts average
Transmit Fidelity	Narrow band ± 6 db, 300 to 2700 Hz
Rx Sensitivity	Wideband ± 3 db, 300 to 23000 Hz
Rx Selectivity	3 uv for S+N/N of 10 db 3 db, 60 kHz minimum 60 db 120 kHz maximum
Audio Output	10 milliwatts, 500 ohm load
Audio Fidelity	Narrow band ± 6 db, 300 to 2700 Hz Wideband ± 3 db, 300 to 23000 Hz
Squelch	Carrier squelch adjustable
Sidetone	Detected RF 10 milliwatts
Size	9" \times 5" excluding knobs \times 1 $\frac{5}{8}$ " (22.86 \times 12.7 \times 4.13 cm)
Weight	5.5 lbs. (2.49 kg) excluding battery

The AN/PRC-66 has been developed under Rome Air Development Centre USAF by Collins Radio Company of Canada Limited and is now in production for Military requirements.



UHF TRANSCEIVER AN/PRC-75

The AN/PRC-75 is a hand-held UHF transceiver that provides AM communications on any one of 3500 channels in the 225.00 to 399.95 MHz frequency range. Weighing only 3.9 pounds (excluding battery) this all solid-state radio produces an average output of one watt. All 3500 channels are readily available through the incorporation of a frequency synthesizer referenced to a single crystal standard oscillator.

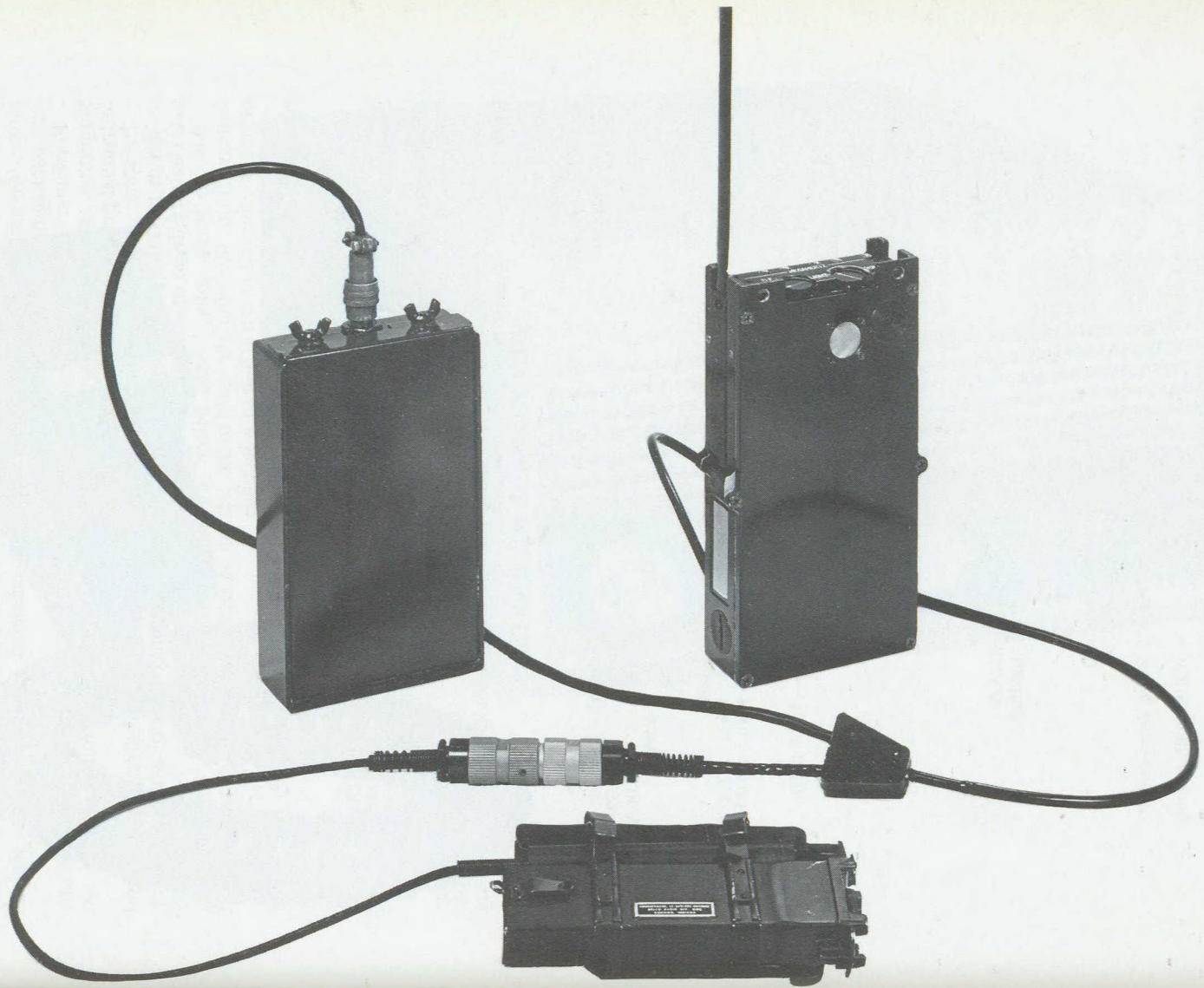
Comprising the AN/PRC-75 are the UHF receiver-transmitter, a battery power supply, helmet speaker, lanyard, carrying harness, accessory cables and transit case. The antenna can be removed and an adapter connected for a coaxial cable to a separate antenna or external power amplifier.

The R/T unit incorporates a push-to-talk button and transducer microphone as well as connector for battery and wideband operation.

Specifications

Frequency Range	225.0-399.95 MHz
Channels	3500 at 50 kHz spacing
Tx Power Output	1 watt average
Rx Sensitivity	2.6 uvolts for 10 db S/N
Audio Output	8 milliwatts into 600 ohms
Audio Response	Voice +2/-6 db 300 to 2700 Hz Wideband ±3 db 300 to 2500 Hz
Size	4¼" wide × 8" high × 1½" (10.48 × 20.32 × 3.81 cm)
Weight	3.9 lb. (1.77 kg)
Power Input	24 VDC Battery 5.9 watts receive 17.6 watts transmit

The AN/PRC-75 was developed by Collins Radio Company of Canada Limited under a Rome Air Development Centre contract and is now in production for the U.S.M.C.



FM 2-WAY MOBILE RADIOS

Designed to operate on various frequency ranges, the Canadian Marconi Company models DT77, DT82, DT83, DT84 and DT87 are compact, lightweight FM 2-way radios for mobile or control station use. High efficiency circuitry permits sealed-case packaging without external heat sinks.

Particular attention has been paid to meet EIA, DOT and FCC requirements. Simplified modulator construction, placing receiver and transmitter circuits on individual printed circuit boards, permits simplified maintenance.

In some units, the "Minit Miser", a combination of stabilized crystal and oscillator module, provides precision transmitter frequency control without heaters, extra battery drain or warm-up delay.

Also in some units, "Amp Miser" circuitry permits monitoring with the least battery drain, allowing the unit to be left on indefinitely, while full transmission power is achieved in a fraction of a second.

Latest state-of-the-art design concepts, including integrated circuits, provides a reliability of operation previously unattainable.

General Specifications

	DT77	DT82	DT83	DT84	DT87
USE:	Mobile	Mobile	Mobile/ Control	Mobile	Mobile
FREQUENCY RANGE:	138-174 MHz	406-420 MHz 450-470 MHz	406-420 MHz 450-470 MHz	406-420 MHz 450-470 MHz	25-35 MHz 35-50 MHz
RF CHANNELS:	1 to 6	1 to 8	1 or 2	1 to 8	1 to 8
POWER OUTPUT:	25W	10W	10W	70W	25-45 MHz 50W 40-50 MHz 45W

The Technical Specifications that are noted below are applicable to the DT77 and are representative of the other models.

DT77 TECHNICAL SPECIFICATIONS

General

Frequency Range:	138-174 MHz.
R.F. Channels:	1 to 6, in any 1 MHz.
Battery Drain:	Receive: 13.8 VDC Amp Miser On .12A Amp Miser Off 1.76A Transmit: 13.6 VDC
	Squelched 1 watt audio .32A 2.06A 6.5A
Dimensions:	L W H Front Mount: 11 $\frac{3}{8}$ " x 9 $\frac{1}{8}$ " x 4" (29 x 23 x 10.2 cm) Trunk-Mount Control Unit: 6 $\frac{3}{8}$ " x 6 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " (16.8 x 16.5 x 6.35 cm)
Weight:	10 lbs. (4.5 Kg.)
DOT Type Approval No.:	100264196 — 150.8 — 174 MHz. Acceptable for licensing: 138.0 — 150.8 MHz.

Transmitter

Power Output:	25 Watts.
Modulation:	± 5 KHz.
Distortion:	Less than 4%.*
Frequency Stability:	(-30° to +60°C) ± 0.001%
Frequency Multiplication:	24 times.
Spurious Emissions:	-75 db.
Hum & Noise Level:	-50 db.*

Receiver

Sensitivity:	(12 db SINAD) 0.30 μV.
EIA Selectivity:	(± 30 KHz) -85 db (12 db SINAD) -120 db (20 db quieting)
EIA Modulation Acceptance:	16 KHz.
Spurious & Image Rejection:	-90 db.
EIA Intermodulation:	(SINAD) -60 db.
Frequency Stability:	(Measured with AFC Applied) (-30° to +60°C) ± 0.0005%.
Squelch Sensitivity:	(For 80% output) 0.25 μV.
AF Output:	(less than 10% distortion) 5 Watts, front-mount -60 db.*
Hum & Noise Level:	4 Watts, trunk-mount

*Reference: 1000 Hz tone, at 3.5 KHz deviation or 4 Watts output.



PORTABLE HF-SSB TRANSCEIVER

Designed by Canadian Marconi Co. as a rugged portable for remote-location field communications, the light-weight, compactness, and minimal power requirements of the CP24 make it ideal for a wide range of applications.

The special mobile mounting bracket provides antenna and power supply connections for instant conversion from portable to mobile operation.

Two whip antennas are available for portable use. A collapsible sectional model, held rigid in use by a tension cable core, occupies a minimum of space when broken down. The cable core prevents sections from being lost. An ultra-flexible model may be coiled into a special tubular container that attaches to the carrying bag.

For semi-permanent use — either a centre-fed dipole or long-wire antenna may be used for additional operating range. For mobile use, an extra-rugged, 8 foot, stainless-steel whip is available.

When the portable whips or long-wire antennas are used, the unique CP24 Adjustable Antenna Tuner provides simplified transmitter tune up to give an optimum match between the transceiver and its antenna for superior communications efficiency.

The CP24 may be used in private, commercial or public communications, systems, and is compatible with other SSB equipment. A full range of options and accessories gives the CP24 a flexibility of operation previously unattainable in SSB portable transceiver.

GENERAL SPECIFICATIONS

FREQUENCY RANGE:	1.6 to 15 MHz
CHANNELS:	2
POWER OUTPUT:	10 Watts P.E.P.
POWER SOURCES:	Zinc-Carbon, Alkaline or Nicad, "D" size (total 9) or from vehicle battery or from 115 VHC with accessory.
DIMENSIONS:	Height 4", Width 9", Depth 12". (10.2 cm, 22.9 cm, 30.5 cm)
WEIGHT:	10 lbs (4.5 kg) including battery.

CP 24 USB TRANSCIVER
CNC 18V 924 DOT APP NC
SERIAL [] MADE IN CANADA BY
CANADIAN MARCONI COMPANY



SINGLE SIDEBAND COMMUNICATIONS RECEIVERS

The Canadian Marconi Company's XH13A receiver system consists of four independent receivers plus a power unit and audio amplifier with built-in monitor speaker. Modulator construction plus a range of models for AM, SSB or switched AM/SSB reception provide extreme flexibility of system design.

All solid-state design allows the installation of the four receivers and its associated power supply and monitor speaker in a panel area of only $8\frac{3}{4}$ " (22.2 cm) on a 19" (48.2 cm) rack. Transistorization also permits extremely low power consumption — 7 watts per receiver, average.

Five tuned circuits, ceramic IF filters and an electromechanical SSB filter provide outstanding selectivity. Optional meter reads signal or AF line levels. AF is available on phone jack and balanced line connection. IF-derived AGC maintains audio level over a signal range of 120 db.

Solid state power supplies, with complete voltage regulation, are available for 115 or 230 volts AC and 12 volts DC.

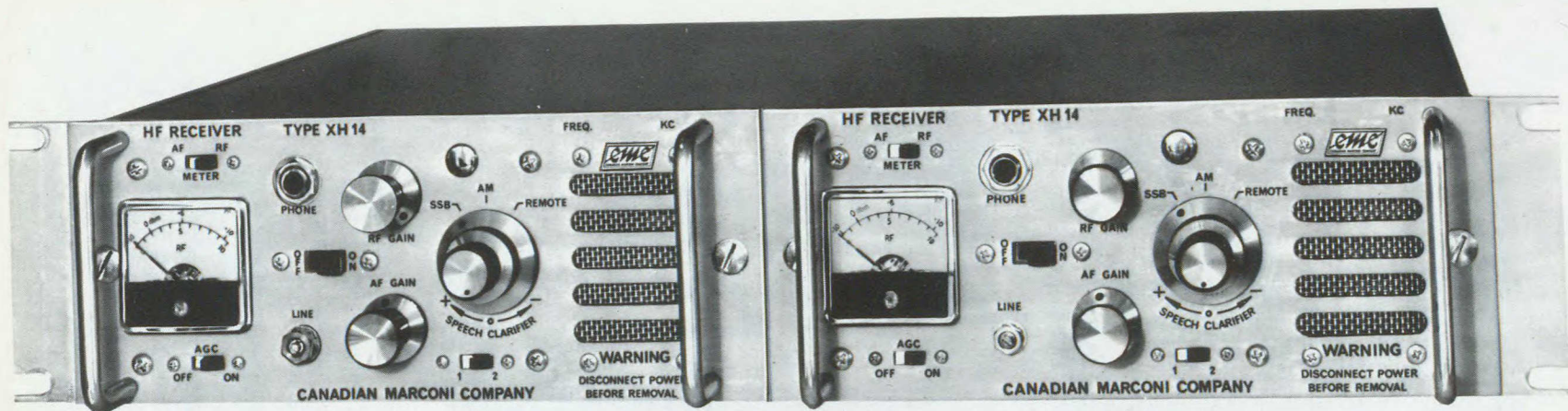
Specifications:

Frequency range; 1.6 to 24 mc. RF channels; 1 per receiver module. Sensitivity: SSB — 1 microvolt for 12 db S+N/N. AM — 1 microvolt for 6 db S+N/N. Selectivity: SSM — 2.1 kc at less than 6 db down, 6 kc at more than 60 db down. AM — 6 kc at less than 6 db down, 30 kc at more than 60 db down.

The above electrical specifications are also available in Canadian Marconi Company's XH14 Receiver. Although identical in electrical design concept and operational facilities, the XH14 is presented as a completely self contained receiver module. As opposed to the XH13A system which operates up to four receiver modules from a common power supply/audio monitor unit, each XH14 module has its own power supply and audio facilities.

Two XH14 receivers may be mounted side by side on a standard 19" rack in $3\frac{1}{2}$ " of panel space (48.2×8.9 cm).

Both XH13A and XH14 receivers are provided with ample remote control facilities.



HF SINGLE SIDEBAND TRANSCEIVER AND TRANSMITTER

The Canadian Marconi Company's CH25 transceiver is the first single sideband unit readily usable for mobile installation. Transistorized design has permitted a 100 watt PEP unit weighing less than 22 lbs (10 kg) in one compact package suitable for underdash mounting.

Six simplified controls perform all operating functions. The transmitter is monitored by automatic load control and the receiver by automatic gain control. These features, plus the outstanding frequency stability, ensure easy operation by non-technical personnel.

The compatible AM feature of the CH25 permits it to be used in conjunction with regular AM systems. A Constant Percentage clarifier control allows fine tuning of the receiver for best signal reception.

Designed to handle 1 to 6 channels, the use of plug-in channel elements permits rapid on-location changing of channel frequencies. An internal 1000 cps signal may be employed for testing or signalling.

The CH25 may operate on completely independent transmit and receive frequencies with a choice of upper or lower sideband. This unit is also adaptable to frequency-shift or CW keying systems.

Specifications:

Frequency range: 1.6 to 15 mc. Channels: 1 to 6. Sensitivity: AM (6 db SINAD) 0.7 microvolts. SSB (12 db SINAD) 0.5 microvolts. Power output: 100 watts PEP (SSB or compatible AM). Power requirements: 115 or 230 VAC, 50-60 cycles — 15 to 180 VA. 12, 24 or 32 VDC, 0.15 to 16 A. Weight: 22 lbs. (10 kg). Dimensions: 13 $\frac{3}{4}$ " x 10 $\frac{3}{4}$ " x 7" (35 x 27.3 x 17.8 cm).

For those cases which require the use of an independent HF/SSB Transmitter, as opposed to a Transmitter/Receiver Unit, Canadian Marconi Company can supply the PH17 100W PEP Single Sideband Transmitter equipment.

This unit is identical in specification and physical dimensions to the CH25 but provides only the transmitting facility.

Such an arrangement would prove useful in the case of a full duplex installation where transmitter and receiver should operate simultaneously and independently.

A 12 channel version, the CH26, is available with identical electrical specifications and performance. The unit is wider to accommodate the additional channels.



SOLID STATE SSB PORTABLE TRANSCEIVER

The Canadian Marconi Company's CP24 SSM transceiver is completely solid-state consequently current drain is low.

Ordinary flashlight batteries, universally available, can be used to power the unit. Alternatively, any standard D cell zinc carbon alkaline or nicad can be used. A charging unit which will permit 50 hours between charges on NICAD cells is available for use with an AC or DC source.

A mobile shockmount and several antenna and microphone variations are offered.

The abnormally low weight (10 lbs including batteries) is achieved by a weight saving aluminum casting.

The CP24 was designed for use in environments ranging from the arctic to the tropics. The sealed interior which completely excludes moisture and dust resists fungus and provides flotation should the unit inadvertently be immersed. A microphone is not a necessity since the built-in loudspeaker can also perform this function.

SPECIFICATIONS

FREQUENCY RANGE:	1.6 to 15 MHz
CHANNELS:	1 to 2
MODES:	10 watts P.E.P. USB (standard) LSB USB/LSB CW
TEMPERATURE RANGE:	Operational; -40°C to $+60^{\circ}\text{C}$ (-40°F to 140°F)
ANTENNA OPTIONS:	Dipole whip or long wire
BATTERIES:	9 "D" (or U 11) cells
WEIGHT:	10 lbs. (4.5 Kgs)
DIMENSIONS:	Height 4", Width 9", Depth 12" (approximately 10 x 23 x 31 cm.)
ACCESSORIES:	Canvas carrying bag and strap Vehicular mounting





COAXIAL CABLE TRANSMISSION SYSTEM—46C

The type 46C coaxial cable transmission system, designed and manufactured by Lenkurt Electric Co. of Canada, Ltd., provides a secure transmission medium for 300 or 600 high grade multiplex communications channels utilising a wide variety of standard, twin-tube coaxial cables with two loaded interstitial pairs. The system has been designed expressly to meet the seasonal extremes of Canadian climate. All active circuits can be protected by duplicate plug-in units and dual, protected amplifiers reduce the possibility of failure to a very low order even when hostile surface conditions make it difficult or hazardous to service repeater installations.

For rapid installation of point to point communications systems the coaxial cable can be plowed directly into place at speeds of approximately four miles per hour where soil conditions permit. Installations may be hardened by burying cable and repeaters to depths dictated by the degree of protection required. The lack of conspicuous surface structures makes coaxial cable transmission facilities less liable to attack and acts of sabotage.

The interface with standard multiplex equipment is the same as a microwave system making it simple and economical to engineer and procure communications facilities where both methods of transmission are employed.

The 46C coaxial transmission system permits circuit lengths of up to 20 repeater sections (typically 5 to 120 miles — 8 to 193 km) with a loaded noise performance not exceeding 3 pw/km. The completely solid-state system utilises plug-in mechanics for rapid replacement of defective units. Where applicable duplicate plug-in units are used in both the terminal and dependent repeater units, thereby minimizing spare parts requirements.

Up to ten dependent repeaters may be powered by 400 Hz, 440 V ac power feed (generated within the equipment) from a terminal or intermediate location via the centre conductors of the coaxial tubes. The dependent repeaters are mounted in pressurized, water tight cabinets suitable for use in underground man-holes. Repeaters may be regulated to compensate for cable losses due to temperature, the regulation being controlled by a pilot above the baseband which is attenuated at the system output prior to transmission into multiplex or radio circuits.

The 46C system includes its own supervisory and service channel circuits using two loaded intersitial pairs. The system is continuously supervised and an alarm is initiated, sensed, confirmed and reported in less than five seconds. Up to 30 separate alarm conditions are scanned consecutively per tone and fault conditions present for two scans are reported. Additional tones increase the alarm reporting capacity by multiples of 30. Pulsed tones above the service channel frequency are used to signal the status of terminal and dependent repeater installations.

Terminal equipment for the 46C system is mounted on standard 19 inch relay racks.

The 46C coaxial cable transmission system is offered in three basic capacity/bandwidth arrangements:—

300 channel capacity, 60 to 1300 kHz for use with 0.174, 0.246 and 0.375 inch coaxial tubes. Regulating pilot frequency, 1.34 MHz.

600 channel capacity, 60 to 2540 kHz for use with CA-N-63 cable. Regulating pilot frequency, 2.6 MHz.

600 channel capacity, 60 to 3084 kHz for use with 0.174, 0.246 and 0.375 inch coaxial tubes. Regulating pilot frequency, 3.17 MHz.

A portable service channel and test set provides communication from a dependent repeater to terminals or other dependent repeaters. The unit includes a telephone set, power pack and meter for pilot level, ac and dc measurements. It is provided in a rugged, steel sling pack.

THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
WASHINGTON, D. C. 20001
MEMBER SINCE 1911



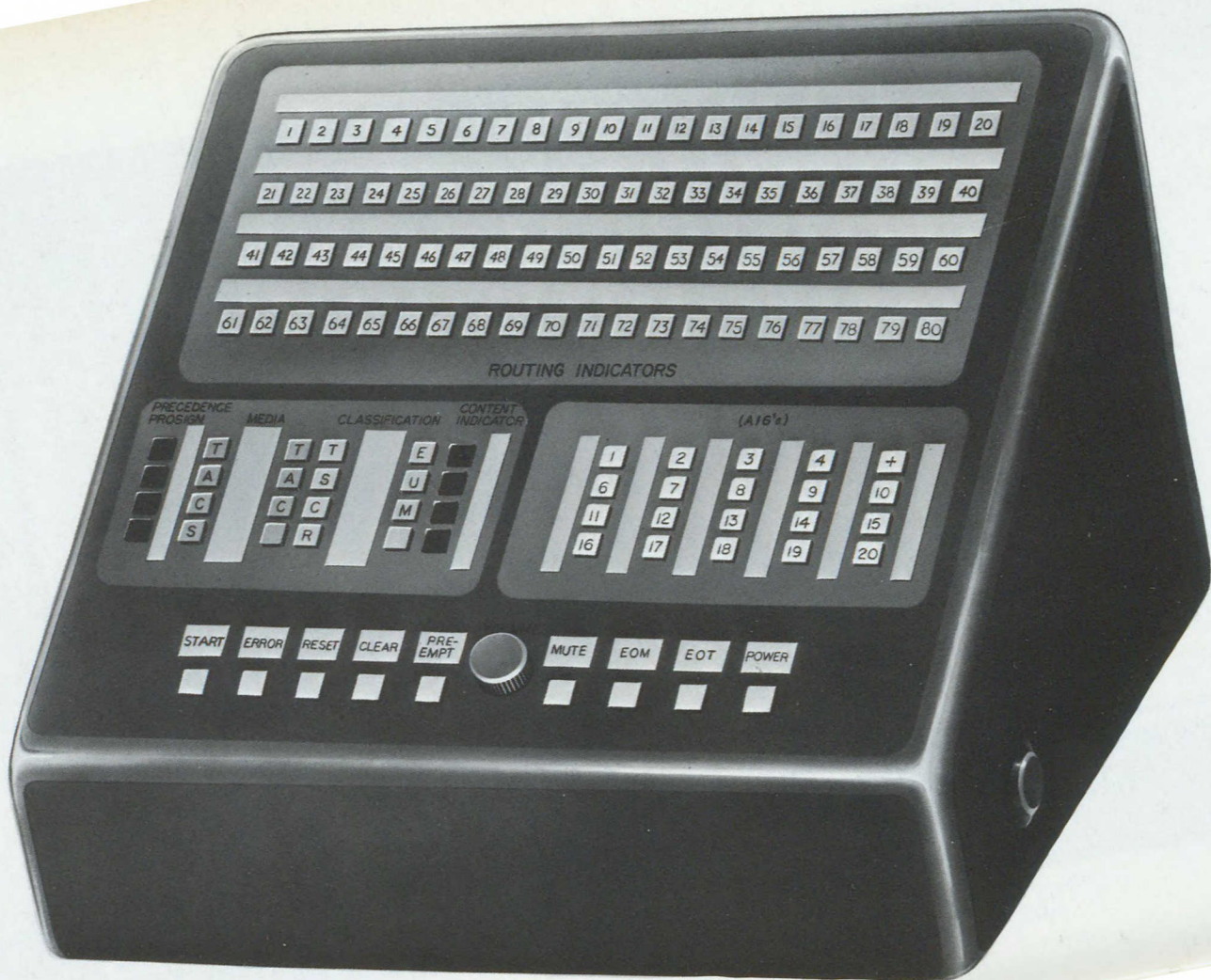
MESSAGE-FORMAT GENERATING EQUIPMENT

Modern-day automatic and semi-automatic communications systems have greatly increased both message capacity and transmission rate. The complexity of communications networks have, in turn, increased the complexity of instructions which must precede the actual message to ensure proper routing through the network, from sender to recipient.

The PHI-tel 300, produced by Computing Devices of Canada Limited, puts the fixed message format required by the communication system right at the fingertips of the operator, resulting in error free addressing.

The equipment stores Routing Indicators (RI), combinations of routing indicators (Addressee Indicator Groups, AIG), Precedence Prosign, Language Media and Format, Classifications and Content Indicator Codes and any other that may be required. When the appropriate pushbuttons on the Operator's Console are selected, the equipment transfers to the teletypewriter an error-free data signal in the correct format. The equipment automatically inserts time, date and message number into the format.

The PHI-tel 300 is programmed for a military network using Baudot codes and Janap format, however, it can be programmed to any format or procedure either military or commercial.



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

ROUTING INDICATORS

PRECEDENCE PROSISM MEDIA CLASSIFICATION CONTENT INDICATOR

T	T	T	E
A	A	S	U
C	C	C	M
S	R		

(A16*)

1	2	3	4	+
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

START ERROR RESET CLEAR PRE-EMPT MUTE EOM EOT POWER

□ □ □ □ □ □ □ □ □ □

TELEPATH COMMUNICATIONS AND DATA CONTROL EQUIPMENT

TELEPATH is the trade name for a line of solid state communications and data handling equipment designed and produced by CAE Industries Ltd. for the telegraph and digital communications industry.

The product line covers the range of selectors, for controlling terminal on-line equipment such as teleprinters, card punches, tape readers, etc. In addition, a line of code translation equipment is available, enabling any of the normal communication and data codes to be translated to common telegraph language forms.

TELEPATH selector units provide facilities for the control and coupling of teleprinter equipment to tape, card-punch, and "on-line" computer processing systems. Selectors are also used as part of message switching networks to supply station control and supervision from a central processor.

All equipment is designed to provide an Operating Time Between Failure of better than two years.

Security and parity checking facilities are available if required.

The TELEPATH line of products has been sold for application in military and commercial flight control, and reservations systems using computer processing equipment, with units in service throughout the world with a number of major airlines and other common carriers, such as the railroads, and with telephone and telecommunications companies.

A new product recently developed by the Telepath group in CAE is the "Keenscope" weather satellite photo receiver which receives FM signals from a variety of orbiting and stationary satellites, automatically switching as the satellites come into view and disappear over the earth's horizon, and prints out the photos. The Keenscope can also receive photo signals from reconnaissance aircraft, permitting instant assessment of photographs transmitted from the aircraft back to field stations. It has application in transmitting and receiving photographs over standard landlines to provide a news wirephoto service or to transmit fingerprints and other photographic information between security forces.

REQUEST



ALARM

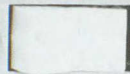


POWER ON



.50 AMP
115 VAC

ON



OFF

cae 

MICRO-ELECTRONIC SITUATION DISPLAY

A key element in its advanced Tactical Data Systems, Litton Systems (Canada) Limited manufacture micro-electronic Situation Display Consoles (SDC). These Displays are designed for use in any tactical role where an efficient man-machine interface is necessary to release the operators from routine tasks and allow them to concentrate on decision-making functions.

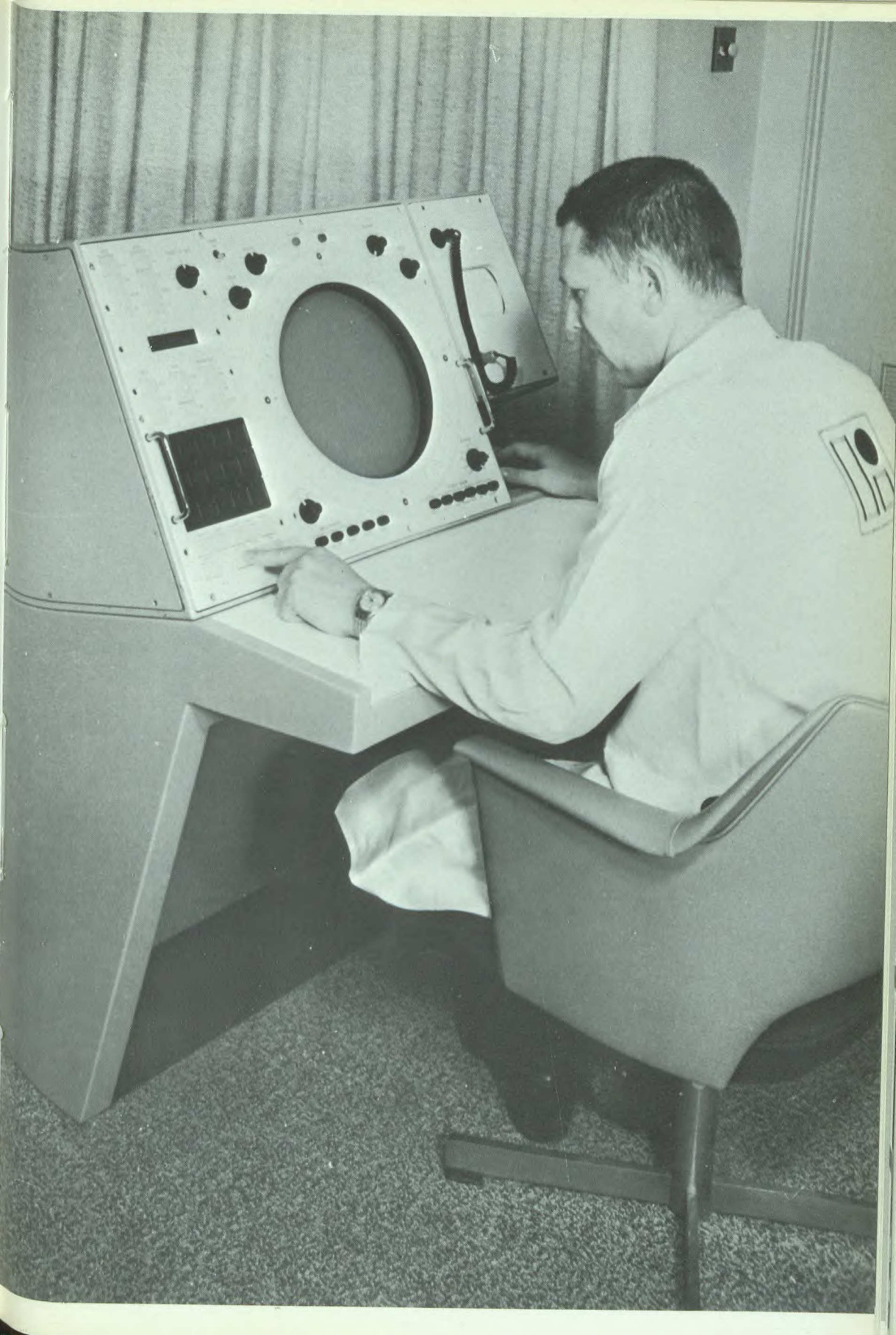
They offer a combination of programmable control flexibility radar/symbolic display, modular design and state-of-the-art micro-electronic construction. The Litton SDC can present radar or sonar video data and provides the operator with various techniques for computer data storage and retrieval. A small CRT Data Information Display provides auxiliary alpha-numeric data and a voice communications panel allows the operator to talk to other operators for switching and patching functions. Because it functions under program control, the Litton SDC has the flexibility to meet a wide range of specified tasks.

The front panel of the Litton Situation Display Console consists of three basic sections:

1. Operational Keypad — contains keypad matrix for data entry, operational task pushbuttons, symbol-select pushbuttons, and alert readouts.
2. Situation Information Display — contains a 12-inch PPI for displaying tactical and surveillance information (track data, video reports, etc.), and various CRT controls.
3. Digital Information Display — contains a 5-inch CRT for displaying and entering into the computer, alphanumeric data of an operational nature; light pen and track ball for data entry and call-up.

The versatility and adaptability of the Litton Digital Display is exemplified by:

1. The number and variety of operating modes and target categories available to the operator.
2. The flexibility achieved through provision of 5 multi-function operational task buttons and 15 momentary action function switches in the keypad matrix. As many as 360 unique actions can be performed by the operator with the multi-function capability.



ALPHA-NUMERIC DISPLAY—WAND 600

The WAND 600 — Westinghouse Alpha-Numeric Display — represents a new concept in visual readout of digital information developed by Canadian Westinghouse.

Data sources utilized by the system include teletype, data link, computer, ticker and keyboard. WAND 600 accepts this digital information and converts it to alpha-numeric form at speeds up to 300 characters per second for readout on one or more standard television monitors. The system stores all input data permanently until it is up-dated or erased.

The WAND 600 system combines the delay line memory with the raster scan deflection system operating at standard NTSC 525 line TV rates. This makes possible the use of standard television monitors and broadcast receivers as display terminals and results in a low-cost, highly versatile system.

A number of auxiliary features are available for additional versatility. These include keyboards plus various edit and flashing functions often required in military and commercial displays. The system can also be integrated with closed circuit television facilities in many instances.

The basic functions of the system have been modularized to accommodate special configurations. This modular concept also permits time sharing of certain display functions in multiple display systems, reducing the cost per display terminal to a very economical level.

Additional Specifications

1. SYMBOL FORMAT: 5 x 7 dot matrix.
2. SYMBOL REPERTOIRE: 64 symbols standard — up to 128 if required.
3. SYMBOL CAPACITY: up to 21 rows of 50 characters.
4. INPUT ADDRESSING: Sequential input. Editing facilities available with keyboard operation.
5. INPUT CODES: A variety of codes including 8-level ASCII and 5-level Baudot.
6. OUTPUT FACILITIES: Hard copy may be provided with standard peripherals (e.g. typewriter, paper punch tape).



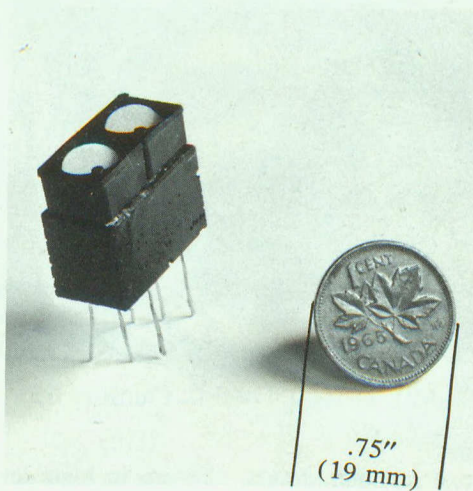
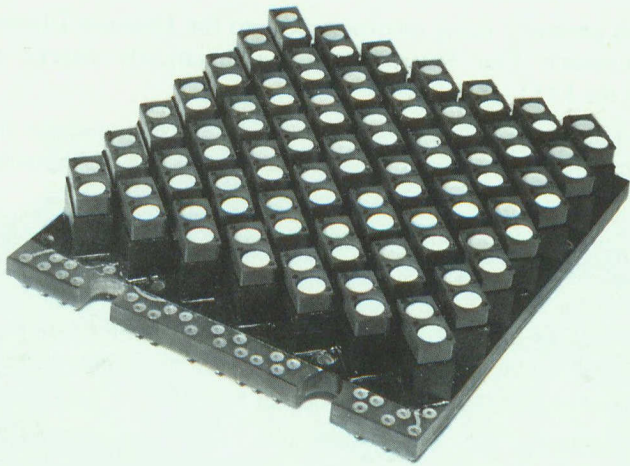
MOBILE RADAR SYSTEM

Ferranti-Packard Electronics Division are supplying electromagnetic Status Indicator Displays for a highly mobile radar system under development by Sanders Associates Inc. for the U.S. Army. The system can detect high-speed aircraft flying at tree top level, and relay target information to nearby anti-aircraft batteries. Known as Forward Area Alerting Radar (FAAR), it includes identification equipment that distinguishes between friendly and enemy aircraft, and a VHF radio link for transmitting target information to the AA batteries. The FAAR system is housed in a transportable shelter and can be vehicle mounted for transportation to the battle area. The radar, which operates in the L band, can be remotely controlled from distances up to 130 feet (39.6 m).

The air defence batteries are equipped with a miniature display box. The display comprises a matrix of status indicators, which receive information from the FAAR and indicate visually the precise sector in which the enemy aircraft are located.

Features of the Ferranti-Packard status indicator which made it particularly suited to this application were its size and weight. Each indicator measures only .45 in. x .45 in. x .775 in. deep (11 x 11 x 19.7 mm). A single indicator has a weight of 4.5 grams, i.e. 0.16 oz. The indicators are rugged, and have a projected life of better than 20 million operations per indicator. The indicators can be set by a 1 ms to 100 ms pulse of 4.2 volts 250 milliamps (with diodes); without diodes the voltage is only 3.1 volts. No power is required to maintain status, which means that power loss will not cause loss of indication. The indicators have an inherent memory; the magnetic remanence in the pole pieces is the latching force which holds the indication, eliminating the need for memory circuits or holding current.

Being light reflecting, good visibility is possible under both poor ambient light conditions and direct sunlight; a distinct advantage over light bulbs which are difficult to see in direct sunlight. Reliability is a key characteristic of these indicators; there are no mechanical linkages to wear and no bulbs to burn out. The only moving part is the indicator element disc which is driven by magnetic coupling. The encapsulated coil is moistureproof and rugged. Printed circuit board mounting allows any number of indicators to be mounted in an array with minimal wiring. The indicator will operate over the temperature range -40°F to $+198^{\circ}\text{F}$ (-40°C to 92°C), and at a humidity of up to 95%.



.75"
(19 mm)

MILITARY PUNCHED TAPE READER

A recent addition to the comprehensive range of punched paper tape readers made by Ferranti-Packard is the Type 4040. Designed to meet the requirements of MIL-T-21200, Class II equipment, this unit is completely modular, constructed for maintainability and reliability.

This unit is presently being incorporated into the Emerson Electric Inc. General Purpose Automatic Test System, which automatically checks electronic sub-assemblies in the F111 aircraft.

The tape reading and handling mechanisms are mounted on the front of the panel and the chassis containing the electronic circuitry is mounted on the rear of the panel.

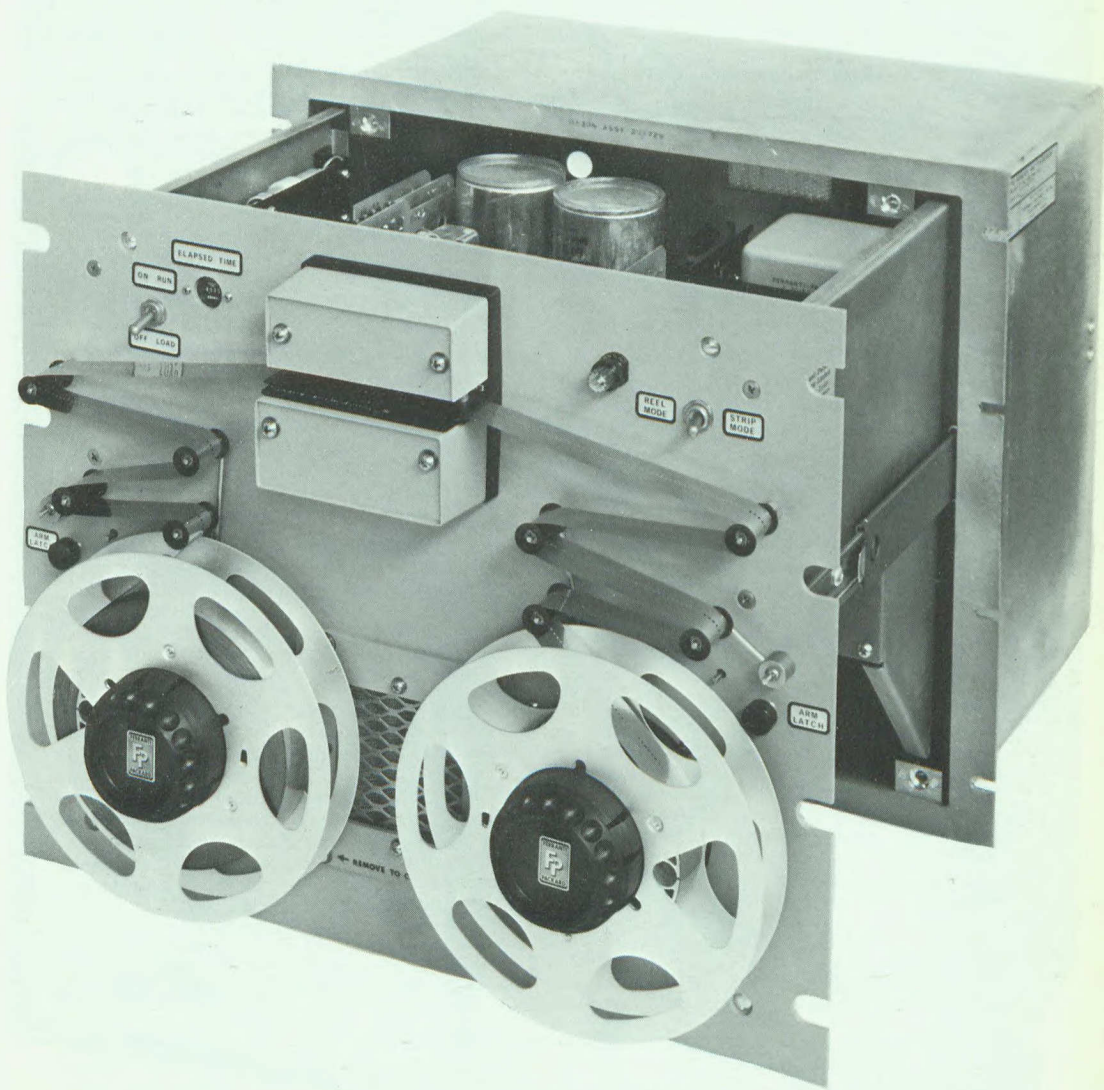
The chassis and panel as a unit are mounted with slides inside the enclosure. The enclosure flanges mount directly to a standard 19-inch rack. Access to the chassis and to the rear of the panel is gained by operating the four quick-release (slot-head) fasteners at the corner of the panel and withdrawing the chassis and panel to the full extent of the slides. Looped service cables within the enclosure permit operation at all extended positions.

For bench service, the cables disconnect from inside the enclosure, the unit releases from its slides and free-stands upright on a bench top in a fully operable condition.

Specifications

SPEED:	420 characters per second, stop on character, bi-directional.
LOGIC LEVELS:	Hole +12V (+2, -2) No Hole OV (+1.0, -0)
REMOTE INPUT CONTROLS:	Stop/Start Rev/Fwd Read/Rewind
POWER:	115 VRMS, 400 Hz.
REELS:	8" NAB Hub.
TEMPERATURE:	0°C to 55°C operating.
SHOCK:	Designed to meet MIL-STD-810A, method 516 procedure VI.
RFI:	Designed to meet MIL-I-26600, Class II.
DOCUMENTATION:	MIL-D-1000, Form II, Category E.

Since the unit is of modular design, changes in logic levels power, speed, etc. will involve changes in the respective sub-assemblies only, and hence minimum non recurring costs.



RADIO RELAY EQUIPMENT—AN/GRC-103

The AN/GRC-103 radio relay equipment, designed and manufactured by the Canadian Marconi Company is a light-weight, portable, general purpose radio relay set designed primarily for use in conjunction with pulse code modulation (pcm) multiplex equipment to transmit up to 24 voice channels. An optional Applique Unit permits its ready adaptation to operation with frequency division multiplex equipment. The radio relay set operates in the UHF frequency band and is intended for service in Military Tactical communications at the Command or Battalion Headquarters level and essential links between field switchboards. It will also find applications with Civil Defence and emergency service communications. The equipment is easily transportable by air, is designed for mounting in either a ¼ ton (226.8 kg) jeep having a trailer or in a ¾ ton (680.4 kg) truck. The individual units of the equipment are each of the size that is easily carried by one man. The equipment fully meets military environmental and construction specifications for this class.

The radio relay set uses a directional antenna system which is also easily transportable and can be rapidly erected and oriented. The whole system is designed for continuous operation with special design considerations providing practical features which ensure easy installation and simple operational procedures under difficult field conditions.

The AN/GRC-103, operating with normal antenna systems, will provide good performance over line-of-sight paths in excess of 50 miles (80.46 Km). The set has reserve power permitting satisfactory operation to a remarkable degree over paths containing obstructions. A system having two terminals and seven relay stations, operating over normal paths provides 'Via Trunk' quality of performance. Reliability analysis predicts a mean time to failure in excess of 3500 hours.

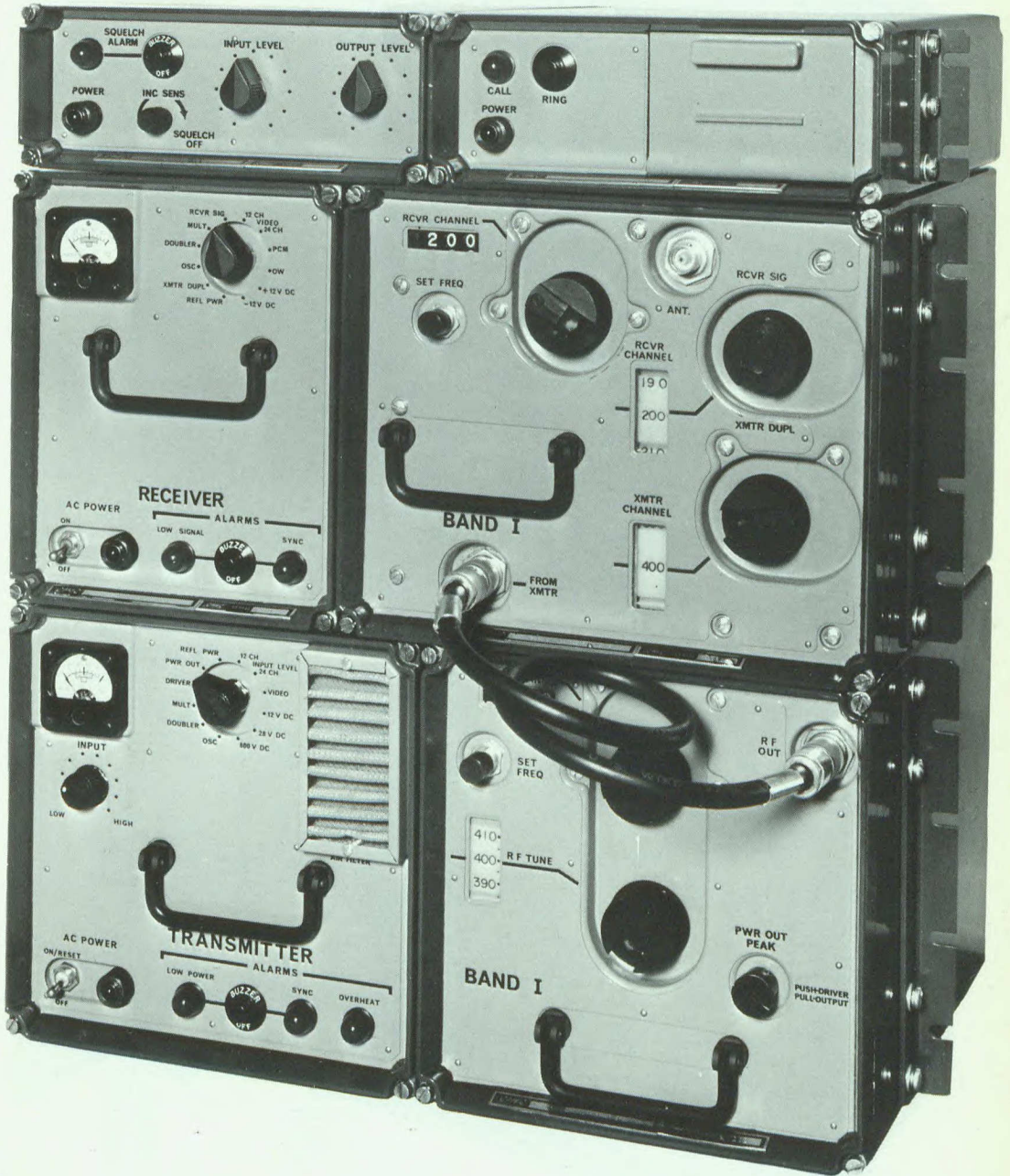
The AN/GRC-103 is fully transistorized (with the exception of the final r-f amplifiers) and operates in the 220 to 1,000 mc frequency range. The transmitter delivers 25 watts to the antenna in any of 1,560 r-f channels. These channels are selectable in 0.5 mc increments throughout the frequency range of the equipment. Other channel separations are available. The receiver and Transmitter each have removable r-f assemblies to cover 3 operating bands, 220 to 405 mc, 395 to 705 mc and 695 to 1,000 mc. Channel changing can be accomplished within 30 seconds. Band changing however, requires that the r-f assembly be changed and the antenna be altered. Band changing may be carried out within 5 minutes.

The equipment is normally employed with a corner reflector antenna or a high gain log periodic antenna. These, together with a light-weight portable mast are specifically designed for easy transportation and rapid erection. The log periodic or corner reflector antenna together with a 30 or 50 foot (9 or 15 meters) antenna support tower, can be erected within 15 minutes by one or two men. The antenna support tower is completely portable, the longest item is five feet (1.5 meters) in length to ensure simple stowage and easy transportation.

The equipment has two major units, the Transmitter and Receiver. Each of these units contains its own power supply, operating from 115 vac, 47 to 420 cps, or, optionally, from 24 vdc. Each of these units is contained in a case 8.5 inches high, 12 inches deep and 17.25 inches wide (21.59 cm x 30.48 cm x 43.81 cm) and each weighs approximately 60 pounds (27.2 kg). These cases are suitable for separate transportation; they may be mounted in a standard 19 inch (48.3 cm) relay rack, or may be stacked, one on top of the other. All controls, indicators and r-f connections are on the front panel, while all other cable connections are to recessed receptacles in the rear of the units. The units have been designed for field use. The individual units are moisture resistant, and have been designed to operate over a very wide range of temperature and environmental conditions.

Each major unit has three replaceable r-f heads, each covering one of the frequency bands 220 to 405; 395 to 705, or 695 to 1,000 mc. The r-f heads are of plug-in form and are easily replaced from the front of the equipment and contain frequency sensitive r-f components together with frequency selection circuitry.

In addition to the two major units of equipment, two ancillary units, the Order Wire Unit and the FDM Applique Unit are available. Each is in a case 3.5 inches high, 12 inches deep, and 8.56 inches wide (8.9 cm x 30.5 cm x 21.7 cm) and each weighs less than 8 pounds (3.6 kg).



INTEGRATED TELECOMMUNICATION SYSTEM—MCS 6900

The Canadian Marconi Company has designed and developed the MCS 6900, a microwave radio relay communications system which comprises radio equipment operating in the 12 GHz band and a PCM multiplex facility which will provide up to 120 telephone channels.

As a standard terminal housed in an existing central office, the MCS 6900 equipment required to provide a communications facility for 48 voice channels can be contained in one ground unit console. The units which will be installed in this console are: radio ground unit, service telephone unit, system control unit, power supply unit and 48 channel units. A cable run will connect the radio ground unit to the mast-head radio mounted above the two-foot parabolic reflector.

Expanding the facility to a double terminal will only require the addition of a mast-head radio and antenna to the existing mast-head assembly and the addition to the existing ground console of a radio ground unit and service telephone unit. The functions of the system control unit will be expanded by adding sub-assemblies.

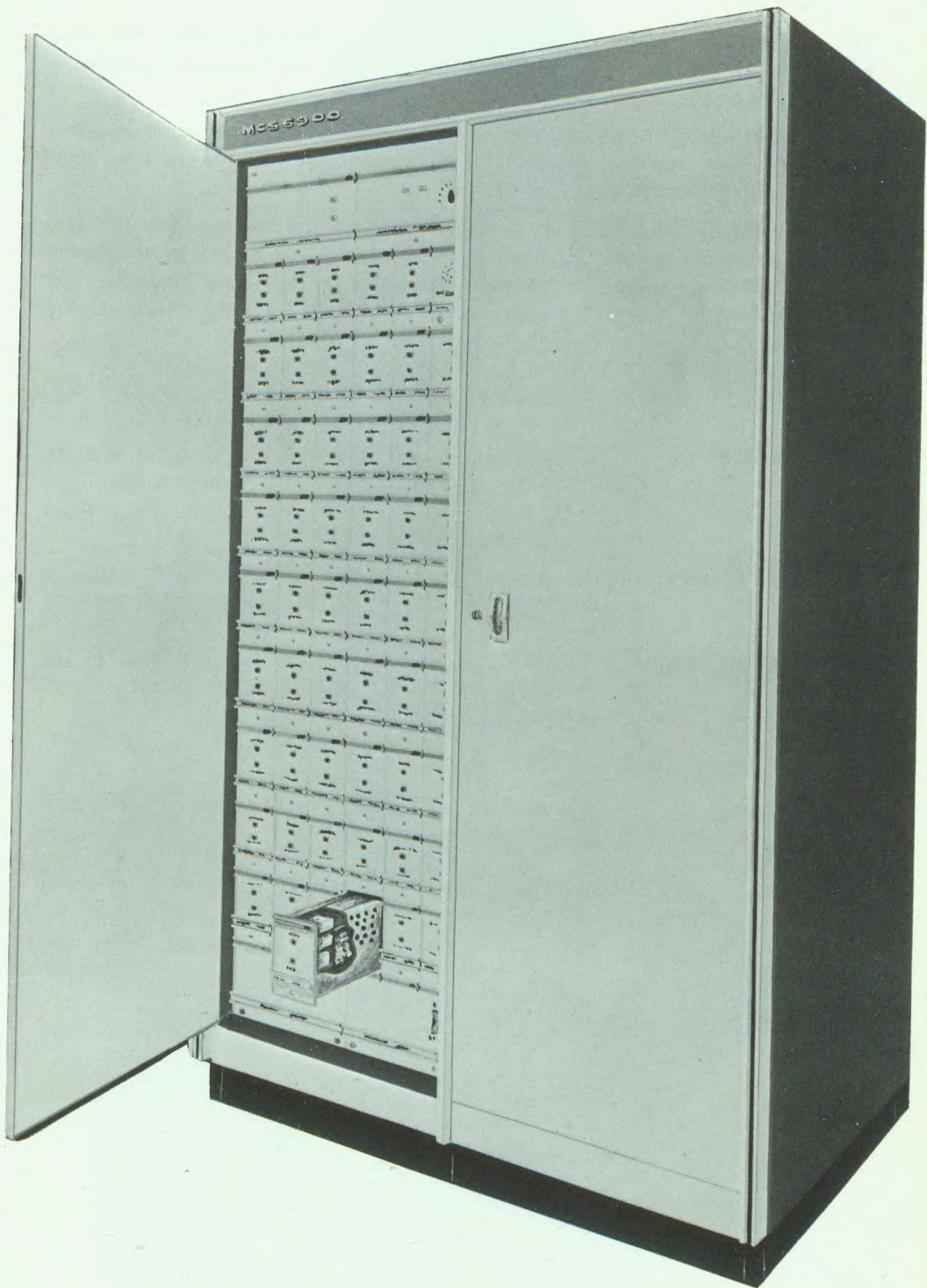
Further expansion of the facility to 120 channels will be accomplished by simply installing an additional 72-channel unit console with its own power supply, without additional common equipment.

The mast-head assembly of a standard repeater will be identical to the double terminal described above. The ground unit would consist of a 15 x 24 x 12-inch weather-proof metal case, enclosing two radio ground units, a service telephone unit, a system control unit, and a power supply unit. The equipment will operate over temperature ranges from -20°F to 130°F and in tropical and sea mist humidity, without the need for heating, air conditioning or cable pressurizing and with only rudimentary shelter. If primary power from mains is not available, an inexpensive shelter to house power generating equipment will be required.

System configurations are available to meet any order of system reliability. Conventional single frequency space diversity systems can be provided as well as dual path working and alternative-frequency hot standby. Single frequency hot standby systems are preferred in order to conserve the frequency spectrum.

Specifications

Radio group: Two section transceiver, mast-head and ground unit.	PCM multiplex equipment:								
Frequency range 12 GHz Band	PCM characteristics Compatible with WECO D1 channel bank.								
Modulation Frequency modulation Gaussian response	Voice channels Group: up to 24 System: up to 120								
Repeater type Demodulates to regenerated pcm Unlimited drop and insert facilities	Voice frequency characteristics Input level, 2 wire: 0 dbm, nominal Output level, 2 wire: -5 to $+3$ dbm, adjustable Impedance: 600 ohms Frequency response from 300 to 3400 Hz (Ref. 1 Kz): $+1$, -3 db Signalling: one way subscriber loop E & M, 2 or 4 wire								
Traffic capacity options 120 pcm telephone channels 120 pcm telephone channels and 1 colour television channel 38.4 Kbits/sec data channels Custom designed telemetry, high speed data, and program channels.	Signal to distortion ratio "C" message weighted Test tone 1000 Hz Signal/Distortion								
Built-In Test Equipment Power output: 150 mw Frequency control: $+.003\%$ Noise figure: 9 db	<table border="0"> <tbody> <tr> <td>Level</td> <td>Ratio</td> </tr> <tr> <td>-40 dbm</td> <td>22 db</td> </tr> <tr> <td>0 dbm</td> <td>30 db</td> </tr> <tr> <td>$+3$ dbm</td> <td>30 db</td> </tr> </tbody> </table>	Level	Ratio	-40 dbm	22 db	0 dbm	30 db	$+3$ dbm	30 db
Level	Ratio								
-40 dbm	22 db								
0 dbm	30 db								
$+3$ dbm	30 db								



FIELD TELEPHONE SET M262A (TA 5012/TTC)

This lightweight, self-contained, telephone system has been designed by Marsland Engineering in collaboration with Canadian Armed Forces Engineers, specifically for front line combat use in all climatic conditions.

Housed in a rugged shell of polycarbonate resin is a complete communication system requiring only attachment to standard telephone lines or the new lightweight assault cable to become fully operational.

Included in the handpone are a micro-circuit microphone amplifier with two levels of amplification, (one for normal voice and one for whisper), power supply for the amplifier, a squeeze operated generator for signalling purposes, and audible and visual indicator for incoming signals and a muting system for the annunciator.

COMMUNICATION RANGE:	In excess of 2 miles with lightweight Assault Cable, 5 miles on standard cable. (3.2 & 8 km)
AMPLIFIER OUTPUT:	1 mw, Power gain 53 db normal mode, 68 db whisper mode.
POWER SOURCE:	1.5V Battery. Life proportional to use. Current drain varies from 0.6 ma to 2.5 ma.
SIGNALLING POWER:	Hand operated AC generator delivers 200 milliwatts to the line at 15-25 Hz. Voltage duration is approximately 200 MS.
CABLE CONNECTION:	By means of two spring loaded binding posts in the base of phone.
WEIGHT:	1.5 pounds. (.68 kg.)

Operating Conditions:

TEMPERATURE:	-40°F to +150°F (-40°C to 66°C)
ALTITUDE:	Up to 10,000 feet (3048 m) above sea level.
SHOCK:	Five foot drops to concrete and thermal shock of 50°F/minute.
MOISTURE:	Up to 100 percent relative humidity at varying temperatures, exposure to driving rain or snow, and immersion in shallow water for sustained periods.
HOSTILE ENVIRONMENT:	Resistance to particle entry, attack by insects, rodents, fungus and salt atmosphere.



TELEPHONE AND TELEGRAPH MULTIPLEX TERMINAL

Radio Engineering Products have developed and produced this militarized multiplex terminal which provides 1 order-wire channel, 4 telephone message channels, and 4 voice-frequency telegraph channels on a 4-wire line or radio circuit. The transmission band is 0.3 to 19.7 kHz. The terminal includes hybrids with 2/4-wire switching, signalling converters and companders on the telephone message channels, test and line-up facilities, and automatic transmission regulator. It requires only 12 watts of power at 12/24 volts dc.

The terminal is immersion-proof and meets all requirements for operation under tactical military environmental conditions. It weighs 22 lb (10 kg), and has a volume of 0.33 cu. ft. (9400 cc). The average period of trouble-free operation under conditions of tactical operation is presently measured in years.

The stability of transmission performance, with variations in temperature, humidity, line voltage and aging, surpasses that of any previously available equipment.

Telephone message loops may be switched either 2 or 4 wire. In the 2-wire position a high-accuracy compressor-expander and a 20/1600 Hz signalling circuit are connected in each channel. The compandor reduces a total volume range of 50 dB at the transmitting terminal to a total range of 25 dB in the transmission path, and at the receiving terminal this is expanded again to 50 dB. A large reduction in noise, of the order of 25 dB, is obtained. These channels are suitable for 2400 baud data transmission.

The order-wire channel has a bandwidth of 0.3 to 2.8 Hz. It permits signalling and talking to all attended points in the multiplex system and to the switchboards and also monitoring of the four telephone message channels and the four vf telegraph channels. The operator signals over the order-wire channel to the operator at the remote multiplex terminal at 1600 Hz and over a local loop, if connected, at 20 Hz.

Four vf fs 100-wpm telegraph channels are provided. Loops are 2-wire full or half-duplex. A miniaturized solid-state dc to ac converter is used at each teletypewriter; this converter also provides the loop currents.

The reduction brought about by the channel companders, of crosstalk and noise introduced in the radio or wire path between the multiplex terminals, permits multiplex operation over radio sets such as the AN/VRC-12 or AN/PRC-25 which have ordinarily been used for a single voice circuit only. A 4 kHz automatic regulator holds the channel vf receive levels within 0.5 dB for changes in attenuation between the two multiplex terminals of as much as 12 dB, and visual and audible alarms are given for a greater change. These features improve transmission by such a large factor that on long vhf radio systems the performance of each of the five multiplex channels is generally superior to that of a single voice circuit operating over the radio system.

This multiplex terminal has been assigned standard nomenclature Terminal, Telegraph-Telephone TH-81/GCC. It forms the principal component of the following equipments:

Terminal Set AN/PCC-1 (1 plus 4 plus 4 channels, used with AN/PRC-25 Radio Set).

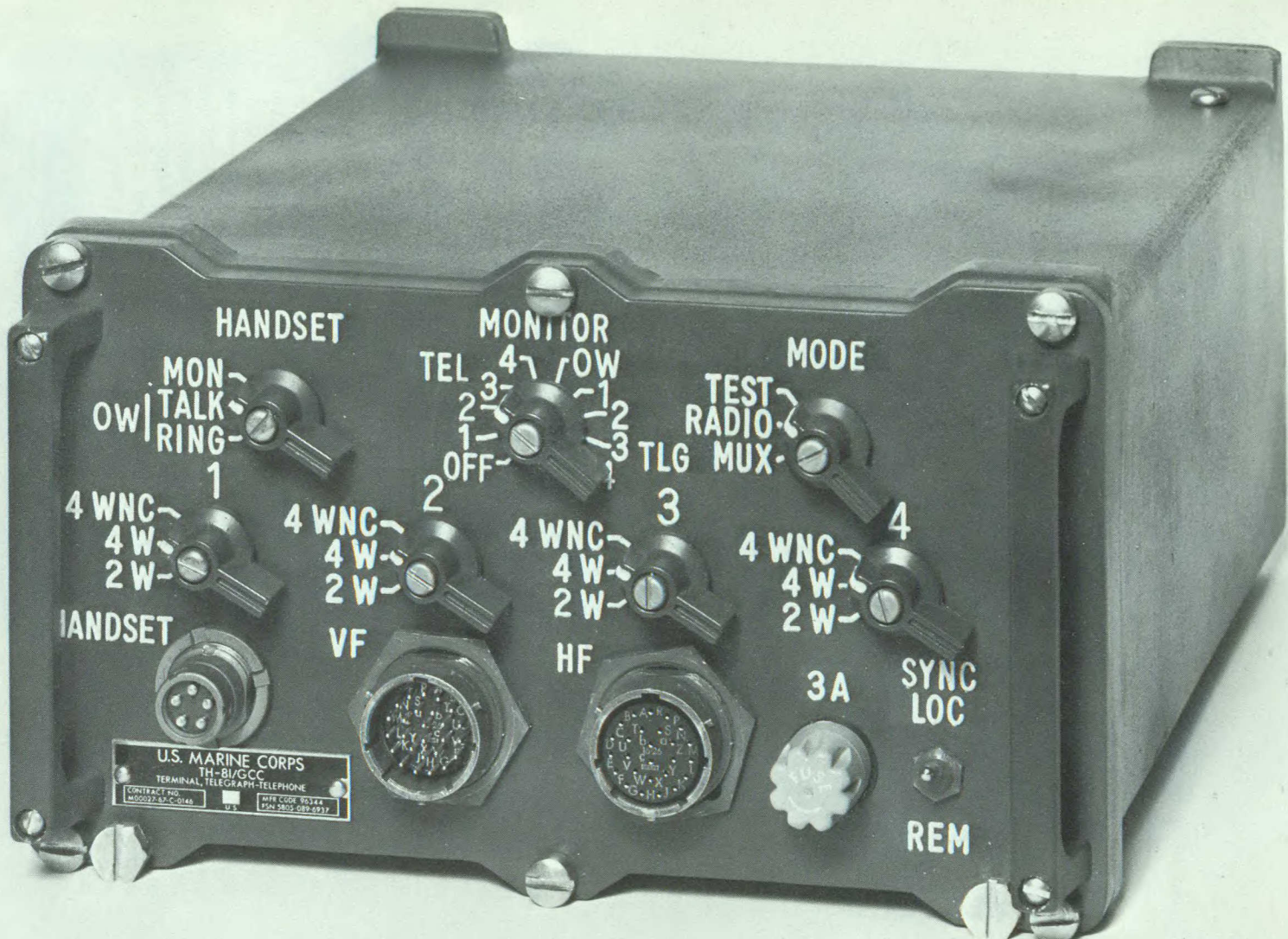
Terminal Set AN/VCC-1 (1 plus 4 plus 4 channels, used with AN/VRC-12 Radio Set).

Terminal Set AN/VCC-2 (2 plus 8 plus 8 channels, used with AN/VRC-12 Radio Set).

Terminal Set AN/VCC-3 (3 plus 12 plus 12 channels, used with AN/VRC-12 Radio Set).

Terminal Set AN/GCC-14 (10 plus 40 plus 60 channels, used with AN/GRC-50, AN/GRC-103 or AN/TRC-97 Radio Sets).

A modified version of this terminal, with 2 in place of 4 telegraph channels, has been assigned standard nomenclature Multiplexer, Telegraph-Telephone TD-856(P)/TCC. This forms the principal component of Multiplexer Set AN/TCC-70, which is used with the AN/VRC-12 Radio Set to form the AN/GRC-163 Radio Set.



HANDSET

MON
TALK
RING
1

4 WNC
4 W
2 W

HANDSET



U.S. MARINE CORPS
TH-81/GCC
TERMINAL TELEGRAPH-TELEPHONE
CONTRACT NO. M50027-B2-C-0146
DATE CODE 90344
PSN 5002-00-0037
U.S.

MONITOR

TEL 4
1 2 3
OFF

4 WNC
4 W
2 W

VF



MONITOR

1 2 3
OFF

4 WNC
4 W
2 W

HF



MODE

TEST
RADIO
TLG MUX

4 WNC
4 W
2 W

3A
SYNC
LOC



REM

TEST SET, TELETYPEWRITER TS-5082/UGM

The Test Set Teletypewriter TS-5082/UGM, supplied to the Royal Canadian Air Force, is used to obtain a complete quantitative check on the performance of the LF/RTT system, including the Topping AN/ARR-501 Airborne Receiver with its associated loop antenna and teleprinter. In simple terms, the first function of the Test Set is to provide a "go-no go" pre-flight check of the teletype receiver located in the aircraft. The second function of the Test Set is more sophisticated in that, acting as a signal generator, it will enable detailed aspects of the receiver to be checked. The Test Set provides fixed frequency signals suitable for matching the antenna and antenna cables to the Receiver and for alignment of RF circuits and in addition, a frequency-shift keyed signal is available for an over-all receiving system checkout and calibration. One of four test frequencies of the Receiver may be selected by a panel switch. This signal is controlled in amplitude (metered) and supplied to a Dummy Antenna and through a 3-foot Antenna Cable directly to the Receiver, or to a Radiating Coil mounted on a pole to induce a signal in the Loop Antenna mounted on the aircraft. The equipment is readily portable and operates from either built-in rechargeable nickel-cadmium batteries or 115 volt 60 cps line.

This equipment is produced by Topping Electronics.

Performance

MEAN-TIME BETWEEN FAILURES: MTBF of 200 hours.

WARM-UP TIME: The equipment performs as specified herein not later than 10 minutes after being switched "ON".

SPEED: The equipment is capable of generating an output signal at 60, 66 and 100 words per minute as selected.

OUTPUTS: The equipment is provided with 3 outputs:

Relay contact An on-off keyed, one side grounded relay, capable of keying a non inductive circuit at up to 45 volts and up to 10 milliamps supplied from an external source.

Radiation Loop The output from a radiation loop is capable of coupling a signal between 70 Kcs - 150 Kcs to the Marconi AD 4488c antenna.

Dummy Antenna A dummy antenna is provided which enables the signal to be connected directly to the ARR501 input without re-alignment.

OUTPUT LEVELS: There are two output levels into the dummy antenna or radiation loop as follows:

High Level approximately 1 mv at receiver input.

Low Level approximately 1 uv at receiver input.

OUTPUT FREQUENCIES: The four pre-set frequencies in the band between 70 Kcs and 150 Kcs are as follows:

Channel 1 73.6 Kcs \pm 3 cps Channel 3 133.15 Kcs \pm 3 cps

Channel 2 121.6 Kcs \pm 3 cps Channel 4 146.1 Kcs \pm 3 cps

FREQUENCY SHIFT: The output frequency shift from the dummy antenna and radiation loop is between 50 and 85 cps.

INPUT: The equipment is capable of accepting the 1000 cps output from the ARR 501 and keying the UGC 502 teleprinter.

**INSTRUCTIONS FOR FIELD LINE TESTS OF
RECEIVER SET, PAIR, ANIAR830 AND SYSTEM**

A. SYSTEM OPERATION

1. Place agit. unit below aircraft antenna.
2. Erect indicated test set antenna and install in the support socket provided in the panel.
3. Connect antenna cable connector to panel socket marked ANTENNA.
4. Ensure that the test set antenna is about 3 feet below the aircraft antenna and located within 1 foot of the perpendicular line from the aircraft antenna center.
5. Set test set controls as follows:
SPEED as desired (100 WPM)
MODULATION to 100% MARK TECH
GOUTPUT set applicable CHANNEL as desired (CHANNEL D)
6. Turn BAT. power ON.
7. Observe that the RF METERS indicates approximately 35 μ A, indicating RF drive to the input attenuator.
8. Position line of test set antenna coil to RF from line of the aircraft. The system should now indicate satisfactory performance by printing continuous lines of ST, separated by line feed and carriage return.

B. SUBSYSTEM TESTS

1. Locate the test set attached to the ANIAR830 Receiver.
2. Disconnect the antenna plug PM1 from the ANIAR830 receiver socket PM1.
3. By means of the matched dummy antenna cable, part number 209, connect the test set GOUTPUT TO AIRSPO connector to PM1 of the ANIAR830 Receiver.
4. Ensure that the test set GOUTPUT is connected to the test set D. ANT INPUT via a short coaxial jumper.
5. Set test set controls as follows:
GOUTPUT to 100 CHANNEL as desired (CHANNEL D)
MODULATION to 100% MARK TECH
6. Switch BAT. power ON.
7. Observe that the RF METERS indicates RF output by reading approximately 35 μ A.
8. Test system performance by switching LOOP 1 and LOOP 2 switches ON, and observing ST printouts at the teleprinter.
9. * The two indicated channel antenna loop amplifiers may be tested by switching LOOP 1 and LOOP 2 signals ON alternately.

10. In the event that printouts are not obtainable, proceed as follows:
a) Disconnect the AIRSPO input connector PM1 and, by means of the matched 1.316 cable part number 209, connect the AIRSPO output PM1 to the test set 1.316 INPUT.
b) Connect the test set GOUTPUT TO AIRSPO as the teleprinter via the same cable and connector provided to the aircraft.

11. Set the test set PRINTERS switch to R-Y and proceed as described in paragraph B, line 9 above. Failure to print will indicate failure of the VTYM.
12. Set the test set PRINTERS switch to L-R. Failure to print will indicate failure of the ANIAR830 Receiver.

C. ANTENNA PERFORMANCE

1. At the ANIAR830 Receiver:
a) Remove the dust cover and disable the receiver AGC local oscillator and output by grounding test point 1790.
b) Connect a sensitive RF VTYM between the RF output test point and ground (see LO 3M8-1AR830-1 Figure 6-6)

CAUTION

TO REMOVE MINIMUM NOISE, BOTH COUPLERS REFERRED TO ABOVE MUST BE MADE ADJACENT TO 1793 OR IF TRANSFORMER BRACKET, 200118.

2. Locate the test set beneath the aircraft antenna and proceed as described in paragraph A, line 7 above.
3. With the receiver on, the RF output from the receiver should read approximately 1.5 milliwatts at the VTYM.
4. Horizontal rotation of the test set antenna by 180° should produce a variation of RF output of not more than 3 db, as indicated by the VTYM.

D. ANTENNA ALIGNMENT

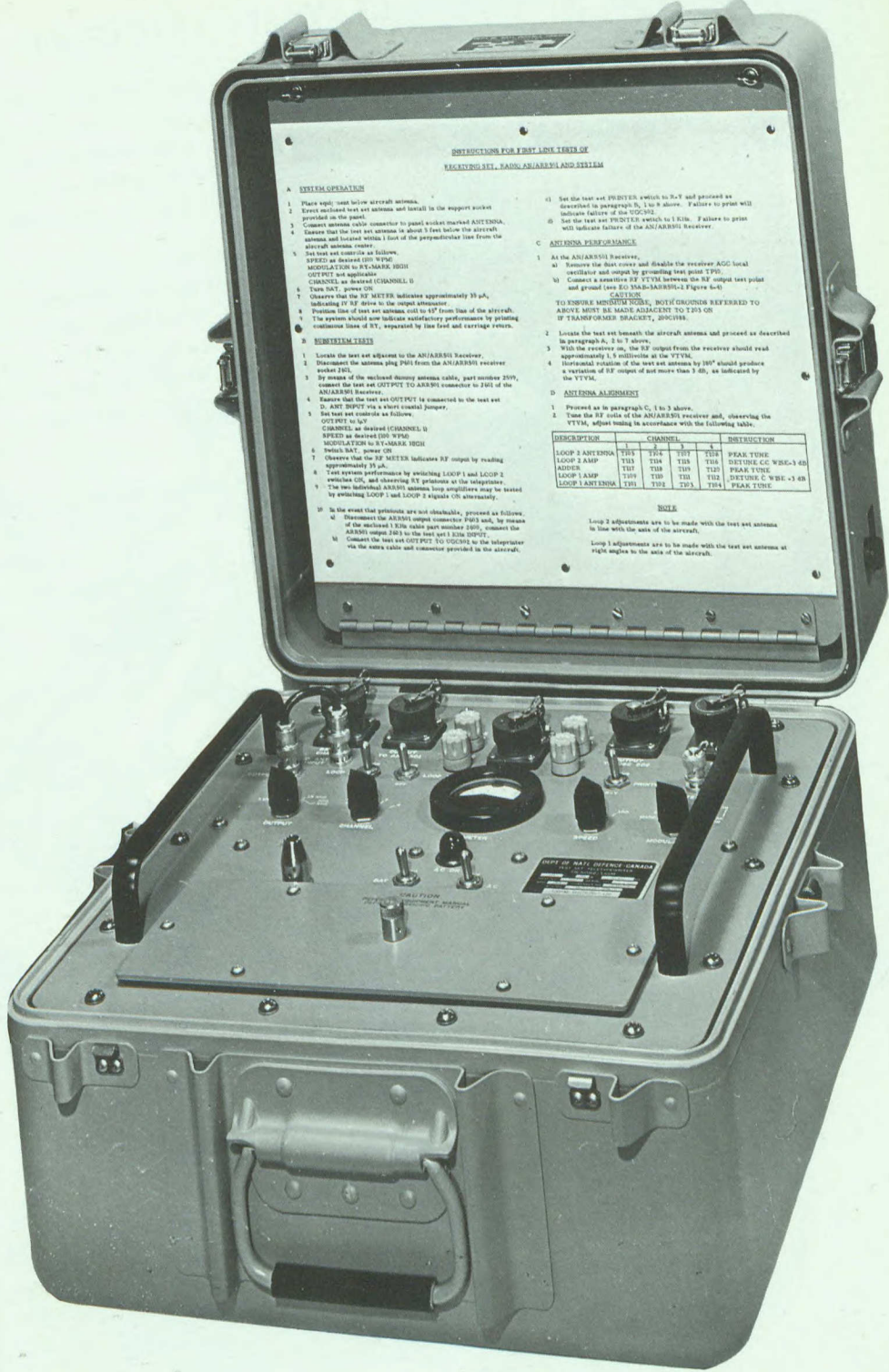
1. Proceed as in paragraph C, line 3 above.
2. Tune the RF side of the ANIAR830 receiver and, observing the VTYM, adjust tuning in accordance with the following table:

DESCRIPTION	CHANNEL				REMARKS
	T101	T104	T107	T110	
LOOP 2 ANTENNA	T101	T104	T107	T110	PEAK TUNE
LOOP 2 AMP	T101	T104	T107	T110	DETUNE CC WBE-3 40
ADDER	T101	T104	T107	T110	PEAK TUNE
LOOP 1 AMP	T101	T104	T107	T110	DETUNE C WBE -3 ER
LOOP ANTENNA	T101	T104	T107	T110	PEAK TUNE

NOTE

Loop 2 adjustments are to be made WITH the test set antenna in line with the axis of the aircraft.

Loop 1 adjustments are to be made WITH the test set antenna at right angles to the axis of the aircraft.

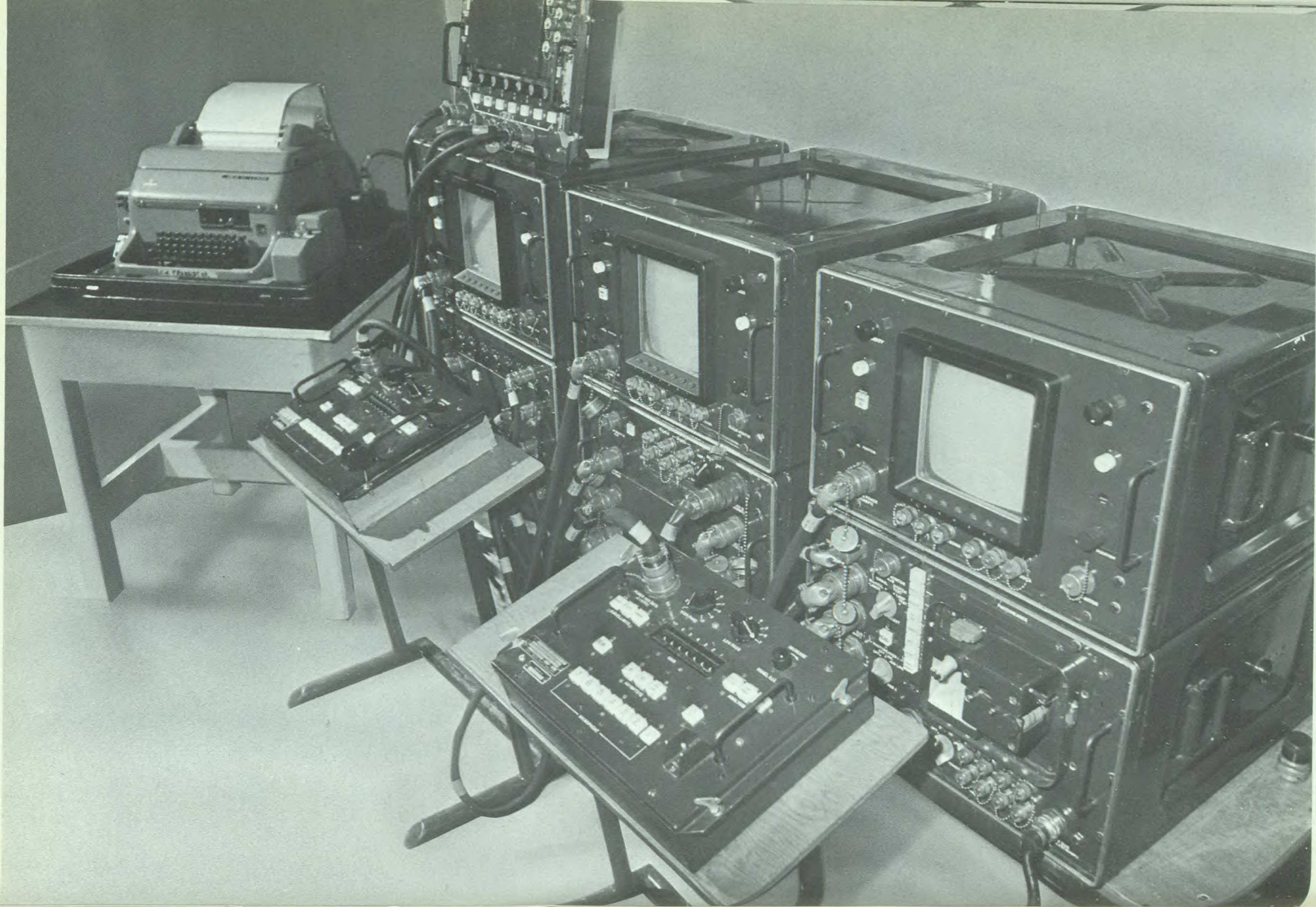


SOUND RANGING CENTRAL—AN/GYK-501

The Sound Ranging Central, as produced by Computing Devices, is the data processing component of a Sound Ranging System. It accepts acoustic signals by radio link or by land line from an array of three to seven microphones deployed on a 1,000 - 20,000 metre base. The system also has the capability of providing 360° surveillance when these microphones are arranged in a cross configuration.

Sound Ranging is a means of locating a sound source be it a gun, howitzer, mortar or shell-burst. The Sound Ranging theory is based on the assumption that sound travels uniformly at a known velocity. From a knowledge of the time taken for a sound wave to travel between two microphones and the distance between these microphones a hyperbole may be computed which will pass through the sound source. The intersection of any two hyperbolae gives the location of the sound source.

The acoustic signals are recorded on magnetic tape and under operator control are played back, sampled, digitized and stored in a digital computer. The stored data signals are displayed on a cathode ray tube so that the operators can mark the relative arrival times at the microphones of the sounds from a single event. With this operator input plus the stored locations of the microphone and the prevailing meteorological conditions the computer calculates the location of the sound source and causes a print out of the results.



ANTENNA CONTROL SYSTEM

Designed, manufactured, tested and installed in Canada, the system demonstrates the capabilities of the electronics industry to supply complex equipment and to support Canadian Defence requirements. The system is a product of TMC (Canada) Limited, in Ottawa and was designed by their Engineering Staff, working in close co-operation with the Military Design Authority.

Basically, the system is required to provide forty outputs from each of 20 high frequency antennas. Future growth potential (more antennas and, more outputs) is a "built-in" feature. To reduce degradation of received signals, the system was carefully engineered to meet certain over-all performance standards. The operational specifications were outlined by the Military, and completely met by the manufacturer. Some of the major characteristics of the system are:—

- (i) Input and output impedance is 50 ohms with an over-all frequency response of ± 2 db from 2.0 to 32.0 mc.
- (ii) Insertion loss from any input to any associated output at any point within this frequency range does not exceed 2 db.
- (iii) A means is provided to attenuate "Broadcast-band" signals below 1.8 mc so that high level signals of this type do not enter vital circuitry and cause intermodulation products.
- (iv) All intermodulation products are held at least 60 db below either of two 250 millivolt signals applied simultaneously at the antenna input and measured at the receiver output connection.
- (v) The input VSWR (looking into the system from any antenna) is better than 1.3:1.
- (vi) The output VSWR (looking back into the system from any receiver) circuit output connection is better than 1.2:1.
- (vii) Isolation between receiver-circuit output connections is at least 50 db at the worst point in the frequency range (30 mc) and 70-80 db at the lower frequencies (2-10 mc).
- (viii) Back-to-front isolation from any receiver output connection to any antenna input is 90-100 db at any frequency.

The heart of the system is TMC's Antenna Multicoupler. This particular unit is one of a series conceived and developed independently to meet a foreseeable requirement for new commercial/military markets.

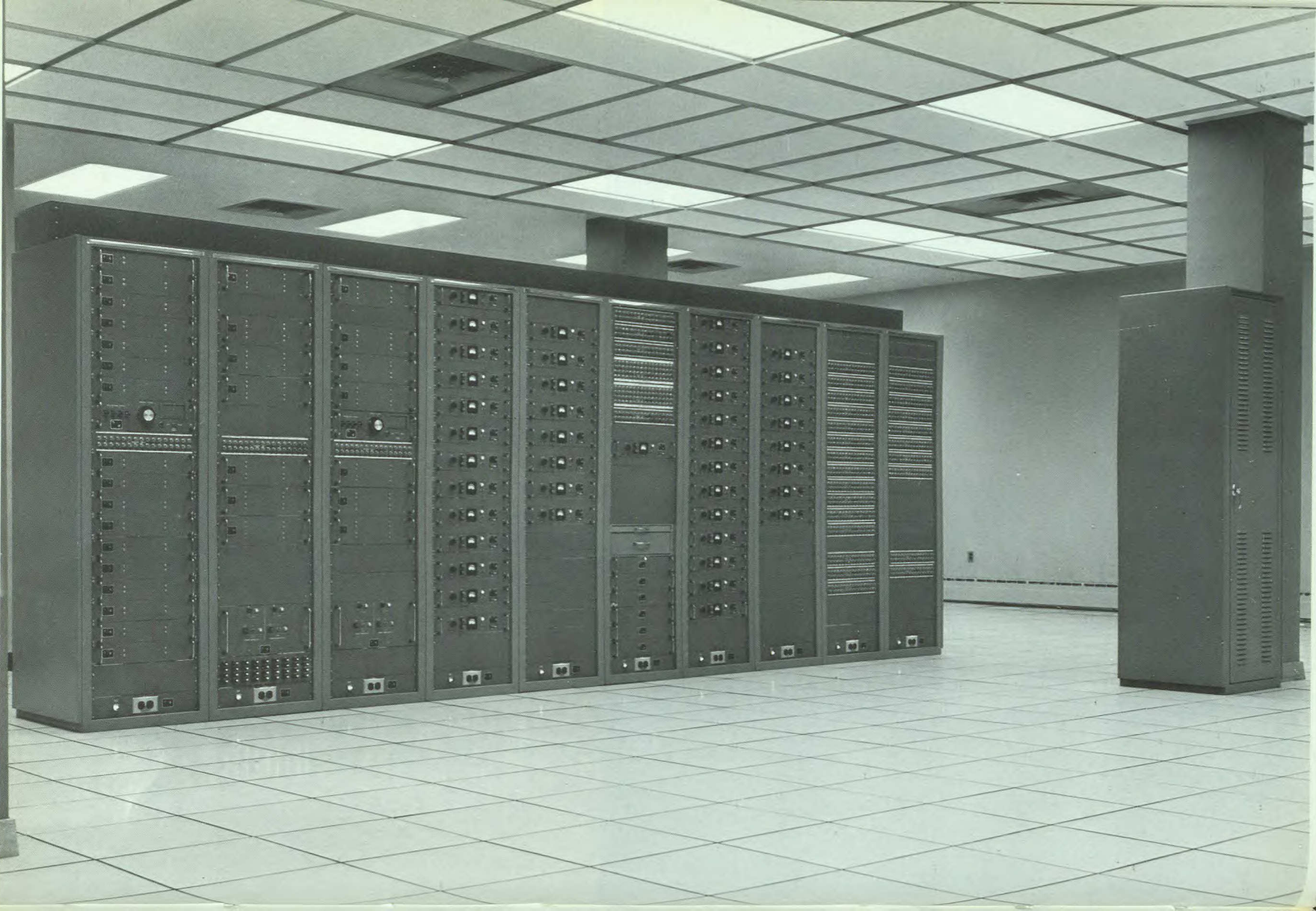
The system was designed to work with an antenna field consisting of twenty antennas; twelve of which are oriented as six uni-directional pairs; the remaining eight as four omni-directional pairs. This antenna field configuration is fully accommodated by new switching and routing techniques to numerous operating positions. Switches can be remotely operated from a control panel mounted near the receivers so that immediate selection of the best pair of antennas, is made at any time. As this switching is virtually instantaneous, rapid comparison of the signal strength available on all antennas is possible.

A further feature of the Antenna Control Group is the coaxial switch used in the system. New techniques of a recently available vacuum switch were used and arranged in a 1 x 12 matrix type of configuration. The packaging of these switches provides an exceptionally high isolation between connectors. Individual switches provide an exceptionally high isolation between connectors. Individual switches were life-tested to 500,000 operations.

All antenna switching functions are capable of remote control, which is of two types; a standard 19-inch panel mounting for use in receiver racks and a small desk-mounted, sloping-front cabinet for use at the control consoles and operator positions.

A Low-frequency multicoupler is used in the system to provide outputs from one LF antenna. This multicoupler is similar in design to the high-frequency multicouplers, differing only in filters and the use of low-frequency transformers at the input and output of the pre-amplifier. With this "companion type" of unit in the system, the logistics of support in the field is minimized.

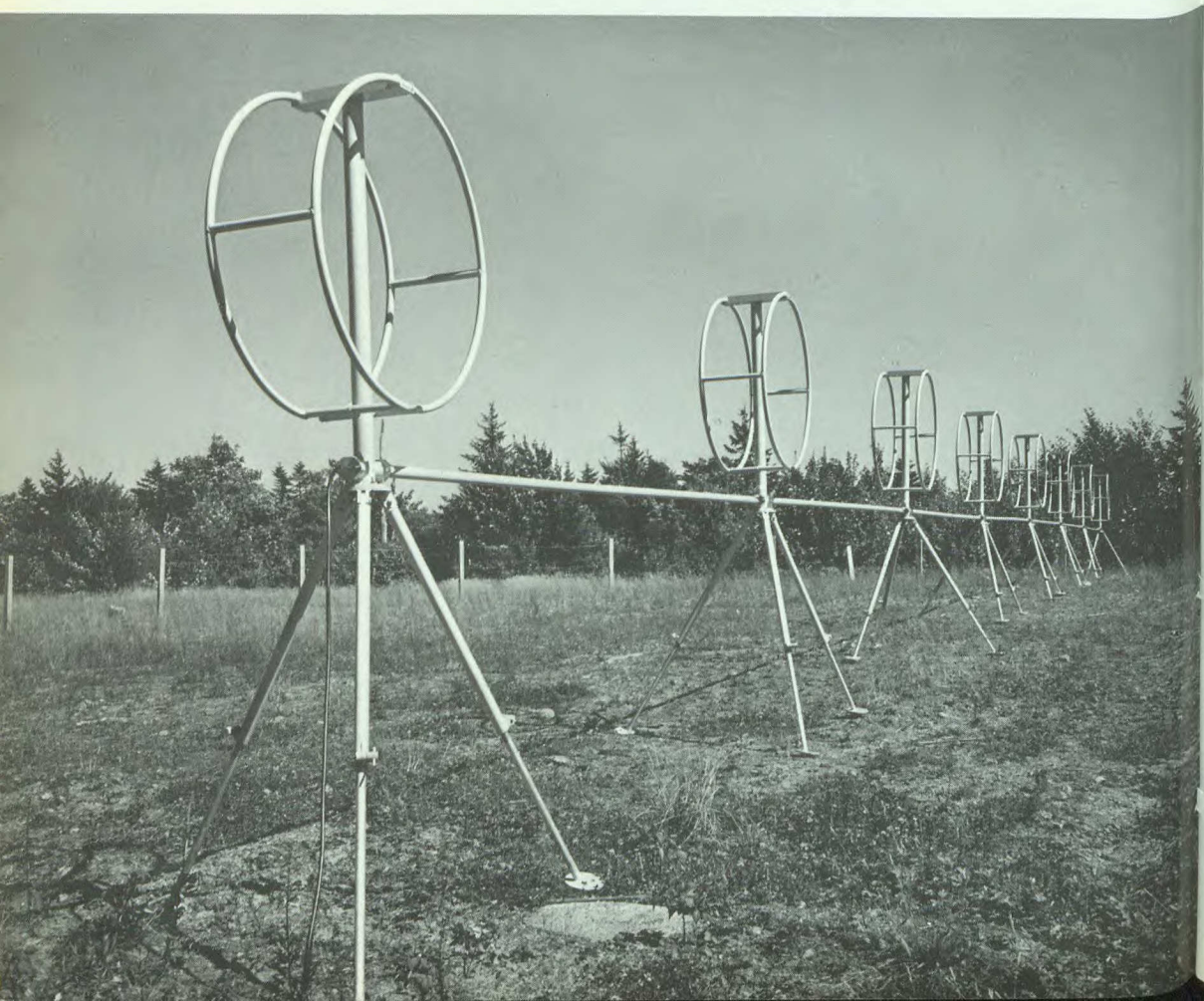
The entire Antenna Control Group system is housed in ten identical cabinets. Each cabinet is protected by a separate AC circuit breaker with a front-panel indicator lamp and the load is evenly distributed between the three phases of a 120/208-volt supply. Utility outlets at the front and rear of each cabinet are provided for technician accessibility and are fused on separate AC circuits. The system uses approximately 1,000 coaxial cables with connectors on each end for the internal RF distribution. The total length of RF cables used to make all RF connections is approximately four miles and 108 cabling charts were required to identify these cabling connections.



ACTIVE APERIODIC LOOP RECEIVING ANTENNA ARRAY

These highly efficient receiving elements, designed and built by E.M.I. Electronics Canada Ltd., combine to form arrays with significant advantages over conventional antennae. The arrays cover 4 octaves (2-32MHz) and polar diagrams can be tailored to specific requirements. Other features of these arrays include:

- Small site requirements.
- Minimum site preparation.
- Minimum installation time.
- Maintenance without ladders or climbing.
- Low profile.
- No masts or guy wires.
- Independent and simultaneous operation of up to 4 receivers on one array.



SIGNAL PROCESSING APPLIED RESEARCH PROGRAM

Since late 1962, the Canadian General Electric Company has been engaged in a continuing program of applied research in the field of signal processing. This effort is jointly funded by the Company and the Defence Research Board of the Department of National Defence of Canada.

The objective of the program is to undertake studies aimed at improving the detection and resolution capabilities of target locating systems operating in non-ideal environments that occur in space, atmospheric and undersea media. This involves extensive investigation into analytic, technological, and system aspects of signal processing applied to specific problem areas encountered by radar, sonar, and communications equipments.

With the aid of a programmable electronic matched filter and a perspective display device both of which were developed by the techniques group at Canadian General Electric, the characteristics of a large number of coded waveforms have been portrayed and catalogued. This effort has produced significant contributions to waveform design some of which are referenced in a recently published text book on signal processing. Current laboratory studies are aimed at expanding the information capacity of correlator devices through the exploitation of digital matched filters and the development of improved real time optical processing techniques.

In recent months, a portion of the applied research activities has been devoted to a field demonstration of the effectiveness of pulse compression when used to enhance target location in a range-extended clutter background. This test program involved the physical coupling of the experimental matched filter with an operational surveillance radar in the Air Defence network, and subjecting the modified system to a series of flight trials. The results obtained in this exercise are in close agreement with those predicted by theory.

Future program activities will be devoted to further demonstrations of effectiveness aimed at similar problem areas in other defence electronic systems. This will be carried out in parallel with the aforementioned laboratory investigations into advanced digital and optical signal processing techniques.



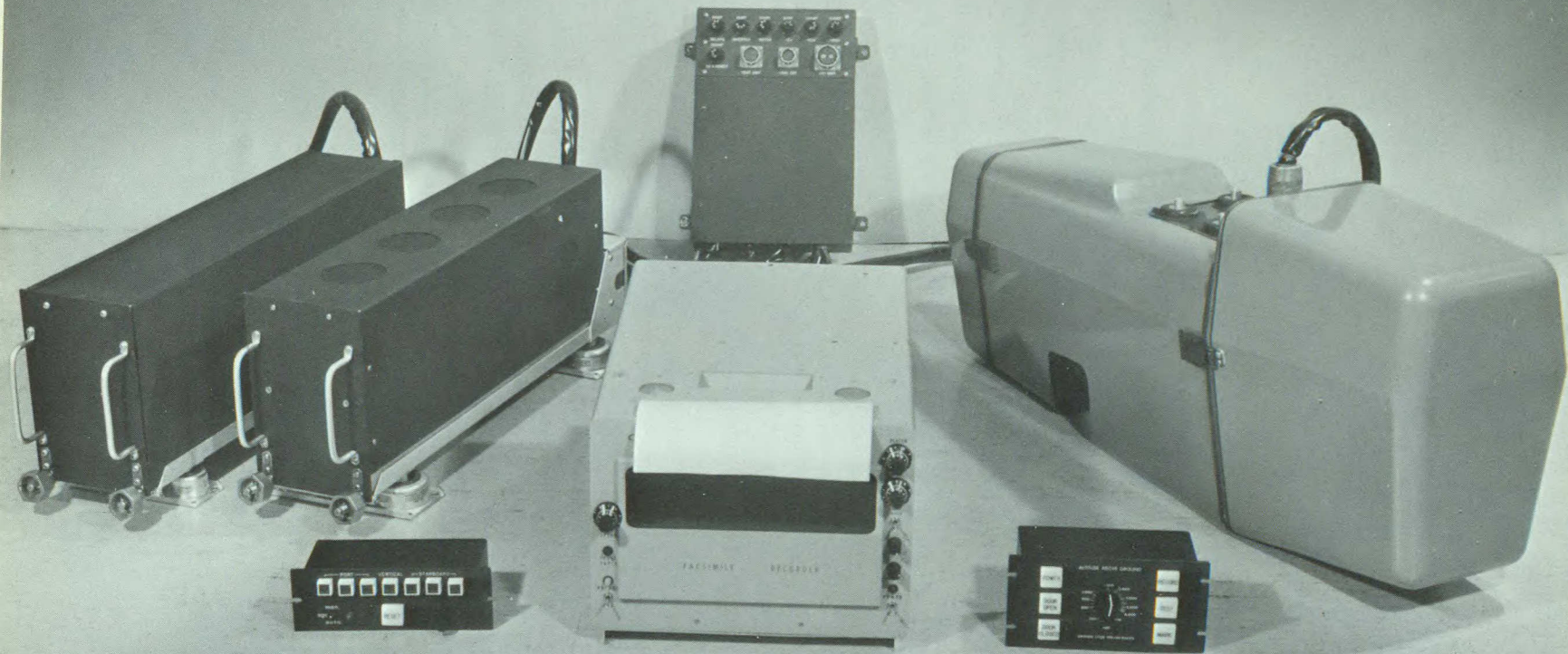
AIRBORNE IR FOREST FIRE MAPPING AND DETECTION SYSTEM

The ability of infra-red devices to detect small differences in "heat" radiation has been exploited for many years in specific fields. Only recently, however, has the technique been applied to mapping and detection from the air of going or incipient forest fires, day or night, whether smoke-obscured or under light to heavy foliage. Such IR scanning equipment also provides terrain information necessary for geographic location; a method for early determination of fire rate-of-spread, effects of weather and fire control measures; an efficient direction and monitoring facility for post-fire mop-up activities; an aid in the location of lost or trespassing parties; a method of locating stream pollutants.

Computing Devices for several years has conducted a successful program resulting in the Firemapper, a system developed expressly for application by Forest Protection organizations. The sound basic design philosophies, acquired by the company through recent design, manufacture and installation of electro-mechanical avionics equipment on more than 4000 aircraft throughout the world, have been applied to the Firemapper to provide reliability and flexibility in concert with simplicity of operation and maintenance.

The system comprises a Power Unit which accepts aircraft generator output and distributes to all components, regulated and fused, and an Electronics Unit housing the bulk of the circuitry. Both units may be remotely stowed. The system is operated from a selected operator/observer station. A Control Unit provides for the operation of all airborne functions and a Display Unit contains an audio alarm capability and visual indicator panel. The Scanning and Film Recording Pod is mounted externally. A near-instantaneous In-cabin Recorder provides an optional, big-image facility. All system units conform to operational avionic configurations.

In operation, IR energy is received from the terrain below the aircraft and is focussed on the detector. The detector, cooled by liquid nitrogen, generates an output electronic signal proportional to the amount of IR energy received. The varying signal related to the IR output from the ground being scanned is amplified and applied to the various system outputs. An instantaneous audio alarm is sounded to notify the operator of high energy "hot" sources detected. The general ground area from which the source originated is also indicated. In the Recorders, a pinpoint of light of proportional varying intensity is scanned at the same rate as the ground below the aircraft. Hence, IR terrain images are permanently recorded. Location, shape and relative fire activity data is then conveyed to ground and air crews.



ORIENTED CAESIUM MAGNETOMETER (AN/ASQ-501)

The Electronics Division of CAE Industries Ltd. has recently developed a high sensitivity airborne magnetometer system suitable for both ASW and geophysical exploration applications. This development follows a series of successful equipments produced by CAE in the general area of MAD and particularly in the field of ASW aircraft compensation, where CAE has attained a position of world leadership.

In addition to having a basic sensitivity of 0.01 gamma, the CAE oriented caesium magnetometer, which is an optically pumped system, combines several important concepts which together make it very desirable for all airborne applications.

The system eliminates heading error effects commonly present in optically pumped magnetometers by orienting the single caesium cell on a mechanical gimbal system, unlike most other systems which attempt to minimize the undesirable rotational or heading error effects by a complex multi-cell approach.

This simple orienting approach, which was developed by The National Aeronautical Establishment (NAE) of the National Research Council of Canada, when combined with an inherently stable self-oscillator caesium sensor loop and a unique low noise level, infinite dynamic range, frequency to voltage converter provides the most sensitive airborne magnetometer available.

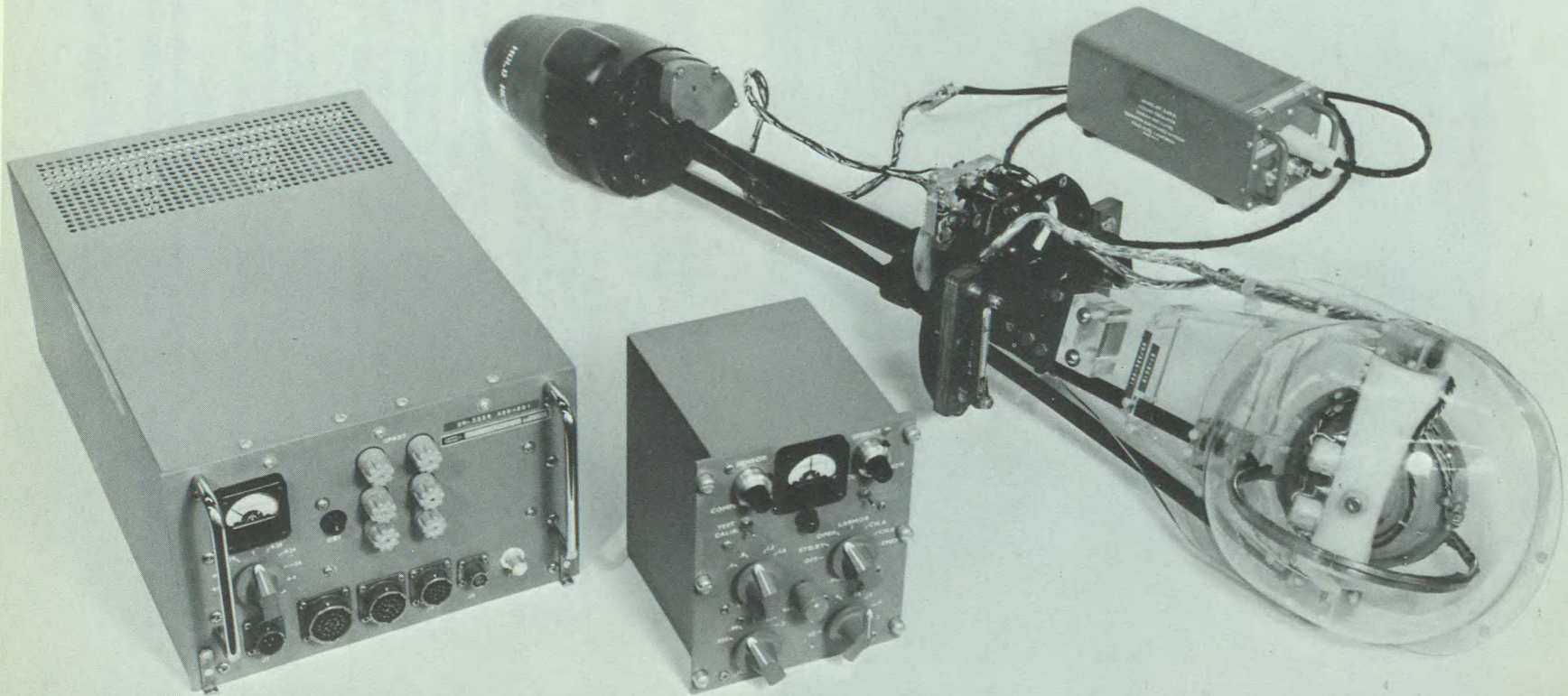
Earlier versions of this magnetometer have been flying in the NAE experimental North Star aircraft for over two years. The present developmental model, (photo opposite page), which was built for the Department of National Defence of Canada, is presently flying in a Royal Canadian Navy CHSS-2 MAD equipped helicopter undergoing operational evaluation tests.

A simpler version of the same magnetometer is presently being flown in a small geophysical survey aircraft for magnetic mapping purposes.

It is presently planned to build a number of Service Test models of the magnetometer which will be designed and tested to satisfy the requirements of the applicable airborne military specifications.

This system, in addition to being greatly simplified with respect to the developmental model, will, through the widespread use of microminiature circuiting, have a total system weight of only 40 lbs. (18.2 Kg.)

The oriented caesium magnetometer is compatible with the requirements of both fixed and rotary wing aircraft and is unaffected by either magnetic field gradients or AC power field levels.



FLUID VELOCITY METER

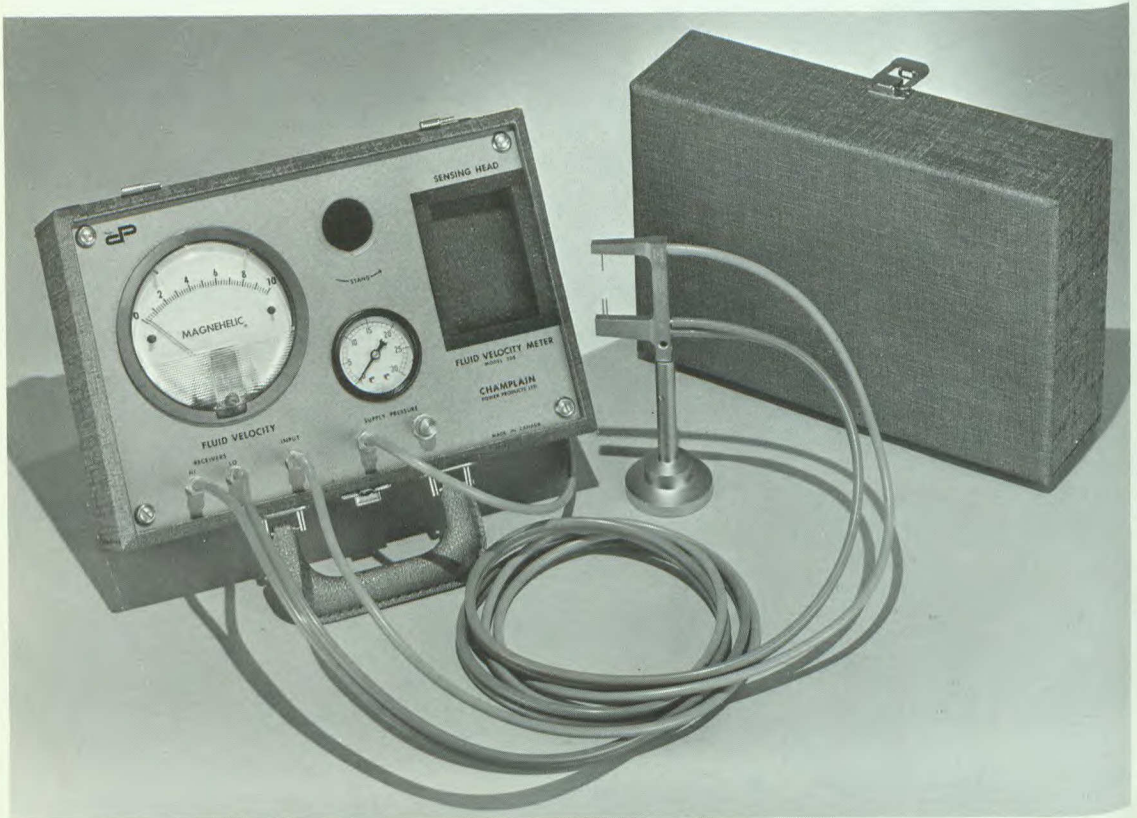
This instrument is now being manufactured by Champlain Power Products Limited for a number of applications where the measurement of low Fluid Velocities is of importance.

Using a unique fluid jet sensor, the instrument is able to measure fluid velocities in a range where the accuracy of comparable devices tends to fall off. For example, measurement of velocities as low as 0.15 FT/Second in air and 0.015 FT/Second in water is possible.

The Fluid Jet Sensor provides an all-pneumatic high gain signal directly proportional to the velocity of the fluid being measured. The sensor consists of a high velocity fluid jet which impinges on two pressure receiver tubes symmetrically spaced in the Jet. Cross Flow velocity of the Fluid causes the Jet to deflect and unbalance the pressure between the receiver tubes. This pressure difference is used as a measure of the fluid velocity.

Applications to date have been mainly in scientific and industrial areas. The instrument shows great promise for use as a low range airspeed indicator for helicopter and VTOL Aircraft use. Other possible applications include the study of ocean and lake currents and the monitoring of explosive gas mixtures.

In addition to the Fluid Velocity Meter, the Company manufactures other environmental instruments and high quality mechanical shaft seals. The shaft seals, based on a hydrostatic principle, have found acceptance on Nuclear Power Reactors.

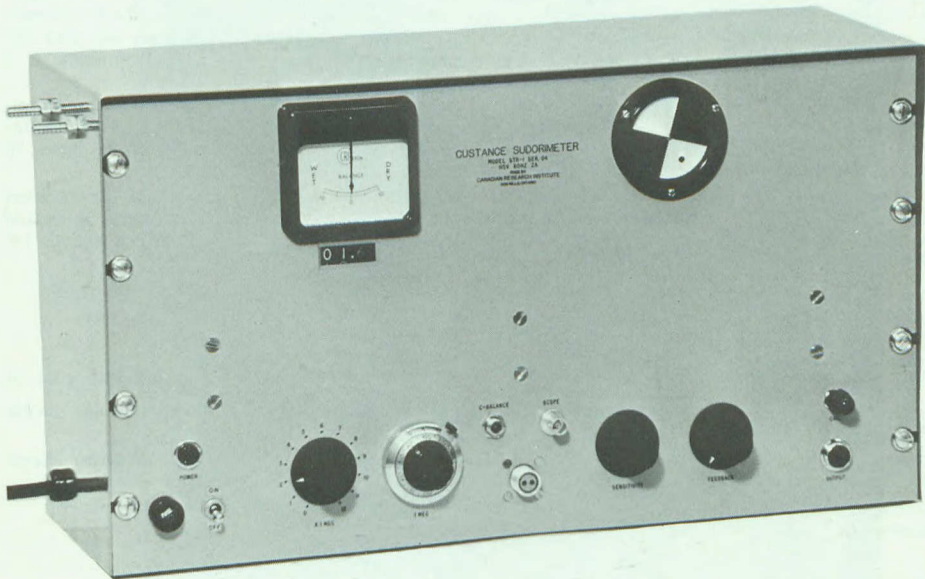


CUSTANCE SUDORIMETER

This new instrument developed by Canada's Defence Research Chemical, Radiation and Biological Laboratories and named after its inventor, Dr A. C. Custance is now being produced by Canadian Research Institute.

The instrument, finds wide use in physiological and psychological research, monitoring during anaesthesia, lie detection, human factors work, etc, etc. The instrument comprises a sensor which is applied to the human subject, capable of measuring small humidity changes. This variation with perspiration actuates a servo mechanism, driving a valve admitting dry air until a pre-established balance is again regained. The digital read-out is in linear relationship to the rate of flow of the restoring air. A sensitive panel indicator shows the degree and direction of unbalance, so that interesting psychological correlations are possible. Provision is made for external recording of results, and available models include single and dual-channel instruments, the latter permitting the use on two subjects simultaneously, or on two locations on the same subject.

A wide application of this instrument to operating room procedures, as a replacement or an extension of oximetry is anticipated. Because the time of response is less than one second, it will provide valuable supporting evidence in forensic lie detection.



H.F. SOUNDING SYSTEM

Long distance radio communication is dependent upon the ability of the Ionosphere to reflect the transmitted signal. To be able to guarantee communication between two stations at all times, a close watch must be kept on the reflecting properties of the Ionosphere so that the frequency giving optimum reflection can be selected for use. The Ionospheric measuring equipment was manufactured under Navy contract according to the requirements of 'Oblique Ionospheric Sounding System Standard' issued by the United States Defence Communication Agency and is only one of many complex equipments researched, designed, engineered and produced by EMI Electronics.

The Transmitter produces a binary-coded pulse train of 30KW p.e.p., 1, 2 or 3 milli-seconds long. Frequency coverage is from 2 Mc/s to 32 Mc/s in four octave bands, each octave having twenty spot frequencies linearly distributed. The pulse train consists of 100 micro-second pulses, each having a Gaussian profile. Ten, twenty or thirty pulses are used according to the pulse-train length, and the pulses are phase-reversal modulated. A train of thirty pulses at 30 KW gives a receiver signal, using pulse addition, equivalent to a single pulse transmitted at 900KW p.e.p., while the binary code enables the signal to be identified.

The Receiver sweeps through the eighty frequencies in synchronism with the transmitter. This is achieved by using highly stable oscillator and timing units, and by further synchronizing both units to time standard signals.

One receiver is capable of operation with any number of transmitters up to a maximum of ten. When a transmitted pulse train is received it is demodulated to provide a binary code, and the separate code elements are added to provide a signal pulse to the display.

Using the pulse-compression technique the power gain by a 30-bit pulse train over a single pulse is 14.8db, while retaining the resolution of a single pulse. The receiver display provides instantaneous information on the state of the Ionosphere as an Ionogram on a c.r.t. display. The Ionogram has an X axis of frequency from 2 Mc/s to 32 Mc/s in eighty steps, and a Y axis of elapsed time. The reflection from the Ionosphere modulates the Z axis to provide a bright-up signal. The low weight and minimal power consumption of the receiver means that it may be fitted into any truck, ship or aircraft having sufficient space.

A Paper Recorder connected to the receiver provides a continuous reference to past conditions. The paper record has eighty channels, one for each frequency, arranged across the paper at sixteen channels to the inch. Elapsed time is recorded along the length of the paper at the rate of one inch per hour, with unique marks at noon and midnight. Each channel records a signal received as a mark on the paper, so that the paper record does not give detailed information, just the fact that a signal was received on a particular frequency at a specified time.

A specially designed, rugged Camera uses standard 100 ft 35 mm daylight-loading spools of film to automatically record Ionograms. The camera has a Wollensak f 1.9 to f 22 Raptor lens, and a flat-field non-distorting optical system. A data chamber provides three types of data: time, date, and exposure number.

The Remote Display c.r.t. provides an Ionogram similar to the one shown at the receiver unit. Either of these Ionograms may be photographed by using the special camera. It should be noted that a photographic record provides complete information concerning a signal, i.e. frequencies reflected, number of hops, etc.

TRANSMITTER

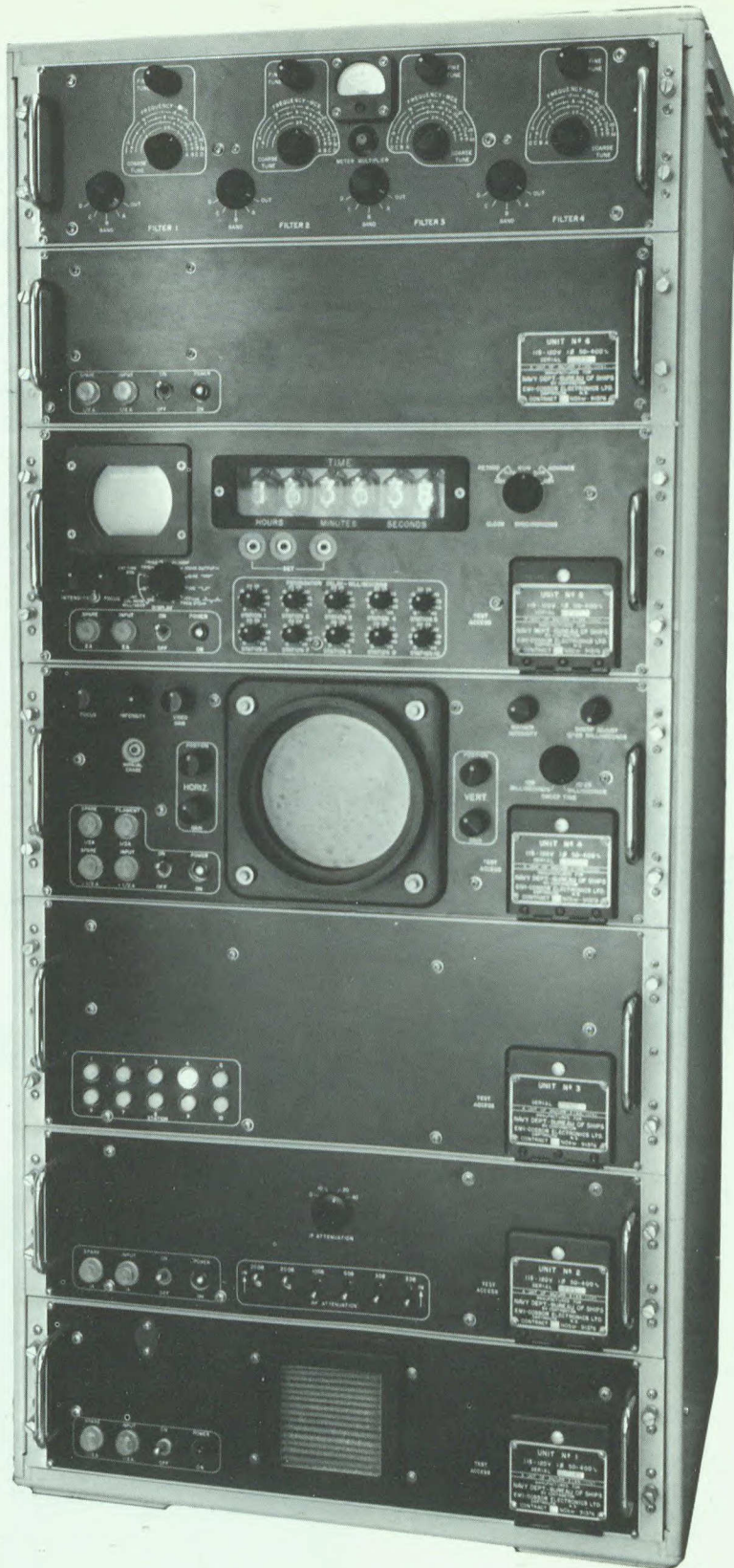
<i>Frequency response:</i>	Output power within 1 db below and 2 db above nominal.
<i>Output power:</i>	30 KW p.e.p.
<i>Duty cycle:</i>	6 per cent max.
<i>PRF:</i>	20 pulse trains per second.
<i>Pulse train:</i>	2 at each frequency per transmission cycle, each consisting of 10, 20 or 30 pulses.
<i>Pulses:</i>	100 μ Sec. duration, phase reversal modulated, Gaussian profile.
<i>Stability:</i>	One part in 10^6 per day.
<i>Accuracy:</i>	One part in 10^6 .
<i>Power Supply variation:</i>	10 per cent change causes less than one part in 10^6 frequency change.
<i>Spurious and harmonic levels:</i>	50 db minimum below the output signal level.

RECEIVER

<i>Sensitivity:</i>	$3 \mu V$ for $\frac{S + N}{N}$ ratio of 20 db.
<i>Overload recovery time:</i>	Less than 500 μ Sec.
<i>Selectivity—</i>	
<i>adjacent channel rejection:</i>	20 db minimum
<i>beyond adjacent channel rejection:</i>	60 db minimum

POWER SUPPLIES REQUIRED

<i>Transmitter:</i>	208V 3 phase 50 or 60 c/s.
<i>Receiver:</i>	115V or 120V at 2 amps single phase 50 to 400 c/s.
<i>Frequency coverage:</i>	2 Mc/s to 32 Mc/s by eighty spot frequencies.



INFRA-RED SPOTTING DEVICE

This infra-red measuring device compares the object radiance to a reference radiance level. The reference level may be varied to meet varying conditions. It is designed to use as a reference signal any other object or background such as a wall in a building or the ground when outdoors. Calibration is carried out by aiming the equipment at the background and then adjusting the threshold control until the audio tone is just extinguished. When the gun is now aimed at an object which emits more radiance than the background an audio tone will be emitted from the speaker. An earphone is available for high noise level environments.

The range of applications is limitless covering such obvious applications as stores or hangars surveillance, electrical checks for overheated ballasts or connections as well as the location of the fire source in smoke filled areas or between walls and ceilings.

This is another development and production by Spar Aerospace Products.

PERFORMANCE

Minimum Detectable Temperature Difference.

(Minimum temperature of the object above ambient which is just detectable depends on ambient temperature).

<i>Object Temp.</i>	<i>Ambient Temp.</i>	<i>MDTD</i>
95°F (35C)	75°F (24C)	20°F (7C)
<i>Field View</i>	6° x 6° angle	
<i>Distance to Size</i>	Area covered at 10 ft. (3.04m) is 1 ft. x 1 ft. (.3 x .3m)	
<i>Ratio</i>	Area covered at 20 ft. (6m) is 2 ft. x 2 ft. (.6 x .6m)	
<i>Spectral Response</i>	2.5 - 2.7 microns.	
<i>Response Time</i>	Less than .25 seconds i.e. for a surface at 10 ft. (3.04m) away, scanning rate should not exceed 4 ft. (1.2m) at 20 ft., 8 ft. (6m, 2.4m) per second etc.	
<i>Dynamic Range</i>	Approx. 95°F. to 500°F. 356 - 260°C.)	
<i>Operating Temp. Range</i>	-10°F. to +130°F. (-23 - +55°C.)	
<i>Range</i>	The range of the equipment is virtually unlimited. It can see a cigarette at 50 feet, (15m), a barbecue fire at 1,000 feet (304m), or the sun at 93,000,000 miles (149,665.000km).	



SOLID STATE POWER CONDITIONING DEVICES

Spar Aerospace Products Ltd. has over ten years of experience in the design, development and manufacture of many types of solid state power conversion of equipment for aerospace, marine and land vehicle applications. The group is supported by manufacturing and quality control facilities experienced in the volume fabrication of such equipment, thus ensuring that all aspects of the power conversion field from conceptual studies through manufacturing to field support can be implemented to meet the full requirements of customers.

The SPS 44 solid state, 2.5 kva frequency converter is designed to meet the needs for aircraft, vehicular and marine electrical power conversion. Primary application: converting variable-frequency input power to frequency regulated 400 Hz output power. This power converter is used in power systems where conventional engine driven alternators are directly coupled to the accessory pad, and a medium level power source with constant frequency is necessary for frequency sensitive electrical equipment. Complex and weighty CSU drives may be eliminated where bulk of power is used for heating, lighting and rectifier loads. It is fully qualified to MIL-E-5272.

INPUT POWER

106 - 120 volt rms, line-to-neutral: 300 - 550 Hz 3-phase: 4-wire
190 volt transients for 100 ms line-to-neutral
2000 volt transients for 0.5 μ s line-to-line

OUTPUT POWER

112.5 - 118 volt rms line-to-neutral: 400 Hz $\pm 2\%$ 3-phase: 4-wire
2.5 kva continuous: 3.25 kva for 5 minutes
0.75 lag to 0.9 lead power factor
300 va of 115 v 3-phase delta output
200 va of 26 v single-phase output
300% short circuit current for 5 seconds, any configuration
4% total voltage waveform harmonic content
120° $\pm 1.5^\circ$ phase displacement for balanced loads
75% efficiency at full load.

The SPS 45 is a compact, solid-state, remotely controlled light dimming device designed to provide simultaneous, efficient brightness control of both 5.5-v and 28-v instrument lamps without additional transformers or resistors. Developed to meet the needs of one particular type of aircraft, the SPS 45 is readily adaptable to a wide variety of aircraft, vehicular or marine applications.

The SPS 45 operates from any 115-v, single-phase, 300Hz-550Hz supply. It meets the requirements of MIL-E-5272 and MIL-E-5400. Its high reliability design provides many advantages for dimming rugged, low-voltage lamps in both new aircraft and retrofit applications. It is short circuit proof and has a design MTBF of 7,000 hours.

INPUT POWER

106 - 120 volt rms
300 - 550 Hz
MIL-STD-704 transients

OUTPUT POWER

5.0 to 28 volts rms; 200 VA @ 28 v
1.15 to 5.5 volts rms; 75 VA @ 5.5 v
Outputs combined: 100 VA @ 28 v plus
50 VA @ 5.5 v
Short circuit: 5 seconds without damage.

MECHANICAL

Weight: 37 lbs. (16.8 kg)
Size: $\frac{3}{4}$ ATR, full 22.5" x 7.5" x 7.5"
(57 x 19 x 19 cm)
Self-cooled.

ENVIRONMENTAL SPECIFICATIONS

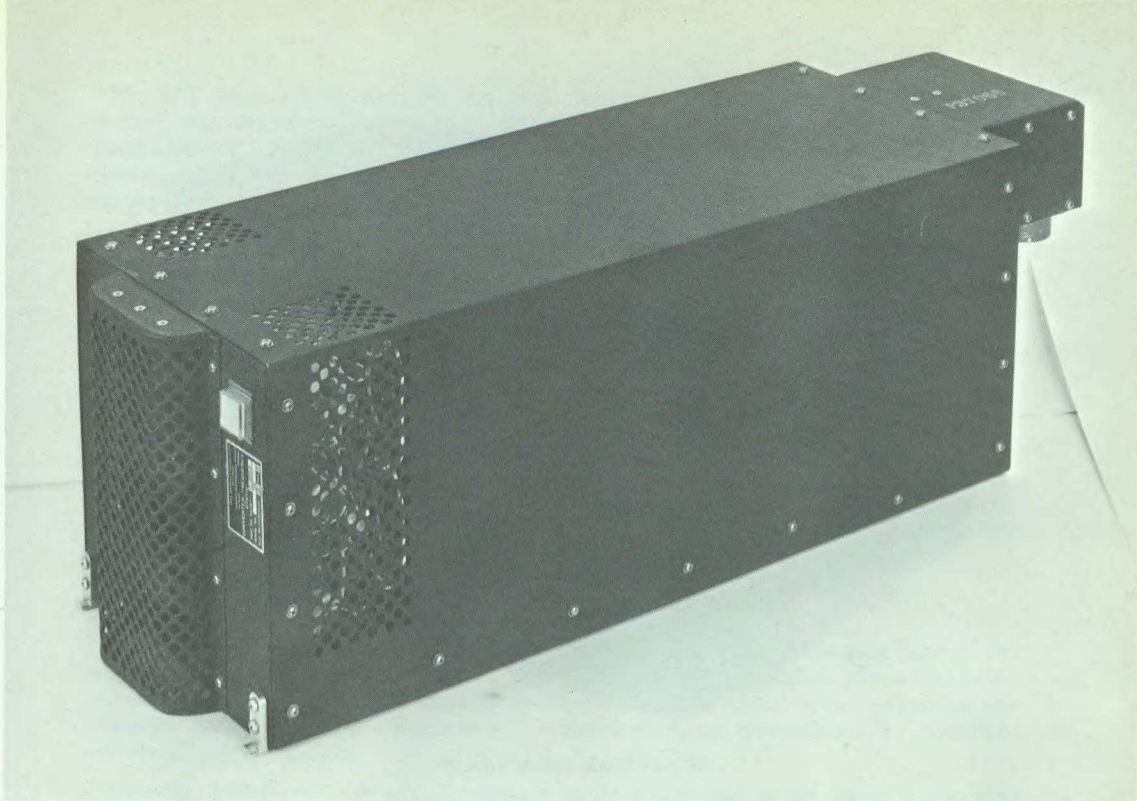
Temperature: -54° to 71°C (-62° to 160°F), 85°C (185°F) for 5 minutes
Altitude: 36,000 ft. (11,000 m)
Vibration: MIL-E-5272, procedure V
EMI: MIL-I-6181
Salt spray: MIL-E-5272, procedure I
Sand & dust: MIL-E-5272, procedure I
Fungus: CAM 4b, appendix I

MECHANICAL

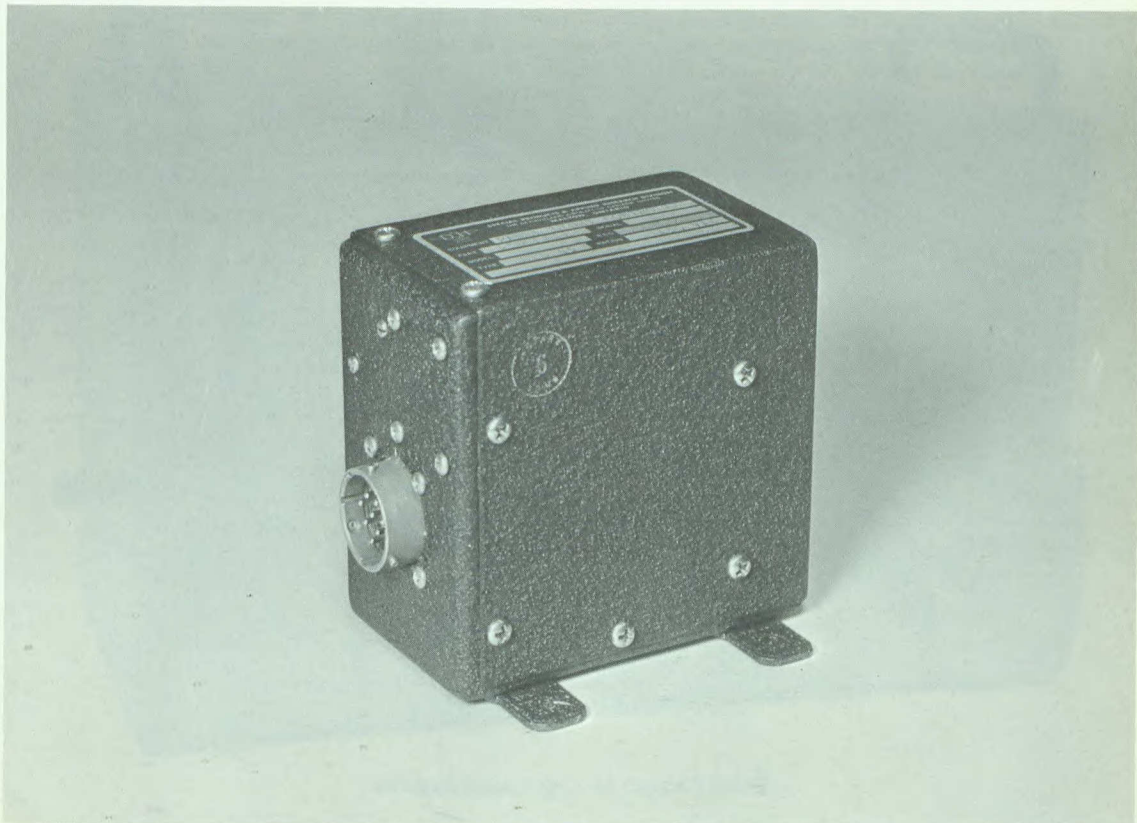
Weight: 36 ounces (1 kg)
Size: 4 x 2½ x 4 ins.
(10.2 x 6.3 x 10.2 cm)

ENVIRONMENTAL SPECIFICATIONS

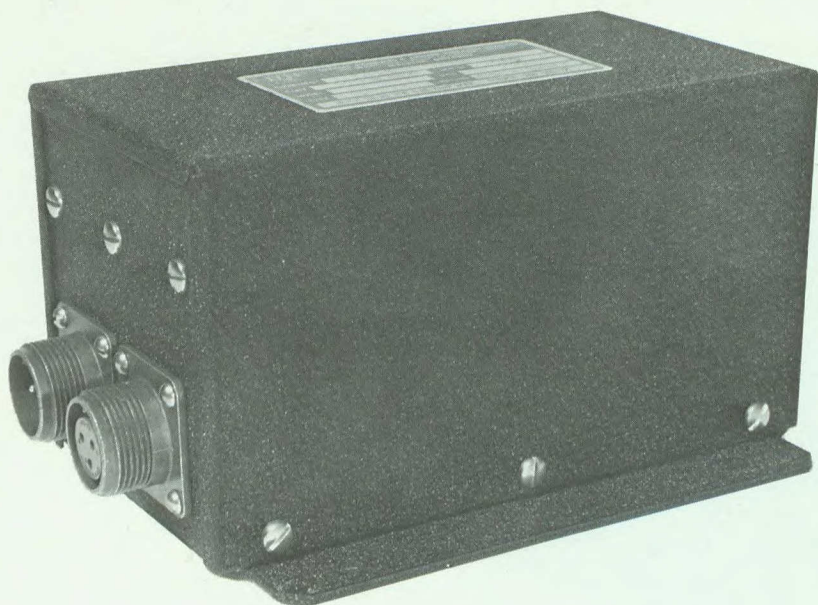
Temperature: -54°C to +71°C, 85°C for 5 minutes
Altitude: 36,000 feet (11,000 m)
Vibration: MIL-E-5272, procedure XII
Shock: MIL-E-5272, procedure V
EMI: MIL-I-6181
Salt spray: MIL-E-5272, procedure I
Fungus: CAM 4b, appendix I
Humidity: 240 hours, 95% RH
Acceleration: 15 g, 3 axes.



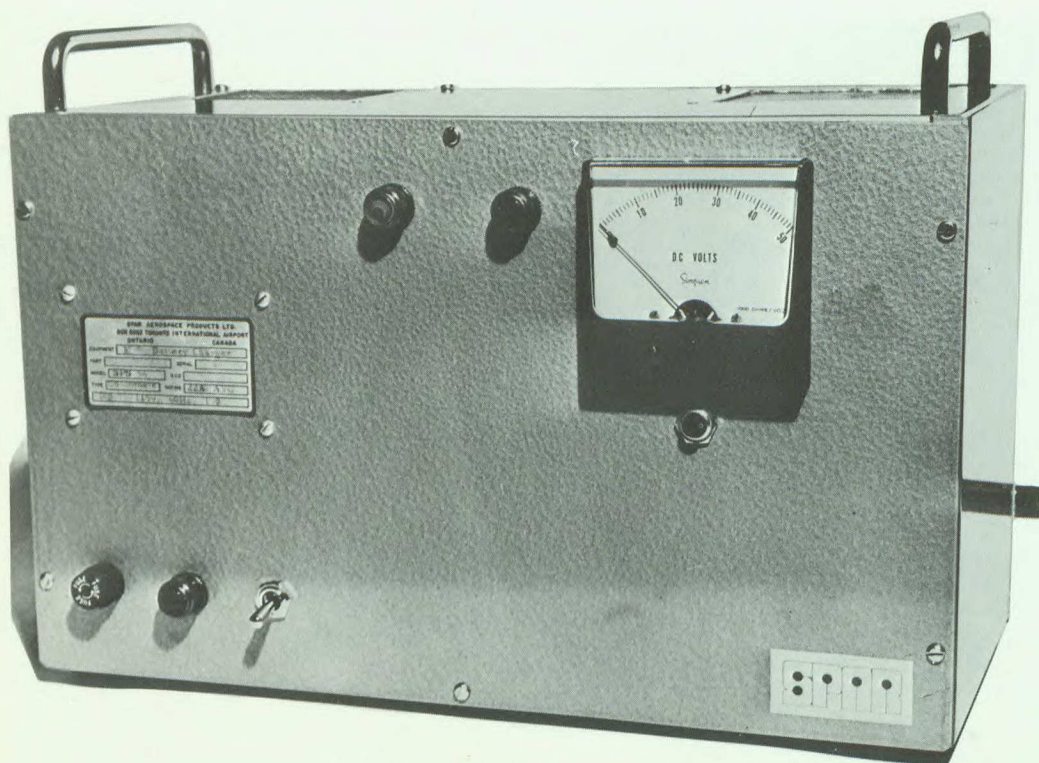
SPS-44 Power Frequency Converter



SPS-45 Panel Light Controller



SPS-48 Static Power Inverter



Bench Charger for Coulometer Batteries

The SPS 48 is a solid state, 65 VA single phase inverter that operates from an input of 20-30 vdc and provides single phase 400 Hz output at either 26 or 115 volts rms or a combination of both. The unit is used in airborne and ground applications where 400 Hz instrument power is required. Through Spar engineering, the inverter can be applied to all military and civilian aircraft and to vehicular and marine applications.

INPUT POWER

20 - 30 vdc
80 volt transient MIL-STD-704
Reverse polarity protected

OUTPUT POWER

115 volt rms or 26 volt rms (or combination)
Single phase
400 Hz $\pm 1\%$
 $\pm 2\%$ voltage regulation (line, load and temperature)
65 VA
0.7 pf lag to 0.9 pf lead
200% short circuit current
150% power overload for 5 min.
5% total harmonic distortion
65% efficiency

MECHANICAL

4.7 in. x 6.7 in. x 3.4 in. (12 x 17 x 8.6 cm)
overall including connectors and base plate
3.25 lb. (1.48 kg) (If unit required to operate fully immersed in water, add 1 lb. 11 oz. (.79 kg))

ENVIRONMENTAL SPECIFICATIONS

Designed to the requirements of TSO-C73
Temperature: -55°C to $+71^{\circ}\text{C}$
Altitude: to 50,000 ft.
Humidity: 48 hours at 95% RH at 50°C
Shock: 6G for 10 ms/plus crash safety 15G
Vibration: 5G max.
RFI: MIL-I-6181D

A recent development at Spar is the Coulometer Controlled Battery Charging System. The Spar Battery Charger forms the base of a sophisticated system designed to provide regulated, maximum-efficiency charging of modern Ni-Cd batteries. Controlled by a coulometer unit within the battery pack, the charger ensures high-rate-of-charge replenishment in accordance with the battery application.

Constant, high-current charging is provided in the initial part of the charge cycle, after which an automatic pulsed overcharge is supplied; this ensures optimum charging with improved battery performance and extended life, assists in cell equalization and reduces field maintenance.

The Coulometer cell measures the quantity of charge removed from the battery during operation, and controls the charging circuit replenishing the battery with an equal amount of charge during the charging cycle. The significant advantages of this system over the presently used constant-potential or constant-current systems are:

- In-service batteries are maintained at a full-charge condition, even with repeated discharge and charge cycles.
- Batteries with unknown past history can be put on charge and most efficiently brought to their full capacity.
- Variable charge rates to suit operating conditions are simple and practical.
- Thermal run-away problems with present Ni-Cd battery charging systems are overcome.
- Equalization of cell voltages is accomplished during the initial operation period with a new battery, and subsequently maintained in service.
- Battery maintenance is reduced; field failures due to gassing and thermal problems are eliminated.
- System efficiency and reliability are improved.
- Provision is made for primary rather than secondary charge control.
- Designs are available for virtually all current ratings and battery capacities for any application.

STATIC INVERTERS

A research and development programme now going into its sixth year at Garrett Manufacturing Limited has produced static inverters as a logical follow-up for this company's work in solid state controls. After evaluating several inverter techniques Garrett has now developed a line of low power single phase sine wave static inverters mainly for aircraft and ground vehicle use. The following are typical units now available:

75VA Static Inverter for Land Navigation Systems

Input — 20-30 VDC
75 VA 26 VRMS $\pm 1.5V$ 400 Hz $\pm 2\%$
Output —
15 VA 38 $\pm 2\%$ VAC 800 Hz $\pm 2\%$
Weight — 10 pounds (4.5 kg)
Can be supplied with phase adapter to operate three phase gyro.

This unit is designed to provide A.C. power for the Army's Land Navigation Systems and serves either the LN 101 (Gyro Compass) or the LN 102 (Magnetic Compass). For further association see pages 264-267.

150VA Static Inverter for U.S. Army P/N 10516412

Frequency — 400 ± 4 cycles
Input — 24 volts ± 6 volts
Output —
115 volts $\pm 5\%$ single phase A.C.
Convection Cooled — no fan.
Dimensions — 7.5" W. x 10.25" L. x 6.0" H.
(19 x 26 x 15 cm)
Weight — 16 pounds (7.25 kg)
Waterproof.

This unit has been qualified to Specification MIL-1-60166 (MU) and is on the Qualified Products List.

250VA Static Inverter for Light Aircraft and Helicopters

This unit has been designed to replace existing rotary inverters. Physically interchangeable with rotary inverters, MS 21983. The unit is lighter and has higher efficiency at a comparable cost. It will be supplied with FAA TSO C73 certification.

Dimensions — 4.75" W. x 6.25" H. x 9.25" L.
Dimensions — (12 x 16 x 23 cm)
Input — 20-30 VDC
Output —
115 ± 5 volts 400 $\pm 1\%$ single phase AC.
26 $\pm 1\frac{1}{2}$ volts 400 $\pm 1\%$ single phase AC.
Convection Cooling — no fans.
Overload — 150% for five minutes
Weight — 10 pounds (4.5 kg)
Maximum Ambient — 71°C
Efficiency — 70%
Reverse polarity protection included.

Short Circuit — Will withstand an output short circuit indefinitely without incurring damage and will provide a minimum of 25% of the rated current to clear a fault (by tripping fault-load circuit breaker).

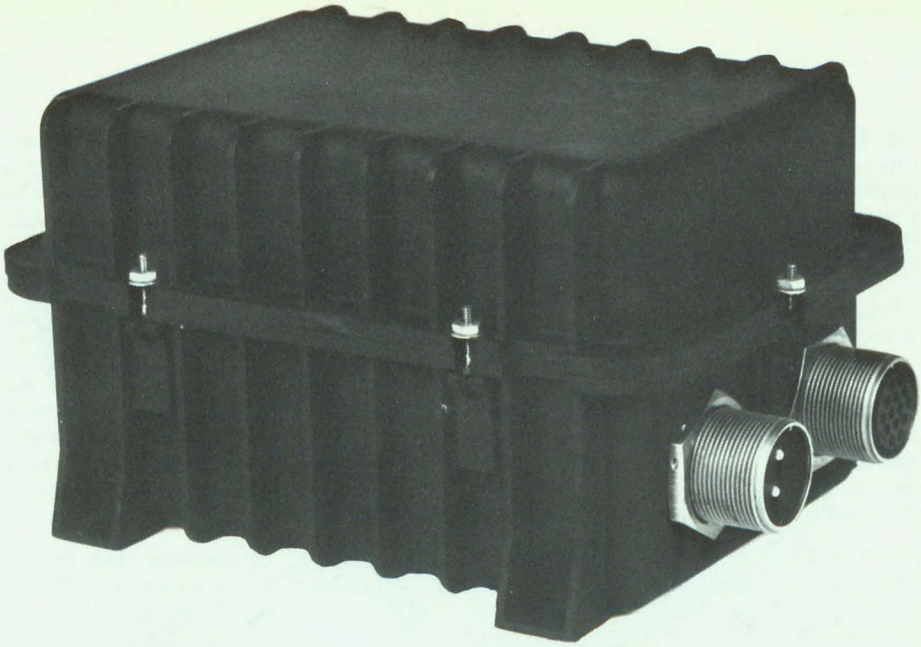
Basic 250VA units can be connected in parallel to form 500, 750 or 1000VA single phase power, or alternately three units can be connected as 750VA three phase unit.

500VA Static Inverter

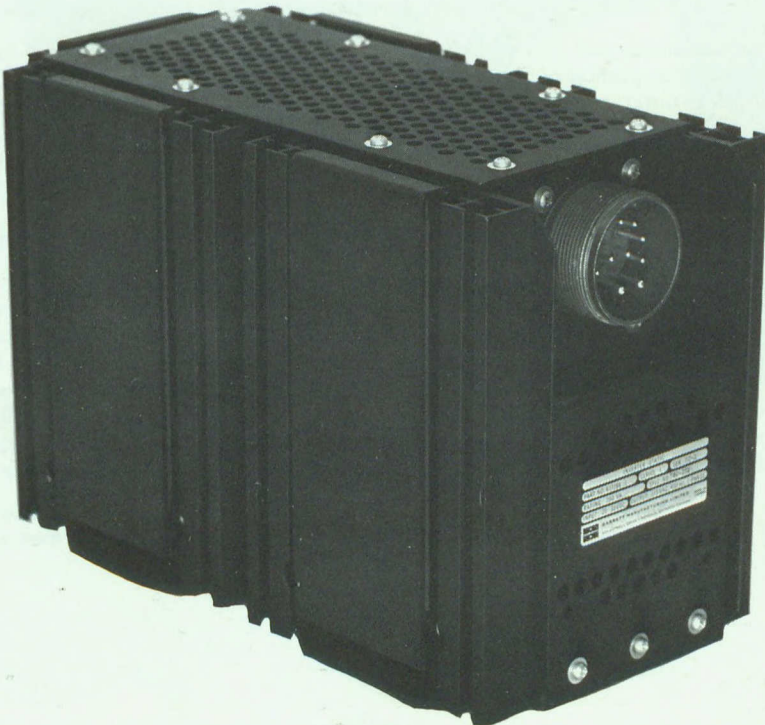
Size — $\frac{3}{4}$ ATR Short — Rack Mount
Input — 21.5 V — 27.5 VDC
Output —
115 + 4.5 V, 400 $\pm 1\%$ HZ Single Phase AC
- 2.5
Convection Cooling — No Fan.
Efficiency — 80% Minimum
Weight — 17 pounds (7.7 kg)
150% for five minutes
Overload —
200% for five seconds

Short Circuit Capability — Will provide a minimum of 250% rated current for 10 seconds into a short circuit placed on its output. In the event of the short existing for longer than ten seconds (i.e. hang-up of fault load breaker) the unit will then self protect until the fault is removed.

Maximum Ambient Temperature — +71°C.



A E L — 75 VA Static Inverter for Land Navigation System.



250 VA Static Inverter for Light Aircraft & Helicopters.

REFLECTION METER—CG-6

The Canadian Research Institute Model CG-6 Reflection Meter is basically a device for shining a standardized light on the sample under study and measuring the quantity and quality of light reflected back on a photo-electric cell. To do this in an easily utilizable way, a simple computer circuit drives a sensitive galvanometer. Depending on the direction of the incident light and the reflected light selected for analysis, the instrument may be used for diffuse reflection, colour, whiteness, brightness, opacity, gloss or sheen.

The Model CG-6 Reflection Meter finds applications in so many fields that its use is virtually limited only by the ingenuity of the operator.

The Model CG-6 can be used without alteration with a wide variety of standard search units or "heads" as well as custom built heads for special applications, all of which plug in to the instrument proper. For diffuse reflection, including several modes of measuring colour, the light strikes the test surface normally and is measured in a conical segment with an average angle of reflection of 45°. Since measurement is taken in all meridian planes, the reflection from surfaces showing directional texture is averaged over 360°.

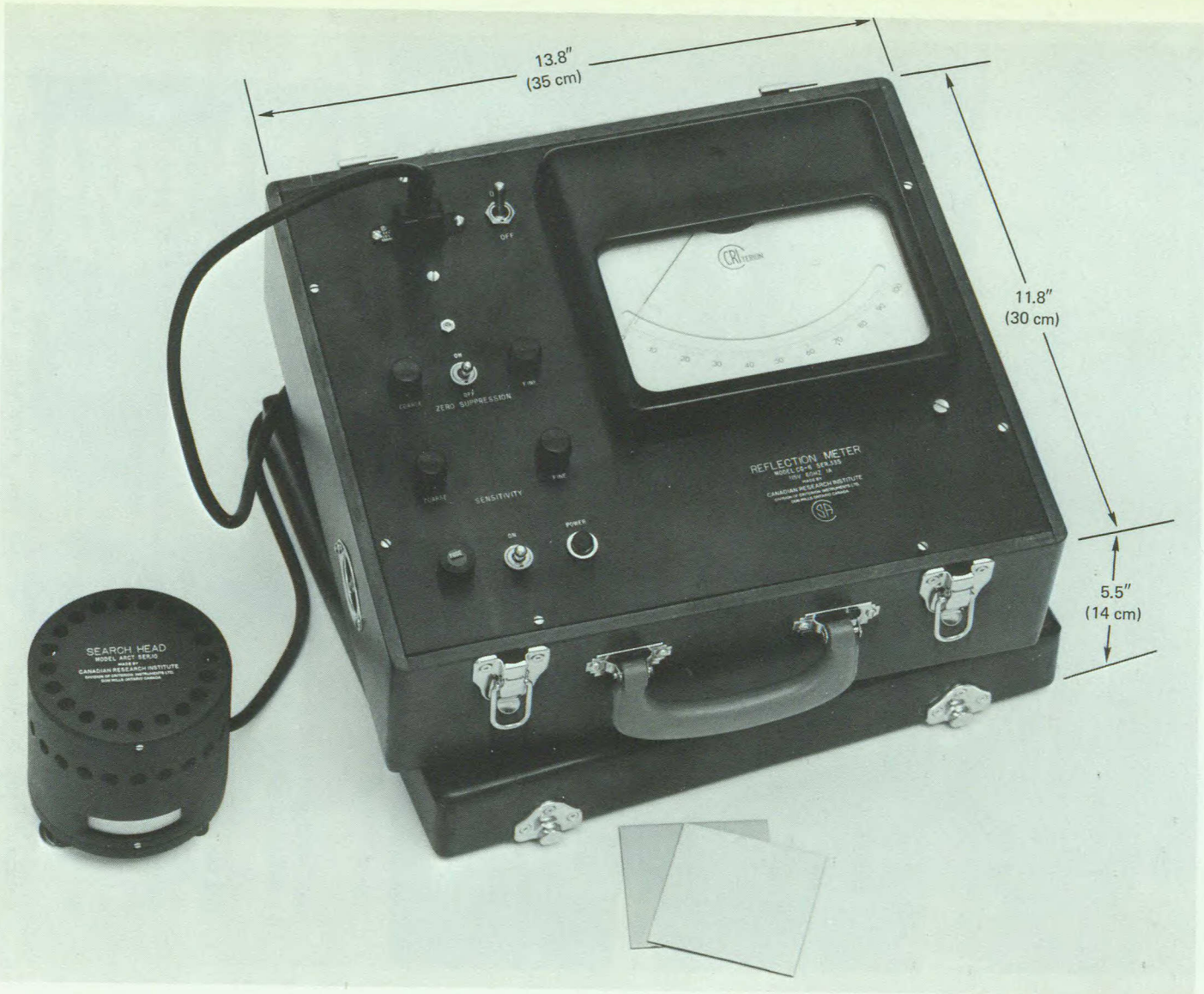
For gloss measurement, the search units provide angles of incidence and inspection which are the same but diametrically opposed. Gloss heads are available for all of the commonly used incident angles as required in the paint, plastic, ceramic, metal and paper industries.

The Model CG-6 is also an extremely sensitive and accurate Colour Difference Meter, having even wider scope than some instruments specifically offered to measure colour difference. A combination of scale expansion and scale suppression features built into the instrument, permit the user to utilize the 155 mm scale normally showing 0 to 100% reflection as, say, 0 to 25% for very dark samples with a 4 X scale magnification, or 55 to 80% for light samples, again with 4 X expansion. These features, completely at the expression of the operator (within the ultimate sensitivity of the meter) solve the problem of matching dark colours in textiles and of matching whites in the appliance trade.

For the measurement of colour and colour difference, the Model ARCT Search Unit covers a 16 mm diameter portion of the sample, and is for use with up to 4 optical filters 25 mm diameter in a turret for immediate use of any one filter. Any system of Wratten-type (gelatin) or glass filters may be used, but the instrument reaches its peak of utility when the three tristimulus filters are used. Results of measurements made with the CG-6 and tristimulus filters are in close agreement with CIE readings, and permit impersonal and international identification of colour. Values may be converted to reflectance, dominant wavelength and purity or brilliance, hue and saturation, or value, hue and chroma — all alternative modes of expression of colour or left as CIE — X, Y, Z.

For the measurement of gloss, no such international agreement has been reached as applies to colour. Several different industries have their own conventions regarding the expression of gloss. Specular gloss is determined by shining a pencil of light on to the surface to be measured at a specified incident angle, and measuring the light reflected at an equal but opposite angle. Calibration is in reference to polished black glass standards. Available search units utilize angles of 45, 60, 75 and 85° with a universal model in preparation. Most measurements are made at a 60° angle. (See the special application notes below).

While the Model CG-6 Reflection Meter finds wide usage for the more obvious measurement of colour and gloss, it is also invaluable for many less direct tests used in science, industry and medicine.



13.8"
(35 cm)

11.8"
(30 cm)

5.5"
(14 cm)



REFLECTION METER
MODEL CS-4 1978-1980
100% MADE IN CANADA
CANADIAN RESEARCH INSTITUTE
1000 UNIVERSITY AVENUE
TORONTO, ONTARIO M5S 1A5
CANADA
C.R.I. PERSON

SEARCH HEAD
MODEL SCS-2000
MADE IN CANADA
CANADIAN RESEARCH INSTITUTE
1000 UNIVERSITY AVENUE
TORONTO, ONTARIO M5S 1A5
CANADA
C.R.I. PERSON

PRECISION TRACKING CONTROLS

The Slewstick Control, designed and built in Canada by Bourns (Canada) Ltd., is used to manually control elevation and azimuth, on parabolic dish, precision tracking antennae.

The control consists of a handle supported on a ball, by virtue of which, two Precision Potentiometers are controlled. The ball is in a teflon socket, with freedom of plus or minus 30 degrees in two axis at right angles to each other. The ball and socket arrangement is let into a plate which forms part of the instrument housing and serves also as the top of the instrument. The handle is installed in such a manner – by means of a spring and roller – that it will return to a central position in the 'hands-off' mode.

Extending through the top of the handle is a shaft with a push button. Depressing this push button, allows the operator to actuate a pair of micro switches and thereby engage the control mechanism.

Employment of the Slewstick Control produces rotation of the Precision Potentiometers which is directly proportional to the angle of displacement in the two axes, which in turn controls the antenna tracking.

The unit has been tested across a temperature range from 0° to 50°C and operation is satisfactory throughout.

Bourns (Canada) Ltd. is active in the design and manufacture of unique electro mechanical and electronic devices, and has an enviable background of experience and 'know-how' at its command.



STEPPER MOTORS

Size 18VR — 15° Step Angle

Novatronics Ltd. 18M34A1 VR stepper motors have a multi-toothed soft iron rotor. When DC pulses are appropriately applied to the stator windings the resulting magnetic field causes the nearest rotor tooth to line up for minimum magnetic reluctance (smallest air gap). By energizing the stator windings sequentially the stator field is made to rotate in steps either clockwise or counterclockwise. Rotation of the stator field will cause the rotor to follow.

The 18M34A1 stepper motor has a rotor inertia of only 3.66 g cm². A stable air gap is maintained by bonding the stator to the housing and using material with compatible temperature coefficients.

• General Specifications

Mechanical Data

Weight	12.8 oz.
Rotor Inertia020 oz. in. ²
Holding Torque	10 oz. in.
Pull-in Torque at 200 Steps/sec	4.3 oz. in.
Step Angle	15°
Pull-out Rate (no load)	520 steps/sec.
Pull-in Rate (no load)	500 steps/sec.

All tests performed after thermal stability with instrument mounted on standard heat sink and in ambient of 25° C.

Electrical Data

Stator Winding	4 phase
Supply Voltage	28 volts D.C.
Resistance (R) per Phase	52 ohms.

Switching Mode

Terminal	Yel.	Red	White	Black
CW	—	—	+	+
	+	—	—	+
CCW	+	+	—	—
	—	+	+	—

Green connected to positive. Motor rotation as viewed from shaft end.

• Options Available

- Special windings
- Special torque/speed characteristics
- Terminals instead of leads
- Different shaft lengths
- Pinion shaft ends

Size 08PM — 45° Step Angle

Novatronics Ltd. type 08M30K3 four-phase motor have a permanent magnet rotor. The rotor lines up with the stator magnetic field produced when DC pulses are applied to the stator windings. By switching the polarity of the DC voltages in a particular way the stator field is made to rotate in steps either clockwise or counterclockwise. The rotor and shaft will follow.

The 08M30K3 stepper motor uses a special patented magnet to insure maximum energy retention over a long service life. A stable air gap is maintained by bonding the stator to the housing and using materials with compatible temperature coefficients.

• General Specifications

Mechanical Data

Weight	1.6 oz.
Rotor Inertia004 oz. in. ²
Holding Torque40 oz. in. (min.)
Pull-out Torque at 160 steps/sec	.3 oz. in.
Operating Temperature	
Range	-55°C to +100°C
Pull-out Rate (no load)	800 steps/sec. (min.)
Pull-in Rate (no load)	235 steps/sec. (min.)
Normal Step Angle	45°

All tests performed after thermal stability with instrument mounted on standard heat sink and in ambient of 25°C.

Electrical Data

Stator Winding	4 phase, 4 pole
Supply Voltage	28 volts D.C.
Resistance (R) Per Phase	200 ohms.
Rotor	permanent magnet

Switching Mode (180° Rotation)

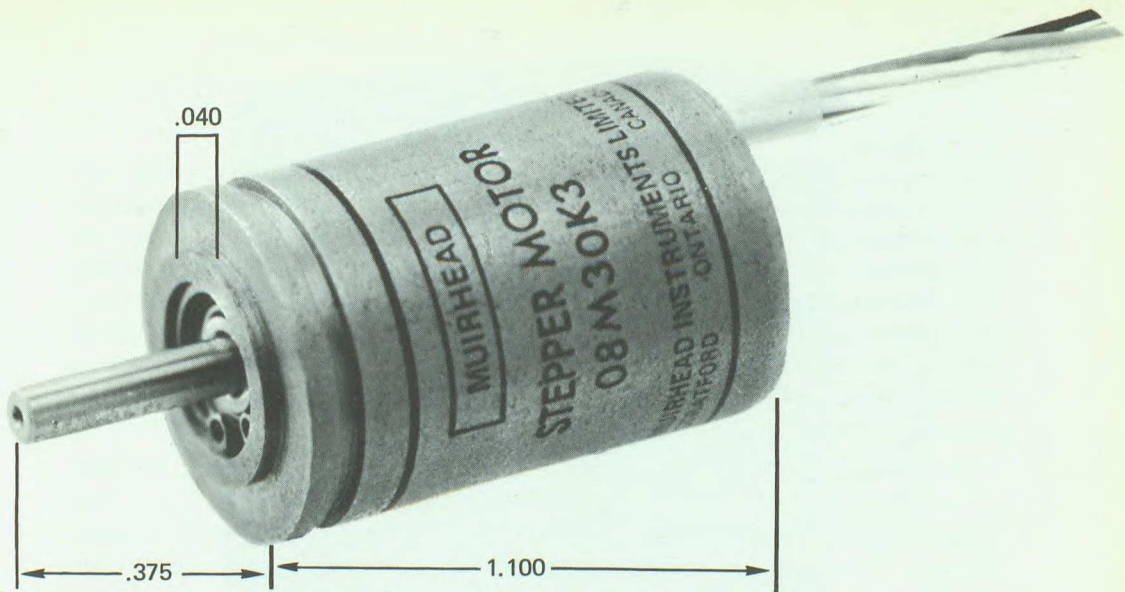
Terminal Step	Yel.	Red	White	Black
CW 1	—	—	+	+
2	+	—	—	+
3 CCW	+	+	—	—
4	—	+	+	—

Terminals Red/Black & Green connected to positive. Motor rotation as viewed from shaft end.

• Options Available

- Special windings
- Special torque/speed characteristics
- Terminals instead of leads
- Different shaft lengths
- Pinion shaft ends

Novatronics Ltd. also produce a range of logic drivers, stepping transmitters, gearheads in sizes 08, 10 & 11, servomotors in 08, 10, 11, 15 & 18, tandem synchros and tandem motor/gearhead/synchros as well as custom gyro motor stators.



ELECTROMAGNETIC INDICATORS

New electromagnetic indicators now in full production at Novatronics Ltd. provide a remarkably versatile display concept. The H2100 electromagnetic indicator module operates from DC pulses applied to its stator coils. There is only one moving part — permanent magnet rotor with indicator drum — mounted on self-lubricating bearing. Exceptionally long life is insured by flotation of the rotor assembly in the stator magnetic field. A special magnet insures maximum energy retention for long service life in adverse conditions. The stator is attached to a military grade PCB. Random access to display character permits direct instantaneous readout.

The indicators, even in direct sunlight, are readable at 12 ft. (3.6m). For dark or poor lighting conditions internal illumination is available. Weight is less than 1 ounce and design exceeds MIL-E-5400 Class 2. The H2100 series is designed for front-of-panel mounting and can be supplied as a module or as a multi-digit assembly. Typical applications are; airborne displays, shipboard and ground test equipment, computer readouts, instrumentation and control systems, and communications information display.

• General Specifications

Typical specifications for Series H2000 and H2100 Indicators are shown below.

No. of Positions 11
Standard Characters 0 to 9 with blank
Character Size 0.26" high x 0.19" wide
(6.6 x 4.8 mm)
Colors White characters on matte black
background
Viewing Angle 45°
Input Voltage 6 volts DC
Input Power 0.9 watts
Duty Cycle continuous at 77°F. (25°C)
Minimum Pulse Duration for random
entry 0.5 sec at 77°F. (25°C)
Minimum Pulse Duration for switching
adjacent characters 0.1 sec. at 77°F.
(25°C)
Electrical Connections 12 (plus 2 if in-
ternal lighting required)
MIL Design Specs Mil-E-5400 Class 2
Character Alignment When energized
no part of a character is cut off by the
upper or lower edge of the window. The
vertical centre line of each character is
aligned with centre line of the window
within $\pm .020$.

Weight less than 1 oz.

Operating (continuous duty cycle)

Temperature Range -4°F to 158°F
(-20°C to 70°C)

Storage Temperature

Range -85°F to 212°F
(-65°C to 100°C)

Case high impact resistant
plastic with dull black finish.

• Options Available

Number of Positions 0 to 12
Characters Other sizes and colors
available

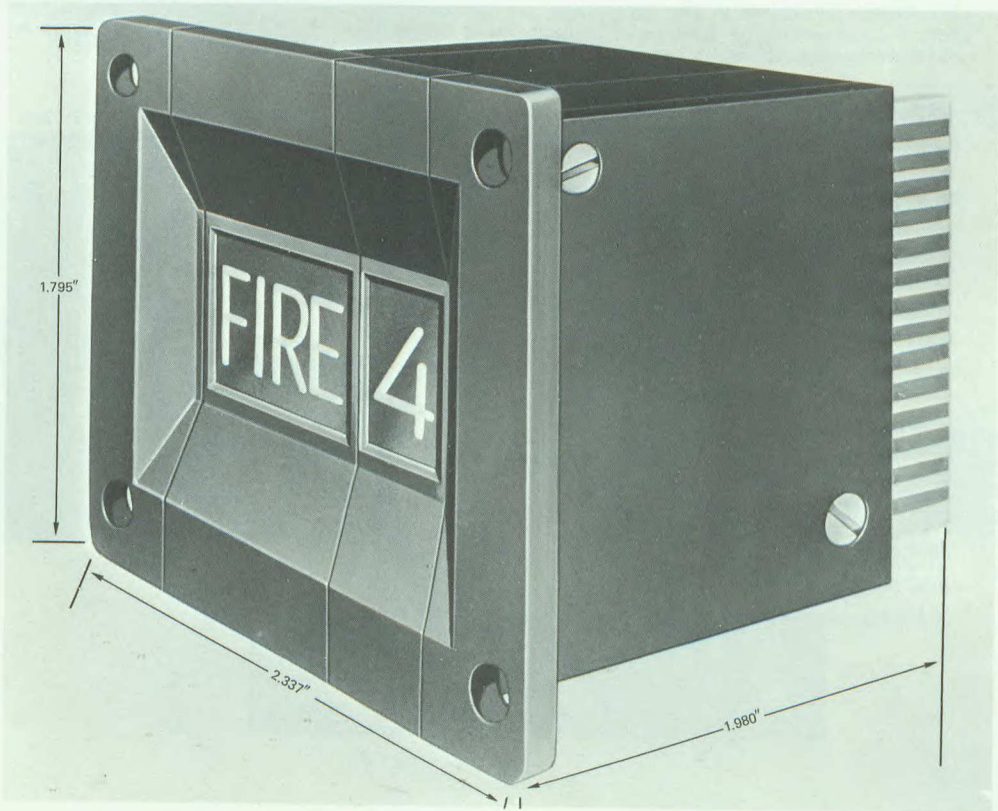
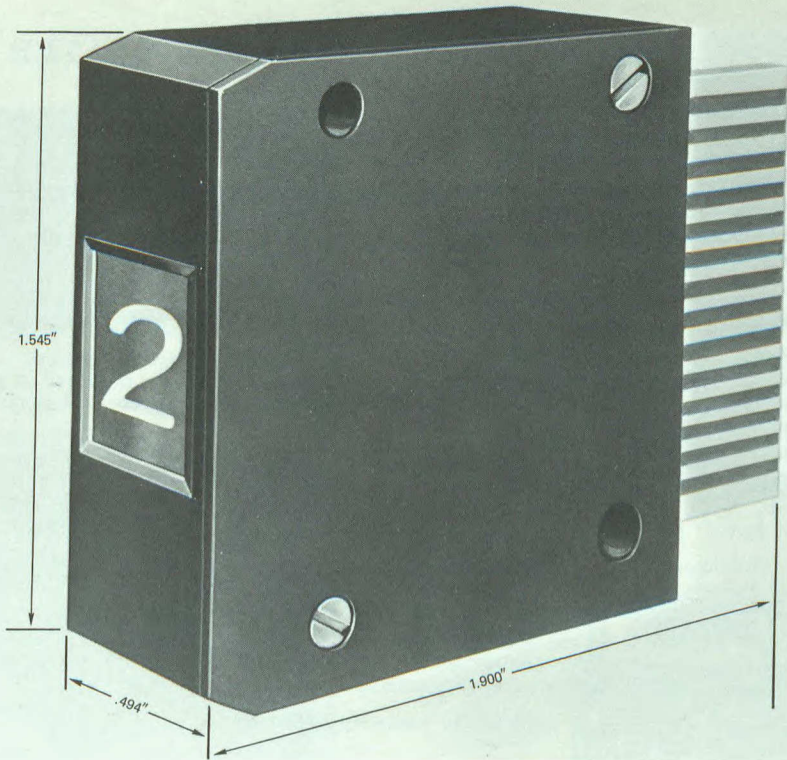
Terminations Lead wires or terminals

Sealing Cases can be sealed

Input Voltage 5, 12, 24 or 28 volts DC

Connection Table Other stator windings
permit other switching modes; e.g., a six
coil stator can be provided to give 12
positions with only 7 connections.

Internal Lighting Two unbased T-1 Size
—(MS24367) connected in parallel.
Lamps may be colour coated to MIL-L-
25467 RED or MIL-L-27160 BLUE-
WHITE. Lamp voltages may be 5.0, 12.0,
28.0.



PRINTED CIRCUIT BOARDS, MULTI-LAYER

The Specialized Components Division of the Canadian Marconi Company offers a complete modern facility for the production of complex multilayer circuit boards, to Military and rigid commercial specifications.

Multi-layer boards containing up to fourteen layers are in regular production and experimental boards up to twenty-four layers are being developed. Tolerances are maintained to Military and IPC-ML-925 standards. The etch back process is used on all plated through holes and finished hole sizes range down to .0135" (.34mm) diameter. Pattern plating is utilized to minimize under-cutting of circuitry. Circuit finishes available include nickel, gold, copper, rhodium, electroless tin, electro-deposited or fused tin lead. Other finishes are available upon request.

Single and double-sided boards with plated through holes and edges if required, are given the same attention to detail and tolerances. Chemically milled parts are produced in prototype and production quantities in a variety of metals including stainless steel, phosphor bronze and brass.

The facility is complete in every respect and is equipped to handle all requirements from the reduction of the master negative or chronoflex through to the finished product with terminals, jacks, connectors and angles installed and component stencilling applied. The finished item is packed in individually-sealed packages or to customers requirements.

The Divisional Quality Program, which conforms to accepted Canadian and United States Standards, assures continual compliance with applicable drawings and specifications and special customer requirements.

Constant monitoring of the plating processes by a Chemical Control Laboratory under a qualified Chemist and close control of all manufacturing operations by experienced personnel, ensures uniform quality in the final product.

Professional assistance is available to potential customers to assist in design, layout and production problems.

Delivery schedules are constantly monitored by means of a modern Data Collection system working into an IBM computer. This provides Production Control with up dated daily records of all jobs in process.

All boards illustrated in the photograph are fabricated to Military Specifications and represent a cross section of the type of printed circuit boards which are presently being produced in production quantities.

TOP RIGHT:

A 6-layer board, .062" (1.6mm) \pm .003" (.076mm) thick, plated gold over nickel. It has 1107 holes, 896 of which are in 28-hole, flat-pack configuration with finished diameters of .018" (.46mm) after plating.

TOP LEFT:

A standard single sided .062" (1.6mm) thick, tin lead plated.

CENTER RIGHT:

This is a single sided indicator lamp board of irregular shape.

CENTER LEFT:

A 5-layer board .062" (1.6mm) \pm .003" (.076mm) thick with 675 holes most of which are .021" (.53mm) diameter after plating.

BOTTOM RIGHT:

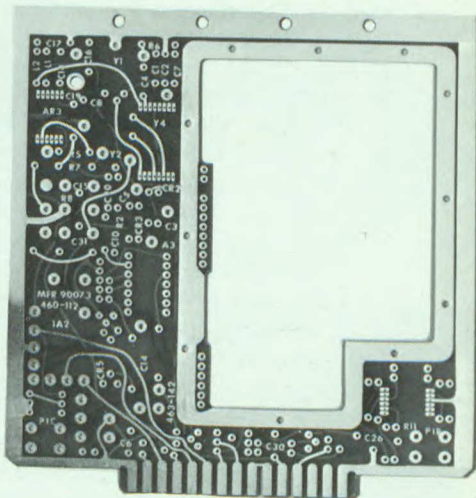
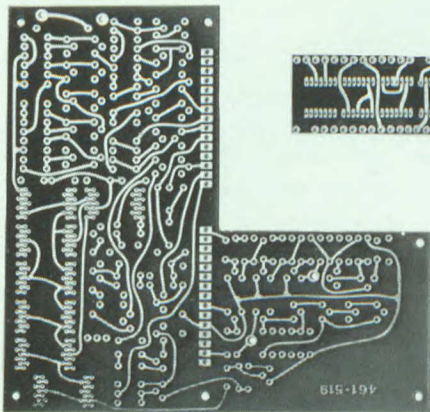
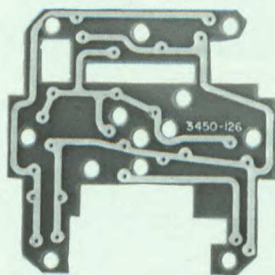
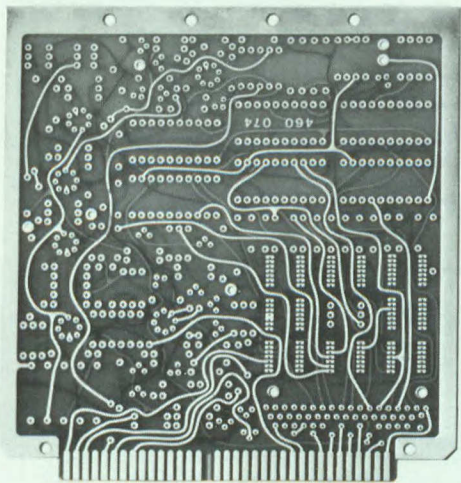
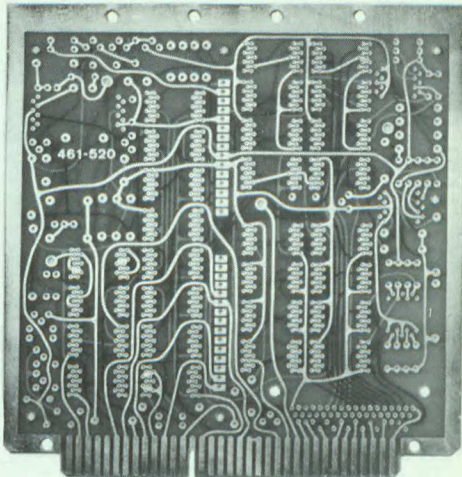
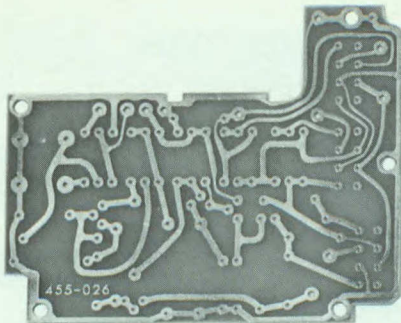
A 5-layer board with a milled center cut-out with plated edges on the cut-out.

BOTTOM LEFT:

A conventional 4-layer board .062" (1.6mm) thick, designed to mate with the board shown on the top right.

BOTTOM CENTER:

A 3-layer module board, .030" (.76mm) thick \pm .003" (.076mm) tolerance.



PRINTED CIRCUIT BOARDS AND EDGE-LIGHTED PANELS

The exacting demands on to-day's technology in such fields as supersonic Aircraft and Aerospace vehicles are producing not only a range of new equipments to futuristic requirements but also facilities which will design, develop, and produce these equipments to to-morrow's standards.

O. & W. Electronics Limited is one of those sources which has been active in the Aerospace field for over fifteen years and which has clearly demonstrated a leading role in Printed Circuitry and Edge-Lighted panels.

Applications range from the Automotive field with flexible mylar printed circuit boards to the rigid boards and panels used in radio and television sets, mobile radio, aircraft radio and instruments as well as in space satellite applications. The Boards are produced from a variety of materials which include single and double sided copper paper-based phenolics, glass epoxies, glass melamines, flexible mylars, etc. From these materials both single and double sided printed circuit boards with or without plated-through holes are produced together with flush bonded circuits for commutator or switch applications.

A variety of finishes are available such as flux-cote, melamine solder resist, nickel-gold, tin-nickel, silver, rhodium and tin-lead with the latter five finishes being electro-plated. These Boards are produced in accordance with MIL-P-55110A and related specifications.

O. & W. Electronics have supplied Printed Circuits for the F-104 programme, the VRC12 and Autodin communication equipments as well as car radio boards for Philco and "flexible instrument cluster boards" for the Falcon and F85 Oldsmobile.

Edge-Lighted panels are designed and produced to the latest revision of MIL-P-7788. The Lackon process is employed in the photo marking of panels giving sharper detail and accuracy of graduations or markings to .001" and angular tolerances of 5' of arc. The process will register in black and white or colour. Certificates of approval from both United States and Canadian military authorities are held covering the quality assurance of both Boards and Panels.

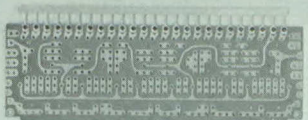
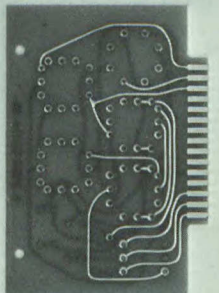
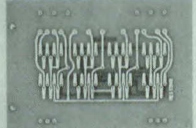
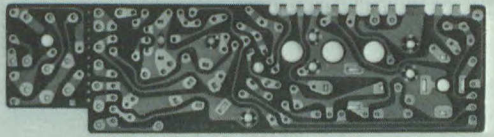
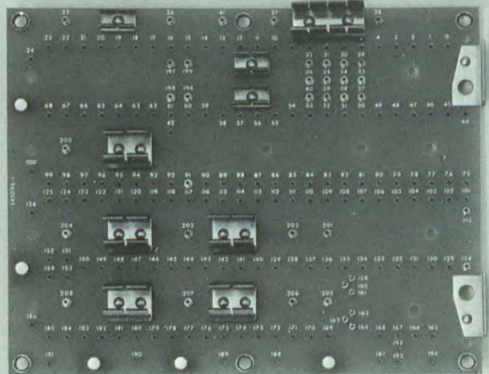
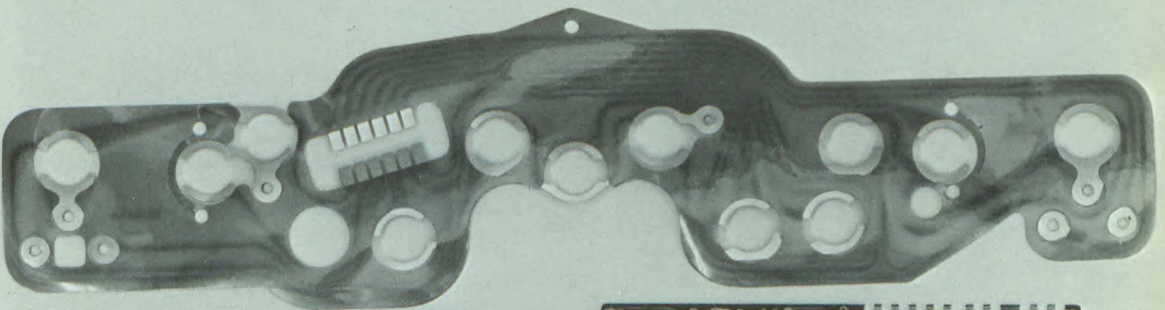
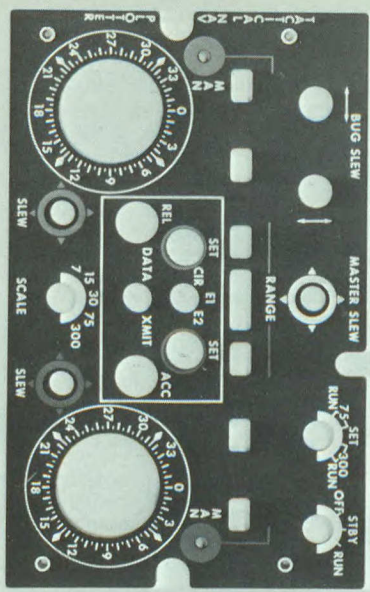
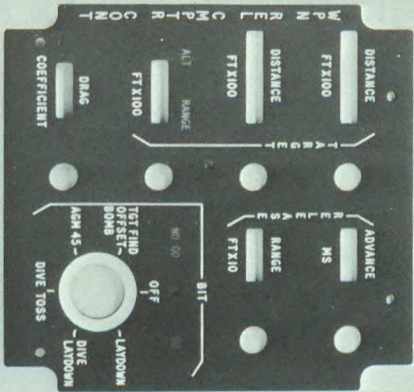
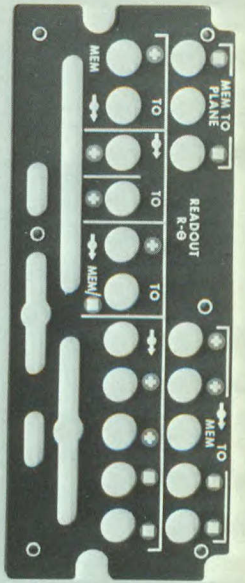
O. & W. Edge-Lighted panels may be found throughout the following aircraft; CL-44, CL-41, F104, F5, F-4 (Phantom), Caribou, Buffalo, Twin Otter and such equipments as the ASN30 Navigation Set in the Grumman.

This same production source maintains the following "in-house" facilities so as to ensure the high quality and reliability demanded of such equipment:

- Engineering: engineering assistance is available to help solve any illumination layout or functional problems which might arise during the design stages.
- Art Department: to work from customer blueprints and specifications to make the necessary photographic master.
- Machine Shop: to maintain the consistent quality of panels, dials and scales.
- Processing and Inspection: over and above the normal to be expected equipment is a Light Laboratory. A DND Inspector is also in residence.

This same facility also produces a wide range of photo-processed custom metal panels, scales and dials for electronic equipment as well as chemically milled parts. Naturally the assembly of hardware to Boards as well as the assembly of electronic circuitry is standard work to custom requirements.

O. & W. Electronics have substantial export markets to such highly technical and competitive areas as U.S.A., England, Holland, West Germany, Italy and Japan.



MILLIMETER REFLEX KLYSTRONS

In 1959, Varian Associates of Canada Ltd. initiated the development of a 70 GHz reflex klystron. At that time, the millimeter radio spectrum, 30-300 GHz corresponding to wavelengths of 10-1 millimeters, was practically unexploited for any practical use and few, if any, tubes or hardware were available for experimental work.

The invention of the laser in 1960 and the possibilities which this device suggested at optical frequencies, caused a general slackening of interest at millimeter frequencies. Varian Associates of Canada Ltd., however, pursued the development programme already underway and by 1962, had developed the VA-250 series of reliable and rugged reflex klystrons covering the frequency band 50-80 GHz as well as reflex klystrons covering the millimeter spectrum from 50 GHz to 220 GHz. Laboratory prototype tubes have been built as high as 245 GHz.

Two cavity klystron amplifiers operating at 60 GHz have been built with a small signal gain of 6 db. When used as an oscillator, over 10 watts of power was delivered to an external load, with an efficiency of 2.5%. The bandwidth, however, was very small. To improve the gain, efficiency, power output and bandwidth, a three-cavity amplifier is now under development.

Prototype Extended Interaction Oscillators operating at 60 GHz produce output powers of 50 W.C.W. at 8% efficiency and have a dynamic bandwidth of 180 MHz. The development of a mechanically tunable Extended Interaction Oscillator with greater power output, improved bandwidth and efficiency is under development.

HIGH POWER SERIES 50 - 170 GHz.

In this series of tubes the tuning range has been sacrificed for power output. 500 mw with 1 GHz tuning or 350 mw with 2 GHz tuning is guaranteed at one end of the series and 75 mw with 2 GHz at the high frequency end of the series.

These tubes find application in microwave spectroscopy, communication transmitters, parametric amplifier pump sources, and maser pumps, where hundreds of milliwatts of power are required and tunability can be sacrificed to obtain more power.

MEDIUM POWER SERIES 50 - 170 GHz.

The tubes in this series are each mechanically tunable over 6 GHz. Tubes above 110 GHz will tune 8 GHz. Featuring somewhat lower guaranteed power, (150 mw at 50 GHz, 50 mw at 170 GHz), these tubes find application where high power is required but tunability cannot be sacrificed.

LOW POWER SERIES, 50 - 170 GHz.

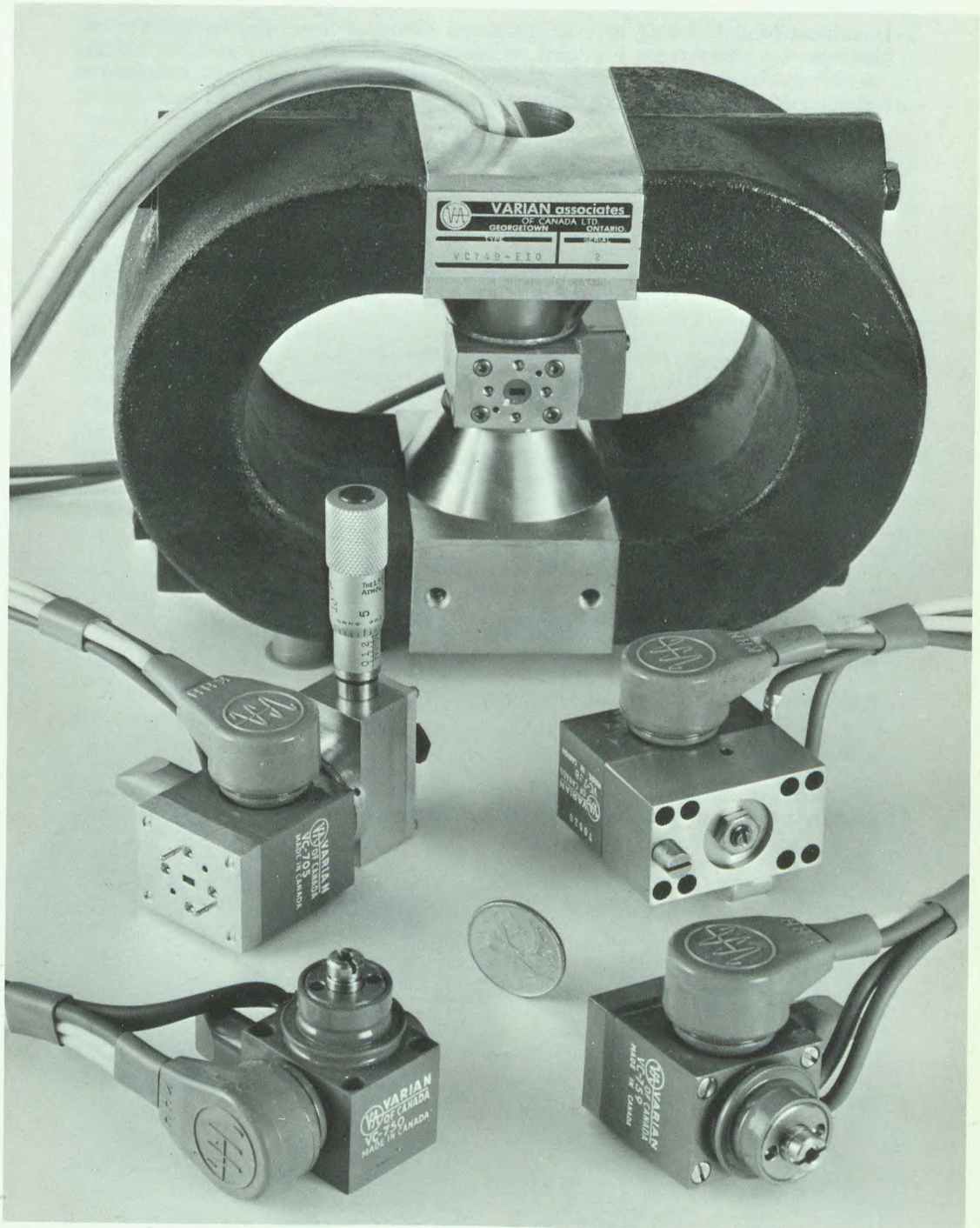
Where the need exists for only a few milliwatts of power, this series can be used with a saving in tube cost and power supply requirements. These tubes tune 6 GHz and give 10 mw at reduced beam voltages. A new tube recently developed by Varian of Canada in the 70-100 GHz range, with a 2 GHz tuning range, will give 50 mw at 900 volts on the beam or 8 mw with 500 V on the beam. These tubes find application in radiometers, radar receivers and communication receivers.

HIGH FREQUENCY SERIES, 170 - 220 GHz.

These tubes have a tuning range of 2 GHz and a guaranteed output of 10 mw. Higher frequencies, up to 240 GHz, are available as laboratory models.

The tubes in all series will survive 50 g shock and are rugged enough to be used in airborne and missile applications.

New techniques needed by our aerospace programmes, by defence and by basic research, ensure that the millimeter spectrum will not be left as a technological vacuum but will, with the advent of practical millimeter klystrons and other components, be much more fully utilized than was thought possible a year or two ago.



VARIAN associates
OF CANADA LTD
GEORGETOWN ONTARIO
VC748-FTD

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OF CANADA
MADE IN CANADA

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OF CANADA
MADE IN CANADA

VARIAN
OF CANADA
MADE IN CANADA
VC-730

VARIAN
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MADE IN CANADA

TOWER LIGHTING TRANSFORMER

Hammond Manufacturing have designed and produced these transformers for applications for where there is a need to isolate the electrical lamp or other circuits on and insulated antenna tower system from the regular electrical distribution system and to minimize the capacity reactance to ground of the tower light circuit.

Features

- System consists of a toroidally constructed Input Transformer with a single turn secondary coupled to an epoxy filled Tower Transformer by means of a one turn primary.
- Low capacitive coupling between input and output is achieved by the large diameter of the 1 turn secondary of the input transformer and its large spacing to the primary of the tower transformer.
- High reliability is achieved by excluding moisture with a special sheath treatment of the primary winding of the input transformer and the epoxy filling of the matching tower transformer.
- Physical alignment of the primary and secondary circuit devices although important is not critical, greatly simplifying installation on tower and insulators.

Technical Characteristics

- VA 700 (Hammond Design #80390)
- Frequency 60 Hz
- System Input – 115 volts with taps at 105, 125, and –5 volts.
- Systems Output – 115 volts \pm 3% at 700 VA.
- Minimum isolation spacing between primary toroid and 1 turn secondary is 3" (7.62 cm).
- Weight 200 pounds (90.7 kg.)

Other VA ratings for 60 Hz, units designed for 50 Hz, units with other primary voltages or units fully tropicalized and available on special order.

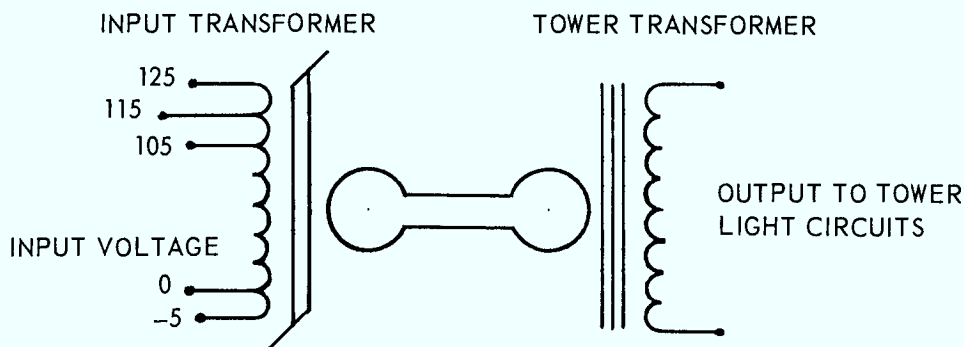


PHOTO-ELECTRIC CELLS

The **Cadmium Sulphide** photocells manufactured by National Semiconductors Limited are sensitive in the visible part of the spectrum and, in fact, their spectral response closely resembles the human eye. They can be used in high voltage circuits (one type has a rating of 2,000 v.) or they can be used in low voltage transistor circuitry. A typical application would involve controlling a relay or a transistor directly in the presence of light to perform some control function. A large application of these cells involves the automatic turning on of outdoor lights at dusk and off at dawn.

The **Cadmium Selenide** photocells are similar to the Sulphide variety except that they are sensitive in the red part of the visible spectrum and have a faster speed of response. They are mainly used in automatic sensing devices such as elevator controls and production counting of objects.

Silicon photovoltaic cells peak in the near infrared part of the spectrum and exhibit extremely high speed of response in the order of 1 microsecond. They can be fabricated in a variety of shapes to suit particular requirements; applications involve sensing of punched computer tape, photo-electric encoders and optical sound track detection in cinema projectors. National Semiconductors Limited has a research facility where special photo-electric transducers can be developed to meet special requirements. The techniques employed in the production of its devices include:

Thin film facilities.

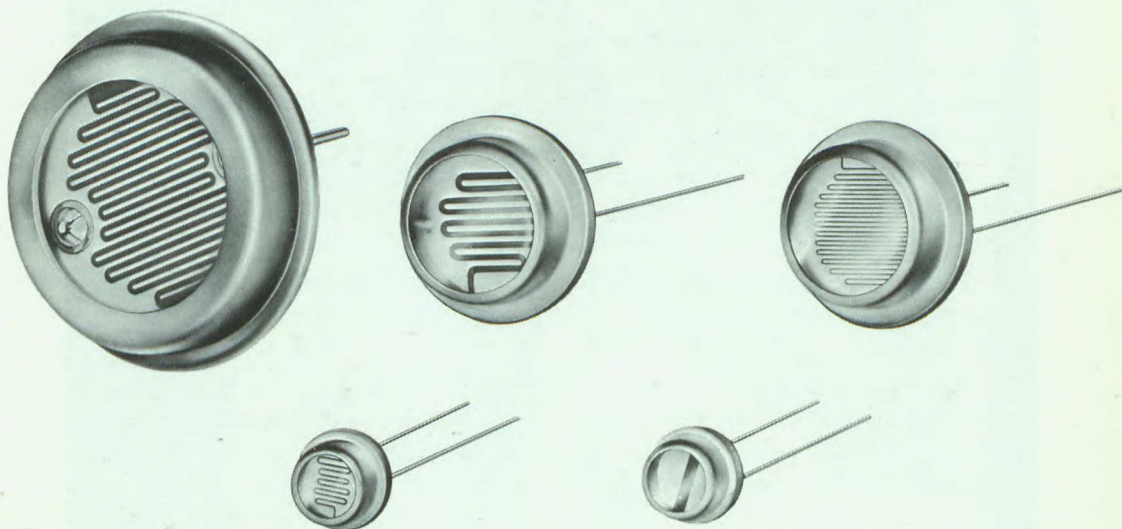
High vacuum production techniques.

Silicon diffusion techniques.

Hermetic sealing and leak detection facilities for semi-conductor devices.

Photometric standard laboratory.

The company also undertakes the development of circuits associated with photo-electric cell applications.



STERILIZATION PLANT—COBALT 60

This Cobalt 60 Sterilization Plant was designed by Atomic Energy of Canada as a high efficiency irradiator for sterilizing medical supplies. Throughputs range up to 48 units per hour equivalent to 162 cu. ft. (4.29 cu. m) per hour.

The plant consists of an irradiator building of composite construction of block and concrete which serves as a biological (protective) shield. Cobalt 60 is the source of radiation; the system comprises a flat vertical plaque carrying the Cobalt 60 source, a source raising and lowering device, the source pass mechanism and a water storage pool to shield the source when not in use.

Operation of the plant is centered in a main console — the console also houses the controls for the maintenance system.

Nominal plant capacity is 300,000 curies of Cobalt 60. The plant may be modified to increase the capacity.

Materials to be irradiated are pre-packaged in corrugated cartons. The cartons are then moved by a power input conveyor to the load position where they are fed automatically onto a monorail carrier and conveyed into the irradiation room — the cartons are then fed automatically from the carrier into the source pass mechanism where they are indexed through different positions about the exposed Cobalt 60 source.

The monorail carrier has two product box positions. An upper position which receives un-irradiated product boxes at the load/unload station from the input storage conveyor and a lower position which receives an irradiated box at the source pass mechanism.

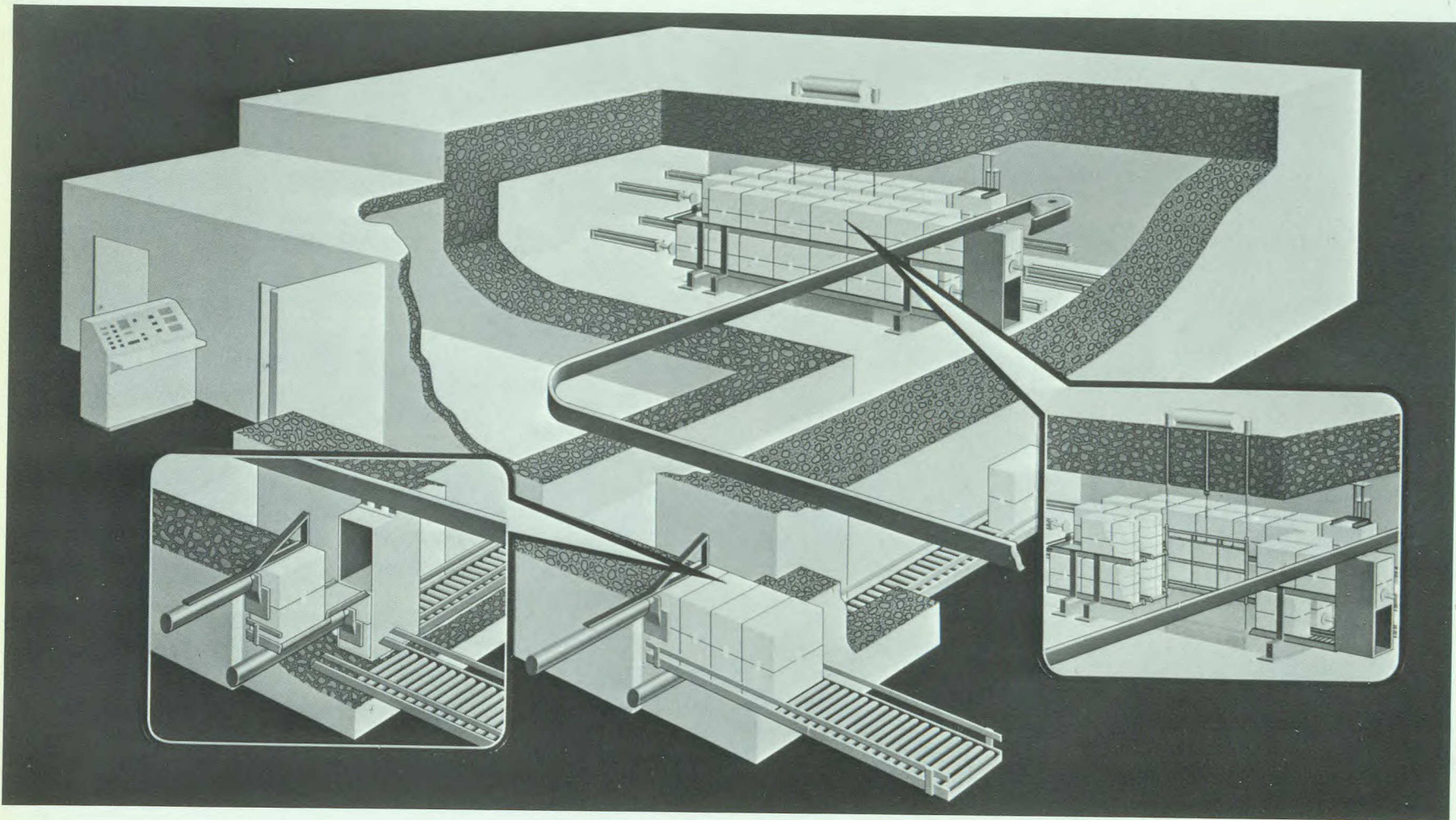
Loading and unloading of the product boxes is done automatically at their respective stations; at the load/unload station the irradiated product box is discharged onto the outlet storage conveyor into the sterile area while an un-irradiated product box is loaded into the upper position from the input storage conveyor.

At the source pass mechanism the un-irradiated product is loaded into the source pass mechanism, while an irradiated product box is loaded into the lower position of the carrier. The carrier then returns to the load/unload station and the sequence is repeated.

The exposure time of the cartons in the irradiation room is pre-set on the control console. Irradiation time is basically determined by product density-dose required and the activity of the source.

This Medical Supplies Sterilization Plant is a fully automated facility, when the source pass mechanism is loaded, the system maintains a constant day-in-out throughput.

The input and output storage conveyors may be designed to accommodate a sufficient supply of cartons to maintain an input and output volume for a desired number of hours; this means that complete plant operation may be carried on — requiring only the presence of one qualified technician.



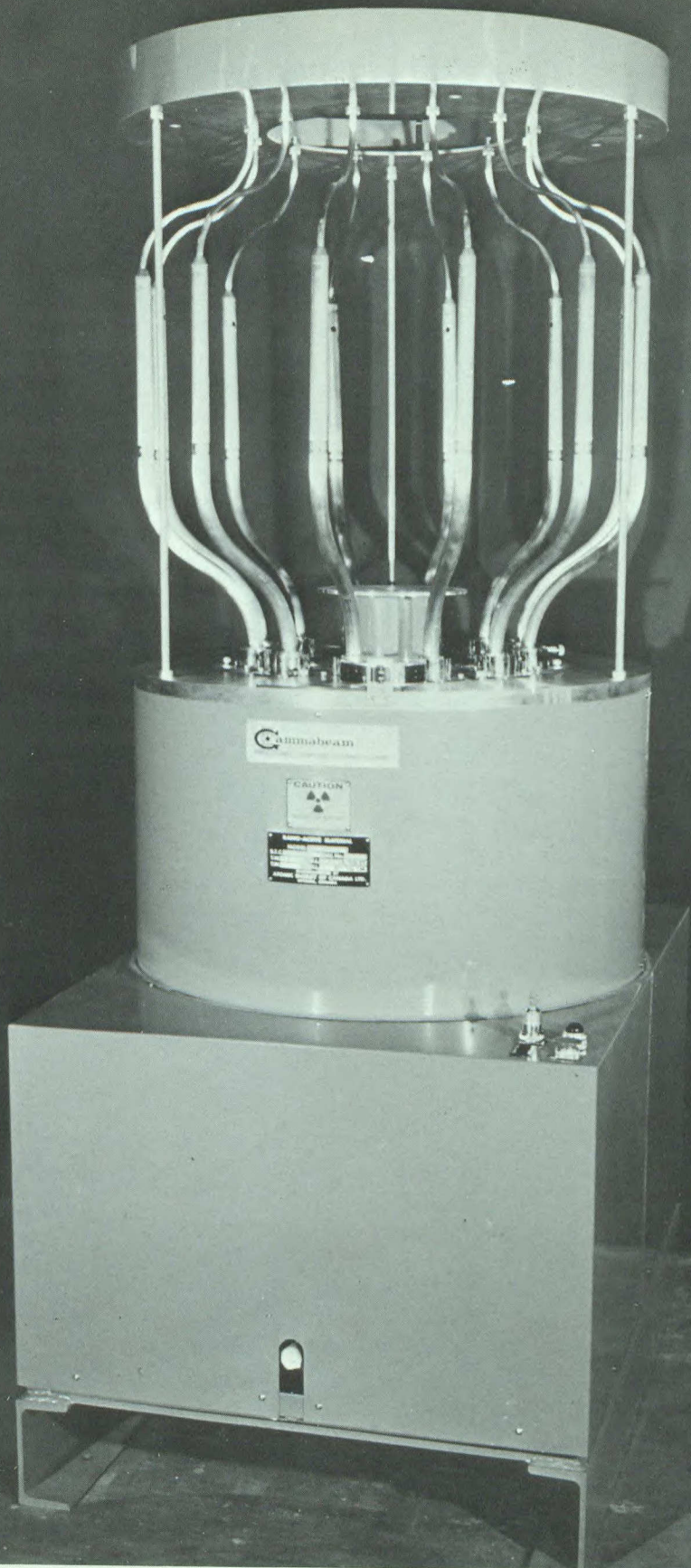
THE GAMMABEAM 650

The Gammabeam 650 Irradiator is a variable dose rate cavity and panoramic irradiator, designed for use in a fully shielded room. Its source capacity is 30,000 curies Cobalt 60 which will produce a maximum central dose rate of 5.4×10^6 roentgens per hour without exceeding tolerance levels or radiation about the source housing as established by the International Commission on Radiological Protection and the United States National Committee on Radiation Protection.

The source is exposed in twelve vertical tubes which are arranged in a cylindrical pattern, and which can provide a variable pitch diameter. Variation in dose rate in the source cavity, or panoramically, can be achieved by preselection of the source pitch diameter and/or the number of active source tubes exposed.

The Cobalt 60 sources are housed in tubes and shielded in a lead container that forms the body of the unit — the sources are moved pneumatically from the stored position to the irradiate position by compressed air — continuous air-flow from the compressor holds the sources in the irradiate position — release of pressure returns the sources by gravity to the stored position. Individual groups of sources are moved up or down to form the irradiation pattern desired. The unit is remotely controlled from a Control Console.

The equipment was designed and produced by Atomic Energy of Canada.



IRRADIATION EQUIPMENT

The atom is a potent factor in the political economy of the world today—in the near future its impact will be even greater. It will play a greater role in all the aspects of economics, particularly in the newly developing nations.

To understand and become familiar with the handling and potential of this new form of energy needs the use of laboratory equipment which permits the safe investigation of both peaceful and defensive applications.

The sterilization, by Gamma Rays, of medical supplies is one of the uses of irradiation equipment. This equipment, designed and produced by Atomic Energy of Canada Limited, has been used to ensure that rations, being shipped to distant outposts, arrive there in such condition that long-term storage is possible. This again is the process of irradiation in a sterilizing role. Such applications have been established and are being refined and extended continually in many laboratories, and a significant contribution from Canada to these advances is the supply of sophisticated laboratory equipment suitable for such investigations.

A.E.C.L. Cammacells are in use in twenty countries for laboratory work. Illustrated is the GAMMACELL 220, a completely self-contained and portable irradiator requiring no additional shielding and with a capacity up to 2.0×10^6 rads/hr is basically for research purposes.

The CAMMABEAM 150, one of a new series may be used in a laboratory role or for batch processing and is capable of delivering an output of 1500 roentgens per hour at one meter from the source in any of three beam configurations from full panoramic to pre-determined beam shape.

The unit is completely portable and is delivered with the source already loaded so that no transfer of active material is necessary in the field. A shielded room or controlled area is required for operation and the unit can be moved to different facilities as required without radiation hazards to personnel concerned.

GAMMABEAMS, for batch or large scale experimental irradiations, are now entering service, and can be installed rapidly, in prepared concrete irradiation rooms, for the preservation and extended storage of local produce.

Large scale permanent Industrial Installations are being built now, but to realize the immense potential of irradiation, much additional laboratory work, for which GAMMACELLS and GAMMABEAMS are needed, still must be completed.

Since Cobalt 60 became available in ever-increasing quantities, scientists have used its high energy gamma emission to study radiation effects on materials of all kinds. Investigations are being carried out on such diversified products as foods, textiles, rubber, glass and chemicals. The range of radiation studies is limited only by the imagination of scientists and researchers the world over.



NAVAL SHIP DESIGN AND CONSTRUCTION

Canadian industry and the Canadian Armed Forces – Maritime have a recognized capability for the design and construction of ships of the frigate and destroyer types (5000-2000 tons). This capability is demonstrated by the “St. Laurent” and “Annapolis” class destroyer now in Canadian Naval service. The latest Canadian ships under construction are the “DDH-280” class. An illustration of this class is on the facing page.

The DDH-280 class was primarily designed as an anti-submarine weapon system, but it has a flexible capability. The design allows the ship to perform effectively in area search, force or convoy protection, air defence, and amphibious support roles. The ships are as modern in concept and design as any contemporary destroyer and suited to provide a 20 to 25 year life for the vessels.

Hull particulars are – Overall Length 426'
Midship Beam 50'
Deep Draught 14'6"
Displacement 4100 tons.

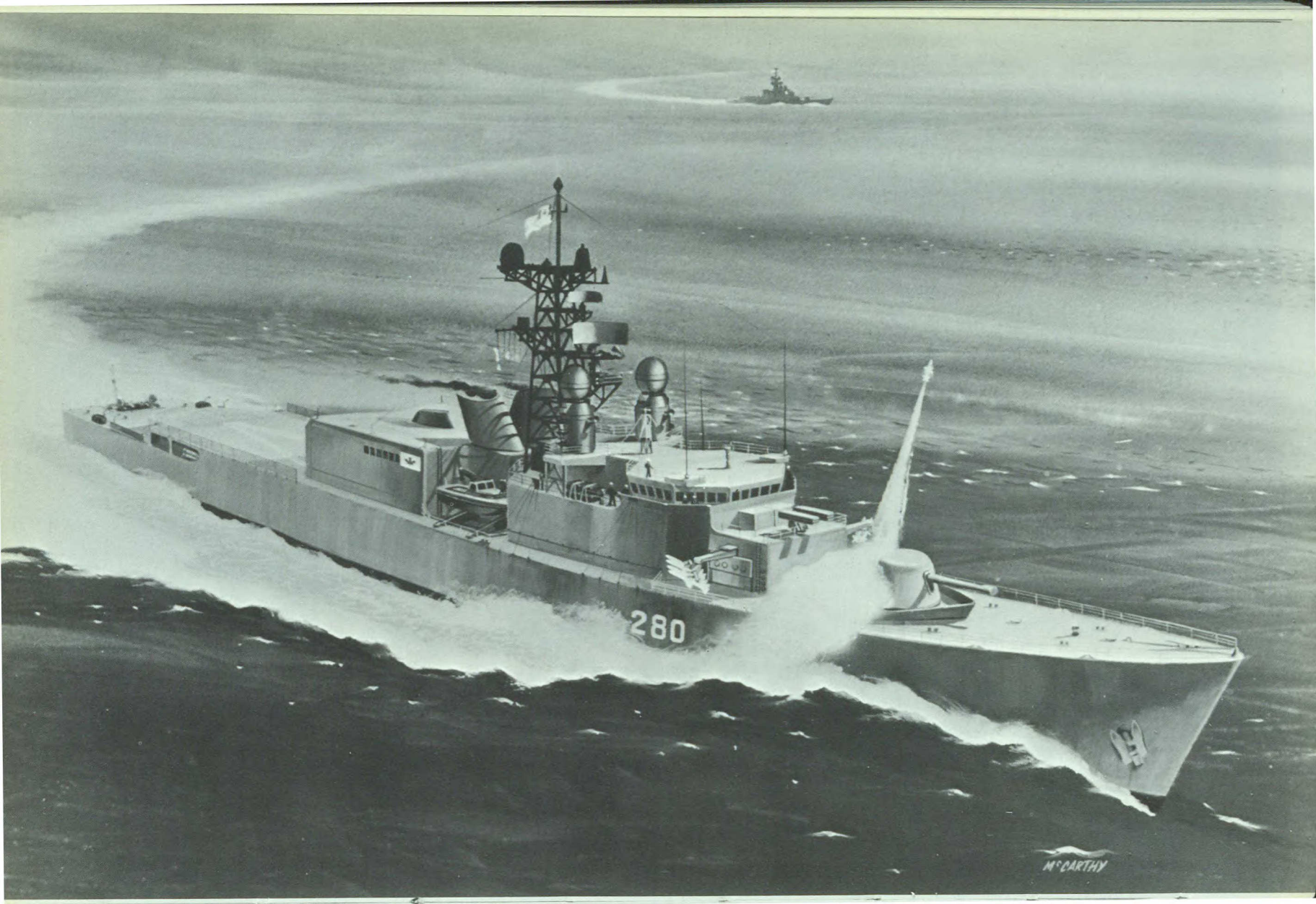
The propulsion system utilizes all gas turbine machinery (COGOG). The main propulsion machinery is a two-shaft arrangement of geared gas turbines, 50,000 total maximum shaft horsepower. Each shaft set consists of a main gas turbine of 25,000 SHP and a cruise turbine of 3,700 SHP, arranged side-by-side, driving a controllable pitch propeller through a common gearbox and clutches. The engines can be controlled from the Bridge or Machinery Control Room.

The remainder of the machinery and power plant design represent advanced engineering and are chosen for maximum performance, durability, and ease of maintenance.

The combat system suit, including sensors, weapons, electronic counter-measures, communications, and command and control systems is highly integrated and automated representing a completely new system taking advantage of the most advanced technical knowledge and fighting concepts. Use of digital computers for this system “core” has provided considerable flexibility for further up-dating in the early 1980's. The integrated weapons package consists of search and attack sonars, both hull mounted and variable depth; dual helicopter weapon system (“Sea King” – CHSS-2); point defence missile system; 5” surface guns; anti-submarine mortar mountings; and anti-submarine torpedoes.

The prime contractors for the DDH-280 ships are Marine Industries Limited, and Davie Shipbuilding Limited. The gas turbine propulsion system is supplied by United Aircraft of Canada, Command and Control System, by Litton Systems (Canada) Ltd.; Sonars by Canadian Westinghouse Ltd.; Helicopter hauldown and securing device by Fairey Aviation Ltd. Other Canadian shipyards and sub-contractors are providing specialized systems and hardware items. (Many of these items are individually described in this book).

The DDH-280 class ships are an example of the Canadian capability for the design and construction of modern naval vessels suited to the variety of roles required in ships by smaller navies. As well as destroyers, a series of composite supply and replenishment ships, patrol and other miscellaneous naval vessels made in Canada are now in operational service. The Canadian shipbuilding industry is experienced and prepared to respond to naval ship systems and hardware requirements in the international market.



280

McCarthy

HYDROFOIL SHIP DESIGN AND CONSTRUCTION

Canadian Industry, in conjunction with the Canadian Armed Forces has demonstrated its ability to design and produce a hydrofoil ship for all weather, ocean-going operation. HMCS BRAS D'OR, FHE 400, is a vessel of this type and her performance during initial trials this year, has equalled or exceeded the design predictions.

BRAS D'OR was designed and constructed to evaluate the effectiveness of ocean-going hydrofoils as alternatives for frigates and destroyers in anti-submarine warfare. With this in mind, her foil system has been designed to permit foil-borne cruising at up to 50 knots in Sea State 5. Hull-borne range is comparable to that of a destroyer. Foil-borne range is several hundred miles.

The foil system selected is of the surface piercing type considered to be advantageous primarily because of its inherent stability in the foil-borne mode but also, by virtue of the massive damping offered by the foils, providing all-important hull-borne stability in heavy seas. The foils are arranged in a "canard" configuration, the main lift occurring well aft. The superior sea-going performance of this configuration compared with the conventional or "aeroplane" arrangement has been firmly established.

Her normal maximum all up weight is 475,000 lbs. (215,460 kg) and of this, approximately 40% is disposable load.

Hull particulars — Length 150'9" (46 m)

Breadth 21'6" (6.6 m)

Depth 15'7" (4.8 m)

Foil particulars — Overall Span

Main Foil 66'0" (20 m)

Bow Foil 21'0" (6.4 m)

The displacement propulsion system utilizes a sixteen cylinder, high speed marine diesel, which produces 2000 bhp at 1500 rpm. This gives a hull-borne speed of approximately 14 knots obtained through controllable pitch propellers via a reduction gearbox and downshafts within the anhedral foils. A power takeoff from the displacement gear box can also drive the auxiliary gearbox for electrical power generation, etc.

For foil-borne propulsion, a marine gas turbine of 22,000 Shp at 3600 rpm is used. The free turbine is coupled to an inboard gearbox which splits and increases the speed of the twin shafts, down through each of the port and starboard struts to the outboard gearboxes. Here, the speed is reduced and power transmitted to the fixed pitch super-cavitating propellers which give the vessel a speed of 60 knots at 1800 rpm.

Control of either propulsion system is from the enclosed bridge or alternatively from the engineer's console in the operations room. The ship's heading is controlled by the bow foil which is steerable and also adjustable in rake to adjust ship's trim. Turns are fully or partially coordinated depending on speed by the variable incidence anhedral tips. These tips are also coupled to an autopilot and act as stabilisers to supplement the foil system's inherent roll resistance.

Three smaller gas turbines are used to drive the auxiliary gearbox (as an alternative to the power takeoff from the diesel), the emergency electrical and hydraulic power unit and the deck mounted fire pump.

After completion of her machinery and hydrodynamic trials which are intended to evaluate performance as a ship, and subject to the conclusions of the evaluation, a fighting equipment package is available for fitting and evaluation of performance together with the ship as a weapons system. This fighting equipment package was especially designed for her and like her machinery and equipment generally, had to meet the requirement of compactness and low weight. The fighting equipment consists of a variable depth sonar including hoist and high speed body, an associated computer based action information system and an advanced intercommunication system. Two of a possible four sets of triple A.S.W. torpedo tubes would be fitted.

The Prime Contractor and Design Agent for the BRAS D'OR is the DeHavilland Aircraft of Canada Limited, who subcontracted the construction of the hull to Marine Industries, where the ship was assembled. The main and auxiliary gas turbines were supplied by United Aircraft of Canada and the propulsion transmission by General Electric. The V.D.S. hoist installation was subcontracted to Fleet Manufacturing, and the Interior Communications System to Marsland Engineering Limited.

The Prime Contractor for the design and production of the Weapons System was Canadian Westinghouse Company Limited, with Hawker Siddeley producing the high speed towed bodies.



TOWING MACHINES

The Garrett Marine Model M-200 Towing Machine system has been designed to provide deep sea towing operators, salvage operators and oceanographic research agencies with a high capacity Towing Machine capable of trouble free operation.

The M-200 model consists of two basic components; a winch system mounted on the weather deck and a below deck 170 horsepower diesel drive engine. The diesel engine, transmission and air holding brake which are located below deck are connected to the winch by a multiple chain drive enclosed in a heavy trunk passing through the deck.

The deck mounted winch consists of an integrally welded structure into which is fitted a unique arrangement of fairlead, fleeting shaft, level wind and main drum assembly all of which are capable of withstanding the breaking strength of 2¼ inch (5.7 cm) wire rope. The drum has a capacity of 2,600 feet (792 m) of 2¼ (5.7 cm) – 6 x 37 wire rope with 1½ inch (3.8 cm) free flange. The drum clutch (set for 200,000 pounds) (91 metric tons) is a planetary type mounted on the low speed shaft with control at the winch and at the upper deck. A gypsy head, dogging device and footage counter are also fitted to the drum assembly. The gypsy head is suitable for 10 inch (25.4 cm) manila rope with a breaking strength of 77,000 pounds (30.4 metric tons).

The Towing Machine is operated from the winch console located on the boat deck immediately above the Towing Winch. While these controls operate the winch, they in effect control the diesel drive located below deck and are divided into two main groups – one group on pneumatic controls for a second group of 24 vDC controls covering permissives, start-up, shut-down, running and diesel brake release. The main control functions are regulated pneumatically by three levers on the winch console. The first is the direction-throttle lever, the second is the shift control (low or high) and the third lever controls air supply to the winch drum clutch brake for motivation of the drum.

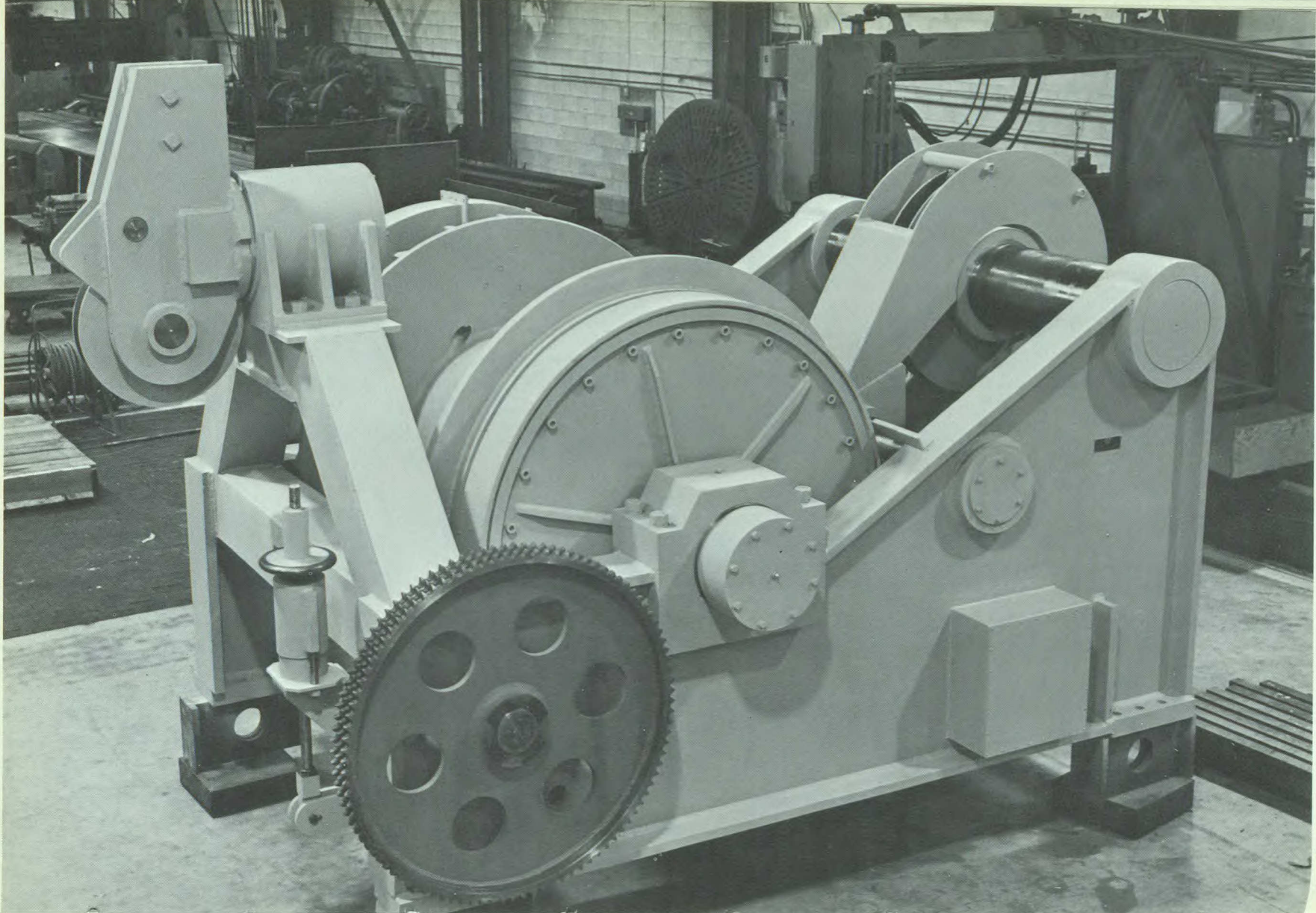
Cable payout is indicated both on the winch console and in the pilot house by a selsyn system driven from the winch. The lifting lever to engage the drum dogging device is a manual adjustment at the winch.

Maximum line pulls of 150,000 pounds (68 metric tons) is at 22 feet (6.7 m) per minute, while line speed is 100 feet (30.5 m) per minute.

The winch which is approximately 14 feet long, 10 feet wide and 9 feet high (4.3 x 3 x 2.7 m) weighs 50,000 pounds (22.7 metric tons). The drive system including transmission and convertor weighs 8,000 pounds (3.6 metric tons).

With the exception of the gypsy head and ring gear, no other cast materials are used. Self-aligning anti-friction bearings are used throughout except for the main frame bronze bushings. The complete winch, drive system and controls meet the performance and construction requirements of United States Coast Guard, American Bureau of Shipping and Lloyds Registry.

Design work on a variety of different types of winches for specific applications i.e. salvage work and anchoring of offshore drilling platforms is currently in progress and drive systems are either diesel, electric or electro-hydraulic.



MARINE WINCHES

The Garrett Marine Model M-100 Mooring Winch has been designed, developed and manufactured to enable ships operators to stop and moor vessels in canal locks, seaway mooring stations and at loading and unloading docks quickly, efficiently and with a minimum of operators.

The all-electric (440/550 V) AC automatic self-tensioning mooring winch requires no hydraulics or motor generator sets. In size it is 6 feet long, 4 feet 6 inches wide and 4 feet 6 inches high (1.8 x 1.4 x 1.4 m) and weighs 7,500 pounds. (3402 kg). The winch with integral 40 horsepower motor is suitable for weather deck mounting. Separate master switches, also suitable for weather deck mounting, permit manual or automatic control of the winch from remote stations. The manual control permits slow or fast heave and slow or fast payout and drift. The characteristics of the two speed gear change provide 65 feet (19.8 m) per minute at 20 - 24,000 pounds (9072 - 10,886 kg) and 275 feet (83.8 m) per minute at 8,000 pounds (3629 kg). The electric motor brake is set for 35,000 pounds (15,876 kg).

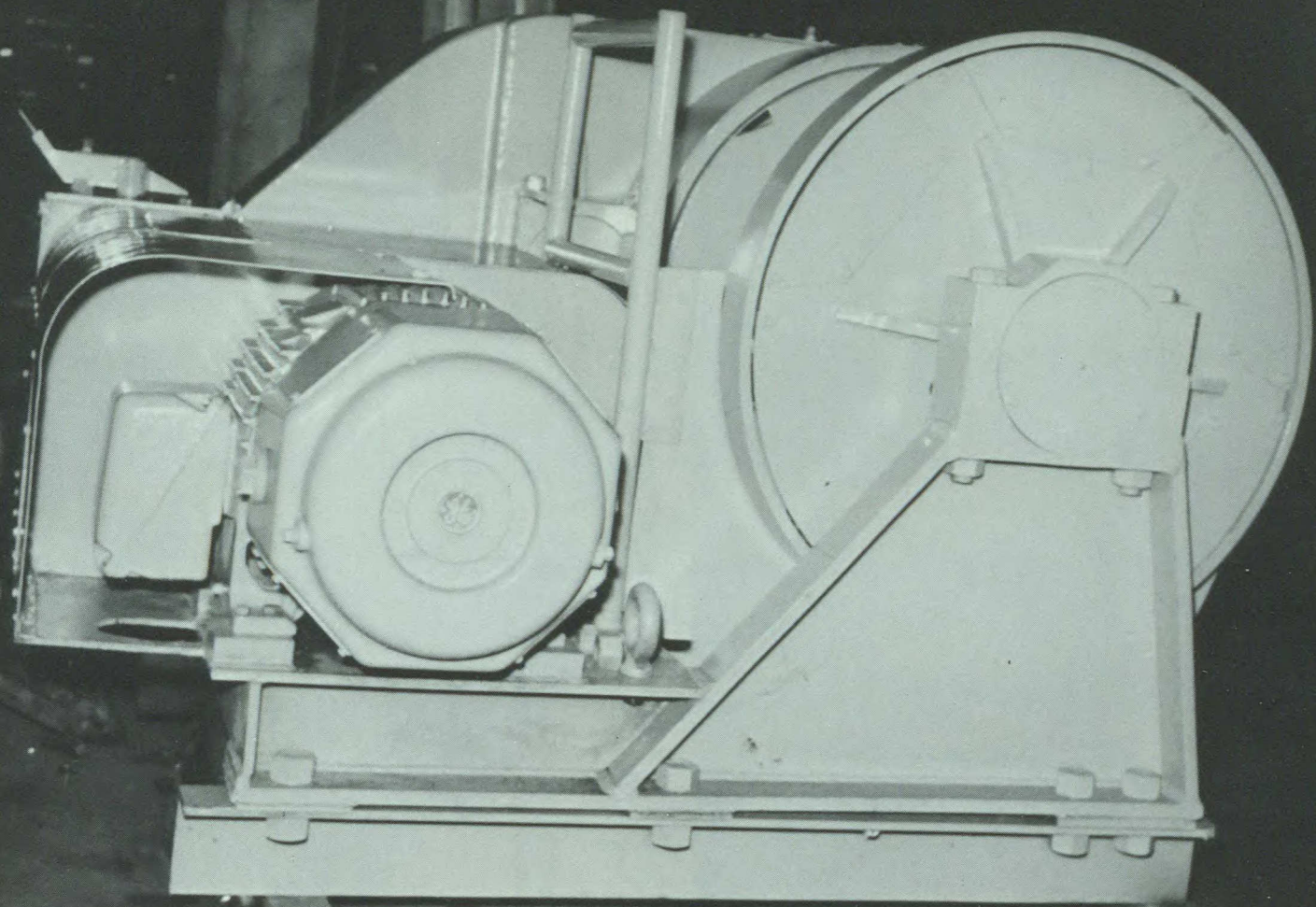
In the automatic mode line tensions can be selected at 13,000 or 20,000 pounds (5897 or 9072 kg) and be maintained within 10 per cent. The automatic tensioning device is built into the drum assembly.

The winch base, drum and main shafts are designed to withstand the breaking strength of $1\frac{1}{8}$ (2.9 cm) diameter 6 x 25 cable. The drum capacity is 600 feet (272 m) of $1\frac{1}{2}$ inch (3.8 cm) cable with $2\frac{1}{2}$ inches (6.4 cm) of drum flange clear of the top layer. The main control apparatus and resistors are suitable for below deck mounting.

All gearing is machine cut to AGMS standards. Anti friction bearings, with only one exception, are used throughout.

All electrical devices, including the motor and brake are of the marine type built to the standards specified for this type of service. The equipment is also built in accordance with the regulations of the appropriate approval agencies for intended service.

An all-electric highline winch for use with replenishment systems is currently in design and feature in-drum gearing to reduce weight and conserve space.



WINCH SYSTEMS

Since 1937 Swann winches have been performing various duties in Canada and throughout the world. Fishing, oceanographic, towing, anchor, cargo and utility winches, capstans and windlasses are just some of the winches in operation. Recently, in co-operation with the Canadian Government, Swann has developed many specialized winches for the fields of oceanography, defence and research.

The ocean is a relatively untapped source of wealth for ourselves and other nations. Only a decade ago did Canada begin to really embark upon oceanography. Over this short period of time Swann Winches has designed, developed and perfected more than two dozen specialized oceanographic winches aiding Canada's research team. These winches are not merely a means to raise a heavy load. They are also a medium of communication from the depths of the sea to man. Bathythermograph winches for relating water temperatures and salinity, sound source winches for detecting vibrations, coring winches for taking samples of the ocean's floor, even television winches for a first hand view of depths man alone cannot reach. Another assistance winches provide is that scientists are able to communicate with the depths from the laboratory by means of telemetry, etc.

A look into the future will show an ever increasing use by oceanographers of micro equipment, circuitry and hardware borrowed from the space engineers. Swann Winches will be supplying these and winches for their use.

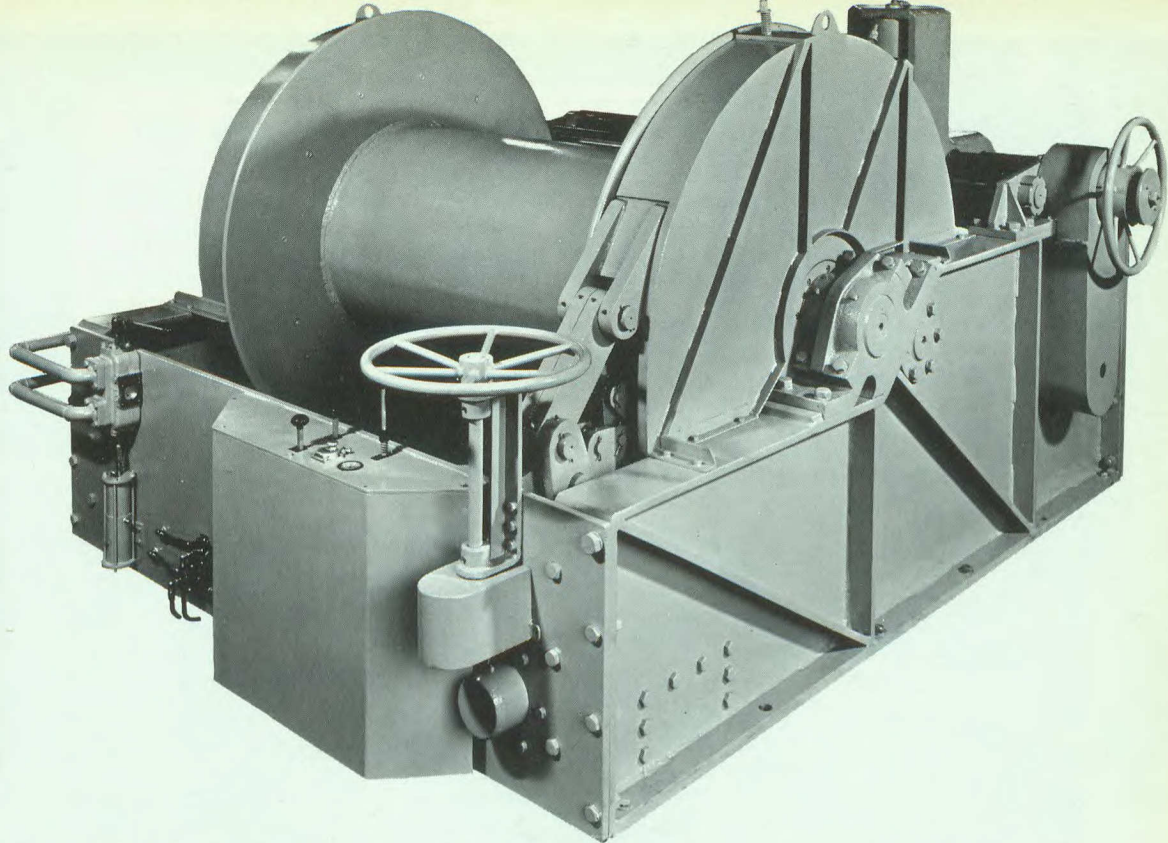
Swann offers a wide range of towing winches, the largest of which was built in 1966 and installed on the "MV" Haida Brave. To envision the size of this winch, the uppermost portion stands almost seven feet high. It carries 2,500 feet of 2¼" diameter wire rope and weighs twenty-three ton. The winch tows a large modern log barge along the coast of British Columbia.

Being Canada's third largest resource, the fishing industry uses winches entirely as a method of harvesting. Swann Winches are in use along both Pacific, Atlantic coasts and in many other areas of the world. Numerous types of winches for trolling, gillnetting, seining, trawling, dragging, longlining, Swann has met them all with aptly designed winches.

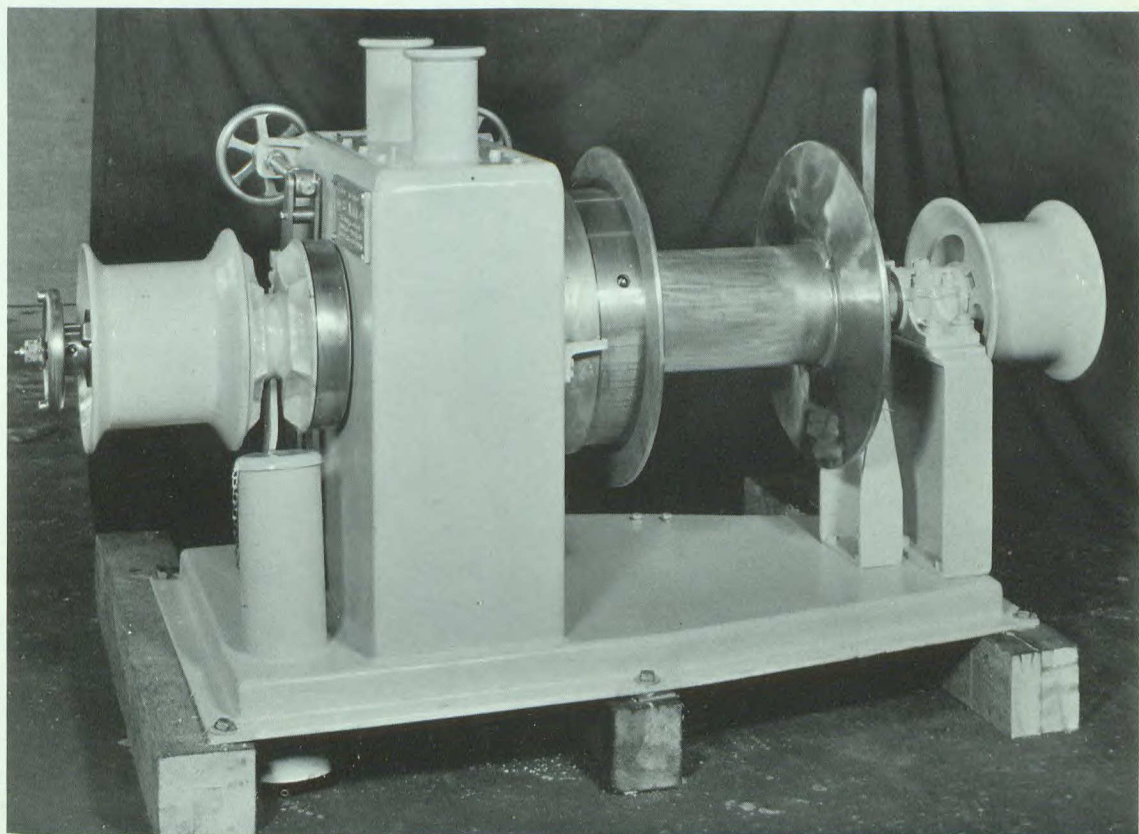
Windlasses have a standard design and are fitted with a custom wildcat governed by chain dimensions. At present the windlasses range from ¼" diameter to 1⅞" diameter (6 to 47 mm) chain. Interesting modifications can and have been made such as the Series 357 windlass/winch installed on Canada's famous Bluenose II.

Another feature of the company is the Hydraulic Services Department which can design systems, rebuild or repair hydraulic components and provide field service for any hydraulic system.

We welcome the opportunity of producing designs to meet the precise requirements of a particular application, whether it is for lightweight oceanographic winches designed to handle delicate instruments or a massive towing winch to haul an ocean going barge.



Two Speed Hydraulic Towing Winch — Series T — 408 as installed on the "Haida Brave".



Hydraulic Windlass/Winch Series 315 M as installed on Blue Nose 11.

AUTOMATICALLY MOORED BUOY—TYPE MB 2500

This medium weight deep sea buoy designed and produced by EMI Electronics, is an automatic two-stage system capable of mooring itself in sea depths down to 18,000 feet.

The moored system consists of a surface buoy connected via a slack cable to a subsurface float which in turn is connected via a taut lower mooring cable to a dead weight anchor. A number of variations are offered to the basic buoy system giving the equipment a considerable degree of versatility in payload distribution, system location in the sea, recovery, etc. Typically, the surface buoy and subfloat can support payloads of up to 50 lb. and 100 lb. (22.7 and 45 kg) respectively.

The maximum current conditions in which the surface buoy will remain on the sea surface are defined by the "limiting" profile curves. If these conditions are exceeded the buoy will submerge and reappear when conditions are again less than the "limiting" profile. The maximum depth to which the buoy (and, similarly, the subsurface float) may descend without damage is such that the system will survive under almost all conditions to be expected in the oceans.

The total weight of the system in air depends upon individual customer requirements but will normally be less than 3000 lb. (1361 kg). The complete system is supplied in a wooden packing case approximately 40 inches square and 16 feet long (258 cm² x 4.9 m).

Launching preparations are simple and once completed the system may be launched from a small ship by dropping in the sea where it will automatically deploy and moor itself without further attendance.

TECHNICAL PERFORMANCE SPECIFICATION

MOORING DEPTH. The system will moor in any sea depth between 500 feet and 18,000 feet (1524 to 5486 m).

SUB-SURFACE FLOAT DEPTH. The implantation depth is readily adjustable and normally deployed set to 300 feet (91 m). This depth, ± 20 feet (6 m) will be achieved in zero current conditions, but the actual depth of the subfloat will vary with current.

LIMITING CURRENTS. In currents up to the limit the *surface buoy* will remain on the ocean surface. If the current exceeds the profile value the buoy will submerge and the subfloat descend by a corresponding amount. The maximum design depth of the surface buoy is 300 feet, and of the subfloat 1000 feet. This should be suitable for practically all conditions encountered except, possibly, the strong deep current areas of the world. With the limiting depth values given, the safety factor is approximately 1.5.

LIMITING ENVIRONMENTAL CONDITIONS. The system tends to protect itself by submergence in excessively bad weather; that is, weather in the storm or hurricane range. When it does not submerge the system will however survive sea state 8 and associated winds in the range 41 to 47 knots.

MOORING LIFE. The moored system has a statistical half-life of six months within the limits defined by the limiting current and environmental conditions.

AUTOMATIC MOORING SEQUENCE. Once dropped into the sea the system will moor itself automatically. The sequence of events is as follows:

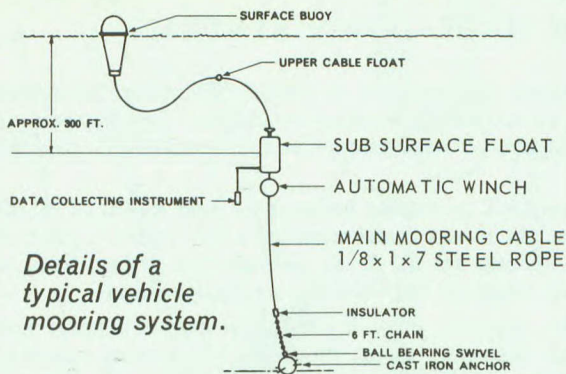
The sub-surface float, winch and anchor assemblies descend in the sea at a velocity of approximately 10 ft./s (3 m/s).

At a depth of approximately 200 feet the anchor manacle assembly releases freeing the anchor from the winch frame.

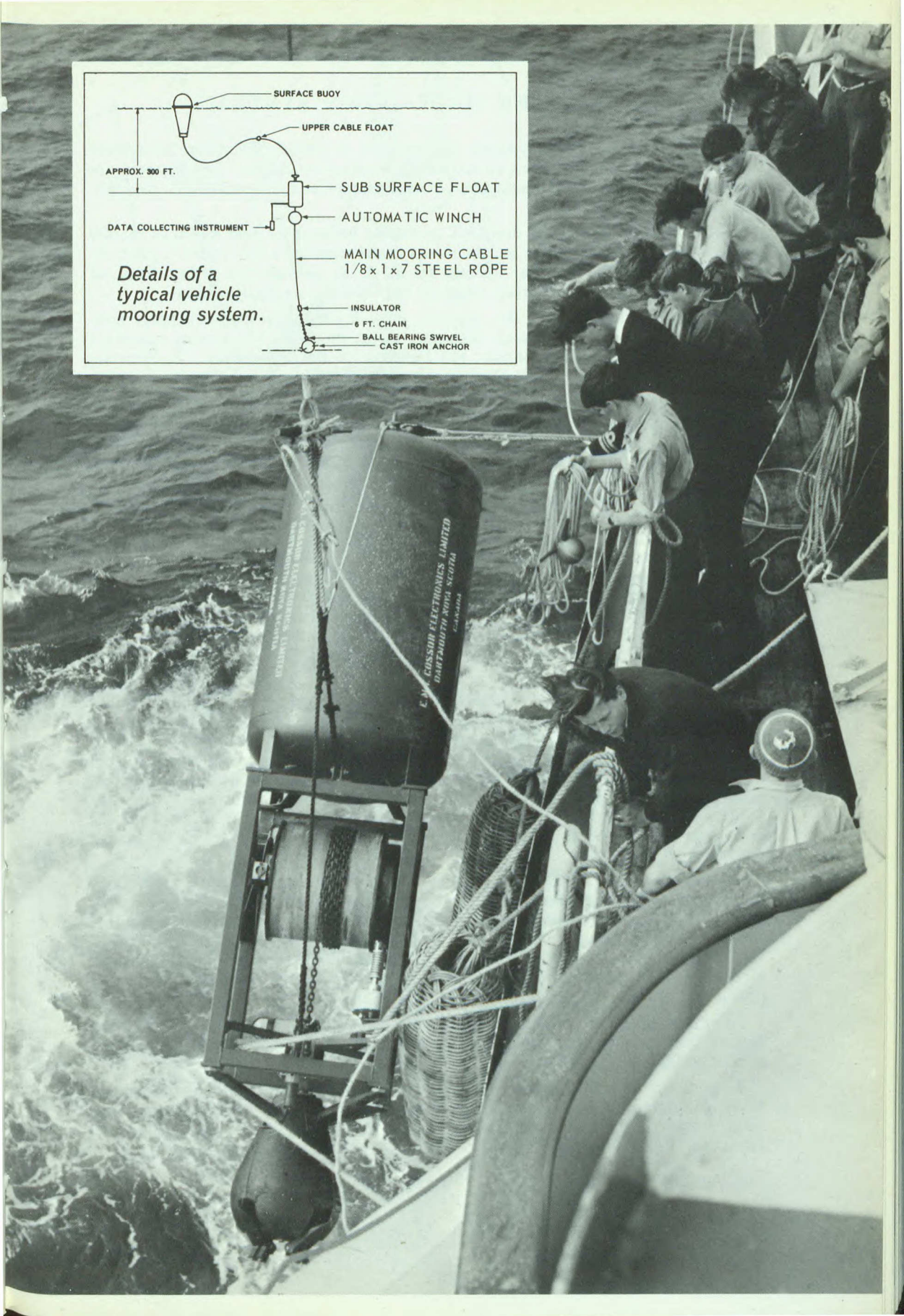
At approximately a depth of 320 feet (97 m) the brake securing the winch relaxes and allows the anchor to descend at a rate of some 14 ft./s (4 m/s).

About two minutes after the anchor reaches the ocean bed a lock located at the winch fires and permanently locks the winch drum.

The modular construction of the basic buoy system allows a variety of optional features to be incorporated to meet the requirements of individual users.



Details of a typical vehicle mooring system.



HELICOPTER HAUL DOWN SYSTEMS

The Helicopter Haul Down Systems are designed to enable helicopters to operate at sea from small flight decks under rough weather conditions. The systems are engineered, designed and manufactured by Fairey Canada Limited, Dartmouth, Nova Scotia.

Various systems have been designed, to handle helicopters from 8,000 to 20,000 lbs. (3629 to 9072 kg) gross weight in sea states causing a roll of 31° , pitch 8° and heave up to 20 feet per second (6 m/s); to provide for either fixed or traversible securing device either single or two-helicopter configuration.

The system illustrated on the opposite page is the latest two-helicopter configuration designed for advanced destroyer escort concept. The system operation may be considered in four phases: (1) Landing on the flight deck. (2) Securing immediately upon landing. (3) Straightening. (4) Traversing into hangar.

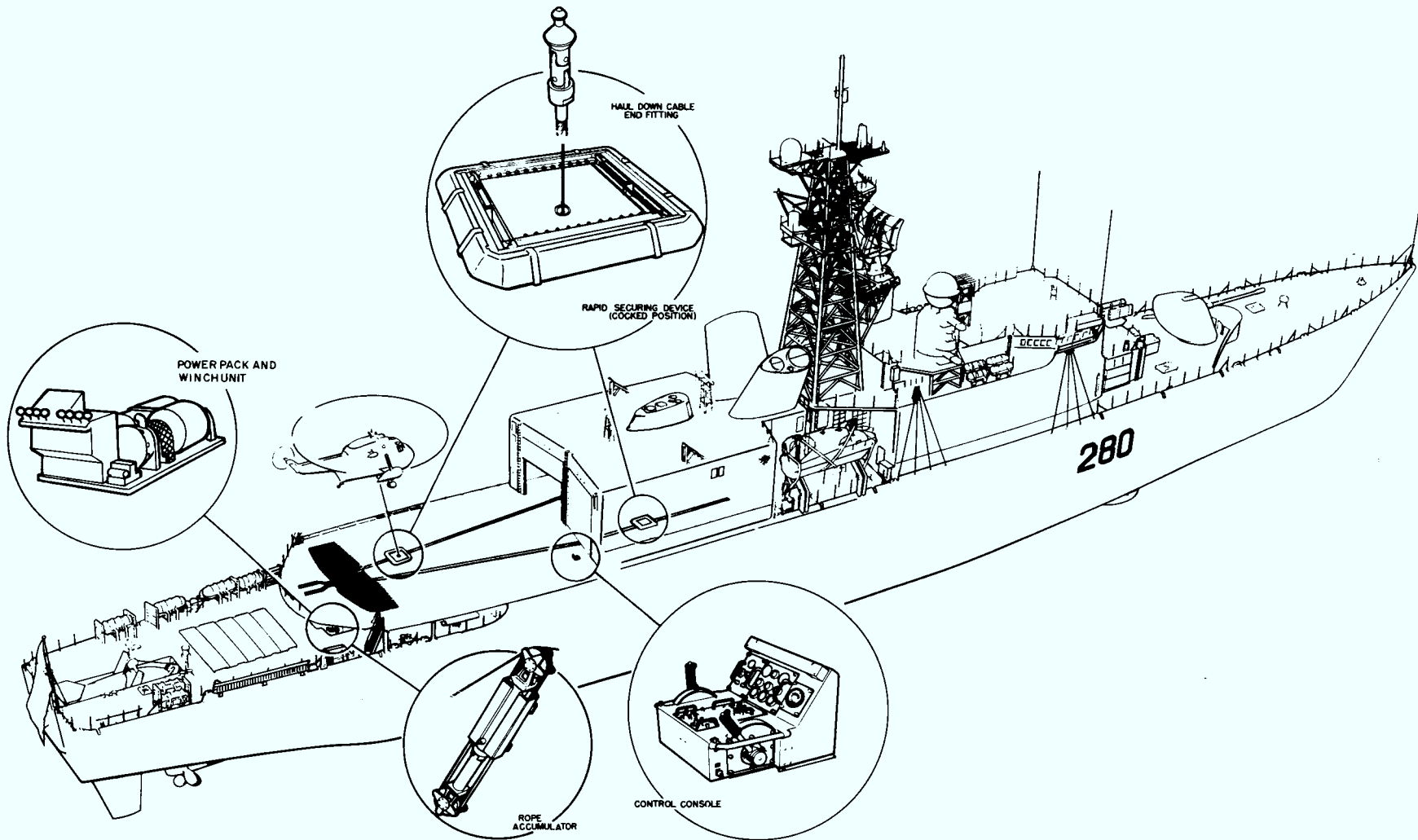
A landing operation is carried out as follows: A line is lowered from the hovering helicopter and connected to the haul down cable end fitting, which is then winched up and locked in a probe in the helicopter bottom fuselage. The haul down cable is reeved around a drum in the winch compartment of the ship, and this drum, powered by a hydrostatic transmission, is operated to winch the helicopter under a selected and controlled tension, to the flight deck. Tension selected at the control console will remain constant regardless of ship motion. At a "null" period in the ship's motion the helicopter will be drawn smoothly down to the flight deck. This constant tension feature is achieved through the use of a servo system which compares cable tension, measured by a load cell, with a command signal or tension selection at the control console. The resultant error signal is used to control the output of a variable displacement pump, causing the haul down cable to be reeled in or out and to maintain the required cable tension. Rate of descent can be controlled by increasing or decreasing the tension selected.

As soon as the helicopter has landed, the Rapid Securing Device, known colloquially as the "Beartrap", is actuated. The securing device is a steel structure about six feet square and eight inches high, which contains two mutually opposed parallel Arresting Beams. These beams are remotely closed and opened from the control console by the securing device hydraulic system. In the closed position, both beams lock together and secure the helicopter probe protruding from the bottom fuselage. When the beams have locked together on the probe, and the helicopter tail probe is lowered, the helicopter is restrained on deck against motion in all directions.

The operation is completed by straightening the helicopter on deck by traversing the securing device aft, with the helicopter attached. A tail guiding winch system can be installed which assists in straightening the helicopter under severe weather conditions. The securing device and helicopter may then be traversed forward into the hangar. In the installation shown, use of a "swinging bellmouth" permits a common haul down system to be used with independent traversing systems for port and starboard hangars.

Alternate systems (not shown) provide for different configurations of traversing feature; single helicopter configurations with or without traversing feature; and simplified fixed securing systems.

In addition to being operationally approved for use with the Royal Canadian Navy and incorporated in the latest destroyers, the "Bear Trap" systems have been installed, evaluated and accepted by the United States Navy and the Japanese defence forces.



TELESCOPIC HANGARS

With the Dominion Aluminum patented telescopic helicopter hangar, it is possible to house and service the aircraft in the same area as that used for landing. In most installation, only two helicopters are carried, and, particularly under difficult weather conditions, both aircraft should be operational, either in the air or ready to fly. Only the telescopic hangar allows this co-use of space for both storage and flight operations. Extended, it is a hangar—retracted, it frees its own deck space for take-off and landing, making it possible for the smallest ships to provide hangar facilities.

The hangar operates on the principle of a telescope, and is installed on the flight deck. Coaxial sections constructed of arched aluminum frames and sheeting retract within each other to expose the flight deck for use. The structure forms an inverted “U” in cross section and with the use of high-strength low-weight aluminum, minimizes the ship’s top weight. The hangar usually employs one fixed section forward and one or more moving sections aft that extend out over the flight deck. The forward fixed section is the largest and contains the power supply, operating control panel, heating units, and maintenance gear.

The moving sections travel on steel tracks recessed in the flight deck. Retraction and extension is accomplished by electric drives with provision for manual operation in the event of power failure. Electric brakes automatically engage the track when not operating to prevent hangar movement caused by the ship’s motion. Grounding of the moving sections eliminates the build-up of static electricity. The hangars have now been designed in sizes ranging from 12 feet wide by 25 feet long and 12 feet high (8.6 x 7.6 x 3.6 m) to 80 feet wide by 300 feet long and 60 feet high (24 x 91 x 18 m).

In the fully extended position, the telescopic hangar is designed to withstand winds up to 130 MPH from any direction. Watertight seals are incorporated throughout, to maintain a suitable environment in the roughest weather. The hangar is designed to withstand maximum pitch and roll of the ship and to operate under heavy sea conditions if necessary.

Special lighting, heating, ventilating and fire-fighting equipment has been developed as an integral part of the DAF telescopic hangar system. In this regard, the DAF hangar possibly is superior to many land-based multi-purpose hangars. Servicing can be carried out under hangar conditions and the helicopter can receive periodic repair and maintenance within feet of where it lands.

Over 50 of the hangars are now at sea with the Canadian, United States and Italian navies as well as with the Canadian and U.S. Coast Guards.

The same type of structure has now found employment in two new roles. The covered docking of submarines for repair and maintenance has always been desirable but usually prohibitively expensive. With the telescopic building both the requirement for cover and the budget are satisfied. The other use is for dockside cover for quality cargos and yet not interfere with the working of winches or cranes.



Sikorsky HH-52A landing on U.S.C.G.C. "Eastwind" with the hangar retracted. Retracted length 18'9½" (5.7m).



U.S.C.G.C. "Edisto". Extended length 56'9" (17.3m) Width 30'4" (9.3m) Height 17'2" (5.2m)

UNDERWAY REPLENISHMENT OF SHIPS

Garrett Marine has developed and produced for the Canadian Navy a unique system which allows the safe transfer of heavy equipment between ships at sea, without interfering with their operational readiness. Conventional methods using inhaul/outhaul techniques have long been used but these methods are very restricted due to problems of co-ordinating three independent winches (inhaul, outhaul and highline) in anything other than calm seas.

The Garrett Marine concept employs a Self-Propelled Vehicle (SPV) operating on a tensioned highline between the supply vessel and a receiving ship. Drive is by an electric motor carried on the vehicle which is controlled from the supply ship via a trailing cable. Self-Propelled Vehicle systems are capable of being used for either liquids or solids transfer and it is envisaged that to achieve optimum cost/effectiveness, equipment will be integrated to the extent of having each station capable of transferring either solids or liquids. Various systems offered by Garrett Marine are as follows:

a. *Single Highline*

Utilizes a conventional highline winch and ram tensioner with the highline dead ended on the receiving ship. A latch assembly incorporating a shock absorber and a means of automatically disengaging the vehicle drive clutch so that the highline may pass back and forward whilst the vehicle is docked in the latch provided at the supply ships. Maximum shock during docking with full payload is 5g.

b. *Double Highline*

Again utilizes the standard highline winch and ram tensioner but with the line passed to the receiving vessel through a flounder plate and sheave and back to the supply vessel where it is dead ended. In this configuration, the vehicle drive is operated on the lower dead ended line whilst the top line is passed through an extra idler sheave in the top of the vehicle so that the vehicle is supported by both lines. Thus for a given payload, it is possible to use lower line tensions than required by the single highline system. Use of the doubled highline imparts greater stability to the vehicle travelling on the line. The docking arrangement is reversed with this method in that the latch assembly is situated on the receiving vessel. Again maximum shock of 5g is seen by the payload during docking.

c. *Three-Drum System*

This is the most advanced of the systems offered in which a doubled highline is carried by two interconnected highline drums. These drums are driven by, and mounted co-axially with, another drum which is connected to the highline winch and ram tensioner. As before, the vehicle is supported by both lines and drives on only one line. In operation truly shockless docking at either the receiving or the supply vessels is achieved by a brake operating on one of the highline drums. Thus with the brake released both highline drums are driven by the winch drum and there is no passage of highline around the tension sheave at the receiving vessel. In this mode, the SPV can approach the receiving vessel as if the highline were dead ended there. On the return, the highline drum brake is operated stopping the line which the vehicle uses for traction. Thus, the vehicle can now approach the supply vessel without regard to ships motion. Ships motion is accommodated by continuing to drive the other highline drum and maintain the line tension.

All systems are designed to operate on a standard 1 inch diameter highline and can be furnished with dual speed drive and automatic control. The automatic control allows the change speed and stop distances to be preset at both ends of the transfer and facilitates operation in poor visibility or at night. Systems are supplied complete with 400 Hz motor generator set and automatic powered cable reel including trailing cable to the vehicle. Principal operational characteristics are as follows: (a) Transfer speeds are 75 feet per minute and 300 feet per minute (22.9 x 91.4 m). (b) Payload capability at present to 5,000 pounds (2268 kg) at 300 foot (91 m) ship separation. (c) Operational in Sea State 5.

A number of accessories for use with the system is also offered and these include:

- a. *Powered Hoist*— This is carried on the vehicle and permits the load to be raised and lowered during the loading.
- b. *Variable Frequency Power Supply*— For use in place of the fixed frequency source giving variable speed drive and providing fast speed return (450 feet (137 m) per minute). Size and weight of the supply would be less than the motor generator set it replaces.
- c. *Telephone Communication and Distance Measuring System*— Provides communication between loading crews and ships bridges as well as ship separation readout on the bridges for station keeping purposes.



OCEANOGRAPHIC MAGNETOMETER SYSTEMS

The Barringer Oceanographic Magnetometer System was developed for the Oceanographic Office of the United States Navy. The system consists of two main parts; an on board instrument console and a marine towing system. The instrument console houses the OM104 Oceanographic Magnetometer, a monitor oscilloscope, a strip chart recorder and a power supply which provides the polarizing and magnetometer power requirements. The marine towing system consists of 750 ft. of special tow cable, an under water connector and a sensor or "fish".

The OM104 Magnetometer was developed to meet the U.S.N.O.O. requirements which called for a direct reading nuclear precession magnetometer with an accuracy of ± 1 gamma over a range of 20,000 to 100,000 gamma. The requirements included digital and analog outputs and a maximum cycling rate of 2 seconds to be initiated automatically, remotely or manually.

As a totally new design concept the equipment carries many interesting innovations but to personnel concerned with the streaming and recovery of such equipment the connector is of special interest.

The cable-fish connector was specifically designed for underwater towing. The techniques employed in the connector have been proved in military designs and were tailored to the magnetometer application. The connector is of the screw-connect type and contains three #12 standard pin type contacts. The shell is made entirely of non-magnetic brass and transmits the towing strain from the pigtail to the strain member of the low cable. All seals in the connector are mechanical and therefore either half can be replaced in the field with simple hand tools.

Use of a connector near the "fish" provides the system with flexibility that some systems do not have:

- (a) Damaged fish can be removed and replaced in a matter of minutes with minimal delay to a survey.
- (b) A tow cable may be used with various sensors using the standard connector.
- (c) Field repair of the connector does not occur at a critical area where contamination could affect the system performance.
- (d) Sensor can be readily removed from cable for continuity check of cable and sensor.

One final provision in the connector assembly is for the insertion of an instrument package between the male and female halves. This could be required for signal preamplification in deep towing applications. The unit is merely screwed into place between male and female connector halves.

Specifications

Resolution: 1 gamma

Accuracy: ± 1 gamma

Range: 20,000 to 100,000 gamma in sixteen overlapping ranges, selected by front panel switch

Cycling Mode: Automatic, manual or remote

Maximum Cycling Rate: 2 seconds

Automatic Cycling Rate: 2 seconds to 3 minutes, adjustable through hard wiring

Display: 5 numerical indicator tubes showing the field directly in gamma units

Outputs: Digital — 5 figure 1-2-4-8 BCD and Print Command

Analog-current output and voltage output
The analog output represents 0-99 gamma and 0-990 gamma on separate channels

Power Requirements: Magnetometer — 22v to 32v DC @ 1.5 amps max

Polarizing — 22v to 45v DC, 4 amps @ 28v (typical)

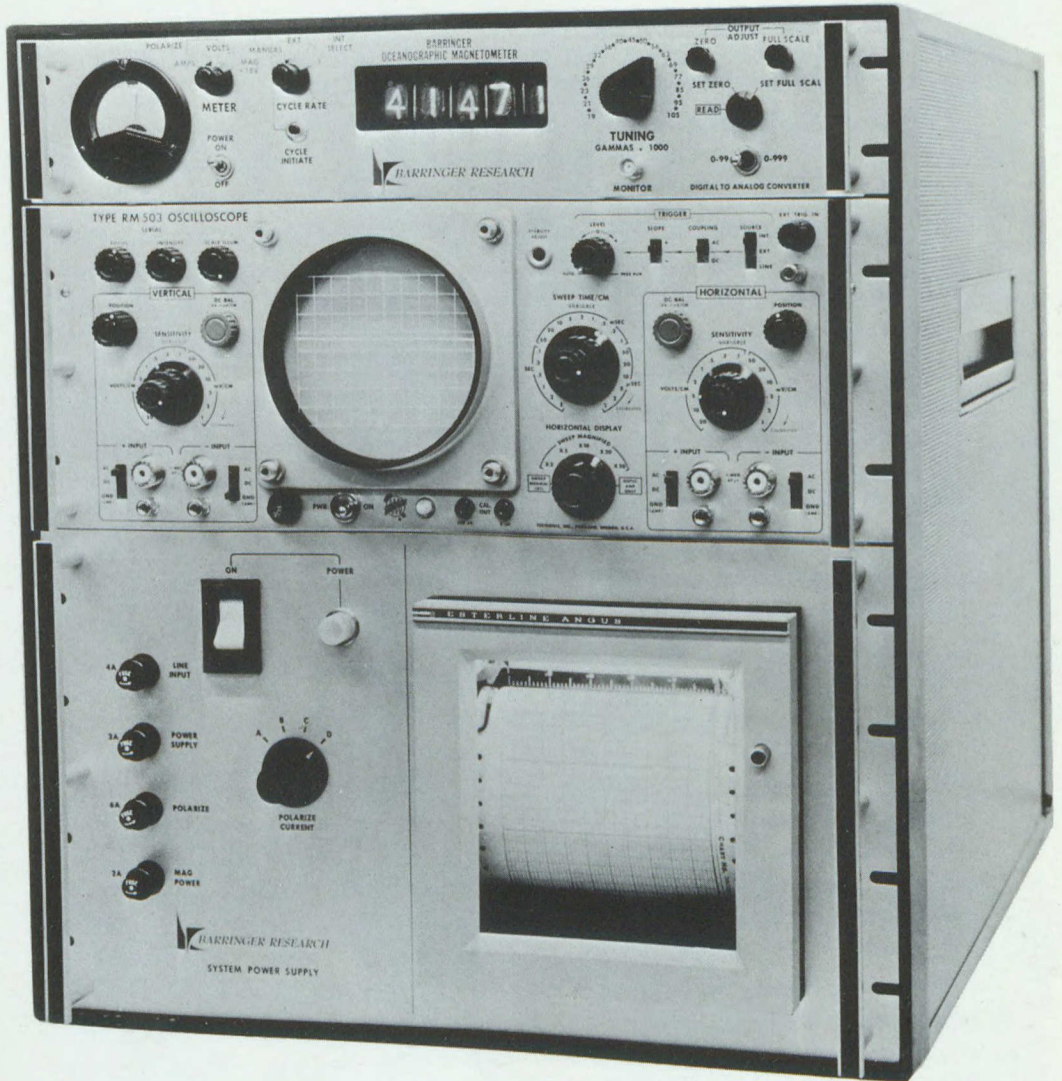
Optional power supply available to provide magnetometer and polarizing power requirements 115v, 220v, 240v AC 50/60HZ

Temperature Range: 0-50°C

Size: Width 19", height 3½", depth 10" (48 x 9 x 25 cm) designed for front panel mounting in standard 19" (48 cm) rack

Weight: 10.6 lbs. (4.9 kg)

Sensor: Barringer Marine Towing System Type C1041.



VDS—VARIABLE DEPTH SONAR (504)

A type of sonar that is one of the most significant developments in the science of submarine detection in recent years has been in use by the Royal Canadian Navy since 1960 and is also in use with the Royal Navy, the Royal Australian Navy, and the Royal Indian Navy.

Called Variable Depth Sonar (VDS), the new system enables warships to lower sonar gear through the ocean's thermal layers, thereby overcoming the submarine's ability to escape detection in or below these temperature strata.

Variable Depth Sonar was the result of more than ten years' research and development by Defence Research Board scientists of the Naval Research Establishment, Halifax and specialists of the Royal Canadian Navy.

The need for a layer-probing sonar first became apparent when enemy submarines, both by accident and design, made tactical use of thermal layers during the Second World War.

The upper levels of oceans usually contain layers of varying temperature which form a horizontally uniform patterns many miles in extent. These layers may impede or completely resist penetration by sonar transmissions from hull-mounted sets.

The problem was of particular concern to the RCN because of such water conditions off Canada's coasts.

DRB scientists and RCN anti-submarine specialists, working together, discovered the problem could be substantially overcome by placing transducers in or below the layers of varying temperatures.

Applied research and revelopment followed. The result is essentially a transducer which can be towed at varying depths. The towing cable houses a core of electrical conductors for carrying signals to the sonar displays and electrical power to the transducer.

The concept that led to the development of VDS was initiated almost simultaneously in Canada and the United States. Close liaison was maintained with the United States Navy and Royal Navy, which also sought improved detection methods along similar lines. Information was shared throughout with Canada concentrating on specified possible methods as the other countries explored allied techniques.

HMCS **New Liskeard** (coastal escort) was the first ship to be used for experimental trials. Repeated testing and modification resulted in improvement in the equipment's performance, and an improved version of VDS, built by Canadian firms, was installed in HMCS **Crusader** (destroyer escort). Intensive evaluation produced effective results and the equipment was accepted for service in the RCN.

While it is most obvious that these are older equipments it should be realized that development in this field has continued and newer equipments have been evolved.



TRANSISTORIZED MARINE RADIO—LN55

This compact Canadian Marconi Company marine navigational radar was designed to bring the benefits of radar navigation to small craft operators without the high cost, high power consumption and the need for technically competent operators associated with previous radars.

The set is available with either 5-inch or 10-inch (12.7 or 25.4 cm) display units which may be bulkhead or chart-table mounted or free standing on a pedestal. The use of all solid-state circuitry (except the CRT) and fixed coil deflection system eliminate the need for ventilation of the display cabinet permitting closed cabinet design for weather protection. The fixed coil deflection system also eliminates motor noise usually found in moving-coil systems and the display units are completely noise-free. An edge-lit panel enhances night-time operation as all functions and major control positions are visible without glare.

Two precision slotted-waveguide antennas are available. The smaller, 3-foot (.9 m) antenna is enclosed in a glass-epoxy radome which provides complete protection from wind, water and icing conditions, eliminating wind drag and ice loading to keep power drain to a minimum. The rotating mechanism is extremely quiet.

For larger vessels or where space and other conditions permit, a conventional 4-foot (1.2 m) tabular rotating antenna provides improved angular discrimination.

Either antenna may be used with either display unit, allowing complete flexibility in meeting operational and environmental requirements.

The separate transmitter/receiver unit can be installed in any convenient location to simplify the running of waveguide. This unit contains the completely solid-state receiver and regulated DC power supplies as well as the 7.5 kilowatt transmitter. Plug-in power adaptors permit efficient operation from 13.6, 26.4 and 36.0 UDC as well as 115/230 VAC power sources. The circuitry is protected by fast-acting primary and extensive secondary fusing. Installation and maintenance have been simplified by the use of a comprehensive system of test points and controls.

Sales of the LN-55 radar have exceeded 1,000 sets, including some for use in U.S. Navy helicopters.

Specifications

RECEIVER

I.F. Bandwidth: 5MHz
I.F. Center: 30MHz
Tuning: Synchronous
Noise Figure: 12db (overall)

Rotation Speed
Horizontal Beamwidth (-3db points)
Vertical Beamwidth
Side Lobe Suppression
Type

Polarization
Wind Load @ Rated RPM

GENERAL

Power Requirements: Approximately 160 watts at 13.6, 26.4, 36 VDC or 115/20 VAC
Ranges: 10" (2.54 cm) Display — 1,4,8 and 16 nautical miles
5" (12.7 cm) Display — 1/2,2,8 and 16 nautical miles

Calibration: $\pm 2\%$ of range
Range Discrimination: 35 yards (32 m) or better
Bearing Accuracy: $\pm 1^\circ$

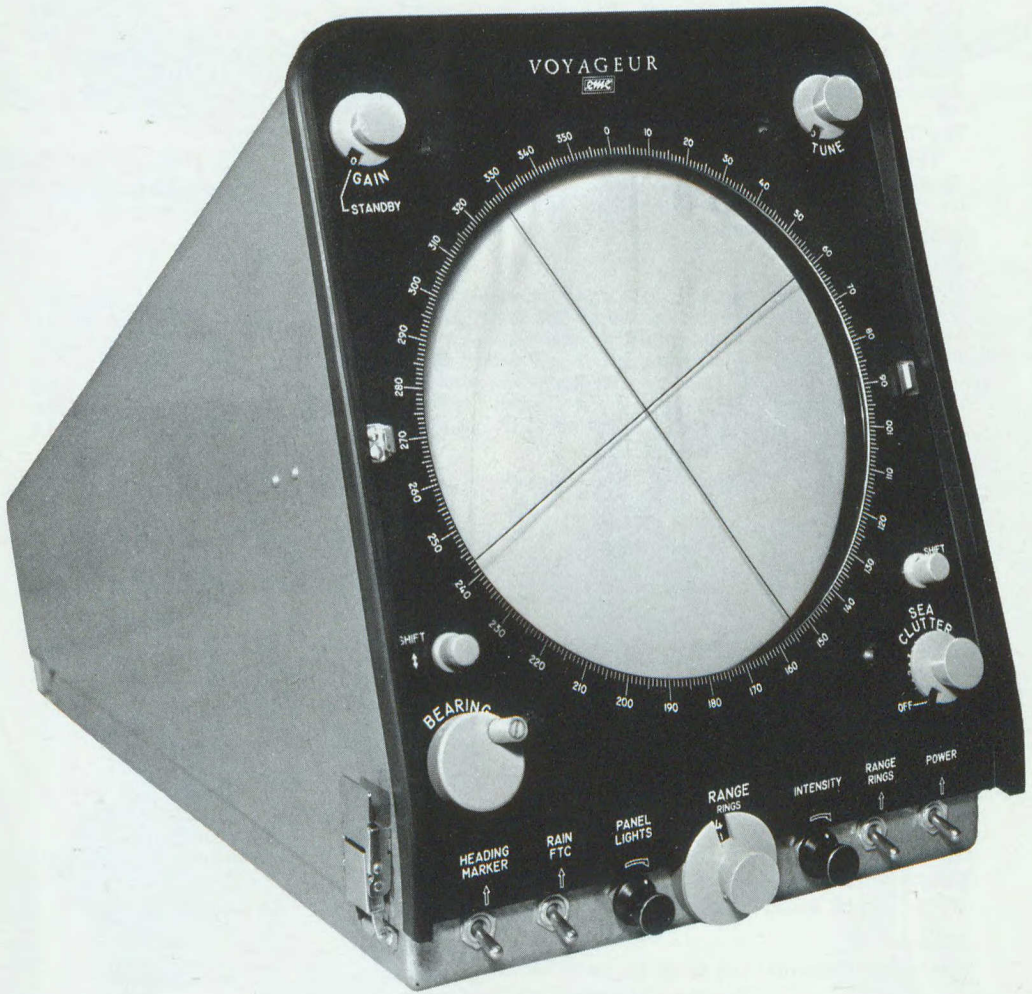
Weights: Transmitter/Receiver	37 lbs. (16.8 kg)
3' (.9 m) Antenna with Radome	50 lbs. (22.9 kg)
4' (1.2 m) Antenna	65 lbs. (29.5 kg)
5" (12.7 cm) Display Unit	28 lbs. (12.7 kg)
10" (25.4 cm) Display Unit	32 lbs. (14.5 kg)

TRANSMITTER

Peak Power Output: 7.5Kw
Frequency: 9375 ± 30 MHz
Modulator: Line & Thyatron
Pulse Length: 0.18 micro seconds
P.R.F.: 1500 pps.

ANTENNAS

3-foot (.9 m)	4-foot (1.2 m)
22 RPM	22 RPM
2.5°	1.8°
22°	25°
24db+	26db+
Precision Slotted Waveguide	Precision Slotted Waveguide
Horizontal	Horizontal
80 Knots	80 Knots



TRANSISTORIZED MARINE RADAR—LN66

The LN66 marine navigational radar set represents an evolutionary development of this equipment line and features commonality of many parts with the LN55 previously described. It differs mainly in increased power, increased range and improved range resolution with these improvements being the result of continuing development by Canadian Marconi in this field. The three major units of equipment in each LN66 system are:

Antenna Group

A 4-foot slotted waveguide antenna is enclosed in a tubular radome and mounted on a gear box or antenna drive unit. This unit is connected via a rotary joint in the gear box to the Transmitter/Receiver unit by means of elliptical waveguide. A smaller, 3-foot (.9 m) slotted waveguide antenna is available. The entire antenna and drive unit is enclosed in a glass-epoxy radome which provides complete protection from wind, water and icing condition eliminating wind dray and ice loading to keep power drain to a minimum.

The Transmitter/Receiver Unit

This contains the regulator for the D.C. voltages required for both the T/R unit and the display unit. The T/R unit contains the modulator, magnetron, duplexer, klystron, local oscillator, mixer and I.F. amplifiers. Warm up time is restricted to 180 seconds by a built-in thermal delay unit.

The Display Unit

This contains no power supply other than the HV supply for the CRT, and combined with the solid-state circuitry and fixed-coil deflection system, eliminates the need for ventilation of the display cabinet permitting closed cabinet design for weather protection. An edgelit panel provides uniform illumination of all switch and control positions. The display unit is equipped with a 10" (25.4 cm) cathode ray tube utilizing a P33 phosphor giving long persistence and good contrast. The short pulse length sub FTC provide for effective resolution during periods of heavy precipitation. A smaller version of the display unit using a 7" (17.9 cm) CRT is available.

Specifications

RECEIVER	TRANSMITTER	
I.F. Bandwidth: 14MHz	Peak Power Output: 10KW	
I.F. Center: 45MHz	Frequency: 9375 ±30MHz	
Tuning: Synchronous	Modulator: Hard Tube Type	
Noise Figure: 12 db (overall)	Pulse Lengths: .05 and .25 micro seconds	
	P.R.F. 2500 and 1250 pps	
	ANTENNAS	
	3-foot (.9 m)	4-foot (1.2 m)
Rotation Speed:	22 RPM	22 RPM
Horizontal Beamwidth (-3 db Points)	2.5°	1.8°
Vertical Beamwidth	22°	25°
Side Lobe Suppression	24 db+	26 db+
Type	Precision Slotted Waveguide	Precision Slotted Waveguide
Polarization	Horizontal	Horizontal
Wind Load @ Rated RPM:	80 Knots	80 Knots

GENERAL

Power Requirements: 180 W @ 12, 24 or 36 VDC

Separate Converter provided for use or 115/230 VAC.

Ranges: ½, 1½, 3, 6, 12 and 24 nautical miles

Calibration: ±1%

Range Discrimination: ±20 yards (18.3 m)

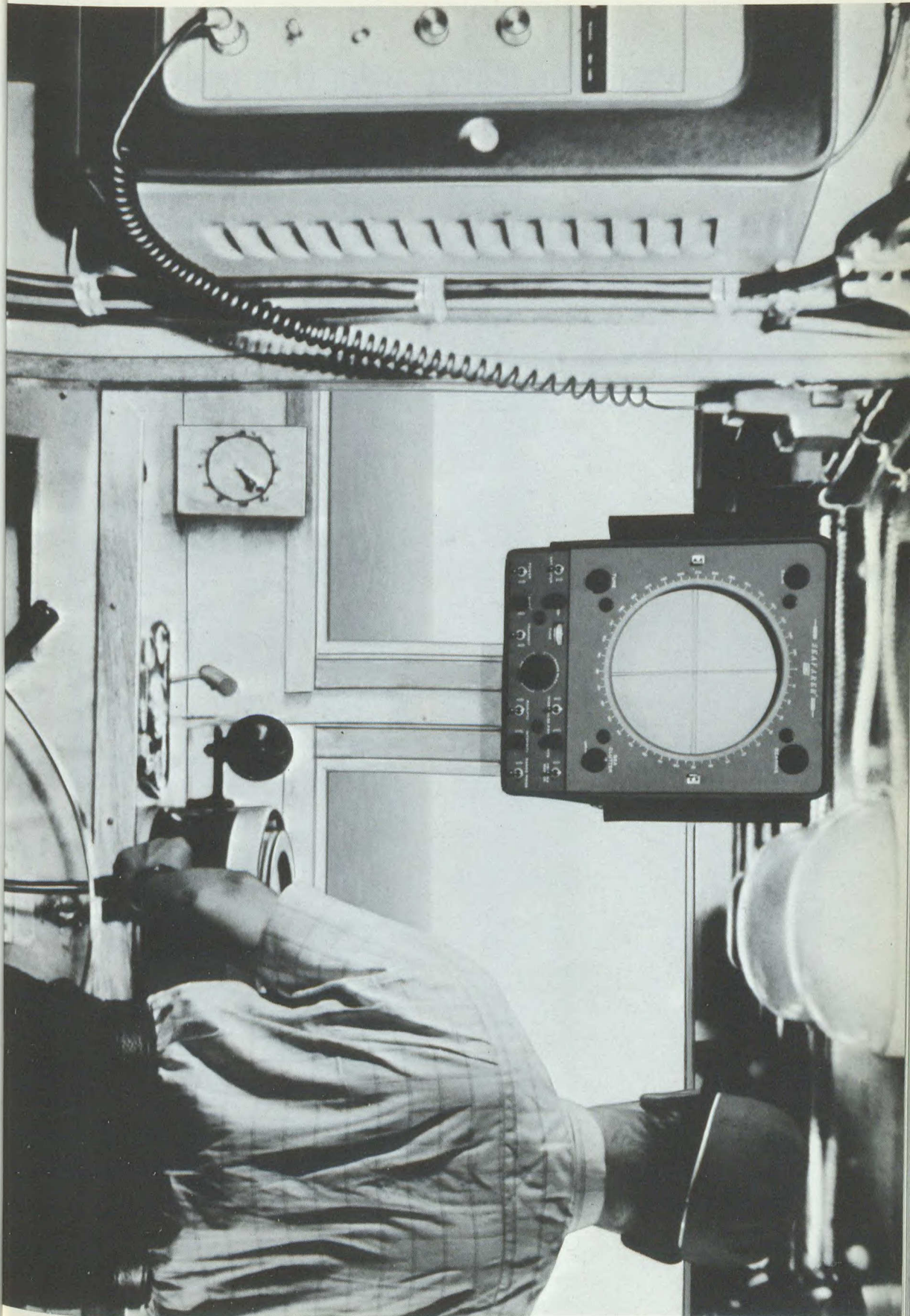
Bearing Accuracy: ±1%

Weights: Transmitter/Receiver 37 lbs. (16.8 kg)

3' (.9 m) Antenna with Radome 50 lbs. (22.9 kg)

4' (1.2 m) 65 lbs. (29.5 kg)

10" (25.4 cm) Display Unit 35 lbs. (15.9 kg)



SUBMARINE SIGNAL SIMULATOR (SSS)

As a result of CAE's leadership in the field of ASW aircraft compensation, further developments in the general scope of MAD (Magnetic Anomaly Detection) have resulted. Due to the limited use of signal processing in MAD, operator training can significantly improve MAD detection capability. To this end the Electronics Division of CAE Industries Ltd. has developed the SSS, an electronic device which generates submarine-like signals, simulating the actual submarine magnetic signature, which may be injected directly into the MAD system. The SSS may be used either while airborne, on the ground, or in a simulated system trainer or bench test set-up.

The SSS, by means of rotary controls on the front face, can be made to simulate 3 different submarine magnetic moments (from small to nuclear size), aircraft speeds from 50 to 300 knots, and aircraft-to-submarine separations from 500 to 3000 feet (152 to 914 m). Each of the above conditions can be simulated for 5 different representative submarine signal shapes corresponding to the various combinations of aircraft and submarine headings.

The simulator is very simple to operate. Once the various controls have been set to select the desired conditions with respect to separation, airspeed, etc., the simulated signal is then started by means of a toggle switch. When the simulated signal reaches the point where the "aircraft" has passed closest (or over) the "submarine" an "ON TOP" lamp lights thus allowing the operator (or instructor) to determine how "late" he was in recognizing the submarine signal.

Since the simulator generates an electrical analog of the submarine signal, it may be used either in the air with actual background geological and geomagnetic noise or on the ground with simulated background noises. The CAE SSS is compatible with all existing MAD magnetometers (ASQ-8, ASQ-10A) as well as new 0.01 Gamma Magnetometers (ASQ-81, CSF Caesium MAD, and the CAE Optically Pumped Oriented Magnetomer (ASQ-501)).

For realistic MAD operator training the SSS is usually operated by someone other than the MAD operator (possibly the co-pilot) so that true operator training and performance evaluation may be effected.

The SSS is also a very useful tool in evaluating and grading overall MAD performance since it provides a stable signal reference with which detection range capability may be evaluated.

The most significant aspect of the SSS is that it eliminates the necessity of tying up a submarine for MAD training purposes. With the SSS, MAD training with simulated submarine signals can be done on each and every MAD flight if desired.

SUB
SIGNAL
SIMULATOR

ON TOP

1 2 3

SUB SIZE

A rotary knob with a white pointer and a scale marked 1, 2, and 3. The knob is currently set to approximately 2.5.

1000 1400 2000
700 2400
500 3000

SEPARATION

A rotary knob with a white pointer and a scale marked 500, 700, 1000, 1400, 2000, 2400, and 3000. The knob is currently set to approximately 1400.

1 2 3 4 .5

PAT.

A rotary knob with a white pointer and a scale marked 1, 2, 3, 4, and .5. The knob is currently set to approximately 3.5.

150 180
100 .240
50 300

AIRSPEED

A rotary knob with a white pointer and a scale marked 50, 100, 150, 180, 240, and 300. The knob is currently set to approximately 180.

START

A pushbutton with a white indicator.

PWR
OFF

A pushbutton with a white indicator, labeled PWR and OFF.

X-Y PLOTTING TABLE, SUBMARINE (Model M450A)

The Marsland Engineering Limited model M450A plotting table is an electro-mechanical-optical display device of a size suitable for installation in submarine vessels, consisting of a plotter display unit, mounted on top of and hinged to an electronics unit. Own Ship's Motion (OSM) data in the form of AC voltages proportional to the North-South (Y) and East-West (X) components of speed are converted into scaled movement of a projector which displays a circular image of Own Ship Position on the plotting surface. Also displayed on the control panel are Own Ship's Position in degrees, and minutes of latitude and longitude. Target bearing data (true) is accepted in the form of 360°/revolution synchro transmission and displayed as an arrow cursor, concentric to the Own Ship Position on the plotting surface.

The plotter display unit (M464A) is a cast frame containing the projector carriage, the mechanical drive assembly, the control panel and the plotting surface. The projector carriage is a platform, positioned in X and Y co-ordinates by a cable drive, and carrying the projector assembly which consists of a blower cooled tungsteniodine lamp, a lens system, a rotary reticle, the target bearing servo-mechanism, and a solenoid actuated shutter to blank out the bearing cursor. The mechanical drive assembly is a step motor driven cable and pulley system which moves the projector carriage in response to digitized increments of own ship's motion from the electronics unit. The plotting surface is a laminated plastic rear-projection screen which may be marked on with a grease pencil or crayon, or which may be covered with transparent drawing paper or a transparent chart.

The control panel is recessed into the top of the plotter display unit and is hinged for ready access for maintenance and repairs. In addition to the various control functions, the control panel also contains the Ship's Position Indicator (SPI), a pair of step motor driven dial counters which display latitude and longitude of own ship.

The electronics unit M465A, is a reinforced sheet metal box containing the electronic packages, regulated power supplies and input cable connections. The electronics packages are all on plug-in printed circuit cards. The majority of the circuit functions are accomplished by means of integrated circuit modules, of the linear and digital logic types.

Specification:

INPUTS:

1. East-West component of OSS (Sox) — 0.25/Kt at 400 Hz, North-South component of OSS (Soy) — 0.25/Kt at 400 Hz, to a maximum of 50 Knots (12.5 volts), referred to a 115V 400 Hz reference voltage (VR) derived from the plotter.
2. Target Bearing Data, 360°/Rev., 400 Hz 3 wire synchro referred to 115V 400 Hz (VR) derived from the plotter.
3. Target "In-Contact", a normally-open switch closure which actuates the bearing cursor shutter.

ACCURACIES:

1. Own Ship Position — $\pm 1\%$ of distance travelled, all scales, all speeds from 5 knots to 40 knots. ($\pm 3\%$ from 1 knot to 50 knots)
2. Target Bearing — $\pm 0.5^\circ$ of ordered bearing up to 20°/sec. bearing rate.
3. Ship's Position Indicator
 - Latitude $\pm 1\%$ of distance travelled
 - Longitude $\pm 1\%$ to 60° Latitude
 - Longitude $\pm 3\%$ to 85° Latitude

SLEWING RATES:

1. Own Ship's Position: East-West 2"/sec.
North-South 2"/sec.
2. Target Bearing: 36°/second.
3. Ship's Position Indicator: Latitude 20 min./sec.
Longitude 20 min./sec.

SCALES: $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 5, 10 nautical miles per inch.

POWER REQUIREMENTS:

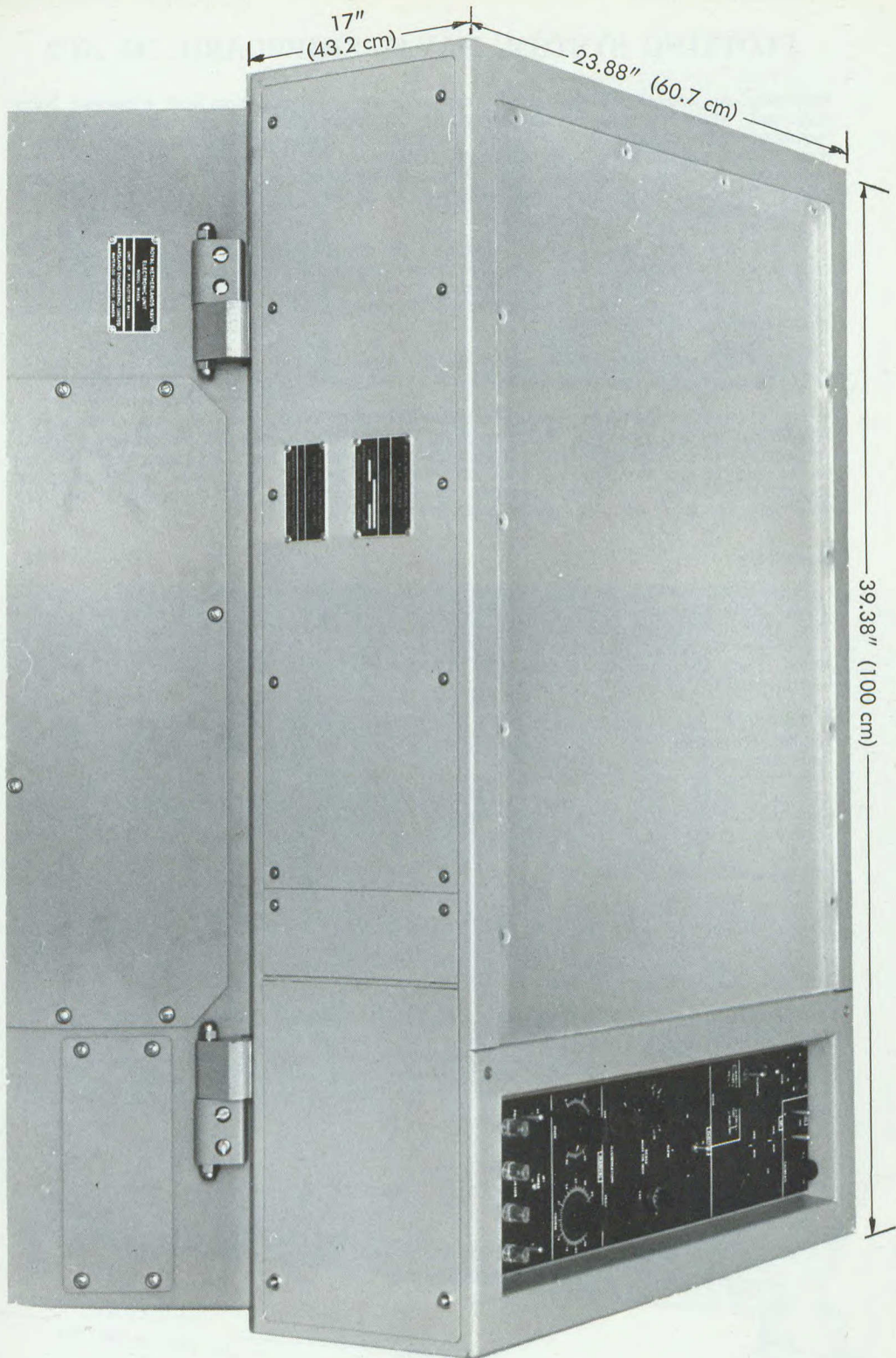
1. 115V $\pm 10V$, 400 Hz ± 20 Hz, 1 Phase, 4.0 Amp.
2. 115V $\pm 10V$, 60 Hz ± 5 Hz, 1 Phase, 2.0 Amp.

DIMENSION: (complete plotter)

17" H x 23.88" W x 39.38" L. (43.2 cm H x 60.7 cm W x 100 cm L).

WEIGHTS:

- | | |
|--------------------------|-------------------|
| 1. Plotter Display Unit: | 132 lbs. (60 Kg) |
| 2. Electronics Unit: | 103 lbs. (47 Kg) |
| Total: | 235 lbs. (107 Kg) |



17"
(43.2 cm)

23.88" (60.7 cm)

39.38" (100 cm)

TELETYPE UNIT
Model 15
Serial No. 10000
1960

TELETYPE UNIT
Model 15
Serial No. 10000
1960

PLOTTING SYSTEM, NAVAL SHIPBOARD, Mk NC2

Following an extensive development program in close collaboration with Canadian Navy personnel, Marsland engineers developed the Analogue Plotting Computer Mk NC2 or "automatic plotting system". The system automatically displays accurate continuous location data of two targets on a large horizontal translucent screen. Over 200 installations have been made on Royal Canadian Navy, Royal Netherlands Navy, and United States Navy vessels equipments in use have been well received by navy personnel and have proven their operational value.

Target range and bearing data is fed into the electro-mechanical computing and drive circuits in the Plotting Table, with the range data passing through the Data Converter where it is modified for use by the plotting system. In a typical operation one target could be a submarine under attack (being tracked by sonar), and the second target an attacking helicopter (being tracked by radar).

"Own ship" speed and course data from the speed log and gyro compass is also fed to the computing and drive circuits, with the speed data passing through the Data Converter.

The computing and drive circuits automatically process the received data, and drive a mechanical-optional assembly (including Main Projector and Target Plot Attachments), which projects on to a translucent screen a compass rose polar diagram with "own ship" position at the centre, and two colored spots of light (one red and one green) representing the targets. A scale Selector Switch provides for seven scales from 0.25 nautical mile per inch (500 yards per inch) up to 10 nautical miles per inch.

Equipment

PLOTTING TABLE has the form of a large office desk, the top of which is a heavy armor plate glass projection screen, overlaid with a plastic sheet for track plotting. The table frame is ruggedly built and the whole unit shock mounted. The Plotting Table contains the electro-mechanical computing and drive circuits; and the mechanical-optical projection units (Main Projector and Target Plot Attachments) which are mounted on a movable carriage and bridge assembly.

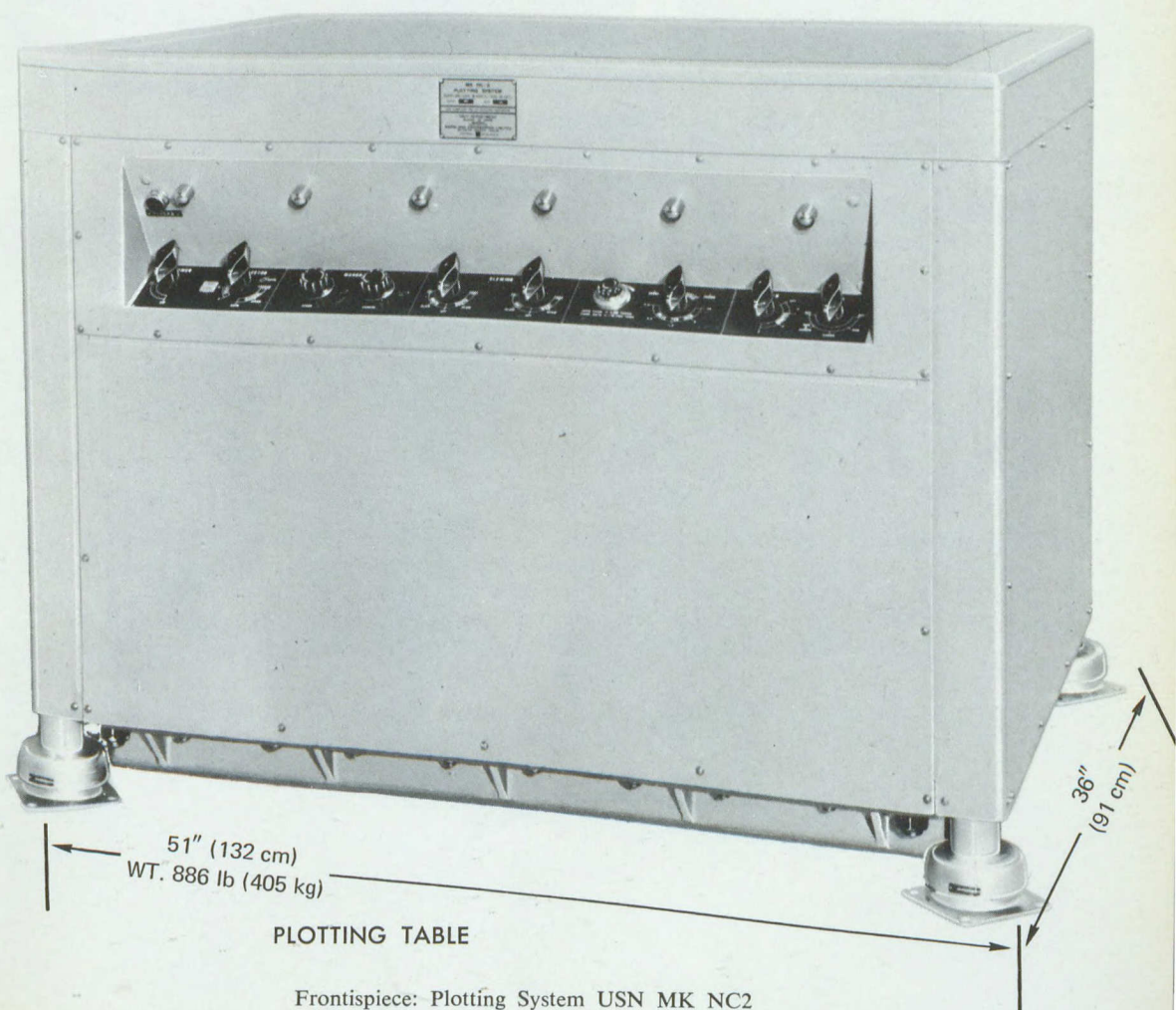
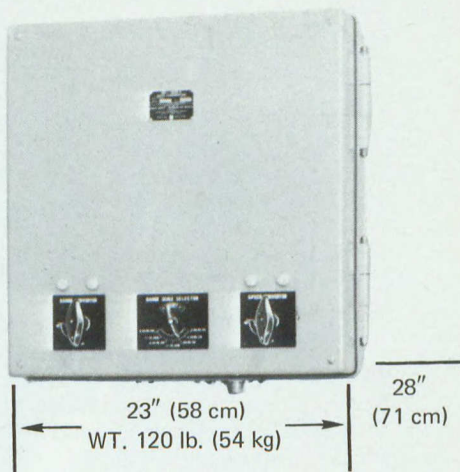
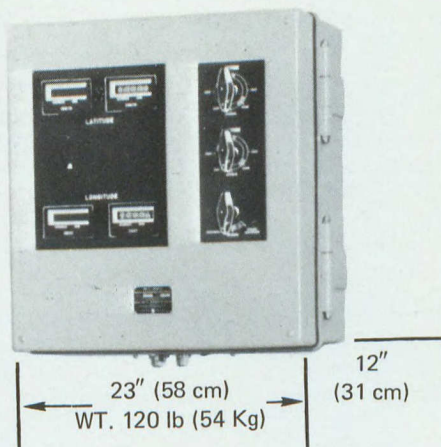
TARGET PLOT ATTACHMENTS are ruggedly constructed, automatic mechanical-optical projection units located in the Plotting Table. Each unit comprises a movable projector which projects a light spot on the display screen, and associated driving mechanism. Systems can be supplied with one or two units as required. In a typical two-unit system one unit would project a red spot to indicate the target under attack, and the other a green spot to indicate a supporting attack weapon (e.g. helicopter or other vessel). The Target Plot Attachments are mounted on the same movable carriage and bridge assembly as the main projector (which projects the compass rose and "own ship" position), so that the target spots accurately show the location of the targets relative to "own ship".

DATA CONVERTER is a strong cast alloy box mounted separately from the Plotting Table, containing electronic and mechanical equipment for converting target range and "own ship" speed data into a form suitable for use by the Plotting Table electro-mechanical computing and drive circuits. It also contains circuits for providing the seven different range scales available for selection by the operator.

DEAD RECKONING INDICATOR is a piece of ancillary equipment available for use with the basic plotting system if required. It is a cast alloy box mounted separately from the other equipment, containing an electro-mechanical computer. This unit displays the calculated position of "own ship" in angles of latitude and longitude, which can be read from drum type indicators through front cover windows. Necessary resetting controls are provided.

DEAD RECKONING INDICATOR

DATA CONVERTER



EMERGENCY RADIO BEACON

The RESCU/99 Emergency Radio Beacon is designed and manufactured by Garrett Manufacturing Limited.

The Beacon is lightweight, compact, fully automatic device intended primarily for use at sea in conjunction with life-rafts. Operation is initiated automatically upon immersion in water. The radiated power is nominally 350 milliwatts average on either or both of the two output frequencies: civil emergency frequency 121.5 MHz and Military emergency frequency 243 MHz. Each channel is amplitude-modulated using chopped-carrier modulation. The modulation sweeps downward in frequency over the range 1500 to 600 Hz at a rate of approximately 2½ sweeps per second, in accordance with the latest ICAO recommendations.

A water-activated magnesium-silver chloride battery provides power to operate the Beacon. The battery is totally dry and inert until activated by immersion in water. While normally intended for use in sea-water, the battery can also be activated by fresh water and by other aqueous liquids. The operating life is in excess of 48 hours.

The transmitter and associated circuitry are fully solid state, with all components operating at conservative ratings. A hermetically-sealed cover encloses all electronic circuitry.

The Beacon can be packed in a stowed life-raft or may be bulkhead-mounted. For the latter application, a bulkhead-mounting bracket is provided.

Tabulated Specifications

Frequency: 121.5 MHz and/or 243 MHz, 0.005% tolerance.

RF Output: 121.5 MHz – 350 milliwatts average power.

243 MHz – 350 milliwatts average power.

Modulation: Modulation in accordance with ICAO recommendations (100% swept tone modulation over 900 Hz range within the range 1500 to 600 Hz; Sweep rate 2 to 3 Hz).

Dimensions: Length (Stowed) 22.25" (56.5 cm)

Length (Operating, with Antenna erected) 38.75" (98.4 cm)

Diameter 2.75" (6.9 cm)

Weight 3.5 lbs. (1.6 kg)

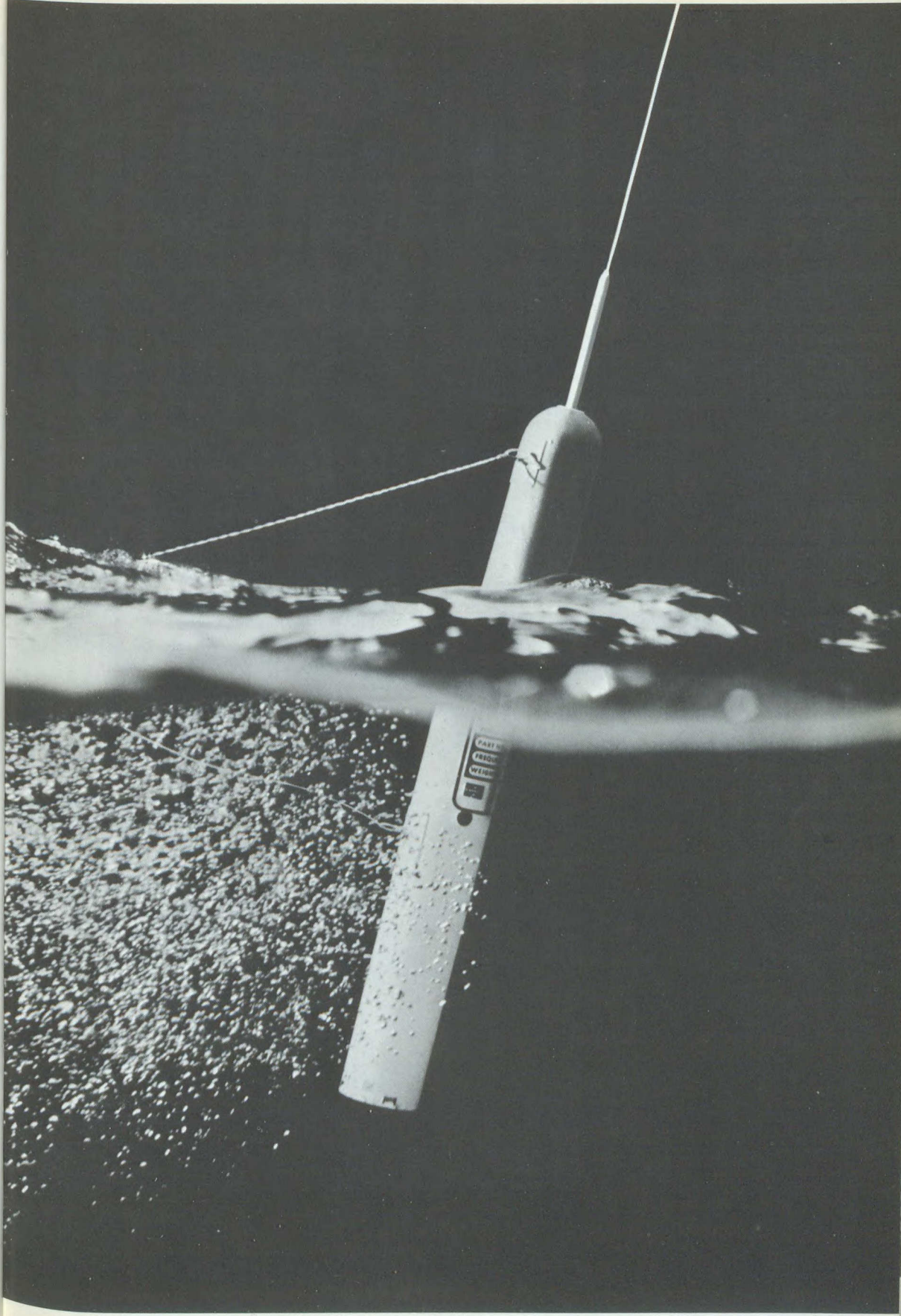
Operating Life: 48 Hours

Storage Life: Indefinite

Range: Over 200 miles (322 Km) at jet altitudes.

Compliance requirements formulated for these Beacons by the U.S. Federal Aviation Agency and Federal Communications Commission as well as by the Canadian Department of Transport have been met by the RESCU/99. With this status achieved the equipment has now been adopted by more than fifty airlines such as: Air Canada, Pan American, TWA, Lufthansa, SAS, Air France and by such aircraft manufacturers as Boeing and Douglas.

These documents differ considerably in scope and content; GML therefore, produced a single combined test procedure which meets the intent of all three documents.



TUL 30 RL LIFERAFT

GENERAL DESCRIPTION

The Tul 30 RL liferaft (reversible type) consists of two, 14 sided, polygon shaped buoyancy chambers superimposed on a single floor tangent to both chambers.

A reversible canopy system is fitted to an aperture located on the center of the raft floor, and confined within removable water-tight protective covers located on each side of the floor aperture.

Removal of either canopy cover will expose the canopy system, and allow an occupant to erect the canopy as per instructions printed thereon.

In the event of a capsizing, the remaining canopy cover now in a topmost position can be removed, and the canopy system can be reversed through the raft floor aperture and re-erected upright by following given instructions.

Liferaft features such as: boarding ramps, life-line, rescue line, sea lights, buoyant safety knife, rain-water catchments, mechanical and manual inflation systems, deflation plugs, hand pump, sea anchor, and repair kit are standard equipment on the Tul 30 RL Liferaft.

An equipment bag, containing survival equipment and emergency rations, can be added to satisfy FAA or military regulations.

INFLATION SYSTEMS

(a) MECHANICAL INFLATION (30-35 Seconds) LIFE RAFT

Provided by a high pressure (3000 PSIG) Nitrogen cylinder, a regulator valve, two hi-pressure hoses and two miniature air aspirators equipped with positive-pressure seal non-return valves.

(b) CANOPY SUPPORT STRUT MECHANICAL INFLATION

This is provided by a carbon dioxide cylinder. Release of CO₂ can be performed from any liferaft attitude. This system is used on initial canopy system erection.

(c) MANUAL INFLATION/TOPPING-UP

This is achieved by using the hand pump provided. Both buoyancy chambers and canopy support strut may be inflated from any liferaft attitude.

MATERIALS

Buoyancy tube fabric conforms to MIL-C-19002.

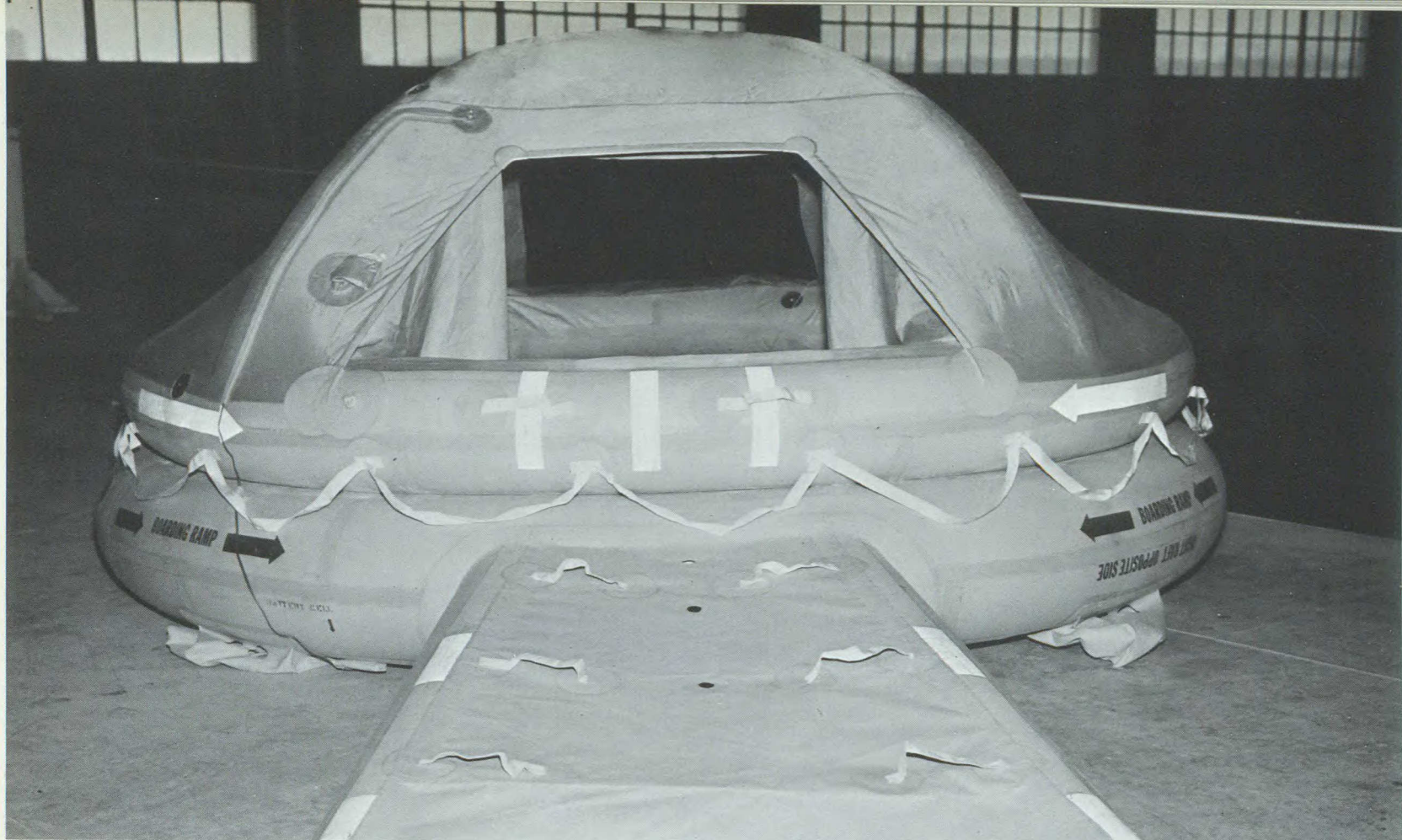
Canopy fabric conforms to MIL-C-7966, variety S.

LIFERAFT BUOYANCY AND WEIGHT DATA

Outside dimensions of buoyancy chambers across flats	13'3¼" (204 cm)
Diameter of upper and lower chambers	14" (35.6 cm)
Total volume of upper and lower chambers	90.8 cu. ft. (2577 litres)
Buoyancy of main chambers only (fresh water)	5675 lbs. (2574 kg)
(salt water)	5847 lbs. (2652 kg)
Maximum effective buoyancy of liferaft	18380 lbs. (8337 kg)
Weight of liferaft (less inflation equipment)	approx. 55 lbs. (25 kg)

EQUIPMENT WEIGHT DATA

Valise container	3 lbs. (1.36 kg)
Nitrogen cylinder c/w regulator & hoses	17 lbs. (7.7 kg)
Bellows bag	7 lbs. (3.2 kg)
Paddles (hand type)	1 lbs. (.45 kg)
Equipment bag	27 lbs. (12.5 kg)



This version of a 10 man raft differs from the one described in the article but serves to point out the variety of original designs offered by TUL. The boarding ramp may be seen together with the opened primary and secondary closure curtains. The water activated battery cell and emergency light are at the left of the canopy opening.

CUSTOM MACHINE SHOPS

The picture on the facing page is an indication of the back-up type of service now considered to be an integral part of in-house quality control of any progressive shop now actively engaged in the aeronautical and space fields. This furnace which has an internal diameter of 5 feet can handle parts up to 20 feet in length and is specifically approved for aluminum alloys in the 7075 T 6 and T 73 as well as 2014 T 6 ranges where temperatures up to 1000°F with controls of $\pm 3^\circ$ are required.

One of the lesser known strengths of Canadian industry is a small but select collection of custom machine shops that are capable of endeavours not normally found in a straight machine shop. Such firms add immeasurably to Canada's industrial make-up and the variety of products covered by some of them may be noted in this section offered by Universal Die & Tool Mfg. Ltd.

The "hard core" of machined parts for to-day's sub and supersonic aircraft continue to exert demands on production sources for the ultimate in skills, techniques and machine tools.

The picture on page 244 is representative of the type of structural component produced by this firm for the aircraft industry. They have produced such components for nearly all Canadian built aircraft since 1946. One of these, the Spar Caps for the DC9, 108" (274 cm) in length and starting off as a 350 lb. (158.8 kg) forging and finishing as a 75 lb. (34 kg) finished machine component, has been in quantity production for some 16 months and will remain so for quite some time to come. Below the Spar Cap is a structural member for the supersonic F 104 which incorporates a homogeneous continuous hinge.

The photograph on page 245 is a sampling of the smaller range of ordnance items produced. They include a Small Arms Universal Cleaning Kit at "A", Blank Firing Attachments for rifles and sub-machine guns at "B", a Tension Bar for steam aircraft catapults at "C", a Maintenance Tool for automatic rifles and a gear toothed Sight Quadrant at "D". The 3 piece steel Cleaning Rod at "E" is one part of the larger kit in the inset.

These two Cleaning Kits are considered capable of cleaning and maintaining any equipment from a hand weapon (pistol) to a .5 machine gun, including shotguns, by merely changing the accessory brushes which screw onto the Pull-through or Cleaning Rod. The two kits have been designed as a family and common parts are used throughout with each and every weapon receiving its own individual attention. Due to these features ordnance spares are greatly reduced and at the same time the cost of the overall item is kept low as it is now used in quantity across a family of weapons as opposed to individual items for each separate weapon.

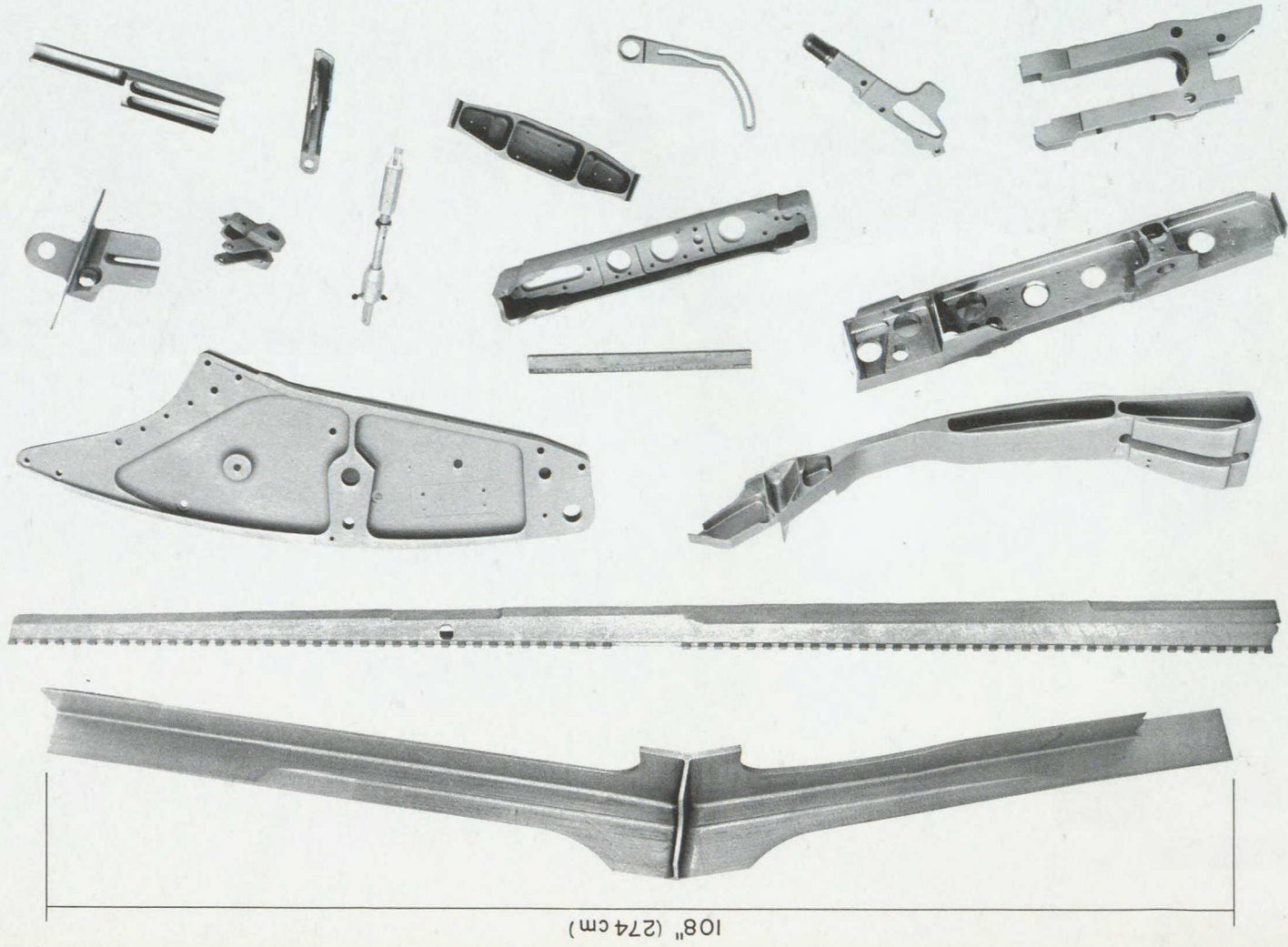
Universal Die & Tool have also produced Drill Rounds and Sub-calibre Devices for recoilless rifles, Rifle Grenade Launchers as well as Electro-Mechanical Target Devices for musketry training.

Firms of this type, in Canadian Industry, can usually be relied upon to provide a high degree of personal attention to an exacting production problem and yet, because of their smaller size, maintain reasonable and acceptable costs.

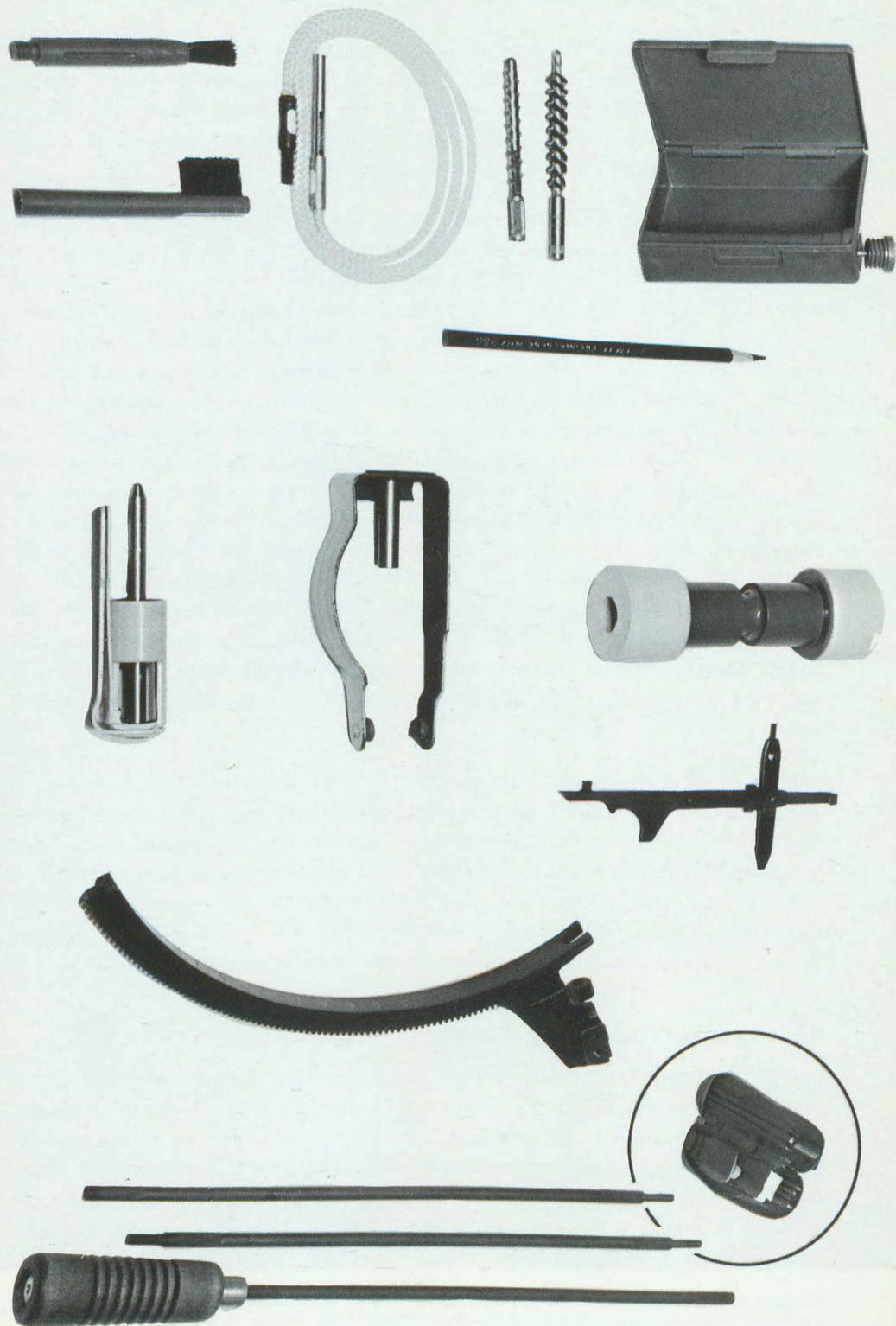


MUNICO

CUSTOM MACHINE SHOPS (cont'd)



CUSTOM MACHINE SHOPS (cont'd)



FLUIDIC DEVICES AND SYSTEMS

Aviation Electric Limited has been pursuing a program of Research and Development in the relatively new field of Fluidics since 1964. Today, the company's devices, recognized as among the most advanced and best performing ones on the market, are sold throughout the world. Complete engineering services are provided, from initial feasibility study through to complete systems design.

First generation elements (known as "LABMOUNT"), recommended for bread-boarding and experimental use, are a monostable amplifier (type 1100 M 0 1) a bistable amplifier (type 1000 B 02) a trimmable proportional amplifier (type 1301 P 01) and a diode (type 1200 D 01). These devices, moulded from polycarbonate thermoplastic, include tri-serrated brass fittings suitable for conventional interconnecting with $\frac{1}{8}$ " (3 mm) i.d. flexible tubing. All incorporate a unique vortex venting technique (patented) which completely eliminates impedance matching problems usually associated with such devices, and operate on the wall attachment principle (Coanda effect). The bistable and monostable amplifiers, like the diode, have been designed for use in digital and pulse processing fluidic circuits which may be built up in the same manner as electronic circuits. The proportional amplifier is used to perform analog computing functions in pneumatic systems. It is suitable for operation in analog control systems such as a level, pressure and temperature controllers. It can also be used in digital controls, for example, in conjunction with the Bistable amplifier, to provide a pressure switch with an adjustable set point. This proportional amplifier is provided with a specially designed trimming feature (patent pending) which may be used to adjust the initial setting of the bias level or establish accurate nulling of the amplifier output differential.

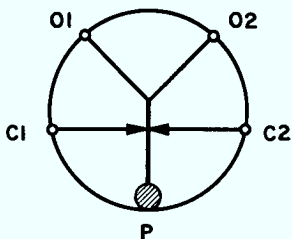
In 1968, Aviation Electric introduced its second generation fluidics, known as EDGEMOUNT. The heart of the Edgemount modular design concept consists of three basic elements that plug in to standard sockets which in turn are mounted on modules: a monostable amplifier, a bistable amplifier, and a trimmable proportional amplifier, all providing improved performance over the conventional first generation elements described previously. In addition, a composite element is available and is designed to provide special channel configurations to meet specific customer requirements.

The Edgemount Modular Plug-in System

The EDGEMOUNT modular plug-in system has been designed with ease of assembly and neat system layout in mind. The mounting on their edge of the amplifiers reduces considerably the panel area required for a system. Moreover, element replacement or circuit modification offers no problem. The EDGEMOUNT concept allows mounting of systems in standard industrial or airborne enclosures thus solving the problem of practical, functional packaging for fluidic circuits, heretofore associated with conventional fluidic hardware.



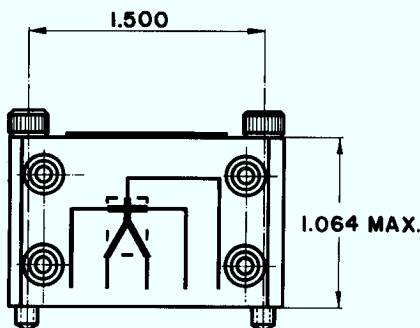
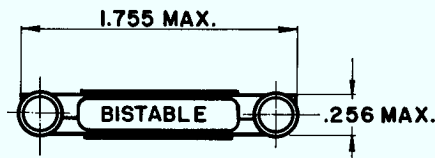
An "Edgemount" fluidic industrial sequencer control panel, demonstrating the easy replacement of elements and/or circuit modification now made possible with Aviation Electric's new modular design concept. All elements are plugged in to standard sockets, thus eliminating the tangle of interconnecting tubing usually associated with fluidic circuits.



- P = SUPPLY
- C1 = LEFT CONTROL
- C2 = RIGHT CONTROL
- O1 = LEFT OUTPUT
- O2 = RIGHT OUTPUT

Rate Sensor Operating Specifications

Function: Angular Rate Sensing
 Operating Medium: Gaseous Fluids
 Operating Principle: Vortex Flow Phenomenon
 Supply Pressure Range: 1.0 - 15 psig.
 Characteristics with the set supply pressure of 5.0 psig
 Flow Rate: 2.3 scfm
 Maximum Range: $\pm 300^\circ/\text{sec}$.
 Linearity: $\pm 2\%$
 Maximum Linear Range: $\pm 150^\circ/\text{sec}$.
 Nominal Gain: $K = 0.0036 \text{ psi}/^\circ/\text{sec}$.
 (Blocked Output)



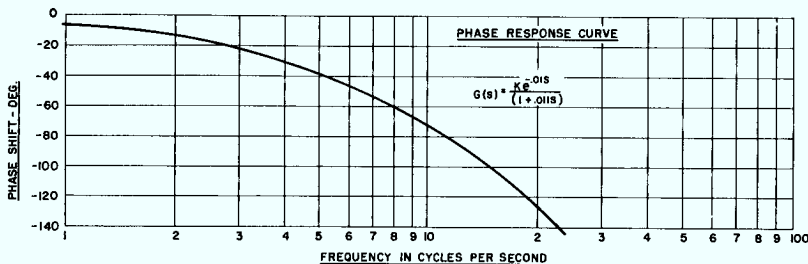
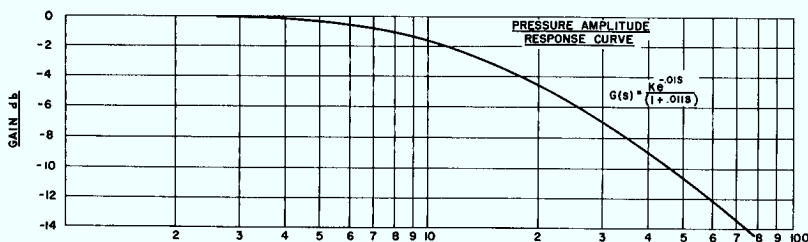
Operating Specifications (Bistable Amplifier)

Function: Two-Input Bistable Flip-Flop
 Operating Medium: Gaseous Fluids
 Operating Principle: Wall Attachment with vented vortex.
 Temperature Range: -65°F to $+160^\circ\text{F}$
 Element and Socket only.
 Supply Pressure Range: 1.0 to 15 psig
 Frequency Response: 800 cps (element only)
 Response Time: 0.0004 sec.
Loading Capacity: Element is stable from the fully opened to the fully blocked loading conditions.

Threshold Limit: $0.1^\circ/\text{sec}$.
 (10 cps bandpass)
 Noise Level: $0.1^\circ/\text{sec}$.
 Dynamic Range: 1500
 Null Output: $0 \pm .004 \text{ psi}$
 Hysteresis: $0^\circ/\text{sec}$.
 Delay Time: 10 msec
 Transfer Function: $G(s) = \frac{K_e}{(1 + 0.011s)}$
 $K_e = -0.015$
 Sensitivity to rotation about axes orthogonal to axis of symmetry:
 Below Threshold

Nominal Operating Characteristics at the Indicated Supply Pressures:

Supply Pressure psig	1.0	2.5	5.0	15.0
Supply Flow scfm	0.09	0.15	0.21	0.37
Pressure (Blocked) psig	0.36	0.94	1.98	5.65
C1 Switching Pressure psig	0.06	0.20	0.35	1.17
C2 Switching Pressure psig	0.12	0.35	0.60	1.26



The Angular Vortex Rate Sensor, type AE 1600 RS 01, available from production, is a device capable of sensing angular velocity about its axis of sensitivity and provides a differential pressure signal proportional to that velocity. The fluidic equivalent of a conventional rate gyro, it is, due to the absence of moving parts, ideally suited for operation in extreme environmental conditions. It can be used in systems for missile and space vehicle stability augmentation, for aircraft autopilots and for torpedo guidance. The rate sensor output signals may be integrated to provide attitude information.



AE 1600 RS 01 Fluidic Angular Rate Sensor, the fluidic counterpart of a gyro.

MICROWAVE FILM DRYER

Starting from a number of microwave application patents developed by the National Research Council in Ottawa, Devtek has developed and commercialized a range of microwave drying equipment. Included are units for the rapid drying of adhesives, paper and leather. Of particular interest for defence purposes is the development of a high speed photographic film dryer, a mock-up version of which is shown in the attached photograph.

The particular film dryer shown was developed for the drying of 9½" (24.1 cm) reconnaissance film. Microwave energy is used in this case to take advantage of the high microwave absorptive properties of water relative to film base materials. This enables the water to be evaporated rapidly without heating the base material. Using 2450 MHz microwave energy, the film can be dried to the required condition at speeds in excess of 100 f.p.m. (30.5 m.p.m.) in a 5 foot (1.5 m) chamber. This rate of drying is achieved without image degradation.

In microwave film drying the processed film is passed through a rapidly alternating electrical field. The dipolar molecules of water in the film emulsion are forced to reverse their orientation in step with the alternating field. The resultant inter-molecular friction produces the heat required for evaporation. This technique of direct energy transfer avoids the problems of thermal lag and temperature gradients inherent in conventional techniques of thermal transfer such as conduction, convection or radiation.

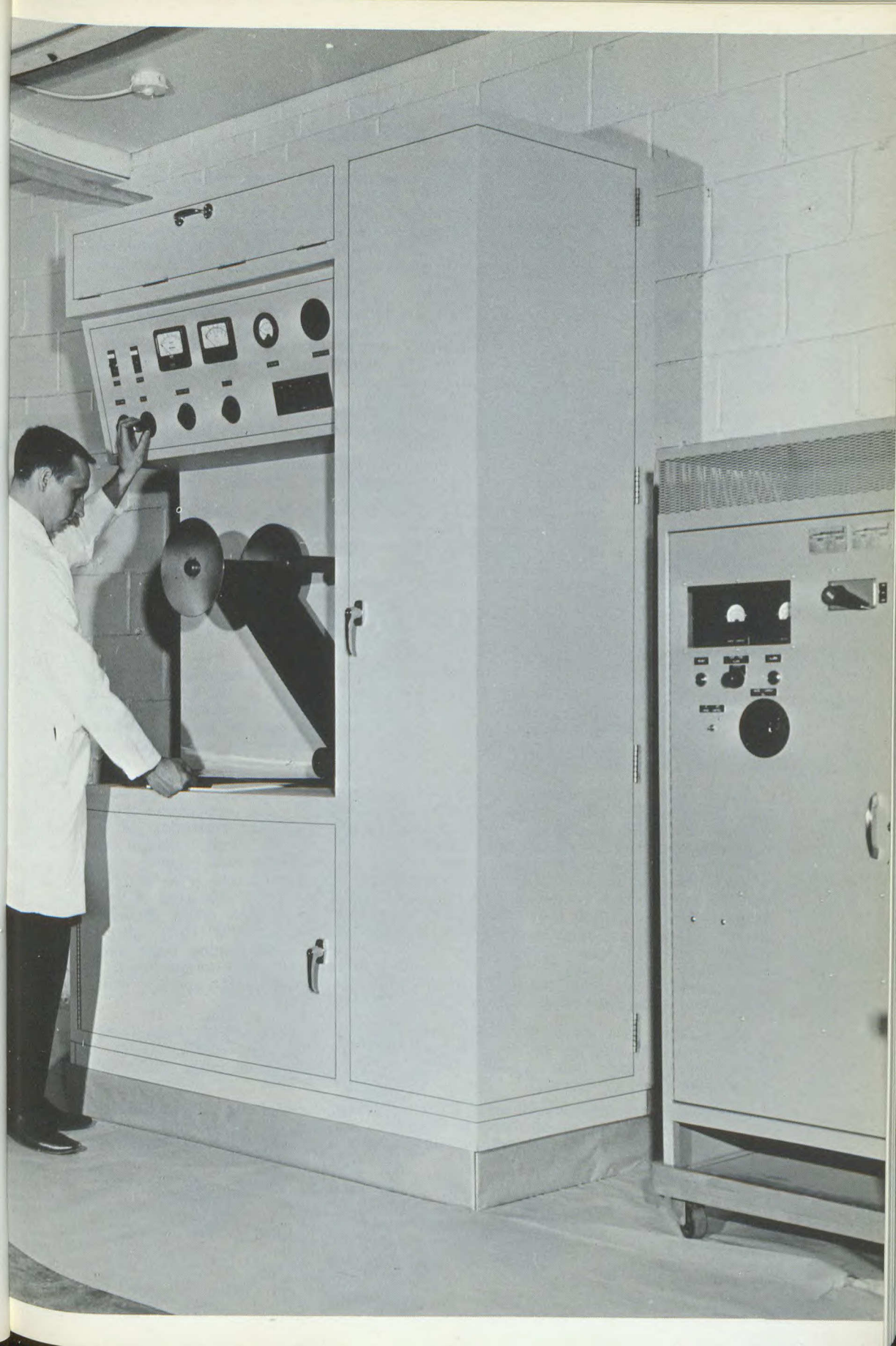
The Devtek film dryer uses a novel "parallel plate" application chamber. This design, a patented development of the National Research Council, is a significant improvement over standard microwave serpentine chambers, giving greater uniformity of drying of web materials such as film. In addition, the use of this parallel plate chamber, where the field is transmitted along the same direction as the web travel, also makes possible the use of a resonant system where a standing wave pattern is established. This leads to high power utilization efficiencies (about 95% RF energy utilization) in the 5 feet of chamber. Thus high output of a uniform high quality product is achieved within a small production space.

Devtek's experience in a variety of industrial applications of microwave energy has enabled the company to overcome a number of operating and maintenance problems previously associated with this technique of heating or drying. Prime among these is the problem of power source failure. With a number of the company's units now entering their third year of constant operation, Devtek has not experienced a single power source failure in the field. This performance results from careful design aimed to give maximum protection of the power source.

Also used to advantage in the film dryer is Devtek's experience in the development and design of film processing equipment. The principle of the Levitron Roll — an air support technique for handling webs without mechanical contact — is used for transporting the film where contact would cause damage to the image.

Additional features of this microwave drying system include rapid threading of the film, since the drying chamber can be opened for ready access, and use of automatic alarms and power cut-offs to protect the product and the equipment in the event of any malfunction of this or any associated equipment. Also, safety features are included to minimize the possibility of accidents due to mis-use of the equipment.

The above description refers primarily to the unit developed to meet one particular set of specifications. However this is not a standardized product and similar units can be designed to meet specific individual requirements. The same features of unique chamber design, product quality, efficient energy utilization and high speed drying would be applied to any Devtek drying system.



AUTOMATIC STRAIGHT-LINE TINNING AND REFLOWING APPARATUS

Automated soldering is the most advanced mass production method for the joining of electronic components or integrated solid state packages to the parent printed wiring board, because of the reliability obtained with little or no hand preparation. The reliability and durability of the resulting soldered electrical connections are of prime interest. The most important factor which affects the success of these objectives is the solderability of the component lead and the printed wiring conductor surfaces which are to be joined.

The surface of the copper print is prone to tarnish and oxidize when exposed to the atmosphere for a duration exceeding several days and the removal of this surface oxide — a prerequisite to successful soldering — can be achieved only with the proper application of a very active flux. The use of a highly aggressive flux is undesirable and its use is often forbidden in soldering specifications.

Since solder has an extremely high affinity for solder, the reliability of the soldered electrical joint can be improved if the copper conductor surfaces have been pre-tinned with hot fused solder. If pre-tinning of the printed wire pattern is undertaken before oxidation has occurred, then aggressive fluxes can be avoided, and high speeds and low temperatures can be employed to perform the component soldering.

The development of the Electrovert ASTRA systems provide a means for applying a highly solderable fused coating to printed wiring boards. Pre-tinning of the printed surfaces using one of the Electrovert systems protects the printed pattern from oxidizing through the formation of a layer of intermetallic alloy of copper and tin, covered by a thin, uniform, continuous and shiny layer of solder.

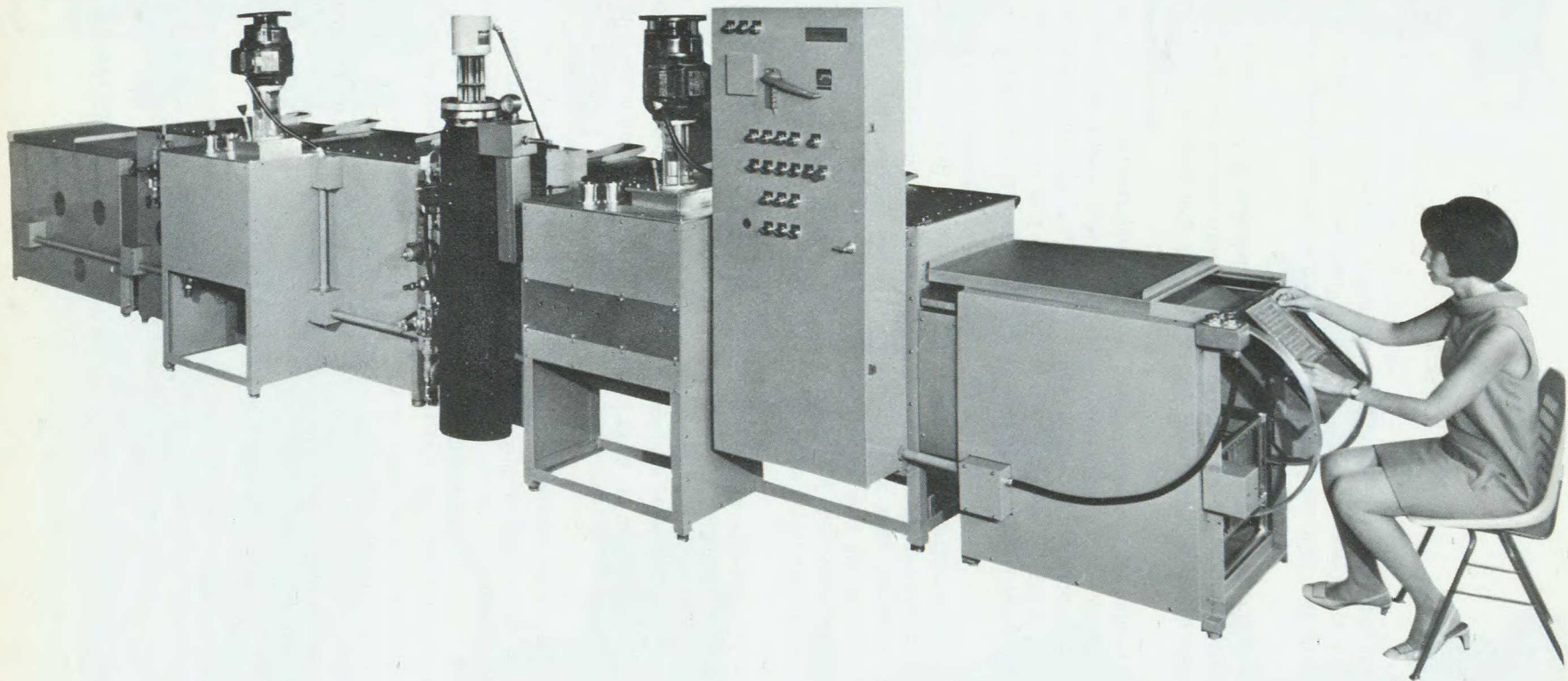
After a printed circuit board has been pre-tinned using one of the Electrovert systems, the shelf life is extended without a decrease in the solderability since the hot fused layer of solder on the printed pattern resists oxidation.

The ASTRA, Electrovert's new Automated Straight-line Tinning and Reflowing Apparatus processes printed wiring panels with dimensions up to 12" x 15" (300 x 375 mm). The machine is designed to accommodate not only individual boards but also large panels which may have several small repeated patterns for mass production processing. The processing speed of the ASTRA is 8' (2.5 m) per minute and will accept single or double sided boards.

The complete machine employs one operator who loads the printed wiring panel onto the conveyor system which takes the board through a flux application station followed by a hot solder coating operation. At this stage, the formation of the copper-tin boundary alloy layer is complete and is covered with a fairly uniform coat of solder. The pre-coated board is subsequently conveyed to the next position where a hot liquid spray is directed to the top and bottom side of the board, with the result that the excess solder coat is removed leaving a uniformly leveled thin coat of shiny solder. All holes are left solder-free except for plated-through holes which are intentionally left with a thin uniform solder coat. Holes as small as 0.010" (0.25 mm) in diameter will be opened. Subsequently the board passes to a cleaning stage where water spray dissolves any leveled agent which may have remained on the board. A return conveyor transports the pretinned and leveled board back to the operator at the loading end of the line where a visual inspection is performed.

The machine is available with or without fluxing and solder coating stage (single or double sided) and the return transport conveyor system. The ASTRA system is capable of achieving a uniform solder coating thickness in the range of .000050" to .000500" (1.3 - 12 microns).

Re-flowing of printed wire boards which have been electroplated with a coating of tin or tin-lead can be undertaken using the ACTA or ASTRA systems with the resulting formation of the intermetallic alloy covered with a thin uniform sealed layer of solderable metal.



FORGED STEEL VALVES AND STEAM TRAPS

Velan Engineering Companies are manufacturers of one of the most comprehensive ranges of forged and cast steel valves and steam traps used throughout North American Industry as well as in Naval vessel and Military establishments.

The company's range of valves can be divided into eight categories:

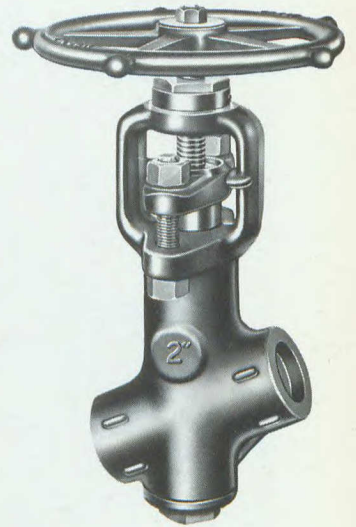
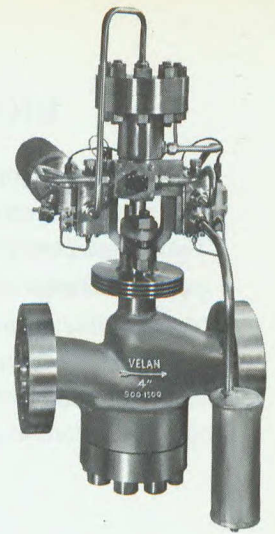
- * Small — ¼" to 2" (.6 - 5.1 cm) Forged Steel Bolted Bonnet Gate Globe and Check valves utilized in general industry from low through high pressure service. ASA Class 150 lb. to 1500 lb. (68 to 680 kg)
- * ¼" to 3" (.6 - 7.6 cm) Forged Steel Bonnetless Gate, Globe and Check valves for power and high pressure service. ASA 600 class, 600 lb. to 1500 lb. (272 to 680 kg)
- * Large Cast Steel valves from 2" to 24" (5.1 - 61 cm) ASA class 150 lb. to 600 lb. (68 to 272 kg)
- * Large Forged Steel "Pressure Seal" valves from 2" to 18" (5.1 - 46.0 cm) for general industrial and high pressure power service. Class 900 lb. to 2500 lb. (408 to 1134 kg)
- * Stainless Steel valves both cast and forged in the complete range from ¼" to 24" (.6 - 61 cm) for corrosive services.
- * Complete line of forged carbon and stainless steel valves specially designed for nuclear applications in sizes ½" to 18". Class 150 lb. to 1500 lb. (68 to 680 kg)
- * Top Entry and Side Entry Ball valves in the complete range from ¼" to 12" (.6 - 46.0 cm).
- * Special service custom built valves designed and engineered by modifying existing designs; as well as completely custom built valves designed, engineered and manufactured from the ground up.

In this last category, valves for such exotic services as Nuclear Power, Cryogenic and Rocketry are manufactured. Typical examples of the company's products are shown on the accompanying page together with the first U.S.N. Nuclear Carrier "U.S.S. Enterprise" which was, along with its sister ship, equipped with Velan valves and steam traps. Bottom right is one of three custom built nuclear control valves built to special specifications for the NERVA nuclear rocket to be used for landing U.S. Astronauts on the moon.

Velan Engineering is located in Montreal. It has excellent raw material, man-power, rail, road, sea and air transportation facilities. To cater to its growing business in the United States, the company operates two independent U.S. Corporations located in Upper New York State and Houston, Texas which are supplemented by the engineering, designing and manufacturing facilities of its two plants in Montreal.

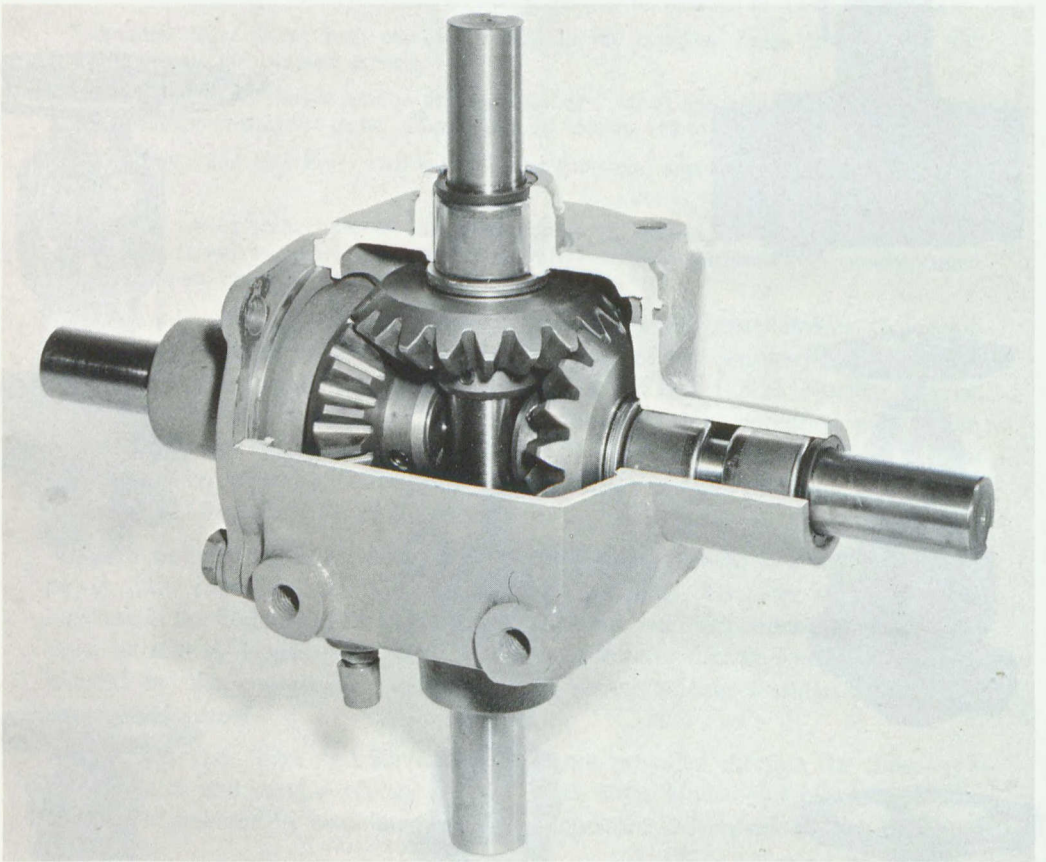
Excellent U.S. Sales and Service facilities are provided through the company's branch sales and service offices in New York City, Houston, Chicago and Los Angeles augmented by associated agents, distributors and representatives in major U.S. cities.

As the company operates a plant in England and has sales and service facilities throughout the world, these facilities are always at the service of Canadian and U.S. industrial and defence commitments abroad, offering replacements, spare parts and servicing in any part of the globe.



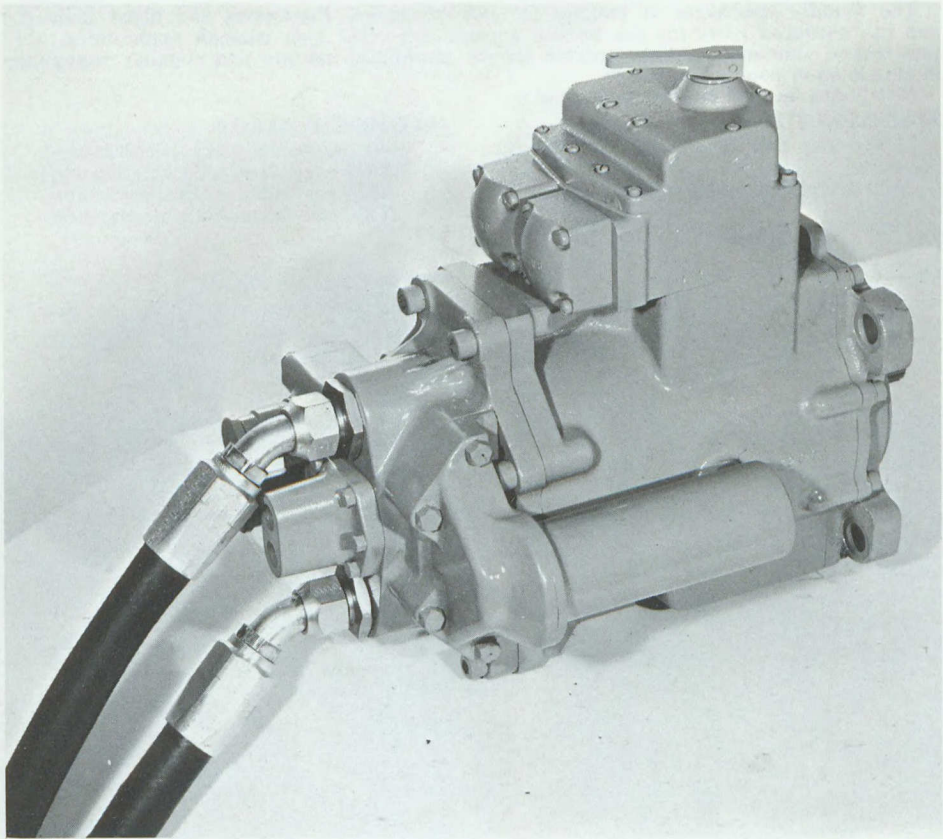
RIGHT ANGLE DRIVE GEAR BOXES

Versatile and compact right angle drive gear boxes custom designed and produced by Canadian Acme Screw & Gear are suitable for accessory and control drives. The design permits direct coupling and overhung belt or chain drive. The photograph illustrates a cross-drive but from a standard basic housing and common components, a simple right angle, a double shaft Tee, a triple shaft Tee, or cross-drives are possible. A choice of four mounting positions is provided in the housing. Gear ratios of 1.00/1 or 1.50/1 are available from production but optional ratios and shaft can be supplied upon request.



HYDROSTATIC TRANSMISSIONS

Axial piston variable displacement hydrostatic transmissions with servo-control for use on mobile equipment are designed and produced by Canadian Acme Screw & Gear to meet custom requirements. The transmissions were completely designed and developed in Canada and have been in production for approximately six years. These units have been used extensively in many heavy-duty industrial applications demanding continuous 24-hour service. Their success in varied backgrounds has assured acceptance in both the United States and United Kingdom.



PRECISION INVESTMENT CASTINGS

The Specialized Components Division of the Canadian Marconi Company manufactures Precision Castings in Ferrous and Non-Ferrous metals. Castings of corrosion resistant steels, nickel based alloys, copper based alloys and aluminum are manufactured by the lost wax method of investment casting.

Capabilities range from the production of castings with sectional thicknesses down to 0.050 inch (1.3 mm) in Ferrous and Nickel based alloys and 0.025 inch (.64 mm) in aluminum and copper based alloys to castings up to 16 inches (41 cm) in length. High strength Aluminum Alloy Castings are made in accordance with ASTM radiographic standards and AMS mechanical strength requirements.

Casting tolerances are maintained in accordance with the standards of the Investment Casting Institute. Closer tolerances can be achieved at customers request, depending upon individual application. Waveguides with tolerances in accordance with MIL-W-85 are a special feature of the foundry.

Strict adherence to customers specifications is ensured by the Divisional Quality Program, with trained personnel including a Radiographer and a Metallurgical Engineer monitoring all aspects of the process. Tensile test specimens and discs for chemical analysis are produced from the same melt as the castings, for customer testing when required. Foundry control is maintained by means of routine tensile and hardness tests as well as penetrant, x-ray and dimensional inspection.

The foundry specializes in castings for the Aerospace, Electronics and allied industries and has produced parts for gas turbine engines and other high strength applications, ultra thin section aluminum castings suitable for the electronics industry and complex waveguides in aluminum or copper base alloys.

Metals cast include, but are not limited to:

STAINLESS STEEL

- 300 series and equivalent AMS specifications
- 400 series and equivalent AMS specifications
- 17/4 PH and equivalent AMS specifications

COPPER BASE ALLOY

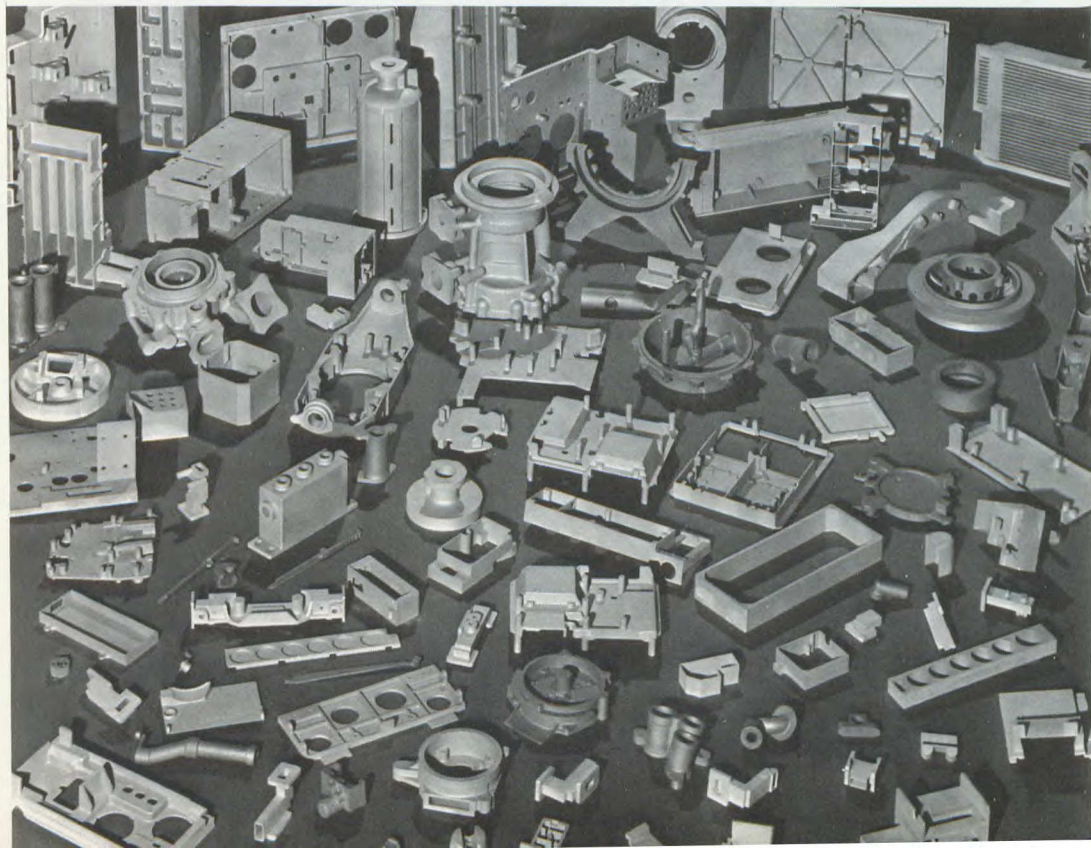
- Silicon Bronze equivalent AMS specification
- Beryllium Copper equivalent AMS specifications

ALUMINUM ALLOY

- 40E equivalent AMS specifications
- A320 equivalent AMS specification
- A355 equivalent AMS specification
- A356 equivalent AMS specification

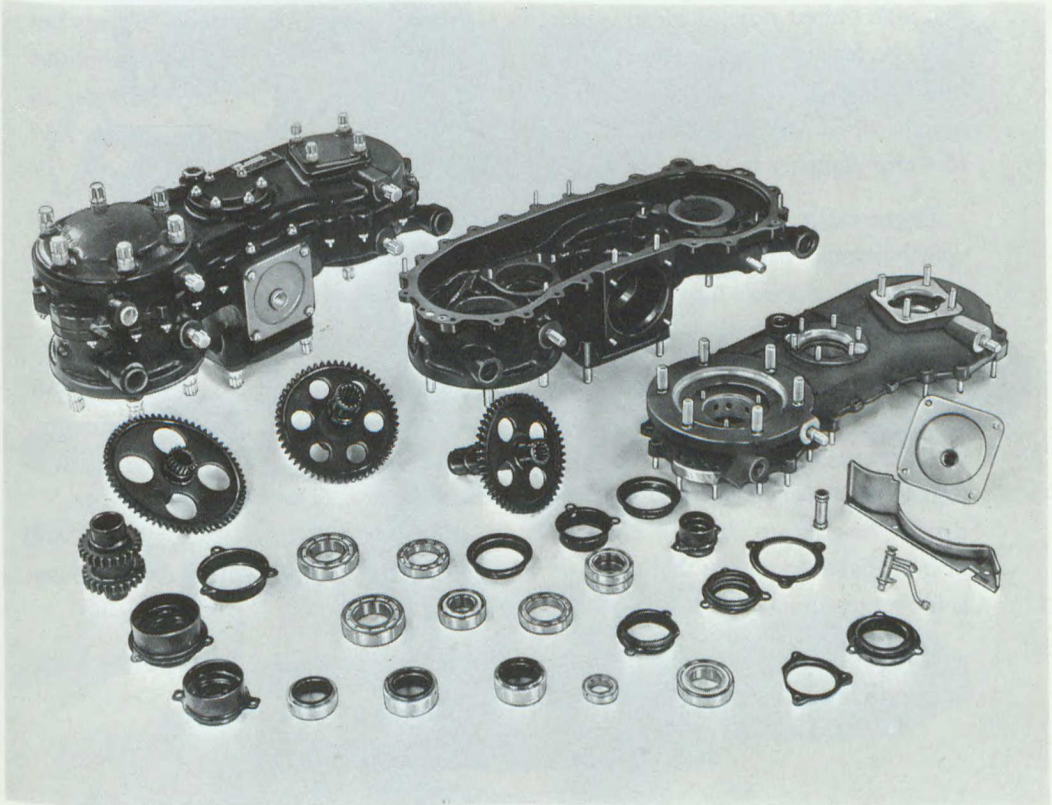
NICKEL BASE ALLOY

- Hastelloy equivalent AMS specification



GEARING

The products shown on the facing page are indicative of the type of work carried out by Spar Aerospace Products Ltd. who are manufacturers of power transmission systems, sub assemblies and precision parts for the aerospace industry. This firm on a production basis supplies Vertol CH 46 and Fairchild Hiller HU12 helicopter transmissions, gearboxes for J79, J85, CH 610 and CF 700 jet engines and various airframe actuator gearboxes, and a full range of precision gears including spur, helical, spiral bevel, and zerol types. Design, development, production engineering, and approved laboratory services are available for customer requirements. In addition, approved repair and overhaul facilities on gearboxes, actuators, transmissions and constant speed drives are maintained at the Spar premises in Toronto.



IMPACT EXTRUSION COMPONENTS

General Impact Extrusions (Manufacturing) Ltd., Toronto, Ontario, specializes in plastic forming and impact extrusion of metals, primarily aluminum, copper, brass and magnesium. It is Canada's largest manufacturer of aluminum impact extrusions. The company's fabrication capabilities include collapsible tubes, vials, mailing containers and other lithographed parts for the packaging industry. The company also produces components for the appliance, automotive, electronics and atomic fields.

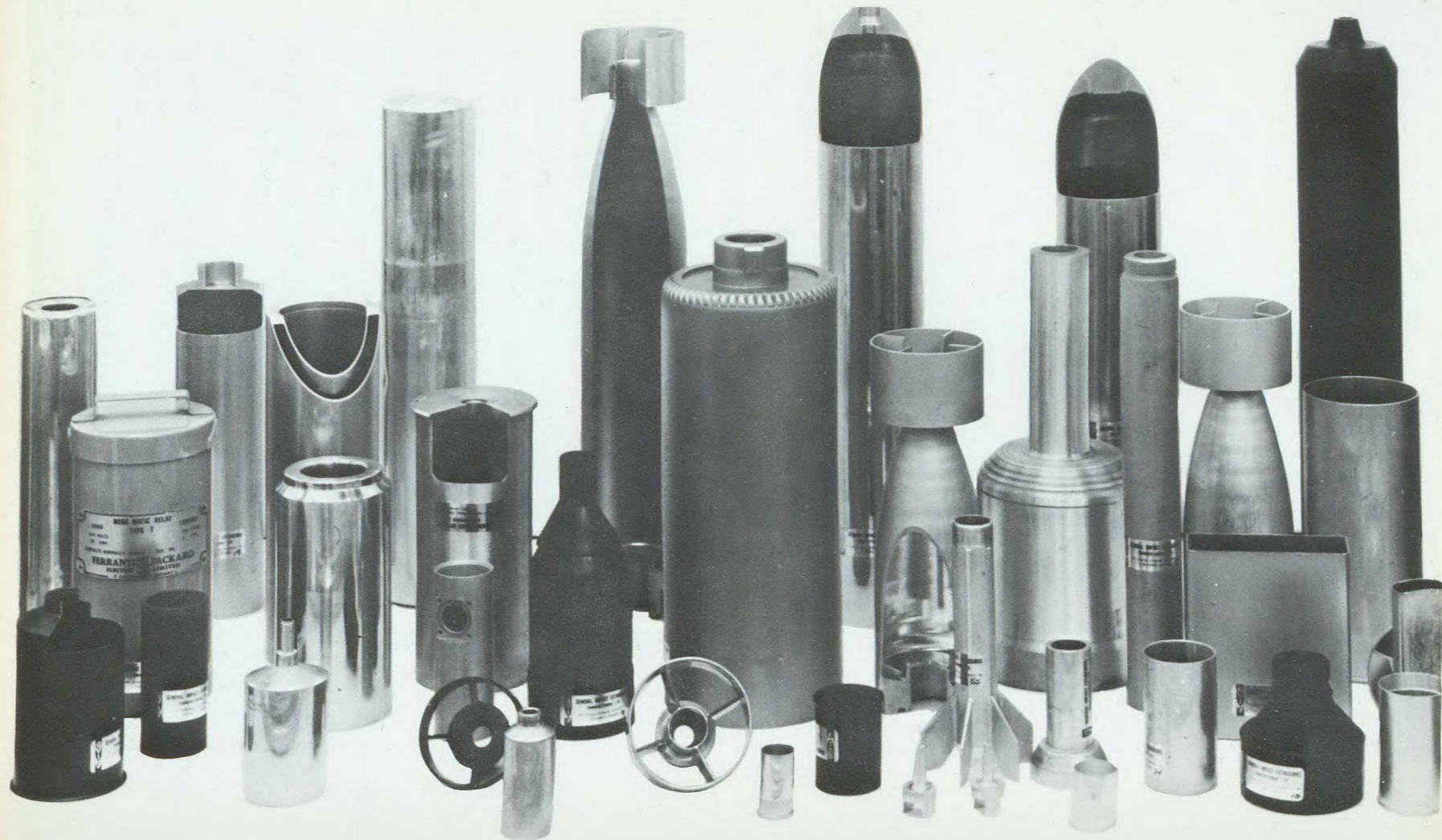
For many years General Impact Extrusions has produced parts and components for defence applications, such as pistons, ammunition shells, missile parts, rocket components, precision cold forgings, and tail fin assemblies. A competent engineering staff is available for component and part design.

The impact extrusion process cold forms metals under high pressures. The method is a most efficient way to produce cans, shells and other hollow shapes. It is a high output process ideally suited to satisfy not only military requirements but also the high volume requirements of the packaging, electronics and automotive industries. Press capabilities for impacts are up to 6" (15.24 cm) diameter in lengths of up to 25" (63.5 cm) and for precision forward extrusions, up to 2.5" (6.4 cm) diameter in lengths of up to 120" (3.5 m) maximum.

Engineering services are available for alloy selection, strength and performance specifications, part design, and production engineering. Other services include small lot production for pre-production testing, evaluation and testing of physical properties and performance.

G.I.E. production facilities include 19 extrusion presses and well over 160 miscellaneous machine tools, draw presses, coining presses, lathes, automatic chuckers, multispindle chuckers, automatic drills, automatic screw machines, drill presses and special purpose machines to handle components from 1/4" dia. to 7" dia. in lengths up to 25". Heat treating, annealing and anodizing facilities are also available to ensure that the level of quality control demanded by the company is in fact maintained.

This same firm also maintains a facility in Buffalo, N.Y. which provides the same services and products as the parent company.



DIFFUSION FURNACE ACTUATOR

The A-798 Actuator is a motorized single spool BI-STEM unit designed by Spar Aerospace Products specifically for use in the manufacture of semi-conductor devices.

The Actuator is used to withdraw crucibles from a diffusion furnace at specific rates to obtain accurately controlled cooling.

The unit features a d-c stepper motor with integrally mounted step servo control. This allows the unit to be set at any extension rate from 0 to 1 in./sec. by adjusting the externally mounted control knob.

FEATURES:

- Repeatable speed control allows programmed operation.
- Slip clutch in drive system protects motor in the event of overload.
- Automatic limit switches at both ends of travel.
- 2 amp fuse fitted as standard.

BI-STEM Length	42 in. max. (1.06 m)
BI-STEM Description	0.75 in. nominal dia. by 0.004 in. thick 301 stainless steel. (19 mm x .1 mm)
Actuation Capability	5 lb. (2.3 kg)
Size	5.6 in. x 4.0 in. x 8.87 in. (14 x 10 x 23 mm)
Weight	5 lb. (2.3 kg)
Drive Motor	IMC d-c stepper
Supply Voltage	28 volts dc \pm 4 volts.



NAVIGATION SYSTEMS LNS 101 AND LNS 102

Development of this equipment was originally undertaken by the Canadian Army and Aviation Electric Limited to meet conditions of modern warfare where units are required to move rapidly about the battlefield under cover of complete darkness or in fog or smoke, or when all hatch covers must be kept closed. Vehicles so equipped are also enabled to navigate accurately on terrain devoid of recognizable landmarks, where reliable maps are not available or in areas devoid of permanent topographical features such as desert or arctic regions.

The Land Navigation System (LNS 101 or LNS 102) accurately and continuously computes and displays the geographical location of the vehicle and the direction in which it is headed. The presentation is designed to let the commander use the information immediately without need for any manual plotting or calculating.

The LNS 101 set comprises a Plotter, Vehicle Position (PVP), an Indicator Heading and Position (IHP), a Computer, and is supplemented by a Power Inverter. The set works in conjunction with a Gyro-Compass when designed for use with heavily armoured vehicles such as tanks.

The LNS 102 set comprises a Plotter, Vehicle Position (PVP), an Indicator Heading and Position (IHP), a Computer, and is supplemented by its own Power Inverter. This system features a company developed Magnetic Heading Reference which eliminates the use of the more expensive Gyro-Compass. This navigation system will usually be found in thin-skinned steel or aluminum armored vehicles such as command or reconnaissance cars and personnel carriers.

A Heading Indicator can be supplied with either system, for use by the driver when he is separated from the vehicle commander and cannot see the Indicator, Heading and Position (IHP).

Characteristics Common to the LNS 101 and LNS 102

- Indicates the exact heading and position of the vehicle in a way that can be immediately interpreted and used.
- No manual plotting, calculating or recording required.
- Four standard map scales: 1:25,000, 1:50,000, 1:100,000 and 1:250,000.
- Routes and directions do not have to be calculated in advance.
- Independent of radio transmission.
- Compact units — permit installation in crowded vehicle compartments.
- Dual capability computer enables system operation with either north seeking Gyro-Compass or Magnetic Heading Transmitter.

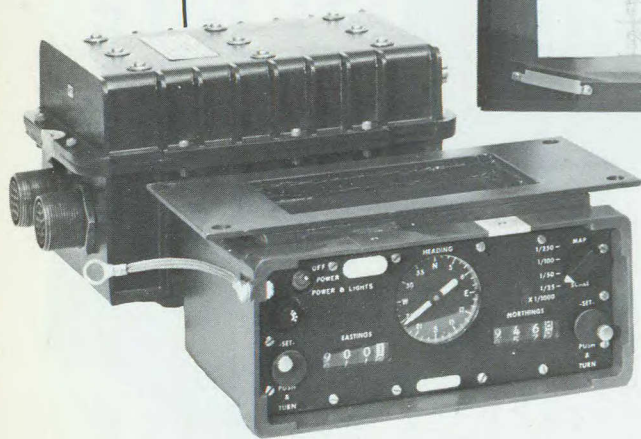
Principle of Operation

The continuous computation and display of the present position of the vehicle is obtained by automatic dead-reckoning from a known starting point. The distance travelled by the vehicle is measured by the odometer drive, while the direction of travel of the vehicle is derived electrically from either a Gyro Compass or a Magnetic Heading Transmitter. These two inputs are fed to the COMPUTER which performs the trigonometrical calculations necessary to convert them to EAST/WEST and NORTH/SOUTH components of the vehicle movement. This information is transmitted in the form of electrical impulses to the display units, INDICATOR, HEADING AND POSITION (IHP) and PLOTTER, VEHICLE

Plotter, Vehicle Position (PVP) —



Power Inverter.



Indicator Heading & Position (IHP)



Gyro-Compass & Controls



Computer.

NAVIGATION SYSTEMS LNS 101 AND LNS 102 (cont'd)

POSITION (PVP). The heading signal from the Gyro Compass or Magnetic Heading Transmitter is also indicated on the display units. Prior to moving off, the starting point co-ordinates, obtained from a standard military map grid, are set into the appropriate units. Any subsequent movement of the vehicle is continuously followed and displayed.

The Heading & Position Indicator unit displays two "4-digit" map references — one for Eastings and one for Northings. These are set to the map reference of the vehicle location before moving off and, in operation, continually record the position of the vehicle in terms of map co-ordinates.

The Vehicle Position Plotter provides a continuous pictorial presentation of the exact geographical location of the vehicle and the direction in which it is headed. This enables the navigator to steer the vehicle along any prescribed course without manual plotting or mental calculations. This is achieved by setting into a transparent holder on the Plotter the pertinent section of a standard military map. An illuminated image comprising a positional 'dot' and directional 'arrow' is projected on to the underside of the map. At the commencement of a run the image is set to the map co-ordinate position of the vehicle corresponding to the map references on the Heading & Position Indicator after which the vehicle location and heading will be both digitally and pictorially displayed.

Field trials in various countries have proven the stated operating characteristics of the equipment particularly with respect to reliability under rugged conditions as well as at extreme temperatures.

Power Requirements

24 VDC. Obtained from vehicle battery.

Computer and all Display Units only . . . 2 amps max:

LNS 101 System: 5 amps-17 amps running depending on the Gyro-Compass in use.

LNS 102 System: 4 amps max:

Speed Range

Zero to 95 Km./hr. (60 mph).

Accuracy

Within 50 meters or an average of 1% of distance travelled, whichever is the greater, with Gyro-Compass. (LNS 101)

Within 50 meters or an average of 1½% of distance travelled, whichever is the greater, with the magnetic heading reference. (LNS 102)

Sets similar to the LNS 101 have been in operation with the Canadian Army for sometime, and both the British and United States Armies have acquired quantities of LNS 101 as well as LNS 102 systems.

Automatic Position Reporting (APR)

Application of the basic navigation system concept and/or units to related field usage are constantly under study. A new development in this area is the Automatic Position Reporting system (APR) which provides the commander, when he is located in a remote command post, with the facility of being able to automatically interrogate vehicles under his command and have displayed in front of him the position of the vehicle interrogated in the form of a six digit readout, to the nearest 100 meters. Although the equipment uses the standard transmitting-receiving equipment, no voice communication of any sort is necessary. Space and mounting facilities have been provided in the Indicator, Heading and Position (IHP) for the incorporation of two modules to provide the necessary signals for the Automatic Position Reporting system. (APR).



LNS 102

CANADAIR CL-89 (AN/USD-501)

The Canadair CL-89 has the service designation 'Drone System, Short-Range Reconnaissance XC1', and performs the functions of target acquisition, damage assessment and surveillance.

The CL-89/XC1 is a self-contained, mobile system which is based on the use of a simple, low-cost drone that carries sensor equipment and is recoverable. It is for day and night use by army formations in forward battle areas and is reusable.

The drone is launched by booster rocket and has a turbojet sustainer engine. On completion of a reconnaissance mission, it returns and lands by parachute, with air bags to cushion ground impact. The drone is then available for further missions.

At present the sensors consist of cameras equipped for day and night operation but an infrared sensor is under development.

Development of the CL-89/XC1 system is funded jointly by the British, German and Canadian governments, with the U.S. Army providing firing-range facilities and technical support for the flight-test program.





SURVEILLANCE SYSTEMS

Canadian Westinghouse has carried out development work in a versatile surveillance system for land, sea and air. Three of the individual equipments in this area which have been under development are: The Wesscam steered and stabilized camera mount for taking motion pictures (16, 35 and 65 mm) via remote control from a moving vehicle; Totem, a high-grade monochrome television system elevated on a slender extensible mast; and Periscopeter, a tethicopter carrying a remotely-controlled space stabilized monochrome television system.

These Westinghouse systems perform the following surveillance functions:

- | | |
|---|------------------------------|
| 1. <i>Line-of-sight Stabilization</i>
(including a stable reference from which to steer the line-of-sight and natural periods of the stabilizer from tenths of seconds to two minutes) | Totem, Periscopeter, Wesscam |
| 2. <i>Remote Control of line-of-sight and other functions</i> | Totem, Periscopeter, Wesscam |
| 3. <i>Bearing Readout of line-of-sight</i>
(relative to magnetic north $\pm 0.5^\circ$) | Totem, Periscopeter |
| 4. <i>Elevation</i> — Ground extended member to 50 ft. | Totem |
| — Tethered flying platform to 600 ft. with position-keeping and wind compensation. | Tethicopter |
| 5. <i>Wide Band Secure Communications</i>
(along the tether: 20 MHz band; multiple if desired; for video or direct radar I.F.) | Tethicopter |

It is considered that these systems and sub-systems would find a basic use in the following fields: air cushion vehicles, tracked land vehicles, tracked amphibious vehicles, wheeled land vehicles, buoyant ships, submarines, hydrofoil craft, autogyros, helicopters and fixed wing aircraft. They can also be used with a variety of unmanned vehicles.

Considered applications of the line-of-sight stabilization and elevating capabilities provided include the following:

Applications of Line-of-Sight Stabilization (sensors, radiators and other functions)

- Television cameras:
daylight, colour, low light-level
- Film cameras
cine, single frame
- I.R. imaging cameras
- Radar
- Line-of-sight microwave for secure communications and image transmission
- Laser rangefinders; illuminators
- Weapons control — indirect
- Weapons control — direct (pointing)

Applications of Elevating Systems (sensors, radiators and other functions)

- Optical (real time)
- I.R. (remote)
- Radar (surveillance)
- Laser intervisibility
- Photographic imaging
- Line-of-Sight microwave
- Electronic warfare devices
- VHF and UHF line-of-sight devices
- VLF and LF antennae (masts)
- Meteorological equipment.



The Wesscam steered and stabilized camera mount provides vibration-free motion pictures. Operator is inside helicopter using remote camera control with television viewfinder. Camera pans through 360° and tilts from +15° to -75° from true horizontal side mounts and smaller housings are available for a variety of sensors.



The Periscope tethicopter elevates a 17 inch, 30 pound payload to 600 ft. on a tethered line. Functions are similar to the Totem with hover, position-offset and follow-along capability.

The Totem elevated television system rises to 50 ft. on a slender extensible mast. Camera has a stabilized 360° azimuth view with compass readout. Tilt of view is +15° to -15°.

DETECTING SET, RADAR SIGNALS "MICRADET" AN/PSS-502

The "Micradet" a rugged, hand held microwave receiver used to detect and determine the bearing of CW and pulse modulated radar signals was designed by Canadian General Electric, Information Systems and Defence Products Department.

It features two detection modules for 8 to 20 GHz and 20 to 40 GHz with 20 and 10 degree beam widths respectively. The unit can be procured with the low frequency detector only to which a high frequency module could be added when needed. It detects pulses as short as 50 nanoseconds and PRF's in excess of 100 KHz. Sensitivity is adequate to give warning at ranges in excess of the radars vehicle detection range. Signal indication is a tone in the headset with a pitch related to the PRF of a pulsed signal or the relative power of a CW signal. The internal battery will provide a minimum of 12 hours continuous operation.

Plug in printed circuit boards ensure ease of maintenance with a mean time to repair of 15 minutes and MTBF in excess of 2000 hours. The equipment is designed to withstand its predicted rough usage. It has been tested and meets the climatic and durability requirements of CAG-100 class G4 for fully exposed portable equipment.



6.9"
(17.5 cm)

2.8"
(7 cm)

3.8"
(9.6 cm)

RADIATION DETECTION SYSTEM AIRBORNE

AN/ADR 501

The AN/ADR 501 is a radiation detection system which measures and records gamma radiation over the range 0.1 to 100 R/hr. It is intended for use in light aircraft or helicopters for the rapid reconnaissance of gamma radiation dose rates due to contamination on the ground. The equipment measures the radiation dose rate at the aircraft and may be converted to dose rate near the ground by multiplying the aerial dose rate by a factor which depends upon the height above ground. The radiation dose rate is recorded automatically.

The AN/ADR 501 consists of the following main components:

The Detector Radiac is the radiation sensitive portion of the AN/ADR 501. It converts gamma radiation dose rate to an electrical signal. The detector is a sealed unit which should be placed so that it is not shielded from the ground by large or bulky objects. It may be mounted inside the aircraft provided that only the aircraft skin is between it and the ground. It may also be mounted outside the aircraft.

The Cable Assembly connects the detector to the amplifier. It provides power to the detector and also carries the electrical signal from the detector to the amplifier.

The Amplifier Assembly amplifies the small electrical signal from the detector and provides sufficient power to operate the recorder assembly. It also includes an alarm device which gives a flashing light whenever the dose rate reaches a preset level. The operator can set the preset level anywhere between 0.1 and 10 R/hr. The amplifier assembly also includes the detector and bias batteries, which have very long life and should only need replacement during periodic maintenance. All operating controls are on the amplifier.

The Recorder Assembly consists of a recording milliammeter calibrated in Roentgens/hour. The meter may be used with the motor OFF, as an indicating meter only, or it may be run as a recorder. The record is provided as a series of dots on a pressure sensitive strip chart. A window on the front opens to permit writing on the strip chart, which may be done either with a pencil or a metal scribe.

The Battery Assembly consists of three separate power supplies, all using mercury cells for high performance:

- (a) *Detector Filament*
- (b) *Amplifier*
- (c) *Recorder*

The Amplifier, Recorder and Battery Assemblies mount in the main case and may be removed for repair or replacement. The detector and cable are used outside the case but provision is made to carry them in the case for convenience in transportation.

Performance of the equipment is as follows:

- (a) *Range:* 0.1 to 100 R/hr. on one 3 decade quasi-logarithmic scale.
- (b) *Response Time:* 90% of correct reading within 3 seconds under adverse conditions, better under normal conditions.
- (c) *Chart Speed:* 60 in/hr or 6 in/hr (152.4 or 15.2 cm/hr), depending upon gear train used. Intermediate speeds may be obtained with special gear trains.
- (d) *Temperature Limits:* Detector, -40F (-40C) to 125F (52C)
Recorder unit, -20F (-29C) to 125F (52C).
- (e) *Operating time:* Limited by batteries at low temperature extremes to 4 hrs. Much longer at normal temperatures. Chart time 12 hrs at max chart speed.
- (f) *Power Supplies:* Completely self-contained batteries.
- (g) *Radiation Sensitivity:* Gamma Radiation only, from 80 kev to over 3 mev. Essentially non-directional.
- (h) *Accuracy:* $\pm 20\%$.

RADIATION SURVEY TRAINING SYSTEM RST 8500

This system enables civil and military personnel to exercise in the use of gamma radiation survey equipment under realistic field conditions without exposure to dangerous gamma radiation. The equipment described here meets this need and is in quantity production by EMI Electronics Canada Ltd., Gamma radiation is simulated by electromagnetic radiation (low power radio frequency signal). The transmitter output is radiated in an elliptical pattern 10 miles long and 4 miles wide. This radiation is detected and measured by portable receivers (gamma simulators) which duplicate an actual Radiacmeter IM/108B in weight, appearance, size and operation. Localized "hot-spots" are simulated by miniature self contained transmitters. The complete system meets full military specification.

To provide realistic training conditions the electromagnetic radiation generated by a continuous wave transmitter is programmed to vary with time to simulate the build-up and decay of the gamma radiation field resulting from a nuclear explosion. A rapid and linear rise from zero to full power can be adjusted to take place between ¼ hour and 2 hours together with a slow exponential decay from full power to substantially zero over a time period from 2 to 8 hours in ½ hour steps.

Whilst an exercise is in progress the transmitter is programmed to emit an identifying call-sign at full power three times in succession each hour. The transmitter is designed to operate from a 12 volt storage battery.

The simulator receiver is built in to an IM/108B Radiac meter case and has been designed with a minimum number of alignment adjustments for ease of maintenance. A crystal controlled local oscillator provides adequate stability of operation in conjunction with a 2 kHz intermediate frequency amplifier which requires no tuning coils. Various types of primary or secondary batteries can be built into the case as desired. Other models of Radiacmeter can be simulated using standard receiver modules.

Brief equipment specifications are: —

Main Transmitter

Frequency (typical) 29.800 MHz
Power output 5 watts max.
Spurious and harmonic radiation 60 dB
below fundamental
Power Supply 12 volts D.C.
Dimensions 12" x 13" x 7"
(30.5 x 33 x 17.8 cm)

Antenna

Height 10 ft. (3.05 m)
Length overall 12 ft. (3.6 m)

Temperature

(in service) -20°C to +52°C.
(in storage) -54°C to +71°C.
Packaged for transport 1 ft x 1 ft x 6 ft.
(30.5 x 30.5 cm x 1.8 m)

Hot Spot Transmitter

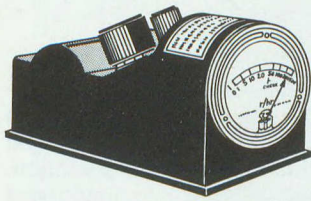
Frequency (typical) 29.800 MHz.
Power output 75 milliwatts
Spurious and harmonic radiation 40 dB
below fundamental
Dimensions 7" x 4" x 2" (5 x 10 x 17 cm)

The equipment is designed to meet the following climatic conditions:

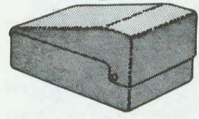
Altitude (in service) 5,000 ft. (1524 m)
(in storage) .. 30,000 ft. (9144 m)

Humidity 98% relative.

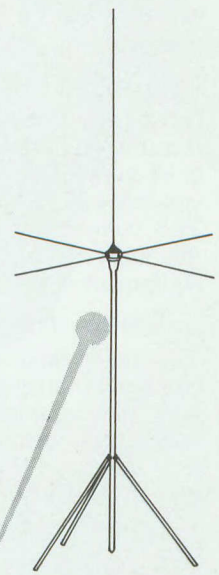
Radiation Pattern — 10 miles long x 4 miles wide (16 x 6.4 km)



RECEIVER



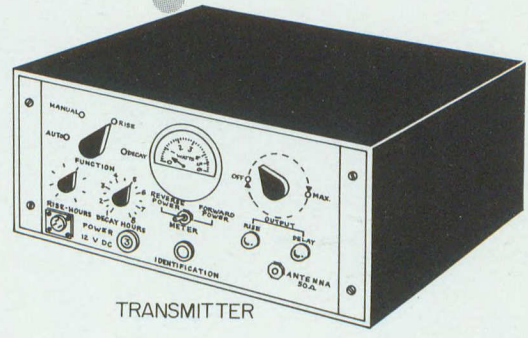
RECEIVER WITH COVER



TRANSMITTING ANTENNA



HOT SPOT TRANSMITTER



TRANSMITTER

OPTICAL DESIGN

The product reputation enjoyed by Ernst Leitz Canada Limited, and described on pages 280 to 287 is not only the result of years of experience but also of a firm foundation in specialized areas some of which are noted below.

Modulation Transfer Function Analyzer

Ernst Leitz Canada Limited is a company engaged in the development and manufacture of highly sophisticated optical systems. An essential part of the operation is of necessity, quality control. In recent years a new concept of testing optical systems was introduced, which is generally known as Modulation Transfer Function. This company is believed to have been the first in North America to have used this most complete and sophisticated equipment to take such measurements. This equipment is known as the EROS IV model, manufactured by Sira-Beck.

Optical Ray Tracing

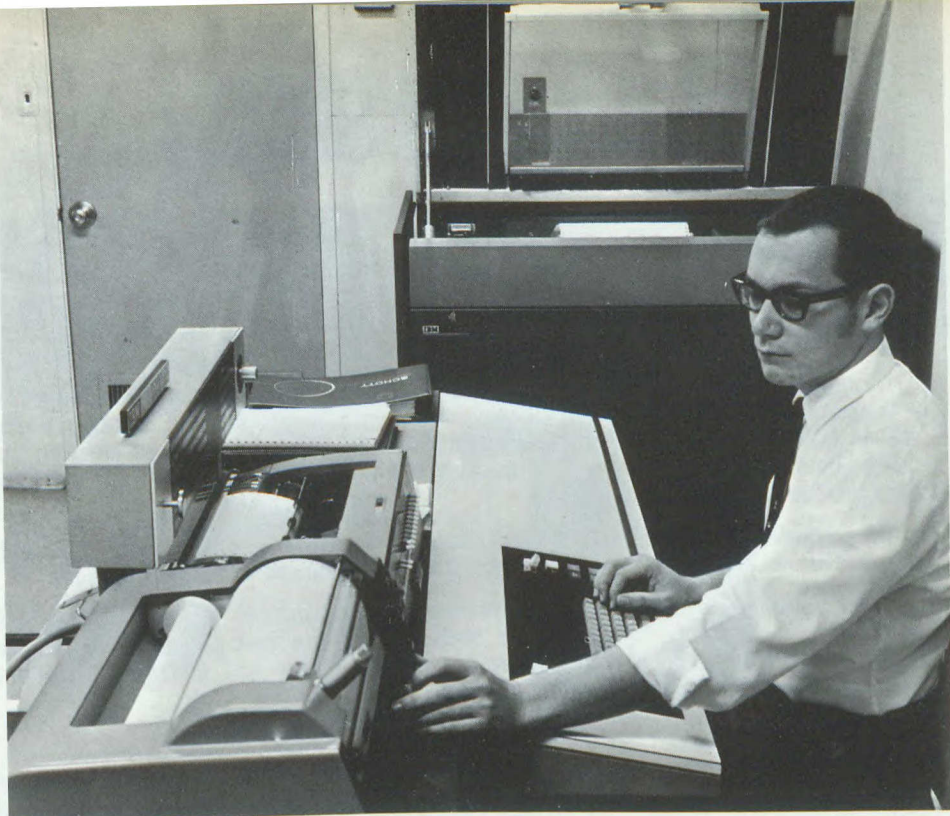
The major function in the development of optical systems is ray tracing. Modern computers have greatly facilitated the work of the designers and this facility also makes use of these modern tools. The picture shows part of the in-house equipment which also permits the designer to automatically plot correction curves as well as lens diagrams. For the design of large and complex systems, the company also employs bigger computers on a time sharing basis.

High Vacuum Department

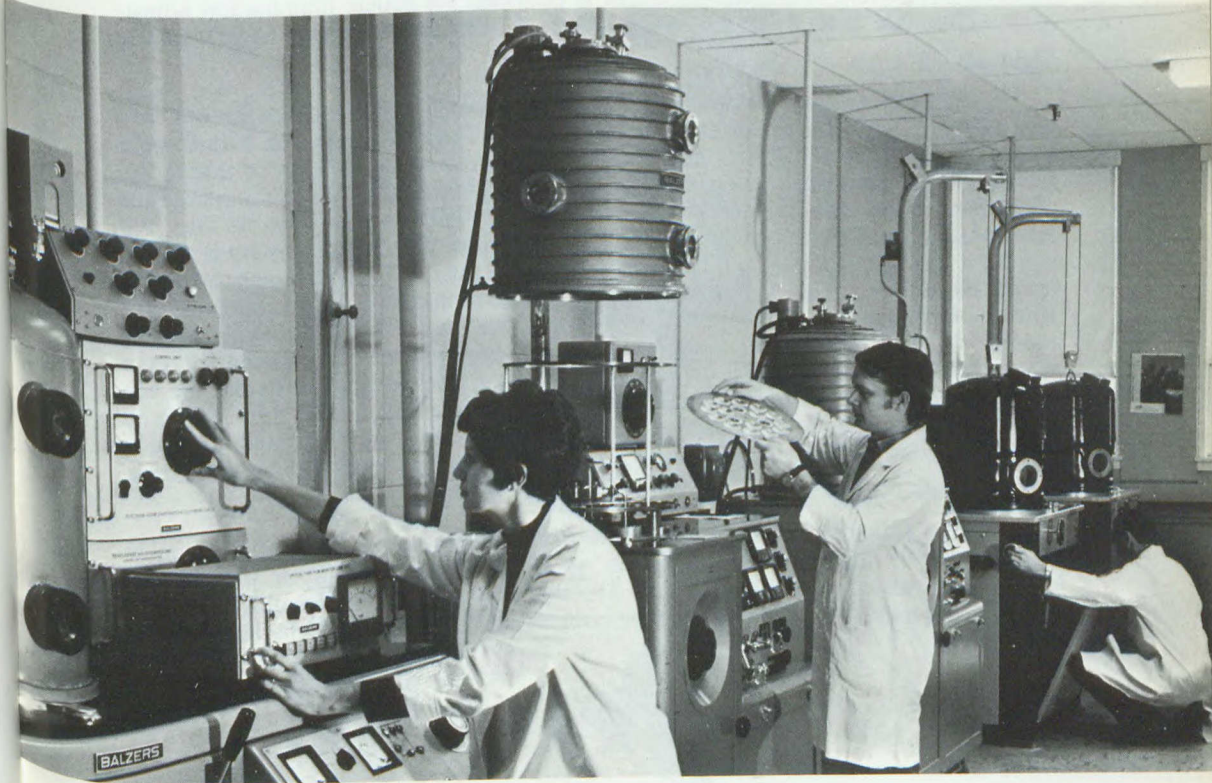
Almost without exception, optical components require some form of thin film deposition. The work in this department ranges from simple anti-reflection coatings of magnesium fluoride to as many as 50 layers for some types of interference filters. The use of an electron gun permits the evaporation of any known material suitable for thin film depositions.



Modulation Transfer Function Analyzer



Optical Ray Tracing



High Vacuum Department

OPTICAL-MECHANICAL FIRE CONTROL

The effectiveness of any weapon system can be denominated by the accuracy and simplicity of the fire control element. The reliability of the weaponry may be measured by the ruggedness designed into the precision instrument and the degree of ease associated with maintenance. Availability of the fire control element may be influenced by cost and excessive costs may well preclude the acquisition of an equipment which could take full advantage of the inherent capabilities of the weapon.

Canadian problems in this area were largely solved when Ernst Leitz Canada Ltd. was established in 1952. This firm has provided Canada and the Canadian Forces with a facility equal to any in North America and personnel with production and design backgrounds trained to the exacting standards demanded by their predominant product — the Leica Camera.

While these same comments were made in an earlier edition they still apply changed only by the further dependancy that time lends to a proven source.

Leitz equipments have found acceptance in allied nations around the world in commercial and military fields where both competition and performance requirements present a restricted field. Some of the more basic and interesting products are noted below.

Day-Night Sight

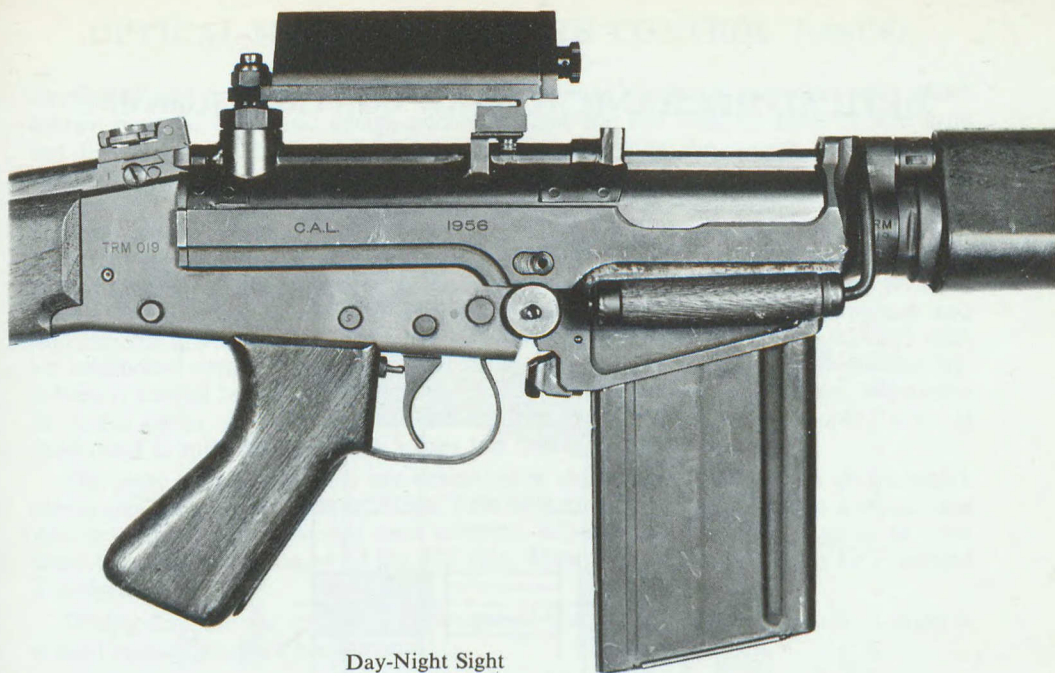
To meet a requirement for an inexpensive Day-Night rifle sight Leitz has developed a light-weight unit power reflecting telescope type of day-night sight that, although short in length and simple in construction, is capable of projecting a reticle to infinity on which to align a target. This is accomplished by providing a real intermediate image of the target on a mirror in which a reticle is located. Night use becomes possible by illuminating this etched reticle with a Trilux light source thereby eliminating batteries. A control is provided for reticle illumination adjustment. This sight is on field trial in Canada, U.K., Sweden, Germany and Denmark.

Sightunit C2

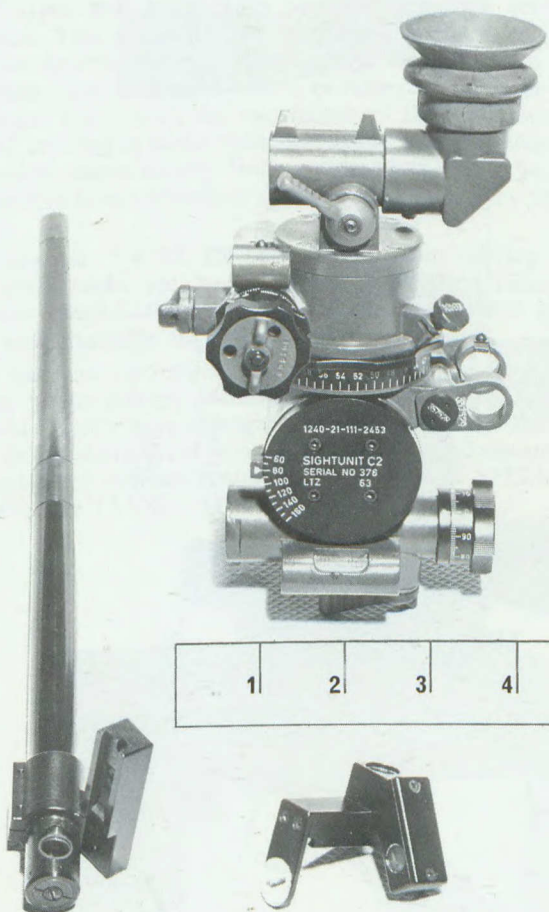
The Sightunit C2 was designed to replace other older Sights such as the M4, M6 and M34A2 which did not meet user requirements. The new equipment had to serve improved fire control systems and procedures as well as be capable of taking the heavier shocks imposed by newer and more powerful mortars. At the same time the Sight had to provide greater accuracies than the older equipments to take full advantage of greater ranges. All Scales are in mils and the accuracy to lay is true in Azimuth and Elevation to within ± 2 mils. The Sight has been designed so that it is capable of being tested and adjusted by unit personnel to ensure proper alliance with the bore axis of the weapon. The Sight weighs only 2.8 lbs. (1.3 kg) and has passed all trials for shock, immersion, drop, temperature, etc. Ancillaries exist which permit an elevated line of sight as well as a light projection device for use with a paralleloscope when the weapon is employed in a deep pit or APC where an outside aiming post is not possible. This equipment has been adopted by U.K., Australia, New Zealand, India and Canada as well as in several other countries.

Sniper Sight

When the Canadian Army adopted the FN Rifle they were left with the choice of accepting existing Sniper Telescopes, as is the usual practice, or providing a Scope which was designed for the rifle and that met the particular ballistics of that rifle. Fortunately they chose the latter course and Ernst Leitz Canada designed,

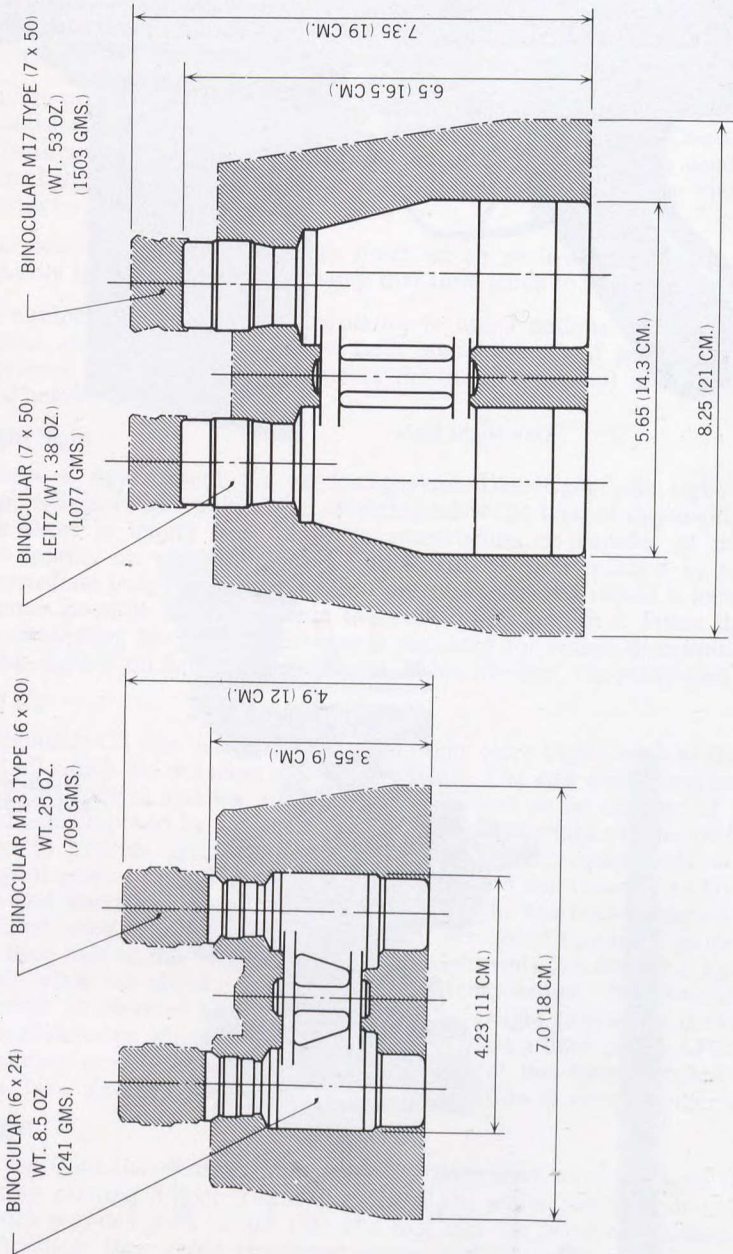


Day-Night Sight



Sightunit C2
and Ancillaries

OPTICAL-MECHANICAL FIRE CONTROL (cont'd)



OPTICAL-MECHANICAL FIRE CONTROL (cont'd)

developed and produced a sight which offers many distinct advantages over other known models. The basic design accommodates the FN Rifle or rifles of that type but the scope can be used with any rifle by changing the mount facilities. The Telescope has a length of 8" (203 mm) and a tube diameter of 1" (25.4 mm) and weighs only 10 oz. (.28 kg) including the mount. It has a magnification of 4 and a field of view of 90 mils. The Telescope Mount is fixed to the rear cover of the rifle and employs a unique shock mount device which provides instantaneous mounting or dismounting of the telescope, as the rifle changes roles, yet still maintains its zero. In range the reticle is elevated or depressed by rotating the eyepiece mount and adjustments are in ½ mil clicks from 100 yards to 1000 yards (91.4 to 914 m) with an additional reticle movement of 6 mils to allow for zeroing. In deflection the reticle is moved laterally by rotating the objective mount which again is adjustable in ½ mil clicks with 6 mils provided for zeroing. The deflection slipping scale is graduated in mils and provides 5 mils left and 5 mils right of center.

The sight optical members are cemented to the ends of a triangular prism which eliminates internal air glass surfaces. This optical system is enclosed in a metal case which incorporates elevation and azimuth adjustments and this case is in turn mounted on the rear cover of the FN rifle. Other adapter mounts can be provided if desired.

During day use the reticle is dark against the bright background but at night it is light against the dark background.

Binoculars

Anyone who has been concerned with repair and maintenance of binoculars for Services would doubtlessly agree that due to an inherent long life there tends to be a multitude of types and makes with an ensuing logistic problem for spares and repair techniques. This company has designed a family of light-weight binoculars which is of considerable interest. In the small sizes, 5 x 20 and 6 x 24, a new prismatic erecting system is used which provides equal inter-objective and inter-pupillar distances. This allows the two halves of the main body to be designed to accept identical erecting systems thus permitting modern maintenance methods as well as economical manufacture. Both glasses have the same eyepiece and differ only in the objective lenses therefore special requirements by the user could be very easily satisfied.

A special binocular, 5 x 35, for observation, from moving vehicles such as aircraft, landing craft, tanks, etc. has been provided with a relatively large exit pupil (7 mm) and low magnification which provides considerable improvement over all present types now available for this purpose.

The 7 x 50 has been re-designed into the light-weight class. Design studies have shown that the larger glasses, including the special 5 x 35, can be produced by using one standard main body changing only the eyepieces and objectives which, of course, would bring about great savings in cost and maintenance. All of this family will meet the standard military requirements of MIL-E-5272A and optical requirements are covered by JAN-G-174 and MIL-O-13830.



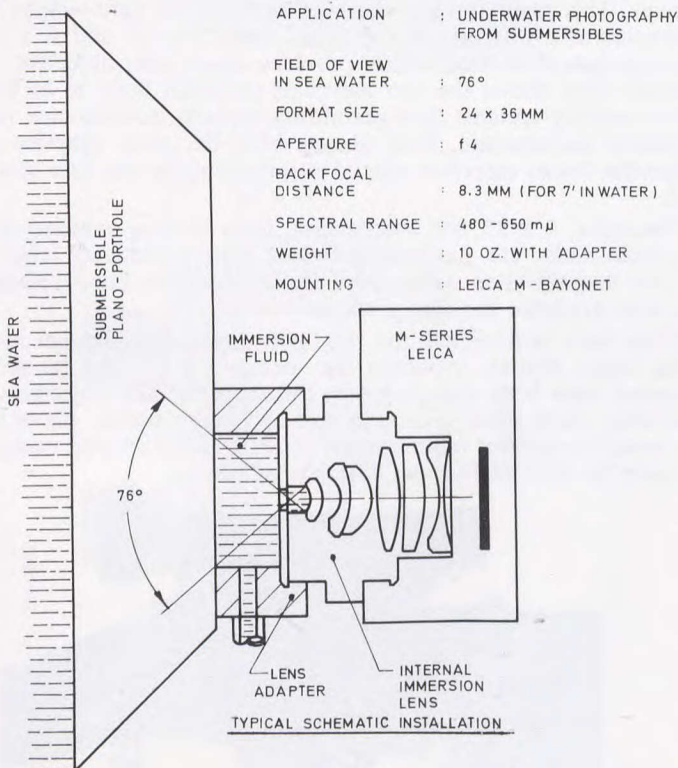
Sniper
Sight

INTERNAL IMMERSION LENSES FOR SUBMERSIBLES

Leitz Canada has developed a family of fully water corrected lenses for various film formats from 16mm to 70mm using a front dome which is in direct contact with sea water. This patented system allows the correction of these lenses to the same degree of performance in water as is now obtainable in aerial lenses.

When deep-sea photography is required, cameras are usually mounted on rigs or on the outside of submersibles, which limits the photographic mission by the film capacity of the camera system. It was, therefore, deemed desirable to develop a new water corrected lens system which would permit the use of cameras inside a submersible. The lens shown on this data sheet describes this immersion system.

As wide-angle coverage should not interfere with visual observation, a lens system with an external entrance pupil was selected, therefore keeping the lens diameter small and maintaining the maximum field of view of the operator. To achieve the necessary correction and angular coverage, the lens has been designed as an immersion lens, that is to say, the space between the inner surface of the plano viewing port and the front surface of the lens is filled with a liquid medium of optical properties identical with, or similar to, the outside water environment. Various methods of attaching the lens to the port-hole, either permanently or temporarily, are possible and the user may select his own preference. One method would be to cement a small mounting cylinder against the port-hole and attach the lens by means of a bayonet ring, another would be to use a simple rubber suction cup against the window.





"Typical 35 mm Underwater Camera with special water contact Lens installed. The lenses on the left are for 2 1/4" x 2 1/4" format; the three lenses on the right for 16 mm Motion Picture Cameras. The domes in the center would be in contact with the water are part of the lens system."

LENSES FOR AIR RECONNAISSANCE CAMERAS

The picture on the facing page illustrates a group of lenses that have been developed and manufactured recently by Ernst Leitz Canada Limited for the RCAF, the United States Military Services, as well as a number of NATO countries.

Using the knowledge gained from the development of high precision photographic lenses for 35 mm cameras, the company approximately 5 years ago started research work on lenses covering larger formats. The VICOM system for the 70 mm format which is installed in the CF-104 aircraft of the RCAF was the first reconnaissance system to utilize these new lenses. The present range of lenses covers the following focal lengths and apertures:

1½"	f/2.8
3"	f/2
3"	f/2 Infra-red.
6"	f/2.8
6"	f/2.4
12"	f/4
24"	f/4

This group gives an angular coverage from 7.5° (24") to 90° (1¾"). The 24" lens is an apochromate and the designer made use of the latest developments of new optical glass. As the lenses are used with filters they are designed for optimum performance in the spectral range of 486.1 m/μ to 656.3 m/μ. The 24", however, is also achromatized for 768.2 m/μ.

Besides lenses for the 70 mm format a group was also designed and made for cameras having the 4½" x 4½" format. These lenses have the following technical specification:

6"	f/2.8
12"	f/4
18"	f/4
24"	f/4

In addition to designing and manufacturing lenses for air reconnaissance cameras the company is also engaged in the development and manufacture of optical fire control instruments, infra-red optics and special lenses for plotting tables, CRT photography, micro recording and projection equipment as well as data processing equipment.

This same firm has produced the Sightunit C2; Telescope, Sniper C1; a family of Aerial Reconnaissance Lenses as well as a Gas Laser and these items are reviewed in this section of the book.



PHOTO RECONNAISSANCE SYSTEMS

Designed and produced by Computing Devices of Canada for the reconnaissance version of the CF-5 aircraft, this equipment is the result of many years experience in photo recce design and established knowledge in data handling and control systems. The equipment makes extensive use of modern technology to provide flexibility and long operating life.

Features:

- System: solid-state design with extensive use of microcircuits means high MTBF and great flexibility.
- Camera: the Vinten 20 mm camera has a world-wide reputation for dependability and ruggedness of design. Three are used in the system.
- Data Recording: provision is made for alpha-numeric data to be read directly from the 70 mm negative.
- Light Intensity Control: two light monitors automatically compensate for lighting conditions.

Located in the detachable nose-cone of the recce CF-5 are the computer, one light monitor and three cameras looking left, right and forward. In the pilots' cockpit are the camera control and the second light monitor. The pilots' control box contains all the operating controls for the system and includes a miniature joystick for selection of any or all of the cameras.

Computing Devices of Canada have many years of experience in the field of camera systems and have pioneered techniques for low-level high-speed photography. Early systems varied in complexity from single-camera, simple controls to multi-camera complex designs. The photo-recce pod designed for the CF-104 aircraft has been flown for many thousands of hours and has demonstrated excellent reliability and fine film quality.

Complete customer service provided by the company includes training courses for technicians, ground support equipment, manuals and engineering orders and a world-wide field representative organization.



SMOKE GENERATOR, AIRCRAFT, ORANGE

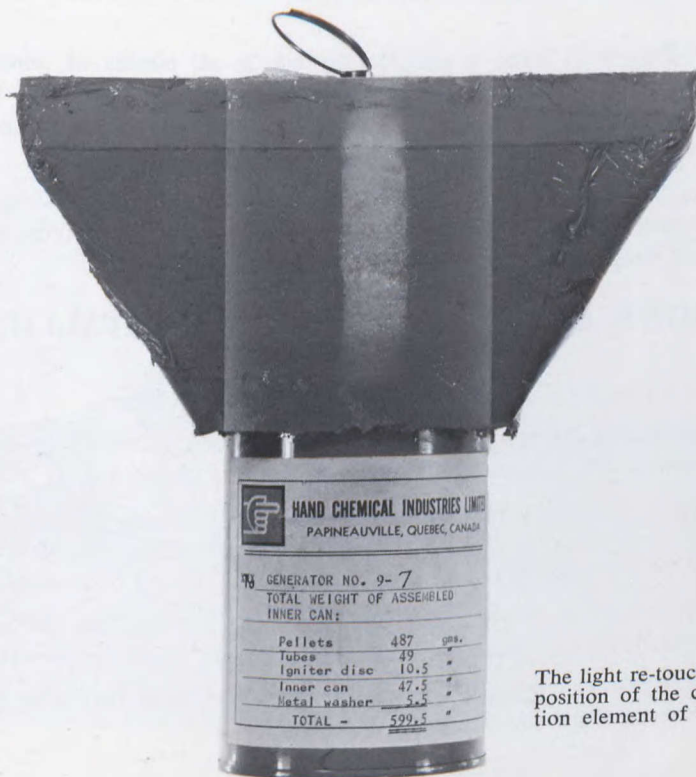
Helicopter pilots operating in remote areas frequently require reliable ground wind information prior to landing at unprepared sites. A coloured smoke generator has been designed specifically to meet this requirement.

The smoke generator functions on land or water, does not bury itself in soft ground or marsh, and creates no fire hazard even in dry grass, or similarly inflammable ground cover. The store is designed to obviate the probability of accidental initiation in the aircraft.

The smoke generator contains an extremely low-temperature burning composition producing an orange smoke, visible from a 2000 foot altitude at a slant range of one mile, against either summer or winter backgrounds. Smoke duration is two minutes. (Altitude 610 m and slant range 1.6 km)

The generator is a 3" diameter metal cylinder 8" H. (7.6 x 20 cm). This cylinder is surrounded over its upper half by an expanded poly-foam body, 8" sq. (51.6 cm²) in cross section but tapered in its lower half. This body acts as a flotation chamber in water, ensures that the generator will land in an upright position on the ground, and retards the device in air-drop to reduce landing shock and earth penetration. The total (unpacked) weight of the item is 2¼ pounds. The generator, including the firing mechanism is completely sealed.

The generator is armed by a pull-type mechanism (three pound pull). A fifteen second delay allows ample time for ejection from the aircraft. Burning will go to completion regardless of immersion in either salt or fresh water.



The light re-touched area indicates the position of the can within the flotation element of the generator.

MINE ANTI-PERSONNEL NON-METALLIC C3A1 (M25)

These mines were developed by the Canadian Army and have been accepted as standard by ABC countries. The C3A1 version contains an aluminum shell 6 gr detonator, while the M25 contains a gilding metal shell M 46 detonator. The two versions are otherwise identical.

Each is a low cost plastic groundburst mine supplied in 2 principle assemblies, consisting of the body assembly; 2" diameter by 3" long (5 x 7.5 cm) with a weight of 2 oz. (57 gm); and the charge assembly, 1.5" long by 2.2" diameter (3.8 x 5.6 cm) with a weight of 1 oz. (28 gm). The total weight of the explosive is 9.45 gm.

The body assembly has a transit plug, which is removed after the body assembly has been emplaced and replaced by the charge assembly, fitted with a safety clip. Removal of the safety clip prepares the mine for function, under a load of 16 to 26 lbs. (7.25 — 11.8 kg). As long as the safety clip remains in place, loads of extreme magnitude will not cause actuation.

The mines are coloured olive drab and are designed with integral camouflage material.

Emplaced mines, after removal of the safety clip, are operationally undetectable with conventional electro-magnetic detection equipment. A detector ring can be fitted if this should be required, which makes the mine detectable by standard methods.

This Anti-Personnel Mine is suitable for use in all classes of mine fields in primary or secondary roles. Examples of operational use would be to protect positions to prevent the lifting of Anti-Tank Mines and to deny terrain to attacking forces.

The mine has been loaded by Canadian Arsenals Limited, Filling Division, with components supplied from various sources. The item is in volume production for the United Kingdom.

MINE ANTI-PERSONNEL NON-METALLIC PRACTICE C4A1

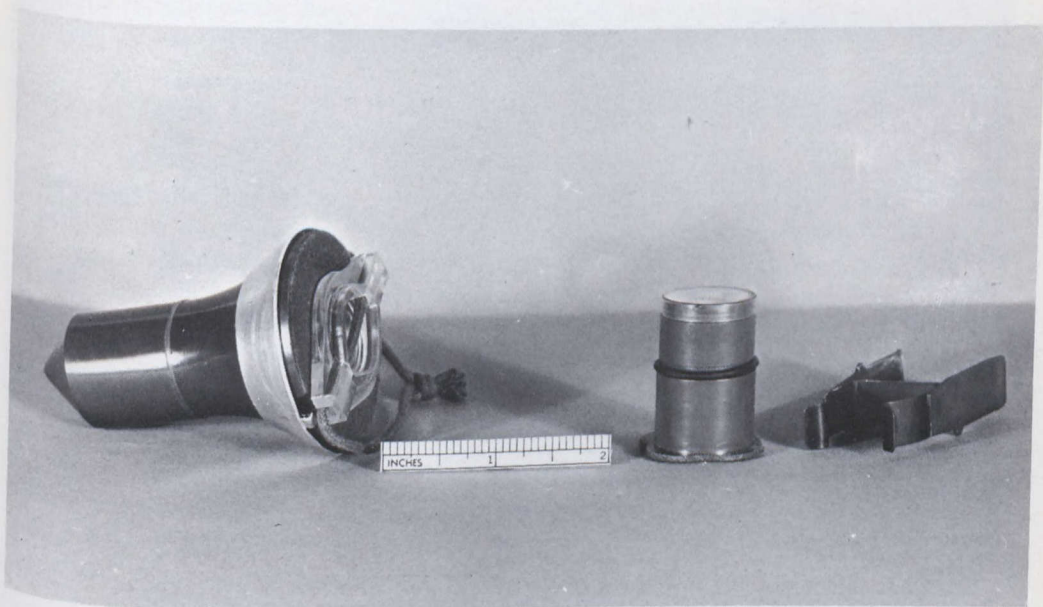
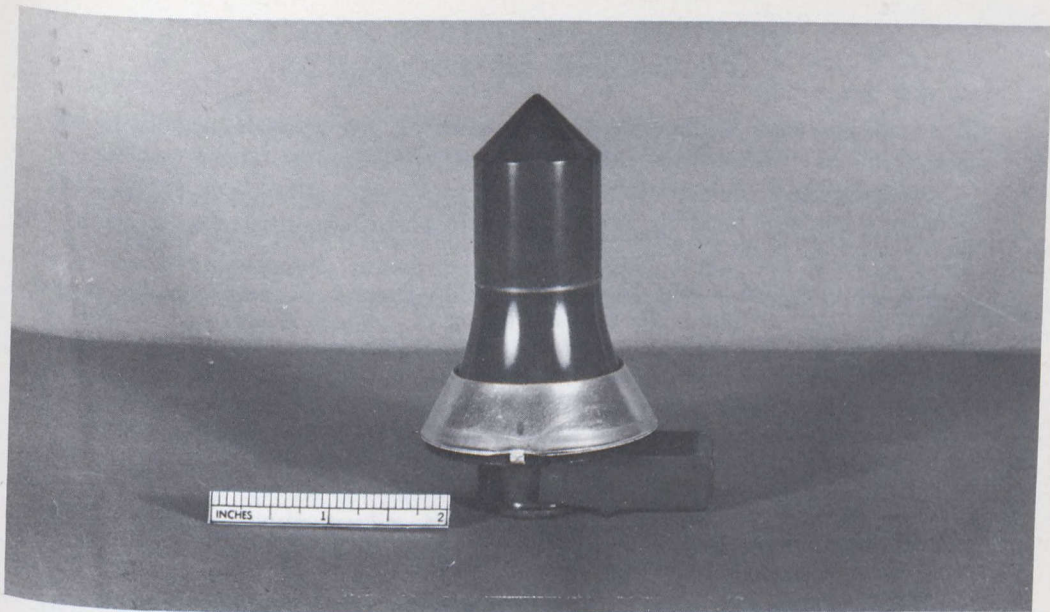
The mine is a practice version of the C3A1 (M25) H.E. mine.

The emplacement assembly and function of the practice mine is the same as for the H.E. version. On actuation, the mine produces a blue coloured smoke signal.

Identification of the components is made through the use of standard NATO colours. It is constructed of plastic materials and is reusable at least five times by replacement of the spotting charge and the re-cocking of the body assembly.

This item has been in volume production for the Canadian Forces and the United Kingdom by Canadian Industries Limited and other contractors.

Imitation inert and dummy versions of the C3A1 Anti-Personnel Mine have been manufactured and are available as required.



I-291

FUSE ASSEMBLIES AND PRECISION METAL PARTS

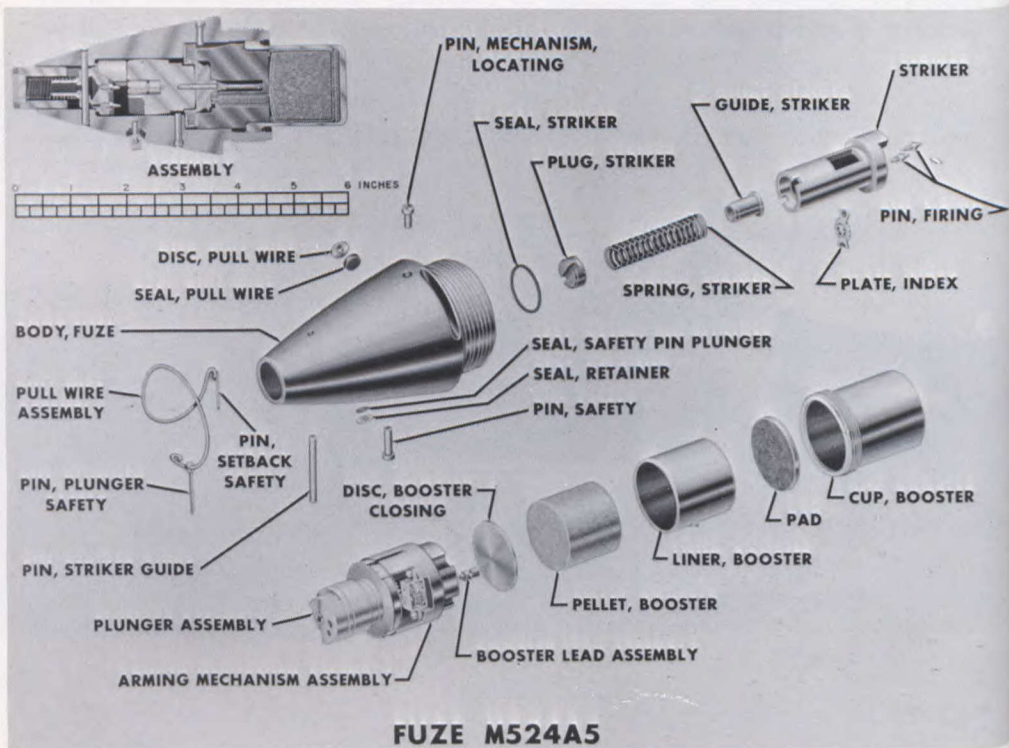
Marsland Engineering Limited has an established high quality in-house facility to produce fuses of the M524 type at a high production rate.

This integrated capability is built around equipment easily adapted to the production of precision parts for commercial needs while giving the facility more scope than a single purpose ordnance plant.

The Company has a long history as a quality supplier of mechanical parts and assemblies from stampings through machining of complex shapes and the cutting of gears, pinions and cams, on modern automatic equipment. All of these facilities are utilized in the kit for the M524 fuse which is supplied to loading plants as required. Wherever there is a demonstrated need for special production machining equipment the Company designs and builds linear as well as rotary transfer machines of high accuracy so that unskilled operators can be used to quickly achieve maximum output.

Other products include teleprinter equipment, military display systems for ship and aircraft installations, electronic components such as loudspeakers, transformers, resistors and television tuners.

A very complete electro-mechanical design and production engineering department is fully staffed at all times and is supported by development and environmental test laboratories. Under these circumstances the Company successfully handles research and development contracts for many international customers in both the commercial and military fields.



CANADIAN ARSENALS LIMITED (Small Arms Division)

The Small Arms Division of CAL has provided the Canadian Armed Services with equipments and designs consistent with the exacting demands of ordnance work where consistency and long life to rigorous specifications is taken for granted.

High speed deep-hole drilling, high quantity and accuracy broaching as well as internal chroming facilities are but three of the techniques available at Small Arms which ensure a production in accordance with specifications and to inspection standards.

The very special qualities of any Arsenal and more particularly CAL, as it is a self-reliant and completely self-contained operation, makes it a valuable back-up source to other segments of the defence industry or to industry at large where the peculiar and specialized techniques of any established arsenal are understood. Very often ordnance experience in material and standards provide the positive assurance required in other than what might be normally considered straight ordnance products.

Recent production at CAL has included .50 Brownings, Air and Ground versions; 7.92 mm Bren LMG's to foreign account; 7.62 mm (FN) C1 & C2 Rifles; 9 mm C1 (Sterling) SMG's and millions of 20 mm Ammunition Links.

The design services available at SAD have made vast improvements on such standard and internationally recognized weapons as the FN Rifle and the Sterling SMG as well produced the 9 mm Browning pistol (Canadian Pattern HP) which is used as a standard side arm in a variety of countries.

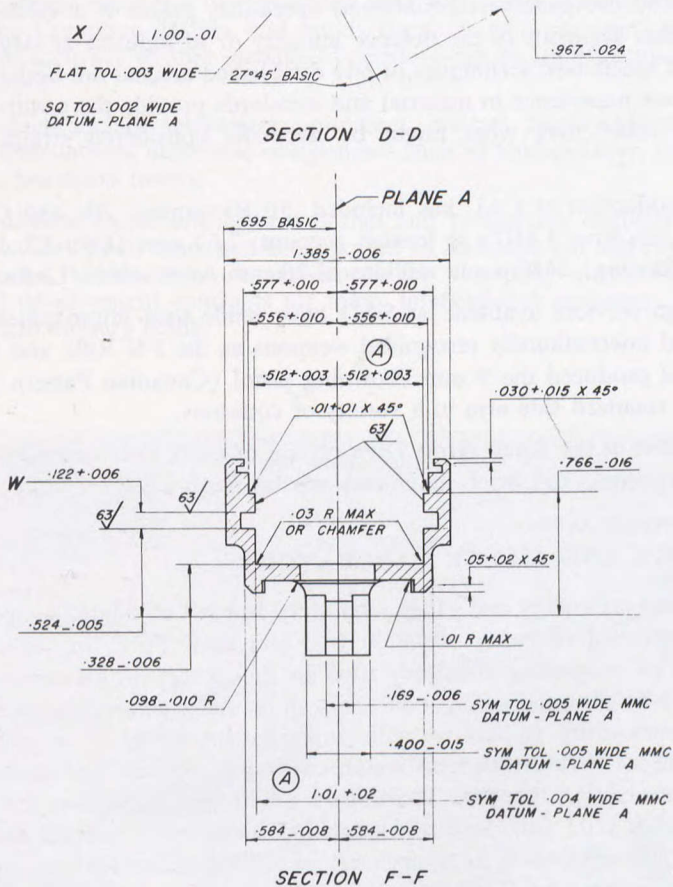
The facilities at the Small Arms Division are of more than ordinary interest, as would be expected, and brief summaries of the more salient features are noted.

METROLOGY AND GAUGE LABORATORY:

The Division metrology and gauge laboratory is a self contained temperature and humidity controlled relatively vibration free unit established for the control and maintenance of measuring standards used in the processing of a wide range of products both defence and commercial that can be manufactured in the Small Arms plant. The measuring equipment with some exceptions is of a universal type permitting the measuring of several features with one machine and includes a three co-ordinate measuring machine, toolmakers microscope, machines for measuring up to 80 inches (203 cm), lead and pitch measuring both internal and external, internal diameter measuring to an accuracy of .00002 inches and an opposed head comparator graduated to .0000001 inches. The metrology laboratory has received R.C.A.F. approval and is listed in appendix "B" of 12 Technical Services Unit Order and Instructions T22 as a source for the complete calibration of gauge blocks as well as plain and threaded ring and plug gauges. The metrology laboratory, in addition to providing for our own internal requirements, calibrates gauge blocks and measuring standards for commercial companies.

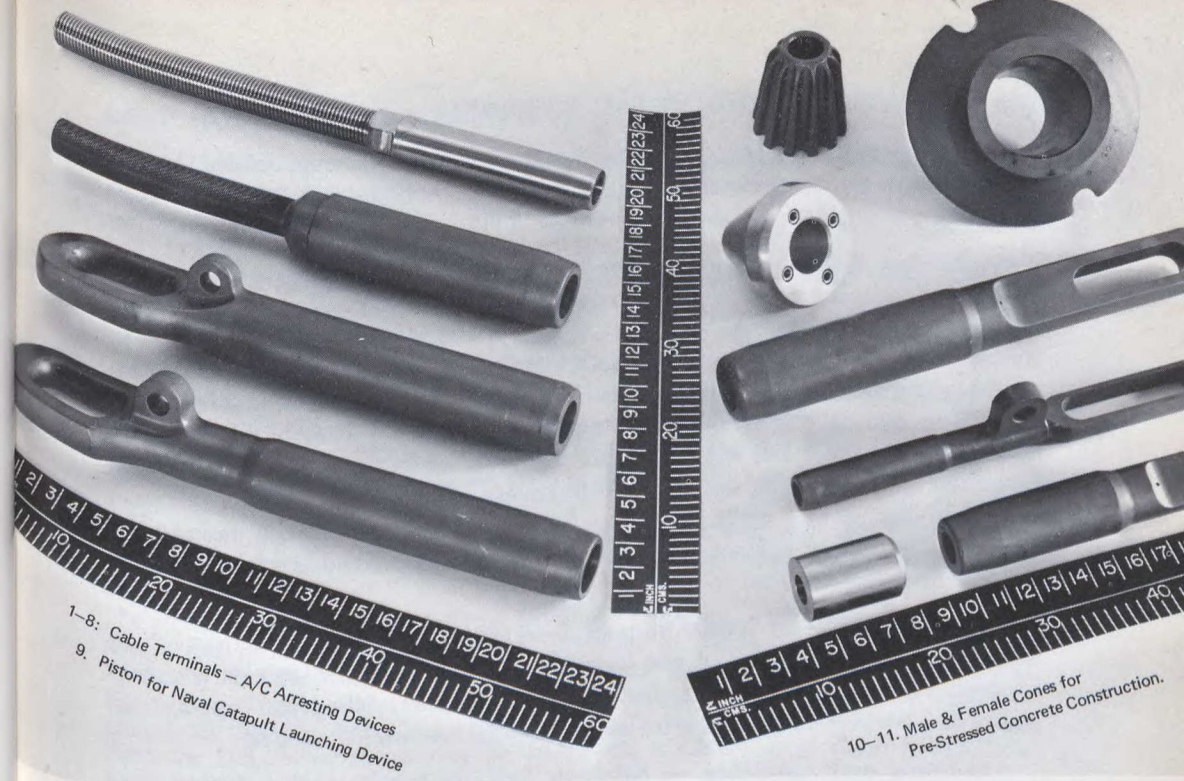
BROACHING:

The Broach Department has 13 surface broaching machines which are pit installed to ensure ease of handling material from floor level and are serviced by an overhead crane system to facilitate the handling of heavy broach tooling. The machines range in size from 10 tons (10 metric) with a 66" (1.7 m) stroke to 25 tons (25 metric) with a 90" (2.3 m) stroke and are of the double ram type with both oscillating and shuttle table arrangements thus permitting maximum use of operator's time during the cutting period of the machine cycle. There are also two vertical internal broaching machines with automatic broach pulling and retrieving mechanisms, each machine of the multi-head type. These machines are used for precision broaching of holes, slots and other through-type internally formed shapes. These machines are capable of broaching many shapes in a wide range of sizes restricted only by their tonnage capacities.

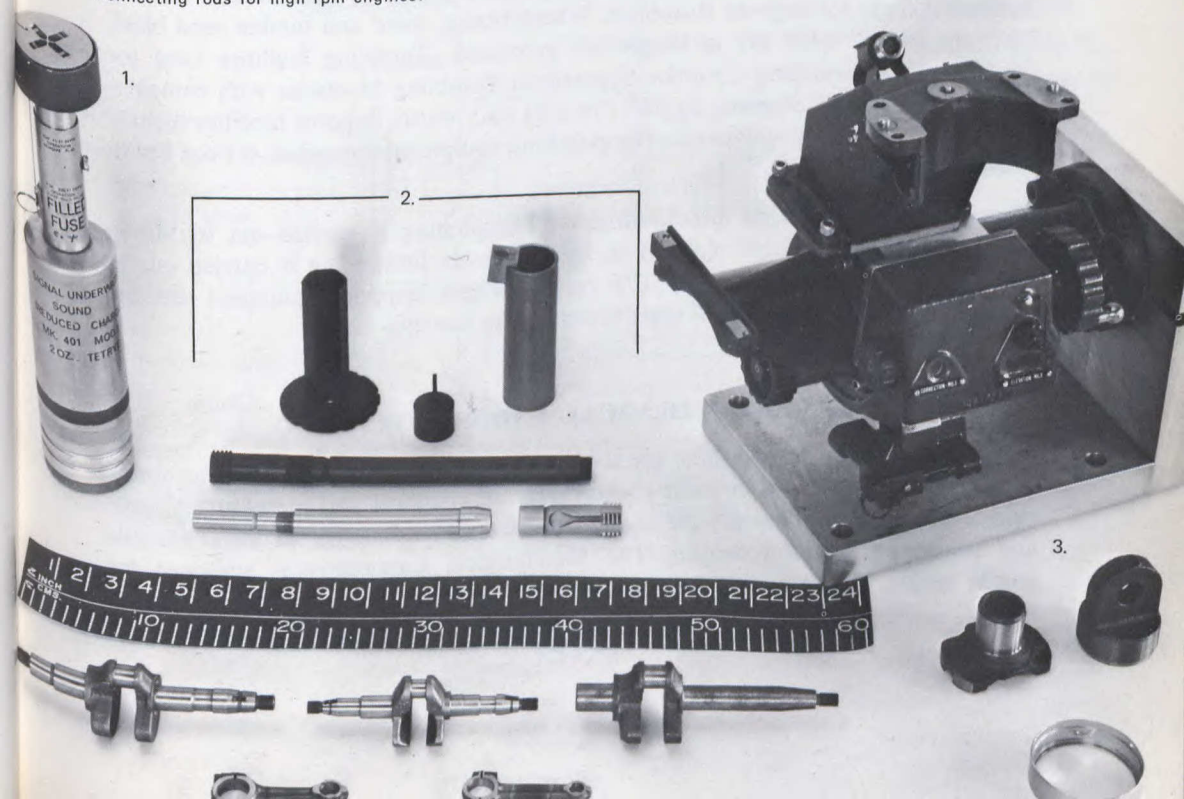


HONING:

The Division has considerable capacity for internal honing with a honing machine equipped to hone bores from $1\frac{1}{2}$ " to 8" (38 - 203 mm) 2D for Internal Diameter and lengths up to 12 feet (3.7 m). Surfaces finishes are produced in order of 8 RMS (micro finish). Recoil and Recuperation systems on the 105 & 155 mm Howitzers are reworked on this equipment.



The diversity of the Division is shown in these items: 1. Parts for Underwater explosive devices; 2. Impact device for setting anchors in concrete for the construction trade; 3. Items for artillery Fire Control; 4. Crank shafts & connecting rods for high rpm engines.



HEAT TREATMENT AND METAL FINISHING:

For convenience this facility will be discussed under its six specialized departments. It must be remembered that all departments work to demanding ordnance standards.

Production Heat Treating — The Heat Treating Department is equipped to handle ferrous metal parts in sizes up to that encountered in weapons as large as 20 mm calibre. The bulk of the heat treatment of finished parts is carried out in atmosphere controlled Lindberg carbonitriding furnaces. Barrel forgings are heat treated in non-atmosphere pit furnaces. Induction heating equipment is available in the form of 10 KW and 25 KW units (450 KC) with and without oil quenching facilities. Molten salt and lead baths are available for cyanide hardening, neutral hardening, tempering and nitriding. Facilities are available for the heat treatment of all varieties of tool steels. Support equipment includes automatic atmospheric controls, deep freeze cabinet, magnetic particle inspection and Rockwell, Brinell and Vickers Hardness Testers.

Electroplating — A special purpose department equipped for electropolishing and hard chromium plating of gun barrel bores and external plating on a variety of small parts. Support facilities include special bore scrubbing and lapping machines and lead-tin alloy plating for use on special conforming anodes.

Anodizing and Alodizing — Sulphuric acid anodizing to Mil-A-8625A type 2 and Alodine Chemical films to Mil-C-5541 are produced in this department. Tank sizes are approximately 30" square by 30" deep (76 x 76 cm) with the exception of the anodizing tank which is long enough to accept three racks at a time.

Abrasive blasting, Tumbling, Polishing and Buffing — The abrasive blasting facilities include a Pangborn Rotoblast, Wheelabrator, hand and tumble sand blast. Parts up to 48" (1.2 m) in length are processed. Tumbling facilities used for deburring and burnishing comprise Supersheen Tumbling Machines with compartment sizes up to 30" diameter by 24" (76 x 61 cm) width. Support facilities include storage bins, stone separators etc. The polishing equipment comprises 6 Ford Smith polishing lathes.

Phosphating and Oxide blackening — Phosphating is carried out to Mil-P-16232 on parts up to 36" (.9 m) in length. Oxide blackening is carried out to Mil-C-13924 on parts up to 30" (76 cm) in length. Support equipment includes acid and alkali cleaning tanks, rinse tanks, oiling benches etc.

METALLURGICAL AND CHEMICAL LABORATORY:

This laboratory is responsible for the composite quality control of all incoming raw materials as well as in plant control over all chemical and metallurgical processes. Chemical facilities are mainly volumetric and gravimetric for metal analysis and processing solution control. The Metallurgical Laboratory is equipped for tensile testing, impact testing, hardness testing, metallograph and salt spray testing.

CANADIAN ARSENALS LIMITED (Filling Division)

This Division, established in the early days of World War II, was designed to load high explosives and propellants into such end products as artillery shells, mines, bombs, grenades, torpedo warheads, depth charges and mortar charges as well as rocket motors. This same facility also designs and produces components for assembly in primers, detonators, delays, as well as a wide spectrum of fuzes.

The Division's operations are also directed toward the improvement and refinement of ammunition. Its range of work covers new compositions, initiatory materials, explosive trains, pyrotechnic materials and devices employing these materials; electronic fuzes and associated power sources engineered to withstand accelerations of Kil-g magnitudes.

Applications for modern controlled-process initiatory powders are being investigated constantly to provide alternate and improved designs of igniters, detonators and primers employing electrical, stab or friction initiation. Improved safety, better manufacturing characteristics with consequent cost advantage, and more stable performance in service are the guidelines for this work. Current work includes investigations into more uniform chemical delay powders with special emphasis on the longer burning time gasless types.

The normal day-to-day work of the Division entails the handling of a wide variety of sensitive explosive compositions and ordnance components. The maintenance of an enviable quality record enjoyed by the Division over the years cannot be left to chance alone nor can it be left to an earnest desire for quality. Only through a rigid and continuing policy of staff training and regulation enforcement together with the engineering division's constant surveillance of production methods is the quality level maintained.

To consider the Division as a filling plant only would be erroneous, despite its name. This facility is staffed and equipped to cover all activities from the quality acceptance of the basic materials and components to the production of the explosive compositions, the filling operation, the assembly, and the final inspection of the end products.

CHEMICAL LABORATORY

A partial listing of equipment would include semi-micro analytical balances, differential thermal analyzers and spectrophotometers. The gravimetric and physical testing bench of the Detonating Composition Room provides for safety of operations along with precision. Also included are shielded analytical balances, friction pendulum, ignition temperature tester, drying facility and ball and disc impact sensitivity apparatus.

The laboratory will also produce small batches of sensitive elements in a synthesis laboratory before scaling them up for full batch production. This same small scale operation is often used to develop the specialized techniques required to handle such new formulas. Such techniques are more important than equipment wherever exacting accuracies or the handling of sensitive or dangerous substances are involved.

The electronic calibration and environmental test of electronic components and assemblies at the Division are carried out with secondary standards which have been calibrated by a Registered Laboratory that is traceable to the primary at the National Bureau of Standards (NBS) in Washington or to the National Research Council (NRC) in Ottawa. The laboratory, which includes static and dynamic cycling of electrical parameters, also tests environs of temperature and humidity cycling, vibration, spin, centrifuge and shock.

Associated with our work in electronic devices is a measurements lab containing

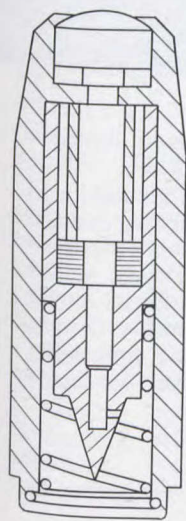
standard test equipment used for the measurements of the basic physical characteristics. Field strength antenna characteristics and power measurements can be made at ultra high frequencies.

Specialized equipment for the laboratory simulation of operational environments include very high speed spinners, (48,000 rpm), very high-g simulation, and the instrumentation required to record these test environments. Analog devices are used to simulate electronic and other physical mechanisms. An analog computer and a high frequency response recorder are included. Particularly, the laboratory is equipped for the measurement, analysis and assessment of proximity fuzes in developmental or investigative phases. This includes not only the electronic components, but in addition, electro chemical and mechanical devices.

Closely associated with this work is the standard and the special equipment used for the measurement of peak amplitudes and intense light pulses from pyrotechnic sources. Selection and calibration of photo cells and filters to provide equivalent spectral response can be done.

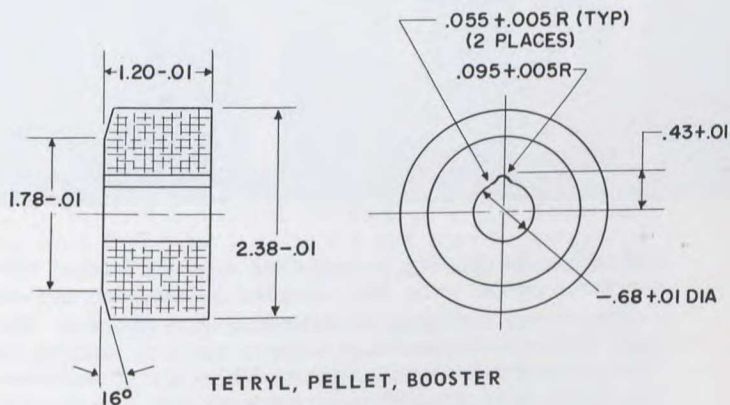
Two complete radiographic laboratories are equipped to handle any film radiography assignment within the capabilities of the five X-Ray machines operated by the Division. The X-Ray equipment includes the 10 to 300 Kilovolt range, as well as a 220 Curie Cobalt source. A 150 KUP maximum fluoroscopic unit for line inspection, fed by a conveyor, is also available.

For small components (in the millimeter range) a 3M microfilm reader with an 8" x 10" micro-flash attachment is used for film inspection and the unit will accept lenses with a magnification up to 35:1. A dry paper reproduction can also be obtained within a few seconds. Some samples of components radiographed in the Small Component Laboratory are: small electronic and mechanical components, detonators and primers of a few millimeters in diameter or larger, electronic and mechanical assemblies and filled cast explosives up to 5" dia. x 15" H. (12.7 x 38 cm). In high quantity productions where 100% X-Ray examination must be carried out a Duplex is used with 60 to 220 KUP units, fed by a conveyor system

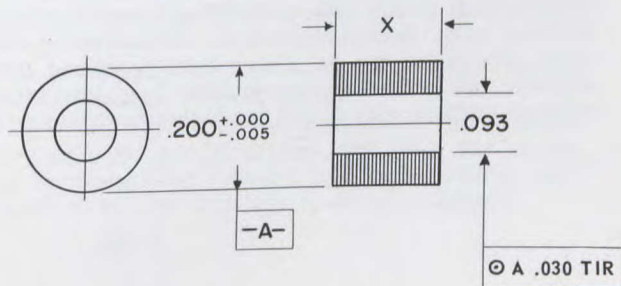


SCALE 6/1

EJECTION
PLUNGER



TETRYL, PELLETT, BOOSTER

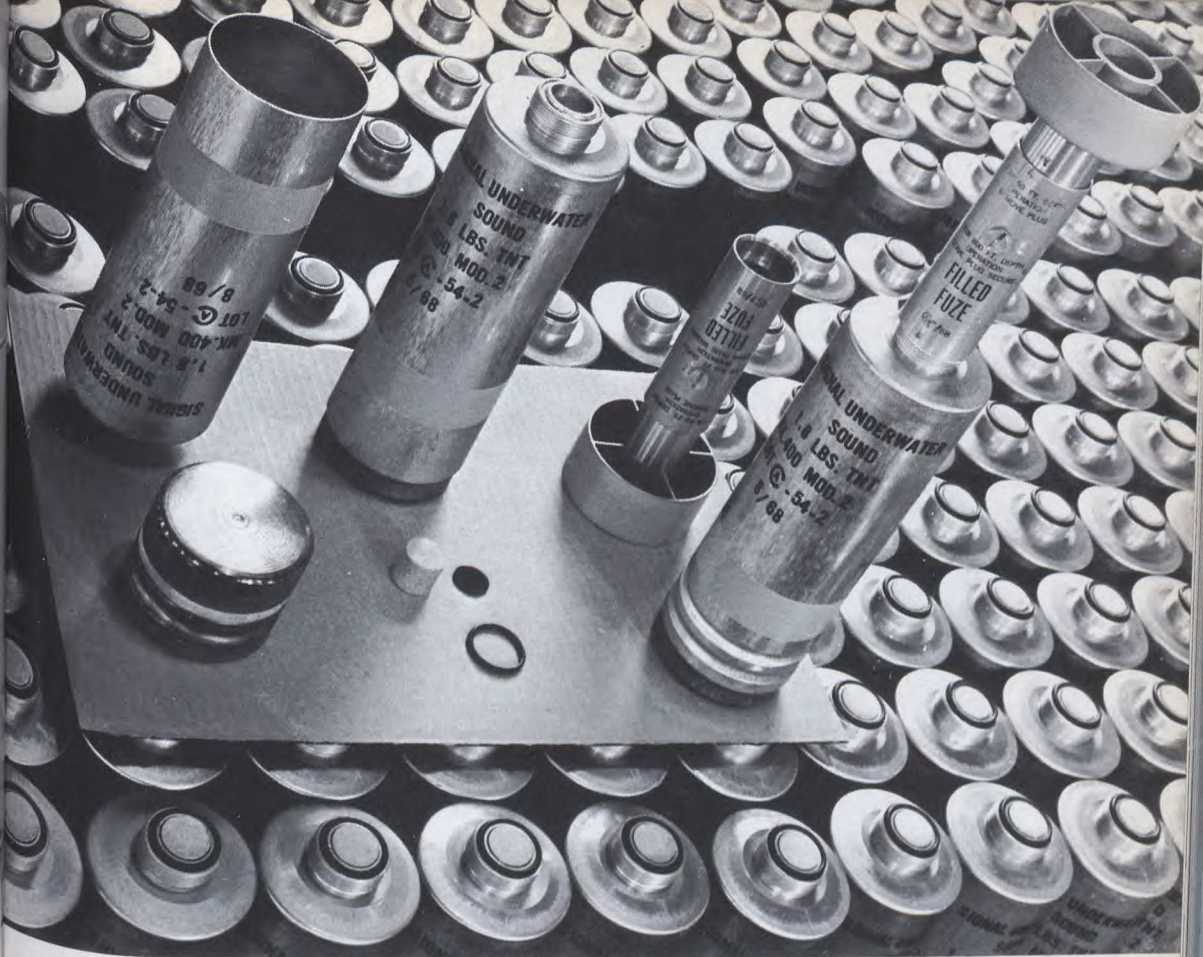


PELLETT, POWDER, BLACK



and with automatic film carriage and exposure control which provides for multiple exposures on the same film when the X-Ray ports are suitably masked.

The second radiographic laboratory is designed to accommodate medium and large type cast explosives in various kinds of metallic and non-metallic casings. The equipment features a 100 to 300 Kilovolt machine using a 360° exposure rod anode tube or a 30° exposure tube with a medium or fine focal spot. A 220 Curie Cobalt source with a 360° exposure capability is located in an adjoining shielded room. Both Laboratories are equipped with a darkroom and a viewing room, and films can be either hand-processed or by an automatic processing machine. Film illuminators include four low intensity viewers, one Sextuplex medium intensity viewer and five high-intensity viewers.



A good example of the high production capabilities of the Division is in the line producing the propelling charge M4A1 for the 155 mm. Howitzer SPM109. Each charge consists of five increments of varying weights. The operation consists of filling the charge to a predetermined weight, check weighing, and then loading into the increment bag and finally to the bag sewing station. The accuracies required in the production of these charges are worth noting and here the Base Charge, which weighs 4.270 lbs. (1.9 kg), has a tolerance of ± 1.6 drams and other increments, weighing from 1 to 3 lbs. (.45 to 1.4 kg), have a tolerance of .8 drams. This line can use approximately 42,000 lbs. (19,051 kg) of propellant per shift and, therefore, safety precautions are a must.

For the above reason, the operating shop is equipped with a high-speed deluge system capable of operating within one second after the flame has reached the heat-actuated device located directly above each supply bin on the line, and is capable of extinguishing the fire in a few seconds. All equipment is grounded to prevent any build-up of static electricity; flexible grounding cables are clipped to the propellant cans when pouring into the bins.

This high production capability is supported by vast secure magazine areas for explosives. Other storage areas are maintained for components.

Another facility available is the Proof Yard which is equipped to test primers, detonators, delays, fuzes, artillery primers, special devices, and flash and smoke munitions. Tests are carried out for sensitivity, pressure bar, sandcrushing, dent test output, delay times, jolt, jumble, drop, low and high frequency vibration.

TRUCK 1¼ TON, 4 x 4 "RAM"

This vehicle has been selected by the Canadian Forces to replace the ¾ ton (762 kg) payload M-37 utility truck. The 1¼ ton (1270 kg) cross country payload was chosen as being optimum for the lightest load-carrying vehicle in tactical units.

This truck is unorthodox in that the frame consists of a monocoque construction aluminum hull, thus providing an inherent swimming capability and maximum protection from dirt and damage to the power train.

The RAM is lightweight, compact, and highly mobile. It meets current military speed and grade requirements. It will float and swim without prior preparation. Water propulsion and steering are provided by the wheels. This vehicle has exceptionally good ride, handling, and control characteristics on or off the road. These advantages are provided by the long stroke, independent suspension, carefully selected springs, and long parallel control arms. Fast manual steering and power-assisted disc brakes also contribute to exceptional control and driving ease.

The commercially proven 318 cubic inch (5.2 lit.) V-8 gasoline engine is located under the cab and is readily accessible for easy maintenance. The remainder of the power train in the 1¼ ton truck consists of a rugged three-speed automatic transmission, a single-speed transfer case, and front and rear driving axles.

The all aluminum integral watertight body provides the lightest weight for the strength required to handle the rugged off-road jobs. The cargo body of the 1¼ ton truck provides 58 square feet (5.3 m²) of usable space. The full-width tailgate makes it easy to load.

A variety of special purpose kits (e.g. ambulance, communications, etc.) are being developed for the vehicle.

This vehicle is now undergoing technical and user trials, which will be completed in mid-1970. The vehicle will be in quantity production in 1971.

Weights

Curb	6,000 lbs. (2,722 kg.)
Payload (Cross-Country)	2,500 lbs. (1,134 kg.)
Payload (Highway)	4,000 lbs. (1,814 kg.)
Crew Allowance (two men)	450 lbs. (204 kg)
G.V.W. (Cross-Country)	8,950 lbs. (4,060 kg.)
G.V.W. (Highway)	10,450 lbs. (4,740 kg.)

Dimensions

Overall Length	180.00 inches (457 cm.)
Overall Width	89.00 inches (224 cm.)
Overall Height	95.75 inches (144 cm.)
Reducible Height	70.00 inches (178 cm.)
Cargo Body Length	97.00 inches (246 cm.)
Cargo Body Width	85.00 inches (216 cm.)
Cargo Body Area	58.00 sq. ft. (5.3 m ²)
Ground Clearance	
(a) Standard Tires (9.00x20)	13.62 inches (34.65 cm.)
(b) High Mobility Tires (16x20) (Opt.)	15.42 inches (39 cm.)
Approach Angle	
(a) Standard Tires	60°
(b) High Mobility Tires	65°
Departure Angle	
(a) Standard Tires	48°
(b) High Mobility Tires	52°
Turning Radius	
(a) Standard Tires	29 feet (8.8 m)
(b) High Mobility Tires	30 feet (9 m)

Performance

Maximum Speed	60 mph (97.6 kilo/h.)
Gradeability (Forward Slope)	60%
(Side Slope)	30%
Range (Highway)	340 miles (547 km)



“DYNATRAC”—(XM-571)

Canadair Limited has designed and developed an extremely versatile tracked vehicle — the Dynatrac. The U.S. Army, who have an interest in this vehicle designate it as the XM-571.

The Dynatrac is a fully tracked, articulated, high mobility, utility carrier with a payload capacity of 2,000 pounds (907 kg) plus driver and co-driver. The vehicle is designed to be used as a cargo or personnel carrier, as a litter evacuation unit, as a platform for a series of light weapons systems and for a variety of other uses such as common post, liaison, scouting and wire laying.

The Dynatrac's swimming ability permits it to cross inland water bodies without special preparation. It will operate at high altitudes and under conditions of driving rain, snow or dust and in temperatures ranging from -65°F to $+115^{\circ}\text{F}$ (-54C . to $+46\text{C}$).

The Dynatrac's exceptional off-road performance is largely the result of a combination of the following unique features: **LOW GROUND PRESSURE**—The fully loaded vehicle has a mean ground pressure, at no sinkage, of about 2 pounds per square inch reducing to about 1.5 pounds per square inch at 4" sinkage. This has been achieved by the maximum use of low density, high strength materials. **HIGH TRACTIVE EFFORT**—A high tractive effort to gross weight ratio of greater than 1:1 is obtained by the use of a high performance engine, suitable gear ratios, and low structural weight. The vehicle can negotiate steep slopes or pull heavy loads with equal ease. **ALL TRACKS POWERED**—Each track of each unit is powered by the engine in the front unit. Over ridges, in ditches, in mud or deep snow, regardless of carrier attitude, optimum tractive effort is produced. Linked hulls prevent “nose high” trim when the Dynatrac is underway, thereby maintaining full traction. **ARTICULATED STEERING**—By using hydraulic actuators to deflect one unit in relation to the other, steering forces are kept within the structure and are not transmitted to the ground. This reduces “bog-down” hazard, a major disadvantage of conventional tracked vehicles when operating in swampy areas.

Whenever required, the front unit may be operated alone. In this case, steering of the unit is accomplished by a conventional clutch-brake system. Front and rear units can be separated or connected in less than two minutes without special tools.

The Dynatrac, with full payload, is transportable by medium helicopter. In addition, the front and the rear units with their respective payloads are individually transportable by light helicopter.

The Dynatrac's design permits the addition of a third articulated unit which is powered in the same way as the second unit. The third unit will carry a 1500 pound (680 kg) payload, increasing the vehicle's carrying capacity to a total of 3,500 pounds (1590 kg) plus driver and co-driver. With three units connected, the Dynatrac retains its high off-road mobility and its performance is virtually unaffected under normal cross-country conditions.

Economy of operation, ease of maintenance and reliability have been designed into the Canadair Dynatrac making it one of the most versatile and highly mobile vehicles in its class today.



AIRFIELD FOAM CRASH TRUCK—MARK 9B

This Foam Crash Truck designed by Pyrene Manufacturing to carry a fire fighting crew of five with their equipment, with utmost speed over rough or improved terrain. In the event of a fire, foam can be discharged immediately, through the turret, on arrival at the scene. The crash truck comprises a 6 x 6 L.H.D. chassis powered by a V.8 gasoline engine developing 330 B.H.P., a water tank, foam tank, and high expansion foam making equipment, allowing full foam production when the vehicle is moving at any speed.

The foam-making equipment consists of variable flow generator/inductor assembly, coupled to an air blower and centrifugal fire pump. These are driven by a V.8, 534 cubic inch gasoline engine. The engine, the blower and the pump are transversely mounted at the rear of the vehicle. The engine compartment is enclosed by a removable light alloy-cover. The 833 Imperial gallon (379 lit.) capacity water tank is connected to the fire pump and the foam tank to the variable 'round-the-pump' inductor.

The generator discharges foam at a nominal expansion ratio of 12:1 through the turret and through two handlines simultaneously or independently as required. The handlines are located in lockers, immediately aft of the crew compartment and consist of 60 ft. (18.3 m) lengths of 4 inch (10.2 cm) foam hose to which are coupled foam nozzles with spray/jet equipment. All the controls for the production and discharge of foam are located within reach of the driver. The turret is designed to discharge at two outputs; when set to the "HIGH" range it is capable of discharging 5000 gallons (2273 lit) per minute. Operating with the turret set in the "LOW" output range, discharge from the turret is reduced to approximately 2500 gallons (1136 lit) per minute, but either one or two 60 ft. handlines can be used simultaneously.

Ground sweep nozzles are installed at the front of the vehicle to provide a foam coverage immediately in front of, and the full width of, the vehicle. Additional foam nozzles are fitted in the wheel arches to provide protection for the tires. Twenty-six of these Mark 9B Airfield Crash Trucks were manufactured for the Royal Canadian Air Force, and are presently in service at bases throughout Canada.



AIRFIELD FOAM CRASH TRUCK—MARK II

The Mark 11 Airfield Crash Truck was designed to combat fires at the smaller domestic airfields in the Dominion of Canada. Emphasis was placed on "One Man Operation" throughout and a simplified air aspirated foam system incorporating the basic characteristics of foam produced by the larger trucks has been employed.

Total foam output is 2500 Imperial gallons (11,365 lit.) per minute through the cab mounted turret and 1440 Imperial gallons (6550 lit.) per minute through the 2½" handline. A Mark 6F fire pump is coupled to the 400 Imperial gallon (1800 lit.) aluminum water tank. A 60 Imperial gallon (272 lit.) foam concentrate tank is fitted together with a round the pump inductor system.

Provision is made to allow the truck to be used as a standard fire engine taking water from the tank or external pressure sources to deal with class "A" (domestic) fires. Seventeen of these Mark 11 vehicles have been supplied to date to the Canadian Department of Transport for use at airfields in the more remote regions of Canada.



AIRPORT AMPHIBIOUS CRASH AND RESCUE VEHICLE

Canadian developed off-road vehicles have been successfully adapted to a wide variety of roles and environments. Typical of such adaptation is the Amphibious Airport Crash and Rescue Vehicle developed from the Bombardier Musket Tractor. Known as the "Red Angel" this vehicle was designed for operation on and around airfields located near marshes, shallow water areas and tidal flats.

With a ground speed of 25 MPH (40 km) and a water speed of 10 MPH (16 km) the vehicle can reach downed aircraft regardless of the position of crash. The floatation chambers, dimensional stability and snorkel type engine air inlets allow operation in waves and breakers up to four feet in height. The vehicle's high permissible payload of 5 tons enhances its rescue capability and permits the carriage of a variety of fire-fighting and salvage equipment.

Engine (Land)	— 190 HP
Engine (Water)	— 20 HP Vicars Hydraulic
Ground Speed	— 25 MPH (40 km)
Water Speed	— 10 MPH (16 km)
Payload	— 5 Tons

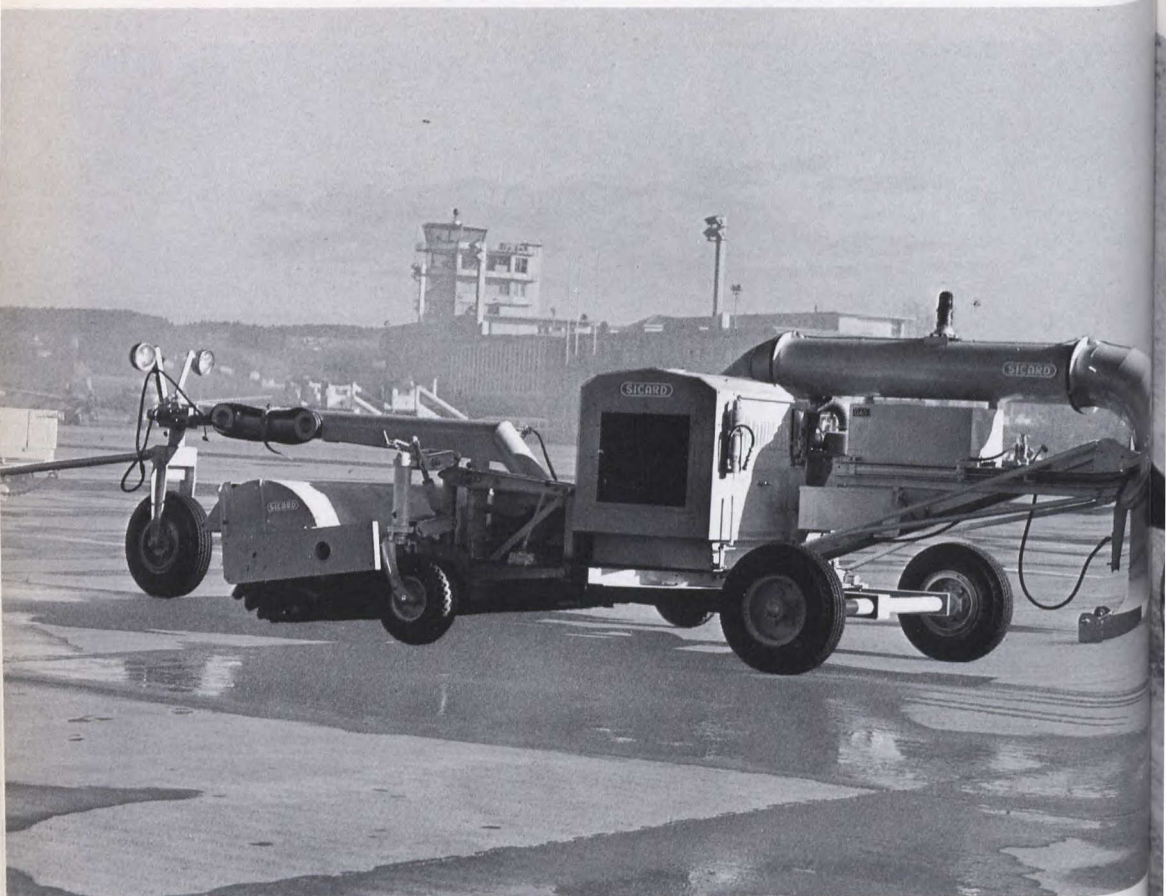


AIRFIELD SWEEPERS

With the advent of jet engines the presence of foreign objects on airfield surfaces has become an even greater problem and cause for concern than before. Damage to aircraft and airfield fixtures continues to mount where adequate protection is not provided to meet these new conditions.

The Sicard SW-112 Airport Sweeper was developed in co-operation with military and civilian airport equipment engineers and is used by numerous international airports throughout the world. The brush-blower combination cleans up to 1,000,000 square feet (92,899 sq. m.) of runway per hour at a speed up to 25 mph (40 Km/hr). The brush will clear the finest sand or 15 pound (6 kgs) rock with equal ease. The unit operates twelve months a year, in snow, slush, water and all weather conditions. It is equipped with a dependable 230 H.P. V-8 gasoline engine.

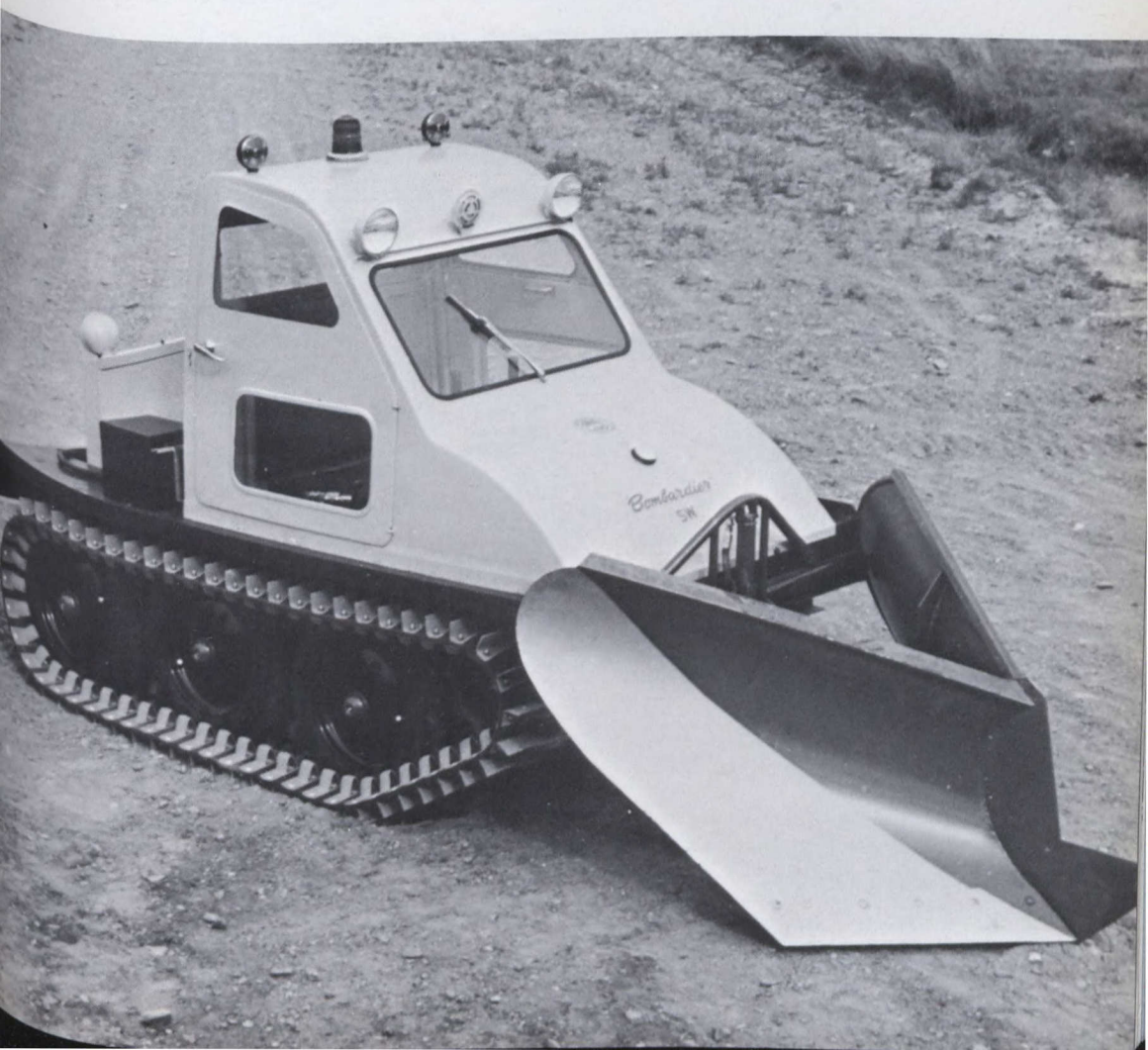
The brush and blower are fully adjustable to eliminate dead runs and match local conditions. The heavy-duty steel brush revolves at 400 R.P.M. The blower develops approximately 6,000 cu. ft/m. The air velocity at the nozzle is about 225 mph (365 Km/hr.). A solenoid remote control box allows the driver of the towing vehicle to operate the sweeper from his cab. All hydraulic controls are duplicated manually on the sweeper for emergency use.



SNOWPLOWS

The compact Bombardier SW is only 48 inches (1.2 m) wide but is capable of snow clearance with V-plow, one-way plow or pusher blade. It is easy to operate, has excellent all-round visibility and is equipped with a warm, comfortable cab. Originally designed as a side-walk plow, it has been used extensively in camp sites and other limited access area.

It has a top speed of 25 mph (40 Km/hr). Tracks are 5" (12.7 cm) rubber belts with heavy duty steel cross-links. The suspension and track system is the standard Bombardier principle which has been proven through more than 75 years service.



SNOWBLOWERS

The Snowmaster, manufactured by Sicard Inc., is the result of 25 years of development under the severe weather conditions that plague Canadian cities and airports. It is designed to operate efficiently under any snow condition, using augers to pulverize hardened snow or ice before feeding them to the impeller. Using its powerful turbine, the Snowmaster casts 200 feet (61m) and more — spreads snow away from runway shoulders — reduces risk of backdrift — prevents accumulation that can endanger underslung engines and wingtips.

Snowmaster's high-powered diesel and gasoline engines — turbo-charged or naturally aspirated — are built to operate at full load under most severe conditions. The Snowmaster is available in various sizes and capacities from 5 to 60 tons (4.5 to 54.4 metric tons) of snow per minute.

Small detachable type units can be installed on suitable commercial or industrial tractors whereas all high-powered units are normally installed on heavy duty all-wheel drive Sicard trucks.

Sicard provides an operational training program whereby Sicard's field men visit areas throughout the world to train personnel on operation and servicing of their equipment.

This company also manufactures: Refuse collectors; Street sweepers; Highway tractors and mine and quarry trucks.



TRACKED CARRIERS—BOMBARDIER

Bombardier offer a variety of models of the type illustrated, using the same basic vehicle, and each incorporating special features required by the particular application.

With double width tracks and greater flotation, the vehicle can carry payloads of 6,000 lbs. over rough terrain, soft soil and through swamps. The 125 HP engine gives plenty of reserve power for high gear operation over tough terrain.

The standard but unique Bombardier flexible suspension is incorporated in the vehicle and speeds of up to 25 MPH are attainable. Unloaded ground pressure is around 1.0 p.s.i., the total weight of vehicle varying from 4000 to 6000 lbs. (1814 to 2721 kg) dependent upon the role for which it is designed.

Some of these roles are:—

Safari — Light personnel carrier, capable of carrying driver and six passengers and having a loaded ground pressure of less than 1.5 p.s.i. (0.1 km/cm²).

Muskeg Carrier — an all purpose carrier, fitted with cab and used for transportation of men, materials and equipment over snow, ice and the softest soil.

Muskeg Tractor — Shown in the illustration. Can be adapted for fire-fighting, logging, ski-slopes, as a dozer, grader, back hoe and many other applications. As an option, a 190 HP — V8 engine is supplied, and an 11 ft. tracked tractor is also available.

J5 Tractor — This is a smaller version (only 3 roadwheels instead of 4) and is illustrated on the opposite page. Versatility is the keynote of this model, which is ideal for logging, ranching, recreation, fire-fighting, conservation, construction, snow removal, transmission, pipe line work, etc. A small tracked trailer is available.

RAM Skidder — This is similar to the J5 but is also equipped with 10,000 lbs. (4536 kg) winch and hydraulic dumping platform.

All these vehicles are stock production items and are in current use in 32 different countries.

Terrain Master — The heaviest of the Bombardier line. This is an articulated four-track vehicle having an 8-ton payload. Both gasoline and diesel powered versions are available.



TRACKED CARRIERS—FOREMOST

FOREMOST TRACKED VEHICLES LTD. over the past four years has developed a complete line of off-road tracked carriers ranging in rated load capacity from two (2) tons to thirty (30) tons. The vehicles have gained acceptance in many areas due to their tremendous versatility.

All FOREMOST units are four track units with a general configuration similar to a truck, that is engines and transmissions are located at the front on the main frame with a standard truck type cab, either in the tilt cab arrangement or in the standard cab arrangement as shown on the illustrations. All units incorporate full power hydraulic steering which enables the machines to steer under any conditions with minimal driver effort. The main frame behind the cab is of standard automotive truck dimensions so that any loads or items which can be mounted on trucks can similarly be mounted on these vehicles.

All FOREMOST units are capable of climbing 65% forward slopes and handling 50% side slopes. Ground pressure is kept at a minimum through the use of extra wide rubber and steel tracks and mobility through swamps is increased through the use of front idlers.

Many options are available in all sized units. These include: gasoline and diesel engines in several horsepower ratings; synchromesh, powershift and automatic transmissions; 3 Man Cabs, 6 Man Cabs and full personnel bodies; flat decks with or without live rolls; cab heaters and block heaters; heavy duty tracks for rock or stump usage; front and rear winches; long wheel base for extra long loads; grill guards; escape hatch; snow and ice cleats; and cold weather operational aids. Many additional options are available at the users request.

Listed below are basic specifications of seven FOREMOST models:

Model No.	Payload	G. V. W.	(at 6" penetration) Ground Pressure Loaded	Top Speed
Spider	1,200 lbs. (544 kg.)	3,050 lbs. (1,384 kg.)	0.68 psi	16 mph. (25.7 km/hr.)
S-100	4,000 lbs. (1,814 kg.)	16,800 lbs. (7,620 kg.)	1.9 psi	16 mph. (25.7 km/hr.)
S-200	6,000 lbs. (2,721 kg.)	20,300 lbs. (9,208 kg.)	1.8 psi	16 mph. (25.7 km/hr.)
6 T	12,000 lbs. (5,443 kg.)	32,000 lbs. (14,515 kg.)	2.5 psi	14 mph. (22.5 km/hr.)
8 T	16,000 lbs. (7,257 kg.)	40,000 lbs. (18,144 kg.)	2.3 psi	14 mph. (22.5 km/hr.)
10 T	20,000 lbs. (9,072 kg.)	48,500 lbs. (22,000 kg.)	2.2 psi	12 mph. (19.3 km/hr.)
12 T	24,000 lbs. (10,886 kg.)	58,000 lbs. (26,309 kg.)	2.1 psi	12 mph. (19.3 km/hr.)
30 T	60,000 lbs. (27,216 kg.)	144,500 lbs. (65,545 kg.)	4.1 psi	14 mph. (22.5 km/hr.)



FOREMOST

TRACKED CARRIERS—FLEXTRACK-NODWELL

Flextrack-Nodwell produce a product line of low ground pressure tracked carriers with payloads ranging from less than one ton up to thirty tons. With full loads each carrier can negotiate slopes in excess of 60% and are safe on side hills of 30% or greater. Flextrack-Nodwell have design facilities to manufacture tracked carriers to meet most all off-highway needs.

The basic carriers are built either with two tracks and controlled differential steering or with four tracks and hydraulic wagon type steering. Either coil torsion spring suspensions or walking beam suspension is available in the various models, each designed to meet particular ground conditions.

Diesel power is standard in the larger 20 and 30 ton payload models and gasoline is standard with diesel as an option in the smaller models.

With spring steel grouser bars and flexible track belt or rayon/nylon or nylon from 4 to 7 plys, track life has been experienced in excess of 3000 hours. To complement this, special options of mud and snow cleats, ice picks, side hill cleats and reinforcing bars, are available as options to meet the varying conditions to improve performance.

Body designs are available with only engine cowl, etc., open one and two man cabs, closed two man cabs, crew cabs or fully closed bodies for personnel, or supplies. Standard type decks designed for the rated payloads are optional, and if required rear winches and/or gin poles and dead or live rolls are available.

The company produces three basic lines which are as follows:

- (i) The Lightweights- which have proven to be ideal for utility companies in service and general survey roles;
- (ii) The Mediumweights, which are in general workhorses of the line and may be equipped as personnel and logistics carriers, recovery vehicles, tankers, crash rescue vehicles, fire-fighting units and amphibious carriers which will find a wide variety of uses particularly with respect to military employment.
- (iii) The Heavyweights, which are the large diesel powered four-track vehicles with a long and successful history in the north, have particular application in the transportation of heavy bridging units and construction equipment; despite such heavy loads these vehicles maintain a ground pressure of less than 4 p.s.i.

Flextrack-Nodwell can equip a tracked carrier to meet the majority of custom demands where an off-highway vehicle is the requirement. These requirements may range from light survey units to artillery tractors and engineering equipment prime movements.

Today, Flextrack-Nodwell vehicles are active in Holland, Gabon, Pakistan, South America, Australia, in most states of the U.S.A., including hundreds in Alaska, and Canada, with ground pressures as low as ½ pound per square inch for deep mountain snow, and up to 3 pounds per square inch carrying rated payloads, this equipment negotiates snow, mud, sand, and muskeg with ease.



TRACKED CARRIERS—GO-TRACT

The Go-Tract series of General Purpose Tracked Vehicles are designed to provide mobility over a wider range of terrain conditions than was hitherto available from vehicles using conventional pin and belt tracks. To meet this requirement it was necessary to develop a new track and suspension system. This system is now developed, has been in service for several years, provides a high degree of reliability, requires minimal maintenance and can be repaired in the field with simple tools.

The Go-Tract track eliminates the pin, and the belt. Each pitch is made up of three elements, a flexible unit, a guide plate and a grouser. The track components are bolted together and interlock to form a continuous track unit. The heaviest track component weighs only 10 lbs (4.5 kg), but the track has a tensile strength of 105,000 lbs. (47,628 kg). This simple construction enables a new track element to be fitted in the field using a cold chisel and hammer to remove the nuts, and a wrench to assemble. The most elementary tooling will suffice to draw the ends of the track together, as the compensating idler system allows the track to become slack when the engine is stopped.

To reduce suspension system maintenance and failure, steel springs and torsion bars have also been eliminated. They have been replaced by a system utilising a hollow rubber spring system. The system performs satisfactorily at -60°F ($-51\text{C}.$) and provides an excellent ride particularly in the fully laden state, but minimizes loss of the 18" (45.7 cm) ground clearance when the vehicle is loaded.

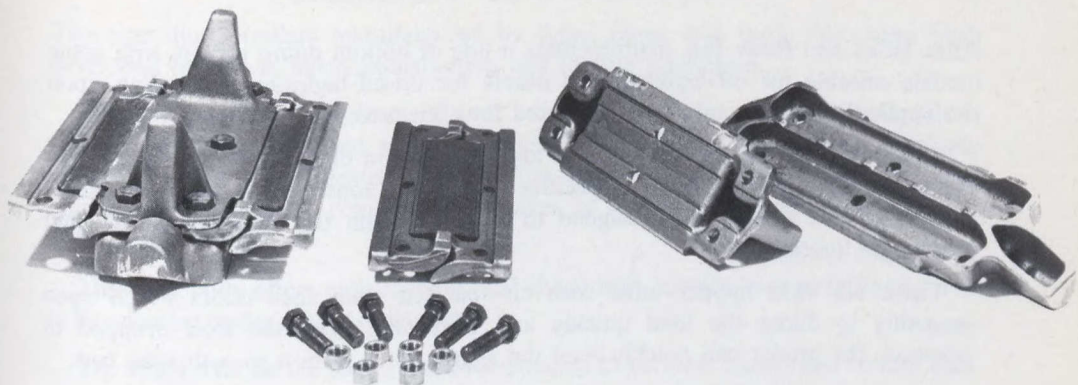
Today Go-Tract vehicles are fulfilling a wide variety of uses. Apart from freight carriers they are equipped with many types of manipulative equipment — cranes, back-hoes, earth borers, oil drills, compressors, pole erectors, gin poles (up to 72 ft. (21.9 m) with appropriate winches), grapples etc.

The GT120 and 220 chassis are also offered with maximum speed capabilities of 28, 34 and 40 mph (45, 54.7 & 64.4 km/hr) for airport fire-fighting. Several vehicles are now fulfilling this role.

Go-Tract vehicles are supplied in three basic designs:

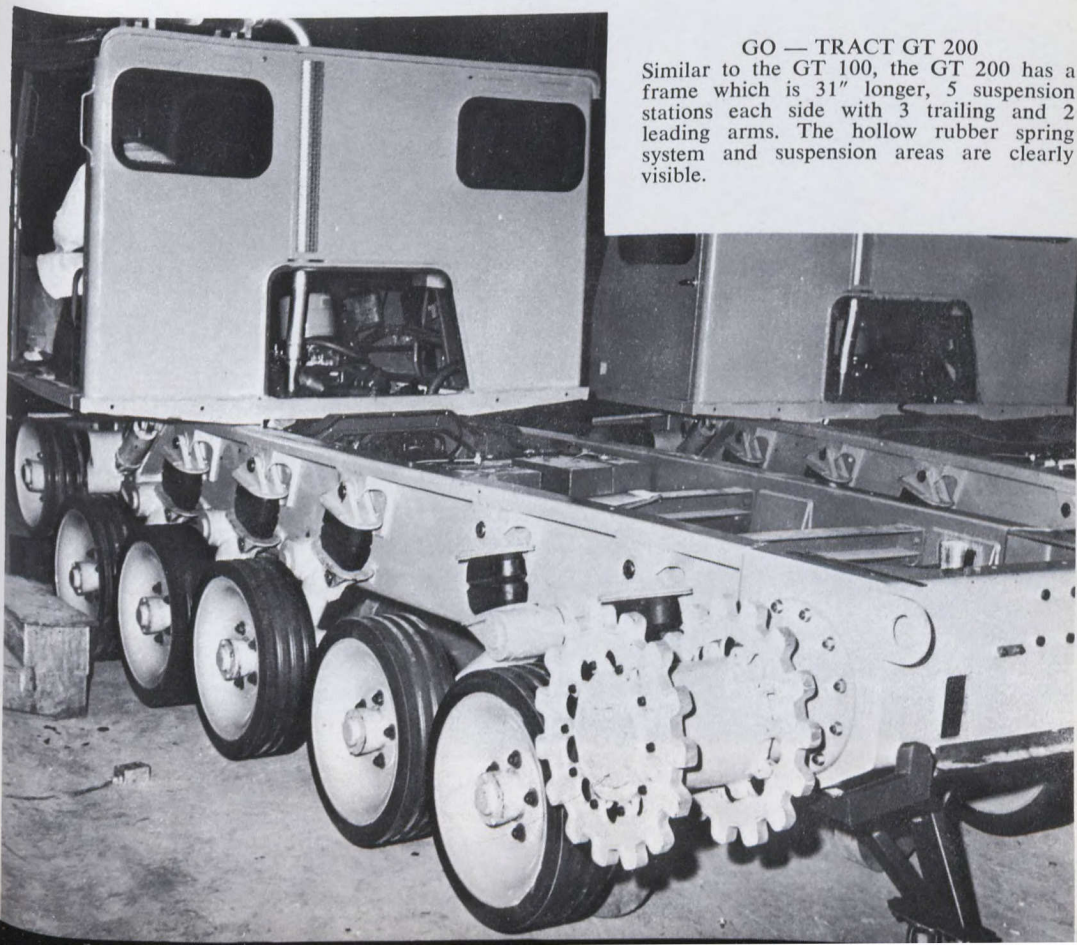
Model	Vehicle Weight	G.V.W.	Gradeability	Side Slope Performance	Speed
GT120	16,500 (7484 kg)	32,000 (14,515 kg)	60%	40%	15 (24 km/hr)
GT220	18,500 (8191 kg)	32,500 (14,739 kg)	60%	40%	15 (24 km/hr)
GT620*	23,500 (10,659 kg)	39,500 (17,917 kg)	60%	40%	14 (22.5 km/hr) (either direction)

The basic GT620 is 128" (3.3 m) wide, and is designed to carry low density products such as bulk supplies, prefabricated structures and bridging components and also to provide a wider base and greater stability for cranes and other manipulative equipment.



GO — TRACT GT 200

Similar to the GT 100, the GT 200 has a frame which is 31" longer, 5 suspension stations each side with 3 trailing and 2 leading arms. The hollow rubber spring system and suspension areas are clearly visible.

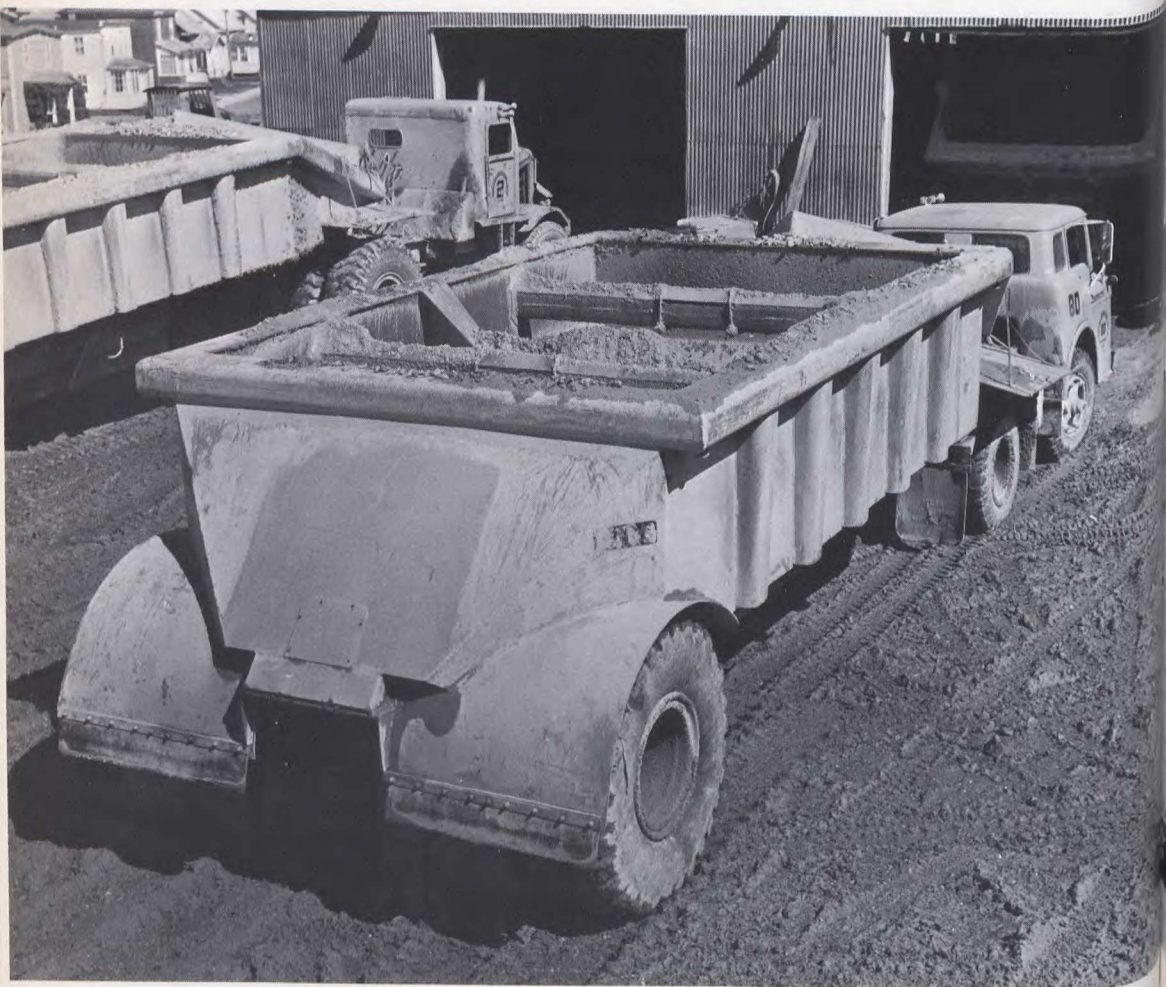


HEAVY-DUTY CONSTRUCTION VEHICLES BOTTOM DUMP TRAILERS

Atlas Hoist and Body Inc. manufactures a line of bottom dump trailers with some models suitable for off-highway and others for on-off-highway. Depending upon the application, these units are fabricated for either steel or aluminum.

They are designed to be hauled by any make of on or off-highway tractor, and are manufactured in payload capacities up to 120 tons. Where highway use is involved, these trailers are designed to operate within the required dimensional and weight limitations.

There are twin hopper units with air-operated clam shell doors which open smoothly to dump the load quickly and efficiently. With the load dropped in winrows, the grader can quickly level the aggregate to form a smooth road bed.



HEAVY-DUTY CONSTRUCTION VEHICLES REAR DUMP TRAILER

The rear dump trailers manufactured by Atlas Hoist and Body Inc. have been developed for use in heavy construction and mining operations.

Payload capacities vary from 30 tons to 65 tons (20 cu. yds. to 40 cu. yds.), each trailer being designed to suit a specific application. Depending upon the application, they are fabricated of either ultra-high strength, heat-treated steel or of aluminum. They can be coupled to all makes of rubber-tired tractors and operate as integrated units.

The wide body offers easy loading, and the robust construction permits the unit to be operated under rugged conditions.

The single axle on the trailer makes it possible to turn on a road bed of less than 36 feet (10.9 m) but the vehicle is also capable of relatively high road speeds.



REFUSE SYSTEMS

With the increasing emphasis on the curbing of pollution in all its forms the efficient handling of refuse at military bases may present a variety of problems if a systems concept is not envisaged. With logistic and financial considerations as the guiding parameters Atlas Hoist & Body have designed and produced such a system.

In large refuse producing areas such as military stations normal collection methods may meet to-day's standards but they will certainly not equal to-morrow's demands.

One system to meet such demands is considered below.

Stationary compactors in sizes of $\frac{3}{4}$ cubic yards, $1\frac{1}{4}$ cubic yards or 2 cubic yards for stationary installation at military bases and industrial plants. The material is dropped into a hopper and the compacting operation is automatic. Electric push button cycles the unit to compress, return and stop automatically and allows the unit to operate continuously while refuse is being compacted. The compactor forces refuse into containers to ensure that the container handles the maximum amount of refuse. The container can then be detached and loaded by means of a roll-off hoist.

Closed containers, from 1 cubic yard to 42 cubic yards, can be loaded by either the rear loader packer or the roll-off hoist manufactured by Atlas. These allow sanitary collection of refuse at the location as well as ease of handling and loading onto the hauling equipment.

The Roll-Off Hoist is designed to load and unload containers and operate by means of two (2) double acting hydraulic cylinders which tilt the frame rails, afterwhich a cable is attached to the container and the hydraulically operated winch pulls the container onto the sills, which are then lowered to allow normal vehicle operations. Dumping a trailer is very simple, since the same hydraulic cylinders tilt the sill and body so that the material is unloaded at either an incinerator, or, a sanitary land fill.

Another major problem which has reared its head is that of dumping sites. Land fills are becoming rarer in major metropolitan areas and refuse must be hauled longer distances. The solution to this problem is the establishment of a terminal equipped with larger, 6 cubic yards to 10 cubic yards, stationary compactors which can load and compact the material into semi-trailers which would be hauled by means of standard highway tractors to the long distance land-fill sites.

Atlas has designed a 75 cubic yard, compactor/ejector trailer with both top loading and rear-loading available. Material is either loaded through the top by means of front end loaders, or, dumped directly from vehicles, or, can be loaded by means of the 6 to 10 cubic yards stationary compactors in the terminal. This allows a maximum amount of refuse to be hauled at legal payloads for the longer distances.

Atlas Hoist & Body also produce a line of standard and custom bulk movers for the construction trade in both on and off highway applications. For further information please see pages 322 and 323.



The Roll-Off hoist which makes the scheduled and pre-packaged collection of refuse not only economical but well within contamination limits.

FLOATER HOSE

Floater Hose was developed by Uniroyal to help solve the problem of fuel supply to and from areas without port facilities where tankers and barges have to load and unload fuel while at anchor.

With Floater Hose, drum deliveries can be converted to bulk handling in areas where the small volume of petroleum products consumed justify expensive undersea lines, submarine hose, mooring facilities and attendant cathodic protection. Heavy coupled lengths of suction and discharge hose, which require empty drums for flotation can be eliminated by using this type of hose.

With long lengths of hose to eliminate metal connections and a specific gravity less than water to eliminate metal drums, Floater Hose can be handled readily. The hose is collapsible for coiling and retrieving on mechanical steel reels. It is light yet strong enough to withstand the pull and drag of wave movements, as well as internal pressures, and floats when filled with petroleum products having specific gravities less than 0.92.

The hose can be used in temperatures as low as -40°F (-40°C) while handling oil products, petroleum fuels, jet fuels, as well as high octane mixtures. Special features can be built in for the handling of L.P.G.

It is constructed of NBR inner tube for resistance to all commercial fuels: two or four layers of spirally applied synthetic cord plies for strength, lightness and extreme flexibility; a neoprene outer cover for good wearing and weathering qualities; and an anti-static wire to assure proper dissipation of static electricity. Various other tube compounds can be furnished to handle other materials. Every length of Uniroyal Floater Hose is hydro-statically tested before leaving the factory. It is manufactured in continuous unspliced lengths up to 650 feet (198 M) thus allowing storage on reels either near the storage tanks or on the fueling vessels.

The company will supply various couplings as required.

SIZE	PLIES	APPROX. O.D.	APPROX. WT. PER FT.	WORKING PRESSURE
2"	2	2½"	1.0	200
2"	4	2¾"	1.4	400
2½"	2	3"	1.4	200
3"	2	3½"	1.5	150
3"	4	3¾"	2.0	275
4"	2	4½"	1.9	125
4"	4	4¾"	2.6	200
5"	2	5½"	2.3	100
6"	2	6½"	2.8	75
6"	4	6¾"	3.7	150



REFRIGERATION AND HEATING UNIT

Developed by Galt Equipment Limited this unit is for the movement of perishable cargo in containers. The unit was proven in service, operating on railroad and on deck of ocean-going vessels in the North Atlantic.

The Galt Thermotrol Model 200A is a completely packaged self-contained unit powered by a diesel engine. It features direct compressor drive via magnetic clutch and a hydraulic fan drive for condenser and evaporator fans. Both cooling and heating are automatically applied as required to maintain set temperature against variable ambient temperatures.

Defrosting of cooling coil is automatic, initiated by static pressure differential switch sensing air resistance of the cooling coil and temperature terminated by a remote bulb actuator sensing the coil temperature. Manual overrides are provided for manual operation of defrost system.

The complete unit is readily detachable and may be exchanged with same of other model units in minutes for purpose of repair, preventative maintenance or application of other purpose equipment. When detached the unit does not expose the interior of the container other than the two openings for supply and return air. Those openings may be suitably protected by screens or bars to prevent unwanted access to cargo. Construction of the unit is substantially in aluminum and weight is kept to a minimum.

Single cylinder four cycle diesel engine of 10 H.P. at 2,700 RPM continuous output ("A" to DIN 6270). Deutz FIL 410. Engine is fitted with fuel lift-pump, electric starting gear of heavy duty capacity for cold weather starting. Heavy duty generator and voltage regulator, extended oil sump and remote lub-oil make-up tank, automatic lub-oil make-up pump maintaining proper oil level in crankcase. Engine can operate safely for 15 days, without adding lub-oil.

Specifications

AIR Standard rating 516-60, Group IVR-22, 8.52 T.R.	Displacement: 880 C.F.H. at 1,350 R.P.M. Forced feed lubrication
Two cylinders	Maximum speed: 1,750 RPM
Bore: 2½" Stroke: 2"	Oil Charge: 5 pints.

Net heating capacity for continuous heating: 6,000 BTU/hr.
-10F box & 90 ambient (14,000 BTU/hr)
-20F box & 90 ambient (31,000 BTU/hr) max.

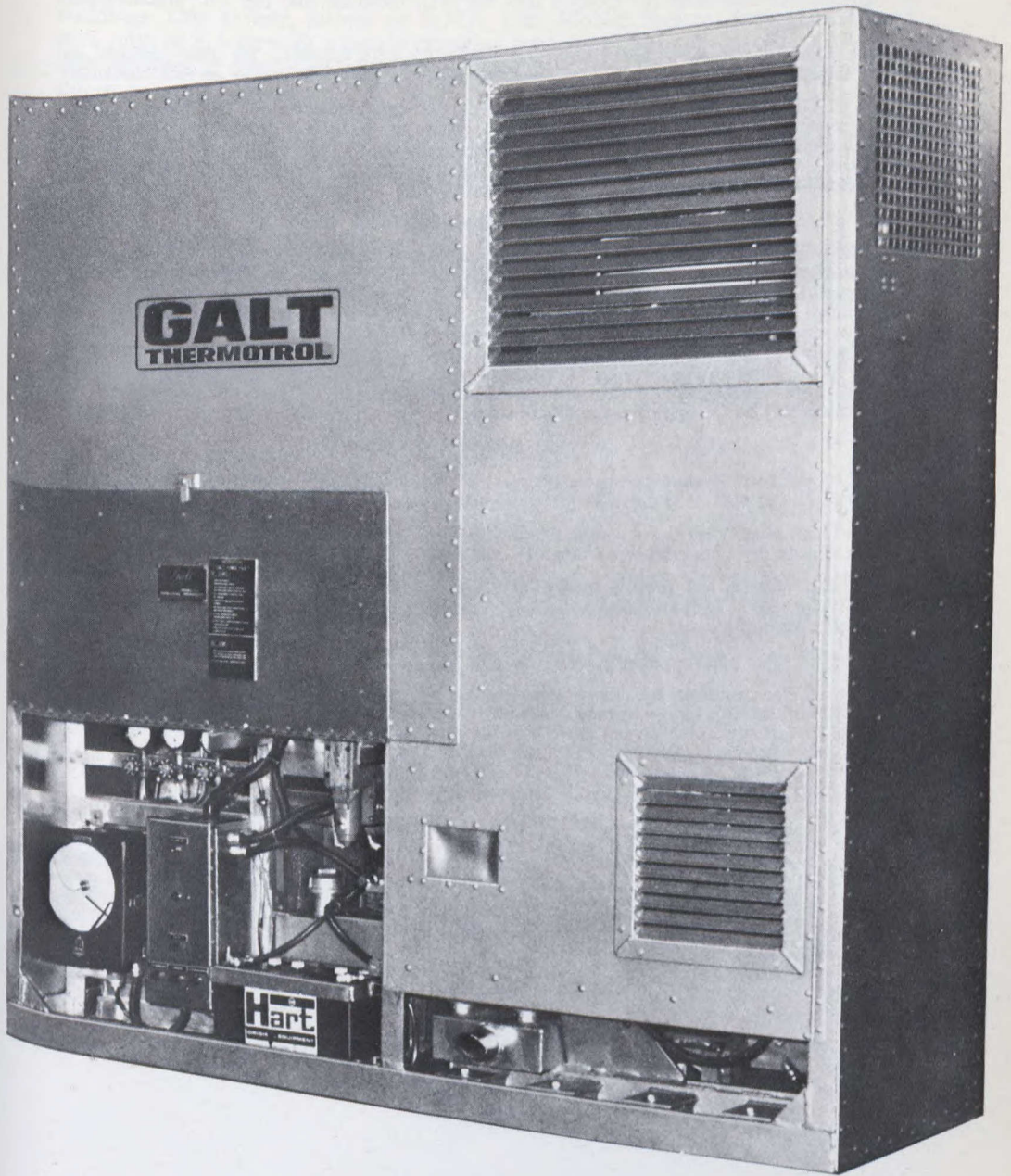
All controls are mounted in water proof enclosure with system ON-OFF Switch on the face of the control box. A Partlow recorder-controller maintains temperature at set point and controls heating or cooling as required automatically. Static pressure initiated temperature terminated Defrost Control.

Manual defrost and over-ride switches are located tamper proof, inside control cabinet.

Recording of temperature on 7 or 14 day chart, inkless system, -20 to plus 80F range.

Width: 6 ft. 3½"
Height: 6 ft. 9"

Depth: 1 ft. 11¼"
Weight: 1960 lbs. includes totally equipped unit except fuel tank.



RAIN REPELLANTS FOR WINDSHIELDS

A semi-permanent rain repellent for aircraft and automobile windshields has been developed by Canada's National Research Council and has been perfected and put into production by Frank W. Horner Ltd.

The equipment consists of two kits; SPR67 Glass Kit with Glaze — for glass surfaces and SPR67 Glaze — for plastic surfaces, perspex, acrylic, etc. Both kits are in aerosol containers.

SPR 67 GLAZE is a combination of waxes and plastics dispersed in a hydrocarbon solvent and is used on any plastic surface and it is simply sprayed on a clean surface and then polished with a clean cloth to form a dependable and durable film. It may also be used as a final protective coating over the repellent film on glass since it prolongs the life of the film considerably.

SPR 67 GLASS KIT WITH GLAZE for glass windshields only:

(a) **Pre-cleaner** consisting of water and finely powdered abrasives to wash the windshield.
(b) **"Antifreeze" Cleaner** — an aerosol unit containing a mixture of abrasives and disilane compound dispersed in a hydrocarbon solvent. This formulation acts as a repellent surface conditioner. It is used to remove any wax glaze which may be present if this has been used, and prevents any build-up of deteriorated film on reapplication. (c) **Repellent** — an aerosol unit containing the same abrasive agents and disilane compound found in the antifreeze cleaner but in different proportions. (d) **Glaze** — same as the glaze used on plastic windshields. An application of this formulation over the repellent film will increase the durability of the film considerably by acting as a protective coating.

- SPR 67 is entirely invisible when well applied and polished.
- It will form a semi-permanent bond with the windshield surface without altering or damaging the characteristics of Perspex or glass windshields.
- There is no decrease in light transmission, no change in refractive index, and is not affected by temperature cycling of -65°F to 300°F or speeds up to 700 m.p.h.
- SPR 67 does not require the use of wipers at speeds in excess of 40 m.p.h. "Ideal for low-level flight, including takeoff and landing." Also suitable for expressway driving.
- SPR 67 is unaffected by normal de-icing with heat, alcohol or glycol.

Some of the comments by various test agencies are noted below. "The pilot reported that the rain repellent effectively improved visibility. On the windshield with the repellent applied, the rain beaded up into droplets and the areas between the droplets were clear and provided satisfactory visibility. . . . It appears, when regularly applied per the instructions, that SPR 67 is an effective rain repellent and a definite aid to good visibility." North American Rockwell Corporation, Sabreliner Division, Los Angeles, California. (T-39A)

"Inflight performance of the SPR 67 Glaze is excellent. The repellent was tested in very light to heavy rain and afforded excellent visibility. Treated areas appeared as clear sections of an otherwise obscured windshield. The repellent becomes effective immediately after brake release during take-off and is effective down to turn-off speed on landing. Repellent becomes effective at around 40 KIAS." Department of U.S. Air Force, Wright-Patterson Air Force Base, Headquarters Aeronautical Systems Division. (T-38 Test)

"In moderate to heavy rain the aircraft was lost by the GCA Radar due to the precipitation when the aircraft was 5 miles out on the final approach leg. At this point the pilot was instructed to take over visually. Vision was completely obscured thru untreated glass while the runway was clearly visible thru the repellent sections. Visibility was so good that the pilot felt no need to actuate the pneumatic rain removal system. The pilot afterward stated, "If I hadn't had the repellent I would have had to go around." Flight Test Plan/Report ASTDN FTR 68-36.

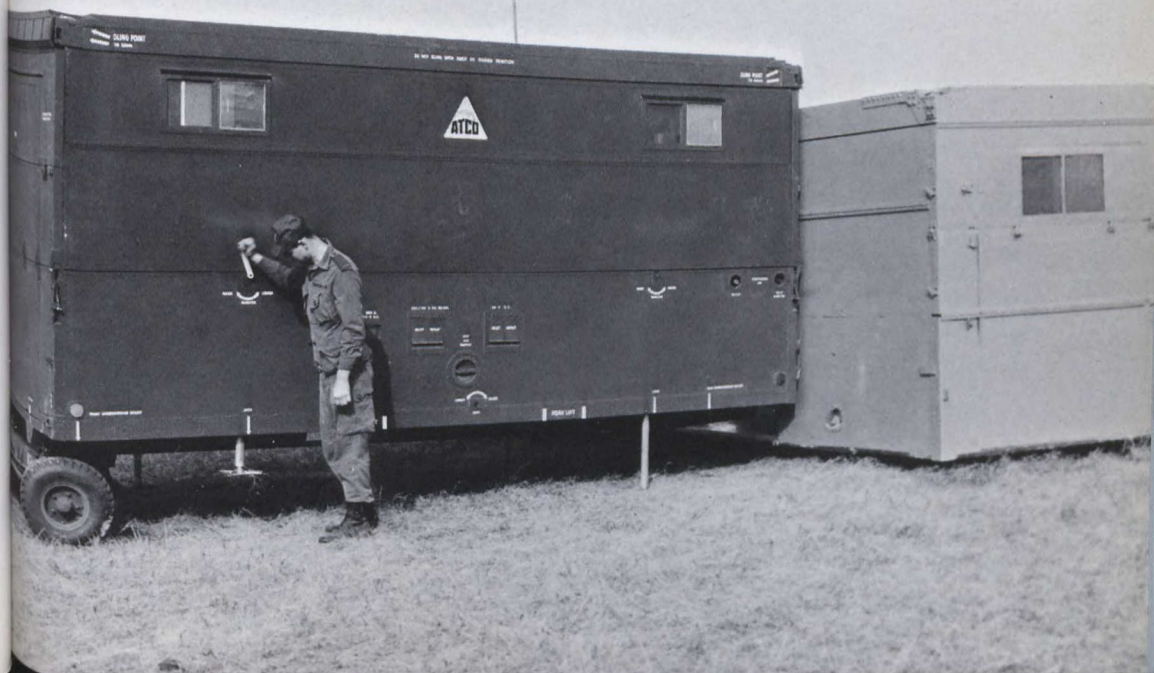
MILITARY AIR-LIFT BUILDINGS

ATCO Research and Development Center has designed a family of military air-lift buildings. One system, known as A.M.S. (Air-Mobile Shelter) expands vertically by a ratio of 2:1 through a simple cranking procedure. Structure is ultra-lightweight and provides a controlled, dust-free environment under field conditions for such things as repair work on turbine helicopter motors.

A.M.S. is designed primarily for lift as sling load under Bell 204-B or 205 helicopters, as internal load in Hercules aircraft. Removeable mobilizers permit transport as trailer, and built-in skids provide for limited ground movement without mobilizers.

Three-man crew can have unit ready for use in less than 22 minutes, including removal of mobilizers and complete deployment from folded condition.

ATCO's other type of military shelter expands laterally, via unfolding lightweight hinged panels, to increase useful floor area by ratio of 3.1. ATCO shelters can be fitted as bunks, latrines, workshops, or variety of other applications. Shelters can serve individually, or can be coupled as complexes to provide large floor areas.

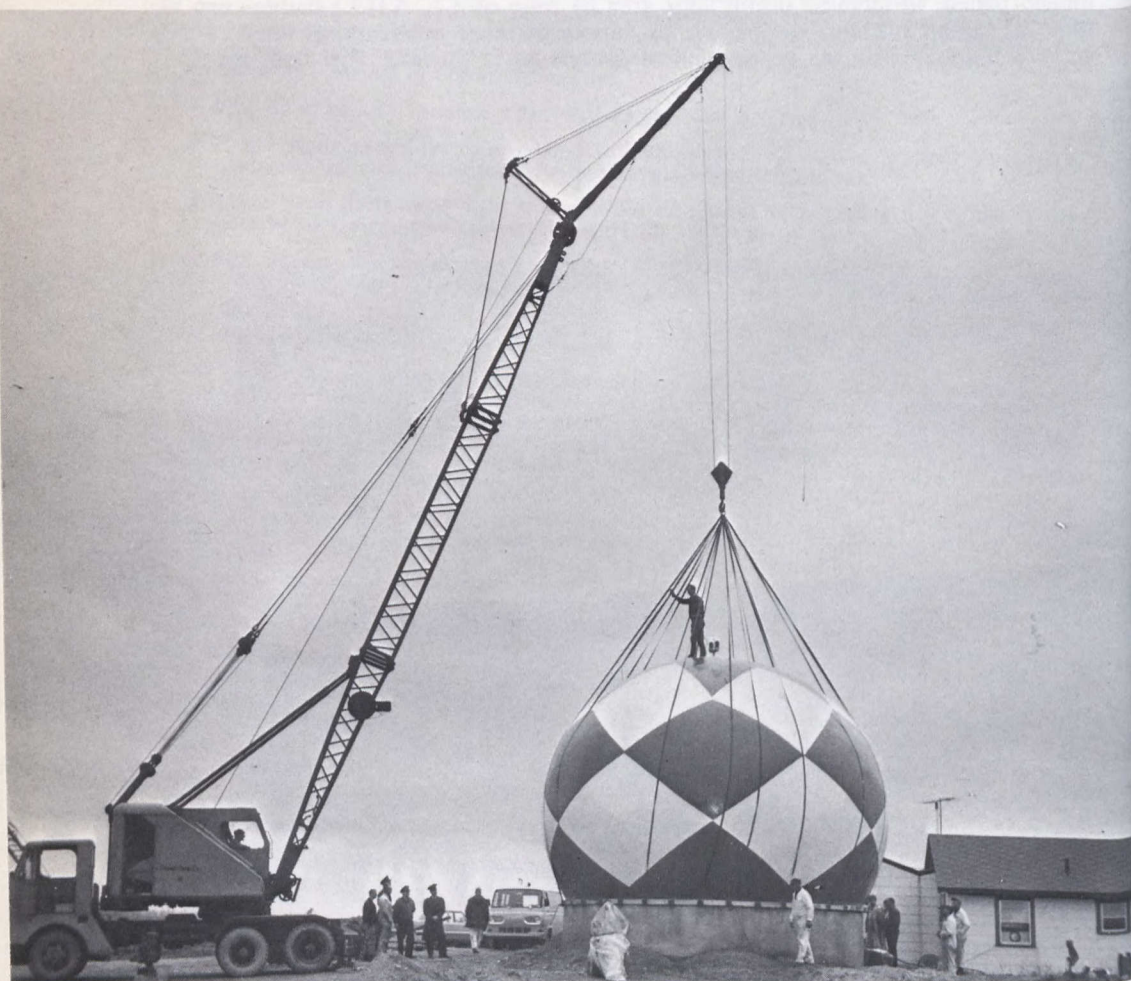


APPLIED CHEMICAL FOAMS

Polyurethane radomes incorporating the *Foamlock* assembly technique have been in use in Canada for many years, and have withstood the rigours of extreme cold and very hot weather conditions.

Being constructed of polyurethane only — with no metal parts — and uniform foam density throughout — there are no variations in boresight accuracy and transmission losses are in the order of only 1%.

A standard 27 ft. (8 m) diameter radome is manufactured by Applied Chemical Foams Ltd., a wholly owned subsidiary of Spar Aerospace Products Ltd., and are assembled on site, anywhere in the world.



SECTION

"C"

Index of Companies

A.I.M. STEEL LIMITED,

P.O. Box 3300,
 Vancouver 3, B.C.
 Telephone 604: 522-0711
 President: J. W. Dunn
 Contact: L. W. Tyson, Purchasing Agent
 Floor Area: 58,000 sq. ft.
 Personnel: 200

Manufacturers of: Bridges; Bridge floats; Pontoon bridges; Cranes; Installation of Antenna farms and similar tower structures; Wire camouflage netting; Fabrications of structural steel.

1080 3940 3950 3990 5420 5445
 5660 5985 9505 and Page B4.

ASM CORPORATION LTD.,

85 de Castelnau St. West,
 Montreal, Que.
 Telephone — 514: 273-1761
 President: R. Guerette
 Floor Area: 20,000 sq. ft.
 Personnel: 25

Manufacturers of: High precision screw machine parts for aircraft and electronic, computer and instrumentation fields.
 Page B10.

ABERCORN AERO LIMITED,

2240 Beaconsfield Ave., N.D.G.
 Montreal 261, Que.
 Telephone 514: 489-4978
 President: Mrs. M. Baker
 Contact: J. P. O'Reilly, Asst. Gen. Mgr.
 Floor Area: 15,000 sq. ft.
 Personnel: 50

Manufacturers of: Inflatable life rafts and jackets.
 2090 4220 and Page I-240.

ABEX INDUSTRIES OF CANADA LTD.,**(Aerospace Division)**

3495 Cote Vertu Road,
 Montreal 382, Que.
 Telephone: 514: 332-3330
 Telex: 01-26683
 TWX: 610-421-3627
 Cable: ABAERO
 President: A. C. MacDonald
 Contact: J. van Hemert, Vice-Pres. — Sales
 Floor Area: 350,000 sq. ft.
 Personnel: 1,400

Manufacturers of: Aircraft landing gear; Hydro-Mechanical systems; Secondary Power Flight Controls; Large Actuation systems;

3-Dimensional machining. Complete repair and overhaul facilities for above.

1420 1560 1620 1630 1650 1680
 2910 2915 2995 4810 4820 4920
 and Pages B6, B10, B14, I-27, I-28, I-32,
 I-33 and I-36.

ABEX INDUSTRIES OF CANADA LTD.,
(Amsco Joliette Division)

Laval St.,
 Joliette, Que.
 Telephone 514: 756-4531
 Telex: 01-20202

Vice-Pres. & Gen. Mgr.: H. M. Brownrigg
 Contact: F. Lapointe
 Floor Area: 200,000 sq. ft.
 Personnel: 490

Manufacturers of: Track materials railroad; Crane buckets and shovel attachments; Mining and earthmoving ancillaries; Castings—Carbon steel, Manganese steel, Chrome molybdenum, Abrasion resistant alloy steel, Low and High alloy steel, Alloy iron (Ni-Hard).

2250 3815 3820 and Pages B4 and B15.

ABEX INDUSTRIES OF CANADA LTD.,
(Electronics Division)

305 Laurier St.,
 Hawkesbury, Ontario.
 Telephone 613: 632-2751
 Contact: N. Knowlton, Gen. Mgr.
 Floor Area: 30,000 sq. ft.
 Personnel: 225

Manufacturers of: R. F. filters, chokes and coils; I. F. transformers, Special ferrite transformers, pulse transformers, miniature audio transformers. Toroid coils. Specially wrapped magnet wire. Harness assemblies. Special Military R. F. assemblies. Sub-assembly manufacture.

2590 2925 5950 5995 5999 6145
 6625 and Page B10.

ACME ASBESTOS LIMITED,

1222 East 67th Avenue,
 Vancouver 15, B.C.
 Telephone 604: 325-1296
 President: Robert Sanderson
 Floor Area: 35,000 sq. ft.
 Personnel: 20

Manufacturers of: All types of Cement Asbestos Building Materials, in flat sheets,

Corrugated sheets, Perforated and Decorative sheets, built up Sandwich panels, Sidings. All thicknesses and in sheets up to twelve foot lengths.
5640 5650

ACRES INTERTEL LIMITED,

298 Elgin St.,
Ottawa 4, Ont.
Telephone 613: 236-0864
TWX: 610-562-1929
Telex: 013-209
Cable: INTERTEL
President: Dr. H. J. von Baeyer
Contact: J. A. Wilson, Vice-Pres.
Floor Area: 5,350 sq. ft.
Personnel: 35

Consultants in all Systems and Phases Pertaining to the Generation, Structure, Organization, Processing, Transmission and Distribution of information. Communication Systems: Satellite, Microwave Relay, Scatter, Point-to-point, Ground/Air, Ship/Shore, Cable for Telephone, Data Broadcast, TV, CATV. Education Technology: ETV, Computer Aids, Training Courses. Navigation Technology: Radar, Air Traffic Systems, Radio Location, Radio Navigational Aids. Computer Applications: Theoretical Studies, Engineering Design, Propagation Analysis, Simulations, Pilot Systems. Market Research: New Electronic Systems, Specific Equipments, New Services. Studies: Theoretical Analyses, Field Surveys, Feasibility and Reliability Studies, Economic Assessments, Rate Structures. Design: System Planning and Design, System and Equipment Specifications, Maintenance Techniques. Bid evaluation, Field Supervision, Acceptance Testing. Total Systems Responsibilities from Planning to Operation.
Pages B4, B6 and B8.

ADVANCED DYNAMICS CORPORATION LTD.,

740 Place Trans-Canada,
Jacques Cartier, Que.
Telephone 514: 679-2253
President: F. M. Groundwater
Contact: F. W. Evre, Vice-Pres.
Floor Area: 12,000 sq. ft.
Personnel: 40

Manufacturers of: Shells, Automation Machinery, Jigs, Fixtures, and Tooling. Consulting and Design Services in: Weapon

Systems Engineering, Automation and Control. Designer of: Shells, Rockets, Automation Machinery, Tooling.
1315 1325 1395 3465 3695
and Pages B6, B8 and B10.

ADVANCED EXTRUSIONS LIMITED,

Robert St. E.,
P.O. Box 359,
Penetanguishene, Ontario.
Telephone 705: 549-8522
Cable: ADVEX
President: Ernest A. Younes
Contact: Bruce E. Keeling, Sales Mgr.
Floor Area: 12,000 sq. ft.
Personnel: 12

Manufacturers of: Technical Impact Extrusions in Aluminum. Aluminum Aerosol Containers. Collapsible Aluminum Tubes.
1310 1330 1336 1340 1345 1350
1355 1360 1395 2730 4730 8110
8140

AERO MACHINING LTD.,

5411 Boul. Industrial,
Montreal-North, Que.
Telephone: 514: 324-4260
President: R. Saulnier
Contact: J. LaPlante, Exterior Relations
Floor Area: 15,000 sq. ft.
Personnel: 125

Manufacturers of: Airframe Structural Components; Aircraft Components. Tools, Jigs and Fixtures, Custom Machining.
1420 1440 1560 1630 1650 1680
3465 and Page B10.

AERO MECHANIC LTD.,

1 Dery Avenue, Beauport,
Quebec 5, Que.
Telephone 418: 663-7871
Cable: AEROQUEBEC
Gen. Mgr.: J. G. Lefebvre
Floor Area: 16,844 sq. ft.
Personnel: 40

Manufacturers of: Hardware for Furniture Cabinets; Fabrication of Tools; Dies, Moulds, Jigs, Fixtures and Precision Work; Metal Stampings and Pressings; Scaffolds; Heat Treating of Steels.
1420 1630 1650 3010 3020 3040
3465 5940 5985 6615 and Page B10.

AERO-PHOTO INC.,

1975 Charest Blvd. W.,
Quebec City, Que.
Telephone 418: 683-2231
Telex: 011-3467
President: Andre Cassista
Vice-President: Charles Bigonnesse

This firm provides the following services:
Map compilation and drafting; Aerial photography; Geodetic surveys; Magnetometer surveys; Forestry inventory and management; Graphic Arts.
7640 and Page B3.

AEROMETALS LIMITED,

(A Division of Dominion Magnesium Ltd.)

7 King St. E.,
Toronto 1, Ont.
Telephone 416: 781-5591
President: J. Thomson
Contact: W. Z. Jarmicki, Plant Mgr.
Floor Area: 15,500 sq. ft.
Personnel: 15

Manufacturers of: Fabricated magnesium alloy components; Aircraft inspection ladders; Refueling ladders; Dock boards; Drill rods, towers and sheave blocks for diamond drilling; Survey tripod signals; Fire ladders; Magnesium snow shoes; Welding; Shielded arc TIG, Shielded arc MIG; Magnesium & Aluminum.

1730 2090 3020 3815 3920 3990
8465

AERO TOOL WORKS LIMITED,

37 Hanna Ave.,
Toronto 3, Ontario.
Telephone 416: 363-8568
President: Douglas J. Brooker
Contact: J. M. Clish, Director of Sales
Floor Area: 36,000 sq. ft.
Personnel: 40

Manufacturers of: Domestic oil burners; atmospheric and power gas burners; circulator pumps; oil-fired glasslined water heaters; swimming pool heaters.
4320 4410 4520 4530

AEROVOX CANADA LTD.,

1551 Barton St. E.,
Hamilton, Ont.

Telephone 416: 545-5893
TWX: 610-371-0214
Telex: 021-735
Contact: J. Cartwright, Gen. Mgr.
Floor Area: 70,000 sq. ft.
Personnel: 200

Manufacturers of: Fixed capacitors.
5910

AIR CONDITIONING ENGINEERING COMPANY (CANADA) LIMITED,

636 St. Paul Street West,
Montreal, Quebec.
Telephone 514: 866-5481
Contact: S. S. Colle, Chief Engineer
Floor Area: 12,000 sq. ft.
Personnel: 120

Manufacturers of: Air conditioning and refrigeration equipment, condensers, receivers, liquid vaporizers, liquid chillers, ventilation equipment, heat exchangers, humidification & dehumidification equipment, filters and pumps.

1660 4110 4120 4130 4140 4420
4440 4450 4460 4520

AIRCRAFT APPLIANCES & EQUIPMENT LTD.,

579-585 Dixon Road,
Rexdale, Ont.
Telephone 416: 249-8411
President: L. V. Myslivec
Contact: D. S. Adams, Mgr. Export Sales

Manufacturers of: Motor Generators, Electrical ground support equipment; etc. High Temperature Clamps; Fuel, Oil and Air Filters; Pressure Switches; Repair and overhaul facilities for AC & DC Electrical Equipment.

1650 1730 2910 2915 2925 2935
2940 2945 2995 4330 5930 5945
6115 6125 6130 6625 and Pages B10
and B14.

AIRCRAFT INDUSTRIES OF CANADA LIMITED,

Any questions concerning the services and products of this company should be referred to the offices noted on pages (XI & XII) of this book.

ALBON WELDING & MECHANICAL WORKS LTD.,

6460 Henri Bourassa East,
Montreal N., 462, Que.
Telephone 514: 322-3390
President: M. Simard
Contact: C. A. Willis, Sales Mgr.
Floor Area: 28,000 sq. ft.
Personnel: 65

Manufacturers of: Aircraft & Transportation Seats; Aluminum & Steel Towers & Antennas; Aircraft Sub Assemblies; Tools; Fixtures; Ground Handling Equipment; Engine Shipping Containers & Light Weight Metal Collapsible Shipping Containers; Sheet Metal Products; Metal Stampings; Pipe Bending; Aluminum Welding Specialist.
1560 1680 1730 1740 2090 2230
2240 2510 5140 5450 5985 8115
8130 8140

ALLANSON MANUFACTURING CORPORATION LIMITED,

33 Cranfield Road,
Toronto 16, Ont.
Telephone 416: 755-1191
Contact: R. A. Crolly, Vice-Pres.
& Gen. Mgr.
Transformer Division

Manufacturers of: Oil burner ignition and specialty transformers; Fluorescent ballasts; Neon transformers, and mercury vapour transformers; Battery chargers; Welding transformers, and power supplies.

Automotive Division

Re-manufacture of: Electrical automotive parts including: Generators; Starting motors; Alternators; Voltage regulators; Water pumps, and starter drives.
2520 2920 2930 5910 6115 6130
6250

ALMAX CERAMIC INDUSTRIES LTD.,

31 Kent St. East,
Lindsay, Ont.
Telephone 705: 324-5100
General Manager: A. J. Ankus
Sales Manager: M. H. Fallis
Floor Area: 4500 sq. ft.
Personnel: 10

Manufacturers of: Hydrophones; Piezoelectric Ceramic; Permanent Magnets; Insulator Ceramic; Transducers.
5845 5955 5970 5999 6625

ALUMINUM COMPANY OF CANADA LTD.,

1 Place Ville Marie,
Box 6090,
Montreal 101, Que.

Telephone 514: 877-2340
Cable: "ALCAN"
Vice-Pres., Export Sales: F. C. Winser
Floor Area: 14,000,000 sq. ft.
Personnel: 16,400

Manufacturers of: Aluminum extrusion ingots; Casting alloys, sheet ingots, — Bars and Rods; Sheet; Foil — Tubing; Wire; Chemicals; Extrusions; Tubing.
1940 4710 5350 6810 9525 9530
9535 9540 9650 and Page B15.

ALUMINUM FOUNDRY & PATTERN WORKS LTD.,

1345 Miron St.,
St. Laurent,
Montreal 9, Que.
Telephone 514: 747-7578
General Manager: W. B. Chadwick
Contact: L. Whitfield, Superintendent
Floor Area: 15,500 sq. ft.
Personnel: 40

Manufacturers of: Wood and Metal Patterns; Aluminum and Bronze castings.
Page B4.

AMERICAN CAN COMPANY OF CANADA LTD.,

1695 Lewis Ave.,
Niagara Falls, Ont.
Telephone 416: 358-3225
Manager: S. J. Wallace
Contact: H. N. Taylor, Chief Designer
Floor Area: 100,000 sq. ft.
Personnel: 180

Manufacturers of: Metal & Paper Fabricating Machinery; Special Purpose Custom Machines; Blanking; Forming & drawing dies; Progressive Dies; Profile Gauges Related to Dies.
3419 3443 3456 3465 5210 5220

AMPHENOL CANADA LIMITED,

44 Metropolitan Rd.,
Scarborough, Ont.
Telephone 416: 291-1621
Telex: 06-217676
TWX: 610-492-4379
President: Robert A. Ely
Contact: Robert Shute, Vice-Pres. Marketing
Floor Area: 50,000 sq. ft.
Personnel: 150

Manufacturers of: Electrical Power and Coaxial Connectors; Filtering Connectors; Printed Circuit Connectors; Adapters; Cable Harnesses; Coaxial Cable; Coaxial Switches; Trimming Potentiometers; Precision Poten-

tiometers; Digital Readout Dials; Vernier Dials.

5355 5905 5930 5935 5965 5975
5985 5995 5999 6145 6625 7440

ANACONDA AMERICAN BRASS LIMITED,

260-8th Street,
Toronto 14, Ontario.
Telephone 416: 259-6611

President: D. F. Cornish
Contact: R. W. Vanderburgh, Gen. Sales Mgr.
Floor Area: 700,000 sq. ft.
Personnel: 1,300

Manufacturers of: Copper, Brass, Bronze, Nickel Silver and Copper Alloys in Sheet, Strip, Rolls, Rod, Bar, Tube, Wire and Extruded Shapes; Anodes, Angles, Channels, Mouldings, Roofing Copper, Commutator Copper, Commutator Segments, Copper Tube in Cartons for Automotive and General Use, Air Conditioning and Refrigeration Tube, Restrictor, Capillary and Cupro-Nickel Tube, Condenser Tube, Oval, Square, and other Special Shape Tube and Casting Ingots.

1395 4710 9525 9530 9535 9540
9650

ANDREW ANTENNA CO. LTD.,

606 Beech St.,
Whitby, Ont.
Telephone 416: 668-3348

President: Richard P. Matthews
Contact: D. L. Dewey, Marketing Mgr.
Floor Area: 65,000 sq. ft.
Personnel: 130

Manufacturers of: Antennas, antenna systems; Transmission lines; Coaxial cables, rigid and flexible; Waveguides, rigid and elliptical flexible; RF switches; RF connectors; Radomes, heated and unheated; Transportable masts.

5915 5930 5985 6145 and Pages B4 and B6.

ARDROX LIMITED,

P.O. Box 390,
Stone Road,
Niagara-on-the-Lake,
Ontario.
Telephone 416: 468-2411

President: G. R. Wooll
Contact: N. Harding, Technical Mgr.
Floor Area: 2400 sq. ft.
Personnel: 7

Manufacturers of: Inspection Materials; Carbon Removers; Paint Removers; Penetrants; Metal Cleaners & Conditioners.

6850 8010

ARMCO DRAINAGE & METAL PRODUCTS OF CANADA LTD.,

P.O. Box 300,
Guelph, Ont.
Telephone 519: 822-0210
President: E. L. Campbell
Contact: D. L. G. Turvey, Sales Manager
Floor Area: 200,000 sq. ft.
Personnel: 420

Manufacturers of: Corrugated Metal Pipe; Nestable Culverts; Asbestos Bonded Pipe; Spiral Weld Pipe and Fittings, Foundation Pipe Piles, Steel Sheet Piling, Prefabricated Steel Buildings, Bin Type Retaining Wall, Guardrail, Structural Plate Pipe, Bridge Deck, Manhole Covers and Open Steel Grating.

4710 4730 5410 5420 5670 9515

ARNOTT-SMITH EXPORT LTD.,

1030 West Georgia Street,
Vancouver 5, B.C.
Telephone 604: 684-1445
Telex: 04-507585
Cable: "RESMITH"
President: Ralph E. Smith

Manufacturers of: Lumber, Timbers, Logs, Poles, Piling, Shingles and Plywood, either Untreated or Treated with all recognized wood preservatives.
5510

ARO OF CANADA LIMITED,

1416 Kipling Avenue North,
Rexdale (Toronto) Ontario.
Telephone 416: 247-2153
President: K. H. Zinsmaster
Contact: A. Vallent-Sandre, Manager,
Aeronautical Division

Manufacturers of: Oxygen Equipment; Regulators; Ground Support Equipment; Cryogenics Equipment; Safety Equipment; Air Tools; Solenoid Valves; Lubricating Equipment; Paint Spray Equipment; Glueing Equipment; Pneumatic-Hydraulic Cylinders and Valves.

1650 1660 1730 2520 3413 3950
4240 4310 4320 4330 4730 4810
4820 4920 4930 4940 5130 6680
7610 8120 8415

ASSOCIATED TUBE INDUSTRIES LIMITED,

7455 Don Mills Rd.,
Milliken, Ont.
Telephone 416: 293-8278
Telex: 06-217644
President: H. J. Middleton

Contact: J. L. Olsen
Floor Area: 44,000 sq. ft.
Personnel: 125

Manufacturers of: Steel & Stainless Steel
Tube & Pipe.
4710

ATCO INDUSTRIES LTD.,

1243 - 48 Ave. N.E.,
Calgary 67, Alberta.
Telephone 403: 276-1101
President: R. D. Southern
Contact: E. N. Farch, Senior Vice-Pres.,
Marketing
Floor Area: 700,000 sq. ft.
Personnel: 1,000

Manufacturers of: Air-transportable Housing, for Helicopter and Fixed-wing Aircraft. Standardized Relocatable Worksite Housing. Modular Classrooms, Hospitals, Offshore Platform Housing. Folding Metal Buildings for Vehicle Maintenance and Depots. Custom-designed Modular Building systems of all kinds.

1740 2330 2510 3920 5410 8115
8140 and Pages B6 and I-331.

ATCO RESEARCH AND DEVELOPMENT CENTER,

5115 Crowchild Trail S.W.,
Calgary 10, Alberta.
Telephone 403: 249-5541
Gen. Mgr.: J. Susnir
Contact: Dr. J. D. Wood, Senior Vice-Pres.
Floor Area: 10,000 sq. ft.
Personnel: 60

Research & Prototype Fabrication on: Factory-built Housing Structure Systems. Military Air-lift Structures, Expanding Vertically and Laterally. Decontamination Shelters. Cargo Handling Systems.
Page B6.

ATLANTIC AVIATION OF CANADA LTD.,

Montreal International Airport,
Dorval, Que.
Telephone 514: 636-4155
Telex: 01-26184
President: V. R. Bennet
Contact: S. J. Staskow, Sales Mgr.
Floor Area: 130,000 sq. ft.
Personnel: 300

Designers and Manufacturers of: Aircraft Interiors and Modifications.
Page B6.

ATLAS HOIST & BODY INC.
(Div. of the Richler Industries)
7600 Cote de Liesse Rd.,
Montreal 376, Que.

Telephone 514: 342-3220
Telex: 01-2366
Cable: ATHOIST
Gen. Mgr.: Max M. Richler
Floor Area: 30,700 sq. ft.
Personnel: 54

Manufacturers of: Hydraulic Hoists & Dump Bodies for Motor Trucks for both On and Off-highway Vehicles; Aluminum Dump Bodies for On and Off-highway Motor Trucks; Bottom Dump Semi-trailers for Construction and Aggregate Materials; Rear Dump Trailers for Rock Hauling & Quarrying. Refuse Collection Trucks & Bodies.

2320 2510 3825 3950 and Pages I-322, I-323 and I-324.

ATLAS STEELS COMPANY,
(Division of Rio Algom Mines Limited)

Welland, Ontario.
Telephone 416: 735-5661
Telex: 021-5114
President: O. S. Leslie
Contact: A. V. Orr, Vice President, Sales & Marketing
Floor Area: 1,180,000 sq. ft.
Personnel: 2600

Manufacturers of: High Speed, Carbon and Alloy Tool; Stainless and Special Purpose Steels in all forms; Forgings, Gun Barrels and Forgings for Ordnance uses and qualities.

1005 1010 1015 1020 1325 1330
1395 3820 4710 9505 9510 9515
and Page B9.

ATLAS TITANIUM LIMITED,
(A Division of Rio Algom Mines Ltd.)

Centre Street,
Welland, Ont.
Telephone 416: 735-5661
Cable: ATLASTITAN
Manager: K. C. Ramsey
Floor Area: 58,000 sq. ft.
Personnel: 80

Manufacturers of: Bar, Wire, Sheet, Strip & Plate in Titanium & Titanium Alloys; Seamless and Welded Tubing in Titanium & Titanium; 0.2% Palladium alloy.
4710 9530 9535

ATOMIC ENERGY OF CANADA LIMITED,

(Commercial Products)
Tunney's Pasture,
P.O. Box 93,
Ottawa, Ont.
Telephone 613: 728-1841
Cable: NEMOTA

Director of Sales: C. H. Hetherington
Contact: F. Feffer, Sales Mgr.
Floor Area: 181,000 sq. ft.
Personnel: 400

Manufacturers of: Isotope Teletherapy Equipment; Gamma Irradiation Facilities; Cobalt 60 and other Reactor Produced Isotopes; Neutron Sources; Radiography Sources; Irradiation Services and Nuclear Radiation Sources.

6525 6640 9610 and Pages B6, B13, I-200, I-202 and I-204.

AUTO SPECIALTIES MANUFACTURING CO. (CANADA) LIMITED,

614 Tecumseh Road East,
Windsor, Ontario.
Telephone 519: 253-5261
President: R. M. Foote
Contact: Guy L. Gratton, Sales Manager
— Foundry Division
Floor Area: 129,400 sq. ft.
Personnel: 290

Manufacturers of: Standard Malleable Iron Castings — Machined and non-machined; Pearlitic Malleable Iron Castings — Machined and non-machined; Vehicle components.

1095 1325 1330 2510 2520 2530
4910 5120 and Page B4.

AUTOMATIC ELECTRIC (CANADA) LTD.,

100 Strowger Blvd.,
Brockville, Ont.
Telephone 613: 342-6621
President: C. R. Hughes
Contact: S. C. Bird, V.P. Marketing
Floor Area: 361,400 sq. ft.
Personnel: 1,500

Manufacturers of: Automatic Telephone Exchange Equipment; Automatic Toll Systems; P.A.X. and P.A. B.X. Toll Systems; Telephone, Industrial Relays; Stepping Switches; Coils & Transformers and Industrial Control System Design & Manufacture.

5805 5820 5930 5935 5945 5950
5965

AUTOMATIC WINDING CORP. LTD.,

1179 Finch Ave. West,
Downsview, Ont.
Telephone 416: 630-2012

President: S. Hoffman
Floor Area: 8,000 sq. ft.
Personnel: 80

Manufacturers of: Relays and Solenoids; Coils and Transformers, Cores, Filters & Inductors. Miscellaneous Electrical and Electronic Components.

5945 5950 5999

AVIATION ELECTRIC LIMITED,

P.O. Box 2140, 200 Laurentien Blvd.,
Montreal, Que.
Telephone 514: 744-2811
President: D. R. Taylor
Contact: C. D. Garbutt, Dir. of Sales
Floor Area: 221,000 sq. ft.
Personnel: 1,000

Manufacturers of: Fuel Control Systems; Fuel Nozzles; Hydraulic Pumps; Flight & Engine Instruments; Aircraft Wheels and Brakes; Gyros and Gyro Components; Ball Resolvers; Anti-G Valves; Electro-Mechanical Accessories; Rate Gyros; Accelerometers; Registering Accelerometers; Navigational Systems; Fluidic Devices & Systems; Test Equipment; Repair & Overhaul Facilities for above-noted Equipment; Engineering Services; Consulting & Design Services; Technical Manuals.

1220 1250 1420 1630 1650 1680
2840 2915 2925 2995 3010 4320
4820 4920 5805 5821 5825 5826
5945 5990 5995 5999 6110 6130
6605 6610 6615 6625 6645 6660
6685 6910 6920 6930 6940 7440
7610 and Pages B6, B8, B10, B13, B14,
I-112, I-246 and I-264.

AVIONICS LIMITED, (a member of the Leigh Group)

P.O. Box 200,
Niagara-on-the-Lake, Ont.
Telephone 416: 468-3632
Cable: AVIONICS
Contact: J. G. Mitchell, Gen. Mgr.
Floor Area: 14,000 sq. ft.
Personnel: 20

Manufacturers of: Printed circuits; Electronic subassemblies. Precious metal plating. Thermal electric cooling modules.
5940 5999 and Page I-56.

B.I.R. PRECISION PRODUCTS,

8300 - 2nd Ave.,
 Montreal 5, Que.
 Telephone 514: 351-3100
 President: C. Broisin
 Contact: G. Isabey, Vice-Pres.
 Floor Area: 10,000 sq. ft.
 Personnel: 52

Manufacturers of: Automatic Turning of High Precision Screws, Shafts, Servo Motor Housings, Gyroscopic Components Related to the Electronic & Aerospace Industries. Tooling for Small Arms Ammunition.

1005	1310	1315	1336	1340	1345
1350	1355	1360	1390	1395	1420
1560	1630	5305	5307	5310	5940
6615					

BLH-BERTRAM LTD.,

15 Hatt St.,
 Dundas, Ont.
 Telephone 416: 628-2233
 Telex: 021-722
 Vice-Pres.: Rea Taylor
 Contact: C. P. Madely, Gen. Sales Mgr.
 Floor Area: 370,000 sq. ft.
 Personnel: 250

Manufacturers of: Special Purpose Machinery; Tools & Gauges; Mining Equipment; Steel Mill Equipment; Machinery Rebuild & Overhaul; Road Graders; Hydraulic Mobile Cranes; Jigs & Fixturers.

1010	1015	1020	1055	2030	3020
3422	3615	3695	3805	3810	3820
3950	4920	4940	5136	5210	5220

BABCOCK & WILCOX CANADA LIMITED,

Galt, Ont.
 Telephone 519: 621-2130
 Telex: 0295-771
 President: J. M. Douglas
 Contact: C. W. D. Fowler
 Floor Area: 403,000 sq. ft.
 Personnel: 1,200

Manufacturers and designers of: Nuclear and fossil fuel steam generating equipment; Marine Boilers; burners, oil, gas and coal; pulverizers, stokers; heat exchangers; pumps, centrifugal and axial flow; pressure vessels; custom plate work; castings, iron, steel and alloy; turbines, steam; condensers. Repair parts, and service facilities. Machining and welding, medium and heavy.

2820	2825	3820	4320	4410	4420
4470	4530	5430	and Pages B4 and B10.		

BACH-SIMPSON LIMITED,

1255 Brydges Street,
 London, Ontario.
 Telephone 519: 451-9490
 Cable: WILBAC
 President: R. Wilton
 Contact: H. A. Leah, Director of Marketing
 Floor Area: 60,000 sq. ft.
 Personnel: 250

Manufacturers of: Laboratory equipment; Meters; Oscilloscopes; Controllers; Instrument transformers; Test equipment.
 5945 6625 6685 7440

THE BALDRIVE COMPANY,

P.O. Box 634,
 Galt, Ont.
 Telephone 519: 653-7161
 Contact: John S. Couse, Gen. Mgr.
 Kenneth G. Vacing, Sales Mgr.
 Floor Area: 3,500 sq. ft.
 Personnel: 10

Manufacturers of: Hydraulic Motors: High Speed, Light Weight; 50 to 35000 RPM; 0.5 to 25 H.P. Hydraulic Motors: Low Speed, High Torque, Hollow Shaft; 1 to 1000 RPM; 0.5 to 10 H.P.
 2030 4320

BARBER DIE CASTING CO. LIMITED,

Box 416, Postal Station "B",
 Hamilton, Ontario.
 Telephone 416: 527-9178
 President: N. J. Clark
 Contact: R. Roediger, Sales Manager
 Floor Area: 100,000 sq. ft.
 Personnel: 270

Manufacturers of: Custom high pressure die castings in Aluminum, Zinc, Magnesium and Brass; Special capabilities for large and complicated die castings; machining and assembling facilities.

1310	1315	1325	1330	1340	1390
1395 and Page B4.					

BARNARD FOUNDRIES LIMITED,

13 Dundas St. E.,
 Brantford, Ontario.
 Telephone 519: 753-7349
 President: G. D. Zimmerman
 Contact: L. J. Newman
 Floor Area: 13,000 sq. ft.
 Personnel: 28

Manufacturers of: Pole line hardware for transmission lines; Ammunition shapes; Stop valves; Flush valves; Faucets; Shower heads.
 1395 4510 5975

WALLACE BARNES CO. LTD.,

274 Sherman Ave. N.,
Hamilton, Ont.
Telephone 416: 545-1172
Telex: 02-1623
President & Gen. Mgr.: W. A. Campbell
Contact: E. J. Baker, Sales Mgr.
Floor Area: 160,000 sq. ft.
Personnel: 380

Manufacturers of: Precision Coil & Flat Springs all Types and Sizes. Light Stampings for Aircraft & Ordnance. Wire Forms.
5340

BARRINGER RESEARCH LIMITED,

304 Carlingview Dr.,
Rexdale, Ont.
Telephone 416: 677-2491
Cable: BARESEARCH
President: A. R. Barringer
Contact: D. A. Whiteman, Mgr.
Floor Area: 15,000 sq. ft.
Personnel: 100

Manufacturers of: Nuclear Precession Magnetometers — Airborne, Oceanographic, Station, Portable. Induced Pulse Transient (Input) Electromagnetic Prospecting Systems — Airborne and Ground, Lightweight Portable Electromagnetic Systems. Atomic Absorption Mercury Spectrometers. Neutron Generators. Electronic Sub-Systems and Instruments. Magnetic Field Generator and Control Systems. Design and Development of Remote Sensing Systems for Airborne and Space Applications — Electromagnetic, Magnetic, Electro Optics. Research Capabilities in Electromagnetics, Magnetics, Electro Optics, Mass Spectroscopy, Atomic Absorption, and U.V. and I.R. Spectrometry. Integrated Exploration Services — Airborne Pulse E.M. (Input) Magnetometer and Gamma Ray Spectrometer, Ground Geophysical and Geochemical Surveys Complete, Custom Geochemical Laboratory Facilities.
6630 6655 6665 and Pages B3, B6 and I-224.

WM. BARTLETT & SON LTD.,

616 St. Clarens Ave.,
Toronto 4, Ont.
Telephone 416: 534-2318
President: H. C. Robey
Contact: F. Cranner, Superintendent
Floor Area: 5,500 sq. ft.
Personnel: 14

Manufacturers of: Canvas Products made from — Cotton, Flax, Glass; Asbestos & Synthetic Fabrics & Film. Plain or Coated,

Water, Rot; & Flame Proofed. Weights from 2 oz. to 33 oz. per sq. yd. Silk to Felts, Air Supported Structures, Loading Door Protection, Air Supported Buildings, Special Tents, Awnings & Covers, Shaped & Reinforced with Rope or Web, Vinyl Film or Nylon Clean Rooms, Frame or Air Supported. Bags, Tubes Curtains, Wing Covers, Copter Mittens, Generator Covers Vented & Insulated, Radiator Shields, Truck Tops & Curtains, Jeep Tops & Curtains, Basket Liners, Stretcher Recovers, Film Body Bags, Special Web Harness, Pack Sacks & Fabric Containers. Specialists in Hard to make Fabric products under 300 lbs.

1005	1010	1015	1020	1025	1045
1055	1080	1290	1340	1450	1670
1680	1730	2040	2240	2510	2840
2920	3820	3990	4010	4130	4140
4240	4610	4710	4940	5340	5410
6515	6530	7230	7830	8105	8305
8340	8345	8460	8465	9930	

BATA ENGINEERING,

Batawa, Ont.
Telephone 613: 398-6111
Gen. Mgr.: G. W. Lawrence
Contact: J. M. Mainville
Floor Area: 50,700 sq. ft.
Personnel: 225

Manufacturers of: Gun components; Aircraft components; Ammunition components; Hydraulic cylinders; Special purpose Machinery; Repair & Overhaul facilities.
1045 1055 1340 1420 1440 1560
1730 3465 and Page B10.

BATHURST CONTAINERS LIMITED,

635 Dorchester Blvd. West,
Montreal, Que.
Telephone 514: 866-7831
President: L. D. Richardson
Contact: E. H. Gibson, Executive Vice-Pres.
Floor Area: 1,300,000 sq. ft.
Personnel: 1,630

Manufacturers of: All weights and grades of corrugated containers for ordinary or special purposes with interior packing; Nailed wood and wirebound containers; Corrugated paper concrete forms and skin packaging equipment.
8115 8140

BAY MILLS LIMITED,

1 Hygel Ave. E.,
Midland, Ont.
Telephone 705: 526-7867
President: S. F. Cerny

Contact: S. J. Nicholls, Gen. Sales Mgr.
Floor Area: 125,000 sq. ft.
Personnel: 250

Manufacturers of: Glass fabrics for reinforced plastics, Waterproofing, Dust tube bags, Filter cloth and Insect window screening.
8305 9340

BAYLY ENGINEERING LIMITED,

Hunt Street,
Ajax, Ontario.
Telephone 416: 925-2126

Contact: D. L. McPherson, Sales Manager
Floor Area: 25,000 sq. ft.
Personnel: 120

Manufacturers of: R. F. Loads, Absorption type (Dummy); R.F. Wattmeters Absorption type; R.F. Wattmeters Inline; Antenna Dummy; Filter Electric; Inductors Toroidal; Communications Equipment.
5805 5815 5820 5821 5830 5895
5915 5935 5950 5985 5995 5999
6625

BEACH FOUNDRY LIMITED,

75 Spencer Street,
Ottawa, Ontario.
Telephone 613: 728-5871

President: D. K. Fleck
Vice-President: J. L. Flëck
Contact: R. S. Vanwart, Factory Manager
D. Cullen, Mgr. of Foundry Div.
G. W. Booker, Mgr. Fleck Div.

Floor Area: 243,500 sq. ft.
Personnel: 300

Manufacturers of: Complete line of gas and electric ranges; warm air heating equipment; grey iron "ductile" and "niresist" castings, steel fabricated parts; electrical water heaters, circulating and immersion types; Grenade and Bomb Bodies and components, cast; Fins and fin assemblies for Grenades and Bombs.
1095 1325 1330 4520 7310
and Page B4.

Fleck Division

Manufacturers of: Pulp and Paper Mill Equipment; Road Rollers and Graders; Industrial Pumps; Custom designed fabrications and equipment.
3615 3805 3830 3910 3990
and Pages B6 and B10.

BEACONING OPTICAL & PRECISION MATERIALS CO. LTD.,

455 Craig St. W.,
Montreal 126, Que.
Telephone 514: 866-8395
TWX: 610-532-6561

Cable: BOPHAR
President: J. A. Benard
Contact: J. C. Carter, Mgr., Contracts Administration
Floor Area: 30,000 sq. ft.
Personnel: 165

Manufacturers of: HF & UHF Communication Equipment. Precision Electro-Mechanical Components & Assemblies.
5820 5821 5840 5895 6210 6625
and Page B10.

BEAVER DECALCOMANIA CO. LTD.,

5545 Cote de Liesse Road,
Montreal 378, Quebec.
Telephone 514: 748-8877
President: C. M. Prevost
Contact: Richard Lavallee, Contract Administrator

Floor Area: 13,000 sq. ft.
Personnel: 26

Manufacturers of: Decalcomania Transfers of every description; Dry decals, Pressure-sensitive emblems, markings, and nameplates; qualified 3M Materials, convertors for Aircraft and vehicle markings.
7690 9905

BEAVERS DENTAL PRODUCTS LIMITED,

Laurier Drive & Highway 2,
Morrisburg, Ont.
Telephone 613: 543-2937
President: Geo. E. Beavers
Floor Area: 24,000 sq. ft.
Personnel: 70

Manufacturers of: Carbide Dental Burrs.
6520

BECKER DRILLING (ALBERTA) LIMITED,

415 Monument Place, S.E.,
Calgary, Alberta.
Telephone 403: 272-5511
Contact: C. W. Galbraith, General Manager

Manufacturers of: Hammer Drills for overburden drilling in gravel, sand and boulder formations.
3820

BECKMAN INSTRUMENTS INC.,

(Helipot Div.)
901 Oxford St.,
Toronto 18, Ont.
Telephone 416: 251-5251
Manager: R. McCormack
Floor Area: 10,000 sq. ft.
Personnel: 55

Manufacturers of: Wirewound and/or conductive plastic and/or cermet, Linear and/or non-linear precision potentiometers; Low

voltage Regulated Power Supplies; Cermet trimming Potentiometers; Turns Counting Dials.
5355 5905 6130

BECLAWAT (CANADA) LIMITED,

335 Laurentian Blvd.,
Montreal, 381, Que.
Telephone 514: 747-9878
Telex: 01-26507

President: G. W. Millar
Contact: J. M. Hendren, Vice-Pres. & Gen. Mgr.

Floor Area: 13,000 sq. ft.
Personnel: 35

Manufacturers of: Windows (Frames & Glass) of Aluminum, Brass, Stainless Steel; Sliding Door Equipment; Freight Car Emergency Brakes; All explicitly designed for use on ships, vehicles, rail-cars and other transportation equipment. Consulting & Design Services on window systems.
2040 2240 2510 5670 and Page B6.

BEDARD-GIRARD LIMITED,

117 Lagachetiere St. W.,
Montreal, Que.

Telephone 514: 861-5631

Cable: GIRBED

President: F. H. Guibert

Contact: L. G. Dunn

Floor Area: 39,000 sq. ft.

Personnel: 600

Manufacturers of: Generator Control Panels; Annunciators (Relay and Transistor Types); Relay and Control Switchboards; Electrical Switchgear; Unit — Substation (Indoor and Outdoor); Marine Motor Control Centers; Industrial, Commercial and Marine Power Switchboards.

5930 5940 5975 6110 6310 6320
6330 6350 and Page B6.

H. L. BLACHFORD LIMITED,

977 Aqueduct St.,
Montreal 3, P.Q.
Telephone 514: 866-9775
Telex: 01-2253

Cable: "CHEMFORD"

President: H. L. Blachford

Contact: H. A. Hencher

Floor Area: 85,000 sq. ft.

Personnel: 100

Manufacturers of: Industrial Chemicals; Protective Coatings; Chemical resisting cements and coatings; Metal working compounds; Wire drawing compounds; Textile finishes; Sound deadening compounds; Jointing compounds and Sealants; Resin flooring compounds; Epoxy Adhesives.
5640 6810 8030

BLACK CLAWSON-KENNEDY LIMITED,

1144 First Avenue West,
Owen Sound, Ont.

Telephone 519: 376-8860

Vice-Pres.: Wm. H. Kennedy

Contact: R. Warburton, Sales Mgr.,

Industrial Products

Floor Area: 445,000 sq. ft.

Personnel: 500

Manufacturers of: Bearings, antifriction, mounted, plain; Castings, iron & steel, alloys, bronze; Couplings, shaft; Crushers, jaw; Filters, vacuum; Gears, spur; Liners, shaft; Propellers; Ship; Pulleys; Pulp and Paper Industry Machinery; Pumps, centrifugal; Specialized Logging Machinery; Speed Increaseers, Reducers; Centrifugally Cast Tubing, bronze, mild and alloy steels; Winches; Repair and Overhaul facilities; Machining, heavy, medium.

2010 2030 2040 2230 3010 3020
3130 3210 3220 3615 3695 3950
4320 4710 4810 4820 9999 and Pages
B4, B10 and B14.

BOEING OF CANADA LTD.,

(Vertol Div.)

P.O. Box 338

Arnprior, Ont.

Telephone 613: 623-4215

Telex: 031-410

Vice-Pres. & Gen. Mgr.: D. H. McNeill

Contact: M. G. Doyle, Mgr. Contracts & Finance

Floor Area: 45,000 sq. ft.

Personnel: 100

Manufacturers of: Precision parts for Helicopters including Model 107 & 114 Boeing Helicopters, Rescue Boom, Skis for Helicopters, Repair & Overhaul facilities for Dynamic Components of Helicopters, Rotor Hubs, Drive Shafts, Transmission Gear Boxes, Repair & Rebuild of Helicopter Airframes. Machining Aircraft Components, Sheet Metal Shop, Aircraft Tubing, Ground Support Equipment for Aircraft, Aircraft Modification Kits. Tools and Tooling. Consulting & Design Aerodynamics. Aircraft Repair & Overhaul, Custom Machining.
1560 1630 1650 1660 1680 1730
1740 3120 3130 3465 4920 and Pages
B6, B10 and B14.

BOGUE ELECTRIC OF CANADA LIMITED,

P.O. Box 900, Station "B",
Ottawa, Ontario.

Telephone 613: 822-2380

Plant Manager: R. Vigeant

Contact: H. Regener
Floor Area: 80,000 sq. ft.
Personnel: 50

Manufacturers of: Electrical Power Supplies, Rotating and Static; Solid State Power Devices; Aircraft Ground Support Power Trailers; Custom Electrical Power Designs for Computers, Electronic Systems, Missile Support, Naval; Special Battery Chargers, Variable Frequency; Induction Heating Motor-Generators; Water Purification, Industrial Application.

1075	1730	4140	4450	4610	4620
5821	5840	5845	5895	5925	5950
5975	6105	6110	6115	6120	6125
6130					

BOMBARDIER SNOWMOBILE LIMITED,

Valcourt, Quebec.
Telephone: 30
Cable: BOMBARSNOW
Telex: 018-3122

President: L. Beaudoin
Contact: J. Hetherington, Marketing Mgr.
Floor Area: 144,000 sq. ft.
Personnel: 500

Manufacturers of: Equipment for over-snow and rough terrain transportation; Passenger type snowmobiles; Tractor for steep hills; Two passenger snow scooters; Muskeg tractors and carriers; Tractors for logging operations; Tractors for snow clearing from streets and sidewalks.

2310 2320 2330 2410 2430 and Pages B6, I-309, I-311 and I-314.

BOURNS (CANADA) LTD.,

36 Cranfield Rd.,
Toronto 16, Ont.
Telephone 416: 751-3880
Telex: 02-29276
Manager: Rodney Buy
Floor Area: 7,000 sq. ft.
Personnel: 80

Manufacturers of: Adjustment Potentiometers; Precision Potentiometers.
5905 and Page I-186.

BOWMAR CANADA LIMITED,

P.O. Box 4076,
Station "E",
Ottawa, Ont.
Telephone 613: 822-0463
TWX: 610-562-1916
Vice-Pres. of Operations & Gen. Mgr.:
R. D. Rinchart
Contact: W. R. Ratcliffe, Vice-Pres.,
Marketing
Floor Area: 22,000 sq. ft.
Personnel: 150

Manufacturers of: Synchros, resolvers; Servomotors; Stepper motors; Gearheads; Motor generators & Motor tachometers. R & O facilities for Servo & Stepper motors.
5990 6105 and Page B14.

BOYLES BROS. DRILLING COMPANY LTD.,

1291 Parker Street,
Vancouver 6, B.C.
Telephone 604: 255-5434
Cable: BOYLBRO
President & Gen. Mgr.: J. D. Campbell
Contact: W. M. Robson, Gen. Marketing
Mgr.
Floor Area: 41,256 sq. ft.
Personnel: 300

Manufacturers of: Diamond Drilling Machines & Equipment; Diamond Set Bits; Segmented Diamond Saws; Masonry Diamond Set Bits; Diamond Dressing Tools; Diamond Drills; Resinoid Bonded Diamond Wheels; Metal Bonded Diamond Wheels; Diamond Impregnated Products — For the Optical and Plate Glass Industry; Pumps, Reciprocating.
3820 5345

THE BRANTFORD CORDAGE COMPANY,

96 Sherwood Drive,
Brantford, Ont.
Telephone 519: 759-4764
President: A. M. James
Contact: J. A. McKay, Vice-President
Floor Area: 100,000 sq. ft.
Personnel: 350

Manufacturers of: Ropes and Twine — Manila, Sisal, Polypropylene, Nylon and Terylene Ropes. Sisal Baler & Binder Twines, also Packaging Twines and Plastic Packaging Twines. Woven polyolefin bags and sandbags, Plastic polyallomer sheeting.
4020 8105 9330

BRANTFORD PRECISION LTD.,

P.O. Box 871,
Prince Charles Rd.,
Brantford, Ont.
Telephone 519: 759-6740
President: G. C. Bailey
Contact: A. Philip, Sales Mgr.
Floor Area: 16,000 sq. ft.
Personnel: 46

Manufacturers of: Aircraft Airframe Components & Parts. Aircraft Engine Components & Parts. Hydraulic Components & Assemblies. Custom Machining to Ordnance Specification. 3-Dimensional Profiling. Numerical Controlled Machining. Production Jigs, Fixtures & Templates.

1325 1340 1355 1420 1560 2840
3465 and Page B10.

BRIMARK ELECTRONICS LIMITED,

349 Carlaw Avenue,
Toronto 8, Ont.
Telephone 416: 461-3511
President: J. R. Longstaffe
Contact: W. J. Muller, Gen. Mgr.
Floor Area: 10,000 sq. ft.
Personnel: 30

Manufacturers of: Flexible & Rigid Wave-
guide; Attenuators and coaxial adapters.
5905 5910 5950 5985

BRISTOL AEROSPACE (1968) LTD.,

(Montreal Division)
10210 Pie IX Boulevard,
Montreal N. 459, Que.
Telephone 514: 321-1330
Telex: 01-26242
Vice-Pres. & Gen. Mgr.: J. R. Alarie
Contact: T. J. Bagg, Sec't.
Floor Area: 100,000 sq. ft.
Personnel: 200

Repair and Overhaul facilities for Aircraft
reciprocating engines; Gear boxes; Carbur-
etors; Fuel injection systems; Ignition sys-
tems and Boost controls.
Page B14.

BRISTOL AEROSPACE 1968 LTD.,

(Winnipeg International Airport)
P.O. Box 874,
Winnipeg, Manitoba.
Telephone 204: 775-8331
President: W. M. Auld
Contact: R. H. May, Vice-Pres., Marketing
Manufacturing Plant Floor Area:
370,000 sq. ft.
Propellant Plant Floor Area: 3,000 Acres
Personnel: 1200

Manufacturers of: High Pressure Storage
Vessels (Missile & Aircraft); Upper Atmos-
phere Sounding Rockets; Instrumentation &
Telemetry; Rocket Motor Casings; Nose
Cones; Radar & Microwave Antennae;
Aircraft Sheet Metal Assemblies; Jet En-
gine Combustion & Exhaust Components;
Jigs, Fixtures & Tooling; Repair & Over-
haul Facilities for Aircraft. Aero-engine
Components and Helicopters; Design &
Manufacture of Solid Propellant Rocket
Motors, Boosters, Jato & Other Propellant
Devices.

1310 1315 1325 1330 1336 1337
1340 1345 1350 1355 1377 1410
1420 1440 1560 1630 1650 1680
1730 2050 2835 2840 3465 5821

5895 5985 5999 8120 9330 and Pages
B6, B8, B10, B14, B15, I-26 and I-114.

BRUNNER & LAY (CANADA) LTD.,

2280 43rd Ave.,
Lachine, Quebec.
Telephone 514: 631-8588
President: Fred J. Brunner,
Contact: R. C. Bentson, General Manager
Floor Area: 20,585 sq. ft.
Personnel: 24

Manufacturers of: Expendable accessory
tools for pneumatic pavement breakers,
clay diggers and/or chipping hammers, such
as Moil points, clay spades, asphalt cutters
and most other standard types of such acces-
sory tools. Detachable, tungsten carbide
inserted threaded rock drilling bits of all
standard gauges and thread designs for use
in blast hole drilling with pneumatic rock
drills. Hollow drill steels of all standard
sizes and types made of forged high quality
mining steel.

3820

BURNDY CANADA LTD.

1530 Birchmount Rd.,
Scarborough, Ont.
Telephone 416: 757-8761
President: F. H. McLenaghan
Contact: G. Vandry, Vice-Pres., Sales
Floor Area: 135,000 sq. ft.
Personnel: 300

Manufacturers of: Electrical Connectors;
Electronic Connectors; Terminals; Cable
Supporting Systems.

5120 5130 5935 5940 5975

BURRARD DRY DOCK COMPANY LTD.,

P.O. Box 99,
North Vancouver, B.C.
Telephone 604: 988-2111
Telex: 04-5177
President: Hon. C. Wallace
Contact: D. E. Wallace, General Manager
Floor Area: 525,000 sq. ft.
Personnel: 1,000

Manufacturers of: All types of ships, in-
cluding Tanker, Passenger and Cargo ves-
sels, Dredges, Icebreakers, Buoy vessels and
Lighthouse Tenders, Fishing vessels, etc.;
Barges of all types; Pontoons; Floating Dry-
docks, and General Industrial Engineering.

1045 1905 1910 1915 1920 1925
1930 1935 1940 1945 1950 1955
2010 2020 2040 2050 2090 3442
3615 3695 3895 3930 3950 4410
4420 4440 5410 5420 5430 5450
5985 7125 and Page B10.

CAE INDUSTRIES LTD.,

(Electronics Div.)

P.O. Box 6166

Montreal 101, Que.

Telephone 514: 341-6780

President: R. W. Cooke

Contact: S. Roth, V.P., Marketing

Floor Area: 155,000 sq. ft.

Personnel: 1000

Manufacturers of: Flight Simulators; Radar & Weapon Simulators; Servo Mechanisms; Aircraft Anti-Magnetic Devices; Anti-Submarine Warfare Equipment; Pipeline Supervisory, Control & Telemetry Systems; Electronic Shipboard Depth Plotting Systems; Printed Circuits; UHF Rescue Beacons; Wiring Analysers; Computers; Electronic Systems for Industry and Defence; Repair Overhaul & Maintenance of Airborne Weapon Control systems; Flight Simulators, Communications Equipment and Electronic Systems and Equipment; Electronic Test and Calibration Services; Transistorized Telegraph Equipment.

1230 1285 4931 5805 5810 5815
5820 5821 5825 5826 5840 5841
5845 5895 5915 5985 5995 5999
6110 6130 6615 6625 6660 6665
6910 6930 6940 7440 and Pages B4, B6,
B10, B14, I-66, I-68, I-76, I-142, I-170 and
I-232.

CAE MACHINERY LIMITED,

3550 East Broadway,

Vancouver 12, B.C.

Telephone 604: 299-3431

Pres. & Gen. Mgr.: G. J. Harris

Vice-Pres., Production: P. von Colditz

Contact: J. M. Oughton, Gen. Sales Mgr.

Floor Area: 110,000 sq. ft.

Personnel: 250

Manufacturers of: Sawmill Machinery; Pulp-mill Woodroom Equipment; General Industrial Equipment to customer specifications; Meehanite-type Iron Castings; Mild Steel Castings; Stainless Steel, Chrome, & Manganese Steel Castings; Steel Fabrication; Pattern Fabrication.

1010 1015 1020 2030 3020 3210
3615 3695 3815 3820 3910 3950
and Pages B4 and B10.

CANADA CYCLE & MOTOR CO. LTD.,

(Div. of Levy Industries Ltd.)

2015 Lawrence Ave. W.,

Weston, Ont.

Telephone 416: 241-9121

Telex: 02-21336

President: T. S. Nease

Contact: F. Sainsbury, Mgr. Engineering

Floor Area: 270,000 sq. ft.

Personnel: 500

Manufacturers of: Bicycles; Sporting Goods; Ice Skates; Hockey Sticks; Gloves & Helmets Hockey; Pads & Shin Protectors Hockey; etc.: Exercise Machines; Rifle & Machine Gun Components; Shell, Mortar & Bomb Inert Components; General Stamping and Machine Shop Facilities.

1005 1095 1310 1315 1325 1330
1340

CANADA FOILS LIMITED,

P.O. Box 8,

1891 Eglinton Ave. E.,

Toronto 16, Ont.

Telephone 416: 750-4200

Telex: 02-21120

Cable: FOILS

President: M. Williamson

Contact: J. A. Skelton, Gen. Mgr.

Floor Area: 300,000 sq. ft.

Personnel: 500

Manufacturers of: Aluminum Sheet, Foil, Chaff, Metallized Films, Flexible Packaging & Packaging Materials.

5895 9535

CANADA FORGINGS LTD.,

P.O. Box 308,

Welland, Ont.

Telephone 416: 735-1220

Telex: 021-595

President: F. Peacock

Contact: A. L. Dean, General Sales Mgr.

Floor Area: 166,000 sq. ft.

Personnel: 225

Manufacturers of: Die forgings for Aircraft; Valve Body Forgings; Ordnance Forgings miscellaneous Railroad, Automotive, Agricultural Implement, Mining Forgings etc. in Carbon, Alloy & Stainless Steel, Copper Titanium, Monel & Inconel; Open Die Forgings up to 20 Tons, Roll-Formed weldless Rings, Crane Hooks, Crankshafts.

1325 1420 1560 4810 4820
and Page B9.

CANADA I.T.W.,

(Shakeproof/Fastex Div.)

67 Scarsdale Rd.,

Don Mills, Ont.

Telephone 416: 447-7251

Contact: R. E. Mark, Gen. Mgr.

Floor Area: 50,000 sq. ft.

Personnel: 250

Manufacturers of: Shakeproof/Fastex Metal & Plastic Fasteners of all types including self-drilling Screws.

5305 5306 5310 5325 5940

CANADA PRECISION DEVICES LIMITED,

**70 Bramalea Rd.,
Bramalea, Ont.
Telephone 416: 459-1406**

**President: Ian F. Rankin
Contact: D. S. McPhie, Treasurer
Floor Area: 10,000 sq. ft.**

Personnel: 45

Designers & Manufacturers of: Small Electronic & Electro-Mechanical Components & Assemblies; Special Linear & Non-linear Precision Wire-Wound Potentiometers; Rotary Switches; Switch Potentiometers; "Slewing" & Similar Precision made Control Devices.

5905 5930 5999 and Page B14.

CANADA WIRE AND CABLE COMPANY LIMITED,

**Postal Station "R",
Toronto 17 (Leaside), Ontario.**

Telephone 416: 421-0440

Telex: 02-2260

Cable: CANWIRCO

President: J. H. Stevens

Contact: H. I. Banfield, Export Manager

Floor Area: 1,565,000 sq. ft.

Personnel: 2,500

Manufacturers of: All forms of wire and cable for electrical and electronics industry including special types of cables for military purposes, such as, shipboard wiring, mine-sweeping, sonar, deep water studies and cables for land communications, low and high voltage cables, magnet wire.

1075 3940 4010 6145 6685 9525

CANADAIR LIMITED,

**P.O. Box 6087,
Montreal, Quebec.**

Telephone 514: 744-1511

President and General Manager:

F. R. Kearns

**Contact: K. J. MacDonald, Director of
Marketing**

Floor Area: 2,690,000 sq. ft.

Personnel: 5,000

Manufacturers of: Aircraft — Turboprop 4 engine cargo/passenger transport, two-seater side-by-side jet pilot trainer, strike reconnaissance supersonic jet aircraft, dynavert V/STOL aircraft, repair and overhaul of aircraft and components, test equipment; Missile systems; Defence system manage-

ment; Architectural and commercial products; Transportable Control Towers; Buses; Dynatrac fully tracked utility vehicle.

1410 1420 1430 1440 1450 1510

1550 1560 1620 1680 1730 2310

3465 4820 4920 5410 6910 6920

6930 7610 9330 and Pages B6, B8, B10,

B14, B15, I-10, I-16, I-18, I-20, I-268 and

I-304.

CANADIAN ACME SCREW AND GEAR LTD.,

(Div. of Levy Industries Ltd.)

207 Weston Road,

Toronto 9, Ont.

Telephone 416: 767-1131

Telex: 02-29137

Gen. Mgr.: L. E. Hamilton

Contact: C. L. Ketchabaw, Gen. Sales Mgr.

Floor Area: 450,000 sq. ft.

Personnel: 1,100

Manufacturers of: Automobile, Truck & Farm Tractor Transmissions; Automobile Rear Axles & Differentials; Automobile Drive Shafts; Vehicle Gears, Shafts & Assemblies; Screw Machine Products; Cold-headed Products; Machining of Castings in Volume; Automobile & Truck Shock Absorbers; Spur, Helical & Bevel Gears; Welded Steel Tubing; Landing Craft Transmissions; Ordnance Fuzes; Oil Pumps; Power Take-off winches; Military Truck Transmissions; Wing-type Shock Absorbers; Precision parts for Aircraft & Helicopters; Universal Joints for Cars, Trucks; Axial Piston Hydrostatic Transmission; Right Angle Drive Gearboxes; Projectile Bodies.

1315 1390 1395 2520 2530 2540

2590 2910 2915 2990 3010 3020

3950 4320 4730 4930 5305 5306

5307 5310 and Pages I-256 and I-257.

CANADIAN ADMIRAL CORPORATION, LIMITED,

**501 Lakeshore Road, E.,
Port Credit, Ontario.**

Telephone 416: 278-5561

President: S. D. Brownlee

**Contact: G. L. Irvine, Manager, Electronics
Division**

Floor Area: 160,000 sq. ft.

Personnel: 600

Manufacturers of: Military and commercial electronic assemblies; radio and TV receivers and tuners; radio sub-assemblies; radar receivers and equipment; Radiac Detectors; Ionization Chambers; Nuclear Instrumentation.

5960 6665 and Page B13.

CANADIAN AERO SERVICE LIMITED,

380 Hunt Club Rd.,
Ottawa, Ont.
Telephone 613: 822-0121
President: Douglas G. MacKay
Contact: E. C. Anderson, Engineering
Floor Area: 200,000 sq. ft.
Personnel: 250

This firm can provide the following services:— Natural resources and engineering surveys — geodetic and photogrammetric surveys; Topographical mapping; Location surveys — engineering design and supervision of construction for railways and roads; Location surveys for transmission lines, microwave and communication routes; Soils surveys; Air-photo interpretation; Land-use studies; Cadastral surveys; City mapping; Aerial photography; Preparation of mosaics; Airborne magnetometer — scintillation counter and electromagnetometer surveys for minerals and petroleum; Airborne and ground geophysical surveys; Ground water investigations; Interpretation of geophysical data.
7640 and Page B3.

CANADIAN AIRCRAFT PRODUCTS LTD.,

261 Viscount Way,
Richmond, B.C.
Telephone 604: 278-9821
President: D. C. Cameron
Contact: D. C. Cameron
Floor Area: 20,000 sq. ft.
Personnel: 20

Manufacturers of: Aircraft Floats & Components. Repair & overhaul of A/C Floats.
1630 1680 and Pages B10 and B14.

CANADIAN ALLIS-CHALMERS LTD.,

125 St. Joseph St.,
Lachine, Que.
Telephone 514: 634-3451
Telex: 01-2716
President: Boyd S. Oberlink
Contact: G. C. Windler, Eales Mgr.
Floor Area: 348,480 sq. ft.
Personnel: 800

Manufacturers of: Air and Gas Compressors of the rotary and centrifugal types. Metal clad switchgear indoor and outdoor types for 5, 15 and 34.5 KV. High voltage motor control; Machinery ore processing — crushers, grinding mills, vibrating screens, rotary kilns, coolers and dryers. Pelletizing plants for iron ore and fine materials; Centrifugal pumps — rubber lined for slurries and

special designs for pulp mills. Repair and overhaul facilities.
3820 4310 4320 4430 6110
and Page B14.

CANADIAN ARSENALS LIMITED,

P.O. Box 717,
Ottawa 4, Ontario.
Telephone 613: 992-3595
Gen. Manager: J. K. Price
Floor Area: 3,000,000 sq. ft.
Personnel: 1,000

Small Arms Division,
Mississauga,
Toronto 14, Ont.
Telephone 416: 278-5263
Division Manager: Lt. Col. J. W. Leavens
Manufacturers of: Military Small Arms and Ancillaries; clips, links and magazines; ordnance gauges; high precision machining services; metrology laboratory; internal and external metal polishing, plating and surface finishing. Deep hole drilling, broaching and honing to ordnance standards.
1005 1240 1720 4030 4933 5210
5220 and Pages B6, B10 and I-293.

Filling Division,
P.O. Box 620,
Montreal, Quebec.
Telephone 514: 581-3080
Division Manager: A. Delage

Manufacturing, loading and assembly of: Artillery ammunition, bombs, rockets, underwater projectiles, torpedo warheads, mines, grenades, signal underwater sound, explosive devices, military pyrotechnics, delay and tracer compositions, detonators and primers various initiatory compositions.
1305 1310 1315 1320 1325 1330
1336 1337 1340 1345 1350 1351
1355 1356 1361 1365 1370 1375
1376 1377 1390 5210 5220
and Pages B6, B10, I-290 and I-298.

CANADIAN BRIDGE, (Div. of Hawker Siddeley Canada Ltd.)

P.O. Box 157,
Walkerville, Ont.
Telephone 519: 256-2661
Gen. Mgr.: P. N. Brown
Contact: E. H. Vogt, Sales & Contracts
Mgr.
Floor Area: 410,287 sq. ft.
Personnel: 770

Manufacturers of: Structural steel for railroad and highway bridges and buildings; Galvanized transmission towers and substations; Masts; Electronic structures such

as radar, scatter antennae etc. Also custom machine shop work. All types of steel erection and design work.

5410 5420 5450 5985 and Pages B4, B6 and B10.

CANADIAN BRONZE CO. LTD.,

**999 Delorimier Ave.,
Montreal, P.Q.
Telephone 514: 524-1133
President: A. J. Moore
Floor Area: 60,000 sq. ft.
Personnel: 320**

Manufacturers of: Non-ferrous Castings, Bronze, Copper, Aluminum and Special Alloys; Metal Spinning Forming and Fabricating; Machine Shop — well equipped for production of medium sized requirements; Chrome — Lead — Silver — Brass plating. 3120 and Pages B4 and B10.

CANADIAN BRONZE (CENTRAL DIV.),

**15 Bury St.,
Winnipeg 3, Manitoba.
Telephone 204: 786-6821
Contact: Fred Sleep, Gen. Mgr.
Floor Area: 75,117 sq. ft.
Personnel: 165**

Manufacturers of: Freight Car Journal Bearings, Diesel Locomotive Suspension Bearings; Fully Machined & Finished Aluminum and Bronze Castings; Aluminum Permanent Mould Castings; Automotive Assemblies, i.e. Screw Machined Products. Fully equipped modern machine shop specializing in tracer turning, production drilling and contour milling. Electro-plating facility with D.N.D. 1015 approved for hard Chrome, Copper, Nickel, Silver, Indium Lead, Zinc & Cadmium. 3130 and Pages B5 and B10.

CANADIAN CAR FORT WILLIAM,

**(Div. of Hawker Siddeley Canada Ltd.)
P.O. Box 67,
Fort William, Ont.
Telephone 705: 622-5351
Vice-Pres. & Gen. Mgr.: R. E. Henderson
Contact: A. L. Lenardon, Contracts Mgr.
Floor Area: 650,000 sq. ft.
Personnel: 1400**

Manufacturers of: Major Aircraft Structural Components; Ground Handling Equipment; Specialized Wheeled Airfield Equipment; Airframe Plastic Reinforced Components; Dies, Jigs, Fixtures and Templates; Trailers, specially designed, Stake Bodies, Specialized

Woodlands Equipment; Van Bodies, Wheeled Tractor Skidders; Sheet Metal Fabrications; Bulge formed Skins, Rapid Transit and Suburban Cars.

1190 1450 1560 1680 1730 1740
1850 2320 2330 2510 2925 3456
3465 9330

CANADIAN CAR (PACIFIC) LIMITED, (Div. of Hawker Siddeley Canada Ltd.)

**1660 Station St.,
Vancouver 4, B.C.
Telephone 604: 681-6181
Gen. Mgr.: L. A. Mitten
Floor Area: 60,000 sq. ft.
Personnel: 125**

Manufacturers of: Torpedo nose and tail housings; 81 MM Mortars and spares; Heavy construction equipment, including: Tunnel liner forms and plates; Step logs and cranes; Diesel engine parts; Hydro electric equipment, including: Hydraulic gates and valves; Hydraulic presses; Specialized lumber, Sawmill, Pulp and paper machinery. 1005 1015 1020 2815 3442 3615 4810 4820

CANADIAN CARBORUNDUM COMPANY LTD.,

**Stanley Avenue, P.O. Box 1007,
Niagara Falls, Ontario.
Telephone 416: 358-5761
Contact: F. W. Scott, Jr. Vice President
& Gen. Mgr.
Floor Area: 300,000 sq. ft.
Personnel: 550**

Manufacturers of: Aluminum Oxide Crude; Grinding Wheels; Silicon Carbide. 5345 5350 6810

CANADIAN CHARTS & SUPPLIES LTD.,

**Box 360,
Oakville, Ont.
Telephone 416: 845-4204
Senior Official: F. C. D. Wilkes Jr.
Contact: D. G. Macrae
Floor Area: 14,500 sq. ft.
Personnel: 55**

Manufacturers of: Charts, Paper Recording; Graph Sheets; Cross-Section Pads; Technical Forms. 7530

CANADIAN CHEMICAL CO., (Div. of Chemical Ltd.)

**800 Dorchester Blvd. W.,
Montreal 2, Que.**

Telephone 514: 878-1581
Cable: CHEMCELL
Director of Marketing: R. T. Hazell
Contact: J. A. Stenstrom, Dir. of Inter.

Marketing
Floor Area: 600,000 sq. ft.
Personnel: 1000

Manufacturers of: Organic Chemicals (Acids; Alcohol, Ester & Ketone Solvents; Methanol; Pentaerythritol; Glycols; Flotation Reagents); Cellulose Acetate Flake; Acetate Yarns; Fibres and Tow.
6505 6750 6810

CANADIAN FILTERS LIMITED,

277 William St. S.,
Chatham, Ont.
Telephone 519: 352-6700
President & Gen. Mgr.: M. J. Ripley
Contact: J. De Konig, Product Mgr.
Floor Area: 150,000 sq. ft.
Personnel: 250

Manufacturers of: Automotive Oil Bath & Cartridge Type Carburetor Cleaners for use on Internal Combustion Engines; Bombs, Practice. Automotive Fan Assemblies and Carburetor Air Temperature Control Systems.

1310 1315 1325 2910 2930 2940
4330

CANADIAN FLIGHT EQUIPMENT CO. LIMITED,

Box 1500,
374 Sidney Street,
Trenton, Ont.
Telephone 613: 392-6584
President: R. A. J. Murison
Contact: W. J. Mann, Managing Director
Floor Area: 21,000 sq. ft.
Personnel: 95

Manufacturers of: Propellant actuated devices; Rocket Catapults; Thrusters; Initiators; Other mechanical and electro-mechanical devices including the manufacture of precision machined parts, aircraft seats (crew and passenger); Fabric covers for boats and aircraft; Repair and Overhaul of propellant actuated devices and aircraft seats.

1340 1350 1355 1360 1377 1390
1395 1420 1630 1650 1670 1680
1720 2240 3465 6110 and Pages B10
and B14.

CANADIAN GENERAL ELECTRIC CO. LTD.,

(Carboloy Section)
1199 Lansdowne Ave.,
Toronto 4, Ont.

Telephone 416: 534-6511
Manager: W. R. Jackson
Contact: D. C. Dick, Mgr. Sales
Floor Area: 35,000 sq. ft.
Personnel: 115

Manufacturers of: Cemented Tungsten Carbide; Blanks, cutting tools, rockbit inserts, masonry drills, toolholders and inserts; Carbide draw dies and die sections; Uranium oxide, reactor fuel pellets.

3455 3456 3460 5133 5136 5310
6135 and Page B13.

CANADIAN GENERAL ELECTRIC CO. LTD.,

(Chemical Materials Section)

940 Lansdowne Ave.,
Toronto 4, Ont.
Telephone 416: 534-6511
Manager: W. E. Noble
Contact: S. R. Magee, Mgr. Sales
Floor Area: 30,000 sq. ft.
Personnel: 75

Manufacturers of: Alkyd resins; Polyester resins; Insulating varnishes; Wire enamels; Plasticisers.
8010 8030

CANADIAN GENERAL ELECTRIC CO. LTD.,

(Construction Materials, Heating & Lighting)

24 Ward St.,
Toronto 4, Ont.
Telephone 416: 534-6511
Manager: T. J. Carey
Contact: A. C. G. Jarvis, Mgr. Sales
Floor Area: 160,000 sq. ft.
Personnel: 280

Manufacturers of: Conduit, rigid and E.M.T., steel, aluminum and plastic; Floodlighting equipment; Heaters and heating devices for domestic, commercial and Industrial applications; Lighting equipment, street and highway, incandescent, mercury and fluorescent; Traffic control equipment; Wiring systems, underfloor, steel.

4410 4520 5975 6150 6210 6250
6310 6320 6330

CANADIAN GENERAL ELECTRIC CO. LTD.,

(Defence & Special Projects)
830 Lansdowne Ave.,
Toronto 4, Ont.
Telephone 416: 534-6511
Cable: GELECTRON
Manager: G. F. Miller

Contact: J. O. Cann, Mgr. Sales
Floor Area: 500,000 sq. ft.
Personnel: 2,000

Manufacturers of: Commercial & Military Communications & Electronic Equipment; Radar Sub-Assemblies; Repair & Overhaul.
1210 1220 1230 1240 1250 1265
1270 1285 1430 5805 5820 5821
5825 5826 5840 5841 5845 5850
5855 5860 5895 5910 5985 5999
6625 7440 and Pages B4, B6, B8, I-167 and I-272.

**CANADIAN GENERAL ELECTRIC
CO. LTD.,**
(Distribution & Specialty Transformer Section)

940 Lansdowne Ave.,
Toronto 4, Ont.
Telephone 416: 534-6511
Contact: J. K. McLinden, Mgr.
Floor Area: 250,000 sq. ft.
Personnel: 650

Manufacturers of: Atmosphere generators, exothermic, endothermic and Nitrogen; Ballasts, fluorescent and mercury lamp; Boilers, steam, electric, capacities up to 3500 B.H.P.; Furnaces, industrial, electric, gas and oil, for metal treating and processing; Heaters, process and comfort, quartz tube and metal-sheathed infrared; Transformers, distribution, up to 500 kva.
5920 5950 6120 6250

**CANADIAN GENERAL ELECTRIC
CO. LIMITED,**
(Industrial Apparatus Department)

107 Park Street North,
Peterborough, Ont.
Telephone 705: 742-7711
General Manager: S. R. Adamson
Contact: D. E. Henry, Manager,
International Sales
Floor Area: 1,600,000 sq. ft.
Personnel: 4,500

Manufacturers of: Motors; Generators; Motor-generator sets; Switchgear; Power Circuit Breakers; Air Circuit Breakers; Motor Control; Power Rectifiers; Power Capacitors; Relays; General-Purpose Control; Process Computers; Machining.
2210 5905 5925 5930 5940 5945
5950 5961 6105 6110 6115 6125
6130 6145 and Page B10.

**CANADIAN GENERAL ELECTRIC
CO. LTD.,**
(Lamp & Electronic Tube Dept.)

165 Dufferin St.,
Toronto 3, Ont.

Telephone 416: 537-4481
Contact: J. V. Cox, Lamps
J. G. Smart, Tubes
Floor Area: 480,000 sq. ft.
Personnel: 825

Manufacturers of: Incandescent, Fluorescent and Mercury Lamps; Sealed Beam Lamps; Floodlamps; Spot Lamps; Heat Lamps; Photoflash Lamps; Projection Lamps; Infra-red Lamps; Exciter Lamps; Pilot Lamps; Switchboard Lamps; Miniature Lamps; Automotive Lamps. All types of Electronic Tubes; Cathode Ray Tubes; Germanium and Silicon Rectifiers; Selenium Diodes; Milar Capacitors.
5960 5961 6240 6750

**CANADIAN GENERAL ELECTRIC
CO. LTD.,**
(Meter and Instrument Section)

1130 Charest Blvd. W.,
Quebec 8, P.Q.
Telephone 418: 683-3431
Manager: M. Drouin
Contact: G. R. Carruthers, Mgr. Sales
Floor Area: 120,000 sq. ft.
Personnel: 350

Manufacturers of: Watthour meters; Panel meters; Switchboard instruments; Carrier current controllers, single and multi-channel; Range and Radio timers; Permanent magnets for speakers, Industrial Applications, Telephone and Magnetic Separation; Repair and Overhaul facilities.
3020 5820 5950 5999 6625 and Page B4.

**CANADIAN GENERAL ELECTRIC
CO. LTD.,**
(Nuclear System)

107 Park St. N.,
Peterborough, Ont.
Telephone 705: 742-7711
Manager: R. C. Johnston
Floor Area: 350,000 sq. ft.
Personnel: 500

Manufacturers of: Nuclear Reactors & Associated Equipment & Nuclear Reactor Fuel.
4470 and Page B13.

**CANADIAN GENERAL ELECTRIC
CO. LTD.,**

(Plastics Section)
755 Division St. N.,
Cobourg, Ont.
Telephone 416: 372-5411
Manager (Plastics): A. M. Hurley
Contact: Ron Hardaker

Floor Area: 125,000 sq. ft.

Personnel: 380

Manufacturers of: Semi Automatic and Automatic moulding of Thermoset Plastics by Compression and Transfer. Fibreglass Reinforced Plastics by Matched Metal Die, Preform and Premix, Autoclave Moulding, Filament Winding and Electrical Laminates. Semi Automatic and Automatic Injection moulding. Blow moulding, extruded shapes in Thermoplastic, Expanded Polystyrene moulded shapes. Moulding of rigid and semi rigid Polyurethane shapes. Technical Design Facilities, Research & Development Group, Tool Room and Laboratory Facilities.

1005	1305	1310	1315	1320	1325
1330	1340	1345	1350	1355	1390
1395	1560	2050	2240	2510	2540
3615	3990	4240	4310	4710	4730
5140	5340	5410	5430	5895	5975
5985	6105	6135	7125	8115	8130
8140	8415	8465	9330	and Page B6.	

CANADIAN INDUSTRIES LIMITED,

630 Dorchester Blvd. W.,

P.O. Box 10,

Montreal, Que.

Telephone 514: 847-3355

President: L. Hynes

Contact: A. S. Donohoe

Floor Area: 4,000,000 sq. ft.

Personnel: 8,000

Manufacturers of: Ammunition, Commercial Explosives and Blasting Agents, Blasting Accessories, T.N.T., P.E.T.N., Sodium Azide and Ammonium Nitrate; Commercial and Military Pyrotechnics, Propellants; Paints, Varnishes and Lacquers, Industrial Chemicals, Fertilizers, Textile Fibres, Polyester and Nylon, Polythene Resins, Film, Sheeting and Tubing, Polyvinyl Chloride Film and Coated Fabrics.

1305	1310	1315	1320	1325	1330
1336	1337	1340	1345	1351	1356
1361	1365	1370	1375	1377	1390
5970	6810	6830	6840	6850	8010
8030	9330	and Page B6.			

CANADIAN LIQUID AIR COMPANY LIMITED,

1210 Sherbrooke St. W.,

Montreal 110, Que.

Telephone 514: 842-5431

TWX: 610-421-3449

President: P. Salbaing

Contact: J. Muller

Floor Area:

Personnel: 1400

Manufacturers of: Industrial and Medical Gases; Welding and Cutting Equipment; Low Temperature Gas Separation Plants; Complete design, engineering and manufacturing services.

3431	3433	3439	3449	3655	3920
4110	4130	4420	6515	6640	6680
6830	8120	9135			

CANADIAN LONGYEAR LIMITED,

1111 Main St. W.,

P.O. Box 330

North Bay, Ont.

Telephone 705: 474-2800

Telex: 027-6194

Managing Dir.: Peter C. Bremner

Contact: Horace C. Gardner, Sales Mgr.

Floor Area: 72,000 sq. ft.

Personnel: 424

Manufacturers of: Diamond Core Drills Machines and Equipment; Diamond Set Coring Bits; Masonry Diamond Bits and Diamond Set Saw Blades. Soil Sampling Tools and Equipment and Slim-hole Oil Well Drilling.

3820

CANADIAN MARCONI COMPANY,

(Head Office)

2442 Trenton Avenue,

Montreal 301, Que.

Telephone 514: 343-3411

Telex: 05-267563

Cable: ARCON

Total Floor Area: 575,000 sq. ft.

Total Personnel: 4,800

1210	1220	1250	5805	5820	5821
5825	5826	5830	5831	5840	5841
5845	5895	5915	5950	5960	5985
5999	6350	7440	7610	and Pages B4, B6, B8, B10, B14, I-78, I-80, I-82, I-84, I-128, I-132, I-134, I-136, I-152, I-154, I-192, I-228, I-230 and I-258.	

(Avionics Division)

Contact: K. C. M. Glegg

Manufacture of: Airborne Doppler sensors for fixed and rotary wing aircraft; airborne computers and indicators for navigational and tactical use; radar altimeters; airborne map displays. Repair and overhaul facilities for all products. System engineering of airborne navigation systems.

(Marine & Land Communications Division)

Contact: H. A. Hamilton

Manufacture of: HF SSB Transceivers, HF & VHF marine radiotelephones, VHF &

UHF FM mobile two-way radio, Selective and Tone calling units, Marine radar.

(Specialized Components Division)

Contact: R. Reeves

Manufacture of: Precision Castings, non-ferrous Single and Multi-Layer Printed Circuit Boards.

(Special Services Division)

Contact: R. MacLeod

Installation of Radar, Communication, Air Navigation, and Microwave Systems, including Towers and Antennas. Repair and Overhaul of Radar, Communications and Navigational Equipments both Ground and Airborne as well as of Sonar and Magnetic Anomaly Detection Equipments. Manufacture of Special Purpose Precision Gears. Repair, Rewinding and Testing of Radar Pulse Transformers and Reactors. Repair and Calibration of Military and Commercial Test Equipment, Facilities approved to Canadian Government DND 1015 Quality Standard.

(Telecommunications Division)

Contact: Mr. J. W. Dodds

Manufacturers of: Tactical and Commercial Radio Relay Equipment, Pulse Code Modulated Combiners and Multiplex equipment. Associated Digital Equipment. System Engineering for Communications Systems.

CANADIAN PORCELAIN COMPANY LIMITED,

Studholme Road,
Hamilton, Ont.

P.O. Box 428

Telephone 416: 522-4648

Telex: 021-633

President & Gen. Mgr.: W. B. Hall

Contact: E. Ladesich, Gen. Sales Mgr.

Floor Area: 175,000 sq. ft.

Personnel: 190

Manufacturers of: Wet process Electric Porcelain Insulators for power and radio applications.

5970

CANADIAN RESEARCH INSTITUTE,

85 Curlew Drive,

Don Mills, Ont.

Telephone 416: 445-6363

Director: R. Spencer Soanes

Contact: Serge Vasquey, Sales Mgr.

Floor Area: 7,500 sq. ft.

Personnel: 20

Manufacturers of: Agitators, Liquid, (Laboratory sizes); Ammeters; Milliammeters; Micrommeters; Amplifiers; Analogue/Digital

Converters; Battery Chargers; Bridges, Electric Testing; Cathodic Protection Units; Chargers, Battery; Chassis, Electronic Assembly; Consoles, Electronic; Counter Type Indicators; Dials, Scale; Frequency Meters; Galvanometers; Geophysical Instruments; Inductive Standards; Inspection Services; Instruments, Testing; Meters; Nuclear Instruments; Ohmmeters; Panels, Indicator and Test; Power Supplies, Electronic; Pyrometers; Regulators, Voltage; Relays, Meter; Resistance Bridges; Resistance Standards; Test Sets, Electric Meter; Test and Inspection; Voltmeters; Watt-meters; Wire Testing Instruments.

5825 5905 5945 6130 6625 6630

6640 6650 6655 6665 6685 7440

and Pages B6, B14, I-173 and I-184.

CANADIAN SKF CO. LTD.,

2201 Eglinton Ave. E.,

Scarboro, Ont.

Telephone 416: 755-4101

Telex: 02-2031

Cable: CANSKFCO

President: N. F. Kallin

Contact: N. L. Rankin, Contract Admin.

Floor Area: 305,000 sq. ft.

Personnel: 800

Manufacturers of: Precision ball & roller bearings, adapters, sleeves, take-ups, locknuts & washers, bushings, pillow blocks & high precision aircraft bearings.

3110 3120 3130

CANADIAN SAFETY FUSE CO.,

Brownsburg, Que.

Telephone 514: 533-4251

President: E. L. Hamilton

Contact: J. C. Finlayson, Marketing Mgr.

Floor Area: 100,000 sq. ft.

Personnel: 300

Manufacturers of: Safety Fuse, Detonating Fuse, Igniter Cord, Ignition Cord Connectors & other related Items.

1375

CANADIAN STEEL FOUNDRIES,

(Div. of Hawker Siddeley Canada Ltd.)

5227 Notre Dame St. E.,

Montreal 426, Que.

Telephone 514: 255-4041

Vice-Pres.: J. G. Mitchell

Contact: L. G. Main, Dir. of Marketing

Floor Area: 650,000 sq. ft.

Personnel: 1200

Manufacturers of: Carbon and alloy steel castings up to 150 tons shipping weight; stainless steel castings; Cansteel rolls; armoured castings; Meehanite iron including

nodular (ductile) iron castings; cast manganese; built up trackwork for subway, surface, mining and industrial plant layouts. Services available for machining, pattern making, welding, pressing, heat treatment and non-destructive testing by gamma ray (100 curie sources), magnaflux.

1095 1325 1330 and Pages B5 and B10.

CANADIAN TAP & DIE CO. LTD.,

27 Yorke Place,
Galt, Ont.
Telephone 519: 621-4940
President: L. E. Teat
Contact: M. E. Dickin, Secretary-Treasurer
Floor Area: 22,900 sq. ft.
Personnel: 30

Manufacturers of: Taps and Tap Wrenches; Dies, Collets and Stocks; Burring Reamers; Repairman's Taper Reamers; Screw Extractors; Acorn Dies.

3455 5110 5120 5136

CANADIAN TECHNICAL TAPE LTD.,

455 Cote Vertu,
Montreal 9, Que.
Telephone 514: 334-1510
Cable: TUCKCAU
Telex: 01-2106
President: L. Cohen
Contact: H. E. Siebert
Floor Area: 150,000 sq. ft.
Personnel: 225

Manufacturers of: Pressure sensitive tapes; Polyethylene film and tubing.

5640 5970 6530 6760 7510 8030
8135

CANADIAN TIMKEN LTD.,

1055 Talbot St.,
St. Thomas, Ont.
Telephone 519: 631-4500
Telex: 024-891
President: George F. Copeland
Contact: B. C. Price, Dir. Sales
Floor Area: 120,000 sq. ft.
Personnel: 730

Manufacturers of: Tapered Roller Bearings. Tungsten Carbide Rock Bits.

3110 3120 3130 3820

CANADIAN TRAILMOBILE LTD.,

Shaver St.,
Brantford, Ont.
Telephone 519: 752-5465
Pres. & Gen. Mgr.: R. M. Syer
Floor Area: 200,000 sq. ft.
Personnel: 350

Manufacturers of: Stake, Van and Dumping Semi-Trailers; Stake Bodies; Van Bodies;

Hydraulic Dump Bodies; Hoists, Hydraulic; Tailgate Loaders; Hydraulic Sand and Material Spreaders for Highway use; Trailing Axles Repair and Overhaul Facilities.
1450 1740 1850 2330 2510 2530
2590 3830 3950 4320

CANADIAN VAC-HYD PROCESSING LTD.,

1371 Speers Road,
Oakville, Ont.
Telephone 416: 827-4171
President: R. E. Pritchard
Contact: J. Wright, Vice-Pres. & Sales Mgr.
Floor Area: 5,500 sq. ft.
Personnel: 30

Provides a service to the aircraft industry in the joining & heat treating of stainless steel using atmospheric hi-temperature furnaces (vacuum, hydrogen & argon).
Page B15.

CANADIAN VALVE CO. LTD.,

872 Derwent Way,
Annacis Industrial Estate,
New Westminster, B.C.
Telephone 604: 521-0791
Telex: 043-5183
President & General Manager: D. E. Stewart
Floor Area: 9,000 sq. ft.
Personnel: 28

Manufacturers of: Valves — Boiler Feed, Water Regulating; Valves — Powered, hydraulic and pneumatic; Valves — Non-powered, Check, Diaphragm, Globe, Marine types, Pressure reducing, Pressure regulating, Relief and Vacuum breakers.
4410 4810 4820

CANADIAN VICKERS LIMITED,

5000 Notre Dame St. E.,
Montreal 404, Que.
Telephone 514: 256-2651
Cable: VICKERS
President: J. Eric Harrington
Contact: T. J. Farrell, Vice-Pres.
Floor Area: 750,000 sq. ft.
Personnel: 2800

Manufacturers of: Steam and Hot Water High Temperature Boilers; Hydraulic Gates and Controls; Mining Equipment; Pulp and Paper Manufacturing Equipment; Copper and Plate Work; Naval and Commercial Ships; Metal Forming and Extrusion Presses; Ship Machinery; Wind Tunnels; Hydraulic Turbines; Marine Turbines and Boilers; Heat Exchangers; Steam Condensers; Oil Refinery Equipment; Aircraft Landing Gear; Ammunition Hoists; Antenna Pedestals and An-

tenna Mast Assembly, Deck Machinery; Windlasses; Winches, Steering Gear, Torpedo Tubes, Sonar Domes and Stabilizers. Weldments in chrome nickel molybdenum alloys including HY80 and HY140, all types of stainless steel, machining of titanium and ultra high tensile steels. Salt bath heat treating of steels and alloys; Repair and overhaul facilities for commercial and naval ships and all classes of industrial machinery.

1045 1190 1340 1440 1450 1620
 1630 1805 1905 1915 1920 1930
 1935 1940 1945 1950 1955 2020
 2030 2040 2050 2090 2220 2240
 2310 2510 2815 2820 2825 3615
 3695 3820 3950 4320 4410 4420
 4470 4520 4810 4920 5450 5895
 6655 7125 8120 and Pages B6, B10 and B13.

CANADIAN WESTINGHOUSE CO. LTD.,
 (Apparatus Products Div.)

P.O. Box 510,
 Hamilton, Ont.
 Telephone 416: 528-8811
 Vice-Pres.: J. Newell
 Contact: A. A. MacIsaac
 Floor Area: 1,100,000 sq. ft.
 Personnel: 1,700

Manufacturers of: Core & Shell Type Power Transformers, Three Phase Voltage Regulators, Turbines & Generators.
 2825 2835 5950 6105 6115 6120

CANADIAN WESTINGHOUSE CO. LTD.,
 (Atomic Power Div.)

Port Hope, Ont.
 Telephone 416: 885-4537
 Contact: W. J. Stirling
 Floor Area: 50,000 sq. ft.
 Personnel: 118

Manufacturers of: Nuclear Grade Ceramic; Uranium-Oxide Fuel Pellets; Metallic and Alloyed Uranium Fuel Rods and Nuclear Fuel Bundles, Zircalloy or Aluminum or Stainless Steel Clad.
 4470 and Page B13.

CANADIAN WESTINGHOUSE CO. LTD.,
 (Distribution Apparatus Div.)

P.O. Box 2220,
 London, Ont.
 Telephone 519: 455-0500
 Manager: N. A. Beyson
 Contact: C. K. Irvine
 Floor Area: 127,600 sq. ft.
 Personnel: 500

Manufacturers of: Distribution, Power & Instrument Transformers, Lightning Arresters, Protective Devices, Capacitors, Power Fuses, Voltage Regulators.
 5910 5920 5925 5950 6110 6120

CANADIAN WESTINGHOUSE COMPANY LIMITED,

(Electronic Tube Division)
 P.O. Box 510,
 Hamilton, Ontario.
 Telephone 416: 528-8811
 Manager: A. A. Peters
 Contact: E. D. Smith
 Floor Area: 179,700 sq. ft.
 Personnel: 698

Manufacturers of: Tubes; miniature, large glass, small transmitting, cathode ray picture.
 5960

CANADIAN WESTINGHOUSE CO. LTD.,
 (Electronics & Defence Products Div.)

P.O. Box 510,
 Hamilton, Ont.
 Telephone 416: 528-8811
 Manager: J. K. Carmak
 Contact: J. C. Wilder
 Floor Area: 180,000 sq. ft.
 Personnel: 950

Manufacturers of: Electronics Systems including Naval Fire Control, Sonar & Torpedoes; Airborne Electronics including Navigation, Intercept & Fire Control Radars; Guidance, Control and Fuzing for Air-to-Air Missiles; Aerospace Ground Equipment, Video Display Equipment, Integrated Circuits, and Electroluminescent Devices.
 1230 1260 1265 1285 1430 5805
 5815 5820 5821 5825 5826 5840
 5841 5845 5895 5915 5950 5985
 5999 6110 6320 6625 6710 6940
 7440 and Pages B4, B6, B8, B10, B14, I-146, I-206, I-208 and I-270.

CANADIAN WESTINGHOUSE CO. LTD.,
 (Lamp Div.)

P.O. Box 1089, 3350 Blvd. Royal,
 Trois Rivieres, Que.
 Telephone 819: 378-6161
 Manager: C. L. Hubling
 Contact: D. J. Moodie, Mgr. Lamp Marketing
 Floor Area: 250,000 sq. ft.
 Personnel: 800

Manufacturers of: Wide Range of Large, Photo & Miniature Class Lamps, Street, Industrial, Flood & Aviation Lighting.
 5950 6240

CANADIAN WESTINGHOUSE COMPANY LIMITED,

(Lighting Division)
P.O. Box 519, Leon Harmel St.,
Granby, Quebec.
Telephone 514: 378-4668
Manager: M. J. McAuliffe
Contact: B. R. Campbell, Manager,
Lighting Marketing
Floor Area: 50,000 sq. ft.
Personnel: 225

Manufacturers of: Street, Commercial, Industrial, flood and aviation lighting, mercury vapour and fluorescent ballasts.
6210 6250 6310 6330

CANADIAN WESTINGHOUSE CO. LTD.,
(Switchgear & Control Div.)

P.O. Box 510,
Hamilton, Ont.
Telephone 416: 528-8811
Manager: L. A. DeRo
Contact: E. W. Hill
Floor Area: 220,000 sq. ft.
Personnel: 750

Manufacturers of: Industrial Control, Moulded Case Circuit Breakers, Power Rectifiers (regulated and unregulated), HV Motor Starters, Instrumentation for Combustion Processes, High Voltage Switch Gear, (5 & 15 KV class), Relay & Instrument Switchboards, Protective Relays and Electrical Indicating Instruments. Runway Lighting Controllers (Solid State) constant current 20 KW capacity.
5925 5945 5950 6110 6120 6130
6150 6625

CANRON LIMITED,
(Electrical Div.)

160 St. Joseph Blvd.,
Lachine 640, Que.
Telephone 514: 637-5531
Gen. Mgr.: K. C. Hague
Contact: T. E. Duffield
Floor Area: 300,000 sq. ft.
Personnel: 1,000

Manufacturers of: Rotating Electrical Equipment; Single Phase Motors — 1/20 h.p. and Larger; Polyphase Induction Motors — 1/8 h.p. to 3000 h.p.; Wound Rotor Induction Motors — up to 2000 h.p.; Direct Current Motors — 1 h.p. to 500 h.p.; Synchronous Motors — 100 h.p. to 2500 h.p.; D.C. Generators — 1/2 K.W. to 400 K.W.; Alternators — 5 K.W. to 2500 K.W.; Vertical Hollow Shaft Motors — 3 h.p. to 500 h.p. Variable Speed Drives, Mechanical, Static Rotating, Eddy Current, Variable Frequency, A.C. & D.C.
6105 6110 6115 and Page B10.

CANRON LIMITED,
(Foundry Div.)

169 Eastern Ave.,
Toronto 2, Ont.
Telephone 416: 363-8801
Telex: 01-2715
Gen. Mgr.: F. E. Miller
Contact: W. E. Burton
Floor Area: 480,000 sq. ft.
Personnel: 580

Manufacturers of: Gray & Alloy Iron Castings; Ingot Moulds; Industrial Wheels; Tunnel Liners.
1325 3820 5680 and Pages B4 and B6.

CANRON LIMITED,
(Mechanical Div.)

160 St. Joseph Blvd.,
Montreal 640, Que.
Telephone 514: 637-6771
Vice-Pres. & Gen. Mgr.: D. J. LaFontaine
Contact: W. T. Welch
Floor Area: 315,000 sq. ft.
Personnel: 460

Manufacturers of: Steel Mill Equipment; Pulp & Paper Machinery; Custom Machinery; Rubber & Plastics Machinery; Valves & Fittings; Metal Working Presses & Shears; Gear Products.
3010 3020 3419 3422 3442 3443
3445 3615 3620 3695 4730 4810
4820 5985

CANRON LIMITED,
(Pipe Div.)

10350 Ray Lawson Blvd.,
Ville D'Anjou 438, Que.
Telephone 514: 352-6600
Telex: 05-267356
Gen. Mgr.: R. Lyle
Contact: M. Roper, Industrial Sales
Floor Area: 500,000 sq. ft.
Personnel: 800

Manufacturers of: Pipe, Cast Iron; Pipe, Gray & Ductile Iron; Pipe Fittings; Concrete Pressure Pipe; Water Supply and Distribution Systems.
4320 4710 4730

CANRON LIMITED,
(Railway Div.)

160 St. Joseph Blvd.,
Montreal 640, Que.
Telephone 514: 637-5531
Telex: 01-2715
Gen. Mgr.: J. K. Stewart
Contact: O. H. Riel
Floor Area: 50,000 sq. ft.
Personnel: 50

Manufacturers of: Railway Track Maintenance Equipment.
2230 2250

CANRON LIMITED,
(Structural Div.)

100 Disco Rd.,
Rexdale, Ont.
Telephone 416: 677-2700
Telex: 01-2715
Gen. Mgr.: I. L. Hamilton
Floor Area: 450,000 sq. ft.
Personnel: 1400

Manufacturers of: Barges, Non Propelled; Building Frames, all types; Bridges Railway, Highway, permanent and portable; Towers — Guyed or Self-supporting, Galvanized or Painted, Transmission, Microwave, Radio, T.V. Scatter, Radar, Aero-Space Communication, Missile Tracking; Switching Structures, Galvanized; Tramway Towers and Related Equipment; Tanks, Storage; Cranes, Bridge, Gantry, etc.; Gates, Stop Logs, Trash Racks; Containers, Cargo, Rigid or Collapsible; Conveyor Supports.

1930 1935 3950 3990 5410 5420
5430 5445 5450 5985 8140 and Page B4.

CANTREND INDUSTRIES LIMITED,

P.O. Box 607,
Hull, Que.
Telephone 819: 777-3832
Telex: 013-3544
Contact: W. Borland, Sales Mgr.
Floor Area: 70,000 sq. ft.
Personnel: 245

S. E. Woods Sportswear Ltd.
Manufacturers of: Sleeping bags & Outer Clothing, Cold Weather.
8405 8410 8415 8465

S. E. Woods (Canvas Div.)
Manufacturers of: Canvas products; Gun Covers Tents etc.
1005 1010 1015 1020 1025 1030
1035 1045 1055 1080 1290 1340
1450 1670 1730 6920 7830 8340
8345 8460 8465

CAPACITORS OF CANADA (1968) LIMITED,

38 Upton Road,
Scarborough, Ont.
Telephone 416: 755-2216
Cable: CAPCAN
President: F. Collins
Floor Area: 15,000 sq. ft.
Personnel: 40

Manufacturers of: Capacitors for the Electronic Industry; Types: Fixed Paper, Tub-

ular, Film Tubulars, Mylar wrap capacitors, Epoxy dipped & Special printed circuit Board Capacitors of Mylar Construction with preformed thermo setting case having fixed configuration.
5910

CAPILANO ENGINEERING CO. LTD.,

1675 West Second Avenue,
Vancouver, B.C.
Telephone 604: 736-9865
President: G. L. McKenney
Contact: W. B. Megaw, Sec. Treas.
Floor Area: 17,500 sq. ft.
Personnel: 33

Manufacturers of: Hydraulic Steering and controls for Boats up to 200 ft. Rudder angle indicators and Boat Steering Wheels. Injection moulded Plastic Cups, "in-flight" Dinnerware and Deep Freeze Containers.
2030 2090 7330 7360

CARRIERE TECHNICAL INDUSTRIES LTD.,

195 Nantucket Blvd.,
Scarborough, Ont.
Telephone 416: 757-5103
President: R. J. Carriere
Floor Area: 57,500 sq. ft.
Personnel: 180

Manufacturers of: Wiring & Cable Harnesses for all purposes. Repair & Overhaul of Power Systems, Linear Actuator Systems, Aircraft Ground Support Systems, Airborne Instrument Systems, Fuel, Vacuum & Hydraulic Systems and Aircraft Electrical Systems.

5995 5999 and Page B14.

JAMES B. CARTER LIMITED,

Osborne & Mulvey St.,
P.O. Box 962,
Winnipeg 1, Manitoba.
Telephone 204: 452-2005
President: D. Sprague
Contact: M. P. Longworth, Sales Mgr.
Floor Area: 80,000 sq. ft.
Personnel: 240

Manufacturers of: Electric Engine Heaters for cars, trucks and tractors; Vehicle interior pre-heaters; Battery heating blankets; Related items for cold weather applications; Heaters and heating elements for liquids.
2540 2990 4520 4540

CARTIER CHEMICAL CO. LIMITED,

445-21st Avenue,
Lachine, P.Q.
Telephone 514: 637-4631
President: A. Robins

Contact: N. J. Keesal, General Manager
Floor Area: Approx. 65,000 sq. ft.
Personnel: 48

Manufacturers of: Industrial Chemical Specialty Products; Floor sealers — Cement — Terrazzo — Wood; Cement curing compounds; Disinfectants; Germicidal cleaners; Soaps — liquid — bar; Floor cleaners; Liquid floor waxes — all types; Insecticides; Safety solvents; Chemical specialties made to specifications; Dishwashing compounds, hands — machine; Laundry compounds; Wall washing compounds; Corrosion resistant finishes (floors) Oil absorbents; Aircraft cleaners; Metal cleaners; Stainless steel cleaners; Steam cleaners.
6840 6850 8010 8030

CENTRAL DYNAMICS LTD.,

147 Hymus Blvd.,
Pointe Claire, Que.
Telephone 514: 697-0810
TWX: 610-422-3906
President: A. C. Boland
Contact: P. Carey, Product Div. Mgr.
(Electronics)
Floor Area: 50,000 sq. ft.
Personnel: 300

Manufacturers of: Electronic and Electro-mechanical Aircraft Components; Thermocouple Harnesses; Audio and Video Equipment; Data Logging Systems; Industrial Instrumentation.

1680 2925 5820 5830 5895 5945
5999 6685 and Page B10.

CERCAST INC.,

3905 Industrial Blvd.,
Montreal 459, Que.
Telephone 514: 322-2371
President: F. Valenta
Contact: E. Heimbach, Sales Mgr.
Floor Area: 30,000 sq. ft.
Personnel: 95

Non Ferrous Investment Castings.
Page B4.

CHAMPLAIN POWER PRODUCTS LTD.,

951 Martin Grove Rd.,
Rexdale, Ont.
Telephone 416: 248-6657
President: P. W. Gooch, P.Eng.
Contact: R. H. Hogue, P.Eng., Vice Pres.
Floor Area: 14,000 sq. ft.
Personnel: 42

Manufacturers of: Control Systems. Hydrostatic and Electrical Shaft Seals; Fluid Velocity Meters; Temperature Recorders; Focussing Magnets; Data Loggers. Manual

Entry Systems. Void Fraction Meters; Focussing Magnets, test rigs, and leak detection tape.

4910 4920 5340 5999 6110 6660
6680 8030 and Page I-172.

CHEMICAL PROJECTS LTD.,

36 Greensboro Dr.,
Rexdale, Ont.
Telephone 416: 247-8282
President: L. A. Pogorski
Personnel: 16

Manufacturers of: Mass spectrometer and gas chromatograph inlets and sample preparation systems, zero dead volume and special stainless steel valves, packless, magnetic pumps, portable trace analysers, complete systems for determination of vapour-liquid equilibria and gas solubilities at low to high temperatures and pressures, custom skid-mounted pilot plants. Research capabilities in chemical engineering, chemistry, physics and earth sciences — cryogenics, experimental determination of thermodynamic properties of multi-component systems, trace analysis, isotope ratio determinations. Geochemical survey services — onshore, offshore surveys for oil and natural gas. Air pollution services.

4320 4820 6630 6635 6640
and Page B6.

CHICAGO RAWHIDE PRODUCTS (CANADA) LIMITED,

Park Road & Henry Street,
Brantford, Ontario.
Telephone 519: 753-4136
Contact: K. B. Mowat, Plant Manager
Floor Area: 585,830 sq. ft.
Personnel: 180

Manufacturers of: moulded synthetic rubber parts, oil seals, hammers, mallets.
2530

CHRYSLER CANADA LTD.,

P.O. Box 60,
Windsor 19, Ont.
Telephone 519: 252-3651
President: R. W. Todgham
Contact: J. E. Elliott
Floor Area: 4,000,000 sq. ft.
Personnel: 14,000

Manufacturers of: Vehicular equipment components, Internal combustion engines (non-aircraft), Cars, Trucks, Gas combustion and Industrial engines, Ammunition components; Aluminum & Grey Iron castings; Powered metal products.
1340 2310 2320 2510 2805
and Page B4.

CLEVITE BURGESS LTD.,

415 Buttrey St.,
Niagara Falls, Ont.
Telephone 416: 354-1671
Vice-Pres. & Gen. Mgr.: W. H. Jeffrey
Contact: S. A. Ellis
Floor Area: 72,500 sq. ft.
Personnel: 160

Manufacturers of: Batteries Dry Cell, Silver-Magnesium Reserve Batteries — Lanterns and Flashlights; Commercial rollers of Pure Zinc and Copper Titanium Zinc Alloy, Ribbon and Sheet.
6135 9535

THE CLEVITE LIMITED,

1177 Talbot St.,
St. Thomas, Ont.
Telephone 519: 631-4880
TWX: 610-356-6708
Vice-Pres. & Gen. Mgr.: Leon J. Wilson
Contact: Donald A. Gustafson, Mgr. Sales & Eng.
Floor Area: 148,000 sq. ft.
Personnel: 525

Manufacturers of: Powder Metal Structural Parts, Gears, Cams, etc: Powder Metal Bushings; Sleeve Bearings, Steel Backed, Non-ferrous Metal Lined, Used as connecting Rod and Camshaft Bearings in internal combustion Engines; Bushings used in Engines, Appliances, etc; Rubber-Metal suspension parts.
3120

GEO. CLUTHE MFG. CO. LTD.,

141 Weber St. S.,
Waterloo, Ontario.
Telephone 519: 743-2695
Sales Manager: J. E. Cluthe
Contact: J. L. Cash — Sales Department
Floor Area: 53,000 sq. ft.
Personnel: 140

Manufacturers of: Screwdrivers; Plastic Oil Cans; Plastic Filter Funnels; Soft Faced Hammers; Custom injection molding of thermoplastics.
5120

COCHRANE TOOL & DESIGN LIMITED,

425 Midwest Road,
Scarborough, Ont.
Telephone 416: 757-6285
President: Robert Cochrane
Contact: Bernard Whitham
Floor Area: 25,000 sq. ft.
Personnel: 64

Manufacturers of: Dies, Fixtures, Gauges, Moulds Special production machinery. Precision Stamping.
3419 3456 3465 3695 5110 5136

COLLINS RADIO COMPANY OF CANADA LTD.,

150 Bartley Drive,
Toronto 16, Ont.
Telephone 416: 757-1101
Cable: COLINRAD
Vice-President: S. F. Jackson
Contact: J. H. Pile, Contracts Mgr.
Floor Area: 104,000 sq. ft.
Personnel: 600

Manufacturers of: Airborne radio communications and navigational equipment; fixed station and mobile SSB ground communications equipment; Tropospheric Scatter equipment; log periodic antennas.
5805 5815 5820 5821 5826 5831
5895 5915 5985 6130 and Pages B6, B10, I-116, I-124 and I-126.

COLONIAL TOOL COMPANY,

1691 Walker Road,
Windsor, Ontario.
Telephone 519: 253-2461
Vice-President and General Manager:
R. H. Strickland
Contact: O. G. Gagnier — Sales Manager
Floor Space: 34,370 sq. ft.
Personnel: 125

Manufacturers of: Metal cutting tools and carbide tools (broaches, fixtures, milling cutters, hobs, gear shaving cutters, gear shaper cutters, rolling racks, special tools).
3455 5130 5220

COLUMBUS MCKINNON LTD.,

P.O. Box 668,
St. Catharines, Ont.
Telephone 416: 682-2661
Telex: 02-1511
President & Gen. Mgr.: E. Kennard
Contact: J. A. Loucks, Marketing Mgr.
Floor Area: 140,000 sq. ft.
Personnel: 270

Manufacturers of: Chain, all types. Chain Fittings & attachments, Hoists, Electric and Hand. Nylon Slings. Herc-Alloy Chain Slings.
3940 3950 4010

COMBUSTION ENGINEERING SUPERHEATER LTD.,

2015 Peel St.,
Montreal 2, Que.
Telephone 514: 842-8701
TWX: 610-421-3692

President: R. L. Riker
Contact: J. D. Anderson, Mgr. Export Sales
Floor Area: Factory, 220,000 sq. ft.
Personnel: 1200

Manufacturers of: Steam generating and fuel burning equipment.

3820 4410 4420 4440 4470 4530
4540 5430 and Page B13.

COMPUTER METAL REG'D.,

7800 Cote de Liesse,
Montreal 376, Que.
Telephone 514: 342-9457
President: W. Odze
Contact: G. Maass, Mgr.
Floor Area: 10,000 sq. ft.
Personnel: 40

Manufacturers of: Standard Electronic Enclosures; Consoles; Cubicles. Racks; Chassis; Panels. Modular Cabinets. R.F.I. Shielded Cabinets. Cabinets with pull-out and swing-out frames. Plug-in chassis assemblies. Printed Circuit Card Cases. Convertible Instrument Cases. Instrument dollies.

5805 5815 5820 5821 5825 5826
5830 5831 5840 5841 5895 5975
5999 7125

COMPUTING DEVICES OF CANADA LIMITED,

P.O. Box 508,
Ottawa 4, Ont.
Telephone 613: 829-1800
Telex: 013-439
President & Gen. Mgr.: J. F. Taylor
Contact: Dr. G. P. T. Wilenius,
Vice-Pres., Marketing
Floor Area: 261,000 sq. ft.
Personnel: 1500

Manufacturers of: Air Navigation Systems, Analog & Digital Computers, Photo Reconnaissance & Photo Optical Systems, Electronic & Electro-mechanical Devices, Electronic & Nucleonic Instruments, Marine Navigation & Survey Electronic Systems. Services: Aerophysics Research; Software Services; Environmental Test Facilities; Data Reduction, Processing and Analysis; Data Handling for Telemetry Stations. Navigation Systems & Support for Survey Industry. Engineering Field Services; Technical and Operational Training; Systems Design Development and Management; Technical Operating and Maintenance Manuals; Hydrographic & Oceanographic Surveys; Marine Survey Consultants; Ship Automation and Instrumentation. Repair & Overhaul.

1210 1220 1230 1287 1290 1410

1420 1430 1440 1450 2010 5805
5815 5820 5821 5825 5826 5845
5850 5855 5860 5895 5915 5985
5995 5999 6310 6320 6330 6350
6605 6610 6655 6665 6710 6910
6920 6930 6940 7440 7610 & Pages
6920 6930 6940 7440 7610 and Pages
B4, B6, B8, B10, B13, B14, I-88, I-110,
I-140, I-162, I-168 and I-288.

THE CONSTANTA CO. OF CANADA LTD.,

280 Regina Ave.,
Montreal 203, Que.
Telephone 514: 766-8569
President: J. K. Wong
Floor Area: 5000 sq. ft.
Personnel: 20

Manufacturers of: Precision deposited carbon film; Metal film; High value; High frequency; Positive temperature coefficient compensation; and Ultra low ohm ribbon resistors.

5905

CONUCLEAR LTD.,

551 Ferry Rd.,
Winnipeg 21, Manitoba.
Telephone 204: 783-4770
President: Dr. K. I. Roulston
Contact: A. M. Roulston, Mgr.
Floor Area: 13,000
Personnel: 20

Manufacturers of: Portable and laboratory radiation measuring instruments for nuclear research and nuclear medicine uses. Nuclear radiation detector probes. Neutron detection probes using Pulse Shape Discrimination methods. A.E.C. Nuclear Instrument modules for nuclear research. Automatic planchet changer.

6665

COPE TOOL DESIGN CO. LTD.,

2477 Howard Ave.,
Windsor, Ont.
Telephone 519: 256-5167
President: Owen J. Peverall
Contact: C. Parry-Jones, Vice-Pres.
Floor Area: 2500 sq. ft.
Personnel: 15

Designers of: Special machines, Fixtures, Jigs, Dies, Gauges and Welding Fixtures for Automotive and Aircraft Industry.
Page B6.

COULTER COPPER & BRASS CO LIMITED,

44 Coronet Road,
Toronto 18, Ontario.
Telephone 416: 239-2771

President & General Manager: W. R. Coulter
Contact: J. T. Wilkinson, Sales Manager
Floor Area: 20,000 sq. ft.
Personnel: 50

Manufacturers of: Non-ferrous castings, Spinnings, Anodized aluminum sheets and reflectors; Steam jacketed kettles, stainless steel tanks, hot water tanks and heater shells; Fire extinguishers; Copper and stainless steel floats.

4210 4420 4440 4520 4620 4730
5450 7330 and Page B4.

THE CRAIG BIT COMPANY LIMITED,

180 Ninth Street, P.O. Box 10
North Bay, Ontario.
Telephone 705: 472-1400
General Manager: J. A. Reid
Contact: F. J. Cooke, Accountant
Floor Area: 37,120 sq. ft.
Personnel: 67

Manufacturers of: Rock Drilling Tools for Mining, Quarrying and Construction: Taper Shank Grinders; Chisel Rod Grinders; Four Wing Bit Grinders; Paving Breaker Tools (moil points, chisels, asphalt cutters, frost wedges, clay spades, digging chisels, etc.); Column Bar Parts; Taper socket tungsten carbide rock drill bits, rods, hand reamers, shims, knock off blocks, rod gauges; Extension rods, couplings, striking bars, bits, recovery tools; Integral T.C. Drill Rods; Tungsten Carbide reamer Bits, Rods and accessories; Steel Throwaway Bits, Rods, and Accessories; Miscellaneous Mine Tools: — Mining Gads, Scaling Bars, Timber Dogs, Grinding Wheels.

3415 3820 5120 5210

CROVEN LIMITED,

500 Beech St.,
Whitby, Ont.
Telephone 416: 668-3325
TWX: 610-384-2750
Gen. Mgr.: S. C. McCarten
Contact: R. E. Dix, Sales Mgr.
Floor Area: 27,000 sq. ft.
Personnel: 400

Manufacturers of: Quartz Crystals; Crystal Ovens and Crystal Oscillators for Frequency Control.

5820 5821 5825 5826 5840 5841
5845 5895 5955

CRUCIBLE STEEL OF CANADA LIMITED,

Sorel, Que.
Telephone 514: 743-7931
President: B. M. Hamilton

Contact: Dr. W. Morris, Mgr. Sales
Floor Area: 340,000 sq. ft.
Personnel: 300

Manufacturers of: Carbon-Alloy-Stainless and Tool Steel. Stainless Steel Flat Roll. Forged Products. Marine Shafting.
2010 9515 and Page B9.

CUMMINS EASTERN CANADA LIMITED, **(Manufacturing Division),**

P.O. Box 40, Station "U",
Toronto 18, Ontario.
Telephone 416: 239-8181
President: N. E. Hipwell
Contact: A. M. Patrick
Floor Area: 6,000 sq. ft.
Personnel: 25

Manufacturers of: Diesel generating sets; diesel powered pumping units, compressor sets; marine auxiliaries; diesel marine propulsion units; local and/or remote controls for above equipment for manual, semi-automatic or fully automatic operation of single or multiple units for all types of site conditions.

2805 2815 4310 4320 5975 6115

CURTIS HOOVER LTD.,

12654 - 97 St.,
P.O. Box 426,
Edmonton 30, Alberta.
Telephone 403: 476-7681
Telex: 037-2674
President: Mrs. C. Hoover
Contact: S. G. Johnson, Production
Superintendent
Floor Area: 15,000 sq. ft.
Personnel: 70

Manufacturers of: Special Purpose Machinery; Special Mobile Equipment; Special Underground Equipment. Gate Valves, Screwed End, Flanged & Weld Neck; Check Valves, Screwed End, Flanged & Weld Neck; Shut Off Valves Pressure Actuated. Duplex Reciprocating Piston Pumps. Flash Butt Welded Products, Tubes, Struts, Rings. Gears — Spur, Helical, Herringbone, Bevel and Internal. Sprockets — Single and Multiple Strand with Flame Hardened Teeth. Special Gear Boxes, Speed Increasers and Reducers. Special Hydraulic Cylinders and Standard Industrial Hydraulic Power Packages. Combination Dump Boxes and Sand-spreaders. Jigs and Fixtures. Repair, Overhaul and Production Facilities. Non-Destructive Testing.

1010 1015 1020 3020 3465 3695
3830 4320 4730 4820 4920 and Page B10.

CYANAMID OF CANADA LIMITED,

**635 Dorchester Blvd. W.,
Montreal 101, Que.
Telephone 514: 866-5611
President: B. H. Loper
Contact: W. J. Nichols
Floor Area: 8 Plants — 300 Acres.
Personnel: 2,500**

Manufacturers of: Nitroguanadine; Heavy
Chemicals; Process Chemicals; Nitrogen
Products; Plastics & Resins; MEL-MAC
quality Melamine Dinnerware; FORMICA
Decorative Laminated Plastics; Pharmaceu-
ticals.

6505 6810 7350 9330

**CANADA DECALCOMANIA COMPANY
LIMITED**

**400 Midwest Road,
Scarborough, Ont.
Telephone 416: 751-6522
President: Ralph Broad
Ottawa Representative
G.M. Dunlop, District Manager
549 Bathurst Ave.,
Ottawa 8, Ont.
Telephone 613: 236-3964
Floor Area: 60,000 sq. ft.
Personnel: 150**

Manufacturers of: Pressure sensitive high
tensile strength films. Decalcomania trans-
fers, water, cement and heat applied for
any application.

DALE ELECTRONICS CANADA LIMITED,

18 Howden Road,
 Scarborough, Ontario.
 Telephone 416: 759-5631
 TWX: 610-492-1381
 Managing Director: R. A. Wells
 Contact: K. J. Beeby, Sales Manager
 Floor Area: 15,000 sq. ft.
 Personnel: 70

Manufacturers of: Vitreous Enamel Wire-Wound Power Resistors; Precision Wire-Wound Silicone Coated Resistors; Precision Trimmers; Resistors, Fixed Wire-Wound, Power Type; Resistor Networks.
 5905

DAVIE SHIPBUILDING LIMITED,

P.O. Box 130,
 Lauzon, Levis, Que.
 Telephone 418: 837-5841
 Telex: 011-254
 Cable: DAVIESHIP
 Gen. Mgr.: T. Veliotis
 Contact: P. J. Gwyn
 Floor Area: 154,000 sq. ft.
 Personnel: 2,600

Manufacturers of: Cargo & Tanker Vessels; Combat Ships & Landing Vessels; Fishing Vessels; Dredges; Special Service Vessels; Transport Vessels, Passenger & Troop; Small Craft Barges & Lighters; Pontoons & Floating Docks; Buoys; Boilers, Industrial; Autoclaves; Tanks, Liquid Storage, Metal; Pressure Vessels, Flasks, Steel, Compressed Air; Heat Exchangers; Launchers, Guided Missile; Pipe Line; Kettles, Asphalt; Hydraulic Control Gates & Appurtances; Repair & Overhaul Facilities; Machining, Medium & Heavy.

1010	1015	1020	1025	1045	1440
1650	1905	1910	1915	1920	1925
1930	1935	1940	1945	1950	1955
2010	2020	2040	2050	2220	3442
3615	3695	3895	3940	3950	4410
4420	4430	4470	4520	4710	4810
4820	5430	5450	5845	8120	and Pages

B10, B13 and I-206.

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED,

Downsview, Ont.
 Telephone 416: 633-7310
 President: William B. Boggs
 Contact: D. L. Buchanan, Vice-Pres. Sales
 Floor Area: 1,361,000 sq. ft.
 Personnel: 4,800

Manufacturers of: STOL (short take-off & landing) Multi-engine transport aircraft for commercial & military use. Aircraft currently in production: 14-20 passenger Twin Otter Turboprop, 41 passenger Twin Turbine Buffalo, 30 passenger Twin, Piston Powered Caribou. Design study underway for a 40 passenger 4 engined STOL Turboprop. Aircraft Components & Assemblies; Repair & Overhaul facilities for Aircraft and Engines; Research & Development of experimental Aircraft and Allied Products; Hydrofoil research & development.
 1510 1540 1560 1620 1670 1680
 1730 4920 6615 and Pages B6, B10, B14, I-8, I-12, I-14 and I-208.

DELAMERE & WILLIAMS COMPANY, LIMITED,

35 Carson Street,
 Toronto 14, Ontario.
 Telephone 416: 259-7677
 Vice President & General Manager:
 H. S. Stevenson
 Contact: B. R. Markell — Vice President,
 Sales
 Floor Area: 25,000 sq. ft.
 Personnel: 200

Manufacturers of: Automatic and Semi-Automatic Packaging Machines.
 3695

DELORO STELLITE,

(Div. of Deloro Smelting and Refining Co. Ltd.),
 Box 5300, Dundas Street East,
 Belleville, Ontario.
 Telephone 613: 968-6431
 Telex: 06-217501
 General Manager: J. C. Houston
 Contact: B. G. MacKenzie, Sales Manager
 Floor Area: 80,000 sq. ft.
 Personnel: 175

Manufacturers of: Castings in cobalt and nickel base alloys; high alloy steels, bronze and aluminum; Hardfacing rods and electrodes (Stellite); Casting methods-Sand shell, Shaw Process (close tolerance) and sand moulding; Weight of Casting — 200 lbs. maximum.

1005	2805	2815	2835	2910	3439
3455	3460	3895	4310	4410	4430
5110	5136	6520	9510	and Page	B4.

DELRO INDUSTRIES LTD.,

1072 King Edward St.,
 Winnipeg 21, Manitoba.
 Telephone 204: 775-8166
 Gen. Mgr.: R. C. Herd

Contact: R. C. Wright, Marketing Mgr.
Floor Area: 22,000 sq. ft.
Personnel: 75

Manufacturers of: Drill bits, Coring & Non-coring Diamond; Rock core drilling accessories; Saws, Concrete & masonry diamond; Wheels, Grinding, Diamond; Tools, forming, diamond; Pullers.

2805 3439 3820 5120 5130 5180
5345

DEMERS, GORDON, BABY LTD.,

1550 West de Maisonneuve Blvd.,
Suite 402,
Montreal 107, Que.
Telephone 514: 935-7447
Telex: 01-20612
Cable: SNCINC
Eng. Partner: Pierre Demers
Floor Area: 7,500 sq. ft.
Personnel: 26

Consulting & Design Services in: Operational Research; Management Control Techniques; Systems Engineering & Analysis in: Digital Computer Applications, Digital Information Systems, Automation & Control, Communications and Electronics.
Page B6.

DESIGNED PRECISION CASTINGS,

75 Eastern Ave.,
Brampton, Ont.
Telephone 416: 677-4422
Vice-Pres.: R. D. Watt
Contact: H. N. Clark
Floor Area: 30,000 sq. ft.
Personnel: 95

Manufacturers of: Precision Castings (Investment), Ferrous & Non-ferrous.
Page B4.

DESITRON COMPANY LTD.,

198 Hymus Rd.,
Scarborough, Ont.
Telephone 416: 759-1151
President: F. A. Walther
Contact: W. B. Scott, Gen. Mgr.
Floor Area: 4000 sq. ft.
Personnel: 15

Designers and Manufacturers of: Microwave Components and Sub-Systems, standard or custom designed.

5820 5821 5825 5826 5840 5841
5895 5915 5985 6625

DEUTZ DIESEL (CANADA) LTD.,

90 Montee de Liesse,
Montreal, Quebec.

Telephone 514: 636-1480
Contact: W. Loevinsohn, Vice-Pres. & Gen. Manager

Floor Area: 15,136 sq. ft.
Personnel: 27

Manufacturers of: Diesel-powered generating sets, pumping sets and specialized Diesel-powered equipment.

2805 4210 4310 4320 6115

DEVILBISS CANADA LTD.,

Box 3000,
Barrie, Ont.
Telephone 705: 728-5501
Telex: 02-8718
President: G. H. Williams
Contact: J. S. Watton, Industrial Sales Mgr.
Floor Area: 100,000 sq. ft.
Personnel: 200

Manufacturers of: Industrial spray painting and finishing equipment; Spray-booths; Finishing systems; Air compressors; Industrial ovens; Spray guns; Air regulators; Hose and hose connections.

4140 4310 4430 4450 4720 4730
4940 6515

DEVTEK LIMITED,

1450 O'Connor Drive,
Toronto 16, Ont.
Telephone 416: 755-3389
President: D. N. Kendall
Contact: D. R. Loveless, Vice-Pres.,
Marketing
Floor Area: 7,500 sq. ft.
Personnel: 20

Manufacturers of: Microwave drying equipment; No-contact Web or Film Handling Equipment; Film Processing Equipment. Research, Development & Design Capabilities and Facilities in Microwave and Electro-mechanical Fields.

3130 3615 3695 6740 and Pages B6, B14 and I-250.

DIEMAKERS LIMITED,

145 Graveline Street,
Montreal 9, Que.
Telephone 514: 735-5521
President: Morris Weiner
Floor Area: 18,000 sq. ft.
Personnel: 32

Manufacturers of: Tools, Dies, Jigs, Fixtures; Special Machinery for Automatic Assembly of Small Parts.

2510 3465 5110 and Page B10.

DOMINION ALUMINUM FABRICATING LTD.,

36 Coronet Rd.,
Toronto 18, Ont.
Telephone 416: 239-4855
Telex: 02-29029

Pres. & Gen. Mgr.: Murray R. Maynard
Contact: Charles F. Wood, Chief Eng.
Floor Area: 50,000 sq. ft.
Personnel: 50

Manufacturers of: Aluminum Flagpoles, Expansion Joints, Light Standards, Railings, Trusses, Scaffolds, etc; Portable Buildings & Shelters; Helicopter Hangars, Telescopic, Aluminum for Shipboard use; Shipping Containers, Aluminum, Rigid; Shipping Containers, Aluminum Collapsible; Aluminum Towers; Repair & Overhaul Facilities. 5410 5670 6210 8110 8115 8140 and Page I-220.

DOMINION BRIDGE COMPANY LIMITED,

555 Notre Dame Street,
Lachine, Quebec.
Telephone 514: 634-3551
President: M. McMurray
Contact: R. J. A. Fricker, Vice-Pres. of Operations
Floor Area: 3,028,567 sq. ft.
Personnel: 7,000

Manufacturers of: Structural steel; Bridges; Towers — guyed or self-supporting, transmission, microwave, radio, T.V. scatter, heavy custom built material handling, machinery, pressure vessels; Tanks; Kilns; Penstocks; Ship components; Nuclear Energy plant components; Miscellaneous steel weldments.

1905 1930 1935 1945 1950 2020
2030 2040 2050 3020 3695 3950
3990 4410 4420 4430 4440 4470
4520 5420 5430 5440 5445 5450
5670 5680 5845 8120 9510 and Pages B4 and B13.

DOMINION CHAIN COMPANY LIMITED,

617 Douro Street,
P.O. Box 578,
Stratford, Ont.
Telephone 519: 273-0840
General Manager: D. E. MacDonald
Contact: J. W. Fraser (Sales Mgr.)
Floor Area: 205,000 sq. ft.
Personnel: 280

Manufacturers of: Chain — All types; Slings — Chain, Wire Rope, Nylon & Wire Mesh; Dropped Forged Chain and Forged Wire Rope Fittings.
3940 4010 and Page B9.

DOMINION CUTOOUT LIMITED,

155 Nantucket Blvd.,
Scarborough, Ont.
Telephone 416: 759-9377
Telex: 02-21524
President: D. C. Ferguson
Contact: W. L. Kennedy, Vice-Pres. & Gen. Mgr.
Floor Area: 23,000 sq. ft.
Personnel: 75

Manufacturers of: HV Electrical Transmission and Distribution Equipment, from 7.5 to 230 KV, incl. Fuses, Fuse Links and Switches and Power Connectors.

5920 5925 5930 5935 6110

DOMINION ENGINEERING WORKS LTD.,

P.O. Box 220,
Montreal 101, Que.
Telephone 514: 634-3411
Telex: 01-2114
Cable: DOMWORKS
President: L. R. Douglas
Contact: R. P. Vaughan, Mgr., Sales & Service
Floor Area: 1,200,000 sq. ft.
Personnel: 2,500

Manufacturers of: Pulp and Paper Machinery; Hydraulic Turbines and Penstock Valves; Rolling Mill Machinery; Rubber and Plastics Machinery; Mining Machinery; Hydraulic Presses; Standard, High Speed and Special Gear Units; Chilled and Alloy Iron Rolls; Cast and Forged Steel Rolls; Butterfly Valves; Tilting Disc Check Valves; Power Cranes and Shovels (1 to 4½ cu. yd.)

2825 3010 3020 3422 3442 3615
3620 3695 3805 3810 3815 3820
3950 4810 4820 and Pages B4 and B10.

DOMINION FORGE CO.

2480 Seminole St.,
Windsor, Ont.
Telephone 519: 254-7545
Pres. & Gen. Mgr.: H. Young
Contact: R. T. Herdgen, Jr., Dir. of Marketing & Sales
Floor Area: 241,000 sq. ft.
Personnel: 700

Manufacturers of: Closed Die Forgings of Steel, Alloy Steel, Stainless Steel and High Temperature Alloys Ranging in Weight to 130 lbs.

Page B9.

**DOMINION FOUNDRIES & STEEL
LIMITED,**

P.O. Box 460,
Hamilton, Ont.
Telephone 416: 544-3761
Telex: 02-1682
President: F. H. Sherman
Contact: R. C. Varah, Asst. to Exec.,
V.P. Commercial
Floor Area: 900 acres
Personnel: 7,000

Manufacturers of: Hot Rolled Steel Sheet and Strip; Electrolytic and Hot Dipped Tin Plate; Steel Plate; Galvanized Steel Sheet and Strip; Floor Plate; Carbon, Alloy and Stainless Steel Castings; Skelp; Pig Iron; Cold Rolled Steel Sheet and Strip; Coke Oven By-Products; Vitreous Enamelling Sheet; Silicon Electrical Steel and Strip; Blue Plate; Tin Mill Black Plate.
9515 9520 and Page B4.

DOMINION HELICOPTERS LIMITED,

R.R. No. 1,
P.O. Box 340,
King City, Ontario.
Telephone 416: 925-9859
President: J. M. Fleming
Floor Area: 7,000 sq. ft.
Personnel: 75

Manufacturers of: Helicopter ground handling equipment, cargo racks and skis; A complete line of cowlings, designed for winter operations, are manufactured in conjunction with a heater kit for cabin and pre-heating helicopters; Major overhaul facilities are available for all light helicopters including transmissions, gear boxes, controls, and related systems.
1660 1670 1730 and Page B14.

DOMINION LOCK COMPANY LTD.,

7301 Decarie Blvd.,
Montreal 9, Quebec.
Telephone 514: 738-1112
President: A. B. Zion
Floor Area: 60,000 sq. ft.
Personnel: 175

Manufacturers of: Die cast components for fuses. Lock sets, key blanks, miscellaneous hardware (die cast items up to 5 lbs.)
5340 and Page B4.

DOMINION MAGNESIUM LIMITED,

7 King St. East,
Toronto 1, Ontario.
Telephone 416: 362-7292

Telex: 02-2720
Cable: DOMAL
General Manager: J. Thomson
Contact: H. G. Warrington, Mgr. Sales &
Technical Service.
Floor Area: 190,000 sq. ft.
Personnel: 500

Manufacturers of: Magnesium metal ingots; Magnesium alloy ingots and billets; Magnesium alloy rods, bars and tubing and pipe; Magnesium alloy extruded shapes; Barium metal; Strontium Metal; Calcium metal; Thorium metal; Master alloys of Magnesium-Thorium; Copper-Zirconium; Magnesium-Nickel.
4710 9530 9540 9630 9650

**THE DOMINION ROAD MACHINERY CO.
LTD.,**

Maitland Rd.,
Goderich, Ont.
Telephone 519: 524-7374
President: B. A. Sully
Contact: E. C. Hill, Gen. Mgr.
Floor Area: 120,000 sq. ft.
Personnel: 285

Manufacturers of: Motor Road Graders; Hydro Planetary; Split Torque Transmissions; Mechanical Transmissions.
3010 3805 3825

DONALD ROPES & WIRE CLOTH LTD.,

125 Napier St.,
Hamilton, Ont.
Telephone 416: 528-5951
Cable: BONACCORD
President: H. S. Baldwin
Contact: R. A. Johnson, Gen. Sales Mgr.
Floor Area: 565,000 sq. ft.
Personnel: 800

Manufacturers of: Wire Rope; Aircraft Launching and Arresting Assemblies; Wire Rope Slings and Assemblies; Perforated Metals; Steel Wire Cloth and Screens.
1375 1710 1720 2020 3695 3820
3940 4010 5335 9505 9515 9535

DOROTHEA KNITTING MILLS LTD.,

20 Research Rd.,
Toronto 17, Ont.
Telephone 416: 421-3773
Contact: L. Borsook, Chairman
Personnel: 200
Floor Area: 80,000 sq. ft.

Manufacturers of: Berets and Military Headwear; Cold Weather Hoods; Sweaters for Men and Women.
8405 8410

DOUGLAS AIRCRAFT CO. OF CANADA LTD.,

Airport Rd.,
Toronto, A.M.F. Ont.
Telephone 416: 677-4341
President: D. W. Douglas Jr.
Contact: A. W. Baker, V.P. & Deputy
General Mgr.
Floor Area: 1,800,000 sq. ft.
Personnel: 4,200

Manufacturers of: Passenger, Cargo and Military Aircraft. Aerospace Components. Structural Assemblies. Galleys. Production Jigs, Fixtures and Templates. Machine and Tool Design. Machining.
1510 1560 1680 1730 1740 2925
3465 and Pages B6, B10 and B15.

DOUGLAS ENGINEERING CO. LTD.,
(EngMark Division)

16 Lesmill Rd.,
Don Mills, Ont.
Telephone 416: 449-1900
Cable: VENTAIR
Contact: J. C. Lange, P.Eng., Mgr. EngMark Div.
Floor Area: 60,000 sq. ft.
Personnel: 240

Manufacturers of: Air Intake Filters, Carburettor.
2945

DOW CHEMICAL OF CANADA LTD.,

P.O. Box 1012,
Sarnia, Ont.
Telephone 519: 337-8282
President: L. D. Smithers
Contact: F. E. Punnett, Mgr. Chemicals & Export Sales
Floor Area: 200,000 sq. ft. plus 20 plants on 450 acre site
Personnel: 2,133

Manufacturers of: Bioproducts, Chemicals, Plastics; Plastic Containers; Textile Fibres. Chlorinated solvents, Polystyrene, Polyethylene, Plastic packaging materials and containers, Glycols, Pharmaceutical chemicals, Veterinary chemicals, Trichlorethylene, Perchloroethylene, Phenol and phenol derivatives, Other industrial chemicals.
6810 6850 8030 8135

DOWTY EQUIPMENT OF CANADA LIMITED,

239 Station Street,
Ajax, Ont.
Telephone 416: 942-3100

Telex: 02-29214
Cable: DOWTY'S
President: R. F. Hunt
Contact: T. H. Staples, Gen. Sales Mgr.
Floor Area: 50,000 sq. ft.
Personnel: 215

Manufacturers of: Aircraft Landing Gear; Aircraft and Industrial Hydraulic Equipment; Fuel System Components; Aircraft Wheels and Brakes; Variable Speed Hydraulic Transmission and Controls; Repair and Overhaul facilities.

1420	1620	1630	1650	1680	1730
2010	2030	2520	2835	2895	2915
2995	3010	3695	3950	4320	4720
4810	4820	4920	5120	5330	7610

and
Pages B6, B10, B14, I-30 and I-34.

DRUMMOND WELDING & STEEL WORKS LIMITED

2277 Joliette St.,
Jacques-Cartier, Que.
Telephone 514: 677-2851
President: R. L. Lacasse
Contact: A. Raymond, Vice-Pres.
Floor Area: 450,000 sq. ft.
Personnel: 150

Manufacturers of: Storage Tanks—Gas and Oil; Under and Above Ground, Field Erected; Pressure Vessels; Lined Tanks; Industrial Tanks for Chemical, Food, Pharmaceutical Processes; Hoppers; Bins; Smokestacks; Ducts; Ferrous and Non-ferrous.
2040 2050 3615 3650 3895 4520
5430 5445 8120

DU PONT OF CANADA LTD.,

P.O. Box 660,
Montreal 101, Que.
Telephone 514: 861-3861
President: R. G. Beck
Contact: G. A. Rader, Dir. Technical Service to Government
Floor Area: 653,400 sq. ft.
Personnel: 6,800

Suppliers of: Chemicals: Industrial and Agricultural; Dyes and Intermediates; Elastomers and Pigments. Acids: Adipic; Hydrochloric; Nitric; Chlorofluorohydrocarbons; Hydrogen Peroxide; Commercial Explosives and Blasting Supplies. Packaging and Industrial Films, Cellulose and Plastic, Paints for building Maintenance; Industrial Product Finishes; Automotive Finishes and Refinish Products. Photo Products: X-Ray and Graphic Arts Films and Photo Polymer Printing Plates. Plastics: Polyethylene Resins, High, Medium and Low Density; Nylon Resins; Polyolefin

Fabrics, Woven, Heavy duty, Coated and Uncoated; Polyethylene Pipe up to 42"; Nylon Monofilament and Nylon non-metallic strapping; Polyethylene Plastic Netting; Polyethylene Loose Leaf Binders and Report Folders. Textile Fibres: Nylon; Textile, Carpet, Tire and Industrial yarns, staple and tow; Acrylic Fibre, Staple and Tow; Spandex Fibre.

1375 4710 5640 6810 6830 6850
7510 8010 8030 8105 8115 8135
8140 9330

**DUNLOP CANADA LIMITED,
(Industrial Division)**

**870 Queen Street East,
Toronto, Ontario.
Telephone 416: 461-9411
Manager, Marketing: H. H. Nolting
Contact: J. M. Snape, Gen. Sales Mgr.
Floor Area: 510,000 sq. ft.
Personnel: 710**

Manufacturers of: Mechanical Rubber Goods; Elastic thread; Rubber lining; Camelback; 'V' Belts; Rubber moulded goods;

Rubber extruded goods; Rubber belting; Fabric-reinforced and wire-reinforced Hose; Conveyor Belting; Adhesives, contact types; Adhesives, natural rubber base; Adhesives, synthetic rubber base.

2610 2640 3030 4240 4720 8040
9320

DYNAMIC INDUSTRIES INC.,

**45 Dorchester St. S.,
P.O. Box 1664,
Quebec 2, Que.
Telephone 418: 524-5221
President: C. N. Lucas
Contact: J. Vallee, Contract Mgr.
Floor Area: 70,453 sq. ft.
Personnel: 260**

Manufacturers of: Transmission Towers and Substations, Microwave Masts, TV and Radio Antennae, Pole line hardware. Plate Shop and Machine Shop for General Fabrication.

1440 1730 2510 3810 3830 3910
3920 5410 5420 5430 5445 5450
5975 5985 6530 7125 8115 8140

E.M.I. ELECTRONICS CANADA LTD.,

P.O. Box 1005,
Dartmouth, Nova Scotia.
Telephone 902: 466-7491
Telex: 014-42244
Cable: EMICOS
President: W. Pigdon
Contact: A. G. B. Judd, Contracts Mgr.
Floor Area: 108,000 sq. ft.
Personnel: 525

Manufacturers of: Sonar equipment; Ionospheric sounding equipment; Radar and Sonar simulators; Microwave antenna; Sonobuoys. Special facilities: Air conditioned and dust free repair and overhaul area; Atmosphere controlled calibration room; White room and full range of environmental testing equipment.

2050 5825 5826 5840 5841 5845
5895 6625 6655 6910 and Pages B4,
B6, I-94, I-166, I-216 and I-276.

ESB (CANADA) LTD.,

P.O. Box 907, Postal Station "U",
2301 Dixie Rd., Mississauga,
Toronto 18, Ont.
Telephone 416: 277-3131
Telex: 029-6152

Storage Battery Div.
Vice-Pres.: D. H. Bates
Vice-Pres. Marketing: H. W. Birkbeck
RAY-O-VAC Div.
Vice-Pres.: J. Doig
Vice-Pres. Marketing: A. L. Rogers
Floor Area: 375,000 sq. ft.
Personnel: 850

Manufacturers of: Batteries, Storage, Alkaline and Lead Acid. Primary Cells.
6130 6135 6140

E T F TOOLS LIMITED,

Box 128, 21 Woodburn Avenue,
St. Catharines, Ontario.
Telephone 416: 684-4368
President: Peter B. Hill
Contact: W. H. Nutt, General Manager
Floor Area: 33,300 sq. ft.
Personnel: 95

Manufacturers of: Drop Forged Mechanics hand tools, edged and non-edged; custom forgings. Commercial Heat Treatment and Sand Blasting.

1325 1330 1340 1395 2230 5110
5120 5140

EASTERN DIE CASTING INC.,

2020 Thimens St.,
Montreal 382, Que.

Telephone 514: 748-7308
Telex: 01-26263
President: Angelo Cerantola
Contact: T. Cathcart, Sales Representative
Floor Area: 22,000 sq. ft.
Personnel: 70

Manufacturers of: High Pressure Die Castings. Aluminum to 12 lbs. Zinc to 5 lbs. Electrical Fittings. Custom made Functional and Ornamental Castings.
1310 1315 5340 5935 5975

EASTERN STEEL PRODUCTS COMPANY,

777 Laurel St.,
Preston, Ont.
Telephone 519: 653-6234
Telex: 0295-447
Pres. & Gen. Mgr.: John R. Irwin
Floor Area: 150,000 sq. ft.
Personnel: 150

Manufacturers of: Snow plows; Dump bodies; Hoists (Truck); Doors — Metal, Rolling and Sliding; Sanders and Salters, Road.
2510 2590 3825 3830 5430 5670

EATON AUTOMOTIVE CANADA LTD.,

P.O. Box 5057,
450 Highbury Ave.,
London, Ont.
Telephone 519: 451-7500
President: W. A. Paterson
Contact: L. D. Elder, Sales Representative
Floor Area: 210,000 sq. ft.
Personnel: 450

Manufacturers of: Single and Two-Speed Truck Axles and Electric Shifting Mechanisms. Multi-speed Truck Transmissions. Automotive and Truck Hot Water Heating and Ventilating Systems. Energy Absorbing Steering Columns. Screw and Washer Assemblies. Compression Moulded Plastic Parts.
2250 2510 2520 2530 2540 5305

THE E. B. EDDY COMPANY,

Hull, Quebec.
Telephone 819: 777-5211
President and Managing Director:
W. D. Moffatt
Contact: J. Wansborough, Export Manager
Floor Area: 1,500,000 sq. ft.
Personnel: 2,300

Manufacturers of: Fine and Specialty Papers; Paper board; Newsprint; Bathroom tissue; Facial tissue; Towels; Serviettes and Paper bags; Packaging materials.
8105 8135 9310

EDWARDS OF CANADA

P.O. Box 430,
Owen Sound, Ont.
Telephone 519: 376-2430
Telex: 02-8739
President & Managing Dir.: R. A. Yates
Floor Area: 55,000 sq. ft.
Personnel: 285

Manufacturers of: Annunciators; Fire alarm systems; Smoke detection systems; Electrical signalling communication and production equipment; Electrical instructional equipment.
6320 6350

ELCO-WOOD INDUSTRIES LTD.,

857 Tecumseh Rd., E.,
Windsor, Ont.
Telephone 519: 256-1871
Telex: 02-477637
President: Percy Elcombe
Contact: Peter Elcombe, Vice-Pres.
Floor Area: 54,000 sq. ft.
Personnel: 100

Manufacturers of: Truck dump bodies, Telescopic and Underbody Hydraulic Hoists, Power Gates, Stake Bodies, Van Bodies, Snow Plows, Sand and Salt Spreaders, Wrecker Cranes and Wrecker bodies, Garbage Disposal units, Containerized units, Pole Derricks, Oilfield Bodies, Winches, Dumping Semi-trailers, Low Beds Aerial Towers, Power take-off units, Tire Carriers, Repair and Overhaul Facilities.
1730 1740 2320 2510 2520 3825
3830 3950 3990 4210 4320 4810
4910 5430 8140 and Page B10.

THE ELECTRIC & GAS WELDING CO. LTD.,

933 Simard St.,
P.O. Box 330,
Chambly, Que.
Telephone 514: 658-6671
Telex: 01-20829
Cable: ELGASWELD
Floor Area: 22,500
Personnel: 45

Manufacturers of: Truck tanks, for all purposes.
1740 2320 4210

ELECTRICAL MFG. CO. LTD.

P.O. Box 130,
Montmagny, Que.
Telephone 514: 248-0235
Telex: 011-3419
President: Claude Rousseau
Contact: Maurice Gougeon, Sales Mgr.
Floor Area: 35,000 sq. ft.
Personnel: 100

Manufacturers of: Electrical Control Equipment; Fuses and Lightning Arresters; Circuit Breakers and Switches; Electrical measuring and testing Instruments; Electrical Distribution Panels. Cabinets, lockers, bins and shelving, steel; Stock and Storage Racks. Cabinets, lockers, metal.
3456 5920 5925 5930 6110 6625
7125

ELECTRIC REDUCTION COMPANY OF CANADA LTD.,

137 Wellington Street West,
Toronto 1, Ontario.
Telephone 416: 366-3791
Cable: ELREDCHEM
President: E. R. Kinsley
Contact: W. M. Karn, International Manager
Floor Area: 635,000 sq. ft.
Personnel: 900

Manufacturers of: Hydrofluosilicic Acid; Yellow Phosphorus; Red Phosphorus; Sodium Chlorate; Potassium Chlorate; Industrial Phosphates; Agricultural Phosphates; Industrial and Agricultural Phosphoric Acid.
6810

ELECTRONIC CRAFTSMEN LTD.,

73 Schaefer St.,
Waterloo, Ont.
Telephone 519: 743-1473
Gen. Mgr.: G. W. L. Davis
Contact: J. P. Davis, Sales Mgr.
Floor Area: 14,000 sq. ft.
Personnel: 105

Manufacturers of: Electric and Electronic Coils, Chokes and Transformers; Inductors; Electrical and Electronic Assemblies and Sub-Assemblies.
5915 5945 5950 5999

ELECTROVERT LTD.,

3285 Cavendish Blvd.,
Montreal 261, Que.
Telephone 514: 488-2521
Telex: 05-267561
Cable: RECTIFIER
President: N. J. Fodor
Contact: E. Pallavicini, Vice-Pres.
Floor Area: 25,000 sq. ft.
Personnel: 60

Manufacturers of: Extension cable racks, Metal framing adjustable; Concrete inserts cable clamps; Racks electrical equipment.
5680 5975

ELECTROVERT MANUFACTURING CO. LTD.,

3285 Cavendish Blvd.,
Montreal 261, Que.
Telephone 514: 488-2521

Telex: 05-267561

Cable: RECTIFIER

President: N. J. Fodor

Floor Area: 36,000 sq. ft.

Personnel: 50

Manufacturers of: Wavesoldering and Solder-coating equipment; Production equipment for the Electrical and Electronics Industry.
3439

ELECTRO-VOX INC.

2626 Bates Road,
Montreal 251, Que.
Telephone 514: 739-1981

Cable: ELEVOX

President: P. E. Chaput

Contact: Richard Lavoie, Gen. Mgr.

Floor Area: 33,000 sq. ft.

Personnel: 150

Manufacturers of: Audio Communication Equipment; Amplifiers Transistorized, Audio; Chassis, Electronic Assembly; Communication Systems; Horns, Loudspeakers; Intercom; Loudspeakers; Megaphone, Electronic Transistorized; Public Address, Sets, Systems; Sound Systems.

5815 5820 5821 5830 5895 and Page I-252.

W. R. ELLIOTT LIMITED,

134 Sydney St., S.,
Kitchener, Ont.

Telephone 519: 743-6351

President: W. R. Elliott

Floor Area: 20,000 sq. ft.

Personnel: 50

Manufacturers of: Radar and Electronic Mechanical Assemblies; Aircraft Components; Fibre Glass Carrying Cases for Fire Control Instruments; Tools, Dies; Jigs; Fixtures. Custom Work to Ordnance Specifications.

1005 1015 1020 1240 1290 1420
1680 2915 4240 5840 5985 6110

and Page B10.

EL-MET-PARTS LIMITED,

47 Head Street,
Dundas, Ont.

Telephone 416: 628-6366

Telex: 021-8207

President: D. C. Barber

Contact: R. A. Briggs, Gen. Mgr.

Floor Area: 50,000 sq. ft.

Personnel: 80

Manufacturers of: Silicon Steel and Nickel Alloy Laminations; Distributed Gap, C-Cut, Oval and O-Shaped Cores wound from Silicon Steel and Nickel Alloys; Magnetic Shielding; Specialty Magnetic Annealing; and other allied products.

5950

EMCO LIMITED,

Box 3300, Terminal "A",
London, Ontario.

Telephone 519: 451-1250

Director of Manufacturing: C. R. Ivey

Contact: F. G. Smith, Manager Factory Sales

Floor Area: 198,000 sq. ft.

Personnel: 623

Manufacturers of: Complete line of plumbers' brass goods; cast iron soil pipe and fittings; fittings for chemical and petroleum application; brass valves.

4510 4730

ENAMEL & HEATING PRODUCTS LIMITED,

Amherst, N.S.

Telephone 902: 667-3315

President: W. J. Wienand

Floor Area: 164,000 sq. ft.

Personnel: 850

Manufacturers of: Airframe structural components including bonded assemblies, both metal to metal and honeycomb; Domestic gas and oil fired forced air furnaces; Space heaters; Gas, oil, electric ranges and water heaters; Rolling Mill producing reinforcing bars; Steel castings as well as cast iron; Jigs, Fixtures and Tooling. Repair and Overhaul of Aircraft and components.

1325 1560 1630 1670 1680 1730

2090 3465 4410 4520 5430 5680

7125 7310 8115 8140 and Pages B4, B10 and B15.

ERIE TECHNOLOGICAL PRODUCTS OF CANADA LIMITED,

5 Fraser Avenue,
Trenton, Ont.

Telephone 613: 392-9251

Telex: 02-2029

Plant Manager: F. W. Deacon

Contact: T. G. Alexander

Floor Area: 65,000 sq. ft.

Personnel: 400

Manufacturers of: Capacitors Fixed and Variable, Ceramic; Ceramic Dielectrics; Ferro-Ceramic Filters; Filters, Radio Interference.

5910 5915

**EX-CELL-O CORPORATION OF CANADA
LTD.,**

**120 Weston St.,
P.O. Box 3535,
London, Ont.**

Telephone 519: 438-2133

Vice Pres.: Wm. M. Sawruk

Contact: R. S. Killy, Marketing Mgr.

Floor Area: 146,900 sq. ft.

Personnel: 400

Manufacturers of: Special Purpose Machine Tools; Precision Bore Machines; Mechanical and Hydraulic Surface Grinders; Ram Turret Milling Machines; Quill Type Hydraulic Power Units; Tapping Units; Surface Plates; Dairy Packaging Equipment; Drill Jig Bushings; Jig and Fixture Accessories; Jigs and Fixtures; Railroad Pins and Bushings; Aircraft Engine Precision Parts; Production Precision Parts; Heat Treating Service; Grey Iron Castings and Patterns.
3417 3419 3465 3695 and Page B10.

**FABRICATED STEEL PRODUCTS
(WINDSOR) LTD.,**

850 Division Rd.,
P.O. Box 1060,
Windsor 12, Ont.
Telephone 519: 969-9580
Vice-Pres. & Gen. Mgr.: T. H. Eansor
Contact: J. N. Eansor, Sec. Treasurer &
Gen. Sales Mgr.
Floor Area: 55,000 sq. ft.
Personnel: 150

Manufacturers of: Automotive stampings;
Small aluminum boats; Boat trailers; Non-
powered materials handling equipment such
as racks, bins, tote boxes, shop trucks and
general custom steel fabrication.

1095	1325	1340	1345	1355	1670
1740	1940	2330	2510	3920	3990
4520	4920	5140	5430	7125	7195
7320	8115	8140			

FABRICON MANUFACTURING LTD.,

Trenton, Ontario.
Telephone 613: 392-1291
President: K. Fabricius
Floor Area: 150,000 sq. ft.
Personnel: 250

Manufacturers of: Coaxial, Electrical and
Electronic Cables; T.V. Cables; Telephone
Cables; Hydro Cables, etc. (of copper, alu-
minum and steel).
5995 6145

FAG BEARINGS LTD.,

P.O. Box 280,
Stratford, Ont.
Telephone 519: 271-3230
Telex: 029-5518
Cable: CANFAG
Managing Dir.: Otto Weth
Contact: R. E. Leeming, P.Eng., Mgr. of
Marketing
Floor Area: 115,000 sq. ft.
Personnel: 475

Manufacturers of: Precision Ball and Roller
Bearings, Bearings, Anti-friction un-mounted;
High Precision Instrument Bearings. Water
Pump Shaft Assemblies and Aircraft Engine
Bearings.
2930 3110

FAIREY CANADA LIMITED

Any questions concerning the services and
products of this company should be referred
to the offices noted on pages XI and XII of
this book.

**FEDERAL WIRE & CABLE COMPANY
LIMITED,**
(Division of H. K. Porter Company (Canada)
Limited)

P.O. Box 90,
265 Suffolk Street,
Guelph, Ontario.
Telephone 519: 822-6730
General Manager: D. G. McKay
Contact: R. M. Sorbara, Product Sales Mgr.
Floor Area: 200,000 sq. ft.
Personnel: 400

Manufacturers of: All forms of Wire and
Cable for Electronic and Electrical Indus-
tries, including Magnet Wire.
6145

FENN-DOR PLASTICS LTD.,

7931 Coronet Rd.,
Edmonton 82, Alberta.
Telephone 403: 465-2370
Telex: 037-3393
Contact: E. Fennema, Mgr.
Floor Area: 10,000 sq. ft.
Personnel: 10

Manufacturers of: Injection moulded plastic
components for the Electric, Electronic and
Ordnance Fields. Thermo forming of
Thermo Plastic Packaging Trays. Vacuum
formed Light Panels for Aircraft, etc.
1310 1315 1320 1325 1330 1340
1345 1350 1355 1390 1395 1560
2510 2540 5999 6150 7320 9330

FERGUSON INDUSTRIES LIMITED,

Front St.,
Pictou, N.S.
Telephone 902: 485-4313
President: A. A. Ferguson, Sr.
Contact: J. B. Ferguson
Floor Area: 69,300 sq. ft.
Personnel: 400

Manufacturers of: Barges, Scows, Lighters, Dredges, Fishing Vessels, Ferries, Cargo & Tanker Vessels, Buoys, Sewage Treatment Plants, Tanks for liquid storage, underground. Ship repair facilities. Machining medium and heavy.

1905 1910 1915 1920 1925 1930
1935 1940 2010 2020 2040 2050
2090 4510 4520 4630 5430 7125
7195 and Page B10.

FERRANTI PACKARD LIMITED,
(Electronics Div.)

Industry St.,
Toronto 15, Ont.
Telephone 416: 762-3661
TWX: 610-491-1434
Cable: FERRANTI
Vice-Pres. & Gen. Mgr.: W. M. Lower
Contact: J. R. Coutts, Marketing Mgr.
Floor Area: 75,000 sq. ft.
Personnel: 350

Manufacturers of: Magnetic Memory Devices and Systems; Paper Tape Handling Equipment; Information Display Systems and Indicators; Electronic Business Equipment; Data Communications and Switching Systems; Numerical Controls and Measurement Control Systems; Special Purpose Digital Equipment and Systems; Instrumentation Read-out Devices; Punched Tape Readers; Lead Computing Gunsights and Airborne Computers; Inspection Machines; Electronic Sub-Systems and Components; Electronic Sub-Assembly contracting.

1230 5820 5821 5825 5826 5840
5841 5895 5950 5960 5990 5999
6110 6120 6130 6615 6625 7440 and
Pages B10, I-148 and I-150.

FERRITRONICS LIMITED,

222 Newkirk Rd.,
Richmond Hill, Ont.
Telephone 416: 889-7313
Cable: FERRIC
President: George G. Armitage
Contact: H. J. Darcy, Gen. Mgr.
Floor Area: 16,000 sq. ft.
Personnel: 80

Manufacturers of: Custom Designed Frequency Selective Devices; Electric Wave Filters (LC); Pulse Transformers; Mixer, Ring Modulators; Diplexer and Duplexers.
5915 5950

FERRO METAL LTD.,
Ville Jacques Cartier, Que.

2300 Garneau,
Telephone 514: 679-3460
President: S. F. Flegg

Contact: M. Cohen, P.Eng.
M. E. Flegg, Gen. Mgr.
Floor Area: 35,000 sq. ft.
Personnel: 125

Manufacturers of: Pressure Vessels; Blow-off Tanks; Expansion Tanks; Hot Water Tanks; Air Receiver Tanks; Monel Tanks; Copper Tanks; Stainless Steel Tanks.
3615 3650 4420 4520 8120

FIELD AVIATION CO. LTD.,

P.O. Box 1001,
Malton, Ont.
Telephone 416: 677-3650
President: A. F. Soutar
Contact: D. E. Melliship, Vice-Pres., Sales
Floor Area: 120,000 sq. ft.
Personnel: 220

Manufacturers of: Aircraft airframe components and parts; Aircraft engine components and parts; Tooling for the above; Sectionalized training aids; Ground handling equipment; Ground servicing equipment; Aircraft modification kits; Repair and Overhaul and modification facility for the aircraft and components; Installation, repair and overhaul of aircraft radio and navigational aids.

1560 1680 1730 2915 4920
and Page B14.

FINDLAYS LIMITED,

Carleton Place, Ontario.
Telephone 613: 257-1400
Telex: 013-3596
President: G. E. Findlay
Contact: A. J. Illingworth, Sales Mgr.
Floor Area: 220,000 sq. ft.
Personnel: 320

Manufacturers of: Electric and gas ranges; Coal, wood, oil and gas stoves and heaters; oil, gas and electric warm air furnaces; Grey iron castings.
4520 7310 and Page B4.

FISHER GAUGE WORKS LIMITED,

194 Sophia Street,
Box 179,
Peterborough, Ont.
Telephone 705: 745-0567
President: W. F. Fisher
Contact: J. W. Hicks, Marketing Mgr.
Floor Area: 22,000 sq. ft.
Personnel: 90

Manufacturers of: Miniature zinc die cast components for precision applications. Assembly die casting machinery and equip-

ment. Encapsulation systems for aircraft engine turbine blades, including tooling for all above items.

1390 3680 3695 and Page B4.

FLAG FIRE EQUIPMENT LTD.,

1680 Kildare Rd.,
Windsor, Ont.

Telephone 519: 252-5725

Gen. Sales Mgr.: George Sava

Floor Area: 12,000 sq. ft.

Personnel: 30

Manufacturers of: Portable fire extinguishers: 2½ gal. soda acid, SS; 2½ gal. foam; 2½ and 5 gal. copper, steel pump tanks; 2½ gal. stainless steel pump tanks; Cartridge water 2½ gal. stainless steel; 4.5 cartridge all purpose dry chemical; 4.5 purple K cartridge unit; 2½, 5, 10, 15, 20 lb. carbon dioxide extinguishers; 2½ gal. Polyethylene (DURABILT) pump tanks; 2¾, 5, 10, 20, 30 lb. heavy duty dry chemicals; 2½, 5, 10, 20, 30 lb. heavy duty Multi-Purpose dry chemicals; 5, 10, 20, 30 lb. heavy duty Purple K dry chemicals.

1680 4210

FLEET MANUFACTURING LIMITED,

P.O. Box 300, Gilmore Rd.,
Fort Erie, Ont.

Telephone 416: 871-2100, Fort Erie

416: 366-4435, Toronto

Telex: 021-565

President: R. K. Fraser

Contact: G. P. Morphy, Exec. Vice-Pres.

Floor Area: 277,000 sq. ft.

Personnel: 1,000

Manufacturers of: Radar Antenna; Radomes Fixed, Microwave and Tropospheric Scatter Antenna; Aircraft Assemblies and Components; Sonar Domes, Towed Bodies and Sonar Handling Gear. Fluid Bed Epoxy Surface Treatment Equipment to BuShip Standards; Close Tolerance Honeycomb Structural Components for Aircraft or Fire Control Plotting Boards. Repair and Overhaul Facilities.

1045 1350 1420 1440 1560 1630
1670 1680 1730 1740 2030 3465
3950 5410 5820 5825 5826 5830
5831 5840 5841 5845 5895 5975
5985 6655 6910 9330 and Pages B6,
B10 and B15.

FLEXTRACK-NODWELL LTD.,

1201 - 42nd Avenue S.E.,
P.O. Box 5544, Station "A",
Calgary, Alberta.

Telephone 403: 287-2280

Vice-Pres. & Gen. Mgr.: W. L. Gibson

Contact: G. C. Agassiz, Vice-Pres. Sales

Floor Area: 80,000 sq. ft.

Personnel: 200

Manufacturers of: Off-Highway Tracked Carriers for negotiating all types of Terrain-muskeg, Snow, Mud, etc. Load Capacities 1,000 to 25,000 pounds; Tracked Fire Fighting Crash Trucks; Tracked Trailers; Mobile Camps; and specialized off-highway equipment; Repair and Overhaul Facilities.

2320 2330 2410 2430 2530 4210 and
Pages B6 and I-318.

FLIGHT LINE QUALITY PRODUCTS LIMITED,

46 Saskatoon St.,
Campbellford, Ont.

Telephone 705: 653-2270

President: R. A. J. Murison

Contact: W. J. Mann, Director

Floor Area: 13,000 sq. ft.

Personnel: 25

Manufacturers of: Aircraft passenger seats & cushions; Boat seats & convertible tops; Snowmobiles seats & tops; Various fabric items for military requirements.

1670 1680 2090

FLUID POWER LIMITED,

282 Belfield Rd.,
Rexdale, Ont.

Telephone 416: 677-1020

President: W. L. Hutchison

Contact: B. S. Male, Dir. of Marketing

Floor Area: 23,000 sq. ft.

Personnel: 50

Manufacturers of: Hydraulic & Pneumatic Linear & Rotary Actuators, Hydraulic Presses, Hydraulic Systems & Specialized Machinery.

1630 1650 2030 2530 3010 3442
3444 3620 3950 4320 and Page B10.

FORANO LIMITED,

7000 Park Avenue,
Montreal 15, Que.

Telephone 514: 276-3621

President: P. M. Forand

Contact: G. A. Ferrier

Floor Area: 310,000 sq. ft.

Personnel: 500

Manufacturers of: Mechanical Power Transmissions & Materials Handling Machinery, Conveyors, Elevators, Crushers, Winches, Sawmill Machinery, Special Machinery.

3010 3020 3030 3040 3130 3210
3441 3615 3695 3820 3825 3895
3910 3950 3990 and Pages B4, B6 and
B10.

FORMOST TRACKED VEHICLES LTD.,

1616 Meridian Rd. N.E.,
 Calgary 62, Alta.
 Telephone 403: 272-3322
 Telex: 038-22772
 President: J. H. Nodwell
 Contact: W. B. Nodwell, Vice-Pres.,
 Marketing
 Floor Area: 28,000 sq. ft.
 Personnel: 75

Manufacturers of: Tracked Carriers, up to
 30 Tons Payload.
 2320 2410 2430 2530 and Page I-316.

FORESTEEL INDUSTRIES LIMITED,

10705 Henri Bourassa Blvd.,
 Montreal, Que.
 Telephone 514: 665-3871
 Telex: 01-20944
 Contact: Michel Forest
 Floor Area: 175,000 sq. ft.
 Personnel: 850

Manufacturers of: Custom plate fabrication;
 Autoclaves; Fabricated pipes; Bins; Chutes;
 Hoppers; Floating docks; Kilns; Ladders;
 Platforms; Penstocks; Pressure vessels;
 Storage tanks; Smokestacks; Special struc-
 tures; Stop logs.

1945 2040 2050 3615 3650 3695
 3895 4430 5430 5440 5450 5985
 7125 8120

FOSTER WHEELER LIMITED,

P.O. Box 1007,
 St. Catharines, Ont.
 Telephone 416: 684-8321
 President: A. A. Irvine
 Contact: R. W. Boyd, Gen. Sales Mgr.
 Floor Area: 192,000 sq. ft.
 Personnel: 700

Manufacturers of: Steam Generating Units
 & Auxiliaries: — Indoor & Outdoor Package
 Field Erected, Watertube, Central Station,
 Marine, Superheaters, Economizers, Air
 Heaters, High Temperature Water Gener-
 ators. Pulverizers, Burners, Stokers, Pneu-
 matic Feeders, Bark & Waste Wood Furn-
 aces, Bagasse Burning Equipment. Surface
 Condensers, High Temperature Vaporizers,
 Heat Exchangers, Waste Heat Boilers, Eva-
 porators, Feedwater Heaters, Distillers,
 Steam Jet Air Ejectors, Accumulators, De-
 superheaters. Mine Air Heating Systems.
 Gas Turbine Regenerators. Petroleum Re-
 fineries & Chemical Plants. Nuclear Plant
 Components such as: — Steam Generators,
 Calandrias, Moderator Coolers. Miscellan-

eous Equipment — Pressure Vessels, Auto-
 claves, Tanks, Ducts, Weldments, Dryers,
 Fired Heaters, Sulphur Burners and Meehan-
 ite & Grey Iron Castings.

3650 3820 4410 4420 4440 4460
 4520 4530 5430 8120 and Pages B10
 and B13.

FREE-PISTON DEVELOPMENT CO. LTD.,

745 Gardiners Rd.,
 P.O. Box 1268,
 Kingston, Ont.
 Telephone 613: 546-2291
 Gen. Mgr.: J. S. Campbell
 Contact: M. B. Drewniak, Chief Engineer
 Floor Area: 9500 sq. ft.
 Personnel: 20

Manufacturers of: Precision Machine Parts
 for Atomic Energy Fuel Charging Systems.
 Vehicle and Aircraft Industry Machined
 Components. Portable Opposed Piston En-
 gine Air Compressor, Research & Prototype
 Development of Engines & Air Compressors.

1340 1355 1395 1420 1630 1730
 2530 2840 4310 and Page B10.

FRINK OF CANADA,

Preston, Ontario.
 (See Eastern Steel Products Ltd.)

FRITZ WERNER LTD.,

695 Montee de Liesse,
 Montreal 377, Que.
 Telephone 514: 748-8771
 Telex: 01-2478
 President: W. H. Graupe
 Contact: R. V. Freeman, Gen. Sales Mgr.
 Floor Area: 22,000 sq. ft.
 Personnel: 45

Manufacturers of: Vertical, Horizontal &
 Universal Milling Machines. Numerically
 Controlled Milling Machines. Machining
 Centers. Jig & Fixture Accessories.

3417 3465

FROMSON HEAT TRANSFER,

77 Railside Road,
 Don Mills, Ontario.
 Telephone 416: 447-5541
 President: S. Fromson
 Floor Area: 33,000 sq. ft.
 Personnel: 60

Manufacturers of: Shell and Tube heat ex-
 changers; Pressure Vessels and Custom-built
 heavy Machinery.

3615 3695 4420 8120 and Page B10.

GABRIEL OF CANADA LIMITED,

3600 Lakeshore Blvd. W.,
 Toronto 14, Ont.
 Telephone 416: 251-2244 & -2245
 Secretary: E. Noonan
 Contact: D. Culver, Asst. Gen. Mgr.
 Floor Area: 138,000 sq. ft.
 Personnel: 578

Manufacturers of: Shock Absorbers and Shock Absorbing Devices for Auto, Truck, Tank and a wide variety of other Applications and Equipments.
 2540

GALT BRITISH FORGE LIMITED,

204 Beverly St.,
 Galt, Ont.
 Telephone 519: 621-8140 & 8142
 President: John H. Murray
 Contact: John A. Fowle, Vice Pres.
 Floor Area: 13,300 sq. ft.
 Personnel: 24

Manufacturers of: Open Die Steel Forgings in Carbon, Alloy, Stainless & Tool Steels. Rings & Discs up to 800 lbs. Spindles & Bars up to 3,000 lbs. Shaped Die Forgings 5-150 lbs.
 Page 000

GALT EQUIPMENT LTD.,

47 Marie Victorin Blvd.,
 Candiac, Que.
 Telephone 514: 861-5294
 President: J. C. Springer
 Contact: J. K. Foessel, Vice-Pres.
 Floor Area: 8,000 sq. ft.
 Personnel: 40

Manufacturers of: Industrial and Marine Refrigeration and Air Conditioning Equipment.
 4110 4120 4130
 Page I-328

GARDNER-DENVER CO. (CANADA) LTD.,

1800 Ellesmere Rd.,
 Scarborough, Ont.
 Telephone—Ottawa 613: 828-5123;
 Toronto 416: 291-2551
 General Manager: J. P. Finnigan
 Contact: F. Burchell, Resident Salesman
 Floor Area: 120,100 sq. ft.
 Personnel: 178

Manufacturers of: Mining Machinery; Paving Breakers; Air Compressors, Portable and Transportable; Rotary Compressors and Vacuum Pumps.
 3820 4310 and Page B10.

GARRETT MANUFACTURING LTD.,

255 Attwell Drive,
 Rexdale, Ont.
 Telephone 416: 677-1410
 Vice-Pres.: W. C. Tate
 Contact: J. L. Gardner, Sales Mgr.
 Floor Area: 85,000 sq. ft.
 Personnel: 620

Manufacturers of: Aircraft Cabin and Compartment Temperature Control Systems and Windshield Temperature Control Systems. Static Inverters. Aircraft Radio Emergency Beacons. Pneumatic Signal Generators for Calibration and Test of Aircraft Flight Instruments. Airport Automatic Weather Data Collection and Digital Conversion Systems. Microelectronic Devices. Repair and Overhaul Facilities.

1420 1430 1650 1660 4120 4920
 5820 5821 5825 5826 5845 5895
 5905 5915 5975 5999 6110 6130
 6605 6625 6660 6685 and Pages B6, B14, I-54, I-58, I-64, I-182, I-210 and I-238.

Garrett Marine Division

Manufacturers of: Shipboard Equipment, Towing Machines, Winches and Replenishment Systems.

2010 2020 2030 3950 6115 6130
 and Pages B6, I-212 and I-222.

GENERAL DEEP HOLE BORING & TURNING CO.,

60 Bertal Rd.,
 Toronto 15, Ont.
 Telephone 416: 766-7218
 President: A. S. Donovan
 Contact: E. L. Davies, Marketing Mgr.
 Floor Area: 33,000 sq. ft.
 Personnel: 80

Manufacturers of: Nuclear Reactor Components & Assemblies. Aircraft Components. Custom Machining to Commercial and Aircraft Standards. Specialists in Deep Hole Boring, Drilling, Honing, Profile Boring & Turning. Electro-Plating Facilities for Chromium and Gold.
 Pages B10 and B13.

GENERAL IMPACT EXTRUSIONS (MANUFACTURING) LTD.,

191 Evans Ave.,
 P.O. Box 220, Station "U",
 Toronto 18, Ont.
 Telephone 416: 255-8194
 Cable: GENIMPEX
 Vice-Pres. & Gen. Mgr.: Otto E. Rieder
 Contact: Donald S. Arnott, Vice-Pres. Sales
 Floor Area: 135,000 sq. ft.
 Personnel: 500

Manufacturers of: Aluminum impact extrusions, TV and Radio cans, collapsible tubes, cases, pistons, missile parts, rocket components, ammunition components, precision cold forgings.

1310 1315 1320 1325 1330 1336
1340 1345 1350 1355 1360 1395
4730 8110 8115 8140 and Page B10 and I-260.

GENERAL METALLIC PARTS LTD.,

16 Milford Ave.,
Toronto 15, Ont.
Telephone 416: 244-5397
President: George Szekely
Contact: Bruno Conzelmann, Mgr.
Floor Area: 10,000 sq. ft.
Personnel: 30

Manufacturers of: Precision Instrument & Aerospace Components & Assemblies. Aircraft Components. Special Purpose Machinery. Aircraft Engine Components. High Speed Air-Bearing Drum Camera to Photograph Shock Waves.

1240 1290 1340 1350 1420 1560
1630 1680 2840 3020 3419 3465
5985 6110 6615 and Page B10.

GENERAL PHOTOGRAMMETRIC SERVICES LTD.,

40 Bentley Ave.,
Ottawa 12, Ont.
Telephone 613: 825-1874
President: W. H. Morton
Contact: R. M. Meyer, Vice-Pres.
Floor Area: 9,000 sq. ft.
Personnel: 70

This firm provides the following services: Aerial photography, aerial surveys such as topographical, planimetric, forest inventory, geological, soils, magnetometer, ground control; Relief models, photographic reproduction.

7640 and Page B3.

GENERAL PRECISION INDUSTRIES LTD.,

455 Craig St. W.,
Montreal 126, Que.
Telephone 514: 866-8395
TWX: 610-532-6561
President: T. Toczvlowski
Contact: J. C. Carter, Mgr. Contracts
Admin.
Floor Area: 25,000 sq. ft.
Personnel: 145

Manufacturers of: Shipboard & Shorebased H/F and UHF Direction Finding Equipment.

5820 5821 5825 5895 5950 and Pages B10 and I-90.

GENERAL TIME CANADA LIMITED, (Westclox Division)

P.O. Box 239,
Peterborough, Ont.
Telephone 705: 742-4231
President & Gen. Mgr.: R. L. Shaw
Contact: R. P. Armstrong, Gen.
Superintendent
Floor Area: 150,000 sq. ft.
Personnel: 450

Manufacturers of: Clocks — spring, Electric and Battery operated; Watches — non jewelled, pocket; Ammunition components and fuse mechanisms.
1390

GENERAL WIRE & CABLE CO. LTD.,

609 William St.,
Cobourg, Ont.
Telephone 416: 372-5491
President: K. Fabricius
Floor Area: 200,000 sq. ft.
Personnel: 500

Manufacturers of: Coaxial, Electrical and Electronic Cables; Communication Cables, Plastic coated and Galvanized Chain Link Fencing; Synthetic ropes, steel and rayon core clothes lines; Guy Strands; Fence Components, Speedometer cables; Annealed Wire.
4010 5650 6145 6680

GEO-MET REACTORS,

P.O. Box 106,
Gloucester, Ontario.
Telephone 613: 822-1266
Cable: GEOMET
President: Dr. W. A. Morgan
Contact: S. J. Pettigrew, Gen. Mgr.
Floor Area: 11,000 sq. ft.
Personnel: 45

Manufacturers of: Ferroalloys; Pure metals.
9630 and Page B6.

GILBARCO CANADA LTD.,

64 Jefferson Ave.,
Toronto 3, Ont.
Telephone 416: 533-2307
President: D. J. Coward
Contact: F. H. Falkiner, Sec. Treasurer
& Asst. Gen. Mgr.
Floor Area: 70,000 sq. ft.
Personnel: 120

Manufacturers of: Gasoline Dispensing Pumps, Centrifugal Pumps & Hand Pumps. Air Compressors. Oil Furnaces, Boilers, Service Water Heaters & Humidifiers.
4310 4320 4410 4520 4530 7290

GLOBELITE BATTERIES LTD.,

1290 Bellamy Rd. N.,
Scarborough, Ont.

Telephone 416: 293-3651

Telex: 02-2789

Cable: GLOBELITE

President & Gen. Mgr.: R. M. Cuddy

Contact: W. Maurice Crawford, Mgr.,

Automotive Sales

Floor Area: 220,000 sq. ft.

Personnel: 280

Manufacturers of: Lead Acid Storage Batteries for Automotive, Transportation, Signal, Switchgear and Power Control, Communications, Emergency Lighting, Electric Light Plants and Motive Power. 6140

GODFREY ENGINEERING CO. LTD.,

480 Montreal-Toronto Blvd.,
Lachine 640, Montreal, Que.

Telephone 514: 637-1122

Cable: GODFREPART

President: E. D. Cornell

Contact: L. C. Gillespie, Contracts Mgr.

Floor Area: 25,000 sq. ft.

Personnel: 80

Manufacturers of: Aircraft Airconditioning Equipment, including Cabin Superchargers & Cooling Turbines & related system components; Complete range of Pneumatic & Hydraulic Ground Servicing Equipment; Sintered Metal Parts; Repair & Overhaul Facility for above allied equipment.

1630 1650 1660 1680 1730 4120

4320 4450 4920 and Pages B11 and B14.

B. F. GOODRICH CANADA LIMITED,

Kitchener, Ont.

Telephone 519: 742-3641

President: R. V. Yohe

Contact: E. D. Gunn, Gen. Mgr.

Commercial Products Sales

Floor Area: 1,200,000 sq. ft.

Personnel: 2,000

Manufacturers of: Tires and tubes for passenger cars; Trucks; Buses; Farm tractors; Implements; Earth moving equipment; Industrial tractors; Trailers and Airplanes. Tire repair and retreading materials; Belts, belting and hose — all types; Custom moulded and extruded parts of rubber or PVC. Chute and launder linings; De-icers, aircraft, pneumatic and electro-thermal. Linings and coverings — rubber and plastic. Custom built bags and containers of rubber or PVC. Adhesive, rubber cement, Matting and sheet packing. Inflatable seals. Metallic pressure seals. Furniture cushioning, pillows and

mattresses of latex foam and urethane foam. Moulded and die cut sponge rubber, carpet cushion, industrial and automotive cellular rubber. Geon vinyl resins, compounds and latexes.

1650 1730 2040 2610 2620 2630

2640 3030 3895 3920 3990 4710

4720 5325 5330 5340 5420 5640

5940 6850 8010 8030 8040 8140

9320 9330 and Page B6.

GO-TRACT SYSTEMS LTD.,

P.O. Box 600,

St. Anne de Bellevue, Que.

Telephone 514: 453-4001

Telex: 01-20825

Cable: GOTRACLIM

Vice-Pres. & Gen. Mgr.: P. M. Howard

Contact: M. A. Cariglia, Works Mgr.

Floor Area: 34,000 sq. ft.

Personnel: 60

Manufacturers of: General Purpose Vehicles for Transporting Men, Materials & Machinery over all types of Terrain — Muskeg, Mud, Snow, etc. Tracked Fire Fighting Vehicles.

2320 2330 2410 2430 4210 and Pages

B6 and I-320.

GOULD-NATIONAL BATTERIES OF CANADA, LIMITED,

275 Lewis Street,

Fort Erie, Ontario.

Telephone 416: 871-5600

Telex: 021517

Cable: GOULDBAT

President: R. G. Neill

Vice-President Sales: D. H. Shaw

Floor Area: 80,000 sq. ft.

Personnel: 70

Manufacturers of: Industrial storage batteries; Stationary batteries; Railroad batteries; Aircraft and Mine batteries; locomotive batteries; Lift Truck batteries.

6135

GRANBY ELASTIC & TEXTILES LTD.,

100 Denison Ave.,

Granby, Que.

Telephone 514: 372-5426

President: P. H. Biovin

Contact: C. W. Philbin, Sales Mgr.

Floor Area: 141,300 sq. ft.

Personnel: 325

Manufacturers of: Braided Elastic Webbing up to 1"; Woven Elastic Webbing of all types and widths; Shock Cord of all types; Army Webbing cotton & nylon.

8305

**GRAPHICO PRECISION WORKS
LIMITED,**

**1100 Bellamy Road, N.,
Scarborough, Ont.
Telephone 416: 293-8266
President: R. Scherenzel
Contact: W. M. Stubbs, Sales Manager
Floor Area: 13,000 sq. ft.
Personnel: 80**

Manufacturers of: Printed circuit boards; Terminal boards; Edgelit panels; Plastic components. Chemical milling; Electro forming; Photo — etching & engraving & profiling of dials, pointers, modules, panels etc. Silk-screen processing; Precision sheet metal fabrication-chassis, brackets, custom parts, etc.
5355 5940 5975 5999 9330

GREENING INDUSTRIES LIMITED,

**55 Queen Street N.,
P.O. Box 430,
Hamilton, Ont.
Telephone 416: 528-5971
Cable: GREENING HAMILTONONT
President: H. S. Baldwin
Contact: H. P. Golding, Export Mgr.
Floor Area: 565,000 sq. ft.
Personnel: 800**

Manufacturers of: Wire rope and cable; Guy strand; Slings and wire rope assemblies; Pre-stressed wire rope. Drawn wires in aluminum, brass, bronze, copper, inconel, monel, nickel, steel, stainless steel, tinned steel, galvanized steel. Resistance wire. Perforated

metals. Wire cloth & wire screens. Netting & wire guards. Wire boxes. Wire shipping & storage containers.
1375 2020 3695 3820 3940 4010
5335 5660 5670 5680 6145 8115
5905 9515 9525 9535

GUILDLINE INSTRUMENTS LIMITED,

**P.O. Box 99,
Smiths Falls, Ontario.
Telephone 613: 283-3000
TWX: 610-561-1681
President: J. Sutcliffe
Contact: D. M. Martin, Sales Manager
Floor Area: 23,000 sq. ft.
Personnel: 85**

Manufacturers of: Precision Electrical Measuring Equipment: Primary Electrical Standards; Oceanographic Instrumentation.
5905 6625

GULTON INDUSTRIES (CANADA) LTD.,

**345 Herbert St.,
Gananoque, Ont.
Telephone 613: 382-2141
Telex: 026-245
President: D. C. Ferguson
Contact: F. J. Hughes, Gen. Mgr.
Floor Area: 17,000 sq. ft.
Personnel: 30**

Manufacturers of: Hydrophone systems — sonar; Piezoelectric ceramic elements and transducers. Indicating, controlling and recording instruments.
5845 5955 6680 6685

HALEY INDUSTRIES LIMITED,

Haley, Ont.
Telephone 613: 432-4875
Telex: 013-3551
President: R. M. Turnbull
Contact: R. N. McNab, Sales Mgr.
Floor Area: 77,000 sq. ft.
Personnel: 215

Manufacturers of: Sand Castings in Magnesium & Aluminum Alloys both for Aircraft & Missile uses and Commercial Affiliations. Also, Permanent Mould Castings in Magnesium & Aluminum Alloys.
Page B4.

HALIFAX SHIPYARDS,

(Div. of Hawker Siddeley Canada Ltd.)

P.O. Box 640,
Halifax, N.S.
Telephone 902: 423-9271
Gen. Mgr.: H. C. Nolan
Floor Area: 270,000 sq. ft.
Personnel: 1,500

Manufacturers of: Barges and Lighters, Cargo & Special Purpose; Dredges; Landing Craft; Small Craft; Cargo Vessels; Tanker Vessels; Combat Ships and Landing Vessels; Special Service Vessels; Fishing Vessels; Transport Vessels, Passenger & Troop; Pontoons and Floating Docks; Floating Dry-docks; Off-shore Oil Drilling Units; Machining Heavy, Medium, Light; Repair & Overhaul Facilities for above-noted equipments.

1905	1910	1915	1920	1925	1930
1935	1940	1945	1950	1955	2030
2040	2050	2090	2230	4510	5420
7125	7195				

HAMILTON GEAR AND MACHINE CO.,

950 Dupont St.,
Toronto 4, Ont.
Telephone 416: 534-8401
Telex: 02-2537
Gen. Mgr.: P. H. Slaughter
Contact: W. H. Stanfield, Sales Mgr.
Floor Area: 90,000 sq. ft.
Personnel: 180

Manufacturers of: Speed Reducers; Gear Boxes (Helical, Spiral Bevel-Helical, Planetary, Worm, Helical-Worm and special types); Bevel Gears; Spiral and Hypoid Bevel Gears; Herring-bone Gears; Helical Gears; Spur Gears; Internal Gears; Flexible Couplings; Hamil-gear, Pin and Buffer and Oldham Types; Car Spotters; Gear-motors; Speed Increasers.

1010	1015	1020	3010	3020
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HAMILTON PORCELAINS LIMITED,

25 Campbell Street,
Brantford, Ontario.
Telephone 519: 753-2615
Cable: HAMPO
President & Gen. Mgr.: A. V. Mason
Floor Area: 50,000 sq. ft.
Personnel: 65

Manufacturers of: Low tension porcelain insulators; Ceramic Grids for Infrared Gas Burners; Evaporator Plates; Ceramic Moulds for Powered Metallurgy; Foundry Strainer Cores; Refractory Specialties.
5355 5970 9350

HAMMOND MANUFACTURING CO. LTD.,

394 Edinburgh Rd. N.,
Guelph, Ont.
Telephone 519: 822-2960
Telex: 0295-6523
General Manager: L. M. Hammond
Contact: G. L. Poulter, Sales Manager
Floor Area: 110,000 sq. ft.
Personnel: 325

Manufacturers of: Transformers and Sheet Metal Fabrications for the Electronic and Electrical Industries.
5910 5945 5950 5975 5999 and Page I-198.

HAND CHEMICAL INDUSTRIES LIMITED,

2170 Nipissing Rd.,
Milton, Ont.
Telephone 416: 925-2119
President: H. T. Hand
Contact: J. B. Donaldson, Vice-Pres.
Floor Area: 99,000 sq. ft.
Personnel: 155

Manufacturers of: Military Pyrotechnics; Store Goods Fireworks; Display Fireworks; Marine Distress Signals; Smoke Generator Grenades; Plastic Wall Tile; Plastic Housewares; Small Size Injection Moulded Items.
1330 1370 9330

HANDY & HARMAN OF CANADA LIMITED,

141 John Street,
Toronto 2B, Ontario.
Telephone 416: 368-6171
Cable: HANSILCA
President: Donald M. Burpee
Contact: J. S. Fullerton
Floor Area: 23,265 sq. ft.
Personnel: 55

Manufacturers of: High and Low Temperature Silver Brazing Alloys; Silver Brazing Alloy Fluxes, Karat Golds and Karat Gold Solders; Dental Golds and Dental Gold Solders; Sterling Silver; Fine Silver Anodes, Mercury, any Alloys containing Precious Metals.
3439 9545

HARRINGTON TOOL & DIE COMPANY LIMITED,

755 First Avenue,
Lachine, P.Q.
Telephone 514: 637-2513
President: Miss P. H. Harrington
Contact: G. McNaught, Vice President
Floor Area: 51,000 sq. ft.
Personnel: 170

Manufacturers of: Airframe, Armament, Piston and Jet Engine Machined Components; Tooling and Assemblies; Light and Medium Machining; Special Purpose Machines and Equipment; Heat Treating Service; Jigs, Fixtures; Dies, including Brake and Flatware; Repair and overhaul facilities.
1310 1420 1560 1730 3120 3419
3456 3465 3615 3695 4320 4920
5110 5120 5136 5210 5220 5340
and Page B10.

HARTFORD TOOLING LTD.,

325 Devonshire Road,
Windsor 15, Ont.
Telephone 519: 252-3449
President: G. H. Shaffer
Floor Area: 7,500 sq. ft.
Personnel: 9

Manufacturers of: Electrodes and prototype job lot and production EDM machining.
Page B10.

HARUNI METAL PRODUCTS,

6120 Metropolitan Blvd. E.,
St. Leonard De Port Maurics, Que.
Telephone 514: 256-7696
President: D. Kucer
Contact: W. S. Hickman, Defence
Production Liaison Officer
Floor Area: 32,000 sq. ft.
Personnel: 60

Manufacturers of: Doors, Watertight, Weathertight, Gastight, in Steel or Aluminum. Hatches, in Steel or Aluminum. Scuttles & Ladders. Custom Built Furniture, Tables Workbenches. Stainless Steel Serving & Tray Carts. Miscellaneous Architectural Metalwork, Stairs, etc. Turnstiles, Manual & Electrically Operated, Foot or Coin Operated.
2040 2090 3510 5340 5670 6530
7125 7195 7310 7320

HASSAN STEEL FABRICATORS LIMITED,

223 Ashland Avenue,
London, Ontario.
Telephone 519: 451-3100
President: Albert Hassan
Contact: R. C. Getty, Sales Manager
Floor Area: 253,000 sq. ft.
Personnel: 70

Manufacturers of: Automotive parts; Metal Stampings; Metal Fabrication; Gaskets; Steel Storage Tanks; Pressure and storage vessels; Cabinets, various Ammunition Cases, steel.

1730	2040	2090	2510	2805	2810
2815	3426	3456	3815	3830	3895
3920	3990	4410	4520	4940	5110
5140	5325	5330	5430	5670	5680
6140	7125	8110	8120	8140	

**HAYES-DANA LIMITED,
(Nasco Div.)**

439 No. 8 Highway
Stoney Creek, Ont.
Telephone 416: 662-8321
Contact: P. Teichroeb, Plant Mgr.
Floor Area: 125,000 sq. ft.
Personnel: 185

Manufacturers of: Vehicular Power Transmission Components (Non-Aircraft) Clutches & Transmissions. Brake Shoes. Engine Accessories (Non-Aircraft) Pumps (Water, Oil & Fuel) and Electrical System Components, Generators, Regulators, Starters, Drives and Solenoids.

2520	2530	2910	2920	2930	3010
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HEATEX LIMITED,

2225 Lapierre St.,
Ville Lasalle, Que.
Telephone 514: 365-6100
Telex: 01-26413
President: D. Sprague
Contact: A. R. McLead, Vice-Pres. &
Gen. Mgr.
Floor Area: 100,000 sq. ft.
Personnel: 210

Manufacturers of: Radiators & Cores for Cars, Trucks, Stationary Engines & Locomotives; Repair & Overhaul Facility for Aircraft Heat Exchangers.
2930 2935

JOHN T. HEPBURN LIMITED,

914 Dupont St.,
Toronto 4, Ont.
Telephone 416: 534-8871
Telex: 02-21305
Vice-Pres.: James F. Hepburn
Contact: V. S. Grater, Gen. Mgr.,
Mechanical Div.
Floor Area: 120,000 sq. ft.
Personnel: 470

Manufacturers of: Launchers; Depth charge; Torpedo; Rocket, Helicopter landing systems, shipboard. Deck machinery; Capstans, Hoists, (Anchor), Towed Body Equipment, Winches, Windlasses. Doors; Bow fairing, Bow landing craft. Lathes, special purpose. Special purpose custom machines. Hydraulic and pneumatic presses, power driven. Pulp and paper industry machinery. Steel mill equipment. Cars, mine. Materials handling equipment; Bridge cranes, Capstans, Cranes, Derricks. Winches; Bathythermograph, Drum (Power Operated), Hydraulic. Elevators. Medium and heavy machining. Meehanite, Ductile and Gray Iron Castings.
1045 1055 1680 1710 2030 2040
3419 3442 3615 3695 3820 3950
3960 5845 and Pages B4 and B10.

HEROUX LIMITED,

340 Thurber St.,
Longueuil, Que.
Telephone 514: 679-5450
Telex: 01-2910
President: Jesse Turner
Contact: Rene Nolet, Vice-Pres. & Gen. Mgr.
Floor Area: 150,000 sq. ft.
Personnel: 750

Manufacturers of: Hydraulic Components & Assemblies, Aircraft & Commercial Extruded Hinges; Spars, Ribs; Longerons & Bulkheads & other Airframe Parts; Gears; Splines; Tools, Jigs & Fixtures; Precision Machining; Plating Facilities including Electro-Plating, Anodizing, & Chemical Finishes; Controlled Glass Head Shot Peening. Repair & Overhaul of all Hydraulic Components.

1325 1336 1340 1355 1420 1560
1620 1630 1650 1680 1710 2040
2840 2910 2915 2995 3010 3465
3615 3695 4730 4810 4820 4920
and Pages B6, B10, B14 and I-38.

HOCHELAGA TOOL & DIE INC.,

4325 Industrial Boulevard,
Montreal North, Que.
Telephone 514: 321-0200
Director: C. Morin
Contact: O. Hurbut
Floor Area: 16,050 sq. ft.
Personnel: 63

Manufacturers of: Hydraulic servo valves; Grinding, milling.
Page B10.

HOLLAND HITCH OF CANADA LIMITED,

595 Athlope Ave.,
Woodstock, Ont.
Telephone 519: 537-3494

Contact: A. R. Gillott, Gen. Mgr.

Floor Area: 30,000 sq. ft.

Personnel: 45

Manufacturers of: Fifth Wheels; Trailer King Pins; Trailer Landing Gear; Pintle Hooks; Tow Hooks & Couplers for Trucks.
2510 and Page B10.

HOLMES FOUNDRY LIMITED,

200 Exmouth St.,
Sarnia, Ont.
Telephone 519: 337-3721
Vice-Pres., Sales: C. N. Blunt
Floor Area: 160,000 sq. ft.
Personnel: 600

Manufacturers of: Grey Iron & Ductile Iron Castings in High Volume; Cylinder Blocks, Truck Hubs, Axle Housings, Crankshafts, Brake Spiders, Pressure Plates, Rocker Arms.
2520 2530 2805 and Page B4.

HOLMES INSULATIONS LIMITED,

200 Exmouth St.,
Sarnia, Ont.
Telephone 519: 337-3721
Telex: 024-7613
President: L. D. Dougan
Floor Area: 160,000 sq. ft.
Personnel: 600

Manufacturers of: Industrial Pipe Insulation; Industrial Block Insulation; Glass Fibre Industrial Insulation Felts & Metal Mesh Covered Felts & Blankets; Glass Fibre Residential Insulation; Metal Pan Acoustical Ceiling Panels.
5640

FRANK W. HORNER LIMITED,

P.O. Box 959,
Montreal 3, Que.
Telephone 514: 731-3931
President: H. R. Horner
Contact: J. N. Best, Vice-Pres.,
Manufacturing
Floor Area: 160,000 sq. ft.
Personnel: 286

Manufacturers of: Pharmaceutical Specialties & Rain Repellants for Wind Screens.
1680 2540 6505 6850 and Page I-330.

HORTON STEEL WORKS, LTD.,

Fort Erie, Ontario.
Telephone 416: 871-1500
President: A. G. Asplin
Contact: G. H. Crase, Vice-President, Sales
Floor Area: 207,000 sq. ft.
Personnel: 600

Manufacturers of: Elevated Tanks, Stand-pipes, Storage Tanks (Oil & Water), process tanks, Horton-spheres, Vaporspheres, Surge

Tanks, Evaporators, Barking Drums, Bark Presses, Penstocks, Crystallizers and all heavy steel plate fabrication.
3210 3695 4440 5430 5445 and Page B10.

JAMES HOWDEN & PARSONS OF CANADA LIMITED,

**1510 Birchmount Road,
Scarborough, Ontario.
Telephone 416: 759-2271
Managing Director: W. MacOwan
Contact: J. H. Fulcher, Marketing Manager
Floor Area: 68,000 sq. ft.
Personnel: 160**

Manufacturers of: Collectors, Dust, Centicell, Multivortex, Vortex, Cyclone; Fans, Forced Draft, Induced Draft, Primary Air, Secondary Air, Exhaust, Ventilating, Sinter, General, Marine, Single and Multi Stage Axial Flow Fans; Compressors, Air, Centrifugal, Air Rotary; Blowers. Marine; Exchangers, Heat, All Purpose, Exchangers and Convertors, Heat; Valves, Marine, Butterfly, Instantner, Sludge, Hydraulic Bilge, Hydraulic Dust Trap, Automatic, Quick-Opening and Quick Closing; Sheet Metal Work medium to heavy; Air Conditioning Equipment; Air Washing Units Industrial; Blowers, Industrial; Air Conditioning Heater, Units, Industrial; Fabrications, Weldments, Structural Steel; Tanks, Fuel, Steel; Howden Rotary Regenerative Air Preheaters, Package Air Preheaters; Howden/Drummond Gas Washers; Electro Precipitators; Turbines, Steam, Auxiliary; Engines, Steam; Silencers; Buoys, Marine; Incinerators.
1740 2040 2050 2330 2510 2820
2825 3615 3910 4120 4140 4310
4410 4420 4450 4460 4530 4540
4810 4820 5430 8120

HOWMET OF CANADA LIMITED,

**364 Waterloo Ave.,
Guelph, Ont.
Telephone 519: 824-1140
Cable: HOWMETCAN
General Manager: W. C. Moeller
Floor Area: 40,000 sq. ft.
Personnel: 66**

Manufacturers of: Rubber Gloves for Surgeons, Obstetrical, Post Mortem, Veterinary use; Also Rubber Gloves for household, industrial uses; Meteorological balloons.
6515 6660 8415

HUSSMANN REFRIGERATOR CO. LIMITED,

**58 Frank Street,
Brantford, Ontario.
Telephone 519: 756-6351
President: H. W. Freeborn
Contact: J. M. Freeborn, Industrial Engineer
Floor Area: 177,000 sq. ft.
Personnel: 300**

Manufacturers of: Refrigerated Display Counters; Adjustable metal shelving; Walk-in Coolers; Mechanical Checkouts; Condensing Units; High-pressure Liquid Receivers; All kinds of light metal and wood fabrication and welding assembly; Drop Wing-tanks; Cabinets, electronic; Pressurized tanks, Aluminum and Steel.
1560 4110 4120 4130 5975 6530
7125 8120 8140

**IRC RESISTORS,
(Division of Renfrew Electric Co. Limited)**

349 Carlaw Avenue,
Toronto 8, Ontario.
Telephone 416: 461-3511
President: J. R. Longstaffe
Contact: W. J. Muller, Sales Manager
Floor Area: 55,000 sq. ft.
Personnel: 150

Manufacturers of: Electronic Resistors — All
Types, Commercial and MIL.
5905 5960

**I.T.E. CIRCUIT BREAKER (CANADA)
LTD.,**

(Bulldog Electric Products Division)

80 Clayson Road,
Weston, Ontario.
Telephone 416: 241-8601
General Manager: J. Kennedy
Floor Area: 85,000 sq. ft.
Personnel: 250

Manufacturers of: Electrical distribution
equipment 600 V and under; Bus duct;
Lighting duct; Safety switches; Service en-
trance equipment; Load centres; Panel-
boards; Switchboards; Molded case circuit
breakers; Multi-outlet assemblies.
5920 5925 5930 5935 5940 5975
6110 6150

**I-T-E CIRCUIT BREAKER (CANADA)
LIMITED,**

(Eastern Power Devices Division),

2401 Dixie Road,
Port Credit, Ontario.
Telephone 416: 279-1520
Telex: 029-6130
Vice-President Marketing: W. E. Rhodes
Floor Area: 125,000 sq. ft.
Personnel: 350

Manufacturers of: Power distribution equip-
ment; Metal enclosed bus; High voltage and
extra high voltage disconnecting switches;
High voltage and low voltage switchgear;
Power switching centres; Naval and marine
switchboards; Silicon semiconductor recti-
fiers, power capacitors, power connectors
and accessories; Unit sub-stations; Circuit
breakers.

5910 5920 5925 5930 5935 5950
5961 5975 6110 6120 6130 6150

ITT CANADA LIMITED,

175 Dawson Rd.,
Guelph, Ont.
Telephone 519: 821-2000
Telex: 0295-6547
President: J. A. H. MacKay
Director of Data Switching: K. C. Cameron

Director of Avionics: J. S. Farrell
Director of Telecommunications:

K. A. Wilkinson

Floor Area: 60,000 sq. ft.
Personnel: 390

Manufacturers of: Military and Commercial
radio communication equipment; Aircraft
guidance equipment; Ground and Airborne
Navigational equipment and Associated Test
Equipment; Microwave and telecommunica-
tion equipment; Installation, Repair and
Overhaul of Electronic Equipment; Elec-
tronic Precision Measuring Equipment Cali-
bration services; Technical Representatives;
Operation and Maintenance of Radar, Com-
munications, and Navaid Equipment.

1430 5805 5820 5821 5825 5826
5840 5841 5895 5915 5950 5975
6310 6320 6330 6920 7610 and Page
B4.

ITT CANNON ELECTRIC CANADA LTD.,

160 Bartley Drive,
Toronto 16, Ont.
Telephone 416: 751-5440
Telex: 02-2250

Vice-Pres. & Gen. Mgr.: D. Simkins
Contact: R. C. Enright, Sales Mgr.
Floor Area: 22,500 sq. ft.
Personnel: 150

Manufacturers of: All types of military and
commercial electrical connectors, plugs and
receptacles.
5935

ILINES MACHINE PRODUCTS LIMITED,

1 Elrose Ave.,
Weston, Ont.
Telephone 416: 249-8228
President: L. J. Ilines
Contact: T. I. Lynch, Gen. Mgr.
Floor Area: 13,000 sq. ft.
Personnel: 40

Manufacturers of: Kitchen & Galley Equip-
ment. Sculptured Aircraft Components.
Production Jigs, Fixtures and Templates.
1560 2840 3465 7310 and Page B10.

**IMPERIAL-EASTMAN CORP. (CANADA)
LIMITED,**

75 Dyment Road,
Barrie, Ont.
Telephone 705: 726-1891
President: C. McNellis
Contact: R. W. Snider, Vice-President Sales
Floor Area: 50,000 sq. ft.
Personnel: 125

Manufacturers of: Hydraulic tube fittings,
Hydraulic hose assemblies, Tubing Tools,
Lubrication fittings, Thermoplastic tubing,
Automatic Screw machine products.
4710 4720 4730 4820

IMPERIAL SCHOOL DESKS LTD.,

7170 Antrim Ave.,
Burnaby 1, B.C.
Telephone 604: 433-0501
Executive Vice-Pres. & Gen. Mgr.: Kenneth
A. Stewart
Floor Area: 120,000 sq. ft.
Personnel: 232

Manufacturers of: Furniture, Wooden, Steel
and Tubular, Custom made for School, Of-
fice and Ship. Cabinets, Shelving and bins
in Wood and Steel.
2090 7110 7125 7195

IMPERIAL TOOL & DIE LTD.,

1335 Martin Grove Rd.,
Rexdale, Ont.
Telephone 416: 244-5821 or 5969
Vice-Pres.: Lewis F. J. Dart
Floor Area: 10,000 sq. ft.
Personnel: 20

Manufacturers of: Special Machines, Jigs,
Fixtures, Dies, Blanking, Forming, Drawing;
Aircraft Components and Assemblies; Pre-
cision Machining; Moulds, Plastic Injection
and Die Cast.
3465 5110

INDESCO LIMITED,

46 St. Clair Ave., East,
Toronto 7, Ont.
Telephone 416: 925-5571
Contact: W. F. Chmela
Floor Area: 3,000 sq. ft.
Personnel: 200

Consulting Engineering Services in the De-
sign and Supervision of Construction in:
Airports and Facilities; Docking facilities;
Mining Installations; Special Purpose Equip-
ment, Machinery Tooling; Communication
Installations; Material Evaluation and Ma-
terial Handling Equipment.
Page B6.

**THE INDIANA STEEL PRODUCTS
COMPANY OF CANADA, LIMITED,**

529 Manitou Dr.,
Kitchener, Ontario.
Telephone 519: 744-1161
Vice President and General Manager:
Charles D. McLeish
Floor Area: 52,000 sq. ft.
Personnel: 100

Manufacturers of: Alnico Permanent Mag-
nets; Heat and Corrosion Resistant Alloy
Steel Castings.
5999 and Page B4.

INDUSTRIAL FINE CASTINGS LTD.,

272 Geary Ave.,
Toronto 4, Ont.

Telephone 416: 534-9281
Gen. Mgr.: D. B. Stewart
Contact: W. J. Cairns, Sales Mgr.
Floor Area: 7,000 sq. ft.
Personnel: 30

Manufacturers of: Precision castings in alu-
minum, bronze, stainless steel and stellite by
Lost Wax Method.
Page B4.

INDUSTRIAL MACHINING LTD.,

3650 St. Joseph Blvd. E.,
Montreal 406, Que.
Telephone 514: 255-2873
President: Jacques Janin
Contact: P. J. Malone, Prod. Mgr.
Floor Area: 156,000 sq. ft.
Personnel: 105

Manufacturers of: Special Purpose Ma-
chinery and Mechanical Equipment; Large
Ammunition Components; Ships' Propeller
Shafts—up to 40 ft.; Machine Shop Facili-
ties for repair and overhaul of Machinery.
1310 1315 1320 1325 1330 1340
1395 2010 3820 and Page B10.

**INGERSOLL MACHINE AND TOOL CO.
LTD.,**

King Street West,
Ingersoll, Ont.
Telephone 519: 485-2210
Managing Director: J. D. Loveridge
Floor Area: 120,000 sq. ft.
Personnel: 300

Manufacturers of: Automotive Steering Gear,
Trailer Axles; Ammunition Components;
General Machining.
1310 1315 1340 2520 2530
and Page B10.

INSTRONICS LIMITED,

P.O. Box 100,
Stittsville, Ont.
Telephone 613: 836-4411
Telex: 013-415
President: J. E. Knowles
Contact: H. E. Haddow
Floor Area: 6,000 sq. ft.
Personnel: 29

Manufacturers of: Data logging systems;
Voice frequency carrier telegraphy equip-
ment; Airport navigational facility remote
monitoring and control systems; Power sup-
plies; Exciters. Calibration, Repair and Over-
haul on Communications equipment, La-
boratory instrumentation, Computers and
Systems, Model Fabrication, Installation and
Proof of Performance Service, Modifications
and Circuit Development.
5820 7440 and Pages B6 and B14.

**INTERNATIONAL COOPERAGE CO. OF
CANADA LTD.,**

P.O. Box 27,
Niagara Falls, Ont.
Telephone 416: 358-3271
Contact: George B. Smith, Asst. Sales Mgr.
Floor Area: 200,000 sq. ft.
Personnel: 100

Manufacturers of: Light and Heavy Gauge Steel Drums with Food Approved Linings; Convolute Wound Round and Square Fibre Drums; Combination Plastic Steel and Fibre Drums for Dry, Semi-liquid and Liquids—BTC types. Moisture-proof, Grease-proof, Aluminum Foil Barriers. Fibre Drums: — Cores for Wire, Wire Products, Wire Reels: Plastic and Fibre. Carboys—Composite Plastic, Steel and Fibre. Wooden Barrels — Shooks — Kegs — for bulk — Dry Commodities; Kegs for Railway Track Bolts and Spikes, Washers, Screw Products. etc. Boxes, Wood, Tote, Wire Bound Pallets. Metal Stampings and Light Metal Automotive Parts.

8110 8115 8125 8130 8135

**INTERNATIONAL MALLEABLE IRON
COMPANY LIMITED,**

200 Beverley Street,
P.O. Box 180,
Guelph, Ontario.
Telephone 519: 822-2560
President and General Manager: Richard P. Carver
Contact: Lindsay Howat, General Sales Mgr.
Floor Area: 200,000 sq. ft.
Personnel: 400

Manufacturers of: Malleable and Gray Iron Pipe Fittings, American (Briggs) and English (Whitworth) Threads; Also Malleable, Pearlitic Malleable and Gray Iron Castings.
1315 1325 4730 and Page B4.

**INTERNATIONAL PARTS (CANADA)
LTD.,**

763 Warden Avenue,
Scarborough, Ont.
Telephone 416: 757-3621
General Mgr.: George Needham
Contact: E. Firth-Eagland, Gen. Sales Mgr.
Floor Area: 300,000 sq. ft.
Personnel: 250

Manufacturers of: Automobile mufflers; Automotive tail pipes and automotive exhaust pipes. Cold rolled welded seam tubing, diameters 1" to 2¼" inclusive; Pre-galvanized and aluminized welded seam tubing diameters 1" to 2¼" inclusive.
2990 4710

**INTERNATIONAL RUBBER & PLASTIC
CORP.**

10773 Place Moisan,
Montreal N., Que.
Telephone 514: 323-4520
Ex. Vice-Pres.: Ronald G. Fuller
Floor Area: 6,000 sq. ft.
Personnel: 15

Manufacturers of: Woven Thermal Insoles Floatation Vests and Belts. Scuba Diving Equipment and Regulators. Wet Diving Suits. Constant Volume Seamless Diving Suits. Custom Rubber and Plastic Moulding. Research and Development facilities for the foregoing.

3515	4220	4240	4630	4720	5120
5310	5325	5330	5340	5430	5680
6515	7240	7320	7350	8140	8335
8415	8430	8435	8465	9320	9330

and Page B6.

INTERNATIONAL SYSTCOMS LTD.,

4900 Fisher St.,
Montreal 377, Que.
Telephone 514: 735-6441
President: J. E. Conner
Contact: W. H. Campeau, Sales Mgr.
Floor Area: 20,500 sq. ft.
Personnel: 95

Manufacturers of: Amplifiers, power; Antennas, UHF and VHF; Chargers, battery; Communication Systems Equipment, Ground and Tone equipment; Decoders; Duplexers, antenna; Receivers, communication; Receivers, Transmitters, Radio; Receivers, VIF; Repeater, radio; Transceivers, mobile, portable, FM radio fully transistorized, portable UHF and VHF, UHF and VHF; Transmitters, FM, portable and mobile, UHF, VHF.
5810 5820 5821 5825 5826 5895
5985 6130

IRVIN AIR CHUTE, LTD.,

479 Central Ave.,
Fort Erie, Ont.
Telephone 416: 871-6510
Telex: 021-569
Contact: Clifford Bonn
Floor Area: 25,000 sq. ft.
Personnel: 100

Manufacturers of: Personnel Parachutes; Anti "G" Suits; Pressure Breathing Waistsuits; Emergency Seat Packs; Automatic Parachute Opening Devices; Troop Training Parachutes; Aircraft Deceleration Parachutes; Aircraft Lap and Shoulder Harnesses; Air Stabilizers; Automobile Safety Belts; Children's Harnesses; Inflatable Safety Products. Repair and Overhaul Facilities. Consulting and Design Services.
1670 1680 8415 8475 and Pages B6, B14 and I-50.

JAMES UNITED STEEL LIMITED,

**P.O. Box 877,
Sherbrooke, Que.
Telephone 819: 569-3685
President: W. L. Notman
Contact: A. G. Currie, Sales Mgr.
Floor Area: 65,000 sq. ft.
Personnel: 80**

Manufacturers of: Mining and Milling Machinery for Asbestos; Special Purpose Machinery, mechanical, hydraulic, electrical; Machinery, pulp and paper, plastic, chemical, petroleum, L.P. Gas; Metal Fabrication, ground handling equipment, conveyors, bucket elevators, chutes, ducts, silos, hoppers, tanks; Weldments, sheet metal fabrication, steel, stainless, aluminum; Power transmission Equipment; Trailers, delivery units, bulk tankers and pups; Pressure Vessels, L.P. Gas, chemicals; Air Receivers; Woodworking Machinery and Equipment. Consulting, design and installation services. Machining, light and medium.

1730 1740 2050 2090 2330 3020
3040 3210 3443 3615 3620 3650
3655 3695 3820 3895 3910 3920
3990 4310 5430 8120 and Pages B6 and B10.

THE O. H. JOHNS GLASS CO. LTD.,

**219 Broadview Ave.,
Toronto 8, Ont.
Telephone 416: 461-8153
Gen. Mgr.: H. W. May
Contact: J. Paul Richards, Comptroller
Floor Area: 35,000 sq. ft.
Personnel: 110**

Manufacturers of: Disposable Scientific Glassware Products, Ampoules, Serum Vials, Culture and Test Tubes, Pasteur Pipettes, Needle Holders, Connecting Tubes. Borosilicate Heat-resistant Glass Burettes-Water Analysis, burettes — Automatic Dispensing, Condensers, Chromatography Columns. Dewar Flasks, Distilling and Fractionating Columns and Heads, Vacuum and Extraction Apparatus, Spinner Flasks, Rain Gauges, Glass-to-Metal Seals. A complete range of Scientific and Laboratory Glassware.
6640

JOHNSON MATTHEY & MALLORY LIMITED,

**110 Industry Street,
Toronto 15, Ont.
Telephone 416: 763-5111
Cable: MATTHEY
Contact: J. E. Shirreff, President
Floor Area: 100,000 sq. ft.
Personnel: 525**

Manufacturers of: Gold, Silver, Platinum and other precious metals and alloys in all forms; Silver Alloy Brazing and Soldering Materials, Electrolytic and Tantalum Capacitors; Electrical Contacts. Resistance Welding Electrodes and Electrode Holders. Non-ferrous Castings and Forgings.

3439 5910 5935 5961 6640 9545
and Pages B4 and B9.

JOHNSON WIRE PRODUCTS LTD.,

**4747 Dagenais Street,
Montreal 207, Quebec.
Telephone 514: 933-2735
Contact: N. Goddard, Sales Manager
Floor Area: 150,000 sq. ft.
Personnel: 125**

Manufacturers of: Wire mesh products including: Mesh panels for antenna; Security screens, gates, architectural meshes; Mesh filters for Chemical, Pulp and Paper and Mining industries; Air-conditioning screens. Trays, baskets, racks for food handling. Baskets — waste paper and trash, degreasing. Gauges .064" to .5" in steel, stainless, galvanized. Mesh products in brass, bronze, copper, monel and aluminum from .0045" to .252". Wire mesh particulate filters up to 100 mesh. PVC plastic coating fluid bed process available for products.

2510 3426 3615 3650 3695 4240
5335 5660 5670 5895 5985 7290
7320 7330 7520

JOLY ENGINEERING LIMITED,

**8945 Park Ave.,
Montreal 11, Que.
Telephone 514: 387-6281
President: Philip Joly
Contact: D. T. Waldron, Gen. Mgr.
Floor Area: 12,000 sq. ft.
Personnel: 75**

Manufacturers of: Precision Fine Pitch Gears of every description; Precision Gear Boxes for Analog Computers; Gyroscope Components; Servo Mechanism; Hydraulic Valve components; Automatic Turning of High Precision Parts by the Swiss Automatic Process; Wave Guides and VHF and UHF machined components; Magnetic Particle and Penetrant to MIL-STD-410A.

1420 1630 1650 3010 3020 5940
5985 6615 and Page B10.

JOY MANUFACTURING COMPANY (CANADA) LIMITED,

**Dundas & Beverly Streets,
Galt, Ontario.
Telephone 519: 623-1550
President & General Mgr.: J. C. Alexander
Contact: D. V. Kempling, Sales Administrator, Marketing Division**

Floor Area: 117,000 sq. ft.

Personnel: 200

Manufacturers of: Rock Drills; Slusher Hoists; Utility Hoists; Sheaves; Air Valves and Hose Fittings; Belt Conveyors; Impact Crushers; Fans; Air Handling Equipment; Dust Collectors; Precipitators; Air Compressors; Pumps; Portable Air Compressors; Contractors' Tools; Quarrying Equipment; Electrical Connectors and Portable Lighting Systems.

1660	2220	2230	2590	3820	3910
4120	4140	4240	4310	4450	4460
4730	4820	5130	5133	5935	5995
6150	6210 and Page B10.				

K.K. PRECISION PARTS LTD.,

340 Oakdale Rd.,
Downsview, Ont.
Telephone 416: 742-5911
President: K. Kololian
Contact: G. Parkes, Gen. Mgr. & Chief Insp.
Floor Area: 10,000 sq. ft.
Personnel: 30

Manufacturers of: Precision Machining of Small and Medium Size, Aircraft and Missile Components and Assemblies, Jet Engine Parts, Nuclear Power Reactor. Components and Accessories, Gear Blanks, Bronze Bearings 4RMS finish, Ball Valves, Ball Joints, High Tensile Alloy Bolts and Nuts, Screw Machine Products of Sophisticated Nature. Exotic Metals, Stainless Steel all types, and Aluminum.

1005	1015	1095	1290	1325	1330
1340	1345	1355	1360	1420	2040
2915	3020	3120	4730	5305	5306

5307 and Page B10.

KEENE CORPORATION OF CANADA LTD.,

455 Dobbie Street,
Galt, Ont.
Telephone 519: 623-2482
President: J. A. McNish
Contact: P. Sharrocks, Dir. of Manufacturing
Floor Area: 50,000 sq. ft.
Personnel: 150

Manufacturers of: Hydraulic and Electrical oil conditioning and maintenance equipment; Industrial meters for petroleum and chemical liquids; Filtration equipment, Gasoline dispensers; Liquid control systems; Light and medium machine shop work; Ammunition components; Gear trains for heavy electronic equipment; Repair and overhaul facilities; Mixing units flame thrower fuel.

1040	1315	2520	2910	2940	4320
4330	4610	4930	5430	6625	6680

8120

**KEEPRITE PRODUCTS LTD.,
(Unifin Div.)**

P.O. Box 5395,
Terminal "A",
Clarke Side Rd.,
London, Ont.
Telephone 519: 451-0230
Telex: 024-664
Vice-Pres. & Gen. Mgr.: F. S. Brown
Contact: G. E. Lill, Sales Mgr.
Floor Area: 35,000 sq. ft.
Personnel: 150

Manufacturers of: Cooling equipment for Heavy Electrical Water Wheel, and Turbo-generators, Motors and Rectifiers. Trans-

former Oil Coolers — Type OFW, ONW (Water Cooled). Transformer Ail Coolers — Type OFP (Air Cooled). Bearing Coolers, Lube Oil Coolers, Motor Coolers, Shell and Tube Heat Exchangers. Diesel Engine Coolers. Air Compressor Inter-coolers and After Coolers (Air and Water). Hydrogen Coolers. Heating and Cooling Coils. Integral Finned Tube — Hifin, W/H and Lofin, Coiled Assemblies.

2825	2830	2930	4130	4310	4420
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6120

GEORGE KELK LIMITED,

48 Lesmill Rd.,
Don Mills, Ont.
Telephone 416: 445-5850
Cable: DELLEX
Telex: 02-29434
President: G. F. Kelk
Contact: C. H. Draper, Vice-Pres. Marketing
Floor Area: 17,500 sq. ft.
Personnel: 55

Manufacturers of: A.C. Line Voltage Regulators 800VA to 350VA, Single and Three-phase, 115V, 230V and 450-750V; Custom Electronic and Electro-mechanical devices and systems for automatic control and measurement; Analog-to-Digital Shaft Position Encoders; Pulse Tacho Generators; Digital Frequency Dividers; Strain Gauge Load Cells with capacities from 100,000 pounds to 8,000,000 pounds per cell; Load Cell Readout Amplifiers; Electronic Weighing Systems; Electronic Light Dimmer Systems; Digital Extensometers; Electric Field Plotters; Reference Thermocouple Ovens; Radio Transmitter Remote Control Systems; Heavy Equipment Remote Control Systems; Aircraft Electronic Test Equipment; Airborne Refractometers; Radiosondes; Electromagnetic Geophysical Ground Survey Instruments. Length, Width and Thickness, Non-Contacting Gauges for hot metal.

5805	5820	5821	5999	6110	6625
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6655 6660 and Page B6.

KELSEY-HAYES CANADA LTD.,

309 Ellis Avenue, E.,
Windsor, Ont.
Telephone 519: 254-7501
Pres. & Gen. Mgr.: L. N. Savoie
Contact: D. L. Horigan, Corporate Development Mgr.
Floor Area: 587,000 sq. ft.
Personnel: 1,400

Manufacturers of: Wheels, Hubs, Brake Drums, Disc Wheels, Cast Wheels, Full Cast Brake Drums, Rims and Spacer Bands for passenger and commercial vehicles.
2520 and Pages B4 and B10.

KINGSTON SHIPYARDS,

P.O. Box 940,
Kingston, Ontario.
Telephone 613: 542-4916
President: R. Lowry
Contact: R. W. Sutton, General Mgr.
Floor Area: 225,000 sq. ft.
Personnel: 185

Manufacturers of: Barges and lighters, Cargo special Purpose; Cargo and tanker Vessels; combat ships and landing vessels; small craft; special service vessels; Transport Vessels, passenger and troop. Repair and Overhaul facilities.

1905	1910	1915	1920	1925	1930
1935	1940	1945	1950	1955	2010
2040	2050	3695	5430	5670	8120

9330 and Page B10.

KOEHRING-WATEROUS LTD.,

P.O. Box 490,
Brantford, Ont.
Telephone 519: 752-6571
Pres. & Gen. Mgr.: P. A. Huffaker
Contact: R. H. McKay, Quality Control Mgr.
Floor Area: 180,000 sq. ft.
Personnel: 250

Manufacturers of: Mobile Truck Cranes, Hydraulic Excavators, Crane Front End Attachments, Gunmounts, Fully Automated Concrete Plants, Cement Handling Equipment, Transit Mix Plants and Construction Type Tilt Mixers (2 to 8 Yard Capacity), Hydraulic Pulpwood Grinders. Wood Chippers, Pulp Presses, Pulpwood Tree Harvesters and Pulpwood Forwarders.
1010 1015 1020 3615 3810

KLASSEN HOMES LIMITED,

P.O. Box 390,
Vulcan, Alberta.
Telephone 403: 485-2261
President: Wm. Klassen
Contact: H. K. Wallace, Manager
Floor Area: 210,000 sq. ft.
Personnel: 150

Manufacturers of: Prefabricated and portable homes, offices, bunkhouses, skid shacks and related units.
5410

KRALINATOR FILTERS LIMITED,

Montrose Street,
Preston, Ont.
Telephone 519: 653-3263
President & Gen. Mgr.: B. C. Fouse
Contact: N. R. Brett, Sales Mgr.
Floor Area: 82,000 sq. ft.
Personnel: 270

Manufacturers of: Full Flow and Partial Flow Oil Filters for Passenger Cars and Trucks; Gasoline Filters for Passenger Cars and Trucks; Oil Filter Replacement Elements for all Cars and Trucks; Replacement Filter Elements for Multi-Fuel Engines; Oil, Gas, and Fuel Filter Elements for Marine Service; Military Standard Junior and Senior Type Cartridges and Filter Assemblies; Oil and Fuel Filter Elements for Armoured and Mobile Field Equipment; Oil and Fuel Filter Elements for Stationary Engines; Water Separator and Final Fuel Filter Units for Diesel Engines; Primary and Secondary Stage Fuel Filters for Diesel Engines; Fuel Filter Replacement Elements for all Diesel Units; Air Filter Elements for Gas and Diesel Engines.
2910 2940 4330

KLOCKNER-MOELLER CANADA LIMITED,

615 Main Street,
Granby, Quebec.
Telephone 514: 378-3954
Vice-Pres. & Gen. Mgr.: W. B. Peterkin
Floor Area: 61,000 sq. ft.
Personnel: 180

Manufacturers of: Complete line of Industrial motor control equipment; AC Motor Starters; Motor control centre; Circuit Breakers; AC Contactors, AC Thermal Overload Relays; Push buttons; Limit switches; Pressure switches; Cam switches; Special Purpose Controllers.
5925 5930 5945 6110

LCS METALS LTD.,

147 Mary Street,
Brantford, Ont.
Telephone 519: 753-7306
President: P. R. Scott
Floor Area: 15,000 sq. ft.
Personnel: 35

General Precision Machining.
Page B10.

LACAL INDUSTRIES LTD.,

56 Charles St.,
Newmarket, Ont.
Telephone 416: 364-5271
Gen. Mgr.: D. C. Cleland
Contact: C. C. Tripard, Mgr. of Manufacturing

Floor Area: 200,000 sq. ft.
Personnel: 250

Manufacturers of: Hardware for the Electrical Industry, General Pole Line, Power Distribution, Power Transmission, and Special Extra High Voltage Hardware. Anchors, Bolts, Braces, Brackets, Clamps, Clevises, Connectors, Guards, Fittings, Nuts, Pins, Racks, Rods, Sectional Steel Poles, Sub-Stations, Terminals, Washers, Yokes, etc.
5975 and Pages B4 and B9.

LASALLE ENGINEERING LIMITED,

1140 Wellington St.,
Montreal, Que.
Telephone: 514: 933-4271
President: A. J. Lynch
Floor Area: 44,000 sq. ft.
Personnel: 175

Manufacturers of: Machine Tools, Jigs and Fixtures; Special Machining; Aircraft Sub Assembly Jigs and Fixtures (Design and Fabrication); Airframe Structural Components; Engine Mounts; Aircraft Ground Servicing Equipment (Design and Fabrication).
1560 1730 1740 and Page B10.

LAURENTIAN CONCENTRATES LTD.,

60 Larkspur Drive,
Ottawa 6, Ont.
Telephone 613: 828-9111
President: Wm. N. Howe
Floor Area: 11,500 sq. ft.
Personnel: 50

Manufacturers of: Mechanical Foam Liquids of All Types—Protein, High Expansion.
4210

LEAVENS BROS. LIMITED,

3220 Dufferin St.,
Toronto 19, Ont.
Telephone 416: 781-5222
President: C. R. Leavens
Contact: Edwin A. Baumgartner,
Manufacturing Mgr.

Floor Area: 35,000 sq. ft.

Personnel: 100

Manufacturers of: Aircraft Assemblies and Parts and Tooling for Aircraft Engine and Propeller Overhaul. Ground Handling Equipment. Tools and Fixtures and Test Stands for Aircraft Engines.

1420 1440 1560 1620 1670 1730
1740 3910 3920 4920

LEFEBVRE FRERES LIMITEE,

970 De Bullion St.,
Montreal 129, Que.
Telephone 514: 861-7471
Telex: 01-26153
TWX: 610-421-3456

President: P. E. Lefebvre
Contact: J. Carmel, Sales Mgr.
Floor Area: 40,000 sq. ft.
Personnel: 175

Manufacturers of: Walking Beam Ore and Stone Feeders. Plastic Extruders. Specially designed Resistance Welders. Materials handling equipment. Jigs and Fixtures. Facilities for Repair and Overhaul of Compressors, Gas and Diesel Engines and Machinery.

1560 1730 2010 2030 3010 3020
3040 3120 3419 3432 3465 3615
3695 3820 3830 3895 3950 4730
4920 and Page B10.

**LEIGH INSTRUMENTS LIMITED,
(A member of the Leigh Group)**

P.O. Box 820,
Carleton Place, Ont.
Telephone 613: 257-3883
Telex: 013-448
President & Gen. Mgr.: J. J. Shepherd
Contact: F. W. White, Dir. of Marketing
Floor Area: 100,000 sq. ft.
Personnel: 350

Designer and Manufacturer of: Flight Data Recorder/Crash Position Indicator Airfoil Deployment Systems; Flight Data Recorder Containment Systems; Servo Repeater Amplifiers; Servoed Altitude Indicators; Navigation Heading and Control Instrumentation; Liquid Steel Oxygen Instrumentation; Automatic Gaseous Fluoride Analyzer; Foliage Penetrating Survey Altimeter; Special Avionic Instruments; Avionic Ground Support Equipment; Consultant and Special Services.

1560 3020 4920 5825 5826 5835
5841 5895 6110 6605 6610 6615
6625 6630 6645 6665 6685 6695
8030 and pages 000, 000, 000, 000,
000, 000 & 000.
8030 and Pages B3, B4, B6, B8, B10, B13,
B14, I-51, I-60, I-62, I-70, I-72, I-74 and
I-92.

ERNST LEITZ CANADA LIMITED,

122 Ellen Street,
Midland, Ontario.
Telephone 705: 526-5401
Cable: ELCAN
Contact: W. G. Kluck, Mgr.
Floor Area: 55,000 sq. ft.
Personnel: 220

Manufacturers of: Still Cameras; Motion Picture Cameras; Projectors; Photographic Lenses; Fire control instruments — Optical and Optical/Mechanical; Loose Optics, e.g. Lenses; Prisms, Wedges, Mirrors, Filters, etc.; Binoculars; Optical Instrumentation for specialized industrial applications; Lasers. Design and development facilities relative to the foregoing fields.

1210 1240 1290 5850 5855 5860
6650 6710 6720 6760 and Pages B6,
I-278, I-280, I-284 and I-286.

LENKURT ELECTRIC CO. OF CANADA LTD.,

75 Albert St.,
Ottawa 2, Ont.
Telephone 604: 298-2464
President & Gen. Mgr.: H. R. Herron
Contact: D. H. Michel, Gen. Sales Mgr.
Floor Area: 126,000 sq. ft.
Personnel: 1,000

Manufacturers of: VHF, UHF and Microwave Point-to-Point Radio Communications Equipment and Systems; Telephone, Telegraph and Data Multiplex Carrier Equipment; Remote Supervisory and Alarm Systems; Ancillary Equipment.

5805 5815 5820 5835 5895 5915
5935 5950 5975 5985 5995 5999
6110 6130 and Pages B4, B6 and I-138.

**LICON,
(Division of Canada Illinois Tools, Limited)**

67 Scarsdale Road,
Don Mills, Ont.
Telephone 416: 447-7251
TWX: 610-492-1353
Telex: 02-29806
Vice-President: F. Ballentine
Contact: E. Kernohan
Floor Area: 2,000 sq. ft.
Personnel: 10

Manufacturers of: Sensitive Miniature and Sub-Miniature Snap Action Switches, Aircraft landing gear type switches.
5930

**LIGHTNING CIRCUITS,
(A Division of Lightning Fastener Co. Ltd.)**

P.O. Box 940,
Victoria Ave.,

Niagara-on-the-Lake, Ont.
Telephone 416: 468-7663
Vice-Pres. & Gen. Mgr.: D. S. P. Conner
Contact: I. C. Langston
Floor Area: 5,000 sq. ft.
Personnel: 30

Manufacturers of: Printed Circuit Boards.
5999

LIGHTNING FASTENER CO. LIMITED,

50 Niagara St.,
St. Catharines, Ont.
Telephone 416: 685-7321
Vice-Pres. & Gen. Mgr.: D. S. P. Conner
Contact: T. F. O'Donnell, Merchandising & Market Research Manager
Floor Area: 100,000 sq. ft.
Personnel: 600

Manufacturers of: All sizes of zippers including Military types specified in Canadian specifications DID PSNL-12-2-IE and US—VF106B including all types of jumbo sizes, two-way bottom opening, center opening, etc.; Also nylon filament slide fasteners; Printed Electronic Circuit Boards; Miniature Zinc Die Casting.

5325 5999 and Pages B4 and B10.

**LINAMAR MACHINERY LIMITED,
R.R. No. 1,**

Arris (Guelph), Ontario.
Telephone 519: 822-4068
President: F. Hasenfratz
Floor Area: 20,000 sq. ft.
Personnel: 45

General precision machining, using both conventional and NC machines. Car towing rig for service work.

Page B10.

LITTON SYSTEMS (CANADA) LTD.,

25 Cityview Drive,
Rexdale, Ont.
Telephone 416: 249-1231
President & Gen. Mgr.: J. D. Freitag
Contact: R. E. Marcille, Dir. of Marketing
Floor Area: 200,000 sq. ft.
Personnel: 1,400

Manufacturers of and Repair and Overhaul Facilities for: Airborne Inertial Navigation Systems; Airborne Weapons Delivery Systems; Tactical Data Systems for Airborne, Land and Sea Applications; Aerospace Ground Equipment; Special Purpose Computer Control Systems; Instrumentation for Aviation, Scientific, Commercial and Industrial Applications.

1420 5810 5825 5826 5841 5995
6110 6130 6605 6610 6615 6625 and
Pages B14, I-52, I-86, I-96, I-98, I-100, I-144
and I-206.

LIVINGSTON INDUSTRIES LTD.,

Tillson Ave.,
Tillsonburg, Ont.
Telephone 519: 842-4211
President: G. F. Francolini
Contact: H. Wade, Exec. Vice-Pres.
Floor Area: 1,000,000 sq. ft.
Personnel: 800

Manufacturers of: Boxes; Crates; Container Assemblies.
8115 8140

LOCKWOOD SURVEY CORPORATION LTD.,

1450 O'Connor Drive,
Toronto 16, Ont.
Telephone 416: 755-1141
Cable: CANLOCK
President: W. H. Godfrey
Floor Area: 60,000 sq. ft.
Personnel: 250

This Company provides the following services: Resource Development Planning and Engineering; Multiple Resources, Forestry, Agriculture, Minerals and Land and Water. Aerial Photography and Photogrammetry; Aerial Photography, Topographic Mapping, Planimetric Mapping, Mosaics, Photo-Interpretation, Route Location, Airborne Profile Recording and Airborne Quantity Surveys. Airborne Geophysics: Magnetometer, Electromagnetometer, Scintillometer, Infra-red Sensor and Gamma Ray Spectrometer.
6910 7640 and Pages B3 and B6.

LOCWELD & FORGE PRODUCTS LTD.,

50 Iberville Ave.,
Candiac, Que.
Telephone 514: 659-9661
President: Morris Fast
Contact: A. Yager
Floor Area: 110,000 sq. ft.
Personnel: 225

Manufacturers of: Work Benches, Steel; Machine Bolts; Tote Boxes, Aluminum Boxes; Fire Escapes; Metal Ladders; Steel Platforms; Light Steel Structures; Dockboards; Architectural Related Metal Products; Electrical and Poleline Hardware; Miscellaneous Construction Material; Design and Fabrication of Transmission Line Towers.
3990 5140 5440 5445 5450 5670
5680 5975 5985 and Page B4.

LONDON CONCRETE MACHINERY COMPANY,

P.O. Box 2605,
London, Ontario.
Telephone 519: 434-7386
President: P. W. E. Hodgson
Floor Area: 80,000 sq. ft.
Personnel: 80

Manufacturers of: Concrete mixers; Hoists and Winches; Pumps.
3895 3950 4320

**LONG MANUFACTURING,
(Division of Borg-Warner Canada Limited)**

656 Kerr St. W.,
Oakville, Ontario
Telephone 416: 845-4291
President: J. H. McCreary
Contact: D. M. Donaldson, Dir. Sales & Engineering
Floor Area: 175,000 sq. ft.
Personnel: 550

Manufacturers of: Clutches, radiators, heat exchangers, oil coolers, Research and development capability on various forms of heat exchange equipment.
2520 2930

LUCAS-ROTAX LIMITED,

5595 Royalmount Ave.,
Montreal 307, Que.
Telephone 514 735-1536
Cable: ROTAXCAN
Vice-Pres. & Gen. Mgr.: I. J. Hulbert
Contact: W. I. Mackie, Commercial & Engineering Mgr.
Floor Area: 50,000 sq. ft.
Personnel: 250

Manufacturers of: Piston Pumps, Vane Pumps, Centrifugal Pumps, Hydraulic Units and Components.

Designers, Developers and Manufacturers of: Gas Turbine Fuel Control Systems including Fuel Pumps, Flow Dividers, Dump Valves, Control Valves, Fuel Nozzles and Afterburner Pumps.
2910 2915 4320 4410 and Pages B6, B10, B14 and I-42.

LUNENBURG FOUNDRY & ENGINEERING LTD.,

16 Brook St.,
Lunenburg, N.S.
Telephone 902: 634-8827
Telex: 014-422-509
Pres. & Managing Dir.: J. J. Kinley Jr.
Floor Area: 66,700 sq. ft.
Personnel: 225

Manufacturers of: Steel barges, lighters and small craft; repair and overhaul facilities for ships up to 3,000 tons; Marine equipment — stern bearings, stuffing boxes, rudders, propellers, tanks, pumps, steering gears, hoists, windlasses; grey-iron and non-ferrous castings; two cycle gasoline marine engines; sheet-metal fabricators; warm-air heating furnaces and stoves; cast-iron "Franklyn" type fireplaces.

1930 1935 1940 2010 2030 2040
2050 2805 3950 4520 and Page B4.

MLW-WORTHINGTON LIMITED,
(Formerly Montreal Locomotive Works, Ltd.)

1505 Dickson Street,
Montreal 426, P.Q.
Telephone 514: 255-3681
Telex: 01-20241

President: H. Valle
Vice-Pres. & Gen. Mgr.: R. L. Grassby
Contact: J. S. O. Neville, Mgr., Industrial
Prod. Div.

Floor Area: 655,000 sq. ft.
Personnel: 1,000

Manufacturers of: Diesel-Electric Locomotives, 900 hp and up; Stationary Diesel Engine Generating Sets, 500 hp and up; Marine Diesel Engines, 500 hp and up; Rapid Transit Cars; Steam Generators, Feed-water Heaters, Heat Exchangers; Pressure Vessels; Pulp and Paper Machinery, Steel Mill Equipment; Pumps and Air Compressors; Armoured Vehicle Bodies; Heavy Steel Fabricating and Machining.

1010 1015 1020 1045 2210 2320
2815 2820 3615 3695 4310 4320
4420 6115 6125 8120 and Page B10.

MAGLINE OF CANADA LIMITED,

P.O. Box 219,
Renfrew, Ontario.
Telephone 613: 432-3253

Vice-Pres. & Gen. Mgr.: D. A. Tetu
Floor Area: 9,000 sq. ft.
Personnel: 15

Manufacturers of: Magnesium and Aluminium Fabrication; Dockboards; Mobile Ramps; Aircraft Boarding and Servicing Ladders; Radome Service Ladders; Hand Trucks; Platform Trucks; Electronic Housings; Magnesium Snowshoes; Magnesium Toboggans; Portable Shelters; Magnesium Tent Pins; Telescopic Tent Poles.

1670 1730 1740 2090 3920 3990
4210 5410 5440 5670 5805 8115
8340 8465 and Page B6.

MAGNA ELECTRONICS,
(Div. of Magna Electronics Corp. Ltd.)

1480 Birchmount Rd.,
Scarborough, Ont.
Telephone 416: 757-2881
President: Burton Pabst

Contact: H. T. Pawson, Vice-Pres., Sales
Floor Area: 40,000 sq. ft.
Personnel: 200

Manufacturers of: Precision Machined Components for Aircraft or Electronic uses; Programmed N/C Vertical and/or Horizontal Milling Machining; 3 Axis Contour N/C Milling; Jig Boring; Pure Beryllium Machin-

ing; Heliarc Welding; TIG Welding; Resistance Welding; Aluminum Dip Brazing; Precision Gears; Chassis Stampings; Anodizing and Painting.

3010 3020 3436 5820 5821 5999 and
Pages B10, B15, I-156, I-234, I-236 and
I-292.

**MALLORY BATTERY CO. OF CANADA
LTD.,**

2333 North Sheridan Way,
Sheridan Park, Ont.
Telephone 416: 274-2361

President: D. R. Brands
Floor Area: 40,000 sq. ft.
Personnel: 200

Manufacturers of: Dry Batteries—Mercury and Manganese Alkaline. High and Low Rate Batteries. High and Low Temperature Batteries.
6135

**MANSFIELD-DENMAN GENERAL
LIMITED,**
(Industrial Products Division)

Welland, Ont.
Telephone 416: 735-5681
Telex: 021-526

President: A. A. Carse
Contact: L. F. DeSantis, Asst. Gen. Sales
Mgr.

Floor Area: 315,000 sq. ft.
Personnel: 500

Manufacturers of: Battery containers, covers and vent plugs; Custom moulded and extruded rubber and plastic parts including extruded sponge rubber and flocked weatherstrips; Glass run channel; Mohair weatherstrips; Roll formed sections; silentbloc bushings.

1310 1315 1320 1325 1330 1345
1350 1355 1390 1395 2530 5330
5340 6140 9320 9330

MARINE INDUSTRIES LIMITED,

Sorel, Quebec.
Telephone 514: 743-3351
Telex: 01-2636

President: Gerard Filion
Contact: J. Boucher, Eng. Mgr., Industrial
Sales

Floor Area: 514,000 sq. ft.
Personnel: 1,800

Manufacturers of: Accumulators, Air; Anchors; Autoclave-Metal Bonding; Barges, Cargo; Barges, Special Purpose; Buoys, All Types; Cargo Vessels; Castings, Steel; Combat Ships and Landing Vessels; Cranes, floating 100 to 300 Tons; Docks, Floating; Dredges; Fishing Vessels; Flasks, Steel; Compressed Air; Heaters, Water, Gas Fired; Heaters, Water, Oil Fired; Kilns, Rotary;

Landing Craft; Lighters—Cargo; Lighters—Special Purpose; Machining; Pontoons and Floating Docks; Pressure Vessels; Rail—Cars; Sheet Metal Fabrication; Small Craft; Smokestacks; Special Purpose Machinery; Special Service Vessels; Tanker Vessels; Tanks; Tank Trailers—Specially Designed; Transport Vessels; Winches—Drum Power Operated; Wind Tunnels.

1905 1910 1915 1920 1925 1930
 1935 1940 1945 1950 1955 2040
 2050 2220 3695 3950 4430 4520
 5430 8120 and Page B10.

MARITIME INDUSTRIES LIMITED,

445 West 6th Ave.,
 Vancouver 10, B.C.
 Telephone 604: 879-4681
 President: J. A. Macdonell
 Floor Area: 50,000 sq. ft.
 Personnel: 35

Manufacturers of: Airline Ground Support Equipment such as Highlift Commissary Vehicles; Mobile Cargo Lifts; Mobile Belt Loaders; Pallet Loaders and Mobile Lighting Towers. Torque Compensated Marine Drives.

1730 6210

MARSLAND ENGINEERING LIMITED, (A member of the Leigh Group)

350 Weber Street North,
 Waterloo, Ontario.
 Telephone 519: 744-3321
 Telex: 029-5440
 President: L. H. Marsland
 Contact: John W. Marsland
 Floor Area: 250,000 sq. ft.
 Personnel: 1,000

Depth Control Units (DCU-41/A), Air-Manufacturers of: Permanent Magnet Loudspeakers and Speaker Systems; Wire Wound Resistors; Hermetically Sealed Relays (miniature); "Ledex" Rotary Solenoids; Gas Meter Registers; Solenoids; Precision Gears and Gear Trains; Servo Systems and Servo Components; Servo Driven Displays for Navigational and Tactical purposes. (MK NC-2 Plotters), AJH/501 and 502 Dual Channel Explosive Echo Range Recorders, Torpedo Depth Control Units (DCU-41/A), Airborne Intercom Sets (CT114), Simulators for Sonar Set Operator Training, Fine Grain Data Generators, High Power Radar Rotary Couplers and Gear Drives; Public Address Amplifiers; Loudspeaker Systems; Television Tuners; F.M. Tuners; Wired Electronic Assemblies; Memory Core Planes; Electro-magnetic coils; Hydraulic Drives; Radio and Television Transformers, D.C. Power Sup-

plies, Toroids. Meteorological Instruments and Special Purpose Digital Computers.

1220 1315 1355 1390 3020 4820
 5805 5820 5821 5825 5826 5830
 5831 5835 5840 5841 5845 5895
 5905 5945 5950 5965 5985 5995
 5999 6110 6130 6320 6605 6625
 6645 6660 6665 6680 6910 6930
 6940 7440 and Pages B10 and B13.

MASTER MECHANICAL MANUFACTURING LIMITED,

139 Wendell Avenue, Weston,
 Toronto, Ontario.
 Telephone 416: 241-8534
 President: T. C. King
 Contact: G. K. Tench, Manager-Operations
 Floor Area: 60,000 sq. ft.
 Personnel: 250

Designers and Builders of: Special machines for automatic assembly, metal removal, metal forming, rotary and inline transfer; Special aircraft tooling, gauges, jigs, fixtures and dies.

1730 3419 3456 3465 3615 3695
 3910 4920 5130 5210 5220 and Pages
 B6 and B10.

MATSUMOTO SHIPYARDS LIMITED,

3829 Dollarton Highway,
 North Vancouver, B.C.
 Telephone 604: 929-3461
 Vice-Pres. & Gen. Mgr.: I. M. Matsumoto
 Floor Area: 25,100 sq. ft.
 Personnel: 40

Manufacturers of: Aluminum, Steel and Wooden Fishing Vessels, Tugs and Work Boats, Pleasure Cruisers, Sea-going Motor Yachts and Landing Craft. Pre-fabricated Metal Structures.

1905 1920 1925 1940 1945 2020
 2040 2050 2090 5420 5430

MATTHEW MOODY DIVISION, (Canadian Bowl-Mor Company Ltd.)

P.O. Box 10,
 Mount Royal P.O.,
 Montreal 16, Que.
 Telephone 514: 666-3711
 Telex: 012-212
 President: P. A. Putziger
 Contact: H. Shapiro
 Floor Area: 85,000 sq. ft.
 Personnel: 106

Manufacturers of: Materials handling; equipment nonself-propelled; Hand Trucks; Factory Trucks and Food Handling Equipment.

1730 1740 2330 3510 3695 3895
 3920 3950 3990 5120 5340 5440
 7125 7320 7330

MEASUREMENT ENGINEERING LTD.,

232 John St.,
Arnprior, Ont.
Telephone 613: 623-4217
Contact: J. B. Turner
Floor Area: 15,000 sq. ft.
Personnel: 66

Manufacturers of: Audio Amplifiers; battery chargers, radio transmitters and receivers; power supplies; beacons; electronic and communications consoles; radio navigation aids; radiac monitoring equipment; telegraph and teletype switchboards; wiring harness; racks and cabinets; teletype tables; electronic test equipment.

5805	5820	5821	5825	5830	5831
5895	5935	5975	5995	5999	6110
6130	6310	6320	6330	6350	6625
6665	6680	6885	6910	6930	6940

MECHRON ENGINEERING PRODUCTS LTD.,

2437 Kaladar Ave.,
Ottawa 8, Ont.
Telephone 613: 733-3855
President: S. T. Ballantyne
Contact: G. H. Askwith, Vice-Pres.
Floor Area: 22,000 sq. ft.
Personnel: 85

Manufacturers of: Generators and Generator Sets—Electrical.
6115

METRO ENGINEERING CO. LTD.,

55 Milton St.,
Ville St. Pierre,
Montreal 130, Que.
Telephone 514: 481-1108
President: H. Saggo
Contact: M. Goldsmith, Exec. Vice-Pres.
Floor Area: 18,000 sq. ft.
Personnel: 75

Manufacturers of: Aircraft, gun and ammunition components; Hydraulic Components and assemblies, Tools, jigs and fixtures. Precision Machining, plating facilities including electro-plating and anodizing, Metal Fabrication. Induction heat treating.

1005	1015	1290	1325	1330	1336
1340	1345	1350	1355	1360	1390
1395	1420	1560	1630	1650	1680
1730	2010	2040	2840	3010	3120
3456	3465	3820	3910	4230	4320
4730	4920	5140	5306	5307	5315
5440	5935	5940	and Page B10.		

MICROSYSTEMS INTERNATIONAL LIMITED,

800 Dorchester Boulevard West,
Montreal 101, Que.
President: A. O. Wolff
Contact: H. Schunk, Marketing Mgr., U.S.A.

Advanced Devices Centre,
75 Moodie Drive,
Ottawa, Ont.
Telephone 613: 828-9191
Floor Area: 340,000 sq. ft.
Personnel: 900

Manufacturers of: Semiconductor devices including transistors, diodes, varistors, thin film devices, integrated circuits, and thin—film hybrid microcircuits.
5961

MICROWAVE DEVICES, INC.,

6120 Metropolitan Blvd. East,
Montreal, Quebec.
Telephone 514: 254-2711
Gen. Mgr.: Roger F. Centner
Contact: Roger F. Centner
Floor Area: 3500 sq. ft.
Personnel: 10

Manufacturers and Designers of: Transmission Lines and Microwave Components; Sub-Assemblies and Instruments in the frequency range from 250 MC thru 12,400 MC. We use all Standard Waveguide from WR 90 thru WR 2300 and all Standard Rigid Coaxial Lines from 2/8" thru 6-1/8".
5840 5841 5905 5915 5945 5985
6625

MILLTRONICS LIMITED,

730 The Kingsway,
Peterborough, Ontario.
Telephone 705: 745-2431
Cable: MILLTRONICS
Exec. Vice-Pres.: Stewart W. Daniel
Contact: John P. Gemmell, Operations Mgr.
Floor Area: 7,200 sq. ft.
Personnel: 30

Manufacturers of: Industrial electronic controls; patented grinding mill control systems; electric and electronic panels; instantaneous speed controls for D.C. motors; motion failure alarms for nuclear industry employees.
5820 5830 5840 5895 5950 6110
6625 6665 7440

MIMIK LIMITED,

Argyll Road,
Galt, Ontario.
Telephone 519: 621-8010
President: L. S. Magor
Contact: N. J. Sweetlove, Sales Mgr.
Floor Area: 23,000 sq. ft.
Personnel: 100

Manufacturers of: Hydraulic Tracer and Positioning Controls for machine tools; Hydraulic Grade and Slope Controllers for paving and road grading machines; Hydraulic Servo and Tracer Valves.
3460 3805 3895 4810

THE ROBERT MITCHELL CO, LTD.,

350 Decarie Blvd.,
Montreal, Que.
Telephone 514: 747-2471
Vice-Pres. & Gen. Mgr.: G. H. Holland
Floor Area: 250,000 sq. ft.
Personnel: 650

Manufacturers of: Ammunition Boxes. Chassis and Consoles Electric and Electronic. Vibratory Conveyors, Heat-exchangers and Pressure Vessels. Stainless Steel Pipe and Fittings. Kitchen and Laundry Equipment. Passenger Bridges for Air Terminals. Storage Tanks. Magnesium and Aluminum Castings. 2510 3910 4710 5815 5820 5821 5825 5895 5999 8140 and Page B10.

MODERN MACHINE INDUSTRY LTD.,

445 Guimond Blvd.,
Jacques Cartier, Que.
Telephone 514: 677-6363
President: E. Trudeau
Contact: G. Choiniere, Works Mgr.
Floor Area: 12,500 sq. ft.
Personnel: 42

Manufacturers of: Precision Gears (Bevel, Spur, Helical, Worm) Gear Boxes. Splines and Sprockets. Shafting. 1420 1560 1630 1680 2010 2240 2530 3010 3020 3040 and Page B10.

MOLONEY ELECTRIC COMPANY OF CANADA LIMITED,

213-219 Sterling Road,
Toronto 3, Ont.
Telephone 416: 534-9226
President: G. E. Dunfield
Contact: H. W. Crosson, Vice-Pres., Sales
Floor Area: 70,000 sq. ft.
Personnel: 150

Manufacturers of: Transformers: Distribution—Single Phase to 200 KVA, Three Phase to 225 KVA; Dry Type—Single and three phase, Class A,B,C, Ventilated and sealed, up to 3000 KVA and 15 KV; Power Transformers—to 30 MVA, 161 KV, Single and Three Phase, with or without on-load-tap-changing; Electronic Transformers; Pulse, Plate Chokes and Autotransformers. 5950 6120

MOLSON INDUSTRIES LTD.,

P.O. Box 6015,
Toronto AMF, Ont.
Telephone 416: 677-5400
Telex: 02-21434
President: D. G. Willmot
Contact: J. M. Morrison
Floor Area: 850,000 sq. ft.
Personnel: 1,600

Manufacturers of: Cast Iron Soil Pipe and Fittings 2" to 15"; Cast Iron Water Pressure Pipe; Gas and Oil Fired Forced Warm Air Furnaces; Gas Fired Unit Heaters; Armoured Gauges; Sump Pumps; Compressed Oxygen and Acetylene Gases; Wood and Steel Office Furniture and Filing Equipment; Open Web Steel Joists; Cold Roll Formed Sections; Paper Filing Supplies; Sectional Steel Scaffolding; Horizontal and Vertical Shoring; Concrete Form Panels; Hoisting Towers; Blasting Explosive Loading Devices (Ano-loaders).

1730 3940 4320 4410 4420 4520
4530 4710 4730 5440 6680

MONORAIL INDUSTRIES LTD.,

10617 Ste-Gertrude,
Montreal North, Quebec.
Telephone 514: 322-8331 or 322-6910
President: M. Charles Rolland
Contact: J. Guy Paiement, Gen. Mgr.
Floor Area: 6,000 sq. ft.
Personnel: 32

Manufacturers of: Hydraulic Components, 3-Dimensional Machining, Tape Control Machining, Machining Fixtures, Hydraulic Valves and Gears and Pulleys. 3020 3456 3465 4320

MONTEBELLO METAL LIMITED,

P.O. Box 250,
Hawkesbury, Ont.
Telephone 613: 632-7096
President: F. M. Giezendanner
Contact: J. P. Cody, Gen. Sales Mgr.
Floor Area: 54,800 sq. ft.
Personnel: 175

Manufacturers of: Collapsible tubes and specialties in aluminum, tin, lead alloy. T.V., Radio cans and Ammunition Components. Impact extrusions to maximum diameter of 3½" and maximum length of 9½". 1395 8110 8140 and Page B15.

MONTREAL JUTE INDUSTRIES LTD.,

711 Common St.,
Montreal 3, Que.
Telephone 514: 866-2663
President: F. Pardo
Floor Area: 30,000 sq. ft.
Personnel: 50

Manufacturers of: Jute and cotton bags; Jute (burlap) tubing for packaging; Jute/kraft laminated bags; Sand bags and burlap cloth. 8105 8135

**MONTREAL METAL HEAT TREATING
CO.,**

5760 Cartier Street,
Montreal 35, Que.
Telephone 514: 271-3035
President: M. Renaud
Floor Area: 8,500 sq. ft.
Personnel: 27

The company is primarily engaged in thermic heat treatment of steel alloys and non-ferrous metals.
Page B15.

MUFFLER CORP. OF CANADA LIMITED,

406 Comstock Road,
Scarborough, Ontario.
Telephone 416: 757-3621
Vice-Pres.: G. Meedham
Contact: B. Firth-eagland, Sales Mgr.
Floor Area: 160,000 sq. ft.
Personnel: 185

Manufacturers of: Mufflers for trucks and automobiles.
2990

**McELHANNEY SURVEYING &
ENGINEERING LTD.,**

1200 West Pender Street,
Vancouver 1, B.C.
Telephone 604: 683-8521
President: F. H. Nash
Contact: R. A. Brocklebank, Gen. Mgr.
Floor Area: 15,000 sq. ft.
Personnel: 130

This firm can provide the following services: Photogrammetric Plotting and Map Production, Control Surveys, Geodetic Surveys, Cadastral Surveys, Highway Design

and Location, Micro-wave Communications Route Surveys, and Consulting Civil Engineering.
7640 and Page B3.

McGUIRE MANUFACTURING CO. LTD.

865 Montee de Liesse,
Montreal 377, Que.
Telephone 514: 748-7877
President: G. E. McGuire
Contact: G. Brian McGuire, Vice-Pres.
Floor Area: 21,000 sq. ft.
Personnel: 45

Manufacturers of: Chassis, Enclosures, Panels, Terminal Boards, Equipment cases and Heatsinks for Electrical and Electronic Equipment. Steel Cabinets and Shelving. Tote Pans and Boxes. Steel Boxes and Containers including Ammunition. Custom Sheet Metal Fabrication.
5140 5999 7125 8115 8140

McPHAR GEOPHYSICS LIMITED,

139 Bond Avenue,
Don Mills, Ontario.
Telephone 416: 444-4451
President: Dr. P. G. Hallof
Contact: A. S. Stevens, Gen. Mgr.
Floor Area: 16,000 sq. ft.
Personnel: 90

Manufacturers of: Geophysical equipment for Mining Industry; Nondestructive Test Equipment; Sonoscopes for Non-Destructive Inspection of Concrete Structures; Geophysical Survey Service and Non-Destructive Testing of Wire-Rope Cables.
6630 6635 6655

NAPANEE INDUSTRIES (1962) LTD.,

51 Ann Street,
P.O. Box 1000,
Napanee, Ontario.
Telephone 613: 354-3377
President: A. N. Campbell
Contact: A. G. McDermott, Vice-President
Floor Area: 125,000 sq. ft.
Personnel: 150

Manufacturers of: Napanee Automatic Packaged Firetube Boilers (from 10 H.P. to 825 H.P.) for Gas-Oil-or Combination Gas-Oil Fuels; Napanee Tankless Water Heaters (20 H.P. to 90 H.P.) for Gas-Oil-or Combination Gas-Oil Fuels; Smaller Heating Boilers; Mobile Cranes (5 Ton, 6 Ton, 8 Ton, 10 Ton); Fork Lift Trucks; Railway Equipment—Nailable Steel Flooring Running Board—DF & DFB Bulkheads; Stamping and Metal Fabrication for all Types.
3695 4410 4420 4520 4530 5430
5450 8120 9515 9535

NATIONAL RUBBER CO. LTD.,

394 Symington Ave.,
Toronto 9, Ont.
Telephone 416: 763-4381
Vice-Pres. & Gen. Mgr.: Sheldon Gross
Contact: Bruno Dattrino, Asst. to Gen. Mgr.
Floor Area: 110,000 sq. ft.-
Personnel: 400

Manufacturers of: Tire and Tube Repair Material and Sectional Vulcanizing Equipment.
2640

NATIONAL SEMICONDUCTORS LTD.,

2150 Ward St.,
Montreal 378, Que.
Telephone 514: 744-5507
President: D. A. Anderson
Contact: George Pankau, Vice-Pres. & Sales Mgr.

Floor Area: 20,000 sq. ft.
Personnel: 80

Manufacturers of: Cadmium Sulphide Photoconductive Cells, Cadmium Selenide Photoconductive Cells and Silicon Photovoltaic Cells.

5961 and Pages B6 and I-199.

NATIONAL STEEL CAR CORPORATION LIMITED,

Kenilworth Ave. N.,
P.O. Box 450,
Hamilton, Ont.
Telephone 416: 544-3311
President: T. F. Rahilly, Jr.
Floor Area: 827,161 sq. ft.
Personnel: 1200

Manufacturers of: Railway cars; Steel fabricated assemblies; Shelters; Shell forgings; Tank tracks; Steel loading platforms; Trailer bodies; Kiln cars; Refuse cars; Ingot buggies; Mould cars; Reducing furnaces; Boiler parts; Acid tanks; Steel doors; Cargo containers; Repair and overhaul facilities.

1010 1015 1020 1045 1310 1315
1320 1650 1930 1935 2220 2230
2240 2320 2330 3695 3895 3990
4130 5430 5670 8120 8140 and page B9.

NEPTUNE METERS LIMITED,

3526 Lake Shore Blvd. West,
Toronto 14, Ont.
Telephone 416: 259-4211
Cable: TRIDMETCO
President: W. O. Randall
Contact: H. C. Greer, Sales Mgr.
Floor Area: 100,000 sq. ft.
Personnel: 400

Manufacturers of: Liquid Meters and Accessories for water, petroleum, chemicals hot and cold; Gas meters for the natural gas industry; Jobbing Foundry for non-ferrous castings.
4730 6680 and Page B4.

NI-SIL CABLES LIMITED,

170 North Queen Street,
Toronto 18, Ont.
Telephone 416: 233-5507
Telex: 02-2670
Cable: NISILCABLE
Gen. Mgr.: P. B. Walters
Contact: W. Shikolka, Mgr. Sales Administration

Floor Area: 50,000 sq. ft.
Personnel: 100

Manufacturers of: Teflon wire and specialty cables for use in electronics, computers, space vehicles, aircraft and high temperature applications. Single end, stranded or bunched copper conductors with no plating. Nickel, silver and tin plating wire and cables. Insulations include teflon, polyethylene, P.V.C., nylon, mylar, kapton, and kynar.
5995 6145

R. H. NICHOLS COMPANY LIMITED,

4544 Dufferin St.,
P.O. Box 500,
Downsview, Ont.
Telephone 416: 633-8190
Telex: 02-29296
TWX: 610-492-1348
Cable: NICOLTROL
Gen. Mgr.: D. A. Rhind
Contact: A. H. Tuxworth, Vice-Pres.
Floor Area: 25,000 sq. ft.
Personnel: 110

Manufacturers of: Remote Supervisory Control Telemetry; Digital Data Systems; Control Metering and Protective Relaying Panels; Automatic Sequence Control Systems for Hydro Plants and Gas Turbines; High Frequency (di-electric) Heating; Battery Chargers; System Diagrams; Annunciators; Events Sequence Recorder Systems; Service and Repair for the foregoing products.

5805 5820 5840 5895 5975 5995
 5999 6110 6130 6150 6310 6320
 6350 6625 6665 6910 7440 and Pages
 B6 and B13.

1265 1285 1430 4935 5805 5810
 5815 5820 5821 5825 5826 5830
 5831 5835 5840 5841 5845 5895
 5905 5910 5915 5920 5930 5935
 5940 5945 5950 5955 5960 5961
 5965 5985 5995 5999 6110 6130
 6145 6240 6350 6625 7440 and Pages
 B4, B8, B10, B14, I-106, I-120 and I-122.

Montreal Works

Montreal, Que.

Floor Area: 1,142,000 sq. ft.

Personnel: 5,300

Manufacturers of: Step-by-step Switching Equipment, Frequency Division Modulation and Pulse Code Modulation Multiplex System and Microwave Radio, with Ancillary Equipment such as Supervisory Control, Protection Switching and Signalling, for the Transmission of Telephone, Telegraph, Data and Television Signals. In support of Switching and Transmission Product Lines, a comprehensive range of Manufactured Components and Associated Hardware, including Dry Reed Switches, Resistors, Capacitors, Inductors, special Electron Tubes, Audio and Radio Frequency Transformers, Networks, Filters, Equalizers, Quartz Crystals, Power Transformers, Filter Chokes, Circuit Modules, Data Sets, Ferrite Memories and Ferrite Magnetic Materials.

Lachine Cable Works

Lachine, Que.

Floor Area: 1,265,000 sq. ft.

Personnel: 2,000

Manufacturers of: A complete line of Voice and High Frequency Communication Cables and Cordage; T.V. Cables; High and Extra High Voltage Overhead and Underground Cables; Medium and Large Paper Insulated, Rubber and Thermoplastic Covered Cables; A complete line of Building Wires and Cables; Copper Rod.

Laurentian Works,

Montreal, Que.

Floor Area: 289,000 sq. ft.

Personnel: 1,200

Manufacturers of: Domestic and Export Crossbar Telephone Switching Systems.

Bramalea Crossbar & Electronic Switching Works,

Bramalea, Ont.

Floor Area: 678,000 sq. ft.

Personnel: 3,153

Manufacturers of: Common Control and Stored Program Control Switching Systems for Toll and Local Telecommunications Applications.

NORANDA COPPER MILLS LIMITED,

President: F. J. E. Lockhart

Floor Area: 214,565 sq. ft.

Personnel: 790

Western Copper Division

920 Derwent Way,

Annacis Island,

New Westminster, B.C.

Telephone 604: 526-3661

Cable: NORMILLS

Contact: R. M. Mills, Mgr. —

U.S. Tubes Sales

Manufacturers of: Copper and various copper alloys pipe and tube,
 4710

Montreal East Division

Sherbrooke & Durocher Sts.,

P.O. Box 1158,

Montreal 3, Que.

Telephone 514: 645-8741

Cable: NORMILLE

Contact: G. A. Fuller, Mgr. U.S. Strip &

Rod Sales

Manufacturers of: Copper and various copper alloys in strip, rod, bar and wire.
 9525 9530 9535

NORTHERN ELECTRIC COMPANY LIMITED,

Head Office,

P.O. Box 6123,

1600 Dorchester Blvd. W.,

Montreal, Que.

Telephone 514: 931-5711

Contact: M. M. Beresford, Mgr.,

Government Liaison,

P.O. Box 232,

141 Catherine St.,

Ottawa, Ont.

Tel. 613: 232-9693

Telex: 05-267414

TWX: 610-421-3750

Total Floor Area: 6,935,000 sq. ft.

Total Personnel: 23,270

**London Works,
London, Ont.**

**Floor Area: 416,000 sq. ft.
Personnel: 1,460**

Manufacturers of: Telephone Apparatus including Telephone Sets, Telephone Booths, Protectors and Connecting Blocks.

**Belleville Works,
Belleville, Ont.**

**Floor Area: 250,000 sq. ft.
Personnel: 850**

Manufacturers of: A wide range of Telephone Apparatus as well as highly sophisticated Electronic Equipment such as Parametric Amplifiers and a wide range of Satellite Communication Equipment.

**Advanced Devices Division,
Ottawa, Ont.**

**Floor Area: 160,000 sq. ft.
Personnel: 680**

Manufacturers of: Semiconductor Devices including Transistors, Diodes, Varistors, Thin Film Devices and Integrated Circuits.

**NORTHERN ELECTRIC CO. LTD.,
(Research & Development Labs),**

**P.O. Box 3511, Station "C",
Highway 17 at Crystal Bay,
Ottawa, Ont.**

**Telephone 613: 828-2761
TWX: 610-562-1914**

**Contact: W. H. Barrie, Programme Mgr.
Floor Area: 225,000 sq. ft.
Personnel: 1830**

Research & Development work in: Microwave Radio Transmission Systems, Parametric & High Power Amplifiers, Digital, Video & Multiplex Transmission Systems, Power Equipment, Communications Satellite and Ground Stations, Transmission Networks, Magnetic Materials, Metallurgical & Semiconductor Research Electronic and Electromechanical Switching System Development, Components, Station and Customer Apparatus, Outside Plant, Wire and Cable, Mechanical System Development.
Page B6.

**NORTHERN RADIO MANUFACTURING
CO. LTD.,**

**1950 Bank Street,
Ottawa, Ont.
Telephone 613: 733-4440
Telex: 013-274**

**President: J. G. MacMillan
Contact: W. Dover, Secretary-Treasurer
Floor Area: 9,000 sq. ft.
Personnel: 60**

Manufacturers of: Fully solid state Multi-Channel Voice Frequency Carrier Telegraph and Data Transmission Systems; Multi-Channel Frequency Shift Diversity Telegraph Systems; Twinplex Equipment; Monitors; Frequency Shift Tone Keyers and Converters; Telemetering Systems; Diversity Receivers; Master Oscillators; Line Amplifiers; Constant Volume Amplifiers; Demodulators; Tone Filters; Regenerative Repeaters; Electronic and Electro-Mechanical Telegraph Relays; Airport Navigational Facility Remote Monitoring and Control Systems.
5805 5810 5815 5820 5895

NORTHWEST INDUSTRIES LIMITED,

**P.O. Box 517,
Industrial Airport,
Edmonton, Alberta.
Telephone 403: 455-3161
Telex: 037-2681**

**President: E. L. Bunnell
Contact: F. A. Moore, Vice-Pres., Marketing
Floor Area: 375,000 sq. ft.
Personnel: 550**

Manufacturers of: Aircraft Structural Parts, Aircraft Ground Handling Equipment, Reinforced Plastic Products, Overhaul and Modification of Aircraft, Aircraft Components, Instruments & Accessories.

1345 1350 1355 1560 1730 2050
2925 3615 4710 5430 5995 7610
9330 and Pages B6, B10, B14 and B15.

**NORTON RESEARCH CORPORATION
(CANADA) LTD.,**

**100 Daly Street,
P.O. Box 690,
Chippawa, Ont.
Telephone 416: 295-4311**

**President: J. J. Jeppson
Contact: Dr. A. F. McKay, Vice-Pres.
& Managing Dir.**

**Floor Area: 51,000 sq. ft.
Personnel: 61**

A Research Design and Development Facility whose Technology Encompasses the Ceramic Inorganic Material Sciences Field. It can provide Consultant and Development Services for Electronic, Abrasive, and Refractory problems in this field. At the present time it produces for sale Optical Grade Fused Magnesia Crystals and Fused Urania and Thoria. Facilities for Synthesis of most Metal Carbides, Borides, Nitrides, Oxides and Silicides are available as well as fabrication means — Hot Pressing, etc. It is capable of producing Semiconductor Materials

such as Silicon Carbide Varistors and Diodes and has a pilot line for limited production of such components.
5350 5895 5961 9350 and Pages B6 and B13.

NOVATRONICS LTD.,

**677 Erie Street,
Stratford, Ont.**

Telephone 519: 271-3880

Telex: 029-5510

Vice-Pres.: R. W. Watler

Contact: E. J. Mulvey, Sales Mgr.

Floor Area: 27,000 sq. ft.

Personnel: 150

Manufacturers of: Stepper Motors (PM & VR), Stepping Transmitters, Electronic Logic Drivers, Digital Indicators, Gyro Stators, Synchros, Servomotors and Gearheads, Mufax Electro-sensitive Recording Paper, Servo Assemblies.

5990 6105 6110 6625 7530 and Pages B10, I-188 and I-190.

NYTRONICS OF CANADA LTD.,

**68 Wall St.,
Trenton, Ont.**

Telephone 613: 392-6544

Gen. Mgr.: R. A. Cohn
Floor Area: 10,000 sq. ft.
Personnel: 25

Manufacturers of: Subminiature Chokes, Radio Frequency; Delay Lines, Inductors, Standard, fixed; Inductors, Standard Variable; Radio Frequency Transformers; L.C. Filters; XL Coils.

5915 5950 5999 6625

NORTHERN MACHINE WORKS LTD.

**450 Main St.,
Postal Stn. "K",
Bathurst, N.B.**

Telephone 506: 546-3318

Telex: 014-245-17

Cable: NORMAC

President: G. Munro

Floor Area: 43,000 sq. ft.

Personnel: 55

Manufacturers of: Rotary Snow Blowers; Front-end Blade Snow Plows; Aggregate Spreaders. Off-highway Trailers; Tractor Mounted Dump Trucks for Mining and Trucking Industries. Custom Sheet Metal Fabrication.

O. & W. ELECTRONICS LIMITED,
(A member of the Leigh Group)

1335 Lawrence Ave. E.,
P.O. Box 278,
Don Mills, Ont.
Telephone 416: 447-6471
Telex: 02-2081

Cable: OKITOR
President: R. B. Bozek
Contact: D. A. Murdock, Sales Mgr.
Floor Area: 30,000 sq. ft.
Personnel: 250

Manufacturers of: Printed Circuit Boards, rigid and flexible, and Edge Lighted Panels; Fabricated Plastic Components and Assemblies; Terminal Blocks, Boards and Strips; Plotting Boards and Scales Mechanical; Reticles, Knobs and Dials; Chemically machined Metal Parts; Printed Circuit Board Assemblies and Package Circuits, Multi-layer Printed Circuit; Flush Commutator and Ancoder Discs; Flexible Circuitry, Electronic Sub-Assemblies and Assemblies.
1220 1560 5355 5805 5820 5821
5825 5826 5830 5831 5840 5841
5940 5970 5999 6110 6605 6910
9330 9905 and Page I-194.

**OAK-HART MANUFACTURING
(CANADA) LIMITED,**

155 Edward Street,
Aurora, Ontario.
Telephone 416: 727-9058
Asst. Gen. Mgr.: D. W. Richardson
Contact: R. S. Phillips — Sales Supervisor
Floor Area: 24,000 sq. ft.
Personnel: 147

Manufacturers of: Electronic and Appliance Switches, Pilot Lamps, Thermostats, Motor Cut-out switches, Bi-Metal Thermostats, Infinite heat Switches (Ranges) Rotary switches (Ranges), Toggle switches, Pilot lights (Neon) Lever switches, Push-button switches, rotary switches, slide switches, Printed - circuit switches, Sub - miniature switches, Thumbwheel switches.
5930 6240 6680

OKANAGAN HELICOPTERS LTD.,

Vancouver International Airport,
Vancouver, B.C.
Telephone 604: 278-5502
Telex: 04-5283
President: Ian Kennedy
Contact: W. D. Crowe, Sales Mgr.
Floor Area: 15,000 sq. ft.
Personnel: 165

Designers and Manufacturers of: Helicopter gear used for the construction of Power Lines, Microwave Systems, Aerial Spraying and other related Air Transportable Equipment. Aerial Surveys including Control

Survey, Land use survey, Photography Geophysical survey. Helicopter Repair and Overhaul.
1680 and Pages B3, B6, B14 and I-46.

**W. H. OLSEN MANUFACTURING CO.
LTD.,**

Louise St. At No. 2 Highway,
Tilbury, Ont.
Telephone 519: 682-2062
President: J. K. Farrar
Contact: T. C. Lemieux, Vice-Pres.
Floor Area: 194,500 sq. ft.
Personnel: 220

Manufacturers of: Unit Heaters; gas and oil fired furnaces; Truck Bodies; Camper Trailers; Military Trailers; Weldments; Laundry Tubs, fibreglass; Grenade and rocket components; Steel Garage Doors.
1310 1315 1320 1325 1330 1340
1355 2330 2510 4510 4520 5670

OMICRON DATA SYSTEMS LTD.,

4480 Cote de Liesse Rd.,
Suite 310,
Montreal 306, Que.
Telephone 514: 733-8502 or 1222
President: C. R. Ahooya
Contact: A. L. Stelmach, Vice-Pres.
Floor Area: 3,000 sq. ft.
Personnel: 10

Management Consulting Services: Simulation, Operations Research, Technical and Economic Feasibility, Project Management and Control, Market Research, Technology Forecasting, Research, Development and Design Consulting Services in: Computer Sciences, Data Communications, Radio, Electronics and Remote Control Systems. Services include system Feasibility Studies, Evaluation, Certification, System Analysis, Programming, Equipment Development and Design.
Page B6.

ONAN GENERATORS CANADA LTD.,

233 Campbell Road,
Guelph, Ont.
Telephone 519: 824-9560
Contact: W. D. Harrison, Gen. Mgr.
Marketing
Floor Area: 40,000 sq. ft.
Personnel: 20

Manufacturers of: Gasoline, gaseous fuel and diesel driven generator sets and controls. Gasoline and Diesel engines.
2805 2815 6115

ONTARIO RESEARCH FOUNDATION,

Sheridan Park,
Clarkson, Ontario.
Telephone 416: 822-4111

President: W. R. Stadelman
Contact: J. D. Jones — Director,
Project Development

Floor Area: 200,000 sq. ft.

Personnel: 275

A research and development facility embracing a wide range of scientific disciplines and industrial technologies, and capable of producing custom built instrumentation and engineering prototypes. Instrumentation units designed and built have included electron beam probe spectrometers and related equipment, atmospheric fluoride analysers, solid-particle count and monitoring devices, a yarn evenness meter and integrator, etc. Engineering prototypes have covered a broad range including high-vacuum pumping systems, agricultural equipment, ore-concentration equipment, etc.

6625 6640 6665

THE ONTARIO RUBBER CO.,

1244 Dufferin St.,

Toronto 4, Ont.

Telephone 416: 535-2154

TWX: 610-491-2247

President: W. C. Copeland

Contact: G. Speight, Export Mgr.

Floor Area: 25,500 sq. ft.

Personnel: 62

Manufacturers of: Custom moulded rubber shapes. Grommets, Bumpers, Slitting Rings and Gaskets. Weather Stripping. Rubber to Metal Bonding.

5325 5330 9320

ORENDA LIMITED,

P.O. Box 6001,

Toronto International Airport,

Toronto, Ont.

Telephone 416: 677-3250

Telex: 02-29933

Cable: ORENDATOR

President: F. P. Mitchell

Contact: D. J. Caple, Sales & Contracts Mgr.

Floor Area: 950,000 sq. ft.

Personnel: 2400

Manufacturers of: Machined parts and sheet metal fabrication of complex parts for Gas Turbines. Nuclear products ranging from Steam Pumps to In-Reactor Instrumentation. Design and Manufacture of Industrial & Aircraft Gas Turbines; Design and Development of Special Purpose Land Vehicles. Engineering Consulting and Design Services. Program Management and Data Computing Services. A wide range of industrial testing including sound surveys, chemical and metallurgical analysis, welding and including sound surveys, chemical and metallurgical analysis, welding and including repairs to instrumentation. Repair and Overhaul of Gas Turbines.

1440 2320 2835 2840 2995 6115
and Pages B6, B12, B13, B14 and B15.

OTACO LIMITED,

West Street, S.,

Orillia, Ont.

Telephone 705: 326-6121

Telex: 02-8759

Cable: OTACO

President: B. W. Barr

Contact: W. Simpson, Sales Mgr.

Floor Area: 425,000 sq. ft.

Personnel: 300

Manufacturers of: Pump Water Supply & Sump. Flow Developers, Ice Removal & Refuse Clearing. Wagons, Towed, Pneumatic Tire 3-8 Ton Capacity. Arctic Sleds 1-10 Ton Capacity, Personnel, Mess & Kitchen & Cargo. Wheels, Hubs, Axles, Springs & Complete Running Gear for Towed Equipments. Bench Vises. Castings, Ductile, Gray & Steel.

2330 2510 2530 3920 4320 and Pages B4 and B10.

OTIS ELEVATOR COMPANY LIMITED,

414 Victoria Ave. North,

Hamilton, Ontario.

Telephone 416: 527-9271

President: G. H. Blumenauer

Contact: R. L. Dafoe, Works Manager

Manufacturers of: Elevators, Passenger and Freight, Electric and Hydraulic; Hollow Metal Doors, Entrances, and Cabs; Escalators, (Moving Stairways); Trav-O-Lators, (Moving Walkways); Dumbwaiters Electric; Elevator, Escalator, and Trav-O-Lator, General Service, Contract Service, and Modernization; Industrial Lift Trucks, Gas, L.P., and Electric, Baker and Raymond; Custom Machining, Assembly, and Fabrication.

1010 1015 1020 1025 3930 3960
and Page B10.

OUTBOARD MARINE CORPORATION OF CANADA LTD.,

910 Monaghan Rd.,

Peterborough, Ont.

Telephone 705: 743-2261

Telex: 029-819

President: T. P. McMillan

Contact: Bruce L. Payne, Vice-Pres.

Floor Area: 850,000 sq. ft.

Personnel: 1700

Manufacturers of: Outboard Marine Motors; Inboard-Outboard Marine Motors; Snowmobiles; Power Lawn Mowers; Chain saws; Internal Combustion Gasoline Engines; Ignition Coils, Die Castings in Magnesium and Aluminum; Automatic Screw Machine Parts.

2430 2805 2920 3695 5130 and Page B4.

PASS & SEYMOUR,
(Division of Renfrew Electric Co. Limited)

349 Carlaw Avenue,
Toronto 8, Ontario.
Telephone 416: 461-3511
President: J. R. Longstaffe
Contact: D. R. Longstaffe
Floor Area: 6,000 sq. ft.
Personnel: 15

Manufacturers of: Commercial and Domestic wiring devices such as: switches, plugs, receptacles, waterproof covers.
5930 5935

PEACOCK BROTHERS LIMITED,

260 St. Patrick St.,
LaSalle, Que.
Telephone 514: 366-5900
President: J. K. Crowley
Contact: B. P. Emo, Vice-Pres.,
Engineering Div.

Floor Area: 180,200 sq. ft.
Personnel: 350

Manufacturers of: Auxiliary machinery for commercial marine and naval ships, including boiler feed pumps; Fire, water bilge, ballast, condensate and oil pumps; Condensers, deaerators, feed water heaters, air ejectors; Sea water evaporators and distillers; Filters and strainers for air and liquid applications; Sliding Padeye and retractable Kingpost units for underway replenishment systems; Complete machine shop facilities for repair and overhaul of machinery, manufacture of machinery and parts.

2020 2030 2825 4310 4320 4420
4620 and Page B10.

THE PEDLAR PEOPLE LIMITED,

519 Simcoe Street South,
Oshawa, Ontario.
Telephone 416: 723-4613
Telex: 02-29655
President: J. G. Geikie
Contact: A. S. Reed, Vice-President, Sales
Floor Area: 250,000 sq. ft.
Personnel: 400

Manufacturers of: Expanded Metals; Shelving; Lockers; Bins; Cabinets; Work Benches; Metal Lathes and Plastering Accessories; Eavestroughing; Culverts; Metal Roofing and Siding; Barn Equipment.
2090 4710 4920 5335 5650 5680
6530 7125 7195 9515

PERFECTION AUTOMOTIVE PRODUCTS LIMITED,

3766 Peter Street,
Windsor, Ontario.
Telephone 519: 256-2353

President: S. J. Wallach
Contact: S. D. Aston, Gen. Mgr.
Floor Area: 143,000 sq. ft.
Personnel: 75

Manufacturers of: vehicle lights, speedometer parts, truck mirrors, springs, muffler clamps, spot lights, etc.
2540 2990

PHILLIPS CABLES LIMITED,

King Street West,
Brockville, Ont.
Telephone 613: 345-5666
President: T. A. Lindsay
Contact: J. E. Thomas, Vice-Pres.
Floor Area: 830,000 sq. ft.
Personnel: 1200

Manufacturers of: Cable, Coaxial, Radio Frequency (RG Series); Cable; Ignition; Cable, Multi-Core Communication; Cable Power; Cable, Power, Electrical Shielded, AN Series; Wire, Electrical; All items in Federal Supply Classification Class 6145 excluding bending ribbon, conductors suppression electrical noise, resistance wire, bonding ribbon.
6145 6150

PHILIPS ELECTRONICS INDUSTRIES LTD.,

116 Vanderhoof Avenue,
Toronto 17, Ontario.
Telephone 416: 425-5161
Vice President: E. Butler
Contact: A. J. Hutcheon, Mgr. Telecom.
Dept.

Floor Area: 30,000 sq. ft.
Personnel: 60

Manufacturers of: Radio Communications Equipment; Fixed, Mobile, Portable Ionospheric Sounders, Low Frequency Radio Beacon Systems, Supervisory Control and Fault Alarm Systems, Microwave Radio Telephone Relay Systems, Telemetry Systems, Telephone and Telegraph Systems.
1285 5805 5815 5820 5821 5825
5826 5840 5841 5895 5950 5955
5960 5961 5985 5999 6625 6645
6910 and Page B6.

PIONEER SAWS LTD.,

(Subsidiary of Outboard Marine)
910 Monaghan Rd.,
Peterborough, Ont.
Telephone 705: 743-2261
Telex: 029-819
President: J. D. Mennell

Contact: Bruce L. Payne, Vice-Pres.
Personnel: 100

Manufacturers of: Chain Saws; Saw Chain;
Guide Bars for Chain Saws.
3695

PIRELLI CABLES LIMITED,

P.O. Box 70,
71 Richelieu St.,
St. Johns, Que.
Telephone 514: 346-6831
Telex: 01-2624

Cable: PIRELCABLE
Contact: P. Lord, Sales Service Reg.
Floor Area: 279,000 sq. ft.
Personnel: 407

Manufacturers of: Electric wire and cable.
6145 6150

PLASTAL MANUFACTURING LTD.,

476 Edouard St.,
Granby, Que.
Telephone 514: 378-8439
President: G. C. Keefer
Floor Area: 18,000 sq. ft.
Personnel: 30

Manufacturers of: Acrylic Parts Including
Aircraft Canopies & Windows. Thermo-
formed Plastic Parts (Kydex, Royalite, etc.).
Fiberglass Reinforced Parts.
1560 6920 8115 9330

PLYMOUTH TOOL AND STAMPING LTD.,

54 Crockford Blvd.,
Scarborough, Ont.
Telephone 416: 751-0440
President: F. Smith
Contact: R. J. Johnston, Sales Plant Mgr.
Floor Area: 11,000 sq. ft.
Personnel: 50

Manufacturers of: Carbide Lamination and
Progressive Dies; Jigs and Fixtures; Pre-
cision machining; High Volume Pre-
cision Metal Stamping.
3456 3465

JOS. POITRAS & FILS LTEE,

L'Isletville, P.Q.
Telephone 418: 247-3988
Manager: Martin Poitras
Floor Area: 35,000 sq. ft.
Personnel: 57

Manufacturers of: Tenoners, Surface planers,
Jointers, Band saws, Circular saws, Dowel
machines, Exhausters, Knives, Grinders and
Shapers.
3220 3230

POLYFIBER LIMITED,

148 Lochiel St.,
Renfrew, Ont.
Telephone 613: 432-3644
Telex: 013-3346
President: D. W. Stewart
Contact: E. A. Brown, Vice-Pres. &
Gen. Mgr.

Floor Area: 44,000 sq. ft.
Personnel: 35

Custom manufacturers of Fiberglass re-in-
forced polyester and epoxy pressings and
mouldings; Press moulded containers; Mech-
anical frames and other components; Fila-
ment winding; Corrosion resistant compon-
ents; Development work and design.

1560 2240 2330 2510 2540 4710
5410 5430 5985 7125 8115 8140
8415 9330 and Page B6.

POLYGON SERVICES LIMITED, (Acme Div.)

50 Northline Rd.,
Toronto 16, Ont.
Telephone 416: 755-3301
Telex: 02-29535

President: E. Chester Hamlin
Contact: A. E. Shaw, Vice-Pres. & Sales
Mgr.

Floor Area: 25,000 sq. ft.
Personnel: 70

Manufacturers of: Transistorized Power
Supplies; Unit Substations; Variable Voltage
Adjustors; Voltage Reference Supply; Volt-
age Stabilizers; D.C. Power Supply Battery
Charger; Generators; Magnetic Power Con-
trols; Motor Speed Controls; Phase Chang-
ers; Power Distribution Centers; Rectifier
Equipment; Saturable Reactors; Sliding Core
Reactors; Dry Type Rectifier, Furnace con-
trol. Distribution and Power size Trans-
formers to 5000 KVA. Custom Engineered
Equipment.

5950 6110 6115 6120 6130

POLYMER CORPORATION LIMITED,

Vidal St. South,
Sarnia, Ont.
Telephone 519: 337-8251
Cable: POLYSAR
Pres. & Managing Dir.: E. R. Rowzee
Contact: J. T. Dunn, Sales Mgr.
Floor Area: 470 Acres
Personnel: 3,000

Manufacturers of: Synthetic Rubbers, La-
tices, Plastics and Chemicals. Synthetic
Rubbers: Styrene-Butadiene Copolymers
(Butyl Rubbers); Trans-Polyisoprene (Syn-
thetic Balata); Acrylonitrile-Butadiene Co-

polymers (Nitrile Rubbers); Polybutadiene (SBR); Isobutylene - Isoprene Copolymers Latices; Styrene-Butadiene Latices; Carboxylated Styrene-Butadiene Latices; Acrylonitrile-Butadiene Latex; Butadiene-Styrene Vinyl Pyridine Latex. Plastics: Acrylonitrile-Butadiene-Styrene (ABS), Polystyrene. Engineering Plastics. Chemicals: Styrene Monomer Isobutylene.
6810 and Page B6.

PORT ARTHUR SHIPBUILDING CO.,

(Div. of Canadian Shipbuilding & Engineering Ltd.),

P.O. Box 690,

Port Arthur, Ont.

Telephone 807: 683-6265

Telex: 033-397

Gen. Mgr.: R. W. Sutton

Floor Area: 300,000 sq. ft.

Personnel: 300

Manufacturers of: Ships, Barges, Tankers, Naval Vessels; Scows, Ocean-going Vessels. Designers and Builders of Pulp & Paper Machinery. Designers and Builders of Mill-work.

1905 1910 1915 1920 1925 1930

1935 1940 1945 1950 1955 2020

2050 2090 3615 3695 3895 3910

3940 4410 4430 4520 5420 5430

5450 7125 7195 and Pages B4 and B10.

PORT WELLER DRY DOCKS LTD.,

St. Catharines, Ont.

Telephone 416: 934-2581

Telex: 021-536

Cable: PORTWELLERDOC

President: J. D. Leitch

Contact: G. S. Black, Vice-Pres. & Gen. Mgr.

Floor Area: 109,000 sq. ft.

Personnel: 450

Manufacturers of: Landing Craft; Cargo & Tanker Vessels; Fishing Vessels; Special Service Vessels; Barges and Lighters; Cargo and Special Services; Small Craft; Pontoons and Floating Docks; Floating Dry Docks; Floating Dock Gates; Dredges; Transport Vessels, Passenger and Troop; Bulk Carriers and Self-Unloaders; Repair and Overhaul Facilities, Dry Dock 750' x 80'.

1905 1910 1915 1920 1925 1930

1935 1940 1945 1950 1955 2010

2020 2040 2050 5420 5430 5450

PORTLAND TOOL AND MACHINE LTD.,

27 Bathurst Street,

Toronto 2B, Ont.

Telephone 416: 362-2451

President: S. Grant

Contact: R. Delaney

Floor Area: 40,000 sq. ft.

Personnel: 125

Manufacturers of: Jigs, Fixtures, Dies, Special Gauges, Special Machines & General Machining.

3456 3465 3695

POWERLITE DEVICES LTD.,

54 Atomic Avenue,

Toronto 18, Ontario.

Telephone 416: 259-8201

President: D. S. Young

Contact: K. R. Ormrod, Mgr. Marketing Services

Floor Area: 60,000 sq. ft.

Personnel: 150

Manufacturers of: Industrial switch gear, high-voltage distribution equipment, outdoor lighting fixtures, standards and buckets. Aircraft starting cables.

6110 6210

POWERTRONIC EQUIPMENT LIMITED,

125 Nantucket Blvd.,

Scarborough, Ont.

Telephones 416: 755-3377 or 691-8491

President: B. W. Richardson

Contact: W. D. Sikrtanc, General Sales Mgr.

Floor Area: 20,000 sq. ft.

Personnel: 70

Manufacturers of: Aircraft Energizers; Instrument Testing and Flight Simulator Power Supplies; Industrial Rectifiers, Controls and Signal Systems; Power and Simulation for Anodizing, Electrolysis, Electro-plating together with voltage and supervisory control; Battery Chargers; Power Supplies for Communication Systems; Emergency Power Systems; Distribution Panels, Switchboards, Relay Panels, Lighting and Traffic Controls; Arc Welding; Motor Generators and Controls; Photoelectric Devices and Laboratory Power Supplies.

1730 3431 5805 6110 6115 6125

6130 6625

PRECI-TOOLS LIMITED,

8565 Devonshire Place

Montreal 307, Que.

Telephone 514: 342-9732

Sec. Treasurer & Gen. Mgr.: Marcel Grunwald

Contact: Raymond Grunwald, Vice-Pres., Sales

Floor Area: 26,000 sq. ft.

Personnel: 100

Manufacturers of: Turbine Engine Components. Metal Working Machinery. Medical & Surgical Equipment & Supplies such as;

Pneumotaxic Guide X-Ray Localizer, Vascular Suturing Instruments and Universal Tele-Stereotaxic Guides.
2840 3413 3416 3419 3443 3456
6515 and Page B10.

PRECISION ELECTRONIC COMPONENTS LIMITED,

19 Hafis Road,
Toronto 15, Ontario.
Telephone 416: 249-7103
TWX: 610-492-1341
President: A. Simoni
Floor Area: 15,000 sq. ft.
Personnel: 100

Manufacturers of: Hot Moulded and Metal Glaze High Reliability Variable Resistors; Precision Trimmers for industrial and military applications.
5905

PRECISION RUBBER PRODUCTS,

255 Hughes Road,
Orillia, Ontario.
Telephone 705: 325-2391
Contact: R. Robin

Manufacturers of: "O" rings; Seals; Moulded specialties.
5330

PRECISION SMALL PARTS LIMITED,

434 Steeles Avenue West,
Willowdale, Ontario.
Telephone 416: 889-5407
President: D. E. Beaumont
Contact: H. J. Callan, Sales Manager
Floor Area: 30,000 sq. ft.
Personnel: 75

Manufacturers of: Automatic screw machine products and machined components to close tolerances.

1005 1310 1315 1336 1340 1345
1350 1355 1360 1390 5305 5306
5307 5315 5940 and Page B10.

PREMIER TOOL & DIE LIMITED,

84-6 Tycos Drive,
Toronto 19, Ontario.
Telephone 416: 783-4239
President and General Manager:
William T. Richards
Floor Area: 6500 sq. ft.
Personnel: 30

Manufacturers of: Custom Tools, Dies, Jigs, Fixtures, etc.; Custom Metal Stampings (Brass, Copper, Stainless Steel).
3456 5110 5130 5136 5180

PRESENTY ENGINEERING PRODUCTS LIMITED,

233 Armstrong St.,
Ottawa 3, Ont.
Telephone 613: 729-7171
President: S. M. Presenty, P.Eng.
Floor Area: 4000 sq. ft.
Personnel: 18

Manufacturers of: AN/ANH-501, tape recorder for CF-104 aircraft; AN/RP5004/ANH-501, Tape reproducer for above; TRS-73 seven channel FM, tape scanner reproducer, used in instrumentation and data work, and detection of (Nuclear) detonations through their effect on vibrations of the earth upper crust; TRAL-7FA-seven channel, airborne tape loop memory recorder/reproducer used in large aircraft for gust acceleration and other stress recording; TRA-14 FR, 14-channel, airborne FM recorder, capable of simultaneous, highly accurate recording of 14 phenomena for use in jet fighter and trainer aircraft; Model DAC-1 for use in automatic, remote positioning of telescopes, launching devices etc. Portable army recorder/reproducers Model TRPG-A1 (field memo pad); IFF/SIF modification kits for quad radar systems to be used with AN/FPN-36 quad radars; Radar simulators for training purposes; Multi channel voice signal consoles for aircrafts; Multi channel track selector units for radio stations; AN/C-5128/FGC Control transmitter — teletypewriter for Navy Ships teletype. (Controls automatically the communication mode of a naval ship); Interface Computer Systems (computer interface systems analog to digital converters including data recording). Special electronics and electro-mechanical devices, custom made.

5815 5820 5821 5835 6645 6665
7440 and Page B6.

PRESTON FOUNDRIES LIMITED,

P.O. Box 386,
633 Margaret St.,
Preston, Ont.
Telephone 519: 653-7121
President: P. J. Kenny
Contact: W. Scott Bere
Floor Area: 55,000 sq. ft.
Personnel: 75

Manufacturers of: Grey Iron, Ductile & Meehanite Castings up to 2000 lbs. with Heat Treat & Test Facilities. Induction Furnaces (Brown Boveri). Herman High Pressure Matchplate Facility.
Page B4.

**PROGRESSIVE ENGINEERING WORKS
LTD.,**

360 West 1st Ave.,
Vancouver 10, B.C.
Telephone 604: 874-5257
President & Gen. Mgr.: W. W. Butler
Floor Area: 38,280 sq. ft.
Personnel: 50

Manufacturers of: Capstans; Castings; Iron; Brass; Non-Ferrous Metal; Steel; Cranes; Overhead Travelling; Agitators — Liquid; Anchors — Pipe Line; Bearings — Blanks; Sleeve Mounted — Plain, Flanged — Plain, Unmounted — Split; Bearing Pillow Blocks; Bases — M/c with Motor Mounts; Chains, Transmission — Block — Driving — Roller Silent — Sprocket; Conveyors; Couplings; Shaft, Flexible — Shaft, Marine; Engines, Steam, Marine; Flanges, pipe and Tube; Gears, Large, Medium, small; Gear Boxes; Wire Rope; Machining — Light, Medium, Heavy; Marine; Engines, Steam, Marine; Flanges, Pipe & Tube; Gears, Large, Medium, Small; Gear Boxes; Wire Rope; Machining — Light, Medium, Heavy; Deck Machinery — Capstans, Winches, Windlasses. Marine Hardware and Hull Items; Pins — All Types; Pipeline Equipment Sets (Landline); Pulleys — All Types; Pulp and Paper Industries Machinery; Dies for Metal Forming and Extrusion; Sawmill Machinery; Shafting — Propulsion, Ship Sheaves; Special Industry Machinery — Power Loading Machines — Steel Mill Equipment; Sprockets; Studs; Winches — Drum Power Operated; Windlasses; Repair and Overhaul Facilities.

2010	2030	2040	2820	3010	3020
3120	3130	3210	3442	3456	3615
3695	3835	3910	3950	4730	4940
5307	6105	and Pages B4 and B10.			

**PROGRESSIVE WELDER (CANADA)
LIMITED,**

P.O. Box 580, 635 Richmond St.,
Chatham, Ontario.
Telephone 519: 352-6200
Contact: B. F. Paterson, Exec. Vice-Pres.
Floor Area: 25,000 sq. ft.
Personnel: 50-75

Manufacturers of: Designed and built Resistance Welders — Spot, Seam, Flash-butt & Projection; Portable Guns; Special Automated welding machines. Weld Head Manipulators; Special Purpose Custom Machines; Production Jigs, Fixtures and templates; Hydraulic Presses; Aluminum, Brass, Bronze, Beryllium & Copper Castings; Copper & Brass Hammers.

3419	3432	3442	3465	3695
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**PURULATOR PRODUCTS (CANADA)
LIMITED,**

1180 Lakeshore Road, East,
Port Credit, Ontario.
Telephone 416: 274-2551
Telex: 02-96141
President: E. R. Perkin
Contact: P. K. Mitchell, Manager —
Technical Sales
Floor Area: 100,000 sq. ft.
Personnel: 185

Manufacturers of: Filters, Filter/Water Separators and replacement elements for the handling of bulk petroleum products at storage depots and aviation fuels at airports. Oil, air, fuel, hydraulic filters for low and high pressure systems in Micronic paper, metal edge and wire cloth media with wide temperature ranges. Filters for all automotive, truck, tractor, marine, industrial and aircraft uses.

2520	2910	2915	2940	2945	4310
4330					

**PYRENE MANUFACTURING CO.
OF CANADA LTD.,**

777 Dundas St. E.,
Toronto 8, Ont.
Telephone 416: 461-0411
Vice-Pres. & Gen. Mgr.: K. R. Laidley
Contact: G. R. Morris, Marketing Mgr.
Floor Area: 40,000 sq. ft.
Personnel: 74

Manufacturers of: All types of Hand & Wheeled Portable Fire Extinguishers; Automatic Carbon Dioxide Fire Extinguishing Systems; Mechanical Foam Producing Equipment. Airfield Crash Rescue & Fire Fighting Trucks.

1680	4210	6350	and Pages B6 and I-306.		
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QUALITY HERMETICS LIMITED,
(A member of the Leigh Group)

45 Hollinger Road,
Toronto 16, Ontario.
Telephone 416: 757-2869
General Manager: H. A. Cohen
Contact: A. H. Brooks, Plant Manager
Floor Area: 8,000 sq. ft.
Personnel: 35

Manufacturers of: All forms of Glass-to-Metal Seals applicable to the Electronics Industry.

5940	5961
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RCA LIMITED,

1001 Lenoir St.,
Montreal 207, Que.
Telephone Montreal 514: 933-7551
Ottawa 613: 236-0619

Telex: 01-2522

President: J. D. Houlding

Vice-Pres., Technical Products:

J. G. Sutherland

Contacts: G. B. MacKimmie, Space Systems
W. H. Holroyd, Broadcast &
Instructional Systems

Contacts: (Montreal)

G. B. MacKimmie, Space Systems
W. H. Holroyd, Broadcast &
Instructional Systems

J. G. Leahy, Communications

H. B. Bodwin, Defence

M. P. Bachynski, Research Labs.
(Ottawa)

G. W. Sparks

Floor Area: 320,000 sq. ft.

Personnel: 1,200

Radio Relay Equipment: FM Transmission Measuring equipment, 2,4,6,7, GHz radio relay terminals, FM modulation equipment, Baseband equipment, Precision circulators, 2,4,6,7, GHz, Coaxial switches and waveguides, Ferrite components, Antennas (microwave) and Complete systems including civil engineering.

Aerospace: Research and experimental satellites Communications satellites, Encoders, Sounders, Spacecraft subsystem, Ground Checkout equipment and Transponders.

Defence Products: Shipborn antennas, Communications Transmitters and Receivers, Computer access equipment, Character generators Alphabetic and Character generators Multi-channel.

Ground Station: Feed Systems, VHF Communications equipment, Up and Down converters, Tracking systems, Control and console equipment, Antennas, Ground Communications equipment, Monitoring equipment, RF Amplifiers, Power amplifiers and Civil engineering.

Broadcast Transmitters: AM Transmitters, AM and FM multiplex transmitters and TV Transmitters.

Antennas (Broadcast) Transmitting: FM Wideband antenna, VHF Wavestack, VHF Nova Antenna (dipole) and VHF Antennas.

Broadcast Studio Equipment: Vertical Interval Chopper, Sync & blanking adder, Black and Background generator, Phase Equalizer, Single Side Band Transceivers and Computer assisted Instruction systems.

Miscellaneous: Educational & Research lasers, Nuclear particle detectors and Spect-

rometers, Gamma Detectors, Integrated circuits (custom).

1230	1265	1285	1430	5805	5810
5815	5820	5821	5825	5826	5830
5831	5835	5840	5841	5845	5850
5855	5895	5915	5945	5950	5960
5961	5985	5990	5999	6130	6625
6660	6665	6910	6930	6940	7440

and Pages B4, B6, B8, B14 and I-102.

RADIO ENGINEERING PRODUCTS,

P.O. Box 460,

Montreal 248, Que.

Telephone 514: 731-3251

President: C. B. Fisher

Contact: S. T. Fisher, Vice-Pres.

Floor Area: 70,000 sq. ft.

Personnel: 960

Manufacturers of: Telephone & Telegraph Multiplex Equipment & Ground Tactical Military Communication Systems.

5805 5815 5830 5895 5915 5935

5965 5985 5995 and Page I-158.

RAILWAY EQUIPMENT,

(Div. of Hawker Siddeley Canada Ltd.)

P.O. Box 160,

Montreal, Que.

Telephone 514: 482-8610

Vice-Pres.: J. C. Mitchell

Contact: L. G. Main, Dir. of Marketing

Floor Area: 1,056,000 sq. ft.

Personnel: 1,000

Manufacturers of: Rail Cars; Railway Equipment; Railway Track Construction Equipment; Axles; Forgings of all types; Buoys, Steel; Pressure Vessels, Steel Castings.

2010 2040 2050 2220 2230 2240

2250 3820 3950 8120 9510 and Pages B9 and B10.

RAYTHEON CANADA LIMITED,

400 Phillip Street N.,

Waterloo, Ontario.

Telephone 519: 745-6831

Telex: 029-5431

TWX: 610-365-3469

President: John R. Cann

Contact: J. McKillican, Manager, Contracts
Planning and Control

Floor Area: 34,000 sq. ft.

Personnel: 169

Manufacturers of: Primary Surveillance Radar; Secondary Surveillance Radar; Radar Displays including Bright Display using Scan Conversion Techniques; Air Traffic Control Radar Navigational Aids, VOR and Omnitest; Weather Radar; Military Counter Mortar Radar; Specialized and Air Traffic Control Test Equipment; Radar Target Simulators; Symbol Generation Equipment;

Assemblies and Sub-Assemblies for Naval Electronic Equipment.

1265 1285 1430 5805 5810 5815
5820 5821 5825 5826 5830 5831
5840 5841 5845 5895 5960 5999
6110 7440 and Pages B4 and B6.

REIL INDUSTRIAL ENTERPRISES LTD.,

**12 Millport Drive,
Weston, Ont.**

Telephone 416: 749-1998-9

President: C. W. Reil

Contact: W. H. Reil, Sec. Treasurer

Floor Area: 6,000 sq. ft.

Personnel: 15

Manufacturers of: Precision Components and Parts for Aircraft Industry; Missile Components; Aircraft Engine Components.

1340 1355 1420 1620 1650 6615

RELIANCE ELECTRIC & ENGINEERING (CANADA) LIMITED,

**127 Judge Rd.,
Toronto 18, Ont.**

Telephone 416: 233-3281

Vice-Pres. & Gen. Mgr.: C. E. Hugus Jr.

Contact: R. White, Gen. Sales Mgr.

Floor Area: 100,000 sq. ft.

Personnel: 250

Manufacturers of: Distribution Transformers; Radar antenna drives; Electronic control for variable speed drives; Motors; M-G Sets; Transmissions; Mechanical Speed Drives; Gear Motors; Vibrating Meters; Hydraulic controls.

3010 5950 5985 6105 6110 6115
6120 6125 6625

RENFREW AIRCRAFT AND ENGINEERING COMPANY LIMITED,

**405 Hall Ave. E.,
Renfrew, Ont.**

Telephone 613: 432-3661

Telex: 013-411

Cable: RENAIRE

President: R. M. Barr

Contact: L. Jump, Administration Mgr.

Floor Area: 114,000 sq. ft.

Personnel: 260

Manufacturers of: Gas Turbine Flame Tubes; Combustion System Parts; Engine Components; Precision machining; Mechanical components for electronic equipment; Metal cabinets; Deep-drawn stainless steel products.

1325 1730 1740 2835 2840 3465
5975 5999 8110 8115 8140 and Pages
B10, B14 and B15.

RENFREW ELECTRIC CO. LTD., (Custom Components Division),

**349 Carlaw Avenue,
Toronto 8, Ontario.**

Telephone 416: 461-3511

President: J. R. Longstaffe

Contact: W. J. Muller, Sales Manager

Manufacturers of: Cable assemblies, junction boxes, metal stampings and sheet metal enclosures.

5975 5999

REX CHAINBELT (CANADA) LTD.,

**1181 Sheppard Ave. E.,
Willowdale, Ontario.**

Telephone 416: 221-9361

Executive Vice-President: L. P. Commerford

**Contact: Martin J. Warren, Sales Manager,
Industrial Products**

Floor Area: 100,000 sq. ft.

Personnel: 220

Manufacturers of: Bulk Material Handling Equipment; Bucket Elevators; Chain Conveyors; Belt Conveyors; Oscillating Conveyors; Rotary Table Feeders; Reciprocating Feeders; Apron Feeders; Travelling Water Screens; Power Transmission Equipment; Roller Bearings; Sprockets; Roller Chains; Steel Chains; Cast Chains; Pulleys; Concrete Mixers; Bin and Bath Plants; Sanitation Equipment; Carrier Vibrating Conveyors.

2520 3010 3020 3040 3130 3895
3910 3990 4010 4630 and B10.

REYNOLDS EXTRUSION COMPANY LTD.,

**630 Dorchester Blvd. W.,
Montreal 101, Que.**

Telephone 514: 868-2801

Vice-Pres. & Gen. Mgr.: Robert A. Weber

Contact: E. E. Mills, Gen. Sales Mgr.

Floor Area: 300,000 sq. ft.

Personnel: 645

Manufacturers of: Aluminum extrusions, Aluminum pipe and tube. Aluminum mouldings, Aluminum fabricated products, Aluminum ladders, Aluminum re-draw rod, Aluminum conduit, Aluminum furniture.

1730 4210 4710 5440 5670 5975
9530 9535 9540 and Page B15.

RICHARDSON ROAD MACHINERY CO. LTD.,

P.O. Box 1068,

819 - 22nd St. West,

Saskatoon, Saskatchewan.

Telephone 306: 242-2248

General Mgr.: C. H. Richardson
Contact: H. C. Prophett, Production Mgr.
 Manufacturers of: Snow plows; Snow blowers.
 2320 3805 3825

ROLLIT PRODUCTS LIMITED,

P.O. Box 56,
226 Park Street North,
Brockville, Ontario.
Telephone 613: 345-5011
President: W. B. Dowell
Floor Area: 14,000 sq. ft.
Personnel: 35

Manufacturers of: Automatic Screw Machine Products; Centerless grinding, thread rolling, other types production machining including small aircraft engine and air frame components, electronic components and ammunition components including electric primers.

1310 1315 1320 1325 1340 1345
 1355 1360 1390 1395 1560 1630
 2935 3120 3130 4730 5305 5306
 5307 5310 5315 5340 5935 5940
 5975 and Page B10.

ROLLS-ROYCE (CANADA) LTD.,

9500 Cote de Liesse Rd.,
Lachine, Que.
Telephone 514: 631-3541
Telex: 01-2382
Cable ROYCAR
President & Gen. Mgr.: K. O. W. Crooks
Contact: G. T. R. Cochrane, Commercial Mgr.

Floor Area: 118,250 sq. ft.
Personnel: 879

Manufacturers of: Aircraft Gas Turbine and Jet Engines Components; Engineering, production, technical and development services; Overhaul and repair facilities for turbo-jet and turbo-prop aircraft engines.
 2840 and Pages B6, B10, B14 and B15.

ROSS-SMITH (1969) LTD.,

1165 Hickson Ave.,
Montreal 203, Que.
Telephone 514: 766-7737
President: J. Caron
Contact: W. Etwell, Gen. Mgr.
Floor Area: 10,000 sq. ft.
Personnel: 16

Manufacturers of: Canvas & Synthetic Products — Aircraft engine, Wing & Control Surface Covers; Aviation Ground Equipment Covers; Aircraft & Ground Vehicle Fabric Seats; Covers for Electronic Gear, Ship's Deck Gear, Vehicles, Boats; Marine Cargo Slings; Fabric Bags of all types; Radio Field Fabric Carrying Cases; Webbing Harness for various uses; Tarpaulins; Hospital Hamper

liners and Laundry Bags; Work Aprons; Painters' Drop Sheets; Industrial Curtains and Dust Covers; Gymnasium Removable Floor Coverings; Dock Covers; Bumper Door Seals.
 1680 1730 2040 2090 2510 3510
 3940 5975 7240 8305 8340

ROUSSEAU CONTROLS LIMITED,

271 Labrosse Ave.,
Pointe-Claire, Que.
Telephone 514: 695-1240
President: F. H. Rousseau
Contact: R. D. Playfair, Vice-Pres.
Floor Area: 7,000 sq. ft.
Personnel: 40

Manufacturers of: Hydraulic and pneumatic systems and assemblies, non-airborne; Test equipment, industrial and aircraft; Ground handling and support equipment; Hydraulic and pneumatic linear actuators, non-airborne; Repair and overhaul of aircraft fire extinguishers; Hydraulic and pneumatic components.

1730 4910 4920

V. W. RUSKIN & ASSOCIATES ENGINEERING LTD.,

470 Granville Street,
Vancouver 2, B.C.
Telephone 604: 682-3808
President: Dr. V. W. Ruskin

Consulting Engineering Services: Operations Research, Computer Systems, Programming and Mathematical Analysis, Technical and Economic Feasibility Studies, Design and Supervision of Construction of Natural Gas and Oil Utility Systems, Defence Systems.
 Page B6.

RUSSEL BROTHERS LIMITED,

2202 3rd Avenue East,
Owen Sound, Ontario.
Telephone 519: 376-3220
President: C. F. Gaviller
Contact: C. A. Rollings, Vice-President, Sales
Floor Area: 96,000 sq. ft.
Personnel: 210

Manufacturers of: Barges, Buoys, Cargo vessels, Docks — floating, Dredges, Fishing vessels, Landing craft, Small craft, Special Service Vessels, Lighters, Pontoon & floating docks and Scows. Ship & Boat Propulsion components; Steering gears — marine; Winches — drum and power operated & Windlasses. Fabricated components — Vehicles.

1905 1915 1920 1925 1930 1935
 1940 1945 1955 2010 2020 2030
 2040 2050 2510 3950

S & C ELECTRIC CANADA LIMITED,

90 Belfield Road,
Rexdale, Ontario.

Telephone 416: 249-9171

Contact: A. R. Morrison, President and
General Manager

Floor Area: 40,000 sq. ft.

Personnel: 95

Manufacturers of: High voltage power fuses,
load-break switches, distribution cutouts,
fuse links.

5920 5925

SAFETY SUPPLY COMPANY,

214 King Street East,
Toronto 2, Ont.

Telephone 416: 364-3234

President: Sidney Hermant

Contact: Peter Dewar

Floor Area: 37,000 sq. ft.

Personnel: 65

Manufacturers of: Fire extinguishers; Ear
Defenders; Firemen's helmets; Crash helmets;
Safety hats and caps; Goggles; Protective
clothing; Asbestos and leather gloves; First
aid materials; Breathing apparatus; Non-
sparking tools; Wood and steel ladders;
Cans, safety, gasoline; Belt's safety; Floor-
ing, non-skid.

4240

**SAINT JOHN SHIPBUILDING & DRY
DOCK CO. LTD.,**

P.O. Box 970,
Saint John, New Brunswick.

Telephone 506: 693-9941

Contact: W. H. White, Vice-Pres. & Gen.
Mgr.

Floor Area: 143,200 sq. ft.

Personnel: 1,800

Manufacturers of: Cargo and Tank Vessels,
Bulk Carriers, Passenger and Troop Ships,
Combat Ship and Landing Vessels, Special
Service Vessels, Dredges, Barges, Fishing
Vessels, Lighters and other Small Craft, Ship
Repair and Overhaul facilities, Service and
Installation of Marine Electronic Equip-
ment. Industrial Fabrications for Hydro and
Thermal Electric Developments, Mining, Oil
and Chemical Plants.

1905 1910 1915 1920 1925 1930

1935 1940 1945 1955 2020 2040

2050 2090 4430 7110 7125 7195

SANGAMO COMPANY LIMITED,

215 Laird Drive,
Toronto 17, Ontario.

Telephone 416: 425-3330

President: W. A. Kennedy

Contact: A. E. Van Clieaf, Gen. Sales Mgr.

Floor Area: 150,000 sq. ft.

Personnel: 575

Manufacturers of: Electrical Rotating Ma-
chinery; Electric Motors; DC and AC Gen-
erators; Inverters; Converters; Ground Power
Supply Units; Watthour Meters; Instrument
Transformers; Meteorological Radiosondes.

5815 5821 5825 5826 5835 5840

5841 5845 5895 6105 6115 6125

6130

**SASKATCHEWAN STEEL FABRICATORS
LTD.,**

1050 St. John St.,

P.O. Box 1276,

Regina, Sask.

Telephone 306: 525-3371

Telex: 031-2202

Manager: G. G. Devlin

Contact: S. Postma, Sales Supervisor

Floor Area: 30,000 sq. ft.

Personnel: 110

Manufacturers of: Structural Steel; Tanks;
Pressure Vessels; Smokestacks; Custom Plate
Fabrication; Miscellaneous Iron; Bins; Plat-
forms; Bridges; Tower; Kilns; Reinforcing
Steel; Barges (non-propelled); Stoplogs.

1945 2040 4430 4520 5420 5430

5440 5445 5450 5660 5985 8120

SCEPTER MFG. CO. LTD.,

30 Cranfield Rd.,

Toronto 16, Ont.

Telephone 416: 757-3235

President: E. Torokvei

Contact: D. Shaw, Mgr. New Products

Floor Area: 30,000 sq. ft.

Personnel: 57

Manufacturers of: Complete line of C.S.A.
approved P.V.C. Electrical conduit, Sch. A,
40, 80 and 120. Rigid P.V.C. pipe. To 12"
dia. complete line of P.V.C. Drain Waste
and Vent piping and complete line of fit-
tings. Blow moulding facilities up to 45
Gallon sized items. Commercial line of plas-
tic jerry cans 1, 2, 3 and 5 gallon. Capacities
injection moulding facilities up to 200
ozs.

4710 4730 5975 7240 9330

SECURITY HARDWARE COMPANY,

2158 Montgomery Street,

Montreal 134, P.Q.

Telephone 514: 527-1575

President: A. M. Fish

Contact: J. E. Marrett, Vice-President

Floor Area: 3,500 sq. ft.

Manufacturers of: Security lock devices and
access control systems.

5340 6350

SEMTEC LIMITED,

3500 Ontario Street,
Windsor, Ont.
Telephone 519: 948-4128
President: Colin MacKenzie
Contact: Vic Pullen, Plant Superintendent
Floor Area: 3500 sq. ft
Personnel: 10

Manufacturers of: Gauges—Flush Pin, Plug, Snap, Fixture, Inspection, Contour, Angle, Hole; Precision Machining—Light; Forming Rolls—For Trim Sections; Tooling Components—(e.g. Chuck Jaws, Arbors, Centres, Locating Pins, Collets—Special, Bushings—Special, Pilots). Precision and Electric Reduction Machinery.

3460 3465 5210 5220 and Page B10.

SHAWINIGAN CHEMICALS LIMITED,

1 Place Ville Marie,
Montreal 113, Que.
Telephone 514: 879-2611
Telex: 01-2896

President: V. N. Hurd
Contact: L. F. Fitzpatrick, Export Sales Mgr.
Personnel: 2,100

Manufacturers of: Calcium Carbide, Industrial Chemicals, Acetylene Black, Synthetic Resins, PVC Film and Sheeting, Coated Fabrics and Packaging Films.
6810 8135 9330

SHERIDAN CONTROLS LIMITED,

48 Shepherd Ave.,
Oakville, Ont.
Telephone 416: 845-3821

President & Gen. Mgr.: D. W. Hayworth
Contact: R. C. Isaac, Vice-Pres. & Sales Mgr.
Floor Area: 4,000 sq. ft.
Personnel: 20

Manufacturers of: Special purpose custom machines—automatic and semi-automatic. Production jigs, fixtures and templates. Profile and general machining—aircraft components, light and medium.

3419 3465 and Page B10.

SHERRITT GORDON MINES LIMITED,

25 King Street West,
Toronto 1, Ont.
Telephone 416: 363-9241
Telex: 02-2491
President: D. D. Thomas
Contact: R. F. Pearce, Manager,
Metallurgical sales
Floor Area: 1,500,000 sq. ft.
Personnel: 1,650

Manufacturers of: Nickel briquettes (for alloying); Nickel powders; Nickel strip; Cobalt briquettes (for alloying); Cobalt powders; Cobalt strip.
9535 9650

SIDO LIMITED,

P.O. Box 159,
480 Robinson St.,
Granby, Quebec.
Telephone 514: 378-2222
Manager: S. Giguere
Floor Area: 15,000 sq. ft.
Personnel: 65

Manufacturers of: Specialists in fine pitch gears, precision custom made electronic hardware and components, terminal lugs, turret type; screw machine products; general precision machining.

1005 1336 1340 1345 1350 1355
1360 1420 3010 3020 3040 3110
3120 3465 4730 5305 5306 5307
5310 5315 5325 5340 5355 5935
5940 5975 and Page B10.

SIGMA INSTRUMENTS (CANADA) LIMITED,

P.O. Box 43,
55 Six Point Rd.,
Toronto 18, Ont.
Telephone 416: 239-8161
TWX: 610-492-2544

President: J. Moran
Contact: N. Silberberg, Vice-Pres.
Floor Area: 12,000 sq. ft.
Personnel: 50

Manufacturers of: Temperature indicators; Automatic controllers; Temperature recorders; Surface pyrometers; Immersion pyrometers; Micro pyrometers; Optical and radiation pyrometer (Automatic process control); Thermocouples—wires and leadwires; Magnetic thermocouples; Bridges; Potentiometers; Resistance thermometers; Electrical instruments; Flowmeters; Low Level D.C. Amplifiers.

5905 6110 6625 6680 6685

**T. S. SIMMS & CO. LIMITED,
(Machinery Division)**

1172 Fairville Boulevard,
Lancaster, New Brunswick.
Telephone 506: 672-1200
President: T. S. Simms
Contact: Donald S. MacKay, Mgr.
Machinery Div.
Floor Area: 11,000 sq. ft.
Personnel: 47

Manufacturers of: Custom-built, high-production industrial machinery. Full machine

shop facilities for light and heavy work; full design engineering and drafting staff. 3695 and Page B10.

SIMTEC LIMITED,

**3400 Metropolitan Blvd. East,
Montreal, Quebec.
Telephone 514: 728-4527
President: Nigel P. Harvey
Contact: David Oliver, Sales & Marketing
Mgr.
Floor Area: 6,000 sq. ft.
Personnel: 26**

Manufacturers of: Silicon Lithium—Drifted Nuclear Radiation Detectors; All-Diffused Silicon Totally-Depleted Nuclear Radiation de/dx Detectors; Low Noise Preamplifiers for High Resolution Nuclear Spectrometry; Main Amplifiers for High-Resolution Nuclear Spectrometry; Probes and Electronics for Medical Radioisotope Tracing; Nim Module Electronics; Germanium Detectors; Beta Spectrometers; Reactor Control Monitoring Systems; Educational Spectroscopy Systems; Annular Detectors; Transverse-Field Silicon Detectors.
6525 6625 6665

SINCLAIR RADIO LABORATORIES LTD.,

**122 Rayette Rd.,
Maple, Ont.
Telephone 416: 889-8800
President: Dr. G. Sinclair
Contact: P. Yachimec, Gen. Mgr.
Floor Area: 15,000 sq. ft.
Personnel: 60**

Manufacturers of: Communications Antennas; Duplexers and Multicouplers.
5895 5915 5985

SINTERINGS LIMITED,

**265 Edinburgh Rd. N.,
Guelph, Ont.
Telephone 519: 822-8870
Gen. Mgr.: D. H. Thorne
Floor Area: 25,000 sq. ft.
Personnel: 95**

Manufacturers of: Powdered Metal Parts, such as: Hubs, Gears, Bomb Plungers, Rod Guides, Valves, Bushings, Washers, Filters, Pulleys.

1315 1320 1336 1340 1390 2520
2940 3020 3120

N. SLATER CO.,

(Division of Slater Steel Industries, Ltd.)

**681 King St. W.,
Hamilton, Ont.
Telephone 416: 528-8888
President: H. Owen Jones**

Contact: E. G. Fraser, Asst. Sales Mgr.

Floor Area: 300,000 sq. ft.

Personnel: 350

Manufacturers of: Pole Line Hardware; Ground Rods and Connectors; Splicing Sleeves for Electrical Conductors; Hot Dip Galvanizing; Sheet Metal Stampings; Cable Grips (Pulling and Supporting); Cable Clips (Supporting and Degaussing); Forgings, Closed Die, Upset; Forgings, Drop; Forgings, Hot Brass Pressings; Forgings, Steel; Bolts, Washers, Nuts and Lock-nuts; Benches, Wood Working and Metal Working; Aluminum Castings.

1305 1325 1345 1395 5120 5306
5310 5340 5975 and Pages B4 and B9.

C. R. SNELGROVE CO. LTD., (A member of the Leigh Group)

**141 Bond Ave.,
Don Mills, Ont.
Telephone 416: 447-8531
Telex: 02-21598
Cable: SNELCRYSTL
Contact: W. C. Hickling, Pres. & Gen. Mgr.
Floor Area: 29,000 sq. ft.
Personnel: 180**

Manufacturers of: Quartz crystals; Crystal ovens; Crystal filters. Packaged oscillators.
5820 5915 5955

SOCIETE NUCLETRON INC.,

**8650 Le Creusot St.,
St. Leonard, Montreal 458, Que.
Telephone 514: 324-6330
Mgr. Vice-Pres.: Roman Poslawski
Floor Area: 25,000 sq. ft.
Personnel: 50**

Manufacturers of: H. V. Disconnecting Switches, Load-Brakers, Pot Heads, Power and Grounding Connectors, Transmission Hardware Indoor and Outdoor Substations, Steel Structure Hot Dip Galvanized, Plate Work—Weldments and Machining.
5925 5930 5935 6110 6150

SOMERVILLE INDUSTRIES LIMITED, (Panel Division)

**20 Bertrand Ave.,
Scarborough, Ont.
Telephone 416: 751-4880
General Mgr.: J. W. Feightner
Contact: F. J. Orr, Dir. of Sales
Floor Area: 95,000 sq. ft.
Personnel: 175**

Manufacturers of: Compression, injection and blowmoulded plastic parts; Fiberglass furniture for rifles.

1005 1095 1560 5410 8115 8140
8415 9330 and Page B6.

**SONOCO PRODUCTS COMPANY OF
CANADA LIMITED,**

**P.O. Box 1025,
Brantford, Ontario.
Telephone 519: 752-6591
President: L. H. S. Fremantle
Contact: L. V. Damant, Gen. Mgr. &
Vice-Pres.**

**Floor Area: 304,000 sq. ft.
Personnel: 300**

Manufacturers of: All-fibre and composite steel and fibre drums, convolutely wound; spiral wound containers and shell containers; spiral and convolute cores and tubes; spiral and convolute shipping and mailing tubes; spirally wound tubes for forming of round concrete columns, dowel sleeves, test cylinder moulds and concrete voids; paper cones and tubes for textile yarns and fabrics; fibre spools and reels; fibre-foil Canadian quart cans for motor oil and similar products.

5440 8110 8130 8140

SPACE CIRCUITS LIMITED,

**156 Roger Street,
Waterloo, Ont.
Telephone 519: 742-5896
President: H. T. Watt
Floor Area: 14,800 Sq. ft.
Personnel: 60**

Manufacturers of: MIL approved printed circuits boards; Terminal boards; Multi-layer printed circuits; Flexible circuitry; Precious metal plating; Chemically machined precision parts.

5940 5970 5995 5999 9330

SPAR AEROSPACE PRODUCTS LTD.,

**825 Caledonia Rd.,
Toronto 395, Ont.
Telephone 416: 783-6171
Gen. Mgr.: J. Fogarty
Contact: D. J. Dalzell, Sales Mgr.
Floor Area: 260,000 sq. ft.
Personnel: 500**

Research, Analysis, Design, Development, Test Manufacture, Repair and Overhaul of Diversified Range of Products that include Infrared Fusing and Acquisition Systems; Airborne Radar Systems; Optical Devices, Solid State Power Supplies; and Aerospace Flight Instruments; STEM Devices, Antenna; Nuclear Reactor Controls; Consulting and Engineering Services for Evaluation and Analysis in such fields as Weapons Systems, Electrical Power Generation and Conversion, Surveillance, Detection, Guidance, and Aircraft/Missile/Satellite Sub-Systems.

Manufacturers of: Transmissions and Rotor Shafts for Helicopters; Gears; Gearboxes; Drive Shafts; Precision Components for Jet Engines; Actuator gearboxes for Airframes. Aircraft Landing Gear; Hydraulic Systems. Special processes include Electrofilm.

1420 1620 1650 2910 2995 3010
4210 5820 5821 5825 5826 5840
5841 5845 5850 5855 5860 5895
5985 6130 6625 6665 and pages 000,
5985 6130 6625 6665 and Pages B6,
B8, B10, B13, B14, B15, I-108, I-170, I-178,
I-259, I-260 and I-332.

SPARTAN AIR SERVICES LIMITED,

**2827 Riverside Drive,
Ottawa, Ontario.
Telephone 613: 731-9940
President: N. E. Lamb
Contact: J. Deacon
Floor Area: 55,000 sq. ft.
Personnel: 150**

This firm can provide the following services: Map compilation, Map draughting, Map negative production, Air photography, Tellurometer surveys, Shoran surveys, Geodetic surveys, Forest surveys, air and ground; Hydrological surveys, Pre-engineering studies, Geological surveys, Groundwater studies, Geophysical surveys, air and ground; Helicopter charter, Helicopter, repair and overhaul, training of Helicopter pilots. 7640 and Page B3.

SPARTON OF CANADA LTD.,

**Elm St.,
P.O. Box 2125,
London, Ont.
Telephone 519: 455-6320
President: N. C. Eiloart
Contact: K. R. Hollins, Vice-Pres.
Floor Area: 104,000 sq. ft.
Personnel: 300**

Manufacturers of: Underwater sound equipment; sonobuoys; short wave and direction finding receivers; radar sub-assemblies and controls; commercial radio, television, and hi-fi equipment. 5845

**SPERRY GYROSCOPE OTTAWA
LIMITED,**

**3 Hamilton Ave.,
Ottawa, Ont.
Telephone 613: 728-4681
Gen. Mgr.: R. P. Welland
Contact: H. D. Wardle, Market Mgr.
Floor Area: 35,000 sq. ft.
Personnel: 180**

Manufacturers of: Wiring Harnesses; Integral Instrument Lighting; Edge Lit Panels; Electronic Modules; Potting; Electronic Test Equipment; Consoles; Repair and Overhaul of Aircraft Flight Instruments; Inertial Navigation Equipment; Analog Computers; Cameras and Optical Instruments.

1210 5820 5821 5825 5826 5830
5831 5840 5841 5895 5995 5999
6605 6625 9330 and Page B14.

SPILSBURY AND TINDALL LIMITED,

120 East Cordova St.,
Vancouver 4, B.C.
Telephone 604: 684-4131
Cable: SPILTIN
President: A. J. Spilsbury
Contact: G. M. Bergson
Floor Area: 19,000 sq. ft.
Personnel: 55

Manufacturers of: Radio Communication Equipment for use on Land, Sea or Air; Antennae for use in the above; Quartz Crystals; Radio Beacons.
5820 5821 5825 5955 5985

SPRAGUE ELECTRIC OF CANADA LIMITED,

10 Bertal Rd.,
Toronto 15, Ont.
Telephone 416: 766-6123
Cable: TELEFARAD
TWX: 610-491-1541
President: H. S. Marmorek
Contact: Wm. O'Meara, Sales Mgr.
Floor Area: 37,000 sq. ft.
Personnel: 95

Manufacturers of: Capacitors: Aluminum Electrolytic; Tantalum Solid Pellet; Tantalum Solid Electrolyte.
5910

R.J. STAMPINGS CO. LTD.,

8001 - 18th Ave.,
Montreal 456, Que.
Telephone 514: 721-4995
Telex: 01-26509
President: R. Jeneau
Contact: R. W. Thornton, Sales Dir.
Floor Area: 95,600 sq. ft.
Personnel: 175

Manufacturers of: Metal Stampings to Specifications, Deep Drawn Shells. Bomb Body Parts, Fuse Housings, etc. Precision Cable reels, Lighting Fixtures, Garage Door Hardware, Electronic Door Operators, Dies—Piercing, Blanking, Draw, Progressive,

Punching and Forming. Automotive Metal Stampings.

1310 1315 1325 1345 1395 2510
3456 8110 8130

STANDARD-MODERN TOOL COMPANY LTD.,

69 Montcalm Ave.,
Toronto 10, Ont.
Telephone 416: 787-2494
Telex: 02-29421
Cable: STANMODCO
President: J. Gilchrist
Contact: R. J. Barrett, Vice-Pres. & Gen. Mgr.
Floor Area: 86,780 sq. ft.
Personnel: 295

Manufacturers of: Engine Lathes 9" - 17" swing; Drilling and Tapping Machines; Rotary Index Tables; Coil Winders; Abrasive Wheel Dressing and Speed Testing Lathe; Packaging Machines; Special Machines; High Production Automatic Machines for industry; Leak Testing Machines; Sound Testing Machines; Automatic Welding Machines; Engineering Design and Prototype Development; Electric Hydraulic Control Panels—design and build; Sub-Contract Machining; Machine Tool Rebuilding; Brake Dies—design and build; Tool and Cutter Regrinding; Welding and Fabrication; Heat Treating; Dies—Lamination, Progressive and single operation, in a wide range of sizes; Moulds—Plastic and Die Cast ranging from small electrical components up to moulds for largest presses; Jigs and Fixtures—All types and sizes; Gauges—Receiver and special types.
3020 3413 3416 3419 3431 3432
3456 3460 3465 3695 4940 5110
5136 5210 5220 and Pages B6 and B10.

STANDARD PRODUCTS (CANADA) LTD.,

1030 Erie St.,
Stratford, Ont.
Telephone 519: 271-3360
TWX: 610-355-8700
Pres. & Gen. Mgr.: Walter I. Nagorsen
Contact: B. J. Billson, Product Development Mgr.
Floor Area: 270,000 sq. ft.
Personnel: 575

Manufacturers of: Rubber Products—moulded, Extruded, Rubber to Metal Bonded, in Dense and Cellular Rubber. Tank Tracks, Engine and Body Rubber Mounts, Weatherstripping. Rolled Metal Parts, Window Assemblies.

2040 2240 2510 2530 2540 5325
5330 5340 9320

THE STANLEY MANUFACTURING COMPANY LIMITED,

230 Bartley Drive,
Toronto 16, Ont.
Telephone 416: 757-3221
President: J. W. Patterson
Contact: F. Mendham, Sales Mgr.
Floor Area: 30,000 sq. ft.
Personnel: 100

Manufacturers of: Printed sheet plastic items; calculators; charts, dials; Scales; Plotting boards; Rulers, etc.; Metal (or plastic and metal) calculators; Non-electrical computers; Dials; Scales, Gauges; Rulers; Nameplates, etc
1220 1290 6605

STAR SHIPYARD (MERCER'S) LIMITED,

61 Duncan St.,
New Westminster, B.C.
Telephone 604: 521-0731
President: G. A. Mercer
Contact: W. E. Mercer, Sec.-Treas.
Floor Area: 8 acres
Personnel: 100

Manufacturers of: Fishing craft, tugs, barges, small coastal ships, special craft—custom built, steel and wood; Component fabrication of tailshafts, rudders, rudder stocks, davits, etc.
1920 1925 1930 1940 2010 2030
2040

STARK ELECTRONIC INSTRUMENTS LTD.,

P.O. Box 670,
Ajax, Ont.
Telephone 416: 942-2120
Telex: 02-21332
Cable: STARKEX
President: A. Kasperski
Contact: C. G. Bell, Marketing Mgr.
Floor Area: 28,250 sq. ft.
Personnel: 100

Manufacturers of: Electrical indicating instruments for military and commercial fields; Electronic Test Equipment; Electronic Training aids; Language Laboratories; Commercial Laboratories.
5895 6110 6130 6625 6910

THE STEEL COMPANY OF CANADA LTD.,

Wilcox St.,
Hamilton, Ont.
Telephone 416: 528-2511
Pres. & Chief Exec. Officer: H. M. Griffith
Contact: G. A. Rutherford, Commercial Research Dept.
Floor Area: 1,800,000 sq. ft.
Personnel: 16,000

Manufacturers of: Pig Iron; Semi-Finished Products; Plates, Sheets and Strip; Galvanized Sheets and Strip; Angles and Bars; Tin Plate; Aromatic Solvents; Pipe; Forgings; Nuts; Bolts; Rivets; Screws; Wire and Wire Products.

2250 3439 4710 4730 5305 5306
5307 5310 5315 5340 5660 5680
5975 6145 6810 7195 8030 9505
9510 9515 9520 9640 and Page B9.

**THE STEEL COMPANY OF CANADA LIMITED,
(Canadian Drawn Works)**

155 Chatham St.,
P.O. Box 679,
Hamilton, Ont.

Telephone 416: 528-8521
Gen. Supervisor: D. D. Richards
Contact: C. A. Robinson, Mgr. of Sales
Floor Area: 160,000 sq. ft.
Personnel: 150

Manufacturers of: "Cold Finished Carbon and Alloy Steel Bars". Cold Drawn Bars, Cold Turned Bars, Turned, Ground and Polished Bars. Shafting. All classifications in Rounds, Squares, Hexagons, Flats and Special Sections.
9510

STEEL TREATERS OF QUEBEC INC.,

560 Sauve Blvd.,
St. Eustache, Que.
Telephone 514: 473-1884
President: M. LaChapelle
Contact: M. Bendit, Sec. Treas. & Gen. Mgr.
Floor Area: 40,000 sq. ft.
Personnel: 35

Manufacturers of: Complete range of heat treatment facilities, salt and controlled atmosphere, operating in accordance with aerospace standard; Metallurgical laboratory; Magnetic particle inspection; Flame induction hardening; Tufftride licensee.
Page B15.

STEMAC LIMITED,

300 Canal Bank,
Ville St. Pierre, Quebec.
Telephone 514: 489-5337
Contact: John C. F. MacLeod
Floor Area: 30,000 sq. ft.
Personnel: 75-100

Manufacturers of: Custom fabricated titanium and high nickel alloys.
4710 4730 and Page B15.

STEWART-WARNER CORPORATION OF CANADA, LIMITED,

349 MacDonald Avenue,
Belleville, Ontario.
Telephone 613: 968-6761
Gen. Mgr.: F. C. Ethier
Contact: N. Martin, Contracts Admin.
Floor Area: 71,800 sq. ft.
Personnel: 172

Manufacturers of: Electronic Communication Equipment; IFF and SIF Equipment; First Line Test Set Equipment; Lubrication Equipment; Casters; Speedometer Cables; Repair and overhaul facilities.

1430 3920 4930 5825 5840 5841
5895 5915 5999 6625 6680

STOHLER ISOTOPE CHEMICALS,

4180 Courtrai Ave.,
Montreal 249, Que.
Telephone 514: 733-5773
Contact: J. Turgel, Vice-Pres. Sales
Floor Area: 1,000 sq. ft.
Personnel: 6

Manufacturers of: Stable Non-Radioactive Isotopes, (Deuterium Chemicals).
6810

STRAUBE INDUSTRIES LTD.,

1888 Mattawa Avenue,
Cooksville, Ontario.
Telephone 416: 277-9449
Telex: 02-296666
President: W. H. Straube
Contact: L. Gottschalk, Mgr.
Floor Area: 8,000 sq. ft.
Personnel: 12

Manufacturers of: Drafting machines, Drafting tables, Engineering Efficiency Equipment. Drafting room furniture—steel and wood; Tracing and light tables.
6675

**STRUTHERS DUNN RELAYS,
(Division of Renfrew Electric Co. Limited)**

349 Carlaw Avenue,
Toronto 8, Ontario.
Telephone 416: 461-3511
President: J. R. Longstaffe
Contact: A. Shelton
Floor Area: 4,000 sq. ft.
Personnel: 10

Manufacturers of: Relays for commercial and aircraft electrical and electronic requirements.
5945

STRITE INDUSTRIES LIMITED,

298 Oak St.,
Hespeler, Ont.
Telephone 519: 658-9361
President: J. Strite
Contact: F. Cressman
Floor Area: 10,000 sq. ft.
Personnel: 100

Manufacturers of: Machined parts for Inertial Guidance equipment for Aircraft and Missiles; Aircraft Wheel Y Brake Parts; Computers; Optical and Photographic Equipment; Pharmaceutical Equipment; Printing Equipment, Metallic Seals. Precision Drilling, Jig Boring, Turning, Tracing and Numerical Controlled Milling. Surface Grinding, Cylindrical, Internal and External Grinding.
1420 and Pages B6 and B10.

SUPREME PRECISION CASTINGS LTD.,

550 Montee de Liesse,
St. Laurent, Montreal 9, Quebec.
Telephone 514: 747-3528
President: H. H. Johnston
Floor Area: 12,800 sq. ft.
Personnel: 55

Manufacturers of: Ferrous and non-ferrous precision investment castings by the lost wax process.
Page B4.

SURRETTE BATTERY LTD.,

P.O. Box 234,
Springhill, N.S.
Telephone 902: 597-3767
Telex: 014-2144
President: John J. Surette
Contact: A. McNeil, Office Mgr.
Floor Area: 29,000 sq. ft.
Personnel: 60

Manufacturers of: Storage Batteries including fork-lift truck batteries, diesel locomotive batteries, marine batteries, emergency lighting batteries and units. All types of heavy duty commercial batteries, and U.S. Navy storage batteries to BuShip standards. This is a complete facility including a Lead Smelter and Oxide Mill.
6140

SURVAIR LTD.,

P.O. Box 469,
Hunt Club Rd.,
Ottawa, Ont.
Telephone 613: 822-7151
Contact: T. E. Rowlands
Floor Area: 26,000 sq. ft.
Personnel: 70

This firm provides the following services:
Aerial Photography and Interpretation, Air-
borne Geophysics, Control Surveys, Geodetic
and Magnetometer Surveys.
Page B3.

SWANN WINCHES LTD.,

**1481 Franklin St.,
Vancouver 129, B.C.
Telephone 604: 253-1196
Contact: W. Swann, President
Floor Area: 75,000 sq. ft.
Personnel: 53**

Manufacturers of: Winches, Windlasses and
Capstans together with Hydraulic Motors
and Controls for the same equipments to
standard or custom design. Oceanographic
and Bathythermograph winches. Towed body
equipment.
2030 3950 4320 6655 and Page I-214.

SYLVANIA ELECTRIC (CANADA) LTD.,

**3750 Cote de Liesse Rd.,
Montreal, Que.
Telephone 514: 735-4201
TWX: 05-267686
President: E. Stuart Wilson
Contact: G. Bevan, Sales Mgr.—Lighting
Floor Area: 300,000 sq. ft.
Personnel: 768**

Manufacturers of: Fluorescent, Mercury
Vapor and Incandescent Lamps; Photo and
Projection Lamps; Electronic Tubes and
Devices; Quartz Halogen Lamps; Color Pic-
ture Tubes; Lamp Ballasts.
5960 6240 6250 6750

SYNTRON (CANADA) LIMITED,

**928 Queenston Road,
Stoney Creek, Ontario.
Telephone 416: 662-8313
General Manager: J. McL. Howes
Floor Area: 20,000 sq. ft.
Personnel: 85**

Manufacturers of: Electric Vibratory Mater-
ials Handling Equipment including vibrators,
Vibratory Feeders, Grizzly Feeders, Screens,
Vibrating Conveyors, Spiral Elevators, Vi-
brating Packers, Gravimetric weigh feeders.
Parts Feeders, Shaft Seals, Lapping Polish-
ing Machines, Test Sieve Shakers. Silicon
Diodes Selenium Rectifiers, Power Supplies,
Special Controls.

2010 3820 3895 3910 3920 3990
5820 5825 5835 5840 5845 5895
5960 5961 5995 6110 6130 6520 and
Page B6.

T.M.C. (CANADA) LIMITED,

**R.R. No. 5,
Ottawa, Ont.
Telephone 613: 822-0244
Telex: 013-446
Cable: TEPEI**

**President & Managing Dir.: D. V. Carroll
Contact: W. F. Potter, Mgr.
Floor Area: 30,000 sq. ft.
Personnel: 100**

Manufacturers of: Commercial and Military communications and electronic equipment; Single Sideband and general purpose transmitting and receiving systems, including frequency and/or space diversity systems and facsimile systems; Filters, wideband R.F. transformers and antenna systems and accessories; Dummy loads, No Break Power Systems, Mobile communication centres; Communication System surveys and engineering installation, training; Repair and overhaul facilities and services.

5805 5815 5820 5835 5895 5915
5950 5955 5975 5985 5995 5999
6130 6625 and Pages B6 and I-164.

T.S.M. INDUSTRIES,

**2451 Dixie Rd.,
Cooksville, Ont.
Telephone 416: 279-2121
Gen. Mgr.: W. H. Walley
Floor Area: 25,000 sq. ft.
Personnel: 45**

Manufacturers of: Aircraft Components; Solid Propellant Actuated Devices; Small and Medium Metal Stampings; Tooling; N.C. Machining.

1055 1325 1340 1680 2840 3465
5210 5220 and Page B10.

TAPATCO LIMITED,

**P.O. Box 126,
Ayer's Cliff, Que.
Telephone 819: 838-4242
President: H. Hall
Contact: W. Hall
Floor Area: 25,000 sq. ft.
Personnel: 109**

Manufacturers of: Kapok filled jackets; Vests, Cushions; Foam filled, Jackets, Vests, Life Preservers. Work Gloves; Cotton, Jersey, Leather, Plastic.
4220

TAYLOR INSTRUMENT COMPANIES OF CANADA LTD.,

**75 Tycos Drive,
Toronto 19, Ont.
Telephone 416: 787-1651**

**President: E. J. Shears
Contact: G. B. Lint, Industrial Sales Mgr.
Floor Area: 60,000 sq. ft.
Personnel: 200**

Manufacturers of: Electronic and pneumatic instrumentation for the automatic control of process industries; Instruments for measurement and control of temperature, pressure, flow, liquid level, force, speed, etc., either indicating or recording.
6680 6685

TECHNODYNE CO. LTD.,

**735 Avoca Ave.,
Dorval, Quebec.
Telephone 514: 636-4114
President: W. Van Helden
Floor Area: 5,000 sq. ft.
Personnel: 28**

Manufacturers of: Medium to high precision machined components for Naval, Electronic, Ordnance and Aerospace applications. Also assemblies of metering pumps and valves for pharmaceutical and chemical industries. Production Machining specialties:— profile milling of airframe parts and right hand and left hand thread rolling.

1310	1315	1320	1336	1340	1390
1395	1560	1630	1650	1740	2030
2520	3650	3695	4410	4810	4820
4920	5985				

TERRA SURVEYS LTD.,

**1320 Bank St.,
Ottawa, Ont.
Telephone 613: 731-9571
Contact: Thomas O'Malley
Floor Area: 11,000 sq. ft.
Personnel: 95**

This Firm provides the following services: Aerial Photography and Interpretation, Airborne Geophysics, Control Surveys, Geodetic and Magnetometer Surveys.
Page B3.

PIERRE THIBAUT (CANADA) LTD.,

**Pierreville, Que.
Telephone 514: 568-3331
Telex: 01-26265
President: Guy Charron
Contact: Gerold Charron, Sales Mgr.
Floor Area: 90,000 sq. ft.
Personnel: 200**

Manufacturers of: Trucks, Fire; Pumps, Fire Portable and Accessories.
4210

THE H. I. THOMPSON CO. OF CANADA LTD.,

60 Johnston St.,
P.O. Box 906,
Guelph, Ont.
Telephone 519: 822-6630
TWX: 610-359-8900
Gen. Mgr.: W. E. Ledingham
Contact: S. K. Lindsay, Secretary
Floor Area: 14,000 sq. ft.
Personnel: 50

Manufacturers of: High temperature and low temperature Insulation; Wrap around and preform foil covered insulation blankets; Duct coverings; High density fiberglass moulded parts; Acoustic insulation.
1680 2840 2995 5640

THOMPSON PRODUCTS, LIMITED,

230 Louth St.,
St. Catharines, Ont.
Telephone 416: 685-8411
Vice-Pres. & Gen. Mgr.: G. E. Irvine
Contact: J. H. May, Mgr. Automotive-Mining Div.
Floor Area: 400,000 sq. ft.
Personnel: 1,300

Manufacturers of: Automotive valves, Pistons; Steering spindles (Knuckles) and steering linkage components and assemblies; Mining drill bits and drill rods; Miscellaneous commercial and/or military alloy and steel forgings and machined forgings.
2530 2805 2910 5133 and Pages B9 and B10.

THOMPSON WOOD PRODUCTS LTD.,

P.O. Box 119,
2194 Regent Ave.,
Montreal 28, Que.
Telephone 514: 489-4671
Cable: "BOXSHOOKS"
Contact: L. C. Thompson
Floor Area: 162,000 sq. ft.
Personnel: 112

Manufacturers of: Boxes, wood; Shooks, wood; Crates, wood; Boxes, ammunition, wood; Crates, export packing; Pallet bins, wood; Hogsheads; Cleated solid fibreboard boxes.
8115 8140

THOMSON-GORDON LIMITED,

200 Queen St. N.,
Hamilton, Ont.
Telephone 416: 528-0186
Telex: 021-757

Contact: G. A. Thomson, Gen. Mgr.
Floor Area: 45,000 sq. ft.
Personnel: 50

Manufacturers of: Small Run Rubber Moulded Products and Extrusions; Rubber and Urethane Covered Rolls; Fabricated Slab Rubber Products; Cast and Moulded Urethane; Cellular Rubber Sheets, Stripping and Die Cut Parts.
9320

TIMBERJACK MACHINES LIMITED,

Devonshire Ave.,
Woodstock, Ont.
Telephone 519: 537-6271
President: W. A. Magill
Contact: W. A. Bottoms, Gen. Sales Mgr.
Floor Area:
Personnel:

Manufacturers of: Off highway vehicles.
3695

TOPPING ELECTRONICS LTD.,

1320 Ellesmere Rd.,
Scarborough, Ont.
Telephone 416: 291-7707
President: F. V. Topping
Contact: J. C. Illingworth, Contracts Administrator
Floor Area: 8,000 sq. ft.
Personnel: 12

Manufacturers of: Communication equipment and accessories, LF Radio Teletype Airborne receivers and associated Test Set complete with nickel-cadmium battery charger, LF Beacon Systems, LF Keysers and Receivers, SSB generators, frequency synthesizers, modification kits for aeronautical mobile radio for 50 KHz channel spacing.
5805 5820 5821 5825 5826 5831
5840 5841 5895 5999 6110 6310
6320 6330 6350 6625 and Pages I-118 and I-160.

THE TORONTO IRON WORKS LTD.,
(Plate Fabrication Div.)

629 Eastern Ave.,
Toronto 8, Ont.
Telephone 416: 416-8111
Executive Vice-Pres.: L. R. Wright
Contact: W. F. Hearne, Sales Mgr.
Floor Area: 120,000 sq. ft.
Personnel: 300

Manufacturers of: Tanks, Storage (oil, gas, water), Standpipes, Conservation Structures (floating roofs), Gasholders, Penstocks, Pressure Vessels, Process Tanks, Autoclaves and Quick-Opening Doors, Heat Exchangers,

Package Boilers (water tube), Large Steel Pipe, Kilns, Driers, Evaporators, and Heavy Steel Plate and Alloy Fabrication.
3695 4410 4420 4430 4440 4710
5430 5450

TRENCH ELECTRIC LIMITED,

15 Prince Andrew Place,
Don Mills,
Toronto, Ont.
Telephone 416: 445-0140
Telex: 02-2305
Cable: TRENLEC
President: J. G. Edison
Contact: R. W. Eden, Vice-Pres. & Gen. Mgr.
Floor Area: 24,800 sq. ft.
Personnel: 54
Manufacturers of: Current limiting reactors;
Current line traps.
5999

TRIDON MANUFACTURING LIMITED,

P.O. Box 5029,
201 North Service Rd.,
Burlington, Ont.
Telephone 416: 637-3863
President: Donald M. Green
Contact: B. Glynn, Mgr. of Marketing &
Sales
Floor Area: 75,000 sq. ft.
Personnel: 200
Manufacturers of: Hose Clamps; Aircraft
Hose Clamps; Plastic Pipe Clamps; Automot-
ive turn Signal Flashers; Electronic Relays;
Plastic Pipe and Fittings, ABS.
2540 2930 4710 4730

TRIONA PRODUCTS LTD.,

2680 Duchesne St.,
Montreal 382, Que.
Telephone Mtl. 514: 336-1600
Ott. 613: 745-9616
Pres. & Gen. Mgr.: Mike Summerlin
Contact: Denys Bryon, Vice-Pres. &
Contract Admin.
Floor Area: 10,000 sq. ft.
Personnel: 22
Manufacturers of: Visual Control Systems
such as Production Control, Maintenance
Control, Project Control, Personnel Control,
Organization, Pert, C.P.M., Gant, Bar and
Graph Charts. Machine Loading Boards for
Computers and Data Processing, Facility and
Production Equipment Loading and Control.
Scheduling Boards. Announcement and Bul-
letin Boards.
7460

TRIPLEX ENGINEERING CO. LTD.,

181 Oneida Drive,
Pointe Claire, Que.
Telephone 514: 695-9872
President: M. Pohoryles
Contact: P. Braun, General Manager
Floor Area: 35,000 sq. ft.
Personnel: 160

Manufacturers of: Screw machine products,
light press work, precision machining, in-
duction type brazing, etc. Equipped to
handle assemblies on ignition controls and
electro mechanical and aircraft components.
Ammunition components.
1310 1315 1336 1340 1345 1350
1360 1390 5305 5306 5307 5310
5935 and Page B10.

TRI-SERVICE FABRICATING LIMITED,

7655 Woodbine Ave.,
R.R. No. 1,
Milliken, Ont.
Telephone 416: 291-6377 and 6682
President: John Berger
Contact: N. Derman, Sales & Engineering
Floor Area: 6,000 sq. ft.
Personnel: 12

Manufacturers of: Aircraft Ground Servicing
Equipment and Ground Handling Equip-
ment. Material Handling Equipment, Tower
Structures and Miscellaneous Metal Products.
Aluminum Shipping Containers. Repair and
Overhaul for Ground Servicing and Ground
Handling Equipment.
1670 1730 1740 3990 4920 5445
5670 8115

TRUCK ENGINEERING LIMITED,

P.O. Box 518,
165 Wellington St. S.,
Woodstock, Ont.
Telephone 519: 537-3461
Telex: 024-7427
President: V. B. King
Contact: V. Scott, Export Mgr.
Floor Area: 129,200 sq. ft.
Personnel: 190

Manufacturers of: High Trailers; Low Bed
Machinery-Hauling Trailers; Pole and Cable
Reel Trailers; Electric and Telephone Con-
struction Bodies; Pole Setting Derricks; Pole
Hole Diggers; Hydraulic Aerial Platforms;
Electric Aerial Lift; Trailer Tankers
Liquid; Trailer Tankers Bulk Pneumatic Un-
loading; Pole and Logging Trailers; Dump
Trailers; Repair and Overhaul Facilities for
Trailers and Aerial Platforms.
1730 1740 1850 2320 2330 2520
3820 3830 3950 5430 and Page B14.

TUL SAFETY EQUIPMENT LTD.,

(See ABERCORN AERO LIMITED
Page C-1)

J. J. TURNER COMPANY LIMITED,

280 George Street,
Peterborough, Ontario.
Telephone 705: 743-3551
Contact: R. J. Davies, Gen. Mgr.
Floor Area: 25,000 sq. ft.
Personnel: 55

Manufacturers of: Non-inflatable Life Jack-
ets and Vests.
3920 4220 8340 8345 8465 9930

TYCOS TOOL & DIE CO. LTD.,

90 Snidercroft Rd.,
P.O. Box 9000,
Downsview, Ont.
Telephone 416: 889-8642
President: O. Doster
Contact: D. Hughson, Sales Mgr.
Floor Area: 23,000 sq. ft.
Personnel: 74

Manufacturers of: Moulds for plastic injection
and extrusion and for die casting. Dies
for forging and stamping. Developers of
special purpose production machinery, par-
ticularly for hot forming and bending of flat
and bar spring steel.
3441 3456 3695

TYWOOD INDUSTRIES LTD.,

32 Penn Dr.,
Weston, Ontario.
Telephone 416: 249-7663
President: B. Tyson
Floor Area: 12,000 sq. ft.
Personnel: 25

Manufacturers of: Airframe structural com-
ponents; Rocket components; Torpedo Inert
Components; Sonar domes; Architectural re-
inforced plastic panels and structures; Boxes,
small parts; Ammunition boxes; Masts and
antenna; Radomes; Toboggans; Sleds person-
nel; Pipe and tubing; Storage tanks and
tanks underground; Buoys.
1340 1355 1560 2050 3920 5450
5845 5985 9330

UNICA RESEARCH COMPANY LIMITED,

Rm. 2560,
630 Dorchester Blvd. W.,
Montreal 101, Que.
Telephone 514: 866-3006
President: J. F. Martin
Floor Area: 1,300 sq. ft.
Personnel: 7

Consulting services in Operations Research, Defence Systems Analysis, Mathematical Modelling and Computer Programming; Technical and Feasibility Studies; Transportation Logistics.

Page B6.

UNION CARBIDE CANADA LIMITED,

123 Eglinton Ave. East,
Toronto 12, Ontario.
Telephone 416: 487-1311
Contact: M. F. Cheetham

3426	3431	3432	3433	3439	3449
3655	3920	4110	4130	4240	4430
4710	4720	5140	5330	5350	5640
5860	5970	5977	6135	6220	6230
6240	6515	6630	6635	6640	6680
6695	6810	6830	6850	7240	7930
8030	8040	8105	8115	8120	8125
8135	8140	9135	9150	9330	9350
9505	9510	9515	9620	9630	

Chemicals, Resins and Fibres

Floor Area: 100,000 sq. ft.
Personnel: 150

Manufacturers of: Phenolic and epoxy resins, compounds and laminates, formaldehyde; Polyethylene resins and compounds; Synthetic organic chemicals including Amines Glycol ethers, Polyethylene Glycol, aircraft de-icing fluids, polyglycol ethers, Automotive anti-stall additives, Ethylene Glycols, Ethylene Oxide, brake fluids, Synthetic lubricants; All types of acids and all types of chemicals.

Consumer Products

Floor Area: 280,000 sq. ft.
Personnel: 460

Manufacturers of: Dry cell batteries, primary and rechargeable; Flashlights, lanterns and torches; automotive cleaning and polishing compounds, anti-freeze, bulbs and lamps; Arc Light, Spectroscopic and Photographic Carbons.

Gas Products

Floor Area: 200,000 sq. ft.
Personnel: 565

Manufacturers of: Industrial and rare gases and containers; Oxyacetylene Welding and Cutting Apparatus; Electrical Welding Prod-

ucts and Processes. Abrasives, Biological freezing and Preservation Equipment; Synthetic Industrial Gems, Metal Compounds and powders, Cryogenic Equipment and fluids, Refrigerants, Oxygen Therapy Equipment.

Metals and Carbon

Floor Area: 950,000 sq. ft.
Personnel: 1,100

Manufacturers of: Ferralloys; Electric Furnace Electrodes; carbon brushes and Carbon Graphite products for Chemical, electrical, mechanical and metallurgical applications; High Alloy Steel sheets (Aircraft), wire, castings and bars.

Plastic Products

Floor Area: 1,960,200 sq. ft.
Personnel: 630

Manufacturers of: Polyethylene tubing and sheeting; Industrial heavy duty Polyethylene bags; Plastic Bags for general packaging use; Fabricated Plastic Products; Cellulose Tubing.

UNION SCREEN PLATE LTD., (A Division of CAE Industries Ltd.)

72 Queen St.,
Lennoxville, Que.
Telephone 819: 562-4754
President: A. S. Mitchell
Contact: H. A. Sawyer, Vice-Pres.
Floor Area: 85,000 sq. ft.
Personnel: 180

Manufacturers of: Non-ferrous castings, Bronze, Aluminum Copper and Special alloys; Slotted, Perforated and Conically Drilled Screen Plates; Wood and Metal Patterns; Honing, Grinding and Custom Machining; Industrial Plating, Chromium, Nickel, Copper, Cadmium, Tin; Centrifugally cast Bronze Bushings; Cast Fire Hose Couplings.

3120 3615 4730 5335 9515 and Page B4.

UNIROYAL LIMITED,

Executive Offices,
550 Papineau Avenue,
Montreal 133, Que.
President: E. A. Martin
Floor Area: 3,329,761 sq. ft.
Personnel: 5,775
Contacts:

Aircraft Fuel Cells and Components,
W. H. Dotzenroth, Marketing Manager
51 Breithaupt St.,
Kitchener, Ont.
Telephone 519: 744-7171
Telex: 029-5430

Chemicals,

W. J. Hogg, Gen. Sales Mgr.
Elmira, Ont.
Telephone 519: 669-5466
Telex: 029-5421

All Other Products,

L. F. Vauthier, Mgr., Government Sales
550 Papineau Ave.,
Montreal 133, Que.
Telephone 514: 522-2111
Telex: 01-2862

Manufacturers of: All types of rubber and plastic products, reclaimed rubber and textile products. Also produces a wide range of organic chemicals used in the rubber and plastic industries and in agriculture. Operates a completely equipped machinery shop which specializes in rubber and other industrial manufacturing machinery and moulds, dies etc. Maintains a research laboratory which specializes in research in the field of chemicals, rubber, textiles and related products of interest to the Company's operations. Also has complete facilities to develop and engineer rubber and plastic products for both the Military and Industry.

1015	1020	1560	1660	1730	1940
1945	2040	2050	2090	2510	2530
2540	2590	2610	2620	2630	2640
2805	2810	2815	2910	2915	2930
2935	3030	3456	3465	3615	3620
3895	3910	3920	3990	4220	4240
4710	4720	5330	5340	5410	5420
5430	5640	5970	5985	6515	6810
6840	6850	8010	8030	8040	8140
8465	9320	9330	and Pages B6, B10, I-44 and I-326.		

Tire Division — Kitchener, Ont.

Manufacturers of: Tires and Tubes — Passenger, Truck, Bus, Farm, Industrial and Aircraft, Solid Rubber Tires and Rubber Tired Wheels.

Rubber Machinery Division — Kitchener, Ont.

Manufacturers of: Special Rubber Working Machinery Fabrications, and other Industrial Manufacturing Machinery. Tire Moulds, Dies, Tools, Jigs and Fixtures, Sheet Metal Duct Work and Tray Truck Fabrications.

General Products Division — Kitchener, Ont.

Manufacturers of: Aircraft and Vehicle — Fuel Cells, Bladder and Self Sealing Types, Reinforced Fiberglass Products, Crash Pads and Floor Mats for the Automotive Industry, Sponge Rubber Underlay, Foam Rubber, Moulded and Sheet Stock, Vinyl Coated Upholstery Fabrics, Pneumatic Mattresses, Rubber Inflatable Boats and Life Rafts, Pontoon and Plastic Floats, Textile Pro-

ducts, Nets, Fleeces, Pile Fabrics, Bonded Fibre Padding and Fiberglass Insulation.

Industrial Products Division — Montreal, Que.

Manufacturers of: Industrial Rubber Products — Hose, Conveyor and Transmission Belting, Moulded, Formed Rubber and Plastic Products, Rubber Covered Rolls and Rubber Lined Tanks and Pipes, Electrical Insulation Tapes, Rubber and Plastic Coated Fabrics — Sheet or Film Stock, Rubber Matting, Expansion Joints and Sponge, Tank and Tractor Rubber Track Treads, Gas Masks, Boat and Dock Fenders, Flexible Rubber Storage Containers for Liquids and Gases, Inflatable Dunnage.

Uniroyal Chemical — Division of Uniroyal Ltd.

MONTREAL — Manufacturers of: Reclaim Rubber, Adhesives — Rubber and General Purpose, Two Part Elastomeric Sealants, Latricrete for Ships' Decks and Hot Poured Joint Sealers.

ELMIRA — Manufacturers of: Agricultural, Rubber and General Chemicals, Polyester Plastic Resins and Rigid Urethane Foam Systems.

UNITED AIRCRAFT OF CANADA LTD.,

P.O. Box 10,
Longueuil, Que.
Telephone 514: 677-9411
President: T. E. Stephenson
Contact: R. D. Richmond, Vice-Pres.,
Operations

Floor Area: 1,000,000 sq. ft.
Personnel: 3,500

Manufacturers of: Aircraft Engines; Piston & Jet, Gas Turbine; Repair & Overhaul Facilities.

2810	2835	2840	2995	7610
2810	2835	2840	2995	7610 and Pages B10, B14, B15, I-22, I-24 and I-206.

UNIVERSAL DIE & TOOL MFG. LTD.,

2125 St. Catherine St. East,
Montreal 133, Que.
Telephone 514: 526-9455
President: L. LeBrun
Contact: A. Zbikowski, Secretary-
Treasurer and General Manager
Floor Area: 47,500 sq. ft.
Personnel: 60

Manufacturers of: Rocket Launchers; Sights Air Lookout; Gas Pressure Gauges; Parts for Rifle sub caliber M20, 75 MM; Cleaning Rifles sub-caliber M20, 75 MM; Cleaning Target Devices; Decontaminating Apparatus Portable; Electro Mechanical assemblies;

Aircraft Masters and allied tooling, Aircraft components, Extruded Hinges; Spars, Ribs; and Guides; Custom machining to ordnance accuracies.

1005 1015 1095 1290 1560 1680

1730 2510 3465 4230 5340 6920

7340 and Pages B10 and I-242.

UNIVERSAL WIRE & CABLE CO. LTD.,

9250 Hochelaga St.,

Montreal 430, Que.

Telephone 514: 351-3511

President: B. Finkelstein

Contact: E. D. Perry, Vice-Pres., Sales

Floor Area: 120,000 sq. ft.

Personnel: 140

Manufacturers of: Round Magnet Wires
(i.e. Oleoresinous Enamels, Polyurethane,
Polyester, etc.) and Served and Litz wires.
6145

VALCARTIER INDUSTRIES INC.,

P.O. Box 790,
 Courcellette, Co. Portneuf, Que.
 Telephone 418: 844-3711
 Contact: T. F. Duchene, Gen. Mgr.
 Floor Area: 650,000 sq. ft.
 Personnel: 2,000

Manufacturers of: Small arms ammunition also large caliber steel and brass ammunition cases. Aircraft parts. Automotive components including gas tanks, hub caps, steering components. Plastic blow moulding and injection moulding. Tool dies, jigs, and fixtures.

1305	1310	1315	1320	1325	1390
1395	2410	2510	2530	3120	3456
3520	5110	5210	5220	8125	9330

VALERIOTE ELECTRONICS (GUELPH) LIMITED,

P.O. Box 603,
 Guelph, Ontario.
 Telephone 519: 824-3220
 President: M. Valeriote
 Contact: P. T. Valeriote, Vice-President
 Floor Area: 7,000 sq. ft.
 Personnel: 17

Manufacturers of: RF, Audio and Power Chokes, Coils and Transformers; RF and Audio Filters and Networks; Audio Amplifiers, Transceivers and Transmitters; Glass Reinforced Plastic Components and Structures; Antennas and Antenna Supports; Vacuum Impregnation and Plastic Encapsulation; Modular Components and Assemblies; Rubber Moulding, Filament wound aircraft structures.

5820	5821	5825	5826	5840	5841
5895	5915	5950	5985	5995	5999
9330					

VAN-WILSON LIMITED,

Burlington, Ontario.
 Telephone 416: 634-5551
 Contact: Mr. A. R. Hutchings, General Sales Manager
 Floor Area: 105,000 sq. ft.
 Personnel: 200

Manufacturers of: Truck Bodies, Rear Unit Vans, Parcel Delivery Bodies, Kurb-Side Bodies, Dairy Bodies, School Buses, Troop-carrying Buses, Municipal Buses.
 2310 2510

VARIAN ASSOCIATES OF CANADA LTD.,

45 River Drive,
 Georgetown, Ont.
 Telephone 416: 877-6901
 Telex: 0295-6528
 TWX: 610-492-2641
 Pres. & Gen. Mgr.: B. H. Breckenridge

Contact: C. G. Smith, Mgr. Applications Engineering

Floor Area: 28,000 sq. ft.
 Personnel: 100

Development and manufacture of Electron Tubes, Klystrons, Magnetrons, Travelling Wave Tubes.

5960 and Page I-196.

VELAN ENGINEERING LTD.,

2125 Ward Avenue,
 Montreal 9, Que.
 Telephone 514: 748-7743
 Telex: 01-20172
 President: A. K. Velan
 Contact: D. H. Hillen, Vice-Pres.
 Floor Area: 240,000 sq. ft.
 Personnel: 500

Manufacturers of: Forged Steel Valves, Alloy Steel Valves, Stainless Steel Valves, Bronze and Iron Valves and patented Steam Traps. Range of valve manufacture embraces in the forged line, 1/4" through 2" sizes, bolted bonnet and bonnetless valves to Commercial, Navy and Military Standards. Pressure-Seal Valves and Cast Steel Valves from 2" up. In the Steam Trap line, a complete range of Velan patented bimetallic universal Steam Traps in all sizes and types. In addition to products manufactured for Commercial, Naval and Military use, the company manufactures a wide range of valves for use in cryogenics, rocketry and nuclear power.

4730 4820 and Pages B10, B13 and I-254.

VESTSHELL INC., (Division of Cercast Inc.)

10351 Pelletier St.,
 Montreal 459, Que.
 Telephone 514: 232-2371
 President: J. Valenta
 Contact: A. W. Drew, Sales Mgr.
 Floor Area: 36,000 sq. ft.
 Personnel: 105

Manufacturers of: Ferrous Investment Castings.
 Page B4.

VICOM LIMITED,

Box 472,
 Kingston, Ont.
 Telephone 613: 546-3224
 President: J. J. MacKay
 Contact: R. S. Sheaff, Chief Engineer
 Floor Area: 16,000 sq. ft.
 Personnel: 60

Manufacturers of: Propellant Actuated Devices, Thrusters. Precision Rolls & Shafts. Pump & Pack Parts for Synthetic Fibres Industry. Portable Diamond Drilling Ma-

chines. Bank Saws. Aluminum Couplings.
Precision Contour Turning (N.C.).
1095 1340 1355 1360 1390 1395
1560 1630 1730 2040 2835 2840
3465 3820

**VICTORIA MACHINERY DEPOT
CO. LTD.,**

**P.O. Box 670,
Victoria, B.C.
Telephone 604: 382-2141
President: H. Husband
Contact: D. W. Clarke, Sales Mgr.
Floor Area: 73,400 sq. ft.
Personnel: 250**

Manufacturers of: Pressure Vessels and Heat Exchangers for the Petrochemical and Fertilizer Industries in wall thicknesses up to 8", heavy steel fabrications and weldments, also heavy machining. Equipment for Pulp & Paper Industries, Sawmills, etc. such as evaporators, digesters, etc.; Steel pipe over 20" diameter; Penstocks, kilns, autoclaves, etc.; Steel castings in carbon and alloy steels to 6000 lbs.; Iron, Brass and Aluminum castings.

2040 2050 3020 3040 3210 3615
3895 4420 4430 4440 4470 4520
4710 5430 8120 and Pages B4, B10 and B13.

**VICTORY CONVEYOR & MACHINE
REG'D.,**

**(Victory Tool & Machine Co. Ltd.)
236-250 Rose de Lima St.,
Montreal 207, Que.
Telephone 514: 933-1138
Cable: VICTOOL
President: Dollard Mathieu
Contact: Raymond Mathieu, Sales Mgr.
Floor Area: 26,000 sq. ft.
Personnel: 100**

Manufacturers of: Ordnance Components, Ammunition Metal Components & Aircraft Metal Components. Conveyors and Conveyor Systems, Dumbwaiters and other Bulk Handling Equipment Including Dollies.
1015 1310 1315 1320 1325 1336
1340 1345 1355 1730 1740 3910
3920 3960 and Pages B6 and B10.

VOLCANO LIMITED,

**8635 St. Lawrence Blvd.,
Montreal 11, Que.
Telephone 514: 381-6281
Telex: 01-2856
Cable: VOLCANO
President & Gen. Mgr.: F. Girouard
Contact: J. Kempnich
Floor Area: 130,000 sq. ft.
Personnel: 350**

Manufacturers of: Steam boilers, steam generators, Heating boilers, Domestic hot water heaters.
4410 4430 4520 4530

THE WABI IRON WORKS LIMITED,

Broadwood Avenue, P.O. Box 20,
New Liskeard, Ontario.
Telephone 705: 647-4383
President: F. E. Miller
Contact: W. S. Carr, Sales Mgr.
Floor Area: 67,000 sq. ft.
Personnel: 260

Manufacturers of: Mining equipment and supplies. Abrasion resistant castings for mining and industry in general. Ni-Hard grinding balls for the cement industry and mining industry.

3820 8120 and Page B4.

WALBAR MACHINE PRODUCTS OF CANADA LTD.,

1865 Sharlyn Rd.,
Cooksville, Ont.
Telephone 416: 625-2880
Contact: C. J. Robinson, Gen. Mgr.
Floor Area: 27,000 sq. ft.
Personnel: 165

Manufacturers of: Blades Gas Turbine; Vanes Compressor; Vanes Turbine; Discs Turbine; Discs Compressor; Support Seals and other Components for Gas Turbine; Jet Engines & Steam Turbines; Precision Machining.

2835 2840 and Page B10.

WALLACEBURG BRASS LIMITED,

1355 Wallace Street,
Wallaceburg, Ontario.
Telephone 519: 627-3361
Vice-President and General Manager:
J. A. Burgess
Contact: C. Luxton, Executive Assistant
to the Vice-President
Floor Area: 160,000 sq. ft.
Personnel: 660

Manufacturers of: Plumbing and laboratory brass fixtures; Cored or solid brass, bronze, copper or aluminum forgings; Shell castings; Brass, bronze, copper or steel automatic screw machine parts; Machined forgings; die castings, rod or tube parts; Finishing, plating and assembly of parts.

1345 1395 4510 and Pages B4, B9 and B10.

WALTER KIDDE & COMPANY OF CANADA LTD.,

154 Oneida Drive,
Pointe Claire 730, Que.
Telephone 514: 697-1310
President: I. J. Hammill
Contact: R. Neal, Asst. Gen. Mgr.
Floor Area: 30,000 sq. ft.
Personnel: 70

Manufacturers of: Fire Protection & Detection Equipment. Burglar & Fire Alarms.
4210 6320 6350

WAYNE FORGE LIMITED,

126 Judge Road,
Toronto 18, Ontario.
Telephone 416: 239-1241
President & General Manager:
D. G. Darling
Contact: E. C. Prowse, Vice-President
& Sales Manager
Floor Area: 8,000 sq. ft.
Personnel: 17

Manufacturers of: Industrial Furnaces — For Heat Treating, Drawing, Tempering, Stress Relieving, Hardening, Annealing, As-saying, Glazing, etc.; Forging Furnaces; Metal Melting Furnaces — for all non ferrous metals; Galvanizing Furnaces; Industrial Ovens — for Baking, Curing, Drying, Finishing, Softening, Ageing etc., — Bench type, Cabinet type, Truck type, Conveyorized. Standard and custom designed equipment.

3424 3426 3615 3650 3695 4410
4430 4440 4520 4530

THE WEATHERHEAD COMPANY OF CANADA, LTD.,

109-117 Inkerman St.,
St. Thomas, Ont.
Telephone 519: 631-8600
Vice-Pres. & Gen. Mgr.: W. F. Braun
Contact: R. T. Glass, Sales Mgr.
Floor Area: 74,600 sq. ft.
Personnel: 230

Manufacturers of: Hydraulic Components; Tube fittings; Hose Assemblies and Couplings; Automatic screw machine products.
1650 2915 2930 2935 4720 4730
4920 5307 and Page B10.

WELLAND FORGE LIMITED,

P.O. Box 216, Centre St.,
Welland, Ont.
Telephone 416: 732-7537
President: G. D. Potter
Floor Area: 75,000 sq. ft.
Personnel: 200

Manufacturers of: Upset, Press and Hammer Forgings, Ferrous and Non Ferrous Materials.
Page B9.

WELWYN CANADA LIMITED,

1255 Brydges St.,
London, Ont.
Telephone 519: 451-9490

Telex: 024-843
Cable: WELCAN
President: R. Wilton
Contact: K. J. Davis, Dir. of Sales
Floor Area: 20,000 sq. ft.
Personnel: 150

Manufacturers of: Precision deposited carbon; Miniature Oxide; Power oxide; High value, High voltage and Ultra low value resistors.
5905

WESTEEL-ROSCO LTD.,

1 Atlantic Ave.,
Toronto 3, Ont.
Telephone: 416: 537-4411
Telex: 02-2635
President: R. M. Calhoun
Floor Area: 991,500 sq. ft.
Personnel: 2,514

Manufacturers of: Sheet metal products; Partitions; Hollow metal doors & fire doors; Hangar and pier shed doors; Pressed steel door frames; Lockers; Shelving; Storage cabinets; Steel Storage tanks; Grain elevator buckets & spouting; Truck tanks; Semi-trailer tankers & dump trucks; Airport tenders; Culverts; Steel roof & floor decks; Roofing & Siding; Metal wall panels; Prefabricated utility building; Tote & skid boxes; Pallets; Custom sheet metal work.

1330 2090 3910 3990 4710 5140
5410 5430 5640 5650 5670 5680
5975 6530 7110 7125 8140 9515

WESTERN CANADA STEEL LIMITED,

450 S. E. Marine Drive,
Vancouver 15, B.C.
Telephone 604: 325-2271
Telex: 04-5389
Cable: WESTCANSTEL
President: M. C. D. Hobbs
Contact: B. H. Crawford, Export Mgr.
Floor Area: 250,000 sq. ft.
Personnel: 500

Manufacturers of: Reinforcing bar, deformed; Angles to 3 x 3 x 3/8; Channels to 4"; Flats to 6" x 1" plain rounds; Plain squares; Hot rolled coiled rod; Special sections on request; Billet sized ingots; All types of bolts, nuts, track and bridge spikes; Pipe and tank bands; Washers; Rivets; Studs; Poleline hardware; Upset forgings and press products.

2250 5306 5307 5310 5975 9510
9515 9520 9640 and Page B4.

WESTERN FLYER COACH LIMITED,

6 Otter Street,
Winnipeg 19, Manitoba.

Telephone 204: 474-1424
President: A. J. Thiessen
Contact: R. A. Thiessen, Vice-President,
Sales and Operation
Floor Area: 35,000 sq. ft.
Personnel: 70

Manufacturers of: Buses Inter-City.
2310

WESTERN TOOLS & INDUSTRIES LTD.,

450 Sheppard St. at Church Ave.,
Winnipeg 14, Man.
Telephone 204: 586-8171
Contact: W. E. Schick, Gen. Mgr.
Floor Area: 54,000 sq. ft.
Personnel: 100

Manufacturers of: Custom Sheet Metal Products; Architectural and Ornamental, Curtain Wall, Hollow Metal Doors and Frames. Cabinets and Shelving, Ventilation & Air-Conditioning. Crop Sprayers.

1095 1325 1355 1560 1730 1740
2090 2330 3456 3990 5670 5680
5895 7125 8140 and B10.

WESTHILL INDUSTRIES LIMITED,

9031 Parkway Blvd.,
Ville D'Anjou,
Montreal 437, Que.
Telephone 514: 352-2310
President: G. Saulnier
Floor Area: 20,000 sq. ft.
Personnel: 115

Manufacturers of: Hydraulic Actuators, Engine and Airframe components and Sculptured parts in the medium to light range.
1560 1650 and Page B10.

WHITE MOTOR CO. OF CANADA LTD.,

1041 The Queensway,
Toronto, Ont.
Telephone 416: 259-8261
President: N. H. Bell
Floor Area:
Personnel:

Manufacturers of: Heavy duty motor trucks and component parts.
2320 2805 2815

WHITEHOUSE FASTENINGS LIMITED,

1170 de Louvain St. W.,
St. Laurent, Montreal 355, Que.
Telephone 514: 636-1326
Telex: 01-2675
President: M. J. Warren
Contact: C. Provost
Floor Area: 12,000 sq. ft.
Personnel: 25

Manufacturers of: Stainless Steel Bolts, Nuts, Screws, Washers, Rivets & Cotter Pins; All types of Corrosion Resistant Fasteners.
5305 5306 5307 5310 5315

WILLIAMS MACHINES LIMITED,**311 Montrose St.,****P.O. Box 430,****Preston, Ont.****Telephone Preston: 519: 653-5774****Toronto: 416: 364-6208****Telex: 0295-764****President: J. J. Havlik****Floor Area: 46,000 sq. ft.****Personnel: 250**

Manufacturers of: Jigs, Fixtures, Dies & Molds, Aircraft Parts & Components, Welded Steel Structures, Special Machinery, Hydraulic Milling Heads, General Machining & 3-Dimensional Machining.

1560 1630 1680 1730 1740 3020

3413 3417 3418 3419 3442 3465

3620 3695 4920 and Page B15.

WIRE ROPE INDUSTRIES OF CANADA LIMITED,**P.O. Box 158,****Montreal, Que.****Telephone 514: 637-3711****Telex: 01-2551****President: G. B. Foster****Contact: W. G. Rathie, Mgr. International Sales****Floor Area: 440,000 sq. ft.****Personnel: 500**

Manufacturers of: Steel Wire Rope; Steel Strand; Synthetic Cordage; Wire Rope Slings; Wire Rope & Strand Assemblies. Synthetic Rope Slings; Bridge Strand; Locked Coil Rope. Chain Link Fencing. Stress Relieved Strand for Prestressed Concrete.

1375 3940 4010 5660

S. E. WOODS SPORTSWEAR LTD.,**&****S. E. WOODS (CANVASS DIV.)****P.O. Box 607,****Hull, Que.****Telephone 819: 777-3832****Contact: W. Borland, Sales Mgr.****Floor Area: 70,000 sq. ft.****Personnel: 225**

Manufacturers of:

S. E. Woods Sportswear: Cold Weather and Special Arctic Clothing. Sleeping Bags.

8405 8415 8465

S. E. Woods (Canvass Div.): Tents, Tarpaulins, Canvass Products.

1005 1010 1015 1020 1025 1045

1055 1080 1240 1290 1340 1450

1670 1730 6920 7830 8340 8345

8460 8465

W. C. WOOD COMPANY LIMITED,**5 Arthur St. S.,****Guelph, Ont.****Telephone 519: 821-0900****Cable: WOODFARMCO****President: W. C. Wood****Contact: J. F. Wood, Vice-Pres. of Mfg.****Floor Area: 240,000 sq. ft.****Personnel: 340**

Manufacturers of: Refrigeration Equipment; Stainless Steel Bulk Storage Tanks; Zero Freezer Cabinets — Farm Refrigeration; Builders Hardware; Bombs, Practice.

1005 1095 1320 1325 1336 1340

1345 1350 1395 1680 3010 4110

4120 4130 5340 5430 7125 7360

and Page B10.

GLENN S. WOOLLEY & CO. LTD.,**Fairall Street,****Ajax, Ont.****Telephone 416: 942-5440****Cable: WOLYCO****General Mgr.: A. A. Medad****Contact: G. R. Kellett, Gen. Sales Mgr.****Floor Area: 25,000 sq. ft.****Personnel: 60**

Manufacturers of: Plastic Melamine Tableware, Trays, Disposable Plastic Cutlery. Custom Moulders of Thermo Plastic and Thermo Set Materials.

7350 9330

WRIGHTS CANADIAN ROPES LTD.,**350 South East Marine Drive,****Vancouver 15, B.C.****Telephone 604: 321-9191****Telex: 02-50218****Cable: WRIGHTROPE****Managing Dir.: P. G. Chutter****Contact: J. D. Clark, Sales Mgr.****Floor Area: 82,500 sq. ft.****Personnel: 120**

Manufacturers of: Steel Wire Rope and Strand.

3940 4010 5660

XYNO-MATIC PLASTICS LTD.,

399 Kennedy Rd.,
 Scarborough, Ont.
 Telephone 416: 264-2581
 President: M. M. Koerner
 Contact: D. C. Wainman, Gen. Mgr.
 Floor Area: 40,000 sq. ft.
 Personnel: 100

Manufacturers of: Semi-automatic & Automatic Injection Moulding of Precision Plastic Components Specializing in Engineering Plastics.

1310 1315 1320 1325 1345 1350
 1355 1390 3120 5310 9330

YARROWS LIMITED,

P.O. Box 1030,
 Victoria, B.C.
 Telephone 604: 385-4421
 Telex: 044-8165
 General Manager: J. A. Wallace
 Contact: P. C. Meredith, Sales Manager

Floor Area: 276,505 sq. ft.

Personnel: 600

Manufacturers of: Barges and Lighters; Cargo, special purpose; Bridges; fixed and floating; Buoys; Cargo and tanker vessels; Conveyors; Dredges; Fishing Vessels; Logging equipment, specialized; Machining — heavy, light, medium; Pontoons and floating docks; Pressure vessels; Sewage treatment equipment; Sheet metal fabrication; Sheet metal stampings; Small craft; Special service vessels; Switchboards; Generator, power; Tanks-liquid storage, metal underground storage; Towers; Antenna support; Transport vessels, passenger and troop; Repair and overhaul facilities.

1730 1905 1915 1930 1935 1940
 1945 1950 1955 2010 2020 2030
 2040 2050 2090 3695 3895 3920
 3950 3990 4120 4130 4460 4520
 4540 5410 5420 5430 5445 5670
 6110 5430 7125 9905 and Page B10.

ZETTEL MANUFACTURING LTD.,

170 Borden Ave. S.,
 Kitchener, Ont.
 Telephone 519: 742-9584
 President: J. A. Zettel
 Floor Area: 40,000 sq. ft.
 Personnel: 90

Manufacturers of: Dies — blanking, forming, piercing, punching, drawing and progressive. Jigs, fixtures and templates. Custom metal stampings and assemblies. Custom designed light machinery. Vehicle brake and body components.

2510 2530 3456 3465 5110 5136
 8130

