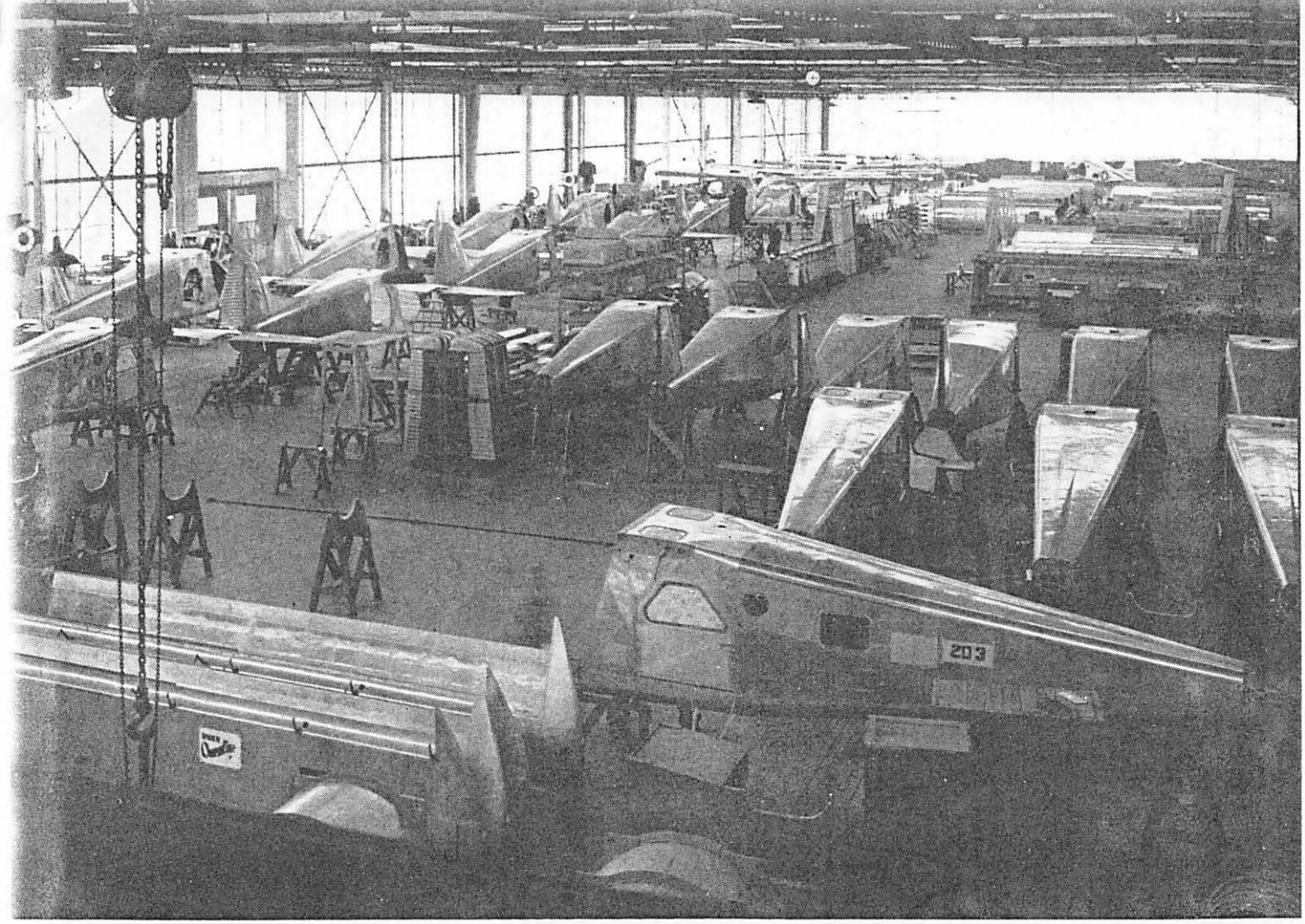
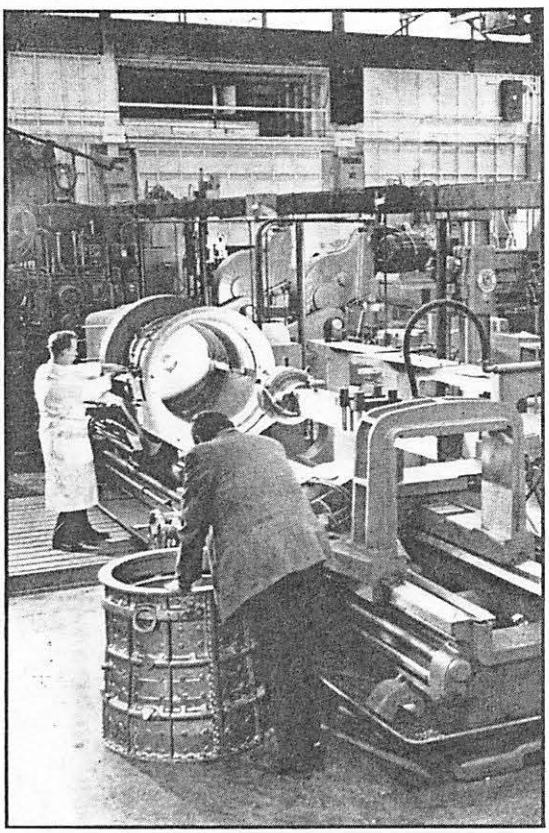




TOP, ONE BEAVER PER DAY IS PRODUCED BY DE HAVILLAND. BELOW, ORENDA PRODUCTION AT AVRO.

A Report on Canad a

IT THROBS WITH NEW ENERGY FROM A COOL B

IN THE DAYS of sail, swift ships were oft becalmed for weeks and sometimes months when the winds that propelled them along the trade routes of the world faltered and failed. So it has been with Canada's Aircraft Industry. In the doldrums of the postwar years it has been moved only occasionally by infrequent light airs.

It is true that in the field of development the Industry made some notable achievements. The Jetliner the Chinook, the Orenda, the Beaver, and the Chipmunk all contributed to Canada's growing stature in the highly competitive field of aircraft design and development. In the production phase, however, there were few bright spots. In the five-year period from 1946 to 1950, only the Canadair Four (and North Star), the Beaver, the Fleet Canuck, and the Chipmunk were produced in appreciable quantities. In all these totalled a piddling 774 complete machines with an aggregate selling value at the factories of just $61,420,191. And about $52,000,000 of this dollar value was made up by the 71 Canadair Fours and North Stars produced by Canadair Limited for TCA, the RCAF, BOAC, and CPA.

For an industry that in the previous five years had turned out 14,584 complete aircraft with a total

a's Aircraft Industry

BILLION AND A HALF DOLLAR TRANSFUSION

value of $706,796,228, the lean years that followed offered what looked like, and was, a starvation diet. Some companies who had been major producers during the fat war years took one look at what was in store for the Industry and bolted the scene. On the other hand, there were a few daring firms from abroad who examined the Canadian situation and ostensibly decided that since things couldn't get any worse, they were bound to get better soon. Canada, they optimistically felt, had a good future as a producer of aircraft and associated products.

Notable examples of foreign firms who decided since the war to stake out a claim on a part of Canada's aviation future are A. V. Roe & Company Limited, of Manchester, England, and Electric Boat Company of Groton, Connecticut. These are among the very first to take the step. Since then there have been many others whose names are known to the aviation industry the world over. Now established components of Canada's Aviation Industry are Lucas-Rotax Limited — subsidiary of the associated British companies, Rotax Limited and Joseph Lucas (Gas Turbine Equipment) Limited; Sperry Gyroscope Company of Canada Limited — a subsidiary of Sperry Gyroscope Company of Great Neck, N.Y.; Fairey Aviation Company of *(Please turn to p. 20)*

AT TOP IS THE CF-100 FINAL ASSEMBLY LINE AT AVRO CANADA; BELOW, CANADAIR'S MACHINE SHOP.

Canada Limited—subsidiary of Britain's Fairey Aviation Company Limited; Bristol Aeroplane Company of Canada Limited—subsidiary of Britain's Bristol Aeroplane Company; Godfrey Engineering Company Limited — subsidiary of Britain's Sir George Godfrey & Partners Limited. More recently another U.S. company has joined the fold: Canadian Steel Improvement Limited, a subsidiary of The Steel Improvement & Forge Company, has been established for the express initial purpose of forging turbine and compressor blades for Avro Orendas.

Not to be overlooked are those companies which established in Canada during the war years and after looking over the postwar situation decided to stick around. Most of these have not only held their own, but have also carried on steady programs of expansion. Prominent in this group are Rolls-Royce Montreal Limited, and Dowty Equipment of Canada Limited.

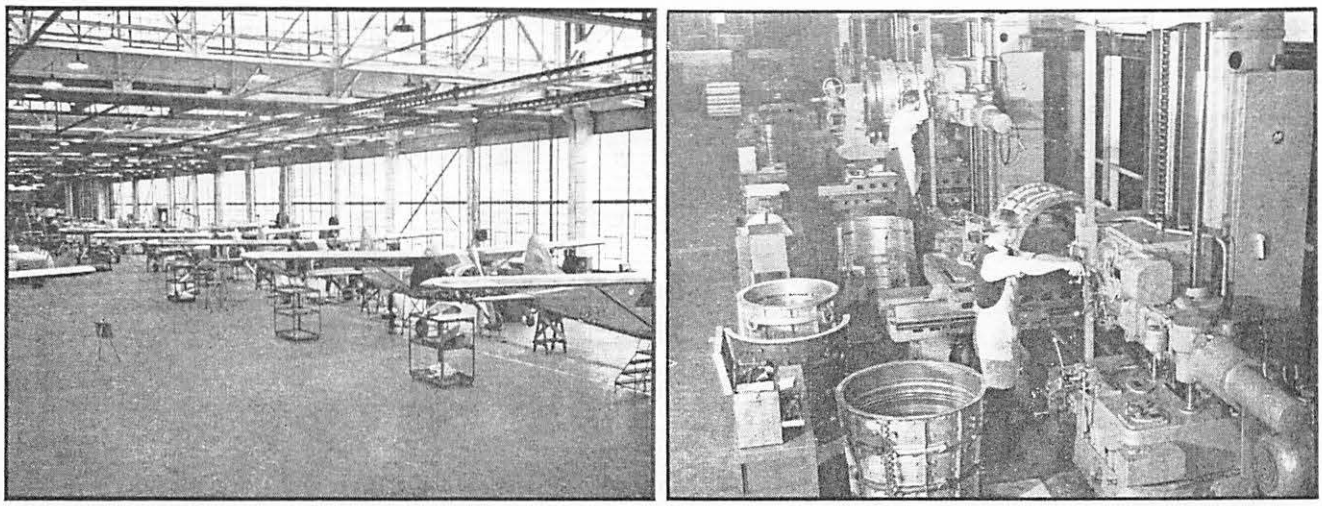
Significant: The decision of these companies to establish manufacturing facilities in Canada would not be particularly significant if they were simply airframe constructors. Canada has been building airframes ever since controlled power flight became a practical reality. However, their presence means that within, at the outside, two years, Canada's Aircraft Industry will be to all intents and purposes, self sufficient. By then it will be manufacturing for Canadian use and for export, not only airframes of the most complex character, but also turbojet engines, small reciprocating engines, propellers, both cordite and electric starters for turbojets, magneto parts, cabin superchargers, cabin refrigeration units, complete hydraulic undercarriages, high pressure hose, ejection seats, and an almost complete range of aircraft instruments and gyro devices, including such intricate equipment as the Sperry Zero Reader and the Sperry gyro gun sight. In addition, the Industry will produce, in quantity, magnesium castings and precision ball bearings for use in both airframes and engines. Practically all of these items will be in production by the end of this year and in all cases peak production should be attained by the end of 1953.

Without exception, the production of this and other associated equipment is far advanced on the road to reality. Plants are now near completion for the production of Pratt & Whitney R-1340 Wasps, Avro Canada Orendas, Rolls-Royce Nenes, Sperry instruments and gyro devices, Lucas and Rotax equipment (fuel systems, starters, etc.), and turbine and compressor blades. Most of the companies concerned expect to be in their new plants by midsummer. In some cases, machine tools may be a bottleneck, though for the most part needed tools are being accumulated in spite of critical shortages and hot competition to obtain what is available. There are, of course, a large number of the companies that have been established in their present plants for some time and are already well into their programs.

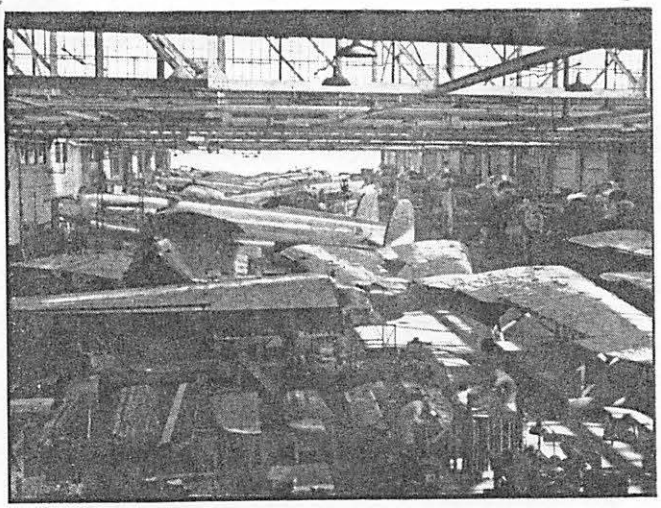
Make no mistake about it, the Canadian Aircraft Industry's manufacturing facilities have left the blue print stage well behind and are very much composed of bricks and mortar. What lies ahead is largely a job of putting the finishing touches to the buildings and moving the production machinery in.

The Exception: With the exception of the new Canadian Pratt & Whitney and Rolls-Royce engine plants, many of the new factories to be used by the firms referred to previously are being financed by the Department of Defence Production. However, even in these cases the firms involved are making extensive plans to continue operations after the present program is concluded. These plans involve the purchase of the buildings which the DDP is financing initially. It is possible to look ahead in this way because most of the companies concerned manufacture lines of industrial equipment and equipment for use in fields other than aviation. Thus, if the aircraft program tapers off, their facilities can be kept going on other types of work without difficulty.

In the early days of the aircraft program, some delays were caused by difficulties in getting through the paperwork involved in letting the necessary contracts. These were largely the result of the growing pains experienced by the newly created Department of Defence Production, which came into being on April 1 of last year. This aspect of the program has now been considerably accelerated and at the close of the year, the Department had let contracts for the construction, repair, maintenance, and overhaul of aircraft and associated equipment to the tune of approximately $800,000,000. Since the complete aircraft program (as now planned) is to cost about $1,200,000,000 over a three-year period, it is obvious that



FINALLY ASSEMBLY OF DE HAVILLAND BEAVERS IS SHOWN AT LEFT WHILE AT RIGHT ORENDA COMPRESSOR CASINGS ARE MACHINED.



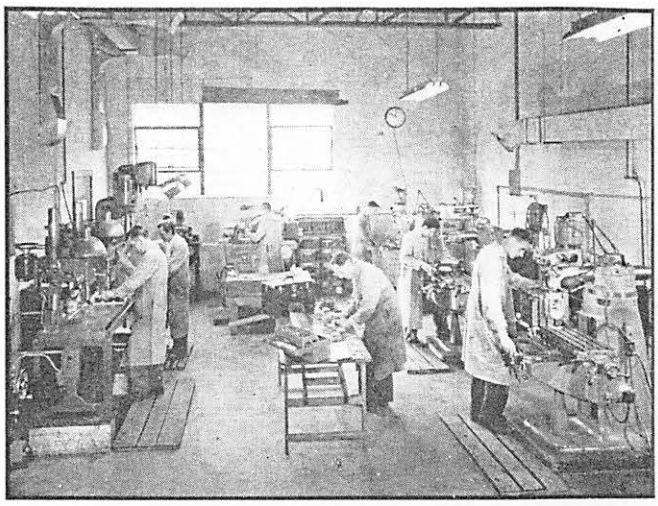


PHOTO AT LEFT SHOWS LANCASTERS IN DE HAVILLAND CONVERSION SHOP. AT RIGHT IS GODFREY ENGINEERING SHOP INTERIOR.

this phase of the paperwork at least is giving little cause for complaint.

Of the expenditure of $1,200,000,000 about $1,000,000,000 will go for new aircraft, engines, and ancillaries. Of this sum, an estimated 80% will be spent in Canada, most of the rest going to U.S. firms and some to the U.K. The remaining $200,000,000 will be used to pay for the repair, maintenance, and overhaul of military aircraft.

Add to the spending for the RCAF, that for NATO and the USAF, both of which are to get Sabres from Canadair. Orders for these two forces may easily bump up the Industry's backlog by another $400,000,000 or more.

out of the doldrums

IT IS NO NEWS that the freshening breeze that has moved the Canadian Aircraft Industry out of its postwar doldrums emanated in June, 1950, from an unheard of Asiatic country with the unheard of name of Korea. This breeze, which soon turned into a scorching wind, not only made it necessary for Canadian citizens to learn to pronounce "Panmunjom", but also brought a somewhat hazy international situation sharply into focus. It was clear that Canada, like other countries, had to look to her defences much sooner than had been thought.

In choosing a weapon, Canada had had selected air power. Originally it was thought that this weapon could be forged at a somewhat leisurely pace. The two front line aircraft, the F-86E and the CF-100, would be built in Canada and eventually powered with a native engine, the Orenda. For some time to come other types of military aircraft — trainers, transports, maritime reconnaissance, light bombers — would come from stocks of airplanes that had been left over from the war years. These were around in sufficient numbers to satisfy the airborne services' needs as long as the we've-got-lots-of-time school of thought prevailed. Until the delivery of the first F-86 in 1950, the only new aircraft purchases since the end of the war had been some 20 North Stars, 80 Vampires, 20 Auster AOP aircraft, 50 Hawker Sea Furies, and 50 Fairey Fireflies, plus a handful of a number of other types.

Lots of Planes: The standard trainer was the Harvard — lots of those to carry out the meager pilot training program. The standard medium transport was the Dakota—plenty of them; there wasn't anywhere to go anyway. For maritime reconnaissance and photo survey there was a glut of Lancasters. That's the way it went in almost every category of aircraft. For the most part they didn't exactly fit in with the popular picture of the jet age, but they all had many hours of flying life left in them. It would have been foolish and fantastically expensive to try to replace them with more modern types, especially when the aircraft at hand could quite capably carry out any job that was likely to come to hand in the foreseeable future.

The events that followed the Korean outbreak are now a familiar story. The RCAF had to be expanded, and fast. What's more, Canada was a member of NATO and as such, she had to contribute something to the mutual effort. It was decided that Canada would do her part by training aircrew from all the NATO countries. Coupled with the RCAF's own requirements, this would mean training pilots, navigators, and wireless operators at a peak rate of 3,000 per year. In addition, Canada promised to send eleven fighter squadrons overseas to help buttress Western European defences. It was quite a commitment, and to carry it out the RCAF needed, even more than men, planes, planes, and more planes.

Alchemy: Almost overnight, those Harvards, which were made of metal and painted yellow, came to be looked upon as being pure gold. Many were the sad looking machines that were dragged out of dusty corners and sold back to the Air Force. And many an abandoned prairie airport that had spent several years under a shade of a forest of Lancasters, found itself exposed to the bright sunlight once again. But the wartime leftovers didn't even begin to fill the bill. In some cases there just weren't any wartime types that could do some of the jobs that had to be done.

And all the time it was hurry, hurry, hurry. We need more Harvards to train our pilots, said the Air Force. So a hundred were borrowed from the USAF (who wanted them back as soon as possible, please) and another 500 were ordered from Canadian Car & Foundry. We need a lot of two-seat jet trainers to convert our pilots from Harvards to jet fighters, said the Air Force. So 20 T-33s were bought from Lockheed Aircraft and another 575 were ordered from Canadair Limited. When we've got our pilots trained, we need fighters for them to fly so we can form our squadrons, said the Air Force. So the orders for F-86E Sabres were added to and multiplied and Canadair began

turning them out at a nice clip which, they regretfully explained, was held back only by the lack of engines (these had to be obtained from the USAF). And now the aircraft program has overcome its intrinsic inertia, though it's still moving at a chuffing pace. So it's still hurry, hurry, hurry.

cause for satisfaction

THERE IS considerable cause for satisfaction with the progress that the Industry has made. Considering the slim pickings that it has had for the past few years, it is reason for wonder that it has been able to shoulder so big a load so fast. It is unfortunate that engineering difficulties with the CF-100 have slowed its production and delayed its getting into squadron service. It is a fact that this is an aircraft under development and as such it can't be hurried along. Production can be accelerated, but development always takes time, even when the situation calls for hurry, hurry, hurry.

No serious snags have apparently been encountered with the Orenda and they are being turned out on a limited basis in Avro Canada's experimental and tool proving shops. Not until the new engine plant is completed this summer will the Orenda be manufactured in substantial numbers.

While it was intended to power the Canadair-built F-86s with Orendas, production of the Sabres was so accelerated immediately after the Korean War started, that over 200 have now been turned out . . . all powered with General Electric J-47s. With few Orendas likely to be available before the beginning of 1953, it is improbable that any of the Sabres will be powered with this engine. By this time, too, enough CF-100s should be coming along to absorb all the initial production of Orendas.

Preparations: Tooling is now under way at Canadair preparatory to the production of the T-33A and it will possibly be approximately one year before the first aircraft is produced. Since the first engines (R-R Nanes) for these aircraft are to be obtained direct from Rolls-Royce in the U.K., where they have been in production for several years, no delay is expected insofar as powerplants are concerned. Of course, the bulk of the 900 Nenes which are on order will be assembled in a plant now being built at Montreal for Rolls-Royce. The engine components for the whole order will, however, still be largely supplied from the U.K.

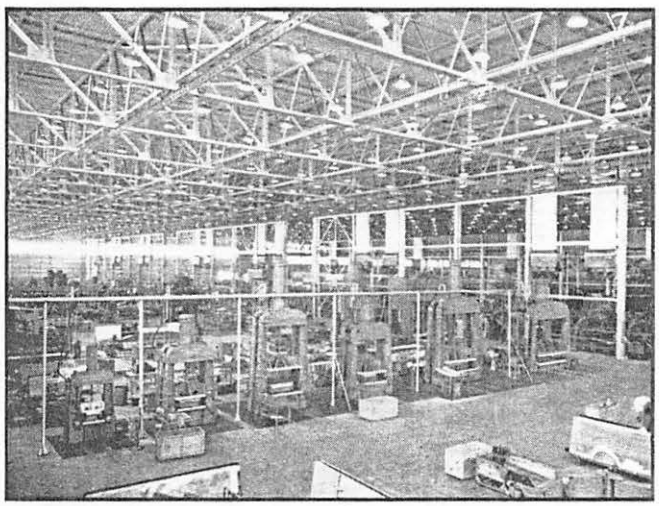
Production of the T-36 crew trainer by Canadair for the USAF is yet some time off, this project having so far advanced only to the stage of the construction of a mock-up. The number of airplanes involved in this order are reported from American sources to be 250-300, which would place the dollar value at around $200,000,000. It should be noted that there has never been any official announcement by either the USAF or Canadiar as to the number of machines involved or their approximate value.

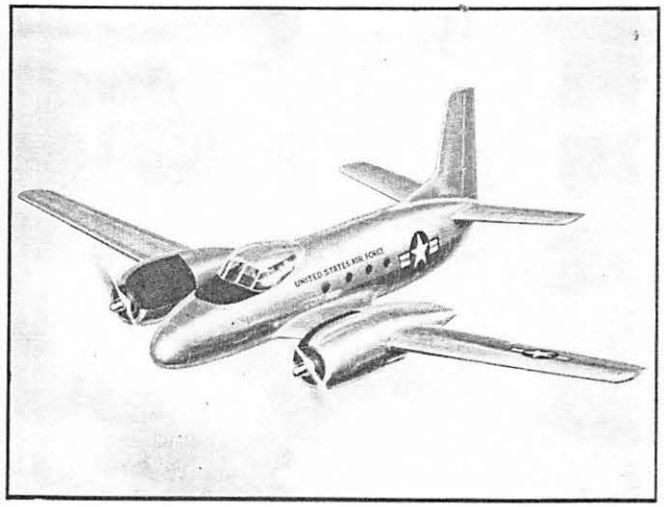
The de Havilland Aircraft of Canada is busily engaged in turning out Beavers at the rate of one a day, mostly for the USAF and the U.S. Army. About one in every six machines is for a civilian customer. On the development side it is working on its Otter, with the prototype rapidly accumulating test time, while good progress is being made on the construction of a second aircraft. The first prototype was designed, developed, and built with the financial help of the DOT and the RCAF. In view of this, orders may be expected from the RCAF (which has never bought any Beavers), while additional orders for the Beaver (the first requirement was for 108) are expected from the two U.S. services.

Parts on Hand: At the Fort William plant of Canadiar Car & Foundry the Harvard program is making progress. About 40 machines have now been assembled from stocks of parts that were left over from World War II. The 41st aircraft is to be the first to be assembled from newly fabricated parts. This company is also supplying Harvard parts to Air Forces all over the world. Canadian orders are for 200 Harvard IV aircraft and 300 Harvard T6J machines (the latter differs from the former mainly in cockpit layout). Orders are expected for another 500 from the USAF and NATO countries, though they have not yet been forthcoming.

At Canadian Car & Foundry's Point St. Charles plant in Montreal, the production of propellers to Hamilton Standard design is well on its way. Difficulty has been experienced in obtaining propeller blade profiling machinery, so the first propellers will have blades supplied from government

(Continued on page 70)





AT LEFT IS A PORTION OF THE MIGHTY CANADAIR PLANT. RIGHT IS THE BEECH T-36 WHICH THIS FIRM IS TO BUILD FOR THE USAF.

he was responsible for its operation as well as for aerodynamic research conducted at the University of Toronto. In 1919 he gave the first course of lectures on aeronautics at the University. Nine years later, he initiated, planned, and instructed at Toronto the first undergraduate aeronautical engineering course in Canada. In 1929 he was appointed Assistant Director, Division of Physics, National Research Council, in charge of aeronautical research. In 1937 he became Director of the NRC's Division of Mechanical Engineering. He became the Director of the NAE when it was established in January of last year.

Dr. Patterson is not only the Director of the Institute of Aerophysics but also its designer. In addition he is Professor of Aerodynamics at the University of Toronto. Considered one of North America's leading authorities in supersonic research, Dr. Patterson is the Canadian who set up the Australian Government's aerodynamics laboratory during the war. Besides his work in Toronto, he is also a member of the aerodynamics panel at the USN Ordnance Laboratory, White Oak, Maryland, where he spends one week in four.

CANADA'S AIRCRAFT INDUSTRY

(Continued from page 24)

stocks. Production is well advanced on the hubs, however, and the first complete propellers (with CanCar hubs and government blades) will be delivered in August. In the following month, Canadian Car will be supplying the blades as well. Also at the Point St. Charles plant, undercarriages and hydraulic equipment for the Harvards are being produced.

Up to this point, little mention has been made of the repair, overhaul, maintenance, and modification phases of the Industry. While the dollar volume being expended on this work is small compared to the amounts being spent on new aircraft purchases, it is nevertheless comparable in importance. Most aviation companies concerned with these phases were active in this field long before Korea, and the aircraft program since has meant in the majority of cases an expansion to the full capacity of their existing facilities.

Overlapping: There is quite a high degree of overlap in the repair and overhaul work and manufacture of the end product or of parts for the end product. That is, many companies do both types of work. The de Havilland Aircraft, for instance, carries out a large Vampire repair program in addition to the manufacture of Beavers, the modification of Lancasters, and the overhaul of Goblin turbojets. In fact, Avro Canada and Canadair Limited are probably the only two companies in Canada whose efforts are devoted almost 100% to the development and manufacture of aircraft and engines.

At the present time, the Industry is employing over 27,000 persons (on manufacturing, repair, overhaul, maintenance, and modification), a figure that will possibly exceed 52,000 when peak production is attained in all phases. Naturally, any change for the worse in the international situation would mean that the whole aircraft program would be enlarged considerably, which would mean an upward revision of both the dollar value of contracts, a further expansion of the Industry's capacity, and an increase in the number of personnel.

A change for the better in the

international situation is not likely to produce any cutbacks in orders, since the present program represents the minimum considered necessary to provide adequate air defence. As a result, Canada's Aircraft Industry can count on a substantial backlog which will see it through the next ten years. The lean years are past for the present at least. Who knows, they may never come again.

E. V. RIPPINGILLE

(Continued from page 17)

up for a jet trainer and twin engine navigation trainer.

Many other projects have been or will shortly be completed. Products new to Canada, such as instrument bearings, precision aircraft forgings, aircraft engine gears and fuel systems are rounding out the program and further ensuring the availability of components to this rapidly expanding industry.

While the production rates are relatively low and the design and change problems ever present, we must maintain these facilities ever ready for immediate expansion to produce the greatest possible aircraft of the most modern and most effective design.

C. D. HOWE

(Continued from page 15)

production or producing components in this country for the first time.

In the past year we have seen steady progress made in the preparations for the production of aircraft to meet our defence requirements. The tooling up and preparatory period is of necessity somewhat long drawn out where many of the items to be produced are still in the development stage and when in many cases new plants and facilities had to be set up. It should, however, be borne in mind that we have been working on the basis of a three-year programme. On the whole, our progress in this first year has been satisfactory.

Looking ahead, I feel that the programme will move at an increasing pace during the coming year. The pattern is pretty well laid down now. In this period of accelerated preparedness, as during the last war, I am confident that our aircraft industry will serve Canada well.