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DEFENCE RESEARCH IN CANADA – 1963

While space activities continued to play a role in the Defence Research Board's programme during 1963, other important projects with direct defence-scientific application continued to progress satisfactorily.

The sequel to 12 years of hydrofoil research carried out at the Board's Naval Research Establishment (NRE) in Dartmouth, Nova Scotia, is the Royal Canadian Navy development project for the design and construction of a 200-ton prototype hydrofoil craft by deHavilland Aircraft at Malton, Ontario. This experimental ship will be 150 feet long and capable of speeds of about 50 knots. The designers are aiming at producing an experimental ship suitable for evaluation tests in rough sea conditions. NRE is continuing to contribute to the project with fundamental research on hydrofoil systems.

HYPERSONIC TEST RANGE

A new and sophisticated research facility at the Canadian Armament Research and Development Establishment (CARDE), Valcartier, Quebec, began operations on June 13 with the official opening by Dr. A.H. Zimmerman, DRB's Chairman, of a new hypersonic range for aerodynamic tests and for examining the effects of bodies re-entering the earth's atmosphere.

Small projectiles, some instrumented with miniature transmitters, are fired at supersonic speeds down a range evacuated of air to simulate upper atmospheric conditions. Their behaviour and the radiations they generate are studied in detail. By scaling upwards the data obtained, CARDE scientists are able to study the interactions that take place when a missile configuration enters the earth's atmosphere.

This research is being carried out as a contribution to the United States Intercontinental Ballistic Missile Development Programme, and the results are shared by both countries. A four-inch gas-gun launcher, with a muzzle velocity of 10,000 miles an hour, hurls the model missiles down the range. Next year, a seven-inch gun now under test will come into use and will permit the study of more realistic configurations at hypersonic velocities.

The new range facility is housed in a semi-circular building of reinforced concrete 630-foot long. The diameter of the range is 10 feet. Its atmospheric pressure can be reduced to simulate altitudes up to 250,000 feet. This facility can be operated by remote control.

DEFENCE INDUSTRY AID

The response to the Board's financial-assistance programme for encouraging the growth of research in Canadian defence industry continued to be highly satisfactory during the past twelvemonth. As of late November, 56 research proposals had been accepted, which will lead to a total expenditure of $15,300,000 on new Canadian industrial research within the next two years.

At the beginning of the programme in 1961, DRB expected that actual research results would take some time to materialize. Specific economic gains, however, are already becoming apparent in the form of product sales and the continuing establishment of new industrial-research laboratories.

(Over)

Scientists at Suffield Experimental Station (SES), Ralston, Alberta, have been busy this year designing and constructing complex measuring equipment for next summer's 500-ton TNT detonation, a major experiment in the SES shock and blast research programme. Two detonations of 20 tons each and two of five tons each were conducted to confirm the results of previous similar experiments and to obtain data required for 1964's massive chemical detonation.

NEW RESEARCH VESSEL

Scientists of the Board's Pacific Naval Laboratory (PNL) at Esquimalt, British Columbia, watched with satisfaction the keel-laying of AGOR 171, to be named CNAV "Endeavour" a specially-designed research ship to be operated by the RCN for the Esquimalt defence-research scientists who specialize in maritime investigations.

The "Endeavour" will be the first Canadian ship specifically designed, built and equipped as a floating laboratory for maritime defence research. The research programme will centre primarily on underwater acoustic and anti-submarine warfare investigations in support of RCN operations.

The ship's overall length will be 235 feet, its breadth 38 feet six inches and its displacement 1,564 tons. It will be capable of cruising 10,000 miles. A bulbous-shaped bow and stabilization tanks will reduce pitching and minimize roll, to facilitate the work of the sea-going scientists. Two large marine-research laboratories will be staffed by 14 PNL scientists, and two helicopter crew members will assist a ship's crew of 36 in supporting the scientists. Special provision is being made for carrying a Naval helicopter aboard.

ARCTIC STUDIES

During the past year, PNL continued studying the behaviour of underwater sound in the ice-covered waters of the Canadian Arctic, as part of its anti-submarine warfare research programme.

Another PNL activity that has taken scientists into Arctic areas is the investigation of low-frequency electromagnetic phenomena. This involves the measurement of small variations of the earth's magnetic field known as "micropulsations", and promises to be of increasing military importance.

Supported by the RCN and the Royal Canadian Air Force, PNL scientists during the year studied natural magnetic phenomena from a station on the ice covering Barrow Strait near Resolute on Cornwallis Island. Records of natural electromagnetic "noise" and its variations from point to point are expected to prove valuable in the design and use of future magnetic detection systems.

In space research, Defence Research Medical Laboratories (DRML) at Downsview near Toronto are contributing usefully to one aspect of the U.S. "man-on-the-moon" programme. The Downsview laboratories were invited to participate in this particular space project, because two of their scientists, Dr. Walter Johnson and Dr. Kenneth Money, have extensive experience in the field of high-altitude physiology.

The DRML scientists are exposing monkeys to various laboratory tests preparatory to flights into space by the animals, varying in time from a fortnight to four weeks. The monkeys will be employed to study the effects of weightlessness and other physiological phenomena encountered by astronauts circling the earth in spacecraft and will be studied on their return to earth by scientists from the Downsview laboratory and from the U.S. Naval School of Aviation at Pensacola, Florida, on behalf of the U.S. National Aeronautics and Space Administration (NASA).

SATELLITE PROGRAMME

In another programme jointly undertaken with NASA, Defence Research Telecommunications Establishment (DRTE) scientists, in association with others interested in studying the ionosphere in efforts to improve long-range radio communications, are continuing to analyse scientific data transmitted to earth stations by DRB's "Alouette" topside-sounder satellite, which celebrated its first birthday in space on September 30. The spacecraft has exceeded in every way the technical performance hoped for by the DRTE scientists and engineers who designed and constructed it. In addition, "Alouette" is adding substantially to man's understanding of the atmospheric envelope called the *ionosphere* that surrounds the earth.

As of December 1, after 14 months of operations, "Alouette" has shown no signs of failure, apart from the normal and expected decrease in solar-cell efficiency from tiny micrometeorites that are gradually etching the glass covering the cells and from damage resulting from man-made upper atmospheric radiations.

It has been unnecessary to switch on any of the satellite's spare components, and the scientists plan further operations for about another 12 months. During its 14 months of operation, the spacecraft has orbited the earth 5,837 times and, in so doing, has travelled 168 million miles. It executed 15,143 commands and provided 2,406 hours of telemetry transmissions, which have resulted in the production of 3,150 miles of magnetic tape containing scientific data.

ADDITIONAL SATELLITES

The usefulness of "Alouette" in providing new information about the upper atmosphere resulted in an invitation from NASA for the design and construction of a series of four additional satellites to be called "Alouette 2" and ISIS A, B and C. Their primary experiments will continue to investigate the ionosphere, and Canadian industry will participate actively in their design and construction. Detailed discussions about the experiments to be carried in the new satellites are now taking place between DRTE and NASA.

A substantial share of the Defence Research Board's resources continued during 1963 to be devoted to operational research, a modern technique of applying scientific methodology to problems

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THE RCAF DURING 1963

The following are highlights from the year-end round-up released by the Royal Canadian Air Force:

NORAD

The official opening occurred on September 26 of North America's first "hardened" Semi-Automatic Ground Environment (SAGE) control centre near North Bay, Ontario. The site, complete with its 276-ton electronic computer, became the first fully-operational underground installation of its kind in North America. It was turned over to Air-Vice Marshal J.B. Harvey, Commander of the Northern NORAD Region, one of eight regions in North America.

The Royal Canadian Air Force also took over operation of the last of 11 U.S.-manned Pinetree Line radar sites in Canada at Lowther, Ontario, on June 26. Some of these sites, with some of the Mid-Canada and DEW Line, feed information to the SAGE site at North Bay.

In October, it was announced that the Ground Observer Corps, comprising about 1,200 civilian volunteers, was to be disbanded. The Corps was formed in 1951 during the construction stage of the early-warning lines.

NATO

In Europe, the RCAF's NATO role changed from one of air defence to one of strike and reconnaissance. During the year, six squadrons – two in France and four in Germany – were re-equipped with CF-104 "Starfighter" aircraft. Two more squadrons are to be similarly equipped next year, bringing the total to eight squadrons within 1 Air Division.

Meanwhile, on November 1, the last of the famous "Sabre" aircraft were flown from Marville, France, to Scotland for disposal. The CF-100s in Europe had been retired earlier in the year.

AIR TRANSPORT

The RCAF's two "Comet" jet transports were retired from service in October and flown to Mountain View, near Trenton, Ontario, for storage pending disposal. The "Comets" came into service with the RCAF in the summer of 1953, and were flown mainly on transport operations by 412 Squadron, Uplands, near Ottawa. Their work-load has now been absorbed by "Yukon" aircraft.

A "Yukon" aircraft, loaded with more than 12 tons of Red Cross and other supplies, left Trenton in June for East Pakistan following a disastrous cyclone that had struck that country.

Three months later, aircrews from Air Transport Command were again called on to carry out another emergency mission, this time in South America. Twenty tons of powdered milk and four tons of canned meat were airlifted to Curitaba, Brazil, a flood-disaster area.

In Canada, "Yukons", "Flying Boxcars" and "Hercules" aircraft shuttled men and material between major military centres and far northern outposts.

Not the least of Air Transport Command's commitments during the year was the rotation of a battalion of the Canadian Infantry Brigade in Germany. In all, about 4,000 soldiers with their families were airlifted in the rotation between Canada and Europe in an operation that got under way in August.

UNITED NATIONS

In June, 134 Air Transport Unit, with 50 officers and men, was assigned to the United Nations in Yemen as the aerial contingent of the eight-nation UN observer team.

In September 1962, two "Otter" aircraft with aircrews and supporting equipment were assigned to UN security forces supervising the transfer of sovereignty of West New Guinea. Canadian responsibility in this area continued until May 1963, when RCAF personnel returned to Canada.

In other UN operations, the RCAF continued its support in the Congo. Two "Yukon" aircraft a month continued to cross the Atlantic to Pisa, Italy, and then to Leopoldville, with personnel and supplies for Canada's UN contingent.

In the Middle East, Canadian "Caribou" and "Otter" planes of 115 Air Transport Unit at El Arish, Egypt, continued their desert patrols and light-transport operations over the Sinai area.

MARITIME AIR COMMAND

Also working with NATO, "Neptune" and "Argus" patrol bombers of Maritime Air Command kept constant watch during 1963 over the shipping lanes of the North Atlantic. Maritime-patrol planes flew a total of more than 20,000 hours on both coasts and participated in NATO exercises in the Azores, Gibraltar, England, France, Ireland and the United States.

In the joint U.S.-Canadian operation "Submarine-Launched Atomic Missile Exercise" (SLAMEX), 24 aircraft from Maritime Air Command and six Royal Air Force patrol bombers co-operated with the United States Navy East Coast Fleet in one of the largest international maritime operations of the year.

SOLAR ECLIPSE

Scientists aboard a specially-instrumented "Yukon" aircraft observed the July solar eclipse from 30,000 feet over the Great Slave Lake area of the Northwest Territories. Aboard the aircraft were scientists from the Dominion Observatory, the National Research Council, the University of Saskatchewan and Oxford University, and RCAF personnel. The flight probably represented the most ambitious and comprehensive effort ever made by Canadian scientists to study and photograph a total eclipse of the sun.

In addition to the "Yukon" flight, a specially-equipped CF-100 from the Central Experimental and Proving Establishment Detachment at Valcartier, Quebec, was chosen to take part in the study of the eclipse, In an attempt to measure and record the infra-red radiation produced by the eclipse, this aircraft flew over the Thetford Mines area of Quebec at 40,000 feet at exactly 515 miles an hour.

NEW RESOURCES ROADS

The federal Minister of Northern Affairs and National Resources, Mr. Arthur Laing, and the Minister of Natural Resources for Saskatchewan, Mr. Eiling Kramer, announced recently that their governments had agreed to include two additional roads in the "Roads to Resources" programme.

The two new roads will provide residents of Cumberland House, Pelican Narrows and Island Falls – Sandy Bay with access to the Saskatchewan highway system. The Cumberland Road will start at Squaw Rapids and proceed in a northeasterly direction along the Saskatchewan River about 60 miles to Cumberland House. The other new road will leave the Hanson Lake Road south of Jan Lake, go north to the settlement of Pelican Narrows, then north and east to the neighbouring communities of Island Falls and Sandy Bay on the Churchill River; it will be about 66 miles long.

VALUE TO THE ECONOMY

The new roads will contribute to the national and provincial economy by providing access to areas of mineral and agricultural potential, commercial timber and fishing, and will open up further excellent recreational regions to assist the increasingly important tourist industry.

Under the "Roads to Resources" programme, the Federal Government shares with provincial governments the cost of roads to open up northern resources. The maximum shareable cost is $15 million for each province.

In Saskatchewan, more than $10 million has so far been spent under the agreement, the two governments contributing more than $5 million apiece. The Otosquen Road linking Hudson Bay, Saskatchewan, with The Pas, Manitoba, has been completed. The Hanson Lake Road, from Smeaton on No. 55 Highway, east of Prince Albert, to Flin Flon, is substantially completed and will be officially opened early in 1964. The La Ronge to Uranium City road has been built to Otter Rapids on the Churchill River, and pre-engineering work is being done for the road north toward Uranium City *via* Reindeer Lake. About 350 miles of road in all have been constructed.

Supervision of construction and maintenance of completed roads are the responsibility of the province.

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PROGRAMME FOR OLDER WORKERS

Mr. Allan J. MacEachen, the Minister of Labour, announced recently that the hiring period for the Federal Government's Older Worker Employment Incentive Programme was being extended by two months, from January 31 to March 31, 1964. Under this plan, which became effective November 1, the Department of Labour is offering to pay to employers up to $75 a month for 12 months for each new employee 45 or over, who has been unemployed for six months or more, whom they hire in a new job or one not vacated since September 1, 1963.

In making the announcement, Mr. MacEachen said that the extension would give employers more time to consider their manpower requirements more fully and to make any adjustments in their hiring practises both to take advantage of the programme and to benefit older workers and their communities.

IMAGINATIVE EXPERIMENT

The Minister said the programme involved a new idea for engaging workers. It is an imaginative experiment to try to overcome reluctance against hiring older workers and to solve employment problems for workers in this category who have experienced long unemployment. It has received the full endorsement of the Canadian Manufacturers' Association, the Canadian Chamber of Commerce, the Canadian Labour Congress, the Canadian Federation of Mayors and Municipalities, and other national organizations. The provincial departments of welfare are also giving their full support and co-operation.

Much interest in the programme has also been shown by individual employers in all parts of Canada. During the first month of the hiring period, some 325 employers had filed applications for older workers with the National Employment Service. The numbers will no doubt increase as the programme continues.

TIME GAINED

The programme is specifically timed to encourage increased employment during the traditional off-season winter lull. This timing has tended to slow down employer response, since many of the job openings at this time of year are filled by rehiring workers temporarily laid off. The extension of the hiring period will allow more time for new jobs to develop.

Labour Minister MacEachen also announced that, in future, eligible older workers would not be required to exhaust their regular unemployment insurance benefits before qualifying under the programme. As long as they have been unemployed for six of the previous nine months, they will be able to participate. The removal of the "exhaustion of benefits" requirement will increase the response substantially on the part of workers and will also, according to the Minister, probably make the programme more attractive to employers.

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involving organizations and systems. This relatively recent technique is employed widely by DRB and the armed services in clarifying and solving a variety of problems. The main emphasis this year was devoted by DRB scientists and specialist service officers to the roles of the armed forces and to their equipment policies.

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