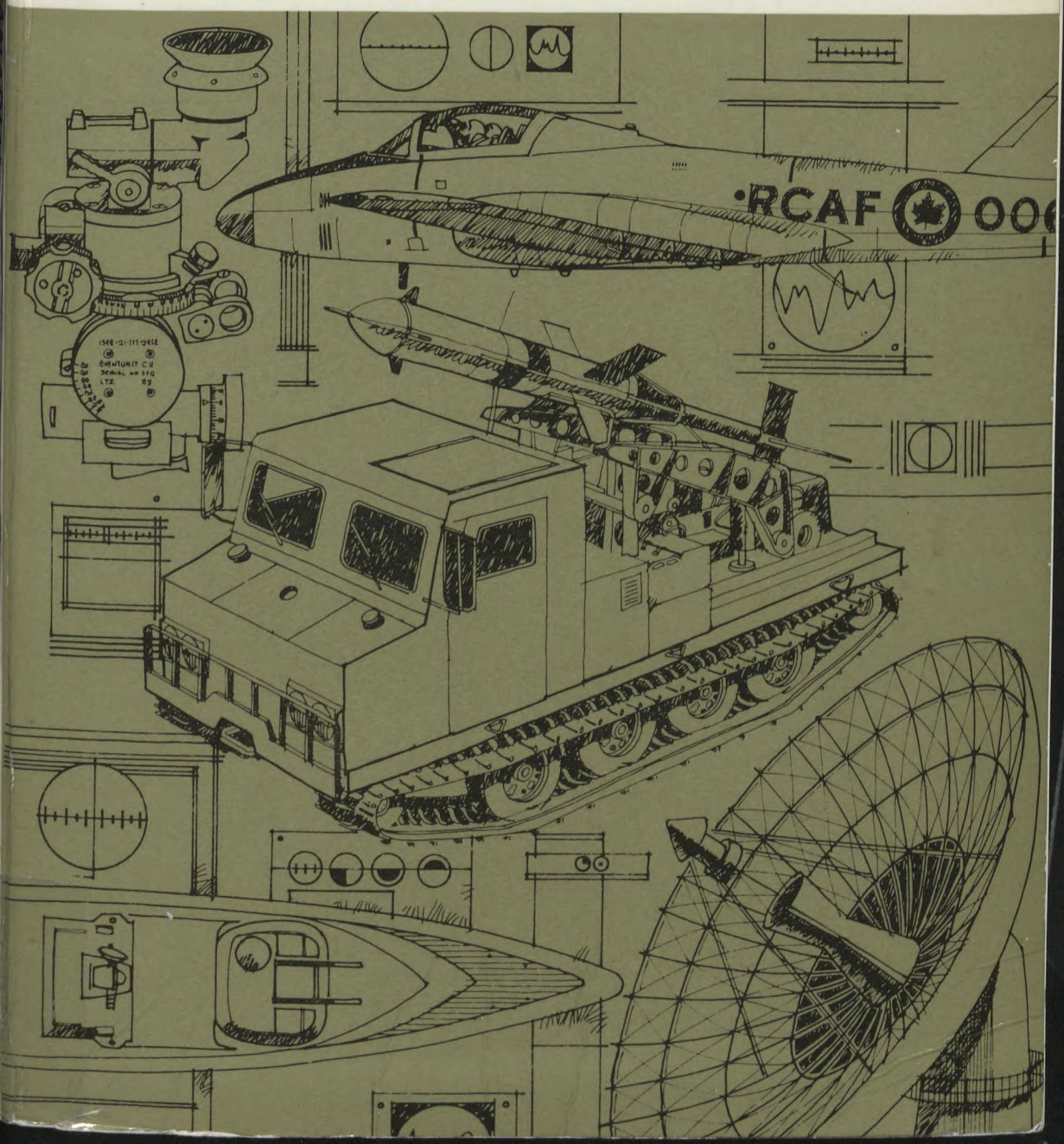
Canadian Defence Commodities

DEPARTMENT OF DEFENCE PRODUCTION, OTTAWA



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CANADIAN DEFENCE COMMODITIES

FIRST EDITION – MARCH, 1967
Formerly entitled "Canadian Commodities Index"

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
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CANADIAN DEFENCE COMMODITIES

Canada-United States
Defence Production Sharing

DEPARTMENT OF DEFENCE PRODUCTION
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CANADIAN DEFENCE COMMODITIES

This book has been compiled by the Canadian Department of Defence Production to assist procurement officials in the United States to find Canadian sources for defence items.

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

The majority of commodities listed, when supplied to meet a United States defence requirement, enter the United States free of duty. There are no "Buy-American" Act restrictions on Canadian defence supplies entering the United States.

Details of duty-free entry procedures and all other aspects of the Production Sharing Program are given in the publication *Production Sharing Handbook* also published by this Department. Copies are available free of charge from the nearest DDP field office or from:

Chief, United States Division,
International Programs Branch,
Department of Defence Production,
141 Laurier Avenue West,
Ottawa, Ontario, Canada.

Since this book cannot cover completely the capabilities and products of all Canadian companies, users are urged to discuss specific requirements with their nearest field office. A list of Field Liaison Offices established by the Department of Defence Production is given on pages VII and VIII.

The following page entitled — *How to Use the Book* should be of considerable assistance to those seeking fresh approaches to procurement problems.

HOW TO USE THE BOOK

This book has been produced with the intent of meeting two objectives; to give to the user an indication of Canadian Industrial Products and facilities and at the same time present this information in a format already recognizable. The following paragraphs will discuss these objectives in detail.

This book must not be considered as a guide or index to Canadian Industry as a whole. It is merely a cross section of the potential available in this country. Nor does the book attempt to list in exact detail the capabilities of any firm listed. Again it attempts only to indicate the general line of endeavour of a particular firm. Bearing in mind that Canada has about one tenth the population of the United States but has the same basic consumer requirements, it should then be realized that Canadian Firms are inclined to be quite diversified in their operation to meet the needs of our own market. Accordingly when more exact detail is required the company should be contacted directly. This is why considerable care has been taken with telephone numbers and the names of personnel to contact.

The book has been compiled in four sections, A, B, C and Illustrated. The first three, A, B & C will be referred to as the White, Yellow and Blue Sections based on the colour of the pages.

The White Section adopts the format of the Federal Supply Classification numerical index and in general employs the nomenclature of the FSC System. It will be noted that within the Class headings of the Groups the individual items have been given a number. These numbers refer directly to the numbers displayed below the name of each company thus pinpointing the particular items manufactured in that class by that company. In some instances a firm may be listed in a class but with no further notation of a specific product in that class; in such an event it may be assumed that it is generally active throughout that field. The omission of a class or group does not indicate that there is no such activity in Canada. As noted before this is a general cross section only. This section is followed by Pink pages which are a partial alphabetical index to Section A.

The Yellow Section makes particular reference to those services or areas where FSC Classification is difficult. Accordingly the service section is an outline of available capacities in basic fields as opposed to finished products. Again this section does not represent industry as a whole. If this section is read in conjunction with the Blue Section then a deeper insight into the service offered may be gathered.

The Illustrated Section has been added to demonstrate equipments currently being employed in Canada but basically the Section is an attempt to demonstrate to you some of the capabilities and possibilities available in Canadian Industry.

The Blue Section is an alphabetical listing of the firms contained in the book and contains such information as mailing address, telephone number, principals involved, floor area and the average number of personnel employed. Then in generic terms it deals with the activities of the company. This description is usually followed by the four figure coordinate which indicates the Group and Class where the company may be found or the page number if it is noted in some other section of the book.

It is hoped that this format will be of further assistance to users of this book who are exploring Canadian potential.

Department of Defence Production Offices in the United States

	Telephone
WASHINGTON, D.C. Post Address — P.O. Box 4897, Cleveland Park Station, Washington, D.C. 20008	202: 483-5505
BOSTON, Mass. Canadian Dept. of Defence Production, Liaison Officer, L. G. Hanscom Field, Bedford, Massachusetts. 01731	617: 274-6100 Ext. 2867
CHICAGO 4, Ill. Canadian Consulate General, 310 South Michigan Ave., Suite 2000, Chicago, Ill. 60604	312: 427-7926
DAYTON, Ohio MCL/DDP Wright-Patterson Air Force Base, Ohio. 45433	513: 255-3633 255-4382
DETROIT, Michigan Canadian Dept. of Defence Production, Liaison Officer, c/o Michigan Army Missile Plant, 38111 Van Dyke Avenue, Warren, Michigan. 48090	313: 264-1100 Ext. 2527
LOS ANGELES, California Canadian Dept. of Defence Production, Liaison Officer, Defense Contract Administration Services District, 125 South Grand Avenue, Pasadena, California. 91105	213: 796-0471 Exts. 597 598
NEW ORLEANS, Louisiana Canadian Consulate General, Commercial Division, Suite 1710, 225 Baronne Street, New Orleans 12, Louisiana. 70112	504: 515-2136

NEW YORK, N.Y.

Canadian Dept. of Defence Production,
c/o Canadian Consulate General,
680 Fifth Ave.,
New York, N.Y. 10019

212: 586-2400
Ext. 19

PHILADELPHIA, Pa.

Representative,
Canadian Dept. of Defence Production,
U.S. Army Electronics Command,
Attn: SELSC/P-CD,
225 South 18th Street,
Philadelphia, Pa. 19103

215: 546-3200
Exts. 2446
2447

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Section "A" (white pages)

Section "B" (yellow pages)

ILLUSTRATIONS

SECTION "A"

Index of Commodities

Section "A"

GROUP 10

WEAPONS

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1005 GUNS, THROUGH 30 MM

1. **Adapters, gun-mount.**
2. **Barrel forgings.**
3. **Bayonet scabbards.**
4. **Bayonets.**
5. **Bipods, machine gun.**
6. **Bipod, legs.**
7. **Bipods, rifle.**
8. **Bipod yokes.**
9. **Covers, canvas.**
10. **Fore ends, rifle, fibreglass.**
11. **Grips, pistol, plastic.**
12. **Kits, cleaning.**
13. **Launchers, grenade.**
14. **Machine carbines.**
15. **Machine guns.**
16. **Ordnance forgings.**
17. **Pistols.**
18. **Rifles.**
19. **Rods, cleaning.**
20. **Sights, rifle, grenade launcher.**
21. **Small arms ancillaries.**
22. **Small arms components.**
23. **Stellite barrel-liners.**
24. **Stock gun, shoulder, fibreglass.**

Atlas Steels Co.
2.16.

Canada Cycle & Motor Co. Ltd.
3.5.6.7.

Canadian Arsenals Ltd.
5.6.7.8.14.15.17.18.21.22.

Canadian Car (Pacific) Ltd.
8.

Canadian General Electric (Plastics)
10.11.

Deloro Stellite
23.

W. R. Elliott Ltd.
13.19.20.21.22.

The Holden Mfg. Co. Ltd.
9.

SIDO Limited
22.

Somerville Industries Ltd.
10.11.24.

Universal Die & Tool Mfg. Ltd.
1.4.12.13.19.20.21.

1010 GUNS, OVER 30 MM UP TO 75 MM

1. **Barrel forgings.**
2. **Covers, canvas.**
3. **Gun mounts.**
4. **Gun shields.**
5. **Ordnance forgings.**
6. **Power drives, hydraulic.**
7. **Rammers.**
8. **Recoil mechanisms.**
9. **Recuperator mechanisms.**

Atlas Steels Co.
1.5.

CAE Sumner Ltd.
4.

Davie Shipbuilding Ltd.
4.6.

Fairbanks-Morse (Canada) Ltd.
3.6.

Hamilton Gear & Machine Co.
6.

The Holden Mfg. Co. Ltd.
2.

Montreal Locomotive Works Ltd.
3.4.

National Steel Car Corp. Ltd.
3.4.

Otis Elevator Co. Ltd.
3.7.8.9.

1015 GUNS, 75 MM THROUGH 125 MM

1. **Barrel forgings.**
2. **Baseplates, mortar, fabricated.**
3. **Cannons, 81 mm. mortar.**
4. **Covers, canvas.**
5. **Gun mounts.**
6. **Gun mounts, power driven.**
7. **Gun shields.**
8. **Gun shields, fibreglass.**
9. **Modification kits, mortar.**
10. **Ordnance forgings.**
11. **Power devices, hydraulic.**
12. **Rammers.**
13. **Recoil mechanisms.**
14. **Recuperator mechanisms.**
15. **Sub calibre components.**

1015 GUNS, 75 MM THROUGH 125 MM *(conc.)*

Atlas Steels Co.
1.10.

CAE Sumner Ltd.
5.7.

Canadian Car (Pacific) Ltd.
3.9.

Davie Shipbuilding Ltd.
7.11.

W. R. Elliott Ltd.
9.

Fairbanks-Morse (Canada) Ltd.
6.

Hamilton Gear & Machine Co.
11.

The Holden Mfg. Co. Ltd.
4.

Montreal Locomotive Works Ltd.
6.7.

National Steel Car Corp. Ltd.
5.6.7.

Otis Elevator Co. Ltd.
5.12.13.14.

Uniroyal (1966) Ltd.
8.

Universal Die & Tool Mfg. Ltd.
2.9.15.

Phil Wood Industries Ltd.
2.

1020 GUNS, OVER 125 MM THROUGH 150 MM

1. Bipod yokes.
2. Covers, canvas.
3. Forgings, barrel.
4. Forgings, ordnance.
5. Gun mounts.
6. Gun shields.
7. Gun shields, fibreglass.
8. Modification kits, mortar.
9. Power drives, hydraulic.
10. Rammers.
11. Recoil mechanisms.
12. Recuperator mechanisms.

Atlas Steels Co.
3.4.

CAE Sumner Ltd.
5.6.

Canadian Car (Pacific) Ltd.
1.8.

Davie Shipbuilding Ltd.
6.9.

W. R. Elliott Ltd.
8.

Fairbanks-Morse (Canada) Ltd.
9.

Hamilton Gear & Machine Co.
9.

The Holden Mfg. Co. Ltd.
2.

Montreal Locomotive Works Ltd.
6.9.10.

National Steel Car Corp. Ltd.
5.6.10.

Otis Elevator Co. Ltd.
5.10.11.12.

Uniroyal (1966) Ltd.
7.

1025 GUNS, OVER 150 MM THROUGH 200 MM

1. Covers, canvas.
2. Mounts.
3. Power drives, hydraulic.
4. Rammers.
5. Recoil mechanisms.
6. Recuperator mechanisms.

Davie Shipbuilding Ltd.
3.

The Holden Mfg. Co. Ltd.
1.

Otis Elevator Co. Ltd.
2.4.5.6.

1030 GUNS, OVER 200 MM THROUGH 300 MM

1. Covers, canvas.

The Holden Mfg. Co. Ltd.
1.

1035 GUNS, OVER 300 MM

1. Covers, canvas.

The Holden Mfg. Co. Ltd.
1.

1040 CHEMICAL WEAPONS AND EQUIPMENT

1. Mixing and transfer kits, thickened fuel.

S. F. Bowser Co. Ltd.

1045 LAUNCHERS, TORPEDO AND DEPTH CHARGE

1. Covers, canvas.
2. Launchers, depth charge.
3. Launchers, torpedo.
4. Torpedo tubes.

Bata Engineering
2.

Burrard Dry Dock Co. Ltd.
2.3.4.

Canadian Vickers Ltd.
2.3.4.

Davie Shipbuilding Ltd.
2.3.4.

Fairbanks-Morse (Canada) Ltd.
3.

Fleet Manufacturing Ltd.
2.3.

The Holden Mfg. Co. Ltd.
1.

Montreal Locomotive Works Ltd.
4.

National Steel Car Corp. Ltd.
2.3.

1055 LAUNCHERS, ROCKET AND PYROTECHNIC

1. Covers, canvas.
2. Launchers, rocket.

Bata Engineering
2.

Firestone Tire & Rubber Canada Ltd.
2.

The Holden Mfg. Co. Ltd.
1.

1075 DEGAUSSING AND MINE SWEEPING EQUIPMENT

1. Controls.
2. Degaussing cable.

Bogue Electric of Canada Ltd.
1.

Canada Wire & Cable Co. Ltd.
2.

1080 CAMOUFLAGE AND DECEPTION EQUIPMENT

1. Bags, camouflage.
2. Wire, camouflage netting.

A.I.M. Steel Ltd.
2.

The Holden Mfg. Co. Ltd.
1.

1095 MISCELLANEOUS WEAPONS

1. Grips, knife, synthetic.
2. Grips, pistol, synthetic.
3. Knives, combat.
4. Racks, bomb, aircraft.
5. Scabbards, bayonet.

Auto Specialties Mfg. Co.
4.

Beach Foundry Ltd.
4.

Canada Cycle & Motor Co. Ltd.
5.

Canadian Steel Foundries
4.

Somerville Industries Ltd.
1.2.

Universal Die & Tool Mfg. Ltd.
3.

GROUP 12

FIRE CONTROL EQUIPMENT

1220 FIRE CONTROL COMPUTING SIGHTS AND DEVICES

1. **Computer groups, ballistic data.**
2. **Computer sets, ballistic.**
3. **Computers, ballistic.**
4. **Computers, barrage release time.**
5. **Computers, depth charge release time.**
6. **Computers, gun direction.**
7. **Controls computers.**
8. **Fans, scale protractor graphical firing.**
9. **Plotting boards, electronic.**
10. **Plotting boards, mechanical.**
11. **Scales, graphical firing.**
12. **Sights, head, computing auto.**

Aviation Electric Ltd.
9.

Canadian General Electric (EDPD)
1.2.3.4.5.6.7.12.

Computing Devices of Canada Ltd.
6.9.10.12.

International Business Machines
1.2.3.4.5.6.7.

Marsland Engineering Ltd.
9.

O. & W. Electronics Ltd.
8.10.11.

Stanley Mfg. Co. Ltd.
8.10.11.

1230 FIRE CONTROL SYSTEMS, COMPLETE

1. **Bombsight systems.**
2. **Fire control systems, airborne.**
3. **Fire control systems, anti-aircraft.**
4. **Fire control systems, ground.**
5. **Fire control systems, shipborne.**

CAE Industries Ltd.
1.2.3.4.5.

Canadian General Electric (EDPD)
1.2.3.4.5.

Canadian Westinghouse (Electronics)
2.3.4.5.

Computing Devices of Canada Ltd.
1.2.4.5.

International Business Machines
1.2.3.4.5.

RCA Victor Co. Ltd.
2.5.

1240 OPTICAL SIGHTING AND RANGING EQUIPMENT

1. **Aiming circle.**
2. **Binoculars.**
3. **Collimators.**
4. **Diaphragms, iris.**
5. **Filters.**
6. **Lenses.**
7. **Mirrors.**
8. **Mounts.**
9. **Prisms.**
10. **Range finders.**
11. **Reticles.**
12. **Sighting systems.**
13. **Sights, bore, optical.**
14. **Sights, mechanical.**
15. **Sights, optical.**
16. **Sightunits.**
17. **Telescopes.**

Canadian Arsenals Ltd.
14.

Canadian General Electric (EDPD)
12.16.

W. R. Elliott Ltd.
14.15.

Ernst Leitz Canada Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.

Ranar Industries Ltd.
8.14.15.

1260 FIRE CONTROL DESIGNATING AND INDICATING EQUIPMENT

1. **Synchro systems, fire control.**

Canadian Westinghouse (Electronics)

1265 FIRE CONTROL TRANSMITTING AND RECEIVING EQUIPMENT, EXCEPT AIRBORNE.

Canadian General Electric (EDPD)
Canadian Westinghouse (Electronics)
Northern Electric Co. Ltd.
RCA Victor Co. Ltd.
Raytheon Canada Ltd.

1270 AIRCRAFT GUNNERY FIRE CONTROL COMPONENTS

1. Computer groups, ballistics data.

Canadian General Electric (EDPD)
Sperry Gyroscope Co. of Canada Ltd.

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

CAE Industries Ltd.
1.4.5.6.7.

Canadian General Electric (EDPD)
1.2.3.4.5.6.7.

Canadian Westinghouse (Electronics)
1.2.3.4.5.6.7.

Northern Electric Co. Ltd.
4.5.6.7.

Philips Electronics Industries Ltd.
5.

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

Computing Devices of Canada Ltd.
13.

W. R. Elliott Ltd.
2.3.4.5.7.8.9.11.12.14.

Alexander Fleck Ltd.
12.

The Holden Mfg. Co. Ltd.
3.

Ernst Leitz Canada Ltd.
1.6.7.10.11.

O. & W. Electronics Ltd.
13.

Ranar Industries Ltd.
1.7.8.9.11.14.

Renfrew Aircraft & Engineering Ltd.
14.

Stanley Mfg. Co. Ltd.
13.

Universal Die & Tool Mfg. Ltd.
7.9.11.12.14.

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.**
7. **Cartridges, small arms.**
8. **Powders, rifle, double.**
9. **Powders, rifle, single base.**
10. **Primers.**

Canadian Arsenals Ltd.
2.4.6.

Canadian General Electric (Plastics)
5.

Canadian Industries Ltd.
1.3.7.8.9.10.

Metalite Co. Ltd.
4.

Tudhope Specialties Ltd.
4.6.

1310 AMMUNITION, OVER 30 MM UP TO 75 MM

1. **Ammunition.**
2. **Ammunition, drill, inert.**
3. **Cartridges, artillery assy and filling (30mm to 4″)**
4. **Cartridges, cases, brass.**
5. **Clips, cartridge.**
6. **Components, metal.**
7. **Components, plastic.**
8. **Fin assemblies.**
9. **Forgings, artillery shell.**
10. **Powders, cannon, double base.**
11. **Powders, cannon, nitroguanidine base.**
12. **Powders, cannon, single base.**
13. **Propellants, extruded.**
14. **Tracer, projectile, empty.**

Automatic Plastics Co.
7.

Barber Die Casting Co. Ltd.
6.8.

Bristol Aerospace Ltd.
8.

Canada Cycle & Motor Co. Ltd.
2.6.8.14.

Canadian Arsenals Ltd.
1.3.4.5.

Canadian Filters Ltd.
8.

Canadian General Electric (Plastics)
7.

Canadian Industries Ltd.
7.10.11.12.13.

General Impact Extrusions
2.6.8.

Harrington Tool & Die Co. Ltd.
5.6.

Hawker Siddeley Canada (Trans. Equip.)
6.9.

Industrial Machining Ltd.
2.6.8.

Ingersoll Machine & Tool Co. Ltd.
6.9.

National Steel Car Corp. Ltd.
2.5.9.

W. H. Olsen Mfg. Co. Ltd.
2.6.8.

Rollit Products Ltd.
2.6.

Triplex Engineering Co. Ltd.
6.

Tudhope Specialties Ltd.
6.

Westeel-Rosco Ltd.
6.8.

1315 AMMUNITION, 75 MM THROUGH 125 MM

1. **Ammunition.**
2. **Cartridge cases, brass and steel.**
3. **Cartridges, dummy.**
4. **Components, metal.**
5. **Components, plastic.**
6. **Drill, dummy and inert.**
7. **Fin assemblies.**
8. **Forgings artillery shell.**
9. **Powders, cannon, double base.**
10. **Powders, cannon, nitroguanidine base.**
11. **Powders, cannon, single base.**
12. **Powder, mortar, sheet.**
13. **Projectiles, cast.**

14. Projectiles, underwater.
15. Propellants, extruded.
16. Tracer, projectile, empty.

Automatic Plastics Co.
5.
Barber Die Casting Co. Ltd.
4.7.
S. F. Bowser Co. Ltd.
6.
Bristol Aerospace Ltd.
7.
Canada Cycle & Motor Co. Ltd.
4.7.16.
Canadian Arsenals Ltd.
2.14.
Canadian Filters Ltd.
7.
Canadian General Electric (Plastics)
5.
Canadian Industries Ltd.
1.5.9.10.11.12.15.
General Impact Extrusions
3.4.7.
Hawker Siddeley Canada (Trans. Equip.)
4.8.
Industrial Machining Ltd.
4.7.
Ingersoll Machine & Tool Co. Ltd.
4.8.
International Malleable Iron Co. Ltd.
13.
National Steel Car Corp. Ltd.
8.
W. H. Olsen Mfg. Co. Ltd.
4.7.
Rollit Products Ltd.
3.4.6.
Triplex Engineering Co. Ltd.
4.
Tudhope Specialties Ltd.
4.7.
Westeel-Rosco Ltd.
4.7.

1320 AMMUNITION, OVER 125 MM

1. Cartridges, dummy.
2. Components, metal.
3. Components, plastic.
4. Forgings artillery shell.
5. Powders, cannon, double base.
6. Powders, cannon, nitroguanidine base.
7. Powders, cannon, single base.
8. Projectiles, underwater.

Automatic Plastics Co.
3.
Bristol Aerospace Ltd.
8.
Canadian Arsenals Ltd.
8.
Canadian General Electric (Plastics)
3.
Canadian Industries Ltd.
3.5.6.7.
General Impact Extrusions
1.2.
Industrial Machining Ltd.
2.
National Steel Car Corp. Ltd.
4.
W. H. Olsen Mfg. Co. Ltd.
2.
Rollit Products Ltd.
1.2.
Tudhope Specialties Ltd.
2.

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.
11. Fin assemblies.
12. Forged components.
13. Fuses, ammunition (incl. proximity).
14. Fuses, bomb, tail.
15. Igniters, bomb.
16. Primers.
17. Vane, arming.
18. Vane, assemblies.

Atlas Steels Co.
12.
Automatic Plastics Co.
10.
Auto Specialties Mfg. Co.
2.3.4.5.6.7.8.9.11.17.18.
Barber Die Casting Co. Ltd.
11.17.18.

1325 BOMBS *(conc.)*

Beach Foundry Ltd.
2.4.5.7.8.9.11.14.17.18.
Bristol Aerospace Ltd.
10.11.
Canada Cycle & Motor Co. Ltd.
11.
Canada Iron Foundries (Foundry Div.)
3.8.
Canadian Arsenals Ltd.
1.4.13.
Canadian Filters Ltd.
8.11.
Canadian General Electric (Plastics)
10.
Canadian Industries Ltd.
10.12.15.16.
Canadian Steel Foundries
2.3.4.5.7.8.9.11.17.18.
ETF Tools Ltd.
12.
Enamel & Heating Products Ltd.
3.6.7.8.9.11.
General Impact Extrusions
5.6.11.14.
Industrial Machining Ltd.
3.5.6.9.11.17.18.
International Malleable Iron Co. Ltd.
5.7.8.
Mansfield-Denman General Ltd.
10.
W. H. Olsen Mfg. Co. Ltd.
3.5.6.9.11.17.18.
Renfrew Aircraft & Engineering Ltd.
6.11.
Rollit Products Ltd.
6.
Westeel-Rosco Ltd.
6.9.11.17.18.
The W. C. Wood Co. Ltd.
9.

1330 GRENADES

1. Fin assemblies.
2. Bodies, grenade, hand practice.
3. Fin assemblies, practice, rifle.
4. Fin assemblies, rifle.
5. Forged components.
6. Fuses, amm. (incl. proximity).
7. Grenade, empty components.
8. Grenades, hand.
9. Grenades, incendiary.
10. Grenades, smoke.
11. Plastic components.
12. Rifle.

Atlas Steels Co.
5.
Auto Specialties Mfg. Co.
1.2.3.4.
Barber Die Casting Co. Ltd.
1.3.4.
Beach Foundry Ltd.
1.2.3.4.
Bristol Aerospace Ltd.
1.
Canada Cycle & Motor Co. Ltd.
1.3.4.
Canadian Industries Ltd.
6.7.8.9.10.12.
Canadian Steel Foundries
1.3.4.7.
ETF Tools Ltd.
5.
General Impact Extrusions
1.2.7.
Industrial Machining Ltd.
1.2.3.4.
Mansfield-Denman General Ltd.
11.
W. H. Olsen Mfg. Co. Ltd.
1.2.3.4.7.
Tudhope Specialties Ltd.
1.3.4.
Westeel-Rosco Ltd .
1.3.4.

1336 GUIDED MISSILE WARHEADS AND EXPLOSIVE COMPONENTS

1. Fuses, (incl. proximity).
2. Fuses, inert.
3. Metal components.
4. Signals underwater sound.
5. Solid propellants.

Bristol Aerospace Ltd.
2.5.
Canadian Arsenals Ltd.
1.4.
Canadian Industries Ltd.
5.
General Impact Extrusions
3.
Triplex Engineering Co. Ltd.
3.

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

1. Solid propellants.

Bristol Aerospace Ltd.
Canadian Industries Ltd.

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

Barber Die Casting Co. Ltd.
6.14.

Bata Engineering
14.

Bristol Aerospace Ltd.
1.2.6.11.13.14.15.

Canada Cycle & Motor Co. Ltd
1.4.5.6.14.

Canadian Arsenals Ltd.
8.13.

Canadian Flight Equipment Co.
1.

Canadian General Electric (Plastics).
2.

Canadian Industries Ltd.
2.10.11.13.

Canadian Vickers Ltd.
4.5.6.12.14.

Chrysler Canada Ltd.
1.4.5.6.7.14.

ETF Tools Ltd.
7.

General Impact Extrusions
1.4.5.6.12.14.

The Holden Mfg. Co. Ltd.
3.

Industrial Machining Ltd.
4.5.6.12.14.

Ingersoll Machine & Tool Co. Ltd.
1.14.

W. H. Olsen Mfg. Co. Ltd.
4.5.6.12.14.

Rollit Products Ltd.
9.14.

Triplex Engineering Co. Ltd.
1.14.

Westeel-Rosco Ltd.
4.5.6.12.14.

1345 LAND MINES

1. Components, metal.
2. Components, plastic.
3. Fuses, (incl. proximity).
4. Fuses and primers, inert.
5. Mines.
6. Mines (empty components).

Automatic Plastics Co.
2.

Bristol Aerospace Ltd.
2.

Canadian Arsenals Ltd.
3.5.

Canadian General Electric (Plastics)
2.

Canadian Industries Ltd.
2.

General Impact Extrusions
1.

Mansfield-Denman General Ltd.
2.

Northwest Industries Ltd.
2.

Rollit Products Ltd.
1.4.

SIDO Ltd.
1.

Triplex Engineering Co. Ltd.
1.4.

Tudhope Specialties Ltd.
1.6.

Wallaceburg Brass Ltd.
1.4.

1350 UNDERWATER MINE INERT COMPONENTS

1. Components, plastic.

Automatic Plastics Co.
1.
Aviation Electric Ltd.
2.
Bristol Aerospace Ltd.
1.2.
Canadian Flight Equipment Co.
2.
Canadian General Electric (Plastics)
1.
Canadian Industries Ltd.
1.

2. Components, metal.

Fleet Manufacturing Ltd.
2.
General Impact Extrusions
2.
Mansfield-Denman General Ltd.
1.
Northwest Industries Ltd.
1.
SIDO Ltd.
2.
Triplex Engineering Co. Ltd.
2.

1351 UNDERWATER MINE EXPLOSIVE COMPONENTS

Canadian Industries Ltd.

1355 TORPEDO INERT COMPONENTS

1. Components, plastic.
2. Components, metal.
3. Warheads.

Automatic Plastics Co.
1.
Bristol Aerospace Ltd.
1.2.3.
Canadian Arsenals Ltd.
3.
Canadian Flight Equipment Co.
2.
Canadian General Electric (Plastics)
1.
Canadian Industries Ltd.
1.
General Impact Extrusions
2.
Mansfield-Denman General Ltd.
1.
Northwest Industries Ltd.
1.
W. H. Olsen Mfg. Co. Ltd.
2.
Rollit Products Ltd.
2.
SIDO Ltd.
2.
Westeel-Rosco Ltd.
2.

1356 TORPEDO EXPLOSIVE COMPONENTS

1. Fuses, (incl. proximity).
2. Warheads.

Canadian Arsenals Ltd.

1360 DEPTH CHARGE INERT COMPONENTS

Aviation Electric Ltd.
Canadian Flight Equipment Co.
Fairey Canada Ltd.
Fairey Canada Ltd. (West. Div.)
General Impact Extrusions
Rollit Products Ltd.
SIDO Ltd.
Triplex Engineering Co. Ltd.

1361 DEPTH CHARGE EXPLOSIVE COMPONENTS

1. Warheads.

Canadian Arsenals Ltd.

1365 MILITARY CHEMICAL AGENTS

1. HMX.
2. HMX/TNT (OCTOLS).
3. Hexachlorethane.
4. Incendiary mixtures.
5. Tracer.

Canadian Industries Ltd.
1.2.3.4.5.

1370 PYROTECHNICS

1. **Fireworks.**
2. **Flares, aircraft.**
3. **Flares, identification.**
4. **Flares, mixtures.**
5. **Flares, parachute.**
6. **Fuses.**
7. **Igniters, pyrotechnic.**
8. **Incendiary filling.**
9. **Markers, location marine.**
10. **Photoflash cartridges.**
11. **Pistol, rocket, signals.**
12. **Signals, distress.**
13. **Signals, illumination.**
14. **Signals, smoke.**
15. **Simulators, flash.**

Canadian Industries Ltd.
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.

Hand Chemical Industries Ltd.
1.2.3.4.5.6.7.9.11.12.13.14.15.

1375 DEMOLITION MATERIAL

1. **Chargers, cartridge.**
2. **Ejectors, seat, aircraft.**
3. **Fuses, cord and detonator.**
4. **HMX.**
5. **HMX/TNT (OCTOLS).**
6. **Initiating compounds.**
7. **Mats, blasting, wire rope.**
8. **Nitrocellnlose (wood pulp).**
9. **Nitroglycerine.**
10. **Plastic explosive (RDX base).**
11. **Propellant, actuated devices.**
12. **Propellants, solid.**
13. **Propellants, sticks, M7.**
14. **RDX.**
15. **RDX Comp. CH-6.**
16. **RDX/Wax compositions.**
17. **Styphnic Acid, refined.**
18. **Tetryl.**
19. **TNT.**

Bristol Aerospace Ltd.
11.12.

Canadian Arsenals Ltd.
6.

Canadian Flight Equipment Co.
2.11.

Canadian Industries Ltd.
1.3.4.5.6.8.9.10.11.12.13.14.15.
16.17.18.19.

Canadian Safety Fuse Co.
3.

Du Pont of Canada Ltd.
9.

Wire Rope Industries of Canada Ltd.
7.

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.**
7. **Fuses, point detonating inert.**
8. **Fuses and primers, empty components.**
9. **Fuses, proximity, practice, empty.**
10. **Primers, electric.**
11. **Primers, percussion.**

Automatic Plastics Co.
1.

Barber Die Casting Co. Ltd.
8.

Canadian Acme Screw & Gear Ltd.
4.

Canadian Arsenals Ltd.
2.3.

Canadian Flight Equipment Co.
4.

Canadian General Electric (Plastics)
1.

Canadian Industries Ltd.
1.11.

General Time Canada Ltd.
(Westclox Div.).
2.5.6.7.9.

Mansfield-Denman General Ltd.
1.

Rollit Products Ltd.
2.3.5.7.9.10.11.

Triplex Engineering Co. Ltd.
4.8.

1395 MISCELLANEOUS AMMUNITION

1. Ammunition shapes.
2. Blanks, discs, cups, rotating bands.
3. Cases, cartridge.
4. Forged components.
5. Plastic components.
6. RDX-base plastic explosive.
7. Shell components.

Anaconda American Brass Ltd.
1.

Atlas Steels Co.
4.

Barber Die Casting Co. Ltd.
2.

Canadian Arsenals Ltd.
3.

Canadian Flight Equipment Co.
1.

Canadian General Electric (Plastics)
5.

Canadian Industries Ltd.
6.

ETF Tools Ltd.
4.

General Impact Extrusions
1.2.3.7.

Industrial Machining Ltd.
1.2.7.

Mansfield-Denman General Ltd.
5.

Rollit Products Ltd.
2.7.

Wallaceburg Brass Ltd.
1.

GROUP 14

GUIDED MISSILES

1410 GUIDED MISSILES

Bristol Aerospace Ltd.
Canadair Ltd.
Computing Devices of Canada Ltd.
De Havilland Aircraft (SPAR)

1420 GUIDED MISSILE COMPONENTS

1. Components & assemblies.
2. Gyro components.
3. Gyro mechanisms.
4. Hydraulic components.
5. Systems, guidance.

Abex Industries of Canada Ltd.
2.4.
Aviation Electric Ltd.
1.2.3.4.
Bata Engineering
1.
Bristol Aerospace Limited
1.4.
Canadair Ltd.
1.4.
Canadian Flight Equipment Co.
4.
Computing Devices of Canada Ltd.
1.4.5.
De Havilland Aircraft (SPAR)
1.2.4.
Dowty Equipment of Canada Ltd.
4.
W. R. Elliott Ltd.
1.
Fleet Mfg. Ltd.
1.4.
Garrett Manufacturing Ltd.
1.
Harrington Tool & Die Co. Ltd.
1.
Joly Engineering Ltd.
1.
Litton Systems (Canada) Ltd.
2.
Ranar Industries Ltd.
2.4.
Sperry Gyroscope Co. of Canada Ltd.
2.3.

1430 GUIDED MISSILE REMOTE CONTROL SYSTEMS

1. Coder, radar, guided missile.
2. Computer groups, guided missile.
3. Systems, guidance.

Canadair Ltd.
1.2.
Canadian General Electric (EDPD)
1.
Canadian Westinghouse (Electronics)
1.2.
Computing Devices of Canada Ltd.
1.2.3.
Garrett Manufacturing Ltd.
2.
ITT Canada Ltd.
1.
Northern Electric Co. Ltd.
1.
RCA Victor Co. Ltd.
1.2.
Raytheon Canada Ltd.
1.2.
Stewart-Warner Corp. Ltd.
1.

1440 LAUNCHERS, GUIDED MISSILE

Bata Engineering
Bristol Aerospace Ltd.
Canadair Ltd.
Canadian Vickers Ltd.
Computing Devices of Canada Ltd.
Davie Shipbuilding Ltd.
Fleet Manufacturing Ltd.

1450 GUIDED MISSILE HANDLING AND SERVICING EQUIPMENT

1. Covers, canvas, protective.
2. Launchers, light gas guns.
3. Structural components.

Computing Devices of Canada Ltd.
2.

The Holden Mfg. Co. Ltd.
1.

Phil Wood Industries 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.

Found Bros. Aviation Ltd.
1.

1520 AIRCRAFT, ROTARY WING

Avian Aircraft Ltd.

United Aircraft of Canada Ltd.

1540 GLIDERS

De Havilland Aircraft of Canada

1550 DRONES

Avian Aircraft Ltd.

Canadair Ltd.

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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. Sculptured parts.
14. Spars.
15. Structural components, honeycomb.
16. Tanks, bladder type.
17. Tanks, fuel and lubricating oil.
18. Tanks, rubber, fuel, self seal.
19. Tubular parts and assemblies.
20. Wing sections.

Abex Industries of Canada Ltd.
3.8.13.

Avian Aircraft Ltd.
7.8.12.

Bata Engineering
13.

Bristol Aerospace Ltd.
5.7.8.10.12.17.19.

Canadair Ltd.
1.4.5.6.7.8.9.10.13.19.20.

Canadian Car (Fort William).
1.2.3.4.6.7.8.9.10.12.13.14.16.17.18.
19.20.

Canadian General Electric (Plastics)
12.

De Havilland Aircraft of Canada
1.4.5.6.7.8.9.10.13.14.19.20.

Enamel & Heating Products Ltd.
8.17.19.

English Plastics Ltd.
2.12.

Fairey Canada Ltd.
1.5.6.7.8.10.12.17.19.

Fairey Canada Ltd. (West. Div.)
3.

Field Aviation Co. Ltd.
8.12.19.

Firestone Tire & Rubber Canada Ltd.
16.18.

Fleet Manufacturing Ltd.
5.7.8.12.13.15.17.19.

Found Bros. Aviation Ltd.
8.

G.M. Plastic Corp.
12.

Harrington Tool & Die Co. Ltd.
8.

Heroux Machine Parts Ltd.
14.

Hussman Refrigerator Co. Ltd.
17.

LaSalle Engineering Ltd.
8.19.

Noorduyn Norseman Aircraft Ltd.
11.

1560 AIRFRAME STRUCTURAL COMPONENTS *(conc.)*

Northwest Industries Ltd.
1.4.5.6.8.9.10.11.12.17.19.20.

O. & W. Electronics Ltd.
8.12.

Polyfiber Ltd.
12.

Protective Plastics Ltd.
12.

Rollit Products Ltd.
8.19.

Somerville Industries Ltd.
12.

Timmins Aviation Ltd.
1.4.5.6.7.8.9.19.20.

Uniroyal (1966) Ltd.
12.16.18.

Westhill Industries Ltd.
8.13.

Williams Machines Ltd.
13.19.

GROUP 16

AIRCRAFT COMPONENTS AND ACCESSORIES

1620 AIRCRAFT LANDING GEAR COMPONENTS

1. Systems and components.

Abex Industries of Canada Ltd.
Canadair Ltd.
Canadian Vickers Ltd.
De Havilland Aircraft of Canada
Dowty Equipment of Canada Ltd.
York Gears Ltd.

1630 AIRCRAFT WHEEL AND BRAKE SYSTEMS

1. Brakes.
2. Cylinders, brake.
3. Fittings.
4. Floats, A/C landing.
5. Hydraulic systems.
6. Landing gear, main & nose.
7. Skis.
8. Struts, retractable.
9. Valves, hydranlics.
10. Wheels.

Abex Industries of Canada Ltd.
1.2.3.5.6.8.9.

Aviation Electric Ltd.
1.2.10.

Bristol Aerospace Ltd.
4.7.

Canadian Aircraft Products Ltd.
4.

Canadian Flight Equipment Co.
3.5.7.

Canadian Vickers Ltd.
6.10.

Dowty Equipment of Canada Ltd.
1.2.3.5.6.8.9.10.

Enamel & Heating Products Ltd.
4.6.

Fleet Manufacturing Ltd.
7.

Genaire (1961) Ltd.
7.

Godfrey Engineering Co. Ltd.
9.

Joly Engineering Ltd.
1.3.

Ranar Industries Ltd.
3.

Rollit Products Ltd.
3.

Williams Machines Ltd.
3.6.

York Gears Ltd.
1.2.5.6.9.10.

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

Abex Industries of Canada Ltd.
2.5.6.8.9.10.11.13.

Aircraft Appliances & Equipment
4.

Aro of Canada Ltd.
9.

Aviation Electric Ltd.
6.7.

Bristol Aerospace Ltd.
1.

Canadian Flight Equipment Co.
2.5.13.

Canadian Valve (Singer Valve)
13.

Davie Shipbuilding Ltd.
1.

De Havilland Aircraft (SPAR)
3.5.7.

Dowty Equipment of Canada Ltd.
2.3.6.10.13.

Fairey Canada Ltd.
2.

Garrett Manufacturing Ltd
3.7.

1650 AIRCRAFT HYDRAULIC, VACUUM, AND DE-ICING SYSTEM COMPONENTS *(conc.)*

Godfrey Engineering Co. Ltd.
12.

B. F. Goodrich Canada Ltd.
3.

Heroux Machine Parts Ltd.
2.5.13.

Joly Engineering Ltd.
5.

National Steel Car Corp. Ltd.
1.

Weatherhead Co. of Canada Ltd.
5.

Westhill Industries Ltd.
2.

York Gears Limited
2.6.13.

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

Air Conditioning Engineering
1.

Aro of Canada Ltd.
6.7.8.9.

Canadian Valve (Singer Valve)
9.

Dominion Helicopters Ltd.
3.4.

Firestone Tire & Rubber Canada Ltd.
6.

Garrett Manufacturing Ltd.
2.

Godfrey Engineering Co. Ltd.
1.5.8.

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

Uniroyal (1966) Ltd.
6.

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

Canadian Flight Equipment Co.
1.

De Havilland Aircraft of Canada
1.8.9.

Enamel & Heating Products Ltd.
1.

Flight Line Quality Products Ltd.
1.

Genaire (1961) Ltd.
5.

The Holden Mfg. Co. Ltd.
2.

Irvin Air Chute Ltd.
3.6.7.8.

Noorduyn Norseman Aircraft Ltd.
1.4.

1680 MISCELLANEOUS AIRCRAFT ACCESSORIES AND COMPONENTS

1. Actuators, electro-mechanical, linear.
2. Blankets, insulation thermal.
3. Bomb and tank pylon assemblies.
4. Covers, aircraft, fabric.
5. Fire extinguishers.
6. Galleys, aircraft.
7. Galley equipment.
8. Guides, extruded, metal.
9. Guides, extruded, plastic.
10. Harness, safety A/C.
11. Hinges, extruded.
12. Racks, cargo, helicopter.
13. Regulators, pressure air.
14. Seats, aircraft, ejection.
15. Seats and benches, aircraft.
16. Seats, fabric.
17. Skis, helicopter.
18. Systems for handling, air transporting & erecting of equipment by helicopter.
19. Winches.

Abex Industries of Canada Ltd.
1.13.

Aviation Electric Ltd.
1.13.

Bristol Aerospace Ltd.
3.4.13.15.

Canadair Ltd.
3.

Canadian Car (Fort William)
15.

Canadian Flight Equipment Co.
4.9.14.15.

Canadian Valve (Singer Valve)
13.

Central Dynamics Ltd.
1.13.

De Havilland Aircraft of Canada
1.3.

Dominion Helicopters Ltd.
12.17.

Dowty Equipment of Canada Ltd.
1.19.

W. R. Elliott Ltd.
1.

Enamel & Heating Products Ltd.
15.

Fairey Canada Ltd.
3.

Field Aviation Co. Ltd.
14.19.

Fleet Manufacturing Ltd.
3.

Flight Line Quality Products Ltd.
16.

Godfrey Engineering Co. Ltd.
13.19.

Irvin Air Chute Ltd.
10.

Noorduyn Norseman Aircraft Ltd.
4.

Okanagan Helicopters Ltd.
18.

Pyrene Mfg. Co. of Canada Ltd.
5.

H. I. Thompson Co. of Canada Ltd.
2.

Timmins Aviation Ltd.
6.7.15.

Universal Die & Tool Mfg. Ltd.
8.11.15.

Williams Machines Ltd.
15.

GROUP 17

AIRCRAFT LAUNCHING, LANDING, AND GROUND HANDLING EQUIPMENT

1710 AIRCRAFT ARRESTING, BARRIER AND BARRICADE EQUIPMENT

1. Barriers, aircraft arresting.
2. Cables, arresting.

Donald Ropes & Wire Cloth Ltd.
1.2.

Fairey Canada Ltd.
3.

3. Helicopter, landing system, shipboard.

Heroux Machine Parts Ltd.
1.

1720 AIRCRAFT LAUNCHING EQUIPMENT

1. Catapults.
2. Launching cables.

Canadian Arsenals Ltd.
3.

Canadian Flight Equipment Co.
1.

3. Terminals, cable.

Donald Ropes & Wire Cloth Ltd.
2.

Heroux Machine Parts Ltd.
1.

1730 AIRCRAFT GROUND SERVICING EQUIPMENT

1. Bags, pneumatic aircraft lifting.
2. Beaching equipment.
3. Booms, self-propelled.
4. Chocks, wheel.
5. Covers, canvas, A/C engine.
6. Covers, canvas, A/C wing.
7. Energizers.
8. Jacks, hydraulic.
9. Ladders, maintenance.
10. Ladders.

Aerometal Products & Design Ltd.
10.11.

Aircraft Appliances & Equipment
7.

Anthes Imperial Ltd.
11.

Aro of Canada Ltd.
15.

Bata Engineering
18.

Bogue Electric of Canada Ltd.
7.15.16.17.

Bristol Aerospace Ltd.
15.17.

Canadair Ltd.
15.17.

Canadian Car (Fort William)
2.4.15.17.

De Havilland Aircraft of Canada
15.17.

Dominion Helicopters Ltd.
14.

11. Platforms.
12. Platforms, hydraulic.
13. Refuelling equipment.
14. Servicing equipment, helicopter.
15. Servicing equipment various.
16. Stands, engine, maintenance and handling.
17. Stands, handling and maintenance, various.
18. Towbars aircraft.

Dominion Rubber Co. Ltd.
1.

Dowty Equipment of Canada Ltd.
8.

Eastern Steel Products Co.
3.

Enamel & Heating Products Ltd.
4.9.10.11.15.16.17.18.

Fairey Canada Ltd.
15.17.18.

Field Aviation Co. Ltd.
15.17.

Alexander Fleck Ltd.
11.16.17.18.

Fleet Manufacturing Ltd.
4.15.18.

Godfrey Engineering Co. Ltd.
7.16.

B. F. Goodrich Canada Ltd.
1.

Harrington Tool & Die Co. Ltd.
16.17.

Hassan Steel Fabricators Ltd.
16.17.

Holden Mfg. Co. Ltd.
5.6.

LaSalle Engineering Ltd.
4.17.

Magline of Canada Ltd.
9.10.11.

Matthew Moody Division
16.17.

Noorduyn Norseman Aircraft Ltd.
4.

Northwest Industries Ltd.
4.9.10.15.16.17.18.

Powertronic Equipment Ltd.
7.

Renfrew Aircraft & Engineering Ltd.
4.10.11.13.18.

Reynolds Extrusion Co. Ltd.
9.10.

Russel-Hipwell Engines Ltd.
7.

Timmins Aviation Ltd.
16.

Truck Engineering Ltd.
11.12.

Uniroyal (1966) Ltd.
1.

Williams Machines Ltd.
18.

Phil Wood Industries Ltd.
4.

Yarrows Ltd.
11.

1740 AIRFIELD SPECIALIZED TRUCKS AND TRAILERS

1. Airfield flushers.
2. Airfield sweepers.
3. Dollies.
4. Tractors, special design.
5. Trailers, aircraft cargo.
6. Trailers, bomb, dolly type.
7. Trailers, rocket.
8. Trailers, special design.

ATCO Industries Ltd.
8.

Canadian Car (Fort William)
3.6.

De Havilland Aircraft of Canada
8.

Eastern Steel Products
4.8.

Fairbanks-Morse (Canada) Ltd.
6.7.

Fleet Manufacturing Ltd.
3.6.7.8.

James Howden & Parsons of Canada
8.

LaSalle Engineering Ltd.
2.

Matthew Moody Division
3.5.8.

Renfrew Aircraft & Engineering Ltd.
3.

Williams Machines Ltd.
3.

Phil Wood Industries Ltd.
8.

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.
Collingwood Shipyards
1.2.
Geo. T. Davie & Sons Ltd.
1.2.
Davie Shipbuilding Ltd.
1.2.
Dominion Bridge Co. Ltd.
2.
Halifax Shipyards
1.2.

2. Landing craft.

Kingston Shipyards
1.2.
Marine Industries Ltd.
1.2.
Port Weller Dry Docks Ltd.
2.
Russel Brothers Ltd.
2.
Saint John Shipbuilding & Dry Dock
1.2.
Victoria Machinery Depot Co. Ltd.
1.2.
Yarrows Ltd.
1.2.

1910 TRANSPORT VESSELS, PASSENGER AND TROOP

Burrard Dry Dock Co. Ltd.
Collingwood Shipyards
Geo. T. Davie & Sons Ltd.
Davie Shipbuilding Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.
Saint John Shipbuilding & Dry Dock
Victoria Machinery Depot Co. Ltd.

1915 CARGO AND TANKER VESSELS

1. Cargo.

Burrard Dry Dock Co. Ltd.
1.
Canadian Vickers Ltd.
1.2.
Collingwood Shipyards
1.2.
Geo. T. Davie & Sons Ltd.
1.2.
Davie Shipbuilding Ltd.
1.2.
Halifax Shipyards
1.2.
Kingston Shipyards
1.2.

2. Tankers.

Marine Industries Ltd.
1.2.
Port Weller Dry Docks Ltd.
1.2.
Russel Brothers Ltd.
1.
Saint John Shipbuilding & Dry Dock
1.2.
Victoria Machinery Depot Co. Ltd.
1.2.
Yarrows Ltd.
1.

1920 FISHING VESSELS

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Davie Shipbuilding Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.
Port Weller Dry Docks Ltd.
Russel Brothers Ltd.
Saint John Shipbuilding & Dry Dock

1925 SPECIAL SERVICE VESSELS

1. Tenders.
2. Tugs.

Burrard Dry Dock Co. Ltd.
Collingwood Shipyards
Geo. T. Davie & Sons Ltd.
Davie Shipbuilding Ltd.
Halifax Shipyards
Kingston Shipyards

3. Vessels, special service.

Marine Industries Ltd.
Port Weller Dry Docks Ltd.
Russel Brothers Ltd.
Saint John Shipbuilding & Dry Dock
Victoria Machinery Depot Co. Ltd.

1930 BARGES AND LIGHTERS, CARGO

1. Barges, cargo.
2. Lighters, cargo.

Burrard Dry Dock Co. Ltd.
1.2.
Canada Iron Foundries (West. Bridge)
1.
Canadian Vickers Ltd.
1.2.
Collingwood Shipyards
3.
Geo. T. Davie & Sons Ltd.
1.2.3.
Davie Shipbuilding Ltd.
1.2.
Dominion Bridge Co. Ltd.
1.
Halifax Shipyards
1.2.3.
Kingston Shipyards
1.2.3.

3. Scows.

Lunenburg Foundry & Engineering Ltd.
1.2.3.
Marine Industries Ltd.
1.2.
National Steel Car Corp. Ltd.
1.
Port Weller Dry Docks Ltd.
1.3.
Russel Brothers Ltd.
1.2.3.
Saint John Shipbuilding & Dry Dock
1.2.3.
Victoria Machinery Depot Co. Ltd.
1.
Yarrows Ltd.
2.

1935 BARGES AND LIGHTERS, SPECIAL PURPOSE

1. Barges.

Burrard Dry Dock Co. Ltd.
1.2.
Canada Iron Foundries (West. Bridge)
1.
Canadian Vickers Ltd.
1.2.
Collingwood Shipyards
1.
Geo. T. Davie & Sons Ltd.
1.2.
Davie Shipbuilding Ltd.
1.2.
Dominion Bridge Co. Ltd.
1.
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 Weller Dry Docks Ltd.
1.2.
Russel Brothers Ltd.
1.2.
Saint John Shipbuilding & Dry Dock
1.2.
Victoria Machinery Depot Co. Ltd.
1.
Yarrows Ltd.
1.2.

1940-1955

1940 SMALL CRAFT

1. Boats, aluminum.
2. Boats, rubber, inflatable.
3. Hulls, steel.
4. Hulls, wooden.
5. Plastic.
6. Ships, small, coastal, custom.

Burrard Dry Dock Co. Ltd.
3.4.6.
Moise Cadorette Inc.
4.5.
Canadian Vickers Ltd.
3.6.
Collingwood Shipyards
3.6.
Geo. T. Davie & Sons Ltd.
3.6.
Davie Shipbuilding Ltd.
3.6.
Firestone Tire & Rubber Canada Ltd.
2.
Halifax Shipyards
3.6.
Kingston Shipyards
3.6.
Lunenburg Foundry & Engineering Ltd.
3.
Marine Industries Ltd.
3.6.
Russel Brothers Ltd.
1.3.6.
Saint John Shipbuilding & Dry Dock
3.6.
Uniroyal (1966) Ltd.
2.
Yarrows Ltd.
3.6.

1945 PONTOONS AND FLOATING DOCKS

1. Floating docks.
2. Pontoons, rubber.

Burrard Dry Dock Co. Ltd.
1.
Canadian Vickers Ltd.
1.
Davie Shipbuilding Ltd.
1.
Dominion Bridge Co. Ltd.
1.
Firestone Tire & Rubber Canada Ltd.
2.
Halifax Shipyards
1.
Kingston Shipyards
1.
Marine Industries Ltd.
1.
Russel Brothers Ltd.
1.
Saskatchewan Steel Fabricators Ltd.
1.
Uniroyal (1966) Ltd.
2.
Victoria Machinery Depot Co. Ltd.
1.
Yarrows Ltd.
1.

1950 FLOATING DRYDOCKS

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Geo. T. Davie & Sons Ltd.
Davie Shipbuilding Ltd.
Dominion Bridge Co. Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.
Victoria Machinery Depot Co. Ltd.
Yarrows Ltd.

1955 DREDGES

Burrard Dry Dock Co. Ltd.
Canadian Vickers Ltd.
Geo. T. Davie & Sons Ltd.
Davie Shipbuilding Ltd.
Halifax Shipyards
Kingston Shipyards
Marine Industries Ltd.
Port Weller Dry Docks Ltd.
Russel Brothers Ltd.
Saint John Shipbuilding & Dry Dock
Victoria Machinery Depot Co. Ltd.
Yarrows Ltd.

GROUP 20

SHIP AND MARINE EQUIPMENT

2010 SHIP AND BOAT PROPULSION COMPONENTS

1. Blades, propeller.
2. Controls, servo, propeller.
3. Couplings, shaft, marine.
4. Hubs, propeller.
5. Hydro-jet propulsion devices.
6. Liners, shaft, propulsion.
7. Propellers, new and reconditioned.
8. Seals, shaft.
9. Shafting, propulsion.
10. Ship and boat propulsion components.
11. Steering, automatic.
12. Tailshaft.

Beloit Sorel Ltd.
3.9.
Black Clawson-Kennedy Ltd.
1.3.4.6.7.
Burrard Dry Dock Co. Ltd.
10.
Computing Devices of Canada Ltd.
11.
Davie Shipbuilding Ltd.
3.6.9.10.
Dowty Equipment Ltd.
5.
Garrett Manufacturing Ltd.
2.
Hawker Siddeley Canada (Trans. Equip.)
3.9.10.12.
Industrial Machining Ltd.
3.9.10.
Kingston Shipyards
3.6.9.10.11.
Lucas-Rotax Ltd.
2.11.
Lunenburg Foundry & Engineering Ltd.
7.
Progressive Engineering Works Ltd.
6.9.
Russel Brothers Ltd.
9.10.12.
Syntron (Canada) Ltd.
8.
TAMCO Ltd.
5.
Yarrows Ltd.
3.6.9.

2020 RIGGING AND RIGGING GEAR

1. Booms, cargo.
2. Masts.
3. Stays, boom, wire rope.

Burrard Dry Dock Co. Ltd.
1.2.
Canadian Vickers Ltd.
1.2.
Collingwood Shipyards
1.2.
Geo. T. Davie & Sons Ltd.
1.2.
Davie Shipbuilding Ltd.
1.2.3.
Dominion Bridge Co. Ltd.
1.
Russel Brothers Ltd.
1.2.
Saint John Shipbuilding & Dry Dock
1.2.
Yarrows Ltd.
1.2.

2030 DECK MACHINERY

1. Capstans.
2. Consoles, ship, control.
3. Consoles, ship, engine, control.
4. Davits.
5. Hoists, anchor.
6. Hydraulic motors & controls.
7. Steering gear.
8. Towed body equipment.
9. Winches.
10. Windlasses.

Black Clawson-Kennedy Ltd.
9.
CAE Sumner Ltd.
7.
Canadian Vickers Ltd.
7.
Collingwood Shipyards
9.
Dominion Bridge Co. Ltd.
4.
Dowty Equipment Ltd.
9.

2030 DECK MACHINERY *(conc.)*

Garrett Manufacturing Ltd.
2.3.
Halifax Shipyards
4.
Lunenburg Foundry & Engineering Ltd.
7.9.
Russel Brothers Ltd.
4.7.9.
J. Swann (1963) Ltd.
1.5.6.8.10.
TAMCO Ltd.
6.
Yarrows Ltd.
4.

2040 MARINE HARDWARE AND HULL ITEMS

1. **Air scoops.**
2. **Anchors.**
3. **Bars, crate.**
4. **Boat, fenders.**
5. **Covers, multi-use.**
6. **Dock fenders.**
7. **Doors, bow fairing.**
8. **Doors, bow, landing craft.**
9. **Doors, metal, marine.**
10. **Doors, sliding.**
11. **Doors, watertight.**
12. **Hatches.**
13. **Ladders.**
14. **Plates, multi-purpose.**
15. **Rudders.**
16. **Rudder posts.**
17. **Rudder, stocks.**
18. **Shackles, buoy.**
19. **Smokestacks.**
20. **Stuffing tubes marine.**
21. **Units, cathodic protection (Hulls).**
22. **Ventilators, multi-purpose.**
23. **Windows, aluminum, brass & stainless.**
24. **Windows, blast resistant.**
25. **Windows, heated, electrical.**

Beclawat (Canada) Ltd.
10.23.24.25.
Burrard Dry Dock Co. Ltd.
1.7.8.9.12.13.14.17.19.22.
Canadian Tap & Die Co. Ltd.
20.
Canadian Vickers Ltd.
1.5.7.8.9.11.12.13.14.19.22.
Collingwood Shipyards
1.5.7.8.9.11.12.13.14.19.22.
Consolidated Mining & Smelting
21.
Geo. T. Davie & Sons Ltd.
1.5.7.8.9.11.12.13.14.19.22.
Davie Shipbuilding Ltd.
1.5.7.8.9.11.12.13.14.19.22.
Dominion Bridge Co. Ltd.
5.15.19.
Firestone Tire & Rubber Canada Ltd.
4.6.
B. F. Goodrich Canada Ltd.
4.6.
Halifax Shipyards
1.5.7.8.9.11.12.13.14.19.22.
Hassan Steel Fabricators Ltd.
19.
Hawker Siddeley Canada (Trans. Equip.)
15.17.18.
James Howden & Parsons of Canada
11.
Kingston Shipyards
7.8.
Lunenburg Foundry & Engineering Ltd.
1.5.9.12.13.19.22.
Marine Industries Ltd.
2.16.19.
Progressive Engineering Works Ltd.
3.
Russel Brothers Ltd.
1.5.9.12.13.14.19.22.
Saint John Shipbuilding & Dry Dock
1.5.7.8.9.11.12.13.14.19.22.
Saskatchewan Steel Fabricators Ltd.
5.9.13.19.22.
Uniroyal (1966) Ltd.
4.6.
Victoria Machinery Depot Co. Ltd.
1.5.9.11.12.13.14.19.22.
Westeel-Rosco Ltd.
7.8.9.11.
Yarrows Ltd.
1.5.7.8.9.11.12.13.14.15.19.22.

2050 BUOYS

1. **Buoys, steel.**
2. **Deepwater moored buoy.**
3. **Plastic.**

Bristol Aerospace Ltd.
3.
Burrard Dry Dock Co. Ltd.
1.
Canadian General Electric (Plastics)
3.
Canadian Vickers Ltd.
1.
Collingwood Shipyards
1.
Geo. T. Davie & Sons Ltd.
1.

Davie Shipbuilding Ltd.
1.

Dominion Bridge Co. Ltd.
1.

E.M.I. — Cossor Electronics Ltd.
2.

Halifax Shipyards
1.

Hawker Siddeley Canada (Trans. Equip.)
1.

James Howden & Parsons of Canada
1.

Kingston Shipyards
1.2.3.

Lunenburg Foundry & Engineering Ltd.
1.

Marine Industries Ltd.
1.

Northwest Industries Ltd.
1.

Russel Brothers Ltd.
1.

Saint John Shipbuilding & Dry Dock
1.

Uniroyal (1966) 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.
5. Ladders, metal.
6. Ladders, wood.
7. Seats, fabric.

Abercorn Aero Ltd.
4.

Aerometal Products and Design Ltd.
5.

Burrard Dry Dock Co. Ltd.
1.2.3.

Canadian Vickers Ltd.
1.2.5.

Collingwood Shipyards
5.

Geo. T. Davie & Sons Ltd.
1.5.

Enamel & Heating Products Ltd.
1.

Flight Line Quality Products Ltd.
7.

Fleetwood Metal Industries Ltd.
1.

Halifax Shipyards
1.2.3.

Hassan Steel Fabricators Ltd.
1.

Industrial Machining Ltd.
1.2.

Pedlar People Ltd.
1.

Saint John Shipbuilding & Dry Dock
1.2.3.5.6.

Victoria Machinery Depot Co. Ltd.
1.2.5.

Westeel-Rosco Ltd.
1.

Yarrows Ltd.
1.2.

GROUP 22

RAILWAY EQUIPMENT

2210 LOCOMOTIVES

1. Diesel.
2. Electric.
3. Steam.

Canadian General Electric (Apparatus)
2.

Fairbanks-Morse (Canada) Ltd.
1.

Montreal Locomotive Works Ltd.
1.2.3.

2220 RAIL CARS

Beloit Sorel Ltd.
Davie Shipbuilding Ltd.
Dominion Steel & Coal Corp. Ltd.
Fairbanks-Morse (Canada) Ltd.
Hawker Siddeley Canada (Trans. Equip.)
Joy Mfg. Co. (Canada) Ltd.
Marine Industries Ltd.
National Steel Car Corp. Ltd.

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

1. Chisels, R/R track.
2. Jacks, track.
3. Mauls, R/R spike.
4. Rail bolters.
5. Rail drillers.
6. Rail lubricators.
7. Tie tampers.
8. Track liners.
9. Spike pullers.

Canada Iron Foundries (Tamper Div.)
2.4.5.6.7.8.9.

ETF Tools Ltd.
1.3.

Hawker Siddeley Canada (Trans. Equip.)
2.4.5.6.7.8.9.

Joy Mfg. Co. (Canada) Ltd.
7.

National Steel Car Corp. Ltd.
2.4.5.6.7.8.9.

2240 LOCOMOTIVE AND RAIL CAR ACCESSORIES AND COMPONENTS

1. Axles, railway car.
2. Car seats and chairs.
3. Doors, sliding.
4. Plastic seats.
5. Lubricators, freight car journal.
6. Rail car components.
7. Seat adjustors.
8. Wheels, railway car.
9. Windows, escape.
10. Windows, fixed.
11. Windows, opening.

Beclawat (Canada) Ltd.
3.7.9.10.11.

Canada Iron Foundries (Foundry Div.)
8.

Canadian Flight Equipment Co.
2.

Canadian Steel Wheel Ltd.
8.

Hawker Siddeley Canada (Trans. Equip.)
1.5.6.

National Steel Car Corp. Ltd.
2.6.8.

Polyfiber Ltd.
4.

2250 TRACK MATERIALS, RAILROAD

1. Plates, tie, standard rail.
2. Rails, standard, heavy.
3. Tie renewers.

Canada Iron Foundries (Tamper Div.)
3.

Dominion Steel & Coal Corp. Ltd.
1.2.

Hawker Siddeley Canada (Trans. Equip.)
1.2.

The Steel Co. of Canada Ltd.
1.2.

GROUP 23

MOTOR VEHICLES, TRAILERS, AND CYCLES

2310 PASSENGER MOTOR VEHICLES

1. Buses, school.

Van Wilson Ltd.
1.2.

2. Buses, inter-city.

Western Flyer Coach Ltd.
1.2.

2320 TRUCKS AND TRUCK TRACTORS

1. Carriers, full track.
2. Muskeg and arctic tractors.
3. Refuellers.
4. Refuse collectors.
5. Snowscooters, high speed.

Bombardier Snowmobile Ltd.
1.2.5.6.

Canadair Ltd.
1.2.

Hayes Mfg. Co. Ltd.
7.8.10.

Kaiser Jeep of Canada Ltd.
9.

Montreal Locomotive Works Ltd.
1.

6. Tractors, snow clearance.
7. Trucks, crane carrying.
8. Trucks, on and off highway.
9. Vehicle, jeep.
10. Water tankers.

National Steel Car Corp. Ltd.
1.

Orenda (Hawker Siddeley)
1.

Robin-Nodwell Mfg. Ltd.
1.2.

Westeel-Rosco Ltd.
3.10.

Phil Wood Industries
4.

2330 TRAILERS

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

ATCO Industries Ltd.
8.13.18.20.25.26.

Bombardier Snowmobile Ltd.
18.22.

Brantford Trailer & Body Ltd.
1.4.9.11.19.25.

Canadian Car (Fort William)
9.19.25.

Hall Machinery Ltd.
9.

Hayes Mfg. Co. Ltd.
11.25.

James Howden & Parsons of Canada
18.

Matthew Moody Division
26.

14. Trailers, pole to 80 ft.
15. Trailers, radar, 4 wheel.
16. Trailers, refrigerated.
17. Trailers, refueller.
18. Trailers, special design.
19. Trailers, stake.
20. Trailers, tank.
21. Trailers, tank recovery.
22. Trailers, treaded, arctic.
23. Trailers, treaded, mobile camp.
24. Trailers, trombone to 60 ft.
25. Trailers, van.
26. Trailers, warehouse.

National Steel Car Corp. Ltd.
18.

W. H. Olsen Mfg. Co. Ltd.
18.20.

Robin-Nodwell Mfg. Ltd.
22.23.

Truck Engineering Ltd.
2.3.4.5.6.7.9.10.11.12.
14.15.16.17.18.20.21.24.

Westeel-Rosco Ltd.
2.5.16.18.20.23.

Phil Wood Industries Ltd.
1.2.11.19.

GROUP 24

TRACTORS

2410 TRACTORS, FULL TRACK, LOW SPEED

1. Tractors, muskeg and arctic.

Bombardier Snowmobile Ltd.
Canadair Ltd.
Go-Tract Ltd.
Robin-Nodwell Mfg. Ltd.

2430 TRACTORS, TRACK LAYING, HIGH SPEED

1. Snowmobiles.

Bombardier Snowmobile Ltd.
1.2.
Canadair Ltd.
1.2.

2. Tractors, muskeg and arctic.

Go-Tract Ltd.
2.
Robin-Nodwell Mfg. Ltd.
2.

GROUP 25

VEHICULAR EQUIPMENT COMPONENTS

2510 VEHICULAR CAB, BODY, AND FRAME STRUCTURAL COMPONENTS

1. **Bodies, refuse collection.**
2. **Bumpers.**
3. **Cowl assemblies.**
4. **Door hinges.**
5. **Doors, sliding.**
6. **Dump bodies.**
7. **Fenders, truck.**
8. **Grills & screens, protective.**
9. **"Jeep" parts.**
10. **Plastic body components.**
11. **Seat adjusters.**
12. **Spring hangers.**
13. **Stabilizer bars.**
14. **Stake bodies.**
15. **Struts.**
16. **Tail gates.**
17. **Torsion bars.**
18. **Trailers, special design.**
19. **Van bodies.**
20. **Vehicle frames.**
21. **Vehicular components.**
22. **Windows, blast resistant.**
23. **Windows, escape.**
24. **Windows, fixed.**
25. **Windows, opening.**
26. **Windshields, adjustable.**
27. **Wooden body racks.**

ATCO Industries Ltd.
3.19.

Auto Specialties Mfg. Co.
4.12.20.

Beclawat (Canada) Ltd.
5.11.22.23.24.25.26.

Brantford Trailer & Body Ltd.
1.3.6.14.16.18.19.20.27.

Canadian Car (Fort William)
14.18.19.

Canadian General Electric (Plastics)
10.

Eastern Steel Products Co.
6.

Hassan Steel Fabricators Ltd.
2.7.13.15.16.17.

James Howden & Parsons of Canada
12.18.

Johnson Wire Products Ltd.
8.

Kaiser Jeep of Canada Ltd.
9.

W. H. Olsen Mfg. Co. Ltd.
6.14.19.

Ontario Steel Products Co.
2.10.17.

Polyfiber Ltd.
10.

Robin-Nodwell Mfg. Ltd.
19.

Russel Brothers Ltd.
20.21.

R. J. Stampings Co. Ltd.
3.7.

Universal Die & Tool Mfg. Ltd.
4.

Van-Wilson Ltd.
19.

Westeel-Rosco Ltd.
6.18.

Wilson Motor Bodies Ltd.
14.19.

Phil Wood Industries Ltd.
13.14.16.

2520 VEHICULAR POWER TRANSMISSION COMPONENTS

1. **Axles, front and rear driven.**
2. **Axles, trailing.**
3. **Clutches.**
4. **Differentials.**
5. **Filters.**
6. **Forks, clutch.**
7. **"Jeep" parts.**
8. **Motors, hydraulic.**
9. **Power take-offs.**
10. **Shafts.**
11. **Transmissions.**
12. **Transmissions, hydraulic.**
13. **Universal joints.**

Aro of Canada Ltd.
5.

Auto Specialties Mfg. Co.
6.

S. F. Bowser Co. Ltd.
5.

Canadian Acme Screw & Gear Ltd.
4.10.11.13.

Dowty Equipment Ltd.
8.12.

Gearmatic Co. Ltd.
8.12.

2520 VEHICULAR POWER TRANSMISSION COMPONENTS *(conc.)*

Hayes Steel Products Ltd.
1.3.9.10.11.13.
Kaiser Jeep of Canada Ltd.
7.
Rex Chain Belt (Canada) Ltd.
13.
TAMCO Ltd.
10.
Truck Engineering Ltd.
2.

2530 VEHICULAR BRAKE, STEERING, AXLE, WHEEL AND TRACK COMPONENTS

1. Automobile hub caps.
2. Axle components.
3. Brake components.
4. Brake shoes.
5. Brake spiders.
6. "Jeep" parts.
7. Liners, brake and gear shift.
8. Pressure tanks.
9. Sprocket rims.
10. Steering components.
11. Steering housings.
12. Tank treads, rubber.
13. Tire, bogie wheel.
14. Tracklayers—traction assist device.
15. Tractor pads, steel.
16. Wheels, rubber covered.
17. Wheels, trailer, pneumatic.
18. Wheels, wagon pneumatic.
19. Wheels, wheelbarrow, pneumatic.

Auto Specialties Mfg. Co.
1.4.5.7.11.
Canada Iron Foundries (Foundry Div.)
4.
Firestone Tire & Rubber Canada Ltd.
12.13.16.
Goodyear Tire & Rubber Canada Ltd.
13.
Ingersoll Machine & Tool Co. Ltd.
2.3.4.10.
Irving Industries
9.15.
Kaiser Jeep of Canada Ltd.
6.
Otaco Ltd.
1.14.17.18.19.
Robin-Nodwell Mfg. Ltd.
14.
TAMCO Ltd.
10.
Thompson Products Ltd.
10.
Uniroyal (1966) Ltd.
12.16.
Phil Wood Industries Ltd.
8.

2540 VEHICULAR FURNITURE AND ACCESSORIES

1. Directional signal kits.
2. Heaters, vehicle, interior.
3. "Jeep" parts.
4. Plastic components.
5. Shock absorbers.

Armstrong Beverley Engineering Ltd.
5.
Canadian General Electric (Plastics)
4.
James B. Carter Ltd.
2.
Kaiser Jeep of Canada Ltd.
3.
Polyfiber Ltd.
4.
Tridon Mfg. Ltd.
1.

2590 MISCELLANEOUS VEHICULAR COMPONENTS

1. Cable assemblies, electric.
2. Hoist units, vehicular body hydraulic.
3. Ladders, vehicle mounted.
4. Rubber tractor treads.
5. Winches, vehicle.

Abex Industries Ltd.
1.
Brantford Trailer & Body Ltd.
2.
Canadian Acme Screw & Gear Ltd.
5.
Canadian Ohio Brass Co. Ltd.
3.
Firestone Tire & Rubber Canada Ltd.
4.
Gearmatic Co. Ltd.
5.
Uniroyal (1966) Ltd.
4.

GROUP 26

TIRES AND TUBES

2610 TIRES AND TUBES, PNEUMATIC, EXCEPT AIRCRAFT

1. Tires.

Dunlop Canada Ltd.
Firestone Tire & Rubber Canada Ltd.
B. F. Goodrich Canada Ltd.

2. Tubes.

Goodyear Tire & Rubber Canada Ltd.
Uniroyal (1966) Ltd.

2620 TIRES AND TUBES, PNEUMATIC, AIRCRAFT

1. Tires.

Firestone Tire & Rubber Canada Ltd.
B. F. Goodrich Canada Ltd.

2. Tubes.

Goodyear Tire & Rubber Canada Ltd.
Uniroyal (1966) Ltd.

2630 TIRES, SOLID AND CUSHION

1. Rubber tractor treads.

Firestone Tire & Rubber Canada Ltd.
B. F. Goodrich Canada Ltd.

2. Tires, solid and pneumatic non-aircraft.

Goodyear Tire & Rubber Canada Ltd.
Uniroyal (1966) Ltd.

2640 TIRE REBUILDING AND TIRE AND TUBE REPAIR MATERIALS

Dunlop Canada Ltd.
Firestone Tire and Rubber Canada Ltd.
B. F. Goodrich Canada Ltd.
Goodyear Tire & Rubber Canada Ltd.
Uniroyal (1966) Ltd.

GROUP 28

ENGINES, TURBINES, AND COMPONENTS

2805 GASOLINE RECIPROCATING ENGINES, EXCEPT AIRCRAFT, AND COMPONENTS

1. Engines, diesel, marine, air cooled.
2. Engines, diesel, marine, liquid cooled.
3. Engines, light, 2 stroke.
4. Gaskets & packing.
5. Gasoline engines, & components.
6. Rods, connecting.
7. Valve components.
8. Valves & valve inserts.

Deloro Stellite
7.8.

Deutz Diesel (Canada) Ltd.
1.2.

Firestone Tire & Rubber Canada Ltd.
4.

Hassan Steel Fabricators Ltd.
4.

Lunenburg Foundry & Engineering Ltd.
1.

Power Machinery (Bristol Aero-Industries)
1.

Russel-Hipwell Engines Ltd.
3.5.

Thompson Products Ltd.
6.8.

Uniroyal (1966) Ltd.
4.

Victor Mfg. & Gasket Co. Ltd.
4.

2810 GASOLINE RECIPROCATING ENGINES, AIRCRAFT: AND COMPONENTS

1. Gaskets & packing.
2. Pistons, valves etc.
3. Spares for R985, R1340, R1830, R2000, R2800 & R4360 Engines.

Hassan Steel Fabricators Ltd.
1.

United Aircraft of Canada Ltd.
1.2.3.

2815 DIESEL ENGINES AND COMPONENTS

1. Diesel engines, and components.
2. Gaskets and packings.
3. Valve components.
4. Valves and valve inserts.

Canadian Car (Pacific) Ltd.
1.

Canadian Vickers Ltd.
1.

Deloro Stellite
3.4.

Fairbanks-Morse (Canada) Ltd.
1.

Hassan Steel Fabricators Ltd.
2.

Montreal Locomotive Works Ltd.
1.

Russel-Hipwell Engines Ltd.
1.

Victor Mfg. & Gasket Co. Ltd.
2.

2820 STEAM ENGINES, RECIPROCATING: AND COMPONENTS

1. Engines, steam, marine.
2. Engines, steam, stationary.

Babcock-Wilcox & Goldie-McCulloch
1.2.

Canadian Vickers Ltd.
1.

James Howden & Parsons of Canada
1.2.

Montreal Locomotive Works Ltd.
1.2.

Peacock Brothers Ltd.
1.

Progressive Engineering Works Ltd.
1.

2825 STEAM TURBINES AND COMPONENTS

1. Pumps, turbine steam.
2. Turbines, auxiliary.
3. Turbines, auxiliary generator.
4. Turbines, blower.
5. Turbines, compressor.
6. Turbines, electric generator.
7. Turbines, electric, propulsion.
8. Turbines, fan.

9. Turbines, geared, propulsion.
10. Turbines, hydraulic.
11. Turbines, marine.
12. Turbines, marine auxiliary.
13. Turbines, marine, electric propulsion.
14. Turbines, marine, geared propulsion.
15. Turbines, mechanical.
16. Turbines, propulsion.

Babcock-Wilcox & Goldie-McCulloch
17.
Beloit Sorel Ltd.
10.
Canadian General Electric (Apparatus)
Canadian Vickers Ltd.
11.
Canadian Westinghouse (Apparatus)
3.6.7.9.11.12.13.14.16.18.19.20.21.22.

17. Turbines, steam.
18. Turbines, steam, electrical generating.
19. Turbines, steam, electrical propulsion.
20. Turbines, steam geared.
21. Turbines, steam, non-condensing.
22. Turbines, steam, power units.

Dominion Engineering Works Ltd.
10.18.
Fairbanks-Morse (Canada) Ltd.
1.
James Howden & Parsons of Canada
2.4.5.8.15.17.

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 Ltd.
1.5.
Canadian Westinghouse (Apparatus)
8.
Deloro Stellite
2.3.7.9.
Dowty Equipment Ltd.
6.
Orenda (Hawker Siddeley)
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.
TAMCO Ltd.
6.
United Aircraft of Canada Ltd.
4.
Walbar Machine Products of Canada Ltd.
2.3.5.8.

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.
3.
Bristol Aerospace Ltd.
1.3.5.6.
Orenda (Hawker Siddeley)
1.2.3.7.9.11.
Renfrew Aircraft & Engineering Ltd.
3.6.

7. Gas turbines.
8. Insulation blankets and heatshields.
9. Jet engines.
10. Seals, turbine.
11. Vanes, compressor.

Rolls-Royce of Canada Ltd.
3.7.9.
H. I. Thompson Co. of Canada Ltd.
8.
United Aircraft of Canada Ltd.
3.7.9.
Walbar Machine Products of Canada Ltd.
2.3.4.6.7.10.11.

2895 MISCELLANEOUS ENGINES AND COMPONENTS

1. Engines, marine, diesel and gas.

Dowty Equipment Ltd.
2.
Russel-Hipwell Engines Ltd.
1.

2. Hydro-jet devices.

TAMCO Ltd.
2.

GROUP 29

ENGINE ACCESSORIES

2910 ENGINES FUEL SYSTEM COMPONENTS, NON-AIRCRAFT

1. Filters, air.
2. Filters, air, micronic.
3. Filters, fuel.
4. Filters, hydraulic fluid.
5. Filters, metal.
6. Fuel filter assemblies.
7. Pumps, fuel.
8. Tanks, rubber, fuel.
9. Valves and pistons.

Abex Industries of Canada Ltd.
7.9.

Aircraft Appliances & Equipment
3.5.6.7.

S. F. Bowser Co. Ltd.
3.

Canadian Acme Screw & Gear Ltd.
7.

Deloro Stellite
9.

Firestone Tire & Rubber Co. Canada Ltd.
8.

Kralinator Filters Ltd.
3.5.6.

Peacock Brothers Ltd.
3.5.

PurOlator Products (Canada) Ltd.
2.3.6.

Thompson Products Ltd.
9.

Uniroyal (1966) Ltd.
8.

Wix Corporation Ltd.
1.3.4.6.

York Gears Ltd.
9.

2915 ENGINE FUEL SYSTEM COMPONENTS, AIRCRAFT

1. Actuators. elec-mech.
2. Filters, fuel.
3. Fuel line assemblies.
4. Hose assemblies.
5. Pumps, fuel.
6. Valves, fuel pump.

Abex Industries of Canada Ltd.
1.5.

Aircraft Appliances & Equipment
2.5.

Aviation Electric Ltd.
5.6.

Dowty Equipment of Canada Ltd.
5.

W. R. Elliott Ltd.
1.

Field Aviation Co. Ltd.
3.

Weatherhead Co. of Canada Ltd.
4.

2925 ENGINES ELECTRICAL SYSTEM COMPONENTS, AIRCRAFT

1. Cable assemblies, aircraft, engine.
2. Coils.
3. Magnetos.
4. Regulators.
5. Solenoids, high temperature.
6. Starters.

Abex Industries Ltd.
1.5.

Aircraft Appliances & Equipment
4.6.

Aviation Electric Ltd.
1.2.3.4.6.

Canadian Car (Fort William)
1.

Central Dynamics Ltd.
1.

Fairey Canada Ltd.
1.

Northwest Industries Ltd.
1.

2930 ENGINE COOLING SYSTEM COMPONENTS, NON-AIRCRAFT

1. Hose lines, armoured.
2. Hose lines, rubber.
3. Radiator cores.
4. Valves, temperature regulating, 2 and 3 way.

Canadian Valve (Singer Valve)
4.

Heatex Ltd.
3.

Uniroyal (1966) Ltd.
2.

Weatherhead Co. of Canada Ltd.
1.2.

2935 ENGINE COOLING SYSTEM COMPONENTS, AIRCRAFT

1. Filters, fluid pressure.
2. Hose lines, armoured.
3. Hose lines, rubber.
4. Radiators.

Aircraft Appliances & Equipment
1.

Heatex Ltd.
4.

Rollit Products Ltd.
3.

Uniroyal (1966) Ltd.
3.

Weatherhead Co. of Canada Ltd.
2.3.

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

1. Filters, air and oil.
2. Filters, fluid, pressure.
3. Filters, metal.
4. Strainers, oil engine.

Aircraft Appliances & Equipment
1.2.3.4.

S. F. Bowser Co. Ltd.
1.2.4.

Canadian Filters Ltd.
3.

Kralinator Filters Ltd.
1.2.3.

Peacock Brothers Ltd.
1.2.3.

PurOlator Products (Canada) Ltd.
1.

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

Aircraft Appliances & Equipment

Fairey Canada Ltd.

2990 MISCELLANEOUS ENGINE ACCESSORIES, NON-AIRCRAFT

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

Canadian Acme Screw & Gear Ltd.
4.

James B. Carter Ltd.
1.2.3.

2995 MISCELLANEOUS ENGINE ACCESSORIES, AIRCRAFT

1. Accumulators, hydraulic.
2. Pumps, hydraulic.
3. Starters, engine, turbine.
4. Valves, hydraulic.

Abex Industries of Canada Ltd.
2.4.

Aircraft Appliances & Equipment
3.

Aviation Electric Ltd.
2.

Dowty Equipment of Canada Ltd.
2.4.

Orenda (Hawker Siddeley)
1.3.

United Aircraft of Canada Ltd.
3.

York Gears Ltd.
2.4.

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.
9. Reducers, worm gear.
10. Speed increasers.
11. Speed reducers.
12. Torque converters.
13. Transmissions.
14. Transmissions, multiapplication.
15. Transmissions, split torque.
16. Universal joints.

Aviation Electric Ltd.
1.6.7.8.11.13.

Black Clawson-Kennedy Ltd.
4.10.11.

Canadian Acme Screw & Gear Ltd.
2.4.6.7.11.13.14.16.

Canadian Allis-Chalmers Ltd.
2.4.5.

Dominion Engineering Works Ltd.
2.4.5.6.7.10.11.

Dominion Road Machinery Co. Ltd.
15.

Dowty Equipment of Canada Ltd.
1.8.12.13.14.

Alexander Fleck Ltd.
2.4.5.

Forano Ltd.
2.4.6.7.8.9.10.11.

Gearmatic Co. Ltd.
3.

Hamilton Gear & Machine Co.
5.7.10.11.12.

Hayes Steel Products Ltd.
8.16.

Joly Engineering Ltd.
6.

Progressive Engineering Works Ltd.
5.7.

Ranar Industries Ltd.
6.

Reliance Electric & Engineering
1.8.11.13.

Rex Chainbelt (Canada) Ltd.
2.4.5.8.11.

York Gears Ltd.
6.7.10.11.13.14.

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.

Aerometal Products & Design Ltd.
20.

Beloit Sorel Ltd.
8.

Black Clawson-Kennedy Ltd.
14.17.

CAE Sumner Ltd.
8.17.

Canadian Acme Screw & Gear Ltd.
9.12.18.21.

Canadian Allis-Chalmers Ltd.
17.20.

Canadian General Electric (Meter and Inst.)
9.10.12.

Canadian Steel Wheel Ltd.
5.

Canus Precision Industries Ltd.
10.

Dominion Bridge Co. Ltd.
20.

Dominion Engineering Works Ltd.
4.7.8.9.10.14.18.

Forano Ltd.
1.2.3.6.7.8.9.12.14.15.
16.17.18.19.20.21.22.

Hamilton Gear Machine Co.
4.7.13.14.21.

Joly Engineering Ltd.
9.11.12.

Leigh Instruments Ltd.
10.12.

Marsland Engineering Ltd.
4.10.11.12.14.

Progressive Engineering Works Ltd.
1.9.17.20.21.

Ranar Industries Ltd.
11.

Rex Chainbelt (Canada) Ltd.
1.17.21.

SIDO Ltd.
12.

Standard-Modern Tool Co. Ltd.
9.

Williams Machines Ltd.
4.8.14.21.

York Gears Ltd.
4.7.8.9.10.11.13.14.18.

3030 BELTING, DRIVE BELTS, FAN BELTS, AND ACCESSORIES

1. Belts, all types.
2. Belts, conveyor.
3. Belts, fan.
4. Belting, transmission.
5. V-Belts.

Canadian Allis-Chalmers Ltd.
4.5.

Dunlop Canada Ltd.
1.2.3.

Forano Ltd.
5.

B. F. Goodrich Canada Ltd.
1.2.3.4.5.

Goodyear Tire & Rubber Canada Ltd.
2.5.

Uniroyal (1966) Ltd.
1.2.3.4.

3040 MISCELLANEOUS POWER TRANSMISSION EQUIPMENT

Forano Ltd.

Rex Chainbelt (Canada) Ltd.

GROUP 31

BEARINGS

3110 BEARINGS, ANTIFRICTION, UNMOUNTED

Forano Ltd.
Rex Chainbelt (Canada) Ltd.
Rollit Products.

3120 BEARINGS, PLAIN, UNMOUNTED

1. Bearings.
2. Bearings, blanks and sleeve.
3. Bearings, nylon.
4. Bearings, plain, flanged.
5. Bearings, plain self aligning.
6. Bearings, plain and unmounted.
7. Bearings, roller.
8. Bearings, sleeve.
9. Bearings, split.
10. Bearings, thrust washer type.
11. Bushings.
12. Bushings, bronze.

Automatic Plastic Co.
3.

Canada Metal Co. Ltd.
4.6.9.12.

Canadian Bronze Co. Ltd.
6.11.

Clevite Ltd.
9.

Alexander Fleck Ltd.
2.4.6.8.11.12.

Forano Ltd.
1.2.4.5.6.8.9.11.

Harrington Tool & Die Co. Ltd.
11.

Progressive Engineering Works Ltd.
2.6.9.

Rollit Products Ltd.
2.4.6.7.8.9.10.12.

St. Maurice Foundries Ltd.
12.

Union Screen Plate Co. Ltd.
2.4.10.

3130 BEARINGS, MOUNTED

1. Bearings, antifriction, mounted.
2. Bearing pillow blocks.
3. Bearings, roller.

Black Clawson-Kennedy Ltd.
1.

Fischer Bearings Mfg. Ltd.
1.

Forano Ltd.
1.2.

Progressive Engineering Works Ltd.
2.

Rex Chainbelt (Canada) Ltd.
2.3.

GROUP 32

WOODWORKING MACHINERY AND EQUIPMENT

3210 SAWMILL AND PLANING MILL MACHINERY

1. **Auto feeders.**
2. **Band saws and resaws.**
3. **Barking drums.**
4. **Burners for shavings, sawdust, slabs.**
5. **Cant cranes.**
6. **Chippers, chip screens and chip handling equipment.**
7. **Circular saw frames.**
8. **Conveyors, transfer, chain and belt.**
9. **Edgers.**
10. **Friction feeds.**
11. **Log carriage equipment.**
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.**
22. **Woodworking machinery.**

CAE Sumner Ltd.
2.4.6.7.9.10.11.13.15.18.19.20.

Jos. Cote Inc.
18.22.

Forano Ltd.
2.4.6.7.9.10.11.13.14.15.16.19.20.

Horton Steel Works Ltd.
3.17.

Progressive Engineering Works Ltd.
1.5.8.9.12.13.14.20.21.

Yarrows Ltd.

3220 WOODWORKING MACHINES

1. **Dowel machines.**
2. **Jointers.**
3. **Planers, surface.**
4. **Saws, band.**
5. **Saws, circular.**
6. **Shapers.**
7. **Tenoners.**

Jos. Poitras & Fils Ltd.
1.2.3.4.5.6.7.

3230 TOOLS, ATTACHMENTS FOR WOODWORKING MACHINERY

1. **Knives, woodworking.**

Jos. Poitras & Fils Ltd.
1.

GROUP 34

METALWORKING MACHINERY

3411 BORING MACHINES

Bertram Machine & Tool Co.

3413 DRILLING MACHINES

Aro of Canada Ltd.
Bertram Machine & Tool Co.
Standard-Modern Tool Co. Ltd.

3415 GRINDING MACHINES

1. Grinders, belt, versa.
2. Grinders, carbide bit.
3. Machines, grinding, drill rod.
4. Stones, abrasive.
5. Stones, diamond, mounted.

Boyles Bros. Drilling Co. Ltd.
4.5.

The Craig Bit Co. Ltd.
2.3.

Ex-Cell-O Corp. (Canada) Ltd.
1.

Hard Metals (Canada) Ltd.
2.

3416 LATHES

1. Lathes, bench.
2. Lathes, engine.
3. Lathes, gap.
4. Lathes, geared head.
5. Lathes, profiling.
6. Lathes, spindle, hollow.

Bertram Machine & Tool Co.
2.3.4.5.6.

Standard-Modern Tool Co. Ltd.
1.2.4.5.

3417 MILLING MACHINES

1. Milling machines, turret, ram.

Ex-Cell-O Corp. (Canada) Ltd.

3418 PLANERS AND SHAPERS

1. Planers, double housing.
2. Planers, open side.
3. Shapers.

Bertram Machine & Tool Co.
1.2.3.

3419 MISCELLANEOUS MACHINE TOOLS

1. Lathes, special purpose.
2. Special purpose custom machines.
3. Tapping machines, hydraulic.

Bertram Machine & Tool Co.
1.2.

Brenco Machine & Tool Co. Ltd.
2.

Cochrane Tool & Design Ltd.
2.

Ex-Cell-O Corp. (Canada) Ltd.
3.

Alexander Fleck Ltd.
2.

Harrington Tool & Die Co. Ltd.
1.2.

Standard-Modern Tool Co. Ltd.
2.

Williams Machines Ltd.
2.

3422 ROLLING MILLS AND DRAWING MACHINES

Beloit Sorel Ltd.
Dominion Engineering Works Ltd.

3424 METAL HEAT TREATING EQUIPMENT

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

Wayne Forge Ltd.
1.2.3.4.5.6.7.8.

3426 METAL FINISHING EQUIPMENT

1. **Anodes, graphite, electrolytic processes.**
2. **Baskets, degreasing.**
3. **Baskets, dip.**
4. **Cathodes, carbon and graphite, electrolytic processes.**
5. **Tanks, degreasing.**
6. **Tanks, dip.**
7. **Tanks, immersion, heated.**
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.**
2. **Automatic.**
3. **Plasma surfacing, cutting equipment.**
4. **Welding machines, pressure, special.**
5. **Welding machines, semi-automatic arc.**
6. **Welding sets, inert gas, shielded.**

Brantford Tool Ltd.
1.

Canadian Liquid Air
1.6.

F-H Welding Machines Ltd.
2.

L. Krushel & Sons
1.

Lincoln Electric Co.
1.

Marquette Equipment Canada Ltd.
1.

Miller Welders Canada Ltd.
1.

Powertronic Equip. Ltd.
1.

Smith-Roles 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.**

F-H Welding Machines Ltd.

Precision Welder & Flexopress

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

Union Carbide (Canada) Ltd.
1.2.3.4.5.6.

3439 MISCELLANEOUS WELDING, SOLDERING, AND BRAZING SUPPLIES AND ACCESSORIES

1. **Cable, arc welding.**
2. **Conductance soldering units.**
3. **Electrodes.**
4. **Electrodes, tungsten.**
5. **Electrode welding equipment, consumable.**

3439 MISCELLANEOUS WELDING, SOLDERING, AND BRAZING SUPPLIES AND ACCESSORIES *(conc.)*

6. Fluxes.
7. Holders, clamps, connectors, electrodes.
8. Hose, welding and cutting.
9. Nozzles, cutting and scarfing and lancing.
10. Power for cutting, scarfing and lancing.
11. Power-cutting, scarfing and lancing equipment.
12. Powder dispensers.
13. Rods.
14. Solder.
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 and LP gas.
21. Torches, welding, inert gas shielded.
22. Welding compositions and fluxes.
23. Wire and rods, welding.

Canada Metal Co. Ltd.
6.14.

Canadian Liquid Air
2.3.6.13.14.15.

Deloro Stellite
3.13.23.

Handy & Harman of Canada Ltd.
6.15.

Johnson Matthey & Mallory Ltd.
15.

The Steel Co. of Canada Ltd.
3.13.

Union Carbide Canada Ltd.
1.3.4.5.6.7.8.9.10.11.12.13.16.17.
18.19.20.21.22.23.

3441 BENDING AND FORMING MACHINES

1. Plate bending rolls.

Bertram Machine & Tool Co.
Forano Ltd.

3442 HYDRAULIC AND PNEUMATIC PRESSES, POWER DRIVEN

1. Presses.
2. Presses, extrusion.
3. Presses, hydraulic.
4. Presses, metal forming and extrusion.

Armstrong Beverley Eng. Ltd.
3.

Bertram Machine & Tool Co.
1.3.

Burrard Dry Dock Co. Ltd.
3.

Canadian Car (Pacific) Ltd.
3.

Davie Shipbuilding Ltd.
1.2.

Dominion Engineering Works Ltd.
1.3.4.

Progressive Engineering Works Ltd.
4.

3443 MECHANICAL PRESSES, POWER DRIVEN

Bertram Machine & Tool Co.

Dominion Engineering Works Ltd.

3444 MANUAL PRESSES

Dominion Engineering Works Ltd.

3445 PUNCHING AND SHEARING MACHINES

1. Plate shears, hydraulic.
2. Plate shears, mechanical.
3. Punching machines.

Bertram Machine & Tool Co.

3448 RIVETING MACHINES

1. Machines, riveting for shoes.

St. Lawrence Mfg. Co. Inc.
1.

3449 MISCELLANEOUS SECONDARY METAL FORMING AND CUTTING MACHINES

1. Shrink-fitting equipment.

Union Carbide Canada Ltd.

3455 CUTTING TOOLS FOR MACHINE TOOLS

1. Blades, bandsaw, metal cutting.
2. Broachers.
3. Burrs, tungsten carbide.
4. Cutters, fly.
5. Cutters, gear.
6. Cutters mill, multitypes.
7. Cutting tools, high speed.
8. Reamer sets.
9. Tools, cutting, tungsten carbide.

Canadian General Electric (Carboloy)
3.9.

Canadian Tap & Die Co. Ltd.
6.

Citco
1.2.4.5.6.7.8.

Colonial Tool Co.
1.2.4.5.6.7.8.

Deloro Stellite
7.

3456 CUTTING AND FORMING TOOLS FOR SECONDARY METAL-WORKING MACHINERY

1. Blank.
2. Dies.
3. Dies, carbide, laminated.
4. Dies, draw.
5. Dies, fitters.
6. Dies, progressive.
7. Dies, punching.
8. Dies, specialties.
9. Dies, stamping.
10. Dies, tungsten carbide.
11. Forming.
12. Piercing.

Bertram Machine & Tool Co.
7.

Brenco Machine & Tool Co. Ltd.
2.4.7.8.11.12.

Canadian Car (Fort William)
1.11.12.

Canadian Engineering & Tool Co. Ltd.
4.7.

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.

Ketchum Mfg. Co. Ltd.
1.2.4.5.7.8.11.12.

LaSalle Engineering Ltd.
1.2.4.5.7.8.11.12.

Master Mechanical Design & Mfg. Ltd.
9.

Metalite Co. Ltd.
4.

Nickleson Tool & Die
1.2.4.11.

Otaco Ltd.
2.

Plymouth Tool & Stamping Ltd.
3.6.8.

Portland Tool & Machine Ltd.
2.

Premier Tool & Die Ltd.
7.

R. J. Stampings Co. Ltd.
1.11.12.

Standard-Modern Tool Co. Ltd.
1.2.4.5.7.8.11.12.

Uniroyal (1966) Ltd.
1.7.11.

Victoria Engineering Co. Ltd.
1.4.11.12.

3460 MACHINE TOOL ACCESSORIES

1. Holders, tungsten carbide.
2. Inserts, drill chuck.
3. Inserts, tungsten carbide.
4. Mandrels, tungsten carbide.
5. Pilots, counterbore.
6. Pilots, countersink.
7. Tables, milling.

Canadian General Electric (Carboloy)
1.3.4.

Deloro Stellite
2.

Semtec Ltd.
5.6.

Standard-Modern Tool Co. Ltd.
7.

3465 PRODUCTION JIGS, FIXTURES AND TEMPLATES

Aero Mechanic Ltd.
Bata Engineering
Bertram Machine & Tool Co.
Brenco Machine & Tool Co. Ltd.
Bristol Aerospace Ltd.
Canadair Ltd.
Canadian Car (Fort William)
Canadian Engineering & Tool Co. Ltd.
Canadian Flight Equipment Co.
Canus Precision Industries Ltd.
Cochrane Tool & Design Ltd.
Diemakers Ltd.
Enamel & Heating Products Ltd.
Ex-Cell-O Corp. (Canada) Ltd.
Fleet Manufacturing Ltd.
Harrington Tool & Die Co. Ltd.
Heroux Machine Parts Ltd.
Master Mechanical Design & Mfg. Ltd.
Noorduyn Norseman Aircraft Ltd.
Otaco Ltd.
Plymouth Tool & Stamping Ltd.
Portland Tool & Machine Ltd.
Renfrew Aircraft & Engineering Ltd.
St. Lawrence Mfg. Co. Inc.
Semtec Ltd.
Standard-Modern Tool Co. Ltd.
Universal Die & Tool Mfg. Ltd.
Uniroyal (1966) Ltd.
Victoria Engineering Co. Ltd.
Weston Machine & Tool Ltd.
Williams Machines Ltd.

GROUP 35

SERVICE AND TRADE EQUIPMENT

3510 LAUNDRY AND DRY CLEANING EQUIPMENT

1. Garment racks and trucks.

Matthew Moody Division
1.2.

2. Trucks, laundry and dry cleaning.

3520 SHOE REPAIRING EQUIPMENT

1. Machines, riveting, for shoes.

St. Lawrence Mfg. Co. Inc.
1.

GROUP 36

SPECIAL INDUSTRY MACHINERY

3615 PULP AND PAPER INDUSTRIES MACHINERY

1. **Chipping & screening equipment.**
2. **Coverings, reinforced plastic.**
3. **Debarking machinery.**
4. **Filters & screens, wire mesh.**
5. **Lubrication systems, pulp & paper machinery.**
6. **Paper converting.**
7. **Pipe & tank linings.**
8. **Pulp & paper industry machinery.**
9. **Pulp & paper mills.**
10. **Pulpwood handling & slashing systems.**
11. **Rolls, rubber covered.**
12. **Special industrial machinery.**
13. **Tanks custom designed, non-corrosive.**

Beloit Sorel Ltd.
8.

Black Clawson-Kennedy Ltd.
8.

Burrard Dry Dock Co. Ltd.
8.9.11.12.

CAE Sumner Ltd.
6.8.

Canadian Car (Pacific) Ltd.
8.

Canadian General Electric (Plastics)
2.

Canadian Vickers Ltd.
8.12.

Davie Shipbuilding Ltd.
8.9.12.

Dominion Engineering Works Ltd.
8.12.

Ferro Metal Ltd.
13.

Alexander Fleck Ltd.
5.8.12.

Forano Ltd.
1.3.10.

Fromson Heat Transfer Ltd.
8.12.

Harrington Tool & Die Co. Ltd.
6.12.

James Howden & Parsons of Canada
8.

Johnson Wire Products Ltd.
4.

Montreal Locomotive Works Ltd.
8.12.

Northwest Industries Ltd.
7.

Progressive Engineering Works Ltd.
8.12.

Uniroyal (1966) Ltd.
2.7.11.

Victoria Machinery Depot Co. Ltd.
8.

Wayne Forge Ltd.
12.

3620 RUBBER AND PLASTIC WORKING MACHINERY

Dominion Engineering Works Ltd.

Uniroyal (1966) Ltd.

3650 CHEMICAL AND PHARMACEUTICAL PRODUCTS MANUFACTURING MACHINERY

1. **Chemical industry equipment.**
2. **Filters & screens, wire mesh.**
3. **Tanks, custom designed, non-corrosive.**

Fairbanks-Morse (Canada) Ltd.
1.

Ferro Metal Ltd.
3.

Johnson Wire Products Ltd.
2.

Wayne Forge Ltd.
1.

3655 GAS GENERATING AND DISPENSING SYSTEMS, FIXED OR MOBILE

1. **Converters, liquefied gas.**
2. **Generators, acetylene.**
3. **Plants, liquefied air, oxygen and nitrogen.**
4. **Pumps, liquefied gas.**
5. **Purification equipment, liquefied gas.**
6. **Vaporizers, liquefied gas.**

Union Carbide Canada Ltd.

3695 MISCELLANEOUS SPECIAL INDUSTRY MACHINERY

1. **Autoclaves, industrial.**
2. **Autoclaves, metal coating.**
3. **Automatic powder fillers & compressors, 30 & 50 mm shells.**
4. **Chain saws, power.**
5. **Loaders, mobile, log & lumber.**
6. **Machine, forming, sealing, loading for plastic bandoliers.**
7. **Machine, vacuum principle loading for explosive powders.**
8. **Machinery, special packaging.**
9. **Meshes & screens.**
10. **Mining industry.**
11. **Skidders, log and pulp.**
12. **Special purpose machinery.**
13. **Specialized logging equipment.**
14. **Steel mill equipment.**

Bertram Machine & Tool Co.
14.

Black Clawson-Kennedy Ltd.
13.

Burrard Dry Dock Co. Ltd.
12.13.14.

CAE Sumner Ltd.
13.

Canadian Vickers Ltd.
1.2.13.

Cochrane Tool & Design Ltd.
12.

Davie Shipbuilding Ltd.
1.

Delamere & Williams Co. Ltd.
3.6.7.

Dominion Engineering Works Ltd.
10.12.14.

Dowty Equipment Ltd.
10.14.

Ex-Cell-O Corp. (Canada) Ltd.
8.

Fairbanks-Morse (Canada) Ltd.
1.10.12.

Forano Ltd.
5.10.11.12.13.

Fromson Heat Transfer Ltd.
1.10.12.

Harrington Tool & Die Co. Ltd.
8.12.

Horton Steel Works Ltd.
8.

Johnson Wire Products Ltd.
9.

Kingston Shipyards
1.

Marine Industries Ltd.
2.

Master Mechanical Design & Mfg. Ltd.
12.

Matthew Moody Division
12.

Montreal Locomotive Works Ltd.
1.12.14.

Napanee Industries Ltd.
12.

National Steel Car Corp. Ltd.
14.

Nickleson Tool & Die
12.

Portland Tool & Machine Ltd.
12.

Power Machinery (Bristol Aero-Industries)
4.

Progressive Engineering Works Ltd.
14.

T. S. Simms & Co. Ltd. (Mach. Div.)
12.

Standard-Modern Tool Co. Ltd.
8.12.

Wayne Forge Ltd.
12.14.

Weston Machine & Tool Ltd.
12.

Yarrows Ltd.
13.

GROUP 38

CONSTRUCTION, MINING, EXCAVATING AND HIGHWAY MAINTENANCE EQUIPMENT

3805 EARTH MOVING AND EXCAVATING EQUIPMENT

1. Graders, road, motorized.

Dominion Road Machinery Co. Ltd.
1.

Galion Manufacturing of Canada Ltd.
1.

3810 CRANES AND CRANE-SHOVELS

1. Cranes, hydraulic, mobile.

Dominion Engineering Works Ltd.
Galion Manufacturing of Canada Ltd.

3815 CRANE AND CRANE-SHOVEL ATTACHMENTS

1. Buckets, concrete.
2. Buckets, drag line.
3. Rollers and sheaves.
4. Teeth, bucket.

Aerometal Products & Design Ltd.
1.

Canadian Steel Wheel Ltd.
3.

Hassan Steel Fabricators Ltd.
1.2.

Irving Industries
4.

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, drill.
6. Bits, reamer.
7. Bits, steel detacbable.
8. Bits, tungsten carbide.
9. Blocks, knock-off.
10. Breakers, paving.
11. Breakers, paving, chisel 3".
12. Breakers, paving, narrow chisel.
13. Cars, mine.
14. Chisels, digging.
15. Chisels, paving breaking.
16. Cbisels, tungsten carbide.
17. Column arms, universal.
18. Couplings, drill rod.
19. Crusber, jaws.
20. Cutters, asphalt.
21. Diamond impregnated products.
22. Drill bits, diamond.
23. Drills, feed leg.
24. Drills, rock.
25. Drill rod, rock drill.
26. Drills, sinker.
27. Drilling accessories.
28. Drilling machines.
29. Gravel plants.
30. Grouser bars.
31. Liners, iron, cbute.
32. Liners, iron, grinding.
33. Liners, iron, mill.
34. Machinery, mining.
35. Moil points, paving breaker.
36. Moils, tungsten carbide.
37. Picks, paving breaker.
38. Pulverizers.
39. Pumps, drill.
40. Rock crushers.
41. Rock washers.
42. Rods, bit.
43. Rods, chisel.
44. Rods, drill, extension.
45. Rods, tamping tool, paving breaker.
46. Saws, concrete, diamond.
47. Saws, diamond.
48. Screens, vibrating.
49. Spades, clay.
50. Spades, paving breaker.
51. Stopers.
52. Striking bars.
53. Tamping tools, paving breaker.
54. Tools, diamond dressing.
55. Tools, diamond masonry.
56. Wedges, frost.
57. Wedges, paving breaker.
58. Wheels, diamond.
59. Wrenches, pull.

Babcock-Wilcox and Goldie-McCulloch
38.

Bertram Machine & Tool Co.
34.

Boyles Bros. Drilling Co. Ltd.
21.22.27.28.39.47.54.55.58.

Brunner & Lay (Canada) Ltd.
5.15.25.35.37.45.50.53.57.

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

CAE Sumner Ltd.
40.41.48.

Canadian Allis-Chalmers Ltd.
40.48.

Canadian Vickers Ltd.
40.41.48.

Combustion Engineering-Superheater
38.

The Craig Bit Company Ltd.
3.4.6.7.8.9.11.12.14.17.18.20.24.36.42.43.
44.49.52.56.59.

Delro Industries Ltd.
22.46.

Dominion Engineering Works Ltd.
34.40.

Fairbanks-Morse (Canada) Ltd.
34.

Alexander Fleck Ltd.
38.40.48.

Forano Ltd.
5.6.7.9.29.

Gardner-Denver Co. (Canada) Ltd.
10.23.26.51.

Hall Machinery Ltd.
1.

Hard Metals (Canada) Ltd.
8.9.16.18.36.

Hawker Siddeley Canada (Trans. Equip.)
13.

Irving Industries
19.30.

Joy Mfg. Co. (Canada) Ltd.
13.24.34.40.

Syntron Canada Ltd.
34.48.

Truck Engineering Ltd.
2.

Wabi Iron Works Ltd.
13.31.32.33.34.

3825 ROAD CLEARING AND CLEANING EQUIPMENT

1. Snow blowers.
2. Snow drags.
3. Snow plows.

Eastern Steel Products Co.
3.

Forano Ltd.
1.

Phil Wood Industries Ltd.
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.
6. Spreaders, salt.
7. Spreaders, sand.
8. Tailgates, hydraulic.
9. Winches, tractor.

Brantford Trailer & Body Ltd.
5.

Eastern Steel Products Co.
1.4.6.7.

Gearmatic Co. Ltd.
9.

Hassan Steel Fabricators Ltd.
3.

Truck Engineering Ltd.
1.2.

Phil Wood Industries Ltd.
4.5.8.

3835 PETROLEUM PRODUCTION AND DISTRIBUTION EQUIPMENT

1. Anchors, pipe line.
2. Gas distribution equipment.
3. Pipeline equip. sets (landing).

Canadian Liquid Air
2.

Progressive Engineering Works Ltd.
1.3.

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

Burrard Dry Dock Co. Ltd.
6.

Davie Shipbuilding Ltd.
10.

Deloro Stellite
2.

Firestone Tire & Rubber Canada Ltd.
7.

Alexander Fleck Ltd.
4.

Forano Ltd.
1.12.

Galion Manufacturing of Canada Ltd.
13.

B. F. Goodrich Canada Ltd.
7.

Hassan Steel Fabricators Ltd.
9.

London Concrete Machinery Co.
5.

Matthew Moody Division
5.6.11.

National Steel Car Corp. Ltd.
10.

Rex Chainbelt (Canada) Ltd.
1.2.3.6.12.14.15.

Syntron (Canada) Ltd.
8.

Uniroyal (1966) Ltd.
7.

Yarrows Ltd.
6.

GROUP 39

MATERIALS HANDLING EQUIPMENT

3910 CONVEYORS

1. **Conveyors, belt.**
2. **Conveyors, carrier, vibrating.**
3. **Conveyors, chain.**
4. **Conveyors, custom built.**
5. **Conveyors, oscillating.**
6. **Conveyors, portable.**
7. **Elevators, bucket.**
8. **Screw, conveyor.**

CAE Sumner Ltd.
4.

Alexander Fleck Ltd.
1.

Forano Ltd.
1.4.6.7.8.

James Howden & Parsons of Canada
4.

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

Progressive Engineering Works Ltd.
3.

Rex Chainbelt (Canada) Ltd.
1.2.3.4.5.7.

Syntron (Canada) Ltd.
2.5.

3920 MATERIALS HANDLING EQUIPMENT, NONSELF-PROPELLED

1. **Bulk material handling equip.**
2. **Casters.**
3. **Dollies, hand.**
4. **Hampers, truck, fabric.**
5. **Sleds, cargo 10 and 20 ton.**
6. **Sleds, living facilities.**
7. **Sleds, magnesium and aluminum.**
8. **Sleds, messing facilities.**
9. **Sleds, personnel.**
10. **Toboggans, aluminum.**
11. **Toboggans, magnesium.**
12. **Trailers.**
13. **Trucks dolly, for compressed gas cylinders.**
14. **Truck, hand, 2-wheeled.**
15. **Truck, rubberlined, material handling.**
16. **Trucks, factory.**

Aerometal Products & Design Ltd.
3.14.

Clinton Products (Canada) Ltd.
2.3.14.16.

Fairey Canada Ltd.
1.

Firestone Tire & Rubber Canada Ltd.
15.

B. F. Goodrich Canada Ltd.
15.

Hassan Steel Fabricators Ltd.
12.

Magline of Canada Ltd.
7.10.11.14.16.

Matthew Moody Division
3.13.14.16.

Metalite Co. Ltd.
10.11.

Otaco Ltd.
5.6.8.9.

Syntron (Canada) Ltd.
1.

J. J. Turner Co. Ltd.
4.

Union Carbide Canada Ltd.
13.

Uniroyal (1966) Ltd.
15.

Yarrows Ltd.
1.14.16.

3930 WAREHOUSE TRUCKS AND TRACTORS, SELF-PROPELLED

Burrard Dry Dock Co. Ltd.

Eastern Steel Products Co.

3940 BLOCKS, TACKLE, RIGGING AND SLINGS

1. **Hoists.**
2. **Slings.**
3. **Slings, nylon.**
4. **Slings, synthetic rope.**
5. **Slings and wire rope assemblies.**
6. **Tackle blocks, rigging all types and sizes.**

A.I.M. Steel Ltd.
1.2.

Anthes Imperial Ltd.
2.

Canada Wire & Cable Co. Ltd.
5.
Columbus McKinnon Ltd.
3.
Davie Shipbuilding Ltd.
1.2.5.6.
Dominion Chain Co. Ltd.
2.5.
Donald Ropes & Wire Cloth Ltd.
5.
Greening Industries Ltd.
5.
Marsland Engineering Ltd.
6.
Wire Rope Industries of Canada Ltd.
2.4.5.
Wrights Canadian Ropes Ltd.
5.

3950 WINCHES, HOISTS, CRANES AND DERRICKS

1. Bridge cranes.
2. Capstans.
3. Cranes, all types.
4. Cranes, bridges, gantry etc.
5. Cranes, floating 100-300 tons.
6. Cranes, overhead, travelling.
7. Derricks.
8. Derricks, hydraulic, rotating & boom extending.
9. Derricks, pole-setting.
10. Hoists.
11. Hoists, chain.
12. Hoists, electric.
13. Hoisting units.
14. Hoists, wire rope.
15. Winches.
16. Winches, bathythermograph.
17. Winches, drum, power operated.
18. Winches, hydraulic.
19. Windlasses.

A.I.M. Steel Ltd.
1.3.6.
Armstrong Beverley Eng. Ltd.
6.
Aro of Canada Ltd.
11.
Black Clawson-Kennedy Ltd.
15.
Brantford Trailer & Body Ltd.
13.
Burrard Dry Dock Co. Ltd.
5.7.
CAE Sumner Ltd.
1.2.3.10.11.17.
Canada Iron Foundries (West. Bridge)
4.
Canadian Acme Screw & Gear Ltd.
15.
Canadian Vickers Ltd.
2.15.19.
Columbus McKinnon Ltd.
11.14.
Davie Shipbuilding Ltd.
2.14.15.19.
Dominion Bridge Co. Ltd.
1.3.7.15.17.
Dowty Equipment of Canada Ltd.
2.6.15.18.
Eastern Steel Products Co.
11.14.
Forano Ltd.
15.17.
Gearmatic Co. Ltd.
15.18.
Hall Machinery Ltd.
2.15.19.
Hawker, Siddeley Canada (Trans. Equip.)
1.2.3.4.5.6.7.10.11.13.14.15.17.18.19.
Hayes Mfg. Co. Ltd.
10.15.
London Concrete Machinery Co.
10.15.
Marine Industries Ltd.
5.15.
Matthew Moody Division
10.11.12.
Progressive Engineering Works Ltd.
2.6.7.11.14.17.19.
Russel Brothers Ltd.
14.15.17.18.19.
J. Swann (1963) Ltd.
2.15.16.19.
Truck Engineering Ltd.
8.9.
Phil Wood Industries Ltd.
13.
Yarrows Ltd.
7.

3960 ELEVATORS AND ESCALATORS

Otis Elevator Co. Ltd.

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.
8. Pallets, steel, material handling.
9. Portable bridges.
10. Shakers, rail car.

A.I.M. Steel Ltd.
8.

Canadian General Electric (Plastics)
7.

Dominion Steel & Coal Corp. Ltd. (Truscon)
8.

Firestone Tire & Rubber Canada Ltd.
3.4.

Alexander Fleck Ltd.
1.

Forano Ltd.
1.

G.M. Plastic Corp.
7.

B. F. Goodrich Canada Ltd.
1.3.4.

Goodyear Tire & Rubber Canada Ltd.
3.4.

Hassan Steel Fabricators Ltd.
5.8.

Magline of Canada Ltd.
2.6.9.

Matthew Moody Division
1.5.

National Steel Car Corp. Ltd.
8.

Rex Chainbelt (Canada) Ltd.
1.

Syntron (Canada) Ltd.
1.10.

Triple-A Mfg. Co. Ltd.
5.

Uniroyal (1966) Ltd.
3.4.

Westeel-Rosco Ltd.
5.8.

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

Canada Wire & Cable Co. Ltd.
3.10.12.

Columbus McKinnon Ltd.
1.6.7.9.12.13.

Dominion Chain Co. Ltd.
1.6.7.9.12.

Donald Ropes & Wire Cloth Ltd.
3.10.12.

General Wire & Cable
8.10.

Greening Industries Ltd.
3.10.

Rex Chainbelt (Canada) Ltd.
5.11.13.

Wire Rope Industries of Canada Ltd.
2.3.4.8.10.12.

Wrights Canadian Ropes Ltd.
4.8.10.12.

4020 FIBRE ROPE, CORDAGE AND TWINE

1. **Rope, manilla.**
2. **Rope, nylon.**
3. **Rope, polyethelene.**
4. **Rope, polypropylene.**
5. **Rope, sisal.**
6. **Rope, terylene.**
7. **Twine, baler, hay.**
8. **Twine, binder.**
9. **Twine, packaging, sisal.**

Brantford Cordage Co.
1.2.3.4.5.6.7.8.9.

Doon Twines Ltd.
1.2.3.4.5.6.7.8.9.

The Hamilton Cotton Co. Ltd.
1.2.3.4.6.

GROUP 41

REFRIGERATION AND AIR CONDITIONING EQUIPMENT

4110 SELF-CONTAINED REFRIGERATION UNITS AND ACCESSORIES

1. Freezing and preservation equipment, biological.
2. Refrigeration units.

Air Conditioning Engineering
2.

Canadian Westinghouse (Sturtevant Dept.)
2.

Hussman Refrigerator 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.
3. Marine air conditioners.

Air Conditioning Engineering
1.2.3.

Canadian Westinghouse (Sturtevant Dept.)
2.3.

Garrett Manufacturing Ltd.

Godfrey Engineering Co. Ltd.

James Howden & Parsons of Canada

Hussman Refrigerator Co. Ltd.

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

The W. C. Wood Co. Ltd.

Yarrows Ltd.

4130 REFRIGERATION AND AIR CONDITIONING PLANTS AND COMPONENTS

1. Air conditioning components.
2. Doors.
3. Doors, R.R.
4. Frozen food storage.
5. Refrigerant system, transport vehicles.
6. Refrigerating equipment.
7. Refrigeration systems.
8. Refrigeration units, condensing.
9. Walk-in coolers.

Air Conditioning Engineering
1.7.8.

Canadian Westinghouse (Sturtevant Dept.)
1.6.7.

Hussman Refrigerator Co. Ltd.
1.2.4.7.8.9.

National Steel Car Corp. Ltd.
3.

Union Carbide Canada Ltd.
5.6.

Westeel-Rosco Ltd.
3.

The W. C. Wood Co. Ltd.
8.

Yarrows Ltd.
9.

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.
8. Fans, tube, axial.
9. Fans, vase, axial.
10. Fans, ventilating, propeller.
11. Impellers, fan, axial.
12. Impellers, fan, centrifugal.

Air Conditioning Engineering
1.2.3.4.5.6.7.8.9.10.11.12.

Bogue Electric of Canada Ltd.
1.2.3.10.

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. **Drier, fire hose.**
4. **Extinguishers, fire, foam.**
5. **Extinguishers, fire, soda-acid.**
6. **Extinguishers, fire, water.**
7. **Extinguishers, fire, wheeled and portable.**
8. **Foam, mechanical liquid, 3 and 6%.**
9. **Foam systems.**
10. **Ladders, fire, aluminum.**
11. **Platforms, hydraulic, truck or trailer mounted.**
12. **Pumps, fire, diesel, air-cooled.**
13. **Pumps, fire, diesel, liquid-cooled.**
14. **Pumps, fire, front mount.**
15. **Pumps, fire portable.**
16. **Trailers, fire pumper.**
17. **Trucks, fire.**
18. **Trucks, fire, crash.**
19. **Trucks, fire fighting, tracked.**

Coulter Copper & Brass Co. Ltd.
4.5.6.

Deutz Diesel (Canada) Ltd.
12.13.

Flag Fire Equipment Ltd.
2.4.5.6.15.

Magline of Canada Ltd.
10.

Pyrene Mfg. Co. of Canada Ltd.
1.4.5.6.7.8.9.18.

Reynolds Extrusion Co. Ltd.
10.

Robin-Nodwell Mfg. Ltd.
19.

Pierre Thibault Canada Ltd.
15.17.

4220 MARINE LIFESAVING AND DIVING EQUIPMENT

1. **Cushions, life saving.**
2. **Life preservers, inflatable.**
3. **Life preservers, non-inflatable.**
4. **Life rafts, inflatable.**
5. **Life rafts, plastic.**

Abercorn Aero Ltd.
2.4.5.

Firestone Tire & Rubber Canada Ltd.
2.4.

Guelph Elastic Hosiery Co. Ltd.
3.

Imperial Industries Ltd.
3.

Tapatco Ltd.
1.3.

J. J. Turner Co. Ltd.
1.3.

Uniroyal (1966) Ltd.
2.4.

4230 DECONTAMINATING AND IMPREGNATING EQUIPMENT

1. **Decontaminating apparatus, portable.**

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. **Cnrtains, fire.**
8. **Dust hoods, industrial.**
9. **Dust hood-respirator combinations.**
10. **Ear protectors, welders'.**
11. **Enamelers' hoods.**
12. **Eyeshields, respirator.**
13. **Facepieces, gas mask.**
14. **Faceshields, industrial.**
15. **Fans, centrifugal, gas filter.**
16. **Filter units, gas-particulate.**
17. **Filters, wire mesh, particulate.**
18. **Finger guards, industrial.**
19. **Foot guards, over-the-shoe type.**
20. **Gloves, welding.**
21. **Goggles, industrial.**
22. **Guards, shin.**
23. **Harnesses, safety industrial.**
24. **Headbands, goggle.**

4240 SAFETY AND RESCUE EQUIPMENT *(conc.)*

25. **Helmets, metal melters'.**
26. **Helmets, plastic.**
27. **Helmets, welders'.**
28. **Hoods, abrasive cleaning.**
29. **Hoods, paint spraying.**
30. **Impellers, fan, centrifugal.**
31. **Installation kits, gas-particulate filter units, armored vehicle.**
32. **Knee pads, industrial.**
33. **Lenses, goggle, industrial.**
34. **Lenses, helmet, welders'.**
35. **Masks, gas.**
36. **Masks, oxygen.**
37. **Nets, safety, non-buoyant.**
38. **Nosepieces, oxygen mask.**
39. **Paint hoods.**
40. **Protective breathing equipment.**
41. **Respirators, air filtering.**
42. **Respirators, industrial.**
43. **Safety goggles, industrial.**
44. **Shields, arc viewing, hand held.**
45. **Spectacles, industrial.**
46. **Steel safety toes.**
47. **Suits, fire fighting, integrated oxygen and/or air conditioning.**
48. **Sults, safety, heat protective, integrated oxygen and/or air conditioning.**
49. **Visors, faceshield, industrial.**

Aro of Canada Ltd.
2.12.38.42.47.48.

Canadian General Electric (Plastics)
26.

Dunlop Canada Ltd.
35.

W. R. Elliott Ltd.
16.31.

Firestone Tire & Rubber Canada Ltd.
36.

Goodyear Tire & Rubber Canada Ltd.
35.

Johnson Wire Products Ltd.
17.

Joy Mfg. Co. (Canada) Ltd.
15.30.

Safety Supply Co.
1.2.3.4.5.6.7.8.9.10.11.12.14.18.19.21.
22.23.24.25.27.28.29.32.33.34.37.39.
41.42.43.44.45.49.

St. Lawrence Mfg. Co. Inc.
46.

Scott Air-Pak Ltd.
40.

Union Carbide Canada Ltd.
20.21.27.

Uniroyal (1966) Ltd.
13.38.

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. **Cyclone cones.**
6. **Filters, air.**
7. **Pumps and air compressors, marine, air-cooled.**
8. **Pumps and air compressors, marine, liquid-cooled.**
9. **Pumps, vacuum.**
10. **Tanks, pressure.**

Aro of Canada Ltd.
9.

Canadian Allis-Chalmers Ltd.
4.

Canadian General Electric (Plastics)
1.

Deloro Stellite.
5.

Deutz Diesel (Canada) Ltd.
7.8.

DeVilbiss (Canada) Ltd.
3.

Fairbanks-Morse (Canada) Ltd.
9.10.

Gardner-Denver Co. (Canada) Ltd.
2.3.4.9.

James Howden & Parsons of Canada
2.10.

Joy Mfg. Co. (Canada) Ltd.
2.3.4.

PurOlator Products (Canada) Ltd.
6.

Russel-Hipwell Engines Ltd.
2.

Webster Air Equipment Ltd.
2.

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, peripheral coolant.**
11. **Pumps, reciprocating.**
12. **Pumps, rotary, hand, multiapplication.**
13. **Pumps, rotary, power driven.**
14. **Pumps, sump.**
15. **Pumps, variable delivery.**
16. **Pumps, vertical turbine.**
17. **Pumps, water supply system.**
18. **Rams, hydraulic.**
19. **Water supply systems, automatic.**

Aero Tool Works Ltd.
17.

Anthes Imperial Ltd.
14.

Aro of Canada Ltd.
12.13.

Aviation Electric Ltd.
8.15.

Babcock-Wilcox & Goldie-McCulloch
2.3.8.11.13.14.15.16.

Black Clawson-Kennedy Ltd.
3.

S. F. Bowser Co. Ltd.
7.

Canadian Allis-Chalmers Ltd.
3.14.17.

Canadian Vickers Ltd.
3.16.

Deutz Diesel (Canada) Ltd.
5.6.

Dowty Equipment of Canada Ltd.
1.8.13.15.18.

Fairbanks-Morse (Canada) Ltd.
2.3.4.7.8.10.11.13.17.

Alexander Fleck Ltd.
3.17.

Gearmatic Co. Ltd.
1.

Godfrey Engineering Co. Ltd.
2.3.4.8.11.15.16.

Harrington Tool & Die Co. Ltd.
3.4.

4320 POWER AND HAND PUMPS *(conc.)*

London Concrete Machinery Co.
3.

Montreal Locomotive Works Ltd.
3.

Otaco Ltd.
14.19.

Peacock Brothers Ltd.
2.3.8.11.13.16.17.19.

Russel-Hipwell Engines Ltd.
3.8.12.

J. Swann (1963) Ltd.
9.

Phil Wood Industries Ltd.
1.8.18.

4330 CENTRIFUGALS, SEPARATORS, AND PRESSURE & VACUUM FILTERS

1. Filters, air and oil.
2. Filters, fluid, pressure.
3. Filters, fuel, engine.
4. Filters (metal).
5. Purifiers, oil.
6. Separators.

Aircraft Appliances & Equipment
2.3.4.5.6.

Aro of Canada Ltd.
2.

S. F. Bowser Co. Ltd.
1.2.3.5.6.

Canadian Filters Ltd.
2.

Kralinator Filters Ltd.
1.3.5.

PurOlator Products (Canada) Ltd.
1.2.3.5.

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.
Anthes Imperial Ltd.
25.26.27.29.31.
Babcock-Wilcox & Goldie McCulloch
9.10.11.13.14.19.21.22.
Burrard Dry Dock Co. Ltd.
28.
Canadian General Electric (Devices, Conduit & Lighting)
26.30.
Canadian Valve (Singer Valve)
34.
Canadian Vickers Ltd.
2.8.11.14.19.22.
James B. Carter Ltd.
26.
Combustion Engineering-Superheater
1.2.10.11.12.13.14.17.19.21.22.
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.
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.
Napanee Industries Ltd.
1.3.5.7.8.11.12.13.14.15.16.21.24.28.30.
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.**
9. **Heat exchangers.**
10. **Heaters, feedwater.**
11. **Intercoolers.**
12. **Oil coolers.**
13. **Superheaters, marine.**

Air Conditioning Engineering
2.6.7.8.9.
Anthes Imperial Ltd.
3.
Babcock-Wilcox and Goldie-McCulloch
2.3.4.5.9.13.
Burrard Dry Dock Co. Ltd.
4.5.7.8.9.10.

4420 HEAT EXCHANGERS AND STEAM CONDENSERS *(conc.)*

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.

Fromson Heat Transfer Ltd.
1.2.7.8.9.11.12.

James Howden & Parsons of Canada
6.9.

Montreal Locomotive Works Ltd.
9.

Napanee Industries Ltd.
10.

Peacock Brothers Ltd.
2.3.4.5.6.9.13.

Victoria Machinery Depot Co. Ltd.
3.4.5.7.8.

4430 INDUSTRIAL FURNACES, KILNS, LEHRS, AND OVENS

1. Burner tips.
2. Crucibles.
3. Drying, electric, gas and oil.
4. Electrodes, electric furnace.
5. Kilns.
6. Lehrs.
7. Ovens.
8. Soft metal melting.
9. Tinning.

Canadian Allis-Chalmers Ltd.
5.

Davie Shipbuilding Ltd.
5.

Deloro Stellite
1.

Dominion Bridge Co. Ltd.
5.

Marine Industries Ltd.
5.

Saint John Shipbuilding & Dry Dock
5.

Saskatchewan Steel Fabricators Ltd.
5.

Union Carbide Canada Ltd.
4.

Volcano Ltd.
5.

Wayne Forge Ltd.
2.3.5.6.7.8.9.

4440 DRIERS, DEHYDRATORS, AND ANHYDRATORS

1. Driers, electric, gas and oil.
2. Evaporators.

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.

Horton Steel Works Ltd.
2.

Victoria Machinery Depot Co. Ltd.
2.

Wayne Forge Ltd.
1.

4450 INDUSTRIAL FAN AND BLOWER EQUIPMENT

1. Blowers, industrial.
2. Fans, industrial.

Air Conditioning Engineering
1.2.

Bogue Electric of Canada Ltd.
1.2.

Canadian Westinghouse (Sturtevant Dept.)
1.

DeVilbiss (Canada) Ltd.
2.

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.
James Howden & Parsons of Canada
1.

2. Dust collectors, cyclone.

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

4470 NUCLEAR REACTORS

Babcock-Wilcox & Goldie-McCulloch
Canadian General Electric (Atomic Power)
Canadian Vickers Ltd.
Canadian Westinghouse (Atomic Fuel)
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

1. Brass goods.
2. Die cast, stems.
3. Enamelled ware.
4. Galley equipment, stainless steel, custom.
5. Sinks, galley equipment.
6. Units, cathodic protection.
7. Vitreous ware.

Consolidated Mining & Smelting
6.

Emco Ltd.
1.2.3.5.6.7.

Halifax Shipyards.
4.5.

Wallaceburg Brass Ltd.
1.

4520 SPACE HEATING EQUIPMENT AND DOMESTIC WATER HEATERS

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, water, electric.
9. Heaters, water, gas.
10. Heaters, water, oil.
11. Heaters, portable, electric.
12. Heaters, space, electric.
13. Heaters, space, gas burning.
14. Heaters, space, oil burning.
15. Tanks, hot water.
16. Tanks, hot water, glass lined.
17. Tanks, steel.

Aero Tool Works Ltd.
8.16.

Air Conditioning Engineering
7.10.12.

Anthes Imperial Ltd.
2.4.6.9.10.

Beach Foundry Ltd.
5.

Canadian Coleman Co. Ltd.
5.8.9.13.14.

Canadian General Electric (Devices, Conduit & Lighting)
7.8.11.12.

Canadian Vickers Ltd.
2.3.4.

James B. Carter Ltd.
8.

Combustion Engineering-Superheater
7.

Coulter Copper & Brass Co. Ltd.
15.

Davie Shipbuilding Ltd.
15.

Dominion Bridge Co. Ltd.
1.2.3.4.17.

Enamel & Heating Products Ltd.
5.6.7.8.9.10.13.14.16.

Ferro Metal Ltd.
12.15.

Findlays Ltd.
5.6.7.13.14.

Hassan Steel Fabricators Ltd.
2.15.

Lunenburg Foundry & Engineering Ltd.
6.

Marine Industries Ltd.
9.10.17.

Napanee Industries Ltd.
1.3.4.9.10.15.

W. H. Olsen Mfg. Co. Ltd.
11.13.14.

Pioneer Electric Brandon Ltd.
12.

Tudhope Specialties Ltd.
13.14.

Victoria Machinery Depot Co. Ltd.
17.

Volcano Ltd.
1.2.3.4.9.10.

Wayne Forge Ltd.
2.7.8.9.10.13.14.

Yarrows Ltd.
15.

4530 FUEL BURNING EQUIPMENT UNITS

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

5. Burners, heating.
6. Burners, propane.
7. Stokers, all types.

Aero Tool Works Ltd.
3.4.

Anthes Imperial Ltd.
3.4.5.

Babcock-Wilcox & Goldie-McCulloch
3.4.9.10.

Canadian Coleman Co. Ltd.
1.3.4.

Combustion Engineering-Superheater
3.4.7.

8. Stokers, coal.
9. Stokers, spreader.
10. Stokers, underfeed.

James Howden & Parsons of Canada
2.8.

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.

Bogue Electric of Canada Ltd.
S. F. Bowser Co. Ltd.
Shawinigan Chemicals Ltd.

4620 WATER DISTILLATION EQUIPMENT, MARINE AND INDUSTRIAL

1. Distillation units.

Bogue Electric of Canada Ltd.
1.

Coulter Copper & Brass Co. Ltd.
1.

4630 SEWAGE TREATMENT EQUIPMENT

1. Sanitation equipment.

Fairbanks-Morse (Canada) Ltd.
1.

Rex Chainbelt (Canada) Ltd.
1.

GROUP 47

PIPE, TUBING, HOSE AND FITTINGS

4710 PIPE AND TUBE

1. **Centricast tubing, bronze, iron, steel.**
2. **Fittings, pipe, P.V.C.**
3. **Magnesium pipe and tube, extruded.**
4. **Pipe, asbestos bonded.**
5. **Pipe, cast, iron.**
6. **Pipe, copper.**
7. **Pipe, corrugated steel.**
8. **Pipe, drain, P.V.C.**
9. **Pipe, ductile iron.**
10. **Pipe, lead.**
11. **Pipe, perforated.**
12. **Pipe, plastic.**
13. **Pipe and tube, aluminum, extruded and drawn.**
14. **Pipe and tube, brass.**
15. **Pipe and tube, bronze.**
16. **Pipe and tube, pipeline.**
17. **Pipe and tube fittings, steam.**
18. **Pipe lining, rubber.**
19. **Pipe, vent, P.V.C.**
20. **Pipe, waste, P.V.C.**
21. **Pipes and fittings of graphite.**
22. **Plastic pipe and tubing.**
23. **Stainless steel pipe.**
24. **Stainless steel tube.**
25. **Steel pipe and tube.**
26. **Steel, welded, corrosion resistant.**
27. **Titanium, seamless and welded.**
28. **Tube, copper.**
29. **Tube, and duct, plastic reinforced.**

Anaconda American Brass Ltd.
6.14.15.28.
Anthes Imperial Ltd.
5.17.
Armco Drainage & Metal Products
4.7.11.13.25.
Atlas Titanium Ltd.
27.
Black Clawson-Kennedy Ltd.
1.
Canada Iron Foundries (Pipe Div.)
5.9.17.
Canada Metal Co. Ltd.
10.
Canadian General Electric (Plastics)
12.22.
Davie Shipbuilding Ltd.
16.
Dominion Magnesium Ltd.
3.
Dominion Steel & Coal Corp. Ltd.
25.
Firestone Tire & Rubber Canada Ltd.
18.
B. F. Goodrich Canada Ltd.
12.18.22.
Goodyear Tire & Rubber Canada Ltd.
18.
Imperial Eastman Corp. (Canada) Ltd.
12.22.
Noranda Copper Mills Ltd.
6.14.15.28.
Northern Resins
2.8.19.20.
Northwest Industries Ltd.
12.22.29.
Ontario Steel Products Co. Ltd.
12.
Pedlar People Ltd.
7.
Polyfiber Ltd.
29.
Reynolds Extrusion Co. Ltd.
13.
Scepter Mfg. Co. Ltd.
2.8.19.20.
Shawinigan Chemicals Ltd.
12.22.
Smith & Stone Ltd.
22.
The Steel Co. of Canada Ltd.
5.17.23.26.
Triple-A Mfg. Co. Ltd.
24.25.
Union Carbide Canada Ltd.
21.
Uniroyal (1966) Ltd.
18.
Victoria Machinery Depot Co. Ltd.
25.

4720 HOSE AND TUBING FLEXIBLE

1. **Hose assemblies, fabric re-inforced, multiapplication.**
2. **Hose assemblies, multiapplication, wire re-inforced.**
3. **Hose, flexible, metal.**
4. **Hose, rubber.**
5. **Hose, welding and cutting.**
6. **Tubing, flexible, coiled metal, H.P.**
7. **Tubing, rubber.**

Dowty Equipment Ltd.
3.6.

Dunlop Canada Ltd.
1.2.4.7.

Firestone Tire & Rubber Canada Ltd.
7.

B. F. Goodrich Canada Ltd.
4.7.

Goodyear Tire & Rubber Canada Ltd.
4.7.

Imperial Eastman Corp (Canada) Ltd.
1.2.

St. Lawrence Rubber Co.
4.7.

Union Carbide Canada Ltd.
5.

Uniroyal (1966) Ltd.
4.7.

Weatherhead Co. of Canada Ltd.
1.

4730 FITTINGS AND SPECIALTIES: 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 and bronze.
11. Fittings, cast iron.
12. Fittings, hose.
13. Fittings, hydraulic.
14. Fittings, pipe.
15. Flanges.
16. Joints, expansion pipe.
17. Strainers, water and petroleum.
18. Traps, steam.

Anthes Imperial Ltd.
14.16.

Armco Drainage & Metal Products
14.

Aro of Canada Ltd.
6.8.9.

Canada Iron Foundries (Pipe Div.)
11.14.

Canadian Acme Screw & Gear Ltd.
12.13.14.

Coulter Copper & Brass Co. Ltd.
10.12.

Emco Ltd.
3.14.

General Impact Extrusions
2.

Heroux Machine Parts Ltd.
7.

Imperial Eastman Corp. (Canada) Ltd.
1.6.7.8.12.13.

International Malleable Iron Co. Ltd.
10.

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

Marsland Engineering Ltd.
3.6.7.

Neptune Meters Ltd.
17.

Progressive Engineering Works Ltd.
15.

Rollit Products Ltd.
12.14.15.

The Steel Co. of Canada Ltd.
14.

Tridon Mfg. Ltd.
3.4.5.

Velan Engineering Ltd.
18.

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.**
7. **Pneumatic.**

Abex Industries of Canada Ltd.
3.4.

Aro of Canada Ltd.
2.3.4.

Canadian Allis-Chalmers Ltd.
1.4.6.

Canadian Car (Pacific) Ltd.
4.6.

Canadian Valve (Singer Valve)
4.7.

Canadian Vickers Ltd.
1.6.

Davie Shipbuilding Ltd.
1.6.

Dominion Engineering Works Ltd.
1.3.4.5.6.

Dowty Equipment of Canada Ltd.
3.4.

James Howden & Parsons of Canada
1.

Peacock Brothers Ltd.
1.2.7.

Phil Wood Industries Ltd.
4.

4820 VALVES, NON-POWERED

1. **Angle.**
2. **Ball.**
3. **Butterfly.**
4. **Check.**
5. **Cryogenic applications.**
6. **Diaphragms.**
7. **Disc.**
8. **Gate.**
9. **Globe.**
10. **High pressure, forged, special purpose.**
11. **Hydraulic.**
12. **Marine and naval type.**
13. **Nuclear applications.**
14. **Pressure, reducing.**
15. **Pressure, regulating.**
16. **Relief.**
17. **Rubber lined.**
18. **Stainless steel.**
19. **Taper, plug type.**
20. **Vacuum breakers.**

Abex Industries of Canada Ltd.
11.

Anthes Imperial Ltd.
1.4.7.8.9.

Aro of Canada Ltd.
11.

Aviation Electric Ltd.
8.15.

Canadair Ltd.
2.

Canadian Allis-Chalmers Ltd.
1.2.3.4.6.9.15.17.18.

Canadian Car (Pacific) Ltd.
11.

Canadian Valve (Singer Valve)
4.6.9.12.14.15.16.20.

Davie Shipbuilding Ltd.
3.

Dominion Engineering Works Ltd.
3.4.11.

Dowty Equipment Ltd.
4.7.11.15.

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.
19.

St. Maurice Foundries Ltd.
1.4.8.9.

Trimonex Mfg. Co. Ltd.
9.

Velan Engineering Ltd.
1.2.4.5.8.9.10.13.18.

Phil Wood Industries Ltd.
1.4.8.9.

GROUP 49

MAINTENANCE AND REPAIR SHOP EQUIPMENT

4910 MOTOR VEHICLE MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Actuators, hydraulic.

Clinton Products (Canada) Ltd.
2.

2. Creepers, garage.

Phil Wood Industries Ltd.
1.

4920 AIRCRAFT MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Fixtures.
2. Fuel system test stands.
3. Pitot, leakage rate test stands.
4. Rigging fixtures.
5. Signal generators.
6. Stands.
7. Test sets, hydraulic components.
8. Test sets, pneumatic.
9. Test stands.
10. Test stands, auto-pilot.
11. Test stands, damper systems.
12. Test stands, engine.
13. Test stands, hydraulic systems.

Abex Industries of Canada Ltd.
7.13.

Aro of Canada Ltd.
8.9.

Aviation Electric Ltd.
2.7.9.10.13.

Canadair Ltd.
1.4.6.

Canadian Vickers Ltd.
12.

De Havilland Aircraft of Canada
2.3.4.6.7.9.12.

Dowty Equipment of Canada Ltd.
13.

Fairey Canada Ltd.
4.9.

Field Aviation Co. Ltd.
1.9.

Garrett Manufacturing Ltd.
3.5.8.9.

Godfrey Engineering Co. Ltd.
9.13.

Harrington Tool & Die Co. Ltd.
1.4.6.

Honeywell Controls Ltd.
2.10.11.

Pedlar People Ltd.
6.

Weatherhead Co. of Canada Ltd.
7.

Williams Machines Ltd.
1.6.

4930 LUBRICATION AND FUEL DISPENSING EQUIPMENT

1. Fueling system, multiapplication.
2. Lubricating equipment.
3. Lubricating units, power operated.
4. Nozzles, fuel.

Aro of Canada Ltd.
2.

S. F. Bowser Co. Ltd.
1.2.3.

Canadian Acme Screw & Gear Ltd.
4.

Canadian Valve (Singer Valve)
1.

Stewart-Warner Corp. Ltd.
2.

4931 FIRE CONTROL MAINTENANCE AND REPAIR SHOP SPECIALIZED EQUIPMENT

1. Fire control test sets.

CAE Industries Ltd.
1.

Honeywell Controls Ltd.
1.

4935 GUIDED MISSILE MAINTENANCE, REPAIR, AND CHECKOUT SPECIALIZED EQUIPMENT

1. Panels, test, electric.

De Havilland Aircraft (SPAR)
Northern Electric Co. Ltd.

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

Aro of Canada Ltd.
5.6.

Bertram Machine & Tool Co.
9.

DeVilbiss (Canada) Ltd.
2.3.4.5.6.7.8.

Hassan Steel Fabricators Ltd.
10.

Progressive Engineering Works Ltd.
1.

Standard-Modern Tool Co. Ltd.
11.

Webster Air Equipment Ltd.
2.3.4.5.6.7.8.

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.**
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.**

Canadian Engineering & Tool Co. Ltd.
8.9.10.

Canadian Tap & Die Co. Ltd.
8.9.10.

Citco
8.11.16.

Cochrane Tool & Design Ltd.
10.

Deloro Stellite
8.9.10.11.

ETF Tools Ltd.
1.2.3.4.5.6.7.12.13.14.17.18.

Harrington Tool & Die Co. Ltd.
8.10.

Hassan Steel Fabricators Ltd.
15.

Ketchum Mfg. Co. Ltd.
15.

LaSalle Engineering Ltd.
8.9.10.15.16.

Premier Tool & Die Ltd.
9.10.

St. Lawrence Mfg. Co. Inc.
10.

Standard-Modern Tool Co. Ltd.
9.

5120 HAND TOOLS, NON-EDGED, NON-POWERED

1. **Anvils, steel.**
2. **Bars, pinch.**
3. **Bars, wrecking.**
4. **Cable grips, pulling and supporting.**
5. **Crimpers.**
6. **Cutters, pipe.**
7. **Expanders, boiler tube.**
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; tinners.**
23. **Jacks, hydraulic.**
24. **Jacks, screw.**
25. **Pliers, curved needle nose.**
26. **Pliers, duck-billed.**
27. **Pliers, fence, tool.**
28. **Pliers, flat nose.**
29. **Pliers, insulated, electricians.**
30. **Pliers, lineman's, insulated, side and nose cutting.**
31. **Pliers, long needle nose.**
32. **Pliers, rib joints.**
33. **Pliers, round-nose.**
34. **Pliers, side and end cutting.**
35. **Pliers, slip joint, angle nose.**
36. **Pliers, slip joint, regular.**
37. **Pliers, slip joint, thin nose.**
38. **Pliers, thin nose, side cutter.**
39. **Pullers, bearing and wheel.**
40. **Pullers, railway spike.**
41. **Punches, centre.**
42. **Punches, lining-up.**
43. **Punches, pin.**
44. **Punches, prick.**
45. **Punches, solid.**
46. **Scratch awls.**
47. **Screwdriver, -21-102-8887.**
48. **Screwdriver, -21-105-2428.**
49. **Screwdriver, -00-189-2316.**
50. **Screwdriver, -00-224-7375.**
51. **Screwdriver, -00-227-7356.**
52. **Screwdriver, -00-234-8912.**
53. **Screwdriver, -00-236-2127.**
54. **Screwdriver, -00-237-8172.**
55. **Screwdriver, -00-237-8173.**

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

56. Screwdriver, -00-278-1282.
57. Screwdriver, -00-278-1283.
58. Screwdriver, -21-596-0866.
59. Screwdriver, -00-596-8502.
60. Screwdriver, -21-639-3155.
61. Screwdriver, -21-639-3156.
62. Screwdriver, -21-639-3289.
63. Screwdriver, -21-639-3769.
64. Screwdriver, -21-807-6087.
65. Screwdriver, -21-808-5189.
66. Screwdriver, -21-814-2552.
67. Sets, nail.
68. Sets, rivet.
69. Spoons, tire changing.
70. Stretchers, wire.
71. Threaders, pipe.
72. Vises, machinist.
73. Vises, pipe.
74. Wrench, -00-277-1801.
75. Wrench, -00-277-1802.
76. Wrench, sets, hexagon.
77. Wrench, sets, pocket.
78. Wrenches, box.
79. Wrenches, box and open end.
80. Wrenches, double box.
81. Wrenches, forged, adjustable.
82. Wrenches, open end.
83. Wrenches, pipe.
84. Wrenches, pneumatic.
85. Wrenches, square drive.
86. Wrenches, stilson pattern.
87. Wrenches, tap.

Armstrong Beverley Engineering Ltd.
23.

Burndy Canada Ltd.
5.

Canadian Tap & Die Co. Ltd.
8.87.

Geo. Cluthe Mfg. Co. Ltd.
10.47.48.49.50.51.52.53.54.55.56.57.58.
59.60.61.62.63.64.65.66.74.75.

The Craig Bit Co. Ltd.
84.

Delro Industries Ltd .
39.

Dowty Equipment of Canada Ltd.
23.

ETF Tools Ltd.
2.3.9.11.12.13.14.15.16.17.18.19.20.21.
22.25.26.27.28.29.30.31.32.33.34.35.36.
37.38.40.41.42.43.44.45.46.67.68.69.70.
73.76.77.78.79.80.81.82.85.86.

Harrington Tool & Die Co. Ltd.
23.24.

Marsland Engineering Ltd.
6.7.71.72.73.83.

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

Aro of Canada Ltd.
3.7.

Burndy Canada Ltd.
1.

Canadian Engineering & Tool Co. Ltd.
5.

Colonial Tool Company
5.

Deloro Stellite
2.

Delro Industries Ltd.
6.

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

Power Machinery (Bristol Aero-Industries)
4.

Premier Tool & Die Ltd.
5.

5133 DRILL BITS, COUNTERBORES AND COUNTERSINKS: HAND & MACHINE

1. Drill blanks.
2. Drills, carbide tipped.
3. Drills, rock.
4. Drills, tungsten carbide.
5. Drills, twist.

Canadian General Electric (Carboloy)
4.

Citco
1.2.5.

Joy Mfg. Co. (Canada) Ltd.
3.

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

Canadian Engineering & Tool Co. Ltd.
8.

Canadian General Electric (Carboloy)
9.

Canadian Tap & Die Co. Ltd.
1.2.10.

Citco
8.10.

Cochrane Tool & Design Ltd.
6.

Deloro Stellite
2.3.4.5.6.7.8.

Harrington Tool & Die Co. Ltd.
2.4.5.6.7.8.10.

Premier Tool & Die Ltd.
3.8.

St. Lawrence Mfg. Co. Inc.
2.

Standard-Modern Tool Co. Ltd.
2.4.5.6.7.

5140 TOOL AND HARDWARE BOXES

1. Boxes, tool, portable.
2. Cases, socket wrench set.
3. Chests, mechanics.
4. Tote boxes.
5. Tote boxes, plastic.
6. Tote pans.
7. Tote pans, plastic.
8. Trailers, tool.

Canadian General Electric (Plastics)
5.7.

Clinton Products (Canada) Ltd.
1.

ETF Tools Ltd.
1.2.3.4.

Hassan Steel Fabricators Ltd.
1.4.6.8.

Locweld & Forge Products Ltd.
1.4.6.

Triple-A Mfg. Co. Ltd.
1.4.6.

Tudhope Specialties Ltd.
1.3.4.6.

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.
2. Tools, forming, diamond.

Delro Industries Ltd.
2.

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.**
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.**

Bertram Machine & Tool Co.
1.2.3.4.5.6.7.9.11.15.16.17.

Canadian Arsenals Ltd.
8.10.12.13.15.17.

Canadian Engineering & Tool Co. Ltd.
10.16.17.

The Craig Bit Co. Ltd.
14.

Harrington Tool & Die Co. Ltd.
5.6.8.10.12.13.

Semtec Ltd.
1.15.

Standard-Modern Tool Co. Ltd.
5.6.8.11.16.

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.**
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.**
19. **Surface plates, cast iron.**
20. **Surface plates, granite.**

Bertram Machine & Tool Co.
2.3.4.5.6.7.8.9.10.11.12.16.17.18.

Canadian Arsenals Ltd.
2.3.4.7.8.16.17.

Canadian Engineering & Tool Co. Ltd.
3.4.

Colonial Tool Co.
1.2.3.7.8.13.14.15.16.

Ex-Cell-O Corp. (Canada) Ltd.
19.20.

Harrington Tool & Die Co. Ltd.
2.3.4.5.6.7.8.9.10.11.12.16.

Semtec Ltd.
1.2.3.7.8.13.14.15.16.

Standard-Modern Tool Co. Ltd.
1.2.3.

GROUP 53

HARDWARE AND ABRASIVES

5305 SCREWS

1. Screws.

Canadian Acme Screw & Gear Ltd.
1.
Dominion Steel & Coal Corp. Ltd.
1.
Rollit Products Ltd.
1.
Shakeproof/Fastex
1.
SIDO Ltd.
1.
N. Slater Co.
1.
The Steel Co. of Canada Ltd.
1.
Triplex Engineering Co. Ltd.
1.
Whitehouse Fastenings Ltd.
1.

5306 BOLTS

1. Bolts.

Canadian Acme Screw & Gear Ltd.
1.2.
Dominion Steel & Coal Corp. Ltd.
1.2.
Industrial Machining Ltd.
1.2.
Metalite Co. Ltd.
1.2.
Rollit Products Ltd.
1.

2. Nuts.

Shakeproof/Fastex
1.2.
N. Slater Co.
1.2.
The Steel Co. of Canada Ltd.
1.2.
Triplex Engineering Co. Ltd.
1.2.
Whitehouse Fastenings Ltd.
1.2.

5307 STUDS

Canadian Acme Screw & Gear Ltd.
Industrial Machining 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.
Whitehouse Fastenings Ltd.

5310 NUTS AND WASHERS

1. Burrs, tungsten carbide.
2. Lock nuts.

Automatic Plastics Co.
4.
Canadian Acme Screw & Gear Ltd.
2.3.
Canadian General Electric (Carboloy)
1.
Dominion Steel & Coal Corp. Ltd.
2.3.
Industrial Machining Ltd.
2.3.
Metalite Co. Ltd.
2.3.
Rollit Products Ltd.
2.3.

3. Nuts and washers.
4. Washers, plastic.

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.
Whitehouse Fastenings Ltd.
2.3.

5315 NAILS, KEYS, AND PINS

1. Keys.
2. Nails.
3. Pins, all types.

Dominion Steel & Coal Corp. Ltd.
2.

Rollit Products Ltd.
3.

SIDO Ltd.
1.

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

Firestone Tire & Rubber Canada Ltd.
5.6.

B. F. Goodrich Canada Ltd.
5.6.

Hassan Steel Fabricators Ltd.
4.

Lightning Fasteners Co. Ltd.
2.7.

Shakeproof/Fastex
1.3.

5330 PACKING AND GASKET MATERIALS

1. Gaskets, rubber and plastic.
2. Packing and gaskets.
3. Packing and seals, mechanical, graphite.
4. Seals, rubber, specially designed.

Dowty Equipment Ltd.
1.2.4.

Firestone Tire & Rubber Canada Ltd.
1.2.

B. F. Goodrich Canada Ltd.
1.4.

Goodyear Tire & Rubber Canada Ltd.
2.

Hassan Steel Fabricators Ltd.
2.

St. Lawrence Mfg. Co. Inc.
4.

Union Carbide Canada Ltd.
3.

Uniroyal (1966) Ltd.
1.4.

Victor Mfg. & Gasket Co. Ltd.
2.

5335 METAL SCREENING

1. Cloth, steel wire.
2. Filters, wire mesh.
3. Metal, expanded.
4. Metal, mesh.
5. Screens.
6. Welded fabric.

Dominion Steel & Coal Corp. Ltd.
6.

Donald Ropes & Wire Cloth Ltd.
1.4.5.

Greening Industries Ltd.
1.4.5.6.

Johnson Wire Products Ltd.
1.2.4.

The Pedlar People Ltd.
3.

5340 MISCELLANEOUS HARDWARE

1. Bolts.
2. Bumpers, rubber.
3. Bushing blanks, multiapplication.
4. Castors, metal wheel.
5. Castors, plastic wheel.
6. Die cast items.
7. Hinges.
8. Knobs.
9. Locks, luggage.
10. Locks and lock sets.
11. Mountings, rubber.
12. Springs, coil.

13. Springs flat.
14. Springs, multiapplication.

Wallace Barnes Co. Ltd.
12.13.14.

Canadian General Electric (Plastics)
5.

Clinton Products (Canada) Ltd.
4.

Dominion Lock Co. Ltd.
6.10.

Firestone Tire & Rubber Canada Ltd.
2.11.

B. F. Goodrich Canada Ltd.
2.11.

Harrington Tool & Die Co. Ltd.
3.

Metalite Co. Ltd.
7.

15. Springs, torsion bars.

O. & W. Electronics Ltd.
8.

Ontario Steel Products Co. Ltd.
12.13.14.15.

Rollit Products Ltd.
1.8.

St. Lawrence Mfg. Co. Inc.
9.

N. Slater Co.
1.

The Steel Co. of Canada Ltd.
1.

Uniroyal (1966) Ltd.
2.11.

Universal Die & Tool Mfg. Ltd.
7.

5345 DISKS AND STONES, ABRASIVE

1. Wheels, grinding.

Canadian Carborundum Co. Ltd.
1.

2. Wheels, grinding, diamond.

Delro Industries Ltd.
2.

5350 ABRASIVE MATERIALS

1. Abrasives, fine alumina.
2. Abrasives, resistant coatings.

Canadian Carborundum Co. Ltd.
4.

3. Corundum, synthetic.
4. Silicon Carbide, KT.

Union Carbide Canada Ltd.
1.2.3.

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.

Hamilton Porcelains Ltd.
8.

O. & W. Electronics Ltd.
1.2.4.5.7.9.

6. Dials, vernier.
7. Knobs and dials.
8. Knobs and pointers, ceramic.
9. Panels, edge light, multiapplication.

Ranar Industries Ltd.
7.

Smith & Stone Ltd.
8.

Sperry Gyroscope Ottawa Ltd.
9.

GROUP 54

PREFABRICATED STRUCTURES AND SCAFFOLDING

5410 PREFABRICATED AND PORTABLE BUILDINGS

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.**
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.
2.11.

Burrard Dry Dock Co. Ltd.
5.

Canada Iron Foundries (West. Bridge)
1.

Canadair Ltd.
4.

Canadian General Electric (Plastics)
11.

Dominion Aluminum Fabricating Ltd.
2.5.

Dosco Industries Ltd.
1.9.11.

Firestone Tire & Rubber Canada Ltd.
10.12.

Fleet Manufacturing Ltd.
12.

Hall Machinery Ltd.
9.

Klassen Homes Ltd.
1.3.7.8.

Magline of Canada Ltd.
11.

Polyfiber Ltd.
12.

Somerville Industries Ltd.
6.12.

Uniroyal (1966) Ltd.
6.10.12.

Westeel-Rosco Ltd.
9.11.

Yarrows Ltd.
2.

5420 BRIDGES, FIXED AND FLOATING

1. **Bridge deck, steel.**
2. **Bridges (complete units).**
3. **Bridges, conversion equipment.**
4. **Bridges, floating.**
5. **Bridges, pontoon.**
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.

Canada Iron Foundries (West. Bridge)
6.

Dominion Bridge Co. Ltd.
2.3.6.

Dominion Steel & Coal Corp. Ltd.
2.3.5.6.

Dosco Industries Ltd.
2.6.

Firestone Tire & Rubber Canada Ltd.
7.9.

B. F. Goodrich Canada Ltd.
7.9.

Saskatchewan Steel Fabricators Ltd.
2.6.

Uniroyal (1966) Ltd.
7.9.

Yarrows Ltd.
2.5.6.

5430 STORAGE TANKS

1. **Metal.**
2. **Plastic.**
3. **Tank lining.**
4. **Tanks, liquid storage.**
5. **Tanks, rubber, collapsible.**
6. **Tanks, rubber, storage.**
7. **Tanks, rubber, transportable.**
8. **Tanks, storage, assembled.**
9. **Tanks, storage, steel.**
10. **Tanks, storage, unassembled.**
11. **Tanks, underground storage.**

Babcock-Wilcox & Goldie-McCulloch
1.4.
S. F. Bowser Co. Ltd.
4.
Burrard Dry Dock Co. Ltd.
1.4.8.9.10.11.
Canadian General Electric (Plastics)
2.
Davie Shipbuilding Ltd.
1.4.8.9.11.
Dominion Bridge Co. Ltd.
1.4.8.9.11.
Enamel & Heating Products Ltd.
1.4.
Fairbanks-Morse (Canada) Ltd.
1.4.8.11.
Firestone Tire & Rubber Canada Ltd.
3.5.6.7.
Alexander Fleck Ltd.
1.4.9.10.
Goodyear Tire & Rubber Canada Ltd.
3.5.6.7.
Hassan Steel Fabricators Ltd.
4.9.11.
Horton Steel Works Ltd.
1.4.8.9.11.
James Howden & Parsons of Canada
1.4.8.9.11.
Kingston Shipyards
1.4.9.11.
Marine Industries Ltd.
1.4.8.9.11.
Napanee Industries Ltd.
1.4.11.
National Steel Car Corp. Ltd.
1.9.11.
Northwest Industries Ltd.
2.4.8.11.
Polyfiber Ltd.
2.
Saskatchewan Steel Fabricators Ltd.
1.4.9.11.
Truck Engineering Ltd.
1.9.
Uniroyal (1966) Ltd.
3.5.6.7.
Victoria Machinery Depot Co. Ltd.
1.4.9.11.
Westeel-Rosco Ltd.
1.4.9.11.
The W. C. Wood Co. Ltd.
1.4.8.9.10.11.
Phil Wood Industries Ltd.
1.
Yarrows Ltd.
1.4.8.9.10.11.

5440 SCAFFOLDING EQUIPMENT AND CONCRETE FORMS

1. Forms, concrete.
2. Ladders, extension, aluminum.
3. Ladders, extension, magnesium C1.
4. Ladders, metallic.
5. Scaffolding, steel.
6. Staging, aluminum.

Anthes Imperial Ltd.
5.
Armson Iron Works Ltd.
1.5.
Dominion Bridge Co. Ltd.
5.
Locweld & Forge Products Ltd.
1.4.
Magline of Canada Ltd.
3.4.
Matthew Moody Division
4.
Reynolds Extrusion Co. Ltd.
2.4.6.

5445 PREFABRICATED TOWER STRUCTURES

A.I.M. Steel Ltd.
Canada Iron Foundries (West. Bridge)
Dominion Bridge Co. Ltd.
Alexander Fleck Ltd.
Horton Steel Works Ltd.
Locweld & Forge Products Ltd.
Tower Communications Co. Ltd.
Wind Turbine Co. of Canada Ltd.
Yarrows Ltd.

5450 MISCELLANEOUS PREFABRICATED STRUCTURES

1. Sluice gates.
2. Towers, antenna.
3. Towers, antenna supports.
4. Towers, communication, multi-type.
5. Towers, fractionating.
6. Towers, microwave.
7. Towers, sub-stations.
8. Tramway towers and related equipment.
9. Wind tunnels.

5450 MISCELLANEOUS PREFABRICATED STRUCTURES *(conc.)*

Burrard Dry Dock Co. Ltd.
1.2.4.5.9.

Canada Iron Foundries (West. Bridge)
8.

Canadian Vickers Ltd.
1.4.

Coulter Copper & Brass Co. Ltd.
5.

Davie Shipbuilding Ltd.
2.4.

Dominion Bridge Co. Ltd.
1.2.3.4.9.

Dosco Industries Ltd.
1.2.4.6.

Alexander Fleck Ltd.
2.3.7.8.

Locweld & Forge Products Ltd.
1.2.6.7.8.

Napanee Industries Ltd.
2.

Tower Communications Co. Ltd.
2.3.4.6.7.

Triple-A Mfg. Co. Ltd.
2.

GROUP 55

LUMBER, MILLWORK, PLYWOOD, AND VENEER

5510 LUMBER AND RELATED BASIC WOOD MATERIALS

1. **Logs.**
2. **Lumber, moulding & trim, Douglas Fir.**
3. **Lumber, moulding & trim, Hemlock.**
4. **Piles, wood.**
5. **Plywood, Douglas Fir.**
6. **Plywood, hardwood.**
7. **Plywood, overlaid.**
8. **Plywood, Western White Spruce.**
9. **Poles, wood.**
10. **Roof decking, Cedar.**
11. **Shingles & shakes.**
12. **Timbers, Douglas Fir.**
13. **Timbers, Hemlock.**

Arnott-Smith Export Ltd.
1.4.5.6.7.8.9.10.11.12.

Crown Zellerbach Bldg. Materials
2.3.5.6.7.8.10.12.13.

GROUP 56

CONSTRUCTION AND BUILDING MATERIALS

5640 WALLBOARD, BUILDING PAPER, AND THERMAL INSULATION MATERIALS

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

Acme Asbestos Ltd.
4.5.6.8.9.10.13.14.15.16.17.

H. L. Blachford Ltd.
11.12.

Canadian Technical Tape Ltd.
2.

B. F. Goodrich Canada Ltd.
4.9.12.

Holmes Foundry Ltd.
4.5.7.9.12.

Mansonville Plastics Ltd.
4.

H. I. Thompson Co. of Canada Ltd.
5.

Union Carbide Canada Ltd.
3.

Victor Mfg. & Gasket Co. Ltd.
1.4.12.

Westeel-Rosco Ltd.
18.

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.

Dominion Steel & Coal (Truscon)
2.

General Wire & Cable
2.

Kaiser Aluminum Co.
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.

Dominion Steel & Coal Corp. Ltd.
3.

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.**

5670 ARCHITECTURAL AND RELATED METAL PRODUCTS *(conc.)*

9. Doors, steel.
10. Doors, wire mesh.
11. Flooring, open steel.
12. Frames, magnesium and aluminum.
13. Frames, steel.
14. Frames and sashes, aluminum.
15. Grating, steel.
16. Grills, decorative wire mesh.
17. Grills, wire mesh.
18. Guards, window, wire mesh.
19. Panels, metal.
20. Partitions, steel.
21. Partitions, wire mesh.
22. Stairs, steel.
23. Treads, steel.
24. Troughs, steel.
25. Windows, blast resistant.

Armco Drainage & Metal Products
11.15.

Beclawat (Canada) Ltd.
7.12.14.25.

The Daymond Company Ltd.
12.14.

Dominion Steel & Coal (Truscon)
7.8.9.14.20.

Dominion Steel & Coal Corp. Ltd.
6.12.14.

Eastern Steel Products Co.
6.9.

Hassan Steel Fabricators Ltd.
1.13.19.22.23.24.

Johnson Wire Products Ltd.
10.16.17.18.21.

Kaiser Aluminum Co.
2.3.4.6.7.8.12.14.

Kingston Shipyards
6.7.8.

Magline of Canada Ltd.
12.

National Steel Car Corp. Ltd.
9.

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

Renfrew Aircraft & Engineering Ltd.
2.12.

Reynolds Extrusion Co. Ltd.
2.7.12.14.

Royalmetal Corp. Ltd.
20.

Westeel-Rosco Ltd.
2.5.7.8.9.12.14.20.

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

Canada Iron Foundries (Foundry Div.)
17.

Dominion Steel & Coal (Truscon)
12.

Dominion Steel & Coal Corp. Ltd.
1.12.15.16.

Electrovert Ltd.
2.16.

Enamel & Heating Products Ltd.
1.

Hassan Steel Fabricators Ltd.
4.5.8.9.11.

The Pedlar People Ltd.
3.7.12.14.15.

The Steel Co. of Canada Ltd.
1.10.13.18.19.

Westeel-Rosco Ltd.
6.12.17.

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. Case, telephone.
6. Carrier equipment, telephone and telegraph.
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 wire.
26. Regulators, audio level, telephone.
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.
9.27.30.31.32.39.42.43.

Aviation Electric Ltd.
3.

Bayly Engineering Ltd.
12.28.31.34.35.36.37.43.45.

CAE Industries Ltd.
13.

Canadian General Electric (EDPD)
6.10.12.16.19.22.23.27.34.

Canadian Marconi Co.
29.

Canadian Motorola Electronics Co.
16.24.

Canadian Westinghouse (Electronics)
2.3.44.

C. P. Clare Canada Ltd.
27.

Collins Radio Co. of Canada Ltd.
6.14.16.18.

Computing Devices of Canada Ltd.
7.

ITT Canada Ltd.
6.45.

Lenkurt Electric Co. of Canada Ltd.
6.10.12.16.17.18.19.24.25.27.28.31.34.35.
37.45.

Magline of Canada Ltd.
5.

Marsland Engineering Ltd.
40.

Measurement Engineering Ltd.
1.3.23.27.29.30.31.32.

R. H. Nichols Co. Ltd.
14.

Northern Electric Co. Ltd.
6.8.9.10.11.12.13.16.17.18.20.21.22.23.24.
25.27.28.29.30.31.32.33.38.39.42.43.45.

O. & W. Electronics Ltd.
9.

Philips Electronics Industries Ltd.
1.14.15.20.23.30.35.36.37.38.

Powertronic Equipment Ltd.
23.31.

RCA Victor Co. Ltd.
1.3.4.6.8.18.19.20.21.22.26.29.33.

Radio Engineering Products
1.2.6.10.11.12.14.15.16.18.20.23.26.28.32.
40.41.44.45.

Raytheon Canada Ltd.
1.23.24.

T.M.C. (Canada) Ltd.
1.6.8.14.15.18.19.22.23.24.29.30.

Topping Electronics Ltd.
8.

5810 COMMUNICATIONS SECURITY EQUIPMENT AND COMPONENTS

1. Coders, audio frequency.

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

2. Indicators, code, teletype.

RCA Victor Co. 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 (Electronics)
2.3.
Chisholm Industries Ltd.
1.
Collins Radio Co. of Canada Ltd.
6.10.
Computing Devices of Canada Ltd.
7.15.
Guideline Instruments Ltd.
2.
Lenkurt Electric Co. of Canada Ltd.
1.4.10.

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

Northern Electric Co. Ltd.
6.8.10.11.12.13.
Philips Electronics Industries Ltd.
11.
Presentey Engineering Products Ltd.
5.
RCA Victor Co. Ltd.
1.3.6.10.11.12.
Raytheon Canada Ltd.
4.
Sangamo Co. Ltd.
6.
T.M.C. (Canada) Ltd.
4.6.10.14.

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. Controls, remote.
11. Consoles, electronic.
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 converter, 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, receivers.
50. Modulator, radio transmitters.
51. Monitor, error voltage.
52. Monitor, phase.
53. Oscillator, 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. Receiving sets, panoramic data.
66. Receiver-transmitters, radio.
67. Receiving sets, telemetric data.
68. Recorders, radio frequency.
69. Repeaters, radio.
70. Restorers, pulse form.
71. Routing equipment, automatic.
72. Telemetering systems.
73. Selector control, sub-assemblies.
74. Television sets.
75. Television systems, closed circuit.
76. Transmitters, radio.
77. Transmitters, single band.
78. Tuners, radio frequency.

Airtron Canada Ltd.
8.

Bayly Engineering Ltd.
19.22.

Beaconing Optical & Precision Materiels
4.8.9.25.37.39.64.66.77.78.

Burroughs Business Machines Ltd.
9.

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 (EDPD)
11.42.57.58.62.63.66.69.72.75.76.

Canadian General Electric (Meter & Inst.)
72.

Canadian Marconi Co.
4.34.35.36.58.62.63.64.66.69.76.78.

Canadian Motorola Electronics Co.
7.12.62.63.66.69.75.

Canadian Westinghouse (Electronics)
1.3.7.9.11.12.23.34.38.41.42.58.67.76.

Central Dynamics Ltd.
3.4.5.58.

Chisholm Industries Ltd.
58.64.76.

Collins Radio Co. of Canada Ltd.
3.4.5.8.9.10.13.20.22.27.28.29.30.31.32.
42.43.45.49.50.54.55.62.63.64.66.67.72.
76.77.78.

Computing Devices of Canada Ltd.
71.

De Havilland Aircraft (SPAR)
58.72.

Desitron Company Ltd.
8.22.25.

Edo (Canada) Ltd.
19.22.

Electronic & Microwave Laboratories
8.21.22.23.

Ferranti Electronics
12.58.

Fleet Manufacturing Ltd.
11.

General Precision Industries Ltd.
64.

Guideline Instruments Ltd.
4.

ITT Canada Ltd.
30.31.32.49.50.76.

George Kelk Ltd.
72.

Lenkurt Electric Co. of Canada Ltd.
28.32.42.58.64.69.70.72.76.

Marsland Engineering Ltd.
4.9.

Measurement Engineering Ltd.
3.4.9.10.11.49.50.57.58.73.77.

Milltronics Ltd.
11.56.

R. H. Nichols Co. Ltd.
5.9.10.12.72.73.

Northern Electric Co. Ltd.
1.2.3.6.8.11.14.15.16.17.18.20.21.23.24.
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.

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

O. & W. Electronics Ltd.
56.

Philips Electronics Industries Ltd.
4.5.9.11.15.34.47.50.53.55.56.57.66.72.74.
76.78.

Presentey Engineering Products Ltd.
5.60.

RCA Victor Co. Ltd.
2.6.7.9.11.15.22.25.26.27.28.29.32.34.35.
45.47.49.53.54.55.56.64.66.67.69.73.74.
75.76.78.

Raytheon Canada Ltd.
2.4.7.9.11.37.42.45.48.50.58.66.67.75.76.
77.78.

C. R. Snelgrove Co. Ltd.
27.

Syntron (Canada) Ltd.
58.

T.M.C. (Canada) Ltd.
4.10.11.13.20.22.27.28.29.30.31.32.43.47.
48.49.50.51.52.55.57.58.62.63.64.66.76.
77.78.

Topping Electronics Ltd.
9.15.27.28.30.31.32.43.45.49.53.55.63.64.
78.

Valeriote 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. Analyzers, 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.
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, trans.
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. Modulation eliminators.
43. Modulator, oscillators.
44. Modulator, power supplies.
45. Modulator, receivers.
46. Modulator, radio transmitters.
47. Monitor error voltage.
48. Monitor phase.
49. Mixer stages, frequency.
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, television.
61. Receiving sets, telemetric data.
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.

Airtron Canada Ltd.
6.41.

Aviation Electric Ltd.
9.

Bayly Engineering Ltd.
54.

Beaconing Optical & Precision Materials
1.6.7.10.22.36.58.70.71.

Bogue Electric of Canada Ltd.
25.
Bristol Aerospace Ltd.
7.8.69.
Burroughs Business Machines Ltd.
7.
CAE Industries Ltd.
2.4.7.17.19.20.24.25.26.27.28.29.30.34.36.
42.43.44.45.46.49.56.57.
Canadian General Electric (EDPD)
8.55.
Canadian Marconi Co. Ltd.
1.7.8.30.31.32.33.36.55.58.59.64.70.71.
Canadian Motorola Electronics Ltd.
8.59.64.70.71.
Canadian Westinghouse (Electronics)
1.2.3.4.5.7.8.21.31.35.39.55.61.70.
Chisholm Industries Ltd.
55.
Collins Radio Co. of Canada Ltd.
1.4.6.7.10.17.24.25.26.27.28.29.35.36.43.
44.45.46.49.51.52.55.58.59.70.71.
Computing Devices of Canada Ltd.
8.9.36.69.70.
De Havilland Aircraft (SPAR)
55.69.
Desitron Company Ltd.
6.22.
Electronic & Microwave Laboratories
6.18.19.
Ferranti Electronics
11.55.
Fleet Manufacturing Ltd.
1.7.46.70.71.
Garrett Manufacturing Ltd.
70.
General Precision Industries Ltd.
58.
Guildline Instruments Ltd.
1.
ITT Canada Ltd.
46.
International Business Machines
8.9.10.11.12.
George Kelk Ltd.
69.
Lenkurt Electric Co. of Canada Ltd.
25.29.55.58.64.65.70.
Marsland Engineering Ltd.
71.
Measurement Engineering Ltd.
9.58.70.
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.
53.54.55.58.59.61.63.65.70.71.
O. & W. Electronics Ltd.
53.
Philips Electronics Industries Ltd.
1.7.46.70.71.
Presentey Engineering Products Ltd.
62.67.68.
RCA Victor Co. Ltd.
2.3.4.5.6.7.9.11.13.17.18.19.20.22.23.24.
25.26.27.28.29.31.32.42.45.49.50.51.52.
53.54.58.59.60.61.66.70.71.
Raytheon Canada Ltd.
1.5.7.9.46.49.
Sangamo Co. Ltd.
55.
Topping Electronics Ltd.
1.7.13.25.26.27.28.29.40.45.
49.50.51.58.61.71.
Valeriote Electronics Ltd.
1.

5825 RADIO NAVIGATION EQUIPMENT, EXCEPT AIRBORNE

1. **Amplifiers, audio and radio frequency.**
2. **Amplifiers, direct current.**
3. **Amplifiers, power supply.**
4. **Beacon sets, radio.**
5. **Blanker, interference, radar.**
6. **Boards, plotting.**
7. **Cavities, tuned.**
8. **Coders, audio frequency.**
9. **Coders, radio beacon.**
10. **Computers, navigational.**
11. **Consoles, electronic.**
12. **Converter, group signal data.**
13. **Converters, analogue to digital.**
14. **Co-ordinate data systems.**
15. **Couplers, keyer.**
16. **Detectors, video signal.**
17. **Direction finder sets.**
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 beacon.**
31. **Homing sets, radio, non-airborne**
32. **Indicators, azimuth and panoramic.**
33. **Indicators, control groups.**

5825 RADIO NAVIGATION EQUIPMENT, EXCEPT AIRBORNE *(conc.)*

34. Indicators, flight command, azimuth-distance.
35. Indicators, frequency channel.
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. Monitor, radio frequency.
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. Receivers, loran.
56. Receivers-transmitters, loran.
57. Receivers-transmitters, radio.
58. Receiving sets, panoramic data.
59. Selector control subassys.
60. Simulators.
61. Transmitters.
62. Transmitters, beacon.
63. Transmitters, radio.
64. Tuners, radio frequency.

Airtron Canada Ltd.
7.38.

Aviation Electric Ltd.
6.10.

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.

Canadian General Electric (EDPD)
4.11.53.

Canadian Marconi Co.
1.4.9.10.17.26.27.28.29.30.31.53.57.
61.63.64.

Canadian Research Institute
13.

Canadian Westinghouse (Electronics)
1.2.3.27.31.33.36.53.63.

Chisholm Industries Ltd.
53.

Computing Devices of Canada Ltd.
10.17.

DeHavilland Aircraft (SPAR)
53.

Desitron Company Ltd.
7.18.

E.M.I. — Cossor Electronics Ltd.
4.

Edo (Canada) Ltd.
55.

Electronic & Microwave Laboratories
7.16.39.

Ferranti Electronics
53.

Fleet Manufacturing Ltd.
11.

General Precision Industries Ltd.
17.

ITT Canada Ltd.
63.

International Business Machines
10.11.12.13.14.

Leigh Instruments Ltd.
4.

Lenkurt Electric Co. of Canada Ltd.
22.25.53.

Litton Systems (Canada) Ltd.
10.63.

Marsland Engineering Ltd.
1.11.

Measurement Engineering Ltd.
1.2.3.4.11.47.52.61.63.

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.
44.45.46.48.49.50.51.52.53.57.58.61.64.

O. & W. Electronics Ltd.
51.

Philips Electronics Industries Ltd.
1.4.9.11.15.27.43.48.50.52.53.63.64.

RCA Victor Co. 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.
56.57.59.62.64.

Raytheon Canada Ltd.
1.4.8.9.11.31.37.39.43.53.57.60.61.62.64.

Sangamo Co. Ltd.
53.

Sperry Gyroscope Co. of Canada Ltd.
10.

Stewart-Warner Corp. Ltd.
9.

Syntron (Canada) Ltd.
53.

Topping Electronics Ltd.
1.4.11.20.22.23.24.25.44.47.48.49.50.62.

Valeriote Electronics Ltd.
1.

5826 RADIO NAVIGATION EQUIPMENT, AIRBORNE

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

Airtron Canada Ltd.
6.38.

Aviation Electric Ltd.
10.33.47.

CAE Industries Ltd.
2.3.4.8.12.14.20.21.22.23.24.25.26.30.
33.34.35.39.40.41.42.43.44.45.54.55.

Canadian General Electric (EDPD)
8.53.

Canadian Marconi Co.
1.8.10.26.27.28.29.30.41.47.53.58.62.63.

Canadian Westinghouse (Electronics)
1.2.3.8.27.30.32.36.53.62.

Collins Radio Co. of Canada Ltd.
30.

Computing Devices of Canada Ltd.
8.10.16.17.31.32.33.47.61.

De Havilland Aircraft (SPAR)
30.35.53.

Desitron Co. Ltd.
6.18.

E.M.I. — Cossor Electronics Ltd.
55.

Edo (Canada) Ltd.
56.

Electronic & Microwave Laboratories
6.

Ferranti Electronics
53.

Fleet Manufacturing Ltd.
9.

ITT Canada Ltd.
62.

International Business Machines
8.9.10.11.12.

Leigh Instruments Ltd.
34.55.62.

Lenkurt Electric Co. of Canada Ltd.
22.25.53.

Litton Systems (Canada) Ltd.
2.4.8.10.

Marsland Engineering Ltd.
1.

5826 RADIO NAVIGATION EQUIPMENT, AIRBORNE *(conc.)*

Northern Electric Co. Ltd.
2.3.6.12.13.15.20.21.22.23.24.25.27.28.
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.
1.27.43.48.50.62.63.

RCA Victor Co. Ltd.
2.3.5.6.11.12.13.14.15.18.19.20.21.22.
23.24.25.27.28.30.39.40.44.48.49.50.51.
52.56.57.58.60.62.63.

Raytheon Canada Ltd.
1.7.9.39.41.43.

Sangamo Co. Ltd.
53.

Sperry Gyroscope Co. of Canada Ltd.
47.

Topping Electronics Ltd.
1.9.20.22.23.24.25.44.48.50.55.

Valeriote Electronics Ltd.
1.

5830 INTERCOMMUNICATION AND PUBLIC ADDRESS SYSTEMS, EXCEPT AIRBORNE

1. **Amplifiers, audio and radio frequency.**
2. **Amplifiers, direct current.**
3. **Amplifiers, power supply.**
4. **Consoles.**
5. **Frequency multipliers.**
6. **Intercom systems.**
7. **Intercommunication sets.**
8. **Megaphones, electronic.**
9. **Panels, indicator.**
10. **Public address systems.**
11. **Selector control subassemblies.**

Aviation Electric Ltd.
4.

Bayly Engineering Ltd.
5.

Canadian Marconi Co.
6.10.

Central Dynamics Ltd.
1.3.10.

Chisholm Industries Ltd.
10.

Electro-Vox Inc.
5.6.8.10.

Fleet Manufacturing Ltd.
4.

Marsland Engineering Ltd.
1.3.6.11.

Measurement Engineering Ltd.
1.3.4.8.10.

Milltronics Ltd.
4.9.

Northern Electric Co. Ltd.
3.7.9.10.

O. & W. Electronics Ltd.
9.

RCA Victor Co. Ltd.
2.7.10.11.

Raytheon Canada Ltd.
1.4.

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.**
6. **Intercommunication sets.**
7. **Megaphones, electronic.**
8. **Panels, indicator.**
9. **Public address systems.**
10. **Selector control subassemblies.**

Canadian Marconi Co.
5.9.

Collins Radio Co. of Canada Ltd.
1.3.5.6.

Electro-Vox Inc.
5.7.9.

Fleet Manufacturing Ltd.
4.

Marsland Engineering Ltd.
1.3.5.6.8.9.

Measurement Engineering Ltd.
4.

Northern Electric Co. Ltd.
3.6.8.9.

O. & W. Electronics Ltd.
8.

RCA Victor Co. Ltd.
2.6.9.10.

Raytheon Canada Ltd.
1.4.

Topping Electronics Ltd.
7.

5835 SOUND RECORDING AND REPRODUCING EQUIPMENT

1. Amplifiers, power supply.
2. Amplifiers, transistorized, audio.
3. Erasers, magnetic.
4. Magnetic tape scanner reproducer.
5. Power supplies.
6. Recorder, reproducer, tape.
7. Reproducer, sound.
8. Rewinders, recording tape, sound.
9. Tape readers, high speed.

Chisholm Industries Ltd.
5.

Electro-Vox Inc.
2.

Leigh Instruments Ltd.
2.6.

Lenkurt Electric Co. of Canada Ltd.
1.5.

Marsland Engineering Ltd.
2.5.7.

Northern Electric Co. Ltd.
1.5.

Presentey Engineering Products Ltd.
4.6.7.

RCA Victor Co. Ltd.
3.8.

Sangamo Co. Ltd.
5.

Sperry Gyroscope Co. of Canada Ltd.
9.

Syntron (Canada) Ltd.
5.

T.M.C. (Canada) Ltd.
1.5.

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. Co-ordinate data systems.
10. Consoles, electronic.
11. Controls, remote operation.
12. Converters, group signal data.
13. Converters, video.
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 and 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. Modulator, 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. Restorers, pulse form.
72. Recorders, radio frequency.
73. Receiving sets, radar.
74. Receiver-transmitters, radar.
75. Scanners, light generating.
76. Selectors, trigger, video signal.
77. Simulators.
78. Simulators, radar target.
79. Target discriminator groups.
80. Transmitters, co-ordinate data radar.

5840 RADAR EQUIPMENT, EXCEPT AIRBORNE *(conc.)*

81. Transmitters.
82. Tuners, radio frequency.

Abex Industries of Canada Ltd.
20.

Airtron Canada Ltd.
6.

Beaconing Optical & Precision Materials
11.12.26.38.42.67.73.74.81.82.83.

Bogue Electric of Canada Ltd.
28.60.

CAE Industries Ltd.
5.7.9.13.22.23.28.29.30.31.32.34.38.39.
41.49.50.51.52.53.54.55.61.62.64.65.66.
67.68.69.70.73.78.79.81.

Canadian General Electric (EDPD)
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.
1.33.34.35.36.37.60.64.67.68.70.73.74.
81.82.

Canadian Motorola Electronics Ltd.
11.

Canadian Westinghouse (Electronics)
2.4.8.10.15.25.37.40.45.46.52.55.60.66.
67.68.70.73.74.78.79.80.81.

De Havilland Aircraft (SPAR)
60.

Desitron Company Ltd.
6.14.24.26.

E.M.I. — Cossor Electronics Ltd.
63.

Electronic & Microwave Laboratories
3.6.14.21.22.23.24.28.49.

W. R. Elliott Ltd.
83.

Ferranti Electronics Ltd.
11.20.25.55.60.

Fleet Manufacturing Ltd.
10.83.

ITT Canada Ltd.
52.67.81.

83. Turntables, radar set.

International Business Machines
8.9.10.11.12.

Lenkurt Electric Co. of Canada Ltd.
60.

Marsland Engineering Ltd.
14.35.

Microwave Devices Inc.
14.

Milltronics Ltd.
59.

Northern Electric Co. Ltd.
2.3.4.5.6.9.15.17.18.19.26.28.29.30.31.
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 Victor Co. Ltd.
2.3.4.6.7.9.12.14.16.21.24.26.27.28.29.
30.31.32.33.35.36.47.48.49.52.53.55.56.
57.58.59.66.67.68.69.70.73.75.76.78.79.
80.81.82.

Raytheon Canada Ltd.
5.7.8.10.13.16.18.19.25.35.38.47.48.49.
52.53.65.67.68.70.73.74.78.79.81.

Sangamo Co. Ltd.
60.

Sperry Gyroscope Co. of Canada Ltd.
78.

Stewart-Warner Corp. Ltd.
20.

Syntron (Canada) Ltd.
60.

Topping Electronics Ltd.
1.10.

Valeriote Electronics Ltd.
1.

York Gears Ltd.
83.

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.
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.

Abex Industries of Canada Ltd.
18.

Airtron Canada Ltd.
6.46.

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 (EDPD)
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 (Electronics)
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.

De Havilland Aircraft (SPAR)
37.40.59.

Desitron Company Ltd.
6.13.21.24.46.

E.M.I. — Cossor Electronics Ltd.
62.

Electronic & Microwave Laboratories
6.13.19.20.21.46.48.77.

Ferranti Electronics
18.54.59.

Fleet Manufacturing Ltd.
9.

ITT Canada Ltd.
51.63.64.66.79.

International Business Machines
8.12.

Lenkurt Electric Co. of Canada Ltd.
59.

Litton Systems (Canada) Ltd.
7.

Microwave Devices Inc.
13.

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.

5841 RADAR EQUIPMENT, AIRBORNE *(conc.)*

O. & W. Electronics Ltd.
58.

Philips Electronic Industries Ltd.
31.32.33.

RCA Victor Co. 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.

Sperry Gyroscope of Canada Ltd.
8.38.77.

Stewart-Warner Corp. of Canada Ltd.
18.

Topping Electronics Ltd.
1.

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

Almax Ceramic Industries Ltd.
12.

Aviation Electric Ltd.
26.

Bogue Electric of Canada Ltd.
5.7.19.

CAE Industries Ltd.
6.7.8.20.

Canadian General Electric (EDPD)
3.19.23.24.25.26.28.31.32.

Canadian Marconi Co.
9.10.11.33.

Canadian Westinghouse (Electronics)
2.3.9.13.16.19.20.24.25.29.31.32.

Computing Devices of Canada Ltd.
3.26.27.32.34.

Davie Shipbuilding Ltd.
23.

Dominion Bridge Co. Ltd.
30.

E.M.I. — Cossor Electronics Ltd.
25.26.29.30.31.32.

Edo (Canada) Ltd.
2.4.14.20.24.25.26.28.29.31.32.

Fleet Manufacturing Ltd.
5.23.

Gulton Industries (Canada) Ltd.
12.

International Business Machines
3.

Marsland Engineering Ltd.
4.5.23.24.25.26.

Northern Electric Co. Ltd.
1.17.18.21.33.

RCA Victor Co. Ltd.
10.11.15.17.22.

Raytheon Canada Ltd.
1.4.14.19.26.34.

Sangamo Co. Ltd.
19.

Sparton of Canada Ltd.
25.30.

Syntron (Canada) Ltd.
19.

5850 VISIBLE AND INVISIBLE LIGHT COMMUNICATION EQUIPMENT

1. **Homing sets, infra-red.**
2. **Infra-red systems.**
3. **Modulator, oscillators.**
4. **Modulator, power supplies.**
5. **Optical systems, infra-red receiver.**
6. **Receiver-transmitter, I. R.**

Canadian General Electric (EDPD)
2.3.4.6.

Computing Devices of Canada Ltd.
2.

De Havilland Aircraft (SPAR)
1.2.5.6.

Ernst Leitz Canada Ltd.
5.

RCA Victor Co. Ltd.
6.

5855 NIGHT VISION EQUIPMENT, EMITTED AND REFLECTED RADIATION

1. **Barrels, condenser, lens.**
2. **Bezels, infrared filter.**
3. **Binoculars, driver's, infrared, helmet mounted.**
4. **Binoculars, image intensifier.**
5. **Binoculars, image intensifier, driving.**
6. **Binoculars, infrared, handheld.**
7. **Binoculars, infrared, helmet mounted.**
8. **Binoculars, night vision.**
9. **Cell assemblies, reticle objectives, passive sight.**
10. **Cells, eccentric.**
11. **Cells, eyepiece.**
12. **Cells, lens.**
13. **Cells, reticle, objective, passive sight.**
14. **Collimators, handheld infrared binocular.**
15. **Collimators, helmet mounted infrared binocular.**
16. **Collimators, image intensifier binocular.**
17. **Collimators, image intensifier goggles.**
18. **Detecting sets, I. R.**
19. **Doublet assemblies, objective.**
20. **Eyepiece assemblies.**
21. **Filters, infrared.**
22. **Lenses, eyepiece.**
23. **Lenses, objective.**
24. **Lenses, retainer, objective.**
25. **Lenses, reticle.**
26. **Lens and prism assemblies, reticle projector.**
27. **Lens-filters, infrared.**
28. **Mirrors, reticle projector.**
29. **Modulator-receivers, I. R.**
30. **Objective lens assemblies.**
31. **Periscopes, tank driving, infrared.**
32. **Projector reticle assemblies.**
33. **Range finders, infrared system.**
34. **Receiver-transmitter, I. R.**
35. **Sights, night vision.**
36. **Sniperscopes, infrared.**
37. **Starlight scopes.**
38. **Weaponsights, infrared.**

Canadian General Electric (EDPD)
18.29.31.

Computing Devices of Canada Ltd.
18.

De Havilland Aircraft (SPAR)
18.29.

RCA Victor Co. Ltd.
34.

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.
32.33.34.35.36.37.38.

5860 STIMULATED COHERENT RADIATION DEVICES, COMPONENTS, AND ACCESSORIES

1. **Exciters, laser.**
2. **Infrared optics (synthetic sapphire).**
3. **Infrared systems.**
4. **Lasers, gas.**
5. **Modulators, laser.**

Union Carbide Canada Ltd.
2.

Canadian General Electric (EDPD)
3.

Computing Devices of Canada Ltd.
3.

De Havilland Aircraft (SPAR)
3.

Ernst Leitz Canada Ltd.
1.4.5.

5895 MISCELLANEOUS COMMUNICATION EQUIPMENT

1. **Amplifiers, audio and radio frequency.**
2. **Amplifiers, direct current.**
3. **Amplifiers, power supply.**
4. **Cavities, tuned.**
5. **Chaff.**

5895 MISCELLANEOUS COMMUNICATION EQUIPMENT *(conc.)*

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, multiapplication.**
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 and 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.**
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, multiapplication.**
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 subassemblies.**
71. **Servo amplifiers.**
72. **Simulators-countermeasures signals.**
73. **Transmitters, countermeasure.**
74. **Transmitters, countermeasure, training.**
75. **Transmitters, radio.**
76. **Tuners, radio frequency.**

Airtron Canada Ltd.
22.69.

Bayly Engineering Ltd.
1.

Beaconing Optical & Precision Materials
1.4.6.8.12.22.35.39.75.76.

Bogue Electric of Canada Ltd.
60.

Bristol Aerospace Ltd.
69.

Burroughs Business Machines Ltd.
6.

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.

CTS of Canada Ltd.
3.60.

Canada Foils Ltd.
5.

Canadian General Electric (EDPD)
1.3.7.9.10.11.12.14.15.17.18.19.31.33.
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.
75.76.

Canadian General Electric (Plastics)
69.

Canadian Marconi Co.
1.7.8.25.31.32.33.34.35.36.37.64.66.75.
76.

Canadian Motorola Electronics Co.
1.8.64.66.75.76.

Canadian Vickers Ltd.
69.

Canadian Westinghouse (Electronics)
1.2.3.20.31.34.38.42.43.47.48.50.60.63.
72.75.

Central Dynamics Ltd.
1.3.

Chisholm Industries Ltd.
60.

Collins Radio Co. of Canada Ltd.
1.4.8.66.75.

Computing Devices of Canada Ltd.
9.10.11.17.18.20.67.68.71.

De Havilland Aircraft (SPAR)
60.

Desitron Co. Ltd.
4.22.

Dominion Tool and Metal Products Ltd.
6.

E.M.I. — Cossor Electronics Ltd.
8.

Electronic & Microwave Laboratories
4.45.

Ferranti Electronics
17.18.20.60.

Fleet Manufacturing Ltd.
11.69.

General Precision Industries Ltd.
19.63.66.

ITT Canada Ltd.
1.14.19.21.42.

International Business Machines
8.9.10.11.12.13.14.15.17.18.20.21.

Johnson Wire Products
69.

Leigh Instruments Ltd.
68.

Lenkurt Electric Co. of Canada Ltd.
1.4.8.12.47.49.54.58.60.66.75.

Measurement Engineering Ltd.
1.3.6.11.60.

Milltronics Ltd.
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.
29.30.31.32.33.34.35.36.37.38.39.41.42.
43.44.45.46.47.48.50.52.53.55.56.57.59.
60.63.64.65.67.68.73.76.

Philips Electronics Industries Ltd.
1.6.8.11.32.33.47.53.56.59.64.66.75.76.

RCA Victor Co. 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
8.

Raytheon Canada Ltd.
1.7.11.14.15.18.38.41.43.60.72.

Renfrew Aircraft and Engineering Ltd.
6.

Sangamo Co. Ltd.
60.

Sinclair Radio Laboratories Ltd.
24.

Sperry Gyroscope Co. of Canada Ltd.
72.

Standard Television Products Ltd.
61.

Stark Electronic Instruments Ltd.
57.

Stewart-Warner Corp. Ltd.
7.42.43.

Syntron (Canada) Ltd.
60.

T.M.C. (Canada) Ltd.
1.8.11.40.47.48.49.50.51.52.56.58.59.60.
63.64.66.73.75.

Topping Electronics Ltd.
1.6.25.26.28.29.30.35.45.50.53.56.66.

Valeriote Electronics Ltd.
1.

GROUP 59

ELECTRICAL AND ELECTRONIC EQUIPMENT COMPONENTS

5905 RESISTORS

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

Airtron Canada Ltd.
1.2.

Amphenol Canada Ltd.
4.6.

Beckman Instruments (Helipot Div.)
7.

Bourns (Canada) Ltd.
3.4.6.7.

CTS of Canada Ltd.
3.6.

Canada Precision Devices Ltd.
3.4.5.6.7.

Canadian General Electric (Apparatus)
17.

Canadian Research Institute
19.

Canadian Stackpole Ltd.
9.

Constanta Co. of Canada Ltd.
9.10.

Dale Electronics Canada Ltd.
5.8.12.13.16.17.

Daystrom Ltd.
4.7.8.

Electronic & Microwave Laboratories
1.2.

Guildline Instruments Ltd.
4.

IRC Resistors
9.10.11.15.16.17.18.20.21.22.

Marsland Engineering Ltd.
16.17.21.22.23.

Microwave Devices Inc.
1.2.

Muirhead Instruments Ltd.
17.

Northern Electric Co. Ltd.
10.16.

Precision Electronic Components Ltd.
8.19.

Welwyn Canada Ltd.
1.9.10.11.12.13.14.15.18.

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.**
14. **Capacitors, high frequency.**
15. **Capacitors, power.**
16. **Capacitors, tantalum.**
17. **Capacitors, variable.**
18. **Capacitors, variable, ceramic, dielectric.**
19. **Capacitors, variable, tuning.**

Aerovox Canada Ltd.
5.7.9.12.13.
Airtron Canada Ltd.
1.
Canadian General Electric (EDPD)
2.4.5.16.
Canadian Westinghouse (Distribution Apparatus)
4.6.14.15.
Capacitors of Canada Ltd.
3.8.9.11.13.
Electronic & Microwave Laboratories
1.
Erie Technological Products Ltd.
7.10.16.18.
Essex Electronics of Canada Ltd.
7.
Hammond Mfg. Co. Ltd.
17.19.
I.T.E. Circuit Breaker (East. Power Devices)
15.
Johnson Matthey & Mallory Ltd.
5.16.
Marsland Engineering Ltd.
17.
Northern Electric Co. Ltd.
1.10.12.19.
Radio Condenser Co. Ltd.
12.17.19.
Sprague-TCC (Canada) Ltd.
5.16.

5915 FILTERS AND NETWORKS

1. Circuits, logic, computer.
2. Circuits, potted, subassemblies.
3. Circuits, symbol, generating.
4. Discriminators.
5. Filter diplexers and multicouplers.
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.
14. Filters, radio interference.
15. Filters, tone.
16. Filters, UHF and 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.

Airtron Canada Ltd.
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 (Electronics)
7.13.17.18.20.21.22.23.24.25.
Collins Radio Co. of Canada Ltd.
7.9.11.
Computing Devices of Canada Ltd.
1.2.3.19.
Desitron Company Ltd.
4.7.13.17.
Electronic & Microwave Laboratories
4.8.9.10.11.13.18.20.21.22.
Erie Technological Products Ltd.
6.14.
Essex Electronics of Canada Ltd.
7.8.9.11.12.15.21.24.25.
Ferritronics Ltd.
4.6.8.9.10.11.12.15.19.21.22.23.24.25.26.
ITT Canada Ltd.
19.
Lenkurt Electric Co. of Canada Ltd.
6.19.
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.
RCA Victor Co. Ltd.
4.7.8.9.13.16.18.19.
Radio Engineering Products
6.19.
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.
6.7.8.
Stewart-Warner Corp. Ltd.
19.
T.M.C. (Canada) Ltd.
6.7.8.9.11.12.19.
Valeriote Electronics Ltd.
16.

5920 FUSES AND LIGHTNING ARRESTERS

1. Boxes, fuse.
2. Fuses.
3. Fuses, link.
4. Fuseholders.
5. Lightning arresters.
6. Protectors, telephone.

Amalgamated Electric Corp. Ltd.
1.4.

CLM Industries
2.3.4.5.

Canadian General Electric (Distribution and Specialty Trans.)
2.3.5.

Canadian Ohio Brass Co. Ltd.
2.5.

Canadian Westinghouse (Distribution Apparatus)
2.5.

Crompton Parkinson Electrical
3.

Electrical Mfg. Co. Ltd.
2.3.4.

Federal Pacific Electric of Canada
3.4.

I-T-E Circuit Breaker (Bulldog Electric)
2.

I-T-E Circuit Breaker (East. Power Devices)
2.

Northern Electric Co. Ltd.
6.

S & C Electric Canada Ltd.
5.

5925 CIRCUIT BREAKERS

1. Circuit breakers.
2. Circuit breakers up to 5000V.
3. Distribution cutouts (up to 15 KV).

Bogue Electric of Canada Ltd.
1.

CLM Industries
1.2.3.

Canadian General Electric (Apparatus)
1.3.

Canadian Westinghouse (Apparatus)
1.3.

Canadian Westinghouse (Distribution Apparatus)
1.2.

A. B. Chance Co.
3.

Dominion Cutout Ltd.
3.

Electrical Mfg. Co. Ltd.
1.2.

Federal Pacific Electric of Canada
2.

I-T-E Circuit Breaker (Bulldog Electric)
1.

I-T-E Circuit Breaker (East. Power Devices)
1.2.

Kearney National (Canada) Ltd.
3.

Pioneer Electric Brandon Ltd.
1.2.3.

S & C Electric Canada Ltd.
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, miniature.
12. Switches, pressure.
13. Switches, printed circuit.
14. Switches, push button.
15. Switches, rotary.
16. Switches, sensitive, pushbutton.
17. Switches, slide.
18. Switches, sub-miniature.
19. Switches, temperature.
20. Switches, thumbwheel.
21. Switches, toggle.
22. Switches, transfer, automatic.
23. Thermostats, bi-metal.
24. Thermostats, hydraulic.

Aircraft Appliances & Equipment
12.

Allen-Bradley Canada Ltd.
12.19.22.

Amalgamated Electric Corp. Ltd.
1.

Amphenol Canada Ltd.
3.

Bedard-Girard Ltd.
1.

CTS of Canada Ltd.
15.

Canadian General Electric (Apparatus)
8.11.15.16.19.

Canadian Stackpole Ltd.
27.

Crompton Parkinson Electrical
15.

Electrical Mfg. Co. Ltd.
1.15.

I-T-E Circuit Breaker (Bulldog Electric)
6.7.

I-T-E Circuit Breaker (East. Power Devices)
2.6.7.15.19.

Licon
11.

Muirhead Instruments Ltd.
10.15.

Northern Electric Co. Ltd.
4.10.15.

Oak-Hart Mfg. (Canada) Ltd.
5.9.13.14.15.17.18.20.21.23.24.

Pass & Seymour
4.11.

Potter & Brumfield
4.11.12.15.

Smith & Stone Ltd.
10.

Triangle Conduit & Cable Ltd.
7.

5935 CONNECTORS, ELECTRICAL

1. **Adapters, plug.**
2. **Connector assemblies.**
3. **Connector clamps.**
4. **Connector, coaxial.**
5. **Connectors, multiapplication.**
6. **Connectors, power.**
7. **Connectors, quick coupling.**
8. **Contracts, electrical.**
9. **Electrical fittings.**
10. **Jack boxes, telephone.**
11. **Jacks, assemblies, telephone.**
12. **Jacks, telephone.**
13. **Receptacle and plug connector assys.**

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.

I-T-E Circuit Breaker (Bulldog Electric)
5.6.9.

I-T-E Circuit Breaker (East. Power Devices)
3.5.6.9.

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.

Northern Electric Co. Ltd.
4.12.

Pass & Seymour
1.5.7.13.

Radio Engineering Products
5.

Rollit Products Ltd.
5.8.

Triplex Engineering Co. Ltd.
1.2.5.7.8.

5940 LUGS, TERMINALS, AND TERMINAL STRIPS

1. **Boxes, terminal, multiapplication.**
2. **Cable clips.**
3. **Cables, battery.**
4. **Terminal blocks, boards & strips.**
5. **Terminals.**
6. **Terminals, clip type.**
7. **Terminals, insulated.**
8. **Terminals, turret type.**
9. **Wire grips.**

Bedard-Girard Ltd.
1.

Burndy Canada Ltd.
5.7.

Canadian General Electric (Apparatus)
4.

B. F. Goodrich Canada Ltd.
3.

I-T-E Circuit Breaker (Bulldog Electric)
9.

Joly Engineering Ltd.
8.

Northern Electric Co. Ltd.
4.

O. & W. Electronics Ltd.
4.

5940 LUGS, TERMINALS, AND TERMINAL STRIPS *(conc.)*

Quality Hermetics Ltd.
7.
Rollit Products Ltd.
4.5.6.
Shakeproof/Fastex
5.
SIDO Ltd.
7.8.
N. Slater Co.
2.

5945 RELAYS, CONTACTORS, AND SOLENOIDS

1. **Actuators, electro magnetic.**
2. **Adapters, antenna to transmitter.**
3. **Choppers, mechanical.**
4. **Coaxial cable to waveguide, multi-application.**
5. **Protective relaying.**
6. **Relays, armature.**
7. **Relays, armature, sub-miniature.**
8. **Relays, hermetically sealed.**
9. **Relays, meter.**
10. **Relays, multiapplication.**
11. **Relays, power.**
12. **Relays, special purpose.**
13. **Solenoids, electrical.**
14. **Switches, thermo.**

Aircraft Appliances & Equipment
5.12.13.
Allen-Bradley Canada Ltd.
11.
Automatic Electric (Canada) Ltd.
10.
Aviation Electric Ltd.
6.7.12.13.
Bach-Simpson Ltd.
9.
Canadian General Electric (Apparatus)
5.11.13.
Canadian Research Institute
9.
Canadian Westinghouse (Apparatus)
5.
Central Dynamics Ltd.
1.
C. P. Clare Canada Ltd.
6.7.
Garrett Manufacturing Ltd.
5.6.10.12.14.
Guildline Instruments Ltd.
3.14.
Hammond Mfg. Co. Ltd.
13.
Marsland Engineering Ltd.
1.7.13.
Microwave Devices Inc.
4.
Northern Electric Co. Ltd.
1.2.4.7.13.
Osborne Electric Co. Ltd.
6.10.11.13.
Potter & Brumfield
7.8.11.
RCA Victor Co. Ltd.
13.

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.**
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. **Transformer, 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.**

Abex Industries of Canada Ltd.
4.5.6.7.9.10.12.13.14.19.21.26.31.

Airtron Canada Ltd.
2.3.

Automatic Electric (Canada) Ltd.
13.

Bayly Engineering Ltd.
1.8.11.14.22.29.36.

Bogue Electric of Canada Ltd.
34.

CLM Industries
1.14.23.34.

CTS of Canada Ltd.
1.

Canadian General Electric (Apparatus)
34.

Canadian General Electric (Distribution & Specialty Trans.)
27.30.

Canadian General Electric (Meter & Inst.)
8.9.

Canadian Marconi Co.
6.14.22.23.29.34.

Canadian Westinghouse (Apparatus)
34.

Canadian Westinghouse (Distribution Apparatus)
13.34.

Canadian Westinghouse (Electronics)
1.

Canadian Westinghouse (Lamp Division)
35.

C. P. Clare Canada Ltd.
9.

Crompton Parkinson Electrical
8.

EL-MET-Parts Ltd.
15.16.17.28.

Electronic & Microwave Laboratories
2.3.

Essex Electronics Ltd.
4.6.7.8.9.10.11.12.13.14.19.21.23.26.31.

Federal Pacific Electric of Canada
33.34.

Ferranti Electronics
24.27.30.33.34.

Ferritronics Ltd.
4.5.6.7.10.11.13.14.17.19.21.22.23.26.29.31.

Garrett Manufacturing Ltd.
1.

General Precision Industries Ltd.
20.

Hammond Mfg. Co. Ltd.
1.2.3.4.5.6.7.8.10.11.12.13.14.21.22.23.25.26.29.30.31.32.33.34.35.36.

I-T-E Circuit Breaker (East. Power Devices)
30.34.

ITT Canada Ltd.
14.

Lenkurt Electric Co. of Canada Ltd.
14.21.

Milltronics Ltd.
1.

Moloney Electric Co. of Canada Ltd.
4.13.24.25.26.27.29.30.34.36.

Muirhead Instruments Ltd.
3.

Northern Electric Co. Ltd.
2.3.8.9.11.14.18.22.29.32.

Osborne Electric Co. Ltd.
29.34.37.

Philips Electronics Industries Ltd.
11.

Pioneer Electric Ltd.
30.34.

Polygon Services Ltd.
1.4.13.21.23.26.29.32.34.35.

RCA Victor Co. Ltd.
2.3.8.14.20.21.22.23.29.32.33.34.36.

Research Industries Ltd.
1.4.13.21.34.

Standard Television Products Ltd.
32.33.34.

T.M.C. (Canada) Ltd.
11.12.13.14.19.22.32.

Valeriote Electronics Ltd.
4.14.29.32.34.

5955 PIEZOELECTRIC CRYSTALS

1. Crystal ovens, piezo.
2. Crystals, quartz.
3. Glass enclosure.
4. Metal enclosure.
5. Piezoelectric ceramics.

Almax Ceramic Industries Ltd.
5.

Croven Ltd.
1.2.

Gulton Industries (Canada) Ltd.
5.

Northern Electric Co. Ltd.
2.3.4.

5955 PIEZOELECTRIC CRYSTALS *(conc.)*

Philips Electronics Industries Ltd.
2.3.

C. R. Snelgrove Co. Ltd.
1.2.

T.M.C. (Canada) Ltd.
1.2.

5960 ELECTRON TUBES AND ASSOCIATED HARDWARE

1. Cathode ray tube envelope.
2. Diodes, germanium.
3. Diodes, microwave, mixer & detector.
4. Diodes, silicon & silicon power.
5. Diodes, zener.
6. Geiger tubes.
7. Holders, semi-conductor devices.
8. Ionization chambers.
9. Instrument and picture type.
10. Photo-electric cells.
11. Reactor transformers.
12. Rectifiers, selenium.
13. Semi-conductors, diodes.
14. Semi-conductors, drums.
15. Semi-conductors, germanium.
16. Semi-conductors, matched.
17. Semi-conductors, materials.
18. Semi-conductors, rectifiers.
19. Semi-conductors, silicon.
20. Semi-conductors, thermoelectric cooling.
21. Semi-conductors, transistors.
22. Thyratrons.
23. Transmitting.
24. Transistors, germanium.
25. Transistors, silicon.
26. Transistors, silicon power.
27. Transistors, switching.
28. Tubes, backward wave oscillators.
29. Tubes, cathode assy.
30. Tubes, electron.
31. Tubes, klystron.
32. Tubes, magnetrons.
33. Tubes, rectifying & receiving.
34. Tubes, travelling wave.

CLM Industries.
4.

CTS of Canada Ltd.
10.11.

Canadian Admiral Corp. Ltd.
8.

Canadian General Electric (Apparatus)
13.18.

Canadian General Electric (EDPD)
1.2.4.5.9.13.15.16.18.19.21.22.
23.25.27.29.30.33.

Canadian Marconi Co.
29.33.

Canadian Westinghouse (Electronic Tube)
6.9.22.23.29.31.32.33.34.

Consolidated Mining & Smelting
17.20.

Ferranti Electronics
10.

IRC Resistors
12.

I-T-E Circuit Breaker (East. Power Devices)
18.

Johnson, Matthey & Mallory Ltd.
18.19.

Northern Electric Co. Ltd.
2.4.5.13.15.16.19.21.24.25.27.33.

Philips Electronics Industries Ltd.
2.9.13.18.29.30.

Quality Hermetics Ltd.
14.17.

RCA Victor Co. Ltd.
2.3.4.7.13.21.24.25.26.27.30.33.

Raytheon Canada Ltd.
11.22.23.28.30.31.32.34.

Sylvania Electric (Canada) Ltd.
30.33.

Syntron (Canada) Ltd.
4.12.13.16.18.19.

Varian Associates of Canada Ltd.
28.31.32.34.

5965 HEADSETS, HANDSETS, MICROPHONES AND SPEAKERS

1. Adapters.
2. Earphone assemblies.
3. Handsets, telephone.
4. Headbands, headset.
5. Headsets.
6. Loudspeakers.
7. Microphones, carbon.
8. Microphones, crystal.
9. Microphones, dynamic.
10. Microphones, ribbon.

Amphenol Canada Ltd.
1.

Marsland Engineering Ltd.
6.

Northern Electric Co. Ltd.
2.3.4.5.6.7.8.9.10.

Radio Engineering Products
3.

Sharpe Instruments of Canada Ltd.
2.7.9.

Sperry Gyroscope Ottawa Ltd.
5.

5970 ELECTRICAL INSULATORS AND INSULATING MATERIALS

1. Film & tubing, polyethylene.
2. Insulators.
3. Insulators, ceramic.
4. Insulators, plastic.
5. Insulators, porcelain.
6. Tapes, insulation, rubber.

Almax Ceramic Industries Ltd.
3.

Canadian Industries Ltd.
1.

Canadian Ohio Brass Co. Ltd.
3.

Canadian Porcelain Co. Ltd.
3.5.

Canadian Technical Tape Ltd.
1.

Firestone Tire & Rubber Canada Ltd.
6.

Hamilton Porcelains Ltd.
3.

O. & W. Electronics Ltd.
4.

Smith and Stone Ltd.
2.3.

Union Carbide Canada Ltd.
1.

Uniroyal (1966) Ltd.
6.

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. Clamps, cable.
8. Conduit, metallic.
9. Conduit, P.V.C.
10. Conduit, fittings, electric, metallic.
11. Connectors, ground rods.
12. Drive hooks.
13. Duct, flush.
14. Duct, header.
15. Duct, trench.
16. Eyebolts.
17. Ferrules.
18. Fetter drive screws.
19. Ground rods.
20. Guy clamps.
21. Guy hooks.
22. Hardware, poleline.
23. Insulator pins.
24. Junction box assemblies.
25. Outlet boxes.
26. Pole steps.
27. Power supplies.
28. Racks, electrical equipment.
29. Sleeves connectors, ground rods.
30. Splicing sleeves, electrical conductors.
31. Systems, raceway, underfloor.

Amphenol Canada Ltd.
10.24.25.

Bedard-Girard Ltd.
4.6.

Bogue Electric of Canada Ltd.
6.27.

Burndy Canada Ltd.
7.28.

CLM Industries
22.

Canadian General Electric (Devices, Conduit & Lighting)
8.

Canadian Ohio Brass Co. Ltd.
22.

Chisholm Industries Ltd.
27.

Dominion Tool & Metal Products Ltd.
24.

Electrovert Ltd.
28.

Fleet Manufacturing Ltd.
6.

Garrett Manufacturing Ltd.
27.

General Die & Machine Co. Ltd.
22.

Hammond Mfg. Co. Ltd.
1.27.

Hussman Refrigerator Co. Ltd.
6.28.

I-T-E Circuit Breaker (Bulldog Electric)
6.

5975 ELECTRICAL HARDWARE AND SUPPLIES *(conc.)*

I-T-E Circuit Breaker (East. Power Devices)
7.28.

ITT Canada Ltd.
6.24.

Lenkurt Electric Co. of Canada Ltd.
28.

Manitoba Bridge & Eng. Works
22.

Measurement Engineering Ltd.
6.24.27.28.

R. H. Nichols Co. Ltd.
27.

Renfrew Aircraft & Engineering Ltd.
6.

Reynolds Extrusion Co. Ltd.
8.

Rollit Products Ltd.
11.

Scepter Mfg. Co. Ltd.
9.

SIDO Ltd.
17.

N. Slater Co.
11.22.29.30.

The Steel Co. of Canada Ltd.
1.2.3.5.7.12.16.17.18.19.20.21.22.23.26.

T.M.C. (Canada) Ltd.
6.28.

Triangle Conduit & Cable Ltd.
6.7.8.10.13.14.15.24.25.31.

Westeel-Rosco Ltd.
6.

5977 ELECTRICAL CONTACT BRUSHES AND ELECTRODES

1. Brushes.
2. Carbons, arc light, spectroscopic, photographic.

Union Carbide Canada Ltd.
1.2.

5985 ANTENNAS, WAVEGUIDES, AND RELATED EQUIPMENT

1. Adaptors, antenna.
2. Antennas, microwave.
3. Antennas, multiapplication.
4. Antennas, radar.
5. Antennas, scatter.
6. Antennas, whip.
7. Attenuators, fixed & variable.
8. Chassis, electronic.
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.
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.

A.I.M. Steel Ltd.
20.

Airtron Canada Ltd.
1.7.9.10.11.15.16.27.29.33.34.

Amphenol Canada Ltd.
1.16.

Bayly Engineering Ltd.
7.10.

Bristol Aerospace Ltd.
2.4.5.8.34.

Burrard Dry Dock Co. Ltd.
17.21.

CAE Industries Ltd.
3.12.

Canadian General Electric (EDPD)
2.3.4.7.8.15.31.

Canadian General Electric (Plastics)
23.

Canadian Westinghouse (Electronics)
3.4.12.

Collins Radio Co. of Canada Ltd.
10.

Computing Devices of Canada Ltd.
17.

De Havilland Aircraft (SPAR)
3.17.

Desitron Company Ltd.
1.10.15.29.33.34.

Dosco Industries Ltd. (Canadian Bridge Works)
21.26.

Electronic & Microwave Laboratories
7.9.10.

W. R. Elliott Ltd.
13.

Firestone Tire & Rubber Canada Ltd.
22.

Alexander Fleck Ltd.
17.

Fleet Manufacturing Ltd.
2.3.5.13.15.

Found Bros. Aviation Ltd.
13.

Hammond Mfg. Co. Ltd.
8.

Johnson Wire Products Ltd.
25.

Joly Engineering Ltd.
13.

Lenkurt Electric Co. of Canada Ltd.
3.

Marsland Engineering Ltd.
9.13.30.34.

Microwave Devices Inc.
1.10.16.33.34.

Northern Electric Co. Ltd.
7.9.10.11.15.16.19.28.29.31.32.33.34.

Philips Electronics Industries Ltd.
1.8.9.11.31.

Polyfiber Ltd.
23.

Protective Plastics Ltd.
23.

RCA Victor Co. Ltd.
1.3.9.10.11.12.15.16.19.28.29.34.

Reliance Electric & Engineering
13.

Saskatchewan Steel Fabricators Ltd.
20.

Sinclair Radio Laboratories Ltd.
14.18.

T.M.C. (Canada) Ltd.
1.3.6.28.

Uniroyal (1966) Ltd.
22.

Valeriote Electronics Ltd.
3.

Wind Turbine Co. of Canada Ltd.
17.24.

York Gears Ltd.
13.

5990 SYNCHROS AND RESOLVERS

Aviation Electric Ltd.

Bowmar Canada Ltd.

Ferranti Electronics

Muirhead Instruments Ltd.

RCA Victor Co. Ltd.

5995 CABLE, CORD, AND WIRE ASSEMBLIES

1. Cable assemblies.
2. Harness assemblies.
3. Harnesses, cable.

Abex Industries of Canada Ltd.
1.2.3.

Amphenol Canada Ltd.
1.2.3.

Aviation Electric Ltd.
1.2.3.

Bayly Engineering Ltd.
3.

CAE Industries Ltd.
1.

Joy Mfg. 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.

R. H. Nichols Co. Ltd.
2.3.

Northern Electric Co. Ltd.
1.

Northwest Industries Ltd.
1.2.

Radio Engineering Products
1.

Sperry Gyroscope Ottawa Ltd.
1.2.

Syntron (Canada) Ltd.
1.3.

5995 CABLE, CORD, AND WIRE ASSEMBLIES *(conc.)*

T.M.C. (Canada) Ltd.
1.2.3.

Tenatronics Ltd.
1.

Valeriote Electronics Ltd.
1.3.

5999 MISCELLANEOUS ELECTRICAL AND ELECTRONIC COMPONENTS

1. Boards, printed circuit.
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. Harnesses, cable.
9. Keepers, magnet.
10. Magnets.
11. Panels, edgelit, multiapplication.
12. Permanent magnets.
13. Resonators, magnetostriction.

Abex Industries of Canada Ltd.
5.8.

Almax Ceramic Industries Ltd.
12.

Amphenol Canada Ltd.
8.

Aviation Electric Ltd.
2.8.

Bayly Engineering Ltd.
5.

Burroughs Business Machine Ltd.
2.

CAE Industries Ltd.
2.8.

CLM Industries
3.4.

Canadian General Electric (EDPD)
1.2.

Canadian General Electric (Meter & Inst.)
9.10.12.

Canadian Westinghouse (Electronics)
2.

Central Dynamics Ltd.
8.

Computing Devices of Canada Ltd.
1.6.7.

Essex Electronics of Canada Ltd.
5.

Ferranti Electronics Ltd.
1.

Hammond Mfg. Co. Ltd.
3.4.5.

Indiana Steel Products Co. Ltd.
12.

George Kelk Ltd.
1.2.

Lenkurt Electric Co. of Canada Ltd.
1.

Lightning Fastener Co. Ltd.
1.

Marsland Engineering Ltd.
2.

Measurement Engineering Ltd.
2.

R. H. Nichols Co. Ltd.
1.2.8.

Northern Electric Co. Ltd.
1.5.8.13.

Nuclear Enterprises Ltd.
1.

O. & W. Electronics Ltd.
1.11.

Philips Electronics Industries Ltd.
1.2.

RCA Victor Co. Ltd.
1.2.3.4.5.13.

Raytheon Canada Ltd.
2.

Renfrew Aircraft & Engineering Ltd.
2.

Sperry Gyroscope Co. of Canada Ltd.
1.11.

Stewart-Warner Corp. Ltd.
5.

T.M.C. (Canada) Ltd.
5.

Topping Electronics Ltd.
2.

Trench Electric Ltd.
4.

Valeriote Electronics Ltd.
5.

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 — ⅓ HP & under.**
2. **SP & C — O & E — over ⅓ HP & under 1 HP.**
3. **SP & C — O & E — 1 HP & up.**
4. **Repulsion — O & E — (all).**

POLYPHASE INDUCTION

5. **O & E — ⅓ HP & under.**
6. **O & E — Over ⅓ 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.**
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.**

NOTE:

SP — Split Phase
E — Enclosed
C — Capacitance
SC — Squirrel Cage
O — Open
WR — Wound Rotor

Bogue Electric of Canada Ltd.
20.21.23.24.25.26.27.28.

Canadian General Electric (Apparatus)
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)
1.2.3.6.7.8.9.10.11.13.14.15.16.17.18.19.
20.21.22.23.24.25.28.29.30.

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)

OPEN & ENCLOSED, EXCEPT FOR TRANSPORTATION

1. ⅓ HP & under (except miniature).
2. Over ⅓ HP & under 1 HP.
3. 1 HP & up to 5 HP.
4. Over 5 HP & up to 25 HP.
5. Over 25 HP & up to 100 HP.
6. Over 100 HP & up to 200 HP.
7. Over 200 HP and up to 1000 HP.
8. Over 1000 HP.

OPEN & ENCLOSED – TRANSPORTATION (RAILWAY & VEHICLE)

9. ⅓ HP & under (except miniature).
10. Over ⅓ HP & up to 5 HP.
11. Over 5 HP.

Bogue Electric of Canada Ltd.
1.2.3.4.5.6.9.10.11.

Canada Iron Foundries (Tamper Div.)
4.5.6.7.

Canadian General Electric (Apparatus)
4.5.6.7.8.11.

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.
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.

Bowmar Canada Ltd.
4.

Muirhead Instruments Ltd.
1.2.3.4.5.6.7.

6105 MOTORS, ELECTRICAL (Parts)

1. Bases, motor mounts.
2. Bearing guides, plastic.
3. Brush holders, plastic.
4. Fans, plastic.

Canadian General Electric (Plastics)
2.3.4.

Progressive Engineering Works Ltd.
1.

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, multiapplication.
12. Controls, motor, electric.
13. Controls, remote, multiapplication.
14. Distribution equipment up to 600 V.
15. Distribution equipment, high voltage.
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.

Allen-Bradley Canada Ltd.
11.12.

Amalgamated Electric Corp. Ltd.
19.26.

Aviation Electric Ltd.
2.9.10.12.16.24.

Aviation Electric (Pacific) Ltd.
5.6.10.12.

Bedard-Girard Ltd.
5.6.12.13.15.16.17.19.20.25.26.27.

Bogue Electric of Canada Ltd.
23.26.

CAE Industries Ltd.
13.

CLM Industries
13.21.23.26.

CTS of Canada Ltd.
21.22.23.

Canada Iron Foundries (Tamper Div.)
23.26.

Canadian Allis-Chalmers Ltd.
16.

Canadian Flight Equipment Co.
3.4.11.

Canadian General Electric (Apparatus)
5.6.8.12.13.16.20.26.

Canadian Motorola Electronics Co.
2.7.13.

Canadian Westinghouse (Apparatus)
6.13.23.

Canadian Westinghouse (Distribution Apparatus)
15.23.

Canadian Westinghouse (Electronics)
2.

Consolidated Engines & Machinery
5.6.11.12.13.24.

Electrical Mfg. Co. Ltd.
6.7.15.16.18.19.20.26.27.

W. R. Elliott Ltd.
24.

Federal Pacific Electric of Canada
12.16.26.

Ferranti Electronics
13.

Garrett Manufacturing Ltd.
1.2.13.19.21.22.23.24.

Honeywell Controls Ltd.
16.

I-T-E Circuit Breaker (Bulldog Electric)
14.16.18.19.20.26.

I-T-E Circuit Breaker (East. Power Devices)
15.18.19.20.26.27.

George Kelk Ltd.
1.13.23.

Klockner-Moeller Canada Ltd.
12.

Leigh Instruments Ltd.
2.16.

Lenkurt Electric Co. of Canada Ltd.
13.

Litton Systems (Canada) Ltd.
2.

Marsland Engineering Ltd.
24.

Measurement Engineering Ltd.
24.

Milltronics Ltd.
1.2.12.

Muirhead Instruments Ltd.
24.

R. H. Nichols Co. Ltd.
1.5.6.10.11.13.16.19.20.23.26.

Northern Electric Co. Ltd.
12.16.23.

O. & W. Electronics Ltd.
16.

Penzer Products Ltd.
1.16.18.19.26.

Pioneer Electric Ltd.
26.27.

Polygon Services Ltd.
12.23.

Powerlite Devices Ltd.
15.27.

Powertronic Equipment Ltd.
5.6.12.23.26.

Raytheon Canada Ltd.
1.21.22.23.24.

Reliance Electric & Engineering
6.12.16.

Research Industries Ltd.
21.22.23.

Russel-Hipwell Engines Ltd.
5.6.16.26.

Sperry Gyroscope Co. of Canada Ltd.
7.9.11.

Stark Electronic Instruments Ltd.
23.

Syntron (Canada) Ltd.
13.

Topping Electronics Ltd.
12.13.

Western Controls Ltd.
13.16.

Yarrows Ltd.
18.19.20.25.26.

6115 GENERATORS AND GENERATOR SETS, ELECTRICAL

1. **Alternators.**
2. **Generating sets, diesel.**
3. **Generating sets, diesel, air-cooled, from 3 to 192.5 kw.**
4. **Generating sets, diesel, liquid-cooled up to 2500 kw.**
5. **Generating sets, gasoline.**
6. **Generating sets, uninterrupted power.**
7. **Generators, alternating current.**
8. **Generators, direct current.**
9. **Power packs, hydraulic.**
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.

Bogue Electric of Canada Ltd.
1.2.5.7.8.10.11.

Canada Iron Foundries (Tamper Div.)
1.7.8.12.

Canadian General Electric (Apparatus)
2.5.10.

Canadian Westinghouse (Apparatus)
1.7.8.11.

Consolidated Engines & Machinery
2.5.9.10.

Crompton Parkinson Electrical
8.

Deutz Diesel (Canada) Ltd.
3.4.

Montreal Locomotive Works Ltd.
2.10.

Orenda (Hawker Siddeley)
2.11.

Powertronic Equipment Ltd.
7.8.10.

Reliance Electric & Engineering
12.

Russel-Hipwell Engines Ltd.
2.5.6.

Sangamo Co. Ltd.
1.7.8.10.

T.M.C. (Canada) Ltd.
1.2.5.7.8.10.

6120 TRANSFORMERS, DISTRIBUTION AND POWER STATION

1. Dry, distribution.
2. Dry, power.
3. Metering units.
4. Oil, distribution.
5. Oil, power.
6. Regulators, step voltage.
7. Transformers.

Bogue Electric of Canada Ltd.
7.

Canadian General Electric (Distribution & Specialty Trans.)
1.2.4.5.6.7.

Canadian Westinghouse (Apparatus)
7.

Canadian Westinghouse (Distribution Apparatus)
1.2.4.5.6.7.

Ferranti Electronics
1.2.3.4.5.6.7.

I-T-E Circuit Breaker (East. Power Devices)
1.2.7.

Moloney Electric Co. of Canada Ltd.
1.2.3.4.5.6.7.

Pioneer Electric Co.
1.2.4.5.6.7.

Polygon Services Ltd.
1.2.7.

Reliance Electric & Engineering
1.2.4.

6125 CONVERTERS, ELECTRICAL, ROTATING

1. Converters.
2. Generator sets, electrical.
3. Inverters, rotary.
4. Motor-converters.

Aircraft Appliances & Equipment
2.

Bogue Electric of Canada Ltd.
1.2.

Canadian General Electric (Apparatus)
2.3.4.

Crompton Parkinson Electrical
2.3.4.

De Havilland Aircraft (SPAR)
3.

Montreal Locomotive Works Ltd.
2.

Powertronic Equipment Ltd.
2.

Reliance Electric & Engineering
2.

Research Industries Ltd.
1.

Russel-Hipwell Engines Ltd.
2.

Sangamo Co. Ltd.
1.2.3.4.

T.M.C. (Canada) Ltd.
2.

6130 CONVERTERS, ELECTRICAL, NONROTATING

1. Battery chargers.
2. Inverters.
3. Power supplies, D.C.
4. Power supplies, electronic.
5. Power supplies, multiapplication.
6. Rectifiers, metallic.

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

Aircraft Appliances & Equipment
1.4.9.
Aviation Electric Ltd.
5.
Bogue Electric of Canada Ltd.
1.2.4.5.9.
CAE Industries Ltd.
4.6.8.
CLM Industries
2.6.7.8.
CTS of Canada Ltd.
1.2.4.6.
Canadian General Electric (Apparatus)
2.4.6.7.8.
Canadian Research Institute
4.
Canadian Westinghouse (Apparatus)
2.
Collins Radio Co. of Canada Ltd.
4.
De Havilland Aircraft (SPAR)
2.4.5.
Electric Storage Battery Co. Ltd.
1.
Ferranti Electronics
4.
Garrett Manufacturing Ltd.
1.2.4.5.9.
I-T-E Circuit Breaker (East. Power Devices)
7.
George Kelk Ltd.
2.
Lenkurt Electric Co. of Canada Ltd.
4.
Litton Systems (Canada) Ltd.
4.
Marsland Engineering Ltd.
1.
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 Victor Co. Ltd.
4.5.
Research Industries Ltd.
1.2.4.5.7.
Russel-Hipwell Engines Ltd.
4.5.
Sangamo Co. Ltd.
4.7.8.
Standard Television Products Ltd.
3.
Stark Electronic Instruments Ltd.
1.4.
Syntron (Canada) Ltd.
2.4.5.6.7.9.
T.M.C. (Canada) Ltd.
4.5.
Tenatronics Ltd.
1.

6135 BATTERIES, PRIMARY

1. Alkaline 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.
9. Cells, bias.
10. Cells, dry.
11. Manganese, silver, chloride.
12. Mercury.
13. Nickel cadmium.
14. Signal cells, (copper oxide).
15. Silver oxide.

Burgess Battery Co.
2.4.6.8.9.10.11.
Canadian General Electric (Carboloy)
13.
Canadian General Electric (Plastics)
7.
Mallory Battery Co. of Canada Ltd.
1.12.
Mansfield-Denman General Ltd.
7.
Union Carbide Canada Ltd.
1.2.3.4.5.8.10.12.14.15.

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

Crompton Parkinson Electrical
15.20.

Electric Storage Battery Co. Ltd.
1.4.5.6.9.10.12.14.15.16.17.18.20.

Globelite Batteries Ltd.
15.

Hassan Steel Fabricators Ltd.
7.

Mansfield-Denman General Ltd.
4.7.8.

Surrette Battery Ltd.
1.2.3.4.7.8.9.11.13.14.16.17.18.19.20.

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.**
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.**

Abex Industries of Canada Ltd.
31.

Amphenol Canada Ltd.
3.

Canada Wire & Cable Co. Ltd.
1.3.4.5.6.8.9.10.12.13.14.15.16.17.18.19.
20.21.22.23.24.25.26.27.28.29.30.31.

Canadian General Electric (Apparatus)
3.4.5.13.15.21.22.24.25.31.

Crompton Parkinson Electrical
13.

Federal Wire & Cable Co. Ltd.
5.13.14.15.17.21.23.25.30.31.

General Wire & Cable
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.

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, Conduits Ltd.
1.5.13.14.15.17.18.21.22.24.25.30.

The Steel Co. of Canada Ltd.
25.

Triangle Conduit & Cable Ltd.
1.2.21.24.25.

6150 MISCELLANEOUS ELECTRIC POWER AND DISTRIBUTION EQUIPMENT

1. **Assemblies, multi-outlet.**
2. **Busduct systems.**
3. **Bus, isolated phase.**
4. **Bus, non-segregated phase.**
5. **Cable assemblies.**
6. **Duct, cable.**
7. **Duct, industrial trolley.**
8. **Duct, lighting.**

Burroughs Business Machines Ltd.
5.

Canadian General Electric (Devices, Conduit & Lighting)
5.

I-T-E Circuit Breaker (Bulldog Electric)
1.2.6.7.8.

I-T-E Circuit Breaker (East. Power Devices)
3.4.

Joy Mfg. Co. (Canada) Ltd.
5.

R. H. Nichols Co. Ltd.
5.

Phillips Cables Co. Ltd.
5.

Pirelli Cables, Conduits Ltd.
5.

GROUP 62

LIGHTING FIXTURES AND LAMPS

6210 INDOOR AND OUTDOOR ELECTRIC LIGHTING FIXTURES

1. Airport lighting equipment.
2. Beacons, flashing.
3. Buoys, flashing.
4. Dimmers.
5. Fixtures, aircraft.
6. Fixtures, marine.
7. Fixtures, railroad.
8. Floodlighting.
9. Industrial lighting.
10. Lighting fixtures (outdoor).
11. Lighting sets, emergency.
12. Light standards.
13. Street lighting.

Beaconing Optical & Precision Materials
5.6.7.

CLM Industries
1.

Canadian General Electric (Devices, Conduit & Lighting)
1.4.5.6.8.10.11.12.13.

Canadian Westinghouse (Lighting Div.)
1.5.6.7.8.9.13.

Computing Devices of Canada Ltd.
2.3.

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

Powerlite Devices Ltd.
8.10.12.13.

Russel-Hipwell Engines Ltd.
11.

6220 ELECTRIC VEHICULAR LIGHTS AND FIXTURES

1. Bulbs, automotive.
2. Lamps, automotive.

Union Carbide Canada Ltd.

6230 ELECTRIC PORTABLE AND HAND LIGHTING EQUIPMENT

1. Controls, airport lighting.
2. Flashlights.
3. Lanterns.
4. Torches, safety.

Northern Radio Mfg. Co. Ltd.
1.

Union Carbide Canada Ltd.
2.3.4.

6240 ELECTRIC LAMPS

1. Exciter.
2. Flood.
3. Fluorescent.
4. Glow.
5. Heat.
6. Incandescent.
7. Infra-red.
8. Mercury vapor.
9. Miniature.
10. Neon.
11. Photoflash.
12. Photoflood.
13. Pilot.
14. Projection.
15. Sealed beam.
16. Spot.
17. Sun.
18. Switchboard.
19. Ultraviolet.

Canadian General Electric (Lamps)
1.2.3.4.5.6.7.8.9.11.12.13.14.15.16.18.

Canadian Westinghouse (Lamp Div.)
1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.
18.19.

Northern Electric Co. Ltd.
18.

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

Sylvania Electric (Canada) Ltd.
2.3.5.6.8.11.12.14.16.

Union Carbide Canada Ltd.
9.

6250 BALLASTS, LAMPHOLDERS, AND STARTERS

Canadian General Electric (Devices, Conduit & Lighting)

Canadian General Electric (Distribution & Specialty Trans.)

Canadian Westinghouse (Lighting Div.)

GROUP 63

ALARM AND SIGNAL SYSTEMS

6310 TRAFFIC AND TRANSIT SIGNAL SYSTEMS

1. Traffic control equipment.

Bedard-Girard Ltd.
CAE Industries Ltd. (Municipal Signal Div.)
Canadian General Electric (Devices, Conduit & Lighting)
Canadian Westinghouse (Lighting Div.)
Computing Devices of Canada Ltd.
Fischer & Porter (Canada) Ltd.
ITT Canada Ltd.
Measurement Engineering Ltd.
R. H. Nichols Co. Ltd.
Topping Electronics Ltd.

6320 SHIPBOARD ALARM AND SIGNAL SYSTEMS

Bedard-Girard Ltd.
Canadian General Electric (Devices, Conduit & Lighting)
Canadian Westinghouse (Electronics Div.)
Computing Devices of Canada Ltd.
ITT Canada Ltd.
Measurement Engineering Ltd.
R. H. Nichols Co. Ltd.
Topping Electronics Ltd.

6330 RAILROAD SIGNAL AND WARNING DEVICES

Bedard-Girard Ltd.
Canadian General Electric (Devices, Conduit & Lighting)
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. Annunciators.
2. Fire alarm systems.
3. Smoke detection systems.
4. Systems, fire detector, infra-red.

Bedard-Girard Ltd.
1.
CAE Industries Ltd. (Municipal Signal Div.)
Computing Devices of Canada Ltd.
4.
Edwards of Canada Ltd.
1.2.3.
Honeywell Controls Ltd.
1.
Measurement Engineering Ltd.
3.
R. H. Nichols Co. Ltd.
1.
Northern Electric Co. Ltd.
1.2.3.
Pyrene Mfg. Co. of Canada Ltd.
2.3.
Topping Electronics Ltd.
1.
UNELCO Ltd.
1.2.

GROUP 65

MEDICAL, DENTAL, AND VETERINARY EQUIPMENT AND SUPPLIES

6505 DRUGS, BIOLOGICALS, AND OFFICIAL REAGENTS

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

Anachemia Chemicals Ltd.
1.2.3.4.

Ayerst McKenna & Harrison Ltd.
7.9.

Canadian Chemical Co. Ltd.
1.2.3.4.5.6.8.

Cyanamid of Canada Ltd.
7.9.

Frank W. Horner Ltd.
7.9.

Mallinckrodt Chemical Works Ltd.
1.2.3.4.

Merck, Sharp & Dohme
7.9.

6515 MEDICAL AND SURGICAL INSTRUMENTS, EQUIPMENT AND SUPPLIES

1. Atomizers.
2. Gloves, obstetrical, rubber.
3. Gloves, post mortem, rubber.
4. Gloves, surgeon.
5. Masks—oxygen, safety and rescue.
6. Nebulizers.
7. Oxygen therapy equipment.

Austenal Canada Ltd.
2.3.4.

DeVilbiss (Canada) Ltd.
1.6.

Firestone Tire & Rubber Canada Ltd.
5.

Union Carbide Canada Ltd.
7.

Uniroyal (1966) Ltd.
5.

6520 DENTAL INSTRUMENTS, EQUIPMENT, AND SUPPLIES

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

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.
2. Cabinets, lockers, metal.
3. Cabinets, medical.
4. Litters, hospital sheet metal.
5. Lockers, medical.

Hussman Refrigerator Co. Ltd.
3.4.

The Pedlar People Ltd.
1.

Renfrew Aircraft & Engineering Ltd.
2.

Triple-A Mfg. Co. Ltd.
1.3.4.5.

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.
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.

Aviation Electric Ltd.
1.4.5.6.7.9.

Computing Devices of Canada Ltd.
6.7.9.10.13.14.

De Havilland Aircraft (SPAR)
12.

Garrett Manufacturing Ltd.
7.

International Business Machines
6.7.9.10.

Leigh Instruments Ltd.
8.11.

Litton Systems (Canada) Ltd.
3.6.

Marsland Engineering Ltd.
1.9.10.12.

O. & W. Electronics Ltd.
1.2.7.

Sperry Gyroscope Co. of Canada Ltd.
3.5.6.9.10.

Stanley Mfg. Co. Ltd.
1.2.6.

6610 FLIGHT INSTRUMENTS

1. Accelerometers.
2. Flight instruments A/C.
3. Indicators, horizontal.

Aviation Electric Ltd.
1.2.

Computing Devices of Canada Ltd.
2.3.

Leigh Instruments Ltd.
2.

Litton Systems (Canada) Ltd.
1.2.

Sperry Gyroscope Co. of Canada Ltd.
2.

6615 AUTOMATIC PILOT MECHANISMS AND AIRBORNE GYRO COMPONENTS

1. Auto pilot.
2. Controls, directional gyro.
3. Gyros.
4. Gyro components.
5. Gyroscopic directional.
6. Gyroscope displacement.
7. Rudder controls.
8. Selectors, heading.
9. Servos.

Aviation Electric Ltd.
4.

CAE Industries Ltd.
6.

De Havilland Aircraft of Canada
7.8.

Ferranti Electronics
3.

Joly Engineering Ltd.
1.4.

Leigh Instruments Ltd.
8.

Litton Systems (Canada) Ltd.
1.2.4.

Ranar Industries Ltd.
4.

Sperry Gyroscope Co. of Canada Ltd.
3.5.6.9.

6625 ELECTRICAL AND ELECTRONIC PROPERTIES MEASURING AND TESTING INSTRUMENTS

1. Absorber, radio frequency.
2. Ammeters.
3. Amplifiers, audio.
4. Amplifiers, nuclear, spectrometry.

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

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. Detectors, radio frequency interference.
18. Diodes.
19. Electrical standard sets.
20. Electrical test instruments.
21. Evaluation programmers.
22. Evaluation sets and evaluators.
23. Frequency meters.
24. Galvanometers.
25. Gauges, electron beam thickness.
26. Gauges, electron single-scatter density.
27. Generators, pulse.
28. Generators, signal and noise.
29. Impulse noise.
30. Indicators, antenna radiation.
31. Indicators, channel alignment.
32. Indicators, counter type, digital display.
33. Indicators, distortion.
34. Indicators, phase sequence.
35. Indicators, pulse analyser.
36. Indicators, radio frequency.
37. Inductors, standard, fixed.
38. Inductors, standard, variable.
39. Instruments, testing.
40. Ionosphere sounding equipment.
41. Magnetometer, rotating coil.
42. Meters, electrical, indicating.
43. Microammeters.
44. Milliameters.
45. Monitors, audio frequency.
46. Monitors, course.
47. Monitors, radio frequency.
48. Multimeters.
49. Multipliers, electrical instruments.
50. Ohmmeters.
51. Oscilloscopes.
52. Panels, monitor, electrical.
53. Panels, test, electrical.
54. Plotters, electric field.
55. Plotters, magnetic field.
56. Pre-amplifiers, nuclear spectrometry.
57. Probes, electron beam, wind tunnel diagnostics.
58. Propagation frequency.
59. Pumping systems, high vacuum.
60. Recorder sets, radiation pattern, radio frequency.
61. Servo test sets.
62. Shunts, measuring.
63. Simulators, antenna position.
64. Slotted line waveguides.
65. Spectrometers, electron beam probe.
66. Standards, frequency.
67. Standards, resistance.
68. Standards, time.
69. Standards, voltage.
70. Standing waves measurement apparatus.
71. Test sets, electrical, meter.
72. Test sets, inverters.
73. Test sets, microwave transmission.
74. Test sets, phase rotation.
75. Telemetering 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.
86. Welders, atmospheric electron beam.
87. X-ray detectors.

Abex Industries Ltd.
37.

Aircraft Appliances & Equipment
7.72.74.

Airtron Canada Ltd.
64.

Almax Ceramic Industries Ltd.
76.

Amphenol Canada Ltd.
66.68.

Aviation Electric Ltd.
76.

Bach-Simpson Ltd.
2.20.23.24.28.32.36.39.42.43.44.48.
49.50.51.62.71.78.79.80.81.82.85.

Bayly Engineering Ltd.
1.15.28.33.39.49.85.

Beaconing Optical & Precision Materials
23.28.32.36.53.

S. F. Bowser Co. Ltd.
16.

CAE Industries Ltd.
32.45.46.47.79.

Canadian General Electric (EDPD)
18.

Canadian General Electric (Meter & Inst.)
2.23.42.43.44.78.80.82.

Canadian Motorola Electronics Co.
75.

Canadian Research Institute
2.9.10.24.39.42.50.71.78.82.

Canadian Westinghouse (Electronics)
31.

Crompton Parkinson Electrical
2.24.34.39.42.43.44.82.

Daystrom Ltd.
2.43.44.

De Havilland Aircraft (SPAR)
40.72.77.

Desitron Company Ltd.
64.

Edo (Canada) Ltd.
15.76.

E.M.I. — Cossor Electronics Ltd.
40.

Electrical Mfg. Co. Ltd.
42.52.53.

Electronic & Microwave Laboratories
10.

Essex Electronics Ltd.
15.37.38.

Ferranti Electronics
15.32.42.82.

Garrett Manufacturing Limited
7.53.61.72.

Guildline Instruments Ltd.
8.9.13.24.62.67.69.

Honeywell Controls Ltd.
20.39.52.53.

George Kelk Ltd.
54.

Litton Systems (Canada) Ltd.
42.82.

Marsland Engineering Ltd.
7.

Measurement Engineering Ltd.
3.7.23.36.39.46.52.71.76.82.

Microwave Devices Inc.
1.64.

Milltronics Ltd.
52.

Muirhead Instruments Ltd.
8.9.28.61.

R. H. Nichols Co. Ltd.
7.52.53.75.76.

Northern Electric Co. Ltd.
5.6.17.21.22.28.29.30.31.33.34.35.
44.45.46.47.52.54.83.84.85.

Ontario Research Foundation
25.26.57.59.65.86.87.

Philips Electronics Industries Ltd.
12.27.40.68.

Powertronic Equipment Ltd.
11.52.53.

RCA Victor Co. Ltd.
5.6.17.28.30.31.32.36.47.51.53.58.
60.61.63.64.84.85.

Reliance Electric & Engineering Ltd.
39.

Research Industries Ltd.
3.7.

Russel-Hipwell Engines Ltd.
73.

Sharpe Instruments of Canada Ltd.
14.41.55.70.

Simtec Ltd.
4.56.

Stark Electronic Instruments Ltd.
2.20.23.28.42.43.44.48.50.51.53.71.

Stewart-Warner Corp. Ltd.
15.

T.M.C. (Canada) Ltd.
5.19.20.36.45.47.84.

Topping Electronics Ltd.
23.28.

6630 CHEMICALS ANALYSIS INSTRUMENTS

1. Absorbents, molecular sieves.
2. Soil and water geochemical kits.
3. Spectrometers, mercury.

Barringer Research Ltd.
2.3.

McPhar Geophysics Ltd.
2.

Union Carbide Canada Ltd.
1.

6635 PHYSICAL PROPERTIES TESTING EQUIPMENT

1. **Balancing machines, static.**
2. **Cold treating machines.**
3. **Non-destructive testing machines wire rope.**
4. **Sonoscopes, non-destructive, inspection concrete.**

Found Bros. Aviation Ltd.
1.

McPhar Geophysics Ltd.
3.4.

Union Carbide Canada Ltd.
2.

6640 LABORATORY EQUIPMENT AND SUPPLIES

1. **Absorbers, graphite.**
2. **Agitators, liquids.**
3. **Catalyst carriers (Chemically loaded molecular sieves).**
4. **Chemical equipment of graphite.**
5. **Infra-red cell cooling equipment.**
6. **Irradiators, gammacell, research.**
7. **Pumps of graphite.**
8. **Pumps, high vacuum.**
9. **Rich/lean ratio equipment.**
10. **Vaporizers, cryogenic.**

Atomic Energy of Canada Ltd.
6.

Canadian Research Institute
2.

Nuclear Enterprises Ltd.
9.

Ontario Research Foundation
6.8.

Union Carbide Canada Ltd.
1.3.4.5.7.10.

6645 TIME MEASURING INSTRUMENTS

1. **Intervalometers, rocket firing.**
2. **Programmer, time, semi-automatic.**
3. **Timers, precision.**

Aviation Electric Ltd.
3.

De Havilland Aircraft (SPAR)
1.3.

Philips Electronics Industries Ltd.
2.3.

Presentey Engineering Products Ltd.
2.

6650 OPTICAL INSTRUMENTS

1. **Binoculars.**
2. **Clinometers.**
3. **Diaphragms.**
4. **Filters.**
5. **Lenses.**
6. **Mirrors.**
7. **Mounts.**
8. **Objectives.**
9. **Optical spotting instruments.**
10. **Prisms.**
11. **Projectors.**
12. **Telescopes.**

Ernst Leitz Canada Ltd.

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.**
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.**

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. — Cossor Electronics Ltd.
2.

Fleet Manufacturing Ltd.
14.

Honeywell Controls Ltd.
7.
George Kelk Ltd.
4.
Lockwood Survey Corp. Ltd.
1.4.5.9.
McPhar Geophysics Ltd.
1.4.5.6.7.9.11.
Sharpe Instruments of Canada Ltd.
4.6.7.11.
J. Swann (1963) Ltd.
3.14.

6660 METEOROLOGICAL INSTRUMENTS AND APPARATUS

1. Meteorological balloons.
2. Rawin sets.
3. Receiving sets, radiosonde.
4. Transmitting sets, radiosonde.

Austenal Canada Ltd.
1.
Aviation Electric Ltd.
2.
CAE Industries Ltd.
2.3.4.
George Kelk Ltd.
4.
RCA Victor Co. Ltd.
2.

6665 HAZARD-DETECTING INSTRUMENTS AND APPARATUS

1. Air pollution monitor.
2. Beta counters.
3. Detector sets, mine.
4. Detectors, alpha particle.
5. Detectors, mercury.
6. Detectors, radiation, solid state.
7. Gel scintillators, detection.
8. Liquid scintillators, detection.
9. Monitoring sets.
10. Probes, radiac.
11. Radiac sets.
12. Recorders magnetic distortion.
13. Systems, fire detection, infra-red.

Barringer Research Ltd.
5.
CAE Industries Ltd.
11.
Canadian Admiral Corp. Ltd.
11.
Computing Devices of Canada Ltd.
11.12.13.
De Havilland Aircraft (SPAR)
12.
Honeywell Controls Ltd.
9.11.
Marsland Engineering Ltd.
9.
Measurement Engineering Ltd.
1.9.11.
Milltronics Ltd.
11.
R. H. Nichols Co. Ltd.
11.
Nuclear Enterprises Ltd.
1.2.7.8.9.10.11.
Presentey Engineering Products Ltd.
1.12.
RCA Victor Co. Ltd.
3.4.9.10.11.
Simtec Ltd.
6.

6670 SCALES AND BALANCES

1. Scales.

Fairbanks-Morse (Canada) Ltd.

6675 DRAFTING, SURVEYING AND MAPPING INSTRUMENTS

1. Boards, drafting.
2. Furniture, drafting room, wood/steel.
3. Machines, drafting.
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.**
2. **Controls, rate flow, liquid.**
3. **Flowmeters, gas.**
4. **Flowmeters, liquid.**
5. **Fuel metering controls.**
6. **Gauges, level, liquid.**
7. **Recorders.**
8. **Regulators, oxygen.**
9. **Regulators, pressure.**
10. **Speedometer cable.**

Anthes Imperial Ltd.
6.

Aro of Canada Ltd.
8.9.

S. F. Bowser Co. Ltd.
4.

Canadian Valve (Singer Valve)
2.5.9.

General Wire & Cable
10.

Liquidometer of Canada Ltd.
6.7.

Measurement Engineering Ltd.
6.7.

Neptune Meters Ltd.
1.3.4.5.

Stewart-Warner Corp. Ltd.
10.

Taylor Instrument Companies Ltd.
1.2.3.5.6.7.

Union Carbide Canada Ltd.
1.3.8.9.

6685 PRESSURE, TEMPERATURE, AND HUMIDITY MEASURING AND CONTROLLING INSTRUMENTS

1. **Controllers, indicating, temperature.**
2. **Indicators.**
3. **Pressure indicators.**
4. **Pressure transmitters.**
5. **Recorders, temperature.**
6. **Thermocouples.**
7. **Thermocouples, lead wire.**
8. **Thermometers, recording.**

Aviation Electric Ltd.
3.4.

Canada Wire & Cable Co. Ltd.
7.

Canadian Motorola Electronics Co.
4.

Central Dynamics Ltd.
6.

Garrett Manufacturing Ltd.
1.

Liquidometer of Canada Ltd.
1.5.

Measurement Engineering Ltd.
8.

Pioneer Electric Brandon Ltd.
8.

Taylor Instrument Companies Ltd.
1.2.3.4.5.6.7.8.

6695 COMBINATION AND MISCELLANEOUS INSTRUMENTS

1. **Beta lights.**
2. **Indicators, crash position, A/C.**
3. **Rods, synthetic sapphire.**

Leigh Instruments Ltd.
2.

Nuclear Enterprises Ltd.
1.

Union Carbide Canada Ltd.
3.

GROUP 67

PHOTOGRAPHIC EQUIPMENT

6710 CAMERAS, MOTION PICTURE

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

Computing Devices of Canada Ltd.
1.2.4.

De Havilland Aircraft (SPAR)
1.

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

Ernst Leitz Canada Ltd.
1.2.3.4.

6720 CAMERAS, STILL PICTURE

1. Cameras, aircraft.
2. Cameras, still picture.

Ernst Leitz Canada Ltd.

6740 PHOTOGRAPHIC DEVELOPING AND FINISHING EQUIPMENT

1. Automatic systems.

Houston Schmidt Ltd.

6750 PHOTOGRAPHIC SUPPLIES

1. Acetic acid.

Anachemia Chemicals Ltd.
1.

Canadian Chemical Co. Ltd.
1.

Canadian General Electric (Lamp Dept.)
2.

2. Photoflash lamps.

Mallinckrodt Chemical Works Ltd.
1.

Sylvania Electric (Canada) Ltd.
2.

6760 PHOTOGRAPHIC EQUIPMENT AND ACCESSORIES

1. Adapters, lens.
2. Filters.
3. Intervalometers, A/C camera.
4. Lenses, multitype.

De Havilland Aircraft (SPAR)
3.

5. Lenses, telephoto.
6. Lenses, wide angle.
7. Mounts.

Ernst Leitz Canada Ltd.
1.2.4.5.6.7.

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

H. L. Blachford Ltd.
59.68.69.70.71.72.80.

Brockville Chemicals Ltd.
19.20.56.78.

Canadian Carborundum Co. Ltd.
17.

Canadian Chemical Co. Ltd.
1.2.3.4.5.6.8.14.15.16.18.24.31.
32.40.43.44.50.51.52.60.79.

Canadian Industries Ltd.
8.10.19.20.31.32.50.56.61.78.

Consolidated Mining & Smelting
21.22.78.

Cyanamid of Canada Ltd.
20.29.38.48.58.78.

Dominion Rubber Co. Ltd.
23.32.39.57.

Dow Chemical of Canada Ltd.
19.31.42.

Du Pont of Canada Ltd.
7.8.9.61.

Electric Reduction Co. Ltd.
34.35.62.63.

International Nickel Co. of Canada Ltd.
37.55.67.75.

Polymer Corporation Ltd.
11.12.13.28.30.33.41.46.64.73.74.77.

The Steel Co. of Canada Ltd.
22.25.26.27.36.47.49.53.54.76.

Shawinigan Chemicals Ltd.
3.5.6.8.10.15.24.29.31.32.38.44.52.60.

Union Carbide Canada Ltd.
18.29.42.45.65.66.

Uniroyal (1966) Ltd.
23.32.39.57.

Zinc Oxide Co. of Canada Ltd.
81.

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

Canadian Industries Ltd.
2.18.

Consolidated Mining & Smelting
2.5.18.

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. **Antioxidants, food.**
2. **Disinfectants.**
3. **Disinfectant, cleaning.**
4. **Fungicides.**
5. **Herbicides.**
6. **Insecticides.**

Canadian Industries Ltd.
4.5.6.

Cartier Chemical Co. Ltd.
2.3.6.

Uniroyal (1966) Ltd.
1.4.5.6.

6850 MISCELLANEOUS CHEMICAL SPECIALTIES

1. **Accelerators, rubber and plastic.**
2. **Anti-freeze.**
3. **Automotive anti-stall additives.**
4. **Brake fluids.**
5. **Carbons, activated.**
6. **Cement curing compounds.**
7. **Chemicals, refined, photographic.**
8. **Compound cleaning, radiator.**
9. **De-icing fluids.**
10. **Dry cleaning chemicals.**
11. **Epoxy resins and hardeners.**
12. **Metal cleaners.**
13. **Oil absorbents.**
14. **Penetrants.**
15. **Powders, plastic moulding.**
16. **Preservative chemicals.**
17. **Safety solvents.**
18. **Solvent, windshield washing.**
19. **Specialties.**
20. **Wallwashing compounds.**

Canadian Industries Ltd.
17.20.

Cartier Chemical Co. Ltd.
6.12.13.14.17.19.20.

Dow Chemical of Canada Ltd.
4.10.12.15.16.

B. F. Goodrich Canada Ltd.
9.

Union Carbide Canada Ltd.
1.2.3.4.5.7.8.9.11.18.

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

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. — Cossor Electronics Ltd.
4.

Fleet Manufacturing Ltd.
9.10.11.

Lockwood Survey Corp. Ltd.
7.

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 Victor Co. Ltd.
4.9.10.

Stark Electronic Instruments Ltd.
9.10.

Harvie Thompson & Steven Waring Ltd.
1.2.3.

6920 ARMAMENT TRAINING DEVICES

1. Loader, gunnery.
2. Recorders, target drone, miss-distance.
3. Targets, aerial tow.
4. Targets, holding mechanism, train-fire.
5. Training devices, electric.

Aviation Electric Ltd.
5.

Canadair Ltd.
4.

Computing Devices of Canada Ltd.
2.

Fairbanks-Morse (Canada) Ltd.
1.

The Holden Mfg. Co. Ltd.
3.

ITT Canada Ltd.
5.

Universal Die & Tool Mfg. Ltd.
4.

6930 OPERATIONAL TRAINING DEVICES

1. Simulator analyser groups.
2. Simulators, flight.
3. Simulators, navigational control.
4. Training devices, electrical.

Aviation Electric Ltd.
4.

CAE Industries Ltd.
2.3.4.

Canadair Ltd.
4.

Computing Devices of Canada Ltd.
3.

Marsland Engineering Ltd.
1.4.

Measurement Engineering Ltd.
4.

RCA Victor Co. Ltd.
1.4.

6940 COMMUNICATION TRAINING DEVICES

1. Simulators, navigation aids.
2. Simulators, radar signal.
3. Sonar target signal generators.
4. Training devices, electric.

Aviation Electric Ltd.
1.

CAE Industries Ltd.
1.3.4.

Canadian Westinghouse (Electronics)
3.

Computing Devices of Canada Ltd.
2.

Marsland Engineering Ltd.
3.

Measurement Engineering Ltd.
1.

RCA Victor Co. Ltd.
1.3.4.

Sperry Gyroscope Co. of Canada Ltd.
3.4.

GROUP 71

FURNITURE

7110 OFFICE FURNITURE

1. Custom built, wood.

Royalmetal Corp. Ltd.
2.

Saint John Shipbuilding & Dry Dock
1.

2. Tubular equipment.

Triple-A Mfg. Co. Ltd.
2.

7125 CABINETS, LOCKERS, BINS AND SHELVING

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

Aerometal Products & Design Ltd.
1.2.3.4.6.7.8.9.

Burrard Dry Dock Co. Ltd.
1.2.3.4.6.7.8.9.11.12.13.14.15.

Canadian General Electric (Plastics)
5.

Canadian Vickers Ltd.
1.2.3.4.6.9.

Dominion Steel & Coal (Truscon)
12.

Electrical Mfg. Co. Ltd.
1.2.3.4.6.7.8.9.12.14.

Enamel & Heating Products Ltd.
1.2.3.9.12.

Fleetwood Metal Industries Ltd.
1.2.3.4.6.7.8.9.

Halifax Shipyards
3.4.6.9.10.

Hassan Steel Fabricators Ltd.
1.2.4.6.7.8.9.11.12.13.14.

Hussman Refrigerator Co. Ltd.
9.12.

Industrial Machining Ltd.
2.3.4.6.8.

Matthew Moody Division
15.

The Pedlar People Ltd.
1.3.7.8.9.12.

Polyfiber Ltd.
5.

Renfrew Aircraft & Engineering Ltd.
1.2.3.4.6.7.8.9.

Royalmetal Corp. Ltd.
3.4.6.7.8.9.12.13.14.

Saint John Shipbuilding & Dry Dock
1.3.4.6.9.10.

Triple-A Mfg. Co. Ltd.
1.7.8.9.11.12.13.14.

Victoria Machinery Depot Co.
3.4.6.9.

Westeel-Rosco Ltd.
1.2.3.4.6.7.8.9.12.13.

The W. C. Wood Co. Ltd.
12.

Phil Wood Industries Ltd.
11.14.

Yarrows Ltd.
1.2.3.4.6.7.8.9.11.12.13.14.

7195 MISCELLANEOUS FURNITURE AND FIXTURES

1. Custom built, steel.
2. Custom built, wood.
3. Work benches and tables.

Halifax Shipyards
2.

Saint John Shipbuilding & Dry Dock
2.

The Steel Co. of Canada Ltd.
1.3.

GROUP 72

HOUSEHOLD AND COMMERCIAL FURNISHINGS AND APPLIANCES

7240 HOUSEHOLD AND COMMERCIAL UTILITY CONTAINERS

1. Bags, dry cleaning.
2. Bags, household.
3. Bags, refuse.

Scepter Mfg. Co. Ltd.
5.6.

4. Films, plastic, household.
5. "Jerry" cans, plastic.
6. Pails, plastic.

Union Carbide Canada Ltd.
1.2.3.4.

7290 MISCELLANEOUS HOUSEHOLD AND COMMERCIAL FURNISHINGS AND APPLIANCES

1. Baskets, wire, hand.

Johnson Wire Products Ltd.
1.

GROUP 73

FOOD PREPARATION AND SERVING EQUIPMENT

7310 FOOD COOKING, BAKING AND WARMING EQUIPMENT

1. Galleys, aircraft.
2. Ranges, coal and wood.
3. Ranges, electric.
4. Ranges, gas.

Beach Foundry Ltd.
3.4.

Enamel & Heating Products Ltd.
3.4.

Findlays Ltd.
2.3.4.

Timmins Aviation Ltd.
1.

7320 KITCHEN EQUIPMENT AND APPLIANCES

1. Baskets, dishwashing.
2. Baskets, food handling.
3. Baskets, tableware.
4. Blades, band-saw, meat cutting.
5. Cabinets, delivery and storage.
6. Carts, produce.
7. Carts, tray.
8. Racks, food handling, etc.
9. Racks, stacking.
10. Trays, refrigerator.
11. Trucks, refrigerator.

Citco
4.

Johnson Wire Products Ltd.
1.2.3.

Matthew Moody Division
5.6.7.8.9.10.11.

Triple-A Mfg. Co. Ltd.
9.

7330 KITCHEN HAND TOOLS AND UTENSILS

1. Baskets, cutlery.
2. Baskets, cutlery, sterilization.
3. Baskets, frying.
4. Cooking kettles, stainless.
5. Pans, bakery.
6. Racks.

Coulter Copper & Brass Co. Ltd.
4.

Johnson Wire Products Ltd.
1.2.3.

Matthew Moody Division
5.

Triple-A Mfg. Co. Ltd.
6.

7340 CUTLERY AND FLATWARE

1. Stainless steel.

Universal Die & Tool Mfg. Ltd.

7350 TABLEWARE

1. Food serving equipment, plastic.
2. Tableware, melamine.
3. Tableware, plastic.

Cyanamid of Canada Ltd.
2.

General Plastics Ltd.
1.2.3.

Maple Leaf Plastics Ltd.
3.

Glenn S. Woolley & Co. Ltd.
2.3.

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

1. Mess kits.

Metalite Co. Ltd.

GROUP 74

OFFICE MACHINES, VISIBLE RECORD EQUIPMENT, AND DATA PROCESSING EQUIPMENT

7440 AUTOMATIC DATA PROCESSING SYSTEMS: INDUSTRIAL, SCIENTIFIC, AND OFFICE TYPES

1. Computers, digital.
2. Computers, electronic.
3. Consoles, electronic.
4. Converters, digital-to-analogue.
5. Cores, memory array units.
6. Data analysis controls.
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.

Burroughs Business Machines Ltd.
5.

CAE Industries Ltd.
8.

Canadian General Electric (EDPD)
2.7.

Canadian Marconi Co.
9.

Canadian Research Institute
4.

Canadian Westinghouse (Electronics)
3.6.8.9.

Computing Devices of Canada Ltd.
1.2.3.4.5.6.7.9.10.

Ferranti Electronics
2.5.7.8.9.10.

International Business Machines
1.2.3.4.5.6.7.8.9.10.

Marsland Engineering Ltd.
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 Victor Co. Ltd.
2.5.8.10.

Raytheon Canada Ltd.
8.

Sperry Gyroscope Co. of Canada Ltd.
2.

GROUP 75

OFFICE SUPPLIES AND DEVICES

7510 OFFICE SUPPLIES

1. Cellulose, transparent and coloured.
2. Cloth, coloured for packaging.
3. Paper, creped for mashing.

Canadian Technical Tape Ltd.

7520 OFFICE DEVICES, ACCESSORIES

1. Baskets, waste paper.

Johnson Wire Products Ltd.
1.

7530 STATIONERY AND RECORD FORMS

1. Charts, recording.
2. Paper, cross section.

Canadian Charts & Supplies Ltd.
1.2.3.

3. Paper, graph.
4. Paper, recording, electrosensitive.

Muirhead Instruments Ltd.
4.

GROUP 76

BOOKS, MAPS, AND OTHER PUBLICATIONS

7610 BOOKS AND PAMPHLETS

1. Maintenance manuals.
2. Operating instructions.
3. Parts lists.
4. Technical publications.

Aro of Canada Ltd.
1.2.3.4.

Avian Aircraft Ltd.
1.2.3.4.

Aviation Electric Ltd.
1.2.3.4.

Canadair Ltd.
3.4.

Computing Devices of Canada Ltd.
1.2.3.4.

Dowty Equipment of Canada Ltd.
1.2.3.4.

Evergreen Press 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.
2. Maps and charts printed.

Aero Photo Inc.
1.

Canadian Aero Service Ltd.
1.2.

Evergreen Press Ltd.
2.

Lockwood Survey Corp. Ltd.
1.2.

McElhanney Surveying & Engineering
1.2.

Spartan Air Services Ltd.
1.2.

7690 MISCELLANEOUS PRINTED MATTER

1. Decals.
2. Markers, adhesive.
3. Plates, identification, adhesive.

Acme Decalcomania Ltd.
2.3.

Beaver Decalcomania Co. Ltd.
1.

GROUP 78

RECREATIONAL AND ATHLETIC EQUIPMENT

7830 RECREATIONAL AND GYMNASTIC EQUIPMENT

1. Mats, canvas, gymnasium.

The Holden Mfg. Co. Ltd.
1.

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. **Coatings, polyester-epoxy.**
2. **Enamels, acrylic.**
3. **Enamels, alkyd.**
4. **Fluorescent coatings.**
5. **Lacquers.**
6. **Masonry block filler.**
7. **Metal primers.**
8. **Paints.**
9. **Paints, marine.**
10. **Resins, acrylic.**
11. **Resins, alkyd.**
12. **Resins, polyester.**
13. **Sealers, plastic.**
14. **Sealers, rubber.**
15. **Stains, fillers.**
16. **Thinners.**
17. **Varnishes.**
18. **Varnishes, insulating.**
19. **Wire enamels.**
20. **Wood primers.**

British America Paint Co. Ltd.
1.2.3.6.7.8.9.10.11.12.13.15.19.

Canadian General Electric (Chem. Mat.)
18.19.

Canadian Industries Ltd.
4.5.6.7.8.14.16.17.18.20.

Cartier Chemicals Co. Ltd.
13.17.

Du Pont of Canada Ltd.
8.

Firestone Tire & Rubber Canada Ltd.
14.

B. F. Goodrich Canada Ltd.
13.14.

Uniroyal (1966) Ltd.
13.14.

8030 PRESERVATIVE AND SEALING COMPOUNDS

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

H. L. Blachford Ltd.
2.4.10.11.

British America Paint Co. Ltd.
1.4.8.10.11.12.

Canadian General Electric (Chem. Mat.)
1.12.

Canadian Industries Ltd.
1.4.6.9.17.

Canadian Technical Tape Ltd.
3.

Cartier Chemicals Co. Ltd.
4.5.6.17.

Dow Chemical of Canada Ltd.
13.

Du Pont of Canada Ltd.
15.

Firestone Tire & Rubber Canada Ltd.
9.15.

B. F. Goodrich Canada Ltd.
4.9.11.15.

The Steel Co. of Canada Ltd.
14.

Union Carbide Canada Ltd.
5.7.10.11.15.16.

Uniroyal (1966) Ltd.
4.8.9.12.15.17.

8040 ADHESIVES

1. **Cement, rubber.**
2. **Contact types.**
3. **Flexible, waterproof.**
4. **Lagging, (MIL C-3316).**
5. **Natural rubber base.**
6. **Resins, phenolic and epoxy.**
7. **Synthetic rubber base.**

Delpex Adhesives Ltd.
4.

Dunlop Canada Ltd.
2.5.7.

Firestone Tire & Rubber Canada Ltd.
1.3.
B. F. Goodrich Canada Ltd.
1.3.
Goodyear Tire & Rubber Canada Ltd.
3.
Union Carbide Canada Ltd.
6.
Uniroyal (1966) Ltd.
1.6.

GROUP 81

CONTAINERS, PACKAGING, AND PACKING SUPPLIES

8105 BAGS AND SACKS

1. Bags, packaged product.
2. Bags, paper, kraft.
3. Bags, plastic, refuse.
4. Bags, polyethylene, dry cleaning.
5. Casings, food.

Domtar Packaging Ltd.
1.2.

E. B. Eddy Co.
2.

Union Carbide Canada Ltd.
1.3.4.5.

8110 DRUMS AND CANS

1. Aluminum.
2. Cans, fibre.
3. Containers, fibre.
4. Covers, fibre.
5. Covers, metal drum.
6. Drums, fibre.
7. Drums, metal.
8. Tubes, metal, collapsible.
9. Tubes, metal, non-collapsible.
10. Tubes, metal, shipping.

Dominion Aluminum Fabricating Ltd.
1.

Domtar Packaging Ltd.
2.3.

General Impact Extrusions
1.8.9.10.

Hassan Steel Fabricators Ltd.
5.7.10.

Montebello Metal Ltd.
1.8.10.

Renfrew Aircraft & Engineering Ltd.
1.5.7.

Sonoco Products Co. Ltd.
2.3.4.6.

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. Cartons, fibre.
11. Cartons, paper.
12. Cases, beverage, plastic.
13. Container assemblies.
14. Containers, food.
15. Containers, wire, shipping.
16. Crates, export.
17. Crates, wood.
18. Pallets.
19. Shooks.

Bathurst Containers Ltd.
2.3.7.8.9.16.17.

Canadian General Electric (Plastics)
5.6.

Crown Zellerbach Building Materials Ltd.
7.8.13.18.19.

Dominion Aluminum Fabricating Ltd.
1.

Domtar Packaging Ltd.
2.3.6.10.11.

Enamel & Heating Products Ltd.
1.

Firestone Tire & Rubber Canada Ltd.
13.

G.M. Plastic Corp.
5.6.

Greening Industries Ltd.
15.

Polyfiber Ltd.
5.

Protective Plastics Ltd.
5.

Renfrew Aircraft & Engineering Ltd.
1.4.13.

Somerville Industries Ltd.
5.6.

Thompson Wood Products Ltd.
3.8.16.17.18.19.

Union Carbide Canada Ltd.
6.12.14.

8120 COMMERCIAL AND INDUSTRIAL GAS CYLINDERS

1. **Cylinders, acetylene.**
2. **Cylinders, compressed gas and components.**
3. **Cylinders, liquid gas.**
4. **Cylinders, LP gas.**
5. **Flasks, steel.**
6. **Flasks, steel, compressed.**
7. **Manifolds, oxygen, acetylene, argon, nitrogen, helium and fuel gas.**
8. **Pressure vessels and components.**
9. **Tanks, liquid gas.**
10. **Tanks, liquid receivers.**
11. **Tanks, pressure.**
12. **Tanks, shipping, dry ice.**
13. **Tanks, storage.**
14. **Tanks, storing, dry ice.**
15. **Tanks, various (small).**
16. **Valves, high pressure.**

LIBRARY
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OTTAWA
Dept. of Trade & Commerce

Aro of Canada Ltd.
8.

Bertram Machine & Tool Co.
8.

S. F. Bowser Co. Ltd.
8.11.

Bristol Aerospace Ltd.
8.

Canadian Vickers Ltd.
6.8.11.

Davie Shipbuilding Ltd.
8.9.12.13.

Dominion Bridge Co. Ltd.
8.9.

Engineering Products of Canada Ltd.
2.4.

Fairbanks-Morse (Canada) Ltd.
8.

Ferro Metal Ltd.
8.13.

Fromson Heat Transfer Ltd.
11.

Hall Machinery Ltd.
8.9.

Hassan Steel Fabricators Ltd.
8.9.11.12.14.

Hawker Siddeley Canada (Trans. Equip.)
8.

James Howden & Parsons of Canada
8.11.

Hussman Refrigerator Co. Ltd.
8.10.15.

Kingston Shipyards
5.8.10.15.

Marine Industries Ltd.
6.8.

Montreal Locomotive Works Ltd.
8.

Napanee Industries Ltd.
8.11.

National Steel Car Corp. Ltd.
5.

Saskatchewan Steel Fabricators Ltd.
8.11.

Union Carbide Canada Ltd.
1.2.3.4.5.7.9.11.16.

Victoria Machinery Depot Co. Ltd.
11.

8125 BOTTLES AND JARS

1. **Bottles, polyethylene.**
2. **Carboys, polyethylene.**

Domtar Packaging Ltd.
1.

Plax Canada Ltd.
1.2.

Polybottle Ltd.
1.

Union Carbide Canada Ltd.
1.2.

8130 REELS AND SPOOLS

1. **Reels, fibre.**
2. **Reels, metal.**
3. **Reels, plastic.**
4. **Spools, fibre.**

Canadian General Electric (Plastics)
3.

Sonoco Products Co. Ltd.
1.4.

R.J. Stampings Co. 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.**
9. **Paper, flat for packaging.**

8135 PACKAGING AND PACKING BULK MATERIALS *(conc.)*

10. Paper, volatile corrosion, inhibiter treated.
11. Paper, wrapping, plastic coated.
12. Tape, pressure sensitive.
13. Tubes, paper.

Canadian Technical Tape Ltd.
1.5.6.8.9.10.11.12.

Domtar Packaging Ltd.
13.

Dow Chemical of Canada Ltd.
2.3.4.7.

E. B. Eddy Co.
8.9.13.

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.

Bathurst Containers Ltd.
5.

Canada Iron Foundries (West. Bridge)
6.

Canadian General Electric (Plastics)
1.8.

Clinton Products (Canada) Ltd.
10.

Dominion Aluminum Fabricating Ltd.
6.

Domtar Packaging Ltd.
1.4.8.

Enamel & Heating Products Ltd.
2.10.11.12.

Firestone Tire & Rubber Canada Ltd.
6.

Fleetwood Metal Industries Ltd.
2.10.

G.M. Plastic Corp.
1.8.

General Impact Extrusions
11.12.

B. F. Goodrich Canada Ltd.
6.

Hassan Steel Fabricators Ltd.
3.

Hussman Refrigerator Co. Ltd.
10.

Metalite Co. Ltd.
10.

National Steel Car Corp. Ltd.
10.

Polyfiber Ltd.
1.

Renfrew Aircraft & Engineering Ltd.
10.

St. Lawrence Mfg. Co.
9.

Somerville Industries Ltd.
1.8.

Sonoco Products Co. Ltd.
4.

Thompson Wood Products Ltd.
5.

Triple-A Mfg. Co. Ltd.
10.

Tudhope Specialties Ltd.
2.10.

Union Carbide Canada Ltd.
8.

Westeel-Rosco Ltd.
2.10.

Phil Wood Industries Ltd.
7.

GROUP 83

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

8305 TEXTILE FABRICS

1. Cotton, braided and woven.
2. Filter cloth.

Bay Mills Ltd.
2.4.

3. Nylon, braided and woven.
4. Screen, insect, glass fabric.

Granby Elastic & Textiles Ltd.
1.3.

8340 TENTS AND TARPAULINS

1. Pegs, tent, magnesium.
2. Poles, tent, telescopic.
3. Tents, canvas.

The Holden Mfg. Co. Ltd.
3.4.5.

Magline of Canada Ltd.
1.2.

4. Tents, canvas, arctic.
5. Weatherlines, adjustable.

J. J. Turner Co. Ltd.
5.

8345 FLAGS AND PENNANTS

1. Cones, wind direction.

The Holden Mfg. Co. Ltd.
1.

2. Panels, signal, ground to air.

J. J. Turner Co. Ltd.
2.

GROUP 84

CLOTHING, INDIVIDUAL EQUIPMENT, AND INSIGNIA

8405 OUTERWEAR, MEN'S

1. Caps, felt and suede, military.
2. Coats, heavy duty.
3. Trousers, heavy duty.

Fashion Hat & Cap Co. Ltd.
1.

The Holden Mfg. Co. Ltd.
2.3.

8410 OUTERWEAR, WOMEN'S

1. Caps, felt and suede, military.

Fashion Hat & Cap Co. Ltd.
1.

8415 CLOTHING, SPECIAL PURPOSE

1. Aprons, rubber, protective.
2. Caps, safety, fluorescent, red.
3. Caps, safety, soft plastic, red.
4. Clothing, arctic.
5. Gloves, dry box, rubber.
6. Gloves, household, rubber.
7. Gloves, industrial, rubber.
8. Gloves, veterinary, rubber.
9. Helmets, plastic.
10. Parkas.
11. Pressure breathing waistcoats.
12. Suits, fire fighting with integrated oxygen and/or air conditioning.
13. Suits, safety, heat protective, with integrated oxygen and/or air conditioning.

Aro of Canada Ltd.
12.13.

Austenal Canada Ltd.
5.6.7.8.

Canadian General Electric (Plastics)
9.

Fashion Hat & Cap Co. Ltd.
2.3.

The Holden Mfg. Co. Ltd.
4.10.

Irvin Air Chute Ltd.
11.

Polyfiber Ltd.
9.

Protective Plastics Ltd.
9.

St. Lawrence Rubber Co.
1.

Somerville Industries Ltd.
9.

8430 FOOTWEAR, MEN'S

1. Boots, insulated, rubber, arctic.
2. Canvas, rubber sole.
3. Mukluks.
4. Plastic.
5. Rubber.
6. Rubber boots.
7. Rubber heels and soles.

Uniroyal (1966) Ltd.
1.2.3.4.5.6.7.

8435 FOOTWEAR, WOMEN'S

1. Boots, insulated, rubber, arctic.
2. Canvas, rubber sole.
3. Mukluks.
4. Plastic.
5. Rubber.
6. Rubber boots.
7. Rubber heels and soles.

Uniroyal (1966) Ltd.
1.2.3.4.5.6.7.

8455 BADGES AND INSIGNIA

1. Tags, personnel.

Ketchum Mfg. Co. Ltd.
1.

8460 LUGGAGE

1. Cases, canvas, multiapplication.

The Holden Mfg. Co. Ltd.
1.

8465 INDIVIDUAL EQUIPMENT

1. Bags, duffle.
2. Bags, sleeping.
3. Belts, ammunition.
4. Belts, pistol.
5. Canteens, plastic.
6. Containers, fabric utility.
7. Haversacks, respirator.
8. Mattresses, pneumatic.
9. Packboards.
10. Packsacks.
11. Snowshoes, magnesium.
12. Web equipment.

Aerometal Products & Design Ltd.
11.

Canadian General Electric (Plastics)
5.

Firestone Tire & Rubber Canada Ltd.
8.

Guelph Elastic Hosiery Co. Ltd.
12.

The Holden Mfg. Co. Ltd.
1.2.3.4.6.7.9.10.

Imperial Industries Ltd.
2.

Magline of Canada Ltd.
11.

J. J. Turner Co. Ltd.
2.

Uniroyal (1966) Ltd.
8.

8475 SPECIALIZED FLIGHT CLOTHING AND ACCESSORIES

1. Anti "G" suits.

Irvin Air Chute Ltd.

GROUP 91

FUELS, LUBRICANTS, OILS, AND WAXES

9135 LIQUID PROPELLANT FUELS AND OXIDIZERS; CHEMICAL BASE

1. Propellant, nitrogen aerosol.

Union Carbide Canada Ltd.

9150 OILS AND GREASES: CUTTING, LUBRICATING AND HYDRAULIC

1. Anti-friction compound. **2. Automotive brake fluid.**

Union Carbide Canada Ltd.
1.2.

GROUP 93

NON-METALLIC FABRICATED MATERIALS

9310 PAPER AND PAPERBOARD

Domtar Packaging Ltd.

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.**
7. **Rubber coated fabrics.**
8. **Rubber foam sheets.**
9. **Rubber sheets.**
10. **Rubber sponge materials.**

Dunlop Canada Ltd.
1.3.4.

Firestone Tire & Rubber Canada Ltd.
3.4.6.7.9.

B. F. Goodrich Canada Ltd.
1.2.3.5.6.7.8.9.10.

Goodyear Tire & Rubber Canada Ltd.
2.5.6.

Mansfield-Denman General Ltd.
3.6.10.

St. Lawrence Rubber Co.
6.7.

Uniroyal (1966) Ltd.
1.3.4.6.7.8.9.10.

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 resins.**
13. **Plastic coated fabrics.**
14. **Plastic extruded shapes.**
15. **Plastic injection moulding.**
16. **Plastic laminates.**
17. **Plastic moulded shapes.**
18. **Plastic sheet.**
19. **Polyethylene film.**
20. **Polyethylene film and tubing.**
21. **Polyethylene resins.**
22. **Polymers cardeplex.**
23. **Transparent cellulose film.**
24. **Urethane foam.**

Automatic Plastics Co.
2.3.4.5.6.7.17.

Bristol Aerospace Ltd.
2.17.

Canadair Ltd.
11.

Canadian Car (Fort William)
8.17.

Canadian General Electric (Plastics)
1.2.8.11.14.17.

Canadian Industries Ltd.
13.18.19.20.21.

The Daymond Company Ltd.
14.15.

Dominion Rubber Co. Ltd.
2.13.18.21.24.

Du Pont of Canada Ltd.
9.19.21.23.

English Plastics Ltd.
2.

Firestone Tire & Rubber Canada Ltd.
21.

Fleet Manufacturing Ltd.
2.16.17.

G.M. Plastic Corp.
2.17.18.23.24.

B. F. Goodrich Canada Ltd.
13.14.17.24.

Hand Chemical Industries Ltd.
8.17.

Hardifoam Products Ltd.
24.

The Hoover Co. Ltd.
14.17.

Kingston Shipyards
17.

Mansfield-Denman General Ltd.
14.17.

Northwest Industries Ltd.
2.11.13.17.

9330 PLASTICS FABRICATED MATERIALS *(conc.)*

O. & W. Electronics Ltd.
2.11.

Ontario Steel Products Co. Ltd.
2.8.14.17.

Polyfiber Ltd.
2.8.14.17.

Scepter Mfg. Co. Ltd.
14.15.17.

Smith & Stone Ltd.
2.8.14.17.

Somerville Industries Ltd.
2.11.14.17.

Union Carbide Canada Ltd.
2.9.10.11.12.14.16.17.18.19.20.21.22.

Uniroyal (1966) Ltd.
2.13.18.21.24.

Valeriote Electronics Ltd.
2.17.

Glenn S. Woolley & Co. Ltd.
17.

9350 REFRACTORIES AND FIRE SURFACING MATERIALS

1. Bricks, refractory, carbon and graphite.
2. Cement, refractory.
3. Ceramics.
4. Porcelain.

Hamilton Porcelains Ltd.
3.

Smith & Stone Ltd.
3.4.

Union Carbide Canada Ltd.
1.2.

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.**
5. **Wire, high alloy.**
6. **Wire, steel, H.C.**
7. **Wire, steel, L.C.**
8. **Wire, tinned steel.**

A.I.M. Steel Ltd.
3.

Atlas Steels Co.
5.

Dominion Steel & Coal Corp. Ltd.
1.3.6.7.

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, reinforcing.**
2. **Bars, round.**
3. **Bars, spring steel.**
4. **Bars, square.**
5. **Bars, steel, alloy.**
6. **Bars, steel, carbon.**
7. **Bars, steel, stainless.**
8. **Black plates, steel.**
9. **Blue plates, steel.**
10. **Half ovals.**
11. **Half rounds.**
12. **Hexagons.**
13. **High speed steels.**
14. **Rods, drill.**
15. **Rods, stellite.**
16. **Sheet & strip, steel, cold rolled.**
17. **Sheet & strip, steel, galvanized.**
18. **Sheet & strip, steel, silicon electrical.**
19. **Sheet & strip, steel, hot-rolled.**
20. **Special sections.**
21. **Steel plates.**
22. **Tin plate, electrolytic & hot dipped.**

Atlas Steels Co.
2.4.5.6.7.13.14.

Canadian Drawn Steel Co. Ltd.
2.4.5.6.7.

Deloro Stellite
13.15.

Dominion Foundries & Steel Ltd.
8.9.17.18.19.20.21.22.

Dominion Steel & Coal Corp. Ltd.
1.2.4.

Hawker Siddeley Canada Ltd.
1.2.4.5.6.7.

The Steel Co. of Canada Ltd.
1.2.3.4.5.6.10.11.12.16.

Union Carbide Canada Ltd.
5.

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. **Porcelain, enamelling.**
17. **Prepainted.**
18. **Sheets, steel.**
19. **Sheets, steel, aircraft.**
20. **Sheets, steel, "Haynes" alloys.**
21. **Sheets, steel, high alloy.**
22. **Ship.**
23. **Special grades.**
24. **Stainless.**
25. **Structural.**

Armco Drainage & Metal Products
14.18.

Atlas Steels Ltd.
15.24.

Napanee Industries Ltd.
13.

The Pedlar People Ltd.
12.13.

The Steel Co. of Canada Ltd.
1.2.3.4.5.6.7.8.9.10.11.15.16.17.22.23.25.

Union Carbide Canada Ltd.
19.20.21.

The Union Screen Plate Co. Ltd.
13.

9520 STRUCTURAL SHAPES, IRON AND STEEL

1. Angles.

Dominion Steel & Coal Corp. Ltd.

9525 WIRE, NON-ELECTRICAL, NON-FERROUS BASE METAL

1. Aluminum.
2. Brass, bronze, copper, flat.
3. Brass, bronze, copper, round.
4. Inconel.
5. Monel.
6. Nickel.
7. Wire, lead, extruded (for bullet cores).

Anaconda American Brass Ltd.
2.3.

Canada Wire & Cable Co. Ltd.
2.3.

Canadian Arsenals Ltd.
7.

Greening Industries Ltd.
1.2.3.4.5.6.

Kaiser Aluminum Co.
1.

Noranda Copper Mills Ltd.
2.3.

9530 BARS AND RODS, NON-FERROUS BASE METAL

1. Aluminum.
2. Aluminum extrusions.
3. Bismuth.
4. Brass.
5. Bronze.
6. Cadmium.
7. Copper and alloys.
8. Lead.
9. Magnesium.
10. Titanium.
11. Zinc.

Aluminum Co. of Canada Ltd.
1.2.

Anaconda American Brass Ltd.
4.5.7.

Atlas Titanium Ltd.
10.

Consolidated Mining & Smelting
3.6.8.11.

The Daymond Company Ltd.
2.

Dominion Magnesium Ltd.
9.

International Nickel Co. Ltd.
7.

Kaiser Aluminum Co.
1.2.

Noranda Copper Mills Ltd.
4.5.7.

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.
7. Foil, aluminum.
8. Foil, lead.
9. Nickel, strip.
10. Perforated sheet metal.
11. Titanium.
12. Zinc.

Aluminum Co. of Canada Ltd.
1.7.

Anaconda American Brass Ltd.
3.4.

Atlas Titanium Ltd.
11.

Burgess Battery Co.
12.

Canada Foils Ltd.
7.8.

Canadian Arsenals Ltd.
3.

Consolidated Mining & Smelting
12.

Donald Ropes & Wire Cloth Ltd.
10.

Greening Industries Ltd.
10.

Kaiser Aluminum Co.
1.7.

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.

Aluminum Co. of Canada Ltd.
Kaiser Aluminum Co.
Reynolds Extrusion Co. Ltd.

9545 PLATE, SHEET, STRIP, FOIL, AND WIRE: PRECIOUS METAL

1. Bars, gold.
2. Bars, silver.
3. Platinum.
4. Sheets, gold.
5. Sheets, silver.
6. Wire, gold.
7. Wire, silver.

Consolidated Mining & Smelting
1.2.4.5.6.7.

Handy & Harman of Canada Ltd.
3.4.5.6.7.

International Nickel Co. Ltd.
2.3.

Johnson Matthey & Mallory Ltd.
3.4.5.6.7.

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.
2. Calcium.
3. Calcium – manganese silicon.
4. Calcium – silicon.
5. Chromium metal.
6. Ferroalloys.
7. Ferroboron.
8. Ferrochrome.
9. Ferrocolumbium.
10. Ferromanganese.
11. Ferromolybdenum.
12. Ferrosilicon.
13. Ferrotantalum.
14. Ferrotitanium.
15. Ferrotungsten.
16. Ferrovanadium.
17. Magnesium nickel.

Dominion Magnesium Ltd.
1.2.17.25.27.28.34.

Geo-Met Reactors Ltd.
9.11.14.15.16.19.21.

18. Manganese metal.
19. Metal molybdenum.
20. Metal powders (spherical).
21. Metal tungsten.
22. Molybdenum disilicide.
23. Molybdenum single crystal, powder.
24. Silicon metal.
25. Strontium.
26. Tantalum, single crystals.
27. Thorium.
28. Thorium-magnesium.
29. Titanium carbide.
30. Titanium monoxide.
31. Titanium sesquioxide.
32. Tungsten powder and single crystal.
33. Zirconium alloy.
34. Zirconium copper.

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.
2. Ingots.

Canadian Steel Wheel Ltd.
2.

Doninion Steel & Coal Corp. Ltd.
1.2.

3. Pigs – iron.

The Steel Co. of Canada Ltd.
1.2.3.

9650 NON-FERROUS BASE METAL REFINERY AND INTERMEDIATE FORMS

1. Aluminum, granulated.
2. Aluminum ingot.
3. Aluminum powder.
4. Bismuth bars.
5. Brass.
6. Bronze.
7. Cadmium sticks.
8. Cobalt briquettes.
9. Cobalt powders.
10. Cobalt strip.
11. Copper.
12. Indium.
13. Lead, antimonial.
14. Lead, pig.
15. Magnesium billets.
16. Magnesium ingots.
17. Metals, refined, super-pure.
18. Nickel briquettes.
19. Nickel powders.
20. Nickel strip.
21. Zinc slab.

Aluminum Co. of Canada Ltd.
2.

Anaconda American Brass Ltd.
5.6.11.

Canada Metal Co. Ltd.
14.

Consolidated Mining & Smelting
4.7.12.13.14.17.21.

Dominion Magnesium Ltd.
15.16.

Eastern Aluminum Reduction Co. Ltd.
1.3.

Sherritt Gordon Mines Ltd.
8.9.10.18.19.20.

GROUP 99

MISCELLANEOUS

9905 SIGNS, ADVERTISING DISPLAYS, AND IDENTIFICATION PLATES

1. Plates, designation.
2. Plates, identification.
3. Plates, instruction.

Beaver Decalcomania Co. Ltd.
1.2.3.

Ketchum Manufacturing Co. Ltd.
1.2.

O. & W. Electronics Ltd.
1.2.3.

Triple-A Mfg. Co. Ltd.
1.2.3.

Yarrows Ltd.
2.

9930 MEMORIALS, CEMETERIAL AND MORTUARY EQUIPMENT AND SUPPLIES

1. Pouches, burial.

J. J. Turner Co. Ltd.
1.

9999 MISCELLANEOUS ITEMS

1. Pulping machines, document destruction.

Alexander Fleck Ltd.
1.

ALPHABETICAL INDEX

TO

SECTION "A"

LIBRARY
1971
OTTAWA
Dept. of Trade & Commerce

"Section B"

CONSULTING AND DESIGN SERVICES

1. Aerial engineering, survey and construction techniques.
2. Aerodynamic.
3. Airports and facilities.
4. Analysis, automation and control.
5. Analysis, communications networks.
6. Analysis, electromagnetic interference.
7. Analysis, radio propogation.
8. Arctic ground transportation equipment.
9. Chemical engineering.
10. Communications.
11. Computers.
12. Control systems, hydraulic.
13. Docking facilities.
14. Electrical power distribution and control.
15. Electronic.
16. Fuel systems, marine boiler.
17. Human engineering.
18. Hydraulics, (Pumps, etc.).
19. Machines and tools.
20. Marine.
21. Material handling.
22. Mechanical.
23. Metallurgical.
24. Mining installations.
25. Navigation equipment.
26. Operational research.
27. Plastics.
28. Pulp and paper machinery.
29. Radioisotope employment.
30. Rubber and plastics.
31. Structural steel.
32. Systems engineering and analysis, digital computer.
33. Systems engineering and analysis, digital information.
34. Systems engineering and analysis, micro-wave.
35. Systems engineering and analysis, radio.
36. Systems engineering and analysis, satellite.
37. Systems engineering and analysis, scatter.
38. Transportation logistics.
39. Window systems.

Atco Industries Ltd.
22.
Atomic Energy of Canada Ltd.
29.
Aviation Electric Ltd.
11.15.25.
Barringer Research Ltd.
15.
Beclawat (Canada) Ltd.
39.
Bombardier Snowmobile Ltd.
8.
Burroughs Business Machines Ltd.
11.
CAE Industries Ltd.
10.15.25.
Canadair Ltd.
2.8.22.
Canadian General Electric (EDPD)
10.11.15.22.27.
Canadian General Electric (Plastics)
27.
Canadian Marconi Co.
10.11.15.25.
Canadian Vickers Ltd.
20.22.
Canadian Westinghouse (Electronics)
10.15.20.22.
Chemical Projects Ltd.
9.
Computing Devices of Canada Ltd.
2.11.15.20.22.25.
Cope Tool Design Co. Ltd.
19.
De Havilland Aircraft of Canada
2.20.
De Havilland Aircraft (SPAR)
10.11.15.22.
Demers, Homa, Baby
4.10.11.15.25.26.32.33.
Dosco Industries Ltd.
31.
E.M.I.-Cossor Electronics Ltd.
10.15.25.
Alexander Fleck Ltd.
22.
Forano Ltd.
22.28.
Garrett Manufacturing Ltd.
11.15.20.
Geo-Met Reactors Ltd.
23.
B. F. Goodrich Canada Ltd.
20.22.27.30.
Hawker Siddeley Engineering
2.11.22.27.
Honeywell Controls Ltd.
22.
Indesco Ltd.
3.10.13.19.21.24.27.
Ingledow Kidd & Associates Ltd.
1.14.22.
International Business Machines
10.11.15.20.25.

Intertel Consultants Ltd.
5.6.7.10.15.34.35.36.37.
George Kelk Ltd.
15.
Lenkurt Electric Co. of Canada Ltd.
10.15.
Lucas-Rotax Ltd.
12.16.18.
R. H. Nichols Co. Ltd.
15.
Northern Electric Co. Ltd.
10.15.25.
Northwest Industries Ltd.
27.
Orenda (Hawker Siddeley)
22.
Philips Electronics Industries Ltd.
10.
Polyfiber Ltd.
27.
Presentey Engineering Products Ltd.
15.22.
RCA Victor Co. Ltd.
10.11.15.
Raytheon Canada Ltd.
10.15.25.
Robin-Nodwell Mfg. Ltd.
8.
Rolls-Royce of Canada Ltd.
22.
V. W. Ruskin & Associates Engineering
10.22.
Somerville Industries Ltd.
3.27.
Sperry Gyroscope Co. of Canada Ltd.
15.22.
Standard-Modern Tool Co. Ltd.
22.
T.M.C. (Canada) Ltd.
10.15.
Unica Research Co. Ltd.
38.
Uniroyal (1966) Ltd.
20.27.30
White & Partners Ltd.
17.22.

ANTENNA, ANTENNA FARM AND SURFACE INSTALLATIONS

1. Antenna farms.
2. Microwave, scatter.
3. Radar.
4. Radio, navigational aid sites.
5. Steel towers, antenna.
6. Telecon cable systems.

A.I.M. Steel Ltd.
1.5.
Burroughs Business Machines Ltd.
2.3.4.
CAE Industries Ltd.
1.2.3.4.
Canada Iron Foundries (West. Bridge)
1.2.3.4.5.
Canadian General Electric (EDPD)
1.2.3.4.
Canadian Marconi Co.
1.2.3.4.
Canadian Motorola Electronics Co.
1.
Canadian Westinghouse (Electronics)
1.2.3.4.5.
Computing Devices of Canada Ltd.
4.
Dominion Bridge Co. Ltd.
5.
Dominion Steel & Coal Corp. Ltd.
5.
Dosco Industries Ltd.
1.5.
E.M.I.-Cossor Electronics Ltd.
1.2.3.4.5.
ITT Canada Ltd.
1.2.3.4.
Intertel Consultants Ltd.
1.2.4.5.6.
Lenkurt Electric Co. of Canada Ltd.
2.4.
Locweld & Forge Products Ltd.
5.
Northern Electric Co. Ltd.
1.2.3.4.6.
RCA Victor Co. Ltd.
2.3.4.
Raytheon Canada Ltd.
2.3.4.
Tower Communications Co. Ltd.
5.

AIRCRAFT REPAIR AND OVERHAUL

1. **Aircraft and engines.**
2. **Boost controls.**
3. **Carburetors.**
4. **Conversion.**
5. **Communications equipment.**
6. **Conversion interior.**
7. **Electrical.**
8. **Electronic.**
9. **Engine.**
10. **Flight instruments.**
11. **Floats, aircraft.**
12. **Fuel injection systems.**
13. **Gear boxes.**
14. **Helicopter.**
15. **Hydraulics.**
16. **Ignition systems.**
17. **Navigation systems.**
18. **Propeller.**

Abex Industries of Canada Ltd.
15.
Aircraft Appliances & Equipment
7.
Aviation Electric Ltd.
3.7.8.10.12.15.16.
Aviation Electric Pacific Ltd.
7.8.15.
Bristol Aerospace Ltd.
10.13.15.
Bristol Aero-Industries Ltd. (Montreal)
2.3.9.12.13.16.
CAE Industries Ltd.
7.8.
Canadair Ltd.
1.4.6.15.16.
Canadian Aircraft Products Ltd.
11.
Computing Devices of Canada Ltd.
5.17.
De Havilland Aircraft of Canada
1.4.8.
De Havilland Aircraft (SPAR)
7.8.10.
Dominion Helicopters Ltd.
14.
Dowty Equipment of Canada Ltd.
15.
Fairey Canada Ltd.
1.4.7.
Fairey Canada Ltd. (West. Div.)
1.2.3.7.10.15.16.
Field Aviation Co. Ltd.
1.
Garrett Manufacturing Ltd.
7.8.10.
Genaire Ltd.
1.
Godfrey Engineering Co. Ltd.
15.
Honeywell Controls Ltd.
10.
Northwest Industries Ltd.
1.4.6.10.15.16.
Okanagan Helicopters Ltd.
14.
Rolls-Royce of Canada Ltd.
9.
Skyrotors Ltd.
14.
Sperry Gyroscope Ottawa Ltd.
7.8.10.
Standard Aero Engine Ltd.
9.12.
United Aircraft of Canada Ltd.
9.14.18.
York Gears Ltd.
3.9.

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.**
10. **Nuclear plant components.**
11. **Probes radiac.**
12. **Radiac detectors.**
13. **Radiation meters.**
14. **Reactors.**
15. **Reactor produced istopes.**
16. **Scintillation phosphors.**
17. **Valves.**

Atomic Energy of Canada Ltd.
1.4.6.7.8.14.15.
Aviation Electric Ltd.
5.17.
Beloit Sorel Ltd.
3.
Canadian Admiral Corp. Ltd.
5.12.13.
Canadian General Electric (Atomic Power)
9.10.14.
Canadian General Electric (Carboloy)
9.
Canadian Valve (Singer Valve)
17.
Canadian Vickers Ltd.
14.
Canadian Westinghouse (Atomic Fuel)
9.14.
Combustion Engineering-Superheater
14.
Computing Devices of Canada Ltd.
2.12.
Davie Shipbuilding Ltd.
10.
De Havilland Aircraft (SPAR)
5.10.
Dominion Bridge Co. Ltd.
10.14.
Hawker Siddeley Engineering
3.5.10.
Marsland Engineering Ltd.
5.13.
R. H. Nichols Co. Ltd.
5.
Nuclear Enterprises Ltd.
11.13.16.
Velan Engineering Ltd.
17.
Victoria Machinery Depot Co. Ltd.
10.

DEFENCE SYSTEM MANAGEMENT

Aviation Electric Ltd.
Bristol Aerospace Ltd.
Canadair Ltd.
Canadian General Electric (EDPD)
Canadian Marconi Co.
Canadian Westinghouse (Electronics)
Computing Devices of Canada Ltd.
Hawker Siddeley Engineering
International Business Machines
Intertel Consultants Ltd.
Northern Electric Co. Ltd.
RCA Victor Co. Ltd.

RELIABILITY STUDIES

Aviation Electric Ltd.
Canadian Westinghouse (Electronics)
Computing Devices of Canada Ltd.
Northern Electric Co. Ltd.
RCA Victor Co. Ltd.

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.

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
1.2.4.6.7.9.11.13.
Lockwood Survey Corp. Ltd.
1.2.3.4.5.6.7.9.10.11.
McElhanney Surveying & Engineering Ltd.
2.6.7.11.13.14.
Okanagan Helicopters Ltd.
1.4.6.7.9.11.
Spartan Air Services Ltd.
1.2.3.4.5.6.7.9.11.13.14.

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.

CASTINGS

1. **Aluminum.**
2. **Brass.**
3. **Bronze.**
4. **Carbon Steel.**
5. **Copper.**
6. **Die casting, aluminum.**
7. **Die casting, brass.**
8. **Die casting, bronze.**
9. **Die casting, magnesium.**
10. **Die casting zinc.**
11. **Die casting, zinc, miniature.**
12. **Grey iron.**
13. **High alloy, steel.**
14. **Investment, lost wax, ferrous.**
15. **Investment, lost wax, non-ferrous.**
16. **Iron.**
17. **Iron, armoured.**
18. **Iron, ductile.**
19. **Iron, malleable.**
20. **Iron, malleable, pearlitic.**
21. **Magnesium.**
22. **Manganese, steel.**
23. **Meehanite.**
24. **Monel.**
25. **Ni-resist, up to 500 lbs.**
26. **Ni-resist up to 8000 lbs.**
27. **Permanent mould, aluminum.**
28. **Permanent mould, brass.**
29. **Permanent mould, bronze.**
30. **Permanent mould, copper.**
31. **Stainless to 3000 lbs.**
32. **Steel.**
33. **Steel, up to 150 tons.**
34. **Steel, stainless.**
35. **Zinc.**

Aluminum Foundry & Pattern Works
1.3.
Auto Specialties Mfg. Co.
20.
Babcock-Wilcox & Goldie-McCulloch
3.16.
Barber Die Casting Co. Ltd.
6.7.9.10.
Beach Foundry Ltd.
12.18.25.
Black Clawson-Kennedy Ltd.
2.3.16.32.
CAE Sumner Ltd.
16.32.
Canada Iron Foundries (Foundry Div.)
12.16.19.32.
Canada Metal Co. Ltd.
3.6.
Canadian Bronze Co. Ltd.
1.2.3.5.27.28.29.30.
Canadian General Electric (Meter & Inst.)
6.
Canadian Steel Foundries
17.18.23.32.33.34.
Cercast Inc.
14.15.
Chrysler Canada Ltd.
1.12.
Coulter Copper & Brass Co. Ltd.
1.2.3.5.
Deloro Stellite
1.3.14.15.32.34.
Design Precision Casting
14.15.
Dominion Foundries & Steel Ltd.
13.32.34.
Dominion Lock Co. Ltd.
1.2.3.7.8.10.35.
Enamel & Heating Products Ltd.
12.
Findlays Ltd.
12.
Forano Ltd.
12.18.26.
The Hoover Co. Ltd.
6.
Indiana Steel Products Co. Ltd.
13.31.
Industrial Fine Castings Ltd.
14.15.27.29.
International Malleable Iron Co. Ltd.
12.19.20.
Irving Industries
16.32.
Johnson Matthey & Mallory Ltd.
1.2.3.5.
Light Alloys
1.21.
Lightning Fastener Co. Ltd.
11.
Lynn MacLeod Metallurgy Ltd.
4.22.32.
Neptune Meters Ltd.
1.2.3.5.
Otaco Ltd.
18.
Precision Castings Ltd.
14.15.
Progressive Engineering Works Ltd.
12.13.
St. Maurice Foundries Ltd.
1.3.16.32.
Supreme Precision Castings Ltd.
1.2.3.5.14.15.23.32.34.
The Union Screen Plate Co. Ltd.
24.
The Wabi Iron Works Ltd.
16.18.
Wallaceburg Brass Ltd.
6.7.8.
Western Canada Steel Ltd.
32.

FORGINGS

1. **Aluminum.**
2. **Artillery, shell.**
3. **Automotive.**
4. **Barrels, ordnance.**
5. **Brass.**
6. **Bronze.**
7. **Cold formed.**
8. **Copper.**
9. **Railroad.**
10. **Stainless.**
11. **Steel.**
12. **Upset.**

Atlas Steels Co.
4.11.
CLM Industries
11.
Columbus McKinnon Ltd.
11.
General Die & Machine Co. Ltd.
5.8.10.11.
General Impact Extrusions
1.
Hawker Siddeley Canada (Trans. Equip.)
4.7.9.11.12.
Johnson Matthey & Mallory Ltd.
5.6.
Kaiser Aluminum Co.
1.
National Steel Car Corp. Ltd.
2.11.
N. Slater Co.
5.11.12.
The Steel Co. of Canada Ltd.
11.
Thompson Products Ltd.
3.7.11.12.
Wallaceburg Brass Ltd.
1.5.6.

MACHINING

1. **Aircraft components.**
2. **Electric reduction.**
3. **Ordnance quality and experience.**
4. **Precision.**
5. **Light.**
6. **Medium.**
7. **Light and medium.**
8. **Medium and heavy.**
9. **Light, medium and heavy.**

Abex Industries of Canada Ltd.
1.3.4.7.
Aero Mechanic Ltd.
1.4.7.
Aircraft Appliances & Equipment
1.4.7.
Aviation Electric Ltd.
1.4.7.
Babcock-Wilcox & Goldie McCulloch
8.
Bata Engineering
3.4.7.
Beaconing Optical & Precision Materials
4.5.
Beloit Sorel Ltd.
3.8.
Bertram Machine & Tool Co.
8.
Black Clawson-Kennedy Ltd.
8.
Brenco Machine & Tool Co. Ltd.
6.
Bristol Aerospace Ltd.
1.4.5.6.
Burrard Dry Dock Co. Ltd.
9.
Burroughs Business Machines Ltd.
4.8.
CAE Sumner Ltd.
8.
Canadian Arsenals Ltd.
3.4.7.
Canadian Bronze Co. Ltd.
8.
Canadian Flight Equipment Co.
1.3.4.7.
Canadian General Electric (Apparatus)
3.4.9.
Canadian Steel Foundries
8.
Canadian Vickers Ltd.
3.9.
Canus Precision Industries Ltd.
1.4.7.
Central Dynamics Ltd.
1.4.5.
Computing Devices of Canada Ltd.
4.5.6.
Davie Shipbuilding Ltd.
8.
Dominion Steel & Coal Corp. Ltd.
8.
Dosco Industries Ltd.
8.
Dowty Equipment Ltd.
1.4.7.

W. R. Elliott Ltd.
1.3.4.7.
Enamel & Heating Products Ltd.
1.4.7.
Ex-Cell-O Corp. (Canada) Ltd.
7.
Fairbanks-Morse (Canada) Ltd.
3.8.
Fairey Canada Ltd.
1.4.7.
Alexander Fleck Ltd.
8.
Fleet Manufacturing Co.
1.7.
Forano Ltd.
8.
Godfrey Engineering Co. Ltd.
1.7.
Hall Machinery Ltd.
7.
Harrington Tool & Die Co. Ltd.
1.3.4.7.
Hawker Siddeley Canada (Trans. Equip.)
8.
Heroux Machine Parts Ltd.
1.3.4.7.
Ingersoll Machine & Tool Co. Ltd.
7.
Joly Engineering Ltd.
1.3.4.7.
Ketchum Mfg. Co. Ltd.
7.
Kingston Shipyards
8.
LaSalle Engineering Ltd.
1.3.4.7.
Marine Industries Ltd.
8.
Marsland Engineering Ltd.
4.5.6.7.
Metalite Co. Ltd.
7.
Orenda (Hawker Siddeley)
1.4.7.

Otaco Ltd.
7.
Otis Elevator Co. Ltd.
3.4.9.
Peacock Brothers Ltd.
8.
Progressive Engineering Works Ltd.
6.
Ranar Industries Ltd.
3.4.7.
Rankin-Strite Ltd.
1.3.4.5.
Renfrew Aircraft & Engineering Ltd.
1.6.
Rex Chain Belt (Canada) Ltd.
7.
Rollit Products Ltd.
3.7.
Semtec Ltd.
2.4.
SIDO Ltd.
5.
T. S. Simms & Co. Ltd.
7.
Standard-Modern Tool Co. Ltd.
9.
Triplex Engineering Co. Ltd.
7.
Uniroyal (1966) Ltd.
9.
Universal Die & Tool Mfg. Ltd.
1.3.4.7.
Wallaceburg Brass Ltd.
7.
Weatherhead Co. of Canada Ltd.
7.
Westhill Industries Ltd.
1.4.7.
Phil Wood Industries Ltd.
7.
Yarrows Ltd.
8.
York Gears Ltd.
4.7.

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.

THE TWIN OTTER

Over the past twenty years de Havilland Aircraft of Canada have provided to STOL airplane users, in most regions of the world, some of the finest and most advanced craft in this field. Their experience, together with the reliability of their product, has virtually followed a building block technique. The Beaver, working in some 65 countries around the world, was followed by the higher load capacity Otter which also joined Beaver fleets. The twin engine Caribou and her higher capacity sister the Buffalo, which followed, have both found world wide acceptance where STOL aircraft are a requirement.

Now a further refinement on a proven aircraft is offered in the DH6 Twin Otter. The Twin Otter, while offering a greatly increased payload, still provides the unique combination of short-field ability, ease of handling and simple, low cost maintenance which the spectrum of applications encompasses for both commercial and military transport roles.

Powered by two PT6A-20 gas turbine engines, the Twin Otter seats 20 for high density, short-haul air commuter applications. As an air ambulance it will accommodate nine stretchers and three attendants. It will carry 4430 lbs. (2010 kg) for a range of 100 miles (161 km) as a cargo transport.

Short-field performance is an impressive Twin Otter feature, without structural or mechanical complexity. At full gross weight of 11,579 lbs. (5252 kg) sea level, standard day, zero wind, the take-off distance to clear a 50 ft (15 m) obstacle is 1240 ft (378 m) and for landing 950 ft (290 m) same conditions.

The cabin is constructed for maximum space utilization, the floor designed for static loads of 200 lb./sq. ft. (91 kg/929 cm^2), with the luggage compartment floor for 100 lb./sq. ft. (45.4 kg/929 cm^2). A large double door on the left side and a single door on the right side permit the easy and rapid loading and unloading of bulky cargoes. Crew access is facilitated by a door on each side of the cockpit.

The Twin Otter can be operated under all climatic and terrain conditions; from high altitude plateaus, rudimentary jungle strips, small bodies of water, ice or snow surfaces. Quick change versions of this aircraft from landplane to seaplane to skiplane make these varying operating conditions possible.

The low and slow flying ability of the Twin Otter allows exceptional accuracy for close controlled drops of both cargo and personnel when it is expedient not to land. This same inherent design feature is particularly significant when a military mission requires the ability to fly below radar coverage.

This aeroplane will serve most effectively where low traffic density and the lack of conventional airport facilities inhibit the use of large aircraft or conventional aircraft in the Twin Otter's weight category.


DE HAVILLAND CANADA TWIN OTTER
CF-SJB-X
CF-SJB-X

THE BUFFALO

The DHC5 Buffalo, designed, developed and in production by de Havilland Aircraft of Canada, represents the refinements of twenty years of proven experience in the STOL field.

Applying the standard 50 ft (15 m) obstacle an improvised strip of only 1490 ft (454 m) is required for operation. From such rudimentary airstrips the following operations are possible:

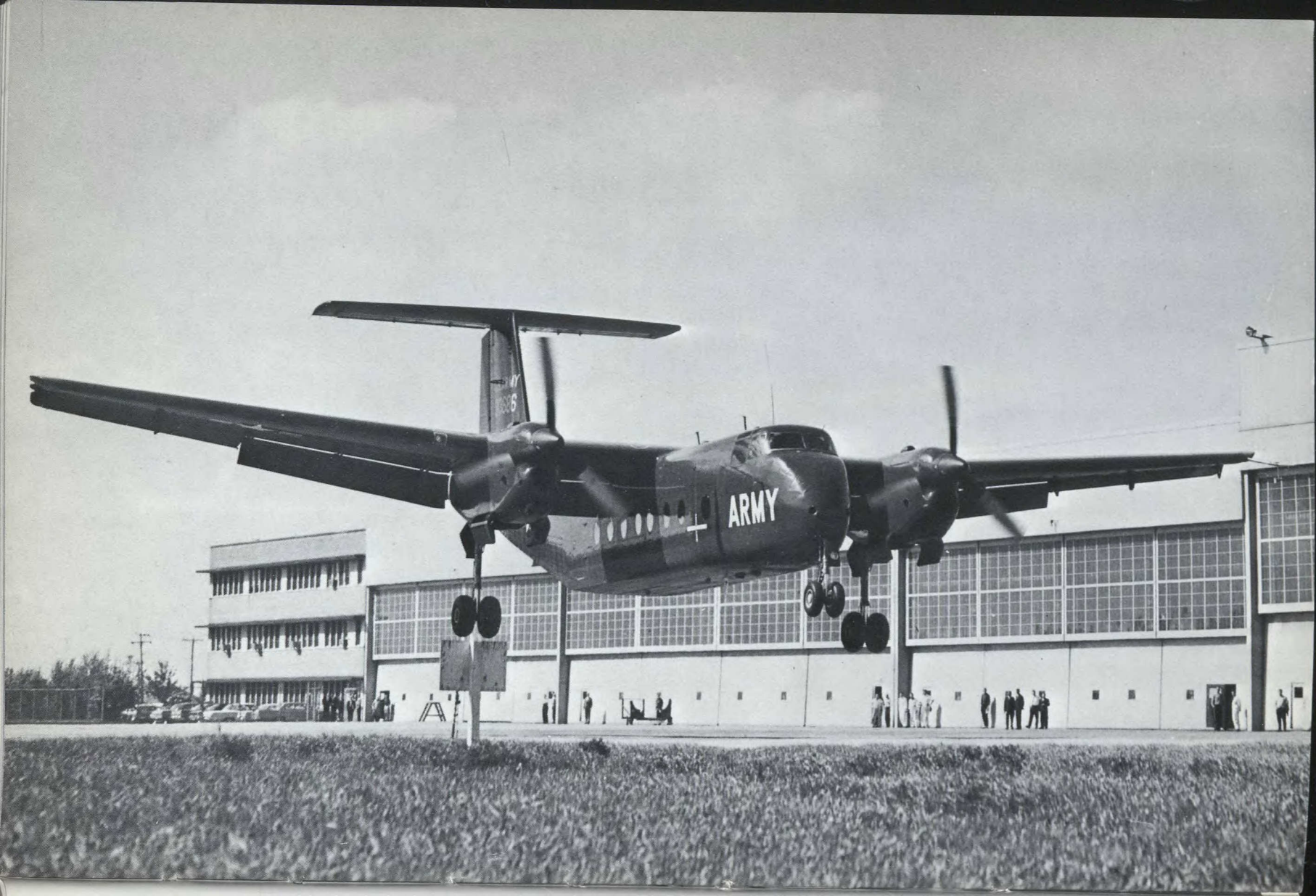
- 13,843 lbs (6,229 kg) for 440 nm (815 km)
- 8,000 lbs (3,629 kg) for 1,320 nm (2,450 km)
- 4,000 lbs (1,814 kg) for 1,885 nm (3,493 km)

The Buffalo achieves these performances by twin T64 propeller turbine engines each rated at 3,068 e.s.h.p.

This aeroplane offers a world-wide self-deployment capability, which is a prime consideration in situations where the rapid availability of aircraft to meet emergency military situations, natural disasters or where low cost commercial transportation is vital. Equipped with long range bag tanks, the Buffalo has a non-stop range of up to 3893 nm (7210 km) flying at 25,000 ft (7620 m). The bag tanks, used for the ferry flight, can be employed in the mission area to serve for aircraft and ground equipment refuelling.

As a troop transport, the Buffalo seats 41 fully equipped troopers or 35 paratroopers. Troops can be landed in the combat zone and deployed rapidly through the rear loading door or paradropped into critical areas. For casualty evacuation 24 litters and seats for 6 attendants can be accommodated. For government administration or commercial passenger service, 40 passengers in forward facing seats can be accommodated and this configuration includes wash room, food and beverage dispensing facilities. A utility version seats 43.

The DHC 5 Buffalo Development Programme was jointly financed on an equal share basis by the United States and Canadian governments and de Havilland Aircraft of Canada Limited. The 4 prototypes now flying have received certification and have been subjected to intensive military effectiveness evaluation programmes, with two having been tested under actual warfare conditions in Vietnam. Deliveries of production models of this aircraft are scheduled to begin early in 1967.


ARMY

THE TURBO-BEAVER

De Havilland Aircraft of Canada Limited have developed an advanced version of the already world wide accepted Beaver aircraft. Th's new aeroplane, the Turbo-Beaver, has retained the rugged structural simplicity and mission versatility of the standard Beaver. This advanced version, while offering turbine power in greater payload capacity, still maintains the short field take-off and landing characteristics which were an inherent design feature of the basic aircraft.

The Turbo-Beaver is powered by a Canadian Pratt & Whitney PT6A-6 single stage free power turbine engine which uses a variety of low grade aviation fuels, effecting a substantial saving in operating costs. Cold weather starting ease is another significant advantage of this aeroplane for winter bush or arctic operations.

The Turbo-Beaver will carry 8 passengers and baggage, or a 1780 lb. (807 kg.) cargo over a stage range of 300 miles (482 km.). It is quickly and easily adapted to wheel, float, ski, wheel/ski or to amphibious gear. The cabin dimensions are 122″ x 43″ x 46″ (310 x 109 x 117 cm) and the access dcors are designed for easy loading and off-loading of bulky items. Conversions from passenger to cargo or ambulance interior configurations can be quickly effected.

STOL (Short Take-off and Landing) capabilities are traditional in aeroplanes of DHC design. The Turbo-Beaver will take-off to clear a fifty foot obstacle (15.24m), full gross weight 5370 lbs. (2436 kg.), zero wind, in 1030 feet (314m) and lands under the same conditions in 880 feet (268 m). Its cruising speed is 163 mph. (262 km/hr.) at 10,000 ft. (3050 m).

The standard Beaver, which is now flying in some 65 countries, established de Havilland Canada's leadership in the STOL utility aircraft design and development field. Turbo-Beavers are now maintaining this leadership and are being employed from the tropics to the Arctic on a variety of missions, ranging from air ambulance service in Iran to air charter service in Alaska. Countries where Turbo-Beavers are now flying include:– Canada, United States, Australia, Costa Rica, Sweden and Iran.


TURBO-BEAVER
VILLAND CANADA

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 manœuvrability 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.

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.

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.

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.


CL-84
CF-VTO-X
CANADAIR · GENERAL DYNAMICS

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 scheduled to go in service with the Royal Malaysian Air Force in the spring of 1967. 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.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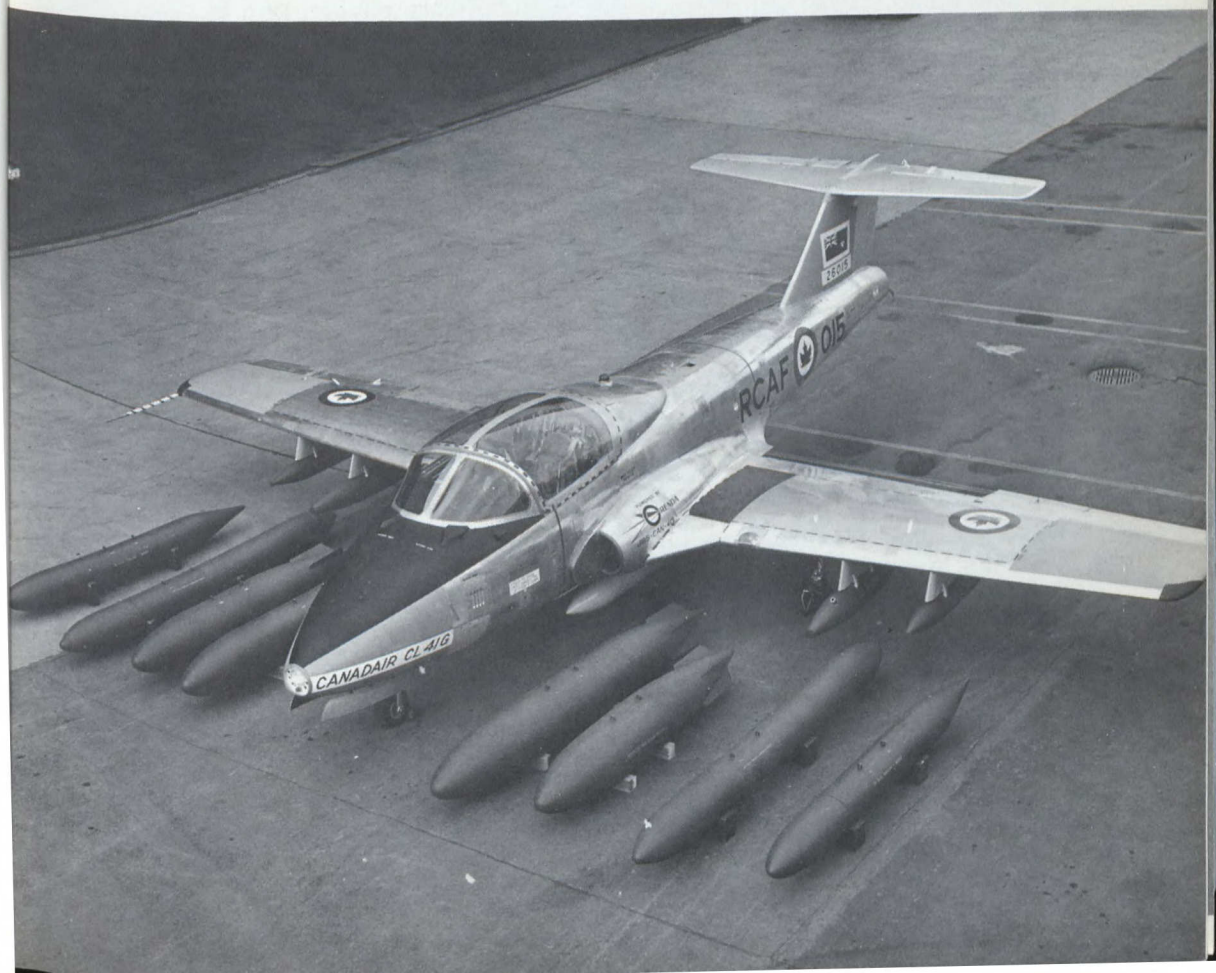
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CANADAIR CL-41G

THE DHC-4 CARIBOU

The Caribou, designed and built by de Havilland Aircraft of Canada Limited, serves as a tactical military air transport aircraft or for off-airway commercial application. Powered by two P. & W. R-2000 engines, its most outstanding characteristic is a combination of STOL (Short Take-Off and Landing) capability and exceptional control at low altitudes and slow speed. At a gross weight of 28,500 lbs. (12,927 kg.) the Caribou will take off to clear a 50 ft. (15.24 m.) obstacle (zero wind) in 1185 feet (361 m.) and land in 1285 feet (392 m.).

In the course of U.S. Army evaluation trials, the Caribou's capability for short, rough field take-off and landing was strikingly demonstrated by a take-off from a field that had been ploughed to a depth of 14 inches (35.5 cm) and then thoroughly soaked. The aircraft also landed successfully in this morass. In further trials it demonstrated excellent capabilities for Ground Proximity cargo and vehicle delivery operations.

The Caribou's cabin is generously proportioned; length, 345 ins. (876 cm) width at floor, 73.5 ins. (187 cm); max. width, 87 ins. (221 cm); height, 75 ins. (190 cm). It has a cargo capacity of 4 tons (3629 kg) and will accommodate 32 troops, 24 fully equipped paratroops, or 32 passengers in the civil utility transport version. For aeromedical evacuation applications it accommodates 20 litters and 2 seats.

The high, wide rear cargo door and convenient adjustable ramp arrangement facilitates rapid loading and off-loading of cargo. Military vehicles, such as cargo carriers, half-ton weapons carriers and the Lacrosse Missile, mounted on a trailer, can be moved into and out of the eabin easily.

The Caribou is the third D.H. Canada designed and built STOL transport 'plane. The DHC2 Beaver, which made its debut in 1947, was designed to meet the specific needs of Canadian bush aviation: short, rough field take-off and landing capabilities, simplicity of design to facilitate ease of maintenance under difficult conditions, and structural sturdiness, all combined with a substantial payload capacity. The Beaver met all these requirements and it was soon known as "the half-ton flying truck". The DHC-3 Otter, which followed the Beaver into the air in 1951, was in fact a big Beaver combining Beaver performance characteristics with double the payload and a longer range. Today, Beavers and Otters are serving the military and civil utility air transport needs of some 65 nations and the characteristics that have won them world respect have come to the Caribou as a natural inheritance.

These aircraft are now flying with the following Services: U.S.A.F., U.N.E.F., R.C.A.F., R.A.A.F., India, Malaysia, Ghana, Zambia, Kenya, Tanzania, Kuwait. While Uganda and Thailand employ the Caribou under administrative and police work the Mandated Airlines of Australia use it on a schedule service to New Guinea and Papua while air charters fly from Taiwan. The success of the aircraft is ensured by a delivery of 253 to date.


5X-AAB
Caribou
UGANDA POLICE

AMPHIBIOUS UTILITY TRANSPORT CL-215

The Canadair CL-215 is a twin-engined amphibian of simple design combining a rugged structure with a substantial reserve of engine power and good low-speed handling characteristics. These features when associated with control harmony at all speeds, ease of operation and maintenance ensure an aircraft which will be capable of undertaking a variety of utility transport roles as well as special purpose duties for both civil and military users.

There are various basic configurations for the aircraft, some of which will be considered here:

- As an aerial fire control or water tanker the CL-215 is the first airplane to be designed for the task of fighting forest or other type of ground fires from the air by the technique known as "water bombing".
- As a commercial transport the CL-215 meets civil airworthiness requirements (as defined by U.S. Federal Aviation Regulations Part 25) for passenger carrying. The aircraft carries 32 passengers or 8,000 lbs (3,360 kg.) of cargo.
- Good low-speed handling characteristics and generous cargo capacity of the CL-215 make it a very suitable platform for air-dropping of supplies and animal feed in times of local emergency or disaster.
- Low cost and economy of operation make the CL-215 first choice for such specialized duties as aerial survey, geological prospecting, flying hospital, coast guard patrol and air/sea rescue.

A soft tire landing gear makes the aircraft independent of hard-surfaced runways and provides great flexibility of operation, whether land or water based. As a flying boat, the CL-215 may be operated in sea conditions with waves up to 4 ft. (1.2 m.) in height. These features make the amphibious CL-215 the logical successor to the Catalina (PBY-5A) or Albatross (HU-16) for reconnaissance, patrol, escort, rescue, casualty evacuation, anti-submarine warfare and other military roles.

Twenty of these aircraft are now flying in the Province of Quebec as aerial tankers in the Forestry Service while an additional 10 of the same version have been purchased by France. Some 12 other countries, including the United States, Germany and Australia, have an active interest in the aircraft.

GENERAL DATA

The following general data is applicable to a "standard" version of the aircraft. It will be realized that various modes will have differing performance figures.

Power plant: two Pratt & Whitney R.2800 engines	2,100 B.H.P.

DIMENSIONS

Span	93 ft. 10 ins (28.6 m)
Length	63 ft. 6.6 ins (19.3 m)
Height	27 ft. 2 ins (8.2 m)
Tail Span	36 ft. (10.97 m)
Wing Area	1,080 sq. ft. (100 sq. m)

WEIGHTS

Operating Weight, Empty	25,000 lb. (11,340 kg)
Zero Fuel Weight	37,000 lb. (16,783 kg)
Take-off Weight — Maximum	41,500 lb. (18,824 kg)
Maximum Payload	12,000 lb. (5,443 kg)
Maximum Fuel Load	6,500 lb. (2,948 kg)
Maximum Landing Weight	33,400 lb. (15,150 kg)

PERFORMANCE

Cruising speed, normal power	185 m.p.h. (298 k/h)
Take-off distance to 50 ft. (15.2 m) at 35,000 lb (15,876 kg)	2,070 ft. water (630 m)
Take-off distance to 50 ft. (15.2 m) at 41,500 lb (18,824 kg)	2,640 ft. land (804 m)
Landing distance from 50 ft. (15.2 m) at 33,400 lb (15,150 kg)	2,825 ft. water (861 m)
	2,200 ft. land (670 m)


CL-215
RESCUE
I. TILTIN

GYROPLANE (V/STOL AVIAN 2/180)

The work now in progress throughout the world on gyroplane development is nowhere more advanced than the AVIAN project at Georgetown, Ontario.

Although at first glance there seems to be a great similarity between the helicopter and the gyroplane, the principles of flight and control are quite different. One of the chief advantages of the Gyroplane over the Helicopter is the fact that only a few hours of conversion are required for a fixed wing pilot as opposed to the complete course required for Helicopter pilotage. The airflow through the rotor disk of the helicopter in level flight is from the top side due to the disc being inclined downward to achieve forward motion. On the other hand, the gyroplane lift is obtained by the windmill effect of air passing through the disc from the bottom because the disc is inclined backwards in forward flight. The helicopter rotor has to perform three functions; namely lift, thrust and control, whereas the gyroplane rotor is only called upon for lift and control. The thrust is provided by a conventional engine and propeller configuration. It will be readily appreciated that the complex problems of flight and maintenance inherent in the helicopter are not found in the gyroplane. The performance of a modern gyroplane with jump-start capability makes it as versatile as the helicopter with the exception of the latter's ability to hover, but the dynamics of the gyroplane rotor system permits higher forward speed than obtainable with the helicopter.

Development on the AVIAN 2/180 gyroplane has progressed through five models for the past five years, starting from an elementary open frame design to the sophisticated monocoque construction of today's aircraft. The basic aim has been to keep to as simple a design as possible consistent with good engineering practice. An example of this philosophy is a simple single aluminum strut undercarriage for ease of manufacture, requiring no maintenance.

One of the distinctive features of the aircraft is the ring shroud or duct which encloses the 200 hp Lycoming engine and pusher propeller. In addition to increasing the thrust from a given diameter propeller, the shroud acts as the unit to stabilize the aircraft in pitch and yaw. The rudder mounted inside the shroud gives directional control down to almost zero forward speeds. The rotor has three blades attached to the hub by steel straps. Working in place of thrust bearings, this system gives a rigid rotor necessary for eliminating ground resonance. Further, no drag dampers or hinges are used, making ground adjustment easy since the blades do not go out of track even under severe operating conditions. The feature of the AVIAN 2/180 that qualifies it as a true V/STOL aircraft is its jump-start capability. The system used is basically very simple and has been explored by others with success. The rotor is spun mechanically with the blades in zero pitch while the aircraft is still on the ground. When the rotor has reached a predetermined rpm the pilot pulls the take-off lever smartly upward. This action disengages the mechanical drive while applying 10° of positive pitch on the blades. This pitch change plus the kinetic energy stored in the blades is converted to lift and causes the aircraft to jump directly off the ground. When the stored energy is dissipated, the angle of attack is reduced to a pre-set cruise position. The rotor will now auto-rotate under its own power. Except for the jump-start the flying techniques are substantially those used for fixed wing STOL aircraft. Since the rotor is auto-rotating at all times when airborne it is impossible to stall or spin the aircraft. The rotor is in effect a parachute that can be used gently to lower the aircraft to earth.

The prototype aircraft built over the past five years have differed in detail to optimize the final production aircraft built during 1965 for certification in 1967.


CF-JTO-X

THE PT6/ST6 500-800 SHP TURBINE ENGINE

The PT6 gas turbine engine, a product of United Aircraft of Canada Limited, is setting new standards in the light plane, helicopter, industrial and marine market. Since its first run in February, 1960, the engine has logged over 30,000 test hours, 300,000 flight hours with more than 1000 PT6 engines delivered into the hands of commercial operators. As a reverse flow, free turbine, opposed shaft engine, this advanced design avoids the use of concentric shafting and features an exceptionally low noise level by retaining the high speed aerodynamic components buried well within the engine casings. The plenum type intake makes possible the use of a large area fine mesh screen which is insensitive to both airflow distortion and icing and precludes all foreign object damage.

As a turboprop engine the PT6 is certified with a full reversing control system featuring wide range Beta control suitable for STOL aircraft installations. This free turbine engine is capable of achieving high approach drag, instantaneous reverse thrust and slam accelerations, as well as output shaft speed flexibility for cruise and very low ground idle propeller and engine speeds.

Pilot operation, identical to that of most piston engines, is controlled by a throttle and propeller conditioning lever with power being set by either engine torque or turbine inlet temperature.

PT6 powered aircraft are now in use all over the world, demonstrating "hot day" performance in the Sudan as well as cold weather starting in Alaska. The ease of maintenance and smooth reliable operation make the PT6 equally at home in utility aircraft such as the Pilatus Turbo Porter, Helio Stallion, De Havilland Turbo Beaver, and the Twin Otter as well as in business aircraft such as the Beechcraft King Air, Potez 841 and the Swearingen Merlin II. The PT6 is also the choice for many conversions such as in the American Turbine Engine Company, Aircraft Industries of Canada Limited Beech Conversions and the McKinnon and Alaska Coastal-Ellis Grumman Goose Conversion.

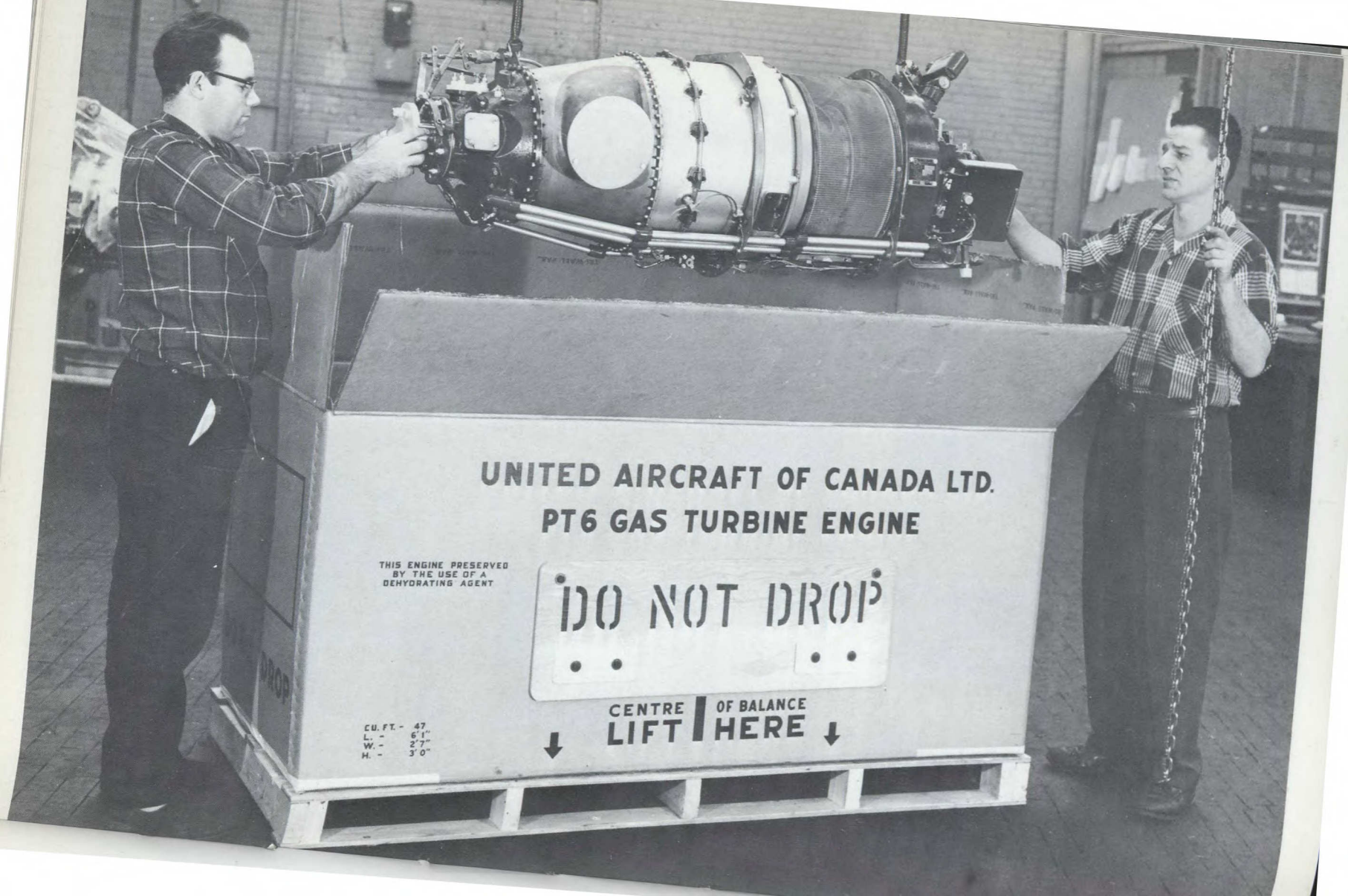
The PT6 may also be found in the following roles:—

- The power plant for the Lockheed rigid rotor Model 286 as well as other helicopter certifications.
- The Beech U21A used by the U.S. Army for the "Tactical Utility" role and also operates in the Presidential Fleet.
- PT6 — designated the YT-74 by the U.S. Military — has operated in both the Convair Charger and North American OV-10-A counter insurgency aircraft.
- The YT-74 has completed preliminary Flight Rating Tests at 650 and 750 SHP Military Ratings for BuWeps.

The marked superiority of the ST6 over conventional power plants is emphasized by the large variety of applications both stationary and mobile in which it is employed.

- Operating as a stationary power supply for a pulpwood chipper in a remote forest location.
- A power source for the 350 KW emergency standby generator.
- Four ST6's being used by the Halliburton Company as a portable 2000 h.p. source for an oil well fracturing unit where the light weight of the engines allows on and off highway transport.
- Approved by US BuShips as a marine gas turbine for prime propulsion following more than 1000 hours of trials in a high speed launch.
- As a prime power supply in high speed snowplows.
- The ST6 has been chosen to power high speed trains for the U.S. Department of Commerce as well as for Canadian railways.

Continuing development at United Aircraft will assure optimum performance as well as the continued acceptance of the PT6/ST6.


UNITED AIRCRAFT OF CANADA LTD.
PT6 GAS TURBINE ENGINE
THIS ENGINE PRESERVED BY THE USE OF A DEHYDRATING AGENT
DO NOT DROP
CENTRE OF BALANCE
LIFT HERE
CU. FT. - 47
L. - 6'1"
W. - 2'7"
H. - 3'0"

WING ACTUATOR SYSTEMS

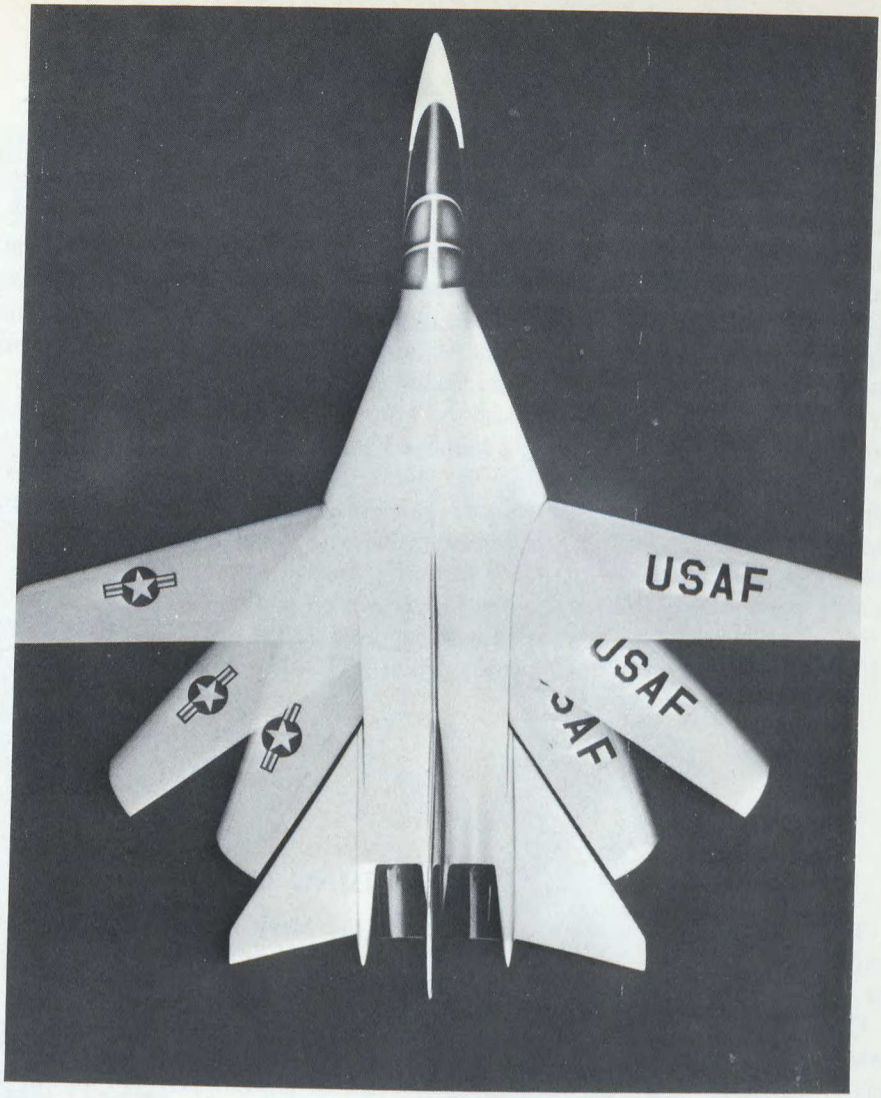
Abex Industries of Canada Ltd., Jarry Hydraulics Division's experience relative to the manufacture of actuators for use in variable geometry aircraft dates back to the Ling Temco Vought XC-142 aircraft wherein Jarry provided the wing incidence actuator. Jarry is also providing the wing tilt actuator for the Canadair CL-84 DYNAVERT aircraft. In providing the wing sweep actuator for the F-111 system, Jarry Hydraulics has established itself as a leader in the field of wing actuators and systems.

The wing sweep actuation system consists of two (2) ACME screw linear actuators, two (2) hydraulic motors, two (2) motor driven gear boxes interconnected by a synchronizing shaft. One gear box has a feedback drive leading to the control mechanism. The control mechanism though originally provided by Jarry Hydraulics is not now a part of the end item.

The pilot operates the mechanism by a pistol gripped sliding lever through a control cable. Two (2) Kellog motors of the AM series are utilized to drive the system. These motors are provided by our Kellog Division and therefore considered part of the end item. The gear box utilizes a planetary gear system to obtain the required reduction. The high speed part of the gear box is splash lubricated using MIL-L-7808E lubricating oil, aircraft engine, synthetic base, with a service temperature range of −65 degrees to 350 degrees F. The low speed part of the gear box is initially buttered with grease and can be relubricated by means of pressure gun fittings using MIL-G-23827 grease, aircraft gear and actuator screw, for low and high temperatures. Positive mechanical synchronization is effected by means of a synchronizing shaft which is driven by the hydraulic-motor shaft via idler gears.

The jack screws have a four start left hand ACME thread. The jack screw and main gear are forged in one piece. Terminal bearings are of the single ball self aligning type. Incorporated in the actuator is a thrust bearing designed to deflect under load and after this deflection the applied load by-passes the thrust bearing and is reacted through the structure in which case the actuator will stall out. Solid stops are provided at each end of travel. A metal dust cover is provided to protect the ACME screw from dust, etc. Lubrication of the jack screw is effected by coating the screw with Teflon. Irreversibility of the actuator is accomplished by the helix of the ACME screw. Pre-selection of wing position is transmitted via the control mechanism to the servo valve input. Movement of the servo valve spool ports system pressure to the hydraulic motors which through the gear boxes drive the screws to extend or retract the actuator. A feedback device makes the actuator movement correspond exactly with the pilot input. Backlash throughout the entire system is minimum and units are synchronized to within .020″. To drive the group at maximum rate and load, 61 gpm U.S. at 3000 psi hydraulic power is required. Each actuator is approximately 56″ long retracted, has a stroke of 31″, and weighs about 166 lbs. To safeguard the systems, the drives are designed so that in the case of one failing, the other does the work of both.

Abex Industries have also designed, developed and manufactured the main landing gear for the DHC-5 Buffalo. The characteristics of this gear contribute greatly to the exceptionally fine STOL performance of that aircraft. Hydraulic systems or controls and other actuators are designed and developed here to meet the demands of to-day's modern aircraft and missiles.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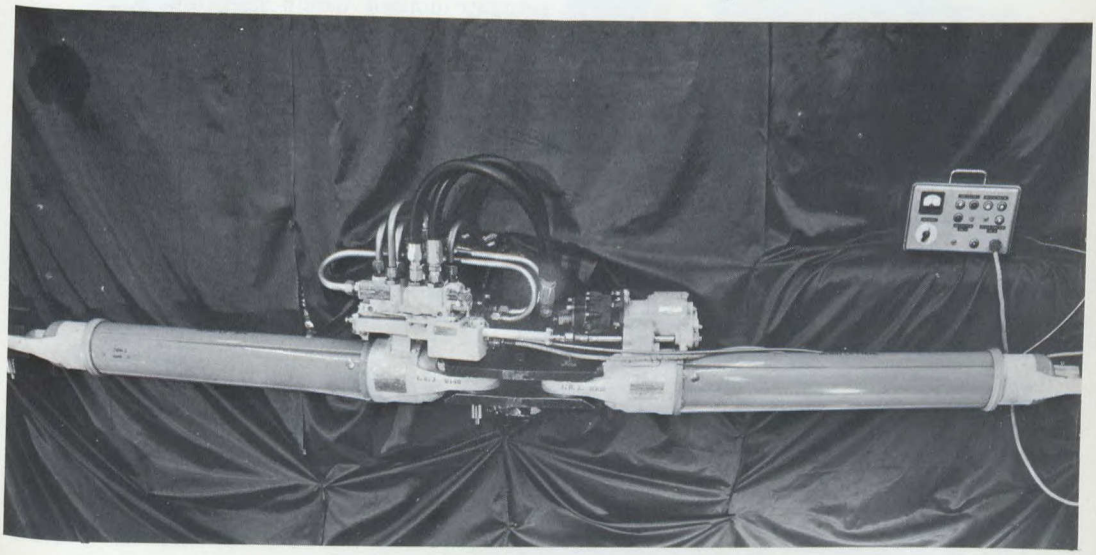


MAIN LANDING GEAR FOR TUTOR AIRCRAFT

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°F to 275°F. (−18C to + 135C); *Fluid* MIL—H—5606.

HELICOPTER LANDING GEAR

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 absorbed mounted between the link and axle member and the main 'Y' member.

Aircraft towing and tie-down eyes are embodied.

Salient characteristics: *Weight* 92½ lb. approx. (42 kg); *Temperature range* −65°F to 160°F. (−18C to + 71.1C); *Fluid* MIL—H—5606.

AUTOMATIC
TOWING GEAR
WARNING

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 closed 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 shut-off 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 model:

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.

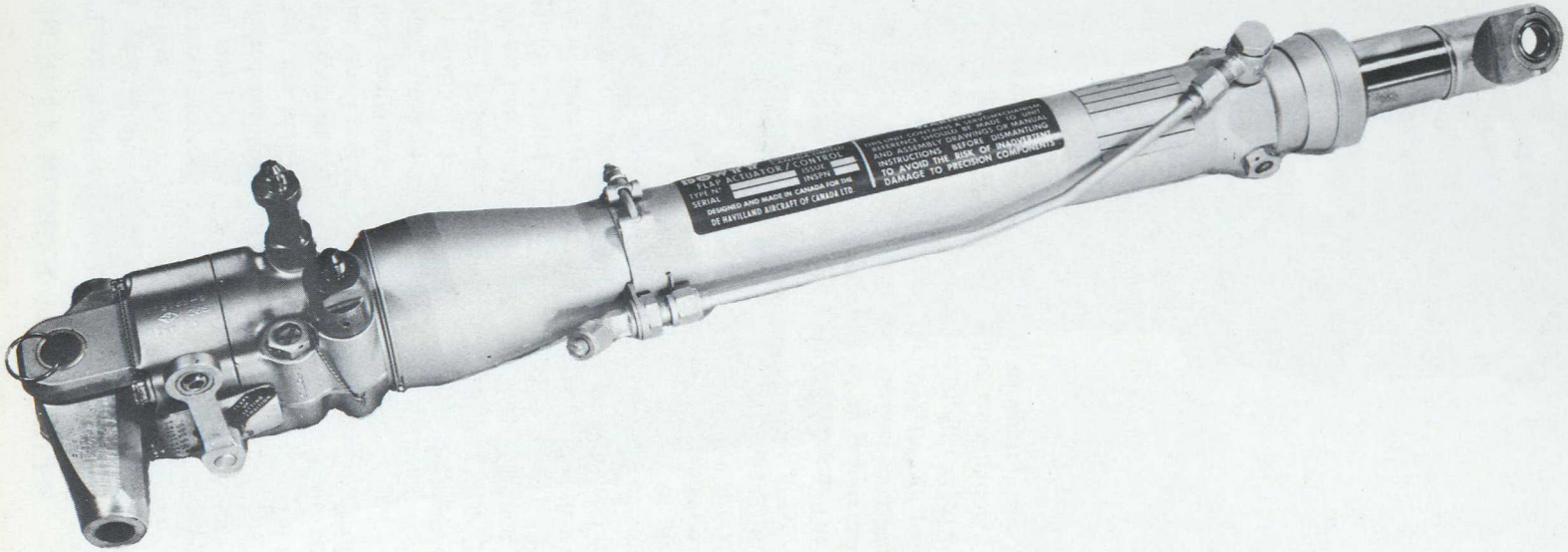
TWO POSITION NOSE LANDING GEAR—CF-5A

The nose landing gear for the Northrop Norair CF-5A 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 Northrop Norair F5 Aircraft, the CF-5A. The first landing gears will be 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 fitting. 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 decreasing 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 fitting under normal aircraft system hydraulic pressure. A splined tube within the main fitting prevents rotation when the gear is 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 via 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 fitting is manufactured from aluminum alloy and the remaining component parts, including the torque arms, are steel: Design Characteristics:

Weight:	73 lb. (33 Kg.)
Length fully extended:	51.50 inches (130.81 cm)
Length shortened for stowage:	40.00 inches (101.60 cm)


FLAP ACTUATOR / CONTROL
TYPE N°
SERIAL
DESIGNED AND MADE IN CANADA FOR THE
DE HAVILLAND AIRCRAFT OF CANADA LTD.
INSPN
INTERNAL COMPONENTS ARE MADE TO EXACT
REFERENCE SHOULD AT DRAWINGS OR MANUAL
AND ASSEMBLY
INSTRUCTIONS BEFORE DISMANTLING
TO AVOID THE RISK OF INADVERTENT
DAMAGE TO PRECISION COMPONENTS

AIRCRAFT RUBBER FUEL CELLS

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 Cells have provided this assurance for many years. Light-weight, flexible, easy-to-install and tested over many thousands of hours of flight, rubber cells have been established as the most reliable fuel containers available today.

Uniroyal (1966) 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 cells are being used in most military aircraft flying today, including: CF-100; CF-104; CF-105; CL-28; CL-41; CL-44; CL-66; CL-94; F-86; F-104D/G; F-94; F-9F; F-5A/B; B24; SB 2C-1; T-33; T-34; T-38; XC-142; UH-12E; Caribou; Otter; Beaver and Harvard. They are also used in the vehicles LTV-2 and 3, CL-91, M-113 and T-97.

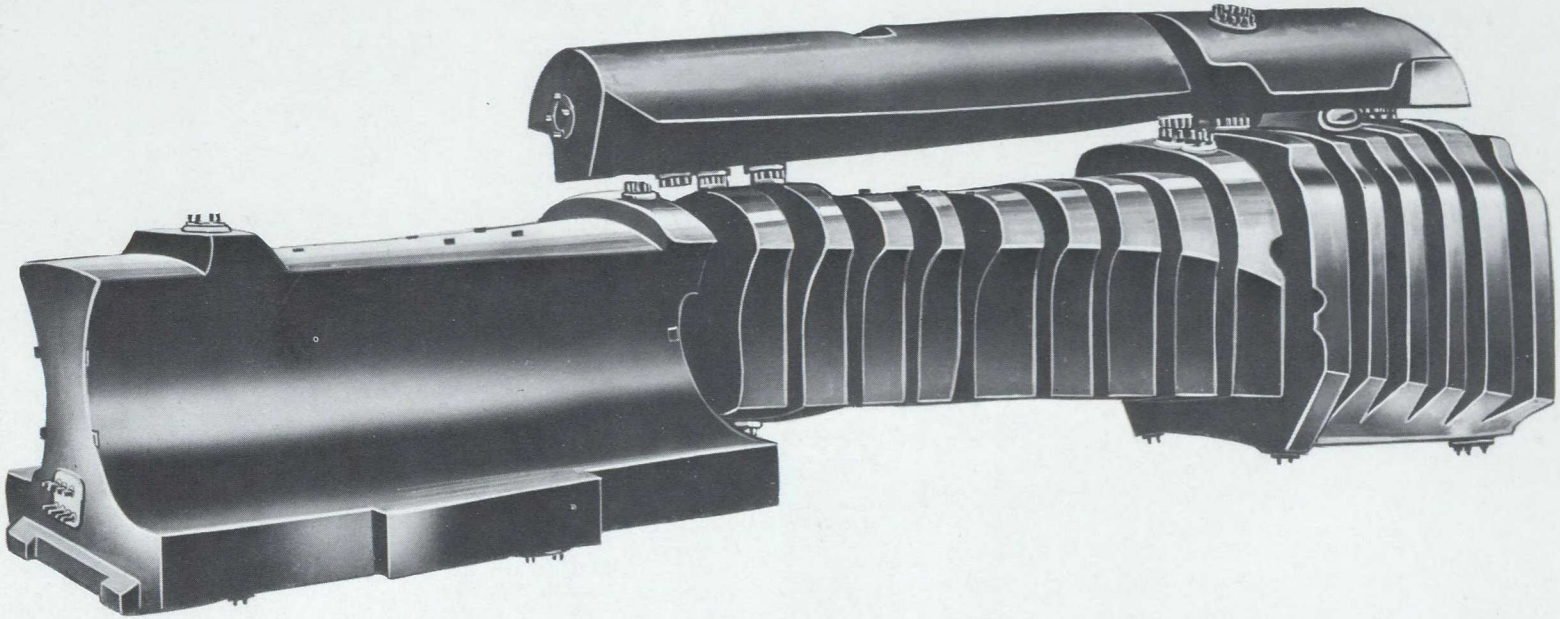
The shape and size of these cells is practically unlimited for they can be tailored to fit into almost any kind of aircraft structure, using stringers and ribs as supports. Fittings and connections are either individually developed, or existing types are utilized. Tight seals are achieved by using "O" rings, gaskets, or plain compression fittings. Cells are held in position by using "hangers", of which a wide variety is available. An average of five or six cells are usually used per aircraft.

The photo on the right illustrates a typical set of T-38 Fuel Cells.

Construction consists of alternate layers of strong nylon fabric, coated with special grades of synthetic rubber to prevent fuel penetration. The range of materials available is very extensive, and can take care of all requirements.

The range extends from flexible light-weight bladder construction, weighing as little as .102 pounds per sq. ft. (46.3 gm. per .092 m^2) of panel wall to rigid self-sealing constructions, weighing 1.15 pounds per sq. ft. (521.6 gm. per .092 m^2) which provide protection against .30 and .50 calibre ammunition.

All constructions are produced and qualified to appropriate Military Specifications.



MAIN LANDING GEAR DHC-5

The patented telescoping Landing Gear shown in the adjacent photograph was designed, developed and manufactured by Abex Industries of Canada Ltd., Jarry Hydraulics Division for the de Havilland DHC-5 Buffalo airplane. The gear not only represents an advance in STOL, rough field landing and taxiing capability but its basic design theory was proven as fact in the DHC-4 Caribou.

Abex-Jarry Engineers used a two stage oleo-pneumatic shock strut with overload relief as the basis for their design. This in effect more than satisfies the major design parameters which include: a STOL capability of 13 ft./sec. (4 m/sec) with a reaction factor of 1.8; a stable static platform for loading purposes; and a rough field landing and taxiing capability. The first stage of the two stage strut provides a static loading platform and in conjunction with large tires also provides stable taxiing characteristics under rough field conditions.

The basic strut consists of two stages comprising of main piston, a cylinder, a first stage floating piston, a second stage floating piston, two rebound control devices, a rebound ring and a flapper valve. When the wheels of the airplane contact the ground the main piston moves up relative to the cylinder which is attached to the airplane. This movement forces oil in the strut from the upper side of the piston head through fixed and metering orifices to the lower side. The oil, which is forced through the restricting orifices at a high velocity, causes a pressure drop across the piston thus doing work and absorbing the kinetic energy of the airplane. The oil displaced across the piston head moves the first stage floating piston downward causing it to compress the air in the low pressure chamber of the strut. At the same time some of the oil passes through the rebound chamber entry holes filling this annular chamber with oil. The volume of oil displaced across the piston head causes the first stage floating piston to compress the air in the low pressure chamber to the point where the first stage floating piston impinges on the second stage floating piston. The high pressure air of the second stage is then compressed resulting in a further closure of the strut. Momentarily the vertical motion of the aircraft is brought to a stop, flow through the orifices ceases and pressures in the oil chambers and high pressure air chamber are in equilibrium. At this point the energy which is stored in the compressed air starts to extend the strut. The floating pistons move upward as the air expands thus forcing the oil from the lower side of the piston head to the oil chamber. Two devices are employed to control this rebound. The first is the positive rebound control which restricts the flow of oil forced from the annular chamber as the strut extends. It comprises a rebound ring, a device controlled by inertia, which is held down during compression and moves upwards during the rebound. When the ring is in the extreme upper position it is held thereby by the pressure drop across it and forms a seal with the piston head. Small calibrated orifices in the side of the rebound ring control the flow of oil from the annular chamber thus limiting the speed at which the strut extends. The second device which is employed to control rebound is a flapper valve which is auxiliary to the positive rebound control. The Flapper valve is similar to the rebound ring in that it too is a device controlled by inertia and when moved upwards it restricts the flow of oil back through the orifices in the piston head.

The shock strut also incorporates an overload relief valve which prevents high transient loads from being transferred to the wing structure. It consists of an air pressurized third stage which functions to dissipate high energy by by-passing hydraulic fluid to the low pressure side of the piston head.

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 Litton 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 flight 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 and RDAF.


50 20T FORK LIFT
LHS

"WORTAC" - OVERALL RADAR TESTER AND CALIBRATOR

WORTAC is a Radar Test and Calibration Set designed and produced by Canadian Westinghouse. As Fire Control Systems become more complex the requirement for the test sets has increased sharply with the realization that simple "go" or "no go" answers are no longer acceptable. Further, the need for pre-flight calibration has also become apparent in modern high speed strike/interception aircraft.

Appreciating this need the company has produced a set which meets all requirements for high accuracy testing, alignment and calibration of a radar directed Fire Control System. Some of the advantages of this system are:

1. It provides a correct simulation of free space.
2. It removes hazard to personnel from radiation.
3. It provides complete end-to-end testing including the tracking of moving targets.
4. It provides accuracy comparable to the best factory test equipment.
5. It is simple to operate and permits flight line testing by a minimum of personnel.
6. It requires no electrical connections to the aircraft.
7. It permits all weather testing.

After considering the above advantages it may be seen that running time on both the radar set and the aircraft have been greatly reduced. This factor also produces advantages: Increased operational life of the system, reduction in maintenance time and repair parts all of which show savings in time and money.

The Dynamic Test Set basically consists of a trailer, a remote control panel, a mechanical alignment system and an electronics cabinet. The size, shape and absorbent lining of the trailer are dictated by the radar set and the accuracy with which test and calibration is required. In addition the all metal exterior of the trailer provides adequate radiation shielding. The remote control panel provides the facility for operating the system while sitting in the cockpit using the radar equipment as it would be used under actual combat use. It facilitates the programming of targets and provides direct read-out indications of the radar sets performance. The mechanical alignment system is so designed that the trailer can be manœuvered easily into position on the aircraft nose in confined and limited quarters. There is also the facility for comparing the mechanical boresight axis with the electrical boresight axis. This is a very essential operation when high accuracy calibration is necessary. The electronics cabinet is of modular construction and provides the necessary signals and targets of the type, range, velocity and power required by the Fire Control System.

The WORTAC Overall Radar Tester Calibrator is currently being used in the following countries; United States, Canada, Germany, Italy, Belgium, Holland and Japan. The system presently in production is adaptable to most aircraft and Fire Control Systems.

In addition to the design and development of special aerospace ground equipment such as the WORTAC-Overall Radar Tester and Calibrator, Canadian Westinghouse is carrying out research and development in shipboard electronics (including fire control, sonar and torpedoes); airborne electronics (including guidance, control and fusing for air-to-air missiles, fire control systems); communications (including tropospheric scatter); ECM/ECCM techniques as well as solid state displays, remote surveillance devices and antenna and microwave development projects.


RCAF
78
RELEASE BRAKE
STEERING
LOCK
AR/APK 509
FORK LIFT HERE
FORK LIFT HERE

AIRCRAFT SIMULATORS

CAE Industries Ltd. 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 ninety 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 to 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.

Between December 1964 and the present, major international airlines ordered flight simulators from CAE. Canadian Pacific Airlines ordered a simulator for the DC-8 Jetliner, Swissair, KLM Royal Dutch Airlines and Iberia Airlines ordered digital simulators for the new DC-9 Jetliner. KLM Royal Dutch Airlines, Iberia Airlines, Air Canada, UTA, and Swissair have ordered digital simulators for DC-8 aircraft.

CAE digital simulators employ General Purpose Digital Computers using silicon monolithic integrated circuits throughout and an all-core memory.

The DC-9 digital simulators in use with Swissair and KLM are the first to be operational in Europe.

The simulator crew compartment, an exact replica of the aircraft cockpit is complete with actual instruments for control of flight, engines, navigation, radar, and weapons. It is mounted on a base which incorporates a motion system capable of violent movement, and is tied in with a visual system which gives the pilot a moving picture of the airport runway on which he is landing or from which he is taking off. The combination of motion and visual systems is sufficiently realistic to produce airsickness in pilots.

CRASH DATA RECORDER

In 1964 both the Royal Canadian Air Force and the United States Air Force raised Contracts with Leigh Instruments Limited to install a Crash Data Recorder/Crash Position Indicator system into the RCAF CC106 "Yukon" aircraft and the USAF C133 "Cargomaster" aircraft, respectively, for evaluation purposes. These particular systems produced analogue recordings, and in each case proved the following features to the user's satisfaction:

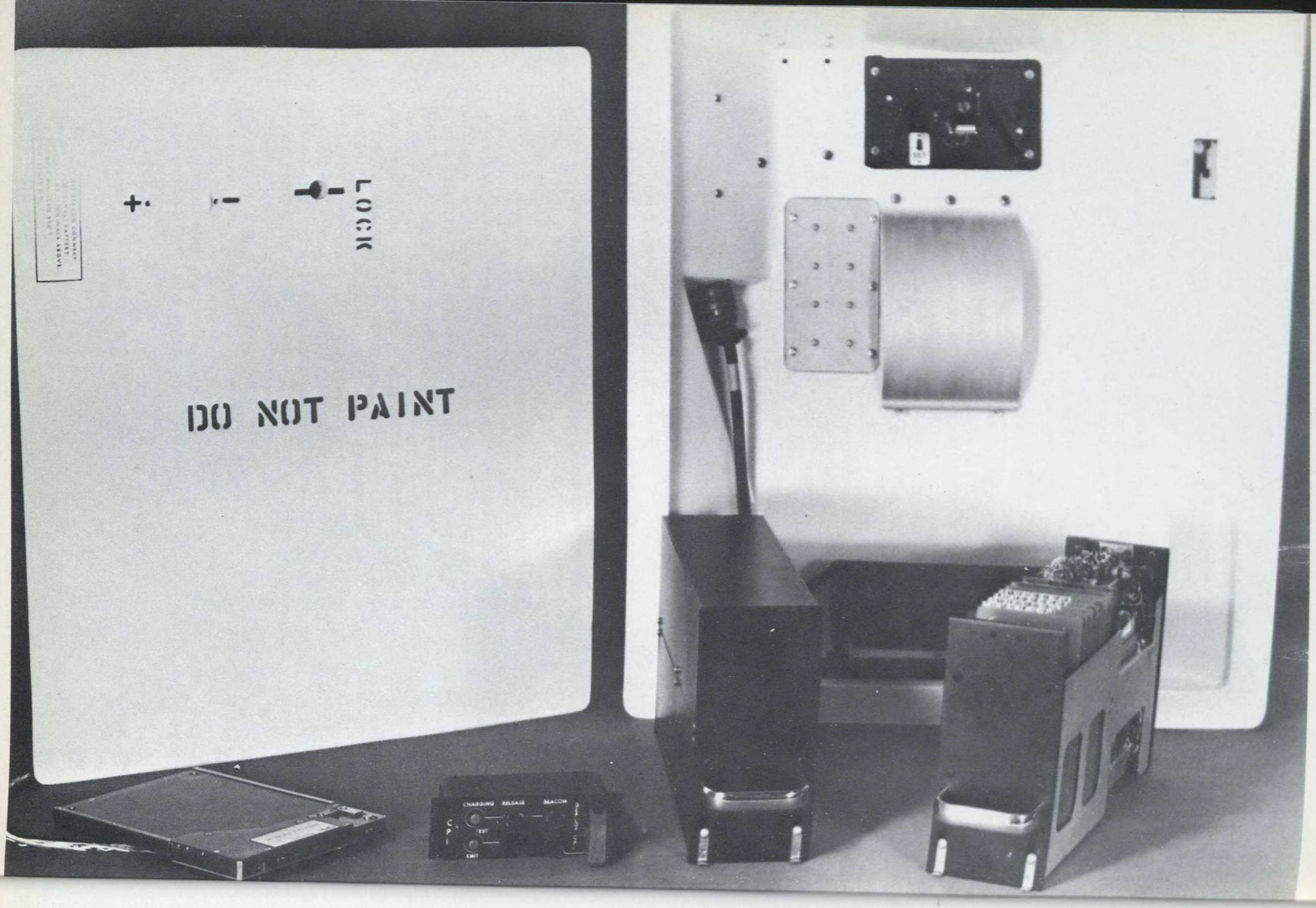
- That the recorder was compatible with existing aircraft systems.
- That good quality voice recordings resulted.
- That the aircraft system parameters were faithfully recorded and reproduced.
- That the airfoil deployment system performed satisfactorily, and that the crash position indicating beacon performed to specification.
- That the tape recording survived deployment and landing onto all types of terrain was and totally undamaged.

As a result, the RCAF ordered fleet fitment of the CDR/CPI into the CC106 fleet.

The Leigh Instruments Crash Data Recorder will provide a reliable means of recording aircraft flight data and of safely deploying this data upon aircraft crash conditions and automatically transmitting distress signals from the accident scene. Upon location of the airfoil and hence the accident the recorded data may easily be removed from the airfoil and reduced to help determine the cause of the accident.

A pulse duration modulation system is used to record multiplexed data on magnetic tape. This magnetic tape is contained in a cassette which is mounted within the airfoil.

The tape-drive power supply and voice recording amplifiers are integral to the airfoil Mounting Unit and are supplied with the recorder system. The voice recorder sub-system meets the requirements of TSO C84.


DO NOT PAINT
LOCK
CHARGING
RELEASE
BEACON
TEST
LIMIT

CRASH POSITION INDICATOR

In the event of an aircraft crash, immediate radio identification of the crash position is highly desirable, in order to provide prompt assistance to survivors and to reduce the cost and hazards of the rescue operation.

Most methods of radio identification have not gained wide acceptance by commercial and private aviation because the available equipment (i) requires manual operation, (ii) in many cases fails to survive the crash, and (iii) is excessive in cost for both initial installation and maintenance. Automatic circuitry has to some extent eliminated the objection of manual operation, but the deployment of the equipment often requires manual removal of the radio beacon from the aircraft. This fact, coupled with the failure of many types of beacons to survive the air crash, has rendered many survival beacons of little value, particularly in single-place aircraft applications.

The Leigh Crash Position Indicator is a distress radio beacon that (i) is automatically released and deployed; (ii) has proven that it can survive crashes, even of high-performance aircraft; (iii) is economical in both installation and maintenance.

Basic Operation: The Leigh Crash Position Indicator consists basically of an airfoilencapsulated radio beacon and crash detection sensors that assure satisfactory deployment. The radio beacon is automatically actuated upon deployment and transmits immediately. Encapsulation of the radio beacon in the form of a tumbling airfoil ensures safe deployment of the equipment at a safe distance from the crash point. The trajectory of the airfoil approximates a circle of 100-foot (30.48 m) radius. The lift and drag characteristics are such as to guarantee safe deceleration to the terminal velocity of approximately 45 knots. In addition, the shock-absorbing qualities of the airfoil material completely protect the beacon from destruction in the event of a hard surface landing.

The Radio Beacon: Leigh solid-state pulsed beacons compatible with both SARAH air-sea rescue equipment and continuous-wave beacons are presently in use. The cw beacons are crystal controlled for the 121.5- or 243-megacycle distress bands, and are tone modulated by a sweeping audio signal. This technique of modulation makes the radiated signal easy to identify against the background of constant frequency interference which is always present in aircraft.

The existing Leigh radio beacons provide a signal detectable at distances exceeding 80 miles (128.7 km) when standard search equipment is used. In addition, the beacons operate for durations of approximately 48 hours and in ambient temperature ranges of −40° to +132°F. (−40°C to +55°C).

The antenna used in all beacons is a parallel plate type wholly enclosed in the airfoil. This configuration provides a radiation pattern particularly suited to the tumbling airfoil. The internal batteries of the beacon are nickel-cadmium types which are maintained at full charge by a low trickle current.

In 1962 the United States Air Force became interested in the Leigh Instruments Limited Crash Position Indicator System primarily because of the airfoil delivery system used to deploy the emergency distress frequency radio beacon from a crashing aircraft. Tests were Contracted for and conducted between July 1962 and October 1964 on various aircraft types (including the C135 and C133 aircraft). The equipment subsequently became USAF Inventory Item AN/URT 26(v).

It has been Contracted for and completely retrofitted to the C133 fleet, and is presently Contracted for and being fitted to the HC130H, C141, C124, C130 and C135 fleets. In all these fleet fitment cases, the airfoil is required to have Crash Data Recorder space and weight provision, i.e. the airfoil is capable of being retrofitted with a recorder tape cassette by simply inserting the cassette after removing the present dummy cassette.

Item	Type of Operation CW
Frequency	Any frequency in 121.5- or 243.0- megacycle distress band, crystal controlled.
Modulation	Sweeping audio 300 to 1000 cps, repetition rate 2 per second.
On/Off Cycle	On continuously
Radiation Pattern	Omnidirectional
*Typical Ranges**	50 nautical miles
Transmitting Life	2 days
Temperature Range (limited by batteries)	−40°F to +132°F (−40°C to +55°C)
Altitude	Up to 50,000 feet (15,240m)
Weight (system)	17 pounds (7.7 kg.) (typical)
Dimensions (beacon only)	20 x 20 x 4 inches (50.8 x 50.8 x 10.16 cm) approximately

* *Detection range is limited by (a) terrain at beacon site, (b) efficiency of search receiver, (c) altitude of search aircraft.*

DO NOT PAINT

GENERAL PURPOSE DOPPLER SENSOR

Canadian Marconi Company-designed doppler sensors, employing the then novel FM/CW modulation technique, were being evaluated by military and commercial operators as early as 1956/57. Designated the CMA-620 series for the commercial application, the AN/APN-501 and AN/APN-147 became the military versions of this highly successful series. More than 3500 such sensors and developments thereof are flying in a variety of aircraft throughout the world.

Today more than 13 years of experience in evolutionary design, development and production are embodied in the CMA-650 series of truly 'General Purpose Doppler Sensors' now in production. The CMA-650 series general purpose doppler concept basically comprises a doppler sensor capable of accurately operating in the flight regimes of rotary and fixed wing aircraft and the applications for which they are employed. At the same time, its built-in versatility allows the user to choose only those performance characteristics of the sensor required for his application(s). Considered modular design makes this a question of merely sliding-in or taking-out the relevant modules; e.g., a fixed wing conventional or STOL aircraft does not require a sensor with hover capability whereas from an interchangeability point of view this capability can be immediately restored by plugging in the hover modules. It need not be stressed that considerable savings and simplifications can be achieved by exploiting this concept in the maintenance and operation of a mixed fleet of doppler equipped air vehicles. This concept has been adopted in the widely used military sensors AN/APN-168 and AN/APN-503(V). Still greater versatility is built into these sensors by the provision of an optional module that gives the sensor an accurate low-level radar altimeter capability.

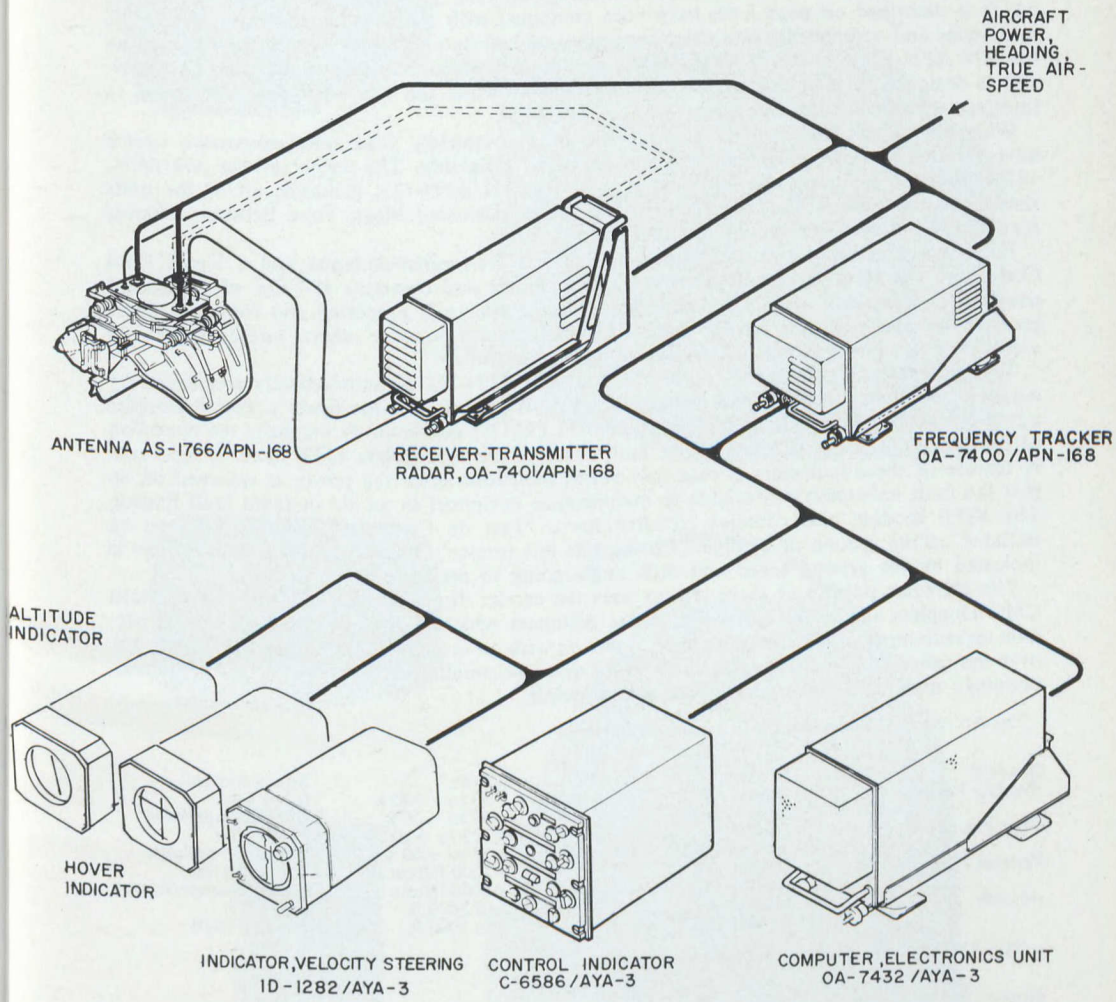
Evaluations in helicopter and STOL aircraft of the Canadian and US forces have been proven highly successful and the equipment has been in quantity production for some time.

The Sensor and computer use the same controller and both Doppler and Computer information are displayed on the same three inch instrument. The hover and altitude indicators may be included or omitted as requirements dictate.

Another point that warrants attention is the fact that CMC has been able to retain the simplicity and superior operational accuracy typical for a design using the FM/CW technique with track stabilized antenna. Although at first sight this may look to be a bit of an anomaly in the case of a hovering aircraft, CMC has found an extremely effective solution to this problem by allowing the antenna to move freely in drift during hover whilst simultaneously carrying out a direct high speed measurement of V_h, V_d and V_v using the antenna drift position for the necessary coordinate orientation. These high speed outputs are used exclusively for ASE inputs and hover indications.

Thus, whilst retaining the high accuracy speed and drift outputs of the track stabilized antenna for the navigation application the hover condition is taken care of by accuracies measured in fractions of knots rather than percentage, thereby solving the requirements for both conditions in proper perspective.

(Please see page I-46 for the complementary Computer)


AIRCRAFT POWER, HEADING, TRUE AIR-SPEED
ANTENNA AS-1766/APN-168
RECEIVER-TRANSMITTER RADAR, OA-7401/APN-168
FREQUENCY TRACKER OA-7400/APN-168
ALTITUDE INDICATOR
HOVER INDICATOR
INDICATOR, VELOCITY STEERING ID-1282/AYA-3
CONTROL INDICATOR C-6586/AYA-3
COMPUTER, ELECTRONICS UNIT OA-7432/AYA-3

MICROMINIATURIZED DOPPLER SENSORS

The proven features of the Canadian Marconi Company general purpose Doppler Sensor, which is described on page I-40, 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 on page 000 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 and in the CMA-521 Radar Altimeter which is described on page 000. It permits measurement of aircraft height above terrain with an accuracy of ± 2 feet (.6 cm) ± 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
Heading Velocity	Digital	−50 to +250 k	0.140 k/bit
	Analog DCV	−50 to +50 k	5 microamps/knot
Drift Velocity	Digital	−100 to +100 k	0.140 k/bit
	Analog DCV	−50 to +50 k	5 microamps/knot
Vertical Velocity	Digital	±5000 ft/min	4.9 ft/min/bit
	Analog DCV	±5000 ft/min	0.2 microamps/ft/min
Altitude	Digital	2 to 3000 ft	1.40 ft/bit
	Analog DCV	2 to 3000 ft	3 millivolts/ft

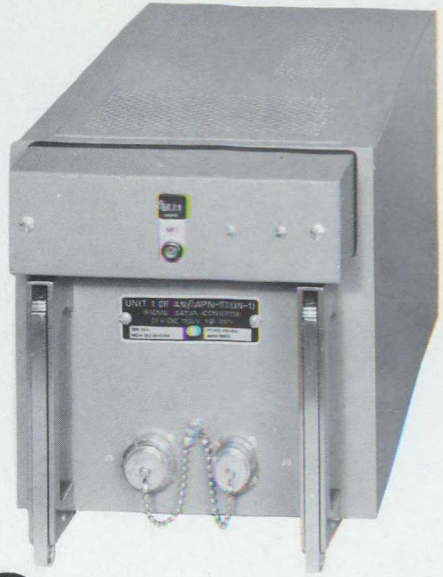
The AN/APN-173 provides the following outputs:

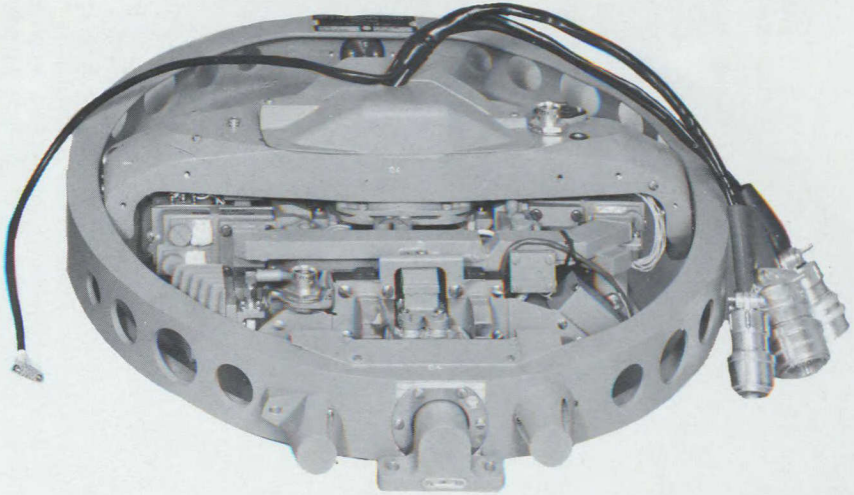
ELECTRICAL

Output	Form	Range	Scale Factor
Groundspeed	Pulse Train	−50 to +250 k	As required
Heading Velocity	400 Hz voltage	−50 to +250 k	30 mvrms/k
Drift Velocity	400 Hz voltage	−100 to +100 k	30 mvrms/k
Vertical Velocity	400 Hz voltage	±5000 ft/min	1.5 mvrms/ft/min

VISUAL

Output	Type of Display	Range	Resolution
Groundspeed	Counter	−50 to +250 k	1 knot
Drift Angle	Pointer & Dial	180° left to 180° right	1°
Altitude	Pointer & Dial	2 to 2500 ft	5 ft
Heading Velocity } *Drift Velocity* }	Horizontal & Vertical Bars	±40 k	2 k
Vertical Velocity	Pointer & Linear Scale	±1000 ft/min	50 ft/min






DRIFT
GROUND SPEED
KNOTS


CONTROL
ON
OFF
TEST


FEET

SUPERSONIC DOPPLER SENSORS

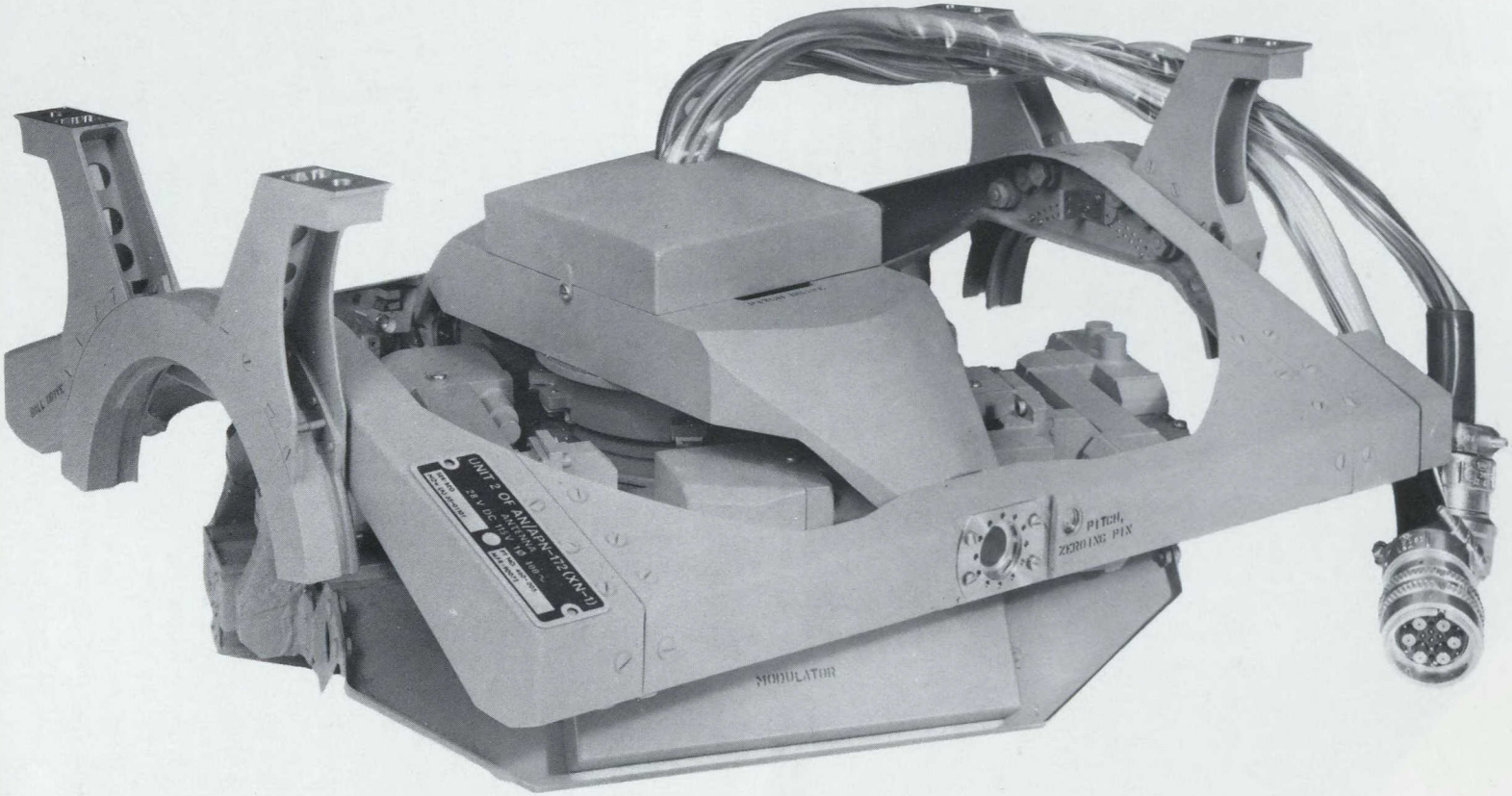
Canadian Marconi Company's latest third generation Dopplers are the CMA-668 family of sensors designed specifically for supersonic aircraft. These Dopplers are characterized by:

(a) Low weight and volume
(b) High accuracy and reliability
(c) Inertial compatibility
(d) Built-In-Test Equipment
(e) Ease of field maintenance
(f) Integral altimetry.

The light weight (34 lbs) CMA-668, 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 CMA-668 is 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 CMA-668 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 CMA-668 dictates a minimal cost of ownership.

The CMA-668 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). Integral 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, 0.1° for drift angle), which can be encoded for use in digital computers, have been optimized to provide Doppler Inertial system compatibility. Salient features of these new supersonic Dopplers are listed below:

PERFORMANCE DATA	
Temperature Range	−65° to +160°F (−53.8° to 71°C)
Sensor Range	50 - 65,000 ft. (15.2 to 19,812m)
Automatic Acquisition	Within 10 seconds
Reflectivity	All terrain and sea states down to Beaufort 1. Automatic compensation for sea bias.
MTBF	1000 hrs.
ANTENNA STABILIZATION	
Gimbal Limits	Pitch +20° to −15° Roll ±35° Drift 20° right or left
Attitude Rate	Pitch ±20°/sec Roll ±40°/sec Drift ±20°/sec
SYSTEM ELECTRICAL CHARACTERISTICS	
Input Power	115 V AC 1_{π} 400 Hz 150 VA max.
Transmitter Output Power	350 mW
Transmitter Output Frequency	13,325 ± 10 MHz
Modulation	FM/CW


UNIT 2 OF AN/APN-172(XN-1)
ANTENNA
28 V DC
PITCH
ZEROING PIN
MODULATOR

NAVIGATION COMPUTERS, AIRBORNE

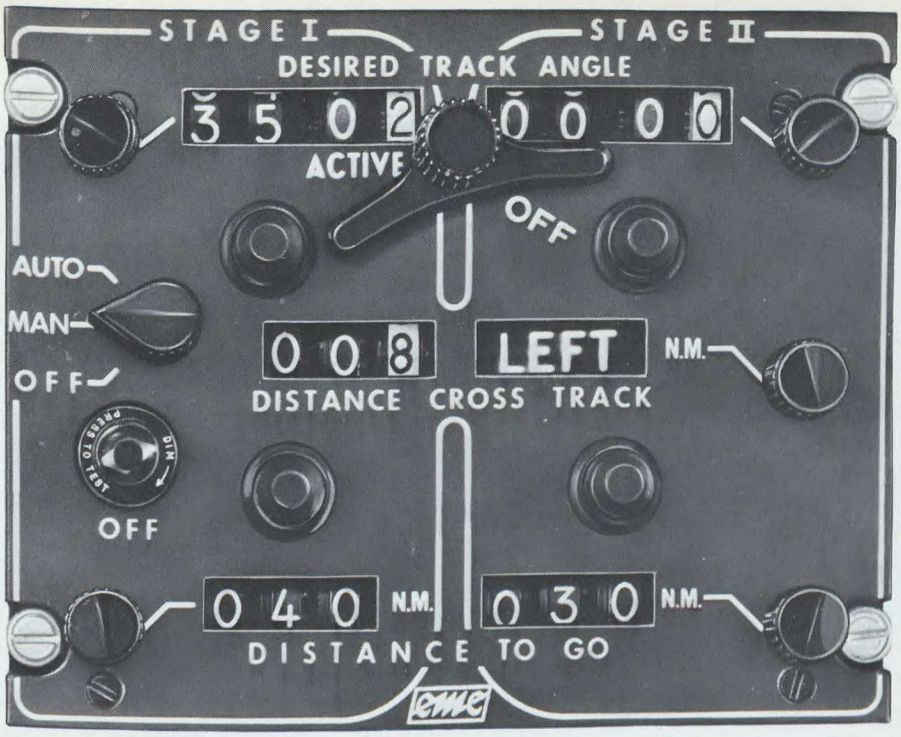
Parallel with the development of doppler sensors Canadian Marconi Company has been engaged in the design and development of compatible navigation computers. Starting with the CMA-601 track guidance computer, in accordance with ARINC characteristic 543, and used with the CMA-620 series doppler sensors in the commercial transport application, designs have branched off into various other commercial and military applications; e.g., the AN/ASN-35 track guidance computer is a more sophisticated version used in military transport aircraft. In total numbers, computers almost equal the number of doppler sensors in use.

In addition to being extremely reliable, one of the more salient features of these computers is the operational digital technique basic to their design. This technique takes full advantage of the high accuracy digital groundspeed outputs available from CMC's doppler sensors. It has also resulted in the availability of a lat/long computer (CMA-690-AN/ASN-35A) yielding outputs of similar accuracy up to and beyond 89 degrees of latitude. Computer outputs can be integrated with digital and pictorial displays, autopilots and the like.

Another distinctive development is the AN/AYA-3 two destination computer (with option of up to 12 destination memory), which computes and displays present position in terms of rectangular coordinates relative to an arbitrarily selected reference point. A pictorial display of bearing and distance to the selected target is part of the system, whilst wind speed and direction are continuously computed and memorized, and may be displayed at will.

The AN/AYA-3 Navigation Computer and the AN/APN-168 Doppler sensor together make up the AN/ASN-64 Doppler Navigation Set which has found wide application in a variety of helicopters and fixed wing aircraft. In order to meet the requirements of different customers versions of the AN/AYA-3 with calibrations in kilometers, nautical miles and in Universal Transverse Mercator Grid or latitude and longitude coordinates are available.

(Please see page I-42 for the complementary microminiaturized Doppler Sensor)


STAGE I
STAGE II
DESIRED TRACK ANGLE
3502
0000
ACTIVE
OFF
AUTO
MAN
OFF
008
LEFT
N.M.
DISTANCE CROSS TRACK
PRESS TO TEST
DIM
OFF
040
N.M.
030
N.M.
DISTANCE TO GO
emc


DOPPLER
LAND
SEA
STBY
TEST
OFF
AIR
VARIATION
G/S DRIFT
SET
N
S
W
E
N0013 W0016
PRESENT POSITION -KM
PRESS TO STORE
S0085 ON E0005
DESTINATION 2-KM
OFF
S0125 W0025
WIND DIR
emc

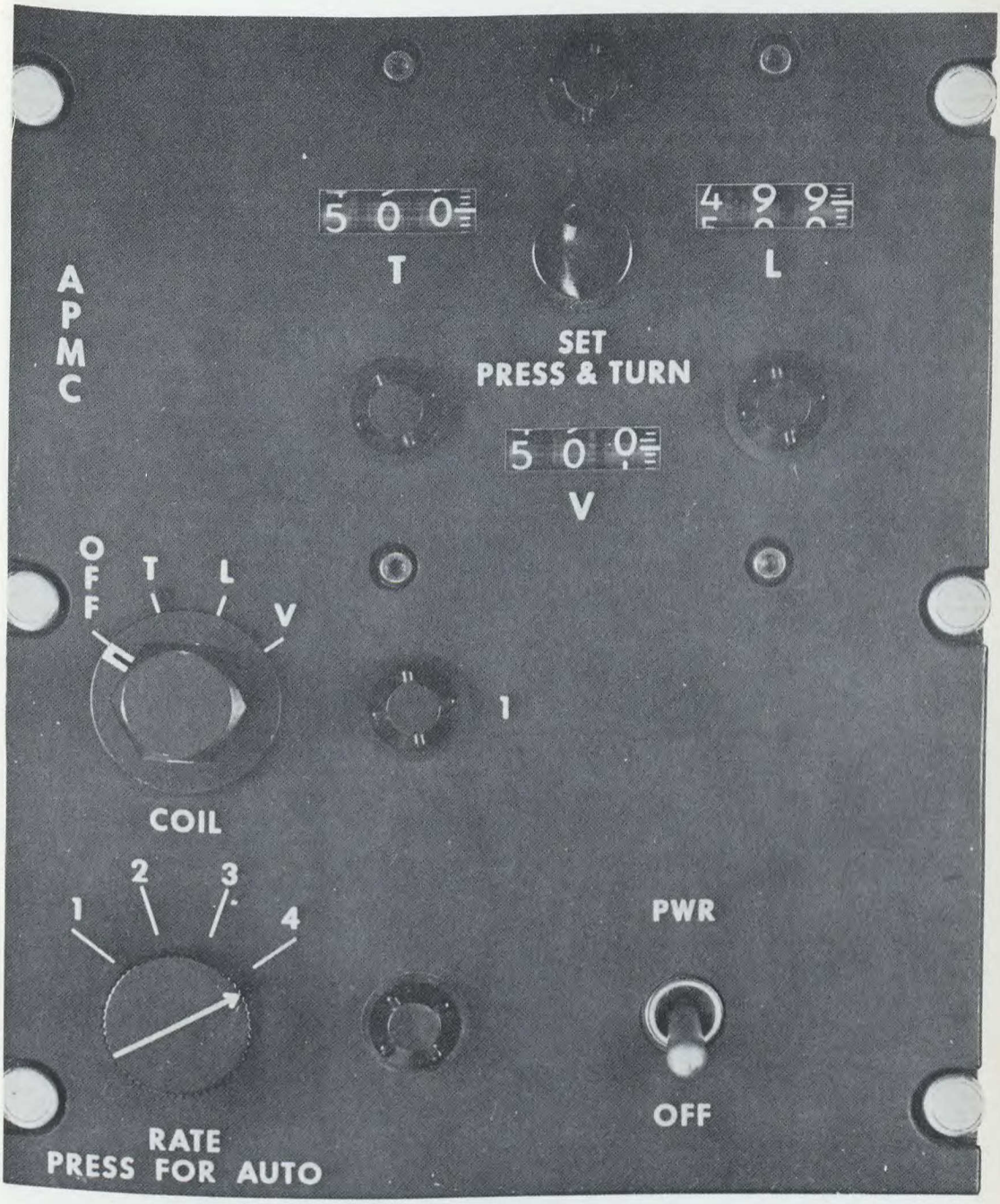
AUTOMATIC PERMANENT MAGNETIC COMPENSATOR (APMC)

The APMC was developed and designed 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 meet USN Specification MIL-C-81328(WP). USN will procure this equipment for their P2V fleet and on this basis a major production program will be launched at CAE before March 31, 1967. Other orders will be received from the Royal Australian Air Force for their Neptunes and from the Royal Australian and Royal Netherlands Navies for their Trackers.

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-10 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-10 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-10.
4. Present practice in the RCAF and the RCN is to re-compensate 4 times per year, since the aircraft's magnetic field changes with time. These compensation flights, using manual techniques with the CN-191/ASQ-8, last approximately 3 hours each and consist of flying the aircraft on cardinal headings while doing 10° rolls and 5° pitches. The operator must plot a graph of compensator settings vs. MAD manœuvre signals in order to determine the best setting. These sustained manœuvres 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. It is noted that 3 hours per compensation flight 4 times per year represents considerable flying time. Accordingly, a considerable saving can be realized by use of the APMC. Also, manual compensation requires extended manoeuvering 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.


APMC
500
T
499
L
SET
PRESS & TURN
500
V
OFF
T
L
V
1
COIL
1
2
3
4
RATE
PRESS FOR AUTO
PWR
OFF

THE 9-TERM COMPENSATOR (9-TC)

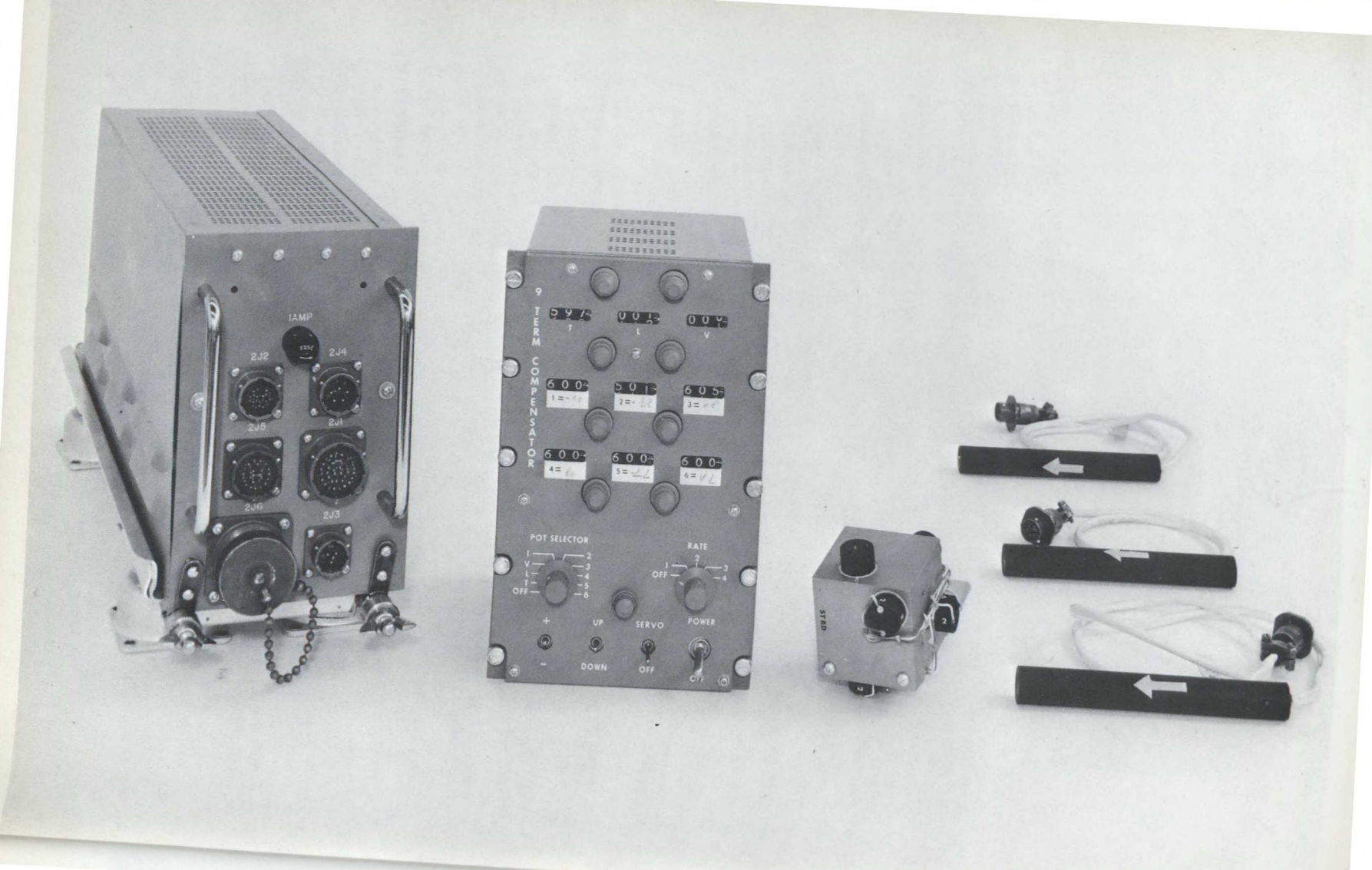
The APMC was developed to compensate for interference generated by an aircraft's permanent magnetic field. There are two other sources of magnetic interference which require compensation on MAD equipped aircraft. Induced fields are caused by the ferromagnetic materials of an aircraft being magnetized 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 CAE 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 and they do not provide adequate compensation for next-generation more sensitive MAD.

The 9-TC has the following advantages:

1. Provides semi-automatic electronic compensation for all aircraft generated permanent, induced and eddy-current field interference.
2. Fully solid-state and qualified to USN Specification NAVAIRDEVCEN AW 3338.
3. Compatible with present and future more sensitive MAD.
4. Short "trim-up" procedures enables optimum compensation for all interfering sources to be achieved at all times.
5. Applicable to new ASW aircraft without lengthy, expensive flight time.

The 9-TC is in production for the newest RAF ASW aircraft, the HS-801 and deliveries to Hawker Siddeley have started in January 1967. The 9-TC has been adopted by USN for use in the "A-New" Orion (P3C). The prototype has been delivered for this program and production quantities being ordered.


1AMP
2J2
2J4
2J5
2J1
2J6
2J3
9 TERM COMPENSATOR
T
L
V
POT SELECTOR
RATE
OFF
+
UP
SERVO
POWER
-
DOWN
OFF
OFF
STAB

REGISTERING 'G' METER

One of the major problems confronting aircraft operators has been the maintenance of airframes. An overhaul schedule based on number of flying hours or calendar time limits proved unsatisfactory since the structural condition of identical types of aircraft, on similar duties, differed considerably due to the fact that aircraft are subject to various G-loadings depending upon many contributing factors. Investigation indicates that the G-loadings are a major factor in airframe wear and fatigue.

The Aviation Electric Registering 'G' Meter is designed to sense the magnitude and count the applications of 'G' loadings along the vertical axis of an aircraft. The sensor design is such that up to 23 increments of 'G' within a maximum range of −2.5 G to +9G can be sensed and transmitted electrically to panel or remotely installed registers. Each indicator contains four 4 figure digital counters and multiple indicators can be installed to provide readings for all of the 'G' increments or a selection suitable for the type of aircraft in which the system is installed.

Applications

1. To record flight loads along the aircraft vertical axis at, or near, the aircraft CG.
2. To record G loadings along the aircraft vertical plane at points other than the CG.
3. By suitable switching (oleo leg extension switch) landing and taxi loads can be recorded on separate counters, eliminated or included in the overall recordings.
4. By alternative orientation the system can measure and record accelerations during catapult launch, rocket launch or arrested landings.
5. By recording G loads applied to an airframe and the total count of such loads, the Registering 'G' Meter will assist airframe manufacturers and aircraft operators in determining statistically the safe fatigue life of an airframe.

System Features

1. Hermetically sealed miniature sensor with provision for mounting on horizontal or vertical surfaces.
2. Clamp or bezel mounted register for panel or buried installation.
3. Range (within limits of sensor), selection of check points, and reset point can be varied by external cable changes only. If more than four recordings are required additional registers can be used.
4. Reset circuit prevents erroneous counts caused by small local vibrations at any G increment.
5. Magnetic damping employed in sensor to provide a constant damping factor over the temperature range.
6. Sensor and Register hermetically sealed to ensure satisfactory operation at all altitudes.
7. Temperature range of components −65 to +250°F. (−18C to +121C)

Operation

'G' loads at the sensor position are sensed by a mass weight located between vertical guides. G forces displacing the mass are balanced by a clocktype spring whilst rate of displacement is controlled to give optimum performance by magnetic damping. Mass displacements are transmitted mechanically to a wiper arm operating over a commutator. Contact of the wiper arm with each successive segment of the commutator applies a 28 volt DC supply to an electro-mechanical counter and causes it to register 1 digit. The counters are of a self-locking type and the circuit is arranged so that the counter locks after moving 1 digit. No further recording is made until the 'G' force has reduced to a pre-set threshold value, thus preventing small local vibrations from falsely producing a high number of erroneous counts at any 'G' increment.


UP
SENSOR
REGISTERING
ACCELEROMETER
CONTRACT NO. 2 800-800
R.C.A.F. REF. 6A/6695-21-802-0813
SERIAL NO. 18 TYPE I
MFR'S. TYPE NO. AE320-2-A
INPUT VOLTAGE 28 VDC
RANGE-2.5 TO +9G
MANUFACTURED IN CANADA BY
AVIATION ELECTRIC
LIMITED
21540-1


9237 3678
REGISTERING-G-METER
9280 5160

AERIAL RECONNAISSANCE SYSTEMS

Designed and produced by Computing Devices of Canada Limited, in cooperation with W. Vinten Ltd. of England, this photographic reconnaissance equipment combines the attributes of the famous Vinten 70mm camera with Computing Devices' established knowledge in the data handling and control system field. This system, designed for versatility, provides at low cost, optimum reconnaissance intelligence from any type of airborne vehicle.

Features

- *System*—rugged and simple, hence reliable and inexpensive to buy and maintain.
- *Camera*—a 70mm camera in service throughout the world . . . a camera of proven performance and established reliability for both day and night operation.
- *Auto-Exposure Control*—a simple three stage system completely automatic . . . using solid-state switching techniques.
- *Data Recording*—readable directly in alpha-numeric form from the 70mm negative . . . standard unit provides three sets of three-digit counters to display target position or other data.
- *Remote Control*—no direct power controls from cockpit to photo system . . . small console provides operator with indicators and selection controls . . . cameras are triggered by a push-button on the pilot's control column.

Management capability in photo-reconnaissance systems has been well established on the CF-104 Photo Pod Program. The PR 3-2(4) system was designed to operate on information received from the existing CF-104 navigation system, and was integrated mechanically and electrically into the pod which was designed simultaneously. All units and the complete system were then tested in accordance with Royal Canadian Air Force Specifications. Computing Devices are responsible for the manufacture of the PR system, and assembly and checkout of the complete pod package. Courses for service trainees have been held at the plant, and training aids that simulate the PR system and pod have been delivered to the RCAF. Ground support equipments consisting of a Unit Test Set and a System Test Set have also been designed, produced, and delivered to the RCAF.

In addition, the firm has produced manuals on each equipment, including training and support equipment, and will produce the official RCAF Engineering Orders for the system. Field representatives are available throughout the world during all phases of any program.


701
INSTRUMENTATION BAY
GUN COMPT ACCESS DOOR
CF 104 PHOTO RECCE POD

CMA-521 RADAR ALTIMETER

Canadian Marconi's CMA-521, an accurate Radar Altimeter designed for installation in any rotary or fixed wing aircraft, measures precise altitudes from −20 to 2500 feet (6.1 to 762 m). The CMA-521 utilizes the Carrier Dispersal height measurement technique invented and originally used at CMC for altimeter attachments to Doppler sensors.

The Carrier Dispersal technique, a new and most effective approach to the actual height measurement problem, is a genuine advancement in the altimetry art. The technique basically consists of finding the amount of frequency modulation required on the transmitter in order to disperse a fixed fraction of the power from the received carrier. This process does not display any of the disadvantages or ambiguities inherent in the Pulse, Swept FM/CW, and Bessel Mode FM/CW techniques, such as, step, offset, and Doppler errors; spatial insensitivity, noise; poor resolution; false locks; interference nulls; microphonics; poor performance in rain; and relatively large bandwidth and power consumptions. The CMA-521 displays none of these faults and uses such a small portion of the bandwidth allotted for Radar Altimeters that dual simultaneous operation, as required for category III approaches, can be realized without any interconnections or RF interference between the two systems.

The CMA-521 Radar Altimeter, consisting of two fixed antennas, a receiver-transmitter unit and an indicator, is designed to meet or exceed the requirements of ARINC characteristic 552. The all solid state construction plus the extensive use of microelectronics in several circuit functions ensures high reliability. This high reliability combined with the modular construction and Built-in-Test Equipment (BITE) of the CMA-521, minimizes maintenance cost and time while completely eliminating the necessity for first line test equipment.

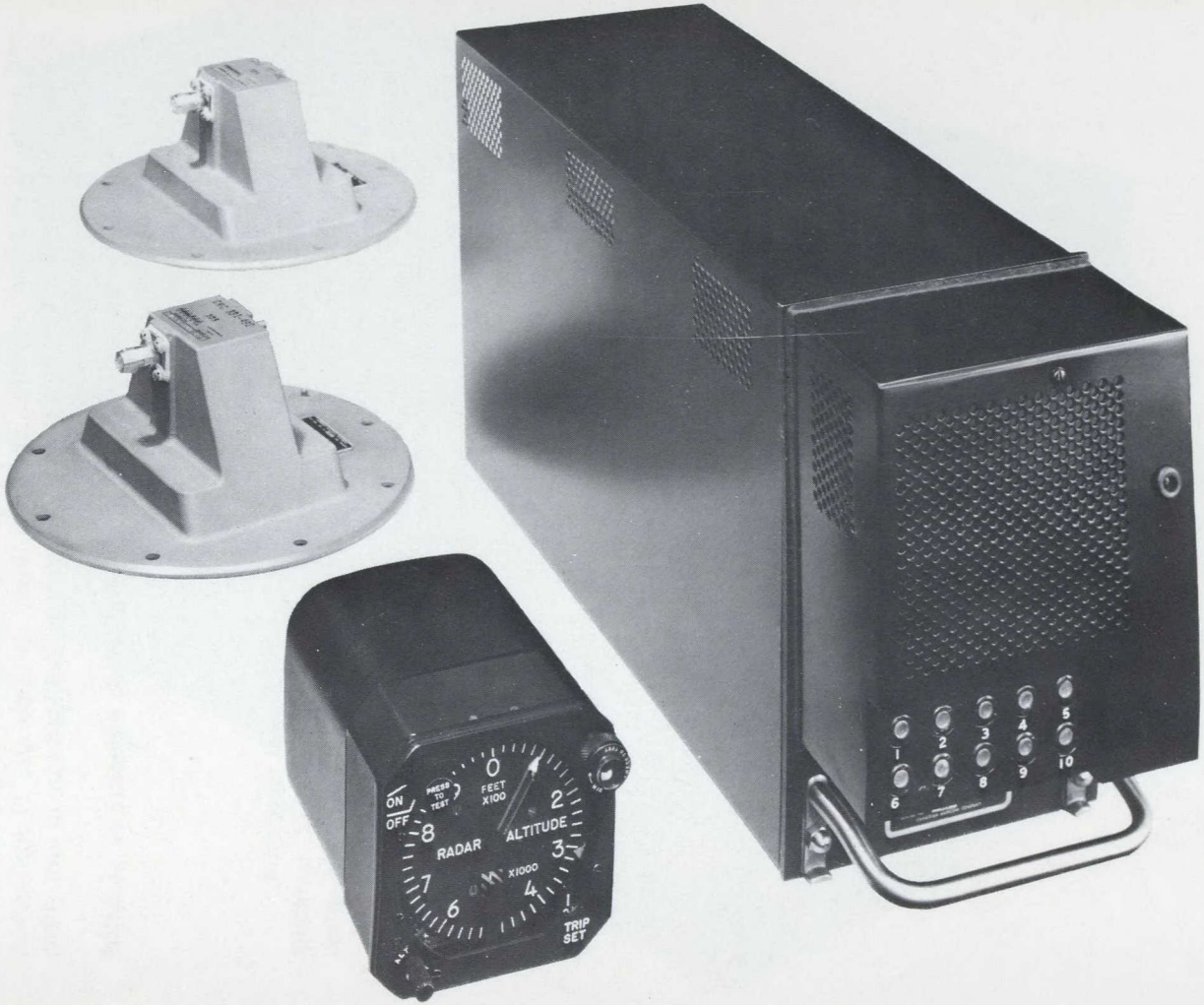
The Built-In-Test facilities in the CMA-521 Radar Altimeter provide the operator, while airborne or on the ground, with GO/NO-GO readiness indications. The readiness status of the CMA-521 is continuously defined by the monitoring of ten BITE sensors. This BITE information is displayed on fault indicators mounted on the front of the Receiver-Transmitter Unit. A self-test mode of operation is also provided to allow the performance of a confidence check on the complete Radar Altimeter. This end-to-end test can be initiated by pressing the "ON-OFF" switch which simulates a given value of altitude at the receiver. A high level confidence check is verified by the display of the prescribed value on the indicator. Self-check features also continuously monitor signal lock-on, tracting and output accuracy.

The CMA-521 provides two linear outputs of both altitude and altitude rate with accuracies of 1 ft. (30.48 cm) ± 20% and 20 ft/min. (6.1m/min) ± 8%, respectively, at low altitudes. Altitude limits are ± 30° in roll and ± 25° in pitch.

A maximum of six pre-set, shop-adjustable trips, covering the entire altitude range, provide altitude signals to ancillary equipments. A single pilot-adjustable trip, adjustable in flight over the entire altitude range, is controlled by the altitude set knob. A warning light on the face of the indicator is illuminated when the measured altitude is less than the set altitude.

The CMA-521 Radar Altimeter, weighing less than 20 pounds (9.1 kg), displays the following major electrical characteristics:

Frequency:	4300 HMz nominal, crystal controlled
RF Output:	500 MW nominal
Modulation:	Carrier Dispersal FM/CW
Modulation Freq:	10 KHz and 160 KHz
Bandwidth:	16 Mc Max.
Power Input:	115V 400 H_z single phase, 100 VA


ON
OFF
PRESS TO TEST
FEET X100
RADAR
ALTITUDE
X1000
TRIP SET
1
2
3
4
5
6
7
8
9
10

SERVO REPEATER AMPLIFIER

The Leigh Servo Repeater Amplifier is designed to meet the need for an 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 unique transistor amplifier. The servo drives up to six size 11 high-power synchro transmitters, all of which can be separately excited, and can, in turn, drive up to 24 high torque synchro receivers.

- Rugged construction — can be either shock mounted or mounted directly to aircraft structure.
- Rubber gasketted 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.

Complete qualification testing has been performed to MIL-E/5272, including vibration, shock, temperature 0-54 C to –71 C, sand and dust, rain, salt spray, humidity and radio interference.

Compatible with C-2, J-2, N-1 gyros, and can drive indicators such as DRMI-1D416, MN97H and AN/ARN501 Tacan. Can also be used for multiple bearing and heading displays for navigation systems and other repeater applications.

SPECIFICATION (Standard Unit)

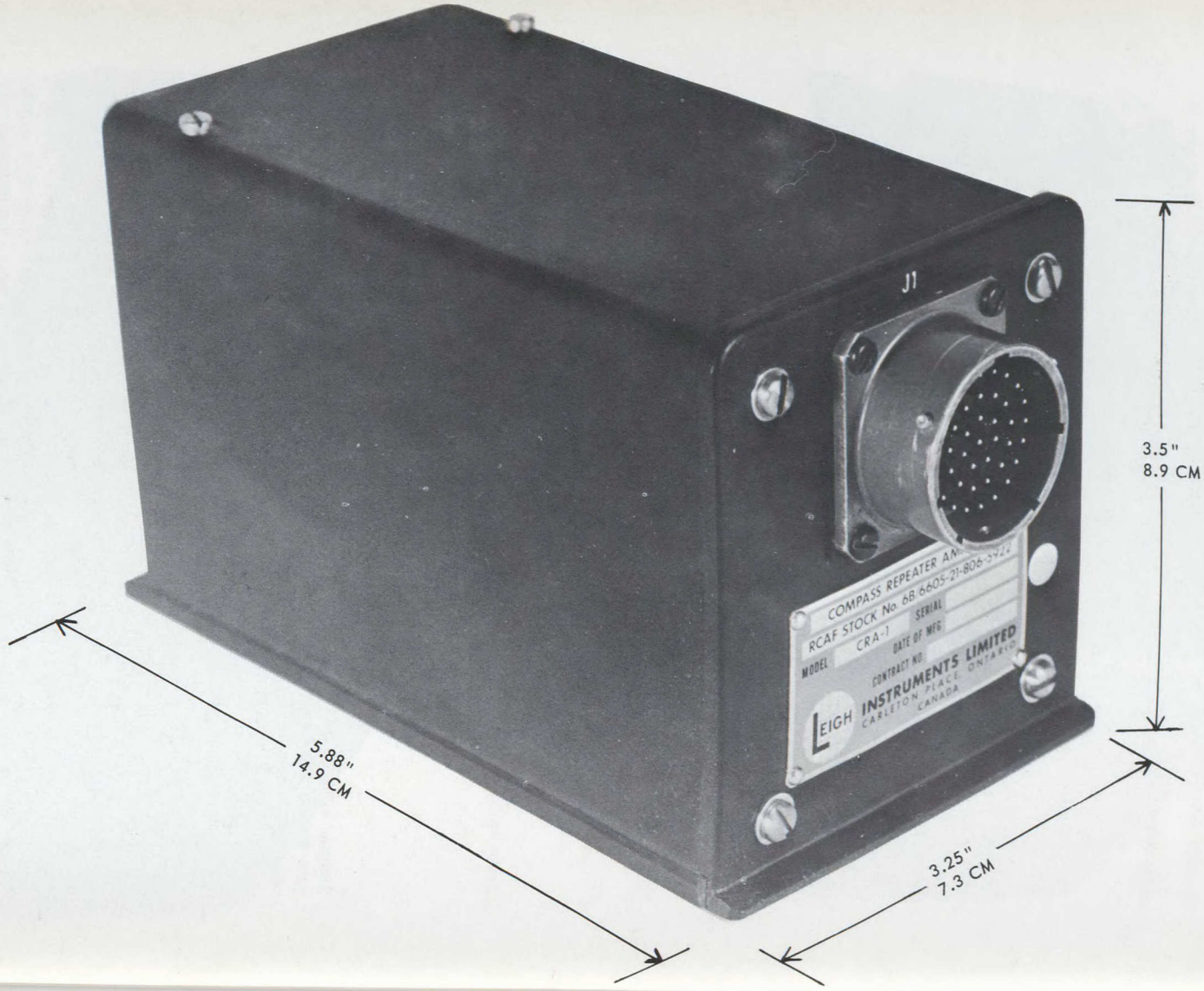
Input CT impedance	Zro 800 + j2900 Zso 115 + j470 Zrss 890 + j350
Follow Up Rate	30 degrees/sec.
Optional	60 degrees/sec.
Outputs	4 size 11 torque transmitters
Stator voltage	11.8V
Output unit torque gradient 5700 mg.mm/deg.	

Optional—2 extra size 11 transmitters and 1 size 10 standard or clutched synchro.

Overall Accuracy ±20 minutes maximum under all conditions.

Power (not including synchro excitations)
26V 400 cps 10VA
Optional 115V 400 cps

Weight (less mounting tray) 2.3 lbs. (1.04 kg.)
Weight (mounting tray only) 0.5 lb. (.226 kg.)


J1
COMPASS REPEATER AMP
RCAF STOCK No. 6B 6605-21-806-5922
SERIAL
MODEL CRA-1
DATE OF MFG
CONTRACT NO.
LEIGH INSTRUMENTS LIMITED
CARLETON PLACE, ONTARIO
CANADA
3.5"
8.9 CM
5.88"
14.9 CM
3.25"
7.3 CM

SERVOED ALTITUDE INDICATORS

The presentation of aircraft altitude information using the traditional multiple pointer against a fixed circular scale is a definite aviation safety hazard. The multiple-pointer indicator requires that the pilot (i) carefully observes the pointers, ((ii) reads the values indicated, and (iii) makes a mental summation. This technique is hazardous because the time required to perform these tasks is long and the necessity of making the mental summation opens the door to error.

Critical examination of altitude display techniques by the RCAF Institute of Aviation Medicine (IAM) has revealed that the common summation errors are in thousands and even ten thousands of feet.

The Leigh Servoed Altitude Indicator displays altitude by two distinct and unambiguous methods: i) a fixed-figure, four-drum digital readout and ii) an outer dial, single-pointer display. The dial-pointer scale is linear and repeatable every 1000 feet.

An optional command altitude marker, incorporated in the display, simplifies the task of maintaining a pre-selected altitude. The command altitude marker is optional and may be operated manually by a second setting knob or remotely by a separate slewing control.

FEATURES

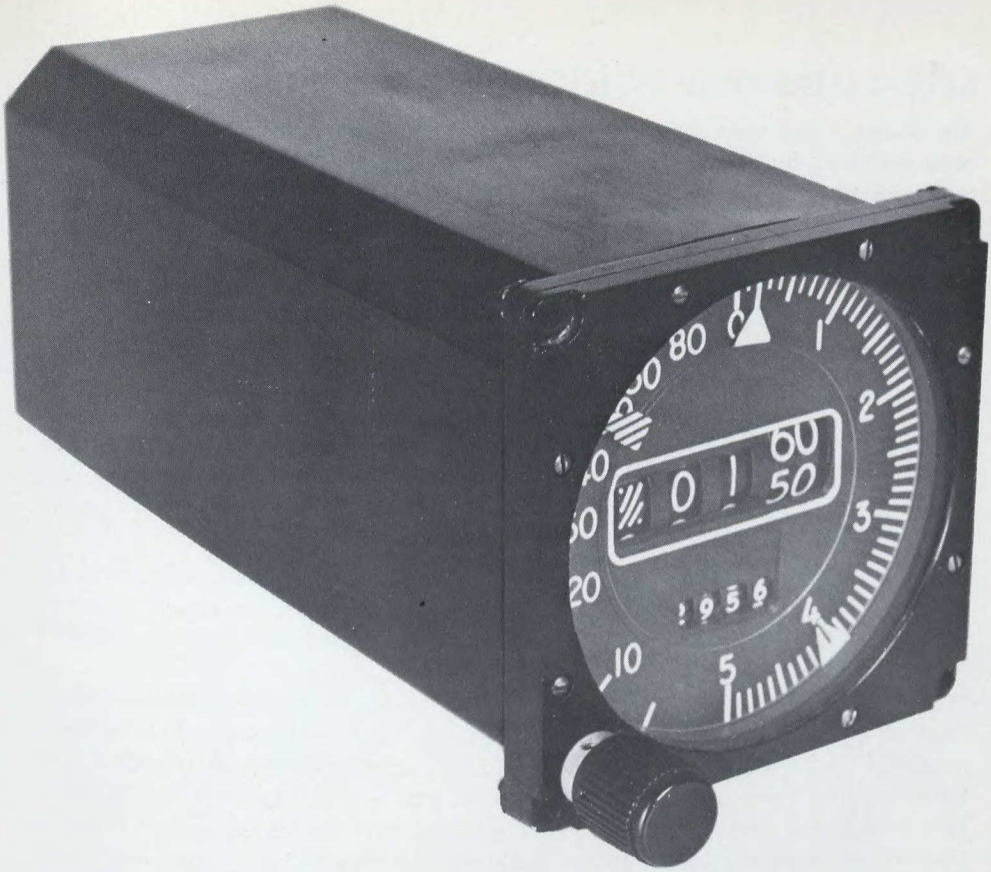
- Accepts inputs either from commercial or military altitude computers
- Reduced pilot error and shorter reading time
- Direct, single reading, eliminating the necessity for mental summation
- 0 to 99,980 feet (0-30,474 m) presented on five-digit counter
- 0 to 1000 feet (0-304.8 m) displayed on linear dia-pointer display repeatable every 1000 feet (304.8 m).
- Failure warning system actuated by excessive error or power failure
- Command altitude marker aids in maintaining selected altitudes (optional)
- Flight recorder output
- Barometric pressure compensation displayed on four-digit counter
- Red-and-white double wedge lighting conforms to MIL-L-25467B
- Proven circuit design with fail-safe dual-channel circuitry
- Conforms to ARINC Specification 545

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 Ltd.

FEATURES

- Doppler of 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.


80
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0 1
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2
3
4


DOP
TEST
350
700
1050
1400
TEST
STBY
140
160
180
120
200
100
INTERVAL
INTERVA
KNOT

AFDS-2 (AIRBORNE INFRA-RED FIRE DETECTION SYSTEM)

The ability of infra-red devices to detect very small sources of "heat" radiation has been exploited for many years in specific fields. Only recently, however, has the technique been applied to the detection from the air of smokeless incipient forest fires, located under light to heavy foliage, day or night. Further use of the same equipment has been found in the mapping of going fires, even though smoke-obscured, for the determination of rate and direction of spread. Similarly, latent hot spots can be mapped from the air to hasten post-fire mop-up operations.

Computing Devices, over the past several years, has conducted a successful program to develop this airborne infra-red scanning system expressly for application by Forest Protection Organizations. The sound basic design philosophies, acquired by Computing Devices through past development, manufacture and installation of electro-mechanical equipment on more than 4000 aircraft throughout the world, have been applied to AFDS-2, to provide reliability and broad flexibility, along with simplicity of operation and maintenance.

Initial flight trials were successfully carried out early in 1964 in cooperation with the Ontario Department of Lands and Forests. Since then, continuous Company development and flight test programs have been conducted leading to the AFDS-2 design.

Basically, the equipment receives aircraft generator power at the Power Supply Unit which furnishes all system electrical power, regulated and fused. A nitrogen supply provides the coolant necessary for high detector sensitivity. Coolant containers, controls and connections are all commercially available. Both these supplies may be remotely located within the aircraft. The complete system is operated at a selected operator/observer station, usually in the cock-pit. The Control Console contains all functions necessary for the airborne utilization of the system. Also installed at this station is an Audio Alarm and Visual Indicator. All control and output units are compact, lightweight, and conform to aircraft configurations. A Film Recorder may be adapted for internal or external mounting.

Infra-red energy is received from the terrain below the aircraft and is focussed on the Detector. The detector generates an output electronic signal directly proportional to the amount of IR energy applied or "heat scan". This signal is amplified and applied simultaneously to the various system outputs. In the film recorder, a pinpoint of light is scanned across a photographic film at the same rate as the terrain below the aircraft. Hence, an IR terrain image is permanently recorded.

Instantaneous information is provided at the operator/observer station by the Display Unit which gives indication of the relative ground area from which a representative forest fire signal was detected. Simultaneously an audio alarm is sounded to bring the indication to the attention of the pilot or observer. This data is then correlated with ground data to pinpoint the precise fire location.

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.

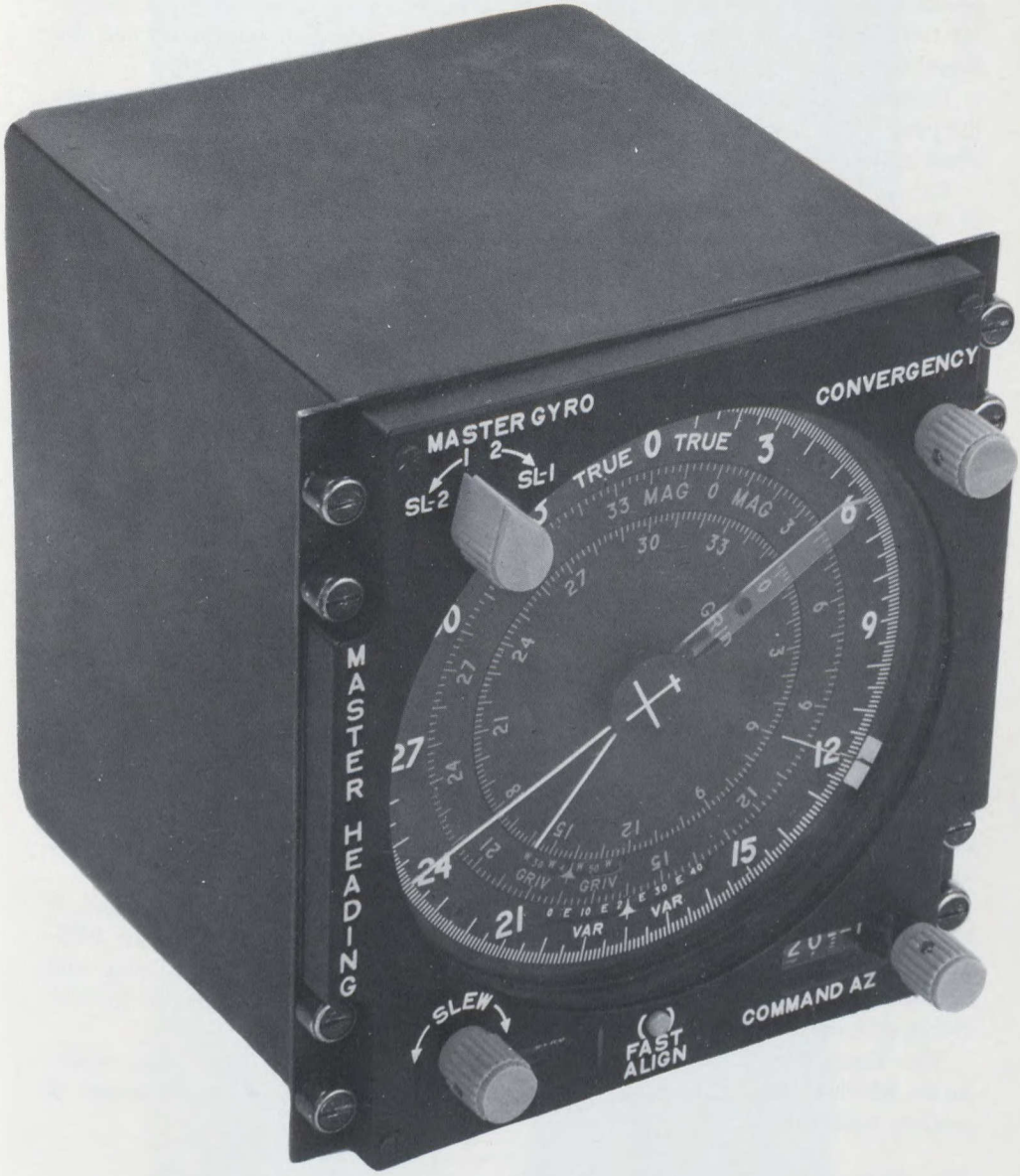
Grid Heading is accepted from the standby gyro and Leigh Instruments' Compass Repeater Amplifier which is fed by the main gyro. This provides separate headings which are converted into Magnetic or True as required by the aircraft.

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
SL-2
SL-1
TRUE
MAG
GRIV
VAR
MASTER HEADING
SLEW
FAST ALIGN
COMMAND AZ

TACTICAL MOVING MAP DISPLAY

Computing Devices of Canada Limited, Ottawa, has developed a new navigation device which provides an important advance in the presentation of navigation information which has both civil and military aviation application.

The development of the Moving Map Display (Topo Map), which will be in production in 1967, included a three year period of extensive flight testing, including trials in the Royal Air Force, the French Army Light Aviation Group and the Royal Canadian Air Force.

Termed "the map that moves with the aircraft" the Moving Map Display provides the pilot with a continuous projection of the complete topographical or aeronautical detail surrounding the aircraft's present position.

The Topo Map was developed in particular to meet the requirements of the pilot of low-level, high speed aircraft who must be continuously aware of the relation between his current flight path and the surrounding and approaching terrain.

The maps required for any given area are photographed and placed on 35 mm film. These are projected on a brightly lit screen so that the aircraft's present position is in the center of the display. The pilot is thus able to see his position in relation to the topographic detail, increasing his effectiveness on a low-level mission. Map movement is fully automatic and the projection moves simultaneously with the aircraft.

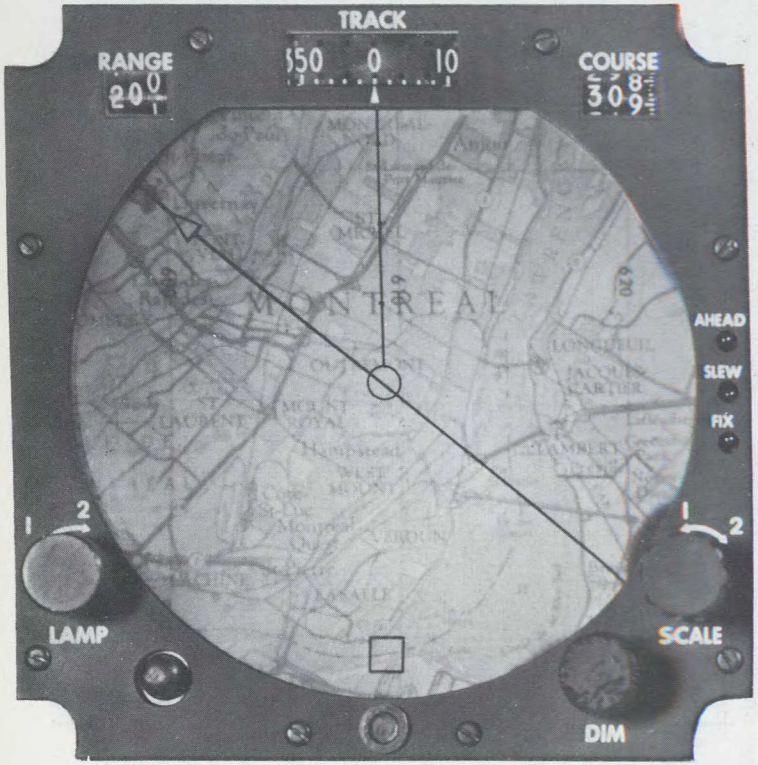
The film magazine contains maps covering an area 1800 X 1800 nautical miles. In the original design by the Royal Aeronautical Establishment for the Ministry of Aviation, United Kingdom, the strip changes were made manually. However, company engineers redeveloped this concept and invented a method of doing this automatically. The maps used for the display are standard air navigation charts of any desired scale in full colour reproduction clearly visible under light conditions between bright daylight (10,000 ft. lamberts) and complete darkness. The high image resolution of the system permits easy recognition of symbols and lettering as small as 1/32 inch (.8 mm).

The display incorporates a look-ahead feature whereby the pilot may manually slew the map to display any area, or to store any destination. At command, the map returns to present position automatically. To overcome cockpit space limitations, course, track, track error and range to destination information are displayed on the same indicator.

The display can be interfaced with any navigation computer system, digital or analogue. Interface with Computing Devices' own computors, including the PHI-10B and UYK-501 have been developed simultaneously with the display and optimum navigation system packages. The display indicator measures 6x6x12 inches and weighs 13 lbs. (15.2 x 15.2 x 30.5 cm and 5.9 kg).

The Topo Map is another member of the family of airborne navigation equipments which Computing Devices have developed to meet the exacting demands of modern military aircraft.

(For PHI-10B see Page I-70 & UYK-501 see Page I-124)


TRACK
RANGE
COURSE
AHEAD
SLEW
FIX
LAMP
SCALE
DIM


SET LEG
10
RELEASE


NAV
FIX
SLEW
DCTR
AHEAD
HOLD
ON TOP FIX

SPECTOCOM HEAD-UP DISPLAY SYSTEM

The Spectocom Head-Up Display System is a new approach to cockpit instrumentation developed initially by Specto Avionics Limited in conjunction with the Royal Aircraft Establishment at Farnborough, England. Subsequently, an agreement was entered into between Specto and Computing Devices of Canada for the expansion of sales and further joint development of Head-Up Display techniques.

This lightweight display system enables the pilot or weapons system operator of any type of operational aircraft to fly high-speed, low-level, all-weather missions with maximum concentration on his tactical task without compromising flight safety. Essential flight and operational information are projected into the pilot's line of sight, focussed at infinity so that any external obstacle, target or conflicting terrain is immediately perceived by the pilot. The display data can be varied by programming or by pilot selection and can include modes for take-off, enroute navigation, terrain-following, IFR station-keeping, approach, blind landing monitoring, or any one of several tactical armament modes.

The Head-Up Display System, an optical-electronic unit, comprises a Display Unit, a Control Box and a Symbol Generator.

The pilot's display unit incorporates a projection cathode-ray tube, collimating lens and reflector systems.

Symbols displayed can be viewed against a background light intensity of 10,000 foot Lamberts; in other words, against a background of bright sunlit clouds. For lower light levels there is automatic compensation.

The pilot's control unit includes the system on-off switch, the mode selector and a manual brightness control. This brightness control, once set by the pilot for the level he requires, is maintained automatically by a photo-electric device.

The symbol generator provides x and y deflection and bright-up waveforms to the cathode-ray tube. Information appropriate to the operational mode is contained in the bright-up waveform and is obtained by scanning a number of matrix stores. Should changes in the symbols displayed be required, they can be accomplished by modification to the matrix stores.

Maximum stability is obtained by a full exploitation of digital techniques to nullify the effect of transition parameters. Display Drift is $\pm$ 2 milliradians over a temperature range of $-10°C$ to $+ 55°C$ and $\pm$ 4.5 milliradians for $-40°C$ to $+100°C$, without using excessive temperature compensation.

The flexibility of the basic Spectocom system makes it applicable to all types of aircraft, including helicopters. A typical configuration of the three units weighs approximately 30 lbs. (13.6 Kg), occupies 0.6 cubic feet (16,993 c.c.) and requires 40va of 115V, 400 cps power.

Intensive evaluation trials have been carried out by the Royal Air Force, Royal Canadian Air Force, Royal Canadian Navy, United States Navy and other operational organizations. These trials have shown that the unit contributes markedly to increased flight safety in all operating modes, permits safe operation to lower weather minima and reduces significantly the tendency towards premature touch-down in low-visibility conditions.

Systems produced by Specto Avionics and Computing Devices are presently flying in a variety of aircraft with the military services of several nations of the free world, including the RAF Hunter and P-1127 and the F-111B sweep-wing fighter-bomber in the United States.


Type & Ser.No.
SPECTO AVIONICS LTD.
OPTICAL HEAD UNIT
Type & Serial NO

PHI – POSITION AND HOMING INDICATOR

The Position and Homing Indicator (PHI) was originally conceived as a point-to-point navigation system using the simplest possible computations with the most meaningful display of data to the pilot. Its simplicity, its capacity to store multiple destinations and its inherent reliability made it the popular choice of twelve nations for short range navigation. The PHI 3, 4 and 5, designed for interface with Doppler, Inertial or Air Data sensors, are still production items 15 years after conception and are still sound choices for aircraft with point-to-point navigation requirements.

The PHI 3, 4 and 5 systems accept input information from various sources or sensors such as air data, air data-doppler and air data-inertial equipments. Sensor changes are easily made by simply exchanging one or two modules in the computer. All PHI's can provide output to other aircraft systems such as photo-reconnaissance, automatic pilot, bombing computer, radar and the tactical moving map display (TMMD). The TMMD, developed by Computing Devices, provides the pilot with a continuously moving topographical map projection of the area over which he is flying, with his own position always indicated.

The PHI 3, 4 and 5 had the capacity for expansion which permitted the airborne programming of new destinations, for the output of information to other systems such as photo-reconnaissance, autopilot or radar and for the display of Tacan or ADF information, but for some roles this was not enough. In order to further expand capability without the sacrifice of basic simplicity a new series PHI-10B has been developed.

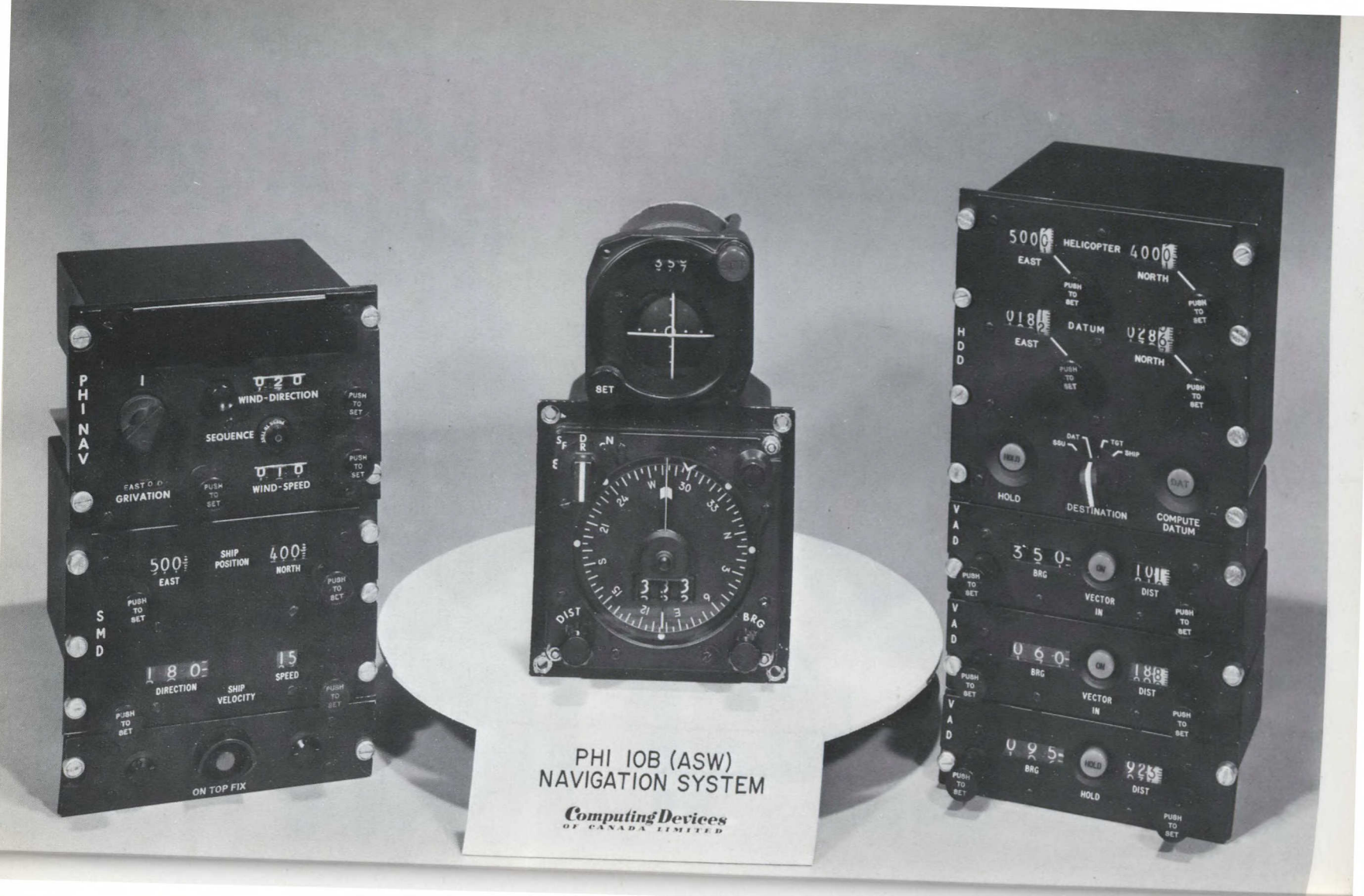
Although the number of units in the different systems varies, the basic elements of each are an indicator, a control console and a computer.

PHI-10B retains all the features of earlier PHI versions but now provides coverage of the full velocity spectrum from the zero velocity helicopter to the mach 2 fighters. It uses a building block concept, so that a basic computer can be coupled with a variety of displays and controls to create a system configuration suitable for the role of the aircraft. For example, the PHI can readily be configured to handle the highly sophisticated ASW helicopter role. In this role provision is made for routine navigation, tactical navigation, navigation with respect to moving bases or targets, with the capability of storing fixed destinations, pre-programmed search patterns, computing target datums in a co-ordinate system plus the display and control devices for all these functions.

Alternatively, the same basic computer can be configured for close support fighter use to provide both pre-programmed and in flight programmed destinations and with either or both a sophisticated area coverage map display.

Computing Devices of Canada Limited, through the development and production of this equipment together with several other navigation systems, have made available to the air forces of the free world the reliability and high degree of accuracy required with to-day's supersonic aircraft. At the same time the resources of this company continue to refine and develop existing systems and through research will offer new solutions to new problems as they appear with the same reliability which is a characteristic of the PHI.

(For TMMD see page I-66)



PHI IOB (ASW)
NAVIGATION SYSTEM

Computing Devices
OF CANADA LIMITED

AIRBORNE INERTIAL NAVIGATION SYSTEMS

Litton Systems (Canada) Limited has produced airborne inertial navigation systems in Canada since early 1960. Initial production was devoted entirely to the Litton LN-3 systems for the F-104 Starfighter aircraft flown by the RCAF and various European NATO air forces. Also in production now is the Litton LN-12 system for the F-4 Phantom aircraft flown by USAF. A third system, the Litton LN-15, has now been developed as a lightweight, low-cost navigation system for both military and commercial applications.

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 maneuverability; 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.

Many of the highly precise machine components which make up this equipment are produced by Rankin-Strite Limited which is a quality facility engaged in "hard core" custom machine shop work for items of this nature.


3J1
3J3
3J2
3J4
3J5
CAUTION
STBY
ALIGN
OFF
NAV
HDG
MEM
INERTIAL NAV

ISIS "N" SYSTEM

The Integrated Strike and Intercept System — ISIS "N" — produced by Ferranti Packard Electronics Limited is the most recent development of the ISIS range of lightweight, low-cost fire control equipments designed for tactical aircraft. It is especially suitable for light and medium ground-attack/multi-mission aircraft where it is essential that the pilot should have a wide choice of attack manoeuver. Principal design features are: good performance in a variety of roles: simple operation: reliability: easy maintenance: and low initial cost. The ISIS "N" System has been suitably designed for installation in the CF5, A4, MIRAGE III, and the FIAT G91 aircraft.

SYSTEM DESCRIPTION

The Sighting Head generates a colimated reticle aiming mark consisting of a centre spot bracketed by two ranging arcs. This image is displayed in the semi-silvered reflector glass: its position is controlled in azimuth and elevation by a 2-axis eddy-current-controlled rate gyroscope. The diameter of the ranging arcs is adjusted by operation of two controls: the SPAN knob on the Sighting Head, which permits the pilot to set in any target wingspan from 25-120 ft. and the Ranging Twist Grip. Range is displayed on a dial on the Sighting Head calibrated from 2,500-600 ft. Event markers may be displayed if required. The aiming mark is roll-stabilized in the ground-attack modes by a bank signal from the aircraft reference gyro or platform. This makes tracking much easier than with a non-roll stabilized display.

Altitude/Air Speed Unit — Altitude (which is required in the computation of lead angle), and airspeed (which is required for calculating gravity-drop and incidence allowances) are measured by two aneroid capsules, which are housed in the Altitude and Airspeed Unit.

Pitch and roll signals from the aircraft reference gyro or platform are used to roll-stabilize the aiming mark and in the computation of gravity-drop allowances for actual aircraft speed and dive angle in the ground-attack modes. Alternatively, if a suitable Doppler is available, outputs of drift angle can be accepted and used in the computation of lead angle and to compensate for across track wind. A simpler version of ISIS "N" dispenses with the twist grip and embodies only a fixed value of firing range. Thus the ranging arcs are adjusted by the Span control only, and the firing range is indicated when the target fills the arcs.

Range measurement against aircraft targets is carried out stadiametrically by use of the Ranging Twist Grip. Having set target wingspan the pilot closes on the target, adjusting the twist-grip as the range closes, so as to keep the ranging arcs just bracketing the target wingspan. This gives a continuous readout of range on the range dial, and the pilot can decide to fire at any range between 2,500 and 600 ft. The Twist Grip may also be used to set the ranging arcs for a desired firing range: no further adjustment is made and the pilot fires when the target aircraft spans the ranging arcs.

The Computer contains the system power pack: amplifiers for the range and reticle servos in the sighting head: mode-selection relay circuits: the gyroscope control circuits (determining gyro sensitivity and initial sight-line deflection): and the roll-servo amplifier. It is in the Computer that the system inputs are processed to give lead angle, gravity drop and incidence allowance, across-track compensation and roll stabilization which are fed to the Sighting Head to control the position of the aiming mark.

Growth Potential — ISIS "N" provides considerable potential for further development. Some of the features that can be added, and for which provision is made in the basic system are listed below:

Radar Ranging — If the aircraft is fitted with radar, continuous radar range information can be fed to the system, thus permitting improved weapon-aiming in the air/air mode. The operation of the radar can be monitored by observation of the movement of the stadiametric ranging arcs and of the range indicator on the Sighting Head.

Automatic Bomb Release — An ancillary unit employing the Ferranti kinematic ranging technique will provide automatic bomb release in shallow-dive-angle attacks with improved bombing accuracy. This unit will also eliminate the time delay between the pilot's decision to release and the actual release.

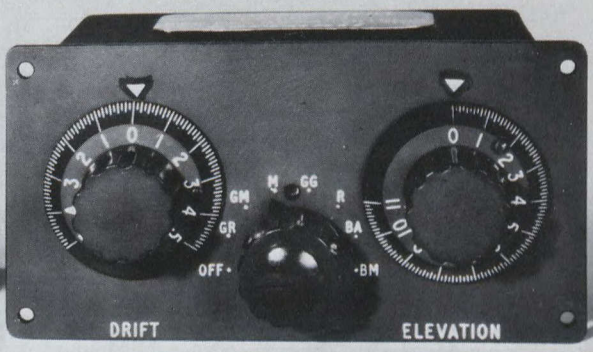
Level Bombing — Additional units can be supplied to provide a level-attack capability using various weapons. The sightline-depression angles already available on the sight have been incorporated in order to cater for these modes.

Power Requirements — ISIS "N" operates on a 200V, 400c/s, 3-phase power supply. Power consumption is VA. A 28V d.c. supply is also required: consumption is 3W.

The Control Unit has three controls, permitting the pilot to select the following modes and weapons

AIR/AIR (GA) Guns
(M) Missiles

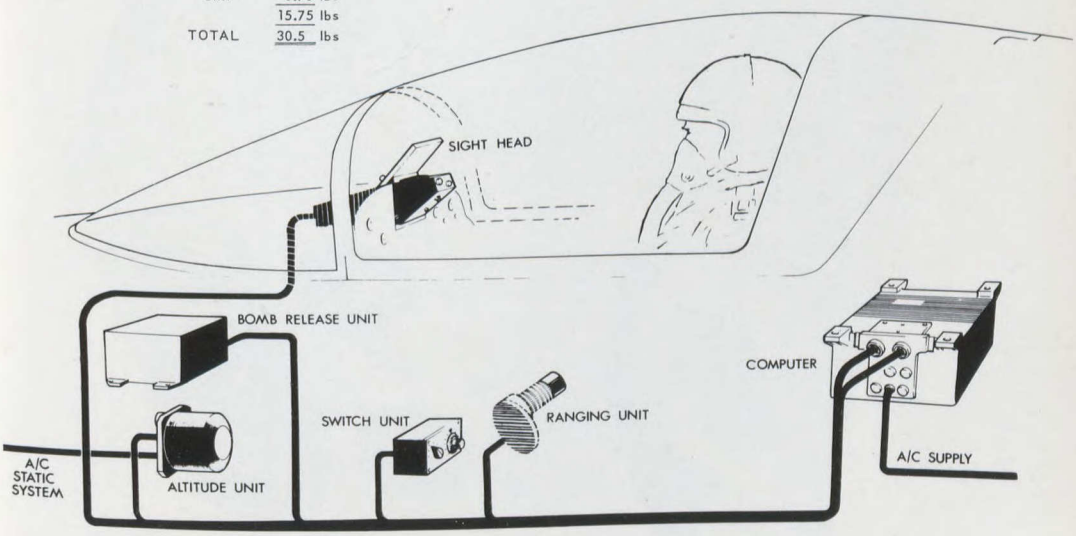
AIR/GROUND
(G) Guns
(R) Rockets
(B) Bombs
(S) Depressed Sightline



CONTROL UNIT

WEIGHTS

In Cockpit		In Equipment Bay	
Sighting Head	13.5 lbs	Computer	15.0 lbs
Control Unit	1.25 lbs	Altitude/ Airspeed Unit	0.75 lbs
	14.75 lbs		15.75 lbs
		TOTAL	30.5 lbs



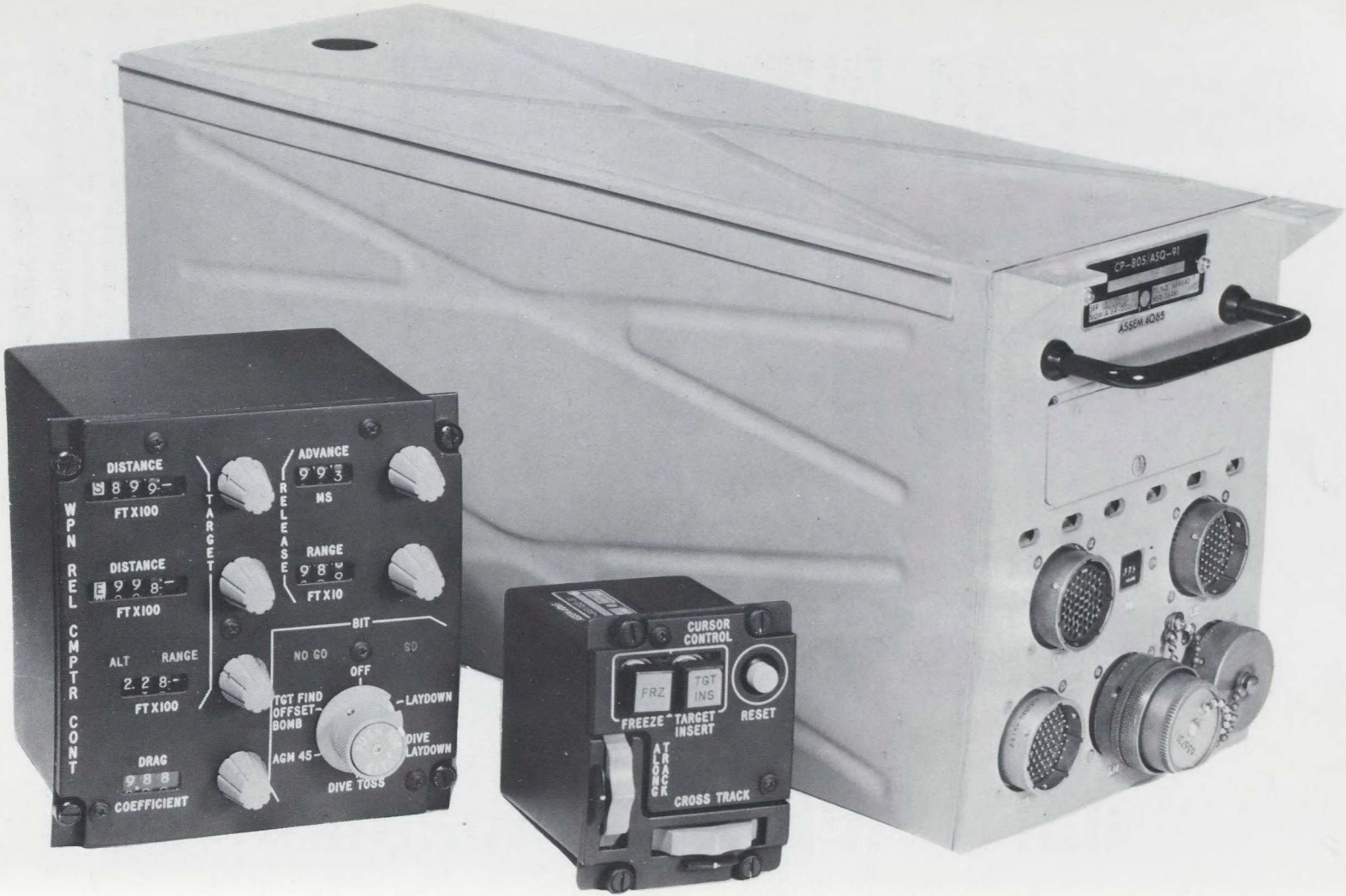
Integrated Strike & Interceptor System

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 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 offset bombing modes of operation. Steering signals and range-to-target information are supplied for use in the target-finding and offset bombing modes. Maneuver 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-4C 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 offset 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.


WPN REL CMPTR CONT
DISTANCE
FT X100
DISTANCE
FT X100
ALT
RANGE
FT X100
DRAG
COEFFICIENT
TARGET
RELEASE
ADVANCE
MS
RANGE
FT X10
BIT
NO GO
GO
OFF
TGT FIND
OFFSET
BOMB
LAYDOWN
AGM 45
DIVE
LAYDOWN
DIVE TOSS
CURSOR
CONTROL
FRZ
TGT
INS
FREEZE
TARGET
INSERT
RESET
ALONG TRACK
CROSS TRACK
CP-805/ASQ-91
ASSEM #065

MK5 AIRBORNE PROFILE RECORDER

The Airborne Profile Recorder (APR), is a precision radar aid for air survey work, designed to meet topographical and planimetric requirements. It is capable of measuring ground elevations with an average accuracy of ± 10 feet (3.04 m) up to an aircraft altitude of 50,000 feet (15,240m) above sea level. The equipment provides a record of terrain clearance and terrain profile on a paper-chart recorder. The recorded data is correlated to the geographical position by simultaneous vertical photography using the MK7 Instrumentation Camera.

The MK5 APR has a very fast recording system and an expanded scale (11 inches per 1,000 feet (27.9 cm per 304.8 m)), therefore random variations of system parameters appear as a noise level of 5 feet (1.5 m) in amplitude. This small amount of noise does not affect the accuracy of the APR since it is of random nature and the reading is taken on the mean of the record.

The relative accuracy is ± 10 feet (3.0 4m) over normal terrain. With simultaneous photography, spot heights of ± 5 feet (1.5 m) are easily obtainable. This accuracy is achieved by using the hypsometer system of pressure detection. Pressure changes are detected by measuring the temperature of boiling toluene by suspending a sensing element in the vapour above the toluene. The sensing element is a thermistor which forms one arm of a bridge circuit. The bridge is balanced by coarse and fine controls on the APR console and a servo-operated potentiometer.

The reliability of the APR has been achieved by continual development and the adoption of the latest electronic techniques. Plug-in printed boards and chassis allow quick repairs to be carried out while in flight. The modular construction used ensures consistency of circuit parameters in production. The radar timing circuits, discriminator circuits and the visual monitor circuit are mounted on printed boards which are plugged into the rear printed cable board.

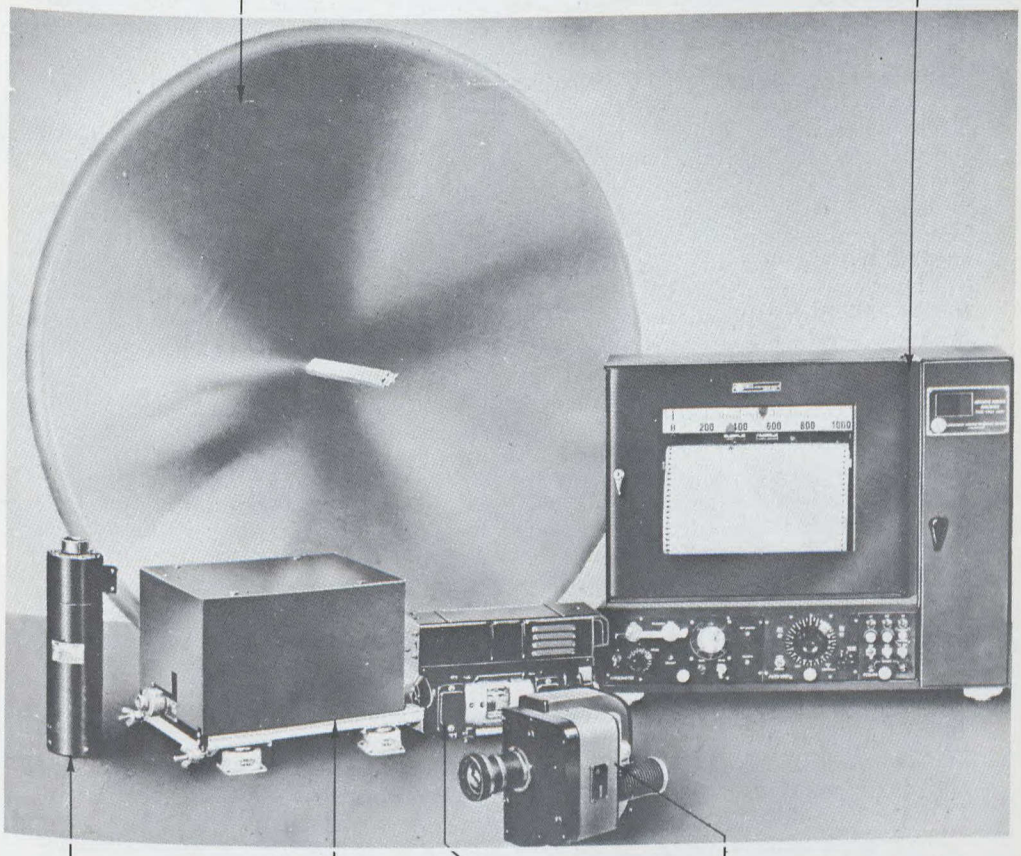
The military version of the MK5 APR, designated MK6 or AN/APQ-78, is standard equipment in the USAF RC-130 reconnaissance aircraft. A modified version of the MK6 APR, incorporating a binary decimal coded output to facilitate automatic data reduction, is being supplied for use in the latest USAF RC-135 reconnaissance aircraft.

The MK5 APR is in use with the major aerial survey organizations throughout the world, with operations in North America, South America, Britain, Europe, Africa, Asia and Australia. Two models are available, the Mark 5 Commercial Model and the Mark 6, which is qualified to Military Specifications. The complete system, Antenna and parabolic reflector included, weighs only 191 lbs (86.6 kg.). This equipment was designed and developed by deHavilland Aircraft of Canada Ltd., SPAR Division.

Specifications

Power Input: 28 VDC, 23 amp.

Characteristics: *Transmitter:* Pulsed Magnetron, 3.2 cm; Peak Power, 10 Kw; Average Power, 3 w; Repetition Frequency, 2000 cps; Pulse Width, 0.10 us; Pulse Shape, Gaussian. *Receiver:* Type, Crystal Video; Sensitivity, 10-6 w; Band Width, 7 mc to 3 db. *Antenna System:* Type, Double Dipole Reflector. *System Beam Width:* Type, 10° in E and H planes to the half power points. *Operating Height:* Maximum, 50,000 feet (15,240 m); Minimum, 1,500 feet (457 m). *Record Display:* Chart Span, 1,000 feet (11 in.) (304 m) (27.9 cm); Chart Speeds, 5, 10, 15, 20 ipm (12.7, 25.4, 38 & 50.8 cm pm); Range Steps, 500 feet (152.4 m).



AIRBORNE PROFILE RECORDER, MK 5 - MAIN COMPONENTS

STEM DEVICES

Each new space venture today, whether manned or unmanned, is an event of epic proportions. There are, however, certain 'first' which capture and hold the imagination of even those who are most intimately concerned with these flights. Such a 'first' was the rendezvous of Gemini 6 and 7, made even more memorable by the fact that here on Earth the conversations of the astronauts could be followed as this historic event unfolded. Communications in these spacecraft, as in all other U.S. space flights, were carried by de Havilland STEM devices.

The de Havilland Special Products and Applied Research Division has designed and manufactured a whole family of devices known as Storable Tubular Extendible Members (STEM). These devices have been used successfully as both antennas and mechanical and gravity gradient stabilization booms on satellites, spacecraft and also on ground installations. The tubular elements are formed out of strip metal, heat-treated into a circular section in such a manner that the edges of the material overlap by approximately 180°, thus providing the tubular element with a bending 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, or into, 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 antenna units produced by SPAR Division 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 fifty 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, unfurlable boom structures for sensor deployment, de-spin and attitude control such as for gravity gradient satellite orientation. Some forty STEMs have been successfully launched on key scientific satellites, space probes and manned spacecraft programs.

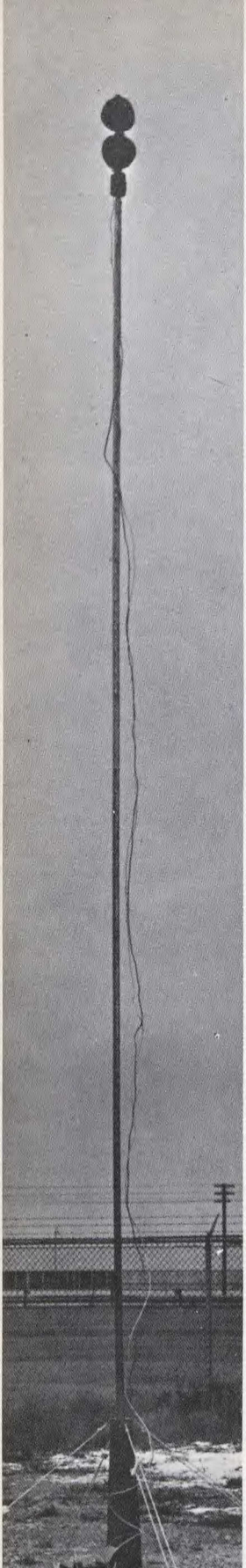
STEM antennas are employed in the ISIS Canadian Alouette satellites I and II, with Alouette II featuring antenna extensions in space of 240 x 75 ft. (73.2 x 22.9 m) which was the longest structure yet to be orbited in space. These antennas were also employed in the GT-3 spacecraft, Mercury MA-8 and MA-9, TOPSI S-48, LOFTI, Transit, Blue Scout and Javelin, to name but a few.

The air-droppable erectable Beacon mast is a lightweight, quickly erectable ground mast to elevate and support a beacon consisting of a pair of motor driven rotating infrared lamps. The beacon assembly comprises three separate airborne packs, the light unit and accessories, the mast assembly and a battery set. *(See page I-82)*

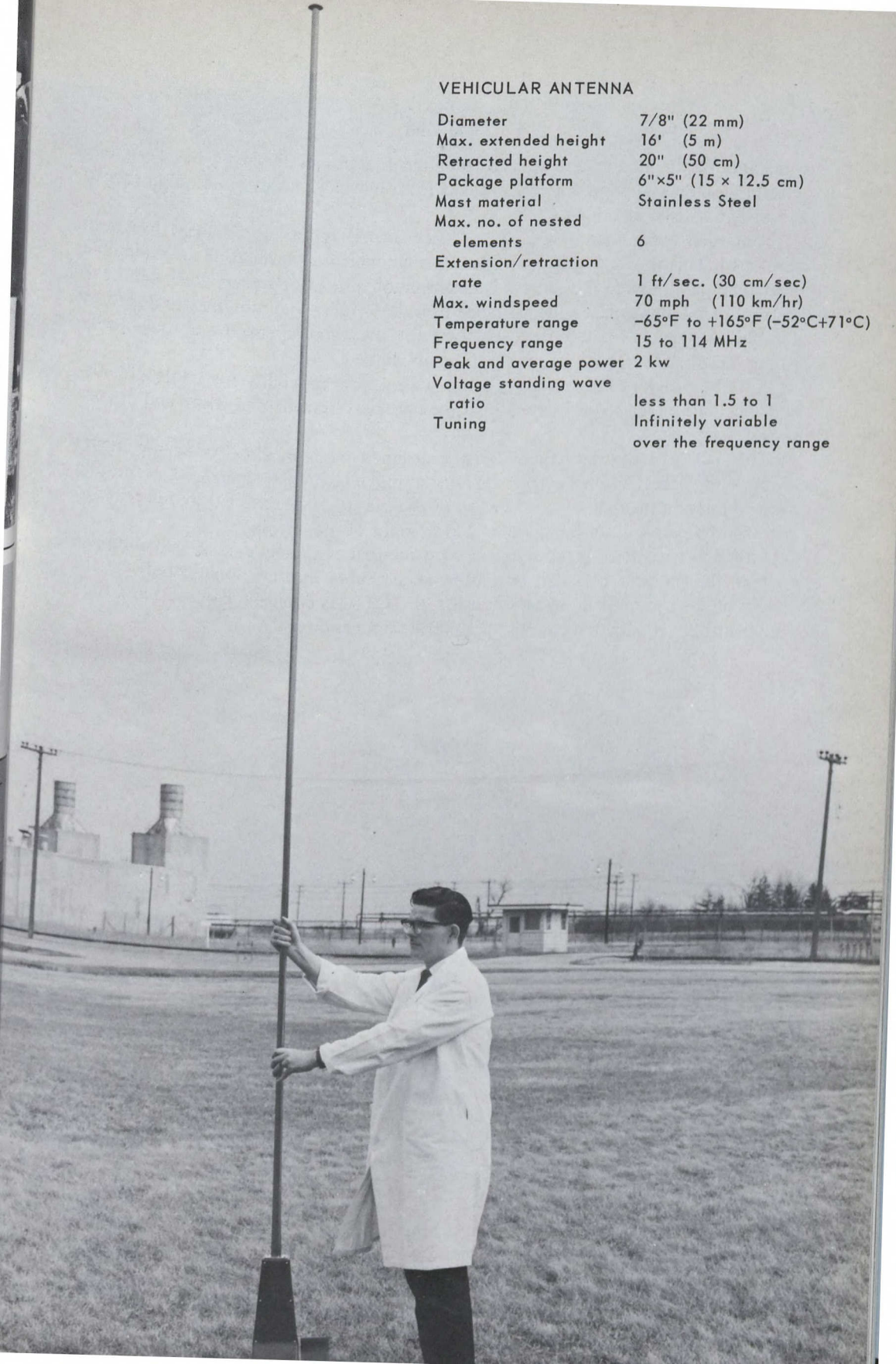
The Ground Environment Elevating Mast and Antenna is capable of elevating and supporting a 100 lb. (45.4 kg) payload at an elevation of 35 ft. (10.7 m). Uses for this mast include: communications antennas for transportable vans, hardening site installations, mobile command posts and standby or emergency point-to-point communications as a monopole for operation in HF band or as a mast to elevate VHF or UHF antenna arrays, or as a combination of both. *(See Page I-82)*

Feasibility studies and development programs for STEM have proven that these devices, employed in ground roles, have now provided answers for compact, rugged portable or fixed ground antenna masts up to 50 ft. (15.2 m) or higher if guyed. These same equipments may be used as elevating devices for a multitude of equipments including booms and advanced military operations, mensuration and communications.

Recovery operations underway on the Gemini 6 spacecraft. The high frequency STEM antenna, used for communications during recovery operations when the capsule lands beyond visual or radar sighting, may be seen extended and in operation.

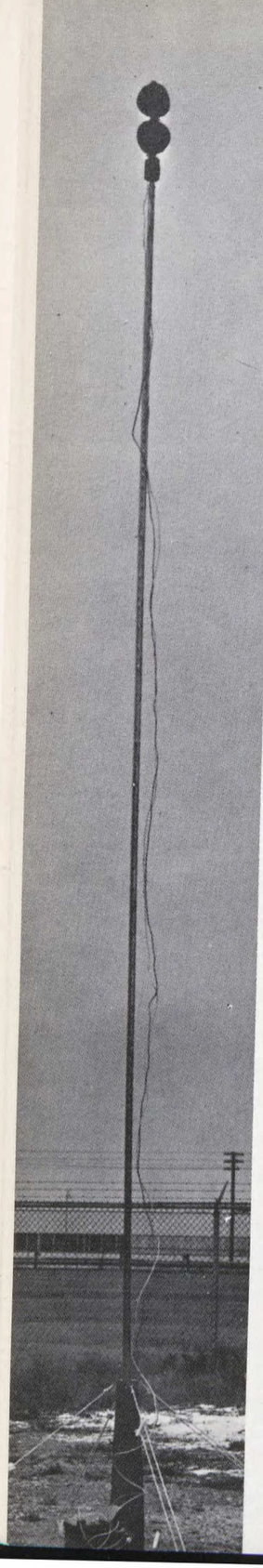


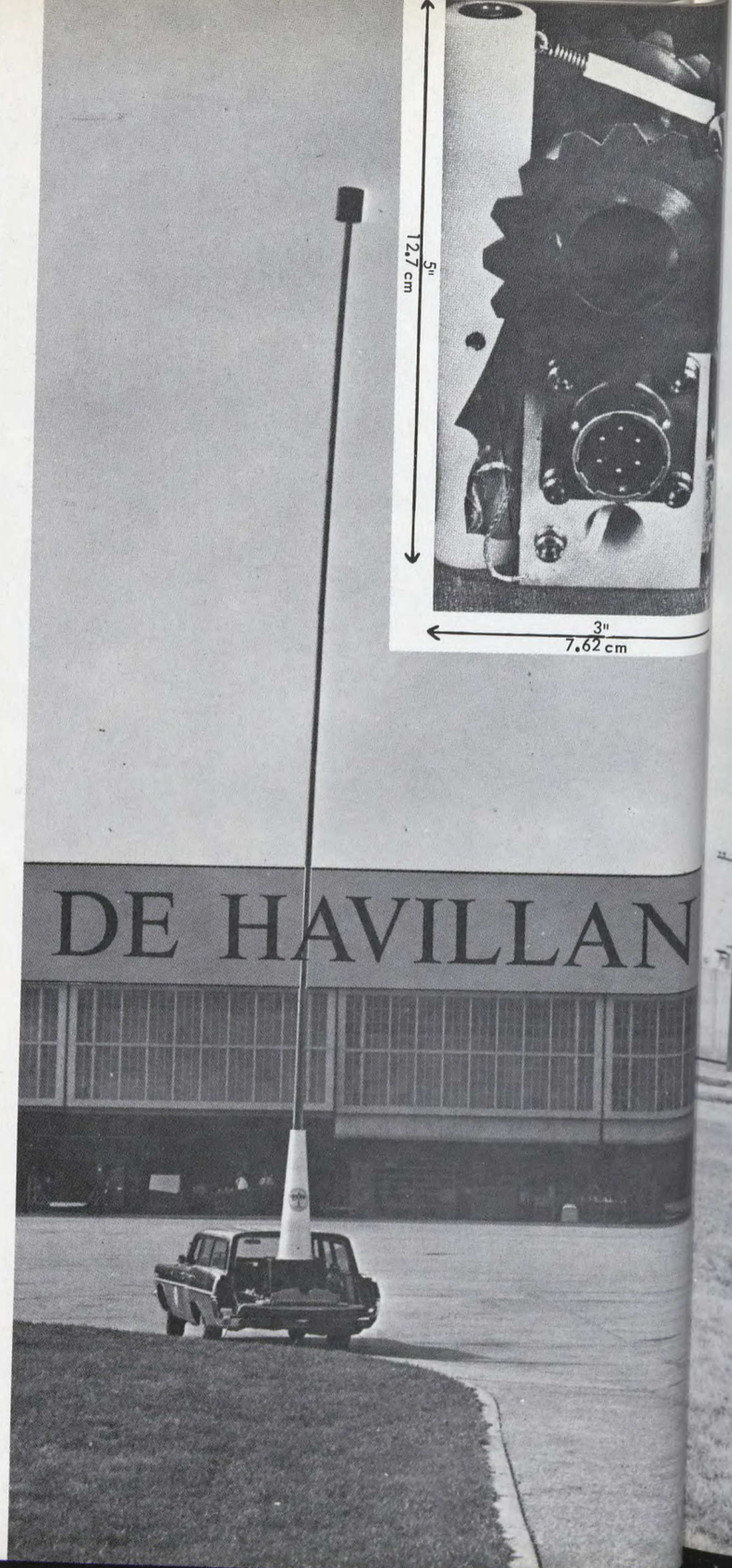

5"
12.7 cm
3"
7.62 cm
DE HAVILLAN

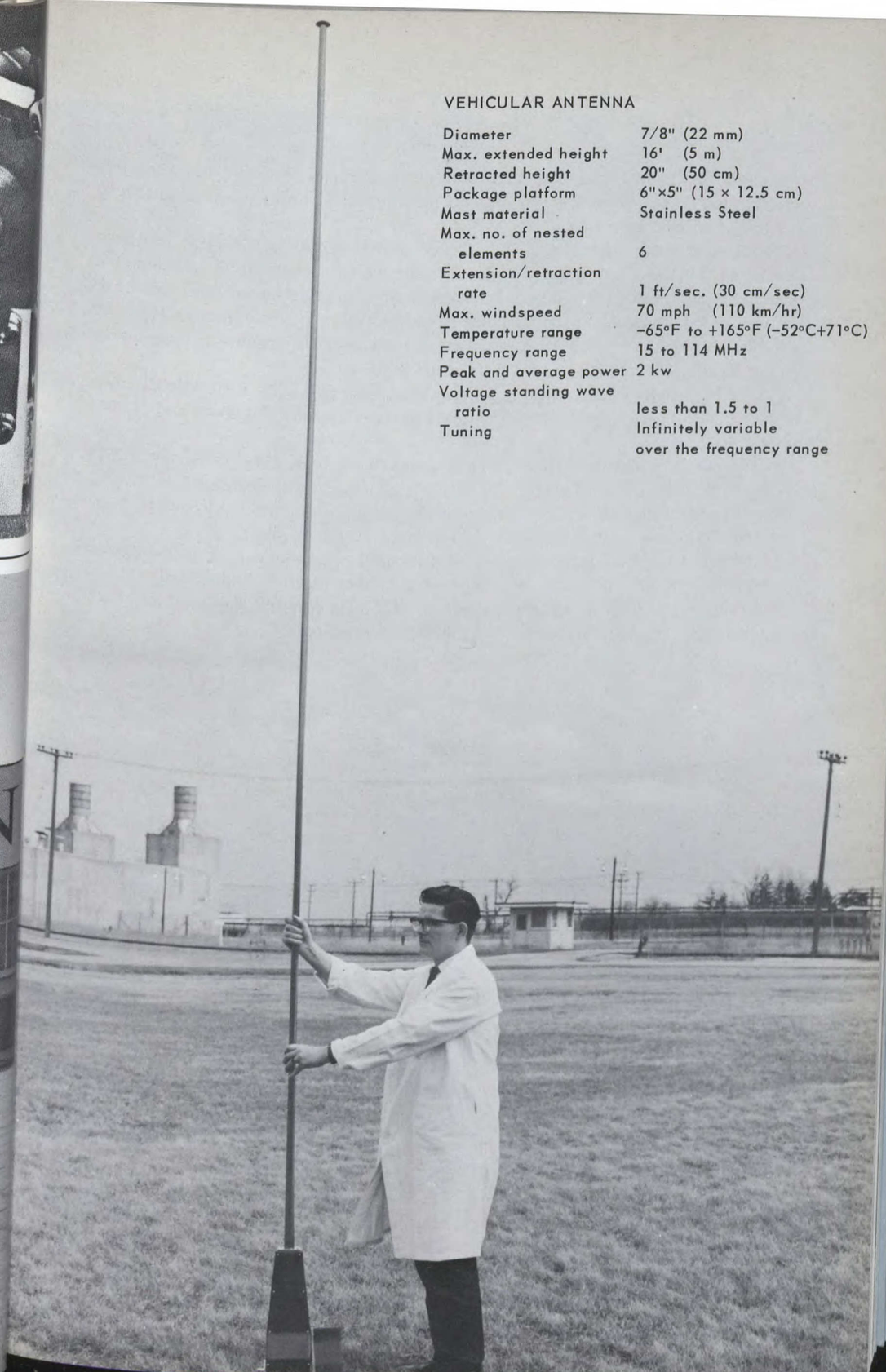


VEHICULAR ANTENNA

Diameter	7/8" (22 mm)
Max. extended height	16' (5 m)
Retracted height	20" (50 cm)
Package platform	6"×5" (15 × 12.5 cm)
Mast material	Stainless Steel
Max. no. of nested elements	6
Extension/retraction rate	1 ft/sec. (30 cm/sec)
Max. windspeed	70 mph (110 km/hr)
Temperature range	−65°F to +165°F (−52°C+71°C)
Frequency range	15 to 114 MHz
Peak and average power	2 kw
Voltage standing wave ratio	less than 1.5 to 1
Tuning	Infinitely variable over the frequency range







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Tuning	Infinitely variable over the frequency range

TOTEM

Canadian Westinghouse, and in particular the Electronics Division, has been responsible for many varied defence projects from Naval Fire Control Equipments to Air-to-Air Missile electronics.

From such experience a new surveillance device known as TOTEM has been developed. This is a high grade television system which is elevated on an extendible mast. The picture from the camera is displayed on a monitor screen which can be at the foot of the mast or at some distance from it. Camera and monitor are linked by a cable and specially stabilized structure for the camera ensures a rock-steady picture despite movements of the mast due to wind.

TOTEM provides the frontline leader with a new capability for battlefield surveillance and target acquisition and can be operated from behind cover and in concealed positions.

With TOTEM the operational area is scanned methodically. As enemy movements and targets are detected, the sensor magnification is increased permitting recognition and identification. Location of each target is determined by reference to the azimuth read-out on the monitor and to maps of the terrain.

Although designed for mounting in an armoured personnel carrier as a complete system, the monitor unit can be placed at a remote location limited only by the length of cable provided. Thus a number of TOTEMs could be deployed and their outputs observed simultaneously in a central command post.


FIRE
CONTROL
TARGET
ACQUISITION
SURVEILLANCE

PERISCOPTER

"Periscopter" is a remotely controlled, space stabilized, tethered platform carrying a viewing system which can be used to supplement present line-of-sight missile fire control systems, to provide out-of-line-of-sight capability to existing or planned tank weapon systems, for battlefield surveillance as well as for artillery and mortar fire control. Briefly, it is an "eye in the sky".

Periscopter is tethered to the ground station by means of a cable which controls flying height and provides power to the motors and the viewing device. In addition the cable is used to transmit video signals and information to the ground station located in an armoured personnel carrier or similar vehicle. The system includes azimuth orientation reference and makes provision for obtaining an instantaneous bearing relative to this reference. The Periscopter may be flown at heights up to 200 meters (656.2 ft.) above ground level. This "eye in the sky", with a monitor located in a vehicle, permits observation combined with a personnel safety which was not previously possible.

Periscopter is now undergoing advanced development at Canadian Westinghouse and this is backed up by research and studies being conducted at Canadian Armament Research and Development Establishment of the Defence Research Board.

Some of the more obvious uses and benefits of the equipment are as follows:

- It is possible that forward Observation Officers may now be situated in vehicles when Periscopter is employed.
- Use of reconnaissance patrols, as we presently know them, may be lessened.
- Guess work associated with mortar indirect fire will be largely overcome.
- Enemy concentrations will be more easily spotted.
- Logistic savings in ammunition through more accurate ranging techniques.

With respect to operation the design criteria have ensured that pre-flight preparation, launch, recovery and post-flight stowage operations can be carried out by two men only, one being the operator, without dismounting from the parent vehicle. Other considerations ensure that the operator can carry out all flight control activities without relaxing his monitoring observations.

Technical training and knowledge requirements are of interest for they call for no greater degree of skill than presently expected with short range surveillance or ATGM equipments.

CHARACTERISTICS

1. RANGE:
   Real time continuous picture surveillance coverage out to 5000 meters. (17,404 ft.)

2. OPERATING HEIGHT:
   Up to 200 meters (656.2 ft.) above ground level.

3. FIELD OF VIEW:
   Wide angle 750 mils. Narrow angle 55 mils.
   Coverage 360 degrees in azimuth and +5 degrees to −20 degrees elevation at the centre of the display.

4. RESOLUTION:
   Recognize a stationary medium tank at 5000 meters. (17,404 ft.)

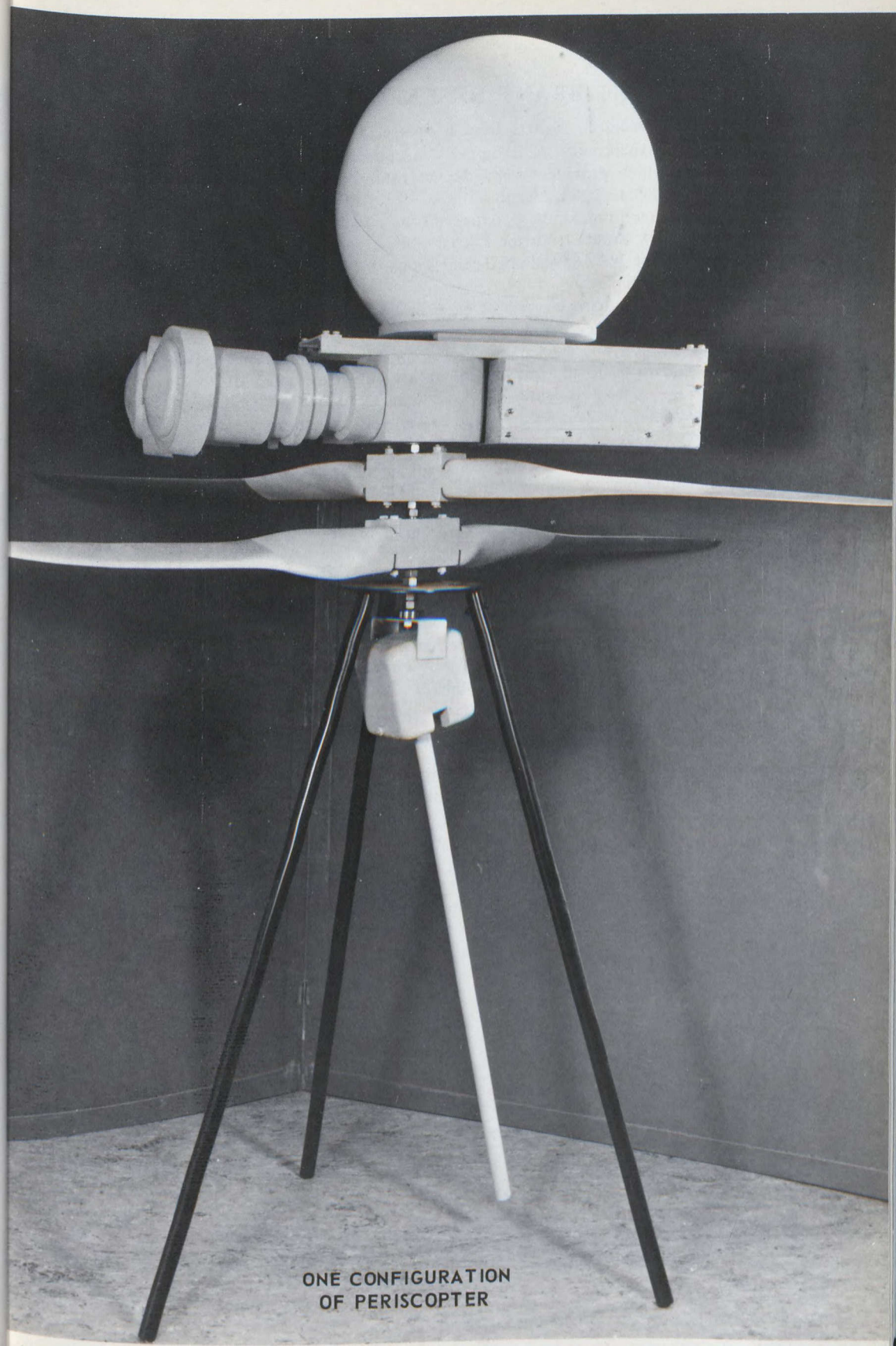
5. SIZE AND WEIGHT:

Rotor diameter	4.5 ft. (1.4 m)
Weight of airborne system	80 lbs. (36.3 kg)
Total System Weight, including ground element, approx.	500 lbs. (226.8 kg)

6. Ascent to maximum altitude—60 secs.
   Complete recovery operation—90 secs.

7. Azimuth bearing read-out relative to Magnetic N. +20 mils.

8. Vehicle installation—MII3 APC or similar vehicles.



ONE CONFIGURATION
OF PERISCOPTER

THE BLACK BRANT RESEARCH ROCKET FAMILY

The Black Brant research rockets have been specifically developed for scientists who wish to conduct experiments in the upper atmosphere. The family is composed of four rocket systems which provide a capability of lifting scientific payloads weighing from 40 to 500 lbs (18.1 to 226.8 kg) to altitudes of 75 to 620 miles (120.7 to 997.8 km).

Bristol Aerospace Limited, the developer of these Black Brant rockets, has participated in launching Black Brants from the Pacific Missile Range, California, Eglin Air Force Base in Florida, the NASA Wallops Island Range in Virginia and from Canada's Churchill Research Range.

A brief review of characteristics of each of the Black Brant rockets and supporting instrumentation is outlined below:

The Black Brant III is the smallest rocket in the family, measuring 10″ (25.4 cm) in diameter and 18.06 ft. (5.5 m) long. With a nominal thrust of 10,800 lbs. (4900 kg) it can lift 50 lbs. (23 kg) scientific payload to an altitude of 110 miles (177 km). This compact single stage solid fueled rocket has excellent performance when compared to competitive two-stage rockets commonly used for this altitude range.

The Black Brant IV is a two-stage solid propellant rocket capable of lifting a 50 lb. (23 kg) scientific payload to an altitude of 620 miles (998 km). It is simply a combination of the 17″ (43.1 cm) motor used for Black Brant V-A with a Black Brant III rocket. The combined length is 37 ft. (11.3 m). Its simplicity and reliability as a two-stage rocket are basic design features.

The Black Brant V-A solid propellant rocket measures 17″ (43.1 cm) in diameter and 25 ft. (7.6 m) long. With a nominal thrust of 25,000 lbs. (11,340 kg) it can lift 150 lbs. (68.1 kg) scientific payload to an altitude of 132 miles (211 km).

The Black Brant V-B is a highly sophisticated vehicle using a modern solid propellant which results in this 17″ (43.1 cm) diameter, 25 ft. (7.6 m) long vehicle lifting 200 lbs. (88 kg) of scientific payload to an altitude of 270 miles (392 km).

The Black Brant vehicles which were designed and developed to the requirement of the scientific community are now being utilized by an ever increasing number of scientists in Canada, the U.S.A., and Europe.

In addition to the Black Brant rocket vehicles, Bristol offers the users a complete line of telemetry, diagnostic flight instrumentation, and auxiliary equipment designed and built at our Winnipeg Plant. Bristol's total capability also includes design and construction of payload structures, payload integration and check-out, launch services and data reduction.

Continuing development is carried out at Bristol to assure keeping in step with the changing demands of the world's scientific community.

GUN FIRED VERTICAL PROBES

PROJECT "HARP"

McGill University has developed a technique for soundings of the upper atmosphere using gun launched probes. For this programme a 16″ (40.6 cm) naval gun, smooth-bored to 16.4″ (41.7 cm) is used to launch, with the aid of sabots, fin stabilised vehicles carrying both chemical and electronic payloads to altitudes of well over 62 miles (100 km.). All vehicles bear the code name 'Martlet'.

The Martlet I airframe is designed to carry 16 litres of gas at pressures up to 250 atmospheres in the after body, with a 25 pound (11.3 kg) telemetry payload in the nose. Flight altitudes are up to 62 miles (100 km.).

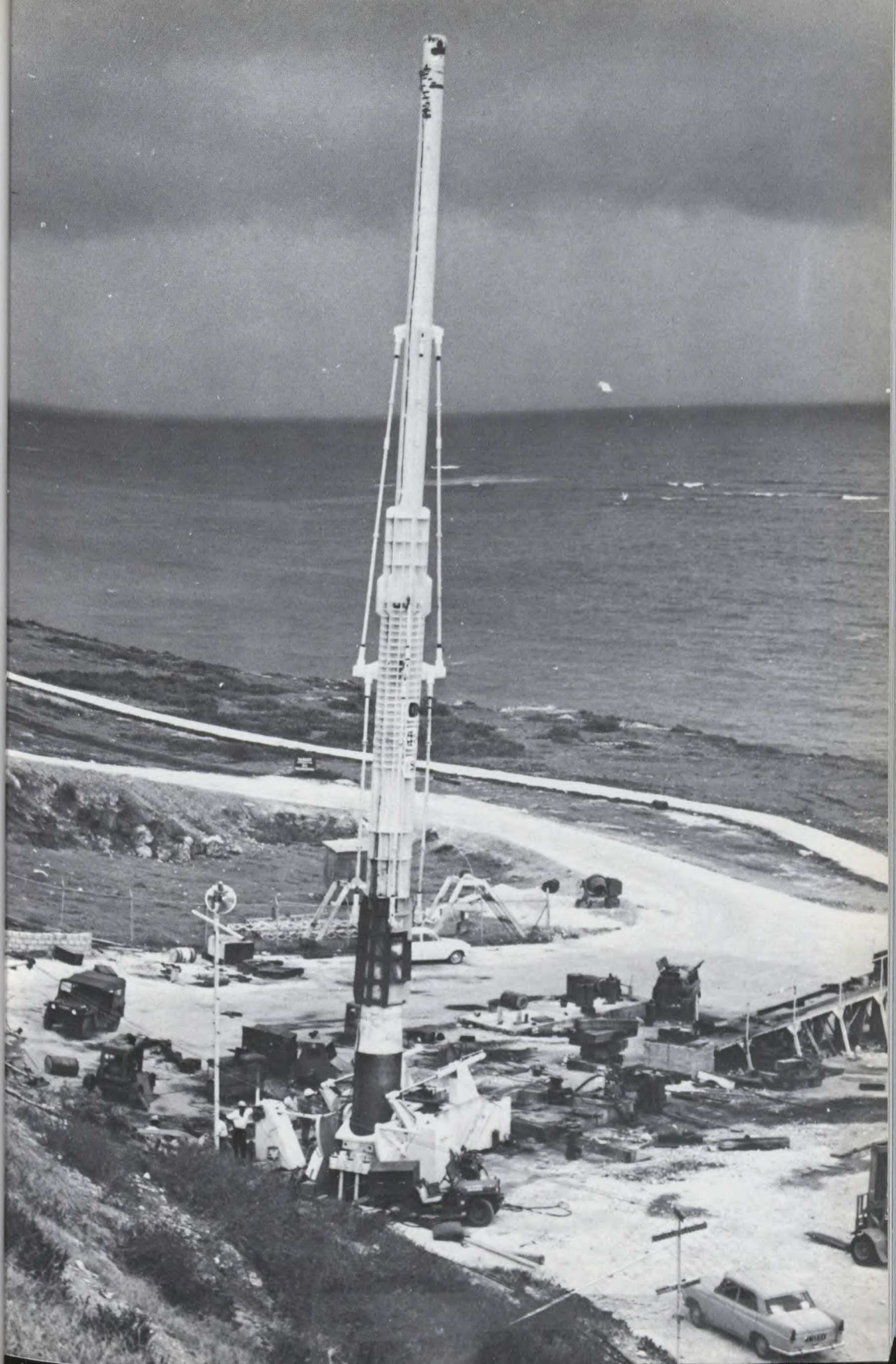
The Martlet II airframe was developed to fly liquid payloads to altitudes up to 93 miles (150 km.) carrying a small instrumentation and telemetry package in the nose. These vehicles have been used successfully to release, as a trail, an 80% tri-methyl aluminum, 20% tri-ethyl aluminum mix. The luminous trail produced above 57 miles (92 km.) has been photographed in the standard manner, and wind profiles obtained. The vehicles have been manufactured by Heroux Machine Parts Ltd., with the release valve being developed and produced by Aviation Electric Limited.

The Martlet III airframe is a rocket assist vehicle capable of placing 50 pounds (22.6 kg) of payload to altitudes of over 187 miles (300 km.). It is currently under development, numerous prototypes having been successfully flown using rocket motors produced by Canadian Arsenals Ltd. The rocket flights are monitored using multi-channel potted telemetry, developed and manufactured by Computing Devices of Canada. Airframes are built by Aviation Electric Ltd. and Heroux Machine Parts Ltd.

Other airframes are under development in the programme. These are aimed at achieving larger payloads and altitudes in the thousands of kilometers.

The gun-launched probe is not influenced by surface winds, and suffers little dispersion from its predicted trajectory. With active programmes under way to modify a wide range of sensors to withstand launching stress, its range of application is continually increasing. Firings are being conducted continually at the Barbados range site, bunched firings having been conducted at the rate of one every hour and a half for periods of over twelve hours. The range is operated under contract from McGill University to Computing Devices of Canada, and is instrumented to provide photographs and radar coverage, both from Barbados itself and from bases on nearby islands. Most firings are supported by the down range facilities of the Atlantic Missile Range.

(For associated equipments and technologies see pages I-92 & I-94)



HIGH "G" ELECTRONICS

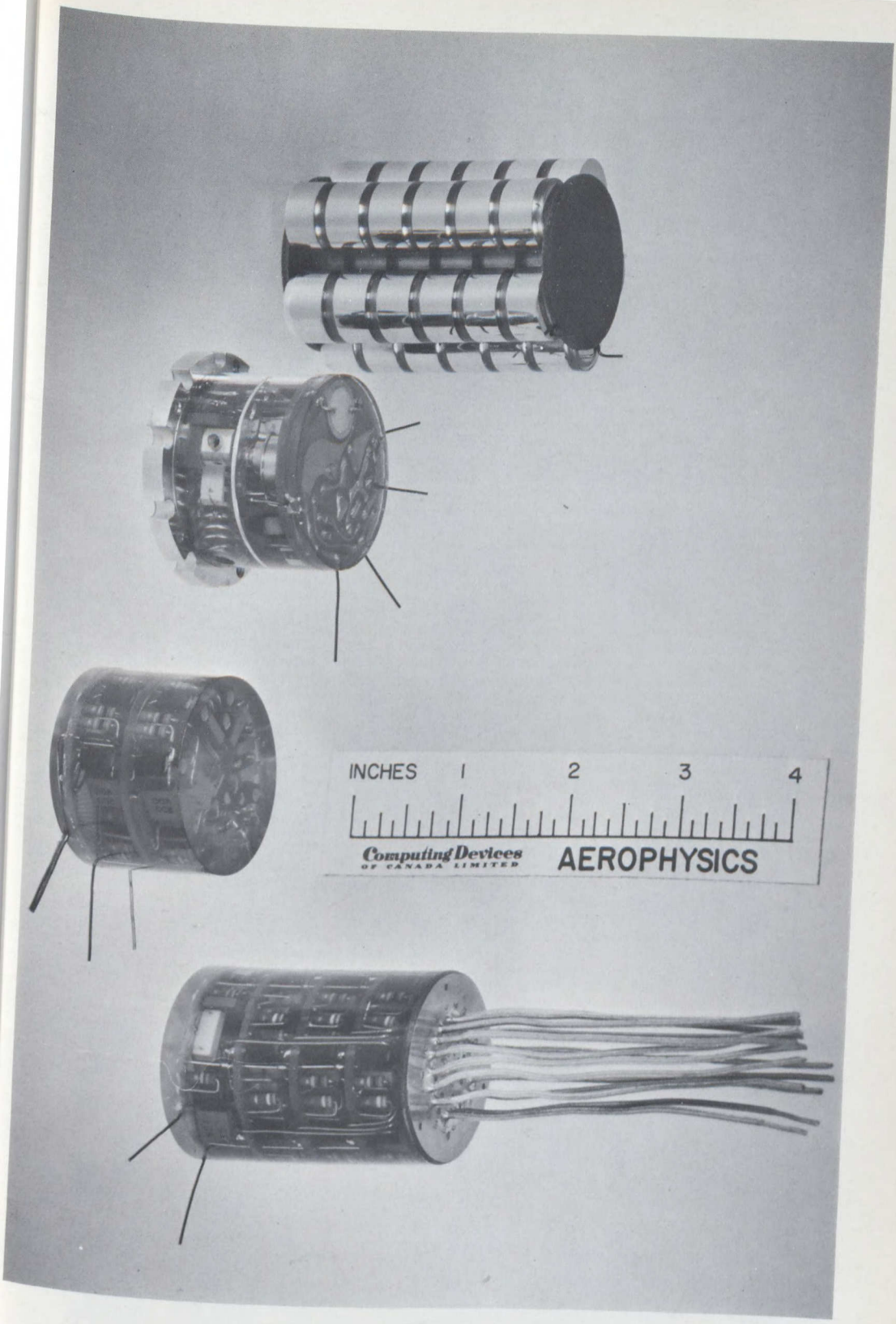
Computing Devices of Canada Limited has been engaged in aerophysics research since 1956. One of the major activities is the study of high g electronics.

The 'Space Age' has brought increased requirements for the decision and construction of high g telemetry systems. Sensors, power supplies, voltage regulators, frequency modulators, sub-carrier oscillators, multi-channel commutators and transmitters are being 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, for applications involving high-speed machinery and for high-acceleration missiles and rockets.

Solid state telemetry systems with 215-250 megacycles per second (Mc/s) FM transmitters operating at power levels up to one watt have been designed and packaged to operate in a 50,000 g environment. These systems are available now for high g telemetry applications.

Using the company's high g testing techniques, components and sub-system evaluation and selection, work is proceeding for ballistic range telemetry applications where g forces will range from 250,000 to 500,000. For upper-atmosphere (above 300,000 ft. (91,440 m)) research probes, telemetry transmitters are being developed in the microwave frequency range, and a high g Langmuir probe is being developed for high-altitude electron density measurements.

The company is also developing an FM transmitter which will operate at a degree of frequency stability never before attained in high g electronic development. This 250 Mc/s transmitter can be used in a hard-landing space exploration instrument which transmits its deceleration time signature when impacted on various materials.


INCHES 1 2 3 4
Computing Devices
OF CANADA LIMITED
AEROPHYSICS

HIGH "G" TECHNOLOGY

Aviation Electric Limited has been acting as sub-contractor since 1962 to the High Altitude Research Project (HARP) being conducted by the Space Research Institute of McGill University. With the sounding vehicles being launched by 16 inch (40.6 cm) naval guns where extremely high 'g' loadings are present at the launch, a major problem was encountered when existing systems and components were not capable of resisting these extreme loads. Through research, development and production elements have been produced which will withstand up to 10,000 g.

The components which are illustrated are a high altitude guidance system for the Martlet IV vehicle. 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.

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 a 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 center 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).

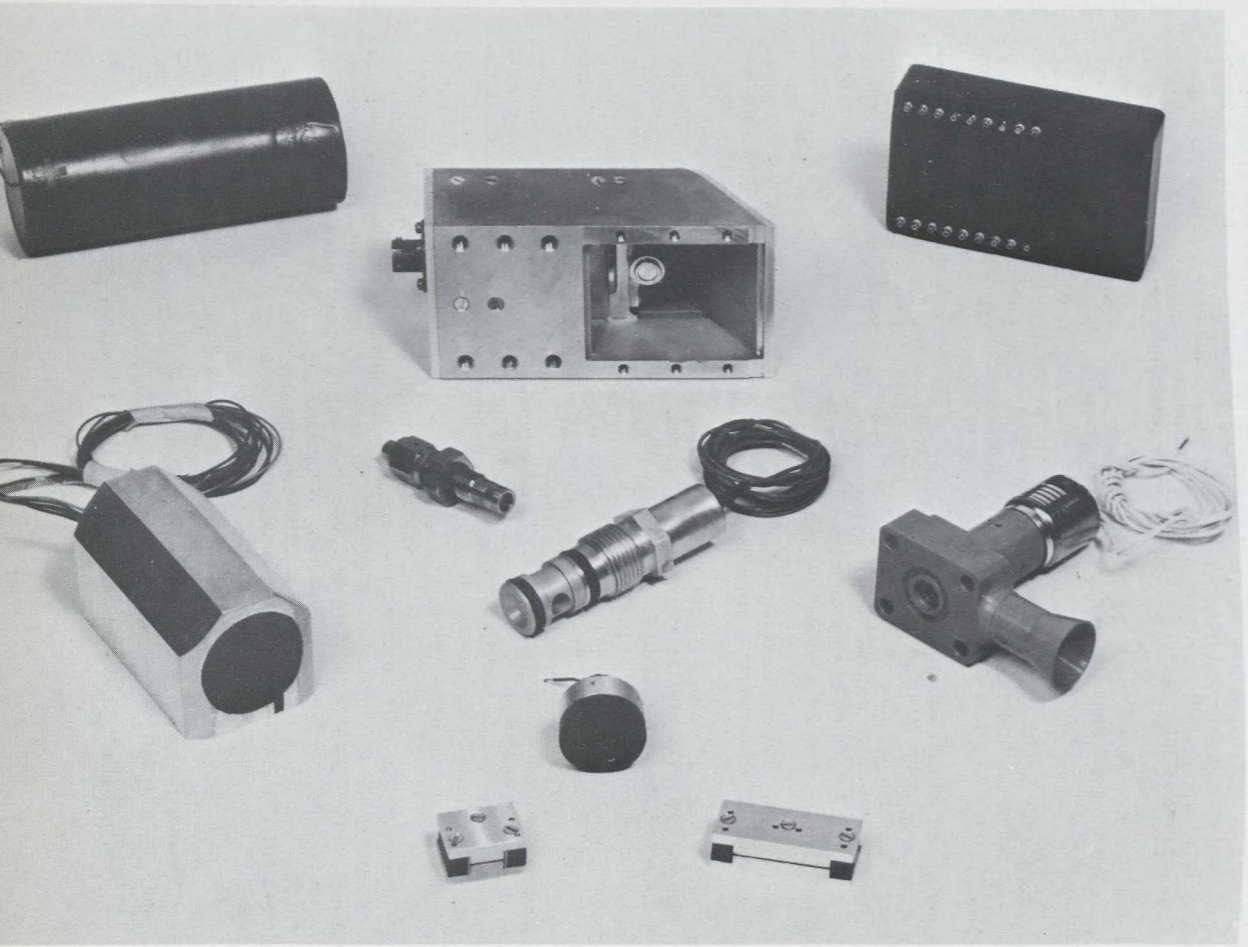
The Reaction Control Equipment consists of four valve/nozzle combination units, a fill valve, an explosive cutter valve and a pressure regulator in addition to the nitrogen storage tank and associated plumbing.

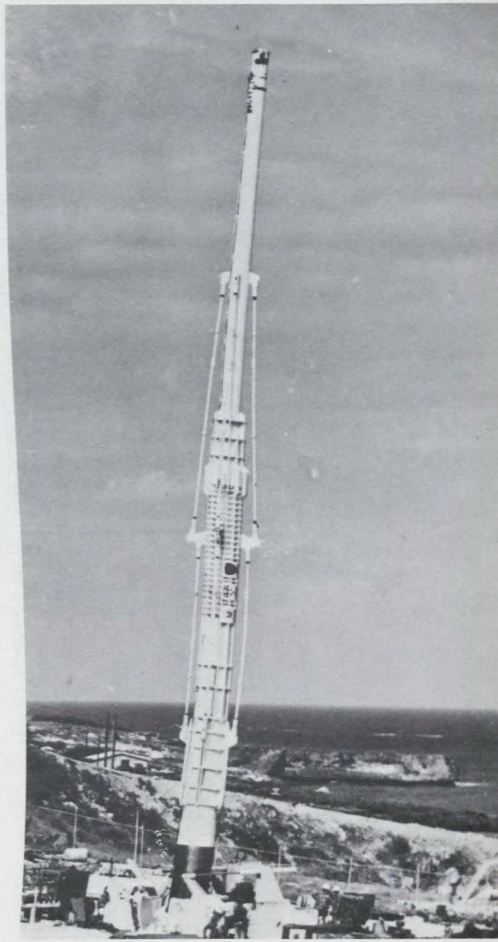
Computation and switching logic is supplied by solid state circuitry which is potted in a mixture of fine sand and epoxy resin.

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 alternately 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).





Illustrated are components of a guidance control system for the Martlet IV space vehicle. The control equipment consists of infrared telescopes, sun sensors, spin rate sensors, solid state electronic logic modules and reaction control valves which operate to provide the desired pitch and yaw attitudes. The equipment is self-powered by a specially

PRECISION SATELLITE TRACKING ANTENNA

The Northern Electric Company, Research and Development Laboratories, has completed the design, installation and testing of a precision 30 foot (9.1m) tracking antenna for the Defence Research Telecommunications Establishment at Ottawa. Canadair Limited of Montreal was the major subcontractor for the design and installation of the structural parts. In view of its test facility role of a general nature, such as satellite communications and atmospheric propagation research, the antenna has been specially designed to provide the most flexible operation.

In order to get useful measurements of atmospheric effects on propagation in the severe Ottawa climate, the antenna is designed to operate without radome protection. In addition, the reflector has good rain drainage, and the feed horn is heated for removal of snow. As a result, the antenna is kept relatively free of the effects of accumulated rain or snow during measurements.

An additional advantage which is available with the horn reflector feed configuration is that, because of the inherent right angle bend, it can pass through the elevation bearing as it does on this antenna, allowing the receiving equipment (and transmitting equipment) to be housed in an always level enclosure on the azimuth platform. Being free of the yoke space restrictions, this enclosure has adequate space for personnel and equipment.

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 the paraboloid, which is supported by a 10 foot (3.05m) 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 0.022 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.

The Cassegrain supports are designed for minimum aperture blockage consistent with the high stiffness requirement which results in a minimum resonant frequency for the complete structure of 5 cps.

The simultaneous operating frequencies for the antenna and feed are approximately 4 Gc/s, 8 Gc/s and 16 Gc/s with a maximum useful frequency of 35 Gc/s where antenna gain of over 64 db has been achieved. High aperture illumination efficiency is achieved in a broadband sense over the frequency range through the use of a Cassegrain configuration with a horn reflector feed operating in the near field zone. This feed system coupled with a "Multi-Mode" angle tracking technique results in a broadband, low noise, highly efficient antenna.

The "Mode Coupler" which is located in the equipment house operates on received signals from the feed. These are circularly polarized in the dominant mode at 4 Gc/s, 8 Gc/s and 16 Gc/s and in the TM_{01} mode at 4 Gc/s from which angle error information is derived for auto-tracking.

The electrical drive system employs low speed torque motors with integral tachometers and low ration gear boxes. These are arranged in opposing pairs on each axis forming an anti-backlash dual drive. The features of this technique are low inertia, and high precision and stiffness.

The antenna control equipment is a compact all-digital equipment providing for operation of the antenna in manual, standby, and computer track modes. The computer itself is external. The resolution of the resolver type shaft encoders and readouts is 0.01°. The absolute pointing accuracy of these modes of operation is 0.03° peak. This includes all effects of environment and inertia.

The servo system is type II with an acceleration constant of 10.

Signals from the mode coupler are processed in a phase lock receiver consisting of three doppler tracking channels, one associated with each of the channels and a composite angle tracking channel. The outputs of the error channel are proportional to boresight error but in antenna aperture coordinates. The coordinate conversion used to account for the elevation rotary joint in the feed, and secant sensitivity correction for azimuth, is carried out in a modulator resolver demodulator system.

In the auto-track mode, the total peak pointing error from all sources is 0.01° when the signal level is −125 dbm and with a receiver noise temperature of 450°K.

Provisions have been made in the design to make the antenna useful for a wide variety of experiments, by incorporating a high degree of flexibility. Chiefly, the features are low noise, high power handling capacity, high frequency, precise pointing and generous equipment space located on the antenna.

SATELLITE AND MICROWAVE RELAY COMMUNICATIONS

An example of the competency of Canadian industry to serve her own needs and those of other countries is the communication satellite earth station completed for the Department of Transport. The station, located on Canada's eastern seabord at Mill Village, Nova Scotia, is linked to the world-wide network of high capacity ground stations to provide trans-Atlantic voice and TV communications with satellite systems launched by Communications Satellite Corporation. The station is made up of four major systems (antenna, acquisition and tracking, wideband communications, and instrumentation and control) and 14 subsystems. The antenna is 85 ft. (25.9 m) in diameter with a Cassegrainian feed system and is enclosed in a 120 ft. (36.6 m) diameter inflatable radome. The electronic circuits employ the latest solid state devices. One example of the precision of the system is the antenna pointing accuracy of 0.02°. The station is now providing communications with the Intelsat I and II synchronous satellite systems. A second station will be built at the Mill Village site during 1967.

Space Systems of RCA Victor Company, Ltd. of Montreal was the system manager for this station and, in addition, manufactured 4 communication and control subsystems for which it has established proficiency. The Company can furnish the same or similar high capacity communication satellite earth stations on a turnkey management basis. Arrangements can be made to train personnel in the technology of satellite communications, and operation and maintenance of a station; and, more significantly, assist countries in establishing "home" content for much of the electronic and mechanical hardware for the station.

Space Systems of RCA Victor engages over 135 scientists and engineers, supported by 61 technicians, for its space electronic work. Over 57 space electronic programs have been performed covering earth stations, satellites and satellite systems, and space research studies. This work has been performed for 34 separate space agencies. Space research covers laser communications, laboratory simulation of geophysical effects, re-entry communications, ionic propulsion, cryogenics, and radar detection of satellites and missiles through plasma sheath effects.

Space Systems of RCA Victor has discharged 14 earth station programs and stands to render service in study of projected international traffic requirements, preparation of specifications for the earth station and associated telecommunication facilities and civil works, and site survey and site selection.

Communication satellite earth stations provide great increase in the quality and traffic handling capacity of a country's international communications. This, in turn, creates the need for additional high capacity, terrestrial microwave relay trunk circuits and low capacity spur circuits for the country's internal communications. RCA Victor Company, Ltd. has specialized in high performance radio relay communications systems for 22 years and now provides solid state equipment with capacities from 60 to 1800 voice channels. Considerable engineering know-how has been accumulated by the system design, equipment manufacture, and installation of over 20,000 route miles (25,748 km) in thirteen countries of the world. The majority of these high capacity systems carry defence traffic.

COUNTER-MORTAR RADAR AN/MPQ-501

This Counter-Mortar Radar equipment was developed for the Canadian Army by the National Research Council and was production-engineered and produced by Raytheon Canada Limited. The AN/MPQ-501 equipment is a mobile microwave radar for the field forces designed to locate the source of hostile mortars, rockets, and other high-angle artillery. It also has demonstrated its ability to locate field artillery and provide rapid registration of counter gunfire. Designed for mounting on an armoured vehicle of the M113 and other types, the radar has a high degree of mobility, enabling it to move rapidly to site, perform its function, and then quickly move away. The air transportability of this equipment, when mounted on such an armoured vehicle, has been demonstrated by the RCAF when they transported tactical vehicular installations of this radar equipment non-stop to Europe from the RCAF Downsview airport in a C130 Lockheed Hercules cargo aeroplane.

The AN/MPQ-501 will perform the following functions:—

(*a*) Accurate location of hostile mortars and other high-angle artillery.
(*b*) Registration and adjustment of divisional artillery.
(*c*) Location of hostile ballistic rocket positions.
(*d*) Combat area surveillance.
(*e*) Survey of own and other positions.

Outstanding features of Radar AN/MPQ-501

- 5 minutes into action and 2 minutes out of action—day or night.
- One man setup and operation without exposure.
- Fully automatic antenna levelling.
- Automatic loading and stowage.
- Automatic time insertion, beam centering and shifting.
- First round location.
- Simultaneous fire capabilities.
- True presentation of signal pairs to avoid confusion.
- Single beam extrapolation provided.
- Locations in both cartesian and polar co-ordinates.
- Fall of shot corrections direct on counters.
- Fast automatic computer clearing between rounds.
- No trailer, no field cables—self-contained and powered on single armoured vehicle allowing maximum mobility.
- Fully air-conditioned including N.B.C. protection.
- Frequency, power, noise figure and tuning monitored.

Raytheon Canada Limited is equipped to design, develop, and manufacture high quality radar systems such as the AN/MPQ-501, as well as communications radar equipment for airport and airways surveillance.

IONOSPHERIC MEASUREMENT

From the Research Laboratories of EMI-Cossor comes an entirely new concept in the ionospheric measurement field, the Model 8000 Ionosonde. This ionosonde will shatter the notion that equipment for ionospheric measurement and study must require several racks to accommodate it, and also a team of highly skilled personnel to operate it. By utilizing solid state circuitry wherever possible, and advanced design techniques, EMI-Cossor have produced a Vertical/Oblique Sounding Terminal equipment which can be literally carried around and operated by a single person.

With this system new concepts and environments for ionospheric observations are now possible, particularly in the mobile vehicle field.

This equipment is applicable for both Point to Point and Mobile Operations.

The design of the equipment is entirely electronic with no switches, relays, rotary capacitors or other mechanical devices. The only tubes used are in the transmitter high power stages. A binary number (128) has been chosen for the total quantity of frequency steps in order to simplify basic design and also to facilitate future potential features of digital processed type readout.

Integrating characteristics at Low S/N ratios are assured by the use of coherent detection in the receiver.

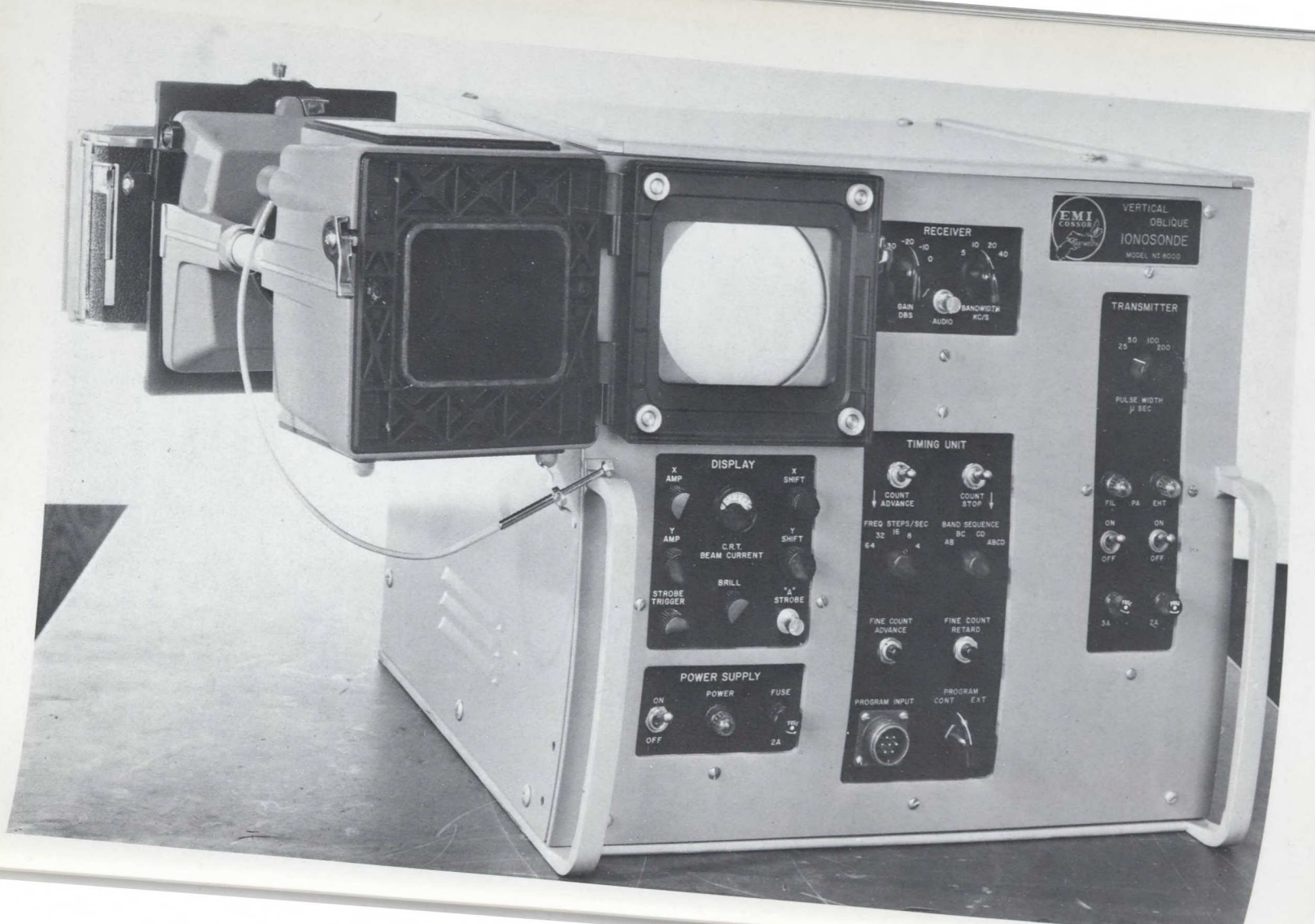
The equipment is designed for 19″ (48.3 cm) rack or table mounting, and has exterior dimensions of 19″ wide × 18¼″ deep × 16″ high (48.3 × 46.4 × 40.6 cm). Weight is approximately 100 lbs (45.4 kg.). Power requirements are 115 volts (50 to 400 cycles) at approximately 300 watts.

The 8000 Ionosonde has a Polaroid type camera supplied as standard equipment. This camera, using Polaroid Land Film will provide developed ionogram prints from the ionosonde in just 10 seconds. A guide attachment arrangement is provided for rapid easy removal of the camera when not in use.

Optional extras and companion equipment available include: Programme unit for automatic programming of the ionosonde to operate at pre-determined intervals; 35 mm Camera of 100 feet (30.48 m) reel capacity and with built-in Time-Date exposure facility. This camera requires the above programme unit as a driven source; 30 Kilowatt pulse power amplifier module for very long sounding circuits and Electronic integrating and storage unit for highest S/N ratio, amplitude-frequency readout, and data processing applications.

Technical Details:

Frequency coverage: 1.8 Mc/s to 28.8 Mc/s in 128 frequency steps spaced in an exact logarithmic progression, to give a constant frequency resolution through the band of approximately ± 1%. *Power output:* 4 kilowatts R.M.S. pulse power. *Pulse widths:* 25, 50, 100 or 200 microsecs. (6dB. points). *Pulse envelope:* Sine squared for minimum interference with neighbouring receivers. *Receiver bandwidths:* 16, 8, 4 or 2 Kc/s net pulse bandwidths. *Receiver dynamic range:* At least 50 dBs. *P.R.F.:* 64 Pulses/sec. *Band sweep period:* 2, 4, 8, 16 or 32 sec. *Receiver tuning:* Solid State Filters. *Display:* B type 5″ display with long persistance screen for direct observation, and also provision for Polaroid or 35mm camera recording. *Integrating characteristic with high level C.W. interference:* Excellent. *Timing accuracy:* ± 1 part in 10^8. *Standard antenna impedance:* 50 ohms or to special order. *Height Markers:* Every 100 kilometres for vertical scaling. *Frequency Markers:* Every ½ frequence octave + electronic strobe with calibrated dial.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STROBE
TIMING UNIT
COUNT
ADVANCE
COUNT
STOP
FREQ STEPS/SEC
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BAND SEQUENCE
BC CD
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FINE COUNT
ADVANCE
FINE COUNT
RETARD
PROGRAM INPUT
PROGRAM
CONT EXT
POWER SUPPLY
ON
OFF
POWER
FUSE
2A

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 and military search radars. Seven different types of amplifiers have been manufactured to date, accounting for over 1000 units in use throughout the world.

Parametric amplifiers are used wherever a small signal is to be amplified with low noise contribution. The amplifier finds its way into troposcatter communication systems and is responsible for the relatively small antenna size and practical transmitter power.

Northern's amplifiers have been used by USAF, NATO forces, CNT, A.T. & T., Bell Telephone Company Limited, and The British Columbia Telephone Company. A typical installation is the BMEWS system.

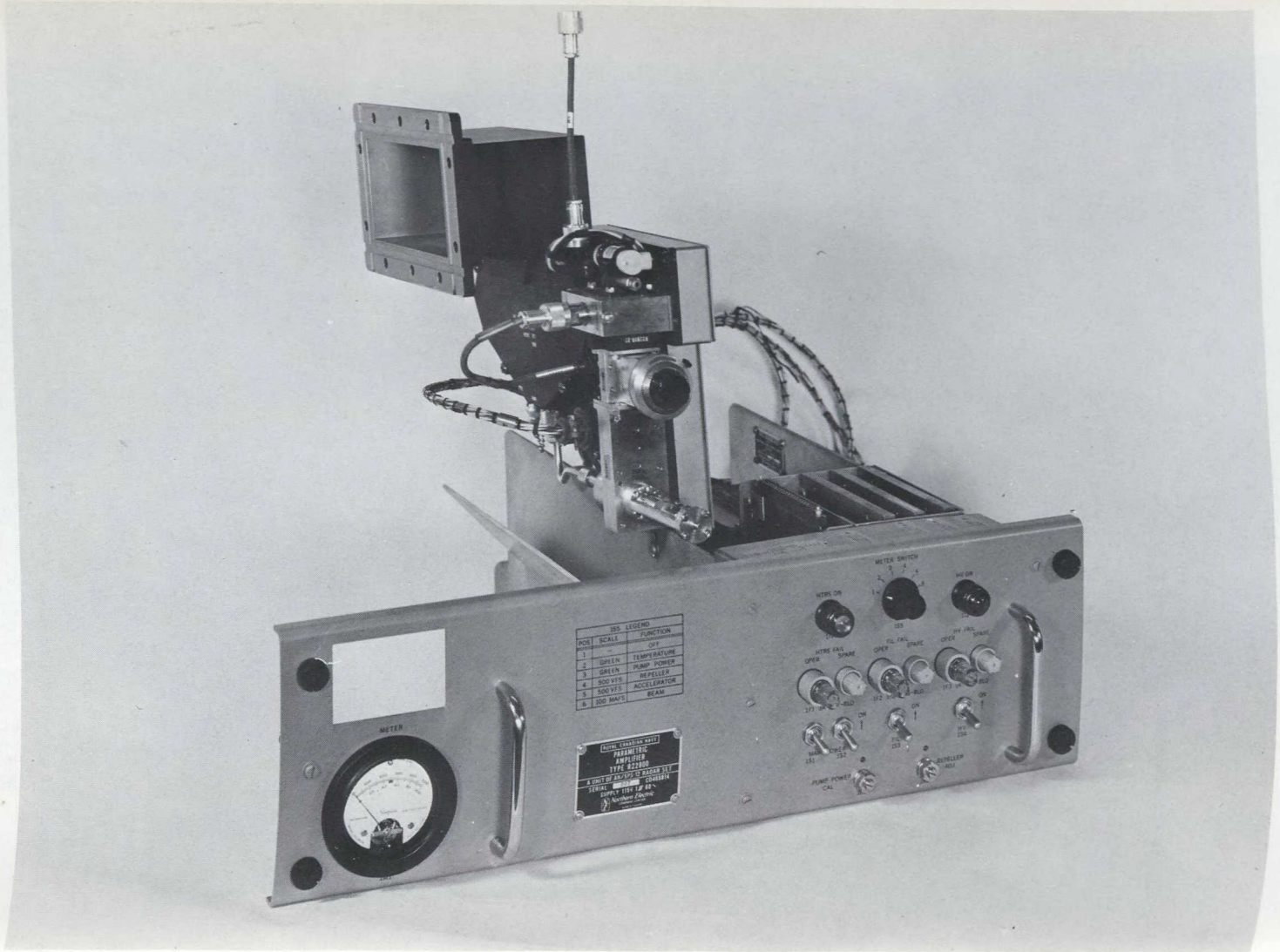
The latest application is in search radars where the amplifier is used to improve the range performance without increasing the transmitter power. Such an application (as shown in the photograph on the opposite page) was designed for the Royal Canadian Navy in conjunction with their ship-based search radar, SPS-12, and is installed as a modification kit.

All parametric amplifiers designed by Northern Electric are one port tunables 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 2700 MHz range, with a bandwidth of 10 MHz to the 1 dB points.

Simplicity and reliability are enhanced by single control tuning and a completely solid state power supply. 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.

The Company's Research and Development Laboratories are continuing investigations to improve parametric amplifier performance in troposcatter, line-of-sight, radar and satellite communication systems.

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 KMHz. *Input-Output* VSWR: 1.2:1. *Linearity:* −35 dBm. *Klystron Frequency:* 10.6 KMHz. *Power Supply:* Regulated Solid State Silicon. *Primary Power:* 115V ± 10%. *Operating Environmental Temperature:* 0°C to 50°C. *Military Specification:* MIL-E-16400. *Weight:* 50 lbs. (22.7 kg).


METER
METER SWITCH
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HV ON
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OPER
SPARE
FIL FAIL
OPER
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HV FAIL
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ON
PUMP POWER
CAL
REPELLER
ADJ
PARAMETRIC
AMPLIFIER
TYPE 422800
SUPPLY TIME 1.2 HRS.

DUAL KEYER, FREQUENCY SHIFT EXCITER

The type DFS-21 Dual Keyer, Frequency Shift Exciter was developed by Topping Electronics to meet modern requirements for a high stability unit which could be easily adjusted to any desired small shift without constant readjustment. The exceptional frequency stability is achieved by use of crystal controlled oscillators throughout, and special means for shifting the crystal frequencies. The output frequency may be changed without affecting shift circuits by replacement of a single crystal. A single control is also provided to vary the entire shift spectrum by ± 40 cps.

The unit combines the functions of a Dual Keyer, Frequency Shifter and Exciter. Channel separation can be adjusted to be anywhere from 5 to 90 cps. Separation of 31.4 cps would require only a single channel NATO bandwidth of 95 cycles, but with this equipment, results in transmission of two messages.

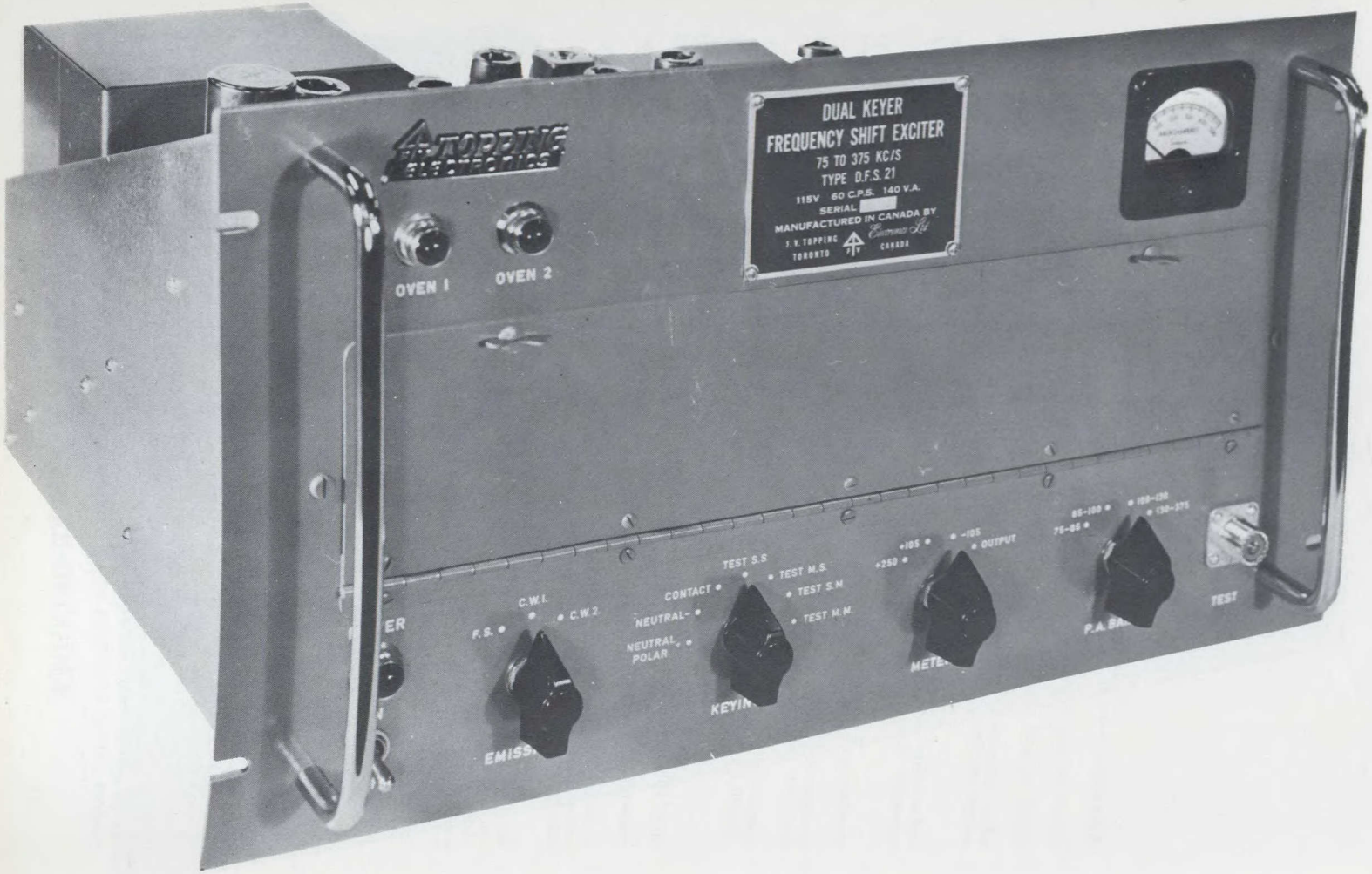
The following table shows output frequencies with channel separation of 49.5 cps with dual frequency shift:

KEYING CONDITION	OUTPUT FREQUENCY		
Ch. 1 Ch. 2			
S. S.	NOMINAL FREQUENCY	–	74.25 cps
M. S.	NOMINAL FREQUENCY	–	24.75 cps
S. M.	NOMINAL FREQUENCY	+	24.75 cps
M. M.	NOMINAL FREQUENCY	+	74.25 cps

The Type DFS-21 Dual Keyer Frequency Shift Exciter comprises four types of circuits, viz: an exciter circuit, two frequency shift circuits, two keyer circuits, and a power supply and metering circuit, all combined to produce an R.F. output signal of up to 2 watts in the frequency range of 75 Kc/s to 375 Kc/s with single or dual frequency shifts of ± 5 cps to ± 100 cps, or at a constant output frequency, depending on the type of keying desired.

Since the desired output frequency, fo, falls below all frequencies generated within the unit, undesired harmonics and spurious frequencies are suppressed by a low pass filter following the second mixer. The output frequency is subsequently passed through a driver stage and then to a tuned power amplifier output stage. Amplitude keying (A1 modulation) is obtained by on-off keying, at the driver stage, from either of the keying circuits.

Frequency:	75 to 375 Kc/s in four bands.
Stability:	Fully crystal controlled, ± 2 cps nominal ± 2 cps at maximum shift, eight hours 0 to 50°C and primary variation of ± 10%
Frequency Separation:	Adjustable continuously from 5 to 90 cps.
Emission:	F1 dual or single channel, C.W. either channel. (A1)
Power Output:	Adjustable, 0.1 watt to 2.0 watts.
Output Impedance:	50 or 75 ohms.
Spurious Output:	40 db below carrier, or better
Deviation, single Channel:	Channel 1: Adjustable, ± 5 cps to ± 50 cps Channel 2: Adjustable, ± 10 cps to ± 90 cps
Keying Rate:	(1) to 1000 Dot P.P.S. on Frequency Shift (2) to 50 Dot P.P.S. on C.W. either channel
KEYING INPUT FACILITIES	
a) Contact Keying:	Input impedance 50K ohms. Loop current 1.0 mA max. (line shorted for MARK keying)
b) Voltage Keying:	Voltage range 10 to 150V. Input impedance is 50 K Ω for positive voltage, 100 K Ω for negative voltage. Neutral and polar sense may be reversed by KEYING switch.
Input Power:	115 volts, 60 cps, 140 VA, nominal. Specifications apply over a voltage range of 105 to 125V. A.C.
Dimensions:	Rack panel 10-½" x 19" (26.7 x 48.3 cm) Chassis depth 14" (35.6 cm) maximum.
Weight:	36 lbs. (16.3 kg) unpackaged. 60 lbs. (27.2 kg) packaged.


TOPPING ELECTRONICS
DUAL KEYER
FREQUENCY SHIFT EXCITER
75 TO 375 KC/S
TYPE D.F.S. 21
115V 60 C.P.S. 140 V.A.
SERIAL
MANUFACTURED IN CANADA BY
F. V. TOPPING
TORONTO
CANADA
OVEN 1
OVEN 2
F.S.
C.W.1.
C.W.2.
EMISS
CONTACT
NEUTRAL-
NEUTRAL, POLAR
TEST S.S
TEST M.S.
TEST S.M
TEST M.M.
KEYIN
+250
+105
-105
OUTPUT
METE
75-85
85-100
100-120
120-375
P.A. BA
TEST

TWIN-SHIFT LF RECEIVER-DECODER

The type DFR-21A Twin-Shift receiver was developed by Topping Electronics to meet modern requirements for a highly selective, high sensitivity low frequency receiver, capable of reception and decoding of narrow shift Twin-Shift radioteletype signals. Designed for maximum operational simplicity, the equipment employs preset RF tuning. Crystal control of preset frequencies and a highly stable VFO for a second conversion results in excellent frequency stability, obviating requirements for automatic frequency control. The receive frequency is selected by a single four-position front panel switch, and a continuously variable fine frequency panel adjustment up to 50 cycles to permit "nose" tuning. Minimum noise response is ensured by full FM limiting and an additional noise pulse clipper. Neon mark space channel lamps provide visual tuning and operational indication. Sidetone output may be obtained from a jack for monitoring or CW purposes. Metering facilities are also provided.

The unit combines the functions of receiver detector and decoder, each of the four preset receive frequencies tuneable over the entire band of 75 to 225 Kc/s. Two independent telegraph outputs are provided, consisting of two unbalanced polar voltage signals. Output voltages are adjustable from ten to twenty volts into 47000 ohms for operation of error correction, storage, or other circuits. A novel type of frequency shift detector-decoder is employed which does not depend on amplitude responses of individually tuned circuits. This has minimum response to transient interference and also permits reasonable deviation of carrier frequency without appreciable degradation of telegraph signal outputs.

The exceptional selectivity of this receiver results from the development of special miniature low frequency intermediate frequency transformers operating at 28 Kc/s. Four stages of intermediate frequency amplification and selectivity are employed, providing 300 cycle 3 db bandwidth and 1500 cycle 80 db bandwidth. Noise pulse clipping at early stages of the intermediate frequency chain virtually eliminates IF ringing problems.

Tuning:	The receiver circuit employs four tuned RF circuits for each receive frequency, preset adjustments are by oven operated crystal replacement, actuation of a 3-position band selector, and peak tuning of four slug-adjusted coils. Alternate VFO input in lieu of crystal operation may be substituted.
Frequency:	Any one of four preset frequencies in the band 75 to 225 Kc/s, crystal controlled, switched.
Sensitivity:	Better than 0.2 microvolts for 10 db S+N to N, measured at limiter input, 3 db limiting at 2 microvolts input.
Selectivity:	3 db at ±380 cps: 60 db at ±1000 cps: 80 db at ±1500 cps.
Image and Spurious:	80 db rejection over band 80 to 220 Kc/s.
Frequency Stability:	±5 cps for 10°C ambient temperature change plus ±2 cps over the range 0 to 40°C.
Frequency Accuracy:	Adjustable over a range of 50 cycles for any preset frequency, continuously variable front panel control.
Noise Limiter:	Impulse noise clipper provided in Intermediate frequency chain to limit noise plus transients 2 db (v) in excess of carrier. This is in addition to the 6 db balanced FM limiter circuit.
Cross Modulation:	Negligible for undesired signal not less than 1 Kc removed and 60 db in excess of desired signal.
Antenna Input:	75 ohms, unbalanced into an SO-239 connector.
Output:	Two independent telegraph outputs, polar, unbalanced, and internally adjustable from ±10 to ±20 volts peak into 47,000Ω. A single multiplex tone output is also provided.
Keying Rate:	DC to 100 bands, either channel independently.
Reception Mode:	Dual Frequency Shift, frequency separation determined by replaceable plug-in filter, anywhere in the range 30 to 70 cps. (51.5 cps is recommended). Single Frequency Shift and CW signals may also be received.
Distortion:	10% Maximum telegraph distortion, either channel, at 51.5 cps shift for carrier frequency variations of 10 cps.
Gain Controls:	60 db of RF gain control may be obtained from either internal AGC or manual front panel control.
Input Power:	115 volts, 60 cps 140 VA nominal. Specifications apply over an input voltage range of 105 to 125 VAC.
Dimensions:	Panel 19" x 8¾" (48.3 x 22.2 cm) Chassis Width 16½" max. (41.9 cm) Depth 17" overall (43.2 cm)
Weight:	39 lbs. (17.7 kg.)


TOPPING
ELECTRONICS
TWINPLEX
L. F. RECEIVER-DECODER
75 TO 225 KC/S
TYPE D.F.R. 21
115 V.A.C. 60 C.P.S. 140 V.A.
SERIAL NO.
MADE IN CANADA BY
TOPPING Electronics Ltd.
TORONTO
FREQUENCIES
1. 110. 750 Kc/s
2. 96. 050 Kc/s
3. 221. 025 Kc/s
4. 146. 450 Kc/s
D.C. MICROAMPERES
M
S
M
S
CHANNEL 1
CHANNEL 2
AUDIO MONITOR
AGC ON
R F GAIN
POWER
OVEN 1
OVEN 2
ON
OFF
LIMITER INPUT
AGC
OSC 1
OSC 2
-350V
+105V
+250V
CH 2 OUT
CH 1 OUT
METER
FINE FREQ
FREQUENCY
EXT OSC

HF SINGLE SIDEBAND TRANSCEIVER & 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: 13-¾″ x 10-¾″ 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.


SSB
TEST
AM
NL
ON
OFF
RCVR
RF
GAIN
AF
GAIN
CHANNEL
CH Twenty Five

FM 2-WAY MOBILE RADIO

Designed to operate in the 148-174 mc range the Canadian Marconi Company DT75 is a compact, light-weight 2-way radio for simplified, one-unit underdash mounting. High efficiency circuitry permits sealed-case packaging without external heat sinks.

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.

Amp Miser circuitry, activated by pressing the Squelch control in, permits monitoring with the least battery drain, allowing the unit to be left on indefinitely. In the Amp Miser position full transmission power is achieved in a fraction of a second. By pulling the Squelch control out a special condition is achieved for heavily loaded channels. This gives moderate battery drain, plus full transmission power in less than 30 thousandths of a second.

Vernier AFC, stabilized crystals plus automatic frequency control lock the receiver precisely to the incoming signal — minimizing distortion and ignition interference. Helical resonators give superior front-end selectivity, a first IF crystal filter provides improvement in inter-modulation interference protection.

Simplified modular construction, the receiver and transmitter are on individual printed circuit boards, permits simplified maintenance.

SPECIFICATIONS

RECEIVER

Frequency Range: ..... 148 - 174 Mc.
RF Channels: ..... 1 to 6, in any 1 Mc.
Sensitivity: ..... (12db SINAD) 0.30 μV.
Eia Selectivity: ..... (± 30 Kc) –70 db.
Eia Modulation Acceptance: ..... 12 Kc.*
Spurious & Image Rejection:
More than –90 db.
Eia Intermodulation: .... (SINAD) –60 db.
Frequency Stability:
(–30 to + 60°C) ± 0.0005%.
Squelch Sensitivity:
(For 80% output) 0.25 μV.
AF Output:
(Less than 10% distortion) 2.5 Watts.

TRANSMITTER

Frequency Range: ..... 148 - 174 Mc.
RF Channels: ..... 1 to 6, in any 1 Mc.
Power Output: ..... 25 Watts.
Modulation: ..... ± 5 Kc.*
Distortion: ..... Less than 4%
Frequency Multiplication: 24
Frequency Stability: ..... (–30 to + 60°C)
FCC Accepted Models: ..... ± 0.0005%.
Dot and Export Models: ..... ± 0.001%.
Spurious Emissions: ..... –65 db, or more.

*Wide-Band Model also available for 60 KC spacing.

Power requirements: (13.8VDC — 1 watt audio)
Amp miser on: 0.32 amp, Amp miser off, 2.06 amp.
Dimensions: 4″ x 9-1/8″ x 10″ (10.2 x 23 x 25.4 cm).
Weight: 10 lbs. (4.5 kg).


ON
TX
VOLUME
OFF
SQUELCH
AMP
PUSH
MISER
2 3 4 5 6
emc
CANADIAN MOBILCOM COMPANY
emc

THE AN/GRC-103 RADIO RELAY EQUIPMENT

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).


SQUELCH ALARM
BUZZER
OFF
INPUT LEVEL
OUTPUT LEVEL
POWER
INC SENS
SQUELCH OFF
CALL
RING
POWER
RCVR SIG
12 CH
VIDEO
24 CH
MULT
DOUBLER
PCM
OSC
OW
XMTR DUPL
+12 V DC
REFL PWR
-12V DC
RECEIVER
AC POWER
ON
OFF
ALARMS
LOW SIGNAL
BUZZER
OFF
SYNC
RCVR CHANNEL
200
SET FREQ
ANT.
RCVR SIG
RCVR CHANNEL
190
200
XMTR DUPL
XMTR CHANNEL
400
BAND I
FROM XMTR
REFL PWR
12 CH
PWR OUT
INPUT LEVEL
24 CH
DRIVER
VIDEO
MULT
12 V DC
DOUBLER
28 V DC
OSC
600 V DC
INPUT
LOW
HIGH
AIR FILTER
AC POWER
ON/RESET
OFF
TRANSMITTER
ALARMS
LOW POWER
BUZZER
OFF
SYNC
OVERHEAT
SET FREQ
R F OUT
410
400
390
R F TUNE
PWR OUT PEAK
PUSH-DRIVER PULL-OUTPUT
BAND I

TELEPHONE & TELEGRAPH FDM 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 or 2-wire line or radio circuit. The transmission band is 0.3 to 19.7 kc/s. The terminal includes hybrids with 2/4-wire switching, signalling converters and compandors on the telephone channels, test and line-up facilities, automatic transmission regulator, operator's telephone set, carrier hybrid for 2-wire line operation, and line equalizer. It requires only 6.4 watts of power at 12/24 volts dc or 10 watts at 115/230 volts ac 50, 60 or 400 cps.

The terminal is immersion-proof and meets all requirements for operation under tactical military environmental conditions. It weighs 31 lb (14.1 kg) or less, depending on the options chosen, 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 temperatures, humidity, line voltage and aging, surpasses that of any previously available equipment.

Telephone loops may be switched either 2 or 4 wire. In the 2-wire position a high-accuracy compressor-expander and a 20/1600 cps signalling circuit are connected in each telephone 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 20 db, is obtained.

The order-wire channel has a bandwidth of 0.3 to 2.8 kc/s, and includes an operator's telephone set, 20/1600 cps signalling converter, compandor, and hybrid circuit. It can be extended to the switchboard on a 2-wire basis. 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 cps and over a local loop, if connected, at 20 cps.

Four vf fs 100-wpm telegraph channels are provided. Loops are 2-wire full-duplex. A miniaturized solid-state dc to ac converter is used at each teletypewriter; this converter also provides the loop currents. When the telegraph channels are not in use, the frequency band they occupy, from 3.045 to 3.755 kc/s, is available on a 4-wire basis for data or other applications.

When two terminals are connected by a line consisting of loaded spiral-four cable the maximum distance between terminals is approximately 45 mi (72 km). Two-wire operation over open wire (100 lb, (45.4 kg), 0.080 in, (2.0 mm) dia. copper) is satisfactory for approximately 160 km. (100 mi) when the telegraph channels are operated simplex. If duplex telegraph operation is required this distance is reduced to approximately 48 km (30 mi). Two-wire operation over field wire is satisfactory for distances up to 10 mi (16 km).

The reduction brought about by the channel compandors, 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 kc/s 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 50 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.

The technical characteristics given are those of only one version of the standard equipment which is being produced. Optional arrangements include all usual frequency allocations and signalling frequencies.

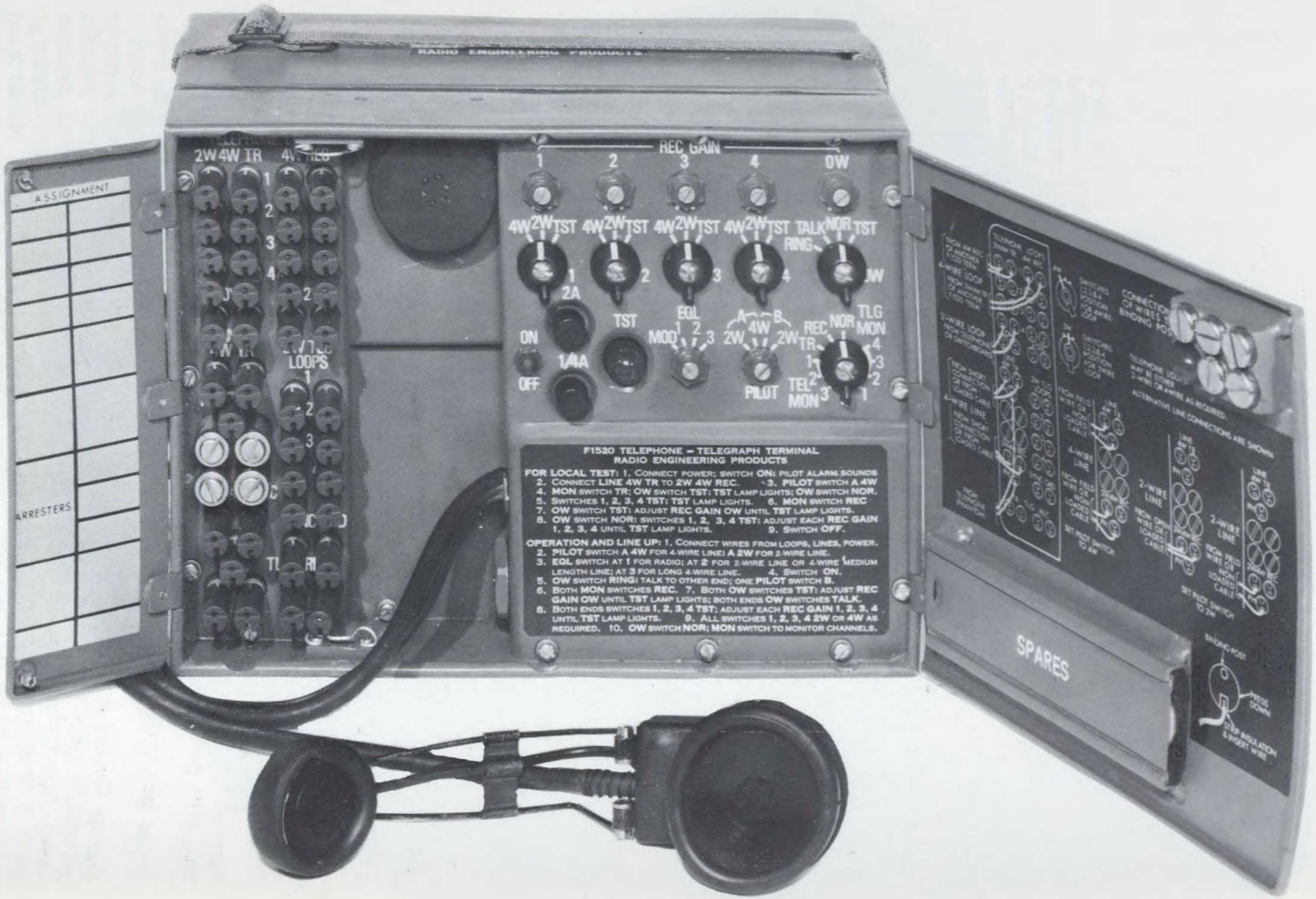
A wide range of field communications equipments is available for use with this multiplex terminal. These include the following:

Group Modems to form 3 plus 12 plus 12 channel terminal and 5 plus 24 plus 20 channel terminals.

Converter for operational over long open-wire circuits.

Lightweight Field Switchboards of 12, 24 and 36 line capacity.

Telegraph Converter for use at teleprinters utilizing 2 wire vf fs full-duplex loops.


RADIO ENGINEERING PRODUCTS
ASSIGNMENT
ARRESTERS
2W 4W TR
LOOPS
REC GAIN
1 2 3 4 OW
4W 2W TST 4W 2W TST 4W 2W TST 4W 2W TST TALK NOR TST
RING
2A
TST
EOL
MOD
ON
OFF
1/4A
A B
4W
2W 2W
PILOT
REC
TR
TEL
MON
NOR
TLG
MON
F1520 TELEPHONE – TELEGRAPH TERMINAL
RADIO ENGINEERING PRODUCTS
FOR LOCAL TEST: 1. CONNECT POWER; SWITCH ON: PILOT ALARM SOUNDS
2. CONNECT LINE 4W TR TO 2W 4W REC. 3. PILOT SWITCH A 4W
4. MON SWITCH TR; OW SWITCH TST: TST LAMP LIGHTS; OW SWITCH NOR.
5. SWITCHES 1, 2, 3, 4 TST: TST LAMP LIGHTS. 6. MON SWITCH REC
7. OW SWITCH TST: ADJUST REC GAIN OW UNTIL TST LAMP LIGHTS.
8. OW SWITCH NOR: SWITCHES 1, 2, 3, 4 TST: ADJUST EACH REC GAIN
1, 2, 3, 4 UNTIL TST LAMP LIGHTS. 9. SWITCH OFF.
OPERATION AND LINE UP: 1. CONNECT WIRES FROM LOOPS, LINES, POWER.
2. PILOT SWITCH A 4W FOR 4-WIRE LINE; A 2W FOR 2-WIRE LINE.
3. EOL SWITCH AT 1 FOR RADIO; AT 2 FOR 2-WIRE LINE OR 4-WIRE MEDIUM LENGTH LINE; AT 3 FOR LONG 4-WIRE LINE. 4. SWITCH ON.
5. OW SWITCH RING: TALK TO OTHER END; ONE PILOT SWITCH B.
6. BOTH MON SWITCHES REC. 7. BOTH OW SWITCHES TST: ADJUST REC GAIN OW UNTIL TST LAMP LIGHTS; BOTH ENDS OW SWITCHES TALK.
8. BOTH ENDS SWITCHES 1, 2, 3, 4 TST; ADJUST EACH REC GAIN 1, 2, 3, 4 UNTIL TST LAMP LIGHTS. 9. ALL SWITCHES 1, 2, 3, 4 2W OR 4W AS REQUIRED. 10. OW SWITCH NOR; MON SWITCH TO MONITOR CHANNELS.
SPARES

SCIENTIFIC SATELLITES & SATELLITE SUBSYSTEMS

RCA Victor Company, Ltd., Montreal, as management contractor for International Satellite for Ionospheric Studies (ISIS) program, has designed, in the course of its work on the Alouette I, Alouette II and ISIS "A" ionospheric satellites, a series of equipments which can find application, with slight modification, in other international space programs. The aerospace business is such that each spacecraft requires its own "custom" equipment; however, the equipment is usually slightly modified versions of a few generic types.

Units and equipments developed by Space Systems of RCA Victor, and which could be used in other space projects, are:

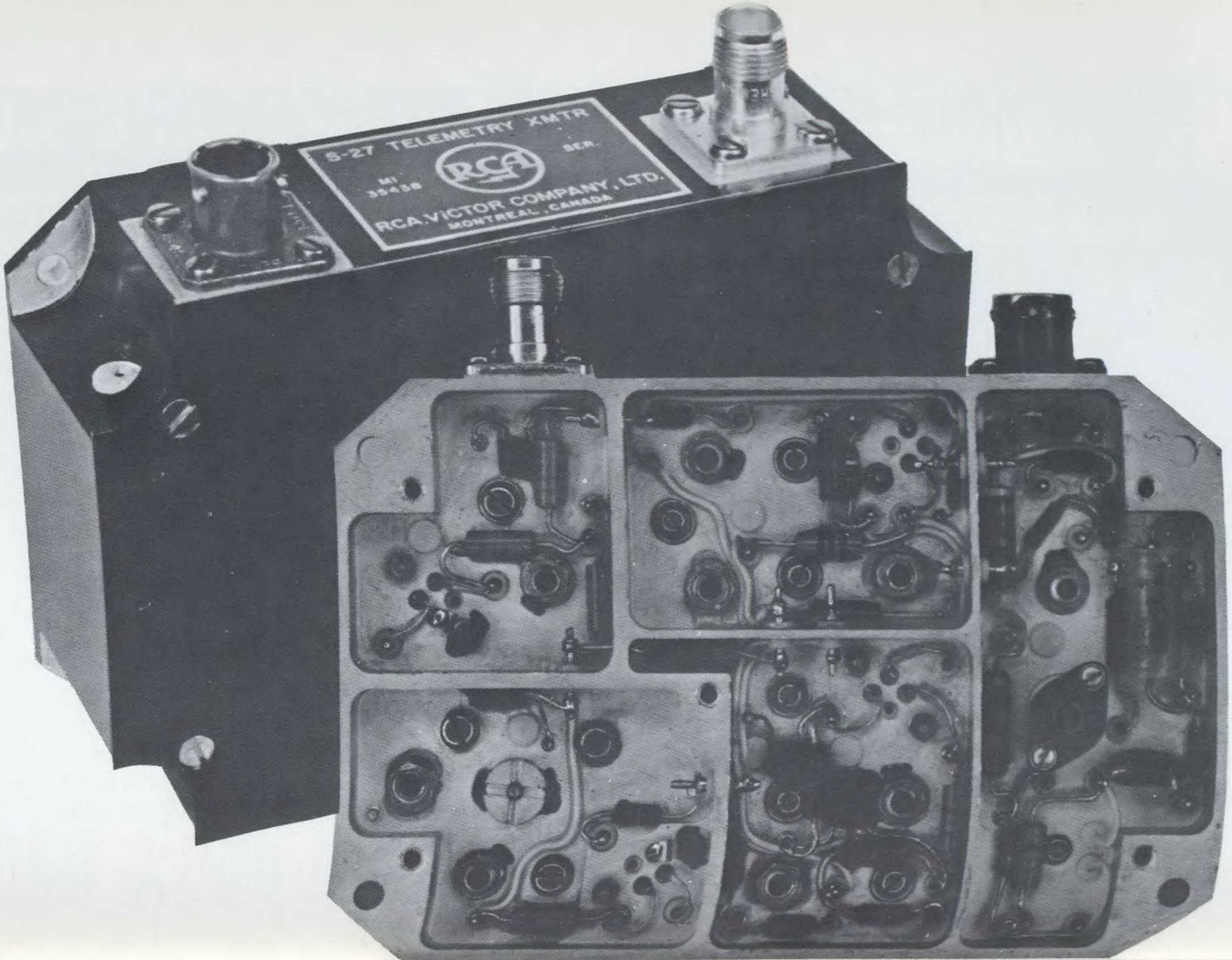
1. F.M. Telemetry Transmitters: 4 watts R.F. output at 136 Mc/s with true F.M. Modulation, d.c. to 50 Kc/s, and d.c. to r.f. power efficiency of close to 50% and weighing 1 lb. (.45 Kg.)
2. P.M. Telemetry Transmitters: 2 watts or 4 watts output at 136 Mc/s and weight of 1.25 lbs. (.58 Kg.)
3. Tracking Beacon Transmitters: 100 milliwatts R.F. output at 136 Mc/s and weighing 0.4 lbs. (.18 Kg.)
4. F.M. and P.M. Telemetry Transmitters: 4 watts R.F. output at 400 Mc/s and weight of 1.5 lbs. (.68 Kg.)
5. Diplexers and Duplexers: strip line designs for operation in the 136 Mc/s and 400 Mc/s telemetry bands and 123 Mc/s and 148 Mc/s command frequency bands. These units have characteristics far superior (in excess of 20 dbs) to anything available on the market.
6. Antennas: Turnstile, whip, quadraloop and annular slot antennas for operation at 123 Mc/s, 136 Mc/s, 148 Mc/s, and 400 Mc/s spacecraft assigned frequencies.
7. Pulse Code Modulation Encoders for encoding analog, serial and parallel digital.
8. Digital and Signals Analog Commutators.

   Combinations of items 7. and 8. could be used to sample (time division multiplex) a large number of digital or analog signals and convert to a single pulse code modulated output.
9. Digital Clocks (time generators).
10. Magnetic Stores.
11. DC to DC Converters: high reliability converters with conversion efficiencies up to 80% at 25 watts output and weighing 1.5 lbs. (.68 Kg)
12. Low — level Magnetic Amplifiers.

Detailed specification data sheets on the above units are available from RCA Victor in Montreal.

In the satellite environment, RCA Victor has furnished equipment for the following satellite programs:

RELAY I	Beacon, wideband transponder, sat. simulator
RELAY II	Beacon, wideband transponder, sat. simulator
Alouette I	FM telemetry transmitter
Alouette II	Manufacture of most of subsystems
Explorer S-48	FM telemetry transmitter
Pegasus (Micrometeoroid)	FM telemetry transmitter
ISIS "A"	systems management contractor


S-27 TELEMETRY XMTR
SER.
MI
35436
RCA
RCA VICTOR COMPANY, LTD.
MONTREAL, CANADA

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-Cossor Electronics.

The Transmitter produces a binary-coded pulse train of 30KW p.e.p., 1, 2 or 3 milliseconds 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.

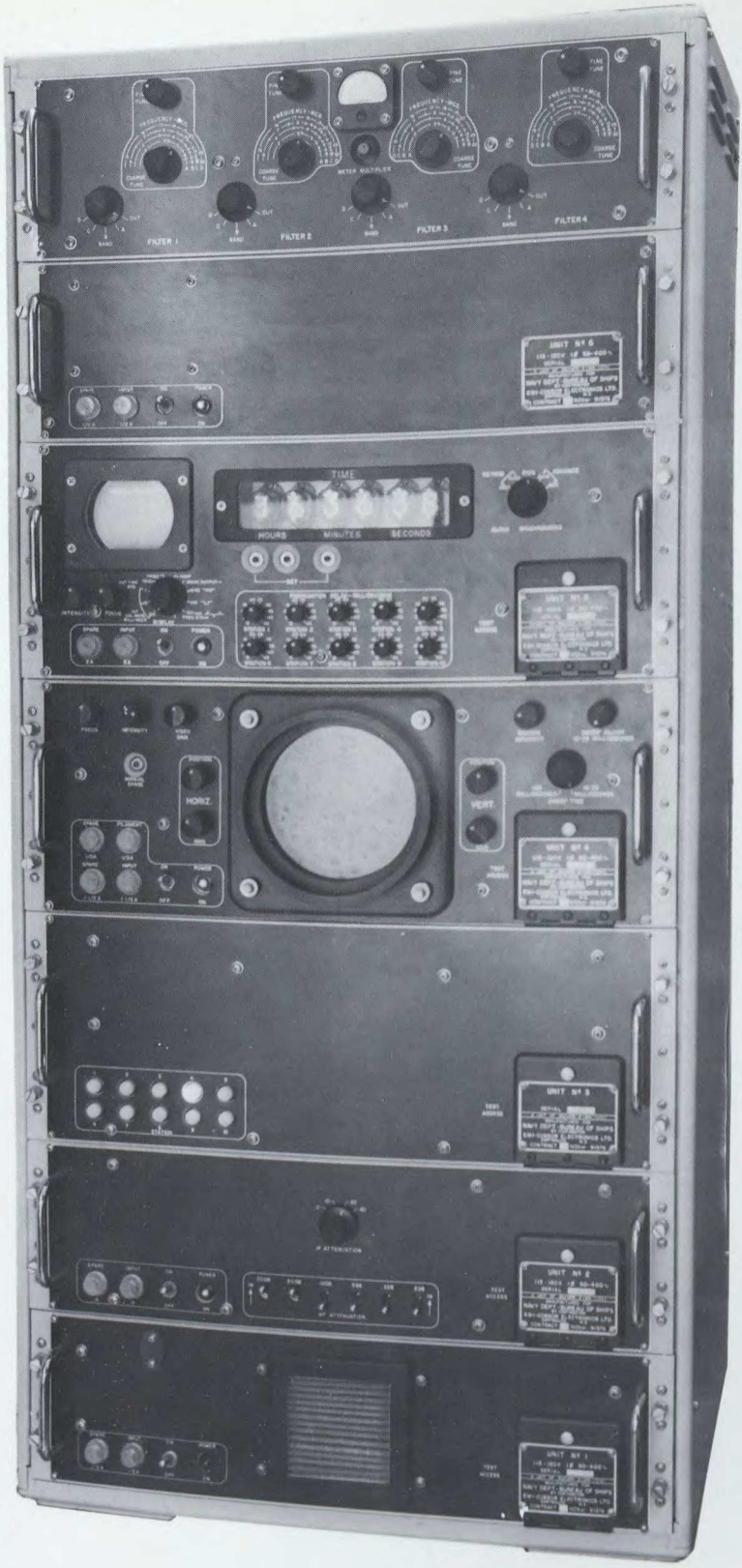
Using the pulse-compression technique the power gain by a 30-bit pulse train over a single pulse is 14.8db, while retaining the resolution of a single pulse. The receiver display provides instantaneous information on the state of the Ionosphere as an Ionogram on a c.r.t. display. The Ionogram has an *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 Raptar 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	
Frequency response:	Output power within 1 db below and 2 db above nominal.
Output power:	30 KW p.e.p.
Duty cycle:	6 per cent max.
PRF:	20 pulse trains per second.
Pulse train:	2 at each frequency per transmission cycle, each consisting of 10, 20 or 30 pulses.
Pulses:	100 μ Sec. duration, phase reversal modulated, Gaussian profile.
Stability:	One part in 10^9 per day.
Accuracy:	One part in 10^6.
Power Supply variation:	10 per cent change causes less than one part in 10^9 frequency change.
Spurious and harmonic levels:	50 db minimum below the output signal level.
RECEIVER	
Sensitivity:	3 μ V for $\frac{S+N}{N}$ ratio of 20 db.
Overload recovery time:	Less than 500 μ Sec.
Selectivity—	
adjacent channel rejection:	20 db minimum
beyond adjacent channel rejection:	60 db minimum
POWER SUPPLIES REQUIRED	
Transmitter:	208V 3 phase 50 or 60 c/s.
Receiver:	115V or 120V at 2 amps single phase 50 to 400 c/s.
Frequency coverage:	2 Mc/s to 32 Mc/s by eighty spot frequencies.


FILTER 1
FILTER 2
FILTER 3
FILTER 4
METER MULTIPLIER
TIME
HOURS
MINUTES
SECONDS
HORIZ.
VERT.
UNIT Nº 6
UNIT Nº 5
UNIT Nº 3
UNIT Nº 2
UNIT Nº 1

AIRBORNE DIGITAL COMPUTER – AN/UYK-501

Of particular significance is the general purpose digital computer, designated AN/UYK-501, designed and developed by Computing Devices of Canada Limited.

It incorporates three features offering distinct advantages: microprogramming, fast interrupt and modular expansibility.

The advanced microprogramming concept of the UYK-501 provides a large variety of commands, giving a total of 110 major commands. Special commands in the repertoire have been based on practical experience of integrating this computer into specific military systems.

Fast interrupt is achieved on 64 independent levels, each with eight working registers without incurring a software penalty. When an interrupt occurs, control is switched to the appropriate set of registers allowing the new program to be executed immediately. Control reverts to the previous set of working registers, with no time lost in switching from one program level to another.

Modular design allows expansion of both arithmetic and memory capacity, and intertalk between the arithmetical and memory units, offering extremely high computing and data handling capability at low cost.

Operating speeds: addition and subtraction, 8 microseconds; multiplication 110, division 118 microseconds. Memory access time, 1 microsecond, read-write cycle 2 microseconds; capacity 4096 words (25 bits), expansible to 32,768 words. Average input/output data handling rate is 135,000 words per second.

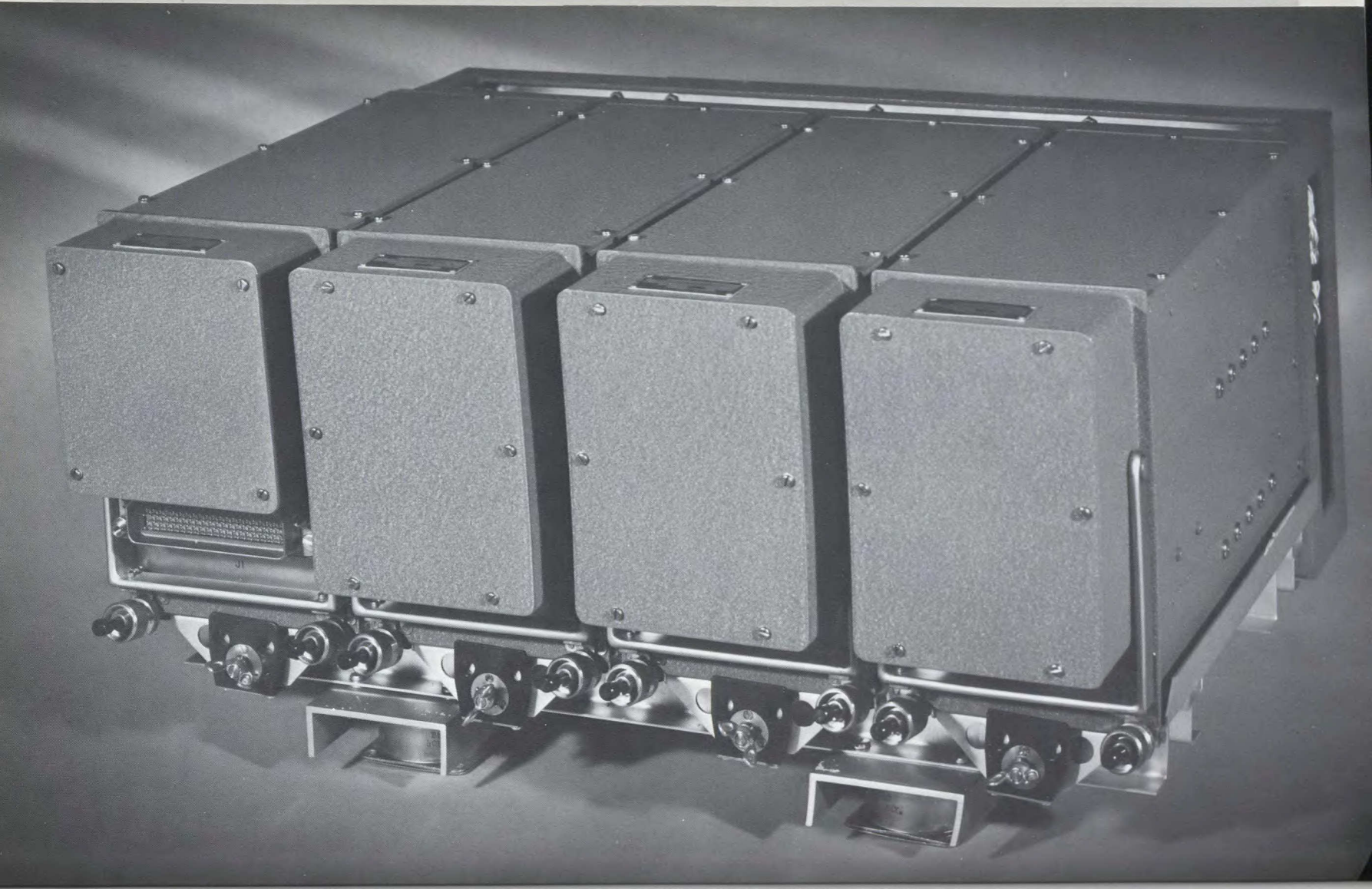
Computer units are housed in short ½ ATR box which measures 4.875 inches (12.38 cm) x 7.625 inches (19.37 cm) x 12.56 inches (31.9 cm); volume approx. 470 cubic in. (7690 cc). Individual weights are: arithmetic unit, 18.2 lbs (8.26 kg), memory unit 20.2 lbs (9.26 kg). A mounting rack to hold the basic computer plus two extension memories weighs approximately 22 lbs (9.98 kg).

The computer will operate from external supplies of 115 volts, 400 cycle, 3-phase, or 24 volts DC. Total power consumption for the basic computer is 240 watts (mean); this will increase by 42 watts with each extension memory unit added.

The computer has been interfaced with a number of standard peripheral units: typewriters, punched cards, paper tape readers and punches, and high speed line printers.

Test equipment includes a circuit card test set, used with a programmed test tape to locate any fault on an individual circuit card; and a computer test set, which is used with diagnostic test programs to locate and identify faults within the computer. The test set also provides the means for loading and displaying the contents of the computer registers and memory locations.

Systems have already been delivered to the United States Department of Defence and other computers now being produced have been sold in Canada and abroad.



DETECTING SET, RADAR "MICRADET"

"Micradet" designed and produced by Electronics and Defence Products Department of Canadian General Electric detects and localizes pulse modulated microwave sources such as radar and jamming transmitters within the normal direct line of sight limitations.

Receiver is a crystal video type, operating on a frequency coverage of 2 to 40 Gc/s. It has three parallel antennas, two horns and one spiral. The range of the receiver is a function of the illuminated radar. Under line of sight conditions, the receiver can detect radar AN/PPS-4 at ranges in excess of 10,000 meters. At extreme ranges, the "Field of View" varies from approximately 1600 mils (90°) at the low end of the frequency range, to about 500 mils (28°) at 40 Gc/s. The signal indication is by audio tone in the head set. The head set is a single earphone with detachable frame and flexible twin cord. This model has a count down feature to allow operator detection of high prf radars.

The unit is small, hand carried, and fits easily into the pocket when not in use. The shelf life of the basic equipment is indefinite while battery shelf life is given as five (5) years. Working life for the basic equipment is indefinite and unit field servicing is possible without recourse to special tools. Battery working life is twelve (12) hours.

"Micradet" was produced using Canadian Army CA-G100 as the basic list specification thus ensuring a rugged and waterproof equipment.

CGE having maintained an Active Research & Development organization has a most impressive group of equipments which they have developed and produced for either the U.S. or Canadian forces. This group includes: AN/FPS-24 Oscillator-Driver; AN/FRC-47 Intermediate Power Amplifier; Radar Sets AN/FPS6, AN/FPS-507, AN/APG-30 and AN/APG-501; AN/ASG-501 Armament Control System and associated Ground Support Equipment; Radio Sets AN/PRC-502 & AN/PRC-503 as well as the AN/ULM-501 Countermeasures Signals Simulator.

This same facility has also produced the AM Radiotelephone Type CRC/FRT-1006; 50 Watt VHF Transmitter Type CRC/CTC-04; 1 Kilowatt VHF Transmitter Type CG6601 and Radar Video Integrator Type CRC-RVE-01 equipments for the Department of Transport, Canada.

The Countermeasures Signals Simulator AN/ULM-501 is a portable test set which generates an output signal of the swept jamming type and is currently in operational use with the USAF and RCAF. The Simulator's output, which covers a wide frequency range, is a microwave cw signal, frequency modulated by noise. The Simulator is used for determining and evaluating the ECCM performance of Radar Receiving Systems that are designed to combat frequency modulated by noise signal jamming. This equipment was designed by Canadian Arsenals and was further developed, production-engineered and manufactured by the Electronic and Defence Products Department of Canadian General Electric.

In the commercial market, Canadian General Electric has developed and/or manufactured products in the following categories: radio and television broadcast equipment, mobile radio communication equipment, medical electronics equipment, industrial analog computer equipment.

Current applied research activity is in the broad field of signal processing with considerable emphasis on defence problems in radar and sonar systems. A marked capability exists in the electronic warfare field resulting from several contracts received from U.S. and Canadian defence agencies.

MICRADET

AN/ULM-501

PRINTED CIRCUIT BOARDS & 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.

MEM TO PLANE
READOUT R-Θ
MEM
TO
WIND UNIT
DISTANCE TO GO
DISTANCE
FT X100
FT X10
RANGE
ADVANCE
MS
BIT
OFF
LAYDOWN
DIVE LAYDOWN
DIVE TOSS
TGT FIND OFFSET BOMB
AGM 45
DRAG
COEFFICIENT
BUG SLEW
MASTER SLEW
SLEW
SCALE
REL
DATA
XMIT
SET
CIR
E1
E2
ACC
STBY
RUN
OFF
MAN
RAY
INCH
CMS.

GAS LASER DEVELOPMENTS

The National Research Council, as a natural function in the Canadian research and development field, commenced work on Lasers in early 1960. The existence of the instruments discussed in this article is largely due to the work carried out by the Interferometric Section of the Council. Another of the basic functions of NRC is to further ensure that a practical and capable source, in Canadian industry, is found for product development and manufacture.

The participation of Ernst Leitz Canada Limited in this programme, which encompassed development, product engineering and production, has a natural background in the following points:

(a) Manufacturing at Ernst Leitz involving optical and fine mechanical instruments, continually demands precision of the highest calibre in production and quality control.

(b) The normal product line of the company is an ideal base for which the Laser can serve as an accessory.

(c) The equipment of the Plant is ideally designed and the personnel have the necessary background for the further development and manufacture of Lasers.

In the field of light sources Gas Lasers are revolutionary, for as known, they emit truly monochromatic light to the highest degree of coherence. This fact has led to the development of the Canadian instrument for a number of practical applications:

- Before the development of Gas Lasers conventional monochromatic light sources had a relatively short length of coherence. This imposed great restrictions to interferometric measurements, in fact, some were even impossible. The Gas Laser has now obviated these restrictions for true coherence is now obtainable over many miles. It is expected that the Gas Laser will become a standard light source for interferometers.
- As it is possible to produce a single-line frequency in a stabilized manner, the Gas Laser has also found application in metrology.
- In physical optics, where it was hitherto impossible to demonstrate many phenomena, the Laser beam is a tool to broaden the understanding of optics and therby broaden the education and background of our future scientists by now physically portraying these phenomena. At the same time the properties of geometrical optics can now be clearly demonstrated to the students of science, engineering, etc., by the employ of this new instrument in a classroom role.
- Active research will continue in the telecommunication field to ensure that the Laser leaves the laboratory at the earliest possible moment and becomes a practical device.
- In aircraft manufacture, the manufacture and erection of massive but precise mechanical equipment, ship building and turbine installations, difficult alignments are a normal requirement. To telescopes and collimators, which have been the primary tools for precision alignments, the Laser has now been added and opens up new possibilities in this field.
- Present development of Lasers would indicate that security measures devices will see an increase in range and a decrease in bulk of equipment over presently employed mechanical or electrical mechanisms.

The picture on the facing page depicts the Leitz Helium-Neon Gas Laser which emits light at 6,328 Å.


LASER
STAND-BY
OFF
ON
ERNST LEITZ CANADA LTD
EXCITER

ELECTRONIC SIGNAL PROCESSING RESEARCH PROGRAM

Canadian General Electric has engaged in a wide variety of design, development and manufacture of military electronic equipment since 1945. In late 1962, this company initiated a major program of applied research in the field of Electronic Signal Processing. The program, to be fully established during a five year period, is jointly sponsored by the Defence Research Board of the Department of National Defence and Canadian General Electric.

The objective of the program is to undertake studies to improve the performance of electric systems and, specifically, to pursue a long term program relating the latest information theory to the design of optimum pulse codes (waveform design). The long term objective is to maximize the information received by given radar or similar obstacle location systems in non-ideal environments (clutter).

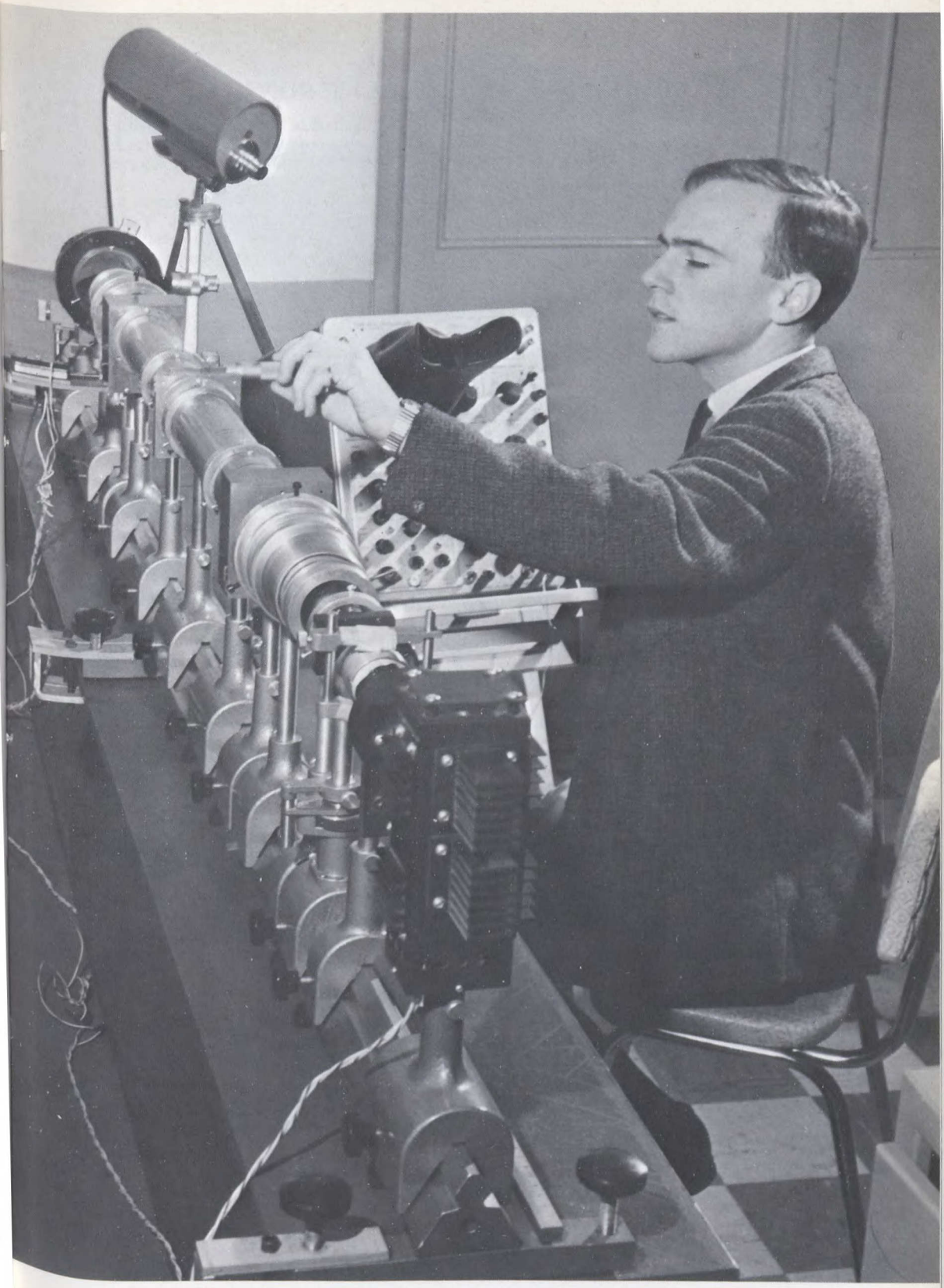
The research relates to systems working in space, atmospheric and undersea media, and the theoretical solutions obtained from the research are verified on a special computer involving a general coded matched filter which has been designed and fabricated as part of the program. The information derived is not only applicable to new or future designs but is also used to design "black box" retrofit modifications to enhance the signal processing capability of existing radar and sonar equipment. Specific research activities are as follows:

Systems Analysis This involves the application of information theory, filter theory and waveform design to signal processing problems; studies of coded waveform implementation techniques in both unclassified and classified programs and studies in obstacle location systems as foreseen for existing and future environments. *Non-Ideal Environments* Analyses and experimental studies employing a general coded matched filter are made on the effects of non-ideal environments on waveform design and application as, for example, the effects of non-ideal transmission media; to assess and recommend the suitability of specific classes of waveforms (different forms of codes) and system concepts operating under such conditions. *Synthesis* Modern methods of applied mathematics are used in conjunction with information from the studies outlined above to investigate and design waveforms or classes of waveforms which are particularly applicable to such special situations, thus providing guidelines for experimental testing. *Experimental Techniques* Experimental equipment with which the synthesis activity can be supplemented has been constructed and results experimentally verified. This involves general coded matched filters using analog and digital techniques. Digital computer programming and electro-optical systems are also used for simulation. *Related Antenna Studies* Inherent in the optimization of radar, communication and sonar signal processing systems and the application of coded waveforms, is the requirement for radically new approaches to antenna and transducer configurations (phased arrays, synthetic apertures, etc.). As the design of the waveform generation equipment and the optimum radiating structure is inseparable, antenna theory studies are pursued in parallel with the activity outlined above.

The research program as outlined above is not only directed at improving existing systems, but at increasing skills to meet the requirements of the future technology.

In recent years, Canadian General Electric has considerably expanded its military research and development program. In 1964, it was selected by the Canadian Department of Defence Production to undertake a Quick Reaction Engineering development program for the Canadian Armed Services to establish the feasibility of their preliminary design objectives. This company has also undertaken an analytical investigation of the performance of the Canadian air defence system against a postulated jamming threat. The company possesses special skills in the field of electronic warfare and has conducted studies for both Canadian and U.S. military services.

Representative of the military electronic hardware which Canadian General Electric has produced in the period since 1945 are Airborne Fire Control Systems, Search and Height Finding Radars, Communication Systems, ECM and ECCM Equipment, Nuclear Explosion Detection Equipment, Missile Tracking Control Equipment, and considerable sub-contract production associated with various defence systems.



OPTICAL MATCHED FILTER which is used to develop advanced methods of coding radar and sonar signals and thus reach maximum system performance.

MILLIMETER REFLEX KLYSTRONS

In 1959, Varian Associates of Canada Ltd. initiated the development of a 70 Gc reflex klystron. At that time, the millimeter radio spectrum, 30 - 300 Gc 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 range 50 - 80 Gc.

In 1963, it was becoming apparent that the laser was something of a 'will-o-the-wisp' as far as practical usage was concerned, and there gradually occurred a reassessment of the practical value of the millimeter spectrum. In late 1963 and 1964, a dramatic quickening of interest in millimeter hardware took place with a resulting upsurge in demand for Varian of Canada's new klystrons.

Spurred on by this encouragement, Varian of Canada has completed the developed three main series of reflex klystrons covering the millimeter spectrum from 50 Gc to 170 Gc as standard catalogue items. Laboratory prototype tubes have been built as high as 210 Gc, and development is being continued to reach higher frequencies still.

These reflex klystrons have gained wide acceptance throughout the electronic community and are being used on nearly every important research or development project requiring a millimeter frequency klystron in North America. Three series of klystrons are now offered as standard catalogue items, all of which are based on the same basic tube design, but which feature optimized performance of three major parameters; power, tunability and low input.

High Power Series, 50 - 170 Gc

This series of tubes, each of which mechanically tunes 2 Gc and features guaranteed power outputs unsurpassed by any other reflex klystron, guarantees minimum power of 350 mw at 50 Gc at one end of the series and 75 mw at 170 Gc at the other end.

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 Wide Tuning Series, 50 - 170 Gc

The tubes in this series are each mechanically tunable over 6 Gc. Tubes above 110 Gc will tune 8 Gc. Featuring somewhat lower guaranteed power, (150 mw at 50 Gc, 50 mw at 170 Gc), these tubes find application where high power is required but tunability cannot be sacrificed.

Low Power Series, 50 - 170 Gc

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 input requirements. These tubes tune 6 Gc, give 10 milliwatts at reduced beam voltage, and find application in radiometers, radar receivers and communication receivers.

The tubes in all series will survive 50 g shock and are rugged enough to be used in airborne and missile applications.

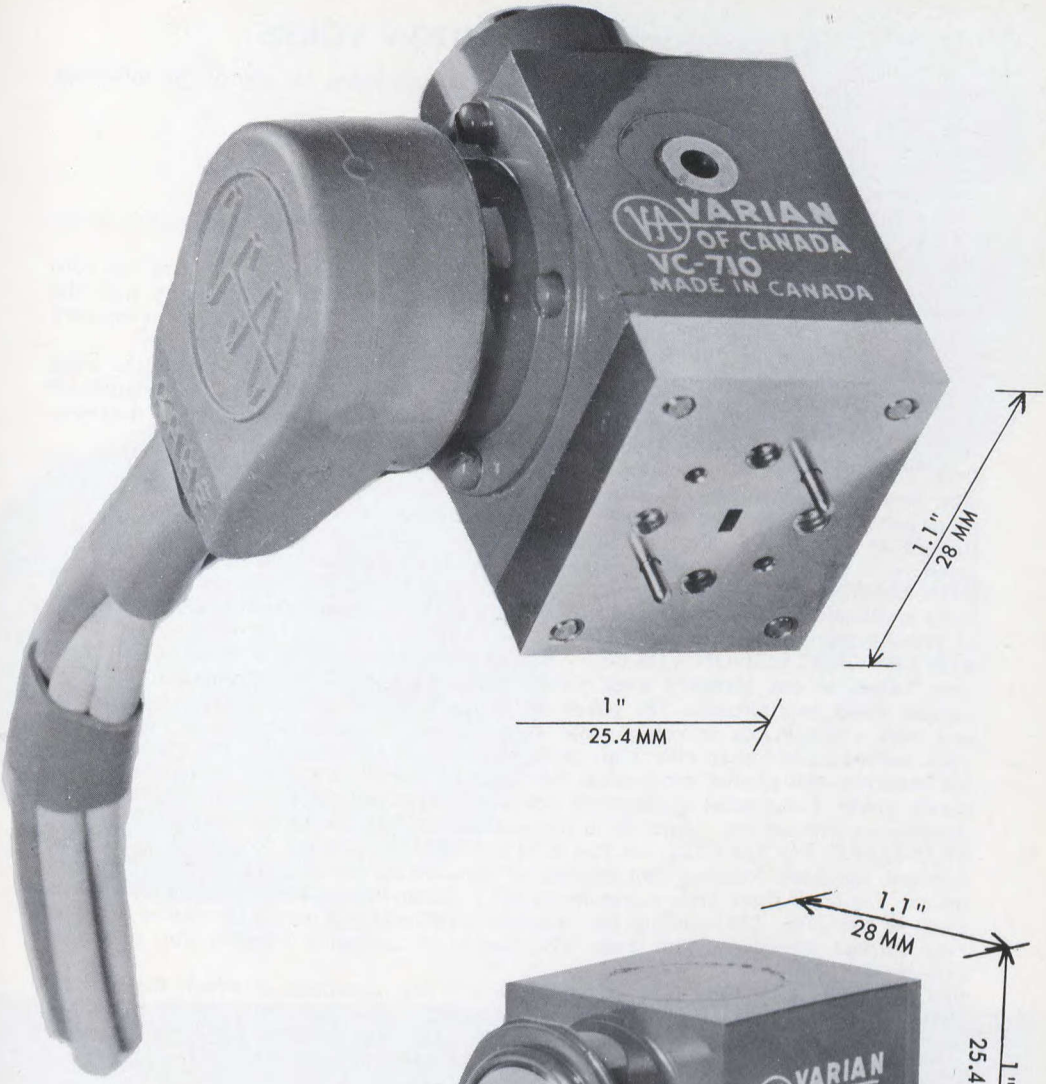
Cooling of these tubes may be accomplished by forced air cooling. This method is quite suitable for a multitude of applications.

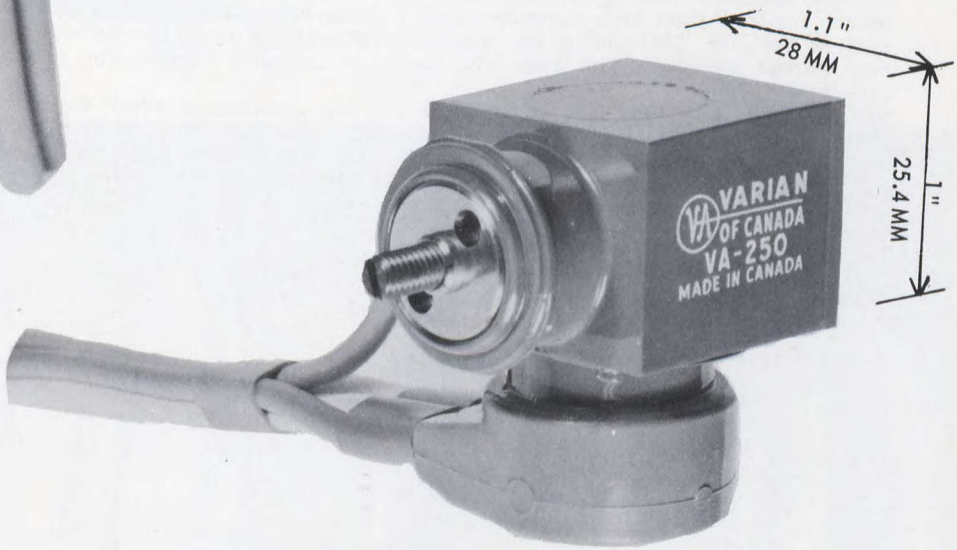
Where a high degree of frequency stability is required, the output flange of the tube can easily be replaced by a water cooled heat sink, or alternatively, the tube may be completely immersed in a temperature stabilizing coolant such as FC75 fluorocarbon.

The potential usefulness of millimeter wavelengths is only now becoming apparent.

New techniques needed by our aerospace programmes, by defence and by basic research, ensure that the millimeter spectrum will not be left as a kind of 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. has also developed and manufactures a wide range of reflex klystrons at other frequencies — power klystrons, magnetrons, backward wave oscillators and travelling wave tubes.


VARIAN
OF CANADA
VC-710
MADE IN CANADA
1.1"
28 MM
1"
25.4 MM


1.1"
28 MM
25.4 MM
1"
VARIAN
OF CANADA
VA-250
MADE IN CANADA

PRECISION DEFLECTION YOKES

E.M.I. Cossor is prepared to design and manufacture yokes for any of the following wide range of applications:

- transistor drive
- extra-wide-angle deflection with p.m. correction
- dynamic focusing systems
- compound or dual-deflection systems

Their engineers are often called upon to design and produce deflection yokes to extremely close tolerances.

YOKE CORES — All yoke parameters depend strongly on the properties of the core material. Sensitivity and response, in particular, require high permeability and the absence of phenomena causing back magnetomotive forces. Hysteresis causes a memory effect which should be as small as possible for non-repetitive scan applications.

MUMETAL CORES — Mumetal cores exhibit the highest sensitivity and the most controllable geometry, resulting in a very precise display, but there is a significant memory and there are slow approach phenomena representable by a back magnetomotive force of 0.4% decaying linearly in 100 microseconds.

COSCANITE CORES — Coscanite cores are not as sensitive as mumetal or ferrite, but they have been developed for negligible memory and zero slow approach. The geometrical performance is good and the material is extremely flexible in application.

FERRITE CORES — Ferrite cores are nearly as sensitive as mumetal, but their geometry is not quite as good and their memory is of the same order as mumetal.

NON-MAGNETIC CORES — Non-magnetic cores are of restricted usefulness, but in some applications such as twin yokes working into the same deflection space, the absence of ferromagnetic materials is desirable.

ROTARY DEFLECTION YOKES — Rotary yokes are available with the same inductance values as our standard fixed yokes. Other values will be prepared to suit customers' exact requirements. The yokes are available for single-ended or push-pull drive, and with a single axis or orthongonal axes. Company standardization of housing and yoke outline enable us to offer high-quality prototypes economically. The environmental performance and precise mechanical tolerance of our fixed yokes is duplicated in our rotary yokes. For special applications yokes can be manufactured with reduced overall dimensions without any reduction in the essential performance characteristics.

STANDARD FOCUS COIL — The E.M.I. COSSOR standard focus coil is a rugged, efficient, magnetic focusing unit capable of constant operation in the toughest environments. The coil's three main components are a silicon-impregnated winding and the two parts of the case. The winding has attached terminals and may be removed from the case without unsoldering the leads. The case is of machined Swedish iron of a particularly high quality.

SHORT DEFLECTION YOKES — There are two situations in which the Standard Yoke will not provide the performances required.

(a) Where the mechanical arrangements on the tube neck, to allow for focus coil location or for other reasons, demand a shorter yoke body.

(b) Where the deflection angle required is greater than 60 degrees (±30°).

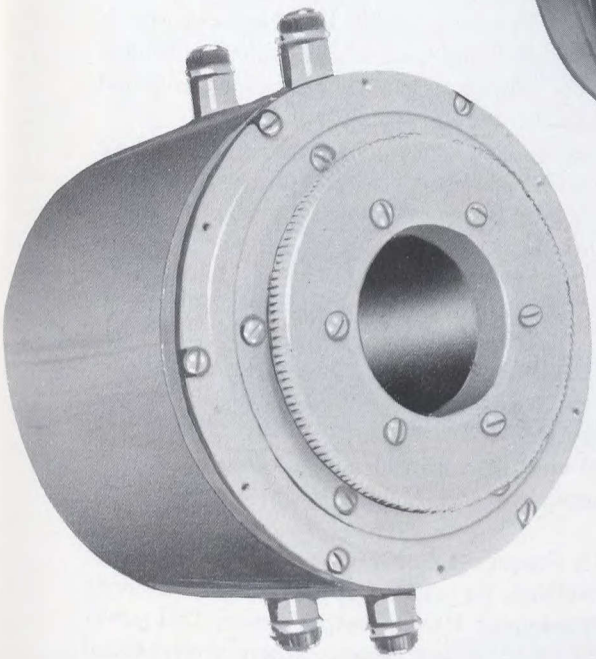
Our new short yoke specifications include:—

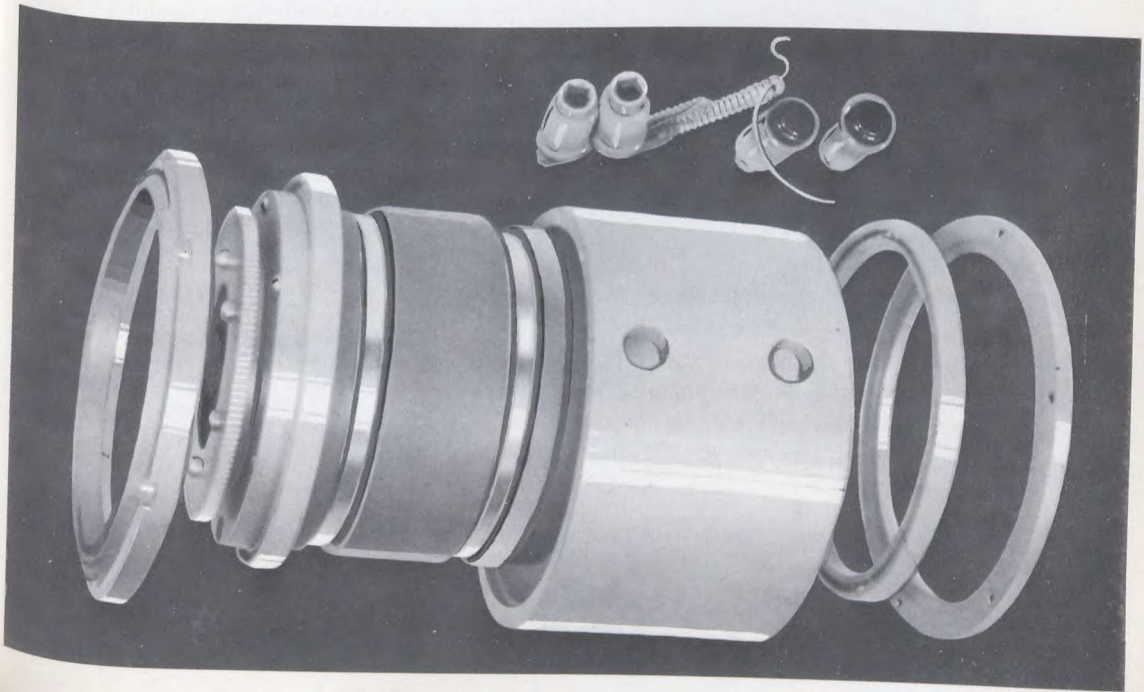
Deflection angle — up to 75° (depending on cathode ray tube).

Sensitivity — 15% less than standard yokes for the same value of inductance.

Other properties substantially unaltered.


E.M.I.-COSSOR
COMPONENTS DIVISION
LOW INERTIA
DEFLECTION YOKE





SOLID STATE POWER DEVICES

De Havilland Aircraft of Canada Ltd. (SPAR Division) has specialized in the design, development and quality production of advanced military grade solid state power supplies. Electrical ratings range from a few watts to kilowatts of quality regulated output powers and include both static inverters and static frequency changers.

Typical units produced (pictured on the right) are: the 2.0 kw Solid State Power Converter Type SV-34 and the SPS 44 Power Frequency Converter.

The SV-34 is a solid-state, internal fan cooled electrical power converter supplying 3-phase 400 cps sine wave power at levels up to 2.0 kw. The converter is designed for 400 cps equipment calibration and checkout where primary available power is 60 cps. Advantages are a precision output waveform of extreme purity and output frequencies selectable in 1 cps steps between 380 and 420 cps.

This converter is of all-aluminum construction, with a front panel door which swings out to permit easy access to internal circuiting. All circuits are fused and output circuits are metered. The unit weighs 355 pounds (161 kg) and measures 37″ x 14″ x 30″ (92 x 35.6 x 76.2 cm). This can be reduced where requirement of shock to MIL. S.901B may be waived.

Environmental factors are: Shock to MIL S-901B, Vibration MIL. STD. 167. Type 1, Temperature 10°C to 50°C.

Scope of applications include: marine, laboratory, production testing, universities and schools, military and aircraft maintenance depots and level two and three ground support of military electronic systems.

Input power 440 V line-to-line 60 cps. three-wire Voltage variation ± 5% Frequency variation on ± 3% . . . Output power level 2.0 KVA at 0.9 pf lagging. Voltage 115/200 V. 4 wire.

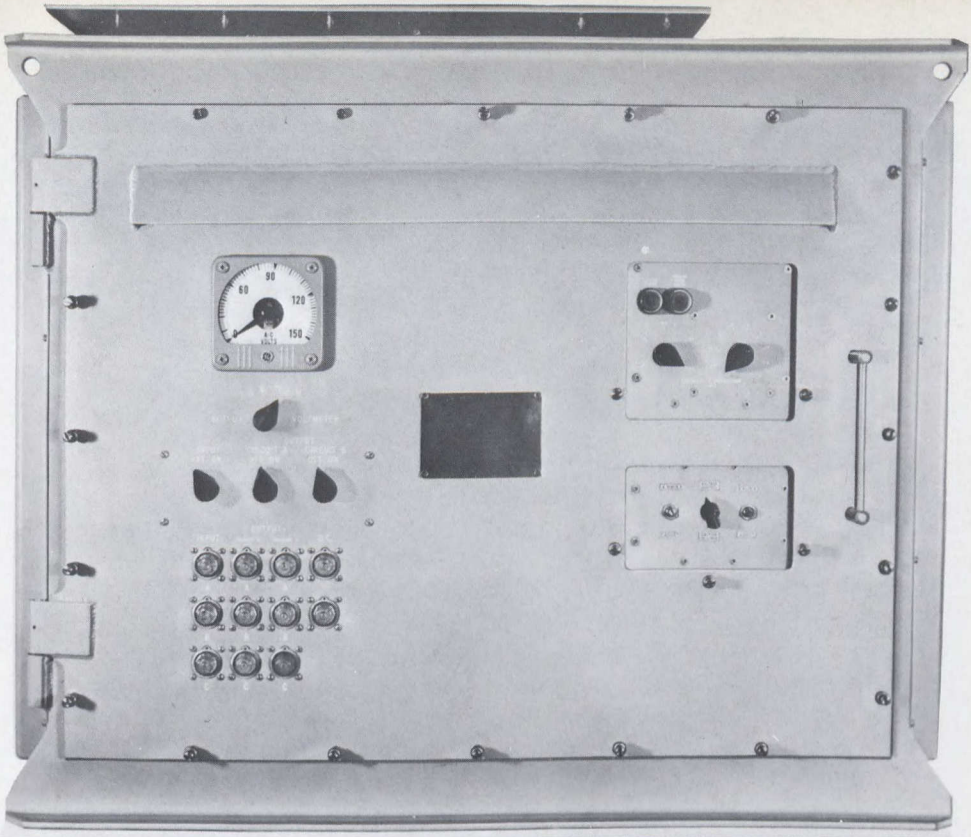
The SPS 44 is a solid state 2.5 KVA Frequency Converter designed to meet the needs for aircraft electrical power conversion. Its primary application is converting frequency-wild primary input power to regulated 400 cps output power. This power converter could typically be used in aircraft power systems where conventional engine driven alternators are directly coupled to the accessory pad, but a medium power source with constant frequency is necessary for frequency sensitive electrical equipment.

This unit weighs 33 pounds (15 kg) and measures 19.5″ x 7.5″ x 7.5″ (49.5 x 19.1 x 19.1 cm) and is forced-air cooled by an internal fan. Input power 100-120 Volt runs line-to-neutral, 300-550 cps, 3 phase, 4 wire. Output: 112.5-118 volts rms line-to-neutral, 400 cps ± 2%, 3 phase, 4 wire.

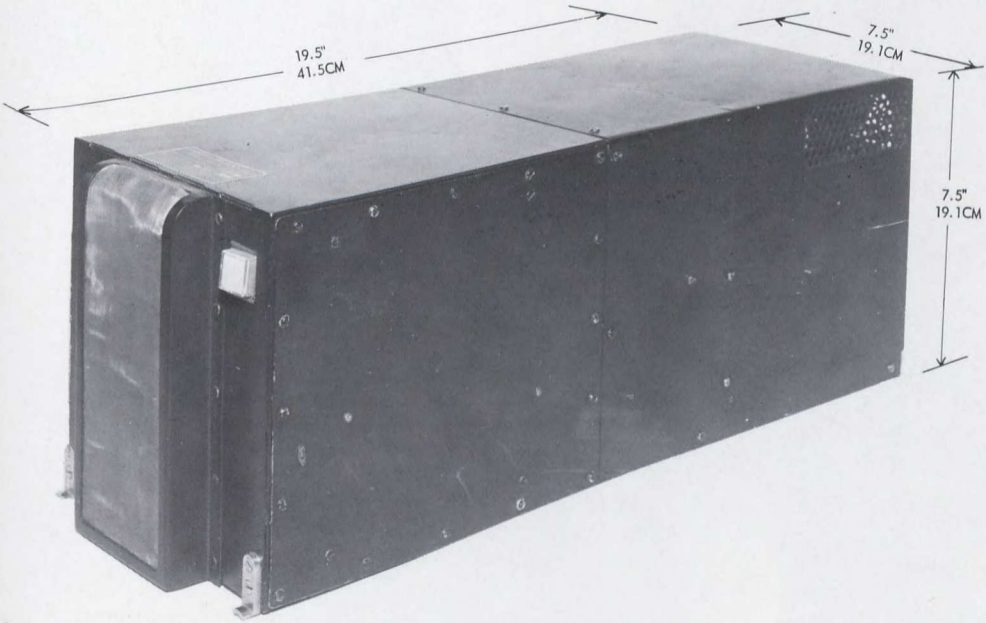
Environmental factors are: Shock; para 3.2.21.6 of MIL-E-5272 procedure 11 EM1; MIL 1-6181 Vibration curve 1 of MIL-E-5400. Temperature: — 54°C to 71°C, 85°C for 5 minutes. Altitude 36,000 feet (1098 m): Salt spray MIL–E–5272 procedure 1, Sand & dust MIL–E–5272 procedure 1.

The SPS 44 is designed for aircraft, vehicular and marine applications.

These products represent some of the creative outgrowths of the SPAR Power Conversion Group. Current development and production in static inverters and frequency changers include new designs and modular concepts for the military aerospace industry.



The SV-34 is a Solid State, Internal Fan-Cooled Electrical Power Converter Supplying 3-Phase 400 CPS.



The SPS 44 is a Solid State 2.5 KVA Frequency Converter.

POWER SUPPLY PP-5143/PRC

The Power Supply PP-5143/PRC is a voltage regulated solid state power supply designed as a power source in lieu of batteries for bench testing man carried portable military communications transceivers such as the PRC-8, PRC-9, PRC-10, PRC-509, PRC-510, CPRC-26 and the new PRC-25 equipments. In addition it will serve as a very useful general laboratory or workshop power source.

The unit consists of four independent adjustable regulated supplies capable of the following outputs:

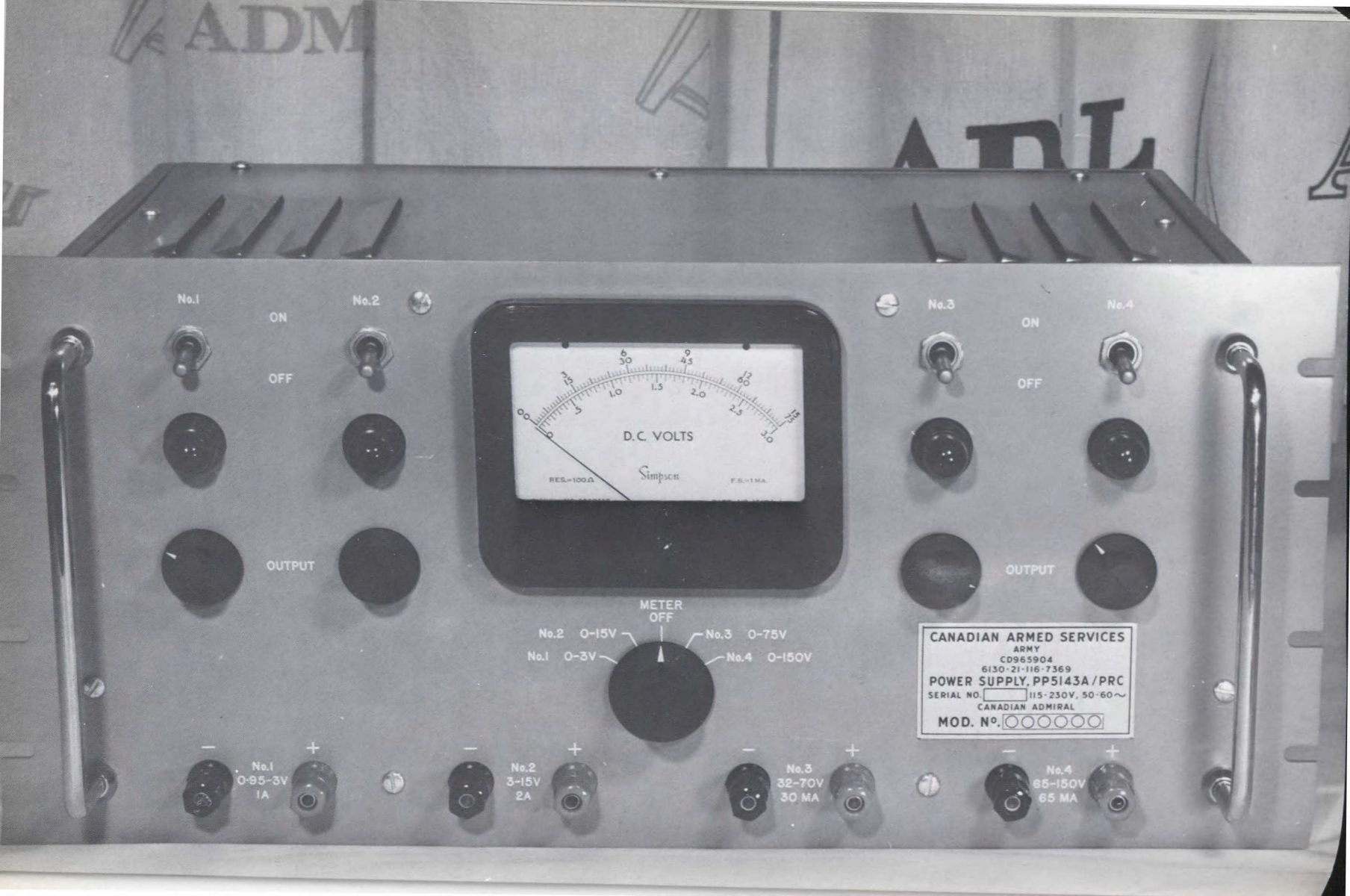
No. 1 — Adjustable from .95v to 3.0v at 1.0 amp maximum
No. 2 — Adjustable from 3.0v to 15.0v at 2.0 amp maximum
No. 3 — Adjustable from 32.0v to 70.0v at 30 ma maximum
No. 4 — Adjustable from 65.0v to 150v at 60 ma maximum

A meter selector switch connects the front panel meter to monitor the output of each supply. Each supply has mounted on the front panel an individual ON/OFF switch, a voltage adjust control and a pair of output terminals. Each supply output is available at a barrier terminal strip located at the rear of the instrument. In addition output cables can be supplied terminated in the appropriate connectors for direct connection with the above-mentioned communications equipment.

Each of the four supplies is protected from overload by an automatic electronic cut-out designed to trigger at about 150% of rated output current.

The unit is powered by either 115 volt or 230 volt 50 to 60 cps single phase line source and is designed for mounting into a standard 19 inch equipment rack.

This equipment has been produced by Canadian Admiral Corporation Limited for the Canadian Armed Forces to the requirements of Canadian Specifications CA-P-204.


No.1
ON
OFF
No.2
OUTPUT
D.C. VOLTS
Simpson
RES.=100Ω
F.S.=1MA.
No.3
ON
OFF
No.4
OUTPUT
METER
OFF
No.2 0-15V
No.1 0-3V
No.3 0-75V
No.4 0-150V
CANADIAN ARMED SERVICES
ARMY
CD965904
6130-21-116-7369
POWER SUPPLY, PP5143A/PRC
SERIAL NO.
115-230V, 50-60~
CANADIAN ADMIRAL
MOD. No.
No.1
0-95-3V
1A
No.2
3-15V
2A
No.3
32-70V
30 MA
No.4
65-150V
65 MA

SOLID STATE DIGITAL TO VIDEO CONVERTER DISPLAY SYSTEMS

RCA Victor Company, Ltd. of Montreal has developed a digital to video converter system under the trade mark DIVCON which is receiving considerable acceptance in the defence, space and commercial markets of Canada, United States, Great Britain and other countries. The most dramatic application of this system has been on TV broadcast of the Canadian, U.S. and U.K. elections, where the returns were posted directly to TV displays to give various standings.

In addition to TV networks, the DIVCON system has also been accepted by stock exchanges, airlines, and defence space agencies for various applications of data display and information retrieval. Air Canada and British European Airways have adopted the DIVCON display system and for stock exchange applications, the DIVCON system has been adopted by the Canadian and Chicago exchanges.

The DIVCON system converts information in the form of digital coding to equivalent 525 or 625 line video signals for display on standard TV monitors and receivers. The information appears with excellent clarity in the form of printed messages.

Principal features of the DIVCON system are:

- Large, medium and small size characters.
- Selective erase, X-Y addressing, roll-up, roll-down, transmit, print-out, and light probe select options.
- Input line adapters for teletype, data-phone and computer parallel interface.
- Multiplexing capability for 150 display pictures and one video channel utilizing local refresh memories.
- Converters available with up to 16 video output channels.
- Eight color capability.

Following are typical specifications for the DIVCON display system:

Number of Channels:	Two channels each with composite and non-composite outputs.
Number of Characters:	Channel 1: 15 lines of 32 medium characters per line. Channel 2: 10 lines of 16 large size characters per line.
Display Storage Capacity:	One frame of Channel 1 and two frames of Channel 2 information. (One Channel 2 frame can be displayed while other frame is being loaded).
Keyboard:	Custom built with 53 characters and symbols comparable to those found on standard typewriter keyboard.
Input Code:	Baudot input code enables acceptance of parallel signals from standard teletype equipment.
Input levels:	Ground for Bit 1, + 6 volts or open for Bit 0.
Circuitry:	Integrated circuits throughout.
Power requirements:	Approximately 1500 VA at 115 V 60 cycles single phase.
Sync source:	EIA sync generator (optional).

MECHANICAL:

Height 78″ (180 cm) — Width 28″ (70 cm) — Depth 24″ (61 cm)

Weight 950 lbs (431 kg)

ENVIRONMENTAL:

Ambient temperature 50F to 100 F. (10 C to 37.7 C)


YOU ARE WATCHING RCA VICTORS
RECENT BREAKTHROUGH IN DIGITAL
DISPLAY SYSTEMS
POTENTIAL APPLICATIONS ARE
AIRLINE OPERATIONS
AIR TRAFFIC CONTROL
WEATHER OFFICES
STOCK EXCHANGES
BANKING HOUSES
TV NEWS BROADCASTING
TRANSPORT DISPATCHING
WAREHOUSE CONTROL
COMBAT OPERATIONS CENTERS
DATA LOGGING

LINATROL TRACING SYSTEM

A Canadian product which has achieved overseas distribution has afforded the small metal-working shop the same automation features as its bigger competitors.

An electronic line tracing attachment for small flame-cutting machines, the device has various names depending on where it is sold. In Europe and the United Kingdom, distributed by Messer Griesheim, Frankfurt, Germany and London, England, the unit is called Photoskop. The Air Reduction Company in the United States sells it as the Aircotron. Canadian Westinghouse, designer and manufacturer of the equipment, markets it in Canada under the name Linatrol Type HL6.

Whatever the name, the device is being well received wherever it is displayed. It can be fitted to a small flame-cutting machine in a matter of minutes — operates by following a simple line drawing — and produces the finished part automatically.

Designed for trouble-free operation Linatrol HL6 was rigorously tested under working shop conditions before being offered to the market. In the event repairs become necessary they can be carried out in the field through a system of modular replacement parts.

Linatrol HL6 is the latest in a line of electronic tracers produced by Canadian Westinghouse for the control of flame-cutting machines. Other types of Linatrol available are the Type HL2 and HL41.

The Type HL2 Linatrol was originally developed to fill an urgent need for a practical device to provide fully automated precision control and guidance for gas-cutting machines and to replace manual or semi-mechanical methods such as template tracing.

The Type HL2 consists of a Sensing Head and a Control Cabinet. The Sensing Head is normally combined with a friction drive mechanism by the user, to form a Tracing Unit which is propelled over the drawing. The Control Cabinet contains the servo electronics and controls for the Tracing Unit.

Type HL2 is ideal for use in tracing operations where low thrusts and low speeds are involved. It will trace with a high degree of accuracy — within ±0.010 inch of the centre of the pattern line.

The co-ordinate drive system developed by Canadian Westinghouse is completely transistorized and employs plug-in printed circuit cards to reduce maintenance problems and to lower maintenance costs. The use of plug-in circuits permits the rapid isolation of a possible fault, and simplifies trouble-shooting techniques.

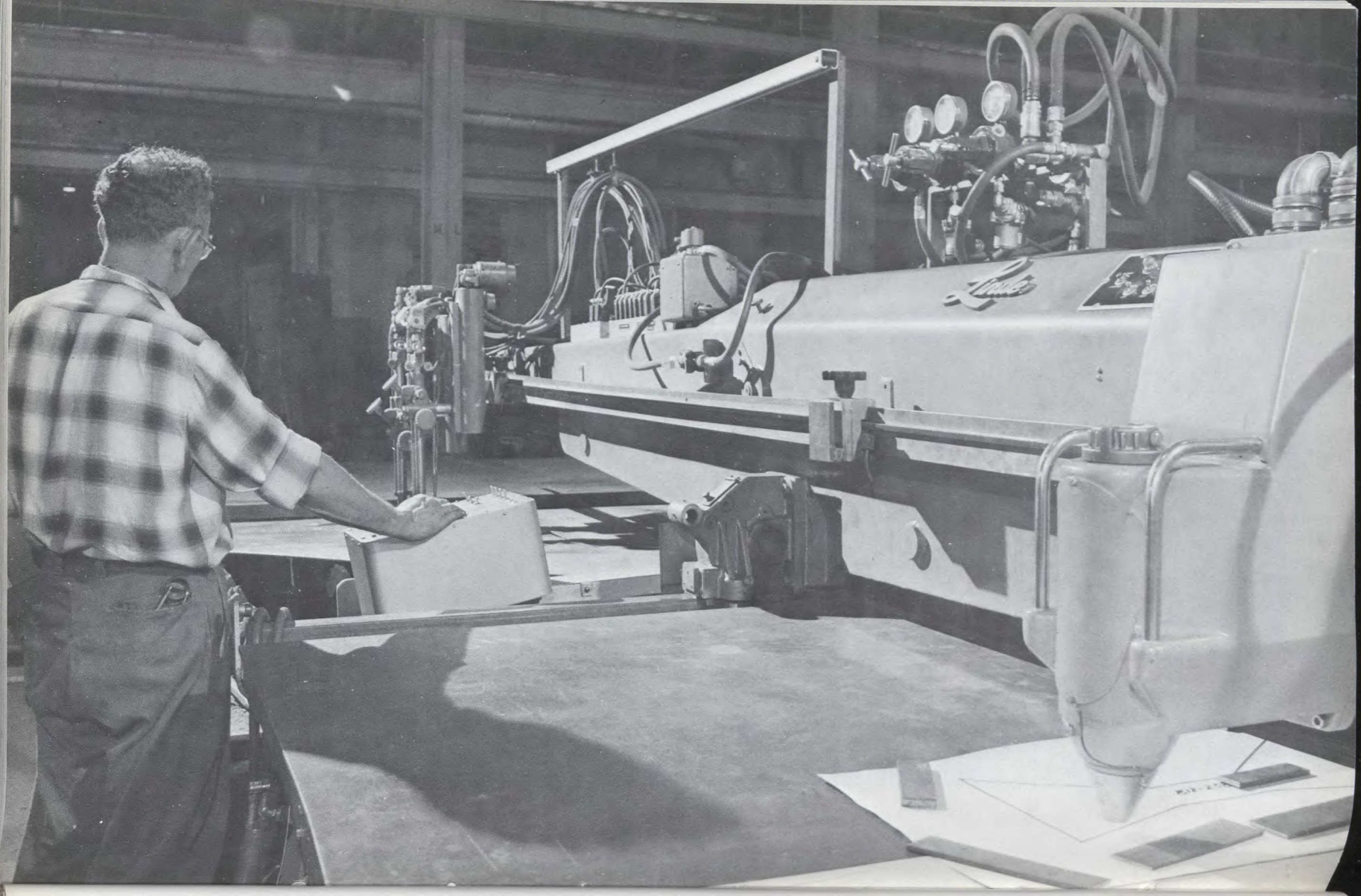
Linatrol co-ordinate drive Type HL41 comprises five basic units; namely, tracing unit, control unit, amplifier unit, X drive unit, and Y drive unit. These units are fitted, for example, to a router to form a single integrated machine. All machine motion controls are housed in the control unit which can be located in the most advantageous operating position. Controls are individually lighted and have been engineered with a view to minimizing human error. The tracing unit is only 8-¼″ (21 cm) wide, permitting maximum working width of the drawing table.

The drives of the normal production model produced by Canadian Westinghouse terminate at the shafts of drive motors in the X and Y drive units. Generally, the 'machine manufacturer' prefers to provide the drive mechanism (consisting of a speed reduction unit, clutches, etc.) required to couple the X and Y drive units to the X and Y carriages of his machine. If deemed necessary, however, Canadian Westinghouse can also supply the drive mechanism.

The positive non-friction co-ordinate drive motors provide great thrust in both axes (over 300 pounds (136 Kg) continuous when geared for a speed of 50 i.p.m.) (127 cm pm), coupled with high machine driving speeds. This available thrust permits the control of machines having high tool pressures or possessing large moving members, such as flame-cutting machines. Fast line tracing speeds are possible, depending upon the speed reduction of the drive motors and the type of machine — from 0 to 250 i.p.m. (635 cm pm) or greater.

To achieve optimum performance of a machine utilizing Canadian Westinghouse control equipment, the company has designed, as a part of the control system, an electric "frequency compensation" circuit to minimize the effect of machine resonance. Final adjustment of this circuit is made after a 'resonance search' of the complete system.

Many hundreds of Linatrol units are in the use throughout the world and the Company's engineers are currently developing the Linatrol System for such applications as wood and metal routing and nibbling machines.



TELEPATH COMMUNICATIONS & 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.

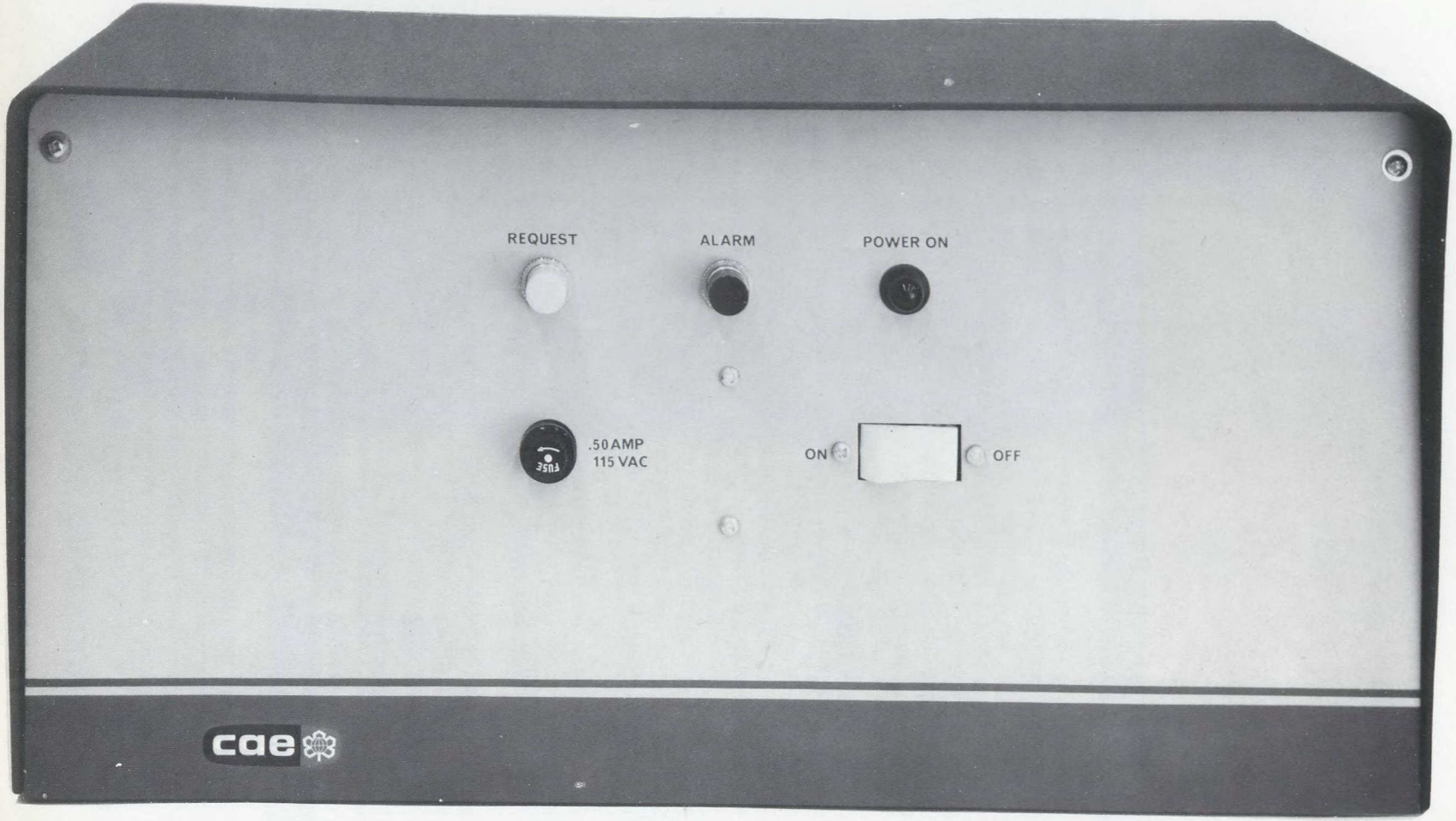
The product line covers the range of Selectors, for controlling terminal on-line equipment such as Teleprinters, Card Punches, Tape Readers, etc. In addition, a line of code translation equipment is available, enabling any of the common communication and data codes to be translated to common telegraph 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 by a number of major airlines and other common carriers.


REQUEST
ALARM
POWER ON
FUSE
.50 AMP
115 VAC
ON
OFF
cae

NUMERICAL CONTROL—MACHINE TOOLS

The automation of standard machine tools for short run production has reached new peaks of practicality and economy with the development of the UMAC 5 numerical control system by Sperry Gyroscope Company of Canada, Ltd.

This modern solid state control embodies extremely advanced design and construction techniques to provide the machine tool builder and end user with outstanding technical and operational features.

In addition to the high performance servo components required in a modern control, UMAC 5 incorporates a unique digital computer. This computer is used to perform a large variety of functions, such as automatic tool off-setting, zero shifting, position determination, post processing—and it performs them all at a reasonable cost.

The numerical control system was conceived and is built on a building block basis, and may be purchased in this manner also. This means that from a relatively simple application at the start, additional degrees of automation may be added at will.

UMAC 5 adapts to any machine tool and machine tool requirement. The character of the machine tool and its application requirements are translated into a computer program and then fed into the system's computer which sets up the control for that particular machine tool application.

If any changes are required at a later date, or if the system has to be expanded to take care of extra machine components such as a rotary axis or the addition of a tool changer, the computer is simply reprogrammed and additional boards containing the necessary hardware are plugged into pre-wired panels.

The machine tool builder uses this feature to adapt the numerical control to any machine, but it is also most important to the end user, for it means that he can retroactively expand his machine to meet changing requirements as they arise.

This system meets the requirements of published North American Machine Tool tape format standards. The digital computer also makes it possible as an option, to allow the control to read and interpret non-standard formats.

Other features of this system are: storage of complete sequences of machining operations that may be repetitive; position measurement and in process inspection; the selection of up to 99 tools with individual Z-axis zero offsets stored in the memory for each tool; tape search cycle; control panel for manual operation; optional metric programming.

The absolute electrical accuracy of UMAC 5 is ± 60 millionths to ± 150 millionths of an inch depending on choice of feedback device.


UMAC 5
SPERRY

"AQUA-JET"

The Tamco Hydro jet propulsion system — "Aqua-Jet" was produced with the aid of the Department of Defence Production and the U.S. Army and has been successfully tested by the U.S. Army with a report noted in the December 1966 issue of the U.S. Army Research and Development Newsmagazine.

The equipment tested by the U.S. Army was propelled by two jets powered by twin Chevy II 110-horsepower gasoline engines, has a fiberglass hull 25 feet 6 inches long with a beam 7 feet 10 inches (7.7 x 2.4 m). It has a 25-knot capability empty, a maximum speed of 15 knots with a 2,000-pound load (907 kg), can be rotated 360 degrees for steering manœuverability and can be used in 13 inches of water (33 cm). It should be noted that each jet intake on this boat was equipped with a weed cutter which ensured constant power and propulsion through weed infested water.

Other versions of the boat are 16-foot (4.9 m) models of the Hunt design fiberglass hull equipped with twin jets and powered by 85 h.p. Perkins Diesel engines with hydraulic steering, a Tamco development which is a new innovation solving many of the existing problems associated with water jet propulsion systems. Here the total weight of the fully equipped boat is 2,200 lbs (1 metric ton) and attains a maximum speed of 30 m.p.h. (48 k). Still other models are 18-foot (5.5 m) which presently are being employed as utility life boats, approved by Canadian Steamship inspection, again equipped with Aqua-Jets and hydraulic steering but powered by 160 h.p. Perkins Diesels where the total weight is approximately 3,200 lbs (1451 kg) and again the speed is 30 m.p.h. (48 k).

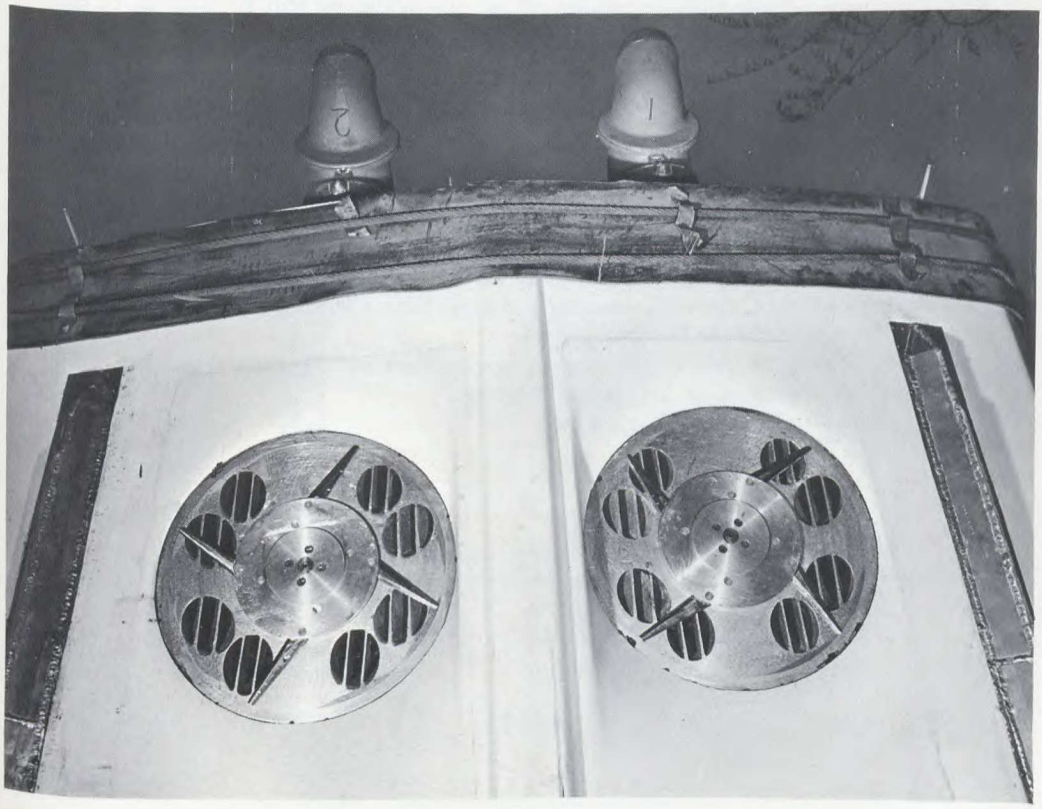
While water jet propulsion systems are not new, the advances made by such companies as Tamco over the last few years have served to ensure that the equipment has become a reliable fact as opposed to a questionable "gimmick". It is because of these proven advances that both builders and naval architects, who are basically conservative, are now consistently employing to advantage jet propulsion systems. The area where Hydro jet propulsion is forging ahead appears mainly in the field that requires a rugged drive with maximum thrust to overcome the many obstacles which are present in other types of drives resulting in damages to the propeller and the boat itself — due to the draught required of conventional craft.

The Tamco "Aqua-Jet" is a Canadian designed propulsion system which has many varied and progressive features consisting in the main of an axial flow pump which, as such, requires no detailed description but what sets it apart is the intake and weed cutting arrangements whose design is based on years of experimental work whose final success was ensured by field trials.

The object of breaking up the intake into eight sections is to avoid the formation of one excessive suction point and, as the total suction force is thus divided by eight, its pickup power is correspondingly reduced. The eight intake ports are so laid out that the shearing action of the rotating blades serves as an effective weedcutter. Weeds entering the intake ports are either cut into short lengths which are inducted into the system, or deflected by the rotating blades. Provision is made to disengage the weedcutter when not in use. All of our trials have shown that the weeds cannot clog the ports. The design and construction of the multi stage pump is such that it effectively further reduces the ingested material, permitting free passage through the unit.

The Tamco Aqua-Jet has found that its basic uses to date are in the following fields.

- Coast Guard employment for speed and manœuverability in close in coastal waters, a continuing problem particularly where tidal features are concerned.
- Fisheries operations or patrol where net protection afforded through shallow draught and maximum manœuverability are requisites.
- Forestry and logging where durability and rough going due to submerged obstacles make conventional craft employment impossible or costly.
- Fire protection service in shallow draught areas.
- Mining, Technical or Topographical service in shallow or weeded water areas.
- Military applications into shallow draught areas where normally troops would be ford or wade with a resultant discomforture and loss of time as well as load carrying capability.


1
2

HYDRAULIC BOAT CONTROLS

This system affords fingertip control and sensitivity. In essence, it is a motor mounted pump that generates line pressure which is valve controlled in activating the cylinders for to and fro steering and reversing motion.

The pump, mounted at the front of the engine, is driven by a V belt from a crankshaft pulley. The circulating circuit which is normally open so that the pump, while circulating oil, is not generating over pressures so that the valve remains in a centre position thus leaving a through passage for the circulating oil. This circulating oil issuing from the pressure outlet of the pump flows through the reversing valve and is directed to the steering valve and then to the return line back to the pump tank.

REVERSE THRUST

Reverse thrust is employed by reversing the nozzle through directing the oil flow into the blind end of the reversing cylinder. The pressures generated on the cylinder rod and the rack rod swing the nozzle into reverse. With the reversing procedure in effect and the controls neutralized the reversing valve allows free circulation again with the nozzle held in reverse by the oil locked in the reversing cylinder. The reversing cylinder being part of the steering arm ensures that the nozzle is held in the reverse position while the steering arm responding to the wheel can now swing the nozzle to any desired position thus giving reverse steering.

FORWARD THRUST

In forward thrust the reversing lever is moved forward so that the reversing cylinder will allow the nozzle to swing from reverse to forward once the circuit has been again opened for free circulation of oil; again the oil will be trapped in the cylinder and lock the nozzle in forward drive.

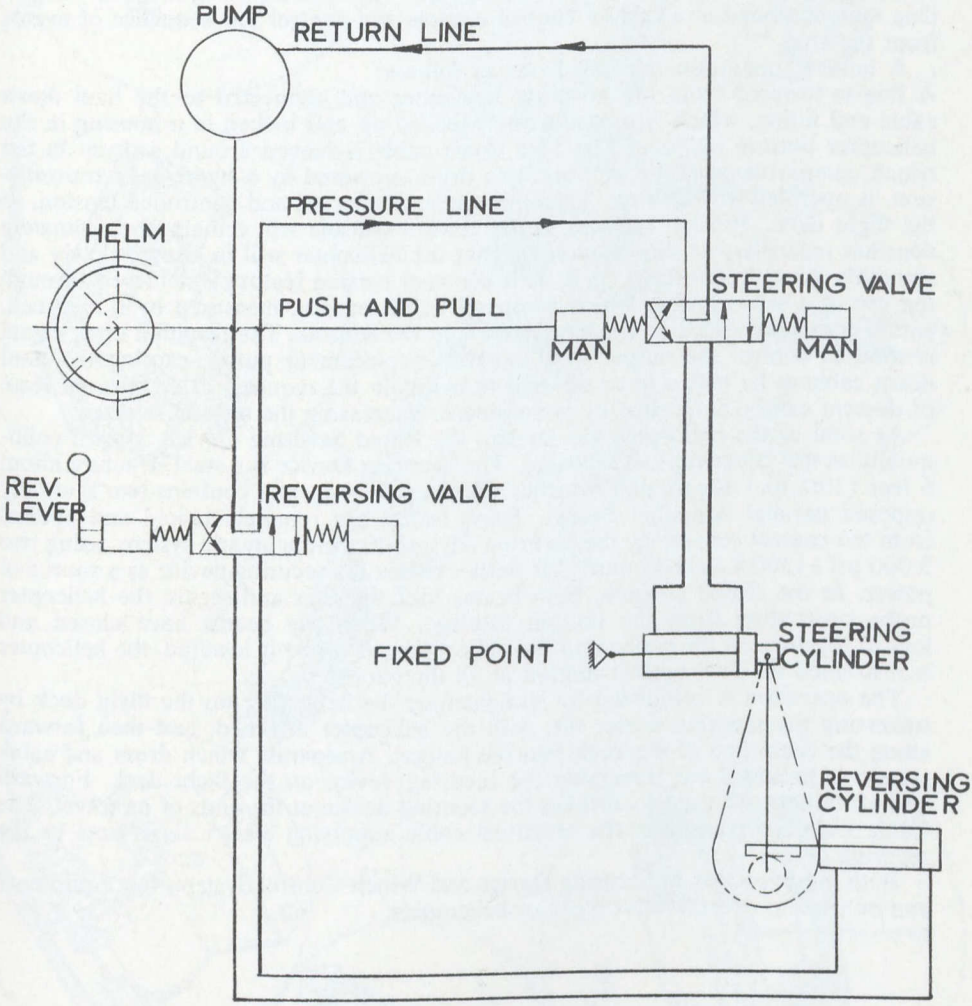
STEERING

The valve that controls the steering is mounted "piggy-back" on the steering cylinder. This valve is normally open as part of the open circuit and allows the oil to flow through freely. Wheel motion instantly changes this open circuit condition as it shuts off the open circuit to divert the flow of oil to the steering cylinder. The instant that the steering wheel motion is stopped, the oil is locked in at both ends of the cylinder, holding the nozzle rigidly in the position it is at that instant. The flow-through parts of the valve open at the same time allowing the oil free passage through the return line to the pump tank.

This equipment is very often used in conjunction with Tamco Aqua-Jet boats or it may be employed as a separate feature.

(See page I-150 for the Aqua-Jet.)

GRAPHICAL DIAGRAM
OF HYDRAULIC STEERING
AND REVERSING CIRCUIT



HELICOPTER HAUL DOWN SYSTEM

The Helicopter Haul Down System was designed to enable helicopters to operate at sea from small flight decks in rough weather conditions. The Rapid Securing Device, Reeving System and Control Console were designed and manufactured by Fairey Canada Ltd., Dartmouth, Nova Scotia. The Winch Unit, Power Pack, Rope Accumulator and Control System were designed and manufactured for Fairey by Dowty Equipment of Canada Ltd.

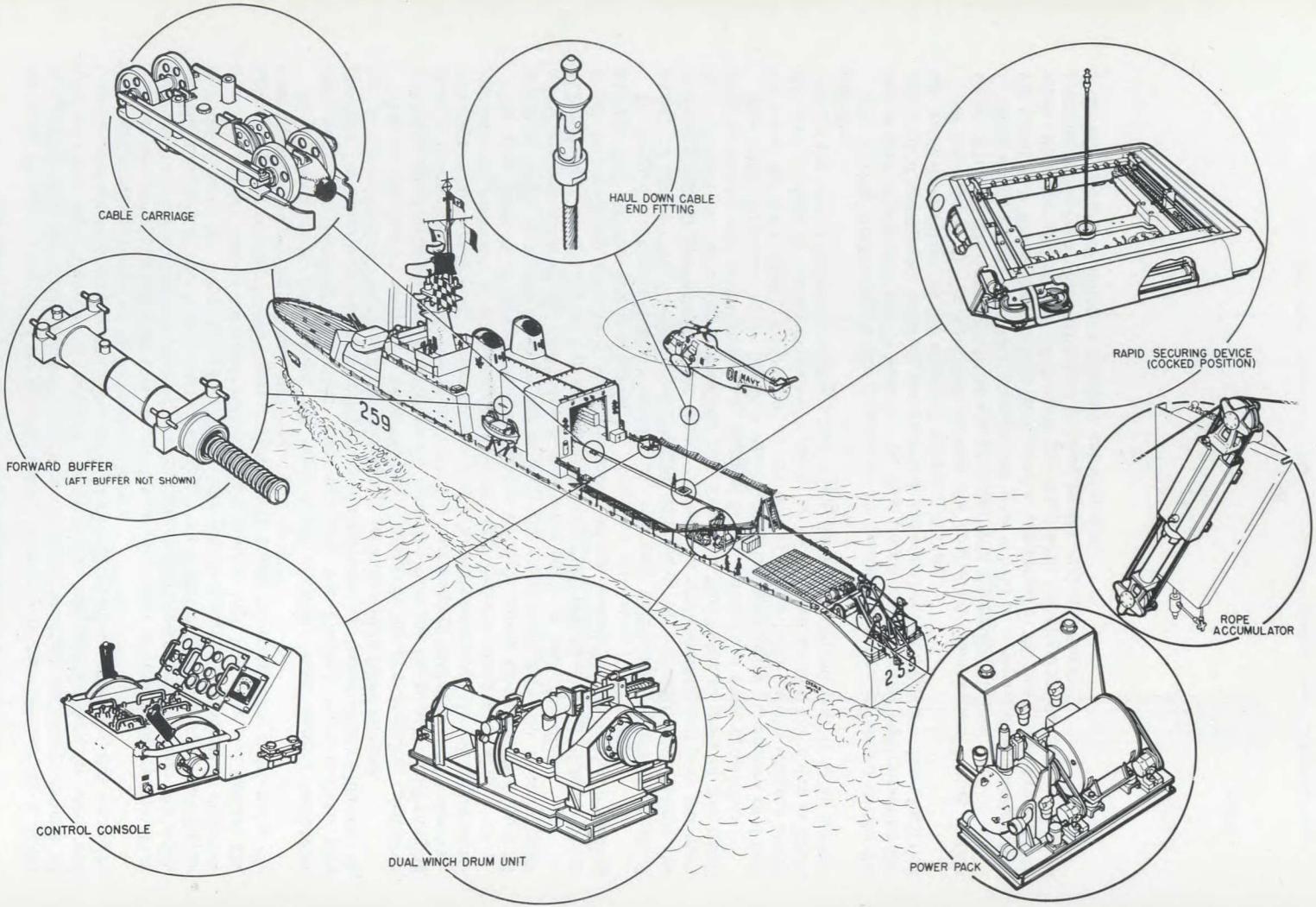
The illustration on the opposite page shows the various components used to land, secure and manœuver a helicopter onboard ship. The equipment is designed to handle a helicopter of 20,000 pounds (9072 kg.) gross weight in sea states causing roll of 31°, pitch 8°, and heave up to 20 feet (6 m.) per second. The system operation may be considered in three phases: (1) Landing on the flight deck; (2) Securing as soon as possible after landing, and (3) Manœuvering into the hangar. One man stationed at a remote control console can control this sequence of events from the ship.

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 subsequently winched up and locked in a housing 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 approximately constant regardless of ship motion, so that the helicopter will be drawn slowly and 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 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 6 feet (1.82 m.) square and 8 inches (20.3 cm.) high, and contains two mutually opposed parallel Arresting Beams. These beams are remotely closed and opened from the control console by the securing device electro-pneumatic system, using two 3,000 psi (1360.8 kg/645 mm^2) air bottles within the securing device as a source of power. In the closed position, both beams lock together and secure the helicopter probe protruding from the bottom fuselage. When the beams have closed and 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 the flight deck by traversing the securing device aft, with the helicopter attached, and then forward along the centerline of the deck into the hangar. A separate winch drum and cable system is provided for traversing the securing device on the flight deck. Forward and aft buffers are used to cushion the securing device at the ends of its travel. The Cable Carriage transports the electrical cable supplying electrical services to the securing device.

With modifications to Securing Device and Winch Control System, this equipment can be used to operate most types of helicopters.


CABLE CARRIAGE
HAUL DOWN CABLE END FITTING
RAPID SECURING DEVICE (COCKED POSITION)
FORWARD BUFFER (AFT BUFFER NOT SHOWN)
ROPE ACCUMULATOR
CONTROL CONSOLE
DUAL WINCH DRUM UNIT
POWER PACK
259
NAVY

RETRACTABLE REPLENISHMENT POST

As rapid high-line transfer at sea of solid stores, ammunition, etc., has become a major factor in present day naval operations, it is becoming increasingly necessary to equip all fighting ships with high-line attachment points which will enable them to carry out transfer operations smoothly and efficiently—under all weather conditions, day or night, while maintaining speeds up to 20 knots or better.

After extensive investigation into the problems associated with such operations, Peacock Brothers Limited has developed a retractable replenishment post to meet this need, and the company is now under contract to supply a number of these units for installation in ASW ships of the Royal Canadian Navy. The post is designed to operate in conjunction with supply vessels equipped with constant tension high-line gear and ensures the precise landing of transferred stores within a very small receiving area, even under extreme conditions of heeling and pitching.

As a permanently rigged post, on some types of ship, could impede helicopter operations and interfere with other deck activities, the Peacock replenishment post provides the advantage of being retractable and self-stowing below decks when not in use. It can be erected from stowed to operational position within three minutes.

This replenishment post has been designed primarily to suit transfer operations involving side-to-side clearances between the receiving ship and the supply vessel ranging from a minimum of 100 feet (30.48 metres) to a maximum of 200 feet, (60.96 metres), although, with modification, other distance could be accommodated. It will adjust automatically to variations in station-keeping up to thirty degrees ahead or astern.

The post itself is of box section, fabricated of high tensile structural steel, and of sufficient height to enable the high-line to carry the stores well above the water at mid-travel and also clear of the deck edge at maximum angle of heel.

Arranged to fit around the box section of the post, and provided with rollers on which it can be moved up and down, is a fabricated pad-eye assembly. It is to this travelling pad-eye that the high-line is attached.

To install the Peacock replenishment post, it is only necessary to provide a vertical trunk, 18 inches (45.72 cm) square inside dimension, of sufficient depth below the operating deck to accommodate the length of the post when stowed, and over the open top of which the mounting base of the unit is bolted. The inside surfaces of this trunk must be smooth and unobstructed, i.e., no rivet heads, stiffeners or other projections.

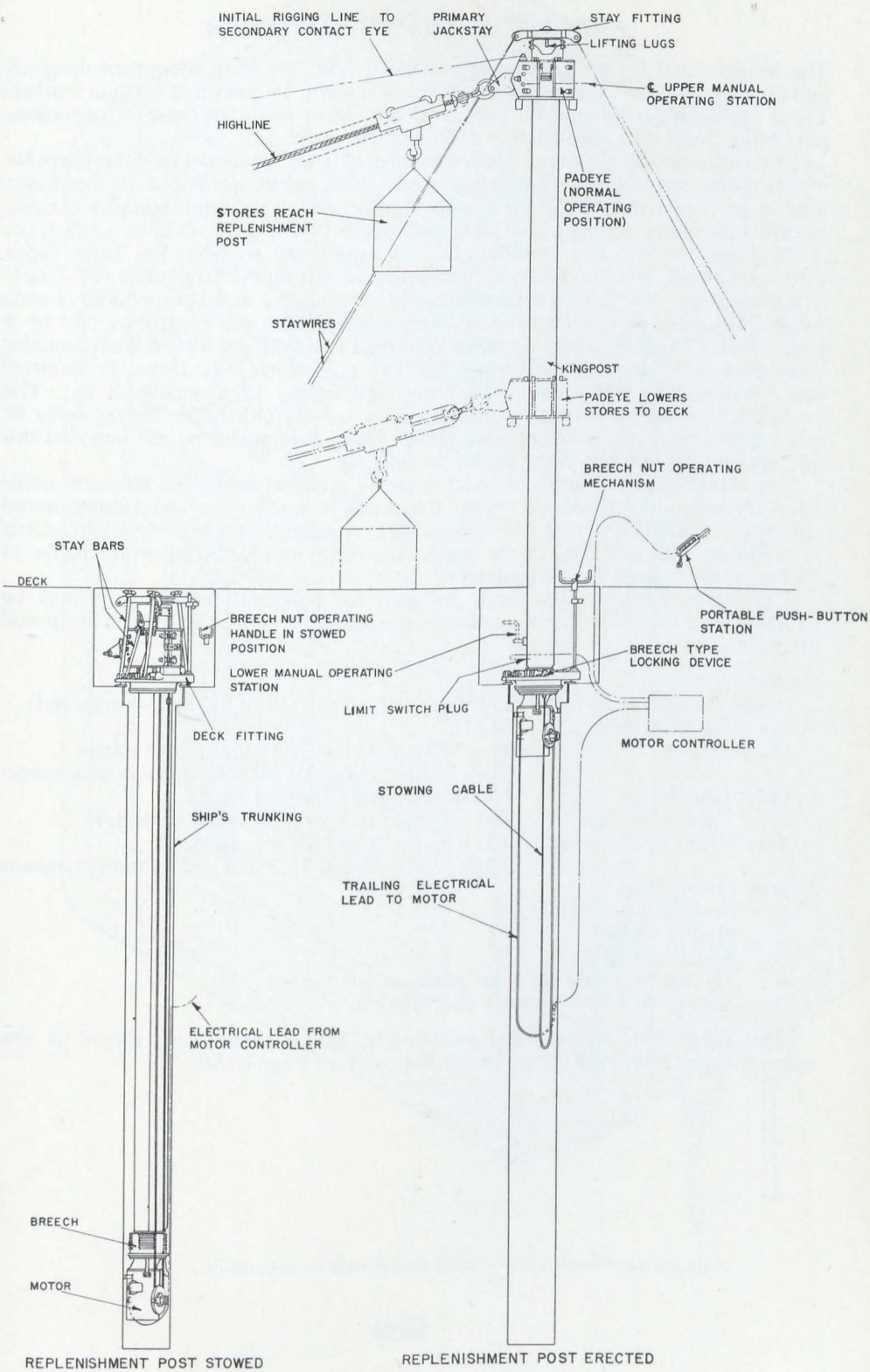
The trunk terminates at the top in a watertight hatch with inside dimensions of 4 feet by 3 feet, by 3 feet high, (1.21 × .91 × .91 metres). This hatch can be situated above the deck surface in the conventional manner or be recessed so that the cover is flush, leaving the deck completely unobstructed when the replenishment post is in its stowed position.

The driving mechanism, which is operated by an electric motor, is housed within the box section of the post and is used for the dual purposes of erecting and retracting the post and of raising and lowering the travelling pad-eye. Provision has also been included for manual operation, in the event of electrical failure.

All movements of the post and pad-eye are controlled from a push-button station which is held in the operator's hand and provided with a long flexible lead.

When erected to its operating position, the post is held in a special deck fitting within the hatch by a breech type locking device and is supported at the top by pre-stressed stay wires. Both top and bottom of the post are fitted with self-aligning bearings, so that no restraint is imposed upon deflection induced by the high-line tension.

Several designs of differing capacity are available.


INITIAL RIGGING LINE TO SECONDARY CONTACT EYE
PRIMARY JACKSTAY
STAY FITTING
LIFTING LUGS
℄ UPPER MANUAL OPERATING STATION
HIGHLINE
PADEYE (NORMAL OPERATING POSITION)
STORES REACH REPLENISHMENT POST
STAYWIRES
KINGPOST
PADEYE LOWERS STORES TO DECK
BREECH NUT OPERATING MECHANISM
STAY BARS
DECK
BREECH NUT OPERATING HANDLE IN STOWED POSITION
PORTABLE PUSH-BUTTON STATION
BREECH TYPE LOCKING DEVICE
LOWER MANUAL OPERATING STATION
LIMIT SWITCH PLUG
DECK FITTING
MOTOR CONTROLLER
STOWING CABLE
SHIP'S TRUNKING
TRAILING ELECTRICAL LEAD TO MOTOR
ELECTRICAL LEAD FROM MOTOR CONTROLLER
BREECH
MOTOR
REPLENISHMENT POST STOWED
REPLENISHMENT POST ERECTED

PRECISION DEPTH SOUNDER

The Model 9040 Depth Sounder is a modern echo sounding equipment designed and built to meet the exacting requirements of a broad Military and Civilian market. These requirements include — high accuracy, linear recording, ease of operation, portability, solid state construction and moderate price.

This Depth Sounder is based upon a number of basic functional modular elements which utilize state-of-the-art techniques and components developed in the Sonar field in particular and the Electronics field in general. The Depth Sounder consists of two (2) units. A single cast aluminum case 19″ × 14″ × 11½″ (48.3 cm × 35.5 cm × 29.2 cm) contains the transmitter, the receiver, the linear depth recorder and all operator controls. The weight of this unit is 50 pounds (22.7 kg). The transducer, which functions alternately as projector and hydrophone, is contained in a separate housing and is interconnected with the electronics unit by a single cable. The transducer normally furnished is the Model 9042 Depth Sounder Transducer. This is a high efficiency, low Qm unit which is 10 inches in diameter and 8 inches high (25.4 cm × 20.3 cm) and weighs 12 pounds (5.5 kg). The conical lobe suppressed beam is 20 degrees at −3 db. Other transducers, more or less sophisticated, are available; the choice being determined by the intended use and operating frequency of the Depth Sounder.

The accuracy of the depth recorder is set by a crystal controlled reference oscillator. The standard reference crystal frequency is based upon an assumed sound velocity of 4,920 ft./second (1499.5 m/sec). A range of plug-in crystal standards is available. The accuracy of the depth recorder is uneffected by wide change in power supply voltage (and frequency).

The Depth Recorder has been designed for bulkhead mounting. It may be operated in a horizontal position (without securing the unit to a deck or horizontal platform).

DESCRIPTIVE DATA:

Power Consumption:	150 watts (24 VDC, 115 V, 60 cps, as required)
Sounding Frequency:	24 kHz
Range Scales:	0 — 720 feet (0 — 219.5 m) in nine ranges
	0 — 720 fathoms (0 — 1316. 7 m) in nine ranges
Pulse Length:	1 to 40 ms (depending on scale)
Pulse Repetition Rate:	736 to 31 per minute (depending on scale)
Recording Paper Speeds:	0.1, 0.5, 1.5, 3 and 6″ per minute
	2.54, 12.70, 38.10, 76.2 and 152.4 mm per minute

SPECIAL FEATURES:

1. Draft adjustment
2. Marker facility
3. White line effect
4. Manual over-ride for 1 ms pulse on any range
5. Time-varied-gain receiver characteristic.

This equipment, designed and produced by Edo (Canada) Ltd., should be considered along with the Remote Depth Indicator on Page I-160.

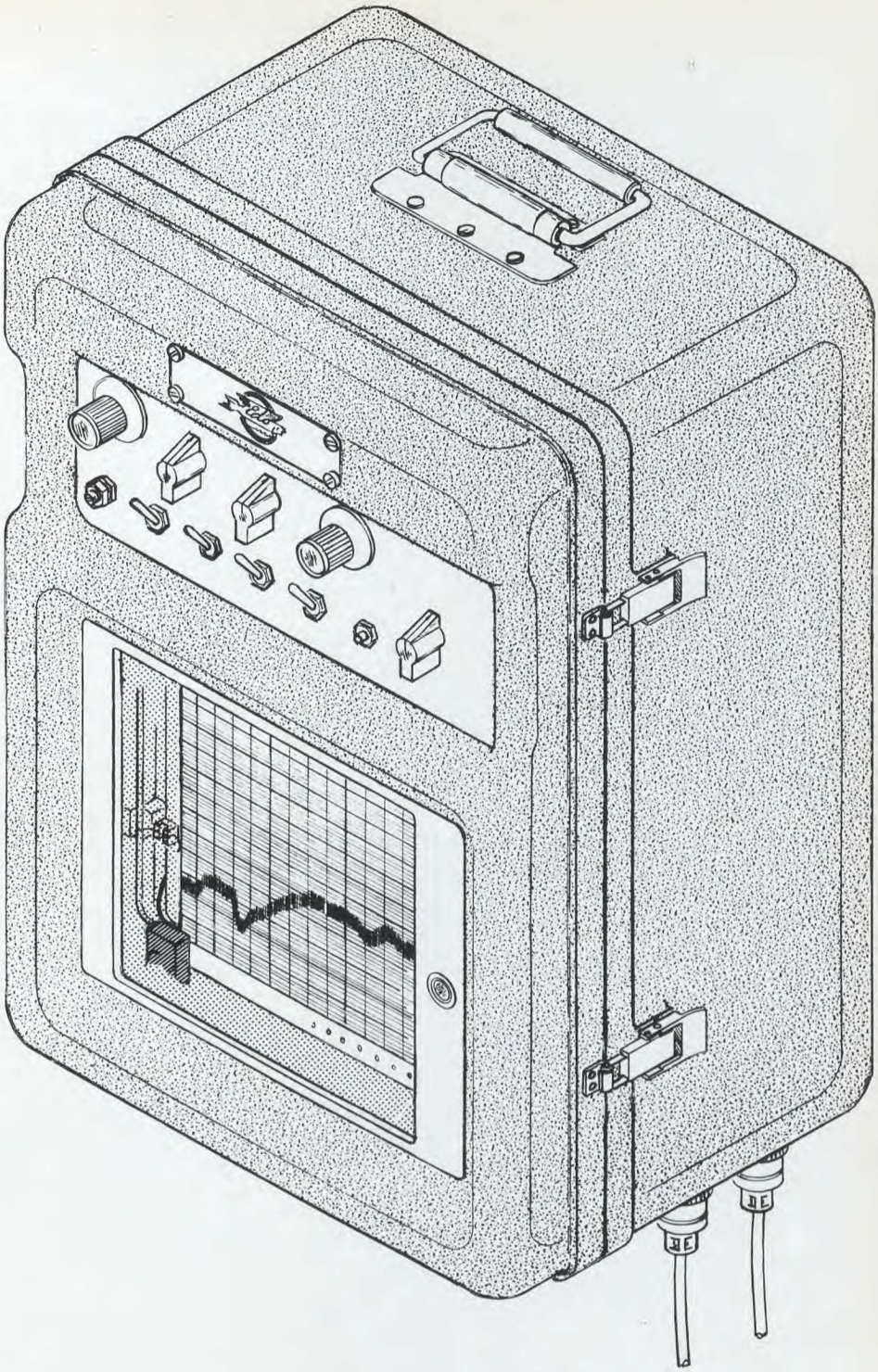


Illustration of Edo Model 9040 — Precision Depth Sounder.

REMOTE DEPTH INDICATOR

In keeping with the trend to digital read-out equipment, a depth indicator has been developed as a remote ancillary unit for use in depth sounding systems. The Model 9046 Remote Depth Indicator is illustrated. It provides a bright digital display of water depth below the vessel in which the system is fitted. The three-digit display can be read at distances up to 27 feet (8.2m).

This Remote Depth Indicator has been designed for use with the Model 9040 described on page I-158. However, by minor changes, other indicating or recording depth sounders can be used to provide the necessary input signals.. The Remote Depth Indicator accepts transmission and echo signals from the recorder. The time lapse between these signals is used to gate electronic counting circuits. The outputs of three counter decades appear as illuminated numerals on corresponding read-out tubes. Accordingly, maximum read-out is 999 feet (304.5 m) or 999 fathoms (1827 m) depending on the mode of operation selected. The numeric display is interrupted at the pulse repetition rate of the associated sounder or recorder.

The prototype unit was designed by Edo (Canada) Limited for use in the R.C.N.'s FHE — 400 hydrofoil craft. In this application, the prime requirements were: small-size, light-weight, ruggedizing against shock and vibration, and ability to withstand exposure to salt-sea atmosphere. The unit is also currently under consideration for use in the USN's Deep Submergence Program.

The case dimensions are 7″ x 6″ x 10″ (17.8 cm x 15.3 cm x 25.4 cm). It weighs only 8 pounds (3 kg).

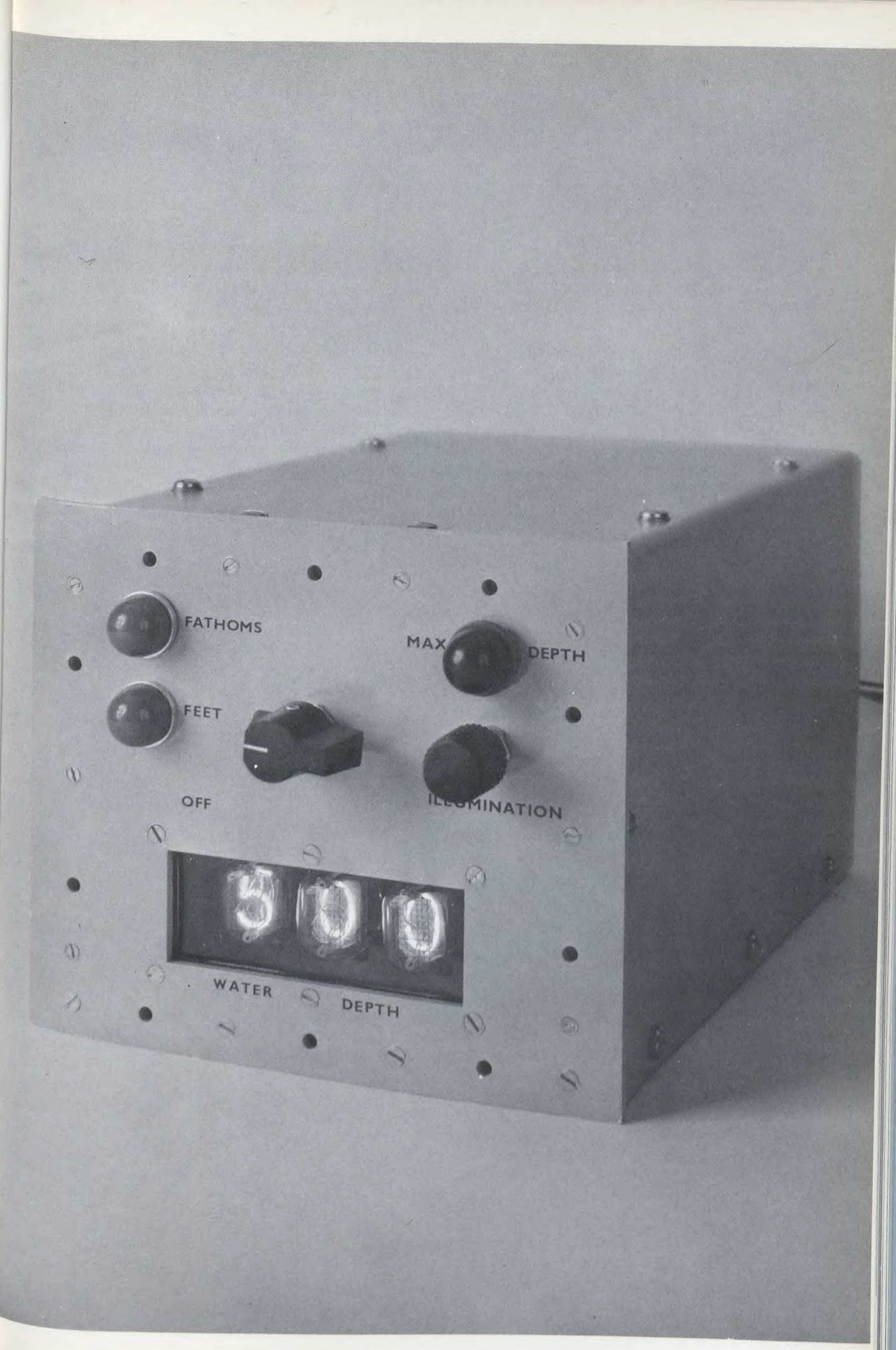
The internal power supply is designed to operate from a 115 volt, 400 cps supply. Operation from 60 cps power is possible by using an alternate transformer in the power supply. Power consumption is under 10 watts.

All circuits are transistorized except for the gas-filled, cold-cathode display tubes. The keying and counting circuits are mounted on removable component boards. Both front panel and internal (preset) controls are available to set up the unit for particular installation requirements.

SPECIAL FEATURES:

1. Feet or fathoms mode of operation can be selected by a front panel control.
2. Accuracy of reading is within 1.0% plus or minus one count with the clock oscillator adjusted for the correct sound velocity.
3. Digital memory circuits retain the last reading in the event of "missed" echoes.
4. An over-depth warning lamp turns on whenever a bottom return has not registered within the range capability of the overall sounder system. (This range setting is adjustable).
5. An adjustable "draft" control enables the display to show actual water clearance below the lowest point of the hull.

The Model 9046 Remote Depth Indicator is essentially a device to measure and display elapsed time between two electrical signals. The manufacturer suggests that minor variants of the design be considered for other applications involving time measurement where the digital output will be in proportional units, not necessarily water depth.


FATHOMS
MAX
DEPTH
FEET
OFF
ILLUMINATION
300
WATER
DEPTH

TRANSISTORIZED MARINE RADAR — 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 weight factor, high power consumption and the need for technically competent operators associated with previous radars.

The display unit measuring 15-½″ x 12-¼″ x 20-½″ (39.4 x 31 x 52.3 cm) may be bulkhead or chart table mounted or free standing on its own pedestal. Ranges of 1, 4, 8 and 16 miles are displayed on the 10″ (25.4 cm) cathode-ray tube with switchable range rings of ½, 1, 2, and 2 mile intervals. The use of all solid-state circuitry and fixed coil deflection system eliminate the need for ventilation of the display cabinet permitting closed cabinet design for weather protection.

The precision slotted-waveguide 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 separate transmitter/receiver package can be installed in any convenient location to simplify the running of waveguide. This package contains a completely solid state receiver and regulated DC power supply as well as the 6 kilowatt transmitter. Plug-in power adaptors permit efficient change-over to 13.6, 26 or 36 volt systems. The circuitry is protected by fast-acting primary and secondary fusing. Installation and maintenance have been simplified by the use of a comprehensive system of test points and controls. At approximately 160 watts consumption the LN55 has the lowest power drain of any 10 inch (25.4 cm) radar available.

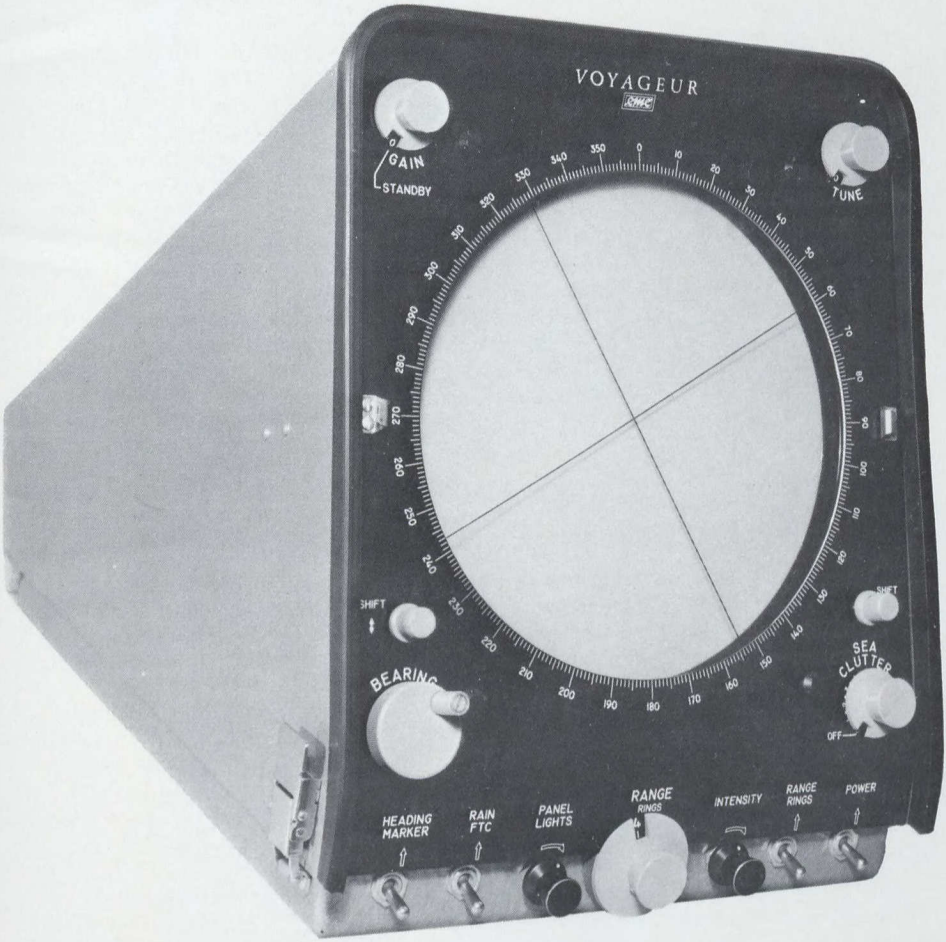
SPECIFICATIONS

RECEIVER
I.F. Bandwidth: 5 Mc
I.F. Center: 30 Mc.
Tuning: Synchronous.
Noise Figure: 12 db (overall)

TRANSMITTER
Peak Power Output: 6 Kw.
Frequency: 9375 ± 30 Mc.
Modulator: Line and thyratron
Pulse Length: 0.2 μS
Pulse Repetition Frequency: 1500 pps.

ANTENNA
Rotation Speed: 22 rpm.
Horizontal Beamwidth: 2.5° (–3db points)
Vertical beamwidth: 22°
Side Lobe Suppression: More than 24 db.
Type: Precision slotted-waveguide.
Polarization: Horizontal.
Radome Wind Load: 80 knots.

Power requirements: approx. 160 watts at 13.6, 26.4, 36 volts DC or 115 or 220 volts AC.
Peak power output: 6 kw.
Ranges: 1, 4, 8 and 16 nautical miles.
Calibration: ±2% of range.
Range discrimination: 35 yards (32 m) or better.
Bearing accuracy: ± °1
Weight: Transmitter/receiver: 37 lbs. (16.8 kg). Radome/antenna unit: 50 lbs. (22.7 kg.) Display: 32 lbs. (14.5 kg.)


VOYAGEUR
GAIN
STANDBY
TUNE
SHIFT
BEARING
SHIFT
SEA CLUTTER
OFF
HEADING MARKER
RAIN FTC
PANEL LIGHTS
RANGE RINGS
INTENSITY
RANGE RINGS
POWER

OCEANOGRAPHIC RESEARCH WINCH SYSTEMS

The Oceanographic Winch described in this article is only one of a family of bathythermograph equipment which J. Swann (1963) Limited have designed and produced for oceanographic surveys.

The Series No. '0' — 410 is a medium duty, deep casting oceanographic winch. This unit will hold 5 miles (9.27 Km.) of 5/32″ (3.97 mm) diameter wire rope and is supplied in various models with line pulls up to 1250 lbs. (567 Kg.) and line speeds up to 625 ft/min. (190.5 m/min). It is driven by a piston type hydraulic motor which was designed by this company. The motor has a constant torque characteristic over its entire operating range. For satisfactory operation the winch requires an oil delivery of 35 U.S. gpm (132.5 lit./p.m) at 1200 psi. (544.3 Kg. per 645 mm^2).

Several unique features are supplied as standard equipment. The direction and line speed of the winch are both controlled by a single lever valve which was developed to meet the sensitive control requirements of this type of work. The valve is a directional, pressure compensated flow control which enables the operator to instantly vary the hauling speed to suit the conditions. The winch is fitted with an automatic hydraulic braking device which holds the load under all operating conditions. It is also fitted with a self-energizing band type manual brake which is operated by means of a handle with a ratchet release and separately by a foot pedal.

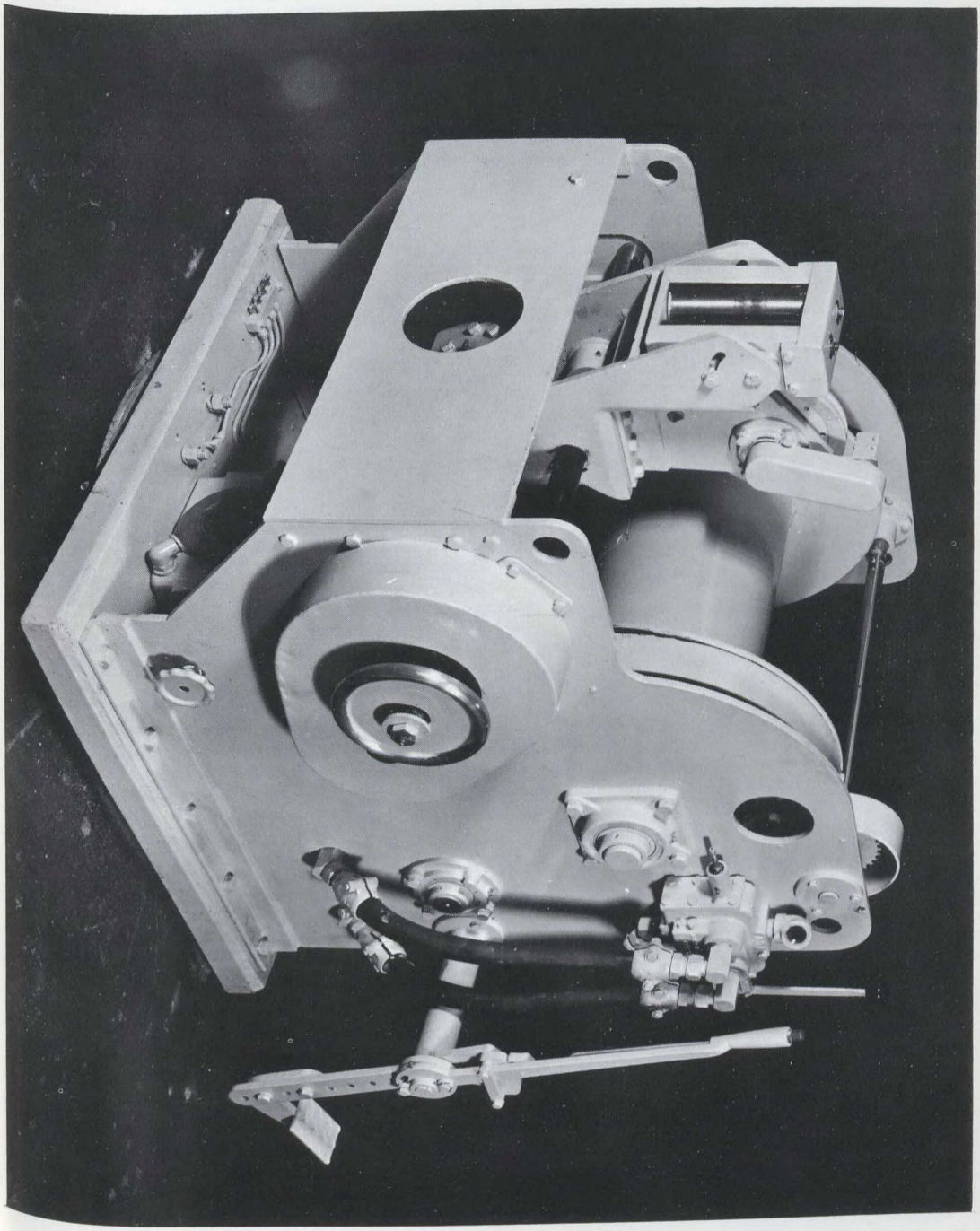
Another feature which is fitted as standard equipment is the automatic spooling arrangement. The spooling drive train is infinitely variable so that any wire size from 3/32″ (2.47 mm) diameter to ½″ (12.7 mm) diameter may be spooled onto the drum. The wire size to be used is selected by means of a small handwheel. The spooling head has two vertical hardened steel rollers which are mounted on sealed ball bearings and can be tilted to allow for a wire lead of from horizontal to 45°. The carriage is driven directly from the drum by a diamond screw and a hardened steel shuttle. It may be declutched and moved manually to suit the wire position on the drum.

Optional equipment available is:

1) A rotating base which enables the winch to be positioned anywhere around 360°.
2) A remote control unit which enables the operating position to be at the rail so that the wire entry into the water can be observed.
3) A maximum of ten gold-plated slip-rings for electrical pick-up can be fitted. These are of the low noise variety and allow continuous electrical readings to be made during payout and haul in operations.
4) A wire measuring device can be mounted on the spooling head. This consists of a wire measuring wheel which drives an electric tachometer-counter. It gives direct readings of line speed and length of wire payed out. The counter will also subtract thus showing the amount of wire remaining to be hauled and has a quick zeroing feature built into the indicator. The indicator is of the remote type and may be placed at any operating position.

The series No. '0' — 410 is one of the units from the complete line of the oceanographic equipment manufactured by J. Swann (1963) Limited. Numerous standard models are available or a custom built winch system can be designed and manufactured for any specific requirement.

This company produces a complete line of deck machinery for use on Tow Boats, Cargo and Fishing Vessels as well as Harbour Craft. Their bathythermograph winches may be found on the most modern survey vessels employed in Canada. Their deck equipment, for fishing vessels in particular, is now being exported to Europe.



BATHYTHERMOGRAPH SLUG

The bathythermograph slug, developed and produced by E.M.I.-Cossor Electronics Ltd., provides a reliable means of obtaining the propagation speed and propagation path of sound waves in water despite temperature variations. In operation, the slug is launched from an aircraft and is dropped to water level inside a bomb-shaped container.

One minute after impact, now automatically released from the container, the slug sinks at a constant rate while a temperature-sensitive device within the unit detects changes in sea water temperature. The sensing device controls the frequency of an oscillator which in turn drives a transducer which radiates acoustic power.

A standard sonobuoy, which may have been dropped at the same time or is already in the water, is used to detect the acoustic signal from the slug. The signal modulates the output of the sonobuoy transmitter. After demodulation by the aircraft receiver, the signal is applied to a translator unit. The output from this unit drives a pen recorder which provides a direct presentation of water temperature in degrees Fahrenheit versus depth of water. The depth factor is introduced as elapsed time from the release of the slug.

The bathythermograph package falls at 225 feet per second (68.6 m/sec). The resulting impact upon hitting the surface of the sea compresses a rubber pad between the nose plate and the slug. This permits a spring-loaded latch to release. The spring is then able to ease off the nose cap and as these components fall clear, the rear section of the package, containing the slug, floats to the surface. The slug fits upside-down in the cylinder like a close-fitting piston. Water leaks into the cylinder through a small hole, permitting the slug to slide slowly downwards. After a delay of one minute, the slug falls clear. Three hinged vanes are provided which spread out as the slug leaves the cylinder. The opening of one of these vanes is slightly retarded, so that the temporary unbalanced condition causes the slug to rotate quickly to the upright position. A switch then closes the battery supply circuit and the slug commences to operate. The vanes produce a uniform sink rate of five feet per second. (1.5 m/sec.)

Electronic and electrosonic components consist of a thermistor (the temperature-sensitive device), a transistorized oscillator controlled by the thermistor, and a transducer, powered by the oscillator output. A small air chamber is located behind the transducer. This equalizes the pressure on both sides of the transducer and compensates for changing seat water pressure as the slug descends. The oscillator frequency range is 4,800 cycles per second to 6,200 cycles per second, for a temperature variation of 25°F to 95°F. (–4°C to 35°C).

Power for the electronic circuit is provided by a sea water activated battery which is entirely inert until wetted during the surface flotation phase. Use of this type of battery permits a shelf life of several years with no attention being required prior to use.

The translator unit is built in a small, standard size, shock-mounted case and operates from a 28v dc supply. The transistorized circuits are designed to minimize the effects of sea noise and multipath interference on the recorded trace. Self-calibration facilities are provided.

The bathythermograph slug was originally designed for tactical use during anti-submarine operations, however, as can be seen, it is a device of considerable value in the gathering of oceanographic data. The conventional method of obtaining temperature readings by employing ships is both slow and costly. By utilizing bathythermograph slugs dropped in conjunction with standard sonobuoys, temperature readings over large areas of ocean can be obtained in a comparatively short time.

BATHYTHERMOGRAPH SLUG

Temperature Measuring Range...25°F to 95°F
Maximum Operating Depth.....1000 ft.
Oscillator Frequency....4800 cycles per second to 6200 cycles per second
Power Output.....100 milliwatts approx.
Sink Rate.....5 ft. per second
Depth Accuracy.....±3 ft. at 100 ft.
±12 ft. at 1000 ft.

Temperature Accuracy—

Normal Conditions

Water Temp. 30-70°F
Slug Ambient Before Launch 30-80°F

Extreme Conditions

Water Temp. 25-95°F
Slug Ambient Before Launch –5 to 120°F

Maximum Launching Speeds

150 to 500 ft.....150 kts. max.
500 to 10,000 ft.....250 kts. max.
Weight.....3.2 pounds
Package Dimensions.....15 in. x 3 in.

TRANSLATOR

Input.....0.1 volts to 2.0 volts rms at 4.8 to 6.2 kilocycles
Output....0 to 1 ma. dc into 10 to 15 K ohms
Power Requirements....28 volts dc, 0.15 amps
Size.....7⅝ x 5 x 10 in.

Case in accordance with MIL-STD-91402-S1

OCEANOGRAPHIC DATA COLLECTION INSTRUMENTATION VEHICLE

One of the major barriers to the extensions of man's knowledge of underwater phenomena, has been the difficulty of placing at sea scientific instruments to measure and record the characteristics of these phenomena. In the past, small research vessels have usually been used to obtain desired data. However, in many instances, particularly when data must be collected over a long period of time, the use of a ship is prohibitively costly.

The oceanographic vehicle described here offers a solution to this problem by providing an instrumentation platform which can be moored at sea, in depths up to 3000 fathoms (5486.4 m) and left unattended for long periods of time. The success of the E.M.I.-Cossor oceanographic vehicle is attributable mainly to the unique launching and mooring technique utilized.

For launching, the entire system is assembled into one package. Launching can be accomplished from virtually any ocean-going vessel equipped with very simple handling gear. Mooring is an entirely automatic operation; the vehicle lowers its own anchor, locks the anchor cable into position, and turns itself on, all on a pre-programmed basis.

The vehicle is used to collect information on underwater acoustic disturbances, and to transmit this information by radio. It consists mainly of three groups of components; a surface group, containing the electronics and power pack; a subsurface group consisting of the subsurface float, data collecting instrument and automatic depth setting unit; and the anchor and mooring cable group.

The Surface Unit is designed to offer minimum resistance to wind and current. The unit also houses the antenna, power source and electronics. The Subsurface Float has been carefully designed and tested to offer a stable platform for underwater instruments. It is essentially a welded steel tank, pressurized to equal the surrounding water pressure. The Automatic Depth Setting Unit comprises a drum which stores the mooring cable, and a hydraulically controlled brake. The brake prevents the drum from unwinding the mooring cable until the predetermined subsurface float depth has been reached. The entire subsurface group of components is attached to the surface group by means of the upper mooring and data transmission cable. The Lower Mooring Cable is ⅛ inch diameter (.3 cm) steel wire rope, which terminates in an insulator to prevent electrolytic corrosion. The insulator is connected to the cast steel anchor through a length of chain and a ball-bearing swivel.

The launching of the vehicle is an almost entirely automatic operation. The buoy is delivered to the User as a rigid, self-contained package. In mooring the buoy it is merely necessary to launch the complete package. The mooring then proceeds automatically and is complete within 45 minutes. Two minutes after the completion of the mooring the winch locks itself automatically and permanently.

The applications of the vehicle are limited only by the ingenuity exercised in the design of the payload. When fitted with suitable instrumentation and electronics, data on almost any characteristic of the sea can be gathered. By using more than one vehicle, simultaneous data can be gathered from any desired number of locations. A less sophisticated application of the vehicle is its use as a permanent position marker. In this role it simply transmits a continuous signal thereby enabling it to be easily located by radio direction finders.

E.M.I.-Cossor Electronics Ltd. has supplied several configurations of the vehicle to organizations and agencies engaged in oceanographic research. The buoys have been supplied completely equipped with the particular electronics and instrumentation required.

Some specific applications have required modification of the basic system. However, the design of the vehicle allows it to satisfy a wide variety of requirements.

E.M.I.-Cossor engineering and scientific personnel are available to discuss with your organization the application and adaptation of the vehicle to your specific requirements.

Details of a typical vehicle mooring system.

PLASTIC GUN SHIELDS

In 1953 the Royal Canadian Navy decided to initiate and guide a design and development programme to produce a 3″/50 gun shield in a plastic material. Such a plastic structure was unique at that time. An aluminum shield was also considered before this decision was reached. The material selected was that of a polyester, resin reinforced fibreglass with non-inflammable characteristics which was preferred due to its shape-forming capabilities, composition and structural features as it provided a better strength/weight ratio than could be obtained with an aluminum structure. It also met a design requirement in which the material itself needed little maintenance.

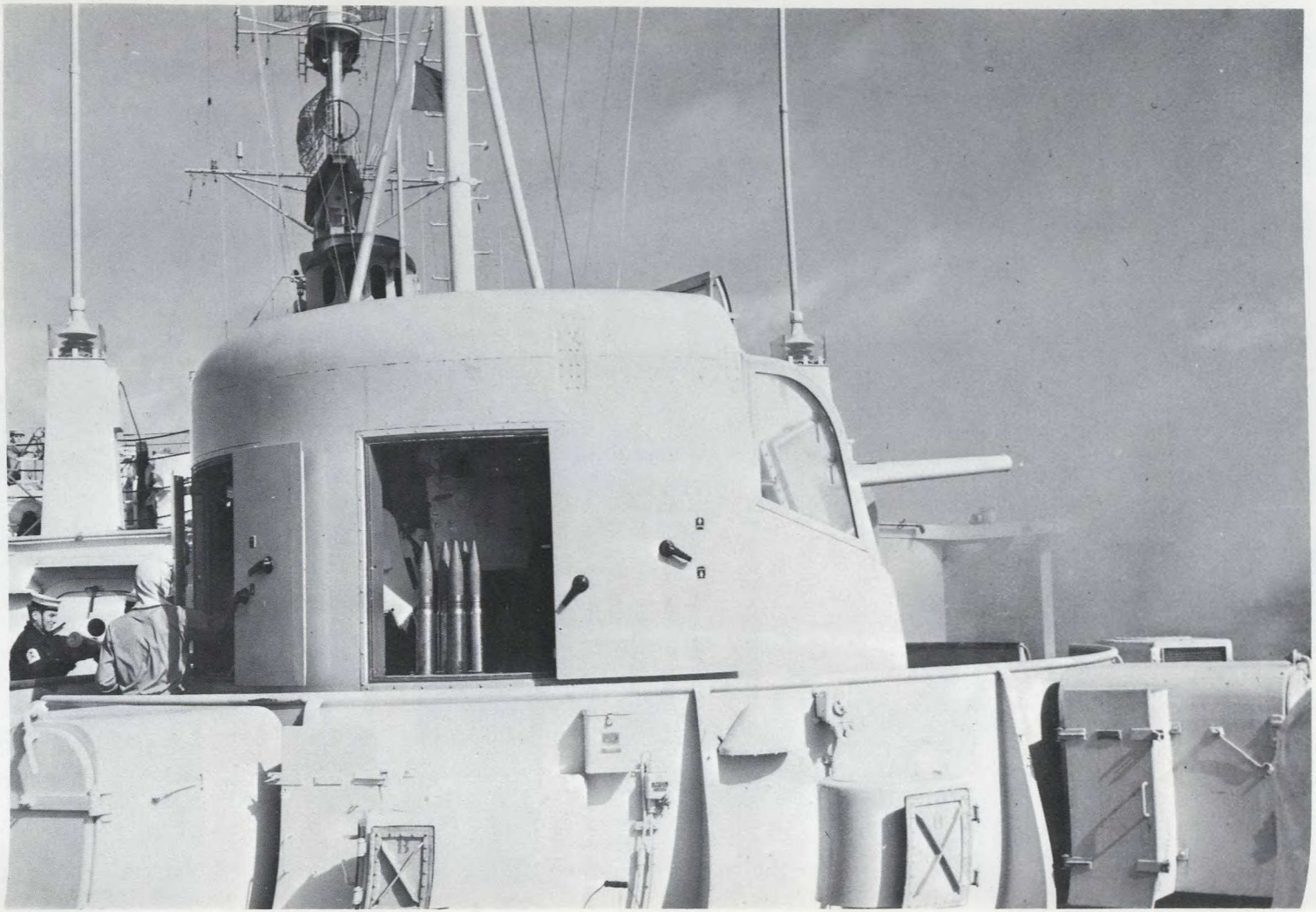
The primary purpose of such a shield is to afford the fullest possible protection of the armament from the adverse effects of a marine environment, thereby considerably reducing the maintenance requirements of the 3″/50 Twin Armament.

An early prototype "guinea-pig" shield was first constructed to establish suitable fabrication processes for the production of fibreglass mouldings in the required shapes and sizes and to enable actual strength characteristics to be physically determined. This work proved the overall feasibility of constructing a suitable fibreglass shield and paved the way for pre-production models to be built by Uniroyal (1966) Limited. These models embodied certain design changes and improved manufacturing techniques and underwent sea-going trials in HMC Ships OTTAWA and SAGUENAY in 1956 and 1958. With the design now firm the company then commenced production models which were supplied to this class on refit programmes.

The shield is equipped with access doors for the crew members and ammunition handling, heating units, de-icing units and fume-exhaust fan motors fitted with flexible trunking. The shield completely encases the armament proper and provides obvious improvements to the habitability of the shield at all times. Colouring pigments, introduced as required during the initial fabrication work, effect a reduction in future painting requirements. The eight major sections of the shield are supported by a fibreglass platform assembly which is secured to the base structure of the mount. Watertight access ports are also incorporated to enable various operational checks and adjustments to be carried out on the armament.

So far as is known no other navy, until recent times, has devised a gun shield comparable with that which has now been in regular Royal Canadian Navy service since 1956.

This singular experience gained by Uniroyal Ltd. has left them in the position to design and develop other structures of this type and to the exacting demands of naval requirements.



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 seven basic categories:

- Small — ¼″ – 2″ (.6 – 5.1 cm) Forged Steel Bolted Bonnet Gate, Globe and Check valves utilized in general industry from low through high pressure service.
- ¼″ – 3″ (.6 – 7.6 cm) Forged Steel Bonnetless Gate, Globe and Check valves for power and high pressure service.
- Large Cast Steel valves from 2″ – 24″ (5.1 – 61 cm)
- Large Forged Steel "Pressure-Seal" valves from 2″ – 16″ (5.1 – 40.6) for general industrial and high pressure power service.
- Stainless Steel valves both cast and forged in the complete range from ¼″ – 24″ (.6 – 61 cm) for corrosive services.
- Top Entry and Side Entry Ball valves in the complete range from ¼″ – 16″ (.6 – 40.6 cm).
- Special service custom built valves redesigned and engineered by modifying existing designs and 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 with excellent raw material, manpower, rail, road, sea and air transportation facilities. To cater for its growing business in the United States, the company operates two independent U.S. Corporations located in upper New York State where the complete range of products is manufactured, supplemented by the engineering, designing and manufacturing facilities of its main plant in Montreal.

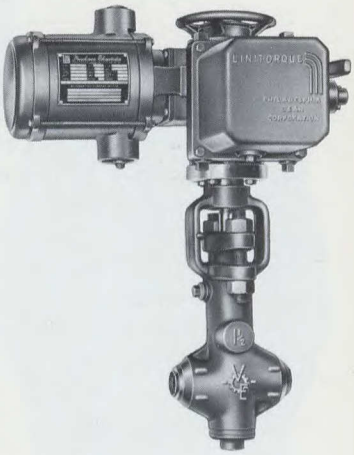
Excellent U.S. Sales and Service facilities are provided through the company's branch sales and service offices in New York City, Houston, Chicago and Los Angeles augmented by associated agents, distributors and representatives in major U.S. cities.

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 U.S. industrial and defence commitments abroad, offering replacements, spare parts and servicing in any part of the globe.

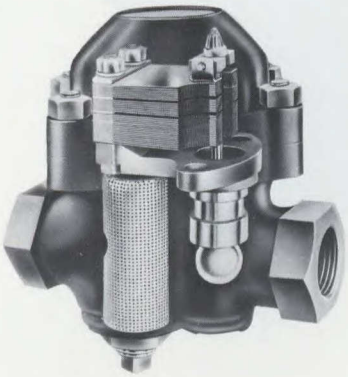

600
FORGED STEEL


1"
VELAN
600


VELAN


LINETORQUE


VELAN




VELAN
600 1500

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:

1¾″	f/2.8
3″	f/2
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″ × 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, infrared 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.


LENS MADE IN CANADA
LENS MADE IN CANADA
LENS MADE IN CANADA
LENS MADE IN CANADA
ELCAN f/2.8 1-3/4 INCH

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.

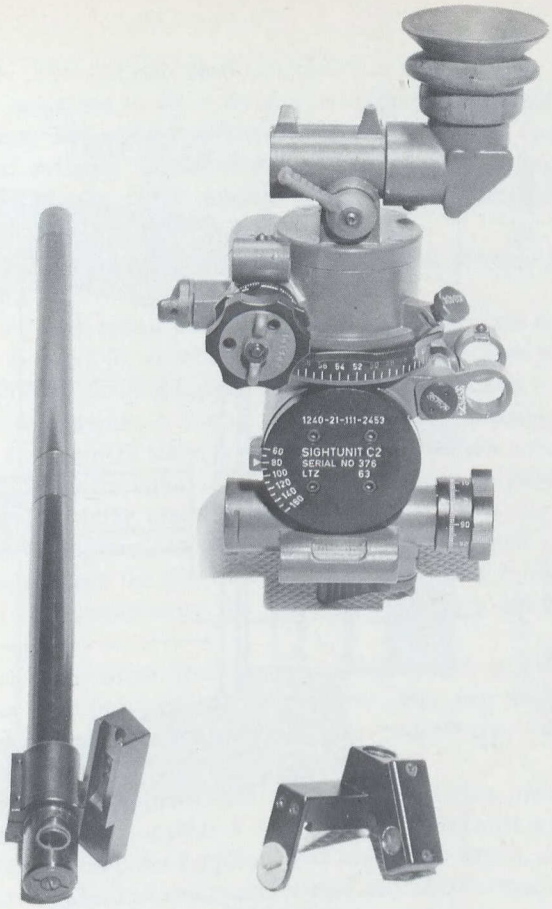
Leitz equipments have found acceptance in allied nations around the world in commercial and military fields where both competition and performance requirements present a restricted field. Some of the more basic and interesting products are noted below.

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 as well as being on trial in several other countries.

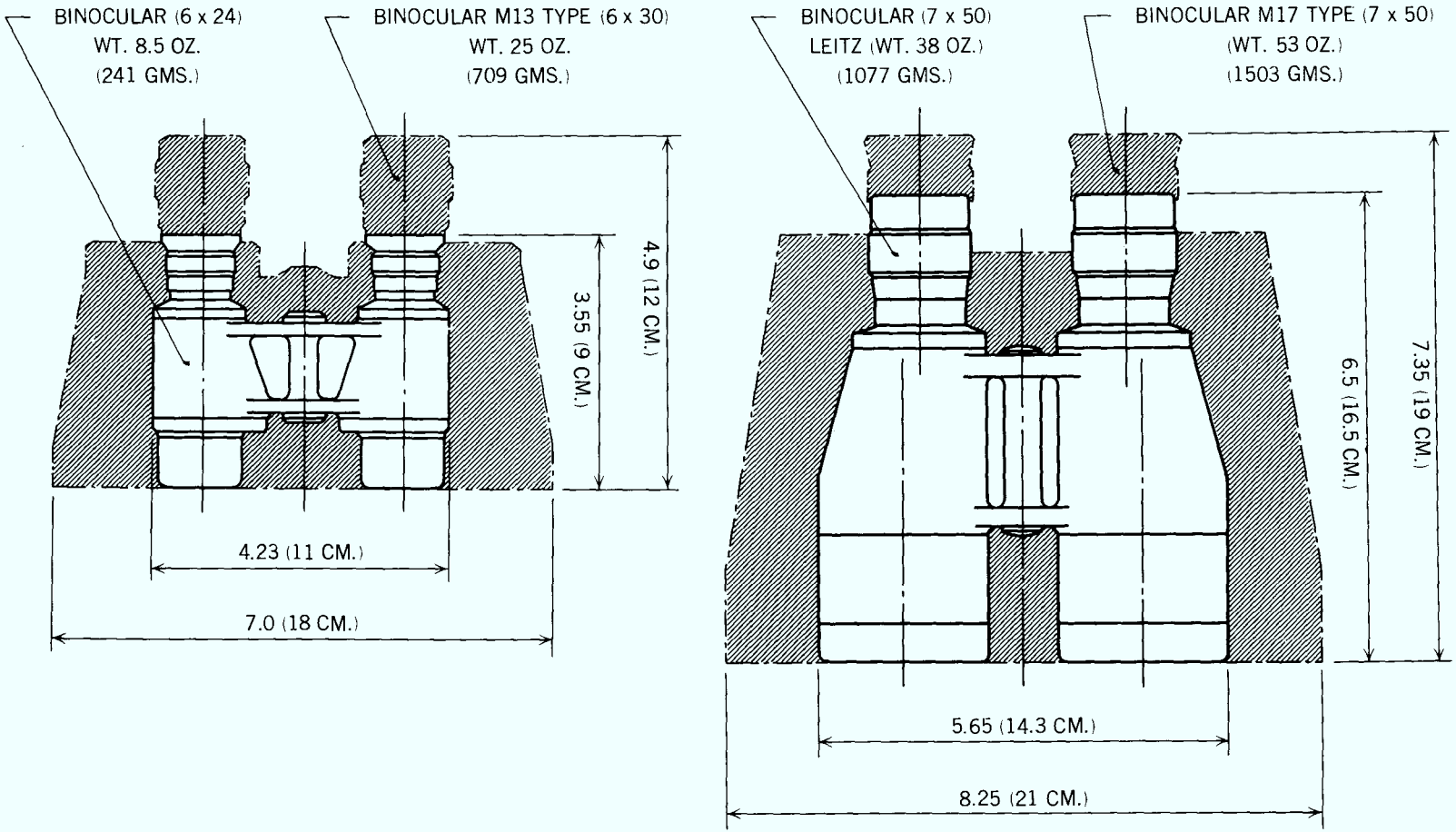
When the Canadian Army adopted the FN Rifle they were left with the choice of accepting existing Sniper Telescopes, as is the usual practice, or providing a Scope which was designed for the rifle and that met the particular ballistics of that rifle. Fortunately they chose the latter course and Ernst Leitz Canada designed, 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.

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

SIGHTUNIT C-2 AND ELEVATED LINE-OF-SIGHT ANCILLARIES.



TELESCOPE, SNIPER C-1.



PART OF FAMILY OF LIGHTWEIGHT BINOCULARS

eliminating batteries. A control is provided for reticle illumination adjustment.

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.

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 redesigned 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.

PRESSURE DOME WATER CONTACT LENS

To meet a requirement for a photographic lens specifically designed to provide the optimum photographic image in a sea water environment, a water contact lens has been designed and manufactured. It is an f2.8 lens covering the 70mm format and having an acceptance angle of 65 degrees. The front element of the lens has been designed so that it is used as the pressure dome window of the camera enclosure thus eliminating an air to glass and a glass to sea water surface in the optical system. This front element also is designed to withstand the water pressure at a depth of 250 feet (76.2 m). The iris control is on the external surface and provides adjustment through a suitable packing gland. Focusing is also accomplished by means of a similar control which has a focusing range of 18 inches to 20 feet (45.7 to 609.6 cm).

Using the same technique, other lenses are being designed by Ernst Leitz, Canada, for use with the 16mm and 70mm format.

TRAINING AIDS AND SIMULATORS

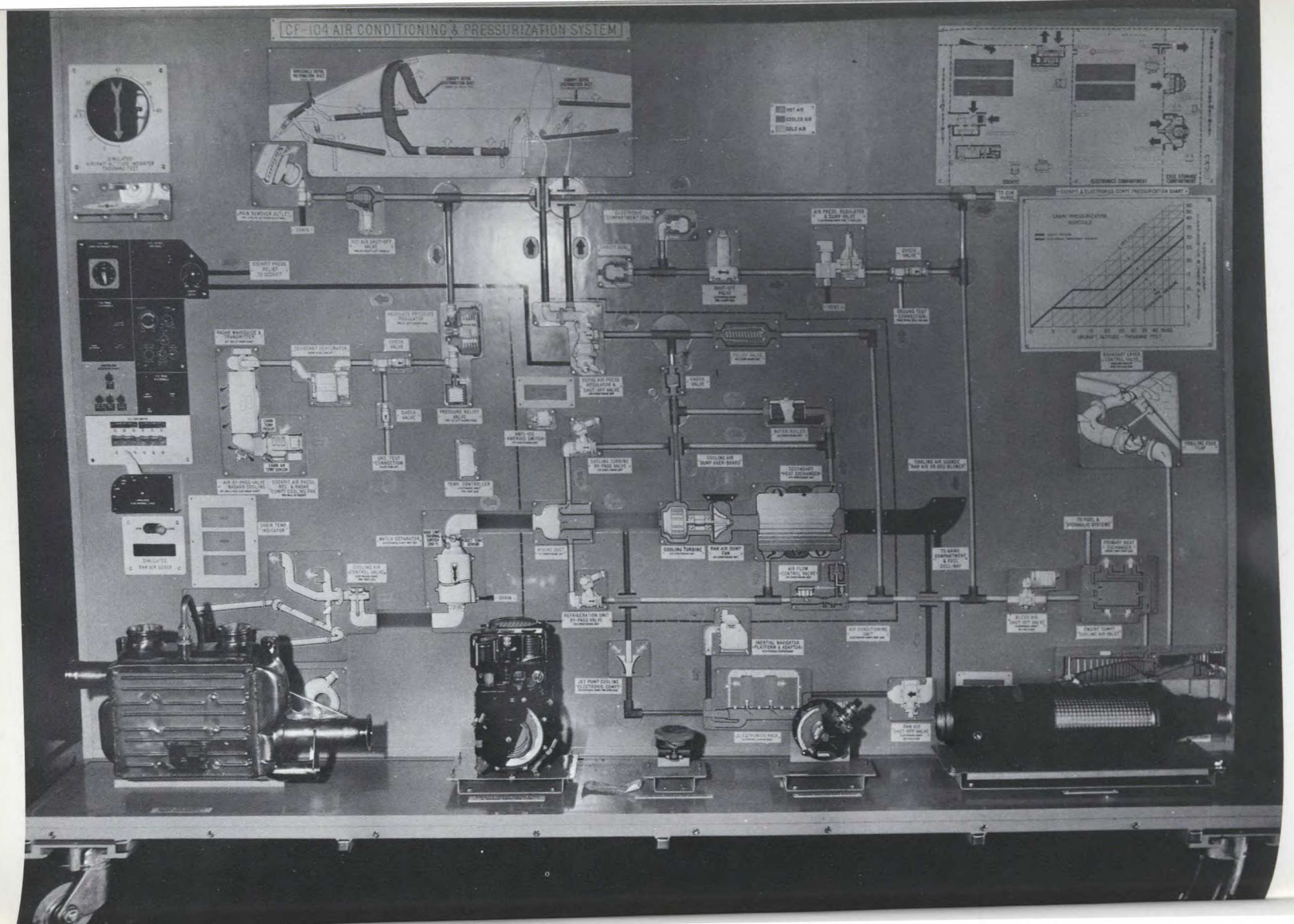
The training of personnel in the function and proper use of new equipments has always been a problem, largely due to the high costs involved in operating the actual equipment. A further consideration is the possibility of damage to the unit or injury to the trainee operator.

To-day even the most simple of equipments are becoming more complex and consequently more expensive, yet due to their complexity the need for training is greater than ever. System diagrams will no longer suffice for instruction. What is required is a device which faithfully represents the actual functioning equipment, and where applicable, be capable of reproducing malfunctions on command.

It may seem paradoxical, that such trainers, intended to save time or funds, may not be purchased due to their high cost when produced from a source with no previous experience. Fleet Manufacturing Limited have produced many of these devices and their experience in this field alone leaves them in a position to act as a consultant or design agent or if required, produce the actual equipment to meet your needs.

In some of the trainers, three of which are depicted here, cold cathode tubes are used to represent hydraulic or electrical lines and they can be colour coded, if applicable to the actual equipment. In all cases components are sectioned so that internal function can be observed.

Discussion of similar problems with Fleet Manufacturing will result in years of experience being applied to their solution.


CF-104 AIR CONDITIONING & PRESSURIZATION SYSTEM
SIMULATED AIRCRAFT ALTITUDE INDICATOR THOUSAND FEET
HOT AIR
COOLER AIR
COLD AIR
COCKPIT
ELECTRONICS COMPARTMENT
CASE STORAGE COMPARTMENT
COCKPIT & ELECTRONICS COMPT PRESSURIZATION CHART
CABIN PRESSURIZATION SCHEDULE
AIRCRAFT ALTITUDE - THOUSAND FEET
RAIN REMOVER OUTLET
DRAIN
HOT AIR SHUT-OFF VALVE
COCKPIT PRESS RELIEF TO COCKPIT
ELECTRONIC COMPARTMENT SEAL
CANOPY SEAL
SHUT-OFF VALVE
AIR PRESS. REGULATOR & DUMP VALVE
TEST
CHECK VALVE
GROUND TEST CONNECTION
ABSOLUTE PRESSURE REGULATOR
RADAR WAVEGUIDE & TRANSMITTER
DESICCANT DEHYDRATOR
CHECK VALVE
CHECK VALVE
PRESSURE RELIEF VALVE
GRD TEST CONNECTION
CABIN TEMP PICKUP
CABIN AIR TEMP SENSOR
AIR BY-PASS VALVE RADAR COOLING
COCKPIT AIR PRESS. REC. & RADAR COMPT COOLING FAN
TEMP. CONTROLLER
DEFOG AIR PRESS REGULATOR & SHUT-OFF VALVE
RELIEF VALVE
CHECK VALVE
ANTI-ICE ANEROID SWITCH
WATER BOILER
COOLING TURBINE BY-PASS VALVE
COOLING AIR DUMP OVER-BOARD
SECONDARY HEAT EXCHANGER
COOLING AIR SOURCE RAM AIR OR GRD BLOWER
BOUNDARY LAYER CONTROL VALVE
TRAILING EDGE FLAP
CABIN TEMP INDICATOR
SIMULATED RAM AIR SOURCE
WATER SEPARATOR
HIGH LIMIT THERMAL SWITCH
DUCT TEMP SENSOR
MIXING DUCT
COOLING TURBINE
RAM AIR DUMP FAN
COOLING AIR CONTROL VALVE
DRAIN
AIR FLOW CONTROL VALVE
TO AMMO COMPARTMENT & FUEL CELL-BAY
TO FUEL & HYDRAULIC SYSTEMS
PRIMARY HEAT EXCHANGER
REFRIGERATION UNIT BY-PASS VALVE
AIR CONDITIONING UNIT
BLEED AIR SHUT-OFF VALVE
ENGINE COMPT COOLING AIR INLET
INERTIAL NAVIGATOR PLATFORM & ADAPTOR
JET PUMP COOLING ELECTRONIC COMPT
ELECTRONICS RACK
RAM AIR SHUT-OFF VALVE

CUSTOM MACHINE SHOPS

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 selection 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.

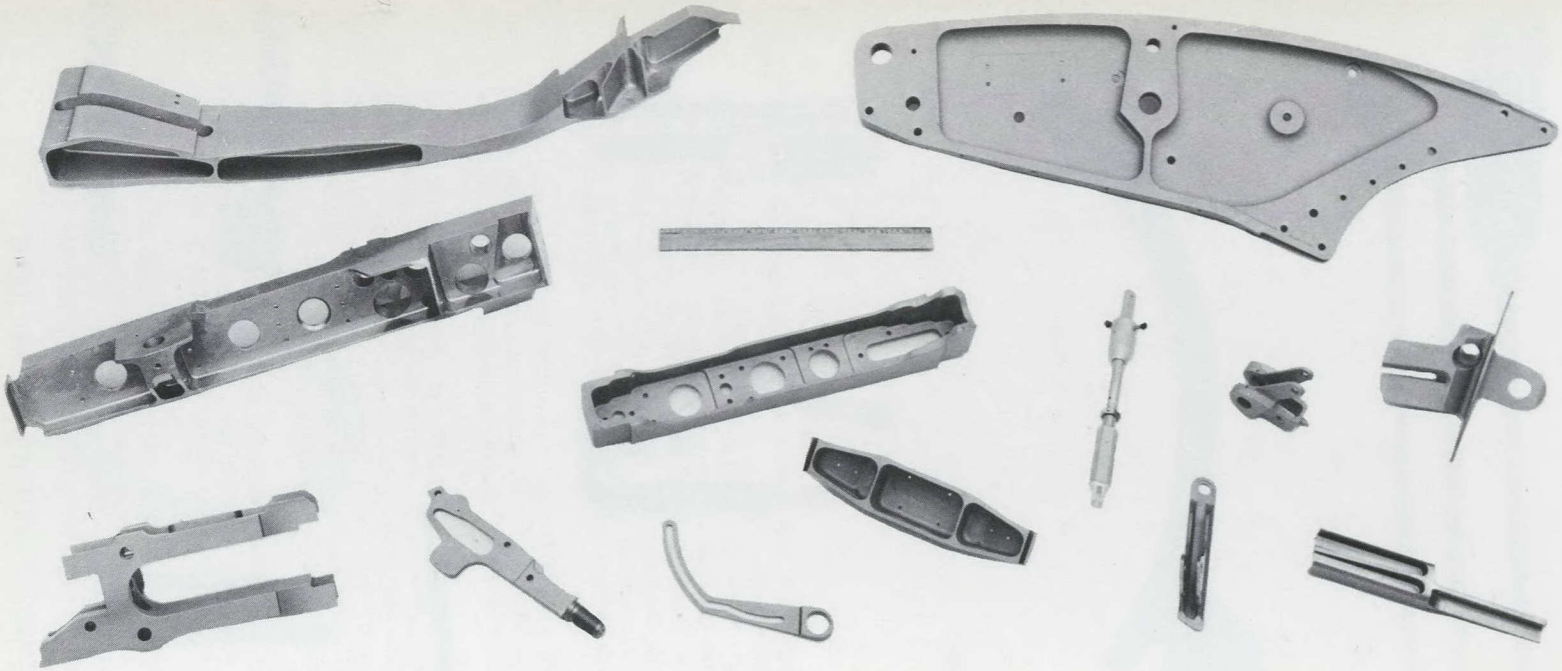
The picture on the facing page is representative of the type of structural component produced by this firm for the aircraft industry. They have produced such components for nearly all Canadian built aircraft since 1946. One of these, the Spar Caps for the DC9, 108″ (274 cm) in length and starting off as a 350 lb. (158.8 kg) forging and finishing as a 75 lb. (34 kg) finished machined 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.

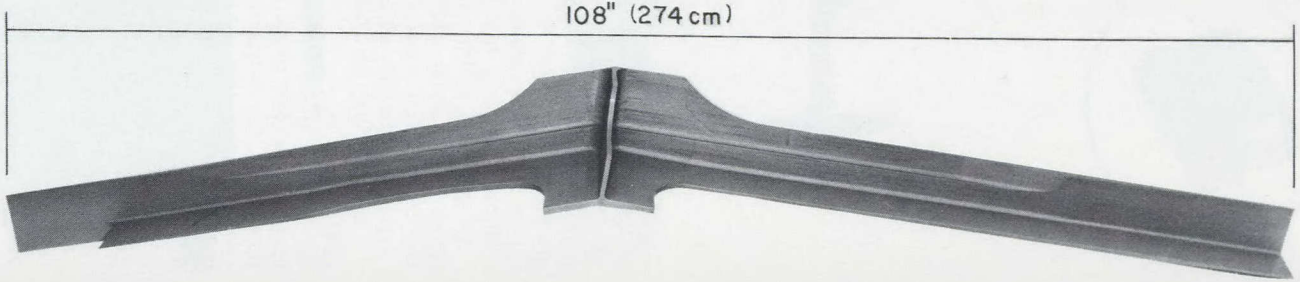
The lower photograph on the facing page is a sampling of the smaller range of ordnance items produced. They include a Small Arms Universal Cleaning Kit at "A", Blank Firing Attachments for rifles and sub-machine guns at "B", a Tension Bar for steam aircraft catapults at "C", a Maintenance Tool for automatic 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 Pullthrough 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.




108" (274 cm)

PAPER, CHEMICAL AGENT DETECTOR

The Canadian Army has developed a simple and rapid method of detecting the presence of the three major classes of chemical warfare agents and differentiating between them. This piece of equipment is in fact a booklet whose size is 2.5 × 4 in. (6.4 × 10.2 cm) and contains 12 sheets of detector paper which are perforated for easy removal when required.

The chemical agent detector is made from a reasonably strong paper. It has good wet strength and is stable in storage when kept dry and away from sunlight. The paper is loaded with three water insoluble dyes to permit detection of and differentiation between G, H and V agents.

Each agent class dissolves one of the dyes to produce a distinctive stain on the paper. G agents produce colours which vary from yellow to orange. H agents produce a red colour, and V agents produce colours which vary from very dark blue-green to light blue-green. The variations in colours produced depend on the particular G or V agent encountered. The inside of the front cover of the booklet has three panels which show the colours produced by G, H and V agents and bears the legend: **"Detects Liquids Only".**

The paper will not change colour with water, gasoline, motor oil, grease or antifreeze.

Decontaminating Agent Cl will cause a colour change in the paper. The colour produced by this agent is black but with large drops a brown colour may be seen in the centre of this black spot.

In detecting liquid chemical agents such as falling drops or splash from chemical munitions, the detector paper is exposed on the clothing or on unscreened surfaces. Where an area is suspected of liquid contamination, the paper is pressed or rubbed over the suspected surface such as grass, broad leaves, etc. Following this action, if coloured spots or streaks appear on the paper the troops immediately don their protective masks. The spots or streaks may then be compared with the colour panel provided and the matching colour determines the agent being used.

The equipment is cheap to produce and individual issue is, therefore, possible.

RADIACMETER, GAMMA SURVEY, LOW RANGE, IM-5016/PD

The Radiacmeter, Gamma Survey, Low Range, IM-5016/PD is a portable geiger tube type instrument designed to measure gamma dose rate over the ranges 0 to 100 mr/hr and 0.1 to 10 r/hr. It is for use at sub-unit level for reconnoitering radioactive contaminated areas, for detecting and measuring radioactive contamination on personnel and equipment, and for training personnel in the operation of dose rate meters. The size of the prototype model is approximately 8⅞ in. x 4⅜ in. x 4½ in. (22.5 cm. x 11.1 cm. x 11.4 cm.) and it weighs 3½ lbs. (1.6 kg).

The radiacmeter possesses the full range of characteristics of ruggedness and environmental performance for military equipment. It meets the draft operational characteristics given at Appendix 4 to Annex to the AC/196-WP/59 subject to the following comments:

(a) It does not measure beta radiation;
(b) The advanced circuit design obviates the requirement for a zero check and zero adjust found in older units;
(c) It is designed with a response time of from 3½ to 4 seconds in order to reduce meter needle oscillation in low dose rate fields. The proposed required response time of one second is not considered realistic;
(d) Although it can be used in the vehicle borne role it is not practicable to adapt it to use the vehicle power supply;
(e) The full range of 0.1 to 500 r/hr requires two instruments:
0.1 to 10 r/hr — Radiacmeter, Gamma Survey, Low Range, IM-5015/PD;
1.0 to 500 r/hr — Radiacmeter, Gamma Survey, IM-108B/PD.

Pre-operating instructions are included on the radiacmeter identification plate. Each radiacmeter is provided with a webbing shoulder strap to facilitate carriage.

Testing of prototype models has been carried out and results published in Canadian Army Engineering Report AEEE-25, Jan 64, "Radiacmeter, Gamma Survey, Low Range, IM-5016/PD (Model XP-1 to XP-4)". Tests corresponding to operational and technical requirements are included in the specification.

The production specification is CA-R-236: Radiacmeter, Gamma Survey, Low Range, IM-5016/PD. This radiacmeter has been adopted for use by the Canadian Forces.

RADIACMETER, GAMMA SURVEY, IM-108B/PD

The Radiacmeter, Gamma Survey, IM-108B/PD is a Canadian modified version of the US designed Radiacmeter, Gamma Survey IM-108/PD. It measures gamma dose rate over the range 1.0 to 500 r/hr and is for use at sub-unit level for reconnoitering radioactive contaminated areas. Its size is 6¾ in. x 4¼ in. x 4½ in. (17.2 cm. x 10.8 cm. x 11.4 cm.) and it weighs 4 lbs. (1.8 kg).

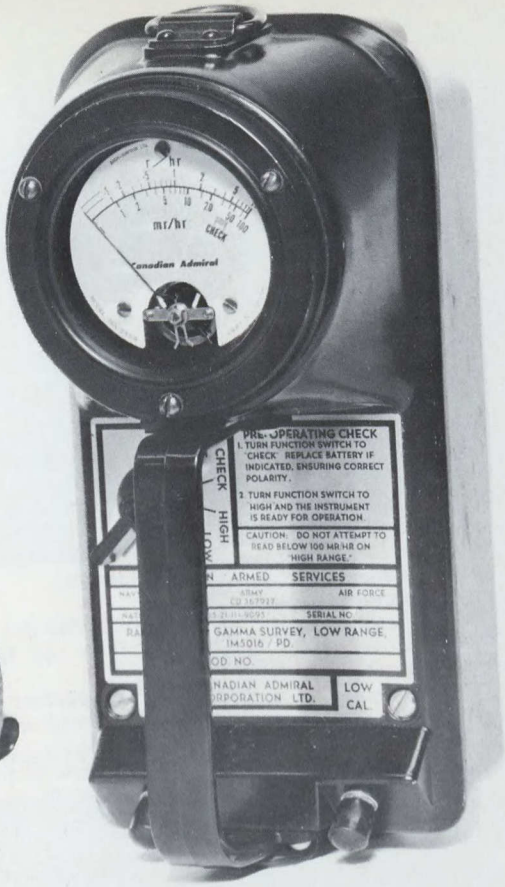
The radiacmeter contains a hermetically sealed chamber and possesses the full range of characteristics of ruggedness and environmental performance for military equipment. It meets the draft operational characteristics given at Appendix 4 to the Annex to AC/196-WP/59 subject to the following comments:

(a) It does not measure beta radiation;
(b) Although it can be used in the vehicle borne role it is not practicable to adapt it to use the vehicle power supply;
(c) The full range of 0.1 to 500 r/hr requires two instruments:
- 0.1 to 10 r/hr — Radiacmeter, Gamma Survey, Low Range, IM-5016/PD;
- 1.0 to 500 r/hr — Radiacmeter, Gamma IM-108B/PD.

Operating instructions are included on the radiacmeter identification plate. Each radiacmeter is provided with a fabric carrying case containing a belt loop and shoulder strap to facilitate carriage.

Tests corresponding to operational and technical requiremens are included in the specification. The results of the production approval tests on pre-production models are contained in Canadian Army Engineering Report AEEE-29, Feb 64, "Production Approval Testing of Radiacmeter, Gamma Survey IM-108B/PD".

The current production specification is CA-N-118: Radiacmeter, Gamma Survey, IM-108(B)/PD. This radiacmeter has been adopted for use by the Canadian Forces and has been produced in large quantities with satisfactory quality control according to the specification.


mr/hr
CHECK
Canadian Admiral
PRE-OPERATING CHECK
1. TURN FUNCTION SWITCH TO 'CHECK' REPLACE BATTERY IF INDICATED, ENSURING CORRECT POLARITY.
2. TURN FUNCTION SWITCH TO 'HIGH' AND THE INSTRUMENT IS READY FOR OPERATION.
CAUTION: DO NOT ATTEMPT TO READ BELOW 100 MR/HR ON 'HIGH RANGE.'
CHECK
HIGH
LOW
ARMED SERVICES
ARMY
AIR FORCE
SERIAL NO.
GAMMA SURVEY, LOW RANGE
1M5016 / PD.
CANADIAN ADMIRAL
CORPORATION LTD.
LOW
CAL


rad/hr
Canadian Admiral

ELECTROSTATIC DOSIMETERS

TACTICAL: Radiacmeter, Tactical Dosimeter, (0-600 r) IM-5013/PD.
RESIDUAL: Radiacmeter, Technical Dosimeter, (0-10 r) IM-5002A/PD.
SPECIAL: Radiacmeter, Technical Dosimeter, (0-500 mr) IM-5006A/PD.
These dosimeters are direct reading instruments for measuring up to their maximum range the total dose of gamma radiation to which they are exposed. They consist of a quartz fibre electroscope and an optical system contained in a tube which is similar in appearance to a fountain pen, and are read by looking through them longitudinally at a source of light. They are 4-13/32 in. (11.2 cm) long, 17/32 in. (1.4 cm) in diameter, and weigh 1-¼ oz. (35.0 gms). They can be re-zeroed by means of the Charger Radiac Detector PP-5120-PD.

The IM-5013/PD dosimeter is for use by officers and NCOs for measuring prompt and residual gamma radiation as an indicator of the dose received in a local area. The IM-5002A/PD (0-10 r) dosimeter is primarily for use by reconnaissance, monitoring, and decontaminating parties. The IM-5006A/PD (0-500 mr) dosimeter is for use by instructors, and technicians for training and special purposes.

The dosimeters are hermetically sealed instruments with the full range of characteristics of ruggedness and environmental performance for military equipment. They meet the draft operational characteristics given at Appendices 2, 3 and 11 to the Annex to AC/196-WP/59 subject to the following comments:

- They do not measure neutrons;
- Energy response testing has only been carried out between 90 kev and 1.2 mev;
- Saturation occurs at ultra high dose rates (eg 10^4 rad per microsecond) of mixed gamma radiation and neutrons;
- The leakage rate is approximately 2 to 3 percent per day of full scale reading;
- An off-scale reading can be artificially created without leaving detectable evidence;
- The scale is in "r" rather than "rad".

Operating Instructions are supplied with each dosimeter.

A continuing programme of testing samples drawn from stock of each type of dosimeter has been initiated to determine the effect of age on performance.

These dosimeters have been adopted for use by the Canadian Forces.

CHARGER, RADIAC DETECTOR, PP5120/PD

The Charger, Radiac Detector, PP5120/PD is for zeroing the above electrostatic dosimeters. It is basically a lightweight transistorized dc power supply operating from a single "D" cell dry battery. Its size is 4-½ in. x 3-¾ in. x 1-⅞ in. (11.4 cm x 9.5 cm x 4.8 cm) and it weighs 1-½ lbs (0.7 kg.).

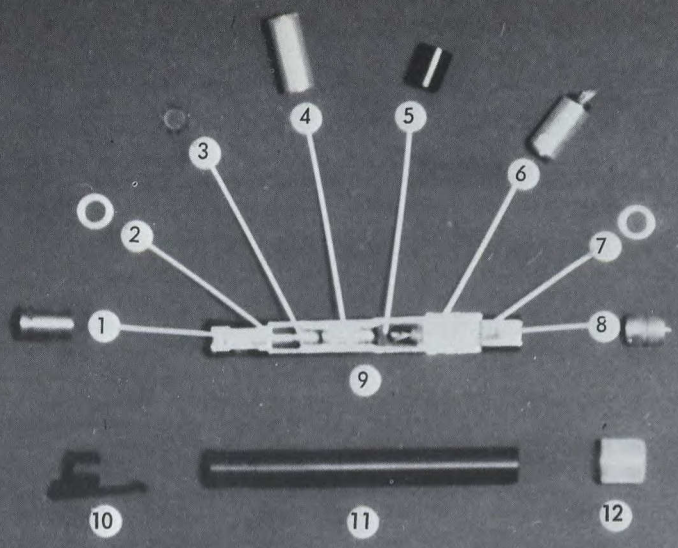
The charger possesses the full range of military characteristics of ruggedness and environmental performance. It substantially meets the draft operational characteristics given in AC/196(WP4)D/3.

Operating Instructions are included with the charger.

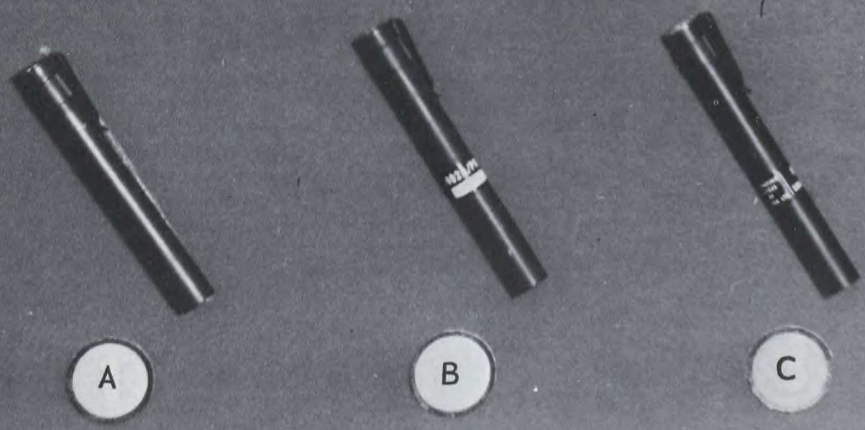
The charger is provided with a fabric carrying case containing a belt loop and shoulder strap to facilitate carriage.

Tests corresponding to operational and technical requirements are included in the specification.

This charger has been adopted for use by the Canadian Forces and has been produced in large quantities with satisfactory quality control according to the specification.



1 – EYE PIECE
2 – UPPER WASHER
3 – STAR WASHER
4 – OBJECTIVE LENS
5 – CHAMBER
6 – CONDENSER, ELECTROMETER
7 – LOWER WASHER
8 – BELLOWS
9 – CUT-AWAY VIEW
10 – CLIP
11 – BARREL
12 – PLASTIC PROTECTOR



RADIACMETER REMOTE MONITORING SINGLE PROBE

The Radiacmeter Remote Monitoring Single Proble IM-5015/TD is designed to detect and monitor gamma radiation in roentgens per hour (r/hr). The monitoring device, or detector, is placed in a protected location and is connected by cable to the exposed detecting element.

The radiacmeter consists of a radiac detecting element, a radiac detecting element mounting bracket, a triaxial cable, a radiac indicator and a wooden carrying case.

The radiac indicator is a battery-operated instrument. It incorporates an electrometer box, a battery power source, a voltage check and operation switches, circuit balance controls and a 0 to 500 r/hr meter. A read line on the meter scale marked VOLT. MIN. denotes the lowest acceptable supply voltage reading. The electrometer box contains a constant current source which provides the zero reference and electrometer tube VI which amplifies the input circuit. Nine mercury cell batteries mounted on a plug-in board provide all the reference and control voltages for the radiacmeter.

The detecting element is a sealed ionization chamber which interconnects with the radiac indicator by means of a 50 or 100 ft. (15 or 30.5 m) triaxial cable.

The normal location of the indicator is an underground or basement center. The interconnecting cable passes through a conduit to the detecting element which is mounted 3 ft. (1 m) above the ground and as far away from buildings as the cable will allow. The indicator can be placed horizontally on a table or mounted vertically on a wall. Mounting details are supplied in the carrying case.

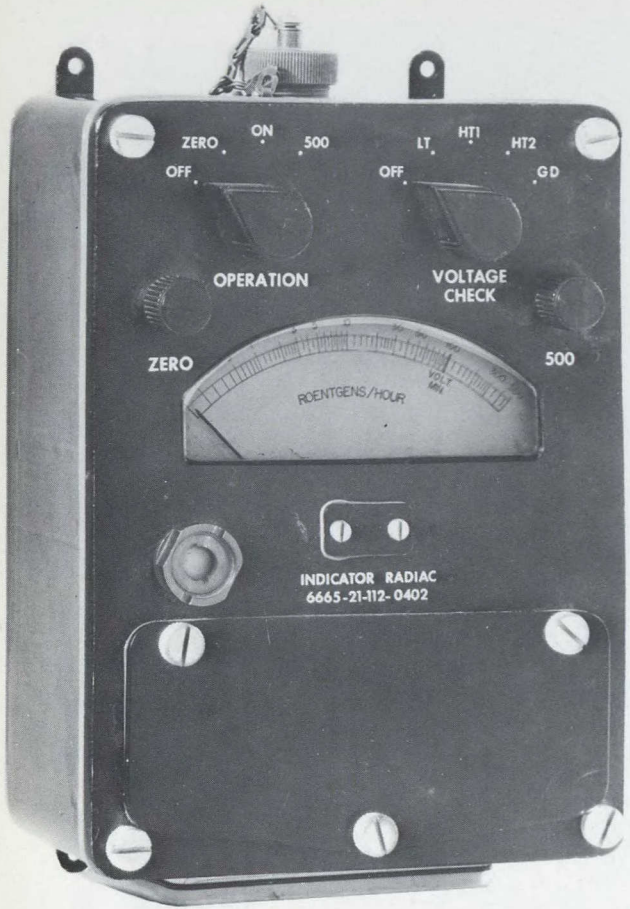
The front panel of the indicator houses the meter, the operation switch, the voltage check switch and 500 set controls. The two switches are mechanically interlocked so that one cannot be rotated unless the other is set to OFF.

Indicator Radiac:	10.5″h. x 7″w. x 5″d. (27 x 18 x 13 cm) 8 lb. 12 oz. (3969 gm)
Detecting Element:	6″h. x 3-⅜″ dia. (15 x 9 cm) 1 lb. 14 oz. (851 gm)
Cable Assembly:	50′ (15 m) 6 lb. 14 oz. (3118 gm)
1-Conductor Twin Shield:	100′ long (30.5 m) 13 lb. (5797 gm)
Carrying Case:	23-⅞″l. 20″w. 8-⅛″d. (61x51x21 cm) 20 lb. complete (9072 gm)

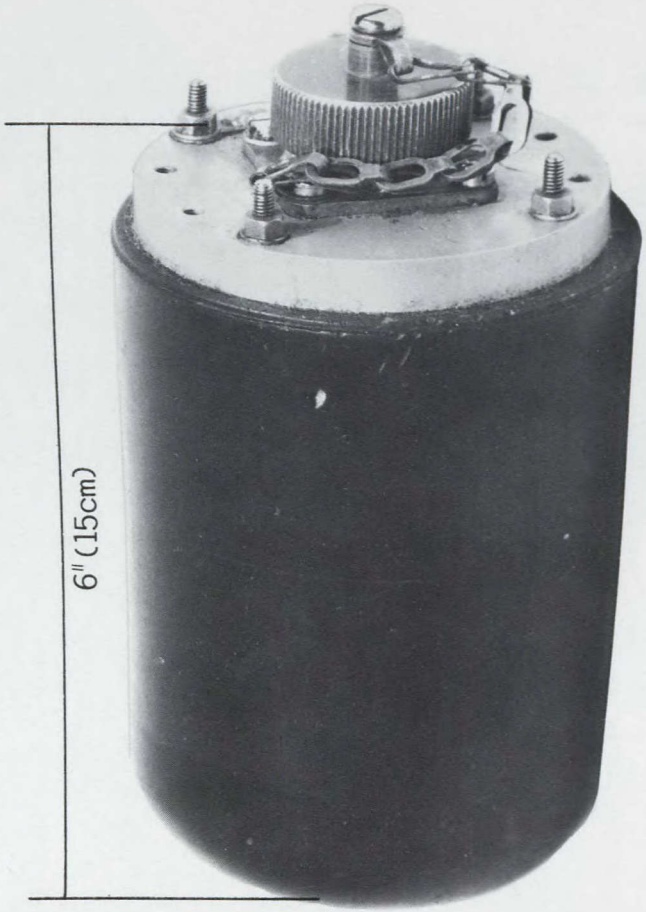
PHYSICAL AND ELECTRICAL DATA

Range:	0 — 500 R/hr
Accuracy:	± 25% within 3 minutes after switching on equipment
Response Time:	90% of maximum response within 15 seconds after exposure to radiation source.
Energy Dependents:	50 Kev to 2 Mev ± 50%
Battery Operating Life:	1.3 voltage DC mercury cell type BA1391/U (250 hrs) 6.7 voltage DC mercury cell type TR165R (600 hrs)
Battery Service Life:	2 years

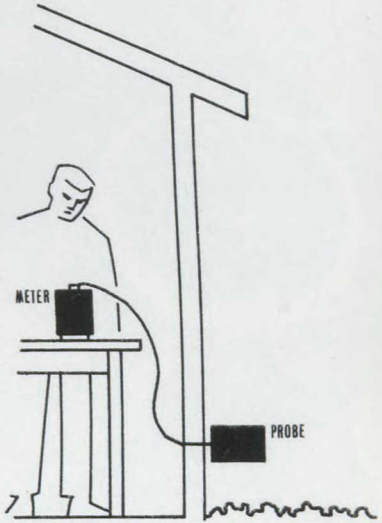
Electrometer Tube Type ME1404 or equivalent.


ZERO
ON
500
OFF
LT
HT1
HT2
OFF
GD
OPERATION
VOLTAGE CHECK
ZERO
500
ROENTGENS/HOUR
INDICATOR RADIAC
6665-21-112-0402

METER


6" (15cm)

PROBE


METER
PROBE

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.

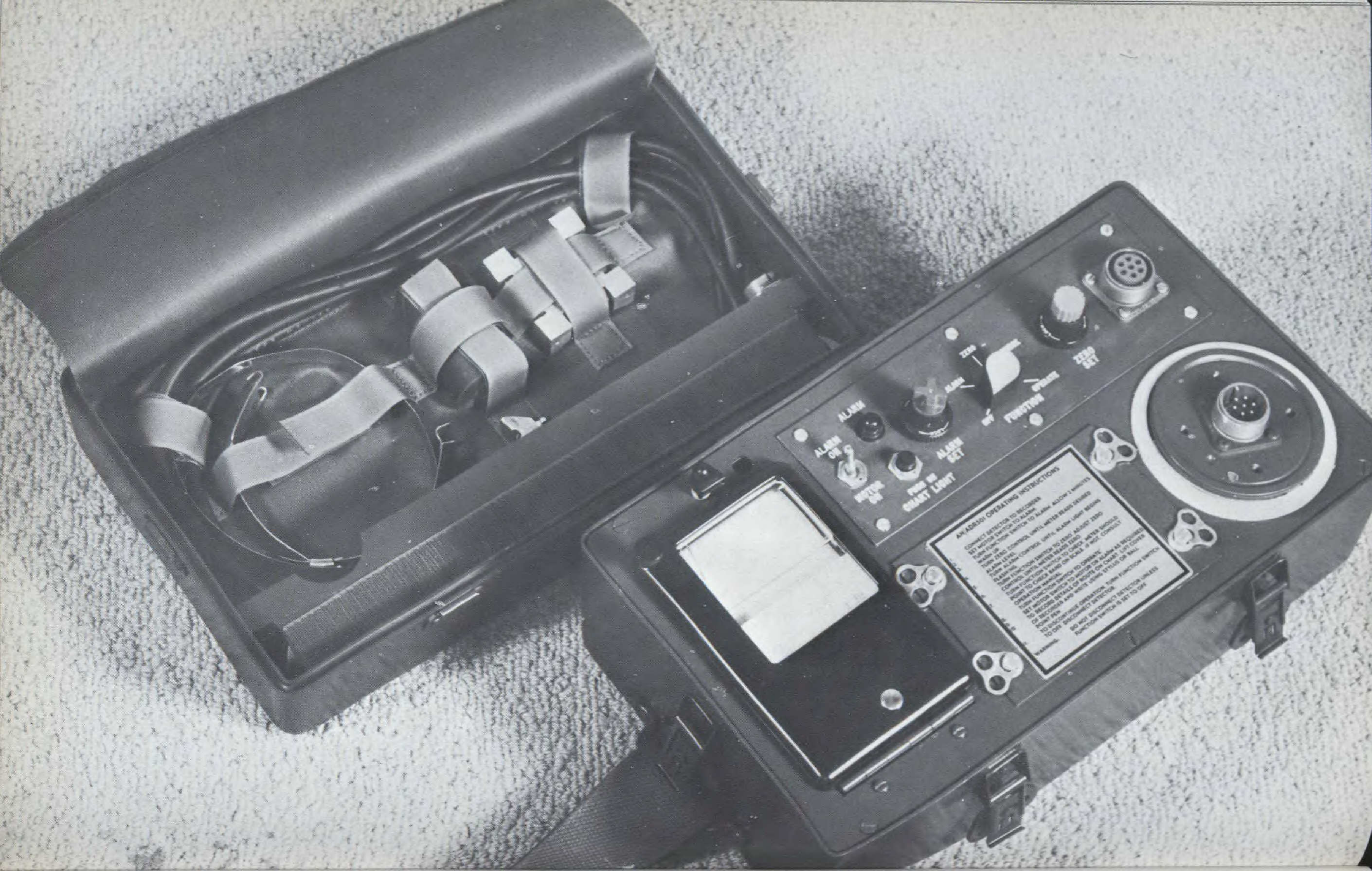
The Battery Assembly consists of three separate power supplies, all using mercury cells for high performance:

(*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:*	± 20%.


ALARM ON
MOTOR OFF
PUSH ON
CHART LIGHT
ALARM
ALARM SET
ALARM
ZERO
OPERATE
OFF
FUNCTION
ZERO SET
AN/ADR501 OPERATING INSTRUCTIONS
CONNECT DETECTOR TO RECORDER
SET MOTOR SWITCH TO ALARM
TURN FUNCTION SWITCH TO ALARM. ALLOW 2 MINUTES WARM UP
TURN ZERO CONTROL UNTIL METER READS DESIRED ALARM LEVEL
TURN ALARM CONTROL UNTIL ALARM LIGHT BEGINS FLASHING
TURN FUNCTION SWITCH TO ZERO. ADJUST ZERO CONTROL UNTIL METER READS ZERO
TURN FUNCTION SWITCH TO CHECK. METER SHOULD POINT TO CHECK BAND ON SCALE. IF NOT, CONSULT OPERATION MANUAL
TURN FUNCTION SWITCH TO OPERATE
SET MOTOR SWITCH TO MOTOR OR ALARM AS REQUIRED
TO RECORD DETAILS OF ROUTE ON CHART, LIFT COVER OF RECORDER AND WRITE USING STYLUS OR BALL POINT PEN
TO DISCONTINUE OPERATION, TURN FUNCTION SWITCH TO OFF. DISCONNECT DETECTOR
WARNING DO NOT DISCONNECT DETECTOR UNLESS FUNCTION SWITCH IS SET TO OFF

DETECTOR RADIAC TACTICAL DOSIMETER, DT60A/PD

The Detector, Radiac, Tactical Dosimeter DT60A/PD is a non self-indicating dosimeter which is worn about the neck as a pendant and is designed to record the total dose of gamma radiation from 0 to 600r to which it has been exposed. It is 1-½ ins. (3.8 cm) in diameter, ⅝ ins. (1.7 cm.) thick, and weighs 1 oz (28 gms). The sensitive element of the Dosimeter is radiophotoluminescent glass which emits luminescence under near ultra-violet irradiation after exposure to gamma radiation.

The Dosimeter is read by means of the Computer-Indicator Radiac Tactical Dosimeter Reader CP95A/PD which detects the intensity of the luminiscence emitted and indicates it directly as a dose in roentgens.

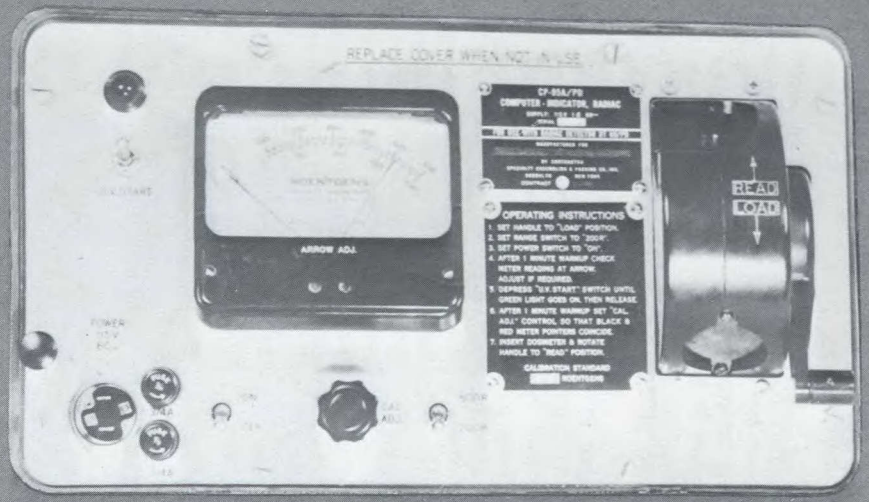
The Dosimeter meets the full range of characteristics of ruggedness and environmental performance for military equipment. It meets the applicable draft of operational characteristics given at Appendix 1 to the Annex to AC/196-WP/59 subject to the following comments:

The range is 0 to 600r.;

It does not record neutrons;

It has not been tested against non-ionizing radiation, thermal radiation or blast.

This Dosimeter has been adopted for use by the Canadian Forces and has been produced in large quantities with satisfactory quality control according to the specification.


REPLACE COVER WHEN NOT IN USE
CF-95A/PD
COMPUTER - INDICATOR, BARIAC
ARROW ADJ.
OPERATING INSTRUCTIONS
1. SET HANDLE TO "LOAD" POSITION.
2. SET RANGE SWITCH TO "200R".
3. SET POWER SWITCH TO "ON".
4. AFTER 1 MINUTE WARMUP CHECK METER READING AT ARROW. ADJUST IF REQUIRED.
5. DEPRESS "U.V. START" SWITCH UNTIL GREEN LIGHT GOES ON, THEN RELEASE.
6. AFTER 1 MINUTE WARMUP SET "CAL. ADJ." CONTROL SO THAT BLACK & RED METER POINTERS COINCIDE.
7. INSERT DOSIMETER & ROTATE HANDLE TO "READ" POSITION.
CALIBRATION STANDARD
READ
LOAD

RADIOACTIVITY SURVEY TRAINING SET

This equipment simulates the techniques of radioactive radiation measurement without the use of radioactive materials and, therefore, makes it possible to train personnel in these techniques without the dangers involved in exposing them to radioactivity.

While exposure to very small amounts of radioactivity may not be dangerous for short periods, exposure for longer periods, or exposure to larger amounts can be extremely dangerous. Personnel from Civil Defence, Military, Industrial and other organizations must be trained in the techniques of measurement of radioactivity and the use of radiation survey meters. It is obviously not practical to expose these personnel to large amounts of radiation during training, so a system must be used which simulates these measuring techniques and instruments, without the use of radioactive materials. The equipment described here meets this need, and has already been in quantity production by EMI-Cossor.

The principle used here is that instead of introducing radioactivity into the training area, this area is covered by a fixed frequency radio signal produced by a transmitter set up at the centre of the training area. Now, instead of using radioactivity detection meters, radio frequency field strength meters are used to detect the transmitted signal. These meters are constructed to look exactly like radioactive radiation survey meters, the meter scale being calibrated in Radiation Units (Roentgens) per hour. The trainee using this meter is operating and obtaining meter readings just as if he were measuring radioactivity. An extra control, not required on the field strength meter, is incorporated in order to duplicate the operation of the radioactivity meter.

Any number of these simulated survey meters can be used when training a group of personnel. They would carry a meter, and would operate in the area serviced by one central transmitter which represents a centre of radiation. To simulate an area with a more elaborate radioactive pattern, more than one transmitter can be used. Changing patterns of radioactivity can be simulated by varying the output level of one or more of the transmitters, and also by moving the transmitting antennas. The equipment will operate over an area of at least three square miles (7.77 km^2).

The transmitter and simulated survey meters are battery operated and portable. The survey meters will operate for 250 hours on one set of batteries which may be changed in the field under adverse conditions.

The whole equipment is extremely rugged. It was designed to meet stringent military specifications, and has been subjected to full shock and vibration tests. Each unit is completely sealed and is, therefore, completely waterproof and dustproof. The equipment will operate over a wide range of ambient temperatures (−60 to +120°F) (−15.5C to +44.4C), and will stand dropping from four feet (1.2 m) and immersion in six feet (1.8 m) of water.

This equipment, as a minimum, consists of the following items:

A. Transmitter complete with battery cable microphone, antenna feeder, etc. Battery for Transmitter (12v car type). (SM-5003/TDQ-501). Transmitter weighs 54 lbs (24.5 kg).

B. Transmitting Antenna complete with tripod stand.

C. Field Strength Meter. (Simulated Radiation Survey Meter). The number of meters used with each transmitter will depend on the number of personnel to be trained at any one time. (SM-5004/TDQ-T501) and weighs 3.5 lbs (1.6 kg).

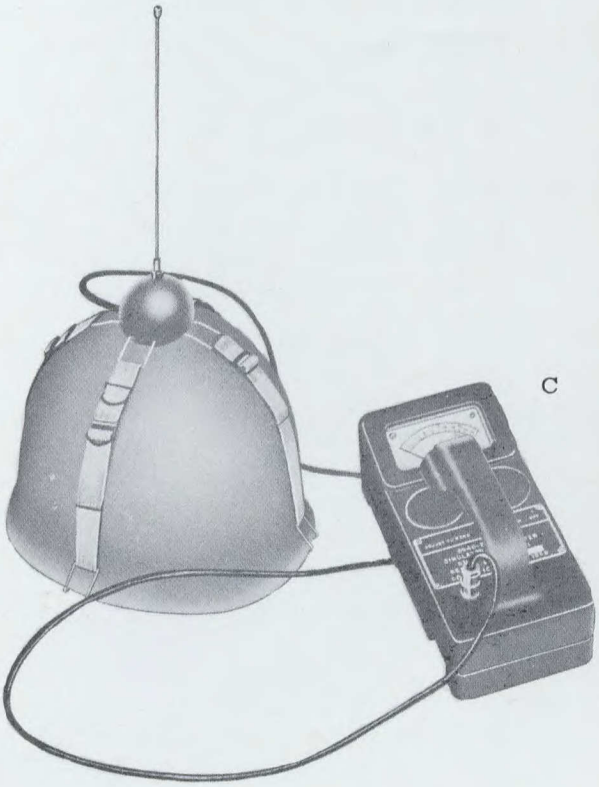
D. Receiving Antenna. This fits on the operator's helmet—one is required for each meter.


RADIAC TRANSMITTER
PRESS TO TALK
ANT
SPARE FUSES
F1
F2
POWER INPUT
12V

A

B

D



C

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. Gammacells 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 GAMMABEAM 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.


Gammacell 220
CAUTION
AECL

BLOOD TESTING KIT CHOLINESTERASE

One of the undesirable characteristics of the antidotes to nerve gasses is that they tend to mask the true condition of the victim. The requirement to cut through this condition has been met by the Canadian Army in the development and production of a kit which determines the cholinesterase enzyme level of the blood within a range of 0 to 100%.

The kit has been developed with three main design criteria; use by non-technical personnel, no dependence on laboratory or other cumbersome equipment and the speed and accuracy with which results may be obtained. The inherent factors of low cost and hence ready availability of issue to all troop levels should not be overlooked.

The packaged kit weighs 2 lbs. (.9 kilo) and measures 4 × 5 × 7 in. (10.2 × 12.7 × 17.8 cm).

The kit consists of two aprons, one for collection and one for analysis. Each apron contains sufficient components for collection and analysis of 49 samples of blood. The components for the collection of blood are contained in pockets of the collection apron and those for the analysis of blood are contained in pockets of the analysis apron. The two aprons with their contents and instruction book are packed in a waterproof container.

The main uses of the equipment are defined as follows:

(*a*) To assess the tolerance of survivors of a nerve gas attack to further exposure.

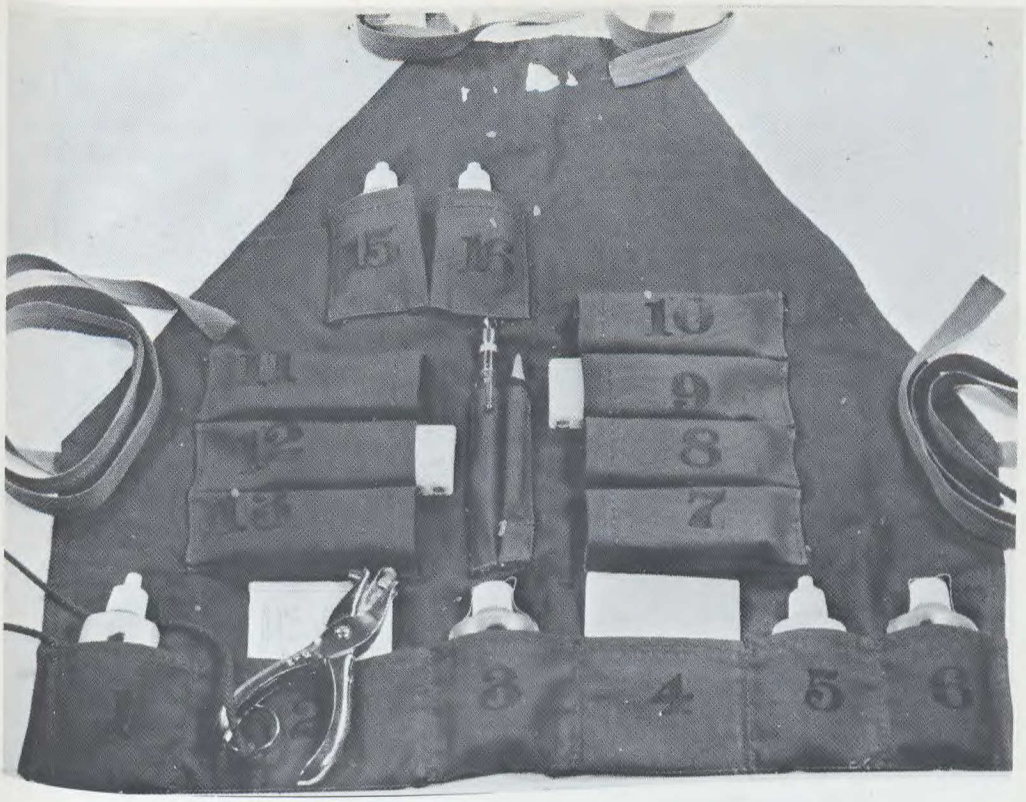
(*b*) To assist in the diagnosis of casualties or disabilities which indicate exposure to cumulative small doses of nerve gasses such as may be experienced through covert attacks.

(*c*) To assess the degree of poisoning of non-severe casualties so as to assist in the determination of therapy.

Employment of the kit is quite simple and follows these general outlines:

Blood is collected by finger prick and collection paper. When dried, a disk of blood-impregnated paper (aliquot) is punched into a miniature test tube; two sets of reagents are added in sequence and the resultant colour produced, in specified times and when matched against the provided colour chart, indicates the percentage of blood cholinesterase of the suspected casualty.

In accelerated storage trials the kit has proven stable and under normal conditions, five years storage life may be expected.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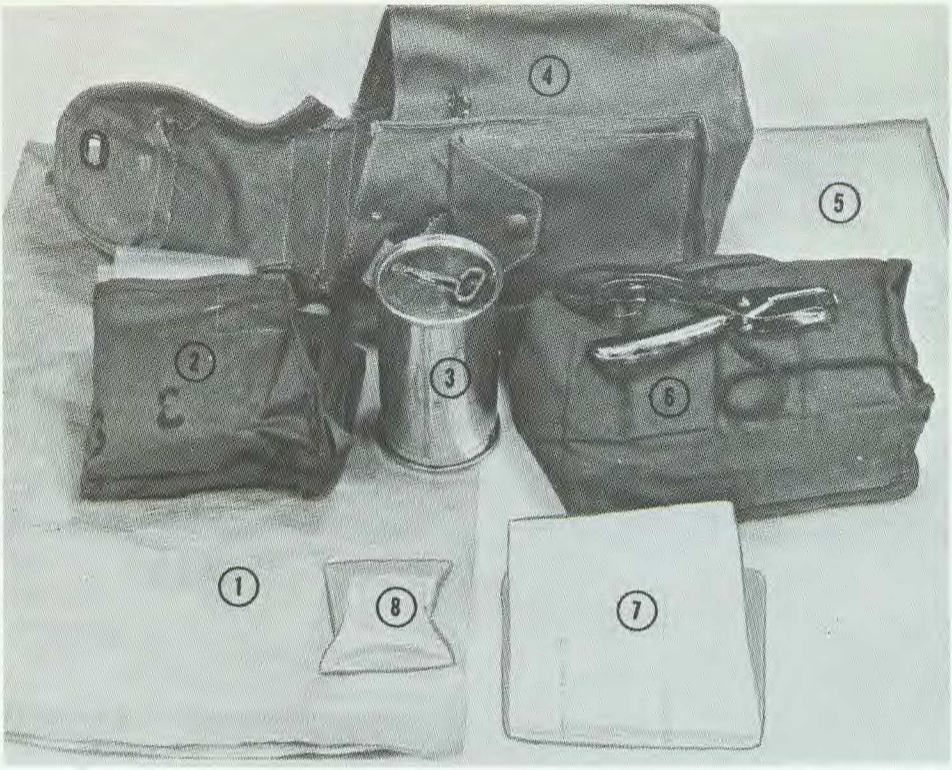


1 Outer Paper Wrapper
2 Blood Sampling Apron
3 Container for Saline and Antiseptic
4 Haversack
5 Polyethylene Inner Wrapper
6 Blood Testing Apron
7 Instruction Manual
8 Desiccant

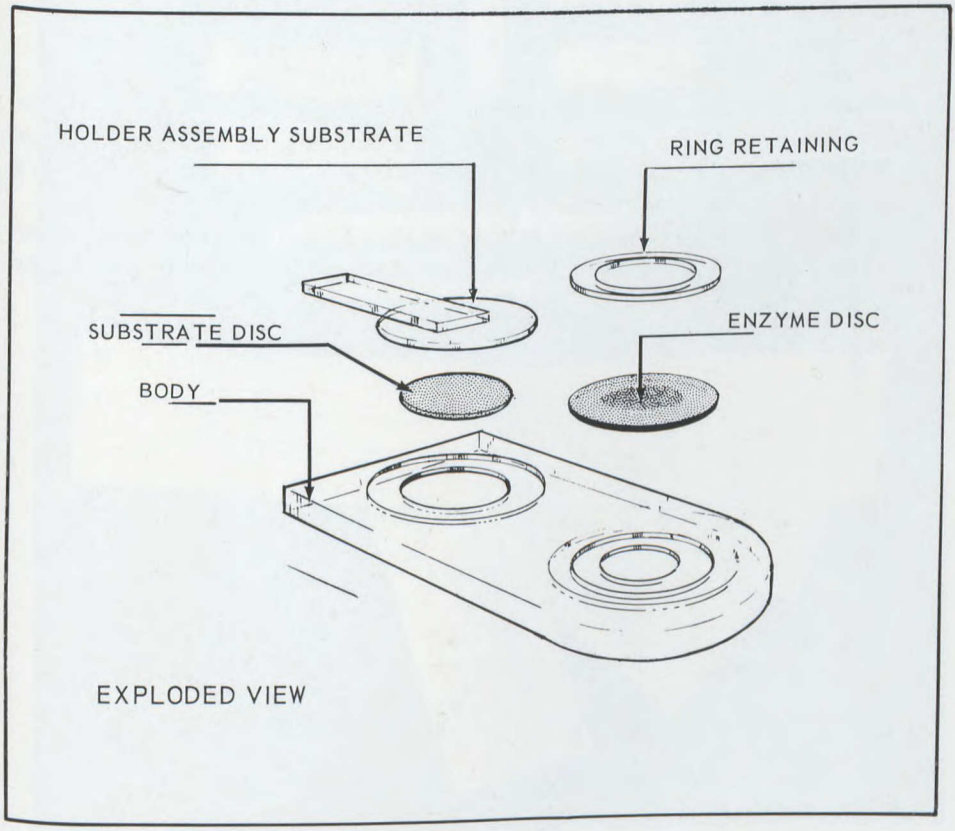
DETECTOR CHEMICAL AGENT (Nerve Vapour)

The Canadian Army has developed and adopted a simple nerve vapour detector which may be used by all personnel and whose cost is low enough to allow individual issue.

While other equipments exist which will perform this test, they are considered too bulky and complicated to be issued on a personal scale.

The detector consists of two main parts comprising a body, containing a bovine acetylcholinesterase-impregnated test paper and a holder containing an indoxyl acetate-impregnated test paper. When the test paper in the body is moistened, exposed to the atmosphere and then pressed into contact with the test paper in the holder, the cholinesterase test paper will turn blue or green in the absence of nerve agent vapour. If nerve agent vapour is present, the colour of the test paper will remain unchanged after contact. The detector, together with an instruction sheet, is packaged in an airtight moisture-proof foil wrap for protection against environmental conditions until required for use.

The item is quite small being only 3-½ x 1-⅛ x ¼ in. (8.9 x 2.9 x .65 cm) and is packaged in a thin lead foil tube. These individual units are then packaged in groups of ten in an air tight, moisture proof container which provides protection until required for use and is 3-¾ x 3-¾ x 2 in. (9.5 x 9.5 x 5.1 cm).



CASE, WATER TESTING, POISONS

The Case, Water Testing, Poisons is a kit consisting of a number of vials of chemical reagents and associated items packed in a metal case. It is designed to enable water to be qualitatively tested for the presence of arsenic, cyanide, heavy metals (lead, mercury, copper), mustard agents, and nerve agents. The pH of water can also be determined.

The kit is for issue to Unit Medical Officers and all Medical Field Units for use in indicating the presence of unacceptable concentrations of CW agents and chemical contaminants in field water supply sources proposed for short period use. If a positive reading is obtained with the kit, the water tested must be banned from use.

Minimum detectable concentrations are as follows:

• Arsenic/Antimony		0.5	ppm
• Cyanogen Chloride		10	ppm
• Cyanide (as CN)		10	ppm
• Heavy metals —	copper	2	ppm
	lead	8	ppm
	mercury	8	ppm
• Mustards —	HN	2	ppm
	HD	50	ppm
• GA		0.09	ppm
• GB		0.03	ppm
• VX		0.03	ppm

Each kit contains individual instructions on separate sheets enclosed in plastic.

The components of the kit are packaged in a metal case, the lid of which is held in place by spring clips. The size of the case is 8-½ in x 6-⅝ in x 3 in (21.6 cm x 16.8 cm x 7.6 cm) and the weight of the complete kit is 4 lbs (1.8 kg).

The set has been adopted for use by the Canadian Forces and production to meet Canadian needs has been carried out by the Defence Chemical Biological and Radiological Laboratories.

A
B
C
I
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SUPPORT KIT, OVERHEAD PROTECTION, C1. (SKOP)

In the construction of a conventional two man hair-pin shelter some 177 pounds (80.4 kg) of stores are required. From this figure it may be seen that an extremely large addition would be made to the logistic tail if this much needed protection were to be carried. The conventional shelter is not an acceptable answer to the problem.

After four years of development and field trials, which included weathering, blast and shock the Canadian Army has produced a kit which will provide forward troops with overhead protection, yet weighs only 1.12% of the conventional equipment.

The Support Kit, Overhead Protection (SKOP) weighs less than 2 pounds (.85 Kg), has a volume of 64 cubic inches (104.87 cc) and can be erected, supporting 18 inches (45.72 cm) of compacted earth, in less than 10 minutes.

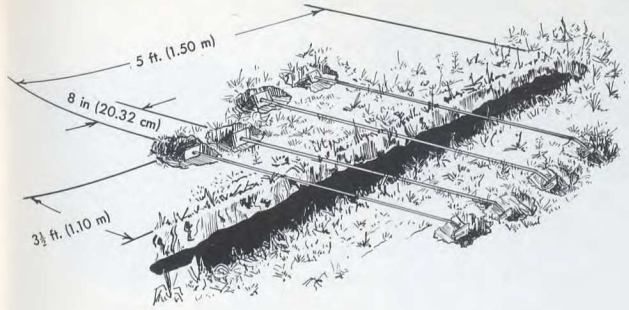
The Kit, now accepted as Standard A in the Canadian Army, consists of:—

(*a*) A camouflaged coated polyester film.
This is a membrane which is 8 feet long by 5 feet wide. (2.43 m. × 1.52 m.) and is 3mm. in thickness.

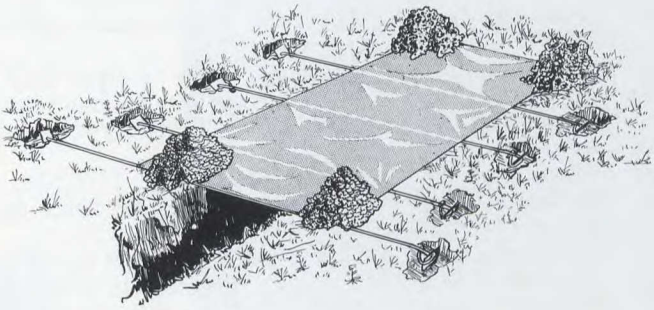
(*b*) Eight aluminum anchors.
The 6 inch × 4 inch (15.2 cm × 10.1 cm) anchors are chemically treated to improve camouflage characteristics.

(*c*) Four terylene cordage assemblies.
The cordage assemblies have a toggle at each end for rapid connection to the anchors. So that the 13 foot long (3.96m) cordages may be tensioned and adjusted to avoid obstacles in the ground, they are provided with a guy line hitch.

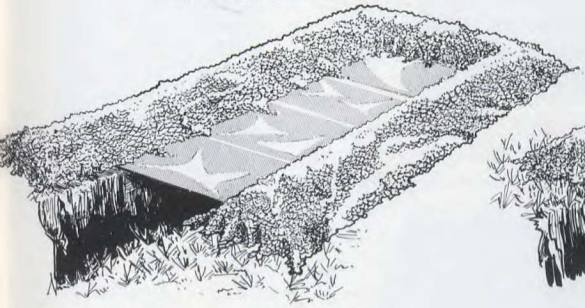
To construct the overhead protection over a battle-trench, four pairs of anchors, each pair connected by a cordage assembly, are driven in the ground. Anchors should be placed at least 3½ feet (1.06m.) from the shelter wall. The first pair is placed at the shelter entrance and at 90 degrees to the longitudinal axis of the shelter, the second set approximately 8 inches (20.32 cm) away, and the third and fourth pairs dividing the remainder of the 5 foot (1.52m.) long shelter into 3 equal parts. When the anchors are placed the cordages are tensioned with a pull of about 35 pounds (15.87 Kg.). The polyester film (membrane) is locked in place around the first two cordage assemblies and positioned over the proposed shelter, with an equal lap on each side and at least 18 inches (45.72 cm) at the back. Earth is built up around the three outer edges of the membrane in the form of a horseshoe, and compacted to help secure the film. The centre portion is then filled with earth, working gradually towards the longitudinal centre-line of the shelter. When 18 inches (45.72 cm.) of compacted overhead protection has been attained it may be camouflaged.



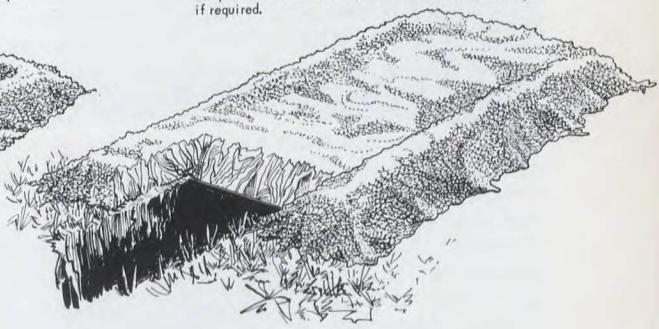
Do not disturb or dig the soil in front of the anchors.

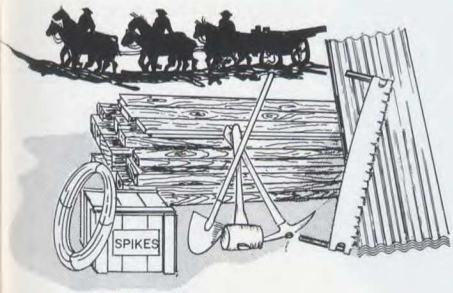


Build and compact a ridge of soil one foot in depth around the edge of the trench.

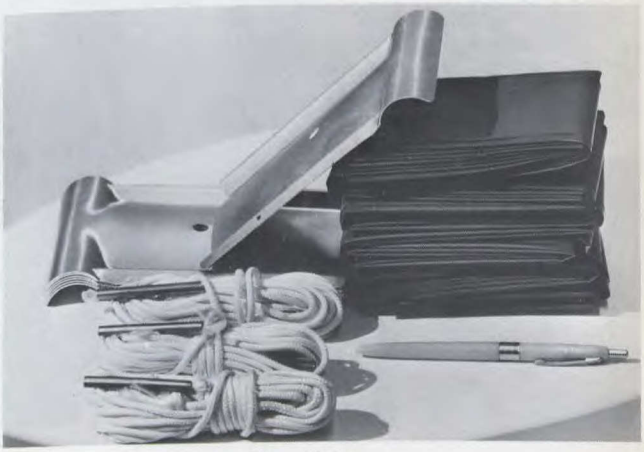


Gently fill in towards the centre from the ridge and compact to a minimum depth of 12 inches. Camouflage if required.





177 lbs.—80.4 kg.



2 lbs.—.85 kg.

NAVIGATION SET, LAND VEHICULAR C2

Development and production of this equipment was 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 continuous display of the present position of the vehicle is obtained by automatic-dead-reckoning. The distance travelled by the vehicle is measured by the odometer drive and the direction of travel is derived electrically from a compass. A Computer automatically works out the East/West and the North/South components of the vehicle movement and transmits this information in the form of direct current impulses to the Heading & Position Indicator and Vehicle Position Plotter. The heading signal from the compass is also retransmitted to these display units. The flexible mechanical drive shaft by which the distance is fed into the Computer can, if desirable, be replaced by an electrical distance transmission system composed of a distance transmitter and a distance receiver.

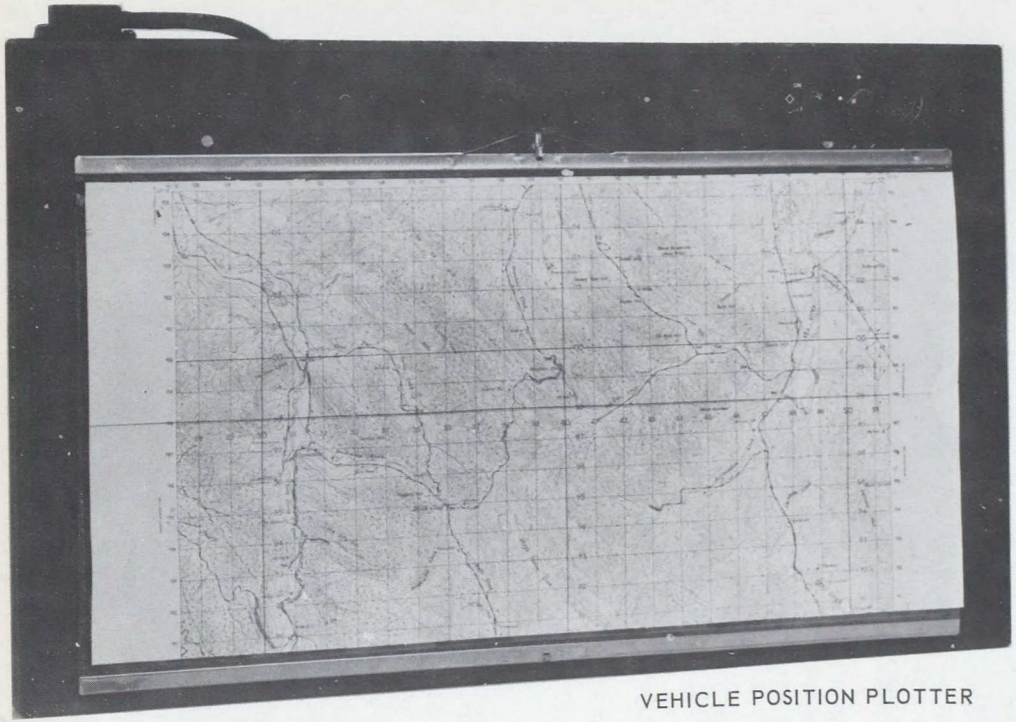
The Heading & Position Indicator unit displays two "4-digit" map references — one for Eastings and one for Northings. These are set to the map reference of the vehicle location before moving off and, in operation, continually record the position of the vehicle in terms of map co-ordinates.

A map selector switch provides for scales of 1:25,000, 1:50,000, 1:100,000 and 1:250,000. The Heading Indicator is provided for use where the driver is physically separated from the vehicle commander.

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 to within one percent of distance travelled.

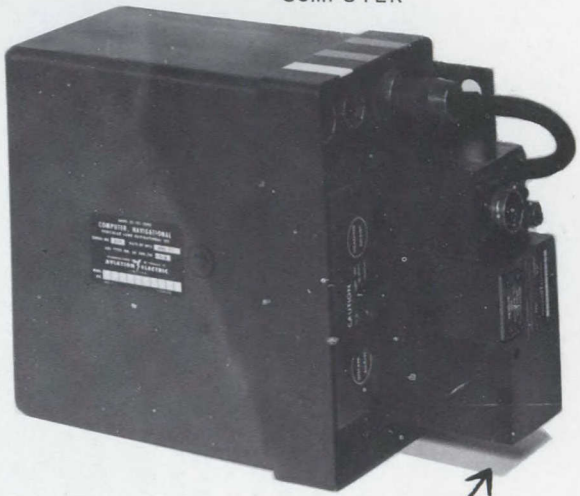
User evaluation trials have been successfully carried out in several NATO countries including the United States. Towards the end of 1965, a contract was awarded Aviation Electric by the United Kingdom, providing for delivery of 235 sets including field support check-out equipment. Sets have been in operation with the Canadian Army for some time. A requirement has also become evident for the equipment for use at Airports for the guidance of aircraft and service vehicles to and from terminal areas under conditions of unfavourable visibility. London Airport, noteworthy for its extreme fog conditions, acquired a Navigation Set in 1965.

Although this equipment was designed and developed for use on tracked or wheeled vehicles to facilitate troop movement, its use has indicated future potential for the basic equipment in applications connected with tactical display, destination or target computation and fire control techniques. In this regard, a Range and Bearing Computer has been developed as an auxiliary unit for computing the range and bearing of a target in relation to the vehicle in which the complete set is mounted.



VEHICLE POSITION PLOTTER

COMPUTER



ELECTRICAL DISTANCE RECEIVER

HEADING INDICATOR

HEADING AND POSITION INDICATOR

ELECTRICAL DISTANCE TRANSMITTER

LAND NAVIGATION SYSTEM TYPE LNS-102

Aviation Electric Limited, Montreal, Canada, has completed the research and development on a new type of navigation system which utilizes a Magnetic Heading Reference instead of the Gyro Compass used in earlier versions. This new system, designated LNS-102, has been developed to meet the need for a low-cost system which can be installed in non-armoured vehicles and is offered as an alternative to the Land Navigation Set Type C2 which has been standardized for use by the Canadian and British Armies.

The LNS-102 system is similar to the LNS-C2, except that the heading input is obtained from a magnetic sensor instead of from a Gyro Compass. It is completey self-contained, operates from the vehicle battery, and provides an average navigation accuracy to within 1.5% of distance travelled.

When a Magnetic Heading Reference is employed, it is necessary to compensate for the permanent and induced magnetism of the steel and iron parts of the vehicle. In addition, this compensation, to be most effective should be continuous and in the system, modifications are incorporated into the standard Computer which satisfy this requirement.

The LNS-102 system described consists of four separate units.

Magnetic Detector and Mast Assembly
Computer
Indicator, Heading and Position (IHP)
Static Inverter

As in the gyrocompass system, Land Navigation Set Type C2, a Vehicle Position Plotter (VPP) is available, together with an alternative version which features the use of a combined Computer-Indicator. The basic system requires approximately 19 VA, 400 Hz of electrical power, or 40 VA when the VPP is used. After initial installation of the system, the compensation for the permanent and induced magnetic components of the vehicle can be accomplished in about two hours by means of a standard set-up procedure.

The Magnetic Detector and Mast Assembly AE 300800 consists of a detector in a protective case, a mast up to one meter (39.4″) high and a mounting pedestal.

The Computer AE 300118 is a modified version of the Computer used in the C2 system and contains two additional potentiometers and two electro-mechanical resolvers with their associated gear trains.

The Heading and Position Indicator AE300126 is identical to that used in the LNS-101 system, except that the unit lighting on-off switch is modified to a system on-off switch. A data sheet describing the unit is attached.

The Static Inverter AE 300810 has been designed to operate under the usual military environments.

The Company is also developing a line of low cost medium accuracy land navigation equipment involving the latest techniques in electronics and electro-optics. These new units are in an advanced stage of development, the first being a Solid State Computer Indicator which will be a high reliability miniaturized computer and display unit adaptable for use with both gyro compass and magnetic heading reference unit. The other unit is the Automatic Position Reporting system which will permit the automatic interrogation of a vehicle with the land navigation system via a standard communications link whereby the coordinate position of the vehicle can be automatically and continuously displayed at a command position.

The development work in hand at Aviation Electric is ensuring that the international users will continue to have modern and reliable equipments made available to them.


MAGNIFY
EASTINGS
NORTHINGS
SET
PUSH
TURN
OFF
ON
MAP
1/500
1/100
1/20
1/10
X 1/1000

GYROSCOPIC COMPASSES

Over 425 of the Sperry MK 23 Gyro Compasses have been produced to date for U.S., Canadian and NATO navies which would indicate the general acceptance of claims for accuracy, ruggedness and reliability.

This compass, a small compact unit capable of withstanding severe operating conditions encountered in small craft, submarines and large ships, continuously provides accurate heading data. The present system is being manufactured in accordance with Specification MIL-C-15952F (SHIPS) and consists of the following:

Master Unit
Transistorized Control Unit
Alarm Control Unit
Speed Unit
Static Power Supply & Control Unit.

The deck mounted Master Unit consists of a shock-mounted, oil filled Binnacle and the compass element which is gimballed to provide freedom of ± 45 deg. about the roll and pitch axis. The Control Cabinet consists of a drip-proof, bulk-head-mounted enclosure which houses the Control Panel, D.C. power supply, Amplifiers and various phasing networks.

Speed correction is applied by means of a precision potentiometer which produces a voltage proportional to speed set in manually or driven from an electro magnetic log. The alarm system provides a warning should the system fail.

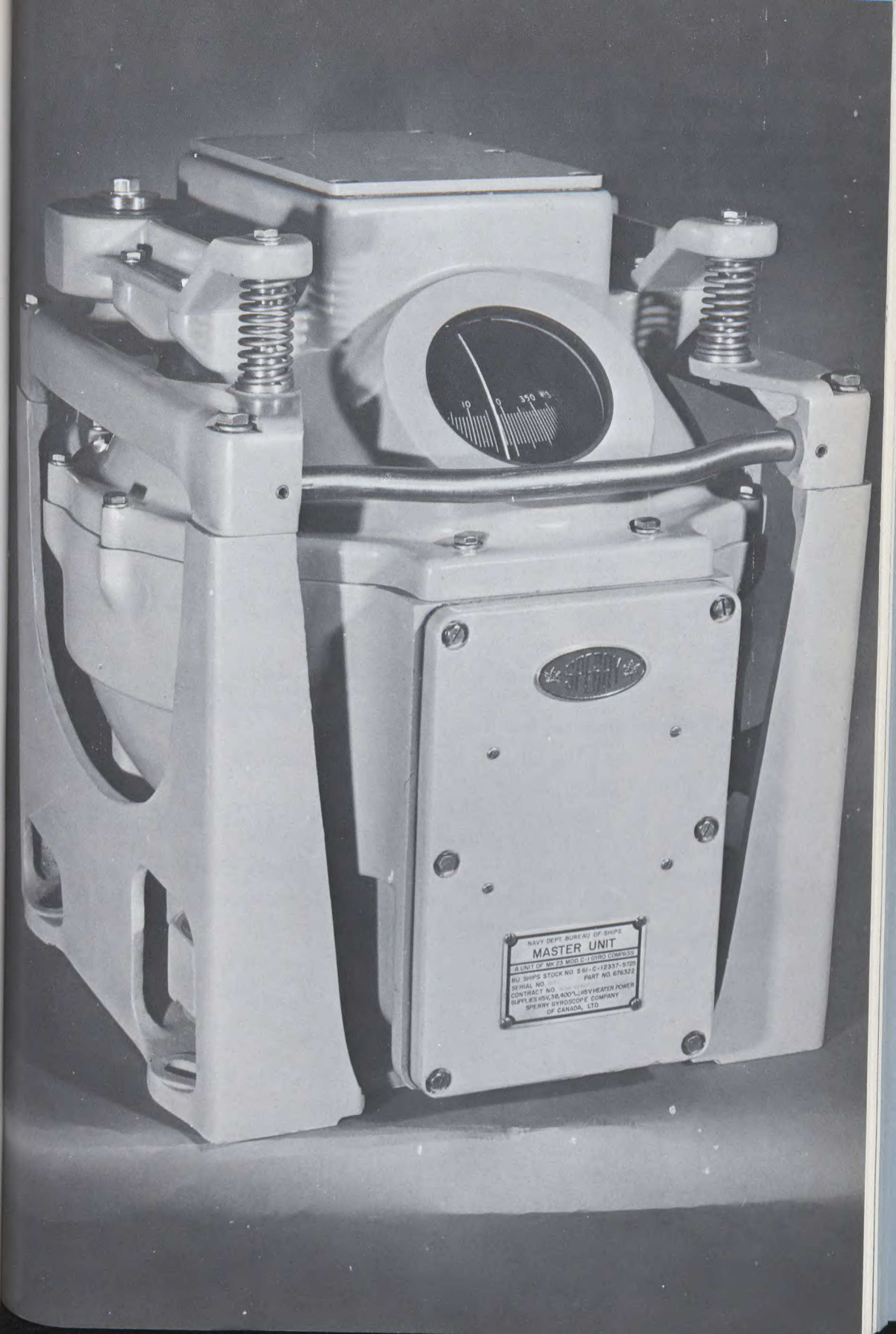
This compass, in addition to being a north seeking Gyro, may be used as a directional Gyro with a free drift rate of ± ¼ ° per hour. Heading data is normally supplied as 1 and 36 speed synchro transmission. Accuracy of the system is 0.75°.

From this development two other compass systems, to meet varied requirements, have been evolved which still maintain the basic design of the MK 23.

Vehicle navigation systems have become essential in modern warfare. Under conditions of darkness, fog, smoke or where the terrain is devoid of distinctive landmarks, vehicle navigation can be most difficult and accuracy may only be obtained through the use of ill afforded time. The Sperry Vehicle Gyro Compass has been designed around this requirement and is compatible with both "readout" and plotting board systems of vehicle navigation.

A further development of the basic Sperry compass has been to provide a direct reading compass system for PT Boats. In this system, due to the small size and compact design, the master unit is mounted directly on the bridge and thus eliminates the requirement for repeaters. This feature also automatically reduces the circuitry carried and at the same time eases maintenance problems and increases system reliability.

(An application for this compass may be seen on page I-208)


NAVY DEPT. BUREAU OF SHIPS
MASTER UNIT
A UNIT OF MK 23 MOD C-1 GYRO COMPASS
BU SHIPS STOCK NO. 561-C-12337-5720
PART NO. 676325
SERIAL NO.
CONTRACT NO.
SUPPLIES 115V, 3Ø, 400~, 115V HEATER POWER
SPERRY GYROSCOPE COMPANY
OF CANADA, LTD

MECHANICAL BALL RESOLVERS

Aviation Electric Ball Resolvers are precision, analogue, mechanical devices capable of continuously resolving polar coordinate inputs into rectangular coordinate outputs. The resolvers will, from suitable inputs, generate any of the six basic trigonometric functions, but they are particularly suited to the role of sine-cosine function generators. Aviation Electric Ball Resolvers are widely used in rho theta navigation systems as sine-cosine and secant-tangent function generators.

The AEL Ball Resolver is a lightweight, rugged, and relatively low-cost solution to many two- and three-dimensional analogue vector component problems, and has potential applications in automatic plotting boards, flight simulators, target range and bearing computer, and air ground marine and submarine navigation systems.

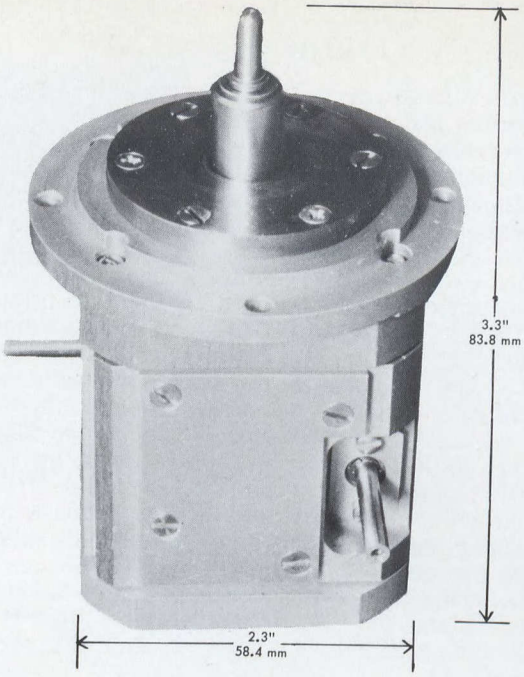
Type AE300007 Ball Resolver (1″ Ball)

Accuracy:	0.5 of one percent.
Weight:	6 ozs. maximum.
Pre-Lubricated:	Lubrication required only at overhaul.
Designed to meet the following conditions:	
High Temp:	MIL-E-5272, Proc. 11 + 71°C for 48 hours.
Low Temp:	MIL-E-5272, Proc. 11 − 62°C for 72 hours non-operating, − 54°C for 24 hours and tested, at end of time, at − 54°C.
Altitude & Temp:	Altitude 70,000 ft. at − 54°C non-operating. Tested at sea level at − 50°C.
Humidity:	MIL-E-5272, Proc. III. 95% for 360 hours.
Vibration:	MIL-E-5272, Proc. XIII. 5 to 500 c.p.s.
Shock:	MIL-E-5400 Para. 3.2.21.6.1. 15g, three axes.
RECOMMENDED OPERATING PARAMETERS	
Operating Speeds:	0-20 r.p.m. on linear input gear with short periods at speeds not in excess of 125 r.p.m. (e.g. 1 minute bursts for memory circuits).
Output Shaft Loads:	0.1 to 0.2 oz. inches.
Input Torques:	Linear — Average under 3.0 oz. inches. Max. starting 10 oz. inches.
(Room Temp.)	Angle — Average under 3.0 oz. inches. Max. starting 10 oz. inches.
GENERAL DATA	
Input Ratio:	Linear gear to driving roller 1:2
Input Ratio:	Angle gear to Yoke 1:1
Outputs:	2 x cosine angle linear input and 2 x sine angle linear input.
Life:	When operated within recommended parameters, 3,000,000 revolutions of the driving roller (i.e. 2500 hours at 10 r.p.m. on linear input shaft).

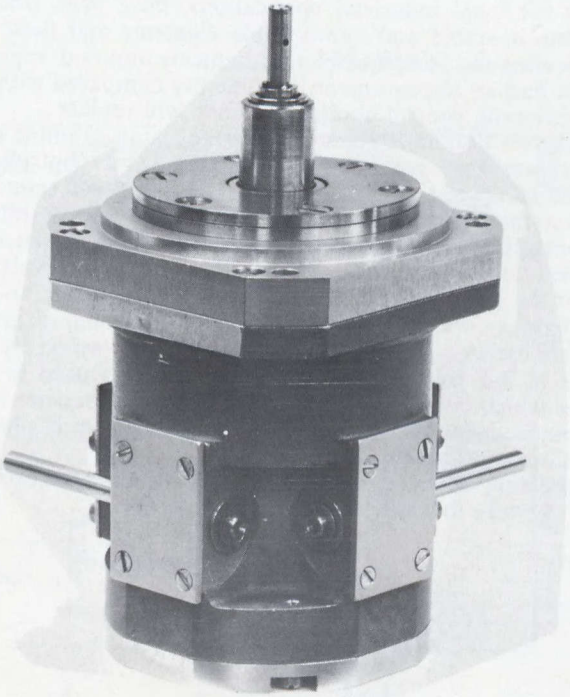
Type AE300040 Miniature Ball Resolver (⅝″ Ball)

Accuracy:	0.1 of one percent.
Weight:	14.5 ozs. (approx.)
Pre-Lubricated:	Lubrication required only at overhaul.
High Temp:	To + 125°C.
Low Temp:	To − 54°C, MIL-E-5400E (ASG). Class 2 Equipment.
Altitude:	Sea level to 70,000 ft. MIL-E-5400E (ASG), Class 2 Equipment.
Humidity:	95% RH as per MIL-T-5422E (ASG), para. 4.4
Attitude:	All positions.
Vibration:	5-62 cps at 0.01 in. double amplitude and 62-500 cps at ± 2G; MIL-E-5400E (ASG) para. 3.2.21.5.2.
Shock:	18 impact shocks of 15G as per MIL-E-5400E (ASG), para. 3.2.21.6.1.
Linear Input Speed:	40 rpm (max.) on the linear input shaft.
Input Running Torque:	(Linear and Angle Input shafts – With zero output shaft loads) is less than 5 oz. in. at − 54°C and less than 3 oz. in. at + 20° and + 125°C.
Starting Torque:	(Linear and Angle input shafts) is less than 10 oz. in. at − 54°C with no output shaft loads.
Life:	1.5 x 10^6 linear input shaft revolutions under normal operating conditions.
RECOMMENDED OPERATING PARAMETERS	
Speed:	18 rpm linear input (number of revolutions not to exceed 600 on any fixed heading).
Output Shaft Loads:	0.1 oz. in. (max.).
Input Ratio:	Input shaft to driving roller, 1:2 Angle shaft to yoke 1:1

Several versions of the AEL Ball Resolver exist and a number of types are approved for use in Canadian, United States, and NATO military applications. Engineering services are available to review feasibility of proposed applications and to ensure that the most suitable unit is matched to specific equipment and environmental conditions.



Type AE 300007 Mechanical Ball Resolver



Type AE 300040 Mechanical Ball Resolver

FLUIDIC ELEMENTS

These devices, applicable to complex control systems in fields as diverse as industrial process operations and missile guidance systems, are equally effective with gas or liquid as an operating medium and having no moving parts are thus resistant to the severest environmental conditions as well as to shock, vibration or line pressure fluctuations. Aviation Electric Limited has developed and is marketing a line of fluidic logic elements and amplifiers, which through use of a unique vortex venting technique (patent pending), completely eliminates the impedance matching problems normally associated with the inter-connection of fluidic devices. Mono-stable and bi-stable logic elements operating in the 1-15 psig input pressure range are currently available. The mono-stable element has a dual input and can therefore also be used as an OR gate. Both elements can withstand variations in output leg loading from fully open to completely blocked without false switching or change in operating characteristics and can even tolerate reverse flows in the inactive leg without "loss of memory". Pressure recovery ratio in the fully blocked conditions is in excess of 40% and the flow recovery ratio in the completely open condition is in excess of 110% being greater than 100% because of the fluid entrainment associated with the vortex venting action. Switching time is of the order of .0004 seconds and switching pressure is less than 15% of the power jet pressure.

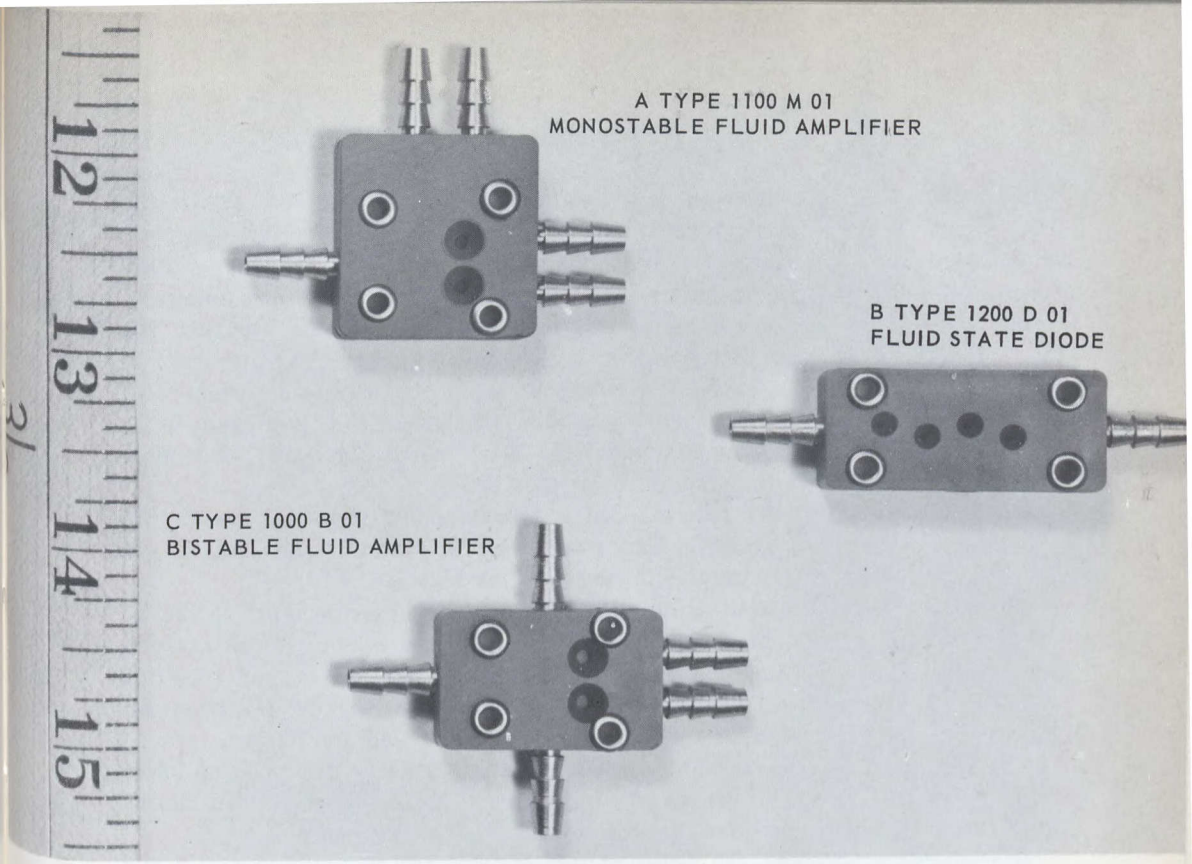
A fluidic diode has also been developed and is also currently available. This device, which also makes use of the vortex venting technique, has a reverse flow ratio of less than 4% and, among other applications, could be used as an insert in the connecting lines of existing fluidic systems to overcome particularly troublesome load matching problems.

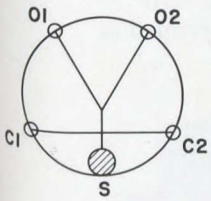
Also under development is a proportional amplifying element, operating in the 1-15 psig range which features an extremely favourable signal to noise ratio (and hence superior dynamic range), as well as the same immunity to load variations that are provided by the mono-stable and bi-stable elements. These novel vented elements have been subjected to an exhaustive series of tests. Several control systems, mainly for local industrial applications, have been designed and bread-boarded using the bi-stable and mono-stable elements and these control systems, in addition to meeting the performance requirements imposed, represent a significant reduction in cost and an improvement in reliability compared with the conventional electronic or pneumatic control equipments they will replace.

A general purpose Fluidic Sequence Controller is an example of the industrially oriented applications that are being investigated. This controller is designed to actuate a number of separate pneumatic cylinders in a timed sequence. An air pulse is supplied when the operator starts the operation, while a pulse, supplied by a fluidic switch when the operation is complete, initiates the sequencing which actuates different cylinders on the order of 0, 2, 3 and 5 seconds intervals or equivalent.

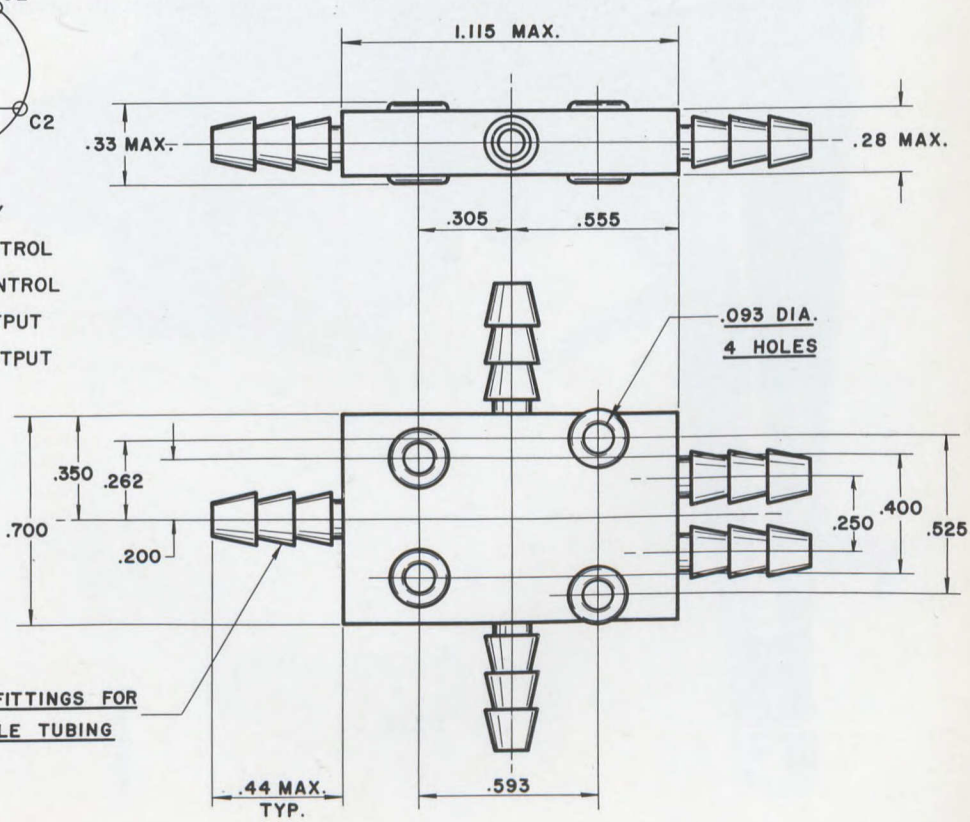
At the end of the sequence the machine is completely reset and ready to receive another start signal. Adjustable restrictors and fixed volumes are used to achieve the specified time delays. The logic decisions are performed by AEL fluidic elements using air at 3-5 psi and the final logic output is used to operate ball type switching valves which control air at up to 100 psi line pressure to actuate the high pressure pneumatic cylinders. The cost of this controller is about two-thirds the cost of conventional equipment.

Complete operating characteristics and data are obtainable for all devices as well as engineering services to study application feasibility.





S = SUPPLY
C1 = LEFT CONTROL
C2 = RIGHT CONTROL
O1 = LEFT OUTPUT
O2 = RIGHT OUTPUT



PLASTICS FLOGUN

While many of today's electrical and electronic equipments are repairable in the field, one of the main problems remaining is the provision for re-insulating broken or damaged lines or connections. With this problem in mind Canadian Aviation Electronics have developed a piece of equipment which meets such a requirement.

The Plastics Flogun is a portable injection moulding machine weighing 3¼ lbs. (1.5 kg.). It operates at a pressure of 2250 lbs. p.s.i. (1020 kg. per cm^2) to 6900 lbs. p.s.i., (3130 kg. per cm^2) and is designed primarily as a portable tool rather than a high volume production machine. The capacity of the Flogun is 1.1 cubic inches (18.03 cc.) or approximately ¾ of an ounce (21.2 gm), depending on the type of thermoplastic material being used.

Because the Flogun operates at such a low moulding pressure, moulds are unusually light and inexpensive, and pre-heating is generally not required. A universal mould holder is available for use with the Flogun.

The Flogun has numerous applications besides injection moulding. It can be used for welding thermoplastics by simply changing the nozzle. It can be used for extruding. It can also be used for encapsulating wire joints, and repairing damaged insulation on wiring, by using a shuttle mould or a Wire Insulation and Encapsulation Tool, accessories made specifically for use with the Flogun.

The Plastics Flogun is available for use with either 110V 60 cycle, or 220V 50 cycle current. It can be held in one hand and manually operated, or it can be fitted into a bench fixture when short production runs are desired.

An untrained operator can learn to use the Flogun efficiently for injection moulding, extruding, welding or cable covering and splicing in approximately 30 minutes. Moulding charts supplied with the Plastics Flogun contain all information required.


Plastics Flocun
MODEL 81
WATTS 300

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.

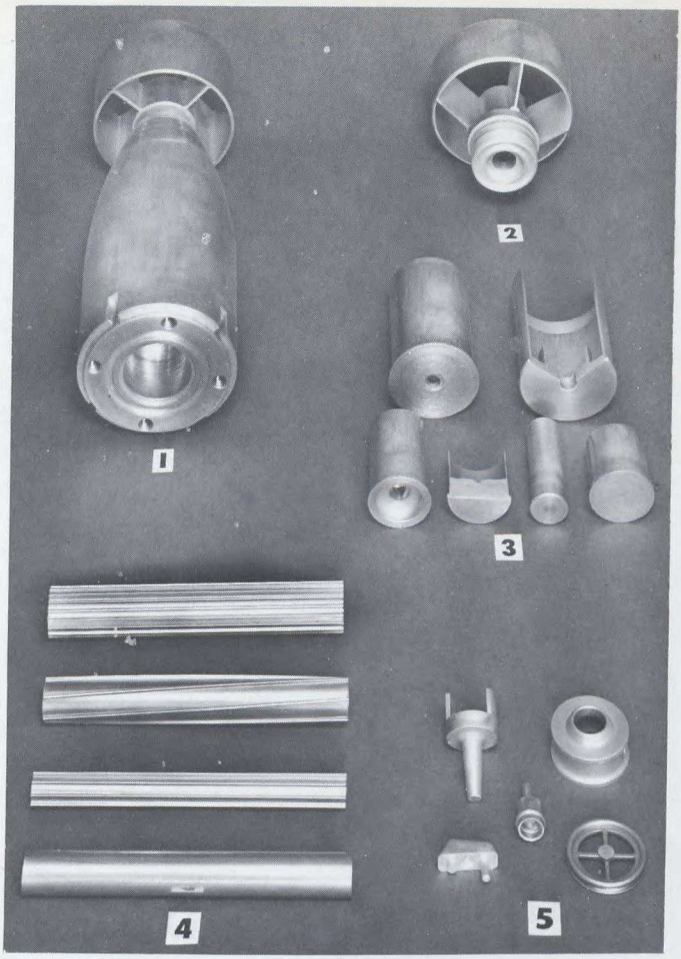
For many years General Impact Extrusions has produced parts and components for defence applications, such as pistons, ammunition shells, missile parts, rocket components, precision cold forgings, and tail fin assemblies. A competent engineering staff is available for component and part design.

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.

The company also handles research and development work and has helped to pioneer a number of new applications of the impact extrusion process both in commercial and in military fields.

GEARING

The assembly on the facing page is indicative of the type of work carried out by York Gears Ltd., who are manufacturers of power transmission systems, sub-assemblies and precision parts for the aircraft industry. This firm on a production basis supplies a full range of gears including spur, helical, spiral, bevel and zerol types which have been used in the J-85 and GE610 jet engines as well as gear boxes for the DHC-5 Buffalo aircraft.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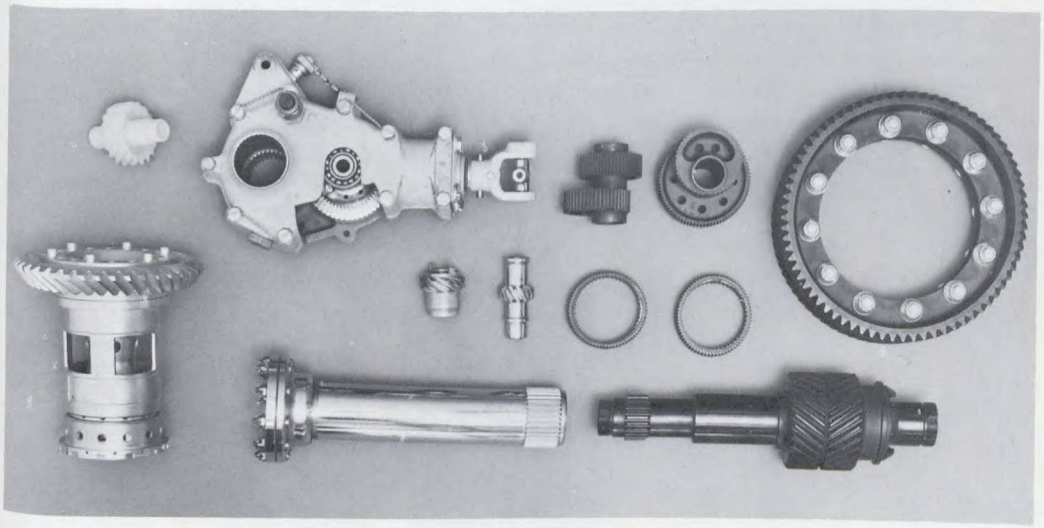


CHAIN BEAM LOADER

Developed, engineered and manufactured at Fairey Canada Limited's plant at Dartmouth, Nova Scotia, the "Fairlift" brings a new versatility and flexibility to the field of materials handling.

This ingenious chain beam loader requires only 16 in. (40.6 cm) of space between cab and body of any standard truck for installation, leaving truck payload unaffected.

The chain link beam is retractable into a 30 in. (76.2 cm) diameter magazine and can be extended by means of the hydraulic motor to a length of 14 ft. (4.3 m). The lifting capacity of the beam is as follows:

14 ft. (4.3 m)	2500 lb. (1134 kg)
9 ft. (2.7 m)	3750 lb. (1701 kg)
7.5 ft. (2.3 m)	4400 lb. (1996 kg)
5 ft. (1.5 m)	6250 lb. (2835 kg)

The "Fairlift" can traverse 360°, plus 7-½° overlap in either direction.

All areas are easily accessible for loading and unloading to a height of 20 ft. (6 m) above ground (without extension boom) and a reach of 14 ft. (4.3 m) radius.

The beam end accepts a large variety of accessories such as Personnel Boom and Basket, Back Hoe, Power Shovel, Log Grapple, Earth Auger, Hydraulic Clam, Power Shovel and Stump Saw. Remote Controls, Dual Controls plus other accessories to the customer's specific requirements can be supplied.

Zero back lash traversing is accomplished by two hydraulic rams attached to roller chains, mounted in the base structure under the main column. The base unit is mounted in bronze bearings providing maximum life and maximum turning ability under load. Chain Links and all moveable parts are provided with grease fittings for efficient maintenance and optimum operation.

"Fail-Safe" operation has been accomplished by the incorporation of a sealed relief valve in the elevating cylinder to prevent overloading, check valves to lock the elevating cylinder and extension motor if the hydraulic pressure should fail, or the operator attempt too quick lowering of the load, and precision hydraulic control valves to allow complete speed control.

The entire equipment has been designed for single operator control. The three basic control levers controlling elevation, extension and traverse are located on the left side of the truck. Right side and electrical remote control accessories are available. Provision is made for four additional control levers for accessories.


FAIREY CANADA LIMITED
DARTMOUTH N.S.
TRUCK SUPPLIED COURTESY
OF
CHRYSLER CANADA LTD.
FAIREY FAIRLIFT
DEVELOPED AND MANUFACTURED BY FAIREY CANADA LIMITED

LOW GROUND-PRESSURE TRACKED CARRIERS

Originally developed to permit year-ground seismic survey and oil explorations in the muskegs of Canada and Alaska, the Nodwell tracked carrier has been used as an off-highway vehicle around the world. In addition to transporting heavy equipment, entire crews and work camps are carried in specially designed units — mobile sleeping quarters, kitchens, diners and portable workshops.

Nodwell units perform a wide variety of jobs, in all areas of the globe, including personnel carriers, logistic carriers, recovery vehicles, tankers, crash rescue vehicles, fire-fighters, amphibious carriers and numerous other military and commercial uses.

There are five basic vehicles as follows:

			Ground Pressure	
Model No.	Payload	G.V.W.	Unloaded	Loaded
RN 25	2,500 lbs. *1134 kg.*	11,000 lbs. *4989.6 kg.*	1.40 psi *39.7 grm/645 mm²*	1.82 psi *51.6 grm/645 mm²*
RN 75	7,500 lbs. *3402 kg.*	17,500 lbs. *7938 kg.*	1.28 psi *36.3 grm/645 mm²*	2.29 psi *64.9 grm/645 mm²*
RN 110	11,000 lbs. *4989.6 kg.*	23,000 lbs. *10,432.8 kg.*	1.1 psi *31.2 grm/645 mm²*	2.1 psi *59.5 grm/645 mm²*
RN 150	15,000 lbs. *6804 kg.*	32,330 lbs. *14,664.9 kg.*	1.40 psi *39.7 grm/645 mm²*	2.59 psi *73.3 grm/645 mm²*
RN 200	24,000 lbs. *10,886.4 kg.*	71,500 lbs. *32,432.4 kg.*	1.7 psi *48.2 grm/645 mm²*	2.6 psi *73.7 grm/645 mm²*

Through a principle of flotation, the full load weight is evenly distributed, at low ground pressure, over the broad area which is covered by the wide, endless tracks of rubber and steel. The vehicles are engineered for a forward gradeability of 60% and a side gradeability of 30%.

The two largest units are equipped with front and rear tracks, powered by independent engines. Multi-axle tracked trailers are also available for the larger units.

A wide variety of options is available with all models to ensure that Nodwell carriers have a role in the expanding requirements of frontier developments around the world.

Model RN 110 as a Personnel Carrier.

Model RN 110 with 15,000 lb. (6804 kg.) Winch.

"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°F (−18C. to +46C).

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 four inches 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 until 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.


U.S. ARMY
19A999
U.S. ARMY

OFF-HIGHWAY TRACKED CARRIERS

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 Chrysler 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. dependent upon the role for which it is designed.

Some of these roles are:—

'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. winch and hydraulic dumping platform.

All these vehicles are stock production items and are in current use in 32 different countries.


Bombardier
"Muskeg"


Bombardier
J5

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.

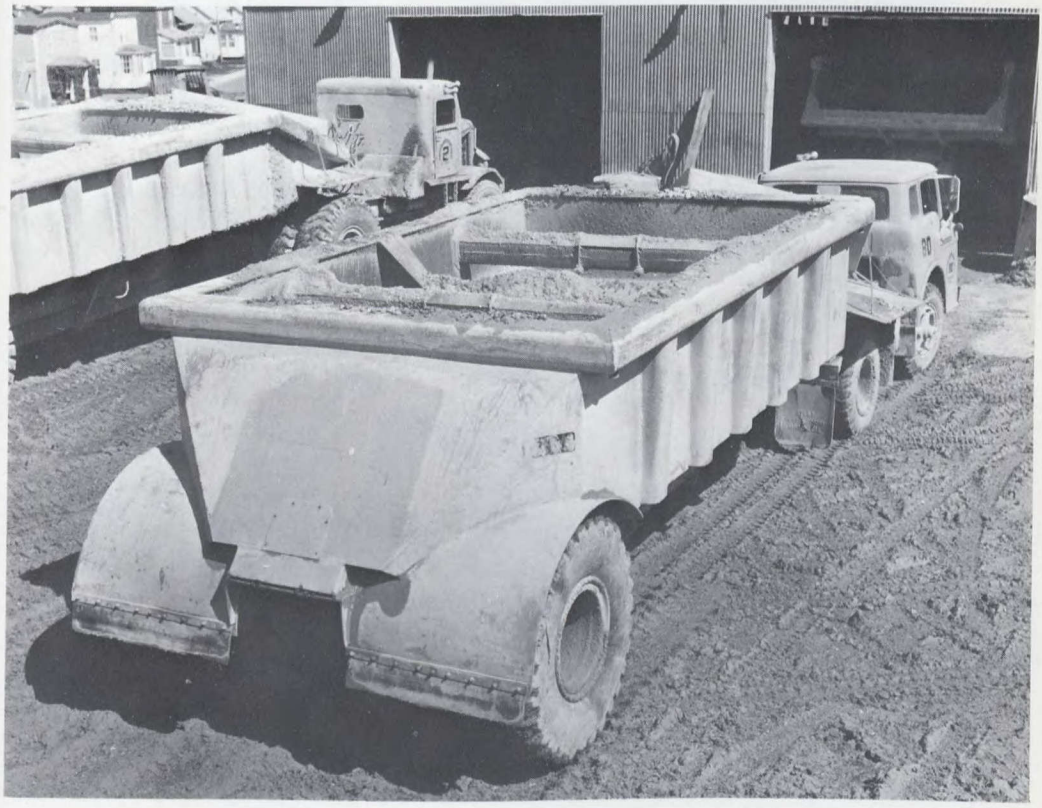
The single axle on the trailer makes it possible to turn on a road bed of less than 36 feet (10.9 m) but the vehicle is also capable of relatively high road speeds.

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.



LIGHT-WEIGHT RECONNAISSANCE VEHICLE (SNOW)

The small snow vehicles depicted on the opposite page (Olympique in the foreground and Alpine in upper left) are the smallest of a series of over-snow vehicles designed and produced by Bombardier Snowmobile Ltd. They are a derivative of the world's first snowmobile which was produced by Bombardier over 40 years ago and which has been in operation throughout the world for 30 years.

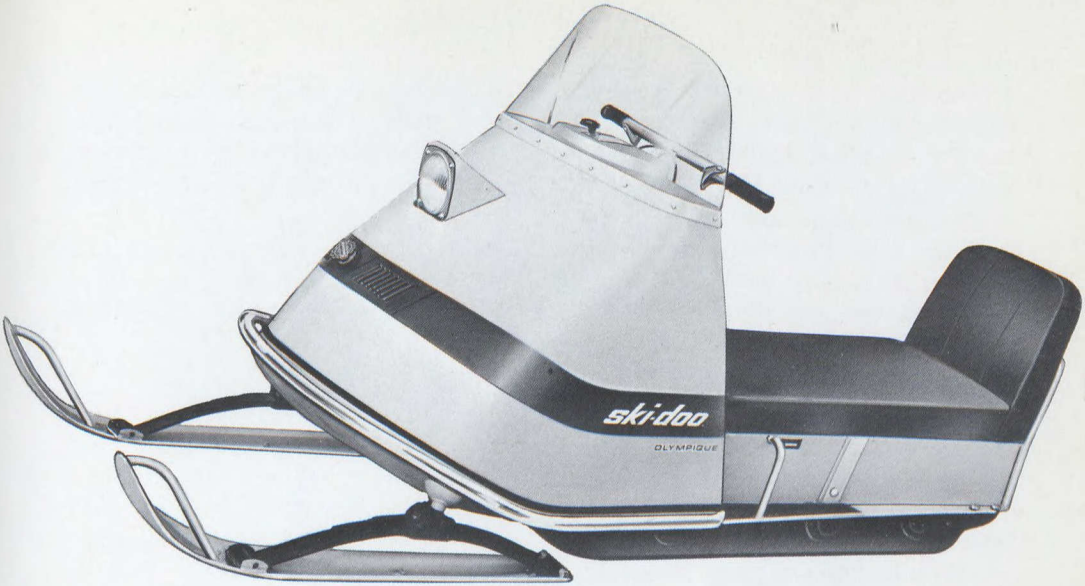
The chassis is of steel monopiece construction with the cowling of reinforced fiberglass. The track is tough, flexible rubber, reinforced with internal steel bars, the sprockets are rubber covered.

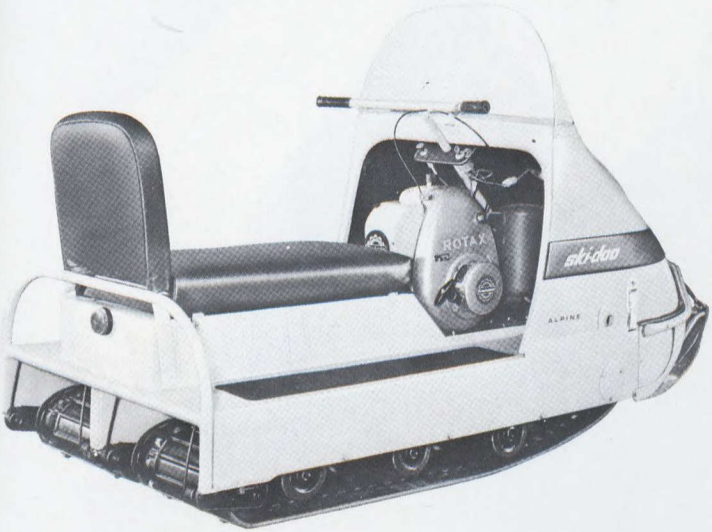
A partial list of the general specifications of these vehicles are as follows:

Super-Olympique		**Alpine**
82 in. (208 cm)	Length of Chassis	81 in. (206 cm)
96 in. (244 cm)	Overall Length	96.5 in. (245 cm)
31.5 in. (80 cm)	Width of Chassis	36 in. (91 cm)
31 in. (79 cm)	Height	36.5 in. (93 cm)
One endless	Track	Two endless
15 in. (38 cm)	Track Width	15 in. ea. (38 cm ea.)
50 in. (127 cm)	Track on Ground	50 in. (127 cm)
14 rubber	Track Supporting Wheels	28 rubber
2	Drive Sprockets	4
Tandems & Springs	Suspension	Tandems & Springs
265 lbs (120 kg)	Weight	395 lbs. (179 kg)
1020 sq. in. (6581 sq. cm)	Bearing Surface	1790 sq. in. (11,638 sq. cm)
.26 lb/sq. in. (108.9 gm/sq. cm)	Ground Pressure	.21 lb/sq. in. (95 gm/sq. cm)
48 mph (77 kilo/hr)	Maximum Speed	35 mph (56 kilo/hr)
2	Seating Capacity	2
3 Imp. Gal. (13.63 lit.)	Fuel Tank Capacity	5 Imp. Gal. (22.7 lit.)
.75 gal/hr. (3 lit./hr)	Gas Consumption	.75 gal/hr (3 lit./hr)
1 cylinder, 2 cycle air cooled, 300 cc	Engine	1 cylinder, 2 cycle, air cooled, 300 cc

It is considered that these vehicles are about as light as a ground traction vehicle can be and yet withstand the punishment that 45 mph (72.5 km/hr) over packed snow or ice will inflict. The uses of the vehicles are as varied as one's imagination and requirements. The rapid movement of forward survey parties, communications groups, couriers, scouts or patrols are all possible with such equipment. The Olympique with the single endless track and narrower chassis would tend to support a high speed scouting or courier role while the Alpine with the double track and wider chassis would lend itself to more utilitarian roles.

The constant development of this type of vehicle at Bombardier has taken a vehicle which was primarily considered an item of sport and placed it in the category of an equipment which can be relied upon for the most exacting of tasks.


ski-doo
OLYMPIQUE


ROTAX
ski-doo
ALPINE

SNOW VEHICLES

SW Snowplow

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.

Fitted with Chrysler Industrial 251 engine, 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.

Snowmobile

These vehicles are helping to solve the winter transportation and travel problems around the world. The vehicle comes either fitted with front wheels or with 60″ x12″ (1.5 x .3 m) skis for over-snow use.

It is powered by a 145 HP V.8 Chrysler engine and is capable of top speed 45 mph (72 Km/hr), with cruising speed of 25-30 mph (40-48 Km/hr). The standard model is designed to carry 15 passengers.

Amongst some of the uses to which the vehicle has been put are:—

Ambulance over snow; winter school buses; general transportation (can be hitched to a sleigh); rescue work in snowstorms; postal service in isolated communities; public utilities (off-highway); prospecting; arctic expeditions.


Bombardier
SN

LIGHT-WEIGHT SMALL ARMS AMMUNITION PACK

Small Arms Ammunition, because of the enormous quantities used, has always presented grave logistical problems such as transportation, adequate packaging, water-proofing, man-portability and costs, to name but a few of the more paramount considerations.

With the creation of new and better materials and techniques it became possible to give consideration to the successful solving of some of the mentioned problems provided the shibboleths of old designs were discarded and full advantage was taken of new materials and the permissive designs admitted by them.

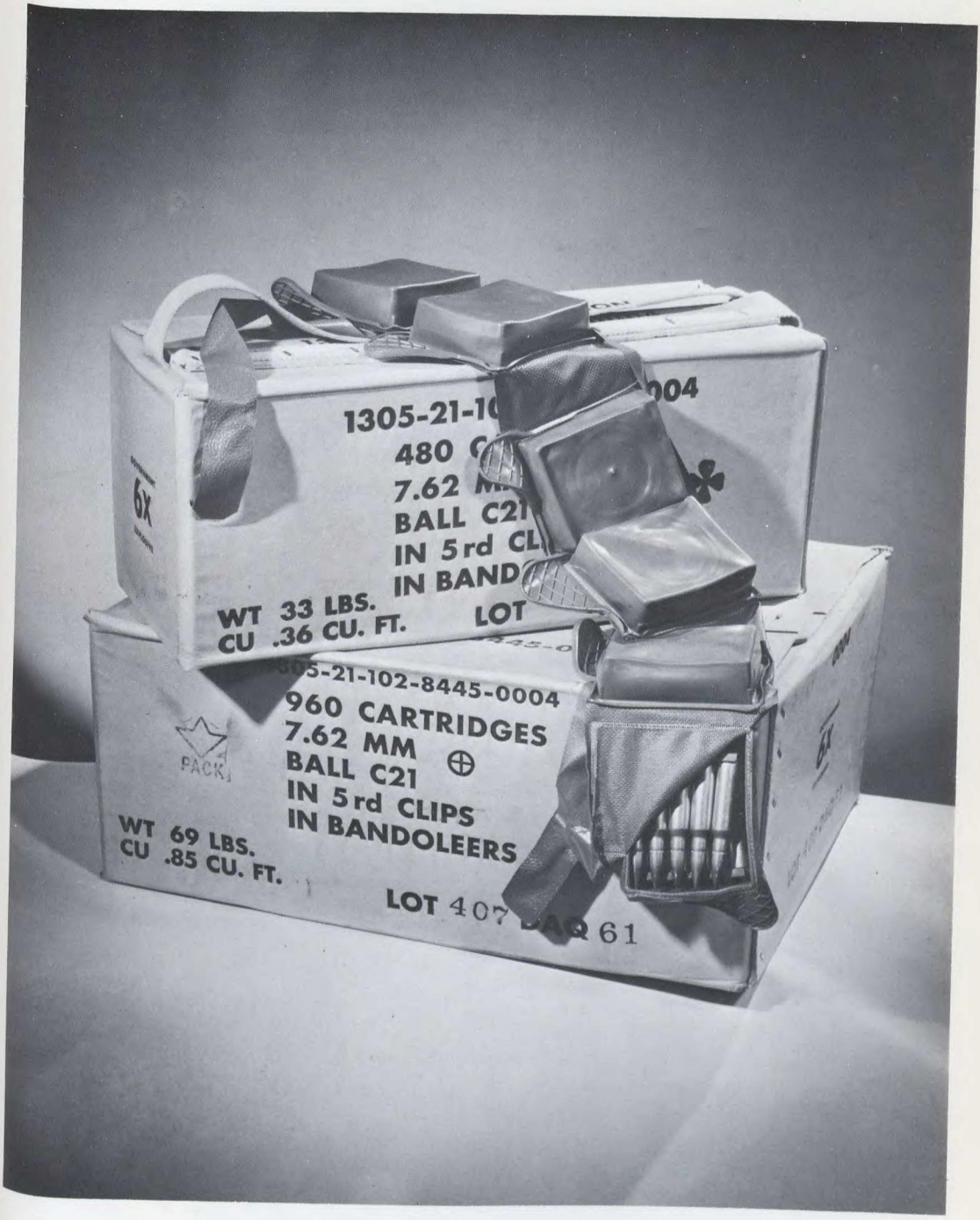
This is what was accomplished by the Canadian Army and Industry when the new light-weight pack was introduced. After considerable development and trial a plastic bandoleer was produced which provided in its material, as an inherent feature, the moisture protection so long sought but never achieved by older packs.

The bandoleer comprises six injection moulded polyvinyl-chloride pockets which are heat sealed to vinyl coated nylon cloth which has as an extension two tapes of the same material to allow the comfortable positioning and fit of the bandoleer over all types of equipment and clothing. The plastic pockets, designed for the NATO 7.62 mm round, are approximately 3⅜ in. by 2¾ in. (8.8 cm by 7.2 cm) and contain two 5 round clips, so that sixty rounds are carried in each bandoleer. As each pocket is an individual unit, the ammunition is continually protected from moisture until required.

With the development and acceptance of the new bandoleer it was now possible to give consideration to a much lighter and less costly outer package. The old case, weighing some 83 pounds (37.6 kg), was of wood with a sealed metal liner for protection against moisture. This seal was good only for as long as it remained unbroken. Once broken, the entire contents of the case were open to moisture. This case was usually considered an accountable item due to its high cost and was back loaded for re-use, occupying as much shipping space empty as when full.

The new lighter pack, containing 480 rounds, was produced from a special type of solid fibreboard with a carrying handle and quick tear-open feature and weighing 33 pounds (14.9 kg). Two of these packs are incorporated in a light outer case having the same quick opening feature but employing two handles for portability. The whole case weighs 69 pounds (31.2 kg.).

The main case, designed with a view to warehousing, also has been designed to fit on the standard pack board as a one man load or may be transported as a balanced load by breaking open the outer case and carrying one pack in each hand. Due to the materials used and the costs involved the entire packaging unit is considered disposable, with obvious savings. In manufacture alone the cost reduction is over 5%, with the main saving being embodied in the disposable feature.


1305-21-10
004
480
7.62
BALL C21
IN 5rd CL
IN BAND
WT 33 LBS.
CU .36 CU. FT.
LOT
6X
-21-102-8445-0004
960 CARTRIDGES
7.62 MM
BALL C21
IN 5rd CLIPS
IN BANDOLEERS
PACK
WT 69 LBS.
CU .85 CU. FT.
LOT 407 DAQ 61

SIGNAL UNDERWATER SOUND MK 400 AND MK 401

These are single source explosive sound signals used in combination with sonobuoys for the detection of underwater intruders. They may be dropped from aircraft by hand or through launchers and also over the side of ships to discourage underwater saboteurs.

The stores are designed to provide optional depth functioning for shallow or deep setting and the latter can be produced to provide any depth requirement between 330 and 800 feet (106 m and 244 m).

There are two versions available, the Mk 400 being High Explosive 1.8 lbs. (820 gms) for operational use and the Mk 401 Reduced Charge 1 oz. of Explosive (28.3 gms) for practice use. The two types are identical in weight and overall dimensions and can be used with the same equipment.

The store has double safety provision, being locked in a safe position until just prior to launching and subsequently armed by hydrostatic pressure. The functioning at the depth selected prior to launch is also by hydrostatic pressure.

The units may be carried in storage racks in aircraft or ships and with a minor modification may be adapted for carriage in racks or pods under aircraft wings.

The store was developed by the Canadian Armament Research and Development Establishment (CARDE) and has been in volume production by Canadian Arsenals Limited for the Canadian Services. This equipment has been adopted by U.K. and is on trial in Australia and West Germany.

MARKER LOCATION MARINE MK. 25, MOD. 2.

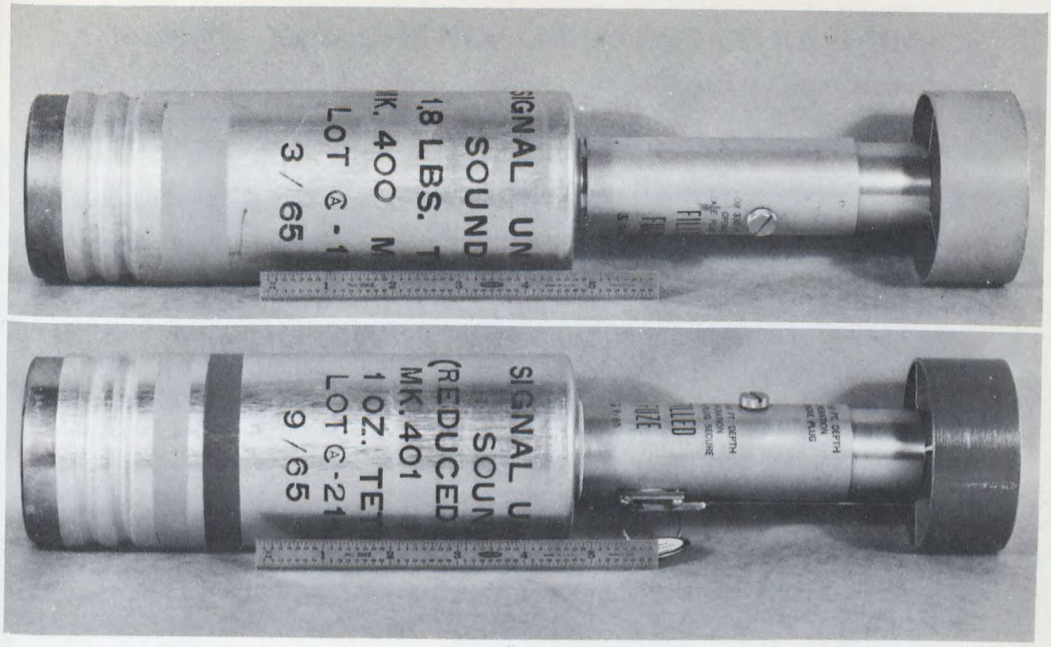
The Marker Marine Mk. 25 is a Pyrotechnic store, which provides both smoke and flame while floating in the water. It is used to determine the drift of aircraft while flying over water and as a visual indicator in anti-submarine exercises. It is launched from the Retro-launcher of the aircraft but may also be carried under the wings or may be dropped from helicopters or over the side of ships. The unit operates for minimum of 13.5 minutes and provides a visual indicator for both day and night.

Flotation orientation in the vertical plane is obtained by the integral volume of air and the position of the centre of gravity. Actuation is by sea-water cells and electric squibs, which ignite the starter mix and thereby the Pyrotechnic charge. Initiation takes place a very short period after impact with the water.

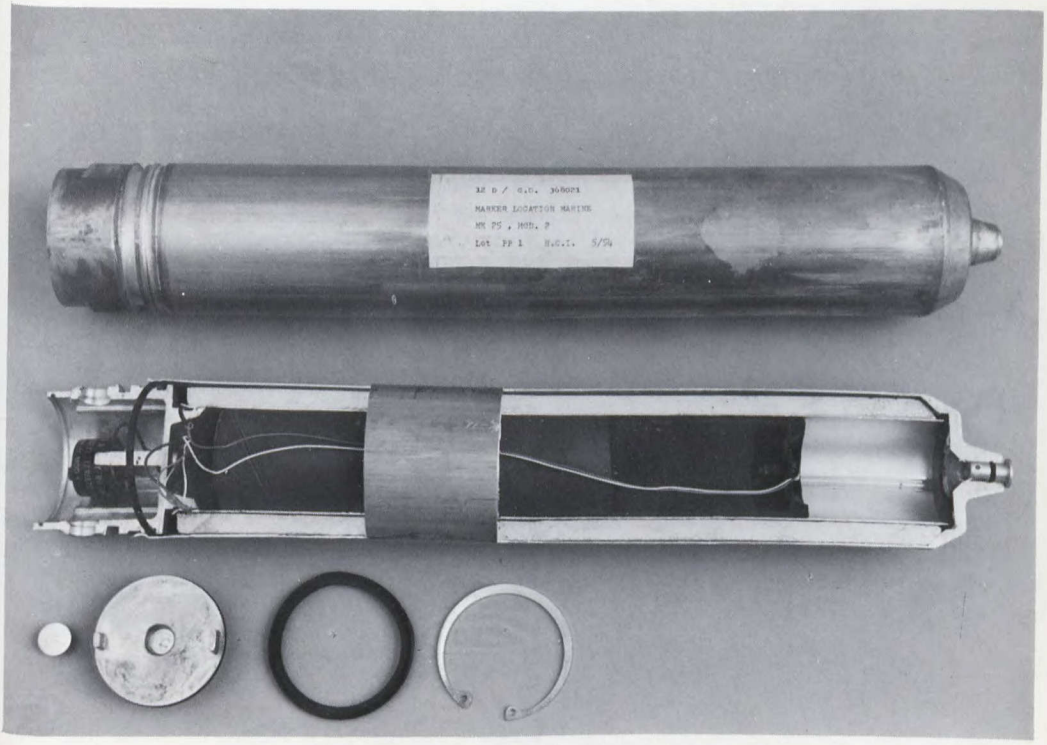
The dimensions of the store are 2.99 inches (7.5 centimetres cm) diameter and 18.5 inches (46.9 cm) long with a weight of 4.5 pounds (2.0 kg). The stores are packaged six per water resistant fibre container suitably reinforced.

The design offers an improvement over the Marker Marine Mk. 7, which it replaces, due to the replacement of the wooden body by an extruded aluminum case, which provides built-in flotation. The initiation by electric squibs results in a more reliable firing train. It is estimated that the increase in burning time and generation of smoke over the Marker Marine Mk. 7 will permit a reduction in operational requirements in a ratio of 2 to 3 or better.

This equipment has been adopted by the Netherlands government.



SIGNAL UNDERWATER SOUND MK 400 AND MK 401



MARKER LOCATION MARINE MK. 25, MOD. 2

MINE ANTI-PERSONNEL NON-METALLIC C3/M25

These mines were developed by the Canadian Army and have been accepted as standard by ABCA countries. The C3 version contains an aluminum shell 6 gr detonator while the M25 contains a gliding metal shell M46 detonator. The two versions are otherwise identical.

It is a low cost plastic groundburst mine supplied in two principal assemblies, consisting of the body assembly, 2″ diameter by 3″ long (5x7.5 cm) with a weight of 2 oz. (57 gm), and a 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, much greater loads will not cause actuation.

The Mines are coloured olive drab and are designed with camouflage to blend into the local ground colour.

Emplaced mines, after removal of the safety clip, are operationally undetectable, with conventional detection equipment. A detector ring can be fitted, if this should be required, which makes the mine detectable by standard methods.

The operational use is 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.

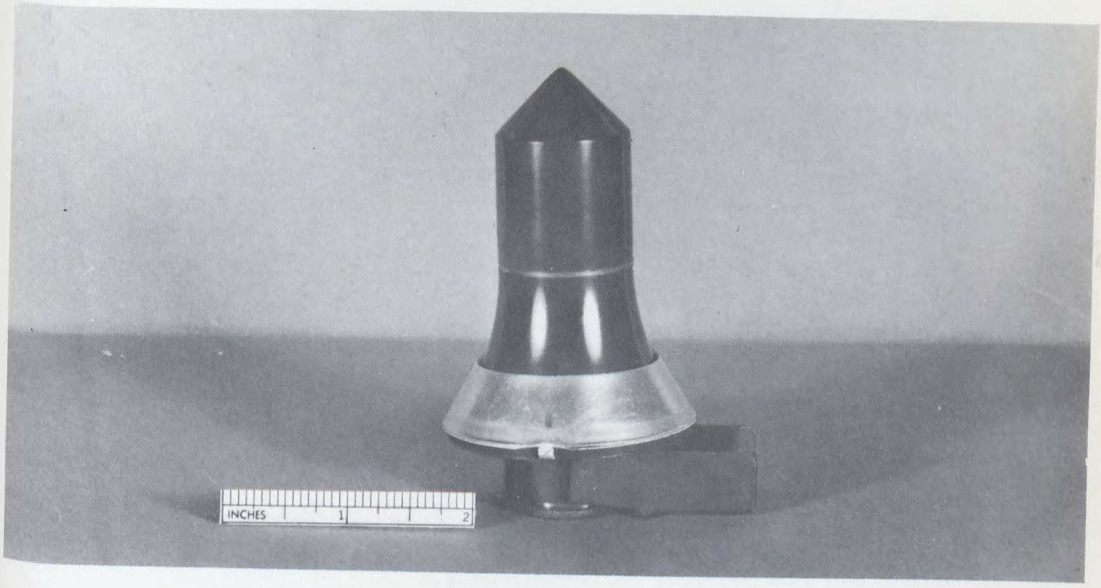
MINE ANTI-PERSONNEL NON-METALLIC PRACTICE C4

The mine is a practice version of the C3/M25 H.E. mine with the exception of producing a cloud of blue smoke on actuation.

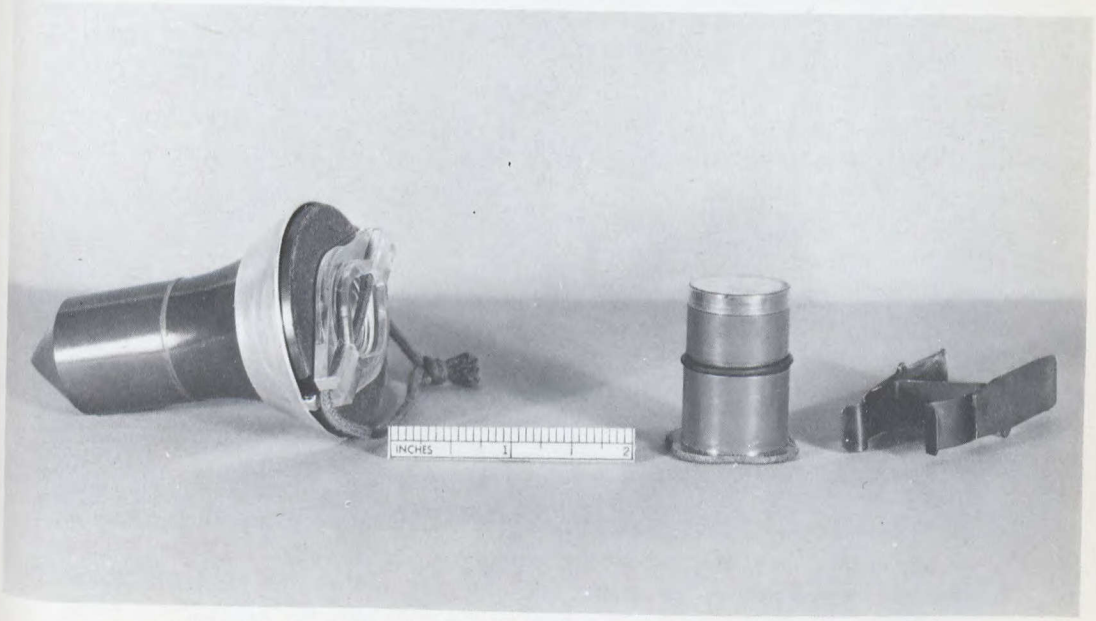
The emplacement assembly and function of the practice mine is otherwise the same as for the H.E. version.

It is constructed of plastic materials and is reusable at least five times by replacement of the spotting charge and the recocking of the body assembly.

The item has been in volume production for the Canadian Forces by Canadian Industries Limited and other contractors.



MINE ANTI-PERSONNEL NON-METALLIC C3/M25



MINE ANTI-PERSONNEL NON-METALLIC PRACTICE C4

HELICOPTER TRANSPORTABLE HOUSING FACILITIES

The cube facilities shown in the photograph on the opposite page are air transportable and may be complexed into a large kitchen, washroom, generators and other such equipment. Cube weights are designed so the maximum lift is approximately 3500 lbs. (1587 kg).

Cube construction is lightweight using sandwich panel design. Foam core with plywood or aluminum skins can be provided. The cubes are designed to operate in environments of −100°F (−37.7C°) and 100 mph (161 k) winds, and have been used successfully in environmental conditions of −130°F (−90C°) in the Antarctic.

The cubes have been designed for knocking down and palletizing to reduce shipping volumes. Special fasteners, seals and joining devices have been incorporated into the design to insure transportability and sure sealing.

Special cubes have been designed and are in use which expand from a floor area of 150 sq. ft. (12.8 m^2) to 330 sq. ft. (30.9 m^2). These expandable cubes have all the necessary mechanical equipment (water storage, pumps, stoves, washbasins, etc.) installed in the fixed part of the cube. The expandable part of the shelter is used for sleeping or dining areas. The equipment (beds, tables, etc.) used in the shelter are a fixed part of the shelter and normally fold up into the walls. These expandable units are designed with a base so the units have the capability of being mounted on wheeled or tracked vehicles.

ATCO Industries of Calgary, Alberta, have provided these lightweight, highly mobile complexes to both government and community agencies on numerous occasions.

TRANSPORTABLE HOUSING COMPLEX

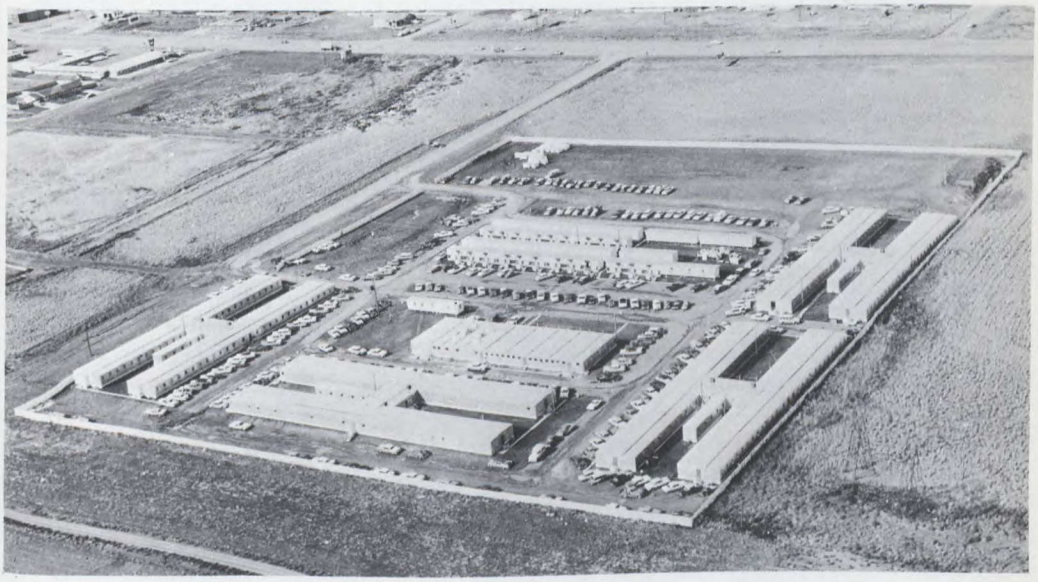
The trailer complex shown on the opposite page provides complete living, kitchen, dining, washroom and office space. ATCO Industries provide complexes in modular form. The individual units may be easily complexed into larger single story or three story facilities. Units are complexed so hallways are continuous from end to end of the complex as in a hotel or apartment. Standard modular units are 10 ft. wide and 40 ft. and 50 ft. long (3.04 × 12 × 15.2m). Units are provided with wheels or skids for traversing rough terrain.

Large open areas free of posts can be provided since 30 ft. (9 m) free spans are common in the trailer design. By complexing three 10 ft. (3.04 m) wide units side by side, open areas for dining, recreation or offices of 1500 sq. ft. (139 m^2) are possible.

The complexes are designed for loading in C-130 aircraft and custom designs are designed for knocking down to reduce shipping volumes in aircraft or for water transportability.

Construction is normally wood frame, steel chassis and aluminum exterior skins; however, complete aluminum structures are available.

Currently modular concepts are being used by ATCO Industries of Calgary, Alberta, to fabricate two 100-bed hospitals for overseas military use. These hospitals can be re-located in rear areas for medical support.



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.

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 1½″ to 8″ (38 - 203 mm) 1D 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.

(Cont'd on page I-246.)

1–8: Cable Terminals–A/C Arresting Devices

9. Piston for Naval Catapult Launching Device

10–11. Male & Female Cones for Pre-Stressed Concrete Construction.

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.

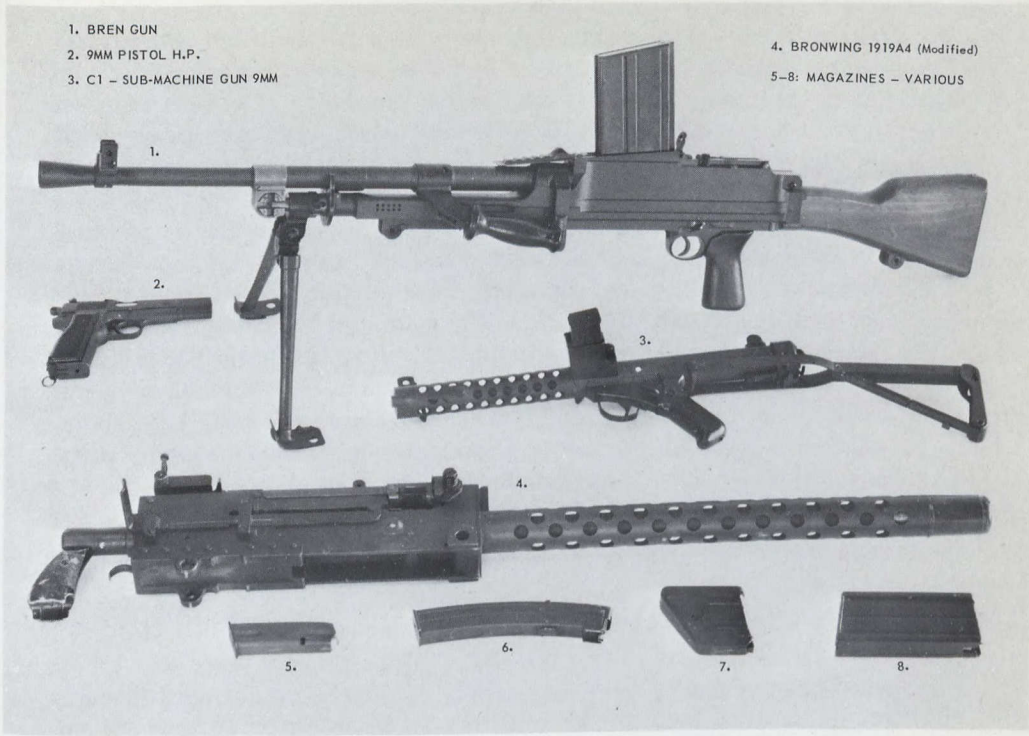
Phosphating and Oxide blackening — Phosphating is carried out to Mil-P-16232 on parts up to 36″ (.9 m) in length. Oxide blackening is carried out to Mil-C-13924 on parts up to 30″ (76 cm) in length. Support equipment includes acid and alkali cleaning tanks, rinse tanks, oiling benches etc.

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.

(Concluded on page I-248.)

1. BREN GUN
2. 9MM PISTOL H.P.
3. C1 – SUB-MACHINE GUN 9MM
4. BRONWING 1919A4 (Modified)
5–8: MAGAZINES – VARIOUS



1. SHOT-GUN 12 GAUGE
2. # 4 RIFLE – .303 LEE ENFILD
3. C1 RIFLE (FN) 762 MM
4. SPORTER .303
5. PISTOL BARREL
6–7: BAYONET & SCABBARD
8. REMINGTON .22 BARREL (Nylon)
9. S.A. BARREL

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 (2 m), 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.

DEEP HOLE DRILLING FACILITY:

The Division possesses unique deep hole drilling capabilities and has the following machines for this purpose:—

(1) Pratt and Whitney ½ B drilling machines capable of drilling holes up to ¾″ (19 mm) diameter by 50″ (127 cm) long.

(2) Barnes drilling machines, presently drilling up to 1¾″ (44.4 mm) diameter by 96″ (2.4 m) long.

(3) Bryant drilling machines for precision drilling of small holes to fine positional tolerances in irregularly shaped components.

Other than the drilling of all types of small arms barrels these machines have applications for the drilling of a wide range of components for industry in general. The most unusual application was the drilling of 12 coolant holes 1½″ (38 mm) diameter with a drilled length of 86″ (218 cm) through a solid copper block weighing approximately 6500 lbs (2948 kg).

Other drilling operations include such items as the wire rope holes for catapult launching terminals, roller shafts for printing machines and thermocouple welds, etc.

Canadian Arsenals (Small Arms Division) enjoy an international reputation in design and production based on such activities as; Design Agent for the Design Authority for the 7.62 FN Rifle in use in Great Britain, Australia, New Zealand, India, Canada and other countries who have adopted it; production of ordnance gauges for the U.S. Army and more lately the Division has received commendation from the U.S. Army concerning the speed and efficiency with which M137 Telescope Mounts were produced for overseas use.

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 B2

ABERCORN AERO LIMITED,
2240 Beaconsfield Ave., N.D.G.
Montreal 28, 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

ABEX INDUSTRIES OF CANADA LTD.,
(Jarry Electronics Div.),
305 Laurier Street,
Hawkesbury, Ontario.
Telephone 613: 632-2751
Contact: N. Knowlton, Gen. Mgr.
Floor Area: 18,000 sq. ft.
Personnel: 175

Manufacturers of: R. F. filters, chokes and coils; R. F. delay lines. 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 5840 5841 5950 5995 5999 6145 6625 and page B7

ABEX INDUSTRIES OF CANADA LTD.,
(Jarry Hydraulics Div.)
P.O. Box 1000,
Rosemont Station,
Montreal, Que.
Telephone 514: 527-4351
Telex: 01-2918
Cable: JARHYD
President: A. C. MacDonald
Contact: J. P. Fullam, Vice-Pres. Engineering
Floor Area: 350,000 sq. ft.
Personnel: 900

Manufacturers of: Aircraft landing gear; Hydraulic systems; Power controls; Selectors and valves; Actuators; Guided missile hydraulics; 3-Dimensional machining; Repair and overhaul facilities.

1420 1560 1620 1630 1650 1680 2910 2915 2995 4810 4820 4920 and pages B3, B7, I-20 & I-28

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

ACME DECALCOMANIA LTD.
16 Sheffield Street,
Toronto 15, Ontario.
Telephone 416: 249-9163
President: J. F. Edmund
Contact: P. R. Lawton, Sales Manager
Floor Area: 20,000 sq. ft.
Personnel: 40

Manufacturers of: Decalcomania transfers; Pressure-sensitive markings and nameplates; Aircraft and vehicle markings; Pressure-sensitive vinyl and mylar emblems.

7690

AERO MECHANIC LTD.,
1 Dery Avenue, Beauport,
Quebec 5, Quebec.
Telephone 418: 663-7871
General Manager: 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.

3465 and page B7

AERO-PHOTO INC.,
1975 Charest Blvd. W.,
Quebec City, Que.
Telephone 418: 683-4459
Telex: 011-3467
President: Andre Cassista
Vice-President: Charles Bigonesse

This firm provides the following services: Map compilation and drafting; Aerial photography; Geodetic surveys; Magneto-

meter surveys; Forestry inventory and management; Graphic Arts.

7640 and page B5

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

AEROMETAL PRODUCTS & DESIGN LTD.,

195 Bentworth Avenue,
Toronto 19, Ontario.
Telephone 416: 781-5591
President: J. Thomson
Contact: W. Z. Jarmicki, Plant Manager
Floor Area: 15,500 sq. ft.
Personnel: 15

Manufacturers of: Fabricated magnesium alloy components; Aircraft inspection ladders; Refuelling ladders; Dock boards; Drill rods, towers and sheave blocks for diamond drilling; Survey tripod signals; Fire ladders; Magnesium snow shoes.

1730 2090 3020 3815 3920 7125 8465

AEROVOX CANADA LIMITED,

1551 Barton Street East,
Hamilton, Ontario.
Telephone 416: 545-5893
President: W. H. Furneaux
Contact: J. Cartwright, Sales Manager
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 LIMITED,

585 Dixon Road,
Rexdale, Ontario.
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 B3 & B7

AIRTRON CANADA LIMITED,

349 Carlaw Avenue,
Toronto 8, Ontario.
Telephone 416: 641-3511
President: J. R. Longstaffe
Contact: W. J. Muller, General Manager
Floor Area: 10,000 sq. ft.
Personnel: 30

Manufacturers of: Flexible and Rigid Waveguide; Ferrite Components; Attenuators; Mixer Duplexers and Associated Microwave components.

5820 5821 5825 5826 5840 5841 5895 5905 5910 5915 5950 5985 6625

ALLEN-BRADLEY CANADA LIMITED,

135 Dundas Street,
Galt, Ontario.
Telephone 519: 623-1810
Telex: 029-5417
Executive Vice-President: K. H. Rapsey
Contact: I. A. Rader, Vice-President, Sales
Floor Area: 98,000 sq. ft.
Personnel: 250

Manufacturers of: Complete line of Electric Motor Control Apparatus; AC and DC Power Relays; AC and DC Contractors; AC and DC Motor Starters and Controllers; Push buttons, Limit switches, Float and foot switches; Phase Reversal and Phase Failure Detection relays; Timing relays; Pressure and temperature switches; Automatic transfer switches; AC Solenoids, High Voltage (5000 Volts AC) Motor Controllers.

5930 5945 6110

ALMAX CERAMIC INDUSTRIES LTD.,
31 Kent Street East,
Lindsay, Ontario.
Telephone 705: 324-5100
General Manager: A. J. Ankus
Sales Manager: M. F. 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 LIMITED,
Box 6090,
Montreal 3, Quebec.
Telephone 514: 877-2340
Cable: ALCAN
Export Sales Mgr.: F. C. Winser
Floor Area: 14,000,000 sq. ft.
Personnel: 17,500

Manufacturers of: Extrusion Ingots; Casting Alloys, Sheet Ingots, etc. — Bars and Rods; Sheet and Foil — Extrusions; Tubing.

9530 9535 9540 9650

ALUMINUM FOUNDRY & PATTERN WORKS LTD.,
1345 Miron Street,
St. Laurent,
Montreal 9, Quebec.
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 B6

AMALGAMATED ELECTRIC CORPORATION, LIMITED,
Bullock Drive,
Markham, Ontario.
Telephone 416: 293-8161
President: M. K. Douglas
Contact: E. D. Leigh, Marketing Mgr.
Floor Area: 130,000 sq. ft.
Personnel: 425

Manufacturers of: Fittings, Electric; Light Fixtures, Incandescent; Lights, Flood; Lighting Fixtures, EEC Standard; Lighting Units; Lugs, Cable; Panels, Fuse; Switchboards, Power; Switches, Disconnect; Switches, Safety; Switchgear; Shades, Glass, Electric Fixtures.

5920 5930 6110

AMPHENOL CANADA LIMITED,
Metropolitan Road (401 and Warden Ave.),
Scarborough, Ontario.
Telephone 416: 445-2510
Sales Manager: Gordon Lee
General Manager: Robert A. Ely
Floor Area: 50,000 sq. ft.
Personnel: 73

Manufacturers of: Electrical Power and Coaxial Connectors; Adapters; Cable Harnesses; Coaxial Cable; Coaxial Switches; Trimming Potentiometers; Precision Potentiometers; Digital Readout Dials; Vernier Dials; Instrument Motors; Sub-fractional Horsepower Motors; Frequency and Time Standards.

5355 5905 5930 5935 5965 5975
5985 5995 5999 6145 6625 7440

ANACHEMIA CHEMICALS LIMITED,
500 Second Avenue,
Ville St. Pierre,
Montreal, P.Q.
Telephone 514: 489-5711
President: C. E. Jorgensen
Floor Area: 17,600 sq. ft.
Personnel: 26

Manufacturers of: Reagents, pharmaceutical and technical chemicals and solutions.

6505 6750

ANACONDA AMERICAN BRASS LIMITED,
8th Street,
New Toronto, Ontario.
Telephone 416: 259-6611
President: J. S. Vanderploeg
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, Tube, Wire and Extruded Shapes; Anodes, Angles, Channels, Mouldings, Block Cutters' Brass, Roofing Copper and Through-wall Flashing, Commutator Copper, Commutator Segments, Copper Tube in Cartons for Automotive and General Use, Refrigeration Tube, Restrictor, Capillary and Cupro Nickel Tube, Oval Square and other Special Shape Tube and Casting Ingots.

1395 4710 9525 9530 9535 9650

ANTHES IMPERIAL LIMITED,
Berryman Avenue,
St. Catharines, Ontario.
Telephone 416: 682-8621
President: D. G. Willmot
Contact: J. M. Morrison, Corporate Planning

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 Hot Water and Steam boilers; Cast iron and non-ferrous radiation; Gas and Oil fired Forced Warm Air Furnaces; Gas fired unit heaters; Brass Valves and specialties; forged steel valves; 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 (anoloders).

1730 3940 4320 4410 4420 4520
4530 4710 4730 4820 5440 6680

ARMCO DRAINAGE & METAL PRODUCTS OF CANADA LTD.,
P.O. Box 300,
Guelph, Ontario.
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

ARMSON IRON WORKS LIMITED,
1558 Howard Avenue,
Windsor, Ontario.
Telephone 519: 254-2501
Contact: F. V. Thomas, Vice President
Floor Area: 30,000 sq. ft.
Personnel: 30

Manufacturers of: Tubular Steel Scaffolding; Tubular Steel Bleachers; Modular Concrete Forming Equipment; Boat Trailers; Bicycle Racks; Park Benches; Picnic Tables (Steel and Wood); Steel Stampings.

5440

ARMSTRONG BEVERLEY ENGINEERING LIMITED,
6975 Jeanne Mance Street,
Montreal 15, Quebec.
Telephone 514: 272-8291
President: D. P. Robertson
Contact: H. Frere, Production Manager
Floor Area: 28,000 sq. ft.
Personnel: 75

Manufacturers of: Shock Absorbers — Automotive; Automotive Jacks — Hydraulic; Shop Cranes — Hydraulic; Hydraulic Presses (to 150 tons).

2540 3442 3950 5120

ARNOTT-SMITH EXPORT LTD.,
1304 West Georgia Street,
The Burrard Building,
Vancouver 5, B.C.
Telephone 604: 684-1445
Cable: RESMITH
President: R. E. Smith

Manufacturers of: Forest products, such as Lumber, Timbers, Logs, Poles, Piling, Posts, Shingles and Plywood.

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

ATCO INDUSTRIES LTD.,
1243 - 48th Avenue Northeast,
Calgary, Alberta.
Telephone 403: 276-1101
President: R. D. Southern
Contact: J. A. Wilfley, General Sales Manager
Floor Area: 200,000 sq. ft.
Personnel: 550

Manufacturers of: All types of custom trailers; modular design relocatable housing including complete, fully-serviced field camps ready-built, palletized or engineered for helicopter or cargo plane transport; custom-designed laboratories, hospitals and other special service units; completely-finished contemporary homes, schools and motels; research, design, development and consulting services in the field for structural, mechanical and civil engineering.

1740 2330 2510 5410 and pages B1, I-242 & I-243

ATLAS STEELS COMPANY
(Division of Rio Algom Mines Limited)
Welland, Ontario.
Telephone 416: 735-5661
President: R. H. Winters
Contact: A. V. Orr, Vice President, Sales and Marketing
Floor Area: 1,180,081 sq. ft.
Personnel: 2,713

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 9505 9510 9515 and page B7

ATLAS TITANIUM LIMITED,
Welland, Ontario.
Telephone 416: 735-5661
Manager: K. C. Ramsey
Floor Area: 58,000 sq. ft.
Personnel: 80

Manufacturers of: Bar, Wire, Sheet, Strip and Plate in Titanium and Titanium Alloys; Seamless and welded tubing in Titanium and Titanium 0.2% Palladium alloy.

4710 9530 9535

ATOMIC ENERGY OF CANADA LIMITED
(Commercial Products),
Tunney's Pasture,
P.O. Box 93,
Ottawa, Ontario.
Telephone 613: 728-1841
Cable: NEMOTA
Director of Sales: C. H. Hetherington
Contact: F. Feiffer, 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 B1, B4 & I-198

AUSTENAL CANADA LTD.,
(Formerly Sterling Rubber Co.),
364 Waterloo Avenue,
Guelph, Ontario.
Telephone 519: 824-1140
Cable: STERUBBER
General Manager: T. A. McEwan
Floor Area: 40,000 sq. ft.
Personnel: 115

Manufacturers of: Rubber Gloves for Surgeons, Obstetrical, Post Mortem, Veterinary use; Also Rubber Gloves for household, industrial and Dry Box uses; Meteorological balloons.

6515 6660 8415

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; Grenade and Bomb Bodies Cast; Fins and Fin Assemblies for Grenades and Bombs.

1095 1325 1330 2510 2520 2530 and page B6

AUTOMATIC ELECTRIC (CANADA) LTD.,
100 Strowger Boulevard,
Brockville, Ontario.
Telephone 613: 342-6621
President: C. R. Hughes
Contact: E. R. O'Kelly, Vice-President and General Manager
Floor Area: 274,000 sq. ft.
Personnel: 1,500

Manufacturers of: Automatic Telephone Exchange Equipment; Automatic Toll Systems; P.A.X. and P.A. B.X. Toll Systems; Telephones, Industrial Relays; Stepping Switches; Coils and Transformers and Industrial Control System Design and Manufacture.

5805 5935 5945 5950

AUTOMATIC PLASTICS COMPANY,
399 Kennedy Road,
Scarborough, Ontario.
Telephone 416: 266-4545
President: A. Flint
Contact: D. C. Wainman, Director of Sales
Floor Area: 20,000 sq. ft.
Personnel: 60

Manufacturers of: Semi-automatic and automatic injection moulding of precision plastic components specializing in engineering plastics.

1310 1315 1320 1325 1345 1350 1355 1390 3120 5310 9330

AVIAN AIRCRAFT LIMITED,
116 Mountainview Road South,
Georgetown, Ontario.
Telephone 416: 877-6995

President: F. S. Walter
Contact: G. B. Sampson, Vice President, General Manager
Floor Area: 12,800 sq. ft.
Personnel: 43

Manufacturers of: Rotary Wing VTOL Aircraft; Plastic components for Aircraft; Engine mounts, A/C; Fabricated assemblies, A/C; Drones and Technical publications.

1520 1550 1560 7610 and page I-16

AVIATION ELECTRIC LIMITED,
P.O. Box 2140, 200 Laurentien Blvd.,
Montreal, Quebec.
Telephone 514: 744-2811
President: A. Bandi
Contact: C. D. Garbutt, Director of Sales and Service
Floor Area: 221,000 sq. ft.
Personnel: 1,000

Manufacturers of: Fuel Control Systems; Fuel Nozzles; Hydraulic Pumps; Flight and 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; Test Equipment; Repair and Overhaul facilities for above-noted equipment; Engineering services; Consulting and Design Services; Technical Manuals.

1220 1350 1360 1420 1630 1650
1680 2840 2915 2925 2995 3010
4320 4820 4920 5805 5821 5825
5826 5830 5845 5945 5990 5995
5999 6110 6130 6605 6610 6615
6625 6645 6660 6685 6910 6920
6930 6940 7440 7610 and pages B1, B3, B4, B7, I-52, I-94, I-208, I-210, I-214 & I-216

AVIATION ELECTRIC PACIFIC LIMITED,
Vancouver International Airport,
Vancouver, B.C.,
Telephone 604: 278-2184
Vice-President: H. H. Ollis
Contact: L. C. Bryan, Sales and Service Mgr.
Floor Area: 12,000 sq. ft.
Personnel: 40

Manufacturers of and repair and overhaul facilities for: Electric generator control systems; Electric motor control centres; Automatic engine control equipment; Liquid level control systems, distribution, repair and overhaul of aircraft electronic and hydraulic accessories, instrument and undercarriage system components; Marine radar, communication and navigation electronic equipment; Marine automatic pilots.

6110 and page B3

AYERST McKENNA & HARRISON LTD.,
P.O. Box 6115,
Montreal, Quebec.
Telephone 514: 744-6771
President: E. Glyde Gregory
Floor Area: 130,000 sq. ft.
Personnel: 680

Manufacturers of: Pharmaceutical Preparations including Hormones; Vitamins; Hematinics; Antacids, Antibiotics; Geriatrics; Ophthalmics; Veterinary Products, etc.

6505

ATLAS HOIST & BODY INC.
(Division of the Richler Industries)
6124 Cote de Liesse Road,
Montreal 9, Que.
Telephone 514: 748-8851
General Manager: Max M. Richler
Floor Area: 30,700 sq. ft.
Personnel: 54

Manufacturers of: Hydraulic hoists and 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 and quarrying.

Pages I-230 & I-231

BABCOCK-WILCOX AND GOLDIE McCULLOCH LIMITED,

Galt, Ontario.
Telephone 519: 621-2130
President: R. M. Robertson
Contact: J. S. E. MacAllister
Floor Area: 355,000 sq. ft.
Personnel: 925

Manufacturers of: Boilers, hot water, industrial and marine; Burners, fuel oil and gas; Condensers; Cranes, all types; Engines, steam; Heat Exchangers; Materials handling Equipment; Nuclear reactors; Pumps, boiler feed, centrifugal, reciprocating, rotary sump, variable delivery, hydraulic, vertical turbine; Stokers, under-feed, spreader; Superheater and liquid storage tanks; Turbines, steam. Repair and Overhaul facilities; Machining, medium and heavy. Sheet metal fabrication.

2820 2825 3820 4320 4410 4420 4470 4530 5430 and pages B6 & B7

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 7440

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: 65,500 sq. ft.
Personnel: 170

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 B6

WALLACE BARNES COMPANY LIMITED,

274 Sherman Avenue North,
Hamilton, Ontario.
Telephone 416: 545-1172
President: W. A. Campbell
Contact: E. J. Baker — Sales Manager
Floor Area: 160,000 sq. ft.
Personnel: 362

Manufacturers of: Precision Coil and Flat Springs all Types and Sizes; Light Stampings for Aircraft and ordnance; Wire Forms.

5340

BARRINGER RESEARCH LIMITED,

145 Belfield Road,
Rexdale, Ontario.
Telephone 416: 247-2193
Cable: BARESEARCH
President: A. R. Barringer
Contact: D. A. Whiteman — Manager
Floor Area: 7500 sq. ft.
Personnel: 60

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 — Airborned Pulse E.M. (Input) Magnetometer and Gamma Ray Spectrometer, Ground Geophysical and Geochemical Surveys Complete, Custom Geochemical Laboratory Facilties.

6630 6655 6665 and pages B1 & B5

BATA ENGINEERING,

Batawa, Ontario.
Telephone 613: 398-6111
General Manager: E. L. Dalton
Contact: J. Hradecky
Floor Area: 50,700 sq. ft.
Personnel: 225

Manufacturers of: Gun components, aircraft components; ammunition components; special purpose machinery; repair and overhaul facilities.

1045 1055 1340 1420 1440 1560 1730 3465 and page B7

BATHURST CONTAINERS LIMITED,

635 Dorchester Blvd., West,
Montreal, Quebec.
Telephone 514: 866-7831
President: L. D. Richardson
Contact: E. H. Gibson, Executive Vice-Pres.
Floor Area: 1,300,000 sq. ft.
Personnel: 1630

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,

Victoria and Fourth Streets,
Midland, Ontario.
Telephone 705: 526-5486
President: S. F. Cerny
Contact: S. J. Nicholls, General Sales Manager
Floor Area: 180,000 sq. ft.
Personnel: 200

Manufacturers of: Glass fabrics for industrial end uses. (insect window screening, dust tube bags, filter cloth).

8305

BAYLY ENGINEERING LIMITED,

Hunt Street,
Ajax, Ontario.
Telephone 416: 925-2126
Senior Official: H. F. Philp
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
General Manager: D. K. Fleck
Contact: R. S. Vanwart, Factory Manager
Floor Area: 243,500 sq. ft.
Personnel: 220

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 B6

BEACONING OPTICAL & PRECISION MATERIALS CO. LTD.,

455 Craig Street, West,
Montreal, Quebec.
Telephone 514: 866-8395
Cable: BOPHAR — Montreal
President: J. A. Benard
Contact: J. C. Carter, Manager, Contracts Administration
Floor Area: 30,000 sq. ft.
Personnel: 165

Manufacturers of: HF and UHF Communication equipment. Precision electromechanical components and assemblies.

5820 5821 5840 5895 6210 6625
and page B7

BEAVER DECALCOMANIA CO. LTD.,

360 Recollets Street,
Montreal 1, Quebec.
Telephone 514: 842-2576
President: C. M. Prevost
Contact: E. Cola, Contracts Administrator
Floor Area: 7,500 sq. ft.
Personnel: 24

Manufacturers of: Decalcomania transfers of every description: Dry decals; Pressure sensitive emblems, Markings and Nameplates.

7690 9905

BEAVERS DENTAL PRODUCTS LIMITED,

Laurier Drive and Highway #2,
Morrisburg, Ontario.
Telephone 613: 543-2537
President: Geo. E. Beavers,
Floor Area: 16,000 sq. ft.
Personnel: 70

Manufacturers of: Carbide Dental Burrs.

6520

BECKMAN INSTRUMENTS INC., (Helipot Division),

901 Oxford Street,
Toronto 18, Ontario.
Telephone 416: 251-5251
Telex: 02-2043
Manager: J. Partridge
Floor Area: 6,000 sq. ft.
Personnel: 40

Manufacturers of: Potentiometers — Wirewound, Controlling, Recording.

5905

BECLAWAT (CANADA) LIMITED,

335 Laurentian Blvd.,
Montreal, Quebec.
Telephone 514: 747-9878
Executive Vice-President: J. M. Hendren
Contact: R. G. Cavanagh, Sales Manager

Floor Area: 13,000 sq. ft.
Personnel: 35

Manufacturers of: Windows (Frames and Glass) of Aluminum, Brass, Stainless Steel; Sliding Door Equipment; Seat Adjusters; — All explicitly designed for use on ships, vehicles, rail-cars and other transportation equipment. Consulting and Design Services on window systems.

2040 2240 2510 5670 and page B1

BEDARD-GIRARD LIMITED,
117 Lagauchetiere Street West,
Montreal, Quebec.
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 6320 6350

BELOIT SOREL LIMITED,
P.O. Box 80,
Sorel, Quebec.
Telephone 514: 743-3381
President: E. C. Lever
Contact: H. Oliver, Vice-President
Floor Area: 400,000 sq. ft.
Personnel: 450

Manufacturers of: Pulp and paper machinery; Atomic energy reactor assemblies; Ship shafts; Rolling mill equipment; Hydraulic turbines; Gears; Precision machine shop services; Repair and overhaul facilities.

2010 2220 2825 3020 3422 3615
and pages B4 & B7

BERTRAM MACHINE AND TOOL COMPANY,
(Division of Levy Industries Ltd.),
15 Hatt Street,
Dundas, Ontario.
Telephone 416: 628-2233
General Manager: B. E. Johnston
Floor Area: 270,000 sq. ft.
Personnel: 400

Manufacturers of: Tools and Gauges; Special Purpose Machinery; Machine Tools; Jigs and Fixtures; Special Machine Work; Mining Equipment; Steel Mill Equipment; Mine Shaft Tubing; Hydraulic and Mechanical Shears and Presses; Compressors; Repair and Overhaul Facilities.

3411 3413 3416 3418 3419 3441
3442 3443 3445 3456 3465 3695
3820 4940 5210 5220 8120
and page B7

H. L. BLACHFORD LIMITED,
977 Aqueduct Street,
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, Ontario.
Telephone 519: 376-8860
Vice-President and General Manager:
Wm. H. Kennedy
Contact: D. P. Crichton, Sales Administrator
Floor Area: 352,000 sq. ft.
Personnel: 500

Manufacturers of: Bearings, antifriction, mounted, plain; Castings iron and 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 Increasers, Reducers; Centrifugally Cast Tubing, bronze, mild and alloy steels; Winches; Repair and Overhaul facilities; Machining, heavy, medium.

2010 2030 3010 3020 3130 3615
3695 3950 4320 4710
and pages B6 & B7

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 Computors, 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: Valcourt 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.

2320 2330 2410 2430 and pages B1, I-228, I-232 & I-234

BOURNS (CANADA) LTD.,
36 Cranfield Road,
Toronto 16, Ontario.
Telephone: 416: 759-1179
Telex: 02-29276
Manager: Rodney Buy
Floor Area: 7,000 sq. ft.
Personnel: 48

Manufacturers of: Adjustment Potentiometers; Precision Potentiometers.

5905

BOWMAR CANADA LIMITED,
P.O. Box 4076,
Station "E",
Ottawa, Ontario.
Telephone 613: 822-0463
Vice-President and General Manager: B. L. Peters
Contact: W. R. Ratcliffe, Sales Manager
Floor Area: 22,000 sq. ft.
Personnel: 100

Manufacturers of: Synchros, resolvers, potentiometers. Servomotors 8's, 10's, 11's. Miscellaneous servo mechanisms. Components and modules. Motor gearheads.

5990 6105

S. F. BOWSER COMPANY LIMITED,
344 Sherman Avenue North,
Hamilton, Ontario.
Telephone 416: 544-2881
Vice-President and Secretary-Treasurer: T. King
Contact: C. R. Lobb, Director of Manufacturing
Floor Area: 187,000 sq. ft.
Personnel: 200

Manufacturers of: Hydraulic and Electrical Oil conditioning and maintenance equipment; Industrial meters for petroleum and chemical liquids; 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

BOYLES BROS. DRILLING COMPANY LTD.,
1291 Parker Street,
Vancouver 6, B.C.
Telephone 604: 255-5434
Cable: BOYLBRO
President and General Manager: J. D. Campbell
Contact: W. M. Robson, General Marketing Manager
Floor Area: 41,256 sq. ft.
Personnel: 300

Manufacturers of: Diamond Drilling Machines and 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.

3415 3820

THE BRANTFORD CORDAGE COMPANY,
96 Sherwood Drive,
Brantford, Ontario.
Telephone 519: 753-2601
President: A. M. James
Contact: J. A. McKay, Vice-President
Floor Area: 100,000 sq. ft.
Personnel: 350

Manufacturers of: Ropes: Manilla, sisal, polyethelene, propylene, nylon, terylene; twines sisal, binder and packaging.

4020

BRANTFORD TOOL LIMITED,
151-161 Wellington Street,
P.O. Box 305,
Brantford, Ontario.
Telephone 519: 753-7341

President and General Manager: J. E. Rich
Floor Area: 15,000 sq. ft.
Personnel: 25

Manufacturers of: Press brake dies; Positioners, horn jig seamers and other types of automatic welding positioning machinery.

3431

BRANTFORD TRAILER & BODY LIMITED,

22 Mohawk Street,
Brantford, Ontario.
Telephone 519: 752-5465
President: A. Hally
Floor Area: 317,460 sq. ft.
Personnel: 380

Manufacturers of: Stake, Van, Low Bed and Dumping Semi-Trailers; Stake bodies; Van bodies; Hydraulic Dump Bodies; Hoists, Hydraulic; Tailgate Loaders; Hydraulic sand and material spreaders for highway use; Repair and overhaul facilities.

2330 2510 2590 3830 3950

BRENCO MACHINE & TOOL CO. LTD.,

Box 954,
Brantford, Ontario.
Telephone 519: 752-3739
President: Howard D. Brown,
Contact: E. E. Mingle, Vice President and General Manager
Floor Area: 16,000 sq. ft.
Personnel: 20

Manufacturers and designers of special tools, jigs, fixtures, blank dies, precision machine tools, form dies, production machining, hydraulic cylinders.

3419 3456 3465 and page B7

BRISTOL AERO-INDUSTRIES LIMITED, (Montreal Division),

10210 Pie IX Boulevard,
Montreal North, Quebec.
Telephone 514: 321-1330
Vice-President and General Manager: J. R. Hutton
Contact: J. R. Alarie, Divisional Secretary
Floor Area: 162,000 sq. ft.
Personnel: 400

Repair and overhaul facilities for aircraft engines, gear boxes, carburetors, fuel injection systems, ignition systems and boost controls.

Page B3

BRISTOL AEROSPACE LIMITED,

Winnipeg International Airport,
P.O. Box 874,
Winnipeg, Manitoba.
Telephone 204: 775-8331
Executive Vice-President: W. M. Auld
Contact: R. H. May, Director of Marketing
Manufacturing Plant Floor Area: 370,000 sq. ft.
Propellant Plant Area: 3,000 Acres
Personnel: 850

Manufacturers of: High Pressure Storage Vessels (Missile and aircraft); Upper Atmosphere Sounding Rockets: Instrumentation and Telemetry; Rocket Motor Casings: Nose Cones: Radar and Microwave Antennae; Aircraft Sheet Metal Assemblies; Jet Engine Combustion and Exhaust Components; Jigs, Fixtures and Tooling; Repair and Overhaul facilities for aircraft and helicopters; design and manufacture of solid Propellant Rocket Motors, Boosters, JATO and other Propellant Devices.

1310 1315 1320 1325 1330 1336
1337 1340 1345 1350 1355 1375
1410 1420 1440 1560 1630 1650
1680 1730 2050 2835 2840 3465
5821 5895 5985 8120 9330
and pages B3, B4, B7 & I-88

BRITISH AMERICA PAINT CO. LTD.,

201 Belleville Street,
Victoria, B.C.
Telephone 604: 382-2133
President and General Manager: W. A. Pendray
Contact: T. G. Davis, Industrial Sales Manager
Floor Area: 435,000 sq. ft.
Personnel: 385

Manufacturers of: Lacquers; Masonry block filler; Metal primers; Paints; Thinners; Varnishes; Wire enamels; Wood primers; Chemical resistant coatings; Marine products — topside and bottom compositions; Polyester resins; Alkyd resins; Acrylic resins; Latex vehicle; Epoxy cement; Urethane resins; Putty; Polyester-epoxy coatings; Stains; Fillers; Alkyd baking enamels; Acrylic baking enamels; Stamp pad ink; Vinyl finishes; Strippable coatings.

8010 8030

BROCKVILLE CHEMICALS LIMITED,

Maitland, Ontario.
Telephone 613: 348-3681
President: C. A. Vandendries,
Contact: B. T. Johnson, Vice-President
Floor Area: 213,332 sq. ft.
Personnel: 250

Manufacturers of: Chemicals—Anhydrous Ammonia, Ammonium Nitrate, Nitric Acid, Urea.

6810

BRUNNER & LAY (CANADA) LTD.,

2280 43rd Avenue,
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 accessory 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

BURGESS BATTERY COMPANY,
(Division of Servel (Canada) Limited),

P.O. Box 120,
415 Buttery Street,
Niagara Falls, Ontario.
Telephone 416: 354-1671
Vice-President and General Manager: W. H. Jeffery
Contact: R. A. Dickson, General Manager — Sales.
Floor Area: 72,500 sq. ft.
Personnel: 160

Manufacturers of: Batteries Dry Cell — Lanterns and Flashlights; Commercial rollers of Zinc Sheet — Plate and coiled Strip.

6135 9535

BURNDY CANADA LTD.,

1530 Birchmount Road,
Scarborough, Ontario.
Telephone 416: 757-8761
President: F. H. McLenaghan
Contact: G. Vandry, General Sales Manager
Floor Area: 115,000 sq. ft.
Personnel: 250

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, including Tanker, Passenger and Cargo vessels, Dredges, Icebreakers, Buoy vessels and Lighthouse Tenders, Fishing vessels, etc.; Barges of all types; Pontoons; Floating Drydocks, 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 B7

BURROUGHS BUSINESS MACHINES LTD.,

443 University Avenue,
Toronto 2, Ontario.
Telephone 416: 362-6641
President: J. L. Rapmund,
Contact: D. H. Peacock, District Manager Defence Contracts
Floor Area: 164,000 sq. ft.
Personnel: 1400.

Manufacturers of: Business machines; Data processing systems and input-output equipment; Specialty carbon papers and ribbons; Specialty forms and cheques; Electronic assemblies; Magnetic core memories; Computer racks; Assembly of printed circuit cards—Electronic data processing service, programming service; Installation and maintenance service for electronic computers, radar equipment, and drafting services.

5820 5821 5895 5999 6150 7440
and pages B1, B2 & B7

CAE INDUSTRIES LTD.,
P.O. Box 6166,
Montreal 3, Quebec.
Telephone 514: 875-5522
President: James F. Tooley
Contact: D. S. D. McDonald, Vice-President
Floor Area: 155,000 sq. ft.
Personnel: 2,500

Manufacturers of: Flight Simulators; Radar and Weapon Simulators; Servo Mechanisms; Aircraft Anti-Magnetic Devices; Anti-Submarine Warfare Equipment; Pipeline Supervisory, Control and Telemetry Systems; Electronic Shipboard Depth Plotting Systems; Printed Circuits; UHF Rescue Beacons; Wiring Analysers; Computers; Electronic Systems for Industry and Defence; Portable Plastics Injection Moulding Machines; Non-Ferrous Castings and Machined Products; Repair, Overhaul and Maintenance of Airborne Weapon Control Systems; Flight Simulators, Communications Equipment and Electronic Systems and Equipment; Repair, Overhaul and Modification of Military and Commercial Aircraft; Aircraft Instrument, Survey and Oil Field Equipment and Scientific Optical Devices; Electronic Test and Calibration Services; Charter and Schedule Airline Service on Canada's Pacific Coast, Vancouver Island and the Queen Charlotte Islands; Traffic Signal Systems — controllers and detectors; 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 B1, B2, B3, I-34, I-48, I-50, I-146 & I-218

CAE INDUSTRIES LIMITED,
Municipal Signal Division,
2665 Marcel Street,
Montreal 9, Quebec.
Telephone 514: 334-2720
Contact: George Berry, Assistant General Manager
Floor Area: 25,000 sq. ft.
Personnel: 30

Manufacturers of: Traffic control and fire alarm signal systems.

6310 6350

CAE SUMNER LIMITED,
3550 East Broadway,
Vancouver 12, B.C.
Telephone 604: 299-3431
President: H. B. Norris
Floor Area: 117,500 sq. ft.
Personnel: 275

Manufacturers of: Sawmill Machinery, Pulpmill Woodroom Equipment; Iron and Mild Steel Castings; Stainless Steel and Manganese Steel Castings; Steel Fabrication; Rock and Gravel Crushing Equipment; High Pressure Pumps; Lift Cranes and Hoists; Patterns for Castings; Spur and Helical Gears; Speed reducers; Water Control Equipment, including Valves, etc. Repair and Overhaul facilities.

1010 1015 1020 2030 3020 3210 3615 3695 3820 3910 3950
and pages B6 & B7

CLM INDUSTRIES,
(McGraw-Edison (Canada) Ltd.),
3595 St. Clair Avenue East,
Scarborough, Ontario.
Telephone 416: 261-7111
President: T. G. Quance
Contact: W. H. Hopper, Marketing Manager
Floor Area: 143,000 sq. ft.
Personnel: 500

Manufacturers of: Semi-conductor Rectifiers; D.C. Power Supplies; Metalclad Switchgear; High Potential Measuring Instruments; Regulated Battery Chargers; Lightning Arresters; Pole Line Hardware; Outdoor Lighting Equipment; Magnetic Components; Outdoor Switchgear; Electrical Connectors.

5920 5925 5950 5960 5975 5999 6110 6130 6210 and page B7

CTS OF CANADA LTD.,
80 Thomas Street,
Streetsville, Ontario.
Telephone 416: 826-1141
Resident Manager: J. W. Hanley
Contact: C. H. Odd, Sales Manager
Floor Area: 65,000 sq. ft.
Personnel: 250

Manufacturers of: Amplifiers, Magnetic Amplifiers, Power Supply; Battery Chargers; Photoelectric Cells; Potentiometers—composition, wirewound; Power electric supplies—electronic; Reactor Transformers; Regulators—current frequency voltage; Resistors—variable composition; Resistors—variable wirewound, low operating temperature (Standard Type RA series to MIL-R-19); Resistors—trimmer potentiometers; Inverters; Switches—Rotary.

5895 5905 5930 5950 5960 6110 6130

MOISE CADORETTE INC.,
St. Jean Des Piles, Quebec.
Telephone 819: 538-2043
President: Moise Cadorette

Contact: L. Lizotte, Vice-President and Manager
Floor Area: 9,800 sq. ft.
Personnel: 24

Manufacturers of: Fibreglass and Wooden Boats, Canoes, Oars and Paddles; commercial fibreglass supplies.

1940

CANADA CYCLE & MOTOR CO. LIMITED, (Division of Levy Industries Limited),
2015 Lawrence Avenue West,
Weston, Ontario.
Telephone 416: 241-9121
President: T. S. Nease
Contact: M. A. Daly, General Sales Manager.
Floor Area: 270,000 sq. ft.
Personnel: 500

Manufacturers of: Bicycles; Sporting Goods; Ice Skates; Hockey Sticks; etc.; Exercise Machines; Rifle and Machine Gun Components; Shell and 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 Avenue, East,
Toronto 16, Ontario.
Telephone 416: 755-1101
Cable: FOILS
President and General Manager: F. W. Young
Contact: W. A. Rennie, Secretary
Floor Area: 200,000 sq. ft.
Personnel: 400

Manufacturers of: Aluminum, tin and lead foils, also chaff.

5895 9535

CANADA IRON FOUNDRIES, LIMITED,
(Foundry Division)
169 Eastern Avenue,
Toronto 2, Ontario.
Telephone 416: 363-8801
Vice President and General Manager: G. D. Turnbull
Contact: E. W. Fraser
Floor Area: 480,000 sq. ft.
Personnel: 665

Manufacturers of: Gray and alloy iron castings, ingot moulds, break shoes, industrial wheels, tunnel liners.

1325 2240 2530 5680 and page B6

CANADA IRON FOUNDRIES, LIMITED,
(Pipe Division),
2055 Peel Street,
Montreal, Quebec.
Telephone 514: 842-9431
General Manager: R. Lyle
Contact: M. Roper, Industrial Sales
Floor area: 700,000 sq. ft.
Personnel: 800

Manufacturers of: Pipe, Cast Iron; Pipe, Ductile Iron: Pipe Fittings.

4710 4730

CANADA IRON FOUNDRIES, LIMITED,
(Tamper Division)
160 St. Joseph Boulevard,
Lachine, Quebec.
Telephone 514: 637-5531
General Manager: K. C. Hague
Contact: J. R. Inglis
Floor Area: 300,000 sq. ft.
Personnel: 1,200

Manufacturers of: Rotating Electrical Equipment; single phase motors – ½ h.p. to 3 h.p.; Polyphase induction motors – ⅛ 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 – ½ 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. Railway track maintenance equipment: rail drillers; tie tampers; track liners; track jacks; tie renewers; spike pullers; spike drivers; rail bolters; rail lubricators.

2230 2250 3950 6105 6110 6115

CANADA IRON FOUNDRIES, LIMITED,
(Western Bridge Division)
145 West First Avenue,
Vancouver 10, B.C.
Telephone 604: 874-2311
Vice-President and Director: S. Hogg
Contact: I. L. Hamilton, Gen. Mgr.
Floor Area: 130,000 sq. ft.
Personnel: 300

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 5410 5420 5445 5450 8140 and page B2

THE CANADA METAL COMPANY LTD.,
721 Eastern Avenue,
Toronto, Ontario.

Telephone 416: 465-4684
President and Gen. Mgr.: C. H. Smith
Contact: H. R. Bradley, Export Mgr.
Floor Area: 118,954 sq. ft.
Personnel: 311

Manufacturers of: Lead ingot; Lead sheet and pipe; Lead oxides; Babbitt and solder; Typemetal; Bronze ingot; Aluminum ingot; Die cast allows; Tin pigs; Centrifugally cast bronze castings; Brass forgings and soldering fluxes.

3120 3439 4710 9650 and page B6

CANADA PRECISION DEVICES LIMITED,
70 Bramalea Road,
Brampton, Ontario.
Telephone 416: 677-2650
General Manager: James Boles
Contact: Anthony J. Palmer, Technical Representative
Floor Area: 10,000 sq. ft.
Personnel: 45

Manufacturers of: Potentiometers; Potentiometers—precision measuring; Potentiometers—sub-miniature; Potentiometers—wirewound, linear and non-linear—to MIL R 12934D; Precision trimmers.

5905

CANADA WIRE AND CABLE COMPANY LIMITED,
Postal Station "R",
Toronto 17 (Leaside), Ontario.
Telephone 416: 421-0440
Telex: 02-2260
Cable: CANWIRCO
President and Gen. Mgr.: L. G. Lumbers
Contact: H. I. Banfield, Export Manager
Floor Area: 1,565,000 sq. ft.
Personnel: 2,000

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, minesweeping, 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, Dir. 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 management; Architectural and commercial products; Transportable Control Towers; Buses; Dynatrac fully tracked utility vehicle.

1410 1420 1430 1440 1510 1550 1560 1620 1680 1730 2320 2410 2430 3465 4820 4920 5410 6910 6920 6930 7610 9330 and pages B1, B3, B4, I-8, I-10, I-14 & I-226

CANADIAN ACME SCREW AND GEAR LIMITED,
(Division of Levy Industries Limited)
207 Weston Road,
Toronto 9, Ontario.
Telephone 416: 767-1131
Vice-President: E. Levy
Contact: L. E. Hamilton, General Sales Mgr.
Floor Area: 450,000 sq. ft.
Personnel: 1,100

Manufacture to customers' specifications of: Automobile, Truck and Farm Tractor Transmissions; Automobile Rear Axles and Differentials; Automobile Propeller Shafts; Military Vehicle Gears, Shafts, and Assemblies Containing Gears and Shafts; Screw Machine Products; Cold-headed Products; Machining of Castings in Volume; Automobile and Truck Shock Absorbers; Spur, Helical and Bevel Gears in Volume; Welded Steel Tubing; Landing Craft Transmissions; Ordnance Fuses; Oil Pumps; Power Take-off winches; Military Truck Transmissions; Wing-type Shock Absorbers; Precision Parts for Jet Aircraft and Helicopters; Universal Joints for Cars, Trucks, Heavy Equipment and P.T.O.

1390 2520 2590 2910 2990 3010 3020 3950 4730 4930 5305 5306 5307 5310

CANADIAN ADMIRAL CORPORATION, LIMITED,
501 Lakeshore Road,
Port Credit, Ontario.
Telephone 416: 278-5561
President: S. D. Brownlee
Contact: G. L. Irvine, Mgr., Electronics Div.
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 pages B4 & I-140

CANADIAN AERO SERVICE LIMITED,
Hunt Club Road,
P.O. Box 468, R.R. 5,
Ottawa, Ontario.
Telephone 613: 822-0121
President: Thomas M. O'Malley
Contacts: Dr. J. M. Zarzycki (Engineering)
Donald M. Wagg (Geophysics)
Floor Area: 200,000 sq. ft.
Personnel: 250

This firm can provide the following services: Natural resources and engineering surveys — geodetic and photo-grammetric 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 B5

CANADIAN AIRCRAFT PRODUCTS LTD.,
International Airport,
Vancouver, B.C.
Telephone 604: 278-5033
President: D. C. Cameron.
Floor Area: 20,000 sq. ft.
Personnel: 20

Manufacturers of: Aircraft Floats. Repair and overhaul of A/C Floats.

1630 and page B3

CANADIAN ALLIS-CHALMERS LIMITED,
125 St. Joseph Boulevard,
Lachine, Quebec.
Telephone 514: 637-4671
President: J. D. Greensward
Contact: C. L. Echlin, Sales Manager
Floor Area: 348,480 sq. ft.
Personnel: 1,000

Manufacturers of: Compressors—Air and Gas—Rotary and centrifugal; Electric motors and motor controls—3 phase; Electric switchgear—Metal clad-indoor and outdoor 5 and 15 KV; Machinery ore processing—crushers, mills, vibrating screens; Kilns, dryers; Machinery power transmission—V-belt drives, couplings; Turbines—Hydraulic; Valves—Butterfly; Pumps—Centrifugal; Repair and Overhaul facilities.

3010 3020 3030 3820 4310 4320
4430 4810 4820 6110

CANADIAN ARSENALS LIMITED,
P.O. Box 717,
Ottawa 4, Ontario.
Telephone 613: 232-8211
President and Gen. Mgr.: J. R. Brisson
Contact: S. Stucken, Assistant to President
Floor Area: 3,000,000 sq. ft.
Personnel: 1,000

Manufacturers of: Military small arms and ancillaries; ordnance gauges; small arm ammunition, clips and links; artillery cartridge cases (30 mm to 4″); loading/or assembly of artillery ammunition, bombs, rockets, underwater projectiles, torpedo warheads, mines, etc.

1005 1240 1305 1310 1315 1320
1325 1336 1340 1345 1355 1356
1361 1375 1390 1395 1720 5210
5220 9525 9535 and pages B7, I-238 & I-244

CANADIAN BRONZE CO. LIMITED,
999 Delorimier Avenue,
Montreal, Quebec.
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 B6 & B7

CANADIAN CAR FORT WILLIAM,
(Division of Hawker Siddeley Canada Ltd.)
P.O. Box 67,
Fort William, Ontario.
Telephone 705: 622-5351
General Manager: 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, Van bodies, wheeled tractor skidders; Sheet metal fabrications; Bulge formed skins, Rapid transit and Suburban cars.

1560 1680 1730 1740 2330 2510
2925 3456 3465 9330

CANADIAN CAR (PACIFIC) LIMITED,
1660 Station Street,
Vancouver 4, B.C.
Telephone 604: 681-6181
Vice-Pres. and 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, Pulp and paper machinery.

1005 1015 1020 2815 3442 3615 4810 4820

CANADIAN CARBORUNDUM COMPANY LIMITED,

Stanley Avenue, P.O. Box 1007,
Niagara Falls, Ontario.
Telephone 416: 358-5761
Contact: F. W. Scott, Jr. Vice-President and General Manager
Floor Area: 300,000 sq. ft.
Personnel: 550

Manufacturers of: Aluminum Oxide Crude; Grinding Wheels; "KT" Silicon Carbide.

5345 5350 6810

CANADIAN CHARTS & SUPPLIES LTD.,

Box 360,
Oakville, Ontario.
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 COMPANY LTD.,

1155 Dorchester Boulevard West,
Montreal 2, Quebec.
Telephone 514: 866-6311
Cable: CHEMCELL
Director of Marketing: J. A. Stenstrom
Contact: W. A. Santel, Mgr., Export Sales
Floor Area: 600,000 sq. ft.
Personnel: 1000

Manufacturers of: Organic chemicals (Acids; Alcohol, Ester and Ketone Solvents; Methanol; Pentaerythritol; Glycols; Flotation Reagents); Cellulose Acetate Flake; Acetate Yarns; Fibres and Tow.

6505 6750 6810

THE CANADIAN COLEMAN COMPANY, LIMITED,

9 Davies Avenue,
Toronto 8, Ontario.
Telephone 416: 465-2414
President: F. W. Crossley
Contact: C. F. Terrell, Vice-President and Director of Exports
Floor Area: 260,000 sq. ft.
Personnel: 460

Manufacturers of: Gas and Oil Burning Space Heaters; Forced Air Furnaces; Floor Furnaces; Gas and Electric Domestic Water Heaters; Gasoline and Kerosene Lanterns, Stoves, Irons, Portable Food Coolers and Beverage Jugs.

4520 4530

THE CANADIAN DRAWN STEEL CO. LIMITED,

155 Chatham Street, P.O. Box 679,
Hamilton, Ontario.
Telephone 416: 528-8521
Manager: F. R. Kurth
Contact: C. A. Robinson, Manager 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

CANADIAN ENGINEERING & TOOL CO. LIMITED,

2265 South Cameron Boulevard,
Windsor, Ontario.
Telephone 519: 254-4343
General Manager: George H. Shaffer
Contact: R. Cravetz, Purchasing Agent
Floor Area: 30,000 sq. ft.
Personnel: 34

Manufacturers of: Tools; Dies; Jigs; Fixtures; Gauges; and Special Machines.

3456 3465 5110 5130 5136 5210 5220

CANADIAN FILTERS LIMITED,

277 William Street South,
Chatham, Ontario.
Telephone 519: 352-6700
President and General Mgr.: M. J. Ripley
Contact: A. C. Jackson, Vice-President, Sales
Floor Area: 50,000 sq. ft.
Personnel: 130

Manufacturers of: Automotive oil bath and cartridge type carburetor air cleaners for use on internal combustion engines; Bombs, practice and fin assemblies.

1310 1315 1325 2940 4330

CANADIAN FLIGHT EQUIPMENT CO. LIMITED,

Box 217, 374 Sidney Street,
Trenton, Ontario.

Telephone 613: 392-6584
President, R. A. J. Murison
Contact: R. B. McIntyre, General Manager
Floor Area: 13,500 sq. ft.
Personnel: 75

Manufacturers of: Propellant actuated devices; Rocket Catapults; Thrusters; Initiators; variable speed Electric Motors; 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.

1340 1350 1355 1360 1375 1390 1395 1420 1630 1650 1670 1680 1720 2240 3465 6110 and page B7

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Atomic Power Department)
107 Park Street North,
Peterborough, Ontario.
Telephone 705: 742-7711
General Manager: M. C. Thurling
Contact: J. L. Olsen, Manager Marketing
Floor Area: 350,000 sq. ft.
Personnel: 500

Manufacturers of: Nuclear reactors and associated equipment and Nuclear reactor fuel.

4470 and page B4

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Carboloy Section)
1199 Lansdowne Avenue,
Toronto 4, Ontario.
Telephone 416: 534-6511
Manager: W. R. Jackson
Contact: E. H. Despard, Mgr. Product Planning
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 B4

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Chemical Materials Section)
940 Lansdowne Avenue,
Toronto 4, Ontario.
Telephone 416: 534-6511
Manager: M. W. Mercer
Contact: N. M. Morrow, Supervisor, Market Research and Administration
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. LIMITED,
(Devices, Conduit and Lighting Section)
24 Ward Street,
Toronto 4, Ontario.
Telephone 416: 534-6511
Manager: T. J. Carey
Contact: A. C. G. Jarvis, Manager Conduit
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. LIMITED,
(Distribution and Specialty Transformer Section)
940 Lansdowne Avenue,
Toronto 4, Ontario.
Telephone 416: 534-6511
Contact: R. D. Richardson, Manager
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,
(Electronic and Defence Products Department)
830 Lansdowne Avenue,
Toronto 4, Ontario.
Telephone 416: 534-6511
Cable: GELECTRON
General Manager: A. R. Nobbs
Contact: I. A. Mayson, Marketing Manager
Floor Area: 500,000 sq. ft.
Personnel: 2,000

Manufacturers of: Commercial and military communications and electronic equipment; Radar sub-assemblies; Television & radio transmitting and study equipment; All types of electronic tubes; Cathode ray tubes; Germanium and silicon rectifiers; Selenium diodes; Milar capacitors; Repair and Overhaul facilities.

1220 1230 1240 1265 1270 1285
1430 5805 5820 5821 5825 5826
5840 5841 5845 5850 5855 5860
5895 5910 5960 5985 5999 6625
7440 and pages B1, B2, B4, I-126 & I-132

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Industrial Apparatus Department)
107 Park Street North,
Peterborough, Ontario.
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 2825 5905 5025 5930 5940
5945 5950 5960 6105 6110 6115
6125 6130 6145 and page B7

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Lamp Department)
165 Dufferin Street,
Toronto 3, Ontario.
Telephone 416: 537-4481
Contact: E. H. Lindsay, General Manager
Floor Area: 480,000 sq. ft.
Personnel: 825

Manufacturer of: Incandescent, Fluorescent and Mercury Lamps; Sealed Beam Lamps; Floodlamps, Spot Lamps; Heat Lamps; Photoflash Lamps; Projection Lamps; Infrared Lamps; Exciter Lamps; Pilot Lamps; Switchboard Lamps; Miniature Lamps; Automotive Lamps.

6240 6750

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Meter and Instrument Section),
1130 Charest Blvd. West,
Quebec 8, P.Q.
Telephone 418: 683-3431
Manager: M. Drouin
Contact: R. Doyle, Sales Manager
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 B6

CANADIAN GENERAL ELECTRIC CO. LIMITED,
(Plastics Section),
755 Division Street, North,
Cobourg, Ontario.
Telephone 416: 372-5411
Manager (Plastics): A. M. Hurley
Manager (Engineering — Sales): R. K. Carlson
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 Die, Preform and Premix; Semi-automatic and Automatic Injection Moulding; Blow Moulding and Extrusion of Thermoplastics; Moulded Shapes in Expanded (foamed) Plastics; Facilities include appropriate Technical Design, Development, Tool Room and Laboratory functions.

1005 1305 1310 1315 1320 1325
1340 1345 1350 1355 1390 1395
1560 2050 2510 2540 3615 3990
4240 4310 4710 5140 5340 5410
5430 5895 5985 6105 6135 7125
8115 8130 8140 8415 8465 9330
and page B1

CANADIAN INDUSTRIES LIMITED,
630 Dorchester Blvd. West,
P.O. Box 10,
Montreal, Quebec.
Telephone 514: 874-3849
President: L. Hynes
Contact: A. C. Viau,
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 1350 1351
1355 1365 1370 1375 1390 1395
5970 6810 6830 6840 6850 8010
8030 9330

CANADIAN LIQUID AIR COMPANY LIMITED,

1210 Sherbrooke Street West,
Montreal 2, P.Q.
Telephone 514: 842-5431
General Manager—(North American Dept.): P. Salbaing
Contact: R. A. Dunn, Assistant General Manager and Director, Canadian Division
Personnel: 450

Manufacturers of: Industrial and Medical Gases; Welding and Cutting Equipment; Low Temperature Gas Separation Plants; Complete design, engineering and manufacturing services.

3431 3439 3835

CANADIAN MARCONI COMPANY,
Head Office

2442 Trenton Avenue,
Montreal 16, Quebec.
Telephone 514: 738-9441
Telex: 012260
Cable: ARCON
Total Floor Area: 575,000 sq. ft.
Total Personnel: 3,000

5805 5820 5821 5825 5826 5830
5831 5840 5841 5845 5895 5915
5950 5960 7440 and pages B1, B2, B4, I-40, I-42, I-44, I-46, I-56, I-110, I-112, I-114, I-116 & I-162

Commercial Products Division
Contact: W. R. Bitcheno

Manufacturers of: Airborne Doppler sensors for fixed and rotary wing aircraft; Airborne computers and indicators for navigational and tactical use; Altimeters; High frequency transmitters and receivers, including single sideband systems; Tactical radio relay equipment. Repair and overhaul facilities for all products. System engineering of navigation and communications systems.

Marine and Land Communications Division
Contact: J. H. Martin

Manufacturers of: SSB, HF and VHF/FM radiotelephones; Selective and tone calling units; Hailing equipment; Direction finders; Echo sounders; Fish finders; Loran; Marine radar; Precision electronic test instruments and industrial control systems.

Special Services Division
Contact: R. MacLeod

Installation of Radar, Communications, Air Navigation, and Microwave Systems, including Towers and Antennas. Repair and Overhaul of Radar Communications and Airborne Equipment. Repair and Calibration of Commercial Test Equipment. Supply and Installation of Granger Associates Log Periodic H.F. Antennas and Towers.

CANADIAN MOTOROLA ELECTRONICS COMPANY,

105 Bartley Drive,
Toronto 16, Ontario.
Telephone 416: 759-2222
President: R. M. Brophy
Contact: J. E. Raftis, Manager, Industrial Products Div.
J. F. Hooper, Manager, Mobile Communications
Floor Area: 25,000 sq. ft.
Personnel: 250

Manufacturers of: Mobile and Microwave Radio Communications; Power Line Carrier; Electronic Instrumentation and Control.

5805 5820 5821 5840 5895 6110
6625 6685 and page B2

CANADIAN OHIO BRASS COMPANY LIMITED,

Thorold Stone Road,
P.O. Box 267,
Niagara Falls, Ontario.
Telephone 416: 354-3851
President: E. R. Davey
Contact: W. R. Flagg, Factory Manager
Floor Area: 250,000 sq. ft.
Personnel: 175

Manufacturers of: Ceramics; Electrical, insulators; Transformer Bushings; Electric car couplers; Utility service and line construction bodies; Truck mounted aerial ladders. Electrical Hardware and Supplies and fuses and lightning arresters.

2590 5920 5970 5975

CANADIAN PORCELAIN COMPANY LIMITED,

P.O. Box 428,
Hamilton, Ontario.
Telephone 416: 522-4648
President and General Manager: C. M. Morden
Contact: W. B. Hall, General Sales Manager
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, Ontario.
Telephone 416: 447-5561
Director: R. Spencer Soanes
Contact: Robert Hutty, Assistant General Manager
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 6640 6655 7440

CANADIAN SAFETY FUSE COMPANY,
Brownsburg, P.Q.
Telephone 514: 533-4251
President: W. T. D. Ross
Contact: J. B. Chalmers, General Manager
Floor Area: 84,830 sq. ft.
Personnel: 200

Manufacturers of: Safety fuse, detonating fuse, igniter cord, ignition cord connectors and other related items.

1375

CANADIAN STACKPOLE LIMITED,
550 Evans Avenue,
Toronto 14, Ontario.
Telephone 416: 255-2373
Vice-President and General Manager: D. Knapp
Contact: J. R. Hayward, Sales Manager
Floor Area: 27,000 sq. ft.
Personnel: 75

Manufacturers of: Resistors, Fixed composition and Slide Switches.

5905 5930

CANADIAN STEEL FOUNDRIES,
(Division of Hawker Siddeley Canada Ltd.)
5227 Notre Dame Street East,
Montreal 5, Quebec.
Telephone 514: 255-4041
General Manager: G. Atwood Gowdy
Contact: Lorne R. Shrum, General Sales Manager
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 B6 & B7

CANADIAN STEEL WHEEL LIMITED,
1900 Dickson Street,
Montreal 5, Quebec.
Telephone 514: 255-3605
Vice-President: E. J. White
Contact: G. W. Barry, Manager — Sales Department
Floor Area: 186,300 sq. ft.
Personnel: 300

Manufacturers of: Wrought Steel Railway Wheels, Forged Steel Single Flange Wheels, Crane Wheels, Gear Blanks, Rollers and Rope Sheaves, Carbon Steel Ingots.

2240 3020 3815 9640

CANADIAN TAP & DIE CO. LIMITED,
27 Yorke Place,
Galt, Ontario.
Telephone 519: 621-4940
President: L. E. Teat
Contact: W. K. Randell, 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; Stuffing Tubes for marine construction.

2040 3455 5110 5120 5136

CANADIAN TECHNICAL TAPE LTD.,
455 Cote Vertu,
Montreal 9, Quebec.
Telephone 514: 334-1510
President: L. Cohen
Contact: H. C. Siebert, General Sales Manager
Floor Area: 150,000 sq. ft.
Personnel: 225

Manufacturers of: Pressure sensitive tapes; Polyethelene film and tubing.

5640 5970 7510 8030 8135

THE CANADIAN VALVE ENGINEERING COMPANY, (SINGER VALVE CO. LTD.),

872 Derwent Way,
Annacis Industrial Estate,
New Westminster, B.C.
Telephone 604: 521-0791
President and General Manager:
D. E. Stewart
Floor Area: 9,000 sq. ft.
Personnel: 22

Manufacturers of: Valves—Relief, Pressure Reducing, 3-Way Mixing or Diverting, Rate of Flow Control, Diaphragm Control, Piston Control, Remote Control, Solenoid Control, Pump Control, Butterfly, Check, No Slam and Silent Type, Globe, Lever Operated and Safety Trip with Manual Reset; Vacuum Breakers and Backflow Preventors; Temperature Regulators; Differential Pressure Regulators; Vacuum Regulators; Liquid Level Controls; Pump Governors; Valve and Instrument Repairs.

1650 1660 1680 2930 4410 4810 4820 4930 6680 and page B4

CANADIAN VICKERS LIMITED,

4970 Notre Dame Street East,
Montreal 4, Quebec.
Telephone 514: 256-2651
Cable: VICKERS
Chairman: R. C. Pearse
Contact: T. J. Farrell, Eng. Director and Vice-President Sales
Floor Area: 750,000 sq. ft.
Personnel: 3,250

Manufacturers of: Steam and Hot Water High Temperatures 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 Antenna 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 1340 1440 1620 1630 1905 1915 1920 1930 1935 1940 1945 1950 1955 2020 2030 2040 2050 2090 2815 2820 2825 3615 3695 3820 3950 4320 4410 4420 4470 4520 4810 4920 5450 5895 6655 7125 8120 and pages B1, B4 & B7

CANADIAN WESTINGHOUSE COMPANY LIMITED,

(Apparatus Products Division),
P.O. Box 510,
Hamilton, Ontario.
Telephone 416: 528-8811
Manager Government Department:
R. T. D. Graham
Contact: J. Dewhurst
Floor Area: 1,100,000 sq. ft.
Personnel: 1,700

Manufacturers of: Core and shell type power transformers, three phase voltage regulators, air and oil circuit breakers, turbines and generators.

2825 2835 5925 5950 6105 6110 6115 6120 6130

CANADIAN WESTINGHOUSE COMPANY LIMITED,

(Atomic Fuel Department),
Port Hope, Ontario.
Telephone 416: 885-4537
Contact: W. J. Stirling
Floor Area: 50,000 sq. ft.
Personnel: 105

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 B4

CANADIAN WESTINGHOUSE COMPANY LIMITED,

(Distribution Apparatus Division),
P.O. Box 510,
Hamilton, Ontario.
Telephone 416: 528-8811
Manager Government Department:
R. T. D. Graham
Contact: J. Dewhurst
Floor Area: 127,600 sq. ft.
Personnel: 270

Manufacturers of: Distribution, power and instrument transformers, lighting 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 Government Department:
R. T. D. Graham
Contact: J. Dewhurst
Floor Area: 179,700 sq. ft.
Personnel: 698

Manufacturers of: Tubes; sub-miniature, miniature, large glass, small transmitting, cathode ray picture.

5960

CANADIAN WESTINGHOUSE COMPANY LIMITED,
(Electronics Division),
P.O. Box 510,
Hamilton, Ontario.
Telephone 416: 528-8811
Manager Government Department:
R. T. D. Graham
Contact: J. Dewhurst
Floor Area: 180,000 sq. ft.
Personnel: 950

Manufacturers of: Electronics Systems including Naval fire control, Sonar and Torpedoes; Airborne Electronics including Navigation, Intercept and Fire Control Radars; Guidance, Control and Fusing for Air-to-Air Missiles; Aerospace Ground Equipment, Communications Equipment.

1230 1260 1265 1285 1430 5805
5815 5820 5821 5825 5826 5840
5841 5845 5895 5915 5950 5985
5999 6110 6320 6625 6940 7440
and pages B1, B2, B4, I-32, I-84, I-86 & I-144

CANADIAN WESTINGHOUSE COMPANY LIMITED,
(Lamp Division),
P.O. Box 1089, 3350 Blvd. Royal,
Trois Rivieres, Quebec.
Telephone 819: 374-6271
Manager: C. L. Hubling
Contact: D. J. Moodie, Manager, Lamp Marketing.
Floor Area: 233,500 sq. ft.
Personnel: 870

Manufacturers of: Wide range of large, photo and miniature class lamps, street, industrial, flood and aviation lighting, mercury vapour and fluorescent ballasts and isolating current transformers.

5950 6240

CANADIAN WESTINGHOUSE COMPANY LIMITED,
(Lighting Division),
P.O. Box 519, Leon Harmel Street,
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 COMPANY LIMITED,
(Sturtevant Department—Construction Division),
P.O. Box 510,
Hamilton, Ontario.
Telephone 416: 528-8811
Manager Government Department:
R. T. D. Graham
Contact: J. Dewhurst
Floor Area: 70,900 sq. ft.
Personnel: 150

Manufacturers of: Air moving, cleaning, cooling and refrigerating equipment.

4110 4120 4130 4450

CANUS PRECISION INDUSTRIES LTD.,
70 Advance Road,
Toronto 18, Ontario.
Telephone 416: 239-2796
President: R. W. Witty
Contact: R. L. Temple
Floor Area: 12,500 sq. ft.
Personnel: 30

Manufacturers of: Aircraft and Missile Components and Assemblies; Precision Machining; Jig, Tools and Fixtures.

3020 3465 and page B7

CAPACITORS OF CANADA LIMITED,
38 Upton Road,
Scarborough, Ontario.
Telephone 416: 755-2216
Cable: CAPCAN
President: L. Verdone
Floor Area: 15,000 sq. ft.
Personnel: 40

Manufacturers of: Capacitors for the Electronic Industry: Types: Fixed Paper, Tubular, Film Tubulars, Mylar wrap capacitors, Epoxy dipped and Special printed circuit Board Capacitors of Mylar Construction with preformed thermo setting case having fixed configuration.

5910

JAMES B. CARTER LIMITED,
Osborne and Mulvey Streets,
Winnipeg, Manitoba.
Telephone 204: 452-2005
President: D. Sprague
Contact: D. A. McCammon—Vice President and General Manager
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 4410 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, Quebec.
Telephone 514: 697-0810
TWX: 610-422-3906
President: A. C. Boland
Contact: D. MacKenzie, Contracts Manager

Manufacturers of: Electronic and Electromechanical Aircraft Components; Thermocouple Harnesses; Audio and Video Equipment; Data Logging Systems; Industrial Instrumentation.

1680 2925 5820 5830 5895 5945 5999 6685 and page B7

CERCAST INC.,

3905 Industrial Blvd.,
Montreal North, P.Q.
Telephone 514: 322-2371
President: F. Valenta
Contact: A. Drew
Floor Area: 28,000 sq. ft.
Personnel: 78

Ferrous and Non Ferrous Investment Castings.

Page B6

A. B. CHANCE COMPANY OF CANADA LIMITED,

100 Howden Road,
Scarborough, Ontario.
Telephone 416: 759-1144
President: W. H. White
Personnel: 40

Manufacturers of: Open type fuse cutouts, anchors, guy guards.

5925

CHEMICAL PROJECTS LIMITED,

60 Overlea Blvd.,
Toronto 17, Ontario.
Telephone 416: 421-4082
President: L. A. Pogorski
Personnel: 12

Manufacturers of: Commercial consulting research and development organization providing service in the fields of chemical service in the fields of chemical engineering, chemistry and physics. Specialization includes cryogenics, Isotope separation, Liquid-vapour equilibrium studies. Water desalination, Absorption processes.

Page B1

CHISHOLM INDUSTRIES LIMITED,

Electronic Avenue,
Port Moody, B.C.
Telephone 604: 939-1166
President: E. M. Chisholm
Contact: J. W. Chisholm, Plant Manager
Floor Area: 65,000 sq. ft.
Personnel: 100

Manufacturers of: Medium VHF and VHF transmitters and receivers; Audio amplifiers and public address systems; Commercial radio and T.V. receivers; Control panels; Marine HF transmitters and receivers; Power supplies and associated equipment; Equipment Racks.

5815 5820 5821 5825 5830 5835 5895 5975

CHRYSLER CANADA LTD.,

P.O. Box 60,
Windsor, Ontario.
Telephone 519: 252-3651
President: R. W. Todgham
Contact: J. E. Elliott
Floor Area: 3,500,000 sq. ft.
Personnel: 13,000

Manufacturers of: Vehicular equipment components; Internal combustion engines (non-aircraft); Cars; Trucks; Gas combustion and Industrial engines; Ammunition components; Aluminum and grey iron castings; Powdered metal products.

1340 and page B6

CITCO
(Division of Canada Illinois Tools, Limited),
75 Scarsdale Road,
Don Mills, Ontario.
Telephone 416: 447-7251
Vice-President: F. Ballentine
Contact: L. Allingham
Floor Area: 24,000 sq. ft.
Personnel: 125

Manufacturers of: Gear cutting hobs; Broaches; Hacksaws; Bandsaws; Rotary Shears; Straight shear blades; Slitters; Special milling cutters; Drills, Taps; Machine knives; Flat form tools; Circular Form Tools; Jigs and Small fixtures; Design and Manufacturing; Special gearing; End mills; Counterbores; Twist drills.

3455 5110 5133 5136 7320

C. P. CLARE CANADA LTD.,
840 Caledonia Road,
Toronto 19, Ontario.
Telephone 416: 789-4335
Vice-President: V. H. Ames
Floor Area: 1,500 sq. ft.
Personnel: 105

Manufacturers of: Relays, Telephone, miniature and sub-miniature; Armature types for the electronic industry; Stepping switches and wired assemblies.

5805 5945 5950

CLEVITE LIMITED,
1177 Talbot Street,
St. Thomas, Ontario.
Telephone 519: 631-4880
President: William H. Martin
Contact: Paul G. Jefferies, Vice-President —Sales
Floor Area: 100,000 sq. ft.
Personnel: 415

Manufacturers of: 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.; powder metal parts.

3120

CLINTON PRODUCTS (CANADA) LIMITED,
108 Talbot Street East,
Wheatley, Ontario.
Telephone 519: 825-4116
President: Fred Geiger
Contact: J. Keith Arner, Vice President and General Manager
Floor Area: 6,000 sq. ft.
Personnel: 9

Manufacturers of: Automotive Service Equipment; Manual Material Handling and Storage Items, e.g. Garage creepers, Hand Trucks and Dollies, Cylinder Trucks for welding, Ice Cream Dollies; Storage Racks.

3290 4910 5140 5340 8140

GEO. CLUTHE MFG. CO. LTD.,
141 Weber Street South,
Waterloo, Ontario.
Telephone 519: 743-2695
Sales Manager: J. E. Cluthe
Contact: J. L. Cash—Sales Department
Floor Area: 53,000 sq. ft.
Personnel: 125

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, Ontario.
Telephone 416: 757-6285
President: Robert Cochrane
Contact: Bernard Whitham
Floor Area: 12,500 sq. ft.
Personnel: 64

Manufacturers of: Dies, Fixtures, Gauges, Moulds; Special production machinery.

3419 3456 3465 3695 5110 5136

COLLINGWOOD SHIPYARDS,
(Division of Canadian Shipbuilding & Engineering Ltd.),
Huron Street,
Collingwood, Ontario.
Telephone 705: 445-4040
Vice-President and General Manager: W. A. Webster
Floor Area: 148,000 sq. ft.
Personnel: 950

Manufacturers of: Bulk Carriers; Self-unloading Bulk Carriers; Steel Carriers; Passenger Ships; Oil Tankers; Naval Vessels, Scows, Oceangoing Vessels and Ships of special design; Electric Hydraulic Ship Mooring Winches; Steam Mooring Winches; Hatch Clamps. Repair and Overhaul Facilities.

1905 1910 1915 1925 1930 1935
1940 2020 2030 2040 2050 2090

COLLINS RADIO COMPANY OF CANADA LTD.,
150 Bartley Drive,
Toronto 16, Ont.
Telephone 416: 757-1101
Cable: COLINRAD
Vice-President: J. L. Plant
Contact: J. H. Pile, Contracts Manager

Floor Area: 104,000 sq. ft.
Personnel: 400

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

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, Ontario.
Telephone 416: 685-7361
President and General Manager: E. Kennard
Floor Area: 140,000 sq. ft.
Personnel: 270

Manufacturers of: Chain, all types. Chain Fittings and attachments. Hoists, Electric and Hand. Forgings, Drop Steel. Nylon Slings.

3940 3950 4010 and page B7

COMBUSTION ENGINEERING—SUPERHEATER LTD.,
540 Dominion Square Building,
Montreal 2, Quebec.
Telephone 514: 866-9991
President: W. H. D. Clark
Contact: H. M. Esdaile, Manager, Export Sales
Floor Area: Factory 120,000 sq. ft.
Personnel: 700

Manufacturers of: Steam generating and fuel burning equipment.

3820 4410 4420 4440 4470 4520 4530 4540 and page B4

COMPUTING DEVICES OF CANADA LIMITED,
P.O. Box 508,
Ottawa 4, Ontario.
Telephone 613: 829-1800
Telex: 013-439
President and General Manager: C. F. Hembery
Contact: R. E. Freeman, Marketing Manager
Floor Area: 261,000 sq. ft.
Personnel: 1500

Manufacturers of: Air navigation systems, analog and digital computers, photo reconnaissance and photo optical systems, electronic and electro-mechanical devices, electronic and nucleonic instruments, marine navigation and survey electronic systems.

Services: Aerophysics research; repair and overhaul; environmental test facilities; data reduction, processing and analysis; engineering field service; technical and operational training; systems design development and management; technical operating and maintenance manuals; hydrographic and oceanographic surveys; marine survey consultants; ship automation and instrumentation.

1220 1230 1287 1290 1410 1420 1430 1440 1450 2010 5805 5815 5820 5821 5825 5826 5845 5850 5855 5860 5895 5915 5985 5999 6210 6310 6320 6330 6350 6605 6610 6655 6665 6710 6910 6920 6930 6940 7440 7610 and pages B1, B2, B3, B4, B7, I-54, I-62, I-66, I-68, I-70, I-92 & I-124

CONSOLIDATED ENGINES & MACHINERY CO. LTD.,
8550 Delmeade Road,
Town of Mount Royal,
Montreal 9, Quebec.
Telephone 514: 747-0611
Telex: 01-20112
Cable: CONENG
President: J. W. Halls, Sr.
Contact: A. G. Dunbar, Regional Manager
Floor Area: 30,000 sq. ft.
Personnel: 150

Manufacturers of: Diesel electric power plants; Gasoline electric power plants; Switchboards; Control panels.

6110 6115

THE CONSOLIDATED MINING & SMELTING COMPANY OF CANADA LIMITED,
630 Dorchester Blvd. West,
Montreal 2, Quebec.
Telephone 514: 861-9851
Cable: COMINCO
President: W. S. Kirkpatrick
Contact: A. Wilkinson, Manager Chemicals and Fertilizers, Sales Division; J. F. M. Douglas, Manager Metal Sales Division.
Personnel: 7,000

Manufacturers of: Chemicals: Chemical Fertilizers; Heavy Chemicals. Metals: Refined Base Metals; Ultra High Purity

Metals; Semi Conductor Materials; Thermoelectric Cooling Elements. Ores and Concentrates.

2040 4510 5960 6810 6830 9530 9535 9545 9650

THE CONSTANTA CO., OF CANADA LTD.,
280 Regina Avenue,
Montreal 19, P.Q.
Telephone 514: 768-3235
Cable: KONSTANTA
President: J. K. Wong
Contact: H. Anowski
Floor Area: 5,000 sq. ft.
Personnel: 22

Manufacturers of: High Stability Precision, fixed deposited carbon and Metal Film Resistors.

5905

COPE TOOL DESIGN CO. LTD.,
(Head Office)
2477 Howard Avenue,
Windsor, Ontario.
Telephone 519: 256-5167
(Branch Office)
881A Jane Street,
Suite 4, Jane Park Plaza,
Toronto 9, Ontario.
Telephone 416: 767-5330
President: Louis Cope,
Contact: O. J. Peverall, Vice-President
Floor Area: 6,000 sq. ft.
Personnel: 16

Designers of: Special machines, Fixtures, Jigs, Dies, Gauges and Welding Fixtures for Automotive and Aircraft Industry.

Page B1

JOS. COTE INC.
St. Ephrem, Quebec.
Telephone 20 St. Ephrem
President: Charles Thibaudeau,
Contact: Benoit Mathieu, Vice-President.
Floor Area: 60,000 sq. ft.
Personnel: 60

Manufacturers of: Sawmill and General Woodworking Machinery.

3210

COULTER COPPER & BRASS CO. LIMITED,
44 Coronet Road,
Toronto 18, Ontario.
Telephone 416: 239-2771
President and General Manager: W. R. Coulter
Contact: J. T. Wilkinson, Sales Manager
Floor Area: 20,000 sq. ft.
Personnel: 50-60

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 B6

THE CRAIG BIT COMPANY LIMITED,
180 Ninth Street, P.O. Box 10,
North Bay, Ontario.
Telephone 705: 472-1400
General Manager: J. W. Chapman
Contact: J. R. McMillin, 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

CROMPTON PARKINSON ELECTRICAL LIMITED,
Shaver Street,
Cainsville, Ontario.
Mailing address: P.O. Box 844,
Brantford, Ontario.
Telephone 519: 753-7359
Contact: Mr. W. J. Ridley, Vice President and General Manager
Floor Area: 25,000 sq. ft.
Personnel: 140

Manufacturers of: Electrical instruments—ammeters, voltmeters, ohmmeters, wattmeters and power measuring instruments (incl. power factor meters); Integral HP motors; Switchgear; Alternators; Generators.

5920 5930 5950 6115 6125 6140 6145 6625

CROVEN LIMITED,
500 Beech Street,
Whitby, Ontario.
Telephone 416: 668-3325
TWX: 610-384-2750
General Manager: S. C. McCarten
Contact: R. E. Dix, Sales Manager

Floor Area: 12,000 sq. ft.
Personnel: 275

Manufacturers of: Quartz Crystals; Crystal ovens.

5955

CROWN ZELLERBACH BUILDING MATERIALS LTD.,

Fraser Mills, 15 King Edward Avenue, New Westminster, B.C.
Telephone 604: 521-1941
Telex: 043-558
General Manager: D. S. Denman
Contact: A. M. Matheson
Floor Area: 750,000 sq. ft.
Personnel: 1,100

Suppliers of Douglas Fir, West Coast Hemlock, Western Red Cedar, Western White Spruce Lumber, Douglas Fir, Western White Spruce Plywood—exterior glue line, all species Hardwood Plywood, high and medium density overlaid Plywood.

5510 8115

CYANAMID OF CANADA LIMITED,

635 Dorchester Blvd., West, Montreal 2, Quebec.
Telephone 514: 866-5611
President: S. R. Stovel
Contact: J. F. Allen, Marketing Director
Floor Area: 8 Plants—300 Acres.
Personnel: 2,500

Manufacturers of: Nitroguanadine; Heavy Chemicals; Process Chemicals; Nitrogen Products; Plastics and Resins; MELMAC quality Melamine Dinnerware; FORMICA Decorative Laminated Plastics; SKY-DOME Acrylic Skylights; Pharmaceuticals.

6505 6810 7350

DALE ELECTRONICS CANADA LIMITED,
18 Howden Road,
Scarborough, Ontario.
Telephone 416: 759-5631
Managing Director: R. A. Wells
Contact: K. J. Beeby, Sales Manager
Floor Area: 15,000 sq. ft.
Personnel: 30

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

GEO. T. DAVIE & SONS LIMITED,
31 Davie Street,
Lauzon, Quebec.
Telephone 418: 837-4741
President: W. Bherer, Q.C.
Contact: K. E. Wood, General Manager
Floor Area: 105,000 sq. ft.
Personnel: 800

Manufacturers of: Cargo and tanker vessels; Combat and landing ships; Transport vessels; Passenger and troop; Special service vessels; Dredges; Scows, all types; Barges and lighters; Pontoons, floating dry docks; Small craft, buoys; Ship repair facilities.

1905 1910 1915 1925 1930 1935 1940 1950 1955 2020 2040 2050 2090

DAVIE SHIPBUILDING LIMITED,
P.O. Box 130,
Lauzon, Levis, P.Q.
Telephone 418: 837-5841
Telex: 011-254
Cable: DAVIESHIP
General Manager: T. Veliotis
Contact: P. J. Gwyn
Floor Area: 154,000 sq. ft.
Personnel: 2,600

Manufacturers of: Barges and lighters; Boilers, industrial; Buoys; Cargo and Tanker Vessels; Combat Ships and Landing Vessels; Dredges; Fishing Vessels; Autoclaves; Heat Exchangers; Kettles, asphalt; Launchers, guided missile; Pipe line; Pontoons and Floating Docks; Small craft; Special Service Vessels; Tanks, liquid storage metal; Transport Vessels, Passenger and Troop; Flasks, steel, Compressed air; Pressure vessels, cargo and special purpose; Repair and overhaul facilities; Machining light, medium and 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 B4 & B7

THE DAYMOND COMPANY LIMITED,
675 Richmond Street,
Chatham, Ontario.
Telephone 519: 352-6600
President: F. R. Daymond
Contact: D. J. Illman, Export Manager
Floor Area: 92,000 sq. ft.
Personnel: 200

Manufacturers of: Aluminium and Vinyl Extrusions; Thermo Plastic Injection Moulding, Aluminium Anodizing, painting, Fabrication, Aluminium Window Frames and Sashes.

5670 9330 9530

DAYSTROM LIMITED,
1480 Dundas Highway East,
Cooksville, Ontario.
Telephone 416: 277-3191
President: J. H. Baldwin
Floor Area: 20,000 sq. ft.
Personnel: 80

Manufacturers of: Electrical Meters; Meter Type Relays; Precision Trimming Potentiometers; Electronic Kits; Transceivers (GRS).

5905 6625

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED,
Downsview, Ontario.
Telephone 416: 633-7310
President: William B. Boggs
Contact: R. Bannock, Vice-President, Sales
Floor Area: 1,700,000 sq. ft.
Personnel: 4,300

Manufacturers of: 6-7 and 11-12 place single engine STOL Utility Aircraft capable of operating on floats, skis or wheels; Multi engine (Piston or turbo prop) STOL Utility Aircraft; Aircraft Components and Assemblies; Repair and Overhaul Facilities for Aircraft and Engines; Research and Development of experimental Aircraft and Allied Products; Hydrofoil research and development.

1510 1540 1560 1620 1670 1680 1730 1740 4920 6615 and pages B1, B3, I-2, I-4, I-6 & I-12

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED,
(Special Products and Applied Research Division),
Malton, Ontario.
Telephone 416: 677-4411

General Manager: J. Fogarty
Contact: D. J. Dalzell, Sales Manager
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.

1410 1420 1650 4935 5820 5821
5825 5826 5840 5841 5850 5855
5860 5895 5985 6125 6130 6605
6625 6645 6665 6710 6760
and pages B1, B3, B4, I-78, I-80 & I-138

DELAMERE & WILLIAMS COMPANY, LIMITED,
35 Carson Street,
Toronto 14, Ontario.
Telephone 416: 259-7677
Vice President and 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,
(Division of Deloro Smelting and Refining Co. Ltd.),
Box 341, Dundas Street East,
Belleville, Ontario.
Telephone 613: 968-6431
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 molding; Weight of Casting—200 lbs. maximum.

1005 2805 2815 2835 2910 3439
3455 3460 3895 4310 4410 4430
5110 5130 5136 6520 9510
and page B6

DELPEX ADHESIVES LIMITED,
133 Jefferson Avenue,
Toronto, Ontario.
Telephone 416: 532-2377
President: M. P. Lister
Contact: R. F. McKay, Managing Director
Floor Area: 14,000 sq. ft.
Personnel: 15

Manufacturers of: Industrial Adhesives.

8040

DELRO INDUSTRIES LTD.,
860 King Edward Street,
Winnipeg 19, Manitoba.
Telephone 204: 775-8166
Division Manager: G. B. Wither
Contact: R. C. Herd, Production Manager
Floor Area: 12,000 sq. ft.
Personnel: 60

Manufacturers of: Drill bits, Coring and Non-coring Diamond; Rock core drilling accessories; Saws, Concrete and masonry diamond; Wheels, Grinding, Diamond; Tools, forming, diamond; Pullers, bearing and wheel.

3820 5120 5130 5180 5345

DEMERS, HOMA, BABY, CONSULTING ENGINEERS,
4815 Carlton Avenue,
Montreal 26, Quebec.
Telephone 514: 739-2208
Eng. Partner: Pierre Demers
Floor Area: 2,500 sq. ft.
Personnel: 10

Consulting and Design Services in: Operational Research; Management Control Techniques; Systems Engineering and Analysis in: digital computer applications, digital information systems, automation and control, communications and electronics.

Page B1

DESIGN PRECISION CASTING,
77 Eastern Avenue,
Brampton, Ontario.
Telephone 416: 677-4422
Contact: R. Obata
Floor Area: 17,500 sq. ft.
Personnel: 95

Precision Castings (Investment), ferrous and non-ferrous.

Page B6

DESITRON COMPANY LIMITED,
309 Pharmacy Avenue,
Scarborough, Ontario.
Telephone 416: 759-1151
President: F. A. Walther
Contact: V. E. Ross, Sales Engineer

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-President and General 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, Ontario.
Telephone 705: 728-5501
President: H. B. Gibson,
Contact: R. A. Armstrong, Vice President and General Sales Manager.
Floor Area: 100,000 sq. ft.
Personnel: 190.

Manufacturers of: Industrial spray painting and finishing equipment; Spray booths; Finishing systems; Air compressors; Industrial ovens; Phosphating machines; Hose and hose connections.

4310 4450 4940 6515

DIEMAKERS LIMITED,
145 Graveline Street,
St. Laurent 9, Quebec.
Telephone 514: 636-0533
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.

3465

DOMINION ALUMINUM FABRICATING LIMITED,
36 Coronet Road,
Toronto 18, Ontario.
Telephone 416: 239-4855
President and General Manager: Murray R. Maynard
Contact: Ross S. Jolliffe, Sales Manager
Floor Area: 50,000 sq. ft.
Personnel: 50

Manufacturers of: Aluminum flagpoles, expansion joints, light standards, railings, trusses, scaffolds, etc.; Portable buildings and shelters; Helicopter Hangars, telescopic, aluminum for shipboard use; Shipping Containers, aluminum, rigid; Shipping containers, aluminum collapsible; Repair and Overhaul facilities.

5410 8110 8115 8140

DOMINION BRIDGE COMPANY LIMITED,
555 Notre Dame Street,
Lachine, Quebec.
Telephone 514: 634-3551
President: M. McMurray
Contact: M. Aykroyd, Vice-Pres. of Marketing Services
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 3950 4410
4420 4430 4440 4470 4520 5420
5430 5440 5445 5450 5845 8120
and pages B2 & B4

DOMINION CHAIN COMPANY LIMITED,
617 Douro Street,
P.O. Box 578,
Stratford, Ontario.
Telephone 519: 273-0840
General Manager: D. E. MacDonald
Contact J. W. Fraser, Sales Manager
Floor Area: 205,000 sq. ft.
Personnel: 280

Manufacturers of: Chain—All types; Slings—Chain and Wire Rope; Dropped Forged Chain and Wire Rope Fittings.

3940 4010

DOMINION CUTOUT LIMITED,
155 Nantucket Boulevard,
Scarborough, Ontario.
Telephone 416: 759-9377
Executive Vice-President: D. C. Ferguson
Floor Area: 23,000 sq. ft.
Personnel: 75

Manufacturers of: Electrical distribution equipment: Disconnect switches up to 167 kv: Cutouts, 5, 15, 23 kv; Power fuses (mainly 69 kv, some 138 kv); Fuse links.

5925

DOMINION ENGINEERING WORKS LTD.,
P.O. Box 220,
Montreal, Quebec.
Telephone 514: 634-3411
President: R. J. Barrett
Contact: R. P. Vaughan, Manager, International Sales
Floor Area: 1,069,000 sq. ft.
Personnel: 2200

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 (¾ to 3 cu. yd.).

2825 3010 3020 3422 3442 3443 3444 3615 3620 3695 3810 3820 4810 4820

DOMINION FOUNDRIES AND STEEL, LIMITED,
P.O. Box 460,
Hamilton, Ontario.
Telephone 416: 549-5211
President: F. H. Sherman
Contact: R. C. Varah, Asst. to Exec., V.P. Commercial
Floor Area: 500 acres
Personnel: 7,000

Manufacturers of: Hot Rolled Steel Sheet and Strip; Electrolitic 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.

9510 and page B6

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 1680 1730 and page B3

DOMINION LOCK COMPANY LIMITED,
7310 Decarie Boulevard,
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 B6

DOMINION MAGNESIUM LIMITED,
7 King Street East,
Toronto 1, Ontario.
Telephone 416: 362-7292
Telex: 02-2720
Cable: DOMAL
General Manager: J. Thomson
Contact: H. C. Warrington, Manager Sales and 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 allows of Magnesium-Thorium; Copper-Zirconium; Magnesium-Nickel.

4710 9530 9630 9650

THE DOMINION ROAD MACHINERY CO. LIMITED,
Goderich, Ontario.
Telephone 519: 524-7374
President: J. K. Sully
Contact: E. C. Hill, Director of Sales
Floor Area: 100,000 sq. ft.
Personnel: 240

Manufacturers of: Motor, Road Graders; Hydrostatic Split Torque Transmissions.

3010 3805

DOMINION STEEL & COAL CORPORATION LIMITED,
Head Office,
P.O. Box 249,
Montreal, Quebec.
Telephone 514: 489-3461
Vice-President: T. H. McEvoy, Steel Sales
Contact: H. R. Gulliver, Sales Mgr. Export
Total Floor Area: 2,880,631 sq. ft.
Total Personnel: 5,275

2220 2250 4710 5305 5306 5310 5315 5335 5420 5660 5670 5680

9505 9510 9520 9640 and pages B2 & B7

SYDNEY WORKS

Floor Area: 1,757,667 sq. ft.
Personnel: 4,000

Manufacturers of: Steel Ingots, re-rolling and forging; Steel Rails; Tieplates; Mine Arch Bars; Splice Bars; Steel Blooms and Billets; Steel Bars; Wire Rods; Wire Rods, patented; Steel Wire, Bright, Annealed, Galvanized, Patented; Barbed Wire; Bale Ties; Wire Nails, Bright, Cement Coated, Blued, Galvanized; Benzol, Toluol, Xylol; Sulphate of Ammonia; Air Cooled Slag; Granulated Slag; Foamed Slag; Coke Ovens Coke.

MONTREAL WORKS

Floor Area: 859,964 sq. ft.
Personnel: 975

Manufacturers of: ⅜" to 4" Cont. weld Pipe, Black and Galvanized; Commercial Fence-Chain Link, Farm, Railway, etc.; Industrial Fasteners covering complete commercial range and specials, over 22,000 types and sizes, including High Tensile Bolts; High Carbon Wire from 0.012 to 0.200; Low Carbon Wire 0.012 to 0.890; Bars-Round from 31/64" to 4½"; Bars-Square ½" to 3". Angles 1 × 1 × ⅛" to 6 × 6 × ¾" Special Shapes, Car Sections, etc., up to 6" in one web. Ingots from 400 to 800 lbs.; Special Ingots up to 28 net tons.

ETOBICOKE WORKS

Floor Area: 263,000 sq. ft.
Personnel: 300

Manufacturers of: Wire: Low Carbon-Bright .800" to .040", High Carbon-Bright .192" to .051", Low Carbon-Galvanized .192" to .054"; Nails: Covering complete commercial range and specials; Fence: Farm Residential, Chain Link, etc. Welded Wire Fabric for highway, building, concrete pipe reinforcing, etc.

DOMINION STEEL & COAL CORPORATION LIMITED,

Truscon Steel Works,
6001 Irwin Street,
LaSalle, Quebec.
Telephone 514: 366-3260
General Manager: T. W. Woodruff
Contact: H. S. Baldwin, Assistant Gen. Mgr.
Floor Area: 213,500 sq. ft.
Personnel: 400

Manufacturers of: Shortspan and longspan steel joists; Metal lath; Steel and Aluminum windows; Steel doors; Steel roofdeck; Reinforcing steel; Slotted angles and Shelving; Pallet racks.

3990 5650 5670 5680 7125

DOMINION TOOL & METAL PRODUCTS LIMITED,

929 Perreault Lane,
Montreal 18, Quebec.
Telephone 514: 861-7401
President: G. F. Marosi
Contact: F. H. Richards, Vice-President
Floor Area: 15,000 sq. ft.
Personnel: 50

Manufacturers of: High Precision small stampings for Electrical and Electronics Field; Assembly of small precision components; Parts for Transistors; Raw Materials used: Brass, Nickel, Silver; Stainless Steel, C.R. Steel, Phosphor Bronze, Barylium Copper, Kovar, Rodar, etc.

5895 5975

DOMTAR PACKAGING LIMITED,

43 Hanna Avenue,
Toronto 3, Ontario.
Telephone 416: 532-3341
Vice-President and Managing Director: W. H. Palm
Floor Area: 1,768,259 sq. ft.
Personnel: 2,748

Manufacturers of: Corrugated shipping containers; Corrugated and Chipboard partitions; Solid fibre shipping containers; Folding cartons; Cylindrical fibre cans; Liquid food containers; Grocery bags; Carry-out bags; Shopping bags; Specialty bags of all kinds; Wrapping paper for both industrial and retail; Counter rolls and sheets; Gummed tapes; Injection molded and blow molded products.

8105 8110 8115 8125 8135 8140 9310

DONALD ROPES & WIRE CLOTH LTD.,

180 King William Street,
P.O. Box 307,
Hamilton, Ontario.
Telephone 416: 528-5951
Cable: BONACCORD
Vice-President and General Manager: G. M. McGregor
Contact: R. A. Johnson, Gen. Sales Manager
Floor Area: 265,000 sq. ft.
Personnel: 380

Manufacturers of: Wire Rope; Aircraft Launching and Arresting Assemblies; Wire Rope Slings and Assemblies; Perforated Metals; Steel Wire Cloth and Screens.

1710 1720 3940 4010 5335 9535

DOON TWINES, LIMITED,

50 Ottawa Street South,
Kitchener, Ontario.
Telephone 519: 745-4739
President: H. C. Krug
Contact: H. H. L. Krug, Vice-President and General Manager
Floor Area: 215,000 sq. ft.
Personnel: 225

Manufacturers of: Jute, Hemp, Flax, Rayon, Manila, Sisal and Polypropylene yarns for Twines, Rope, Baler and Binder Twines.

4020

DOSCO INDUSTRIES LIMITED,
(Canadian Bridge Works)

1219 Walker Road,
Windsor, Ontario.
Telephone 519: 256-2661
Cable: CANBRIDGE
President: J. E. Clubb
Contact: R. C. Leslie, Assistant General Sales Manager
Floor Area: 410,287 sq. ft.
Personnel: 1200

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 B1, B2 & B7

DOW CHEMICAL OF CANADA, LIMITED,

P.O. Box 1012,
Sarnia, Ontario.
Telephone 519: 337-8282
President: L. B. Smithers
Contact: F. E. Punnett, Assistant General Sales Manager
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, Polystrene, Polyethylene, Plastic packaging materials and containers, Glycols, Pharmaceutical chemicals, Veterinary chemicals, Trichlorethylene, Perchlorethylene, Phenol and phenol derivatives, Other industrial chemicals.

6810 6850 8030 8135

DOWTY EQUIPMENT OF CANADA LTD.,

239 Station Street,
Ajax, Ontario.
Telephone 416: 942-3100
Telex: 02-29214
Cable: DOWTYS
President: R. F. Hunt
Contact: T. H. Staples, Gen. Sales Manager
Floor Area: 50,000 sq. ft.
Personnel: 150

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 B3, B7, I-22 & I-24

DUNLOP CANADA LIMITED,
(Industrial Division)

870 Queen Street East,
Toronto, Ontario.
Telephone 416: 461-9411
Vice-President and General Manager: K. Byard
Contact: C. T. Snidal, Gen. Sales Manager
Floor Area: 510,000 sq. ft.
Personnel: 750.

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

DU PONT OF CANADA LIMITED,

P.O. Box 660
Montreal, Quebec.
Telephone 514: 861-3861
President: R. G. Beck
Contact: R. C. Wright, Mgr., Export Division
Floor Area: 653,400 sq. ft.
Personnel: 5,992

Manufacturers of: Acids: Adipic, Hydrochloric, Nitric; Chlorofluorohydrocarbons: Hydrogen Peroxide, Commercial Explosives, Plastic Films, Nylon Resins, Polyethylene Resins.

1375 6810 6830 8010 8030 9330

E.M.I.-COSSOR ELECTRONICS LIMITED,
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 Manager
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 B1, B2, I-102, I-122, I-136, I-166 & I-168

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 ALUMINUM REDUCTION CO. LIMITED,
11445 Rivet Street,
Montreal East, Quebec.
Telephone 514: 645-4558
President: Henry F. Pollock
Floor Area: 15,500 sq. ft.
Personnel: 18

Manufacturers of: Granulated Aluminum and Aluminum Powder.

9650

EASTERN STEEL PRODUCTS COMPANY,
777 Laurel Street,
Preston, Ontario.
Telephone 519: 653-6234
General Manager: John H. Taylor
Floor Area: 150,000 sq. ft.
Personnel: 150

Manufacturers of: Snow plows; Dump bodies: Hoists (Truck); Doors—Metal, Rolling and Sliding; Tractors and Attachments; Sanders and Salters, Road.

1730 1740 2510 3825 3830 3930 3950 5670

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

EDO (CANADA) LIMITED,
P.O. Box 97,
Cornwall, Ontario.
Telephone 613: 932-6774
Contact: R. R. Walker
Floor Area: 33,000 sq. ft.
Personnel: 125

Manufacturers of: ASW systems including shipborne and submarine fitted sonar systems. Transducers, sonar receivers and transmitters. Marine loran, airborne loran, navigational equipment; Transistorized echo sounders for ship-fitted, submarine-fitted and air-towed applications; LC filters, filter networks and delay lines. A completely instrumented underwater test facility is available for underwater research and development projects. Repair and overhaul facilities for all types of sonar equipment and transducers are also available.

5820 5825 5826 5845 6625 and pages I-158 & I-160

EDWARDS OF CANADA LIMITED,
P.O. Box 430,
Owen Sound, Ontario.
Telephone 519: 376-2430
President and Managing Director: A. Yates
Floor Area: 40,000 sq. ft.
Personnel: 200

Manufacturers of: Annunciators; Fire alarm systems; Smoke detection systems; Electrical signalling communication and production equipment; Electrical institutional equipment.

6350

ELECTRIC REDUCTION CO. OF CANADA LIMITED,
137 Wellington Street West,
Toronto 1, Ontario.
Telephone 416: 366-3791
Cable: ELREDCHEM

President: E. R. Kinsley
Contact: W. M. Karn, International Mgr.
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

THE ELECTRIC STORAGE BATTERY CO. (CANADA) LIMITED,

P.O. Box 907, Postal Station U,
2301 Dixie Road,
Toronto 18, Ontario.
Telephone 416: 277-3131
President: D. C. Brownell
Contact: H. W. Birkbeck, Manager, Industrial Sales
Floor Area: 220,000 sq. ft.
Personnel: 350

Manufacturers of: Batteries, storage, alkaline and batteries, storage, lead acid.

6130 6140

ELECTRICAL MFG. CO. LIMITED,

P.O. Box 1300,
Montmagny, Quebec.
Telephone 514: 861-7445
General Manager: Claude Rousseau
Contact: Maurice Gougeon, Sales Director
Floor Area: 35,000 sq. ft.
Personnel: 100

Manufacturers of: Electrical Control Equipment; Fuses and Lighting 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

ELECTRONIC & MICROWAVE LABORATORIES LIMITED,

2430 Fairview Avenue,
Burlington, Ontario.
Telephone 416: 637-7881
President: R. Hooper
Contact: A. Ramsey, Sales Manager
Floor Area: 10,000 sq. ft.
Personnel: 6

Manufacturers of: Microwave Components; Radio and Television Communication Equipment; Radio Navigation Equipment; Radar Equipment; Miscellaneous Communication Equipment; Fixed and Variable Attenuators; Filters and Networks; Ferrite Circulators; Isolators and Switches.

5820 5821 5825 5826 5840 5841 5895 5905 5910 5915 5950 5985 6625

ELECTROVERT LIMITED,

3285 Cavendish Boulevard,
Montreal 28, Quebec.
Telephone 514: 488-2521
Telex: 01-2268
Cable: RECTIFIER
President: N. J. Fodor
Contact: E. Pallavicini, Vice-President
Floor Area: 25,000 sq. ft.
Personnel: 60

Manufacturers of: Extension Cable Racks: Metal Framing Adjustable; Concrete Inserts. Wavesoldering Equipment, Tinning Equipment, Custom made Production Equipment for the Electrical and Electronics Industry.

5680 5975

ELECTRO-VOX INC.,

2626 Bates Road,
Montreal, Quebec.
Telephone 514: 739-1981
Cable: ELEVOX
President. P. E. Chaput
Contact: Richard Lavoie, General Manager
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.

5830 5831 5835

W. R. ELLIOTT LIMITED,

134 Sydney Street South,
Kitchener, Ontario.
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 B7

EL-MET-PARTS LIMITED,
55 Head Street,
Dundas, Ontario.
Telephone 416: 628-6366
TWX: 610-375-0431
President: D. C. Barber
Contact: R. A. Briggs, General Manager
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, Mgr. 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,
Sackville, New Brunswick.
Telephone 506: 536-1521
President: Norman A. Hesler
Vice President: W. J. Wienand
Contact: R. B. Fullerton, General Manager
Floor Area: 164,000 sq. ft.
Personnel: 850

Manufacturers of: Airframe structural components, jigs, fixtures and tooling; 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; 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 B6 & B7

ENGINEERING PRODUCTS OF CANADA LIMITED,
5035 Ontario Street East,
Montreal 4, Quebec.
Telephone 514: 255-3613
President: Leon Simard
Contact: A. E. Comisso, Executive Vice-President
Floor Area: 160,000 sq. ft.
Personnel: 200

Manufacturers of: Propane Gas cylinders; Double Glazed Hermetically Sealed Glass Units; Expanded Metal Products.

8120

ENGLISH PLASTICS LIMITED,
245 Queen Street East,
Brampton, Ontario.
Telephone 416: 677-1460
Vice-President and General Manager: M. M. English
Floor Area: 14,000 sq. ft.
Personnel: 30

Manufacturers of: Custom fabricators of Plastic Materials—Aircraft canopies, windows, wing lights, etc.

1560 9330

ERIE TECHNOLOGICAL PRODUCTS OF CANADA LIMITED,
5 Fraser Avenue,
Trenton, Ontario.
Telephone 613: 392-9251
Telex: 02-2029
Vice-President and General Manager: G. F. Kempf
Contact: F. W. Deacon, Sales Manager
Floor Area: 40,000 sq. ft.
Personnel: 250

Manufacturers of: Capacitors Fixed and Variable, Ceramic; Ceramic Dielectrics; Ferro-Ceramic Filters; Filters, Radio Interference.

5910 5915

ESSEX ELECTRONICS OF CANADA LIMITED,
68 Wall Street,
Trenton, Ontario.
Telephone 613: 392-6544
General Manager: J. E. Kalfus
Floor Area: 10,000 sq. ft.
Personnel: 55

Manufacturers of: Capacitors, Fixed, Ceramic Dielectric; Subminiature Chokes, Radio Frequency; Delay Lines, Inductors, Standard, fixed; Inductors, Standard Variable; Radio Frequency Transformers; L.C. Filters.

5910 5915 5950 5999 6625

EVERGREEN PRESS LIMITED,
1070 South East Marine Drive,
Vancouver 15, B.C.
Telephone 604: 325-2231
President and Manager: G. C. Hyatt,
Contact: J. McCracken, Vice-President.
Floor Area: 70,000 sq. ft.
Personnel: 225

Manufacturers of: Text Books; Continuous Business Forms; Printed or Lithographed Advertising Material; Telephone Directories; Maps; Charts and all General Printing or Lithography.

7610 7640

EX-CELL-O CORPORATION OF CANADA LIMITED,
120 Weston Street, P.O. Box 3535,
London, Ontario.
Telephone 519: 438-2133
Vice President: S. Lynn
Contact: R. A. Lodge—Sales Manager
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; Versa-Belt Grinders; 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; Granite and Cast Iron Surface Plates.

3415 3417 3419 3465 3695 5220
and page B7

F-H WELDING MACHINES LIMITED,

92 North Queen Street,
Toronto 18, Ontario.
Telephone 416: 233-3265
President: J. C. Fitzpatrick
Personnel: 50 - 99

Manufacturers of: Machinery for welding, metal forming and induction heating; Jigs and fixtures.

3431 3432

FAIRBANKS-MORSE (CANADA) LIMITED,

141 Ontario Street,
Kingston, Ontario.
Telephone 613: 548-7731
President: C. I. Allen
Contact: J. E. Pickering
Floor Area: 650,307 sq. ft.
Personnel: 300

Manufacturers of: Steam and Diesel Locomotives, Pumps — Centrifugal, Turbine, Propellor, Peripheral Coolant, Rotary; Water Supply Systems; Scales; Plate Fabrication; Pressure Vessels; Calibration of Gauges; Tanks, Liquid Storage; Mining Machinery; Process Equipment for Mining, and Chemical Industry; Gunnery Loader Trainers; Torpedo Launchers; Repair and Overhaul Facilties; Machining, Light, Heavy, Medium.

1010 1015 1020 1045 1740 2210
2220 2815 2825 3650 3695 3820
4310 4320 4630 5430 6670 6920
8120 and page B7

FAIREY CANADA LIMITED,

P.O. Box 1002,
Dartmouth, Nova Scotia.
Telephone 902: 469-4351
Telex: 014-42430
President: D. W. Howell
Contact: J. F. Godwin, Contracts and Sales Manager
Floor Area: 308,200 sq. ft.
Personnel: 850

Manufacturers of: Helicopter Hauldown and Rapid Securing System; Fairey "Fairlift" Materials Handling Device; Electronic Equipment; Hydraulic Valves; Actuators, etc.; Engine Test Stands; Ground Handling Equipment; Aircraft Sheet Metal work; Aircraft Plastic and Fibreglass Components; Aircraft Spares; Repair and Overhaul facilities.

1360 1560 1650 1680 1710 1730
2925 2945 3920 4920 and pages B3, B7, I-154 & I-222

FAIREY CANADA LIMITED,
(Western Division)

Victoria International Airport,
Sidney, B.C.
Telephone 604: 656-1115
Branch Manager: G. Marr
Floor Area: 62,000 sq. ft.
Personnel: 40

Manufacturers of: Aircraft Spares; Repair and Overhaul facilities for: Aircraft airframe and engines, Telecommunications equipment, Aircraft hydraulic components, Generators, Starters, Voltage regulators and Carburators, Scientific instruments, offset printing presses.

1360 1560 and page B3

FASHION HAT AND CAP CO. LTD.,

90 Chestnut Street,
Toronto 2, Ontario.
Telephone 416: 366-2251
President: B. Banks
Contact: S. Banks, Sales Manager
Floor Area: 40,000 sq. ft.
Personnel: 130

Manufacturers of: Safety and Military Headwear.

8405 8410 8415

FEDERAL PACIFIC ELECTRIC OF CANADA,

19 Waterman Avenue,
Toronto 16, Ontario.
Telephone 416: 759-5651
President: B. W. Ball
Contact: A. G. Daley, Vice-President, Marketing.
Floor Area: 240,000 sq. ft.
Personnel: 407

Manufacturers of: Medium and high voltage metal-clad switchgear; Switchboards; Power transformers; Oil and air circuit breakers; Control deck and supervisory control panels; Motor control centres.

5920 5925 5950 6110

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
Vice-President: L. M. Lake
Contact: R. M. Sorbara, Product Sales Manager
Floor Area: 200,000 sq. ft.
Personnel: 400

Manufacturers of: All forms of Wire and Cable for Electronic and Electrical Industries, including Magnet Wire.

6145

FERRANTI ELECTRONICS,
(A Division of Ferranti Packard Electric Ltd.),
Industry Street,
Toronto 15, Ontario.
Telephone 416: 762-3661
Cable: FERRANTI
Vice-President and General Manager: W. M. Lower
Contact: F. E. Paine, Applications Engineering Manager
Floor Area: 75,000 sq. ft.
Personnel: 350

Manufacturers of: Magnetic Memory Devices and Systems; Paper Tape Handling Equipment; Information Display Systems; Electronic Business Equipment; Data Communications and Switching Systems; Numerical Controls and Measurement Systems; Aircraft Navigation and Fire Control Systems; Process Control Systems; Special Purpose Digital Equipment and Systems; Microwave Components, Semiconductors, etc.

5820 5821 5825 5826 5840 5841 5895 5950 5960 5990 5999 6110 6130 6615 6625 7440 and page I-74

FERRITRONICS LIMITED,
222 Newkirk Road,
Richmond Hill, Ontario.
Telephone 416: 889-7313
Cable: FERRIC
Senior Official: George G. Armitage
Floor Area: 5,000 sq. ft.
Personnel: 30

Manufacturers of: Electric wave filters of all types; Lo pass-hipass-band pass-band stop-tone channel-octave-pulse transformers; Power handling RF transformers; IF filters (455 kc) for FM mobile two-way radio.

5915 5950

FERRO METAL LTD.,
9500 St. Lawrence Blvd.,
Montreal, Quebec.
Telephone 514: 387-7357
President: S. F. Flegg
Contact: M. Cohen
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 COMPANY LIMITED,
P.O. Box 1001,
Toronto International Airport,
Malton, Ontario.
Telephone 416: 677-3650
President: D. N. Kendall
Contact: A. F. Soutar, General Manager
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 B3

FINDLAYS LIMITED,
Carleton Place, Ontario.
Telephone Carleton Place 265
President: D. H. Findlay
Contact: G. E. Findlay, Vice-President, Marketing
Floor Area: 220,000 sq. ft.
Personnel: 265

Manufacturers of: Electric and gas ranges, stoves, warm air furnaces and heaters.

4520 7310 and page B6

FIRESTONE TIRE & RUBBER CO. OF CANADA LTD.,
P.O. Box 400,
1579 Burlington Street East,
Hamilton, Ontario.
Telephone 416: 545-4711
President: T. M. Mayberry
Contact: F. Sommers, Manager Manufacturers' Sales Division
Floor Area: 968,000 sq. ft.

Manufacturers of: Adhesives and cements, natural and Synthetic rubber. Boats, pontoons and rafts, pneumatic; Life preservers, pneumatic; Fuel cells, parts and fittings, aircraft; Radomes (inflatable); Rockets and rocket launchers (anti-tank); Rubber products, moulded; Bogie Wheels and support rollers; Tank pads, rubber; Gas masks; Tanks, collapsible, fuel and water; Hose, automobile radiator; Tires and tubes, ground and aircraft; Vibration dampeners.

1055 1560 1660 1940 1945 2040 2530 2590 2610 2620 2630 2640

2805 2910 3895 3920 3990 4220
4240 4710 4720 5325 5330 5340
5410 5420 5430 5970 5985 6515
8010 8030 8040 8115 8140 8465
9320 9330

FISCHER BEARINGS MANUFACTURING LTD.,

P.O. Box 280,
Stratford, Ontario.
Telephone 519: 271-3230
Telex: 029-5518
Cable: CANFAG
Managing Director: Otto Weth
Contact: R. E. Leeming, P. Eng., Manager of Marketing
Floor Area: 102,201 sq. ft.
Personnel: 435

Manufacturers of: Precision Ball and Roller Bearings, High Precision Instrument Bearings, Water Pump Shaft Assemblies and Aircraft Engine Bearings.

3130

FISCHER & PORTER (CANADA) LIMITED,

134 North Finch Drive,
Toronto, Ontario.
Telephone 416: 633-9810
Contact: W. A. Breukelman, Sales Manager
Floor Area: 60,000 sq. ft.
Personnel: 230

Manufacturers of: Traffic and transit signal systems.

6310

FLAG FIRE EQUIPMENT LTD.,

1680 Kildare Road,
Windsor, Ontario.
Telephone 519: 252-5725
General Sales Manager: George Sava
Contact: George Sava—General Sales Manager
Floor Area: 10,000 sq. ft.
Personnel: 25

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; 10, 20, 30 lb. stainless steel press, dry chemical; 10, 20, 28 lb. stainless steel purple K; 2½, 5, 10. 15, 20 lb. carbon dioxide extinguishers.

4210

THE ALEXANDER FLECK LIMITED,

75 Spencer Street,
Ottawa, Ontario.
Telephone 613: 728-3541
General Manager: J. L. Fleck
Contact: G. W. Booker—Plant Manager
Floor area: 30,000 sq. ft.
Personnel: 65

Manufacturers of: Pulp and Paper Machinery; storage chest agitators; bronze and alloy bearings; special purpose machinery; Overhaul and repair facilities for manufactured products; Jaw and Impact Crushers and allied quarry equipment; centrifugal pumps; storage vessels; lubricating systems; and machining heavy and medium.

1290 1730 3010 3120 3419 3615
3820 3895 3910 3990 4320 5430
5445 5450 5985 9999 and pages B1 & B7

FLEET MANUFACTURING LIMITED,

P.O. Box 300, Gilmore Road,
Fort Erie, Ontario.
Telephone 416: 871-2100 Fort Erie,
416: 366-4300 Toronto.
Telex: 021-565
President: G. D. Clarke
Contact: A. W. Baker, Vice-President
Floor Area: 277,000 sq. ft.
Personnel: 450

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
1680 1730 1740 3465 5410 5820
5821 5825 5826 5830 5831 5840
5841 5845 5895 5975 5985 6655
6910 9330 and pages B7 & I-180

FLEETWOOD METAL INDUSTRIES, LIMITED,

1801 Walker Road,
Windsor, Ontario.
Telephone 519: 256-5427
President: William Hurwitz
Floor Area: 37,000 sq. ft.
Personnel: 130

Manufacturers of: Steel Cabinets; Lockers; Automotive Parts; Metal Stampings.

2090 7125 8140

FLIGHT LINE QUALITY PRODUCTS LIMITED,

46 Saskatoon Street,
Campbellford, Ontario.
Telephone 705: 653-2270
President: R. A. J. Murison
Contact: R. B. McIntyre, General Manager

Floor Area: 13,000 sq. ft.
Personnel: 20

Manufacturers of: Aircraft passenger seats and cushions; Boat seats and convertible tops; Snomobiles seats and tops; Various fabric items for military requirements.

1670 1680 2090

FORANO LIMITED,

7000 Park Avenue,
Montreal 15, Quebec.
Telephone 514: 276-3621
President: P. M. Forano,
Contact: G. A. Ferrier
Floor Area: 310,000 sq. ft.
Personnel: 500

Manufacturers of: Mechanical Power Transmissions and Materials Handling Machinery, Conveyors, Elevators, Crushers, Winches, Sawmill Machinery, Special Machinery.

3010 3020 3030 3040 3110 3120
3130 3210 3441 3615 3695 3820
3825 3895 3910 3950 3990
and pages B1, B6 & B7

FOUND BROS. AVIATION LIMITED,

12 Taber Road,
Rexdale, Ontario.
Telephone 613: 247-5486
President: N. K. Found
Contact: W. H. Bayley, Vice-President
Floor Area: 5,000 sq. ft.
Personnel: 35

Manufacturers of: Aircraft; Airframes; Antenna Radar Drives; Electrical Controls for Industrial Equipment; Stable Platforms; Balancing Equipment and Sheet Metal Fabrication.

1510 1560 5985 6635

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 exchangers; Pressure Vessels and Custom-built heavy Machinery.

3615 3695 4420 8120

G.M. PLASTIC CORPORATION,
630 Dorchester Street,
Montreal, Quebec.
Telephone 514: 866-5757
President: B. Koken
Contact: J. Bonnett, Vice-President, Sales
Floor Area: 70,000 sq. ft.
Personnel: 145

Manufacturers of: Extruded thermoplastic sheet; Vacuum formed products; Moulded and fabricated foam parts and fabricated reinforced fiberglass plastic components including plastic tote boxes and bins.

1560 3990 8115 8140 9330

GALION MANUFACTURING OF CANADA LTD.,
39 Burwell Road,
St. Thomas, Ontario.
Telephone 519: 631-7080
President: R. D. Macdonald
Contact: J. H. Rourke—Vice President
Floor Area: 72,000 sq. ft.
Personnel: 64

Manufacturers of: Motor Graders, Road Rollers, Mobile Cranes.

3805 3810 3895

GARDNER-DENVER CO. (CANADA) LTD.,
14 Curity Avenue,
Toronto 16, Ontario.
Telephone—Ottawa: 613: 828-5123;
Toronto: 416: 751-2040
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

GARRETT MANUFACTURING LIMITED,
19 Atwell Drive,
Rexdale, Ontario.
Telephone 416: 677-1410
Vice-President: W. C. Tate
Contact: J. L. Gardner, Sales Manager
Floor Area: 60,000 sq. ft.
Personnel: 275

Manufacturers of: Aircraft Temperature Control Systems; Magnetic Amplifiers; Static Power Supplies; Current and Voltage Regulators; Servo Amplifiers; Aircraft Instrument Test Sets; Radio Emergency Beacons; Temperature Control Test Sets; Repair and Overhaul Facilities.

1420 1430 1650 1660 2010 2030
4120 4920 5821 5945 5950 5975
6110 6130 6605 6625 6685
and pages B1 & B3

GEARMATIC CO. LTD.,
7400-132nd Street,
North Surrey, B.C.
Telephone 604: 596-6255
Executive Vice President: John B. Morfitt
Contact: W. Bonar, Sales Manager
Floor Area: 45,000 sq. ft.
Personnel: 150

Manufacturers of: Industrial transmissions; Tractor winches; Hydraulic Winches and Hydraulic gear-head motors.

2520 2590 3010 3830 3950 4320

GENAIRE (1961) LIMITED,
P.O. Box 84,
St. Catharines, Ontario.
Telephone 416: 684-1165
President: H. B. Picken
Contact: G. R. Wooll, Managing Director
Floor Area: 60,540 sq. ft.
Personnel: 100

Manufacturers of: Aircraft Skis, Aircraft Cargo Pallets; Repair and Overhaul facilities for aircraft and aircraft components.

1630 1670 and page B3

GENERAL DIE & MACHINE COMPANY LTD.,
Major Street,
Welland, Ontario.
Telephone 416: 734-7455
Vice-President and Manager: Carl Painter Jr.
Contact: James Gardner—Plant Engineer
Floor Area: 20,000 sq. ft.
Personnel: 68

Manufacturers of: Drop and Upset Forgings up to 100 lbs. in steel (alloy, carbon, stainless) copper and brass for Agricultural, Mining, Automotive, Marine, Plumbing, Pole Line Hardware and General Engineering.

5975 and page B7

GENERAL IMPACT EXTRUSIONS (MANUFACTURING) LTD.,
191 Evans Avenue,
P.O. Box 220, Station "U",
Toronto 18, Ontario.
Telephone 416: 255-8194
Cable: GENIMPEX
President: M. M. Koerner
Contact: Otto E. Rieder, Vice-President and General Manager
Floor Area: 75,000 sq. ft.
Personnel: 300

Manufacturers of: Aluminium 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 8140 and pages B7 & I-220

GENERAL PHOTOGRAMMETRIC SERVICES LTD.,
40 Bentley Avenue,
Ottawa 12, Ontario.
Telephone 613: 825-1874
Vice President: W. H. Morton
Contact: R. M. Meyer, Assistant General Manager
Floor Area: 5600 sq. ft.
Personnel: 48

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.

Page B2

GENERAL PLASTICS COMPANY LIMITED,
77 York Street,
Toronto 1, Ontario.
Telephone 416: 364-6157
President: H. A. J. Cumming
Contact: A. Rickerby, Vice-President, Sales
Floor Area: 90,000 sq. ft.
Personnel: 120

Manufacturers of: Melamine tableware, injection moulding and plastic tableware.

7350

GENERAL PRECISION INDUSTRIES LTD.,
455 Craig Street West,
Montreal, Quebec.
Telephone 514: 866-8395
President: T. Toczvlowski
Contact: J. C. Carter, Manager, Contracts Administration
Floor Area: 25,000 sq. ft.
Personnel: 145

Manufacturers of: Shipboard and Shore-based H/F and UHF Direction Finding Equipment.

5820 5821 5825 5895 5950

GENERAL WIRE & CABLE CO. LTD.,
609 William Street,
Cobourg, Ontario.
Telephone 416: 372-5491
President: K. Fabricius
Floor Area: 200,000 sq. ft.
Personnel: 500

Manufacturers of: Coaxial cable, Electrical Cables and Wire, Plastic coated chain link fencing—Speedometer cables, Plastic Sheeting.

4010 5650 6145 6680

GENERAL TIME CANADA LIMITED, (Westclox Division),
P.O. Box 239,
Peterborough, Ontario.
Telephone 705: 742-4231
Vice-President and General Manager: F. R. Pope
Contact: R. I. Elliott, General Superintendent
Floor Area: 142,000 sq. ft.
Personnel: 600

Manufacturers of: Clocks—Spring, electric and battery operated; Watches—non jewelled, pocket; Ammunition components and fuse mechanisms.

1390

GEO-MET REACTORS,
P.O. Box 106,
Gloucester, Ontario.
Telephone 613: 822-1266
Cable: GEOMET
President: Dr. W. A. Morgan
Contact: S. J. Pettigrew, General Manager
Floor Area: 11,000 sq. ft.
Personnel: 45

Manufacturers of: Ferroalloys; Pure metals.

9630 and page B1

GLOBELITE BATTERIES LIMITED,
1717 Wellington Avenue,
Winnipeg 21, Manitoba.
Telephone 204: 774-4571
Telex: 03-5344
Cable: GLOBELITE
President and General Manager: P. Cuddy
Contact: D. G. Bryan, Vice-President, Marketing
Floor Area: 80,000 sq. ft.
Personnel: 120

Manufacturers of: Lead Acid Storage Batteries for Automotive, Transportation, Signal, Switchgear and Power Control, Communications, Emergency Lighting, Electric Light Plants.

6140

GODFREY ENGINEERING COMPANY LTD.,
480 Montreal-Toronto Blvd.,
Lachine, Montreal, P.Q.
Telephone 514: 637-1122
Cable: GODFREPART
President: E. D. Cornell
Contact: D. M. Howard, Contracts Manager
Floor Area: 20,000 sq. ft.
Personnel: 70

Manufacturers of: Aircraft airconditioning equipment, including cabin superchargers and cooling turbines and related system components; Hydraulic restrictor valves; Self-priming centrifugal pumps; Pneumatic and hydraulic ground servicing equipment; Sintered Metal Parts; Repair and Overhaul facility for above allied equipment.

1630 1650 1660 1680 1730 4120 4320 4450 4920 and pages B3 & B7

B. F. GOODRICH CANADA LIMITED,
Kitchener, Ontario.
Telephone 519: 742-3641
President: R. V. Yohe
Contact: E. D. Gunn, General Manager, 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 B1

THE GOODYEAR TIRE AND RUBBER COMPANY OF CANADA, LIMITED,
3050 Lake Shore Blvd. West,
Toronto 14, Ontario.
Telephone 416: 251-4111
President and General Manager: L. E. Spencer
Contact: W. E. Ecclestone, Vice-President i/c Sales
Personnel: 4,000 to 5,000.

Manufacturers of: Tires and Tubes—Solid and Pneumatic—non-aircraft; Tires and Tubes, Aircraft; Transmission Belting; Hose Rubber all types; Matting; Tank Lining; Rubber Dunnage Bags Inflatable; Moulded Shapes; Packing and Gaskets and Materials; Rubber Shoe Products; Conveyor Belting; V-Belts; Packing; Tanks Rubber Collapsible; Pipe Lining; Extruded Shapes; Bogie Wheels, Tracked Vehicle; Tracked Vehicle Bogie Wheels; Adhesives, Flexible Waterproof.

2530 2610 2620 2630 2640 3030 3990 4240 4710 4720 5330 5430 8040 9320

GO-TRACT LIMITED,
(Subsidiary of Rolls-Royce of Canada Limited),
St. Dominique, (Co. Soulanges), P.Q.
Telephone 514: 636-1061
Vice President and General Manager: P. M. Howard
Contact: M. A. Cariglia—Works Manager
Floor Area: 34,000 sq. ft.
Personnel: 50

Manufacturers of: General Purpose Vehicles for transporting men, materials and machinery over all types of terrain—muskeg, mud, snow, etc.

2410 2430

GRANBY ELASTIC & TEXTILES LTD.,
100 Denison Avenue,
Granby, Quebec.
Telephone 514: 372-5426
President: P. H. Biovin
Contact: C. W. Philbin, Sales Manager
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 and nylon.

8305

GREENING INDUSTRIES LIMITED,
55 Queen Street North, P.O. Box 430,
Hamilton, Ontario.
Telephone 416: 528-5971
President: H. H. Stromberg
Contact: S. O. Greening, Export Manager
Floor Area: 300,000 sq. ft.
Personnel: 400

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 and wire screens. Netting and wire guards. Wire boxes.

3940 4010 5335 8115 9505 9525 9535

GUELPH ELASTIC HOSIERY COMPANY LTD.,

77 Waterloo Avenue,
P.O. Box 339,
Guelph, Ontario.
Telephone 519: 824-0020
President: H. E. Kent
Contact: R. D. Glendenning
Floor Area: 18,000 sq. ft.
Personnel: 51

Manufacturers of: Non-inflatable Life Jackets and Vests.

4220 8465

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: 10,000 sq. ft.
Personnel: 75

Manufacturers of: Precision electrical measuring equipment: Resistance, inductance and capacitance standards, Voltage.

5815 5820 5821 5905 5945 6625

GULTON INDUSTRIES (CANADA) LTD.,

P.O. Box 1150,
Herbert Street,
Gananoque, Ontario.
Telephone 613: 382-2141
General Manager: D. R. Best
Floor Area: 10,000 sq. ft.
Personnel: 30

Manufacturers of: Hydrophone systems—sonar; Piezoelectric ceramic elements and transducers.

5845 5955

HALIFAX SHIPYARDS,

Barrington Street,
Halifax, Nova Scotia.
Telephone 902: 423-9271
General Manager: D. Scouler, Jr.
Floor Area: 270,000 sq. ft.
Personnel: 1,500

Manufacturers of: Barges and Lighters, Cargo and special purpose; Dredges; Landing Craft; Small Craft; Cargo Vessels; Tanker Vessels; Combat Ships and Landing Vessels; Special Service Vessels; Fishing Vessels; Transport Vessels, Passenger and Troop; Pontoons and Floating Docks; Floating Dry-docks; Machining—heavy, medium, light; Repair and overhaul facilities for above-noted equipments.

1905 1910 1915 1920 1925 1930
1935 1940 1945 1950 1955 2030
2040 2050 2090 4510 7125 7195

HALL MACHINERY LIMITED,

P.O. Box 877,
Sherbrooke, Quebec.
Telephone 819: 569-3685
Telex: 018-243
Executive Vice-President and General Manager: J. G. Mitchell
Contact: H. C. Hall, Manager
Floor Area: 65,000 sq. ft.
Personnel: 80

Manufacturers of: Capstans; Hoists, wire rope; Machining, Light and Medium; Mining Machinery, Asbestos; Pressure Vessels; Sheet Metal Fabrication; Slings and Hoists, Specially Designed; Special Purpose Machinery; Trailers, low-bed; Trailers, specially designed; Winches, drum, power operated; Windlasses.

2330 3820 3950 5410 8120
and page B7

THE HAMILTON COTTON COMPANY LIMITED,

P.O. Box 397,
Hamilton, Ontario.
Telephone 416: 527-2986
Cable: NOTTOC
President: W. H. Young
Contact: G. H. Pullam, Vice-President, Sales
Floor Area: 993,000 sq. ft.
Personnel: 1,800

Manufacturers of: Cotton and synthetic rope; Cordage and twine; Cotton and Synthetic elastic and non-elastic webbing; Cotton yarns; Natural and dyed; Natural cotton woven fabrics.

4020

HAMILTON GEAR AND MACHINE COMPANY,

950 Dupont Street,
Toronto 4, Ontario.
Telephone 416: 534-8401
General Manager: P. H. Slaughter
Contact: P. R. Manktelow, Sales Manager
Floor Area: 90,000 sq. ft.
Personnel: 250

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; Hamilgear, Pin and Buffer and Oldham Types; Car Spotters; Gearmotors; Speed Increasers.

1010 1015 1020 3010 3020

HAMILTON PORCELAINS LIMITED,

25 Campbell Street,
Brantford, Ontario.
Telephone 519: 753-2615
Cable: HAMPO
President and General Manager: 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 Molds for Powdered Metallurgy; Foundry Strainer Cores; Refractory Specialties.

5355 5970 9350

HAMMOND MANUFACTURING CO. LTD.,

394 Edinburgh Road North,
Guelph, Ontario.
Telephone 519: 822-2960
Telex: 029-5623
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 5985 5999

HAND CHEMICAL INDUSTRIES LIMITED,

P.O. Box 910,
Milton, Ontario.
Telephone 416: 925-2119
President: H. T. Hand
Contact: J. B. Donaldson, Vice-President
Floor Area: 99,000 sq. ft.
Personnel: 155

Manufacturers of: Military Pyrotechnics; Store Goods Fireworks; Display Fireworks; Marine Distress Signals: Smoke Genera-

tors; Plastic Wall Tile; Plastic Housewares; Small Size Injection Moulded Items.

1370 9330

HANDY & HARMAN OF CANADA LIMITED,

141 John Street,
Toronto 2B, Ontario.
Telephone 416: 368-6171
Cable: HANSILCA
Vice-President: T. H. Gallagher
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

HARD METALS (CANADA) LIMITED,

2442 South Sheridan Way,
Clarkson, Ontario.
Telephone 416: 274-2371
General Manager: O. L. Dixon
Contact: L. G. Rhude, Plant Manager
Floor Area: 35,000 sq. ft.
Personnel: 100

Manufacturers of: Mining accessories for Rock Drilling. All types and sizes of tungsten carbide rock bits, Chisel rods, pointed and chisel moils. Drill and extension rods, knock off blocks, couplings, lug chuck adapters and grinders for sharpening rock bits.

3415 3820

HARDIFOAM PRODUCTS LIMITED,

66 Fordhouse Blvd.,
Toronto 18, Ontario.
Telephone 416: 259-8451
President: J. W. Hardie
Contact: J. I. McKinney, Secretary-Treasurer
Floor Area: 52,500 sq. ft.
Personnel: 42

Manufacturers of: Polyurethane foam.

9330

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 B7

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

HAWKER SIDDELEY ENGINEERING,
(Division of Hawker Siddeley Canada Ltd.),

P.O. Box 6001,
Toronto International Airport,
Ontario.
Telephone 416: 677-3250
Vice President: C. A. Grinyer
Contact: C. Johnson, Contracts Manager
Personnel: 350

Design and development of Gas Turbine Engines, Special Purpose Vehicles, Atomic Products, Missile Launchers and Miscellaneous Products ranging from reinforced plastics to ferrous and non-ferrous metals. Engineering consulting, Program Management and Data Computing services: Technical services including sound surveys, Chemical and Metallurgical analysis, Welding consulting, repairs to instruments and components.

Pages B1, B4

HAWKER SIDDELEY CANADA LTD.,
(Transportation Equipment Division),

P.O. Box 160,
Montreal, Quebec.
Telephone 514: 489-3461
Vice-President: W. B. Boggs

Contact: L. G. Main, Sales Manager, Rail Car Products
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; Ammunition projectiles to 105 mm; Buoys, Steel: Pressure Vessels.

1310 1315 2010 2040 2050 2220 2230 2240 2250 3820 3950 8120 9510 and page B7

HAYES MANUFACTURING CO. LTD.,

Box 818,
Vancouver, British Columbia.
Telephone 604: 874-3441
General Manager: A. M. Patmore
Floor Area: 60,000 sq. ft.
Personnel: 170

Manufacturers of: Custom built, heavy-duty, on and off-highway trucks and truck tractors; Special heavy-duty trailers; Trucks, crane carrying; Water tankers; Trailers, van; Heavy duty winches and yarders with diesel, gas or electric power.

2320 2330 3950

HAYES STEEL PRODUCTS LIMITED,

Thorold, Ontario.
Telephone 416: 227-3751
President: G. B. Mitchell
Contact: P. Capps, Marketing Manager
Floor Area: 250,000 sq. ft.
Personnel: 700

Manufacturers of: Universal Joints and complete Drive-Shaft Assemblies; Rear Axles, Transmissions, Power-Take-Offs, Clutches and Locking Differentials.

2520 3010 5975

HEATEX LIMITED,

780 St. Remi Street,
Montreal, Quebec.
Telephone 514: 937-9521
President: D. Sprague
Contact: A. R. McLeod, Vice-President and General Manager
Floor Area: 70,000 sq. ft.
Personnel: 210

Manufacturers of: Radiators and cores for cars, trucks, stationary engines and locomotives; Repair and Overhaul facility for aircraft heat exchangers.

2930 2935

HEROUX MACHINE PARTS LIMITED,

340 Thurber Street,
Longueuil, P.Q.
Telephone 514: 679-5450
President: Jesse Turner
Contact: Rene Nolet, Vice President and General Manager
Floor Area: 100,000 sq. ft.
Personnel: 450

Manufacturers of: Hydraulic components and assemblies, aircraft and commercial extruded hinges; spars and ribs; gears; splines; tools, jigs and fixtures; precision machining; plating facilities including electro-plating and anodizing. Repair and overhaul of all hydraulic components.

1560 1650 1710 1720 3465 4730 and page B7

THE HOLDEN MANUFACTURING COMPANY LIMITED,

P.O. Box 607,
Hull, Quebec.
Telephone 819: 777-3832
Assistant General Manager: W. Borland
Floor Area: 70,000 sq. ft.
Personnel: 245

Manufacturers of: Tents; Sleeping Bags; Clothing; Canvas Products.

1005 1010 1015 1020 1025 1030 1035 1045 1055 1080 1290 1340 1450 1670 1730 6920 7830 8340 8345 8405 8415 8460 8465

HOLMES FOUNDRY LIMITED,

200 Exmouth Street,
Sarnia, Ontario.
Telephone 519: 337-3721
Vice-President: C. J. Koehler
Contact: A. L. Saunders, General Sales Manager, Toronto Sales Office, 150 Eglinton Avenue East.

Manufacturers of: Industrial pipe insulation; Industrial block insulation; Glass fibre industrial insulation felts and metal mesh covered felts and blankets; Glass fibre residential insulation; Metal pan acoustical ceiling panels and foundry products including motor blocks, etc.

5640

THE HOOVER COMPANY LIMITED,

P.O. Box 128, Postal Station B.,
Hamilton, Ontario.
Telephone 416: 545-1151
Vice-President and General Manager: W. A. Munz
Contact: R. W. Bradley, Sales Manager, Commercial Die Cast Division,
Floor Area: 126,348 sq. ft.
Personnel: 324

Manufacturers of: Dynamotors; Inverters rotary; Blowers and fans; Aluminum alloy die casting; Floor polishers domestic; Vacuum cleaners domestic; Plastic moulded and extruded parts; Steam irons.

9330 and page B6

FRANK W. HORNER LIMITED,

P.O. Box 959,
Montreal 3, Quebec.
Telephone 514: 731-3931
President: H. R. Horner
Contact: J. N. Best, Operations Manager
Floor Area: 160,000 sq. ft.
Personnel: 286

Manufacturers of: Pharmaceutical Specialties.

6505

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, Standpipes, Storage Tanks (Oil and Water), process tanks, Horton-spheres, Vapor-spheres, Surge Tanks, Evaporators, Barking Drums, Bark Presses, Penstocks, Crystallizers and all heavy steel plate fabrication.

3210 3695 4440 5430 5445

HOUSTON SCHMIDT LIMITED,

1450 O'Connor Drive,
Toronto 16, Ontario.
Telephone 416: 755-3380
President: D. N. Kendall
Contact: K. D. Fraser, Executive Vice-President
Floor Area: 7,500 sq. ft.
Personnel: 16

Manufacturers of: Film processing equipment, Sheet and strip film processors. Paper coating, drying and handling and kindred products. Research and development allied fields, Repair and overhaul capabilities.

6740

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, Instanter, 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

HUSSMAN 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 entrance equipment; Load centres; Panelboards; Switchboards; Molded case circuit breakers; Multi-outlet assemblies.

5920 5925 5930 5935 5940 5975 6110 6150

I-T-E CIRCUIT BREAKER (CANADA) LTD.,
(Eastern Power Devices Division)
2401 Dixie Road,
Port Credit, Ontario.
Telephone 416: 279-1520
Vice-President Marketing: W. E. Rhodes
Floor Area: 125,000 sq. ft.
Personnel: 350

Manufacturers of: Power distribution equipment; 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 rectifiers, power capacitors, power connectors and accessories; Unit sub-stations; Circuit breakers.

5910 5920 5925 5930 5935 5950 5960 5975 6110 6120 6130 6150

ITT CANADA LIMITED,
101 de Louvain Street West,
Montreal, Quebec.
Telephone 514: 389-8221
Telex: 01-2206
Vice-President Marketing:
R. R. B. Hoodspith
Contact: J. S. Farrell, Mgr., Export Sales
Floor Area: 120,000 sq. ft.
Personnel: 350

Manufacturers of: Military and Commercial radio communication equipment; Aircraft guidance equipment; Ground and airborne navigational equipment and associated test equipment; Microwave and telecommunication equipment; Installation, Repair and Overhaul of Electronic Equipment; Electronic Precision Measuring Equipment Calibration services; Technical Representatives; Operation and Maintenance of Radar, Communications, and Navaid Equipment.

1430 5805 5820 5821 5825 5826 5840 5841 5895 5915 5950 5975 6310 6320 6330 6920 7610 and page B2

ITT CANNON ELECTRIC CANADA LTD.,
160 Bartley Drive,
Toronto 16, Ontario.
Telephone 416: 751-5440
Vice-President and General Manager:
W. A. Bradley
Contact: R. C. Enright, Sales Manager
Floor Area: 22,500 sq. ft.
Personnel: 150

Manufacturers of: All types of military and commercial electrical connectors, plugs and receptacles.

5935

IMPERIAL EASTMAN CORP. (CANADA) LIMITED,
75 Dyment Road,
Barrie, Ontario.
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 INDUSTRIES LIMITED,
9861 Park George Boulevard,
Montreal North 39, Quebec.
Telephone 514: 321-5420
President: S. Pearl
Floor Area: 50,000 sq. ft.
Personnel: 125

Manufacturers of: Sleeping bags; Comforters; Pillows; Life jackets (non-inflatable); Boat Cushions (Buoyant).

4220 8465

INDESCO LIMITED,
46 St. Clair Avenue East,
Toronto 7, Ontario.
Telephone 416: 924-9397

Contact: W. F. Chmela
Floor Area: 3,000 sq. ft.
Personnel: 200

Consulting Engineering Services in the Design and Supervision of Construction in: Airports and Facilities; Docking facilities; Mining Installations; Special Purpose Equipment, Machinery, Tooling; Communication Installations; Material Evaluation and Material Handling Equipment.

Page B1

THE INDIANA STEEL PRODUCTS CO. OF CANADA, LIMITED,

135 Hayward Avenue,
Kitchener, Ontario.
Telephone 519: 744-1161
Vice-President and General Manager: Charles D. McLeish
Floor Area: 35,000 sq. ft.
Personnel: 100

Manufacturers of: Alnico Permanent Magnets; Heat and Corrosion Resistant Alloy Steel Castings.

5999 and page B6

INDUSTRIAL FINE CASTINGS LIMITED,

272 Geary Avenue,
Toronto 4, Ontario.
Telephone 416: 533-7917
Manager: R. A. Elderkin
Contact: H. E. Harrison, Sales Manager
Floor Area: 7,000 sq. ft.
Personnel: 30

Manufacturers of: Precision castings in aluminum, bronze, stainless steel and stellite by Lost Wax Method.

Page B6

INDUSTRIAL MACHINING LIMITED,

3650 St. Joseph Boulevard East,
Montreal 36, Quebec.
Telephone 514: 255-2873
President: Jacques Janin
Contact: P. J. Malone, Production Manager
Floor Area: 156,000 sq. ft.
Personnel: 80

Manufacturers of: Machinery and Mechanical Equipment; Large Ammunition Components; Ships' Propeller Shafts—up to 40 feet; Machine Shop Facilities; Repair and Overhaul Facilities.

1310 1315 1320 1325 1330 1340 1395 2010 2090 5306 5307 5310 7125

INGERSOLL MACHINE & TOOL CO. LTD.,

King Street West,
Ingersoll, Ontario.
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 Machinery.

1310 1315 1340 2530 and page B7

INGLEDOW KIDD & ASSOCIATES LTD.,

1112 West Pender Street,
Vancouver 1, B.C.
Telephone 604: 683-2411
President: Dr. T. Ingledow
Floor Area: 10,147 sq. ft.
Personnel: 100

Consulting Engineering Services in the fields of: Economic and Planning Studies; Civil and Structural Engineering; Mechanical Engineering; Electrical Engineering; Aerial Engineering.

Page B1

INTERNATIONAL BUSINESS MACHINES COMPANY LIMITED,

Head Office,
150 Laurier Avenue West,
Ottawa, Ontario.
Telephone 613: 236-0271
Contact: J. D. Bailey

Manufacturing Facility
844 Don Mills Road,
Don Mills, Ontario.
Telephone 416: 444-2511
Floor Area: 406,000 sq. ft.
Personnel: 4,500

Manufacturers of: Command and control equipment, computer control of machine tools, control systems, core memory array units, data analysis controls, data handling equipment, data processing equipment, data reduction, digital computers, digital converters, digital display indicators, digital—to-analogue converters, electronic computers, electronic consoles, information display systems, industrial process systems. Services: Computer programming, electronic data processing services, systems design and analysis; defence systems management, management information systems.

1220 1230 5821 5825 5840 5841 5845 5895 6605 7440 and pages B1 & B4

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. Gen. 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 B6

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED,
55 Yonge Street,
Toronto 1, Ontario.
Telephone 416: 362-6311
Executive Vice-President: J. C. Parlee
Contact: K. H. J. Clarke
Personnel: 21,000

Manufacturers of: Nickel Cathodes, Shot, Ingots, Oxides, Oxide Sinter and Salts; Copper, Cobalt, Sulphur, Iron Ore, Gold, Silver, Tellurium, Selenium.

6810 9530 9545

INTERTEL CONSULTANTS LIMITED,
298 Elgin Street,
Ottawa 4, Ontario.
Telephone 613: 236-0864
Telex: 013-209
Cable: INTERTEL
President: Dr. H. J. von Baeyer
Contact: F. Gall, Vice-President
Floor Area: 3,500 sq. ft.
Personnel: 18

Manufacturers of: Telecommunications Consultants. Systems Engineering wire, radio, microwave, scatter, satellite systems, installation and testing, feasibility studies, electronic computation and analysis for communications networks, radio propagation, electromagnetic interference, sonar.

Pages B1, B2 & B4

IRVIN AIR CHUTE, LIMITED,
479 Central Avenue,
Fort Erie, Ontario.
Telephone 416: 871-6510
President: Clifford Bonn
Floor Area: 20,000 sq. ft.
Personnel: 55

Manufacturers of: Personnel parachutes; Anti "G" suits; Pressure breathing waistcoats; Emergency seat packs; Automatic parachute opening devices; Troop training parachutes; Aircraft deaccelleration parachutes; Aircraft lap and shoulder harnesses; Air stabilizers; Repair and overhaul facilities.

1670 1680 8415 8475

IRVING INDUSTRIES,
(Foothills Steel Foundry Div.)
6711 Fairmount Drive, South West,
Calgary, Alberta.
Telephone 403: 255-0125
President: D. F. Irving
Contact: V. G. Lovell, Sales Manager
Floor Area: 20,000 sq. ft.
Personnel: 80

Manufacturers of: Steel Castings of Manganese, mild alloy and Stainless steel. Also small steel forgings. Replacement parts for Tractors, Shovels, Crushers, and other construction machinery. Custom castings for Industrial and Farm machinery and mining. High pressure steel valve bodies for the oil industry.

2530 3815 3820 and page B6

JOHNSON MATTHEY & MALLORY LTD.,

110 Industry Street,
Toronto 15, Ontario.
Telephone 416: 763-5111
Cable: MATTHEY
Contact: J. E. Shirreff, President
Floor Area: 100,000 sq. ft.
Personnel: 500

Manufacturers of: Gold, Silver, Platinum and other precious metals and alloys in all forms; Silver Alloy Brazing and Soldering Materials, Electrolytic and Tantalum Capacitors; Silicon Rectifiers; Electrical Contacts. Non-ferrous Castings and Forgings.

3439 5910 5935 5960 9545 and pages B6 & B7

JOHNSON WIRE PRODUCTS LIMITED,

4747 Dagenais Street,
Montreal 30, 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 & 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 Avenue,
Montreal 11, Quebec.
Telephone 514: 387-6281
President: Philip Joly
Contact: Louis Joly, Vice-President
Floor Area: 12,000 sq. ft.
Personnel: 75

Manufacturers of: Precision Fine Pitch Gears of every description; Precision Gear Boxes for Analog Computors; Gyroscope Components; Servo Mechanism; Hydraulic Valve components; Automatic Turning of High Precision Parts by the Swiss Automatic Process; Wave Guides and V.H.F. and U.H.F. machined components.

1420 1630 1650 3010 3020 5940 5985 6615 and page B7

JOY MANUFACTURING COMPANY (CANADA) LIMITED,

Dundas & Beverly Streets,
Galt, Ontario.
Telephone 519: 623-1550
President and Gen. Manager: J. C. Alexander
Contact: D. V. Kempling, Sales Administrator, Marketing Division
Floor Area: 88,950 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 3820 3910 4120 4140 4240 4310 4450 4460 4730 4820 5130 5133 5935 5995 6150 6210

KAISER ALUMINUM COMPANY,
(Division of Kaiser Aluminum & Chemical Canada Limited),
191 Ashtonbee Road,
Scarborough, Ontario.
Telephone 416: 755-2261
Vice-President and General Manager: R. L. Knipe
Contact: J. G. Pinto, Gen. Sales Manager
Floor Area: 150,000 sq. ft.
Personnel: 200

Manufacturers of: Aluminum Alloy Extrusions, Sheet, Plate, Foil, Rod Bar and Wire, Forgings: Aluminum Building Products—Doors, Windows, Siding and Painted Coil.

5650 5670 9525 9530 9535 9540 and page B7

KAISER JEEP OF CANADA LIMITED,
2525 Central Avenue,
Windsor, Ontario.
Telephone 519: 945-1111
Vice-President and Gen. Mgr.: H. G. Munro
Floor Area: 40,000 sq. ft.
Personnel: 125

Manufacturers of: Jeep 4 wheel drive vehicles, parts and accessories.

2320 2510 2520 2530 2540

KEARNEY NATIONAL (CANADA) LTD.,
P.O. Box 670,
430 Elizabeth Street,
Guelph, Ontario.
Telephone 519: 822-3670
President and Gen. Mgr.: C. I. Cook
Floor Area: 90,000 sq. ft.
Personnel: 200

Manufacturers of: Switchgear from 7.5 kv to 735 kv; Fuse links; Cutouts; Photo electric lamp controls; Hot line tools.

5925

GEORGE KELK LIMITED,
5 Lesmill Road,
Don Mills, Ontario.
Telephone 416: 444-8464
Cable: KELLEX
President: G. F. Kelk
Contact: C. H. Draper, Sales Manager
Floor Area: 17,500 sq. ft.
Personnel: 34

Manufacturers of: A.C. Line Voltage Regulators 800VA to 350KVA, 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; Electro-magnetic Geophysical Ground Survey Instruments.

5820 5821 5999 6110 6130 6625 6655 6660 and page B1

KETCHUM MANUFACTURING CO. LTD.,
396 Berkley Avenue,
Ottawa 13, Ontario.
Telephone 613: 722-3451
President and Gen. Mgr.: Mrs. I. C. Percival
Contact: L. V. Davidson, Plant Superintendent
Floor Area: 18,000 sq. ft.
Personnel: 52

Manufacturers of: Metal tags and seals, personnel tags, branding and tattoo equipment, metal hand stamps, pole tag insignia, embossed metal signs, custom diework, custom machining.

3456 5110 8455 9905 and page B7

KINGSTON SHIPYARDS,
P.O. Box 940,
Kingston, Ontario.
Telephone 613: 542-4916
President: R. Lowry
Contact: R. W. Sutton, General Manager
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 B7

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

KLOCKNER-MOELLER CANADA LTD.,
615 Main Street,
P.O. Box 427,
Granby, Quebec.
Telephone 514: 378-3954
Vice-Pres. and Gen. Mgr.: W. B. Peterkin
Floor Area: 56,000 sq. ft.
Personnel: 160

Manufacturers of: Motor control centres; Contactors; Cam switches.

6110

KRALINATOR FILTERS LIMITED,
Montrose Street,
Preston, Ontario.
Telephone 519: 653-3263
President and Gen. Manager: C. N. Fouse
Contact: W. G. Fouse, Field Sales Manager
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 & 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

L. KRUSHEL & SONS,
Box 938,
Morden, Manitoba.
Telephone 204: 822-4778
Contact: L. Krushel, General Manager
Floor Area: 3,500 sq. ft.
Personnel: 25

Manufacturers of: Arc welders; Air compressor units.

3431

LASALLE ENGINEERING LIMITED,
1140 Wellington Street,
Montreal, Quebec.
Telephone 514: 933-4271
President: A. J. Lynch
Floor Area: 32,000 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 3456 5110 and page B7

LEIGH INSTRUMENTS LIMITED,
P.O. Box 820,
Carleton Place, Ontario.
Telephone 613: 257-3883
President and Gen. Mgr.: J. J. Shepherd
Floor Area: 30,000 sq. ft.
Personnel: 125

Designer and Manufacturer of: Flight Data Recorder/Crash Position Indicator Airfoil Deployment Systems; Servo Repeater Amplifiers; Servoed Altitude Indicators; True Airspeed Adaptors; Master Heading Controls, Track Position Indicators.

3020 5825 5826 5835 5895 6110 6605 6610 6615 6695 and pages I-36, I-38, I-58, I-60 & I-64

ERNST LEITZ CANADA LIMITED,
122 Ellen Street,
Midland, Ontario.
Telephone 705: 526-5401
Cable: ELCAN
President: Guenther R. W. Leitz
Contact: W. G. Kluck, Manager
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.

1240 1290 5850 5855 5860 6650 6710 6720 6760 and pages I-130, I-174, I-176 & I-179

LENKURT ELECTRIC CO. OF CANADA LIMITED,
7018 Lougheed Highway,
Burnaby 2, B.C.
Telephone 604: 298-2464
President and Gen. Manager: C. W. Hunter
Contact: R. A. Marsh, Sales Engineer Mgr.
Floor Area: 126,000 sq. ft.
Personnel: 625

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 5821 5825 5826 5835 5840 5841 5895 5915 5935 5950 5975 5985 5995 5999 6110 6130 and pages B1 & B2

LICON,
(Division of Canada Illinois Tools, Limited),
67 Scarsdale Road,
Don Mills, Ontario.
Telephone 416: 447-7251
Vice-President: F. Ballentine
Contact: E. Kernohan
Floor Area: 2,000 sq. ft.
Personnel: 9

Manufacturers of: Sensitive Miniature and Sub-Miniature Snap Action Switches.

5930

LIGHT ALLOYS,
(Division of Haley Industries Ltd.),
Haley, Ontario.
Telephone 613: 432-4875
President: Jesse Turner
Contact: I. H. Rutherford, General Manager
Floor Area: 77,000 sq. ft.
Personnel: 180

Manufacturers of: Precision magnesium and aluminum castings in sand, permanent mould or plaster castings.

Page B6

LIGHTNING FASTENER CO. LIMITED,
50 Niagara Street,
St. Catharines, Ontario.
Telephone 416: 685-7321
Vice-President and General Manager: D. S. P. Conner
Contact: T. F. O'Donnell, Merchandising and Market Research Manager
Floor Area: 100,000 sq. ft.
Personnel: 500

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 page B6

LINCOLN ELECTRIC CO. OF CANADA, LIMITED,

179 Wicksteed Avenue,
Leaside, Toronto 17, Ontario.
Telephone 416: 421-2600
Contact: M. N. Vuchnich, President
Floor Area: 100,000 sq. ft.
Personnel: 150

Manufacturers of: Welding equipment—electrodes and welders; Electric motors.

3431

LIQUIDOMETER OF CANADA LTD.,

1740 Cote Vertu,
Montreal 9, Quebec.
Telephone 514: 744-2314
President: C. A. deGiers
Contact: A. Kivissoo, Manager
Floor Area: 8,000 sq. ft.
Personnel: 6

Manufacturers of: Aircraft Type Liquid Level Gauges; Position Indicators and Transmitters; Industrial Type Liquid Level Gauges; Railroad Type Thermometers and Temperature Recorders and Control Units.

6680 6685

LITTON SYSTEMS (CANADA) LIMITED,

25 Cityview Drive, Rexdale,
Toronto, Ontario.
Telephone 416: 249-1231
President and General Manager:
J. M. Bridgman,
Contact: S. L. H. Wilson, Director of Marketing and Customer Relations
Floor Area: 200,000 sq. ft.
Personnel: 2,500

Manufacturers of: Airborne inertial guidance navigation systems; Air data computers; Electronic altimeters; Gyroscopes; Accelerometers, Electronic ground support equipment; Precision Electronic and electro-mechanical control equipment; Servomechanisms; Instrumentation for aviation, scientific and industrial applications; A.S.W. equipment; Intervalometers; Ultraclean assembly facilities (Class IV); Repair and overhaul facilities.

1420 5810 5825 5826 5841 5995 6110 6130 6605 6610 6615 6625 and pages I-30, I-72 & I-76

LOCWELD & FORGE PRODUCTS LIMITED,

1545 Cabot Street,
Montreal, P.Q.
Telephone 514: 766-2301
President: Morris Fast
Contact: A. Yager.
Floor Area: 35,000 sq. ft.
Personnel: 160

Manufacturers of: Work benches, steel; Machine bolts; Tote Boxes, Aluminum Boxes; Metal Boxes; Fire Escapes; Metal Ladders; Steel Platforms; Light Steel Structures; Towers, Transmission Line.

5140 5440 5445 5450 and page B2

LOCKWOOD SURVEY CORPORATION LIMITED,

1450 O'Connor Drive,
Toronto 16, Ontario.
Telephone 416: 755-1141
President: D. N. Kendall
Floor Area: 60,000 sq. ft.
Personnel: 250

This company provides the following services: Aerial and ground surveys and mapping; including Airborne Profile Recording, "Orthophotography", terrain analysis, airborne geophysics, natural resources surveys and cartography.

6655 6910 7640 and page B5

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

LUCAS-ROTAX LIMITED,

5595 Royalmount Avenue,
Montreal 9, Quebec.
Telephone 514: 735-1536
Cable: ROTAXCAN
Contact: H. S. James-Smith, Contracts Administrator
Floor Area: 50,000 sq. ft.
Personnel: 200

Manufacturers of: Hydraulic Systems, Control Systems, Hydraulic Actuators; Fuel Systems including Fuel Pumps, Flow Dividers, Fuel Nozzles, Pintles, Control Valves and Fluid Controls. Designers and Developers of Hydraulic Systems, Components and High Pressure Pumps.

2010 4410 and page B1

LUNENBURG FOUNDRY & ENGINEERING LIMITED,

16 Brook Street,
Lunenburg, Nova Scotia.
Telephone 902: 634-8827
President and Managing Director:
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 3000 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 4520

LYNN MACLEOD METALLURGY LIMITED,

Thetford Mines, Quebec.
Telephone 418: 335-9186
President: O. H. Seveigny
Floor Area: 70,000 sq. ft.
Personnel: 125

Manufacturers of: Castings: Carbon Steel, Manganese Steel, Low alloy Steel, "SAR" Steel (Abrasion Resisting), "NI-HARD" (Alloy Iron).

Page B6

MAGLINE OF CANADA LIMITED,
P.O. Box 219,
Renfrew, Ontario.
Telephone 613: 432-3253
Vice-President and General Manager: D. A. Tetu
Floor Area: 7200 sq. ft.
Personnel: 15

Manufacturers of: Magnesium and Aluminum 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.

1730 3920 3990 4210 5410 5440 5670 5805 8340 8465

MALLINCKRODT CHEMICAL WORKS LIMITED,
600 Delmar Avenue,
Point Claire, Quebec.
Telephone 514: 695-1220
Cable: MALLCHEM
President: D. S. Calder
Contact: J. G. Holland
Floor Area: 36,000 sq. ft.
Personnel: 40

Manufactures and distributes Chemicals and solutions.

6505 6750

MALLORY BATTERY COMPANY OF CANADA LIMITED,
2333 North Sheridan Way,
Sheridan Park, Ontario.
Telephone 416: 274-2361
President: John D. Buchanan
Contact: K. R. Brands, Vice President and General Manager
Floor Area: 40,000 sq. ft.
Personnel: 160

Manufacturers of: Dry Batteries—Mercury and Manganese Alkaline.

6135

MANITOBA BRIDGE & ENGINEERING WORKS,
(Division of Dominion Bridge Co., Ltd.),
845 Logan Avenue,
P.O. Box 578,
Winnipeg, Manitoba.
Telephone 204: 774-5441
Contact: J. S. Campbell, General Manager
Floor Area: 200,000 sq. ft.
Personnel: 200

Manufacturers of: Castings; Steel tanks; Grain elevator machinery; Mining machinery; Architectural steel work.

5975

MANSFIELD-DENMAN GENERAL LIMITED,
Industrial Products Division,
Welland, Ontario.
Telephone 416: 735-5681
Telex: 021-526
President: A. A. Carse
Contact: L. F. DeSantis, Assistant General Sales Manager
Floor Area: 225,000 sq. ft.
Personnel: 425

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.

1325 1330 1345 1350 1355 1390 1395 6135 6140 9320 9330

MANSONVILLE PLASTICS LTD.,
Mansonville, Quebec.
Telephone 514: 292-5858
President and General Manager: A. Korman Jr.
Contact: C. Jersey, Sales Manager
Floor Area: 30,000 sq. ft.
Personnel: 23

Manufacturers of: Expanded polystyrene bead board; Rigid urethane foam; Flexible foam and Roof-decking insulation.

5640

MAPLE LEAF PLASTICS LIMITED,
375 Danforth Road,
Scarborough,
Toronto, Ontario.
Telephone 416: 698-2545
President: J. B. Goldhar
Contact: J. L. Dean, Sales Manager
Floor Area: 58,000 sq. ft.
Personnel: 175

Manufacturers of: Melmac dinnerware, moulds, thermo-setting resins both compression and transfer—presses up to 400 tons capacity, all thermo-plastic materials —Automatic and semi-automatic injection presses to 50 ozs. capacity; Blow moulding and extrusion equipment.

7350

MARINE INDUSTRIES LIMITED,
Sorel, Quebec.
Telephone 514: 743-3351
President: A. L. Simard
Contact: J. Boucher, Eng. Sales Division
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 B7

MARQUETTE EQUIPMENT CANADA LIMITED,

296 Rexdale Blvd.,
Rexdale, Ontario.
Telephone 416: 247-7491
Contact: C. W. Kirkpatrick, Executive Vice-President and General Manager
Floor Area: 27,000 sq. ft.
Personnel: 70

Manufacturers of: Electric welding equipment.

3431

MARSLAND ENGINEERING LIMITED,

350 Weber Street North,
Waterloo, Ontario.
Telephone 519: 744-3321
Telex: 029-5440
Contact: L. H. Marsland, Vice-President, Engineering.
Floor Area: 200,000 sq. ft.
Personnel: 520

Manufacturers of: Permanent Magnet Loudspeakers and Speaker Systems; Wire Wound Resistors; Glass Piston Trimmers; Hermetically Sealed Relays (miniature and sub miniature); "Ledex" Rotary Solenoids; Gas Meter Registers; Solenoids; Battery Chargers; Stereo and Monaural Audio Amplifiers; 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; Valves; Hose Fittings; Pipe Wrenches; Threading Tools; Sheave Blocks; Vises.

1220 3020 3940 4730 5120 5805
5820 5821 5825 5826 5830 5831
5835 5840 5845 5905 5910 5945
5965 5985 5995 5999 6110 6130
6605 6625 6665 6910 6930 6940
7440 and pages B4 & B7

MASTER MECHANICAL DESIGN & MFG. LIMITED,

139 Wendell Avenue, Weston,
Toronto, Ontario.
Telephone 416: 241-8534
Executive Vice President: R. C. Brown
Contact: A. T. Fell, Chief Engineer
Floor Area: 30,000 sq. ft.
Personnel: 100

Manufacturers of: Special Machine tools—high and low production; Machine tool rebuild; Design and manufacture aircraft and automotive assembly jigs and fixtures; Aircraft precision machined parts; Progressive dies and tooling; Prototype, development—design and build, welded fabrications in steel, stainless steel and aluminum.

3456 3465 3695

MATTHEW MOODY DIVISION,
(Canadian Bowl-Mor Company Ltd.),

P.O. Box 10,
Mount Royal P.O.,
Montreal 16, Quebec.
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 5440 7125
7320 7330

MEASUREMENT ENGINEERING LTD.,

232 John Street,
Arnprior, Ontario.
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

MERCK, SHARP & DOHME OF CANADA LIMITED,
560 De Courcelle Street,
Montreal, Quebec.
Telephone 514: 933-7371
President: D. H. Crombe
Contact: J. N. Clark
Floor Area: 98,000 sq. ft.
Personnel: 300

Manufacturers of: Pharmaceutical products.

6505

METALITE CO. LTD.,
527 St. Laurent Street,
P.O. Box 307,
Cap de la Madeleine, P.Q.
Telephone 819: 374-2313
Manager: Paul Cadrin
Floor Area: 17,000 sq. ft.
Personnel: 40.

Manufacturers of: Metal Stampings; Metal drawing and forming; Toboggans; Hand Shovels; Lawn furniture; Kitchenware; Hardware; Aluminware; Small arms ammunition components.

1305 3456 3920 5306 5310 5340 7360 8140 and page B7

MICROWAVE DEVICES, INC.,
6120 Metropolitan Blvd. East,
Montreal, Quebec.
Telephone 514: 254-2711
General Manager: 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

MILLER WELDERS CANADA LIMITED,
8451 Parkway Blvd.,
Montreal 5, Quebec.
Telephone 514: 352-2210
Contact: A. C. Mulder, President
Floor Area: 25,000 sq. ft.
Personnel: 53

Manufacturers of: Welding apparatus.

3431

MILLTRONICS LIMITED,
730 The Kingsway,
Peterborough, Ontario.
Telephone 705: 745-2431
Cable: MILLTRONICS
Executive Vice-President: Stewart W. Daniel
Contact: John P. Gemmell, Operations Manager
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

MOLONEY ELECTRIC COMPANY OF CANADA LIMITED,
123-219 Sterling Road,
Toronto 3, Ontario.
Telephone 416: 534-9226
President: G. E. Dunfield
Contact: H. W. Crosson, Vice-President, 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

MONTEBELLO METAL LIMITED,
P.O. Box 250,
Montebello, Quebec.
Telephone 819: 423-6942
President: F. M. Giezendanner
Contact: J. P. Cody, General Sales Manager
Floor Area: 38,500 sq. ft.
Personnel: 85

Manufacturers of: Collapsible tubes and specialties in aluminum, tin, lead alloy.

Impact extrusions to maximum diameter of 3½". Maximum length of 9½" (lead, tin and aluminum).

8110

MONTREAL LOCOMOTIVE WORKS, LIMITED,

1505 Dickson Street,
Montreal 5, P.Q.
Telephone 514: 255-3681
President: H. Valle
Contact: J. S. O. Neville, Executive Assistant
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, Feedwater Heaters, Heat Exchangers; Pressure Vessels; Pulp and Paper Machinery, Steel Mill Equipment; Centrifugal Pumps; Armoured Vehicle Bodies; Heavy Steel Fabricating and Machining.

1010 1015 1020 1045 2210 2320 2815 2820 3615 3695 4320 4420 6115 6125 8120

MUIRHEAD INSTRUMENTS LIMITED,

677 Erie Street,
Stratford, Ontario.
Telephone 519: 271-3880
Telex: 029-5510
Cable: MUIRINST
Vice-President: I. H. H. Smith
Contact: M. P. Wigan, Sales Manager
Floor Area: 27,000 sq. ft.
Personnel: 150

Manufacturers of: Servo test equipment; Synchros and Servometers; D.C. Stepper Motors; Transmitters and Logic Drive Circuits; Servo amplifiers; Test bridges; Signal generators; Decade boxes and attenuators; Electrosensitive facsimile papers; Resistance bridges.

5905 5930 5950 5990 6105 6110 6625 7530

McELHANNEY SURVEYING & ENGINEERING LTD.,

1200 West Pender Street,
Vancouver, B.C.
Telephone 604: 683-8521.
President: F. H. Nash
Contact: R. A. Brocklebank, General Manager
Floor Area: 10,000 sq. ft.
Personnel: 75

This firm can provide the following services: Air Photo Interpretation, Photogrammetric Plotting and Map Production, Control Surveys, Forest Inventory and Forest Engineering, Land Use Surveys, Relief Models.

7640 and page B5

McPHAR GEOPHYSICS LIMITED,

139 Bond Avenue,
Don Mills, Ontario.
Telephone 416: 444-4451
President: D. B. Sutherland
Contact: W. A. Robinson, General Manager
Floor Area: 10,000 sq. ft.
Personnel: 70

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 and DFB Bulkheads; Stamping and Metal Fabrication for all Types.

3695 4410 4420 4520 4530 5430
5450 8120 9515 9535

NATIONAL STEEL CAR CORPORATION LIMITED,
Kenilworth Avenue North,
P.O. Box 450,
Hamilton, Ontario.
Telephone 416: 544-3311
President: A. P. Shearwood
Contact: T. F. Rahilly, Jr., Vice-President
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 B7

NEPTUNE METERS LIMITED,
3526 Lake Shore Blvd. West,
Toronto 14, Ontario.
Telephone 416: 259-4211
Cable: TRIDMETCO
President: W. O. Randall
Contact: H. C. Greer, Sales Manager
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 B6

R. H. NICHOLS COMPANY LIMITED,
4544 Dufferin Street, Toronto,
P.O. Box 500,
Downsview, Ontario.
Telephone 416: 633-8190
Cable: NICOLTROL
President and General Manager:
S. A. Turnpenny
Contact: A. M. McLeod, Vice-President
Floor Area: 25,000 sq. ft.
Personnel: 170

Manufacturers of: Remote Supervisory Control Telemetering; 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 B1 & B4

NICKLESON TOOL & DIE CO. LTD.,
1562 Windsor Avenue,
Windsor, Ontario.
Telephone 519: 256-7849
President: C. A. Nickleson
Contact: L. B. Menard, Factory Manager
Floor Area: 1300 sq. ft.
Personnel: 55

Manufacturers of: Special Machines (Design and Build); Jigs, Fixtures, Gauges; Large Dies, Blanking, Forming, Drawing; High Precision Machining of Aircraft Components.

3456 3695

NOORDUYN NORSEMAN AIRCRAFT LTD.,
P.O. Box 5,
Station "O",
St. Laurent,
Montreal 9, Quebec.
Telephone 514: 334-3210
Vice-President and General Manager:
A. Latremouille
Floor Area: 40,000 sq. ft.
Personnel: 25

Manufacturers of: Aircraft structural parts; Metal stampings; Aircraft swaged control cables; Tiedown equipment; Helicopter cargo nets.

1560 1670 1680 1730 3465

NORANDA COPPER MILLS LIMITED,

920 Derwent Way,
Annacis Island,
New Westminster, B.C.
Telephone 604: 526-3661
Cable: NORMILLS
Vice-President: F. J. E. Lockhart
Contact: J. J. Mullen, U.S. Sales Manager
Floor Area: 214,565 sq. ft.
Personnel: 790

Manufacturers of: Copper and various copper alloys in strip, rod, bar, wire, pipe and tube.

4710 9525 9530 9535

NORTHERN ELECTRIC COMPANY LIMITED,

Head Office
P.O. Box 6123,
1600 Dorchester Blvd. West,
Montreal, Quebec.
Telephone 514: 937-8541
Contact: B. W. Chave, Assistant Vice-President
Total Floor Area: 5,525,000 sq. ft.
Total Personnel: 19,251

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 5965
5985 5995 5999 6110 6130 6145
6240 6350 6625 7440 and pages B1, B2, B4 & I-104

Montreal Works

Floor Area: 1,598,000 sq. ft.
Personnel: 8,332

Manufacturers of: Communications equipment which includes manual and step-by-step switching systems. A full range of transmission systems in the telephone, telegraph and radio fields. All major assemblies are backed up by an extensive range of component manufacture, such as relays, dry reed switches, resistors, capacitors, inductors, special electron tubes, audio and radio frequency transformers, repeating coils, networks, filters, equalizers, quartz crystals, power transformers, filter chokes and ferrite magnetic materials.

London Works

Floor Area: 391,000 sq. ft.
Personnel: 1,577

Manufacturers of: Telephone apparatus including telephone sets, protectors and cable terminals; loading coils.

Toronto Works

Floor Area: 478,000 sq. ft.
Personnel: 1,948

Manufacturers of: Common control crossbar switching systems for toll, PBX and local applications.

Belleville Works

Floor Area: 249,000 sq. ft.
Personnel: 819

Manufacturers of: Radar and scatter communications equipment in the L and X Band; AM and FM transmitting equipment; Industrial video transmission systems; High quality audio and video amplifiers; Radio and Television broadcast studio consoles and switching systems; Fire alarm and traffic signalling equipment.

Advanced Devices Centre, Ottawa, Ontario.

Floor Area: 160,000 sq. ft.
Personnel: 345

Manufacturers of: Semi-conductor devices including transistors, diodes, varistors, thin film devices and integrated circuits.

Cable Division, Lachine, Quebec.

Floor Area: 981,000 sq. ft.
Personnel: 2.049

Manufacturers of: A complete line of voice and carrier 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.

NORTHERN ELECTRIC COMPANY LIMITED,

RESEARCH AND DEVELOPMENT LABS,
P.O. Box 3511, Station "C",
Highway 17 at Crystal Bay,
Ottawa, Ontario.
Telephone 613: 828-2761
Contact: J. A. Grant, Research Coordinating Manager
Floor Area: 249,000 sq. ft.
Personnel: 752

Research and Development Work in: Data transmission systems; Parametric amplifiers for tropospheric scatter and radar microwave communications; Sound recording and amplification; Video monitors, amplifiers and synchronizing generators; carrier, radio and switching systems; Solid state physics and development of transistors and silicon diodes; Molecular electronics; Radar; Cable insulation; Ferrites; Electronic components; Telephone sets and apparatus.

Pages B1 & I-96

NORTHERN RESINS LIMITED,

P.O. Box 339,
Berthierville, Quebec.
Telephone 514: 836-3781
Vice-President and General Manager: P. Poirier
Floor Area: 15,000 sq. ft.
Personnel: 25

Manufacturers of: Plastic pipe; Polyethylene, PVC, ABS and Styrene.

4710

NORTHWEST INDUSTRIES LIMITED, (Municipal Airport),

P.O. Box 517,
Edmonton, Alberta.
Telephone 403: 455-3161
Telex: 037-2681
President: C. D. Reekie
Contact: E. L. Bunnell, Vice-President, Sales and Contracts.
Floor Area: 264,758 sq. ft.
Personnel: 625

Manufacturers of: Aircraft Structural Parts, Aircraft Ground Handling Equipment, Reinforced Plastic Products, Overhaul and Modification of Aircraft, Aircraft Components, Instruments and Accessories.

1345 1350 1355 1560 1730 2050
2925 3615 4710 5430 5995 7610
9330 and pages B1 & B3

NUCLEAR ENTERPRISES LIMITED,

550 Berry Street,
Winnipeg 21, Manitoba.
Telephone 204: 774-1991
Cable: NUCLEAR
Manager: J. B. Heath
Floor Area: 14,000 sq. ft.
Personnel: 30

5990 6640 6665 6695 and page B4

Scintillator Division

Manufacturers of: Scintillation Phosphors, glasses and related liquid and gel scintillators for radiation detection and differentiation; Automatic Sample Changer Systems for internal and external beta counting; Edinburgh Series, complete range of transistorized and nucleonic instruments; Rooms, Low Level, pre-atomic age steel, 6″ thick walls; Monitors, Human Body for detection of radiation contamination. "Betalights"—Lights activated through isotopes in phosphors used as markers, instrument dials, exit signs, etc., no power or light required to activate.

Instrument Division

Manufacturers of: Electronic Instruments, printed circuits, portable and laboratory radiation instruments for nuclear research and medical uses. Detector probes for all radiation. Moisture Meter for grain and related commodities. Industrial instruments using radioisotopes for sorting and counting.

O. & W. ELECTRONICS LIMITED,

1335 Lawrence Avenue East,
P.O. Box 278,
Don Mills, Ontario.
Telephone 416: 447-6471
Telex: 02-2081
Cable: OKITOR
General Manager: J. T. Oki
Contact: A. R. Gardner, Sales Manager
Floor Area: 30,000 sq. ft.
Personnel: 170

Manufacturers of: Printed Circuit Boards 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 Encoder Discs; Flexible Circuitry, Electronic Sub-Assemblies and Assemblies.

1220 1290 1560 5340 5355 5805
5820 5821 5825 5826 5830 5831
5840 5841 5940 5970 5999 6110
6605 6910 9330 9905 and page I-128

OAK-HART MANUFACTURING (CANADA) LIMITED,

155 Edward Street,
Aurora, Ontario.
Telephone 416: 727-9058
Assistant General Manager: 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

OKANAGAN HELICOPTERS LTD.,

Vancouver Airport,
Vancouver, B.C.
Telephone 604: 278-5502
President and Managing Director: G. W. McPherson
Contact: Ian Kennedy, Secretary
Floor Area: 1,500 sq. ft.
Personnel: 150

Designers and Manufacturers of: Helicopter Gear Used for the construction of Power Lines, Microwave Systems 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 & B5

W. H. OLSEN MANUFACTURING CO. LTD.,

Louise Street at No. 2 Highway,
Tilbury, Ontario.
Telephone 519: 682-2062
President: W. H. Olsen
Contact: T. C. Lemieux, Vice-President
Floor Area: 194,500 sq. ft.
Personnel: 220

Manufacturers of: Unit Heaters; gas and oil fired furnaces; Truck Bodies; Military trailers, Weldments; Grenade and rocket components; Steel Garage Doors.

1310 1315 1320 1325 1330 1340
1355 2330 2510 4520 5670

ONTARIO RESEARCH FOUNDATION,

43 Queens Park Crescent,
Toronto 5, Ontario.
Telephone 416: 924-6201
President: W. R. Stadelman
Contact: D. R. Christie—Director of Field Services
Floor Area: 100,000 sq. ft.
Personnel: 225

A research design and development facility capable of producing custom built instrumentation particularly for R and D applications. This instrumentation is in the specialized field of uses and applications for electron beams for the study of the properties of matter and performing useful transformations of matter. Equipments designed and produced have been: Electron beam probe spectrometers; Atmospheric electron beam welders; X-ray detectors; Electron beam probes for wind tunnel diagnostics; electron beam thickness gauges; electron single-scatter density gauges and High vacuum pumping systems.

6625 6640

ONTARIO STEEL PRODUCTS COMPANY LIMITED,

7 King Street East,
Toronto 1, Ontario.
Telephone 416: 363-4317
President: O. D. Cowan
Contact: I. F. Flemming, General Sales Manager
Floor Area: 670,000 sq. ft.
Personnel: 1434

Manufacturers of: Torsion Bars; Coil Springs, Flat Springs; Automotive Bumpers; Injection Moulded Plastics.

2510 4710 5340 9330

(ORENDA DIVISION),
HAWKER SIDDELEY CANADA LTD.,

P.O. Box 6001,
Toronto International Airport,
Ontario, Canada.
Telephone 416: 677-3250
Vice-President: F. P. Mitchell
Contact: D. J. Caple, Sales and Contracts Manager
Floor Area: 800,000 sq. ft.
Personnel: 2,000

Manufacturers of: Aircraft Gas Turbine Engines; Aircraft Engine Components and Assemblies; Industrial Gas Turbines. Repair and overhaul of Gas Turbine Engines; Miscellaneous Production-Machining assembly fabrication.

2320 2835 2840 2995 6115
and pages B1 & B7

OSBORNE ELECTRIC CO. LTD.,

95 Wesley Street,
Toronto 18, Ontario.
Telephone 416: 259-7886
President and General Manager: G. Y. R. Allen
Contact: M. Longley, Sales Manager
Floor Area: 7200 sq. ft.
Personnel: 30

Manufacturer of: Telephone and Power System Protective Equipment; Transformers; Telephone, Protection, Custom or Specialty, High Voltage; Relays; Solenoids; Magnet Coils.

5945 5950

OTACO LIMITED,

West Street South,
Orillia, Ontario.
Telephone 705: 326-3583
Vice-President: G. W. Phelps
Floor Area: 370,000 sq. ft.
Personnel: 300

Manufacturers of: Sleds—personnel 1 and 3 ton, lumber 10 ton, cargo 10 and 20 ton, 10 ton equipped for personnel accommodation, mess and kitchen; Snow plows—8'-0" 12'-0" blades; Trailers—boat and package goods; Wagons—pneumatic tires, 3-8 tons capacity; Castings—ductile iron; Sheet metal fabrication; Sheet metal stampings; Tracklayers—Traction assist. devices (Jungletrac); Flow developers—ice removal and refuse clearing; Dies—drawn; Dies—piercing, blanking and forming; Jigs, fixtures and templates assembly and machining; Pumps—sump; Pumps—water supply system; Wheels—wagon (Pneumatic); Wheels trailer (Pneumatic); Wheels—wheelbarrow (Pneumatic). Machining light, medium and heavy.

2530 3456 3465 3920 4320
and pages B6 & B7

OTIS ELEVATOR COMPANY LIMITED,

414 Victoria Avenue, 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 3960
and page B7

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 Street,
LaSalle, Quebec.
Telephone 514: 366-5900
President: J. K. Crowdy
Contact: J. J. Hillen, General Sales Manager
Floor Area: 180,200 sq. ft.
Personnel: 350

Manufacturers of: Stationary and Marine steam engines; condensers, all types, water distillation equipment; filters, all types except aircraft; gas and oil burning heat treatment furnaces; gears; speed reducers; feed water heaters; pumps and pump assemblies, all types; oil, water and fuel separators; valves, powered and nonpowered; heat exchangers, Machine shop services.

2820 2910 2940 4320 4420 4810
and pages B7 & I-156

THE PEDLAR PEOPLE LIMITED,
519 Simcoe Street South,
Oshawa, Ontario.
Telephone 416: 723-4613
President: J. G. Gelkie
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 9515

PENZER PRODUCTS LIMITED,
72 Vine Street,
P.O. Box 361,
St. Catharines, Ontario.
Telephone 416: 684-8541
Contact: McDonald, General Manager
Floor Area: 20,000 sq. ft.
Personnel: 36

Manufacturers of: Electrical control equipment; Automatic engine control equipment; Electric generator control systems; Electric motor controls; Remote multi-application controls (railway signalling equipment); Distribution equipment, high voltage; Control and indicator panels, power distribution panels; Electrical breaker systems protection panels; Power switchboards; Power switchgear groups (metal clad switchgear); Wiring devices (splitter troughs, small boxes); Spare parts for aircraft energizers; Miscellaneous steel fabrication.

6110

PHILLIPS CABLES LIMITED,
King Street West,
Brockville, Ontario.
Telephone 613: 345-5666
President: T. A. Lindsay
Contact: J. E. Thomas, Vice-President
Floor Area: 569,000 sq. ft.
Personnel: 1,175

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. Batler
Contact: R. E. Wright, Manager
Telecommunications Department
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 5985 5999 6625 6645 6910
and page B1

PIONEER ELECTRIC LIMITED,
101 Rockwood Street,
Fort Garry,
Winnipeg, Manitoba.
Telephone 204: 452-7446
President and General Manager:
R. Noonan

Contact: E. G. Bennett, Sales Manager
Floor Area: 77,000 sq. ft.
Personnel: 180

Manufacturers of: Power transformers; metering transformers; sub-station equipment.

5950 6110 6120

PIONEER ELECTRIC BRANDON LIMITED,
(Special Products Division),
11th Street and Richmond Avenue,
Brandon, Manitoba.
Telephone 204: 729-1451
President: R. Noonan
Contact: J. B. Thorsteinsson, Manager
Floor Area: 20,000 sq. ft.
Personnel: 75

Manufacturers of: Patented "C.T." Current Totalizing Circuit Breakers, "Load Misers" and "Rate Saver" Demand Controls, Pioneer Trimelec Electric Heat Base-Board, Thor Electric Heat Thermostats, Li-tronic light sensitive Automatic Night Set-back Thermostats, Special switchgear, Pioneer Push Unit Suspension Heaters, Electric Charcoal Lighters.

4520 5925 6685

PIRELLI CABLES LIMITED,
P.O. Box 70,
71 Richelieu Street,
St. Johns, Quebec.
Telephone 514: 346-6831
Telex: 01-2624
Cable: PIRELCABLE
Contact: R. Graves, Sales Manager
Floor Area: 279,000 sq. ft.
Personnel: 407

Manufacturers of: Electric wire and cable.

6145 6150

PLAX CANADA LIMITED,
50 St. Clair Avenue West,
Toronto 7, Ontario.
Telephone 416: 923-5441
President: D. S. Chant
Contact: D. R. Pepall, Sales Manager
Floor Area: 240,000 sq. ft.
Personnel: 250

Manufacturers of: All types of Blown Moulded Plastic items.

8125

PLYMOUTH TOOL AND STAMPING LTD.,
54 Crockford Blvd.,
Scarborough, Ontario.
Telephone 416: 751-0440
President: F. Smith
Contact: R. J. Johnston, Sales Plant Manager
Floor Area: 11,000 sq. ft.
Personnel: 50

Manufacturers of: Carbide Lamination and Progressive Dies; Jigs and Fixtures; Precision machining; High Volume Precision 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

POLYBOTTLE LIMITED,
1925 Wilson Avenue,
Weston, Ontario.
Telephone 416: 249-2271
National Sales Manager: E. J. Finn
Contact: H. Cairns, Sales Manager

Manufacturers of: Blow Moulded Containers.

8125

POLYFIBER LIMITED,
148 Lochiel Street,
Renfrew, Ontario.
Telephone 613: 432-2231
President: D. W. Stewart
Floor Area: 44,000 sq. ft.
Personnel: 75

Manufacturers of: Custom manufacturers of fiberglass reinforced polyester and epoxy pressings and mouldings, press moulded containers, mechanical frames and other components, filament winding, corrosion resistant components, development work and design.

1560 2240 2510 2540 4710 5410
5430 5985 7125 8115 8140 8415
9330 and page B1

POLYGON SERVICES LIMITED,
(Acme Electric Division),
50 Northline Road,
Toronto 16, Ontario.
Telephone 416: 755-3301
President: E. Chester Hamlin
Contact: A. E. Shaw—Sect. and Sales Eng.
Floor Area: 25,000 sq. ft.
Personnel: 70

Manufacturers of: Transistorized Power Supplies; Unit Substations; Variable Voltage Adjustors; Voltage Reference Supply; Voltage Stabilizers; D.C. Power Supply

Battery Charger; Generators; Magnetic Power Controls; Motor Speed Controls; Phase Changers; Power Distribution Centers; Rectifier Equipment; Saturable Reactors; Sliding Core Reactors; Transformers: Dry, Rectifier, Furnace, Control and Custom Engineered.

5950 6110 6120 6130

POLYMER CORPORATION LIMITED,
Vidal Street South,
Sarnia, Ontario.
Telephone 519: 337-8251
President and Managing Director: E. R. Rowzee
Contact: J. T. Black, General Manager Sales and Distribution
Floor Area: 470 Acres
Personnel: 3,000

Manufacturers of: Synthetic Rubbers, Lattices, Plastics and Chemicals. Synthetic Rubbers: Styrene-Butadiene Copolymers (SBR); Isobutylene-Isoprene Copolymers (Butyl Rubbers); Trans-Polyisoprene (Synthetic Balata); Acrylonitrile-Butadiene Copolymers (Nitrile Rubbers); Polybutadiene. Lattices: Styrene-Butadiene Lattices; Carboxylated Styrene-Butadiene Lattices; Acrylonitrile-Butadiene Latex; Butadiene-Styrene Vinyl Pyridine Latex. Plastics: Acrylonitrile-Butadiene-Styrene (ABS) Engineering Plastics. Chemicals: Styrene Monomer Isobutylene.

6810

PORT WELLER DRY DOCKS LIMITED,
P.O. Box 296,
St. Catharines, Ontario.
Telephone 416: 934-3373
Telex: 012-536
Cable: PORTWELLERDOC
President: J. O. Leitch
Contact: J. F. Vaughan, General Manager
Floor Area: 60,000 sq. ft.
Personnel: 350

Manufacturers of: Barges and Lighters: Cargo, Special Purpose; Cargo and Tanker Vessels; Combat Ships and Landing Vessels; Dredges; Fishing Vessels; Floating Dry Docks; Pontoons and Floating Docks; Small Craft; Special Service Vessels; Transport Vessels, Passenger and Troop; Repair and Overhaul Facilities, Dry Dock 750' x 80'.

1905 1915 1920 1925 1930 1935 1955

PORTLAND TOOL AND MACHINE LTD.,
27 Bathurst Street,
Toronto 2B, Ontario.
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 and General Machining.

3456 3465 3695

POTTER & BRUMFIELD,
(Division of AMF Canada Limited),
135 Oxford Street,
Guelph, Ontario.
Telephone 519: 822-0390
Telex: 029-5622
TWX: 610-359-8907
Divisional Manager: Alan Laws
Floor Area: 20,000 sq. ft.
Personnel: 60

Manufacturers of: Electromagnetic Relays —Armature, Power, Telephone Types, Special Purpose; Switches.

5930 5945

POWER MACHINERY,
(Division of Bristol Aero-Industries Limited),
Vancouver Airport,
Vancouver, British Columbia.
Telephone 604: 278-5111
Telex: 04-5426
Cable: BRISTWEST
Vice-President: A. F. B. Milligan
Contact: H. J. Hutchinson, Marketing Manager

Manufacturers of: Chain saws, gasoline powered; lightweight 2 stroke gasoline engines for industrial uses.

2805 3695 5130

POWERLITE DEVICES LTD.,
54 Atomic Avenue,
Toronto 18, Ontario.
Telephone 416: 259-8201
President: D. S. Young
Contact: K. R. Ormrod, Manager Marketing Services
Floor Area: 60,000 sq. ft.
Personnel: 150

Manufacturers of: Industrial switch gear, high-voltage distribution equipment, outdoor lighting fixtures, standards and brackets. Aircraft starting cables.

6110 6210

POWERTRONIC EQUIPMENT LIMITED,
50 Bermondsey Road,
Toronto 16, Ontario.
Telephones 416: 755-3377 or 691-8491
President: B. W. Richardson
Contact: W. D. Sikrtanc, General Sales Manager

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, Electroplating 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

PRECISION CASTINGS LTD.,

156 St. Helens Avenue,
Toronto, Ontario.
Telephone 416: 537-3146
Contact: D. C. Barber
Floor Area: 21,600 sq. ft.
Personnel: 52

Precision Castings (Investment), ferrous and non-ferrous.

Page B6

PRECISION ELECTRONIC COMPONENTS LIMITED,

19 Hafis Road,
Toronto 15, Ontario.
Telephone 416: 241-4491
TWX: 610-492-1341
President: A. Simoni
Floor Area: 10,000 sq. ft.
Personnel: 40

Manufacturers of: Hot Moulded and Metal Glaze High Reliability Variable Resistors; Precision Trimmers for industrial and military applications.

5905

PRECISION WELDER & FLEXOPRESS (CANADA) LIMITED,

72 Carnforth Road,
Toronto 16, Ont.
Telephone: 416: 759-1138
Contact: T. E. Jones, Vice-President and General Manager
Personnel: 25 - 49

Manufacturers of: Spot seam, projection, flash-butt; Portable guns; Special welding machines.

3432

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

PRESENTEY ENGINEERING PRODUCTS LIMITED,

233 Armstrong Street,
Ottawa 3, Ontario.
Telephone 613: 729-7171
President: S. M. Presentey
Floor Area: 3,500 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 recorder/reproducer used in large aircraft for gust acceleration and other stress recording; TRA-14, 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. Special electronics and electromechanical devices, custom made.

5815 5820 5821 5835 6645 6665 7440 and page B1

PROGRESSIVE ENGINEERING WORKS LTD.,

360 West 1st Avenue,
Vancouver, B.C.
Telephone 604: 874-5257
President and General Manager: 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 Pil-

low Blocks; Bases—M/c with Motor Mounts; Chains, Transmission—Block—Driving—Roller Silent—Sprocket; Conveyors; Couplings, Shaft, Flexible—Shaft, Marine; Derricks; Engines, Steam, Marine; Flanges, pipe and Tube; Gears, Large, Medium, small; Gear Boxes; Hoists, Chain, Wire Rope; Machining—Light, Medium, Heavy; Marine Hardware and Hull Items; Pins—All Types; Pipeline Equipment Sets (Landline); Presses, Metal Forming and Extrusion; Pulleys—All Types; Pulp and Paper Industries Machinery; Sawmill Machinery; Shafting—Propulsion, Ship, Sheaves; Special Industry Machinery—Plastic Bandolier Machinery—Power Loading Machines—Steel Mill Equipment; Sprockets; Studs; Winches—Drum Power Operated; Windlasses; Repair and Overhaul Facilities.

2010 2040 2820 3010 3020 3120
3130 3210 3442 3615 3695 3835
3910 3950 4730 4940 5307 6105
and pages B6 & B7

PROTECTIVE PLASTICS LIMITED,

84 Railside Road,
Don Mills, Ontario.
Telephone 416: 444-6657
President: P. G. Szasz
Floor Area: 26,000 sq. ft.
Personnel: 55

Manufacturers of: Reinforced Plastics; Plastic Components.

1560 5985 8115 8415

PUROLATOR PRODUCTS (CANADA) LIMITED,

320 Kipling Avenue South,
Toronto 18, Ontario.
Telephone 416: 259-7611
President and General Manager:
E. R. Perkin
Contact: Jack Ayers
Floor Area: 75,000 sq. ft.
Personnel: 180

Manufacturers of: Micronic air, fuel, gasoline, hydraulic, transmission oil filters and replacement elements. Air, gasoline, fuel hydraulic strainers for automotive, truck, tractor and industrial applications. Filters and replacement elements for bulk liquid application, i.e. aviation fuels at bulk storage plants and airports. Furnace fuel oil filters and elements.

2910 2940 4310 4330

PYRENE MANUFACTURING CO. OF CANADA LIMITED,

777 Dundas Street, East,
Toronto 8, Ontario.
Telephone 416: 466-0411
Vice-President and General Manager:
K. R. Laidley
Contact: G. R. Morris, Sales Manager
Floor Area: 40,000 sq. ft.
Personnel: 74

Manufacturers of: All types of hand and wheeled portable fire extinguishers; Automatic Carbon Dioxide Fire Extinguishing Systems; Mechanical Foam Producing Equipment.

1680 4210 6350

QUALITY HERMETICS LIMITED,

45 Hollinger Road,
Toronto 16, Ontario.
Telephone 416: 757-2869
Vice-President and General Manager:
H. A. Cohen
Contact: A. H. Brooks, Plant Manager
Floor Area: 8,000 sq. ft.
Personnel: 33

Manufacturers of: All forms of Glass-to-Metal Seals applicable to the Electronics Industry.

5940 5960

RCA VICTOR COMPANY, LTD.,
1001 Lenoir Street,
Montreal, Quebec.
Telephone Montreal 514: 933-7551
Ottawa 613: 236-0619
President: J. D. Houlding
Contacts: H. B. Godwin, V.P. Government Contracts
J. A. Collins, Space Systems
J. G. Leahy, Terrestrial Telecommunications
W. H. Holroyd, Broadcast & TV
J. R. Wright, Data Display
G. W. Sparks, Ottawa District Mgr. (General enquiries)
Floor Area: 320,000 sq. ft.
Personnel: 1200

Manufacturers of: Radio communication transmitters and receivers; Broadcast and T.V. Transmitters and Studio Equipment; Audio, R.F. and Video Amplifiers; Data Handling Equipment with particular attention to Digital to Video Converters under the RCA Victor trade name DIVCON; Radar Equipment; Duplexers; Tropospheric Scatter Receivers; Frequency Diversity and Facsimile Receivers; Short Haul and Long Haul Solid State Radio Relay Systems and associated specialty test equipment; Communication Satellite Ground Stations and Specialty Subsystems thereof such as Low Noise Antenna Feed System, Wide Band Solid State Communications System, 6 gc Power Amplifier, etc.; complete Experimental and Communication Satellites and Subsystems thereof such as Solid State Telemetry System, Integrated Circuit Encoder, Wide Band Solid State Transponders, etc.; Miniature Receiving Tubes; Monochrome and Color TV Picture Tubes; Semi-conductors; Nuclear Particle Detectors; Photodiodes; Repair, Overhaul and Field Maintenance of Electronic Equipment and Systems; Environmental Testing; Instrument Repair and Calibration. Communication satellite earth stations.

1230 1265 1285 1430 5805 5810 5815 5820 5821 5825 5826 5830 5831 5835 5840 5841 5845 5850 5855 5895 5915 5945 5950 5960 5985 5990 5999 6130 6625 6660 6665 6910 6930 6940 7440 and pages B1, B2, B4, I-98, I-120 & I-142

RADIO CONDENSER COMPANY LTD.,
6 Bermondsey Road,
Toronto 16, Ontario.
Telephone 416: 755-2235
Vice President and General Manager: Clarence D. Murdock
Contact: Norman J. Cushman, Assistant General Manager
Floor Area: 26,000 sq. ft.
Personnel: 200

Manufacturers of: Variable and Fixed Capacitors, (Condensers).
5910

RADIO ENGINEERING PRODUCTS,
P.O. Box 460,
Montreal 29, Quebec.
Telephone 514: 731-3251
President: C. B. Fisher
Contact: S. T. Fisher, Vice President
Floor Area: 65,000 sq. ft.
Personnel: 660

Manufacturers of: Telephone and telegraph multiplex equipment.
5805 5895 5915 5935 5965 5995 and page I-118

RANAR INDUSTRIES LIMITED,
6121 Cote de Liesse Road,
Montreal 9, Quebec.
Telephone 514: 748-7355
Cable: RANARIND
President: Odd W. Ryden
Floor Area: 12,000 sq. ft.
Personnel: 40

Manufacturers of: Mechanical and Optical Assemblies to MIL Specification; Custom designed gear units; Precision instrument and aerospace components; Fine pitch gears, scales, dials, etc. Aluminum dip brazing; Electroplating and Anodizing.
1240 1290 1420 1630 3010 3020 5355 6615 and page B7

RANKIN-STRITE LIMITED,
298 Oak Street,
Hespeler, Ontario.
Telephone 519: 658-9361
President: I. F. Rankin
Contact: J. Strite
Floor Area: 10,000 sq. ft.
Personnel: 100

Manufacturers of: Gyroscope components; Servo-mechanisms; Hydraulic valve components; Transducers and components; Custom machining to optical/mechanical and instrumentation standards.
Pages B7, I-72.

RAYTHEON CANADA LIMITED,
400 Phillip Street North,
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 B1, B2 & I-100

RELIANCE ELECTRIC & ENGINEERING (CANADA) LIMITED,
127 Judge Road,
Toronto 18, Ontario.
Telephone 416: 233-3281
Vice President and General Manager: N. J. McCartney
Contact: T. Drennan, General Marketing Manager
Floor Area: 75,000 sq. ft.
Personnel: 208

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 Avenue East,
Renfrew, Ontario.
Telephone 613: 432-3661
Telex: 013-411
Cable: RENAIRE
President and General Manager: C. A. Hore
Contact: W. Wright, P. Eng., General Sales Manager
Floor Area: 114,000 sq. ft.
Personnel: 200

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.

1290 1325 1730 1740 2835 2840
3465 5670 5895 5975 5999 6530
7125 8110 8115 8140 and page B7

RESEARCH INDUSTRIES LIMITED,
2971 Lake City Way,
Burnaby 2, British Columbia
Telephone 604: 299-6268
President: Hugh Kay
Floor Area: 17,000 sq. ft.
Personnel: 52

Manufacturers of: Battery Charging Plants up to 50KW capacity; magnetic amplifiers, controlled constant voltage type; transistor power supplies, A.C. to D.C., D.C. to A.C.; transistor voice frequency amplifiers; solid state industrial control systems.

5950 6110 6125 6130 6625

REX CHAINBELT (CANADA) LTD.,
1181 Sheppard Avenue East,
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 3110 3130
3895 3910 3990 4010 4630
and page B7

REYNOLDS EXTRUSION COMPANY LIMITED,
630 Dorchester Blvd., West,
Montreal 2, Quebec.
Telephone 514: 868-2801
Vice-President and General Manager: B. R. Allan
Contact: J. D. Murphy, General Sales Manager
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.

1730 4210 4710 5440 5670 5975
9530 9535 9540

ROBIN-NODWELL MFG. LTD.,
50th Avenue and 1st Street S.W.,
P.O. Box 1450,
Calgary, Alberta.
Telephone 403: 255-4431
President: John M. Boyd
Contact: W. B. Nodwell, Vice-President
Floor Area: 40,000 sq. ft.
Personnel: 150

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; Bus Bodies; and specialized off-highway equipment; Repair and overhaul facilities.

2320 2330 2410 2430 2510 2530 4210 and pages B1 & I-224

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 3110 3120 4730 5305 5306 5307 5310 5315 5340 5935 5940 5975 and page B7

ROLLS-ROYCE OF CANADA LIMITED,
6265 Cote de Liesse Road,
Lachine, Qnebec.
Telephone 514: 631-3541
Telex: 01-2382
Cable: ROYCAR
Vice-President and General Manager: K. O. W. Crooks
Contact: G. T. R. Cochrane, Commercial Manager
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 B1 & B3

ROYALMETAL CORPORATION LIMITED,
Box 340,
Galt, Ontario.
Telephone 519: 621-6300
Vice-President and General Manager: R. P. McLean
Contact: R. Nixon, General Sales Manager
Floor Area: 160,000 sq. ft.
Personnel: 400

Manufacturers of: Hospital Beds, Hospital Case Goods, Patients' Room Furniture, Lounge Furniture, Cafeteria Furniture, Office Furniture, Posture and Executive Chairs, Steel Shelving, Storage Cabinets, School Furniture, Partitions — Ceiling Height — Low Wall, Filing Systems and Dormitory Furniture.

5670 7110 7125

V. W. RUSKIN & ASSOCIATES ENGINEERING LTD.,
580 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 B1

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 and floating docks and Scows. Ship and Boat Propulsion components; Steering gears—marine; Winches—drum and power operated and Windlasses. Fabricated components—Vehicles.

1905 1915 1920 1925 1930 1935 1940 1945 1955 2010 2020 2030 2040 2050 2510 3950

RUSSEL-HIPWELL ENGINES LIMITED,
(Manufacturing Division),
P.O. Box 370,
2198-3rd Avenue East,
Owen Sound, Ontario.
Telephone 519: 376-6700
President: N. E. Hipwell
Contact: G. J. I. Leslie
Floor Area: 40,000 sq. ft.
Personnel: 60

Manufacturers of: Diesel generating sets and controls; Diesel uninterrupted power ("No Break") generating sets; Motor generator sets; Switchgear and Electrical control panels; Diesel powered pumping units; Diesel powered compressor units; Diesel marine auxiliaries; Diesel marine propulsion units.

1730 2805 2815 2895 4310 4320
6110 6115 6125 6130 6210 6625

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, Ontario.
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; Flooring, 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, General Manager
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 Equipment. Industrial Fabrications for Hydro and Thermal Electric Developments, Mining, Oil and Chemical Plants.

1905 1910 1915 1920 1925 1930 1935 1940 1955 2020 2040 2050 2090 4430 7110 7125 7195

ST. LAWRENCE MANUFACTURING COMPANY INC.,
3030 Blvd. Ste Anne,
Giffard, Quebec.
Telephone 418: 661-3721
Telex: 011-3536
President: George Couture
Contact: Andre A. Belanger — Manager
Floor Area: 75,000 sq. ft.
Personnel: 450

Manufacturers of: Ice skate blades; roller skates — roller board; skate guards; shoe attaching machine (riveting); rivets; core caps; steel toes; highway advance warning devices (safety triangles); seals; luggage locks; sponge plates (mops); plastic heels; polyethylene bottles; dies; jigs and tooling; metal stamping; foam liners.

3448 3465 3520 4240 5110 5136 5330 5340 8140

ST. LAWRENCE RUBBER CO.,
(Division of Turnbull Elevator Ltd.),
155 Main Street,
Farnham, Quebec.
Telephone 514: 293-5324
General Manager: W. H. Bulger
Floor Area: 31,000 sq. ft.
Personnel: 125

Manufacturers of: Rubberized nylon clothing (proofed goods), custom moulded goods.

4720 8415 9320

ST. MAURICE FOUNDRIES LIMITED,
40 Rue de la Fonderie,
Cap de la Madeleine, Quebec.
Telephone 819: 375-7338
President: J. R. Pellerin
Contact: A. A. Niman, General Manager
Floor Area: 16,112 sq. ft.
Personnel: 42

Manufacturers of: Aluminum, bronze and iron castings; Centrifugally cast bushings and liners; Patterns; Also, bronze, cast iron and cast steel Globe; Angle and gate flanged valves.

3120 4820 and page B6

SANGAMO COMPANY LIMITED,
215 Laird Drive,
Toronto 17, Ontario.
Telephone 416: 425-3330
President: W. A. Kennedy
Contact: A. E. Van Clieaf, General Sales Manager
Floor Area: 150,000 sq. ft.
Personnel: 575

Manufacturers of: Electrical Rotating Machinery; Electric Motors; DC and AC Generators; 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 Street,
P.O. Box 1276,
Regina, Saskatchewan.
Telephone 306: 569-9664
Manager: G. G. Devlin
Contact: S. Postma, Sales Supervisor
Floor Area: 27,000 sq. ft.
Personnel: 110

Manufacturers of: Structural steel; Tanks; Pressure vessels; Smokestacks; Custom plate fabrication; Miscellaneous iron; Bins; Platforms; Bridges; Towers; Kilns; Reinforcing steel; Barges (non-propelled); Stoplogs.

1945 2040 4430 5420 5430 5660 5985 8120

SCEPTER MFG. CO. LTD.,
30 Cranfield Road,
Toronto 16, Ontario.
Telephone 416: 757-3235
President: E. Torokvei
Contact: D. Shaw, Manager 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 fittings. Blow moulding facilities up to 45 Gallon sized items. Commercial line of plastic jerry cans 1, 2, 3 and 5 gallon. Capacities injection moulding facilities up to 200 ozs.

4710 5975 7240 9330

SCOTT AIR-PAK LTD.,
2254 South Sheridan Way,
Clarkson, Ontario.
Telephone 416: 278-9117
Vice-President: W. Lloyd Sandham
Contact: C. P. Farr, General Manager
Floor Area: 20,000 sq. ft.
Personnel: 10

Manufacturers of: Protective breathing equipment for fire departments, Industry, Aircraft, etc. Custom vacuum formed plastic products, Cases, Tanks, Trays, etc.

4240

SEMTEC LIMITED,
3500 Ontario Street,
Windsor, Ontario.
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 B7

SHAKEPROOF/FASTEX,
(Division of Canada Illinois Tools, Limited),
67 Scarsdale Road,
Don Mills, Ontario.
Telephone 416: 447-7251
Vice-President: F. Ballentine
Contact: G. McIlwain
Floor Area: 30,000 sq. ft.
Personnel: 100

Manufacturers of: Shakeproof/Fastex Metal and Plastic Fasteners of all types including self-drilling screws.

5305 5306 5310 5325 5940

SHARPE INSTRUMENTS OF CANADA LIMITED,
79 Martin Ross Avenue,
P.O. Box 360,
Downsview, Ontario.
Telephone 416: 636-0801
President: Milton Klyman
Contact: Dr. H. O. Seigel, Managing Director
Floor Area: 12,000 sq. ft.
Personnel: 30

Manufacturers of: Headphones; Headphone-microphone combinations; Fluxgate magnetometers; Susceptibility meters; Induced polarization units; Self-potential and Resistivity units; Gravity meter; Electromagnetic units; Special geodetic and research geophysical equipment.

5965 6625 6655

SHAWINIGAN CHEMICALS, LIMITED,
#1 Place Ville Marie,
Montreal, Quebec.
Telephone 514: 879-2611
President: H. S. Sutherland
Contact: L. F. Fitzpatrick, Export Sales Manager

Manufacturers of: Calcium Carbide, Industrial Chemicals, Expanded Vinyl.

4610 4710 6810

SHERRITT GORDON MINES LIMITED,
25 King Street West,
Toronto 1, Ontario.
Telephone 416: 363-9241
Telex: 02-2491

President and Managing Director:
E. L. Brown
Contact: R. F. Pearce, Manager, Metallurgical Sales.
Floor Area: 1,500,000 sq. ft.
Personnel: 1,368

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 Street,
Granby, Quebec.
Telephone 514: 378-2222
Manager: S. Giguere
Floor Area: 15,000 sq. ft.
Personnel: 65

Manufacturers of: All types of Gears, precision; General precision machining; Electronic hardware, specialized in Terminal Lugs, Turret type; Screw Machine Products.

1005 1345 1350 1355 1360 3020 5305 5307 5310 5315 5940 5975 and page B7

T. S. SIMMS & CO. LIMITED,
(Machinery Division),
1172 Fairville Boulevard,
Lancaster, New Brunswick.
Telephone 506: 672-1200
President: T. S. Simms
Contact: A. M. Hallworth, Manager—Machinery Division
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 B7

SIMTEC LTD.,
3400 Metropolitan Blvd. East,
Montreal, Quebec.
Telephone 514: 728-4527
President: Dr. Sydney Wagner
Contact: Nigel P. Harvey, Sales Manager
Floor Area: 5,000 sq. ft.
Personnel: 22

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.

6525 6625 6665

SINCLAIR RADIO LABORATORIES LIMITED,
21 Toro Road,
Box 179,
Downsview, Ontario.
Telephone 416: 635-1881
President: Dr. G. Sinclair
Contact: P. Yachimec, General Manager
Floor Area: 15,000 sq. ft.
Personnel: 60

Manufacturers of: Communications Antennas; Duplexers and Multicouplers.

5895 5915 5985

SKYROTORS LIMITED,
P.O. Box 861,
White Lake Road,
Arnprior, Ontario.
Telephone 613: 233-4552 Ottawa,
613: 623-4591 Arnprior
Managing Director: C. T. Cannon
Contact: O. J. Westcott-Toms, President
Floor Area: 5,400 sq. ft.
Personnel: 14

Helicopter repair and overhaul.

Page B3

N. SLATER CO.,
(Division of Slater Steel Industries, Ltd.),
681 King St. West,
Hamilton, Ontario.
Telephone 416: 528-8888
President: H. Owen Jones
Contact: F. G. Weston, Manager, Special Manufacturing
Floor Area: 300,000 sq. ft.
Personnel: 350

Manufacturers of: Pole Line Hardware, Ground Rods and Connectors; Lightning Arresters (up to 18KV); Distribution Cutouts (up to 15 KV); 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.

5120 5305 5306 5310 5340 5920 5925 5940 5975 and page B7

SMITH-ROLES LIMITED,
34th Street and Alberta Avenue,
Saskatoon, Saskatchewan.
Telephone 306: 652-5626

Contact: C. Roles, President and General Manager
Floor Area: 17,000 sq. ft.
Personnel: 74

Manufacturers of: Welders, battery chargers.

3431

SMITH & STONE LIMITED,
50 St. Clair Avenue West,
Toronto 7, Ontario.
Telephone 416: 923-5441
President: D. S. Chant
Contact: D. R. Pepall, General Sales Manager
Floor Area: 300,000 sq. ft.
Personnel: 600

Manufacturers of: Ceramics; Electrical Wiring Devices; and Moulded Plastic Articles.

4710 5355 5930 5970 9330 9350

C. R. SNELGROVE CO. LTD.,
141 Bond Avenue,
Don Mills, Ontario.
Telephone 416: 447-8531
TWX: 610-492-1360
President: C. R. Snelgrove
Contact: W. C. Hickling, Vice-President and General Manager
Floor Area: 13,500 sq. ft.
Personnel: 168

Manufacturers of: Quartz crystals; Crystal ovens; Crystal filters.

5820 5915 5955

SOMERVILLE INDUSTRIES LIMITED, (Panel Division),
20 Bertrand Avenue,
Scarborough, Ontario.
Telephone 416: 757-3661
General Manager: F. J. Orr
Contact: G. McGlone, Sales Representative
Floor Area: 95,000 sq. ft.
Personnel: 175

Manufacturers of: Compression, injection and blowmoulded plastic parts; Fiber glass furniture for rifles.

1005 1095 1560 5410 8115 8140 8415 9330 and page B1

SONOCO PRODUCTS COMPANY OF CANADA LIMITED,
P.O. Box 1025,
Brantford, Ontario.
Telephone 519: 752-6591
President: R. J. Fletcher
Contact: L. V. Damant, General Manager and Vice President
Floor Area: 304,000 sq. ft.
Personnel: 280

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, dowell 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.

8110 8130 8140

SPARTAN AIR SERVICES LIMITED,
2117 Carling Avenue,
Ottawa, Ontario.
Telephone 613: 728-3576
President: W. P. McGill
Contact: Col. C. H. Smith
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 B5

SPARTON OF CANADA, LIMITED,
Elm Street,
P.O. Box 2125,
London, Ontario.
Telephone 519: 455-6320
President: G. A. Holmes
Contact: K. R. Hollins, Assistant Secretary-Treasurer
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 COMPANY OF CANADA LTD.,
6011 Cote de Liesse Road,
Ville St. Laurent,
Montreal 9, Quebec.
Telephone 514: 747-5561
Cable: SPERRYCAN
President: B. W. King
Contact: R. H. Littlefield, Director of Marketing

Floor Area: 100,000 sq. ft.
Personnel: 400

Manufacturers of: All types of military electronic equipment; computers, data processing; radar equipment; plotting boards; simulators; numerical control for machine tools and industrial process controls; inertial components.

1270 1420 5825 5826 5835 5840 5841 5895 5999 6110 6605 6610 6615 6940 7440 and pages B1, I-148 & I-212

SPERRY GYROSCOPE OTTAWA LIMITED,
3 Hamilton Avenue,
Ottawa, Ontario.
Telephone 613: 728-4681
General Manager: J. G. Musgrave
Contact: H. D. Wardle, Sales and Services Supervisor
Floor Area: 30,000 sq. ft.
Personnel: 165

Manufacturers of: Dial finishing, self illuminated; Harness Cable; Headsets; Instruments, Flight, Aircraft; Instruments, integral lighting; Intercommunication sets; Panels, Edge lit, Plastic; Telephone handsets (Sound powered); Wiring harnesses; Aircraft flight instrument repair and overhaul.

5355 5965 5995 and page B3

SPRAGUE-TCC (CANADA) LIMITED,
50 Bertal Road,
Toronto 15, Ontario.
Telephone 416: 766-6123
Cable: TELEFARAD
TWX: 610-491-1541
President: H. S. Marmorek
Contact: Wm. O'Meara, Sales Manager
Floor Area: 37,000 sq. ft.
Personnel: 95

Manufacturers of: Capacitors: Aluminum Electrolytic; Tantalum Foil Electrolytic; Tantalum Wet Pellet; Tantalum Solid Pellet; Tantalum Solid Electrolyte.

5910

R. J. STAMPINGS CO. LTD.,
8001 18th Avenue,
Montreal 38, Quebec.
Telephone 514: 721-4995
President: R. Juneau
Contact: R. W. Thornton, Sales Director
Floor Area: 65,000 sq. ft.
Personnel: 80 to 150

Manufacturers of: Metal stampings to specifications. Deep Drawn Shells (Fire extinguishers—Filter cups, Roasting Pans etc.) Precision cable reels, Lighting fixtures, Garage door hardware, Electronic door operators, Dies—piercing, Blanking and forming. Automotive metal stampings.

2510 3456 8130

STANDARD AERO ENGINE LIMITED,
No. 6 Hangar,
Winnipeg International Airport,
Winnipeg, Manitoba.
Telephone 204: 772-0461
President and General Manager: E. H. Moncrieff
Contact: V. R. Knudsen, Assistant General Manager, Sales and Service
Floor Area: 71,794 sq. ft.
Personnel: 375

Facilities for the Overhaul and Repair of Reciprocating Aircraft Engines and Associated Accessories: Also Repair and Overhaul of Turbo Prop, Turbo Shaft and Turbo Jet, Aircraft Engines and Associated Accessories, including Fuel Metering Components.

Page B3

STANDARD-MODERN TOOL COMPANY LIMITED,
69 Montcalm Avenue,
Toronto, Ontario.
Telephone 416: 787-2494
TWX: 610-491-1792
Cable: STANMODCO
President: J. Gilchrist
Contact: R. J. Barrett, Vice-President and General Manager
Floor Area: 86,780 sq. ft.
Personnel: 295.

Manufacturers of: Engine Lathes 9"—16" 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, Types 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 B1 & B7

STANDARD TELEVISION PRODUCTS LIMITED,
108 Sydney Street South,
Kitchener, Ontario.
Telephone 519: 743-4324
President and General Manager:
N. H. Futher
Contact: P. Hardy, Sales and Office Manager
Floor Area: 27,000 sq. ft.
Personnel: 145

Manufacturers of: Radio and Television Transformers, D.C. Power Supplies, Toroids.

5895 5950 6130

THE STANLEY MANUFACTURING COMPANY LIMITED,
230 Bartley Drive,
Toronto 16, Ontario.
Telephone 416: 757-3221
President: J. W. Patterson
Contact: F. Mendham, Sales Manager
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

STARK ELECTRONIC INSTRUMENTS LTD.,
P.O. Box 670,
Ajax, Ontario.
Telephone 416: 942-2120
President: A. Kasperski
Contact: L. L. Samuel, Vice-President
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 Street,
Hamilton, Ontario.
Telephone 416: 528-2511
President and Chief Executive Officer:
V. W. Scully
Contact: L. T. Craig, Vice-President
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 9640 and page B7

STEWART-WARNER CORPORATION OF CANADA, LIMITED,
349 MacDonald Avenue,
Belleville, Ontario.
Telephone 613: 968-6761
President and General Manager:
L. A. Young
Contact: J. P. Hawkins, Comptroller
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 4930 5825 5840 5841 5895
5915 5999 6625 6680

STRAUBE INDUSTRIES LTD.,
1888 Mattawa Avenue,
Cooksville, Ontario.
Telephone 416: 277-9449
Telex: 02-29666
President: W. H. Straube
Contact: L. Gottschalk — Manager
Floor Area: 8000 sq. ft.
Personnel: 12

Manufacturers of: Drafting machines, Drafting tables, Engineering Efficiency Equipment. Drafting room furniture — steel and wood; Tracing and light tables.

6675

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 B6

SURRETTE BATTERY LTD.,
P.O. Box 234,
Springhill, Nova Scotia.
Telephone 902: 597-3408
President: John J. Surrette
Contact: A. MacNeil, Office Manager

Floor Area: 20,000 sq. ft.
Personnel: 20

Manufacturers of: Storage Batteries including fork-lift truck batteries, diesel locomotive batteries, marine batteries. All types 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

J. SWANN (1963) LIMITED,
1481 Franklin Street,
Vancouver 6, 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-164

SYLVANIA ELECTRIC (CANADA) LTD.,
6233 Cote de Liesse Road,
Montreal, Quebec.
Telephone 514: 631-4201
President: E. Stuart Wilson
Contact: G. Bevan, Sales Manager—Lighting
Floor Area: 233,000 sq. ft.
Personnel: 600

Manufacturers of: Fluorescent, Mercury Vapor and Incandescent Lamps; Photo and Projection Lamps; Electronic Tubes and Devices; Flash Approach Systems.

5960 6240 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: 78

Manufacturers of: Electric Vibratory Materials Handling Equipment including vibrators, Vibratory Feeders, Grizzly Feeders, Screens, Vibrating Conveyors, Spiral Elevators, Vibrating Packers, Gravimetric weigh feeders. Parts Feeders, Shaft Seals, Lapping Polishing 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 5995 6110 6130 6520

T.M.C. (CANADA) LIMITED,
R.R. #5,
Ottawa, Ontario.
Telephone 613: 822-0244
Cable: TEPEI
Telex: 013-446
President and Managing Director:
D. V. Carroll
Contact: W. F. Potter, Sales Manager
Floor Area: 30,000 sq. ft.
Personnel: 210

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
6115 6125 6130 6625 and page B1

TAMCO LIMITED,
1180 Gladstone Avenue,
La Salle, Ontario.
Telephone 519: 734-7808
General Manager: L. Neal
Floor Area: 30,000 sq. ft.
Personnel: 75

Manufacturers of: Automotive Components; Screw Machine Parts and Stampings; Hydro-jet Propulsion Devices for Marine Purposes.

2010 2030 2520 2530 2835 2895 and pages I-150 & I-152

TAPATCO LIMITED,
P.O. Box 126,
Ayer's Cliff, Quebec.
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, Ontario.
Telephone 416: 787-1651
President: E. J. Shears
Contact: G. B. Lint, Industrial Sales Manager
Floor Area: 40,000 sq. ft.
Personnel: 160

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

TENATRONICS LIMITED,
P.O. Box 185,
Newmarket, Ontario.
Telephone 416: 895-4583
President and General Manager: P. Posnikoff
Floor Area: 32,000 sq. ft.
Personnel: 70

Manufacturers of: Battery chargers 1 to 20 amp size, Automobile radios complete line, reverberators, UG connectors, ground rods, lightning arrestors, transformers (complete line), automobile aerials, stereo and monaural amplifiers, cable assemblies.

5995 6130

PIERRE THIBAULT CANADA LTD.,
Pierreville, Quebec.
Telephone 514: 568-3331
President: Rene Thibault
Contact: Marion Thibault, Sales Manager
Floor Area: 90,000 sq. ft.
Personnel: 150

Manufacturers of: Trucks, Fire; Pumps, Fire portable.

4210

THE H. I. THOMPSON CO. OF CANADA LTD.,
60 Johnston Street,
P.O. Box 370,
Guelph, Ontario.
Telephone 519: 822-6630
General Manager: W. E. Ledingham
Contact: S. K. Lindsay, Secretary
Floor Area: 14,000 sq. ft.
Personnel: 35

Manufacturers of: High temperature and low temperature Insulation; Wrap around and preform foil insulation blankets; Duct coverings; High density fiberglass moulded parts; Acoustic insulation.

1680 2840 5640

THOMPSON PRODUCTS, LIMITED,
230 Louth Street,
St. Catharines, Ontario.
Telephone 416: 685-8411
Vice-President and General Manager:
G. E. Irvine

Contact: J. H. May, Manager Automotive-Mining Division
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 page B7

HARVIE THOMPSON & STEVEN WARING LTD.,
1 Niagara Street,
Toronto 2, Ontario.
Telephone 416: 364-1558
President: H. Thompson
Contact: S. Waring, Secretary Treasurer
Floor Area: 2,800 sq. ft.
Personnel: 14

Manufacturers of: Scale models of military equipment, vehicles, aircraft, missiles, etc.; Of custom precision parts, small production runs of special parts, small production runs of injection moulded items; Mock-ups, prototypes, design models, models for wind and water tunnel testing.

6910

THOMPSON WOOD PRODUCTS LTD.,
P.O. Box 119,
2194 Regent Avenue,
Montreal 28, Quebec.
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

TIMMINS AVIATION LIMITED,
Montreal International Airport,
Dorval, Quebec.
Telephone 514: 631-5501
President: J. A. Timmins
Floor Area: 60,000 sq. ft.
Personnel: 225

Manufacturers of: Aircraft galleys and galley equipment; Aircraft sheet metal components; Airborne thermo-electric refrigerators.

1560 1680 1730 7310

TOPPING ELECTRONICS LTD.,
94 Laird Drive,
Toronto 17, Ontario.
Telephone 416: 421-2270
President: F. V. Topping
Contact: I. R. Devine, Director of Operations
Floor Area: 15,000 sq. ft.
Personnel: 35

Manufacturers of: Communications accessories, frequency shift exciters 05(D)FR airborne receivers LF and UHF, single sideband signal generators, frequency synthesizers, air transportable LF Beacons, Annunciators.

5805 5820 5821 5825 5826 5831 5840 5841 5895 5999 6110 6310 6320 6330 6350 6625 and pages I-106 & I-108

TOWER COMMUNICATIONS CO. (CANADA) LIMITED,
105 Howden Road,
Scarborough, Ontario.
Telephone 416: 757-1191
President: G. A. Collins
Contact: A. J. Nightingale, General Manager
Floor Area: 15,000 sq. ft.
Personnel: 19

Manufacturers of: All types of communication towers and associated structures. Both guyed and self supporting — from light to very heavy loadings.

5445 5450 and page B2

TRENCH ELECTRIC LIMITED,
15 Prince Andrew Place,
Don Mills,
Toronto, Ontario.
Telephone 416: 445-0140
Contact: R. W. Eden, Vice-President and General Manager
Floor Area: 10,000 sq. ft.
Personnel: 12

Manufacturers of: Current limiting reactors; Current line traps.

5999

TRIANGLE CONDUIT & CABLE (CANADA) LIMITED,
756 Warden Avenue,
Scarborough, Ontario.
Telephone 416: 757-8741
President: E. S. George
Contact: A. D. R. Lowe, Vice-President — Sales Manager
Floor Area: 250,000 sq. ft.
Personnel: 300

Manufacturers of: Building wires and cables; including non-metallic sheathed cables; flexible armored cables; flexible cords; fixture wires; light duty portable

cords; thermoplastic and rubber building wires; power supply cables and signal and control cables. Rigid conduit, including nipples, couplings and elbows and electrical metallic tubing, including bends—all sizes. Complete underfloor raceway systems including underfloorduct, headerduct, trenchduct, flush header, flush duct and jumbo duct. Service entrance equipment, including fusible disconnect switches, service entrance panels, troughs, metal cabinets, wiring duct and lighting panels.

5930 5975 6145

TRIDON MANUFACTURING LIMITED,
P.O. Box 5029, 201 North Service Road,
Burlington, Ontario.
Telephone 416: 637-3863
Vice-President: Donald M. Green
Contact: K. J. Forsyth — Manager of Marketing and Sales
Floor Area: 75,000 sq. ft.
Personnel: 135

Manufacturers of: Hose clamps; Aircraft clamps; Plastic pipe clamps: Automotive turn signal flashers; Electronic relays.

2540 4730

TRIMONEX MANUFACTURING CO. LTD.,
12 Sable Street,
Toronto 15, Ontario.
Telephone 416: 241-6933
President: Gordon C. Garbig
Floor Area: 5,000 sq. ft.
Personnel: 15

Manufacturers of: Forged Steel Gate and Globe Valves to American Standards Association and American Petroleum Institute Specifications for 800# and 600# classes. Globe Valves to United States Military specification Mil-V-22094.

4820

TRIPLE-A MANUFACTURING CO. LTD.,
111 Manville Road,
Scarboro, Ontario.
Telephone 416: 757-3622
Vice-President: Leon Gasner
Floor Area: 30,000 sq. ft.
Personnel: 45

Manufacturers of: Adjustable Steel Shelving; Adjustable Pallet Racks; Material Handling Racks; Store Fixtures; Tubular Products and Fabricated Metal Products.

3990 4710 5140 5450 6530 7110
7125 7320 7330 8140 9905

TRIPLEX ENGINEERING CO. LTD.,
181 Oneida Drive,
Pointe Claire, Quebec.
Telephone 514: 695-9818
President: M. Pohoryles
Contact: P. Braun, General Manager
Floor Area: 35,000 sq. ft.
Personnel: 100

Manufacturers of: Screw machine products, light press work, precision machining, induction 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 B7

TRUCK ENGINEERING LIMITED,
P.O. Box 518,
165 Wellington Street, South,
Woodstock, Ontario.
Telephone 519: 537-3461
President: V. B. King
Contact: A. R. Gillott, Export Manager
Floor Area: 87,200 sq. ft.
Personnel: 190

Manufacturers of: High Trailers; Low Bed Machinery-Hauling Trailers; Pole and Cable Reel Trailers; Electric and Telephone Construction Bodies; Pole Setting Derricks; Pole Hole Diggers; Hydraulic Aerial Platforms; Electric Aerial Lift; Trailer Tankers Liquid; Trailer Tankers Bulk Pneumatic Unloading; Pole and Logging Trailers; Dump Trailers; Repair and Overhaul Facilities.

1730 2330 2520 3820 3830 3950
5430

TUDHOPE SPECIALTIES LIMITED,
P.O. Box 280,
Orillia, Ontario.
Telephone 705: 326-3529
President and General Manager: J. N. Spencer
Floor Area: 96,400 sq. ft.
Personnel: 95

Manufacturers of: Cartridge Clips and Links; Metal Components for Ammunition, Fins, Fin Assemblies etc. Tote Boxes and Pans. Space Heaters Gas and Oil.

1305 1310 1315 1320 1330 1345
4520 5140 8140

J. J. TURNER COMPANY LIMITED,
280 George Street,
Peterborough, Ontario.
Telephone 705: 743-3551
Contact: R. J. Davies, General Manager
Floor Area: 25,000 sq. ft.
Personnel: 55

Manufacturers of: Non-inflatable Life Jackets and Vests.

3920 4220 8340 8345 8465 9930

UNELCO LIMITED,
103 Gun Street,
Pointe Claire, Quebec.
Telephone 514: 697-1240
Contact: Larry Gladwish, Sales Manager
Floor Area: 22,500 sq. ft.
Personnel: 62

Manufacturers of: Annunciators, fire alarm systems.

6350

UNICA RESEARCH COMPANY LIMITED,
RM. 2690,
630 Dorchester Blvd., West,
Montreal 2, Quebec.
Telephone 514: 866-3006
President: J. W. Simpson
Contact: E. J. O'Brien, Vice-President and General Manager
Floor Area: 1,300 sq. ft.
Personnel: 8

Consulting services in Operations Research, Defence Systems Analysis, Mathematical Modelling and Computer Programming; Technical and Feasibility Studies; Transportation Logistics.

Page B1

UNION CARBIDE CANADA LIMITED,
123 Eglinton Avenue 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 Products 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.

THE UNION SCREEN PLATE COMPANY OF CANADA (LIMITED),
72 Queen Street,
Lennoxville, Quebec.
Telephone 819: 562-4754
President: E. W. Gilbey
Contact: A. S. Mitchell, Sales Manager
Floor Area: 80,000 sq. ft.
Personnel: 180

Manufacturers of: Non-Ferrous Castings; Slotted Screen Plates; Perforated and Drilled Plates; Wood and Metal Patterns; Honing, Grinding and custom machining; Chromium, Nickel, Copper, Cadmium and Tin Plating.

3120 9515 and page B6

UNIROYAL (1966) LIMITED,

Executive Offices,
550 Papineau Avenue,
Montreal, Quebec.
President: E. A. Martin
Contacts: Montreal, Quebec—J. R. Falconer —Manager Marketing Administration
Kitchener, Ontario—W. H. Dotzenroth — Manager Government Sales
Elmira, Ontario—W. J. Hogg — Sales Manager
Telephone: Montreal — 514: 522-2111
Kitchener — 519: 744-7171
Elmira — 519: 664-2234
Floor Area: 3,141,947 sq. ft.
Personnel: 7,000

Manufacturers of: Rubber and Plastic Products, Textiles, Chemicals and Rubber Working Machinery. Also, complete facilities to Develop and Engineer — Rubber and Plastic Products for both Military and Industry.

1015 1020 1560 1660 1730 1940
1945 2040 2050 2530 2590 2610
2620 2630 2640 2805 2910 2930
2935 3030 3456 3465 3615 3620
3895 3920 3990 4220 4240 4710
4720 5330 5340 5410 5420 5430
5970 5985 6515 6810 6840 8010
8030 8040 8430 8435 8465 9320
9330 and pages B1, B7, I-26 & I-170

Tire Division — Kitchener, Ontario

Manufacturers of: Tire and Tubes — Passenger, Truck, Bus, Farm, Industrial and Aircraft, Solid Rubber Tires and Rubber Tired Wheels.

Rubber Machinery Division — Kitchener, Ontario

Manufacturers of: Special Rubber Working Machinery Fabrications, Tire Moulds, Tools, Jigs and Fixtures, Sheet Metal Duct Work and Tray Truck Fabrications.

General Products Division — Kitchener, Ontario

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 Products, Nets, Fleeces, Pile Fabrics, Bonded Fibre Padding and Fiberglass Insulation.

Industrial Products Division — Montreal, Quebec

Manufacturers of: Industrial Rubber Products—Hose, Conveyor and Transmission Belting, Moulded, Extruded or 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.

Footwear Division — Montreal, Quebec

Manufacturers of: Rubber, Plastic and Canvas Footwear, including Special Arctic Footwear, Boots Insulated Rubber and Mukluks.

Latex and Reclaim Division — Montreal, Quebec

Manufacturers of: Reclaim Rubber, Adhesives — Rubber and General Purpose, Two Part Elastomeric Sealants, Laticrete for Ships' Decks and Hot Poured Joint Sealers.

Naugatuck Chemical Division — Elmira, Ontario

Manufacturers of: Agricultural, Rubber and General Chemicals, Polyester Plastic Resins and Rigid Urethane Foam Systems.

UNITED AIRCRAFT OF CANADA LIMITED,

P.O. Box 10,
Longueuil, Quebec.
Telephone 514: 677-9411
President: T. E. Stephenson
Contact: J. W. R. Drummond, Vice-President — Administration.
Floor Area: 1,000,000 sq. ft.
Personnel: 3,500

Manufacturers of: Aircraft engines; Piston and jet, gas turbine; Repair and overhaul facilities.

1520 2810 2835 2840 2995 7610
and pages B3 & I-18

UNIVERSAL DIE & TOOL MFG. LTD.,
2125 St. Catherine Street East,
Montreal, Quebec.
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 Kits, Rifle 7.62 MM and 9 MM; Trainfire 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 1680 2510
3465 4230 5340 6920 7340
and pages B7 & I-182

VALERIOTE ELECTRONICS (GUELPH) LIMITED,

3 Victoria Road North,
Box 356,
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, Ontario.
Telephone 416: 877-6901
Telex: 028-5628
President and General Manager: B. H. Breckenridge
Contact: M. J. Oldershaw, Manager, Applications Engineering
Floor Area: 28,000 sq. ft.
Personnel: 100

Development and manufacture of Electron Tubes, Klystrons, Magnetrons, Travelling Wave Tubes, Backward Wave Oscillators.

5960 and page I-134

VELAN ENGINEERING LTD.,

2125 Ward Avenue,
Montreal 9, Quebec.
Telephone 514: 748-7743
President: A. K. Velan
Contact: J. Kotkas — Marketing Manager
Floor Area: 95,000 sq. ft.
Personnel: 300

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, ¼″ 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 bi-metallic 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 B4 & I-172

VICTOR MANUFACTURING CO. OF CANADA LTD.,

Victor Drive,
St. Thomas, Ontario.
Telephone 519: 631-1600
General Manager: G. C. Elms
Contact: N. H. Dalziel
Floor Area: 85,000 sq. ft.
Personnel: 102

Manufacturers of: Gaskets: For Automotive, Marine, Small Engines, and Industrial Equipment. Sprayed Asbestos Mineral Fiber: For Fireproofing Sound Proofing, Thermal Insulation, Condensation Control, Acoustical Correction.

2805 2815 5330 5640

VICTORIA ENGINEERING CO. LTD., (Venco Metals Ltd.),

347 Royal York Road,
Toronto 18, Ontario.
Telephone 416: 251-3381
President: M. Milrod
Contact: R. Williamson, Plant Manager and Engineer
Floor Area: 20,000 sq. ft.
Personnel: 80

Manufacturers of: Jigs and Fixtures; Dies, Blanking. Piercing, Drawing, Forming; Sheet Metal Stampings.

3456 3465

VICTORIA MACHINERY DEPOT COMPANY LIMITED,

P.O. Box 670,
33 Dallas Road,
Victoria, B.C.
Telephone 604: 382-2141
President: H. Husband
Contact: J. D. Smith, Sales Engineer
Floor Area: 100,000 sq. ft.
Personnel: 1,000

Manufacturers of: Ships; Commercial: — including freighters, tankers, ferries, tugs, and special purpose; Ships, naval, destroyer, frigates, minesweepers, etc.; Barges, steel; Pipe, steel, 18″ and up, coated and uncoated; Heat transfer equipment, exchangers, condensers, distillers, boilers, etc.; Presses, shears and special machinery; Pressure vessels, to any thickness of wall, based on availability of plate at mills; Heavy weldments, engine beds, special machines, etc.; Castings steel and low alloy steel to 6000 lbs. capacity, larger by special arrangement; Penstock components; Kilns, autoclaves and cookers.

1905 1910 1915 1925 1930 1935
1945 1950 1955 2040 2050 2090
3615 4420 4440 4470 4520 4710
5430 7125 8120 and page B4

VOLCANO LIMITED,
8635 St. Lawrence Blvd.,
Montreal 11, Quebec.
Telephone 514: 381-6281
Telex: 01-2856
Cable: VOLCANO
President and General Manager:
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 and Managing Director:
J. McKay-Clements
Contact: W. S. Carr, Plant Manager
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 and page B6

WALBAR MACHINE PRODUCTS OF CANADA LIMITED,
333 Horner Avenue,
Toronto 14, Ontario.
Telephone 416: 255-4478
Contact: C. J. Robinson, General Manager
Floor Area: 8,000 sq. ft.
Personnel: 60

Manufacturers of: Blades gas turbine, Vanes compressor, Vanes turbine, Discs turbine, Discs compressor, Support seals, and other components for Gas turbine, Jet engines and Steam turbines; Precision machining.

2835 2840

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: 143,000 sq. ft.
Personnel: 425

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 B6 & B7

WAYNE FORGE LIMITED,
126 Judge Road,
Toronto 18, Ontario.
Telephone 416: 239-1241
President and General Manager:
D. G. Darling
Contact: E. C. Prowse, Vice-President and Sales Manager
Floor Area: 8,000 sq. ft.
Personnel: 17

Manufacturers of: Industrial Furnaces — For Heat Treating, Drawing, Tempering, Stress Relieving, Hardening, Annealing, Assaying, 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 Street,
St. Thomas, Ontario.
Telephone 519: 631-8600
Vice-President and General Manager:
W. W. Bortner
Contact: W. F. Braun, Sales Manager
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 B7

WEBSTER AIR EQUIPMENT LIMITED,
P.O. Box 4575, 1161 King Street,
London, Ontario.
Telephone 519: 455-1220
President: J. B. Webster
Contact: A. C. Madge
Floor Area: 42,500 sq. ft.
Personnel: 108

Manufacturers of: Compressors; Paint Spray Equipment; Spray Booths.

4310 4940

WELWYN CANADA LIMITED,
1255 Brydges Street,
London, Ontario.
Telephone 519: 451-9490
Cable: WILBAC
President: R. Wilton
Contact: K. J. Davis, Director 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 LIMITED,

1 Atlantic Avenue,
Toronto 3, Ontario.
Telephone 416: 537-4411
President: R. M. Calhoun
Floor Area: 991,500 sq. ft.
Personnel: 2,514

Manufacturers of: Sheet metal products; Partitions; Hollow metal doors and fire doors; Hangar and pier shed doors; Pressed steel door frames; Lockers; Shelving; Storage cabinets; Steel storage tanks; Grain elevator buckets and spouting; Truck tanks; Semi-trailer tankers and dump trucks; Airport tenders; Culverts; Steel roof and floor decks; Roofing and siding; Metal wall panels; Pre-fabricated utility building; Tote and skid boxes; Pallets; Custom sheet metal work.

1310 1315 1325 1330 1340 1355
2040 2090 2320 2330 2510 3990
4130 5140 5410 5430 5640 5650
5670 5680 5975 6530 7125 8140

WESTERN CANADA STEEL LIMITED,

450 South East Marine Drive,
Vancouver 15, B.C.
Telephone 604: 325-2271
Telex: 04-5389
Cable: WESTCANSTEL
President: G. H. D. Hobbs
Contact: W. J. McDonald, Export Sales Manager
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.

Page B6

WESTERN CONTROLS LIMITED,

342 Munster Avenue,
Toronto 8, Ontario.
Telephone 416: 239-9122
President: T. A. Hislop
Floor Area: 8,000 sq. ft.
Personnel: 18

Manufacturers of: Low voltage switchboards, fuse or moulded case circuit breaker types; Industrial control equipment and accessories (simple supervisory control, instrumentation and control centres); Physical properties testing and inspection equipment (nylon tensile tester, lycra tensile tester).

6110

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

WESTHILL INDUSTRIES LIMITED,

9031 Parkway Blvd.,
Ville D'Anjou,
Montreal 5, Quebec.
Telephone 514: 352-2310
President: A. G. Boisclair,
Contact: L. Leclerc, Vice-President and General Manager
Floor Area: 16,000 sq. ft.
Personnel: 53

Manufacturers of: Hydraulic Actuators, Engine and Airframe components and Sculptured parts in the medium to light range.

1560 1650 and page B7

WESTON MACHINE & TOOL LIMITED,

2121 Weston Road,
Weston, Ontario.
Telephone 416: 241-4674
Secretary-Treasurer: Hayden Jones
Floor Area: 6,000 sq. ft.
Personnel: 14

Manufacturers of: Jigs, Fixtures, Tools; Designing and building special purpose Machinery.

3465 3695

WHITE & PARTNERS LTD.,

220 Putney Avenue,
St. Lambert, Quebec.
Telephone 514: 671-2386
Vice-President: D. O. Blake
Floor Area: 1,500 sq. ft.
Personnel: 15

Manufacturers of: Designers and Consultants in Mechanical Engineering Undertake Engineering Feasibility Studies. Prototype Design; Supervision of Construction and Testing; Production Design of a wide range of Products; Special reference to Human Engineering Studies and Design of Wheeled and Tracked Vehicle Weapons; Communication and Special purpose kits.

Page B1

WHITEHOUSE FASTENINGS LIMITED,

165 rue Graveline,
St. Laurent, Montreal 9, Quebec.
Telephone 514: 636-1326, Telex: 01-2675
President: W. A. Wood Jr.
Contact: C. Provost
Floor Area: 20,000 sq. ft.
Personnel: 35

Manufacturers of: Stainless steel bolts, nuts, screws, washers, rivets and cotter pins; All types of corrosion resistant fasteners.

5305 5306 5307 5310 5315

WILLIAMS MACHINES LIMITED,

311 Montrose Street,
Preston, Ontario.
Telephone 519: 653-5774
President: J. J. Havlik
Floor Area: 46,000 sq. ft.
Personnel: 65

Manufacturers of: Jigs, Fixtures, Dies and Molds, Aircraft Parts and Components, Welded Steel Structures, Special Machinery, Hydraulic Milling Heads, General Machining, and 3-Dimensional Machining.

1560 1630 1680 1730 1740 3020 3419 3465 4920

WILSON MOTOR BODIES LIMITED,

2970 Lake Shore Blvd.,
Toronto 14, Ontario.
Telephone 416: 922-4040
Contact: A. R. Hutchings, General Manager
Floor Area: 40,000 sq. ft.
Personnel: 80

Manufacturers of: Van Bodies, Parcel Delivery Bodies, Stake Bodies.

2510

THE WIND TURBINE COMPANY OF CANADA LIMITED,

145 Lucan Street,
Waterloo, Ontario.
Telephone 519: 742-1323
President: J. S. Lackie
Contact: W. H. Fuller, General Manager
Floor Area: 10,000 sq. ft.
Personnel: 16

Manufacturers of: Communication Towers and Antennas, Microwave Passive Reflectors, Gymnasium Equipment.

5445 5985

WIRE ROPE INDUSTRIES OF CANADA LIMITED,

P.O. Box 158,
Montreal, Quebec.
Telephone 514: 637-6781
Telex: 01-2551
President: G. B. Foster
Vice-President and Managing Director: R. E. C. Cadman
Contact: W. G. Rathie, Export Manager
Floor Area: 440,000 sq. ft.
Personnel: 520

Manufacturers of: Steel Wire Rope; Steel Strand; Synthetic Cordage; Wire Rope Slings; Synthetic Rope Slings; Bridge Strand; Locked Coil rope.

1375 3940 4010 5660

WIX CORPORATION LIMITED,

25 Curity Avenue,
Toronto 16, Ontario.
Telephone 416: 751-2424
Telex: 02-2468
Cable: WIX
President: L. W. Nourse
Contact: T. C. Jeffrey, Export Manager
Floor Area: 85,000 sq. ft.
Personnel: 225

Manufacturers of: Oil, Air, Fuel, and Hydraulic filter Assemblies and Replacement Cartridges.

2910

THE W. C. WOOD COMPANY LIMITED,

5 Arthur Street South,
Guelph, Ontario.
Telephone 519: 824-2230
Cable: WOODFARMCO
President: W. C. Wood
Contact: W. H. Martin, Assistant Manager in Charge of Sales
Floor Area: 250,000 sq. ft.
Personnel: 250

Manufacturers of: Refrigeration Equipment; Stainless Steel Bulk Storage Tanks; Zero Freezer Cabinets—Farm Refrigeration; Builders Hardware; Bombs, practice.

1325 4110 4120 4130 5430 7125

PHIL WOOD INDUSTRIES LTD.,
857 Tecumseh Road East,
Windsor, Ontario.
Telephone 519: 253-3531
President: H. C. Johnson
Contact: H. McCarthy, Sales Manager
Floor Area: 54,000 sq. ft.
Personnel: 82

Manufacturers of: Valves, hydraulic; Truck engine shipping and storing containers; Rotator assemblies for gun mounts; Oil frame coolers (tank engine); Structural members for missile handling equipment; Garbage Disposal Bodies; Axles, Trailer and Trailer Tandem; Hoists, Hydraulic (for trucks, dump body type); Battery Electrolyte; Hose, Hydraulic; Tailgates, elevating; Bodies, dump truck (Steel and aluminum), Truck (Steel and aluminum); Cranes, motor truck, mounted; Motors, Hydraulic; Power Takeoff Units; Pumps, Hydraulic; Derricks, truck (mechanical and hydraulic); Racks, stock, tire and tool (metal); Flooring, bus, trailer or truck; Rams, hydraulic; Sanders, road; Snow Plows; Tandem Suspensions, Trailer, truck; Tire Carriers; Trailer Fifth Wheels; Trailers, bulk cement transport, bulk flour hauler, commercial, dump, logging; Universal Joint Parts and Kits; Universal Joints; Winches (truck); Wreckers.

1015 1450 1730 1740 2320 2330
2510 2530 3825 3830 3950 3990
4320 4810 4820 4910 5430 7125
8140 and page B7

GLENN S. WOOLLEY & CO. LTD.,
Fairall Street,
Ajax, Ontario.
Telephone 416: 942-5440
Cable: WOLYCO
General Manager: A. A. Medad
Contact: G. R. Kellett, General Sales Manager
Floor Area: 15,000 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, British Columbia.
Telephone 604: 321-9191
Cable: UNIVERSE
Managing Director: P. G. Chutter
Contact: J. D. Clark, Sales Manager
Floor Area: 82,500 sq. ft.
Personnel: 120

Manufacturers of: Bridge Strand; Wire Rope; Slings; Guy Wire; Chain Link Fencing; Barbed Wire; Wooden Reels and Pallets.

3940 4010 5660

YARROWS LIMITED,

P.O. Box 1030,
Victoria, B.C.
Telephone 604: 385-4421
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 3210 3695 3895 3920 3950 3990 4120 4130 4460 4520 4540 5410 5420 5430 5445 5670 6110 6530 7125 9905 and page B7

YORK GEARS LIMITED,
(Division of Levy Industries Ltd.),

825 Caledonia Road,
Toronto 19, Ontario.
Telephone 416: 783-6171
General Manager: W. Schabereiter
Contact: F. Doran
Floor Area: 120,000 sq. ft.
Personnel: 420

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. Repair and Overhaul facilities.

1620 1630 1650 2910 2995 3010 3020 5840 5985 and pages B3, B7 & I-220

ZINC OXIDE COMPANY OF CANADA LIMITED,

1435 Island Street,
Montreal 22, Quebec.
Telephone 514: 935-8571
Cable: ZOCOBRAND
President: E. S. Austin
Contact: D. B. Clark
Floor Area: 60,000 sq. ft.
Personnel: 40

Manufacturers of: Zinc Oxide.

6810

ERRATA

Page A-84:— Class 5815 — For "Guideline" read "Guildline".

Page A-85:— Class 5820 — For "Guideline" read "Guildline".

Page A-95:— Class 5855 — Canadian General Electric (EDPD)
Delete 31. *Add* 34.

Page A-95:— Class 5855 — Ernst Leitz Canada Ltd.
Delete 34. *Add* 31.

Page A-101:— Class 5930 — Canadian Stackpole Ltd.
Delete 27. *Add* 17.

HONEYWELL CONTROLS LIMITED –

Delete all reference to this company who are noted in the following classes and areas: 4920 — 4931 — 6110 — 6350 — 6625 — 6655 — 6665 — and pages B-1, B-3 & C-49.