

APOGEE

THE CANADIAN SPACE PROGRAM NEWSBULLETIN

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Nominated** p.7



Canadian Space Agency Officially Launched

On March 1, 1989, the federal government announced the establishment of a new Canadian Space Agency to coordinate Canada's civilian space program, which has an anticipated budget of almost \$3 billion to the end of the century.

Dr. Larkin Kerwin, former head of the National Research Council, has been appointed President of the Agency. Dr. Kerwin's distinguished career as a scientist and academic includes a term as Rector of Université Laval (Quebec).

The Agency will directly manage the majority of space program activities and will coordinate other Canadian space activities.

The Montreal headquarters of the Agency will include the executive, administrative and most research functions, as well as the management of the Space Station, RADARSAT,

Astronaut, Space Mechanics and European Space Agency programs. The David Florida Laboratory and Space Science Program will remain in the National Capital Region and an Ottawa liaison office will be established.

The Agency will eventually have a total of 300 employees, approximately 200 based in Montreal and 100 in Ottawa. The space activities previously carried out by several federal departments and agencies will now be coordinated by the new Agency.

A Space Advisory Board will be created to advise the Minister and provide on-going appraisal of the Canadian Space Program and the work of the Agency. The Board will be made up of key representatives from the space science community, the provinces and the private sector.



Government
of Canada

Gouvernement
du Canada

Canada

Minister Welcomes Space Agency

The history of space exploration in Canada spans over a quarter-century and it is filled with pioneering endeavour and accomplishment. It is my pleasure to be able to bring the readers of the inaugural issue of **APOGEE** news of the creation of the Canadian Space Agency and the appointment of Dr. Larkin Kerwin, a renowned scientist and administrator, as its first President.

With the launch of the Space Agency, Canada is entering a challenging new era of space exploration and development. The consolidation of major elements of our diverse Space Program into one Agency will ensure that Canada is able to take full advantage of the economic, scientific and technological benefits accruing from our investment in space.

Canada has already established a reputation of excellence in the development of space science and technology. The mandate of the new Space Agency will be to work with our space industry, universities and provincial governments to enhance and

build upon that reputation. The formation of the national Space Advisory Board will ensure that space science and industry representatives will have an opportunity to contribute advice and expertise to the development of future space plans for Canada.

Canadian companies already compete successfully with the world's best in areas such as remote sensing, communications satellite systems and space-based robotics. The creation of a

Space Agency reinforces the government's commitment to developing high technology expertise in Canada and will ensure that our space program continues to make a significant contribution to the overall strength of our national economy in the decades to come.

Honourable Harvie Andre
Minister of Industry, Science
and Technology

President's Greeting

As the recently-appointed President of the new Canadian Space Agency, I wish to introduce myself and welcome the readers of the inaugural issue of **APOGEE**, our Canadian Space Program Newsbulletin. Challenging times are ahead — for those of us at the Agency as well as for the Canadian space community as a whole.

The establishment of the Canadian Space Agency will mean a new structure and a new approach to the federal space effort. However, the Agency will continue to implement the primary mandate of the Space Program, that is, to promote the peaceful uses and development of space for the social and economic benefit of all Canadians. It will manage major space projects — in particular the international cooperation required for them; work with the space agencies of other countries to develop Canadian involvement in new international programs; recommend to the government policies and plans on space matters; and coordinate Canada's

overall space program.

The Agency will provide clear direction to our science and technology efforts in space. It will be a focal point for the development, in partnership with industry, of important technologies which will lead to new products and services for Canadians and for export abroad. The establishment of our own national Agency marks an important milestone in Canada's involvement in space, and I am confident the future holds great promise.

I and the two Agency Vice-Presidents, Mac Evans and Garry Lindberg, are looking forward to working with our colleagues in the Agency and members of the larger space community in this important venture.

Larkin Kerwin, C.C.
President
Canadian Space Agency

APOGEE

Apogee is the term applied to the highest point above the earth in the orbit of a planet or satellite.

APOGEE is published by The Canadian Space Agency on behalf of the Canadian Space Program.

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Recording Apogean Accomplishment

Welcome to the first edition of **APOGEE**, a newsbulletin about the Canadian Space Program (CSP), produced by the Canadian Space Agency.

Because the CSP involves numerous federal departments and agencies and many elements within the private sector, there is a growing need to exchange information and communicate with the general space and science and technology communities. **APOGEE** is intended to fill that need. The publication will be distributed to those involved in the many facets of the CSP, within the public and private sectors.

Our goal is to deliver news and information on the CSP in a timely and succinct fashion. In the masthead, you'll find the names and telephone numbers of those involved in **APOGEE**. We welcome your comments and news tips. We hope Apogee will keep you in touch with the exciting developments within the CSP and the Agency, as we strive for truly "Apogean" accomplishments in space development.

The Editorial Board

Space Scan

Remote Sensing

IGARSS '89 at UBC

The 1989 International Geoscience and Remote Sensing Symposium (IGARSS '89) will be held July 10 - 14 at the University of British Columbia, Vancouver, B.C. It will combine the 9th IGARSS with the 12th Canadian Symposium on Remote Sensing and with "URSI Commission F" technical sessions to form potentially the largest and best remote sensing meeting ever held.

Titled "Quantitative Remote Sensing: An Economic Tool for the Nineties", the theme of the meeting emphasizes the increasing capabilities of remote sensing to provide economically valuable information.

The meeting will survey the full range of applications in all aspects of resource and environmental management.

For more information: IGARSS '89/12th Canadian Symposium on Remote Sensing, Suite 801, 750 Jervis St., Vancouver, B.C., V6E 2A9. Telephone: 604-681-5226. FAX: 604-681-2503. Telex: 0435 2848 VCR.

Canada Sponsors Environmental Management Seminar

A seminar entitled "Environmental Management Needs and the New Resource Mapping Technologies" was held February 13 - 17 in Ottawa under the auspices of the Canadian Government.

Arranged by the Canada Centre for Remote Sensing (CCRS) and coordinated by External Affairs, the event was timed to complement a meeting of the United Nations Committee on Peaceful Uses of Outer Space (UN COPUOS) Science and Technology Sub-Committee, held in New York, Feb. 21 to March 3. The Canadian seminar followed through on the theme of the UN meeting, "Space Technology as an Instrument for Combatting Environmental Problems", which was especially directed at Third World countries.

In addition to encouraging participation by Third World countries in the UN sub-committee meeting, the seminar increased awareness of Canadian expertise in remote sensing technologies and its applications. Twenty-one countries were invited to participate in the seminar.

GIS Conference Held in Ottawa

Representatives from Canadian government and industry attended a national conference "Geographic Information Systems: Challenge for the 1990s" held February 28 - March 2 at the

Westin Hotel, Ottawa.

The event was co-sponsored by The Canadian Institute of Surveying and Mapping and Energy, Mines and Resources Canada, in co-operation with the American Congress on Surveying and Mapping and the American Society for Photogrammetry and Remote Sensing.

Space Station

Space Station Reviews

Canadian Government and industry officials and Spar Aerospace met in Toronto March 13 to 23 with representatives from NASA and ESA for a Program Design Review of the Mobile Servicing Centre, the largest Canadian element of the Space Station. The review was to ensure that the design requirements for Canada's Mobile Servicing System (MSS) were commonly agreed upon by the various agencies involved in the Space Station.

Communications

MSAT Pioneer Company Formed

A new Canadian communications company, Telesat Mobile Inc. (TMI) was launched December 12 by Telesat Canada, Canadian Pacific Limited and the Japanese Group (a Japanese investment consortium headed by C. Itoh and Co., Ltd.).

TMI will construct and operate the first Mobile Communications Satellite (MSAT) system in North America.

Earlier in the year, these companies (acting on behalf of TMI) signed an agreement with the federal Department of Communications concerning the lease of MSAT services.

Valued at \$126.5 million, the agreement represents a federal government accord to lease mobile satellite communications services over a period of ten years. This evidence of government support for MSAT is expected to generate considerable private sector interest in the program.

A main goal of the MSAT program is to help develop new mobile telecommunications services in Canada.

In particular, the program is aimed at satisfying urgent national needs for improved public and civil government mobile communications to under-served areas of the country, including resource development activities in remote areas.

MSAT Trials in '89

An informal agreement between key

players has been reached on the basic pre-launch voice and data trials planned for MSAT. A special MSAT committee has been formed to manage the selection of users and participants in the trials.

Early procurement action for the equipment required for the trials is under way with Canadian Astronautics Limited (CAL) of Ottawa, through Telesat Canada, and with Skywave Electronics Limited of Ottawa, with a view to implementing trial activity this year.

DFL - Olympus Undergoes Final Tests

Europe's *Olympus* satellite, one of the world's largest and most powerful communications satellites, has completed the final test phase at the David Florida Laboratory (DFL) at Shirley's Bay, Ontario.

The DFL is one of the few facilities in the world capable of accommodating and testing this European Space Agency satellite.

Staff from British Aerospace, the project's prime contractor, Spar Aerospace and the DFL recently completed a final series of tests on the protoflight model, including partial thermal vacuum retest (Jan 11 - 24), appendage release (Feb. 14 - 23) and mass properties measurement (mid-March).

The DFL has been involved in a variety of tests for the *Olympus* program since January, 1985, including testing of the thermal and structural models. *Olympus* left in early April for Kourou, French Guiana, for launch aboard *Ariane* flight V32 scheduled for mid-June.



Rolf Mamen, Director, David Florida Laboratory, demonstrates how *Olympus* will orbit the earth to Larkin Kerwin (centre) President, Canadian Space Agency, and Hon. Harvie Andre, Minister, Industry, Science and Technology.



Communications

New MSAT Design Tested

Spar Aerospace Ltd. has successfully operated a breadboard design for an L-Band 60-watt amplifier for MSAT. This latest design is based on a high-powered FET device specifically designed for class A-B operation. The design is an improvement over its predecessor which used a complicated bias approach and Class C devices.

Spar is also in final negotiations with ComDev Limited to develop a high-powered switch and with Canadian Astronautics Limited to develop a passive intermodulation test set.

All are key elements within the MSAT program.

DFL Tests Anik E1

Environmental tests on the fifth generation of *Anik* satellites will soon be under way at the David Florida Laboratory (DFL) when the first of two satellites, *Anik E1*, arrives at DFL in mid-April.

Anik E2 will follow shortly thereafter.

During the next 12 months, both satellites will undergo a series of tests, including thermal vacuum, vibration, radio frequency and mass properties measurement. The mass properties measurements will use a new horizontal axis measurement system (HAMS) which was developed by DFL/CRC to test today's larger satellites.

Anik E1 and *Anik E2* are owned and operated by Telesat Canada. Spar Aerospace is the prime contractor.

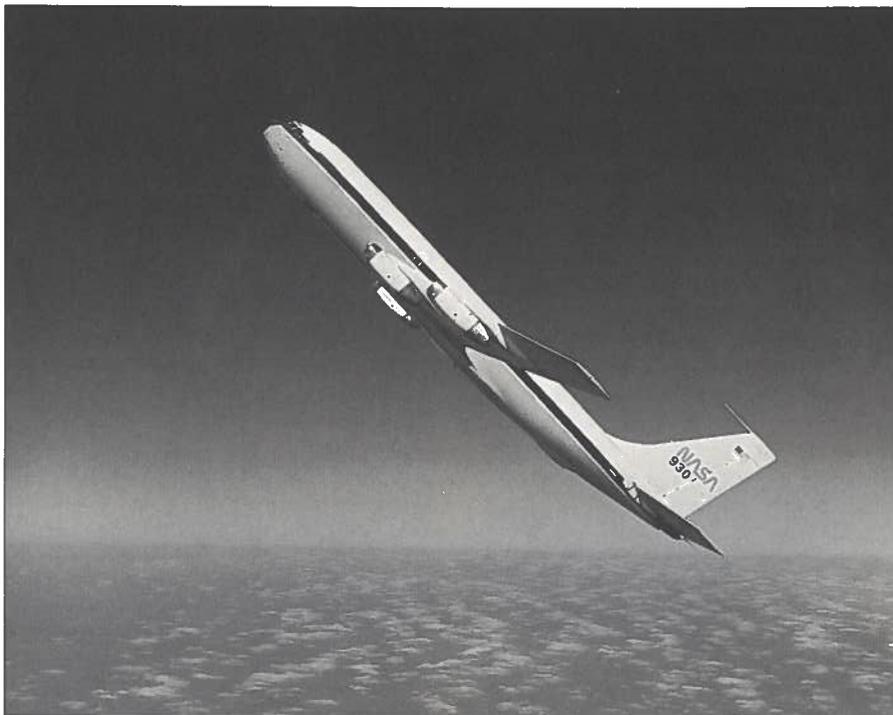
DFL Upgrades Antenna Measurement Facilities

From an unsolicited proposal, Canadian Astronautics Limited (CAL) of Ottawa has been awarded a contract to develop a spherical near-field antenna measurement system at the David Florida Laboratory.

The project will upgrade the current source antenna measurements facilities and will make testing more efficient.

The system combines hardware and software to generate and measure antenna radiation patterns within the existing 12 metre RF chamber at DFL. CAL supplies the data processing software, mounting mechanism and hardware fixtures. DFL is responsible for developing the data acquisition system.

The definition phase of the project is completed and good progress has been realized on software development and associated documentation.



NASA's KC-135 allows Canadian astronauts and scientists to conduct micro-gravity experiments. Weightlessness is achieved at the top of the parabola.



Canadian astronauts are left weightless during a KC-135 flight. From left: Marc Garneau, Bjarni Tryggvason, Steve MacLean and Bob Thirsk.

The project has entered its final implementation phase and is expected to be completed this spring.

The project is receiving funding assistance from the departments of National Defence; Supply and Services and Communications.



Space Science

KC-135 Flights

A new series of Canadian microgravity experiments on NASA's KC-135 parabolic-flight aircraft flew March 14, 15, and 16.

The National Research Council flies experiments on the KC-135 twice a year. A KC-135 mission consists of three flights, each of which has 40 parabolas of about 15-20 seconds of 0.01 g or less, followed by a 2 g pull-out.

The KC-135 provides a relatively inexpensive and quick way for investigators to check their experiments in microgravity prior to flying them in more expensive flights such as rockets or the Space Shuttle.

The Canadian Space Agency covers the KC-135 flight costs under the Space Station User Development Program, and additional limited funding is available to universities and non-profit research organizations to assist with travel costs and other expenses.

Experiments are selected from responses to an Announcement of Opportunity, which is issued about 10 months prior to each flight. For more information, contact Space Station User Development Program Manager, Canadian Space Agency, (613) 990-0787.



Space Science

EXOS-D Launch

The Japanese-built *EXOS-D* satellite, equipped with Canadian Suprathermal and Energetic Ion Mass Spectrometer (SMS), was launched from Kogashima Space Centre in Japan February 22, 1989.

In addition to the SMS, *EXOS-D* carries seven scientific instruments primarily designed to investigate the particle acceleration regions above the auroral zone.

Canada provided for reception of *EXOS-D* data at the Prince Albert, Saskatchewan satellite facility which has been modified to include the required tracking data reception hardware. Canada and Japan will share the SMS data and cooperate in scientific data analysis.

The SMS' principle investigator is Dr. B. A. Whalen. The prime contractor is SED Systems Ltd. of Saskatoon.

Oedipus Launched

Canada's *Oedipus A* sounding rocket was successfully launched January 30 from the Andoya Rocket Range in Norway about 300 km inside the Arctic Circle.

The payload consisted of two parts connected by a tether on a reel. Separation to a distance of 1 km was accomplished. The tether was used as an antenna and a conducting wire to measure ambient electric fields and waves in the upper atmosphere and ionosphere, and to study the response of the electrically charged gases to waves emitted by the tether and spacecraft.

The *Oedipus* payload was carried to an apogee of over 600 km using a three-stage Black Brant 10 rocket. Unique developments on this payload included a tether subsystem, a gas separation subsystem to perform the controlled separation of the two payload components to a distance of one kilometer, and a video-camera based relative position subsystem.

The project was undertaken with the cooperation of NASA, which provided the first-stage booster, attitude control system and backup ground station. The prime contractor was Bristol Aerospace of Winnipeg.

Canadian Experiments to Fly in '91 and '93

The Canadian Space Agency's Wide Angle Michelson Doppler Imaging Interferometer (WAMDII) is scheduled to fly aboard Space Shuttle in November, 1991. WAMDII is designed to measure

low-level light emitted from atoms and molecules to study the connection between upper atmospheric disturbances and weather patterns on earth. It will fly aboard the Space Shuttle for seven days.

The Waves in Space Plasma (WISP) experiment will be flown during the maiden voyage of NASA's reusable "space tug", the Orbital Manoeuvring Vehicle (OMV-1), in 1993. Developed by Canadian Astronautics Limited of Ottawa under contract to the federal government, the experiment will measure the interaction of an antenna with charged particles (called plasma).

WINDII Launch Scheduled for 1991

Canada's Wind Imaging Interferometer (WINDII) will be launched on NASA's Upper Atmospheric Research Satellite (UARS) in October, 1991, and will remain in space for 18 months. It will measure very low-level light from atoms and molecules above the earth. The images provided will enable scientists to measure winds and temperatures and also to provide information on the composition of the upper atmosphere. The results will help establish relationships between upper atmospheric disturbances and weather on earth.



Astronaut Program

Money, Bondar Begin Training

Canadian astronauts **Ken Money** and **Roberta Bondar** began an extensive pre-flight training program almost

immediately after being nominated January 11 as payload specialists for the IML-1 Space Shuttle Flight currently planned for launch in February, 1991 (see story page 7).

Bondar and Money will train along with NASA astronaut **Roger Krouch**, and **Ulf Merbold**, an astronaut from West Germany. The Canadian pair are life sciences specialists, while the other two are material specialists.

The four will follow a busy pre-flight agenda that will take them virtually around the world as they work with the laboratories supplying the 15 experiments that will be completed on IML-1. The astronauts, who must become intimately familiar with all aspects of every experiment, work closely with investigators to ensure experiments are carried out accurately. Beginning in May, the astronauts will travel across Canada, spending time with investigators in laboratories located in Vancouver, Calgary and Montreal. The actual Mission orientation sessions will be held at NASA's G.G. Marshall Space Flight Center and at the Johnson Space Center covering experiment and flight simulations.

Eight to 10 months prior to launch, the astronauts will begin training at NASA's Cape Canaveral Facility in Florida in order to prepare for living and working in the space orbiter. Astronaut Steve MacLean has a similar training regimen in preparation for his flight, planned for March, 1992.

Space International

Canada-Japan Panel to Meet in Spring

The Canada-Japan Joint Panel on Space Cooperation, formed last October, will hold its first meeting in Tokyo this spring. The panel was created under the auspices of the Canada-Japan Science and Technology Agreement to promote and coordinate cooperation on space projects of interest to both countries.

The official Canadian representative will be **Dr. Jocelyn Ghent Mallett**, Director-General, Policy, Canadian Space Agency. The Japanese representative will be the Director of International Affairs in the Japan Science and Technology Agency.

Japanese Request Follow-up to Mission

Japanese companies which participated in an October mission to Canada have requested additional follow-up meetings with officials and companies involved in the Canadian Space Program.

The Japanese were impressed with Canadian developments in several areas, including remote sensing. Both countries are seeking stronger ties among space-based industries.

The meetings, which will take place this year, will involve Japan-based companies such as Nissan and a number of Canadian organizations involved in the Space Program.

Working Towards Canada's Place in Space

Canadian involvement in the International Space Station Program is gathering momentum at both government and industry levels.

Involvement in Space Station represents the largest undertaking ever launched by Canada's space community. The federal government has contracted an industry team from all regions of the country to develop Canada's primary contribution to the Space Station, the Mobile Servicing System, (MSS). The MSS is an advanced robotics device that will assure the construction, servicing and maintenance of the Space Station.

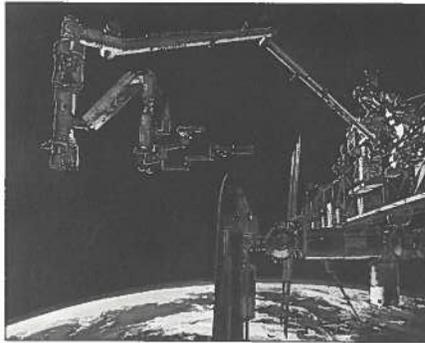
Spar Aerospace is the prime contractor on the project, serving its client, the Canadian Space Agency. Spar has issued subcontracts for the project to companies from across Canada. The industrial team participated in a design review with government officials and NASA representatives for two weeks in March. The team includes:

Spar Aerospace, Toronto: prime contractor, systems engineering, design and development of station manipulator and the special purpose dextrous manipulator control systems, and overall product assurance.

CAE Electronics Limited, Montreal: design and construction of simulator systems, design of crew control stations

for the MSS and associated software, central source of high-reliability parts.

Spar Aerospace, Montreal: design and development of manipulator-based electronics, video and communications systems, and of the mobile servicer base.



An artist's illustration of the MSS in operation on the Space Station. (Illustration by Paul Fjeld)

IMP Group, Halifax: design and development of cable and harness systems.

PRIOR Data Systems, Halifax: independent software verification and validation.

Canadian Astronautics Ltd., Ottawa: design and development of the data management, power and distribution management systems, and associated software.

Dynacon Enterprises, Toronto: analysis on simulators.

SED Systems Inc., Saskatoon: design and development of ground segment systems test equipment and the operations centre for MSS logistics support and training.

MacDonald, Dettwiler and Associates, Vancouver: software systems and support, technical management and information system.

Canada's involvement in the Space Station represents an investment of \$1.185 billion to the year 2000.

The benefits to Canada will be significant: \$5 billion in space and terrestrial spinoffs and 80,000 person years of employment over the next 15 years.

The multi-billion dollar Space Station will be built in orbit by 1997. It will require for its assembly a total of 20 Space Shuttle and two Ariane flights over a period of three years. Canadian astronauts will be directly involved in the construction, maintenance and use of the facility.

Canada Meets Space Challenges Head-On

Editor's Note: The Canadian Space Program represents a diverse and complex grouping of activities and players. The following overview has been prepared for this introductory issue of APOGEE.

Satellite Communications and Remote Sensing

Since Canada placed *Alouette* in orbit in 1962, its space industry has gained international recognition in satellite communications and remote sensing.

The 1967 Chapman report, prepared by Dr. John Chapman, further reinforced Canada's position as a world leader. Dr. Chapman's recommendations led to the development of the *Anik* series of communications satellites and the establishment of an extensive remote sensing program.

The current development of RADARSAT and the Mobile Communications Satellite (MSAT) maintains that direction. RADARSAT, to be operational in the mid-nineties, will use a

special microwave instrument, Synthetic Aperture Radar, to transmit and receive signals over the entire planet through clouds or at night. MSAT, the world's first domestic communications satellite for mobile users, scheduled for launch in 1992, will provide voice and data communications for vehicles, ships, aircraft and portable stations anywhere in Canada.

Originally reliant on government funding, the space industry now sells a majority of its \$300 million annual production to private interests in Canada or to public and private space interests abroad.

Space Station

Building on Canadarm, the Mobile Servicing System (MSS) will be Canada's contribution to the development of the international Space Station. A major element of the \$1.185 billion dollar investment in robotic equipment will be a large manipulator arm capable of

handling three times the Canadarm's capacity.

A multi-million-dollar project, Space Station will bring together Canadian, American, European and Japanese scientists, administrators and astronauts. They will undertake research in cooperation with government, industry and university researchers over the 30-year lifespan of the Station. A Canadian will be on board for the equivalent of three months each year.

Astronaut Program

The Canadian Astronaut Program began in 1983, when six astronaut scientists — two medical doctors, one physiologist, two engineers and one laser physicist — were chosen from among four thousand applicants. Marc Garneau flew aboard the Space Shuttle "Challenger" in 1984. Two other Canadian astronaut-scientists will soon go into space.

(See **SPACE**, page 7.)

Bondar, Money Nominated for '91 Shuttle Flight

Canadian astronauts **Roberta Bondar** and **Ken Money** were nominated January 11 as payload specialist candidates for the International Microgravity Laboratory 1 (IML-1) Space Shuttle Flight (STS-47), currently planned for launch in February 1991.

The IML flights are a co-operative program in which NASA provides the international scientific community with access to Spacelab and its capabilities. NASA formally accepted Canada's proposal to include six Space Physiology Experiments on IML-1, and invited Canada to nominate two candidates for the mission. Bondar and Money began their training almost immediately. After an initial period, Canada and NASA will

SPACE (from page 6.)

Space Science

Space Science has been a part of Canada's space program since the 1930s. While continuing to work in its traditional area of expertise — upper atmosphere physics and chemistry — Canada expanded its work into microgravity and space astronomy research in the 1980s. Collaborations with Sweden, Japan and the European Space Agency (ESA) on space science projects have added to Canada's reputation.

David Florida Laboratory

The growth of the Canadian space industry has created the demand for specialized centres to support the needs of the industry. One of these centres, the Space Agency's David Florida Laboratory, is a world-class satellite testing facility. The laboratory assesses the "space worthiness" of satellites and spacecraft through tests duplicating the heat, cold and vacuum of space.



Ken Money, left; Roberta Bondar, right.

decide on the prime and backup payload specialist for the flight.

The Canadian Space Physiology Experiments to be conducted on the IML flight are concerned primarily with space adaptation — the complicated range of human responses to the weightless environment of space. Emphasis will be given to the study of the adaptation of the human vestibular system, which controls balance, and the proprioceptive system which helps humans sense body positions and motion even with eyes closed. Neither of these systems function normally in weightlessness. The experiments to be conducted were developed by more than 24 researchers in government and university laboratories from across Canada. The payload specialists will also conduct experiments for researchers from other countries.

The Canadian Astronaut Program was established in 1983 to have payload specialists conduct Canadian-sponsored experiments on Space Shuttle missions and to provide astronaut support to all elements of the Space Program. Ken Money and Roberta Bondar were among the original six astronauts selected.

Roberta Bondar has a BSc in zoology and agriculture, an MSc in experimental pathology, a Doctorate in neurology and a medical degree. Her research interests include neurology, and the effects of microgravity on humans.

Ken Money has a BSc, MSc and Doctorate in physiology and has authored more than 80 scientific papers. His research has focussed on vestibular physiology related to space flight.

Space Net

CCRS Compiling Directory

A new directory on surveys, mapping and remote sensing industries is being compiled by the Canada Centre for Remote Sensing. To be included, contact **Dr. Robert Ryerson**, CCRS, 1547 Merivale Road, Ottawa, Ont., K1A 0Y7. Tel: 613-952-2735

ISU '89 in Strasbourg, France

The University Louis Pasteur, in Strasbourg, France, has been selected as the second International Space University (ISU) site for the 1989 summer session. Nine Canadians will be among the one hundred and twenty graduate-level students from over 20 countries expected to attend the summer session.

Calgary Conference Promotes Industrial Opportunities

On January 12 and 13, 200 representatives of industry, universities and governments attended a conference called "Canadian Space Program: Opportunities for Western Canada." At the conference, organized by the Alberta Research Council, CSP program managers told delegates about current and future funding and contract opportunities presented by Canada's involvement in the Space Station, RADARSAT and MSAT projects, and the Space Science Program.

Hawkins Receives Award

Dr. Robert Hawkins, Data Acquisition, Canada Centre for Remote Sensing, has been awarded the 1988 Science and Technology Award Fellowship by the Japan International Science and Technology Exchange Centre. The Fellowship is for a period of six months at a Communications Research Laboratory in Japan.

Ghent Mallett appointed to ISU Board

Jocelyn Ghent Mallett, Director General, Policy, Canadian Space Agency, is Canada's latest member appointed to the International Space University (ISU) Board of Directors.

Two other Canadians, Robert D. Richards of the Space Generation Forum and John Dinsmore of the Corporate Higher Education Forum, sit on the Board which meets four times a year to set ISU policies.



Ghent Mallett

Marc Garneau Given Senior CAPO Position

Canadian astronaut Marc Garneau has been appointed Deputy Program Manager of the Canadian Astronaut Program. Garneau's background as a scientist and space veteran, plus administrative experience gained in the Canadian military, makes him an invaluable technological and administrative resource to this program. He will also continue his work as co-investigator of the Space Vision System Experiment for the CANEX 2 Flight.

Space Resources

◆ **Directory of Publications and Audio-Visual Materials, Department of Communications.** The directory lists brochures and handbooks, fact sheets, newsletters, posters, studies and reports, and audio-visual material available from DOC. Some publications are free of charge, others can be purchased from authorized bookstores or from the Canadian Government Publishing Centre. Audio-visual materials can be borrowed free of charge.

Communications Canada
300 Slater Street,
Ottawa, Ontario
K1A 0C8
Tel. (613) 990-4900

◆ **The Space Resource Centre Catalogue, 1988, The Marc Garneau Collegiate Institute (MGCI).** The catalogue describes materials available for duplication in areas such as aeronautics, applications satellites, space life sciences, manned spaceflight, space sciences etc.

◆ **The Capsule.** MGCI's newsletter.

The resource catalogue and newsletter can be obtained from:

Marc Garneau Collegiate Institute
135 Overlea Boulevard
Don Mills, Ontario
M3C 1B3
Tel. (416) 429-6166

◆ The Space Resource Centre at MGCI, a nation-wide NASA materials distribution centre, includes videotapes from numerous Canadian agencies and businesses. Other

resources available to Canadian educators include packaged audio-tapes and slide presentations, teacher guides and course materials. References to sources of information related to space science and a list of speakers and contact persons in related fields can be ordered.

◆ **The David Florida Laboratory fact sheets folder.**

David Florida Laboratory
P.O. Box 11490, Station "H"
Ottawa, Ontario
K2H 8S2
Tel. (613) 998-2383

◆ **Canadian Space Agency Resources:**

• **Canadian Space Program Profiles:** Canada's Place in Space / MSS Facts - Space Station

• **Pamphlet:** Canada in Space: 25 Years and Counting

• **Video Tapes:** Canada in Space: 25 Years and Counting / Canada's Place in Space (Space Station)

• **Posters:** Canada's Place in Space / Space Station (MSS) / RADARSAT

• **Photo Cards:** Canada's Place in Space / Space Station (MSS) / RADARSAT / Canadian Astronauts / Space Science (Aurora)

• **Stickers:** Canadian Space Program Patch

Contact:

Space Communications
Canadian Space Agency
240 Sparks Street
Ottawa, Ontario K1A 1A1
Tel: (613) 993-1310

Calendar

◆ **May 9-10, 1988:** Second UDP Conference "Spacebound '89". University of Ottawa. *For more information contact:*

• Conferences Services,
NRC, Building M58,
Montreal Rd.,
Ottawa, Ontario
K1A 0R6
Tel. (613) 993-9009.

◆ **June 8 - 18, 1989:** The Paris Air Show - Le Bourget, France.

◆ **July 10-14, 1989:** The 1989 International Geoscience and Remote Sensing Symposium (IGARSS '89) - University of British Columbia, B.C.

◆ **August 9-13, 1989:** Air Show Canada - Abbotsford, B.C.