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MAJOR HYDRO-ELECTRIC EXPANSION

A million and a half horse-power of new capacity was added to Canada's water-power industry in 1957, it was announced by Resources Minister Alvin Hamilton in his annual report to the nation on Hydro-Electric Progress.

To meet the demand for power, the industry is in the midst of a major expansion effort which is expected to continue for several years. New capacity completed last year came within a quarter of a million horse-power of equalling 1954's record-breaking total. Other installations at present under construction are expected to add about 2,200,000 h.p. during 1958 and nearly double that amount in succeeding years. The total installed capacity of water-power plants in Canada is listed at 19,871,008 horsepower, representing less than 28 per cent of the nation's hydro-electric resources.

British Columbia led the provinces in the addition of new capacity and matched Quebec's

greatest increase of 300,000 h.p. to an individual plant. The coastal province recorded an increase of over 600,000 horse-power, half of which was represented by the addition of the fifth and sixth units, each of 150,000 h.p. to the Kemano plant of the Aluminum Company of Canada.

Quebec's total additions of 473,900 horse-power included two units of 150,000 h.p. each in the Bersimis I development some 300 miles north of Montreal. These two units are the fourth and fifth and bring the capacity of the plant to 750,000 h.p. It will have an ultimate capacity of 1,200,000 h.p.

In addition to hydro-electric developments, there was an increase in new thermal-electric plants and extensions in various parts of the country. The construction of main transmission lines, distribution lines and substation capacity was also proceeded with vigorously during 1957.

GOVERNMENT FINANCES

A statement of the Government's financial operations for November 1957 and the first eight months of the current fiscal year, issued by Finance Minister Donald Fleming, shows that for November, budgetary revenues were \$395.8 million, expenditures were \$393.9 million and the surplus was \$1.9 million. For November last year, revenues were \$415.1

million, expenditures were \$368.6 million and the surplus was \$46.5 million.

For the first eight months of the current fiscal year, budgetary revenues were \$3,304.8 million or \$79.9 million more than for the same period a year ago while expenditures, which included a payment of \$100 million to the Canada Council, were \$3,045.7 million or \$208.4 million more than a year ago. The surplus for the first eight months of this

fiscal year was \$259.1 million compared with a surplus for the same period a year ago of \$387.6 million.

Operations of the old age security fund, which are not included in budgetary transactions, resulted in a deficit of \$17.2 million for November 1957 and an accumulated deficit of \$47.3 million for the eight months to November 30, 1957. Last year for the eight months to November 30, 1956 there was an accumulated deficit of \$18 million. The deficits were covered by temporary loans by the Minister under the terms of the Old Age Security Act.

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SIGNAL IMPROVEMENT AT GANDER

With its newly-installed air-ground radio communication system now working on a round-the-clock basis, the Aeradio Signals Centre at Gander, Newfoundland, has been officially declared open by the Department of Transport.

Opening of the Signals Centre marks the final phase of an extensive programme of renovation of Gander as a key point in North Atlantic air-ground and point-to-point telecommunications. The air-ground facilities are being used in conjunction with the tape relay centre housed in the same premises, and which was put into use several months ago.

Transmissions from the centre are broadcast from a new and powerful remote transmitter station that rates among the world's best of its type.

The new Aeradio Signals Centre is staffed by eight radio operators at a time for air-ground communications and has been designed to permit further expansion when necessary.

Briefly described, the air-ground operations do in from two to three minutes an operation that formerly required about 15 minutes. An airline office, for instance, sends a message to a pilot over the Atlantic. It reaches the Signals Centre via a punched tape. This is fed into a machine that produces it as a type-written message. In this form it is given to a supervisor whose charts tell him which operator is "working" each of the planes over the ocean and he sends the message to the right operator via a belt-operated conveyor. Within seconds the pilot has the message.

The process is reversed for a message coming from aircraft.

The operator types it on a machine that sends it via teletype to Air Traffic Control, "Met" office and to the tape relay that connects the pilot with his home office.

In the transmitter station, Transport department-developed equipment provides for the use of more than 50 frequencies and links the station with Shannon, Ireland; Birdlip, England; Reykjavik, Iceland, and Goose Bay, Labrador. A new 40-Kilowatt transmitter has been added to connect the centre with Birdlip. Its tremendous power has made these communications operative 98.2 per cent of the time.

RECORD MINERAL PRODUCTION

Continuing a series of uninterrupted annual increases since 1944, Canada's mineral production broke all previous records again in 1957 when the value rose to \$2,133,941,000 from \$2,084,906,000 in the preceding year, according to the preliminary annual estimate released by the Dominion Bureau of Statistics. The year's increase of 2.5 per cent was modest by comparison with the increases of 15 per cent in 1956 and 20 per cent in 1955 and below the rate of gain since 1946. This year's value was more than double 1950's \$1,045,450,000 and more than triple 1947's total of \$644,870,000.

Among major minerals, a large increase in the production of uranium, coupled with lesser gains in nickel, platinum, silver, asbestos, salt, crude petroleum and natural gas, cement, lime, and sand and gravel, more than counter-balanced declines in copper, gold, iron ore, lead, zinc, coal, clay products, and stone.

The value of all metallics declined to \$1,136,411,000 from the preceding year's \$1,146,350,000. Nickel topped the other metals by a wide margin with a substantial rise to \$261,253,000 from \$222,205,000 in 1956, but copper, second in value size, dropped sharply to \$199,543,000 from \$292,958,000. Iron ore declined to \$155,549,000 from \$160,362,000 and gold to \$148,787,000 from \$151,024,000, while uranium rose sharply to \$130,911,000 from \$45,732,000. Zinc dropped to \$99,696,000 from \$125,437,000 and lead to \$52,464,000 from \$58,583,000 but silver rose to \$26,320,000 from \$25,498,000, and platinum to \$17,490,000 from \$15,726,000.

Boosted by a substantial increase in crude petroleum, now by far Canada's leading mineral product from a value standpoint, coupled with a large increase in natural gas, the mineral fuels group jumped to a record total of \$555,500,000 from \$518,761,000. Crude petroleum rose to \$444,785,000 from \$406,562,000 in the preceding year and natural gas to \$20,823,000 from \$16,850,000. Coal dropped to \$89,893,000 from \$95,350,000.

Non-metallics as a group also rose in value to \$167,290,000 from \$160,342,000. Asbestos rose in value to \$106,395,000 from \$99,860,000, salt to \$15,074,000 from \$12,144,000, and pyrrhotite pyrite to \$5,019,000 from \$4,539,000. Value of gypsum fell to \$6,256,000 from \$7,260,000, and titanium dioxide to \$7,528,000 from \$7,683,000.

Structural materials as a group also rose to a record total of \$274,740,000, substantially above the preceding year's \$259,453,000. Cement rose to \$93,765,000 from \$75,233,000, sand and gravel to \$84,052,000 from \$81,957,000, and lime to \$16,563,000 from \$15,668,000. Stone production was down to \$45,662,000 from \$48,810,000, and clay products to \$34,698,000 from \$37,785,000.

Ontario again led the provinces with a total value of \$739,219,000 or 34.6 per cent of the national total in 1957, up from \$650,823,000 or 31.2 per cent in 1956. Alberta took

over second place from Quebec with a total of \$411,961,000 or 19.3 per cent (\$411,172,000 or 19.7 per cent in 1956). Quebec was in third position with \$384,465,000 or 18 per cent (\$422,464,000 or 20.2 per cent).

Next in order was British Columbia with \$174,764,000 (\$203,278,000 in 1956); Saskatchewan, \$161,487,000 (\$122,745,000); Newfoundland, \$76,245,000 (\$84,349,000); Nova Scotia, \$65,434,000 (\$66,092,000); Manitoba, \$61,299,000 (\$67,909,000); New Brunswick, \$23,250,000 (\$18,258,000); Northwest Territories, \$21,966,000 (\$22,158,000); and Yukon, \$13,851,000 (\$15,656,000).

BUSY YEAR FOR TCA

Trans-Canada Air Lines carried an estimated 2,375,000 passengers in 1957. It was the second successive year that TCA had exceeded the two-million passenger mark.

Approximately 1,150,000,000 revenue passenger miles were flown on TCA's services in Canada and the United States, while another 230,000,000 were flown on routes to the United Kingdom and Europe and on the southern services to Bermuda and the Caribbean area. The total represented a 16 per cent increase over 1956. It was noted, however, that traffic was considerably stronger in the first half of the year and some evidence of weakening demand gave cause for concern as 1957 drew to a close.

President G.R. McGregor of TCA said that the airline had, in its 20th birthday year, again expanded its activities to meet public demand for air transportation. In making available almost two billion seat miles, TCA provided the greatest capacity in its history and an increase of 19 per cent from 1956.

Air freight traffic on TCA's routes rose during the year by 10 per cent to approximately 13,160,000 ton miles and TCA continued its policy of providing cargo accommodation on all scheduled flights in addition to a daily trans-continental freight service using all-cargo North Stars capable of carrying nine tons each. About 2,610,000 express ton miles were flown for a slight increase over the previous year.

The volume of mail traffic continued its impressive growth, with almost 10,000,000 ton miles being flown throughout the system, an estimated 8,000,000 of them in North America.

Features of the year were the introduction of non-stop air services trans-continentially between Toronto and Vancouver, and on the North Atlantic between Toronto and the United Kingdom. The trans-continental service that started in early summer with TCA Super Constellation equipment proved an immediate success. Later in the year, the Toronto trans-Atlantic non-stop Super Constellation service was inaugurated.

During the summer of 1957, TCA operated seven daily trans-continental flights and two others between eastern Canada and Alberta. On the North Atlantic, as many as twelve weekly overseas operations were scheduled.

The year was outstanding also in that TCA consolidated its plans for the coming jet age by placing an order for 20 Vickers Vanguard prop-jet airliners and taking an option on four more. The move followed previous orders for Douglas DC-8 jetliners and Vickers Viscount prop-jets. The latter popular aircraft have been in service since April 1955.

The compilation of the company's future fleet plan has, Mr. McGregor said, been the result of long and careful forecasting and technical analysis. As finalized, it provides for an all-turbine, all four-engined fleet by the end of 1961.

The three basic types will be the Viscount for short to medium routes, the Vanguard for the longer North American and southern routes and the DC-8 for the non-stop trans-continental and trans-Atlantic routes. All will be powered by Rolls-Royce turbine engines with the Viscount having the Dart, the Vanguard the Tyne and the DC-8 the full jet Conway, one of the most powerful engines yet devised.

The latest purchase - of Vanguards - represented a total cost of \$67,100,000 and was the largest single commercial dollar order ever placed in postwar Britain. A further \$11,700,000 will be spent if the four planes on option are later purchased.

The Vanguard will carry some 107 passengers in excess of 420 miles an hour and the unique design of the aircraft's fuselage will permit it to be used for all-cargo purposes when not being utilized in passenger service.

Fourteen Viscounts were delivered to TCA during the year and an option was exercised on 13 more.

The TCA fleet at the end of the year also included 11 long-range Super Constellations, 21 North Stars and 18 DC-3s. Outfitting of the Super Constellations with weather radar and the installation of wing tip fuel tanks was commenced during the year.

Some 30 per cent of the service offered by TCA during 1957 was tourist class, thus extending the market for air travel both on the North American continent and overseas. Family fare plan rates were continued, giving family parties the lowest possible fares for both domestic and trans-Atlantic flight.

The Pay Later Plan, excursion fares for low-cost European vacations and an extra-cities plan for European travellers were also in effect.

During the year TCA successfully demonstrated one of its newest developments - a new type of Electronics Reservations System which possesses sufficient flexibility to be adapted to other type of business operations without modification. It is called the Transactor System of data processing.

A prototype of the transactor was shown in Toronto and tests are continuing to determine whether it will be entirely suitable for TCA's vast reservations system which handles annually some three and one half million transactions.

A total of 209 new stewardesses and 118 new pilots were graduated during the year and TCA also maintained an active training programme in all departments. The TCA staff numbered 9,800 at the end of 1957.

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CONFERENCE ON EDUCATION

Five hundred delegates of national organizations representing two million Canadians in all walks of life will attend the Canadian Conference on Education to be held in Ottawa on February 17-20. They will study the objectives and needs of Canadian education in the next decade and seek ways and means to meet these needs.

Preparatory work by provincial committees and eight programme commissions will form the basis of study in workshops concerned respectively with organization and curricula; teaching personnel; financing education; higher education; the role of the home, agriculture, business, industry and organized labour in education; physical and mental needs; education for leisure; and buildings and equipment.

Nineteen major organizations are sponsoring the Conference, which has the financial support of large industries and associations. Dr. Wilder G. Penfield, of the Montreal Neurological Institute, will be the Conference Chairman.

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SMALL HOMES PROGRAMME

Public Works Minister Howard Green has announced that the Government of Canada small homes loans programme to encourage low-cost housing for lower-income borrowers under the National Housing Act passed the \$150,000,000 mark in fifteen weeks of lending activity.

Mr. Green said that in the fifteenth week, ended December 20, 288 loans for 434 units and an amount of \$4,642,545 were approved to bring the programme total to 12,236 loans for 15,900 units and an amount of \$150,714,884.

The special programme was announced by Prime Minister Diefenbaker on August 21. By the second week of September, meetings had been held between representatives of Central Mortgage and Housing Corporation and approved lenders, and technical details completed. Lending activity reached its peak towards the end of October with weekly loan approvals amounting to more than \$15,000,000.

Applications in process at the end of the 15-week period could result in another 1,940 units with an estimated loan potential of \$19,400,000, Mr. Green noted.

EXPEDITION TO NEW GUINEA

Canada's status as one of the leading countries of the world in the scientific study of insect classification has been further enhanced by a two-man scientific field trip to New Guinea. G.P. Holland and Dr. E.G. Munroe, of the Science Service Division of the Canada Department of Agriculture, recently completed the largest collection of insects ever made in that country. Hundreds of thousands of specimens were procured including representatives of about 2,000 species of one important family of moths (Pyralidae), of which several hundred are new to science.

Insect classification is of tremendous importance to practical field studies in entomology research because these studies are based on the correct identification of the pests concerned. Although Pyralidae, a large group containing several thousand species is under investigation on a world basis by Dr. Munroe, and collections have been made available to him through the co-operation of the Entomological museums of the world, many species in the group are poorly understood. For this reason steps were taken to collect specimens from New Guinea, a country noted for its rich and varied animal and insect life. Study material from this area is expected to prove extremely valuable in establishing the status of species occurring in many countries of the world.

Co-operation in this scientific venture was provided by the Commonwealth Scientific and Industrial Organization of Australia, a country much interested in the outcome of the ensuing studies.

At the termination of the expedition, Dr. Munroe proceeded to Bangkok, Thailand, to represent the Canada Department of Agriculture at the 9th Pacific Science Congress. Mr. Holland returned to Canada to resume duties as Head of the Insect Systematics and Biological Control Unit with the Entomology Division of Science Service in Ottawa.

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UNEF AIR TRANSPORT

A reorganization of Canada's contribution of aerial transport support to the United Nations Emergency Force in the Middle East will bring approximately 150 personnel and four C-119 Flying Boxcar aircraft back to Canada by next February, it has been announced by Air Force Headquarters.

The personnel and aircraft based at Capodichino military airport at Naples, Italy, will be phased back into Nos. 435 and 436 Transport Squadrons, located at Namao, Alta., and Downsview, Ontario, respectively.

The reorganization of the transport elements in the Middle East has been made possible by the completion of the major transportation requirements of UNEF from Naples to El Arish

DRB SCIENTISTS ACTIVE

The Defence Research Board's programme during 1957 shifted in emphasis from research leading to direct development to fundamental investigations. The newly-aligned studies were directed to support United Kingdom and United States ballistic missile defence activities, and expanded weapons and defence systems evaluations.

Working closely with scientists from the other two countries, DRB staff members increased and accelerated scientific effort related to the development of a defence against intercontinental ballistic missiles (ICBMs). The programme involves studies of a scale model ICBM passing through a simulated atmosphere, research in upper atmospheric physics, infrared detection and guidance, and the development of new propellants for large rockets.

To assist in obtaining vital scientific information about the upper atmosphere, the Board and the United States Air Force are beginning construction of a large radar installation near Prince Albert. Aimed at studying the aurora borealis (northern lights) and its likely effects upon ICBM detection, the joint project will begin this summer. Staff members of the University of Saskatchewan's Institute of Upper Atmospheric Physics will collaborate with the defence scientists.

Scientific advances related to military operations that have developed so rapidly during the past few years have dictated that Canada choose new defensive weapons in the near future. For this reason, DRB operational research specialists increased their efforts in the field of systems evaluations during the past 12-month period. These careful assessments, detailed examinations of the variables involving the different parts of defence and weapons' systems, aim at ensuring the comparability both of the system's component parts and of the individuals operating them.

The approaching need for interlocking anti-bomber and ballistic missile defences has necessitated intensification of these allied studies.

Also under consideration by the operational research scientists is the problem of missile-armed, long-range submarines. Because of the ranges now possible by guided weapons, Canadian and allied scientists are exploring practical methods of developing effective barriers to keep enemy submarines and surface ships well beyond our coasts during wartime.

The position of Vice Chairman of the Board, vacant since Dr. A.H. Zimmerman assumed the Chairmanship in 1956, was filled last April with the appointment of Dr. John E. Keyston, for the past seven years Chief Superintendent of the Naval Research Establishment (NRE) at Dartmouth, N.S.

An eminent scientist who has gained re-

cognition for his research both in industrial and defence scientific fields, Dr. Keyston led NRE to a number of advances of particular military importance. Under his leadership, the laboratory developed submarine detection equipment with outstanding characteristics and significantly efficient methods of protecting ships' hulls from corrosion. The latter scientific procedures result in appreciable annual maintenance savings for the Royal Canadian Navy.

The Board released details relating to a number of interesting activities during the past 12-month period.

Advanced scientific investigations of hydrofoil craft were made possible late in April with the launching in the United Kingdom of "Bras d'Or", a larger and more extensively instrumented successor to "Massawippi", the Board's first hydrofoil craft.

Of aluminum alloy construction, the 59-foot, 17½-ton craft is fitted with three hydrofoil units of similar size. Two are mounted on each side of the hull near the bow and the third, which serves also as a rudder, is fixed to the stern. Because hull drag is reduced or even eliminated as the craft rises on its foils, unusually high speeds become possible.

Trials began late in the autumn in Halifax harbour and will be conducted for an indefinite period by NRE scientists.

Following the launching of Sputnik I by the USSR early in October, Defence Research Telecommunications Establishment (DRTE) scientists, working closely with the National Research Council, were believed the first in the Western World to determine accurately the satellite's orbit and to fix its position in space. They calculated its speed and obtained other useful information which checked closely with the scientific data released subsequently by the Soviet Union.

The same group of scientists, in association with NRC, The Dominion Observatory and the Department of Transport, contributed similar information concerning Sputnik II and its carrier rocket. The measurements and calculations were forwarded to the appropriate International Geophysical Year (IGY) committee in each case.

DRTE scientists used the moon as a radio wave reflector during 1957 while studying ionospheric characteristics which affect long range telecommunications. In bouncing radio signals off the moon's surface, a television-type transmitter with an antenna 28 feet in diameter was employed. The information obtained from the project provided data for the Board's ballistic missile defence programme as well as for its telecommunications activities.

DRB announced the development of a new radar navigational aid for aircraft called "DAGMAR" early in 1957. A light-weight, low-

power Doppler radar, it measures ground speed and the true motion of aircraft over the earth's surface. In employing the Doppler principle, DAGMAR utilizes the frequency changes in radio signals transmitted from a moving source.

Led by Dr. Geoffrey Hattersley-Smith, a glaciologist with the Board's Geophysics Section, a group of scientists began a series of geophysical, geological and climatological studies of the Lake Hazen area in North Ellesmere Island early in May. The DRB-sponsored expedition was established to provide Canada with geophysical information about her far northern territories and to support the IGY programme.

While obtaining glacial ice cores near the base of Henrietta Nasmith Glacier at the northwest end of Hazen Lake, Dr. Hattersley-Smith discovered in a stone cairn documents left by United States explorer Lieutenant A.W. Greely in 1882. During previous expeditions to the northern part of Ellesmere Island, Dr. Hattersley-Smith found similar documents and other historical relics deposited at widely separated sites by members of early exploration parties.

"Arctic Canada from the Air", a 540-page book which examines Canada's arctic in detail and promises to become a "bible" for individuals operating above the treeline, was

published late in August. Written by Miss Moira Dunbar, of the Geophysics Section, and Wing Commander Keith R. Greenaway, one of the western world's foremost polar navigators, the project was undertaken at the request of the RCAF. W/C Greenaway was seconded to the Board for about three years and spent much of that period gathering data for the text.

DRB engineers recently began a programme aimed at evaluating vehicle performance by means of working scale models. The Board financed the production of a model of a Canadian Army tracked vehicle designed for over-snow and tundra operations.

The studies are being directed towards the evaluation of this technique as a pre-design tool for new types of vehicles. The engineers expect that trials with small working scale models will result in significant cost reductions when operational prototypes are produced.

During the firing of a series of United States research rockets at Fort Churchill in support of the IGY, Defence Research Northern Laboratory (DRNL) staff members assisted in carrying out electronic measurements, telemetering and in contributing to other associated activities. DRB scientists integrated into the launching team gained practical and useful experience in large, research rocket firing techniques. DRNL facilities were made available as a headquarters for the project.

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UNEF AIR TRANSPORT

(Continued from P. 4)

in the Gaza area, and improvements in the shipping and commercial airline transportation between these points. In addition, four-engine North Star aircraft from No. 426 Transport Squadron at Dorval, which have been making weekly flights to Capodichino will not terminate there but will carry on to Beirut, Lebanon.

No. 115 Communication Flight based at El Arish in the Gaza area, which has a strength of about 70 officers and airmen and has depended upon RCAF facilities at Capodichino for carrying out engine overhauls, will be redesignated as an Air Transport Unit and strength-

ened by approximately 30 personnel and one Dakota aircraft.

In November 1956, Canada committed a squadron of twelve C-119 Flying Boxcars from the transport squadrons based at Namao and Downsview to UNEF. The personnel and aircraft of No. 435 Transport Squadron, augmented by aircraft from No. 436 Squadron, moved to Capodichino. A large scale airlift of urgently required troops and materiel from Capodichino to Abu Sweir, Egypt was completed in January 1957, after which eight of the aircraft returned to Canada and No. 435 Squadron returned to Namao, Alta. To replace the squadron, two communications flights, Nos. 114, equipped with Flying Boxcars, and No. 115 equipped with Dakota and Otter medium transport aircraft were set up at Capodichino and El Arish.

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