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CANADA'S AIRCRAFT INDUSTRY: 1959

True to form, the Industry's business continues on its boom or bust cycle

THE SHOCK waves of the Arrow/Iroquois program cancellation are still being felt throughout the farthest reaches of Canada's Aircraft Industry. Indeed, it may be expected that some years hence there will still be faint echoes of the crash heard when the Arrow bit the dust.

Shocking as the effects of the Arrow's cancellation are, even more alarming is the apparent lack of understanding on the part of the Government . . . as pointed up by the manner in which the cancellation was handled . . . as to the importance of the Industry as a national asset, as an integral component of the defence structure. Mr. Diefenbaker's precipitous action may have been politically courageous, as many are apt to claim in awe, but it was in no way related to defence requirements (See page 38).

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The full effects of the abrupt ending of the Arrow program cannot be known for some months yet, but there is obviously no palliative immediately available which can restore the Industry to its former healthy vigor, on even a short term basis. The only treatment possible will be long and hard, but the possibilities of a return to full strength are sufficiently good to make taking the toughest cure worthwhile.

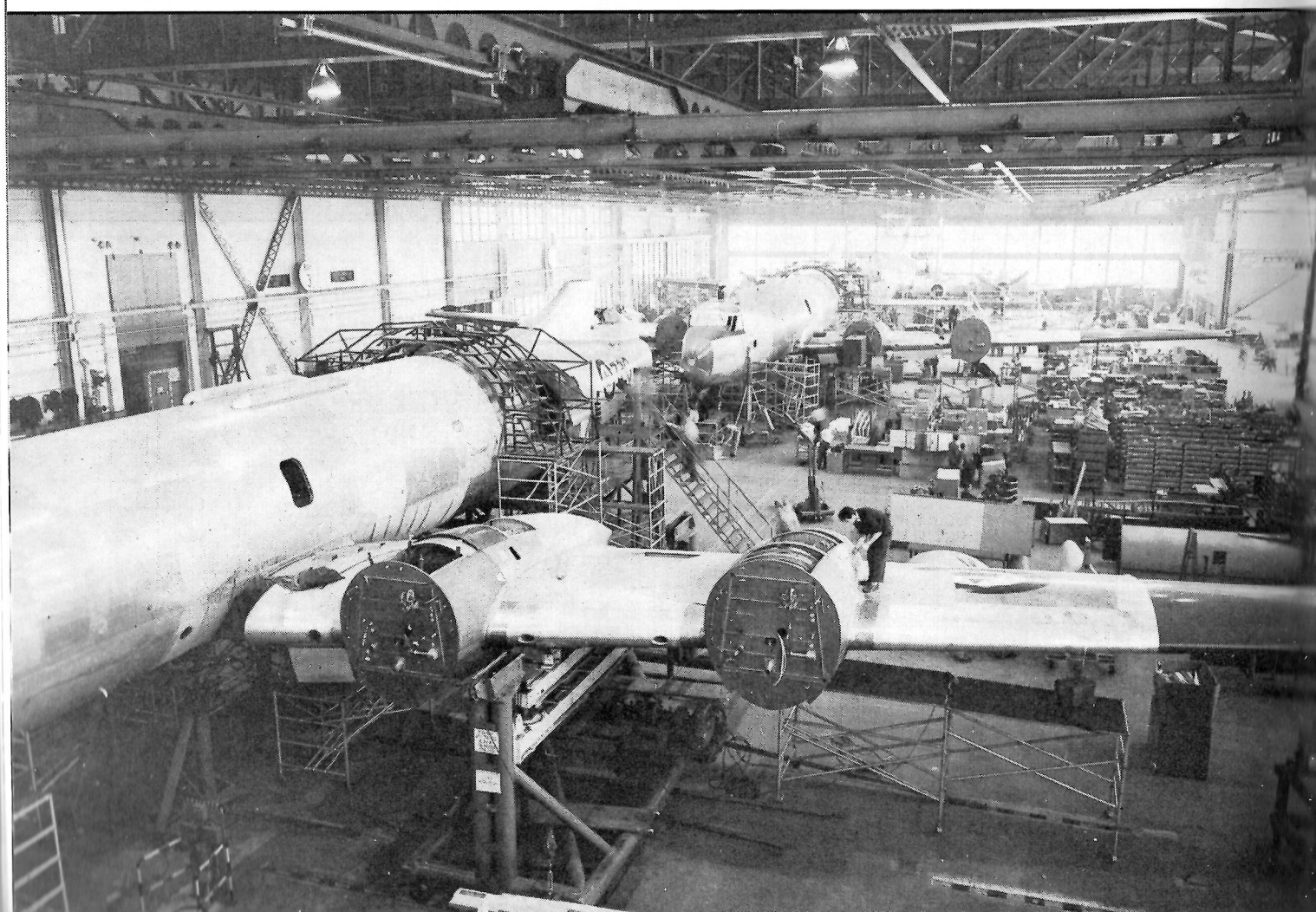
A quick review of Industry projects indicates that there is a distressing lack of large scale production programs on hand or in immediate prospect. The past year has seen the end of several major programs, either as a result of completion of orders, or because of contract termination for economic or other reasons.

Other development and/or production programs still keeping the Industry busy:

•**Canadair CL-28 Argus:** Some 37 of these large four-engined maritime reconnaissance aircraft have been ordered and over half have been delivered to the RCAF. Current orders should keep the production shops working until sometime in 1960. With the missile-firing submarine an increasing threat, there is a possibility that more CL-28's may be ordered.

•**Canadair CL-44:** Another large four-engined descendant of the Britannia family, this aircraft has been ordered by the RCAF in sufficient quantity to equip a single transport squadron. None has been delivered yet (first one will be turned over to the RCAF late in 1959), but with such a small number on firm order, it may be expected that deliveries would be

CL-28 Argus maritime reconnaissance aircraft for RCAF continue in series production at the big Canadair plant.



Current orders for RCN CS2F-1 Trackers will ensure continuous production at de Havilland Canada to mid-1960.

completed in less than a year after their beginning. However, this design has considerable potential as a commercial airliner and to this end Canadair is carrying on an aggressive world-wide sales campaign.

•**Canadair 540:** This is the well-known Convair 440 Metropolitan equipped with turboprop power (Napier Elands). It is the ideal stablemate for the long-range CL-44 series and likewise is being pushed hard on a world-wide basis. Similarly, a small number have been ordered by the RCAF for a single transport squadron, but the sales prospects are excellent as a civil transport.

•**Canadair CL-41:** A jet trainer, this project is still under development but has been delayed by the recent cancellation of the Fairchild J-83 turbojet which had been selected as the powerplant. The P & W JT-12 has been chosen as a replacement. Two prototype airframes have been completed for some time with a third one under construction. The CL-41 is a private venture, originally initiated on the logical assumption that the RCAF would soon be introducing all-through jet training to its pilot training curriculum. However, with the cancellation of the Arrow, the future role of the RCAF is not clear. It becomes increasingly possible that Canadair will have to look mainly to foreign air forces for customers for this promising little trainer.

•**De Havilland DHC-2 Beaver:** Little new can be said about the ubiquitous Beaver. Over 1300 have been produced and sold to date and production is assured through most of 1959 at least. Most of these aircraft have gone to the U.S. military, but civil sales continue on a reduced scale, hampered by credit problems both home and abroad.

•**De Havilland DHC-3 Otter:** Production of the Otter will continue through 1959. Largest single customer for this aircraft has been the U.S. Army, with the RCAF being second on the list. Over 300 have been built to date. Like the Beaver, the Otter finds ready acceptance by customers, but financing problems restrict sales to dollar-short countries.

•**De Havilland DHC-4 Caribou:** Now well into its flight testing program, the Caribou is showing lots of promise, both in the area of performance and as a future sales item. The initial production batch totals 20 of which 15 are to be completed by the end of this year. Five of these are an evaluation batch ordered by the U.S. Army; another is for the Canadian Army. Apart from these, there are at present no firm orders in hand. An active sales campaign is under way but this may not be expected to reach fever pitch until a demonstrator with a C of A is available to back up the brochures.

•**De Havilland CS2F-1 Tracker:** This Grumman-designed anti-submarine aircraft is now in its fourth year of license production at de Havilland Canada. Current production is still to the original order and work on hand at the present rate is sufficient to keep the Tracker line going until mid-1960. There is still the frequently mentioned possibility that other variants of the

CS2F may be ordered for the RCN, notably the AEW version.

•**Aero Engines:** In addition to the airframe projects noted briefly above, there are still two aero engines in production in Canada. These are the Pratt & Whitney R-1340 and the Wright R-1820-82, both manufactured at Montreal by Canadian Pratt & Whitney Aircraft Co. Ltd. In both cases the production rate is very low.

The picture that can be assembled from these pen sketches is that for Avro and Orenda . . . and a few of their major subcontractors who were wholly dependent on orders from the two A.V. Roe Canada subsidiaries . . . things couldn't be blacker.

For the rest of the industry, the landscape is not quite so dismal. Activity at none of the firms is very high, but most have projects in hand that are very promising indeed. If they live up to their promise, the effects could be felt widely.

IT IS EXTREMELY significant that the companies that have least been affected by recent contract terminations, natural or otherwise, are those which are least dependent on the native military market.

For example, de Havilland Canada says that 40% of its business is for the civil market, the remainder military. However, during the 1948-58 period, 83% of all Beavers built were exported; during the 1952-58 period, 73% of all Otters built were exported. In other words, practically all of DHC's military sales were for foreign air forces. They were straight commercial sales of more or less off-the-shelf airplanes, made on the merits of the aircraft alone.

Nearly 80% of Canadian Pratt & Whitney's effort is directed towards the civil market and a large part of this may be classed as export trade. Canadian P & W has been very successful in replacing declining business with the Canadian Government with a growing number of foreign customers.

The importance of building up the civil and/or export side of its business has long been recognized by Canadair, but it was not until it was able to conclude the license deals which have enabled it to go into production on the CL-44 and the 540, that it has had any products to offer with a wide commercial appeal. Up till now, Canadair's business has been almost 100% with the military market, though during the past year a very large part of this military production has been for export.

In the past month, Canada's Aircraft Industry has learned a very hard lesson: a lot of little customers are better than one big one.

This lesson has been amply demonstrated many times in the past, but never in such a dramatic and cataclysmic way. Fortunately, there's still a sound foundation on which to rebuild. But it won't be done overnight.

THE COMPANIES: WHAT THEY'RE DOING

Avro Aircraft

A STAGGERING setback was suffered by Avro Aircraft Ltd. in February when the Canadian Government cancelled all further development and production of the CF-105 Arrow.

At this time, it is still not clear to what extent Avro will be able to continue operations, as the company effort was over 90% directed to Arrow development and production activities. Most of the 1,700,000 sq. ft. of plant area was also devoted to these activities, so that the vast majority of this space is now empty and silent.

At cancellation of the Arrow, the entire staff of about 8800 was released, but about 2000 of these have now returned to work, it is understood. A large number of these are engineering personnel and under an agreement between the company and the Government, the latter is paying half the cost of keeping them on the payroll for six months. This plan has been adopted in an effort to retain at least a nucleus of the design team which had been built up by Avro since its founding about 13 years ago.

Several proposals have been put forth for projects which will revive the giant Malton, Ont., aircraft manufacturing complex, but to date none of these have taken on concrete form. It appears that the best prospect lies in the direction of building a replacement for the RCAF Air Division's Sabres and CF-100's. This could involve about 400 aircraft.

Actual work still being carried out at Malton includes the repair and overhaul of CF-100's as well as a CAIR program in connection with the same aircraft. CF-100 spares manufacture also continues. Research and development is being continued for the USAF and the U.S. Army in connection with "Project Y", the vertically rising aircraft on which Avro has been working for several years.

Canadair

STILL HEAVILY dependent on military contracts which in 1958 made up an estimated 99% of the company's total business volume, Canadair expects a large increase in the proportion of commercial business during 1959. Toward this end, Canadair has several sales teams touring all parts of the free world.

The big Montreal aircraft manufacturer has 2.6 million square feet of plant area, and employs a work force of 9500 persons; this figure is down from 10,200 one year ago. A subsidiary of General Dynamics, Canadair divides its activities largely between manufacturing (88.4%) and research and development (10.4%). The remaining 3.2% is devoted to repair and overhaul contracts.

At the present time, Canadair is engaged in the production of CL-44 long-range turboprop transports; CL-28 Argus anti-submarine aircraft for the RCAF's Maritime Command; and the medium-range, twin-engine Canadair 540 transport. The 540 is the Napier Eland powered Convair design of which ten are presently on order for the RCAF. The company expects to sell this versatile aircraft to commercial operators.

In production, on sub-contract to the Boeing Airplane Co., are the wings and ailerons for Bomarc missiles. This contract has been hailed as the first of more-to-come defence subcontracts from the U.S.

Meanwhile, Canadair is going ahead with development work on its CL-41 basic jet trainer. Two prototypes have been built of the small trainer which features side-by-side seating for instructor and pupil. Other research and development projects include an electronic mail sorter.

Canadian Pratt & Whitney

LOCATED in Longueuil, across the river from Montreal, Canadian Pratt & Whitney Aircraft Co. Ltd. has a plant area of some 800,000 sq. ft. The company's payroll has declined slightly from a year ago, dropping to 2000 from 2300. Unlike the larger Canadian firms in the industry, Canadian P & W directs 77% of its business toward the civil market.

The bulk of the company's activities lie with manufacturing, (64.7%); while representation for lines made in the U.S. take up 17%. Repair and overhaul of engines accounts for a further 12%, while the remaining 6.3% is devoted to active research and development work.

Canadian P & W manufactures the Pratt & Whitney Wasp R-1340, the Wright R-1820-82 and numerous spare parts having application to all Pratt & Whitney reciprocating engines. The sale of the R-1340 engines and spare parts throughout the world represent a substantial contribution to Canada's export trade.

In the field of original design and development, the company has produced the accessory drive gear boxes which will be used on the Canadair CL-44 aircraft, and is now proceeding with the design and development of gas turbines suitable for small aircraft and helicopters.

Canadian P & W sells, services and overhauls in Canada the products of the United Aircraft Corp., of East Hartford, Conn. Principal products are the reciprocating and gas turbine engines of the Pratt & Whitney Div., the propellers, air-conditioning units, fuel controls and other aircraft accessories of the Hamilton Standard Div. Other items include the analog and digital computers, rotating components and other electronic control units of the Norden Div., and the helicopters of the Sikorsky Div.

De Havilland of Canada

THAT SUCCESS is attendant with this Canadian company is evidenced by the fact that of all the major aircraft manufacturers, de Havilland Canada is perhaps the only one to have increased its staff in the past year. At the present time, the Downsview, Ont., company employs some 4100 people; last year at this time 3700 were on the payroll.

The company is wholly devoted to manufacturing and has a plant working area of some 882,374 sq. ft. The firm's total business volume is divided 60% on military orders, 40% on civil commercial orders. In production at the present time are the DHC-2 Beaver, the DHC-3 Otter, and the DHC-4 Caribou.

Biggest event of the past year for de Havilland Canada was the unveiling of its new STOL twin-engine transport, the Caribou. Making its maiden flight July 30, the prototype began intensive flight testing. Designed for both civilian and military operators, the aircraft has a gross weight of 26,000 lbs., packs a 3½-ton payload over a 1000 mile range.

The production and sale of Beaver and Otter aircraft to both civilian and military operators continued throughout the year, although at a slightly reduced rate. In the ten year span since the Beaver first flew, more than 1300 have been produced and are now flying in 61 different countries.

Substantial numbers of Otters continued to be supplied to the U.S. Army, as well as new orders being filled for the Burmese and Indonesian Air Forces. Qantas Air Lines of Australia received four Otters, (two land planes, two amphibians), for operations in New Guinea.

The CS2F Tracker for the Royal Canadian Navy continued on schedule and will run into 1960 before completion of the contract. The company's export sales of aircraft continue to show a marked percentage increase as has been the case for the past three years. In 1958, some 93.7% of the Beavers sold were exported, while 94.8% of the Otter production was also sold outside the country.

Orenda Engines

TO AN EVEN greater extent than its sister company Avro Aircraft, Orenda Engines was hit by the cancellation of the Arrow program and consequently its engine, the Iroquois.

At the time of the cancellation, Orenda was employing approximately 5000, only a few of which have been re-engaged at this time. Practically all the work that is going on at present is related to the Orenda repair and overhaul programs, as well as the supply of spares for the various models of these engines in service with the RCAF and the German Air Force. Contracts in

High hopes are held that the Canadair 540 will find a ready and expanding market among the world's airlines.

Civil and military prospects for Caribou are considered extremely promising.

this connection currently total about $8,000,000.

There is some faint hope, encouraged by a remote possibility, that Iroquois development may be revived. This remote possibility is that Curtiss-Wright holds a license from Orenda to manufacture and sell the engine in the U.S.; the licensing agreement also extends to the U.S. firm the right to develop the engine as necessary to meet the requirements of the American market. The existence of this agreement may provide some incentive for Orenda to continue the development program at least to the point where the engine is fully proven in the air.

There has been some wishful thinking that if the Government selects the Grumman Super Tiger as a replacement aircraft for the RCAF's Air Division, the Iroquois could be used for a substitute powerplant, á la Orenda Sabre. However, the difference in the physical dimensions of the two engines (Iroquois' diameter 42 in vs. the J-79's 32 in.) seem to rule this possibility out unless the fuselage of the aircraft is extensively re-engineered.

Major Secondary Firms

• **Aircraft Industries of Canada:** Located at St. Johns, Que., AIC is engaged in the overhaul and repair of piston aircraft up to 75,000 lbs. In a plant area of 148,075 sq. ft., (an increase of 13,000 sq. ft. over last year), AIC handles the repair, overhaul, conversion and/or refurbishing of a wide variety of aircraft ranging up to North Stars.

In addition to the above, aircraft component repair is a sizeable portion of the company's yearly work. Complete engineering facilities are available to give immediate service on major repairs, new or prototype fitments. Salvage operations are a highly specialized phase of the company's operations.

The company's bread-and-butter contracts are with the RCAF, some 85% of their total work being directed toward the military. Employees number above 400.

• **Aviation Electric:** Active in Canada's aviation industry since 1931, Aviation Electric Ltd., Montreal, concerns itself to a large extent with the design and fabrication of a large number of diverse flight and engine instruments, rate and free gyros, aircraft hydraulic system valves, jet turbine fuel controls, electronic servo amplifiers, missile components and various mechanical high precision units. At the present time, the firm has a plant working area of 154,000 sq. ft.

Since recent changes in defence policy have brought about cancellation of orders which affected AEL's sales, and in particular their manufacturing activities, the company has turned its attention to obtaining work from the U.S. This slow-down is reflected in the personnel figures for last year and the present time. A year ago the company employed 865; this year, 710.

The company's manufacturing and overhaul divisions are backed by an engineering department. Research and test facilities include an engineering model shop, instrument, hydraulic, electronic, metallurgical, chemical, fuel and environmental laboratories occupying approximately 10,000 sq. ft.

AEL's overhaul division has continued to overhaul and repair a wide range of aircraft accessories, aircraft and industrial instruments and specialized electronic equipment. While overhaul of equipment from non-military sources has steadily increased, the emphasis remains on military equipment. A new and larger electronic shop was opened at AEL during the past year.

• **Bristol Aero-Industries:** A change of name plus some re-organization has greatly simplified the corporate structure of this company. With headquarters in Montreal, Bristol Aero-Industries Ltd. is broken down into three divisions in Canada and in addition operates a Mexican subsidiary.

Montreal Division: This facility boasts a work area of 162,000 sq. ft., which is almost completely devoted to repair and overhaul work. The Montreal Division's payroll has increased to 537 from 514 a year ago.

Chief activity is the repair, overhaul and servicing of piston engines, powerplants and accessories for the RCAF, TCA and other commercial operators. Contracts are split 30% civil and 70% military.

The Montreal plant of Bristol is one of the most modern of its type in Canada. It is self-sufficient in engineering, machine shop and plating, test and other specialized services necessary to maintain the exacting standards and controlled economies demanded today by both military and commercial operators. The Accessory shop has complete air circuit testing equipment for Bendix carburetors and master controls.

Approximately 400 units are processed per year, including Hercules 734, Merlins, North Star powerplants, and various Wright Turbo-Compound models.

Winnipeg Division: The largest of the Bristol plants in North America, the Winnipeg plant has some 1170 employees. Plant area is approximately

436,100 sq. ft. Some 90% of this facility's effort is directed toward the military market, this effort being divided 35% in manufacturing pursuits and 65% in repair and overhaul.

Other activities include modification and conversion, provision of mobile repair parties in the field, and ramp handling facilities for airline operators.

The western division concerns itself, too, with the manufacture, repair and overhaul of standard and amphibious aircraft floats; the manufacture of nose cones and pressure vessels for aircraft and missile application; jigs, fixtures and tooling; radar antennae.

Vancouver Division: The West Coast division of Bristol has, in the past year, expanded its work force by more than 30% to a total of 177 persons. Plant area at the Vancouver Airport site totals 67,000 sq. ft., and the company divides its aviation business between civil (60%) and the military (40%).

The Vancouver Division is engaged in the repair and overhaul of piston engines for the armed services and commercial customers. This work is chiefly centred on Curtiss-Wright R2600 engines and on Pratt & Whitney R1830 and R1820 engines. The company is also engaged in the overhaul of Proteus turboprop engines in use with CPA, Aeronaves de Mexico and Cubana in their Britannia aircraft.

• **Canadian Applied Research:** One of the fastest growing and most progressive young companies in the industry, CARL operates out of two Toronto plants. Plant area is 56,000 sq. ft., and total employment 650, an increase of 250 during the past year.

CARL's activities are diversified, include such things as design, development and production of the R-Theta Navigation Computer System. The company also does design engineering and production of aircraft instrumentation, photogrammetric and optical instruments, airborne geophysical survey equipment, aircraft armament intervalometers, microwave plumbing and a special CARL development, the automatic tri-film processor.

The company has been very active in the field of aircraft anti-ice and ice detection systems. Their automatic dual-probe ice detection system is considered one of the most efficient in the world.

A portion of CARL's activity is devoted to the repair and overhaul of aircraft instruments. Recently the company acquired Phoenix Engineered Products Ltd., giving CARL an additional 90,000 sq. ft.

• **Canadian Aviation Electronics:** Employing over 1000 persons, CAE is one of the largest electronics firms in Canada. The Montreal company is chiefly concerned with the design, development and production of flight simulators and flight trainers, mainly for the military.

In the past twelve months, the last of 11 CF-100 Mk. 4 flight and weapon system simulators was completed and delivered to the RCAF. Another large RCAF contract made over a year ago was for 12 general purpose, twin-engine piston type simulators for Air Transport Command use.

CAE has two branch plants, one in Winnipeg and the other in Vancouver. Both of these operations are concerned with repair and overhaul of radar equipment.

• **Canadian Marconi Co.:** Aviation work is only a small portion of the well-known Montreal company's production. The Aviation Department of Canadian Marconi is responsible for the design, development, production and service of a wide range of communications equipment. The firm has been active in development of the CMA-621 Doppler Sensor, an electronic aid to navigation.

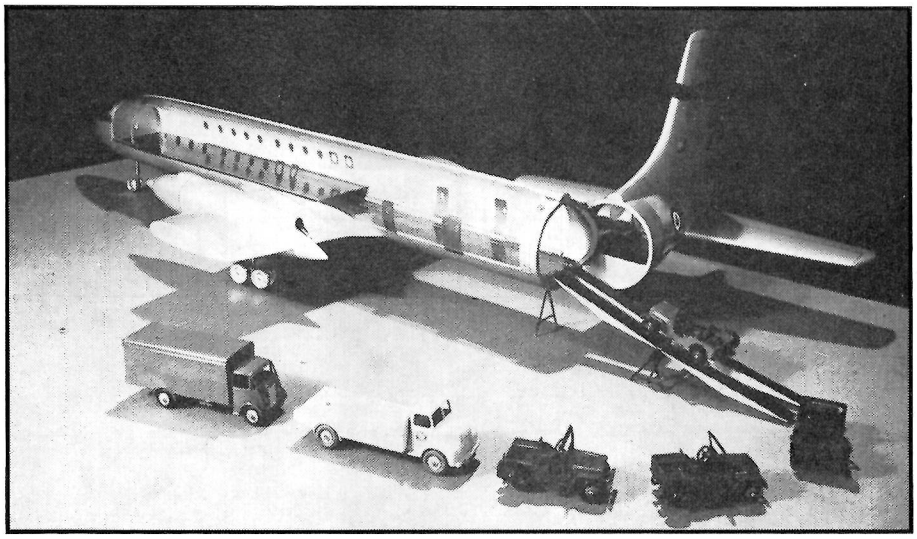
• **Canadian Steel Improvement:** CSI has one of the most up-to-date forge and foundry facilities in North America. The company's operation is specifically aimed at the aircraft industry.

Cancellation of the Arrow program forced the company to lay off about 250, or 50% of its staff.

• **Collins Radio Co. of Canada:** This Toronto firm employs some 265 persons in a compact 25,000 sq. ft. plant. The company is actively engaged in the production of electronics equipment for both airborne and ground applications. Collins embodies complete sales, engineering and production facilities for airborne communications and navigation systems. Government military contracts being filled during the past year include the AN/ARC-552 1750 channel UHF transceiver for the RCAF and the RCN. Another item is the AN/ARC-38 HF transceiver for the RCAF.

• **Canadian General Electric:** CGE's Electronic Equipment & Tube Dept. is situated at Royce Works, Toronto, and is engaged in the design, development and production of such aviation items as airborne and ground radar equipment.

The company recently received a



New Canadair CL-44G features a swing tail for loading bulky cargo and mobile equipment. Note the stepped floor in fuselage.

Now in squadron service with Maritime Air Command are Canadair CL-28 Argus maritime reconnaissance aircraft.

$9 million contract to produce an improved height-finding radar for installation in all radar sites along the Pinetree Line from one coast to the other.

• **Computing Devices of Canada:** CDC, the well-known Ottawa electronics firm, continues active in research and development in that field, as well as maintaining a manufacturing operation and continuing its repair and overhaul activities. The firm employs approximately 550.

The company is engaged in engineering and development in the fields of simulation, automation, computers, semiconductors, and electronics instrumentation. A Canadair contract calls for the development and production of the Antac navigation system for the CL-28 Argus.

Another of CDC's more interesting lines is its work in the development of better equipment for airborne geophysical exploration. The firm is responsible for the operation of the Data Processing Centre at the Cold Lake Weapons System Range.

CDC handles the agency sales of nearly all Bendix Aviation electronic equipment.

• **Custer Channel Wing (Canada) Ltd.:** This Montreal firm is a subsidiary of Custer-Frazer Corp. of New York City, by which it has been licensed to build in Canada the Custer CCW-5 Channel Wing aircraft. Production plans for this aircraft were announced last fall, and since that time work has been proceeding apace to implement these plans. The parent firm has placed a production order for 100 aircraft with the Montreal firm, mainly for sale in the U.S. Reason for Canadian production is given as lower production costs. Actual fabrication is being undertaken under subcontract by Noorduyn Norseman Aircraft Ltd., Leader Products Ltd. and Gorde Tool & Die Co. Ltd., all of Montreal.

• **Dowty Equipment of Canada:** Dowty of Canada, which is located in the town of Ajax, during the past year has expanded its work area by almost 45% to its present 85,000 sq. ft.; dropped slightly in personnel to 310. Generally, the company is engaged in the design, development and manufacture of aircraft landing gear and hydraulic equipment, with military contracts comprising some 70% of the total.

Dowty's engineering and manufacturing divisions have, in the past year, been actively engaged with landing gear, hydraulic and fuel system components for the ill-fated Avro Arrow and Orenda Iroquois; other work involves the Canadair Argus, CL-44 and CL-41, as well as de Havilland's Caribou and CS2F Tracker.

Although production of landing gear, wheels, brakes and hydraulic components for the CF-100 came to an end during the year, supplies of spares, and repair and overhaul contracts for the RCAF have resulted in a continued manufacturing demand. Licensing arrangements were completed for repair and overhaul in Belgium of the company's many products fitted to the CF-100.

The market for Dunlop aviation equipment made and distributed under licence in Canada, increased during the year when the company received orders for the wheels, brakes, anti-skid equipment and windshield wipers for the Canadair CL-44.

• **Field Aviation:** With headquarters at Oshawa Airport, Field Aviation Co. Ltd., has a second large operation at McCall Field, Calgary. The Oshawa facility employs over 200 men and occupies 110,000 sq. ft. of work space. Fully half of the company's business is in the sale of various aviation products from the U.S. and the U.K., while repair and overhaul accounts for 45% and a modicum 5% of manufacturing rounds out the picture at Field. About two thirds of the company effort is directed toward private owners, corporation-owned aircraft, and commercial operators.

Field is responsible for all RCAF storage and inhibiting operations conducted by No. 6 Repair Depot, Trenton, Ont. A small amount of telecommunications servicing work is also carried out.

• **Fairey Aviation Co. of Canada:** Located at Dartmouth, N.S., Fairey of Canada employs nearly 1,000 in a variety of overhaul and modification programs for both the RCAF and the RCN. In addition to this, hydraulic actuators for the Canadair CL-28 are in production. Until the end of the Avro CF-100 program, Fairey of Canada was producing hydraulic boosters for the all-weather fighters. Some repair and modification work is still carried on in this respect. The Nova Scotia facility has a total of 235,000 sq. ft. of plant space devoted to aviation activities.

A branch of the company is located at the West Coast's Patricia Bay. Un-

De Havilland Canada-built CS2F Tracker is shown landing on HMCS Bonaventure. Production of Trackers is assured till mid-1960.

like the main plant, the western enterprise has little dealings with the military but confines its attentions mainly to the civil commercial field. Some 50,000 sq. ft. of plant area is devoted here to repair, overhaul, modification and conversion jobs.

• **Fleet Manufacturing Ltd.:** Fleet is one of Canada's oldest aviation companies, and after a period of low activity has been making slow but steady progress toward recovery. At the present time, Fleet devotes roughly 60% of its manufacturing capacity to aviation products. Engaged in this phase of Fleet's overall operation are some 160 men. About 20% of the company's aviation effort is taken up with civil work.

Component parts manufactured by Fleet include flaps, ailerons, wing extension, fin and rudder, rocket pod armament and spares for CF-100's. For de Havilland Canada they produce cargo doors, honeycomb panels, floorings, bomb bay doors, reinforced fibreglass fin and rudder components. Ski assemblies for both Otter and Beaver aircraft are produced by Fleet. Another item of manufacture is antennae assembly AN/FPS-6A.

• **Honeywell Controls Ltd.:** Almost completely devoted to military contracts, Honeywell's Aeronautical Division has a work area of 35,250 sq. ft., employs 172 people. The Division has designed, developed and manufactured a variety of airborne instruments and components, as well as associated flight test equipment. However, manufacturing covers only 10% of Honeywell's total activity. Half of the firm's work is in providing a complete overhaul service for a variety of aeronautical equipment.

• **Jarry Hydraulics Ltd.:** Jarry, of Montreal, has undergone steady expansion in the past few years, today employs over 300 people in their aviation enterprises which include hydraulic components of such well-known Canadian-built aircraft as the de Havilland Caribou and the Canadair Argus. Jarry devotes some 70,000 sq. ft. of working space to aviation work, with 87% of the total effort taken up with manufacturing.

The company is heavily dependent upon military contracts, some 85% of its total aviation business being concentrated here. Jarry was responsible for the engineering and production of the complex and ingenious nose wheel assembly and nose wheel steering mechanism for the now-defunct Arrow. Another major item of Arrow hardware designed and supplied by Jarry to Avro was the hydraulic elevator actuator, a 4000 psi unit which had a design output load of 72,000 lbs.

Meanwhile, the company is continuing with the landing gear for the CL-28 Argus and CL-44 aircraft. What may turn into the most lucrative item of all for Jarry, is its unique STOL landing gear design which is incorporated in the Caribou. Other de Havilland-built aircraft which employ Jarry components are the CS2F Tracker, the Otter and Beaver.

Jarry is chiefly concerned with the production of equipment designed by its own engineering department.

• **Lucas-Rotax Ltd.:** Located in Toronto, Lucas-Rotax, splits its operation between the manufacture of, and the repair and overhaul of, fuel systems for gas turbine engines and aircraft electrical systems. The company has a plant working area of some 150,000 sq. ft. By far the greater portion, (93%) of the company's business is with military-type aircraft.

Until recently, prior to the untimely demise of the Arrow, Lucas-Rotax was chiefly concerned with the fabrication of the entire fuel system for the Iroquois, and the electrical generating system for the Arrow itself.

At the company's Montreal and Vancouver plants, the main activity has always been the repair and overhaul of military and commercial jet fuel systems and aircraft electrical systems.

• **Northwest Industries:** Located at the Municipal Airport, Edmonton, Northwest employs some 600 and commands a working area of more than 320,000 sq. ft. The company is heavily committed to military contracts in the repair and overhaul line, including overhaul, repair and conversion of the RCAF's C-119 and T-33 aircraft, as well as the repair of airframe components from these and other military aircraft.

The Commercial Aircraft Service Department provides a complete service for civil aircraft. This service embraces repair, overhaul, conversion and operational checks for scheduled airline, charter, and executive aircraft.

The Instrument & Electronic Department, in addition to its major work of repair and overhaul of in-

struments for the RCAF, is developing an active business in the overhaul of instruments for commercial aircraft and industrial instruments.

The Engineering Department is engaged in developing and perfecting modifications and improvements to aircraft, design studies and new developments.

• **Raytheon Canada Ltd.:** Located in Waterloo, Ont., Raytheon employs a staff of 100, and is engaged in the design, development and manufacture of radar and other electronic products. The Canadian firm was engaged last year in the completion of an $8 million order from the DoT to provide and install 15 surveillance radar sets at selected airfields across Canada.

• **Renfrew Aircraft & Engineering:** Located at Renfrew, Ont., Renfrew Aircraft & Engineering is engaged in the manufacture of combustion and other equipment for gas turbine aero engines. The company has a payroll of about 300 personnel, a plant working area of 107,000 sq. ft.

Renfrew Aircraft is also engaged in the design and manufacture of a variety of fueling equipment for airport use. The plant is equipped to undertake large scale production work, as well as special engineering and development projects.

• **Rolls-Royce of Canada Ltd.:** With its large plant at Montreal, R-R Canada employs some 693 people, and has a total working area of 118,855 sq. ft. This figure includes a recently completed test bed specially designed for turbo-prop engines. This new facility enables the company to undertake the overhaul of Darts.

The company's business is divided between sales of Rolls-Royce engines made in the U.K., and the repair and overhaul of these engines. Some 45% of their business is with the military, while the remainder is with civilian operators. Military contracts include the repair and overhaul of RCAF Nenes for the RCAF which use the engine in T-33 trainers; and for the RCN. The Canadian firm also does the repair & overhaul of RCN Westinghouse J-34's.

• **Sperry Gyroscope Co. of Canada:** Sperry, whose main plant is in Montreal, has contracted its aviation workforce during the past year to the present figure of 100 men. The amount of plant space devoted to the production of aviation equipment has shrunk from 75,000 sq. ft. of a year ago, to a present 35,000 sq. ft. The firm's aviation business is divided 75% manufacturing, 10% for research and development, and 15% in sales representation.

Over 1300 DHC-2 Beavers have been built, mainly for the export market.

Until recently, Sperry was manufacturing a series of aircraft instruments for military use. However, with the completion or termination of several of these military aircraft programs, this is not an important factor in Sperry's production load. The two main aviation products presently in manufacture at the Montreal plant are the APN-502 Radar, and the Canadian-designed LDG-1 Low Drift Gyro compasses.

• **Standard Aero Engine:** Standard which occupies three hangars at Winnipeg's Stevenson Airport, has a total of 63,000 sq. ft. of work space devoted to aviation activities in which some 350 personnel are engaged.

Standard Aero Engine is engaged in the overhaul of aircraft engines, including Gypsy, Continental, Lycoming, Franklin, Jacobs, and Pratt & Whitney. Standard is also concerned with the overhaul and testing of jet engine fuel metering components. During the past year, this test equipment was increased to allow the company to fully process all fuel metering components in the Orenda and Nene engine systems.

Other units being overhauled include more than 300 different types of aircraft accessories as well as trailer-type energizers used by the RCAF for starting jet engines. Standard Aero also has complete facilities for overhauling aircraft wheel and brake systems.

A comprehensive stock of engine and accessory parts is maintained at Winnipeg and branch offices at Vancouver and Edmonton.

Supporting Firms

• **Aeroquip (Canada) Ltd.:** Located in suburban Toronto, this company has some 50 employees engaged in the development and manufacture of flexible hoselines with detachable reusable fittings and self-sealing couplings for the aircraft industry; 20,000 sq. ft. of work space is allotted to the program.

• **Aircraft Appliances & Equipment Ltd.:** This small but expanding Toronto company has increased its work force by 20% during the past year, now employs 60. The firm has a work area of 17,000 sq. ft. Chief source of revenue lies in the repair, overhaul and sales of aircraft electrical and electronic equipment and accessories; oil, gas and air filters.

• **Aircraft Overhaul & Repairs**

Ltd.: Located at Lac a la Tortue Airport, Grand Mere, P.Q., this long-established firm specializes in repair and overhaul work. With a staff of 14, and approximately 8000 sq. ft. of work area, the company is entirely dependent on civil aircraft work. Engine overhauls are done on aero engines up to 600 hp; airframes are overhauled, change-overs and conversions made.

• **Aviation Electric Pacific Ltd.:** A wholly-owned subsidiary of Aviation Electric Ltd., this Vancouver Airport firm is engaged in the sales and overhaul of aircraft instruments and accessories. The company employs some 47 men in a plant having 8000 sq. ft. of work area. Business is divided 60% civil and 40% military.

• **Avionics Ltd.:** Situated at Niagara-on-the-Lake, Ont., Avionics Ltd. designs and manufactures electronic, mechanical and communication equipment for aircraft and industrial use. The firm is currently active in the design and production of specialized printed circuits.

• **Bach Simpson Ltd.:** Located in London, Ont., this Canadian company is primarily concerned with the manufacture of instruments for the electronics industry, Bach Simpson also produces aircraft instruments of the volt meter, ammeter and volt-ammeter variety.

• **Bancroft Industries Ltd.:** This well-known Montreal firm is primarily a distributor of aircraft standard parts and instruments. The company employs about 75 people and devotes some 70,000 sq. ft. of total plant area to aviation activities. A small proportion of the company's overall business is accounted for in the repair and overhaul of aircraft instruments. Military/civil business ratio is about 75/25.

• **B.C. Propeller Co. Ltd.:** This West Coast company specializes in the repair and overhaul of propellers. The firm sells and services all types of propellers and accessory parts.

• **Canadian Flight Equipment Cobourg Ltd.:** Located in Cobourg, Ont., this firm is engaged in the manufacture, repair and overhaul of cartridge actuated devices of various kinds, and are planning to produce rocket catapults. The firm has 35 persons on the payroll, operates in a plant having 15,000 sq. ft. of working space. Research and development work is going on in the ultra-fast opening parachute field.

• **Canadian Pacific Air Lines (Repairs) Ltd.:** A subsidiary of CPA, this firm operates as a repair depot facility for the RCAF at Lincoln Park, on the outskirts of Calgary. Functions include repairs and aircraft storage, as well as salvage operations.

• **Canadian SKF Co. Ltd.:** Known for the manufacture of ball and roller bearings, Canadian SKF also produces pillow blocks and precision bearings for the aircraft industry. The firm is located in the suburbs of Toronto, employs approximately 650.

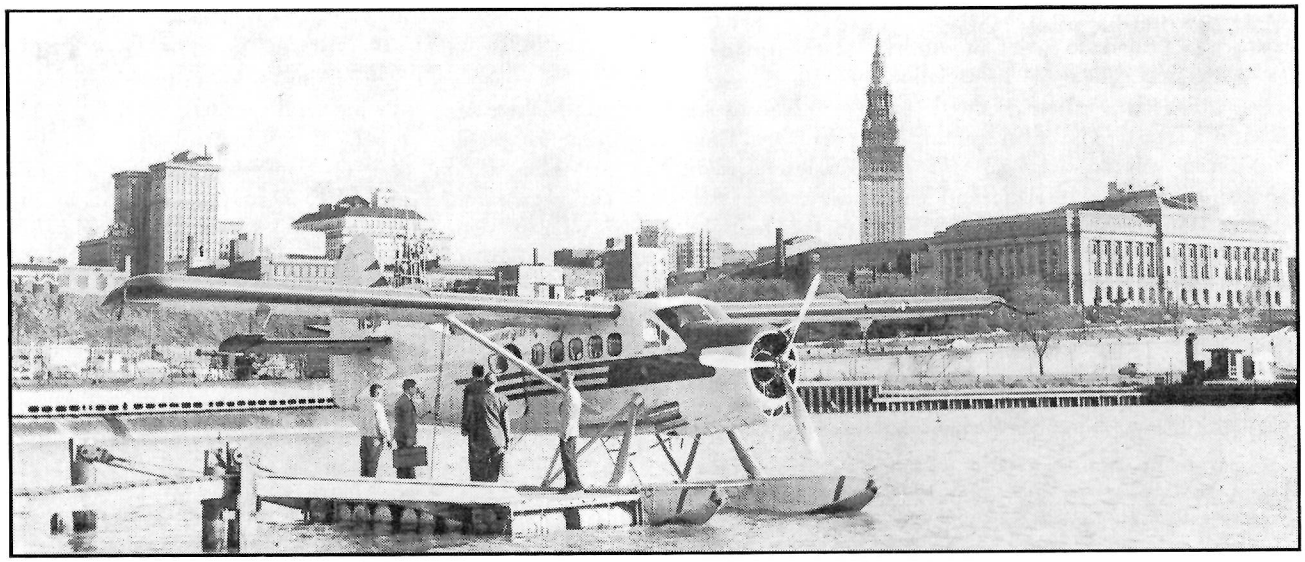
• **Canadian Westinghouse Co. Ltd.:** Canadian Westinghouse specializes in complete aircraft power generation, regulation and protective systems for AC and DC requirements. Some items produced by this versatile firm are: AC and DC electrical aircraft motors, rectifier units, electrical instruments; temperature control relays, airport and approach lighting systems; radar equipment, etc.

• **Carriere & MacFeeters Ltd.:** This fast-growing company is situated in Scarborough, Ont. It has grown in one year from 24,000 sq. ft. of work space to 35,000 sq. ft., and from 140 employees to 162. Some 30% of the company's activity is in the manufacturing of electro-mechanical components; also currently engaged on development of hermetically sealed sub-miniature relays and high temperature solenoids. Half of the firm's business lies in the repair and overhaul of electrical, hydraulic and instrument components.

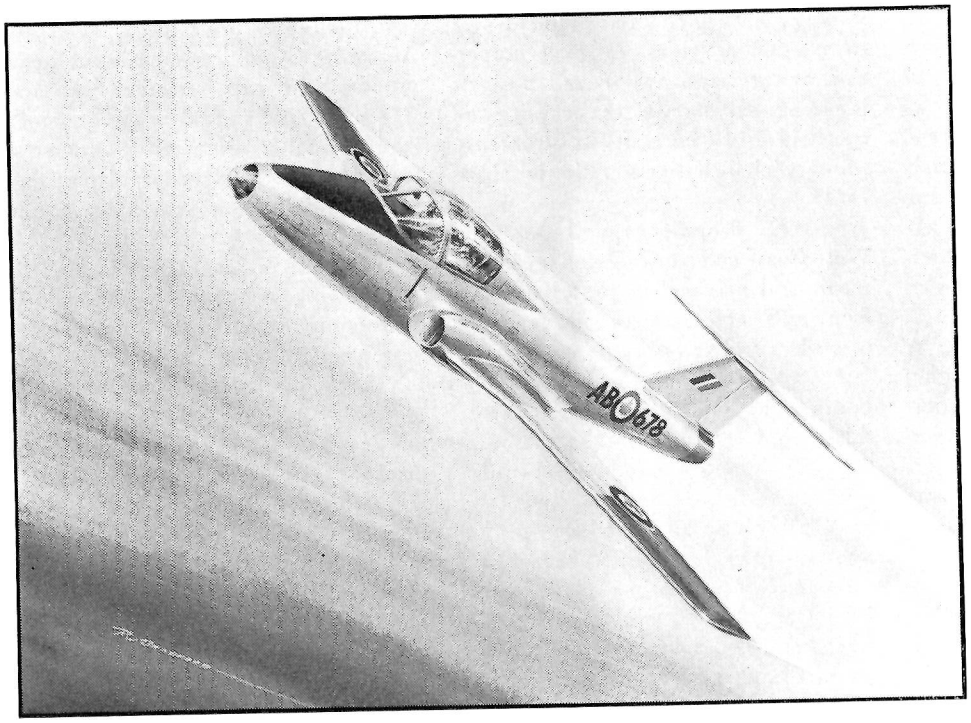
• **Curtiss-Reid Mfg. Co. Ltd.:** Located at Cartierville Airport, Montreal, Curtiss-Reid employs 15 men in a plant having 11,000 sq. ft. of work area. The greater portion of the company's business lies in the repair and overhaul of light aircraft.

• **Dunlop Canada Ltd.:** The Toronto company is known in the aircraft industry for the sales and service of Dunlop tires. Other items of manufacture used by the aircraft industry include the Maxaret anti-skid device.

• **Edo (Canada) Ltd.:** This two-year old firm continues to operate from its 20,000 sq. ft. plant at Cornwall, Ont. Though the parent firm in the U.S. started out as a manufacturer of aircraft floats, it has now broadened



Production of de Havilland Canada's Otter for military and civil customers is now approaching the 300 mark.



First flight of Canadair CL-41 Trainer awaits delivery of JT-12 turbojet from Pratt & Whitney.

its scope of activities to include airborne Loran equipment, and the development of sonar equipment.

• **EMI-Cossor Electronics Ltd.:** Located in Halifax, this firm employs some 300 persons and is actively engaged in the production and development of advanced electronic equipment. Projects presently under way include airborne radar defence equipment; aircraft intercom equipment; advanced radar and computer display systems; transducers and the installation, repair and overhaul of antennae systems.

• **Enheat Aircraft:** A subsidiary of Enamel & Heating Products Ltd., Enheat Aircraft is located at Amherst, N.S. The company has 128,800 sq. ft. of space allocated to aviation work; 225 employees engaged in aviation work which is entirely centred on military aircraft. The firm manufactures on a sub-contract basis for de Havilland, the rear fuselage and empennage components for the CS2F-1 Tracker. Repair and overhaul work is carried out on components of RCAF and RCN aircraft. The company also manufactures engine deflectors for Canadian Pratt & Whitney.

• **Ferranti-Packard Electric Ltd.:** This Toronto firm devotes 25,000 sq. ft. of its plant area to aviation activities. A work force of 50 are engaged in Ferranti's aviation interests which is primarily repair and overhaul (60%), and secondly manufacturing (30%). The company manufactures such components for military aircraft as artificial horizons, vertical gyros, rate gyros, airborne computers, etc.

• **Flight Refuelling (Canada) Ltd.:** A subsidiary of the British firm Flight Refuelling Ltd., the Canadian firm is engaged in the design, development, testing and manufacturing of fuel system equipment for aircraft. Flight Refuelling was responsible for the CF-105 fuel system.

• **Found Brothers Aviation Ltd.:** Among the diversified bits and pieces manufactured by Found Bros. for the aircraft industry are aircraft temperature instruments; ground handling equipment; magnetic clutches and dynamometers. The company has a plant area of 3780 sq. ft. and a staff of 10.

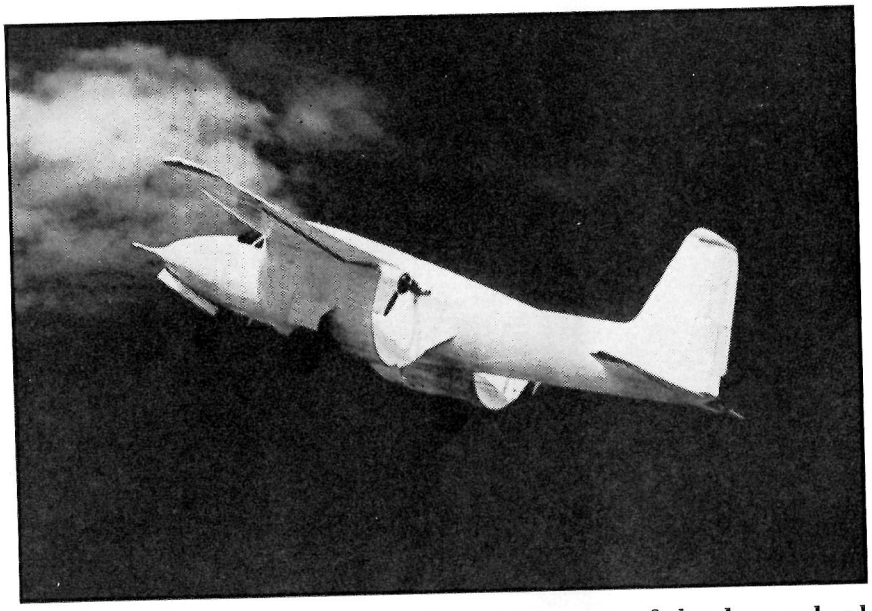
• **Garratt Aircraft Ltd.:** Malton Airport, Ont. Employing some 70 people, Garratt Aircraft has 20,000 sq. ft. of work space which is entirely devoted to the manufacture of aircraft structural components for military (80%) and civil (20%) aircraft. The firm has tool facilities for sheet metal fabrication, profile milling, welding, painting and machining.

• **The Garrett Mfg. Corp. of Canada Ltd.:** Garrett Canada has 9000 sq. ft. of space in Rexdale, Ont. On the Garrett payroll are some 93 employees. The company's work includes sales representation for lines made by the parent or sister-subsidiary firms in the U.S. Other activities include manufacturing, research & development, and repair & overhaul of Garrett Corp. equipment. Recent engineering projects include air conditioning, pressurization and temperature control systems for the CL-41 and the CL-44.

• **Genaire Ltd.:** With headquarters at St. Catharines, Genaire has branch plants at both Malton Airport and at Niagara - on - the - Lake. The company splits its business between military and civil operators. Activities include repair, overhaul, maintenance and engineering of airframes, components and accessories. The Toronto facility of the company is largely used for the servicing and maintenance and storage of civil aircraft.

• **Godfrey Engineering Co. Ltd.:** Specializing in aircraft cabin air conditioning and ground servicing equipment, this Montreal firm — with a staff of 55 persons working in a plant area of 1,000 sq. ft. — splits its business evenly between manufacturing and repair & overhaul. Godfrey Engineering also designs and manufactures a wide range of hydraulic test equipment cabin pressure testing equipment, etc.

• **Goodyear Tire & Rubber Co. of Canada Ltd.:** The large and well-known Goodyear firm is active in the manufacture, sales and service of aircraft tires, tubes, and brakes. Goodyear Canada also provides a sales and service outlet for the parent firm's products such as anti-skid systems.



Canadian production of 100 Custer Channel Wing aircraft has been ordered.

• **Husky Aircraft Ltd.:** Located at the Vancouver International Airport, Husky Aircraft has been working on the development of the Alvis Leonides 503/8 powered conversion of the Fairchild F-11 Husky. Airframe repair & overhaul is a chief source of revenue.

• **Irvin Air Chute Ltd.:** This Fort Erie, Ont., firm employs some 50 men in a plant having a work area of 20,000 sq. ft. A full 95% of Irvin's manufacturing activity is wrapped up with the military. Irvin produces and repairs all types of parachutes, as well as anti "G" suits, pressure breathing waistcoats and ventilation suits. The company fabricates and repairs aircraft safety harnesses, emergency seat packs and banner tow targets.

• **Walter Kidde & Co. of Canada Ltd.:** Kidde of Canada has its main plant in Montreal with a branch office in Toronto. The Montreal plant has a working area of 20,000 sq. ft. and employs 10 men. A full 80% of the firm's business is with the military. The company provides complete lightweight pneumatic systems for aircraft and missiles; fibreglass containers for emergency high pressure air supply to Canadair, de Havilland and Avro. A major activity involves the well-known Kidde fire detection and extinguishing devices for aircraft.

• **Laurentian Air Services Ltd.:** An Ottawa company, Laurentian has 19,000 sq. ft. of space devoted largely to civil airframe and engine repair and overhaul services, as well as operating a non-scheduled charter service. Employees number 34.

• **Leavens Brothers Ltd.:** The long-established firm of Leavens in Toronto, devotes 40,300 sq. ft. of plant space to aviation interests. Repair and overhaul work accounts for 50% of the total effort, while manufacturing comprises another 25%. A well-equipped machine and welding shop fabricates aircraft parts under subcontract. Shop facilities permit engine overhauls on aircraft engines up to and including the Wasp Jr. Sales of aircraft engines, propellers, skis and related parts and supplies are carried on throughout Canada.

• **Leggat Aircraft Ltd.:** Located at Buttonville Airport, near Toronto, Leggat is Champion Aircraft sales representatives for Ontario. The firm engages in the repair and overhaul of aircraft engines and airframes.

• **Martin-Baker Aircraft Co. Ltd.:** Wholly-owned subsidiary of the British ejection seat manufacturer of the same name, the Canadian company has its headquarters at Collingwood, Ont. Employing some 75 men, the firm has over 10,000 sq. ft. of plant space devoted to the repair, overhaul, and modification of the Martin-Baker ejection seats used in RCAF CF-100's.

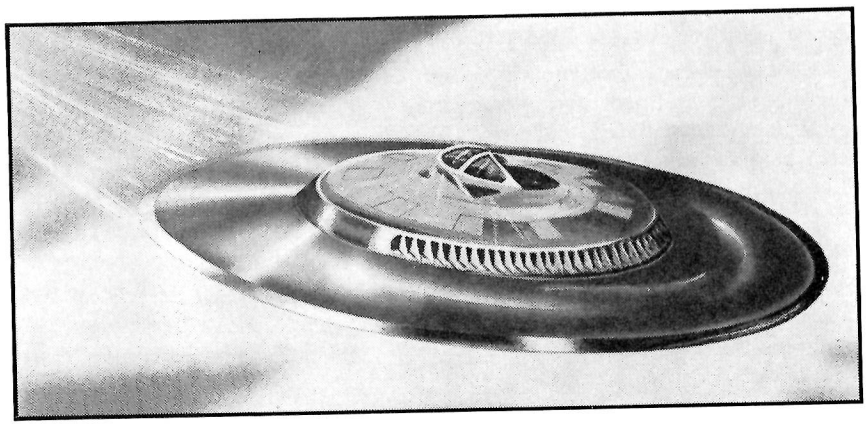
• **Noorduyn Norseman Aircraft Ltd.:** Noorduyn has 40,000 sq. ft. of plant space at Montreal's Cartierville Airport devoted to a mixture of manufacturing (60%) and repair and overhaul (30%). Employing 30 persons, the company deals mainly with civilian operators (80%). At the present time, the firm is overhauling Norseman aircraft and with the new company's new facilities has undertaken conversions of DC-3 and PBY aircraft for private owners. The firm was named last fall as prime sub-contractor for the Custer Channel Wing aircraft.

• **Normalair (Canada) Ltd.:** This Toronto firm, with nine employees and a work area of 2000 sq. ft., is primarily concerned with the manufacture of cabin pressurization and associated relief equipment. A remaining 35% of its business lies in repair and overhaul.

Normalair handles the sales of personal lightweight breathing equipment, and offers sales, service and engineering liason with operators in Canada.

• **Pioneer Parachute Co. of Canada Ltd.:** This well-known Canadian firm is located at Smiths Falls, Ont. Pioneer manufactures all types of parachutes —personnel, cargo, deceleration. Other items include webbing, wing covers, and tents.

• **Prenco Progress & Engineering Corp. Ltd.:** This Toronto firm is basically concerned with selling lines of aviation equipment made elsewhere. Prenco uses 10,000 sq. ft. of its Toronto plant for aviation lines, employing 20 people on this activity. About



Only firm development program still under way at Avro Aircraft is "Project Y".

30% of the operation is in sub-contract manufacturing of ground equipment, gauges, and valves.

• **Radio Communications Equipment & Engineering Ltd.:** This Lachine, P.Q., firm employs some 75 persons, and is engaged in the manufacture of radar target simulators for the DoT's surveillance radar equipment. The company also manufactures high power LF radio beacons of its own design.

• **Sanderson Acfield Aircraft Ltd.:** This Toronto-Malton aircraft firm recently opened a new hangar and flying executive terminal. Cessna dealers for Ontario, Sanderson-Acfield is also active in the repair and overhaul field. The company is equipped to do airframe repairs on all models of Cessna aircraft.

• **Saskatchewan Government Airways:** SGA is mainly an air service operator, but also has an overhaul and inspections plant located at Prince Albert; has 22,400 sq. ft. of work area. Some outside commercial work is done here on civil aircraft up to 20,000 lbs. gross.

• **Servomechanisms (Canada) Ltd.:** Located at Toronto, Servomechanisms has 50 on the payroll and a plant area of 18,000 sq. ft. The company is chiefly engaged in the manufacture of airborne computing equipment and components, primarily as spare parts for earlier original installations. Repair and overhaul is entirely on the company's own products under contract with DDP and individual orders from world-wide customers.

• **S. Smith & Sons (Canada) Ltd.:** The Aviation Division of the Canadian subsidiary of the well-known British firm of the same name, has about 5000 sq. ft. engaged in sales, service and overhaul of instruments and various types of equipment. Still relatively small, 15 men are currently employed in this Division. Some 85% of the company's aviation business in Canada is civil.

• **Spartan Air Services Ltd.:** Spartan's Uplands Airport plant facilities provide 42,000 sq. ft. of working space. Work done here includes the rebuilding and overhaul of Bell helicopters for commercial and military operators, and the manufacture of certain helicopter components. Spartan's fixed-wing division handles overhaul and modification for the Spartan fleet and commercial operators.

• **Standard Telephones & Cables Mfg. Co. (Canada) Ltd.:** This Montreal firm plays a significant role in the field of ground to air radio communications; production includes radio beacons for the RCAF and DoT. An important item both for the RCAF and for export to other countries, is Standard's VHF/ADT radio equipment.

• **Superior Airways Ltd.:** This Fort William firm has some 25 employees and a total plant area of 14,000 sq. ft. Repair and overhaul activities for the civil market comprise about 30% of total work. Superior manufacture Pee-Kay aircraft floats and as a Cessna dealer, offers complete repair, overhaul and rebuilding facilities for Cessna aircraft.

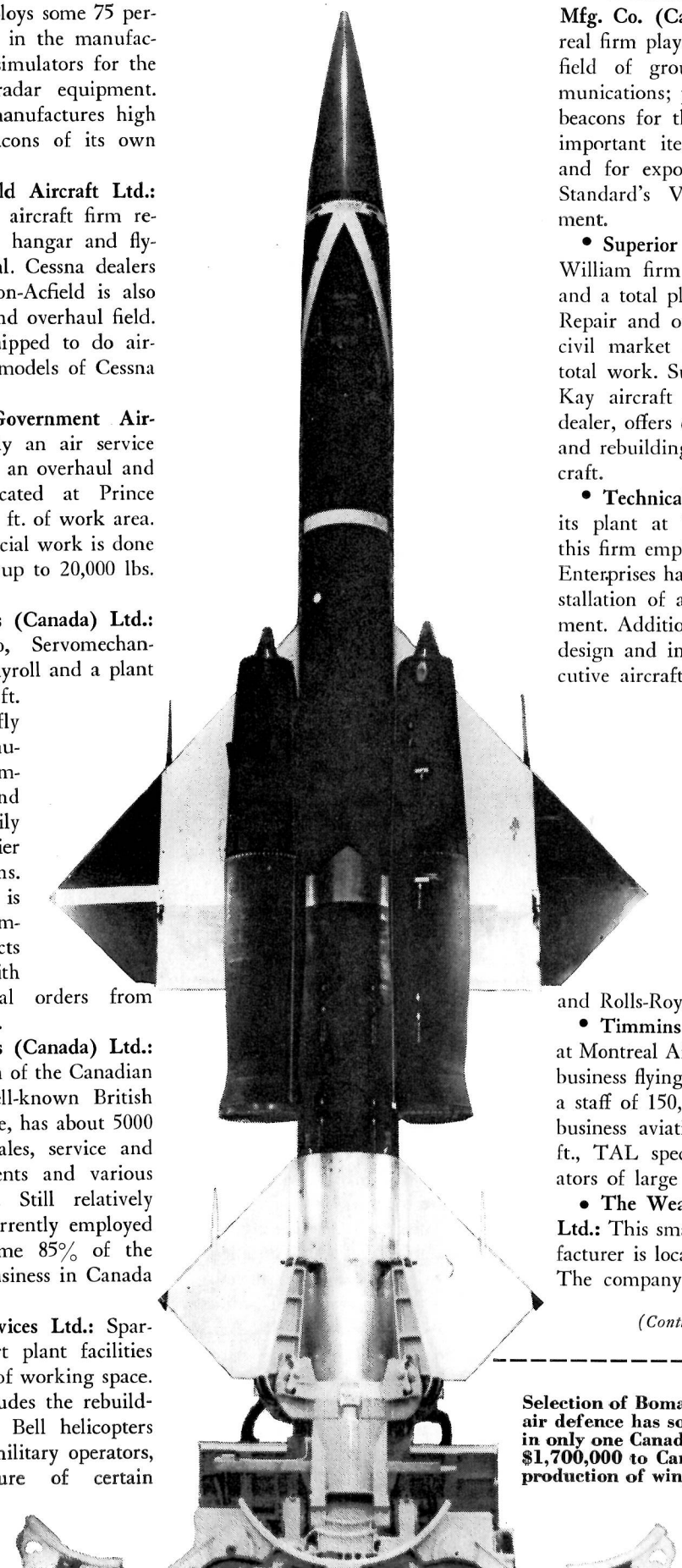
• **Technical Enterprises Ltd.:** With its plant at Toronto-Malton Airport, this firm employs 20 people. Technical Enterprises handle sales, service and installation of airborne electronic equipment. Additionally, the firm offers the design and installation of custom executive aircraft communication, navigation and radar systems.

• **Thompson Products Ltd.:** This St. Catharines, Ont., firm produces aluminum and titanium forgings, and alloy steel blades for gas turbine engines. The bulk of its business is with American firms, but some work is done for Canadian P & W, and Rolls-Royce of Canada.

• **Timmins Aviation Ltd.:** Located at Montreal Airport, TAL is the largest business flying caterer in Canada. With a staff of 150, and a work area in the business aviation centre of 68,000 sq. ft., TAL specializes in serving operators of large executive aircraft.

• **The Weatherhead Co. of Canada Ltd.:** This small but progressive manufacturer is located in St. Thomas, Ont. The company devotes about 7500 sq.

(Continued on page 74)



Selection of Bomarc for Canadian air defence has so far resulted in only one Canadian contract: $1,700,000 to Canadair for production of wings and ailerons.

deck I but incorporating small refinements, was completed on September 11, 1909, and made its first flight at Baddeck on September 20. This was the last successful aircraft to be produced by the Canadian Aerodrome Co.* and shortly thereafter Canada's first aircraft manufacturing concern expired quietly.

*Three other aircraft of various types were built at Baddeck in the period 1910-12. These were the "Onionos", an attempt to combine Bell's tetrahedral cells with the successful lifting surface aerodrome; the "Mike", a Bleriot type monoplane; and the Cygnet III, a smaller version of the Cygnet II. The Onionos flew on March 10, 1910, the Cygnet on March 9, 1912. None of these machines was considered a success.

BROKEN ARROW

(Continued from page 40)

scribed the Bomarc as "the second line of defence."

On Jan. 27, Gen. Thomas White, Chief of Staff, U.S. Air Force, told the U.S. Senate armed services committee that there is a "clear and pressing military requirement" for the F-108 long-range interceptor. The F-108 would be able to police the DEW line and "begin destruction of attacking aircraft long before they reach our borders or the population centres of Canada."

In the Canadian Commons, Mr. Diefenbaker had the last word: "There is no purpose in manufacturing horse collars when horses no longer exist."

Examining the Ruins: Now, what has been the upshot of the Arrow decision?

- Simply, Canada has turned over its air defence role and possibly all its air defence to the United States.
- The RCAF will not get a new interceptor for the defence of Canada. To all intents and purposes, it is through as a combat force.
- Canada will have two Bomarc bases which are primarily intended for the defence of the U.S.
- The U.S. will pay two-thirds of the cost of the Bomarcs, SAGE and the seven new radar stations.
- Five of these radar stations will be built on the Canadian prairies to control operations of American interceptors based in Canada.

In short, the RCAF's role in air defence will be directing from the ground American interceptors and American Bomarcs to their targets.

In exchange for all this, Canadian companies *may* get the crumbs which fall from the American industrial table.

All this might have been accepted if the government had had some plan to put in the place of the Arrow. But it had none. It underestimated the Canadian taxpayer and rolled over and played dead. Feb. 20 was indeed a Black Friday.

THE COMPANIES

(Continued from page 37)

ft. of the total plant area, to the production of aviation components. Weatherhead is concerned with the design, development and manufacture of rigid and flexible fluid connections.

- **Western Airmotive Ltd.:** Located at Vancouver International Airport, Western Airmotive employs 23, has a plant area of 20,000 sq. ft. Concerning itself solely with commercial and private aviation, the company offers general maintenance and overhaul facilities; repair and rebuild facilities for Bell airframes; instrument overhaul; radio repair and sales.
- **Vertol Aircraft Co. (Canada) Ltd.:** This Arnprior, Ont., company handles the repair, overhaul and modification of Vertol aircraft in Canada. The Canadian firm also manufactures certain spare parts for Canadian-operated Vertol helicopters.
- **Parmatic Engineering Ltd.:** This Owen Sound, Ont., firm has a staff of 50 and a plant area of 800 sq. ft., Parmatic manufactures pressure switches, differential and vacuum gauges, temperature sensing devices and all types of filters.
- **Simmonds Aerocessories of Canada Ltd:** This Hamilton, Ont., firm acts as manufacturing representatives for Simmonds-designed lightweight Pacitron gauging equipment; cowling latches; Hi-Shear rivets, tools and anchor bushings.
- **Western Propeller Co. Ltd.:** Employing some 25 men at Edmonton Municipal Airport, Western Propeller is primarily active in the field of propeller and governor overhaul and repair. Much work is done in general aircraft and engine repair and overhaul

by an associate firm, National Servicair.

•**English Plastics Ltd.:** English Plastics Brampton, Ont., has a plant area of 10,000 sq. ft., employs a work force of 15. Company is concerned with the fabrication of clear acrylic aircraft canopies, windows and windscreens.

•**Bata Engineering:** Located at Batawa, Ont., this organization devotes 35,000 sq. ft. of plant space to aviation matters. Bata produces aircraft hydraulic equipment, undercarriage components, airframe components.

• **Brunswick of Canada:** This Toronto firm devotes about one-fifth of its production to aviation products. The company fabricates low pressure reinforced plastic components such as radomes and antennae housings.

• **Consolidated Diesel Electric Corp. of Canada Ltd.:** Engaged in the design and manufacture of ground starting and servicing equipment for jet aircraft Con-Diesel of Canada also produces hydraulic, pneumatic, and electrical test equipment, as well as gasoline and diesel generator sets for precision power and industrial applications.

• **Cannon Electric Canada Ltd.:** This small Toronto firm manufactures several different electrical connectors for use in aircraft applications including engine, communications, radar, cockpit lighting and retractable landing gear.

• **Liquidometer of Canada Ltd.:** This Montreal firm is a wholly-owned subsidiary of the American firm Liquidometer Corp. The company manufactures aircraft liquid level gauges, position indicators, transmitters and other instrumentation.

• **Rotaire Ltd.:** Recently moved to Niagara-on-the-Lake, Rotaire is an affiliate of Genaire Ltd., St. Catharines. Rotaire offers a complete range of helicopter services, including maintenance, repair, overhaul and engineering.

SUNBEAM ARAB

(Continued from page 48)

drilling the right one beside it, which weakened the part and added to our pile of rejects, which by then was about as high as the first floor of the plant."

By August of 1918, according to Prof. Melson, improvements had been made to the engine to the point where it would run for 150 hours on a test bench. All work on the project was discontinued abruptly on November 11, 1918. "We got a telegram from Air Board in London to stop work immediately and destroy all engines on hand, even the tools and fixtures we were using to produce it. All in all, we shipped just over 150 engines before it all ended", states Prof. Melson.

Ending with the Armistice, aircraft engine production in Canada was not resumed until over 30 years later when Canadian Pratt & Whitney and Orenda Engines entered the field.

VOR-DMET

(Continued from page 57)

to substantiate their claims. They made their point.

Claim: The British opposed the adoption of DMET as an ICAO standard because they claimed:

"No objective assessment has been made of the capability of DMET to satisfy the operational requirements,