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Canada's catalyst in space – new communications tool launched

The newest Canadian-built experimental satellite, the Communications Technology Satellite (CTS) – said to be the world's most powerful – was successfully launched into outer space from the Kennedy Space Center, Florida, on January 17.

The satellite, seen as the advanced technology forerunner of a new type of high-powered orbiting transmitters expected to provide a wide range of expanded communications services in the 1980s, is the product of more than five years' work by Canadian government and industry scientists and engineers.

The primary aims of the CTS program are: to demonstrate high-powered television and other transmission to small, low-cost earth stations; to flight-test major advanced technology subsystems of the spacecraft itself; and to further develop and demonstrate the abilities of Canadian industry in the design and fabrication of subsystems and components for the space/communications systems of tomorrow.

For the next two years, the \$60-million satellite will be used for a series of social, technological and technical

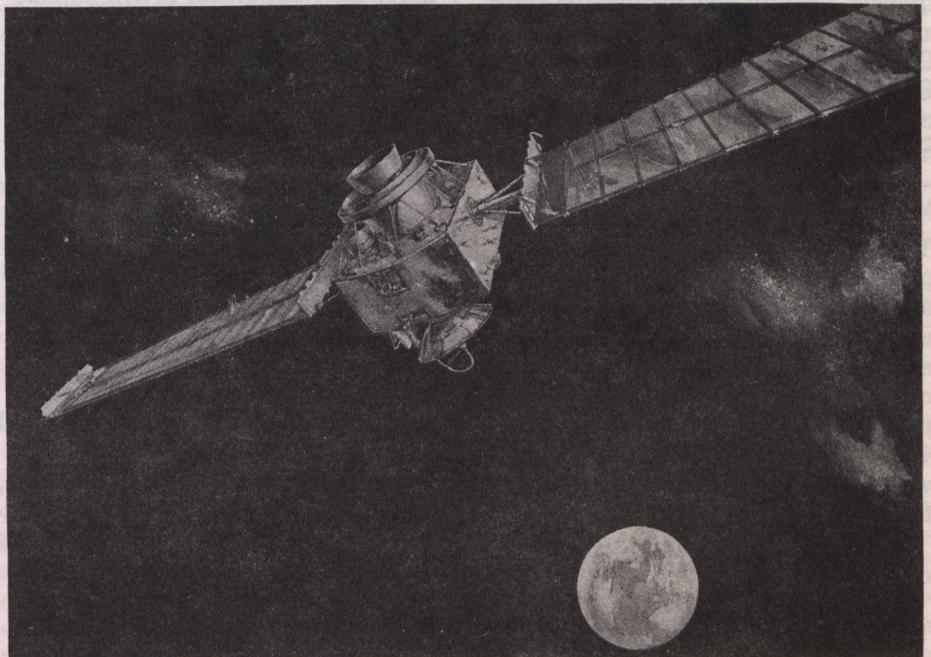
communications experiments by various groups on both sides of the Canadian and United States border.

It was put into orbit under a continuing program of Canada/U.S. collaboration in the peaceful uses of outer space that began with the launch in 1962 of *Alouette I*, Canada's first satellite – the first of any nation other than the U.S. and the Soviet Union.

Canada designed and built the spacecraft; the U.S., which provided its high-powered transmitting tube and pre-launch test support, carried out the launch. Each country is fully responsible for its own parts of the program. The European Space Agency also participated, through a bilateral agreement with Canada.

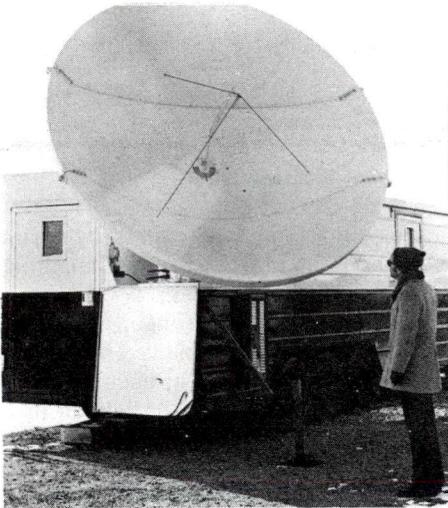
The Canadian management and design authority is the Communications Research Centre of the Department of Communications at Shirley Bay, just west of Ottawa. The Lewis Research Centre of the National Aeronautics and Space Administration in Cleveland is responsible for the U.S. part of the program. During the early stages of its flight, the satellite will be monitored

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Canada's Communications Technology Satellite, launched on January 17, will spend its two-year lifetime at a height of 22,300 miles in space.

Secretary of State for External Affairs Allan MacEachen recently concluded a ten-day tour of five countries in the Middle East. Details of the visit will appear in next week's issue.



An earth station with fully collapsible ten-foot antenna, and its own generator, is small enough to be transported in a trailer.

and controlled by U.S. ground stations; then it will be turned over to engineers and technicians at Shirley Bay, the centre and focal point for satellite control, and for the experiments to follow.

Canadian groups of experimenters, whose interests include the fields of broadcasting technology, telemedicine, tele-education, community interaction, data transmission and government operations in remote areas, will begin 26 experiments in May. Experimenters include several major universities in central Canada and the Maritimes, the Quebec, Ontario and Manitoba governments, the Canadian Broadcasting Corporation, Bell Canada, Telesat Canada, the Alberta Native Communications Society and the Rural Health Society of Victoria, British Columbia.

Miniature ground stations

The CTS ground stations are as important as the satellite itself. Eighteen, small, lightweight terminals, designed and built by RCA Limited of Montreal and SED Systems of Saskatoon, Saskatchewan, have been supplied to the experimenters, who have agreed to provide the Communications Department with assessments at the conclusion of the program.

There are ten terminals with antennas of three-foot diameter and eight with "dish" antennas about twice that size. The smaller stations will be used for such purposes as reception of audio broadcasting (perhaps, under very

favourable conditions, even television) and two-way voice communications.

The seven-foot terminals will be used for reception and transmission of community and educational television, as well as for other, simpler forms of communication.

SED Systems was chosen to supply two fully self-contained, transportable earth stations. Housed in a trailer, the earth station includes a collapsible ten-foot antenna and its own generator. The terminal can be transported to virtually any location in Canada by road, rail or (with equipment removed from the trailer) by light aircraft. It will be capable of providing a full-range of communications services, and will even be able to originate high-quality colour TV programming.

Major earth stations with 30-foot antennas are located near Ottawa at the Communications Research Centre. One provides telemetry, tracking and command functions for the mission; the other is the communications control station.

Experiments

Among the experimental communications services these terminals will make possible are community reception of radio and TV broadcasting in remote locations, interactive educational TV, and telemedicine. One experiment will help determine optimum uses of two-way television in providing health care in remote rural areas. It will explore the extent to which the effectiveness

of a medical team in a remote area can be increased through audio-visual and data links to specialists in urban areas. Results will help develop a model for a national urban-rural medical centre.

Another experiment involves the evaluation of curriculum-sharing. Carleton University, Ottawa, and Stanford University, California, will exchange courses by means of a digital video compression technique developed by NASA's Ames Research Center.

"Human" satellite

The new satellite operates on a human scale, and this is the key to its flexibility. Conventional communications satellites, because they operate on frequencies used by existing terrestrial services, must be limited in the power they transmit; if they are too powerful they interfere with earth-based communications systems. To capture their relatively weak signals, ground stations must be large, expensive and normally fixed in one location.

With CTS and the new generation of broadcasting satellites, all that is changed: operating on previously unused frequencies, these satellites can be far more powerful than their predecessors without disturbing existing communications. Broad solar "arrays", folding out accordion-like from the satellite and equipped with thousands of solar cells, draw energy from the sun and give the CTS its increased power. And higher power in the satel-

(Continued on P. 6)

Canada's place in space

Little more than a decade has passed since Canada became the first nation to join the Soviet Union and the United States in the "space club".

Six successful Canadian scientific and communications satellites have now earned this country's space scientists and engineers a performance and reliability record respected throughout the world.

Beginning with *Alouette I*, in 1962, and concluding with *ISIS II*, in 1971, four scientific satellites established Canada's place in space. They worked perfectly, providing science with tremendous amounts of data to further man's knowledge of the ionosphere

and giving both Canadian government and industry invaluable experience in the design, manufacture and operation of satellites and their subsystems.

The Canadian space program entered a new phase in 1972, when the launch of Telesat Canada's *Anik I* gave Canadians the world's first domestic geostationary telecommunications satellite system. *Anik's* twin, *Anik II*, was launched the following year.

Canada now stands on the threshold of a new venture in space with the launch of the Communications Technology Satellite, which will test the technology and applications of a new generation of high-powered satellites to meet the communications needs of the 1980s.

Alternative ways sought of achieving Canada's commercial broadcasting aims

Other means of obtaining the objectives of the Canadian broadcasting system will be considered when United States and Canadian officials meet again to discuss the Canada Radio-Television Commission's policy of deleting commercial advertising on TV programs originating in the U.S. and shown in Canada.

The following excerpts are from a joint communiqué issued after a meeting of representatives of both countries on January 13.

Representatives of the Governments of Canada and the United States met January 13 in Ottawa at the request of the United States State Department, to consider the views of the United States Government concerning the deletion from Canadian cable television transmissions of commercial messages originating from United States broadcasting sources, as required by the Canadian Radio-Television Commission.

The implications of this requirement were discussed by Canadian officials in the context of the economic activities in Canada of U.S.A. border sta-

tions. In addition, mutual regulatory activities and policies as they affect transborder broadcasting and cable issues were comprehensively discussed.

* * * *

It was agreed that further meetings would take place in the near future between appropriate Canadian and U.S.A. officials to consider alternative means for achieving the objectives of the Canadian broadcasting system. Obviously officials in their talks would continue to be guided by the policies of their respective Governments.

Breakthrough in animal breeding – calf sex known months before birth

Agriculture Canada veterinarians who have been carrying out research on embryo transfers in cattle have scored another first in animal breeding.

Researchers now can determine the sex of a two-week-old calf embryo taken from its mother's uterus. Embryos of known sex can then be transferred to recipient cows, which carry them to full term. The development has important implications for future use of embryo transfers in multiplying stocks of genetically superior cattle. The sex of calves born from transfers can be chosen at will.

The proof of this most recent milestone in cattle breeding made its appearance on Christmas Day, when a 70-pound heifer calf was born at the federal department's Animal Diseases Research Institute in Ottawa. Researchers had known its sex since 14 days after it was conceived on March 20, 1975.

Transfer is used to rapidly multiply superior stock. Instead of a pedigreed mother bearing one or occasionally twin calves, several of her fertilized eggs are transferred into surrogate mothers.

First, the purebred cow is treated with a hormone to make her superovu-

late. Instead of one or two eggs being released, as many as 30 may be produced, most of which can be fertilized by artificial insemination.

The quality of the recipient is of no importance as the genetic constitution of the embryo is not affected by the uterine environment in which the resulting pregnancy is completed. However, about half the calves produced are bulls and in the case of dairy-cattle breeding, heifers are much more in demand for milk production.

Now the Agriculture Canada veterinary research team – Keith Betteridge, Bob Eaglesome, Douglas Hare, Douglas Mitchell and Geoff Randall – has developed a method for pre-determining the sex of these calves. They can choose to produce heifers or bulls at will.

It is the first time such a technique has been reported. It involves taking a biopsy from the embryo to determine its sex by chromosomal analysis. The only other report of embryo sexing from Cambridge, England, is one in which rabbits were used.

"During the past year, using developed surgical transfer techniques, we first found it possible to successfully transfer unsexed embryos as late as

16 days after the onset of the donor's heat cycle," say the researchers. This delay in removing the embryos from the donor's uterus allows them to develop from their early, small, spherical shape to a larger, more elongated form which can vary in length from about one to 35 mm.

While the other members of the team carry out the embryo removal and transfer, Dr. Hare, a cytogeneticist, cuts a small portion from the end of the embryo. The cells contained in the tiny tissue slice are used for sex-chromosome determinations.

For the next three hours, in which the removed tissue is processed and the sex of the embryo determined, the embryo is incubated in a tissue culture medium.

After the chromosome examination is complete, embryos of the desired sex can be transferred to the recipient cows. Should pregnancy follow, the sex of the developing calf is known.

The heifer calf born on Christmas Day confirmed the accuracy of the sexing technique.

In experiments to date, a total of 22 embryos – 10 male and 12 female – have been sexed and transferred, with 10 pregnancies resulting.

"This development means we can produce genetically superior bulls or heifers at will," say the scientists, who will describe details of their procedure at the International Congress on Animal Reproduction and Artificial Insemination in Poland next July.

Continued participation in UNFICYP

Canadian participation in the United Nations Peacekeeping Force in Cyprus (UNFICYP) is to continue for a further six months to June 15 in response to a request from the UN Secretary-General.

The period of further Canadian participation approved by the Government coincides with the mandate renewal period recently agreed to by the Security Council for UNFICYP. Secretary of State for External Affairs Allan MacEachen noted that UNFICYP was contributing significantly to an atmosphere of restraint on the island which, it is hoped, will assist progress towards a negotiated settlement of the Cyprus issue. Canada, at present, contributes 515 personnel to UNFICYP.

Canada hosts international ice hockey tournament

Federal Health and Welfare Minister Marc Lalonde announced on January 8 that an international ice hockey tournament, organized by Canada, would be held in the autumn. All countries invited to participate – Czechoslovakia, Finland, the Soviet Union, Sweden and the United States had accepted. Cash prizes totalling \$465,000 will be presented. Excerpts from Mr. Lalonde's statement follow:

* * * *

Formal negotiations began in November 1975. The organizing committee met for two days in Stockholm with representatives of all invited countries. Representatives of the International Ice Hockey Federation were also in attendance. At that meeting, all countries agreed in principle to participate in the tournament and substantial agreement was reached on the details of the Canadian proposal.

It was proposed that the tournament be a "single round robin" to be held in the fall of 1976 with the two top teams participating in a two out of three games play-off.

Cash prizes would be awarded by order of finish according to the following scale:

1st place	\$100,000
2nd place	75,000
3rd place	65,000
4th place	55,000
5th place	50,000
6th place	45,000

In addition, the winning team and the losing team of the final three-game

series would receive \$50,000 and \$25,000 respectively.

In the interest of fostering broad participation in deciding technical hockey matters related to the tournament, Canada proposed the creation of a tournament directorate composed of representatives of all invited countries plus the International Ice Hockey Federation. These participants agreed to the proposal and the first meeting was held here in Toronto, yesterday, January 7.

I am pleased to announce that as a result of that meeting, all countries have now officially agreed to participate in Canada's invitational hockey tournament to be held in September 1976.

With respect to Canada's participation in the tournament, I am pleased to announce further that the organizing committee has been assured of the full co-operation of the players' associations and the owners of the National Hockey League and the World Hockey Association teams.

* * * *

gating, sleigh rides, curling and ice fishing as well as enjoying the many carnivals that take place.

Snowmobiling

Snowmobiling, invented in Quebec, is growing quickly in popularity. Hundreds of snowmobile clubs have been established, and whole families take part in the sport. The number of trails has multiplied to such an extent that regulations have had to be laid down to prevent accidents and protect the environment.

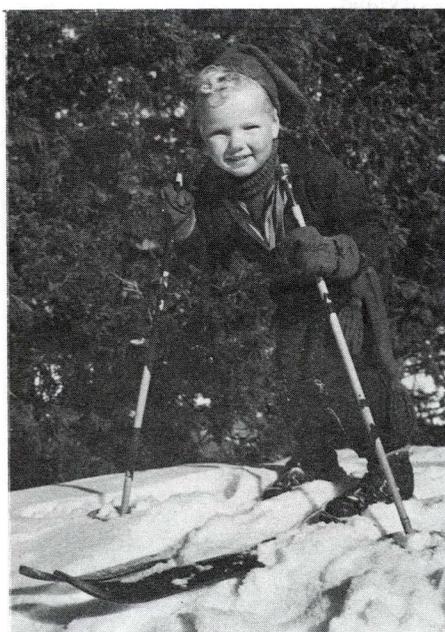


Winter sports and recreation in Quebec

In winter as in summer, Canadians, like people in the other industrialized nations, feel a growing need to spend much of their free time far from the big cities.

When there is a nip in the air, when the biting north wind blows and powdery snow falls over the province of Quebec, the sports-minded rejoice, and the winter resorts near the slopes and trails welcome the crowds of snow-worshippers.

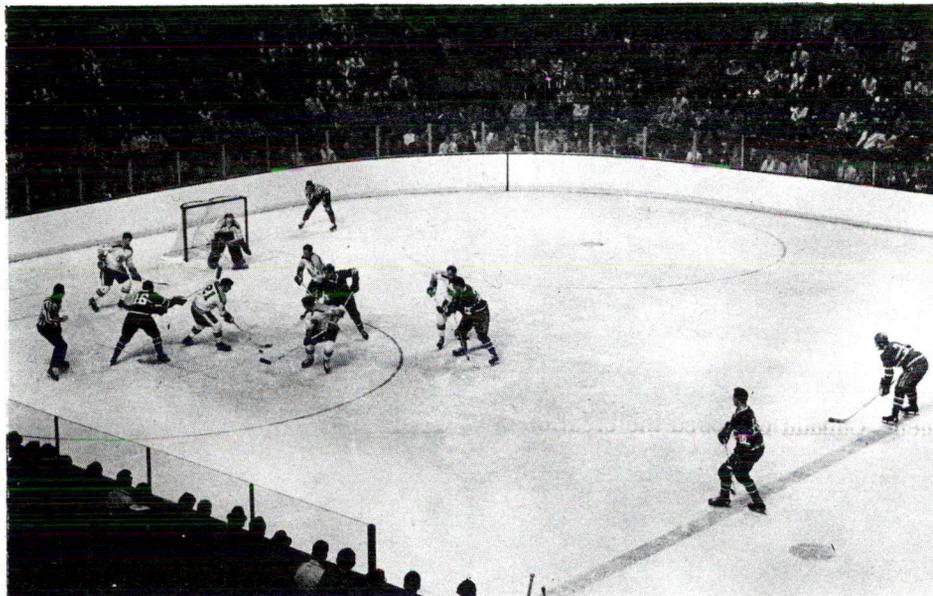
Quebecers, used to cold temperatures, have transformed the long Canadian winter into a time of enjoyment and activity in the outdoors. They like the cold, snowy weather because it enables them to take part in a wide variety of sports and recreation – skiing, ice hockey, skating, snowshoeing, tobog-



Skiing

Quebec, truly a skier's paradise, has 115 winter resorts, 866 slopes to suit all tastes and skills, 487 cross-country ski trails, and 354 mechanical lifts. There are also 66 lighted trails and, for the daring, 13 ski jumps. Twenty-seven centres can provide artificial snow when necessary.

Four main regions in Quebec stand out for excellent skiing because of their size and proximity to the big cities: the Laurentians north of Montreal, the Eastern Townships to the southeast, the Gatineau Hills, close to Ottawa, and the area surrounding Quebec City, in particular Mont Ste-Anne, which in 1969, 1971 and 1973 drew the top European, United States and Canadian skiers to compete in the World Cup trials (see *Canada Weekly*, No. 11, March 1975).



Hockey

Probably, the sport that interests Canadians most is ice hockey. Almost every boy and girl learns to skate at an early age. Every village, every neighbourhood and almost every school yard has its skating rink, and the large cities have very modern facilities. The Montreal Forum, home of the Montreal Canadiens, a top team in the National Hockey League, has acquired international renown.

Curling and snowshoeing

Curling, initially played mainly by English-speaking Canadians, especially those of Scottish descent, is attracting a growing number of Quebecers, and snowshoeing, another sport gaining in popularity, has now more than 35 trails.

Carnivals

The Quebec Winter Carnival, held in Quebec City, is the event that draws the most visitors. It begins with the arrival of "Bonhomme Carnaval", the Carnival snowman king, who is accompanied by the Carnival Queen and her six duchesses. For two weeks parades, street dances, balls, concerts, dog-sled races and countless other festivities take place (see *Canada Weekly*, No. 8, February 1974). Carnivals are also held in several other cities in Quebec, notably Ste-Agathe-des-Monts, in the Laurentians, and Chicoutimi.

A unique smelt-fishing festival that lasts for seven to eight weeks is held every year at Ste-Anne-de-la-Pérade,

half way between Quebec City and Montreal. On the frozen river, over 1,500 wooden cabins, well heated and equipped with electricity and radio, shelter the thousands of fishermen who have been "bitten" by the sport (see *Canada Weekly*, No. 7 February 1975).

After a day of sports in the fresh air, people meet in the evening in the relaxed atmosphere of winter-resort hotels. Jokes and cheerful banter are exchanged by the fire, there is dancing, and Quebec or French cuisine is enjoyed with a heady wine – a perfect end to a beautiful winter's day. The more romantic take a midnight sleigh ride through a nearby forest, changed by moonlight into a dazzling white fairyland.



Mammal fossils in Arctic indicate link with Europe

Two United States scientists, working with the support of the Polar Continental Shelf Project of the Department of Energy, Mines and Resources, have discovered fossilized bones of mammals and reptiles on Ellesmere Island, the northernmost island of the Canadian Arctic Archipelago.

The fossils, estimated to be about 50 million years old, are of a type that is also known from Western Europe. This, according to the discoverers, indicates a link between Europe and North America, the last such connection between the two continents before they moved apart.

The two scientists are Dr. Mary R. Dawson, of Pittsburgh, Pennsylvania, and Dr. Robert M. West, of Milwaukee, Wisconsin.

As reptiles are unable to exist in Arctic conditions, the discovery also shows that the climate in what is now Ellesmere Island was once much warmer.

Hospital equipment to Turkey

Harco Electronics Limited, of Winnipeg, Manitoba, has shipped \$44,000-worth of cardio-monitoring and intensive care systems equipment to Ankara, Turkey, to complete a \$70,000-contract with the Turkish Ministry of Defence. The equipment was sold through the Manitoba Trading Corporation for use in a number of Turkish military hospitals.

Morris Settler, president of Harco, said that negotiations with the defence ministry by Manitrade, a company representative and their agent in Turkey, commenced in September 1974, following a display of Harco's electronic monitoring equipment at the Izmir International Trade Fair, August 20 – September 20. The show resulted in the sale of \$20,000-worth of equipment.

"This \$44,000-shipment represents the conclusion of our largest overseas order although we will soon be sending Turkey another \$19,000-worth of equipment which we sold, with Manitrade's help, at the 1975 Izmir Fair," he said.

R.M. Armstrong, Manitoba's Assistant Deputy Minister of Industry and Commerce and chairman and manager

of Manitrade, who said that the Izmir International Trade Fair was sponsored by the federal Department of Industry, Trade and Commerce, noted that the Canadian Trade Commissioners staff in Ankara had been instrumental in bringing the contracts to Manitoba.

"All shipments have been airfreighted via the new direct CP Air flight from Winnipeg to Amsterdam, where a connection is made with Turkish Airlines to Ankara," said Mr. Armstrong. "This factor is important for Harco's delicate equipment, since it provides a fast link to connecting overseas carriers and reduces handling of the cargo to a minimum."

Manitrade, an agency of the Manitoba Department of Industry and Commerce, has been successful in selling Harco Electronics' products in Mexico, Venezuela, Cuba, Spain, Italy, South Africa, and the Peoples' Republic of China.

Canada student loans plan

Finance Minister Donald S. Macdonald announced in January that loans totalling \$129,660,142 to 140,644 students were authorized under the Canada Student Loans Plan during the year July 1, 1974 to June 30, 1975. During the previous year, loans totalling \$115,773,679 to 125,987 students were authorized.

Since the plan began in 1964, the nine participating provinces and two territories have issued some 1,209,101 certificates of eligibility amounting to \$843 million.

Operation of the plan

The Canada Student Loans Plan provides Government-guaranteed bank loans to students who need assistance to continue full-time studies beyond the secondary school level.

Loans may be authorized by partici-

pating provincial authorities up to \$1,400 a year or, for students enrolled in institutions operating on the trimester system, to a maximum of \$700 a semester where the semester forms part of a longer program of studies. The maximum a student may borrow under the program is \$9,800.

The Government pays the interest charges on loans while borrowers are in full-time study and for a further six months. The borrower then assumes repayment of both principal and interest over a period of up to nine-and-a-half years. The rate of interest to be charged is negotiated between the borrower and the bank, subject to a maximum rate established under a formula agreed with the banks and in effect since August 1968. The formula provides for a maximum rate of 1 percent above the current average yield of Government of Canada securities maturing in five to ten years.

The province of Quebec, which does not participate in this plan operates its own program of student aid. Quebec receives an alternative payment from the Federal Government of a share of the cost to the Government of interest payments and claims for loss in respect of loans advanced in participating provinces. In 1975, Quebec received \$12,708,115 under the arrangement.

Music successes overseas

The Orford String Quartet recently returned from a successful tour of the U.S.S.R., Romania, Yugoslavia and Italy.

In Bucharest, the ensemble drew an unusually large crowd and were called back to perform two encores. This recital was broadcast over the Romanian radio and television network.

The Orford Quartet won the 1974 European Broadcasting Union Competition and has gained a considerable reputation overseas. Another European series of concerts is planned for the spring.

An External Affairs grant assisted the Canadian contemporary music ensemble, the Lyric Trio, in a one-month tour of Iceland, Norway, Sweden and Finland, plus engagements in Brussels, Paris and London. Bob Aitken, flute, Mary Morrison soprano, and Marion Ross, piano, were heard in a series of

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concerts and masterclasses during their autumn tour. Several of their performances were broadcast.

John Hendrickson of Edmonton, Alberta, recently won third prize at the International Chopin Festival in Warsaw, a competition held every five years.

Mr. Hendrickson's performance was particularly popular with the Polish audience. He also received a special award from the Polish Music Critics' Association. Organizers of the Chopin Festival have arranged a series of concerts in Poland for Hendrickson.

Communications Technology Satellite (Continued from P. 2)

lite means smaller, more portable, less costly antennas on earth. With a dish as small as a metre in diameter, and with the cost of an entire ground station eventually reduced to that of a colour television set, the possibilities for "person to person" communication are remarkable.

Whether it be through the experimental transmission of a native newspaper by facsimile to a number of remote locations; providing diagnosis or medical staff training and supervision from a distance; enabling students in widely separated classrooms to share the same professor and course; or extending the horizons of broadcasting, CTS is a major Canadian achievement.

The challenge of designing and building such a complex spacecraft to operate reliably for two years has been compared to building a colour TV set that will work flawlessly for 1,000 years without need of repair.

Whether or not CTS ultimately meets that challenge fully, Canadians have moved another step forward in putting communications technology at the service of humanity.

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