

INDUSTRY INVENTORY

Presented Herewith...a Cross Section of the Canadian Industry

Avro Aircraft

SOME TIME in the middle of 1957, the first of the development batch of CF-105 supersonic fighters will be rolled out of the Malton, Ont., plant of Avro Aircraft Ltd. Tension is mounting as the movement through the plant of more and more parts, and the completion of more and more tools and jigs, make it quite evident that the big day is rapidly drawing near. The converging lines of effort and planning, once so far apart that the target date for the first rollout seemed to be on the distant side of infinity, are now perceptibly closing in.

The CF-105, which is occupying an increasingly large proportion of Avro Aircraft's overall effort, is to be the fighter to end all fighters . . . an expression that is quite literally true, since Dr. O. M. Solandt, recently retired chairman of the Defence Research Board, has expressed the opinion that the CF-105 will probably be the last manned interceptor that Canada will ever develop.

In general, the new twin-engine fighter is a big all-weather interceptor

grossing between 50 and 60 thousand pounds, with a design speed in the Mach 2.0 region. It has a thin delta wing which is probably of considerable size, as the aircraft is to be capable of fighting at altitudes in the neighborhood of 60,000 feet and up, indicating that the wing loading must be kept low. Quoted range figures are from 1,500 miles to as high as 3,000, which means that the maximum duration will probably not exceed two hours.

The first half dozen or so machines in the development batch (there are no prototypes in the old sense) are to be powered by Pratt & Whitney J-75's, rated at approximately 15,000 lbs./st./th. However, following versions are to have the Orenda PS-13, providing that anticipated progress is made with the big new engine being developed by Orenda Engines Ltd., Avro Aircraft's associate company.

Meanwhile, though emphasis is shifting to the CF-105, production and further development of the now-familiar CF-100/4 are continuing. Last year the production rate of the CF-100 was reduced by 60% to about ten per

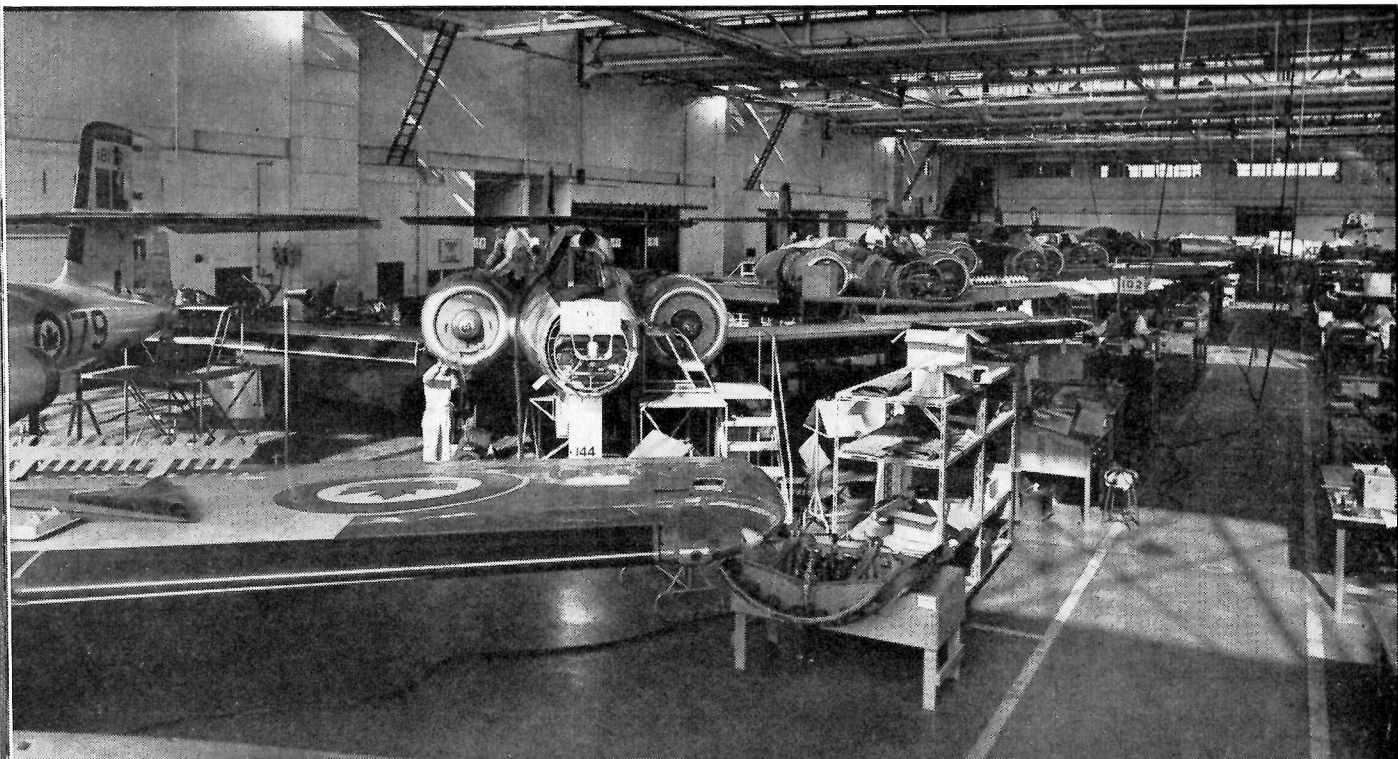
month. The total number of aircraft on order was not affected by this slow-down, which was primarily aimed at keeping the plant busy until the swing to the CF-105 was more advanced. Recently, a new version of the CF-100, the Mark 5, has been made public. The Mk. 5 has been developed to enable the aircraft to fight effectively at altitudes upwards of 50,000 feet.

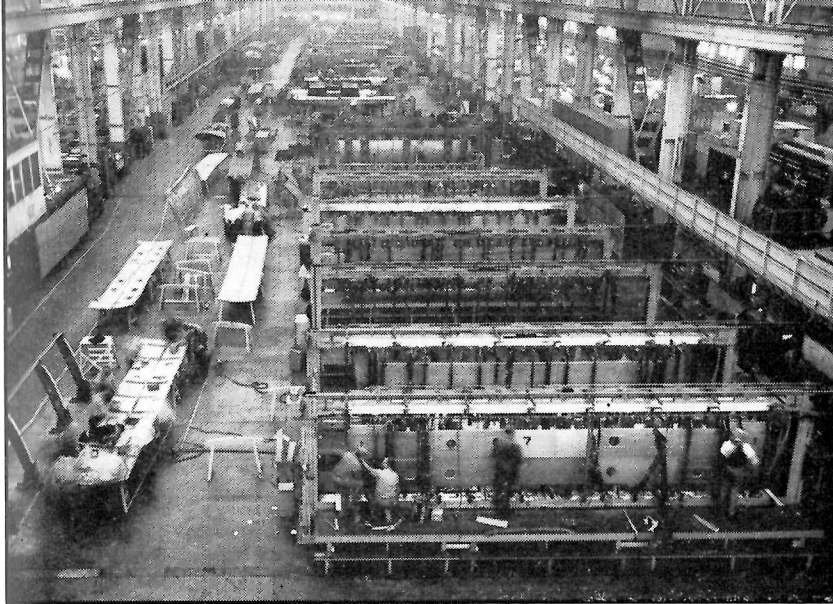
Other projects at Avro Aircraft include a supersonic trans-Atlantic jet airliner and a 450 mph twin-jet executive aircraft, activity on both of these so far being confined to the thinking department.

Of considerable interest is the continuing research & development that is being carried on in connection with Designer John Frost's VTO "flying saucer". Originally backed by the Canadian Government, which decided to withdraw its support after nearly \$400,000 was spent, this unique flying machine is now sponsored by the USAF (further comments on this development appear on page 61).

Plant expansion at Avro Aircraft during the past year has added approximately 140,000 sq. ft. of floor space,

At Bristol Aircraft (Western) CF-100/3's are being converted into pilot trainers on a production line basis.





most of it in connection with the CF-105 program. New equipment that has been purchased and installed recently includes a 15,000-ton hydraulic rubber pad forming press, which is said to be the biggest of its kind in North America. Adjacent to the new press is a new automatic air circulating furnace, to be used mainly for the treatment of aluminum alloys, though its high temperature range of 1,450° makes it suitable for the heat treating of titanium.

Total staff at Avro Aircraft is now about 8,000.

Canadair

THOUGH PRODUCTION of Sabres and Silver Stars continues as a source of bread and butter for Canadair Limited, both of these aircraft are now coming off the assembly lines at a very low rate. With a large proportion of the Sabre 6's required to re-equip the RCAF's No. 1 Air Division completed, there appears little likelihood that anything but token production can be continued much longer. A similar situation prevails with regard to the Silver Stars, practically all of the original order for 576 now having been completed (though the Government later granted an additional order for an unspecified number).

Of course, there remains a strong possibility that the export market may develop a strong appetite. South Africa has ordered 34 Sabres and associated spares, which are to be delivered this year. Sales negotiations have been carried on with several South American countries and some of these contacts may yet bear fruit.

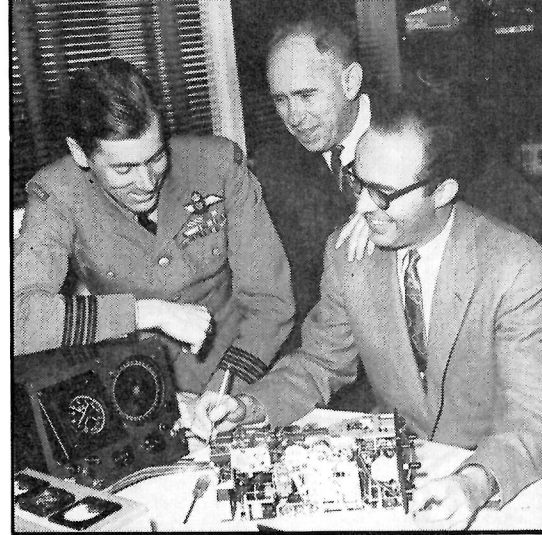
A strong sales pitch is also being made to the embryo West German Air

Force, and certainly this service has shown considerable interest in Canadian-built aircraft. Talks have been held on an intergovernment level and German officials have visited Canadian aircraft plants. If a slice of this business comes to Canada, a very large share of it would appear on Canadair's plate. Sales to this prospective customer of both Sabres and Silver Stars are a distinct possibility and naturally would give the two production programs a very healthy boost.

There has been no recent news relating to a Sabre replacement, a much discussed subject during 1954, when such airplanes as the F-100, F-102, F-104 were being variously mooted as just the ticket to take over from the F-86. However, the success of the Sabre 5 and to an even greater degree, the Sabre 6, took some of the appeal away from the "Centuries". Certainly the mating of the Orenda to the Sabre produced a combination which made it advantageous for the RCAF to wait and see what develops.

But as the Silver Star and the Sabre production lines are diminishing to trickles, the tempo of activity on the biggest airplane ever manufactured in Canada, the CL-28 Maritime Reconnaissance Britannia, is rapidly building up. The plant is full of CL-28 jigs and tools with various parts and components of the aircraft in widespread evidence. In less than a year the first development batch of 13 airplanes will be well into its flight test program. In all, it is understood that 50 CL-28's will be built.

Canadair is also doing some design engineering work on a side-by-side jet trainer, in anticipation of the day when the RCAF decides that it must switch



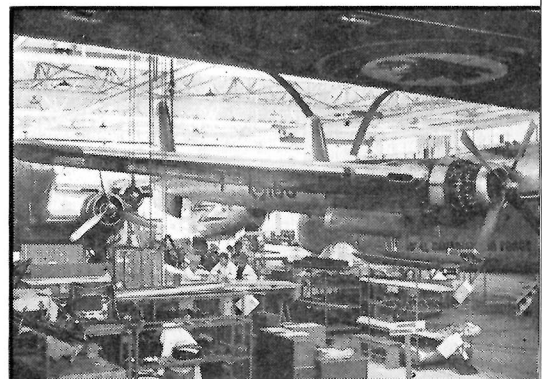
Left, CS2F wing production at Can-Car; above, L to R, Inventor Wright, Project Engineers, Haehnel and McKelvie discuss R-Theta Computer.



Above photo shows Enheat Aircraft plant at Amherst, N.S., where empennage components for CS2F are being produced under subcontract.

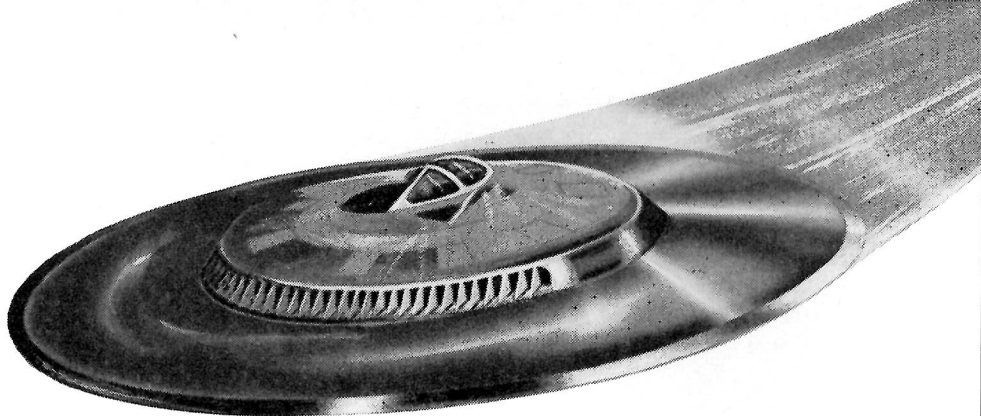


Above, Nene flame tube inspection at Rolls-Royce of Canada. Below, C-119 repair line in the Northwest Industries' plant at Edmonton, Alta.



PROJECT "Y"

Avro Aircraft's Frost Takes a Flyer into the Future



Now under the sponsorship of the USAF, work continues at Malton on Project "Y", the brainchild of John C. M. Frost, Chief Design Engineer (Special Projects Group) for Avro Aircraft Limited.

The fact of Project Y's existence first leaked out early in 1953, at the height of the "flying saucer" craze, an unfortunate coincidence that resulted in the aircraft being immediately labelled a "flying saucer".

It was not until late in 1954 that any Canadian made any official reference to the project, and then only to admit that while it did exist, the Canadian Government had withdrawn support about a year previous after expending some \$400,000. The USAF began picking up the tab some time shortly thereafter.

The accompanying drawing was released a few months ago by the USAF with the comment that it could illustrate a disc-shaped vertical-rising

aircraft such as was being developed under contract to the USAF by Avro Aircraft.

Project Y is, according to most accounts, oval shaped, measuring about 40 ft. in its greatest dimension. Its powerplant is a large vertically-shafted gas turbine, the jet efflux of which is distributed to the perimeter of the aircraft by a spoke-like arrangement of ducts (180, according to some reports). The ducts, or in any event, the duct nozzles, are rectangular in shape and the bottom side of each is fitted with a hinged flap. This flap is controlled by the pilot and can be moved from a position in line with the bottom of the duct, down through an arc of some 31°.

The thinking behind this design is based on the frequently mentioned "Coanda Effect", the discovery of Monsieur Henri Coanda, a Rumanian engineer, now resident in France. Very simply, M. Coanda's discovery was that a jet of gas coming from a rectangular nozzle can be deflected, not

only by a flap placed in the jet, but also by one placed below it. This discovery neatly does away with the problem of developing a material which would deflect hot jet efflux and at the same time resist the corrosive burning effects of the jet gases.

However, the deflecting action of the underflap is effective only down to 31° from a position parallel to the bottom of the duct. Thus, for take-off, the flaps would be set in this position for maximum vertical lift. For hovering, the same position would be used, but the thrust would be reduced to a level just sufficient to counteract the effects of gravity.

Horizontal flight would be effected by closing off all the ducts except those on the side opposite to the direction in which it was desired to travel, at the same time moving the flaps up to the neutral position. The so-called saucer would then become, to all intents and purposes, just another jet propelled airplane, albeit an oddly shaped one.

to all-through jet training. When this happens, some Canadian company will receive a very healthy contract.

Research & development on the Velvet Glove guided missile is still being carried on, on behalf of CARDE, though it now appears that this Canadian-design missile will never go into production. The government recently announced that it had been decided to produce the Sperry Swallow missile for the RCAF. However, Canadair is participating in this program by fabricating the missile airframes (Avro is in overall charge of the project; Canadian Westinghouse is making the guidance systems).

Spares continue to bring a very substantial income to Canadair. In 1954, parts worth over \$27,000,000 were shipped to 75 customers—commercial and military—in 50 different countries. These include parts for C-47/DC-3 types, C-54/DC-4M's, Sabres, and Silver Stars. Last year, shipments of spares were worth \$17,000,000. Total new spares business placed in 1955 was \$22,486,000 and the unfilled backlog of orders at the end of the year was \$14,753.00.

Canadair is also doing work in the atomic energy field, and building component parts for a swing reactor which will have one specific purpose: to determine the potential of irradiated nuclear fuels for other reactors.

The most recent highlight of what seems to be a more or less continuous plant expansion program was the opening of a new engineering building which houses most of Canadair's growing test development facilities.

Employment at the Cartierville firm is gradually building up again, having risen during the past year from 7,000 to about 8,500.

Canadian Car & Foundry

MAIN ACTIVITY at the Fort William plant of Canadian Car & Foundry Co.'s Aircraft Division has for the past year been the production of major airframe components under subcontract to The de Havilland Aircraft of Canada Ltd.

These components include CS2F wings and nacelles, of which there are 42 sets on order at present; and 102 sets of Otter wings and empennages. In addition, production of spares for

Harvard T-6 and T-34 Mentor aircraft keeps a considerable number of hands busy. Harvard spares especially are in good demand, since CanCar holds world rights for the type. It seems superfluous to comment on recent production of complete Harvards by this firm, but for the record, CanCar has in the last few months completed the assembly, from parts on hand, of fifteen Harvards which had been ordered in a straight commercial deal by the Egyptian Government. All have now been shipped to Egypt.

In terms of complexity and dollar-earning power, the CS2F-1 program is the most important project currently in progress. In spite of this complexity, CanCar has met all target dates. The firm received the first shipment of tooling technical assistance in August of 1954 and by November of 1955 had: (1) Established production of center and outer panels; (2) Built 9,169 tools in its own shops and obtained 3,945 from subcontractors; (3) Maintained originally planned tool and production program despite the fact that they called for an extremely tight schedule; (4) Shipped the first panels within

the originally scheduled time.

The wing components manufactured by the well-equipped Fort William facility comprise about 40% of the weight and value of the CS2F airframe and constitute the largest part of the airframe made by any contractor. They include, of course, all the necessary mechanism for wing folding.

Latest employment figures for the Lakehead plant show 1,840 employees, but it should be noted that a considerable proportion of the manufacturing activity is devoted to the production of buses.

During the year, control of all divisions of Canadian Car & Foundry Co. Ltd. passed into the hands of A. V. Roe Canada Ltd., which announced at the time the deal was completed (October, 1955) that there would be no changes in management. Consequently the firm continues to operate under the CanCar name as a member of the A. V. Roe Canada Group of companies,

which also includes Avro Aircraft Ltd., Orenda Engines Ltd., and Canadian Steel Improvement Ltd.

Canadian P & W

AS PRODUCTION of the Pratt & Whitney R-1340 Wasp is being phased out at the Jacques Cartier, Quebec, plant of Canadian Pratt & Whitney Aircraft Co. Ltd., its place is being taken by the Wright R-1820 Cyclone, some 400 of which are being manufactured for installation in the CS2F anti-submarine aircraft.

Deliveries of the R-1820 have already started with nearly 20 engines having left the plant. R-1340's which have been built now total approximately 1,000. However, though the production of complete R-1340's is coming to an end, there is no reduction in the manufacture of parts or spares, this being explained by the fact that Canadian Pratt & Whitney is now the world's only source of newly-manufactured

spares for this engine. Similarly, it manufactures parts for such other Pratt & Whitney engines at the R-985, the R-1830, and the R-2000; in the case of these engines, too, it is the only parts maker anywhere. The volume of spares output is considerable and about 75% of it is for the export market.

In connection with the CS2F program, Canadian P & W is also responsible for providing the Hamilton Standard 43D51 Hydromatic dural three-bladed propellers. The Jacques Cartier plant is making all the components except for the blades, which are being supplied by Hamilton Standard (like Canadian P & W, a subsidiary of United Aircraft Corp.). Final assembly is being carried out by Canadian P & W however.

Overhaul of aero engines, helicopters, propellers and aircraft accessories, continues to provide a substantial flow of business; this is not surprising considering that it was with such activities that the firm concerned itself exclusively, during the first quarter century of its existence.

The helicopter business has developed at a gratifying pace during the last few years, a situation that has prompted Canadian P & W to consider seriously plans to produce Sikorsky helicopters in Canada. Canadian P & W Vice President J.W.R. Drummond says on this subject that: "It is a natural development of our present operation. As an associate company of Sikorsky aircraft we have represented them in Canada since the outset in sales, service & overhaul. Our overhaul experience embraces assembly and many sub-assembly operations on helicopters. We are making engines which they use and the mechanical components of the helicopter are similar to engine components and can be made with little addition to our present machinery and equipment. Much of the original planning for this work has already been completed." There are now approximately 40 civil and military Sikorsky helicopters operating in Canada.

Capital expenditures during the past year have included more than \$1,500,000 on new equipment required for R-1820 production. The firm also purchased from the Government all the machinery and equipment supplied by the Crown for the manufacture of R-1340 Wasps.

ORENDA'S PS-13 PROGRESSES

The arrival last month of a USAF B-47, on loan to the RCAF for the next two years as a flying test bed for the flight trials of the Orenda PS-13 turbojet, is a measure of the rapidly advancing state of development of this powerful new Canadian gas turbine.

It is also an indication that the PS-13, which was originally initiated by Orenda Engines Ltd. (then the Gas Turbine Div. of A. V. Roe Canada) as a private venture, is now being officially sponsored by the Canadian Government for the RCAF.

The picture below shows the B-47 landing at Cartierville, where it will be converted to carry a seventh powerplant. The conversion process is expected to take till the end of the year and will be carried out by Canadair Ltd. under contract to Orenda Engines.

Details of the PS-13's installation in the B-47 have not been released, but it is understood that it will be hung under the rear fuselage, far enough back so that the tail surfaces

will not be subjected to any buffeting or sonic vibratory effects from the jet efflux. Consideration was given to a retractable bomb bay installation, but the engine was too big.

Published, though unconfirmed, information about this big new turbojet indicates that it has a design thrust of approximately 18,000 lbs., which can be augmented by means of reheat to 25,000 lbs. Target weight was said to be 4,000 lbs., which would give a very commendable thrust/weight ratio of better than 4.5:1. Extensive use has been made of titanium alloys.

Planning on the PS-13 began in 1953 and fabrication got underway early in 1954. The engine was first run early in 1955 and reports last spring indicated that it was then being run at about three-quarters design thrust. If reasonable progress has been made since that time, and the B-47's arrival would hint that such is the case, then it is probable that the PS-13 is now running on the test stand at design thrust.



de Havilland Canada

THE AVIATION company in Canada with the most diversified line of activities must surely be The de Havilland Aircraft of Canada Ltd. What other firm in Canada can claim to be in production simultaneously on six different models of four distinct types of airplanes, not to mention an overhaul program which embraces not only a variety of commercial and military jet and propeller aircraft, but also aero engines, of both the piston and turbo jet variety?

The aircraft production program looks something like this:

- Beaver—being turned out as the DHC-2 commercial model for civil and government operators all over the world; as the L-20 military version for the U. S. Army and the USAF.

- Otter—current production is devoted mainly to the U-1A model for the U.S. Army; as the DHC-3, it is made for commercial operators.

- CS2F-1 Sentinel—on order for the RCN, with the possibility that production may later be extended, with the additional airplanes being allocated to Mutual Aid for distribution to NATO countries.

Although de Havilland Canada's year was marred by a four-month strike, this seems to have had little effect on the firm's operations financially; at least, if there was an effect, it was not reflected in the company's annual report covering the year ending Sept. 30, 1955. According to this report, DH Canada made a net profit of \$375,281, compared with \$121,935 for the previous year. P. C. Garratt, vice president & managing director, has described the outlook for 1956 as promising. He reports a substantial backlog of military and civil orders sufficient to ensure full-scale operations throughout 1956.

The strike, which came after a long period of harmonious industrial relations at DH Canada, set production back on all items, and it is expected that it will not be until late this year that everything will be caught up.

On the design and development side, de Havilland is concerning itself with the DHC-4, a twin-engined utility transport. It is also carrying on secret research and development work in the guided missiles field.

Repair and overhaul is performed on all the types of aircraft that the firm has produced over the years, including

"'TWAS I," SAID THE SPARROW.



The Sperry Sparrow air-to-air guided missile has been adopted as a standard aerial weapon by the RCAF and is to be built in Canada by a three-company production group comprising: A. V. Roe Canada Ltd., which will administer the overall program; Canadair Ltd., which will build the airframes, and Canadian Westinghouse, which will make the electronic guidance systems.

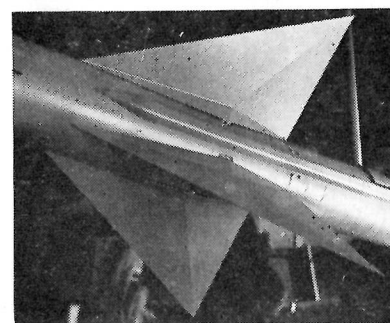
According to reports, experimental work will continue on the Velvet Glove, with the object of keeping intact the guided missile research & development team that has been built up at Canadair and at CARDE.

A number of versions of the Sparrow have been developed, but it has not been revealed which one will be built in Canada. The model shown in the accompanying photographs is the Sparrow 1, which bears the designation AAM-N-2. Other models that have been mentioned are the Sparrow 2, AAM-N-3, and the Sparrow 3, AAM-N-6. Externally, all models are understood to be similar in appearance.

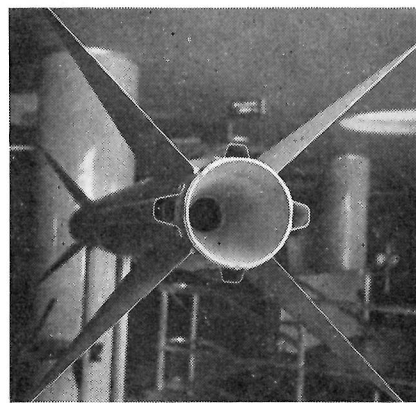
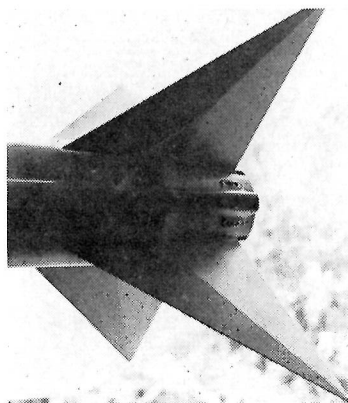
The Sparrow is approximately 8 ft. long and 6 in. in diameter. Maximum span is 2 ft. 3 in. The aerodynamic design embodies delta wings (right) and tail fins (lower L) in a cruciform arrangement. The

movable wings are swept greater than the fixed tail fins, and both surfaces utilize double-wedge airfoil sections. Driven by a solid propellant rocket up to speeds said to be as high as Mach 3.0, the 275 lb. Sparrow is guided by a beam-rider system directed from the launching aircraft. A terminal homing system takes over control during the latter phases of an attack. Maximum range is approximately five miles.

The photo at top shows four Sparrows mounted on underwing racks on a Douglas F3D Skyknight. The Sparrow was originally developed by Sperry Gyroscope Co., working with the USN's Bureau of Aeronautics.



Aviation Week Photos.



the Chipmunk, the Beaver and the Otter, as well as the DH parent firm's Vampires and Doves. North Stars also pass through the overhaul bay frequently. The engine division is responsible for the overhaul of the RCAF's Orenda (10-12 per month) and Goblin (2-4 per month) turbo jet engines, as well as de Havilland Gipsy Queen and Gipsy Major piston engines.

Personnel at de Havilland number approximately 3,300, compared to about 2,600 a little more than a year ago.

Orenda Engines

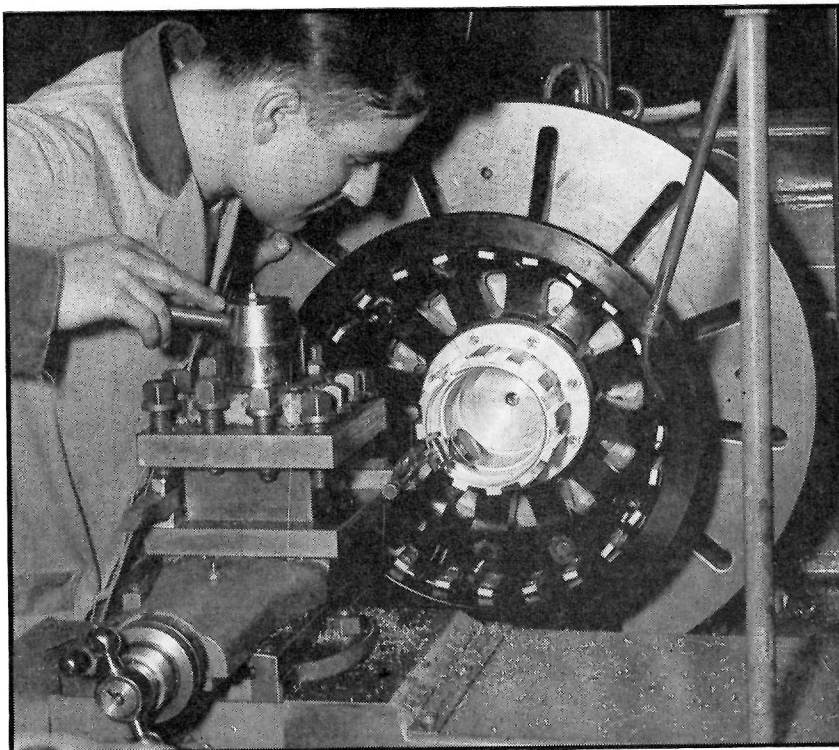
PRODUCTION of the Orenda 11 and 14 turbojet engines continues apace at the Malton, Ont., plant of Orenda Engines Limited, with total output of all Orenda models that have been produced at various times now in excess of 3,000.

And while the routine of Orenda production goes on, the firm's new engine, the PS-13, has become the focal point of interest . . . not only for Orenda employees, but also for the RCAF and a number of other foreign military services. The PS-13 has been running on the test bench for many months and results have been most encouraging; the engine shows real signs of being a "comer".

At the present, preparations are being made to install the new supersonic turbojet in a B-47B flying testbed which has been loaned to the RCAF by the USAF. There is a good possibility that flight testing may begin before the end of the year. Originally initiated as a private venture by Orenda Engines, the PS-13 (for which a name has been selected, though not yet approved) is now being sponsored by the RCAF. However, before the RCAF began to back the engine's development, Orenda spent several millions of dollars of its own funds.

There are recurring reports concerning the development of a system of afterburning for the current Orenda turbojets, with the names of such firms as Marquardt and Bristol being mentioned in this connection.

The flight test operations of Orenda Engines received a severe blow last year when a disastrous hangar fire destroyed all of the firm's flying test beds. However, flight test has since been re-equipped with two Sabre 6's and two CF-100's, and in addition will operate the B-47B which is now being converted by Canadair into a flying test bed for the PS-13. Operations have



AT DOWTY EQUIPMENT of Canada, machining operation is carried out on component of Dunlop wheel assembly which Dowty produces under license.

been moved from Malton to the RCAF's Downsview Airport.

Plant expansion during the past year has included the addition of some 60,000 sq. ft. of floor space to Plant 2 for use by the Sales & Service Dept.

Employment figures are unaltered recently, remaining steady at around 6,000.

Rolls-Royce of Canada

ROLLS-ROYCE has had representation in the aviation field in Canada since 1921, but it was not until 1947 that firm established permanent residence. At that time it organized a company known as Rolls-Royce Montreal Ltd., which was primarily an aero engine service and parts supply organization.

In 1951, when a contract for 900 Nene turbojets was placed by the Canadian Government with Rolls-Royce Ltd., Derby, England, to power the RCAF's T-33's, it was decided to construct a manufacturing and assembly plant at Montreal, and subsequently a new firm known as Rolls-Royce of Canada Ltd., was organized, while Rolls-Royce Montreal Ltd., went out of existence.

Manufacturing operations were commenced at the new plant early in 1953, and by 1954, production of components was on an established scale, while overhaul of jet engines for the RCAF

had commenced. The contract covering the production of components and engine overhaul was supplementary to the main contract for complete Nenes.

The initial program in Canada revolved around the Nene order, for which deliveries were completed in 1955. The approximate value of the contract was \$33,000,000 and one of its stipulations was that Rolls-Royce would create the facility to manufacture a number of these engines in Canada. The first Canadian-built engine successfully passed its 150 hour type test to RCAF requirements in September, 1954, and 50 engines in all were built at the Cote de Liesse plant.

More recent projects include the establishing of facilities for the overhaul of the Westinghouse J-34, which powers the McDonnell F2H-3 Banshee jet fighter, a number of these now being in service with the RCN.

The purchase of the Vickers Viscount by TCA created a requirement for the establishment of Technical Service and the provision of spare parts for the Rolls-Royce Dart. This was duly organized and plans have been revised subsequently to meet the increased demands brought about mainly by the purchase of 60 Viscounts by Capital Airlines and the expansion of the TCA Viscount fleet. A similar type of service has been maintained for

the users of Merlin engines in Canada since 1947.

During the past year, a school of instruction patterned after the school at Derby was established to deal with the instructional aspects of running and maintenance of all Rolls-Royce products used in North America, its main objective at the moment being the Dart engine. Coupled with the Dart instruction have been courses on the Nene turbojet being used by the RCAF.

Employment in all divisions totals approximately 500, most of these being engaged in aero engine work.

Aircraft Industries

ONE OF SEVERAL large firms in Canada which specializes in the repair, overhaul, modification and conversion of aircraft, Aircraft Industries of Canada Ltd. is fully equipped to carry out practically every conceivable kind of aircraft work on all types of airplanes up to a gross weight of 35,000 lbs.

Shop facilities offered by the company at its headquarters at St. Johns Municipal Airport, Que., include sheet metal fabrication, radio and electrical installations, fabric, woodwork, hydraulic overhaul, instrument work, painting, sandblasting, magnaflux, cable swaging, heat treating and cadmium plating. These shops occupy 85,000 sq. ft. of floor space and employ the skills of approximately 400 people.

Present projects include complete overhauls on Dakotas, Cansos, and

Harvards for the RCAF, as well as overhauls and conversions on various types of civil aircraft for executive and commercial operators.

Aviation Electric

AN IMPORTANT recent development at Aviation Electric Ltd. has been the acquisition of a substantial interest in the Montreal firm by Bendix Aviation Corp. Aviation Electric has long been closely associated with the Bendix organization, having for many years provided sales & service representation for a wide range of Bendix products. Some of these AEL has manufactured in Montreal under license; for others it has provided repair & overhaul facilities.

While the new affiliation with Bendix will not have any effect on AEL policy or management, it will enable the Canadian company to expand its activities in the aviation and marine fields.

During the past year, an additional 19,000 sq. ft. of plant space was created to provide increased facilities for engineering and research and space for expansion of other departments.

For some time now, Aviation Electric has been carrying out an instrument manufacturing program under contract from the DDP. Production rate has exceeded 1,000 instruments per month. Additional instruments are being manufactured, some of these being on a licensee basis, others being of original AEL design.

New equipment has been added to the overhaul shops so that it is now possible to overhaul an even wider line of aircraft instruments and accessories. In addition, the electronic overhaul shop is now in operation and is turning out radio and electronic equipment for a number of aircraft operators.

AEL's subsidiary on the West Coast has continued to add facilities and personnel in order to provide adequate overhaul service for an increasing number of customers in western Canada. Last year a branch office was opened in Calgary; a branch has been in existence at Halifax for some time. Employment at Montreal together with that at all branches totals 660.

Bristol Aero Engines

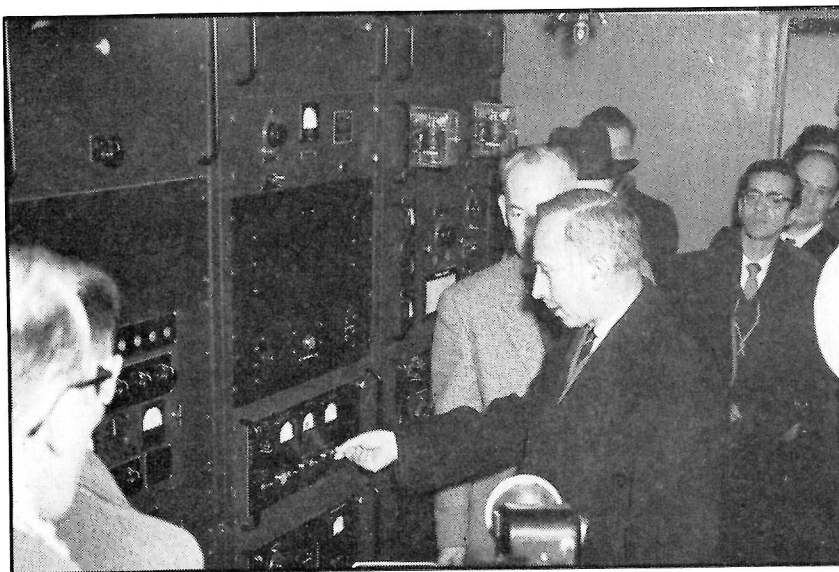
WHAT IS described as the largest and most up-to-date engine overhaul plant in Canada is operated at Montreal by Bristol Aero Engines Ltd., where complete rebuilds of a diversified line of aircraft engines employs the talents of 600 personnel.

This overhaul facility is capable of handling both engines and powerplants of up to 5,000 hp. Two hangar test cells, complete with dynamometer installation, are both able to test engines and powerplants up to this horsepower rating, which exceeds that of any aero engines in use or contemplated for use in Canada.

Through the 150,000 sq. ft. plant pass such engines as Wright R-3350 Turbo Compounds from TCA Super Constellations and RCAF Packets; Rolls-Royce Merlin engines and powerplants from RCAF North Stars and Lancasters; Packard Merlins from RCAF Mustangs; Bristol Centaurus engines from RCN Sea Furies; Bristol Hercules engines from Bristol Freighters. The plant has also taken on the overhaul of a number of Meteor tank engines for the Canadian Army.

Bristol Aero Engines (Western):

At Vancouver International Airport is located the plant of the West Coast affiliate of Bristol Aero Engines Ltd., known as Bristol Aero Engines (Western) Ltd. Like Bristol Aero Engines, the Vancouver firm is a subsidiary of The Bristol Aeroplane Co. of Canada (1956) Ltd., and is mainly



TRANSPORT Minister Marler is shown switching on first Canadian omni station, equipment for which was produced by Canadian Aviation Electronics.

engaged in the overhaul of aero engines.

Approximately 140 personnel are engaged in overhauling various models of Pratt & Whitney and Wright reciprocating engines, on behalf of both the RCAF and a number of commercial operators in Western Canada. These overhaul activities also extend to most types of propellers, carburetors, and fuel injectors.

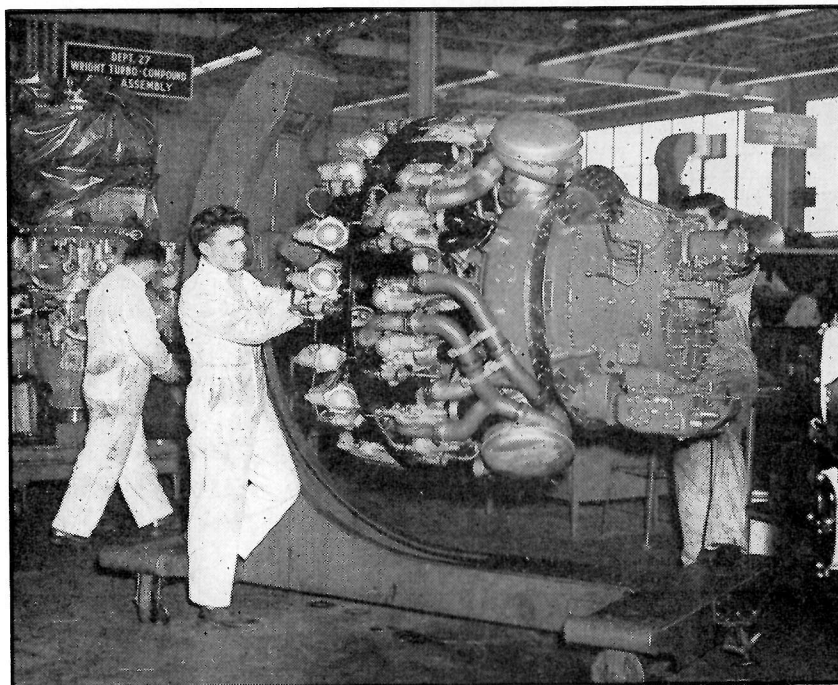
A modern and fully equipped plating shop capable of undertaking most plating processes to aircraft specifications, is also operated by the company. Modern test cells can handle the largest piston engines now in use in Canada.

Bristol Aircraft (Western)

A HEAVY program of airframe conversion, modification, repair & overhaul, and subcontracting, is currently underway at the Winnipeg establishment of Bristol Aircraft (Western) Ltd. Until recently known as MacDonald Bros. Aircraft Ltd., Bristol Aircraft is, like Bristol Aero Engines Ltd. and Bristol Aero Engines (Western) Ltd., a subsidiary of The Bristol Aeroplane Co. of Canada (1956) Ltd.

Among the varied projects now going through the Stevenson Field plant are: (1) Conversion of a number of CF-100/3 all-weather fighters into dual-control pilot type trainers; several of these have already been completed; this work occupies about half of the available plant space. (2) Repair, overhaul, and modification of B-25 Mitchells, practically a continuous job that has been going on in this facility for many years. (3) Manufacture under license of B-25 and F-51 Mustang parts. (4) For the CS2F-1, Bristol Aircraft is fabricating the power-plant assembly, as well as a number of small airframe components. (5) For the Otter, 100 cowl sets are being produced. (6) For the Orenda, "hot end" components are turned out, including the tailpipe assembly used in the CF-100. (7) Manufacture of Edo floats, for Beaver, Otter, and Cessna 180 aircraft. (8) Repair & overhaul of Expeditors, Mustangs, and Cessna L-19's.

A harbinger of possible future activity is to be found in the recent announcement that the Winnipeg firm had formed a five-man team



IN THE MODERN Montreal plant of Bristol Aero Engines, Wright Turbo Compounds are overhauled for Trans-Canada Air Lines and Royal Canadian Air Force.

which is to become the nucleus of a helicopter unit. Says Bristol: "The unit has been formed in anticipation of possible orders for Bristol helicopters in Canada and will be responsible not only for the servicing and maintenance of the aircraft in the Dominion, but also for carrying out any modifications necessary to fit the helicopters for service under Canadian conditions."

Most recent employment figures show 1,150 on staff at Winnipeg.

Canadian Aviation Electronics

THE OFFICIAL ceremony marking the putting into operation of Canada's first VHF omnirange airway system, which took place recently at Montreal Airport, was particularly significant to Canadian Aviation Electronics Ltd., because this pioneer Canadian electronics firm had manufactured the units for the system.

At the time CAE received the contract for the units, they were the first omnirange installations to be manufactured in this country as a production run. The job involved systems engineering and complete tooling and manufacturing, all done at CAE's Cote de Liesse Road plant, near Montreal Airport, Dorval, Que.

The production of this VOR equipment is just one of the many jobs that have been undertaken during the past few years by this versatile

firm. For instance, there is the design and manufacture of prototype and production models of a CF-100 flight simulator for the RCAF. As Canadian licensee, CAE also produces in Canada the Lear L-5 and F-5 autopilots. In addition, the company acts as sales representative for SARAH, and markets the Sonotone sintered-plate nickel cadmium battery.

An engineering research department is prepared to undertake original design or product development in aerodynamics, electronic computers, pulse and radar techniques, recording devices, servo-mechanisms, telemetering, fire control, guided missiles and military applications. One of the products of this department has been the Caeta P-1, a radio-controlled jet-propelled target aircraft, which was designed by CAE as a private venture.

An industrial electronics division undertakes the repair, overhaul, and modification of aviation and general electronic equipment of all types.

Other activities in which the various different divisions engage include the design and installation of ground and airborne radar; servo motor assemblies, computer work, antenna system design and installation; design, development and manufacture of a variety of ground and airborne communications equipment; ground and airborne scintillometers.

Canadian SKF

SINCE 1951, Canadian SKF Co. Ltd. has been making deliveries of ball and roller bearings from the production facility which was completed at Scarborough in 1950.

Although Canadian SKF turns out its products for a variety of different industries, one of its biggest single customers is the aircraft industry, mainly as represented by such aero engine firms as Rolls-Royce of Canada, Orenda Engines Ltd., and Canadian Pratt & Whitney. York Gears Ltd. is also a customer, as a result of the work it does for Orenda Engines in connection with the production of Orenda gear boxes.

Canadian SKF is Canada's first manufacturer of ball and roller bearings, though it is understood that others are now entering the field. Types of ball and roller bearings unknown a few years ago insofar as fine precision, load carrying capacity, variety of types and finishes, are now part of SKF Canada's daily output and are not surpassed anywhere in the world. The 40-acre site at Scarborough is expected to provide for the natural growth of the company for the next 25 years, though increas-

ing volume has already required the addition of a second manufacturing unit to the original structure.

Total employment at Canadian SKF is over 650 in all divisions.

Canadian Steel Improvement

CANADIAN Steel Improvement Ltd., though only about five years old, has established itself as a North American technical leader in at least one very demanding field . . . the processing of titanium. Recently, CSI, which is a member of the A. V. Roe Canada Group of companies, was able to announce that it had received an order from a large U.S. manufacturer for a quantity of titanium jet engine blades.

The order came about as a result of the development by CSI of a method of processing titanium which eliminates many of the difficulties of forging it, thus resulting in substantial reduction in cost. It is possible with this process to forge a finished precision blade as cheaply as a rough forging, thereby eliminating the costly process of finishing blade surfaces. Development of the processing method came about as a result of work being done for Orenda Engines in

connection with the new PS-13 supersonic engine.

A \$3,500,000 expansion program has recently been completed, this being aimed at broadening the base of company's activities. Aluminum sand and permanent mould castings, as well as aluminum die casting and magnesium sand casting have recently been added to the range. A third forge shop has been constructed and has heavy forging equipment and 2,000 and 5,000 ton hydraulic presses for the manufacture of large forgings in aluminum and titanium for the aircraft industry.

The new forging equipment includes a 10-ton gravity drop hammer, said to be the largest ever installed in a Canadian forging plant. This hammer is intended for use in connection with the production of such aircraft components as undercarriages, wing sections, and engine parts.

CSI has, until this recent expansion program was undertaken, been engaged primarily in the manufacture of compressor blades, turbine buckets, and other precision parts for Orenda turbojets. Similar parts have also been produced for Nene engines.

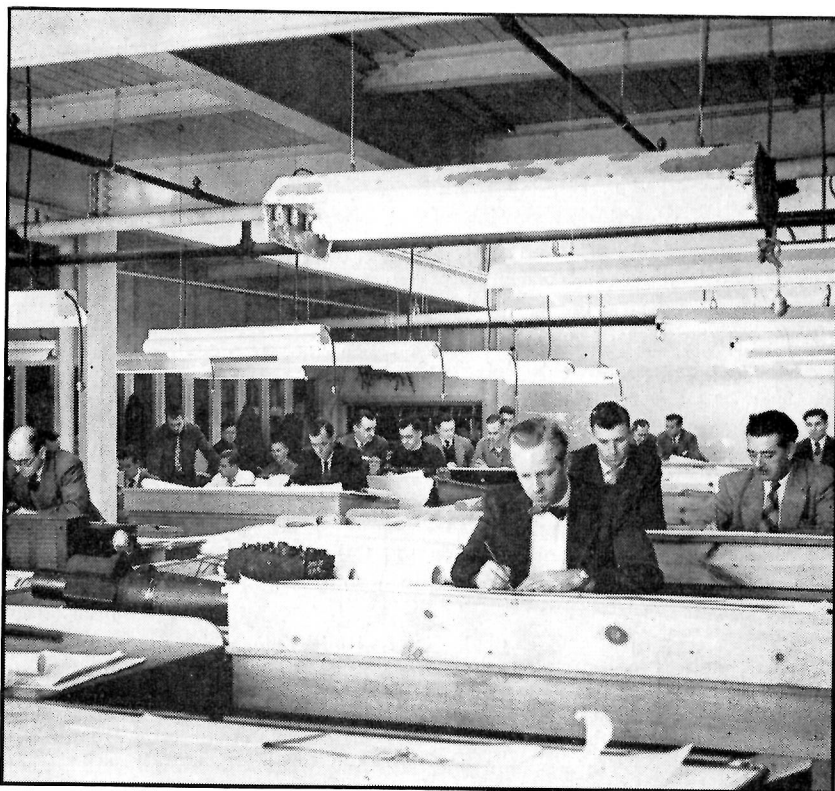
Dowty of Canada

DOWTY EQUIPMENT of Canada Ltd., which has headquarters at Ajax, Ont., near Toronto, is a self-contained company engaged in the design, development and manufacture of landing gear and hydraulic equipment. At present, the major portion of Dowty's productive capacity is absorbed in the manufacture of some 60 items of equipment for the CF-100.

Recent expansion includes the erection of a 25 ton mechanical drop test rig for complete undercarriage drop testing. This structure caters for aircraft weights up to 175,000 lbs. The company is also actively engaged in research leading to the development of hydraulic equipment for operation under conditions much more severe than hitherto experienced.

Current projects include the design and development of the main undercarriage for the CF-105, and the production of the nose landing gear assembly and the retractable tail bumper for the CS2F-1.

Dowty of Canada also operates a



A THRIVING aircraft design office is operated by Fairey Aviation of Canada.

repair and overhaul department for the maintenance of its products in use with the RCAF and the RCN.

Fairey of Canada

THE FAIREY Aviation Co. of Canada Ltd. seems to have established itself as the industrial arm of Canada's maritime air forces. With plants on both coasts, it meets practically all of Canadian Naval Aviation's needs, insofar as airframe repair, overhaul, modification and conversion is concerned. Similarly, it is backing up the RCAF's Maritime Air Command.

For the Navy, it has for the past several years been engaged in a continuous program of repair & overhaul of Avengers and Sea Furies, and in addition, it has been responsible for the progressive development of the Avenger as an anti-submarine aircraft. In this regard, the most recent model to be turned out is the AEW Avenger, or "Guppy", a radar equipped version.

With the acquisition by the RCN of a number of F2H-3 Banshees, Fairey has also become responsible for the airframe maintenance and repair of these jet fighters. It is expected that when the new CS2F Sentinel anti-submarine aircraft comes into service, the Dartmouth, N.S., firm will probably be asked to look after their maintenance requirements.

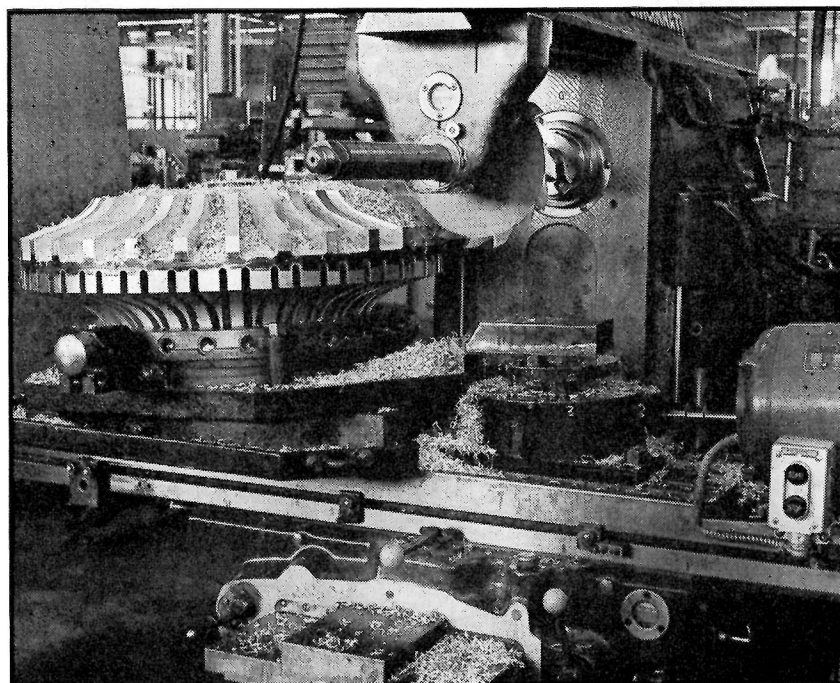
For the RCAF, Fairey has for the last several years carried out all repair & overhaul and modification work on MAC's MR Lancasters. This work, which is drawing to a close as the Lancasters are being withdrawn from service, is being replaced in the shops by a similar program in connection with the Lockheed Neptunes which have succeeded the Lancasters.

An important phase of the activities at the Dartmouth plant involves the manufacture of Fairey Hydro Booster aircraft power controls, for use in the CF-100.

Employment now totals 875, including that of the Patricia Bay establishment on Vancouver Island, this being a comparatively small airframe repair & overhaul shop.

Field Aviation

THE ACTIVITIES of Field Aviation Co. Ltd., with headquarters at Oshawa, Ont., and a branch at Calgary, Alberta, are divided gener-



ROLLS-ROYCE of Canada continues to produce Nene parts for the RCAF. A cutting operation on a Nene compressor rotor is shown in process in above photo.

ally into four main categories.

The first of these embraces aircraft overhaul, maintenance and repair services for civilian operators, this work being carried out at both Oshawa and Calgary. Major activities in this field include complete maintenance of the fleet of aircraft operated by Kenting Aviation Ltd., an associate company of Field, on aerial survey work.

Considerable maintenance work is carried out for DC-3, Beechcraft, and Lodestar executive aircraft operators, and also for helicopter operators.

A second category of work performed is concerned with RCAF contracts, under the terms of which Field carries out aircraft servicing, inhibiting, and storage, and special installations on RCAF aircraft. These jobs are done at both the Oshawa base and at various RCAF stations.

Subcontract manufacturing and inspection work is another very important phase of Field's activities. Considerable light manufacturing is carried out in the Oshawa shops, including machine shop instrumentation work and engine sectionalizing, tube bending, and sheet metal fabrication of various kinds.

The fourth phase of activities involves aircraft sales and sales of aircraft parts and general supplies. Last year, the lines handled by Field were

considerably augmented when it acquired the Supply Sales Division of MacDonald Bros. Aircraft.

Total number of personnel employed at all locations is approximately 260.

Fleet Manufacturing

FOR THE PRESENT the tempo at Fleet Manufacturing Ltd. is on the low side, though the promise of projects now in hand is such that there is good possibility of a build-up in activity in the near future.

The Fort Erie, Ont., firm continues to carry out considerable subcontract work on behalf of such major manufacturers as Avro Aircraft, Canadair, de Havilland Canada, Republic Aviation, Canadian General Electric and Northern Electric. Over the past 2½ years, nearly all of Fleet's improved and modernized facilities have been committed to sub-contract production of aircraft components and radar assemblies.

Other major programs involve the manufacture of Helio Courier aircraft, for which Fleet holds Commonwealth rights, and the manufacture on behalf of its associate company, Doman-Fleet Helicopters Ltd., of the Doman LZ-5 helicopter. Facilities to produce the LZ-5, one of which has already been built, are currently being set up.

Jarry Hydraulics

A MAJOR development of the past year at Jarry Hydraulics has been the signing of an agreement with Bendix of Canada whereby Jarry now manufactures all Bendix wheels and brakes for Canada.

For the main part, however, current activities of this Montreal manufacturer are little changed from a year ago, embracing the design and manufacture of aircraft landing gear and such hydraulic assemblies as power control actuators, servo-valves, hydraulic jacks, ball-screw actuators, accumulators, compensators, up-and-down locks, etc.

Jarry is, or will be, supplying these parts for installation in seven different aircraft being built by the Canadian Aircraft Industry. These aircraft include: the F-86, for which Jarry produces the nose landing gear, accumulators, compensators, actuators, valves, etc.; the T-33, landing gear spares; the CL-28, for which Jarry has contracted to build the complete landing gear . . . so far work has been confined mainly to the conversion of British drawings; the CF-105, the design, development and manufacture of the nose landing gear, complete with steering system; for the Beaver and the Otter, practically all the hydraulic equipment used therein, including the flap actuators and tailwheel struts. The Otter tailwheel strut is an oleo-pneumatic unit designed by Jarry and now in production. The company is also in full production on the main landing gear and other hydraulic components for the CS2F.

Jarry has approximately 200 employees engaged in these activities.

Lucas-Rotax

CURRENTLY under development at the Scarborough, Ont., facility of Lucas-Rotax Ltd. are new types of fuel pumps and controls, reheat controls and starting equipment for larger and more powerful turbojets than are now in service; a completely new alternating current generating system and ancillary equipment, including actuators, booster pumps, hydraulic devices, and navigation light flasher units to operate at altitudes in excess of 60,000 feet.

In general, Lucas-Rotax is engaged

in the design, development, manufacture and service of fuel systems for gas turbine engines, and aircraft electrical, hydraulic, and combustion equipment. While the manufacture of fuel systems and electrical equipment is carried out at the Scarborough plant, the repair and maintenance of these products takes place at the company's Montreal plant.

At Scarborough, Lucas-Rotax has recently established a fully-equipped laboratory for aircraft electrics. Prior to the completion of this laboratory, the company was equipped for the development and performance testing of all types of electrical apparatus.

Currently under construction is a new engineering laboratory adjacent to the 120,000 sq. ft. main plant at Scarborough. This building, which is being built at a cost of over \$1,000,000, is to be completed soon.

The Lucas-Rotax plant, originally built by the Canadian Government especially for the production of jet engine components and ancillary equipment, late last year was purchased outright by the company.

Northwest Industries

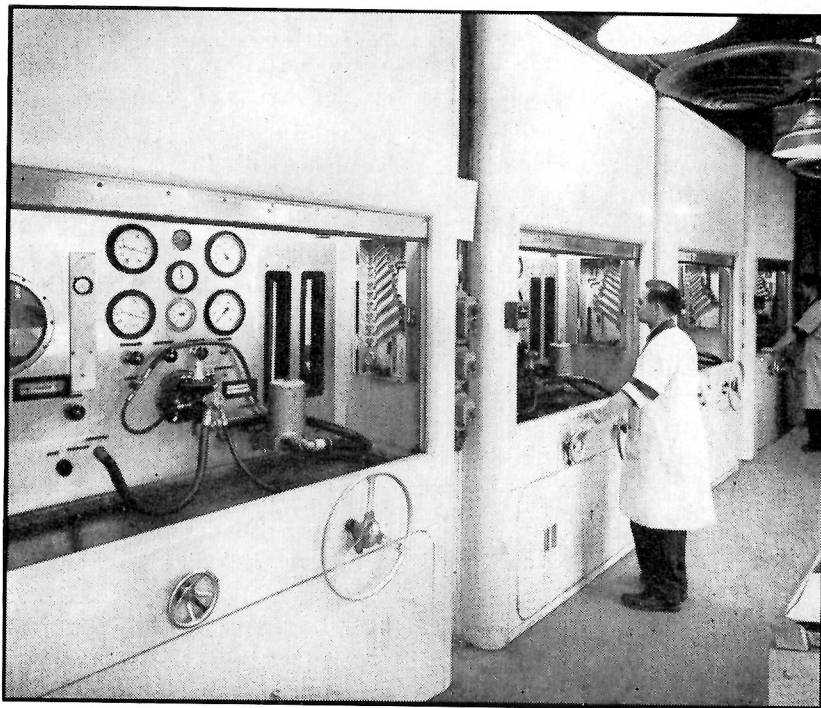
STRATEGICALLY located for "service" is the way Northwest Industries Ltd. describes its comprehensive Edmonton plant, where more

than 775 technicians are engaged in the repair and overhaul of all types of aircraft and a wide variety of aviation equipment.

The bulk of the work being carried on at the present time in the company's three large hangars is on behalf of the DDP. This includes contract work on Mitchells, Dakotas, Harvards, C-119's, and T-33's. In the case of the latter, repair & overhaul activities involving all T-33's in service in Western Canada has been going on for the past two years under subcontract to Canadair.

During the past year, commercial activity has also grown considerably, with many operators of large aircraft on Dew Line and other work taking advantage of NW Industries' extensive facilities and readily accessible location. For civil operators, the firm offers complete service on all Douglas aircraft, as well as Fairchild, Lockheed, Bristol, and Bellanca airplanes, and in fact any type of all-metal or fabric-covered machine.

Facilities available include a complete electronics department; instrument department; fabric shop; hydraulics, lines, cables and accessories department doing specialized work; a powerplant build-up; sheet metal shop; assembly shop carrying out the normal functions of overhaul & repair.



LUCAS-ROTAX has modern facilities for testing of aircraft ancillary equipment.

Aviation Imports to Canada: 1954 and First Ten Months of 1955

	UNITED KINGDOM		UNITED STATES		OTHER	
	1954—12 Mos. No. Value	1955—10 Mos. No. Value	1954—12 Mos. No. Value	1955—10 Mos. No. Value	1954—12 Mos. No. Value	1955—10 Mos. No. Value
AIRCRAFT						
Not over 1,500 lbs.		4—\$ 6,250	130—\$ 315,395	129—\$ 361,342		5—\$ 15,090
1,501-3,000 lbs.		1— 3,750	63— 584,555	129— 1,079,932		1— 17,762
3,001-7,500 lbs.		1— 87,812	26— 2,679,715	27— 2,099,496		
Over 7,500 lbs.	2—\$ 696,552	25— 8,644,278	16— 8,513,577	88— 35,998,707		2— 94,363
AIRCRAFT ENGINES						
Up to 200 hp.		4—\$ 2,000	182—\$ 206,725	181—\$ 384,432		7—\$ 13,798
201-500 hp.	9—\$ 35,147	1— 2,967	82— 192,656	203— 699,065		1— 2,099
501-1,001 hp.		4— 34,093	74— 631,638	37— 401,565		
Over 1,000 hp.	302— 7,082,606	255— 4,762,004	119— 4,650,845	398— 6,957,638		4— 20,760
AIRCRAFT PARTS	\$ 4,039,508	\$ 3,783,565	\$ 83,483,241	\$ 69,662,617	\$ 84,488	\$ 88,197
ENGINE PARTS	\$ 4,956,896	\$ 3,331,539	\$ 16,888,349	\$ 12,231,358	\$ 2,994	\$ 5,067
AVIATION GASOLINE			81,556,477 gals. worth	83,113,762 gals. worth	1,030,325 gals. worth	2,272,020 gals. worth
			\$ 16,548,880	\$ 17,023,984	\$243,647	\$496,734
TOTALS, by countries	\$16,810,709	\$20,658,258	\$134,695,576	\$146,900,136	\$331,129	\$753,870

	1954 12 Months	1955 10 Months
TOTALS, by classes		
Aircraft	\$ 12,789,794	\$ 48,408,782
Aircraft Engines	12,799,617	13,280,421
Aircraft Parts	87,607,237	73,534,379
Engine Parts	21,848,239	15,567,964
Aviation Gasoline	16,792,527	17,520,718
TOTAL, All aviation imports	\$151,837,414	\$168,312,264

The latest addition to the company's expanding program is a 49,200 sq. ft. hangar used exclusively for aircraft modification, repair and maintenance. Work is done for oil and pipe line operators, executive aircraft owners and such commercial operators as CPA, PWA, Flying Tigers, and others.

Northwest has provided a comfortable and attractive waiting room for the use of operators and passengers of private and executive aircraft coming into Edmonton. The new waiting room adjoins the commercial hangar and, while aircraft are being serviced, the following facilities are provided: weather maps and reports, direct taxi telephone line to downtown Edmonton, washroom facilities, etc.

PSC Applied Research

ONE OF CANADA's top "black box" team of experts is to be found at PSC Applied Research Ltd., a member company of the Hunting Associates group of Canadian firms.

Applied Research's 260 engineers and technicians are engaged mainly in the design engineering and production of aircraft instrumentation and controls, photogrammetric and optical instruments, airborne geophysical survey equipment, photographic equipment, etc. Production of micro-

wave plumbing on a subcontract basis is a special facility. Other activities include the repair & overhaul of a wide variety of instruments.

Current projects involve the production of: R Theta Navigation Computer Systems; Automatic Ice Detection & Shedding Control Systems; Automatic Tri-Film Processors Mk. 2; Type T232 Instrumentation Cameras; Type T2490 Rocket-Fire Control Intervalometers; Test sets for the R Theta, the Ice Detection & Shedding Control Systems, and the Rocket-Fire Control Intervalometer; Electromagnetic Survey Systems; Microwave plumbing; mounting trays; technical manuals and RCAF "EO's".

Meanwhile, development engineering work goes ahead on the Gamble-Schmidt Stereo Plotter; specialized navigation computer equipment; specialized armament control equipment; dual-probe Ice Detectors Mk.8; optical instruments; qualification testing for other firms.

During the past year, the firm put into operation a qualification testing laboratory, including an icing wind tunnel.

Sperry of Canada

FOR SEVERAL years now Sperry Gyroscope Co. of Canada Ltd. has been engaged in the manufacture

and supply for military and commercial markets of aircraft instruments of Sperry and Kollsman design, as well as electronic components for flight, fire control and general flight and engine instrumentation.

Two events highlighted Sperry of Canada's past year: the first was the purchase of the Montreal plant it occupies from the Canadian Government; the second was the receipt of a large contract from the USAF.

The USAF contract, worth \$1,300,000, was for fire control equipment and was the first order for this type of equipment to be received by a Canadian manufacturer. The order is currently being processed and should be completed by September.

The property purchased from the Government by the company comprised 13 acres of land and buildings having a floor area of 90,000 sq. ft.

Sperry's Canadian instrument repair & overhaul activities are carried out at Ottawa by a subsidiary firm, Sperry Gyroscope (Ottawa) Ltd.

Standard Aero Engine

DURING THE past year, Standard Aero Engine Ltd. of Winnipeg began work on contracts covering the overhaul and testing of jet engine fuel controls, pumps, and accessories for the Orenda engine.

Standard has also contracted to overhaul and test fuel control units, metering valve units and fuel control units for Nene engines.

This step into jet engine work by one of Canada's oldest established engine and accessory overhaul firms was preceded by the addition of a 9,000 sq. ft. annex to the company's Stevenson Field plant, where equipment and test facilities were installed to handle jet engine fuel and electrical ancillary equipment. In addition to the new annex area, the stores area has been expanded by some 2,000 sq. ft., bringing the total plant space at Standard Aero's disposal to over 55,000 sq. ft.

Apart from the new jet accessory activities, the firm's piston engine overhaul business continues to expand steadily, with all types of aero engines up to and including P & W R-1340 Wasps being processed for the RCAF and civil operators throughout Western Canada. The repair and overhaul activities extend as well to over 200 different types of engine and aircraft accessories.

In addition to this repair and overhaul work, Standard is distributor for a wide variety of well-known aviation lines. Stocks are carried at Winnipeg and at branch offices at Vancouver and Edmonton.

Computing Devices

COMPUTING Devices of Canada Ltd., Ottawa, Ontario, with employees now numbering approximately 400, is a growing factor in the Canadian avionics industry. Principal lines of endeavor involve research and development in the avionics field; guided missile design; tactical and aircraft simulators; precision electronic instrumentation, aerial data compiler, precision cathode ray tube tester; computation and data processing services; custom electronic and electromechanical equipment. This firm was responsible for the design and development of the Position & Homing Indicator, popularly known as the "pushbutton navigator".

The Position & Homing Indicator, originally developed under RCAF sponsorship, is now being promoted by Computing Devices for possible commercial applications. These ap-

pear to be numerous, if the price is right.

Other Companies

•**Phoenix Engineered Products:** Primarily on behalf of the RCAF and the RCN Phoenix Engineered Products Ltd. of Toronto is engaged in a comprehensive program of instrument repair and overhaul work. Other activities which also occupy the attentions of this modern facility's 300 employees are the development and manufacture of aircraft instruments and fuel booster pumps.

•**Aero Engineering Ltd.:** This Edmonton-based firm specializes in overhaul of airframes up to 8,000 lbs. and aero engines up to 600 hp. Other activities include general aircraft servicing, repairs, accessory overhaul, and sales of aircraft supplies. Storage of aircraft up to DC-3 size can also be handled. Employees now number about 40.

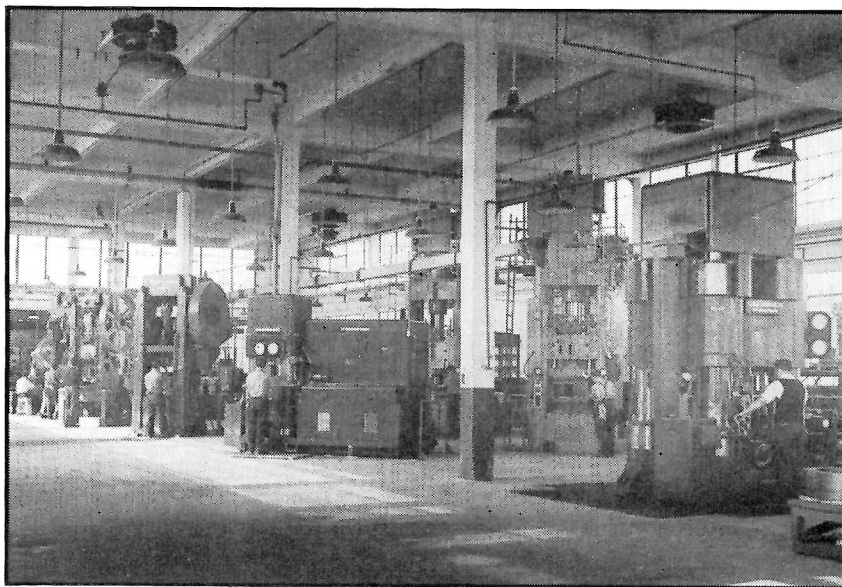
•**Aeroquip (Canada) Ltd.:** A subsidiary of the Aeroquip Corp. of Jackson, Mich., Aeroquip (Canada) about a year ago took over the high pressure flexible hydraulic hose business formerly operated by Preenco Progress & Engineering Corp. The Canadian firm now has its own plant located in suburban Toronto and its 57 employees are engaged in the design, development, and marketing of flexible hose assemblies incorporating detachable and reusable fittings, self-sealing couplings, lightweight el-

bows and rigid tubing, Marman clamps.

•**Aircraft Appliances & Equipment Ltd.:** Since its inception, this firm's basic business has been the repair and overhaul of a variety of aircraft electrical equipment, plus sales & service of such well-known lines of aviation products as Jack & Heinz equipment, Hartman relays, and Potter filters. During the past year AAE has become distributor and overhaul contractor for the aircraft searchlights produced by Strong Electric Corp. Another recently added distributorship is on behalf of Electronic Specialty Co. of Los Angeles, which specializes in a variety of electronic equipment. AAE plans eventually to procure production facilities for the items it distributes if demand warrants.

•**Aircraft Overhaul & Repairs Ltd.:** Based on one of the oldest airports in Canada, Aircraft Overhaul & Repairs specializes in aircraft overhauls, repairs, conversions, changeovers, and sales. Complete engine overhauls are carried out on all aero engines up to 600 hp (formerly limited to 450 hp). Stocks of AN engine and aircraft parts are carried and servicing facilities for land and seaplanes are available. A recent job concerned the complete build-up of two Norseman V aircraft.

•**Aircraft Services (Western) Ltd.:** A subsidiary of Trans-Air Ltd., this



JET ENGINE combustion components are made by Renfrew A/C & Engineering.

Aviation Exports from Canada: 1954 and First Ten Months of '55

(Does not include Mutual Aid shipments)

COUNTRY	AIRCRAFT		AIRCRAFT PARTS	
	1954—12 Mos. No. Value	1955—10 Mos. No. Value	1954— 12 Mos.	1955— 10 Mos.
United States	221—\$11,222,578	161—\$ 7,328,013	\$13,900,336	\$ 5,940,497
Alaska		1— 36,808	2,015	384
United Kingdom			674,596	176,801
Union of South Africa	1— 40,933		96,366	59,117
India			123,203	123,188
Pakistan			11,575	14,883
Morocco			206,967	476
Mexico	3— 44,165	1— 7,300	400	747
Norway	6— 667,701		153,271	22,059
French East Indies	1— 35,446		4,984	116
Australia	4— 136,936	2— 51,253	34,443	38,424
New Zealand	3— 74,949		15,392	17,616
Arabia	2— 78,588	1— 41,755	1,656	2,645
Brazil			158,299	30,638
Colombia	4— 157,410	7— 349,308	36,987	69,315
Japan		1— 41,029		43,681
Falkland Islands		1— 44,714	2,864	212
Egypt	1— 40,711	1— 44,426	14,602	49,409
Finland		1— 46,842	1,043	
The Philippines		3— 238,125	70,607	1,031
Other Countries	6— 101,773		331,452	244,412
TOTAL, All Countries	252—\$12,601,190	180—\$ 8,227,573	\$15,841,058	\$ 6,835,651
RE-EXPORTS*	13—\$ 979,820	15—\$ 284,165	\$ 3,309,303	\$ 1,537,699
			1954 12 Mos.	1955 10 Mos.
TOTAL EXPORTS, Aircraft and Parts			\$28,442,248	\$15,063,224
TOTAL RE-EXPORTS*, Aircraft and Parts			4,289,123	1,821,814
TOTAL, All aviation exports			\$32,731,371	\$16,885,038

*Re-exports concern foreign-made products which have been imported to Canada and then, during the period under review, exported again.

Winnipeg firm's main activity is the provision of aircraft repair and overhaul services for its parent company, as well as for other commercial and private operators. It employs about 27 persons on this work.

•**Aro Equipment of Canada Ltd.:** This company is located in suburban Toronto and provides sales, service, and overhaul facilities for such products of its parent company, Aro Equipment Corp., as oxygen regulators, pneumatic and hydraulic valves and controls, liquid oxygen converters, anti-G-suit valves, and relevant test equipment.

•**Amphenol Canada Ltd.:** Also a Toronto firm, this company's 50 employees manufacture AN electrical and RF connectors, microphone connectors, radio and industrial electron tube sockets, RF cable, communications antennas, cable assemblies, radar and radio components, moulded and fabricated plastics.

•**Aviation Radio Ltd.:** With headquarters on Edmonton's Municipal Airport, Aviation Radio provides communications equipment sales & service. Scope of activities includes

custom installations on executive aircraft, custom designed radio control panels, indirect lighting, maintenance on all types of aircraft radio and navigational equipment.

•**Avionics Ltd.:** This Niagara-on-the-Lake firm designs and manufactures electronic, mechanical, and communication equipment for aircraft and industrial use. Current projects include the design and production of specialized printed circuits and the provision of sales & service for mobile aircraft and ship radio and radar equipment, and relays, connectors and such aircraft testing equipment as accelerometers.

•**Aluminum Co. of Canada Ltd.:** Plants at Kingston, and Etobicoke, Ont., and Arvida, P.Q., turn out a variety of products for the Canadian Aircraft Industry, including aluminum sheet, plate, tubing, extrusions, forgings, castings, foil, wire, rod, bar, and cable.

•**Astrolante Instruments Ltd.:** This small Toronto firm specializes in the repair & overhaul of aircraft instruments on behalf of commercial oper-

ators and under subcontract to DDP contractors.

•**Bancroft Industries Ltd.:** Although primarily an aviation supply organization, Bancroft has established an instrument shop in Montreal which provides instrument sales & service, including overhauls, to airlines, operators, government agencies, and the RCAF. The instrument shop, which was set up in 1954, is now completely staffed and much new equipment has been added.

•**Bata Engineering:** This organization is located at Batawa, Ont., and is a division of Bata Shoe Co. of Canada. Its main activity is the performing of precision machining operations on aircraft hydraulic equipment, aircraft undercarriage parts, and airframe structural parts. It also makes jigs and fixtures. Bulk of the work is on behalf of Dowty Equipment.

•**Bach Simpson Ltd.:** A London, Ont., firm, Bach Simpson is an affiliate of Simpson Electric Co. of Chicago and manufactures radio compass major components, aircraft instruments and panel meters.

•**B.C. Propeller Co. Ltd.:** This company recently moved to new, larger quarters at Vancouver. The move followed successful refinancing. The shop's overhaul equipment has been added to, making it possible to accommodate every type of propeller overhaul in the commercial field.

•**Bogue Electric of Canada Ltd.:** This is a new firm, established late last year as a subsidiary of Bogue Electric Mfg. Co. of Paterson, N.J. Plans call for the Gloucester, Ont., plant to produce motor-generator sets, magnetic amplifiers and control systems, power equipment for a wide variety of precision applications, rectifiers, aircraft ground support and service equipment. About 350 persons will be employed eventually.

•**Canadian Marconi Co.:** Activities of this firm's Aviation Dept., which is situated in Montreal, have in the past year included the engineering of a take-off monitor which indicates the relation between airspeed and acceleration at all times during the take-off run. A new lightweight aircraft radio compass was also designed and produced and satisfactory flight trials of the first model carried out. Development in transistor and minia-



Northwest Industries of Edmonton provides service for a wide variety of large and small commercial aircraft.

turizing techniques are being carried out and show promise for applications making possible the production of lightweight and compact airborne communications and navigation facilities. Late last year Canadian Marconi was licensed to manufacture and market in Canada the Napier Spraymat electrical de-icing system for aircraft.

•**Cannon Electric Canada Ltd.:** With headquarters in Toronto, Cannon is well-known as a manufacturer of electrical connectors for use in such aviation applications as powerplants, communications, radar, lighting, and retractable undercarriages. A branch is located at Montreal Airport.

•**Curtiss-Reid Mfg. Co. Ltd.:** Principal recent activity of this associate firm of Curtiss-Reid Flying Service has been the assembly of two new Noorduyn Norseman aircraft. The firm also is doing overhaul work on large aircraft components for some of the major operators. Quarters are located on Cartierville Airport.

•**Crystal Glass & Plastics Ltd.:** This Toronto-based company is best known in the Aircraft Industry as a fabricator of Plexiglas and other plastic components for aircraft, including canopies, astradomes, windows, windcreens, ducts, etc. It is also Canadian distributor for Plexiglas acrylic plastic in sheets, rods, and tubes.

•**Carriere & MacFeeters Ltd.:** For many years now, Carriere & MacFeeters' Toronto shop has been providing complete service for aircraft electrical accessories: pumps, valves, controls, airport electrical equipment; coil and armature winding. These

functions are carried out both under DDP contract and on behalf of commercial operators. There are now over 70 employees.

•**Canadian Flight Equipment Ltd.:** With plants at Cobourg and Campbellford, Ont., Canadian Flight Equipment is engaged in the manufacture and repair & overhaul of Martin-Baker ejection seats. Over 90% of the seat is now fabricated in Canada from Canadian materials and to AN standards. The firm also carries on a substantial volume of aircraft parts manufacture under subcontract. Employment at both plants now totals about 50.

•**Chatco Steel Products Ltd.:** Insofar as the Aircraft Industry is concerned, the principal activity of this Tilbury, Ont., firm involves the detail manufacture and assembly of the CF-100 fuselage rear section and rear center section, upper fin and rudder, and lower rudder. This work is carried out under subcontract to Avro Aircraft.

•**Collins Radio Co. of Canada Ltd.:** The new Toronto plant of Collins of Canada has grown rapidly since it was established within the last two years and now employs some 200. The firm is a subsidiary of Collins Radio Co. The Canadian manufacturing facilities in Toronto are presently engaged in the production of UHF military airborne transceivers, HF and VHF transmitters and receivers, high power UHF "over-the-horizon" transmitters, dual diversity receivers, etc. Considerable emphasis is being placed on engineering devel-

opment to meet Canadian communication needs.

•**Cossor Canada Ltd.:** Located in Halifax, Cossor is engaged in advanced electronic development and production. The staff of 200 turns out airborne radar equipment; aircraft intercom systems; underwater equipment; test gear . . . including industrial oscilloscopes, logarithmic amplifiers, signal generators, advanced display systems (radar and computers), sound systems, transducers, antennae. Electronic equipment repair & overhaul and installation services are also provided.

•**Canadian Pacific Airlines (Repairs) Ltd.:** Approximately 500 persons are employed by this subsidiary of CPA in the operation of the RCAF's Western Repair Depot, at Currie Field, near Calgary. Work embraces inspection, maintenance and repair of a variety of Air Force aircraft ranging through single and multi-engine types, jets, helicopters, and flying boats. A major activity involves the salvage of crashed aircraft.

•**Dominion Magnesium Ltd.:** Dominion is based at Haley, Ont., and produces extrusions in magnesium, zirconium, and thorium alloys. An associate company, located at Renfrew, Ont., turns out magnesium and aluminum castings for aircraft engines, as well as sundry airframe castings in the same metals.

•**Dorval Metalcraft Co.:** The 14 employees of this Dorval-based firm are kept busy in a variety of activities including: aircraft repair, modifica-

(Continued on page 108)

.....A TRIO OF TWINS FOR THE DOT.....



The DoT recently took delivery of three Piper Apaches from Trans Aircraft Co. of Hamilton, Canadian distributors for Piper. The airplanes, which are the first light twins to be acquired by the Government Department, will be based at the regional offices of Moncton, N.B., Edmonton, Alta., and Ottawa, Ont.

They will be used on the customary variety of DoT duties, including radio range calibration, liaison, etc. Two of the machines may be temporarily assigned to the annual DoT sponsored instructors' schools.

All three of the airplanes are the

Super Custom model and are equipped with full instrumentation, dual vacuum pump and dual generators. They are, however, fitted with ADF 14's instead of ADF 12's. The first of the three machines, which are painted in DoT colors, was delivered on Jan. 16 and the other two followed in February.

Below, DoT Supt. of Flight Operations J. D. Hunter (L) accepts log books from Glenn White of Trans Aircraft. At top, standing before the first Apache, is one of the DoT's VIP Pilots, S. T. Grant.



licensed civil aircraft flew 294,449 miles, carrying 9,153 passengers and 79,850 pounds of freight. In 1954, 2,800 civil aircraft flew 61,582,481 miles, carrying 115,013,477 pounds of freight. (No figures were given for passengers.) The number of airports increased from 35 to 470.

The number of passengers carried by Canadian air lines first broke through the million mark in 1948, when 1,136,208 passengers travelled by air; a decade previously, only 131,107 people flew.

No Larger Letters

The Canadian Owners & Pilots Association reports that the Transport

Department has dropped its proposal to have all aircraft registration markings increased in size. The large number of protests from industrial and private owners is said to be responsible.

Frequency Allocated

The Transport Department has allocated the frequency 5680kc/s for non-scheduled air operations in Northern Canada outside designated airways. It has been installed at the following DoT stations: Montreal (temporary), Knob Lake, Fort Chimo, Coral Harbor, Churchill and Yellowknife.

Operating companies may be authorized to use this frequency at aeronau-

tical ground stations, with a maximum ground station power of 300 watts, to provide a communications service to non-scheduled operators. The DoT is also prepared to authorize its use by non-scheduled aircraft. Operating agencies are advised to notify the department of their intentions and to submit the radio licenses for their aircraft and private commercial ground stations involved for suitable amendment.

TWA Goes Jet

Trans World Airlines, for \$4,500,000 each, has purchased eight Boeing 120 Jet-Stratoliners, delivery to begin in April, 1959. TWA says that within the next few months its orders for jet airliners will total 30.

INDUSTRY INVENTORY

(Continued from page 84)

tion and overhaul of all types of aircraft up to and including DC-4's; manufacture of parts and components for civil and military aircraft; salvage of aircraft, temporary repairs and ferry-out of all types of aircraft up to and including DC-4's, modification and repair of aircraft ground handling equipment; manufacture of custom sheet-metal components for airborne and ground telecommunications equipment.

•**Enheat Aircraft:** As the aircraft division of Enamel & Heating products Ltd., Enheat is engaged at its Amherst, N.S., plant in the production of aircraft spares and components; repair and overhaul of parts and components; tool and jig making; stocking and selling of component aircraft materials and parts. Current projects include the repair & overhaul and production of Lancaster spares and components; production of the CS2F-1 empennage; repair & overhaul of civilian aircraft components and airframes; cannibalization of Lancasters for the RCAF; production and repair & overhaul of Lockheed Neptune spares.

•**Ferranti Electric Ltd.:** This Toronto firm produces electrical gyroscopic aircraft instruments for use by the military services.

•**Flight Refuelling (Canada) Ltd.:** Located in Toronto and a subsidiary of Flight Refuelling Ltd., of Britain,

this company is becoming active in the design, development, testing, and manufacture of aircraft fuel system equipment, including that for the Avro Aircraft CF-105.

•**Found Bros. Aviation Ltd.:** Located at Toronto's Malton Airport, Found Bros. produce precision resistors, temperature bulbs, AN parts, and transformers. The company also represents a number of companies whose products are used in the aviation field.

•**Garrett Mfg. Corp. of Canada Ltd.:** Garrett of Canada is a subsidiary of The Garrett Corp. of Los Angeles and has been operating in Canada for several years. Until recently its principal function has been the representation of a number of U.S. manufacturers of aircraft components in a sales and engineering capacity. Its plant is located in suburban Toronto where sales & engineering offices and shop facilities are maintained. Arrangements have been completed to undertake the repair, overhaul and manufacture of a number of highly specialized aircraft components in the instrument and electronic field. The company has orders to manufacture in Canada equipment for aircraft being designed and built for the RCAF.

•**Genaire Ltd.:** With bases at St. Catharines and Toronto, this firm is chiefly engaged in the repair, overhaul, maintenance and engineering of airframes, components, and accessories. Most of this work is performed at the St. Catharines location, while the Toronto hangar is used mainly for maintenance and storage of civil aircraft. A subsidiary firm, Gensales Ltd., handles a number of lines of aviation products. Total employment is about 125.

•**BELA Aircraft Company:** BELA Aircraft Co. is associated with BELA Machine Corp. (Canada) Ltd., machine tool distributors with headquarters in Toronto. BELA Aircraft is North American distributor for several types of aircraft, aero engines, and propellers; the aircraft include the Belaero 45 four-five place twin-engine executive aircraft, the Avia LD-40 four-place single-engine personal aircraft, and the L-60 Brigadyr duster and sprayer. A third associated firm is Grand Valley Air Services Ltd.,

based at Waterloo-Wellington Airport, Breslau, Ont., which specializes in service to executive aircraft. This firm has facilities to carry out major repair & overhaul, and routine maintenance on engines up to 800 hp; repair & overhaul of airframes. Shop facilities include an approved machine shop and a spraying department.

•**Greer Hydraulics of Canada Ltd.:** This Montreal firm is the comparatively young subsidiary of the well known U.S. Greer organization and

is engaged in the repair & overhaul of ground handling equipment, design and fabrication of aircraft ground support equipment, aircraft hydraulic components, engine test and accessory test facilities.

•**Godfrey Engineering Co. Ltd.:** An affiliate of Sir George Godfrey & Partners Ltd. of England, Godfrey Engineering manufactures aircraft air conditioning equipment, including cabin superchargers and cold air units. The firm also designs and



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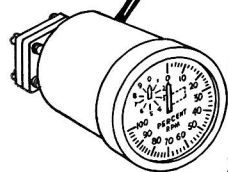
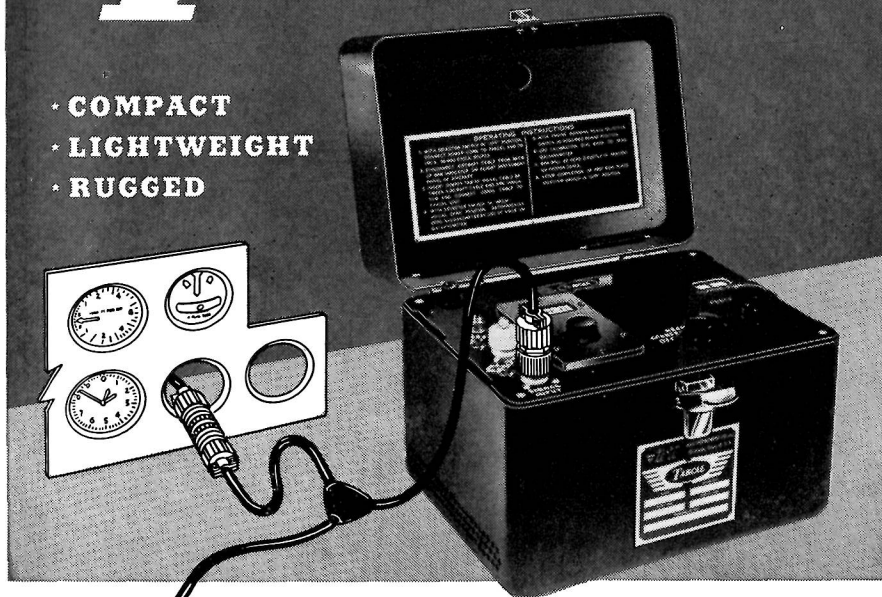
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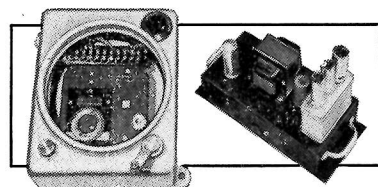
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manufactures such ground servicing equipment as oxygen servicing trailers, hydraulic test units, and cabin pressure testing trolleys. There are 50 employees.

•**Inaerco Ltd.:** Located in Perth, Ont., Inaerco produces hose assemblies for aircraft and industrial use, as well as machined parts under sub-contract to aircraft manufacturers.

•**Irvin Air Chute Ltd.:** Located at Fort Erie, Ont., Irvin of Canada manufactures personnel parachutes of various sizes and types; also cargo, air stabilizer, tail brake, and missile recovery chutes of all sizes. Recent production has included parachutes for the Canadian Army and air pressure anti-G-suits for the RCAF. The company has staff and facilities to carry out research and development engineering in the lines in which it specializes.

•**Walter Kidde & Co. of Canada Ltd.:** Formed in 1928 as a subsidiary to Walter Kidde & Co. Inc. of Belleville, N.J., Walter Kidde of Canada has for several years been manufacturing and supplying to the aircraft industry portable extinguishers for ground fire fighting, together with built-in carbon dioxide systems and nose reels for hangar protection. It also makes aircraft carbon dioxide portables and hundreds of these units have been supplied to Canadian airframe manufacturers for use in military aircraft. The Canadian firm manufactures all of the air bottles which it supplies to the Aircraft Industry, importing only the bare cylinders from the parent company's plant, since the Canadian firm does not have the necessary drawing facilities. There is a resident engineering staff at the firm's Montreal plant which specializes in aircraft business. The engineers on this staff have designed fire extinguishing systems for aircraft and have worked with the aircraft industry in its pneumatic and fire detector problems. Thousands of pneumatic quick disconnects designed and made in Montreal have been supplied to the RCAF and Canadian airframe manufacturers. Life raft inflation equipment is also made by this company, which recently moved into a new 20,000 sq. ft. plant. There are some 60 employees.

•**Laurentian Air Services Ltd.:** Well-known for its activities in the

aircraft and aero maintenance fields is this Ottawa firm. Among the services offered are aero engine repair & overhaul, airframe overhaul, aircraft maintenance and servicing, and Magnaflux inspection services.

•**Leavens Bros. Ltd.:** One of the best known aviation houses in the Canadian industry, Leavens Bros. is currently active as a subcontractor to de Havilland Aircraft, producing welded assemblies and machined parts for the Beaver, Otter, and CS2F programs. Other work of an industrial nature includes the fabrication of reinforced plastics for RCAF and commercial uses, overhaul of engines, airframes, propellers and accessories, instruments and radio. In addition, the firm distributes many well-known lines of aviation products. These activities are, of course, additional to the various air services which Leavens operates from Toronto, Windsor, and London.

•**Industrial Electronics of Canada Ltd.:** This company, a subsidiary of Servomechanisms Inc., Westbury, N.Y., specializes in the manufacture of such products for the aviation industry as fire control computers and accessories. The construction of a new, 20,000 sq. ft. plant in suburban Toronto was announced recently and this will be occupied some time this summer.

•**Joy Mfg. Co. (Canada) Ltd.:** Located at Galt, Ont., Joy of Canada manufactures aircraft fans and blow-

ers, airport and aircraft electrical connectors, pneumatic production tools, and also carries out subcontract machine shop, tool and die work for aircraft manufacturers.

•**J. W. Lawrence Radiators Ltd.:** This Montreal company specializes in the repair and overhaul of all types of aircraft heat exchangers, including component valves, and are Rolls-Royce approved contractors for aircraft heat exchange equipment.

•**Minneapolis-Honeywell Regulator Co. Ltd.:** An Aeronautical Division was formed by Minneapolis-Honeywell about a year ago, primarily for the servicing and overhaul of gyroscopic components of the M-H 11B auto pilot systems used in the CF-100. The Aeronautical Div. has grown so rapidly since its formation, that expansion plans have been made and property was recently purchased in suburban Toronto by M-H for the erection of a new 70,000 sq. ft. building which will house the Aeronautical Div., as well as the Industrial Div.

•**Normalair (Canada) Ltd.:** This organization was originally set up to repair and overhaul equipment made by Normalair Ltd. of Yeovil, England, and fitted to aircraft operated in Canada. The Canadian firm, which is based in suburban Toronto, has since been expanded to provide engineering liaison with Canadian operators and design liaison with Canadian aircraft manufacturers and the military flying services. Now in

association with A. C. Wickman Ltd., Normalair (Canada) provides manufacturing facilities for pressurization and air conditioning equipment.

•**Precision Rubber Products (Canada) Ltd.:** This firm can claim to be Canada's pioneer manufacturer of hydraulic "O" rings for aircraft and industrial applications. Employment is now up to 47. The plant is located at Ste. Therese de Blainville, P.Q., while the general sales office has recently been moved to Toronto.

•**Piasecki Helicopter Co. of Canada Ltd.:** A program of repair, overhaul, and modification of Piasecki helicopters is currently being carried out at this firm's Arnprior, Ont., base on behalf of the RCAF and the RCN. There are 26 employees whose activities, in addition to the foregoing, include the manufacture of spare parts and service tools.

•**Pioneer Parachute Co. of Canada Ltd.:** Based at Smiths Falls, Ont., Pioneer of Canada is a manufacturer of parachutes and a variety of parachute equipment, such as tow targets, etc. There are now ten employees with this firm, which is just over a year old.

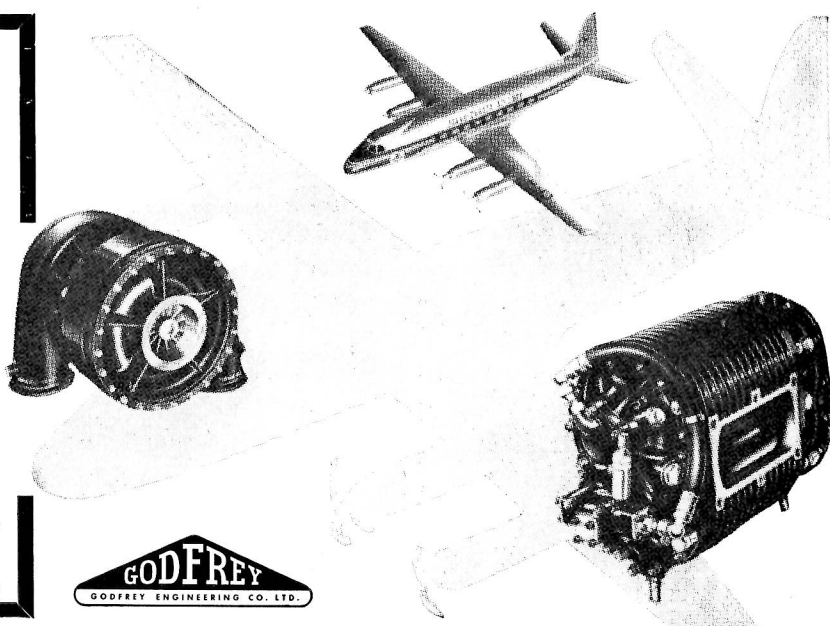
•**Prencos Progress & Engineering Corp. Ltd.:** This early member of Canada's Aircraft Industry is once again expanding its aviation activities, which now include the design and manufacture of aircraft hydraulic controls (valves, cocks . . . manually,

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A research contract on ring-wing type aircraft has recently been awarded to Kaman Aircraft by the Office of Naval Research. Also known as an annular-wing, it has been dubbed the "flying barrel". This marks another important step in Kaman's ten year history of special aeronautical research . . . in addition to production of Kaman helicopters for National Defense.

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hydraulically, or electrically operated), remote controls, and ground equipment and instruments. The firm also undertakes machining of light aircraft parts and light metal design and applications. The plant is currently located in Toronto, but plans were recently announced to build a new 40,000 sq. ft. factory at Uxbridge, Ont.

•**Renfrew Aircraft & Engineering Co. Ltd.:** Renfrew Aircraft & Engineering, which is located at Renfrew, Ont., is the successor to Cockshutt Aircraft. It is currently engaged in the manufacture of combustion equipment for gas turbine aero engines, as well as the design and manufacture of a variety of fueling equipment for airport use. There are some 300 employees.

•**Sanderson Aircraft Ltd.:** This Malton, Ont., company has for some time been carrying out the production under subcontract to de Havilland Canada of Beaver empennage components and flaps and ailerons. While most of the 85 employees are engaged in this phase of the overall operation, there is also a considerable volume of business involving aircraft and engine repair, overhaul and maintenance for executive, private, and commercial aircraft.

•**Saskatchewan Government Airways:** Headquarters of this Crown company are at Prince Albert, Sask., where it has an approved major overhaul and repair shop for airframes up to 20,000 pounds and engines up to 900 hp. The shop can undertake wood and metal work, doping, and instrument repair. SGA also manufactures M & C Pneumatic Ski Pedestals and air bags.

•**Standard Telephones & Cables Mfg. Co. (Canada) Ltd.:** Included in the activities of this Montreal firm are the manufacture and installation of radio aids to air navigation (e.g., instantaneous DF equipment for the RCAF), radar apparatus (e.g., GCA systems for the RCN). Most of the work that is carried out in the aeronautical communications equipment field is on behalf of the military services.

•**Technical Enterprises Ltd.:** Based at Malton, Ont., this specialty firm provides sales, service and installation of airborne electronic equipment. It

also specializes in the engineering design and installation of custom executive aircraft communication, navigation and radar systems.

•**Stark Electronic Instruments Ltd.:** Among the activities of Stark are the overhaul, repair and modification of air and ground communication equipment, as well as radio compasses, for the RCAF. The firm is based at Ajax, Ont., and performs a wide variety of services in the electronics field.

•**H. I. Thompson Co. of Canada Ltd.:** At this firm's Guelph facility are made Refrasil high temperature insulation blankets for jet engines and aircraft; cabin insulation and duct insulation for all types of aircraft; covers for engines, aircraft, canopies, etc.

•**Thompson Products Ltd.:** Main activity of the Thompson Products aircraft division is the forging of aluminum, titanium, and alloy steel blades for gas turbine aero engines. Most of this production is on behalf of U.S. manufacturers. Other engine components are produced for Rolls-

Royce of Canada, Orenda Engines, and Canadian Pratt & Whitney.

•**Timmins Aviation Ltd.:** Formed especially to cater to large executive aircraft operators, the Timmins Business Aviation Centre is located on Montreal Airport. A full range of aircraft services from routine maintenance to major repair and overhaul is available from Timmins, which now occupies two hangars at Dorval, the first of which it built itself, the second of which it fell heir to when it purchased a controlling interest in Ross Aero Ltd.

•**Thor Industries Ltd.:** Formerly known as Thor-Canadian Co. Ltd., this firm is now Canadian controlled, all assets having been bought from the former parent company, Thor Corp. of Chicago. Located in suburban Toronto, the firm has for some years been associated with the Canadian Aircraft Industry as a producer of ejector seats for the T-33 and the F-86 under subcontract to Canadair. More recently, it has received a contract from de Havilland Aircraft to

fabricate crew seats for the CS2F. Other activities include the manufacture of a number of Orenda parts.

•**United Aviation Ltd.:** Located on Edmonton's Municipal Airport, this company specializes in major overhaul of aircraft and engines, as well as accessory overhaul. Aircraft sales, maintenance, and storage also provide some volume of business. There are 16 employees.

•**Vancouver Aircraft Sales Ltd.:** Although this company was originally established primarily to handle aircraft sales, an ancillary overhaul and maintenance service has developed to the point where it was necessary recently to purchase another hangar on Vancouver Airport. This hangar, which formerly belonged to Photographic Survey Corp., will provide an extra 20,000 sq. ft. of working space, in addition to sandblast facilities, sea-plane hoist, etc.

•**Vicom & Co. (Canada) Ltd.:** Among the activities of this Kingston, Ont., firm are the manufacture of aircraft dies, jigs, and fixtures; design

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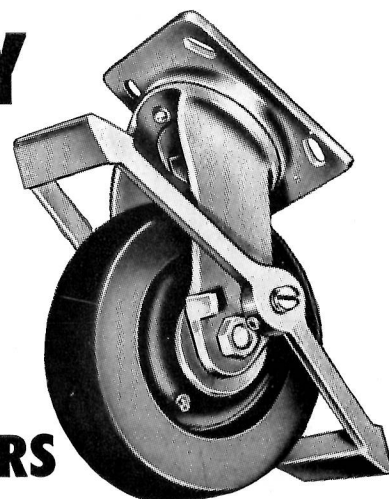
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and manufacture of airborne and ground radio equipment; radio maintenance; aircraft storage. The company also manages the airfield on which it is based, Norman Rogers Airport. Employees number 18.

•**Weatherhead Co. of Canada Ltd.:** St. Thomas, Ont., is the home of this firm, whose line of products is well-known in the Aircraft Industry. The firm's Aviation Division, which functions as a separate unit, is responsible for the production of automatic screw machine products, precision aircraft and engine parts, hydraulic components, tube fittings for flared and flareless designs to AN and MS standards, aircraft hose, hose assemblies and coupling components.

•**Western Propeller Co. Ltd.:** The types of propellers which this company regularly processes range from the smallest wooden club to the big four-bladed units used on the RCAF's Fairchild Packets. In addition to propeller overhaul it is staffed and equipped to overhaul practically any type of governor. The firm, which is located on Edmonton Municipal Airport, is also distributor for several well-known lines of propellers. It does a large volume of business with the RCAF, but also enjoys a considerable trade with Western Canada commercial operators.

•**York Gears Ltd.:** This Toronto firm manufactures a complete line of gears, gear boxes and complicated assemblies for the Orenda engine.

Other types of gears and assemblies are produced for use in the CF-100 and the F-86. Numbered among York Gears' other customers are Canadian P & W, de Havilland, Fleet Manufacturing, and Rolls-Royce of Canada.

•**Vokes (Canada) Ltd.:** The manufacture of air, fuel, and lubricating oil filters for all aircraft applications is the specialty of this Toronto firm.

CESSNA 310

(Continued from page 92)

Cessna's have included as standard equipment a stall warning light and a stall warning horn heard through the radio at a speed 5-10 mph above the stall.

A fascinating "extra" on Lauretide Aviation's 310 is the Lear auto-pilot. It is thrown into the circuit by a switch on the pilot's flying control wheel. On the auto-pilot control box is trim for both pitch and roll, plus a rate of roll control knob. Using the roll control, any desired rate of turn, up to 180 degrees per minute, can be set. On this flight, after flying with the auto-pilot in the circuit, the marked impression was of the far superior job it did of flying the 310 as compared to a mere human pilot.

Letting down into Cartierville's circuit, we discovered that the visibility had deteriorated during our absence. The 310's good all-round visibility was appreciated under these conditions. Due to its clean aerodynamic form, it requires more than a little thought to

decelerate to circuit speed of 130 mph; reducing power has a delayed action in reducing speed. Circuit is normal. We progressively reduced speed on finals to 95 mph over the hedge, using a trickle of power.

On the round-out, we found we were over-controlling on the elevator, main reason being "ham hands," although we like to feel that other factors contributed a little.

Stopping Short: When the main gear eventually touched the power was pulled off, the nosewheel making contact almost simultaneously. The ground run is short, although no particular effort was made to brake hard.

For this landing we used full flap, 45 degrees, which allows a moderately steep approach. Flap actuation is electrical and is effected by a large, flat, guarded three-way switch to the right of the engine control pedestal. Flap lowering and raising are fast, but as change of longitudinal trim with flap deflection is small, this is an advantage. Flaps can be stopped and locked in any position between 0° and 45° by placing the three-way switch to neutral. An instrument in the cockpit indicates flap position.

Bad visibility and an adamant air traffic control prevented further circuit work, so we reluctantly taxied back to Lauretide Aviation's ramp.

Cessna's 310 is an exhilarating airplane to fly and has much to commend it. It will out-perform the majority of aircraft in its class, and will in fact give larger, more powerful machines a very hard race performance-wise.

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