



CANADA

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## "ALOUETTE" AFTER ONE YEAR

By the end of its first year in orbit, on September 29, the *Alouette* topside-sounder satellite, designed and built by Canada's Defence Research Board (DRB) for ionospheric and other upper-atmospheric investigations, had exceeded in every aspect of its technical performance the highest hopes of Defence Research Telecommunications Establishment (DRTE) scientists and engineers. Canada's first satellite had also added much to man's understanding of the atmospheric envelope surrounding the earth.

### BIRTHDAY MESSAGE

An *Alouette* "birthday greeting" to Dr. A.H. Zimmerman, DRB Chairman, from Dr. Hugh L. Dryden, Deputy Administrator of the U.S. National Aeronautics and Space Administration (NASA), the American agency associated with the Board in the international project, read:

"We at NASA are particularly happy to congratulate our friends in Canada on the first birthday of *Alouette*. This successful Canadian entry into space research embodied many new and courageous ideas, among which I might mention a spacecraft radio antenna 150 feet long. The satellite has provided abundant high-quality data and is still transmitting. We are proud of the association that made possible the first international spacecraft entirely designed and built by another nation and launched by the United States as part of our overall program of international co-operation in space research and exploration."

### ANNIVERSARY REPORT

The following is the first annual report of Satellite Controller R.W. Southern to Frank T. Davies, Chief Superintendent of the Ottawa research laboratory:

"At the end of the first year of operation, *Alouette* is performing even beyond the hopes and expectations of DRTE. To date, there is no sign of failure or degradation of any of the equipments or components in the satellite, except, of course, the normal decrease in solar-cell efficiency. All four experiments are performing very well and continue to provide good data.

"The quality of the telemetered signals received at the ground stations has been excellent. No problems have been encountered in commanding on the satellite or in recording of the telemetry transmissions.

"There has been no requirement for any of the spare equipments in the satellite. These include a spare high-frequency pulse amplifier, a spare for each of the two telemetry transmitters and two spare batteries for the power system. As preventative maintenance, the two spare batteries in the satellite were recharged in a special operation on August 13.

### STATISTICS

"The solar-cell efficiency is decreasing normally and, at the end of the first year of operation, is 58 per cent. When the satellite orbit is fully sunlit, these solar cells provide 15 per cent more power

than is required for the operations schedule of 5.7 hours per day. When the sunlit portion of the orbit periodically decreases to 65 per cent, the schedule is trimmed to 4.7 hours of operation per day.

"During the first year of operation, the satellite orbited the earth 4,981 times and in doing so, travelled 144,000,000 miles. It executed 12,900 commands and provided 2,060 hours of telemetry transmissions, which resulted in 2,700 miles of magnetic tape containing scientific data recordings - the equivalent of the mileage between Toronto and Vancouver. This information is sufficient to make 423,000 ionograms. During *Alouette's* first year, the spin rate decreased from 1.4 to 0.9 revolutions per minute.

"Long-range plans are now being made for the second year of the satellite's operation. Solar-cell efficiency should not vary by more than a few per cent during the next year; hence, it is planned to maintain the present schedule of operation which averages 5.0 hours per day."

The satellite was launched into orbit from a rocket-pad at Vandenberg Air Force Base in California as the Canadian payload on a two-stage *Thor Agena "B"* rocket provided by NASA. The project represents a classic example of international co-operation in a joint scientific venture by two countries.

#### AIM OF OPERATION

DRB embarked on the project because of its long-time interest in the vagaries, caused by disturbances in the upper atmosphere, that beset radio communication in and over Canadian territory. During its upper atmospheric investigations, the Board has examined the lower and mid regions of the ionosphere with ground-based scientific "sounders" and with instrumented rocket nose-cones.

The 320-pound *Alouette* satellite, however, with its inboard "sounder", examines in detail the top side of the ionosphere, telemetering scientific information to 13 ground stations in various parts of the world, including four in Canada. The data so collected are forwarded to DRTE, where ionograms or taped records are prepared and studied.

Other *Alouette* experiments, including one carried out by Canada's National Research Council, count the number of solar particles near the satellite, observe the electrical noise from cosmic sources, determine the atmospheric noise from distant storms at low radio frequencies and observe the sighing sounds called "whistlers" which originate as lightning strokes and which follow the earth's magnetic field. Indirectly, whistlers provide information about many other facets of geophysical phenomena associated with the earth's atmospheric environment.

#### PRACTICAL RESULTS OF PROGRAMME

Already, nearly a score of scientific discoveries have resulted from the *Alouette* experiments. Some have been acclaimed by the international scientific community as major advances, rather than mere academic curiosities.

The satellite is providing information from which the characteristics and distribution of the earth's

ionosphere can be charted in much greater detail than was hitherto possible. Eventually, this should benefit radio communication in all parts of the world.

#### NEW INFORMATION ABOUT EQUATOR

*Alouette* data have shown, for example, that ridges and troughs in the ionosphere exist along the magnetic equator close to, but not precisely parallel with, the earth's geographical equator as shown in ordinary atlases. In some respects, this is similar to the recent discovery that there is a pronounced mound along the equator at the bottom of the Pacific Ocean. Data analysis has also yielded significant information relative to the mapping of the earth's magnetic field.

As the spacecraft cruises silently on its passages about the earth, it observes cosmic and solar noises. These are telemetered to ground stations, increasing extensively man's knowledge of the cosmic and solar radiations that are unable to penetrate the ionosphere and cannot, therefore, be studied from the ground.

The solar and cosmic information received is also providing a means of predicting the arrival of the clouds of particles spasmodically expelled from the sun's surface. These particles cause magnetic and ionospheric storms and frequently affect communications adversely.

Recent *Alouette* observations in the same research area give evidence of electromagnetic radiations from the planet Jupiter. This information has resulted in visits to DRTE by scientists from other agencies particularly interested in studying this evidence.

The satellite's external temperature varies widely because of its changing positions with respect to the sun. The solar cells, batteries and other components were designed specifically to withstand such temperature variations.

*Alouette's* 6,500 solar cells provide power to charge its batteries. Although solar-cell performance has decreased as expected to 58 per cent because of encounters with space radiation and atmospheric dust or micrometeorites, sufficient reserve power was provided in the design for continuing operation despite further slow deterioration of the cells.

#### METEORITE HAZARD

The scientists calculated that during its first year of space whirlings, *Alouette's* chances of not colliding with a meteorite large enough to penetrate its electronics mechanisms would be about 90 per cent. The spacecraft appears so far to be unharmed by meteorites. DRTE forecasts a 72-percent probability that *Alouette* will continue to escape meteorite damage during the next 12-month period.

The satellite should continue to revolve about the earth for from 200 to 2,000 years. Uncertainty in forecasting its life span stems from lack of knowledge of possible space hazards likely to be encountered in future years.

*Alouette's* usefulness in providing new information about the upper atmosphere has given rise to an invitation from NASA for the design

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## ESKIMO AT BRITISH CO-OP SHOW

George Koneak, an Eskimo interpreter with the Northern Affairs Department and a member of the Eskimo Co-operative at Fort Chimo in northern Québec, is representing all Eskimo co-operatives in Canada at an exhibition in Manchester, England. While in Britain, he is also to attend the World Co-operative Congress in Bournemouth.

According to Northern Affairs Minister Arthur Laing, Koneak is the Eskimo best-informed on the subject of co-operatives, having been in the movement from the start and taken part in the establishment of most of the co-operatives in the Eastern Arctic.

The opportunity of seeing and learning how co-operatives are run in other parts of the world appeals to George Koneak. While travelling with officials of the Northern Affairs Department, he became interested in the co-operatives that were being established in Canada's North. As an interpreter, he worked with Northern Affairs development staff and Eskimos in setting up the co-operatives at Port Nouveau Quebec (George River), Port Burwell and Payne Bay. Soon after the co-operative was established at Fort Chimo, he became a member. He takes an active part in the char fishery, bakery, coffee-shop, logging operations and handicraft activities of the co-operative. "The idea of all people working together to help themselves is good", he says.

### BIOGRAPHY

Born in Payne Bay in 1931, Mr. Koneak travelled with his parents as they trapped and hunted between Cape Hopes Advance and Diana Bay. When he was 15, his father was employed with the Department of Transport at Cape Hopes Advance. By teaching the

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### NATIONAL MUSEUM TRAINEES

The Fifth Museum Training Programme sponsored by the National Gallery of Canada began October 1, when two young ladies, Michele Boulizon of Montreal and Jane Maynard Mather of Vancouver, reported for duty. The programme is carried out with the co-operation of the Montreal Museum of Fine Arts, the Art Gallery of Toronto and the Royal Ontario Museum.

The two latest trainees, who will spend the first two months of the eight-month programme at the Montreal Museum of Fine Arts, have already completed studies in the field of fine arts.

Miss Boulizon, 21, is a graduate of the University of Montreal, where she obtained her M.A. in 1962. She has spent several summers at the École du Louvre, Paris, and has taken special courses in fine arts at L'Institut Catholique de Paris.

Miss Mather, 33, graduated from McGill University in 1952. She is at present working toward her M.A. in the history of art at the University of British Columbia.

wireless operators Eskimo, George learned English. Until he was 21, he earned his living hunting and trapping, then worked as a baker with the Transport Department at Fort Chimo. Three years later he served with the Hudson's Bay Company at Payne Bay as a clerk, and in 1957 joined the Northern Affairs Department as an interpreter and returned to Fort Chimo.

At the Manchester exhibition there are displays of goods manufactured by co-operatives all over the world. Canada's Eskimo co-operatives are represented by a large display of arts and crafts.

The World Co-operative Congress in Bournemouth celebrates the 100th anniversary of the founding of the first co-operative in Rochdale, England.

Mr. Koneak was the interpreter at the first Conference of Arctic Co-operatives in March 1963 at Frobisher Bay. Every Eskimo co-operative sent representatives; for many it was the first time they had met Eskimos from other northern areas.

### GROWTH OF CO-OPS

The first Arctic co-operatives were established in Canada in April 1959 at Port Nouveau Quebec (George River) and at Port Burwell in the Northwest Territories. Now 18 Eskimo co-operatives have been formed, with a total membership of over 500 - about one of every five Eskimo families. Five are engaged in commercial fishing, five operate retail stores, and seven produce and market fine crafts. At Frobisher Bay, a group of 13 Eskimo families formed a co-operative to build themselves two and three bedroom homes. Among the best-known is the West Baffin Eskimo Co-operative at Cape Dorset, whose graphic art, sculpture and crafts have become known internationally.

The purpose of the programme is to provide professional training and experience for individuals interested in entering the museum and art-gallery field in Canada.

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### PROVINCIAL EMPLOYMENT

Employees of eight provincial governments and the governments of the Yukon and Northwest Territories earned \$183,353,000 in the period April-June 1963, a gain of 5.9 per cent from January-March total of \$173,056,000. Data for Quebec and British Columbia are not now available.

Provincial employees at June 30, 1963, numbered 187,698, a gain of 10.2 per cent, compared to 170,386 at March 31. Earnings of employees for the period January-June 30, 1963, were distributed as follows: departmental services, \$206,015,000 or 57.8 per cent; institutions of higher education, \$41,430,000 or 11.6 per cent; enterprises, \$104,335,000 or 29.3 per cent; and workmen's compensation boards, \$4,629,000 or 1.3 per cent.

## LANDING AIDS USE PHOTO-ELECTRIC CELLS

An improved method of measuring ceiling (height of cloud base) and visibility where they count most — in the approach to and along the runway — is now in use at most of Canada's major airports, according to the Department of Transport. Over the past few years, the jet-age tools to do this job have been installed at the airports at Gander, Halifax, Montreal, Ottawa, Toronto and Vancouver, and at North Bay (Ontario), Goose Bay (Labrador), and Frobisher Bay (Northwest Territories). Another set, at Winnipeg International Airport, became operational this autumn.

The instruments, called ceilometers and transmissometers, are necessary because of the huge size of modern airports. At Vancouver, for instance, the touchdown point on the main instrument runway is two miles away from the weather-observing office. When ceiling and visibility are nearing the point at which it is no longer safe for an aircraft to land, small variations become very important.

### FUNCTION OF INSTRUMENTS

The ceilometer measures the height of the cloud base at a critical point on the final approach path. Similarly, the transmissometer measures the visibility in the aircraft-touchdown zone. On both instruments a photo-electric cell is used.

In the case of the ceilometer, a beam of light interrupted 120 times a second is reflected from the cloud base to a detector. Recognizing the light beam only, the detector is sensitive enough to record its reflection even in broad daylight.

The transmissometer measures visibility by computing the percentage of light that is lost when a beam of known intensity travels along the runway. This measurement can be converted into an accurate estimate of visual range along the runway.

The instruments' findings are recorded electronically in the weather office.

Eventually the information will be relayed direct to air-traffic controllers so that they can give instant ceiling and visibility data to pilots on approach.

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## FAMILIES IN CANADA

The number of families in Canada, excluding the Yukon and Northwest Territories, on June 1, 1962, was estimated at 4,239,000, an increase of 99,000 or 2.4 per cent since the 1961 census. The average number of persons in a family in Canada on June 1, 1962, was 3.9, unchanged from the 1961 census, and a slight increase from the 1956 census. The average family size was greatest in Quebec and the Atlantic Provinces, at 4.3 persons a family, followed by the Prairie Provinces at 3.8, Ontario at 3.7 and British Columbia at 3.6 persons a family.

### CHILDREN

The average number of children in a Canadian family in June 1962 was 1.9, the same as shown in the 1961 census. The 1962 estimates show marked differences between regions in the number of children

in a family. Families with no children, for example, were only 25.2 per cent of all families in Quebec and 26.1 per cent in the Atlantic Provinces, but constituted 32.4 per cent of the total in British Columbia, 29.7 per cent in Ontario and 29.5 per cent in the Prairie Provinces. On the other hand, 14.8 per cent of all families in the Atlantic Provinces and 14.5 per cent in Quebec reported five or more children, the Prairie Provinces and Ontario 6.6 per cent and 5.9 per cent respectively, with British Columbia reporting only 5.0 per cent.

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## NEW STRATFORD DIRECTOR

Jean Gascon, co-founder and artistic director of Montreal's Le Théâtre du Nouveau Monde and executive director of the National Theatre School, has been appointed associate director of the Stratford Ontario Shakespearean Festival.

As his first project in his new post, Mr. Gascon, who directed "The Comedy of Errors" during the past season, will stage "Le Bourgeois Gentilhomme", which the Festival will present next April at Chichester, England, with "Timon of Athens" and "Love's Labour's Lost", during the celebration of the 400th anniversary of Shakespeare's birth. "Le Bourgeois Gentilhomme" will also be one of the four productions to be seen at Stratford next summer during the twelfth season, from June 15 to October 3.

Mr. Gascon has had a long association with the Stratford Festival. In 1956 he played Constable in "Henry V" at the Festival Theatre and, with fellow members of Le Théâtre du Nouveau Monde, presented and appeared in three farces by Molière at the Avon Theatre. Two years later he returned to the Avon, again with Le Théâtre du Nouveau Monde, to direct and play in "Le Malade Imaginaire". In 1959 he co-directed (with George McCowan) "Othello" on the Festival Theatre stage.

Mr. Gascon will continue to live and work in Montreal but will spend part of the year in Stratford.

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## FOREST FIRES

Forest areas burned in Canada by the end of August point to one of the lightest forest-fire seasons on record.

According to estimates released by the Department of Forestry, 6,220 forest fires, with a total area of 296,000 acres, were reported to the end of August. This includes 97 fires that burned 22,000 acres in the Yukon and Northwest Territories.

At the end of August last year, 5,711 fires had swept through some 482,000 acres of forest. The figures for the Yukon and Northwest Territories were 148 fires with an estimated area of 33,000 acres.

Statistics for August this year are as follows: 1,138 fires covering 27,000 acres, of which eight fires with an overall area of 1,000 acres occurred in the Yukon and Northwest Territories.

The lightest forest-fire season on record was in 1954, when the area burned was 266,000 acres.

## NATIONAL POWER POLICY

The following statement was made in the House of Commons on October 8 by the Minister of Trade and Commerce, Mr. Mitchell Sharp:

It is my privilege today to announce, on behalf of the Government, a national power policy. I do not think that I have to emphasize the vital role the power industry is playing and must continue to play in the development of our nation.

The story of the electric-power industry of today is one of constant evolution as it strives successfully to reduce costs. Canada must provide the climate in which we can take advantage of these technical break-throughs. Our policy places particular emphasis on:

- (a) the desirability of Canada taking fullest advantage of the evolutionary changes that have taken place in the nature of the power industry, including technological improvements in generating and transmission facilities, and the reduced costs of power associated with these;
- (b) the provision of abundant supplies of electrical energy to consumers throughout Canada at the lowest possible cost to encourage and accelerate economic development and growth;
- (c) the need for Canada to have a flexible export policy which, *inter alia*, would permit the export of large blocks of power to the United States for a relatively long period of years to assist in the immediate development of certain large-scale Canadian power projects, particularly undeveloped hydro resources which might not be viable in the near future unless provision were made for the marketing in the United States of a significant portion of their output; and
- (d) the strengthening of our balance-of-payments position through the export of power surplus to our own needs.

The policy now being announced reflects important changes which have taken place in the circumstances affecting export of power. The Government is fully aware of the body of public opinion that has been opposed to export of power, in the first instance because of events which occurred over 50 years ago.

### CONDITIONS OF EXPORT LICENSING

The National Energy Board Act now provides that all exports of power must be licensed by the National Energy Board with the approval of the Governor in Council. Licences may not be issued for a term in excess of 25 years. The National Energy Board is required to certify that the power to be exported does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada — this has been interpreted to mean surplus to Canadian requirements which can be supplied economically from the generating facilities producing the power for export. Further, the Board must satisfy itself that

the export price of the power is just and reasonable in relation to the public interest.

From 1907 until the coming into force in 1959 of the National Energy Board Act, the export of power was subject to licence under the Exportation of Power and Fluids and Importation of Gas Act. By regulation under that Act, the term of a licence was limited to one year. This was intended to prevent permanent alienation of Canadian power capacity which, though surplus when installed, would be required in Canada as time went on. It was realized that, if an industry or a community in the United States became dependent on a Canadian power supply, it would be difficult, if not impossible, to withdraw that supply.

### DEFECTS OF ORIGINAL CONTRACTS

Such difficulties as have occurred in respect of the recapture of power exports arose, in part, because over 50 years ago long-term contracts (up to 85 years) were made by Canadian power producers with specific industries in the United States. The contracts contained no provisions for the repatriation of the power. The Canadian supplier, in effect, had taken on within the United States the responsibility of a public utility to maintain continuity of supply for its customers. As a result, the protection of the one-year limitation on licences was illusory.

The nature of the power industry today is very different from what it was in 1907 and in most of the intervening years. It is now unusual for the capacity of a large, modern electric plant to be dedicated to a single industry or for a large utility to be dependent on one source of power supply. We are entering the era of large private and public electrical utilities, interlinked with high-voltage lines, and operated pursuant to interconnection agreements designed to take advantage of the new technological improvements and the economies of scale.

A public utility, whether in Canada or the United States, now takes it as a matter of course that it must contract for or install capacity to replace a portion of its total power supply when the contract covering that portion runs out. The old aphorism that an export sale, once established, cannot be terminated without hardship in the export market and danger of international friction is no longer valid if the export contract is made with a public utility in the United States under reasonable terms and conditions.

When the National Energy Board Act came into effect in 1959, power export licences which had been issued under the Exportation of Power and Fluids and Importation of Gas Act were continued in effect for some time so that the Board might apply to each case (with minor exceptions) the procedure of application, public hearing, detailed analysis and recommendation to the Governor in Council.

### REDUCTION IN POWER EXPORTS

In 1959, actual total exports, as distinguished from licensed authorizations, were 4,582 million kilowatt hours. In 1962, exports had declined to 89 per cent of the 1959 total.

In 1962, Canada produced 117 billion kilowatt hours, including 11.4 per cent from thermoelectric plants. Of the total production, only 0.47 per cent was exported as firm energy and 2.8 per cent as interruptible energy. Of the latter, 86 per cent was interchanged with United States utilities, having been returned to Canada at the same time over other circuits, or over the same circuits at other times.

In the light of the circumstances I have outlined, the Government has decided to develop and carry forward effective policies embracing two essential concepts:

*first*, encouraging development of large low-cost power sources and the distribution of the benefits thereof as widely as possible through interconnection between power system within Canada;

*second*, encouraging power exports and interconnections between Canadian and United States power systems where such induce early development of Canadian power resources.

More specifically, our policy is as follows:

The Government, having due regard to the rights of the provinces with respect to the development and distribution of power and keeping in mind its own responsibilities in this field, desires to encourage interconnection agreements and maximum utilization of inter-tie facilities between electrical systems, both publicly and privately owned.

#### INTERCONNECTING POWER SYSTEMS

The Government, in co-operation with the provinces, has already undertaken studies to investigate the possibility of interconnecting power systems across the country. It realizes that the complete interconnection may not be economically feasible for some years to come. Nevertheless, it would appear that, by establishment of interconnection facilities between utilities in adjacent regions wherever practical, a national system might be developed by a succession of stages, each valuable in itself.

The Government believes that it would be beneficial to Canada and to the United States, and not prejudicial to the national interest to encourage interconnection agreements and inter-ties between utilities in the respective countries in cases where the interconnection agreements suitably protect the Canadian interest.

In cases in which Canadian utilities enter into appropriate interconnection agreements with United States utilities, the Government will be prepared, upon recommendation of the National Energy Board, to give favourable consideration to the authorization of export of power to United States utilities for purposes including the following:

- (i) to provide standby service in the case of emergencies, thus making possible the reduction of reserve generating capacity otherwise required by the utilities;
- (ii) to provide for economy flows between plants or systems;
- (iii) to provide for sales of surplus interruptible energy;
- (iv) to provide for exchange of power and energy to take advantage of load, watershed or other diversities;

- (v) to provide for exports of firm power for limited periods to make possible the step-by-step construction of the most economical generating facilities on either side of the boundary.

The Government also believes that it would be in the national interest, in suitable cases, to license the export of large blocks of firm power to United States utilities to permit the development of large-scale remote hydro or other power projects which would not be viable unless supported by the export for long periods of a significant proportion of the power generated. The National Energy Board Act permits such exports for periods of up to 25 years. Provision would have to be made for the recapture of such exported power over a period of years, in stages commensurate with the need or ability of the Canadian market to absorb it, and upon notice adequate to enable the importing utility to arrange for replacements. The provisions of the National Energy Board Act would, of course, apply to any case of this nature, as to any export of power.

The Government will, upon recommendation of the National Energy Board, continue to authorize the export of relatively small amounts of power and energy to border areas in the United States where, for geographical reasons, Canada is the economic source of supply.

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#### TRADE PACT WITH BULGARIA

The signing of a three-year trade agreement between Canada and Bulgaria was announced on October 8 in the House of Commons by the Minister of Trade and Commerce, Mr. Mitchell Sharp. The agreement provides for an exchange of most-favoured-nation treatment between the two countries and a commitment by Bulgaria to purchase a minimum of 100,000 metric tons of wheat in each of the three years involved. However, Bulgaria will buy an additional 150,000 metric tons of Canadian wheat subject to the Canadian supply position during the current crop year, and the way is open for both parties to negotiate for even greater quantities in the future. At buyer's option, all or part of the above-mentioned quantities of wheat may be taken in flour equivalent.

The agreement provides for consultation between representatives of the two governments respecting its implementation, should this be required.

It has likewise been agreed that trade offices may be opened both in Canada and Bulgaria for the purposes of market exploration and trade promotion.

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#### THE "ALOUETTE" AFTER ONE YEAR

(Continued from P. 2)

and construction of a series of four additional satellites. Ionospheric research will constitute their major experiments and Canadian industry is preparing to participate actively in their design and construction.