POWER FOR THE AVIATION INDUSTRY WILL COME FROM THE NEW PLANTS OF AVRO CANADA (TOP) AND CANADIAN P & W (BELOW)

BIRTH OF AN INDUSTRY

Canada's New Power Plants

WITHIN the last two weeks of September, three new plants—all for either the manufacture or overhaul of aero engines—were exposed to the public gaze for the first time. Construction of none of the three plants was started before March of 1951. Two of these official openings were particularly significant, for they marked the beginning in Canada of aero engine manufacture, from unshaped metal to finished product. The three new plants are:

• The A.V. Roe Canada Limited Gas Turbine Division's Orenda engine plant at Malton, Ontario, officially opened on September 29. It has orders from the Department of Defence Production valued at $66,000,000.

• The Canadian Pratt & Whitney Aircraft Limited Manufacturing Division's aero engine plant at Jacques Cartier, P.Q., shown to the press for the first time on September 19. Defence Production orders for R-1340 engines total over $30,000,000.

• Canadian General Electric Company Limited's Downsview Works, on Downsview Airport, near Toronto, for the overhaul of axial flow turbojet engines, officially opened on September 24.

The first two of these are the manufacturing plants already noted. Their addition to Canada's Aviation Industry brings it a considerable distance closer to full maturity. The establishment of this new manufacturing industry has had a chain reaction throughout Canadian industry as a whole, and has in fact fostered the founding of a number of satellite industries.

Avro Canada alone can count off some 400 subcontractors and suppliers scattered from the Maritimes to Manitoba. Production of the Orenda is directly responsible for the starting of such plants as the Light Alloys Limited magnesium foundry at Haley, Ontario (castings); Cockshutt Aircraft Limited (combustion systems) at Brantford,

INSIDE THE ORENDA PLANT (L) ROW ON ROW OF MACHINE TOOLS MAKE OR FINISH PARTS LIKE COMPRESSOR CASINGS AT RIGHT

Ontario; Canadian Steel Improvement Limited, Long Branch, Ontario (precision forging of blades); and Canadian Acme Screw & Gear's engine gear division at Toronto (high quality gears). Other companies like Lucas-Rotax Limited, with a new plant near Toronto, are vital not only to Orenda production, but also turn out ancillary products which are used with aero engines of other types. In all, some 70% of the Orenda engine is subcontracted to these and other firms.

Because the official opening of the Avro Canada plant has just taken place does not necessarily mean that the first Orendas are yet to be produced. Preproduction engines were for some time turned out by the tool proving shop and the experimental shop, and then several months ago the former's facilities were transferred to the new plant to become the first production equipment to be installed. With the gradual addition to the new plant of new machine tools, the experimental shop (located in Avro Canada's main plant on Malton Airport) was relieved of its engine production duties and allowed to devote full time to its experimental work.

Initial production rate for the Engine Division has been reported, unofficially, at one a day. However, the peak rate, which will probably be reached in about a year's time, will obviously have to be considerably higher than that. With Orendas scheduled to go in Canadair Sabres beginning next Spring, this requirement alone will gobble up two to three times that amount. And of course each CF-100 requires not one, but two engines.

It is expected that when the Orenda program hits its stride, some 8,000 persons will be employed at the engine plant. Naturally, many thousands more will be affected through the subcontracts.

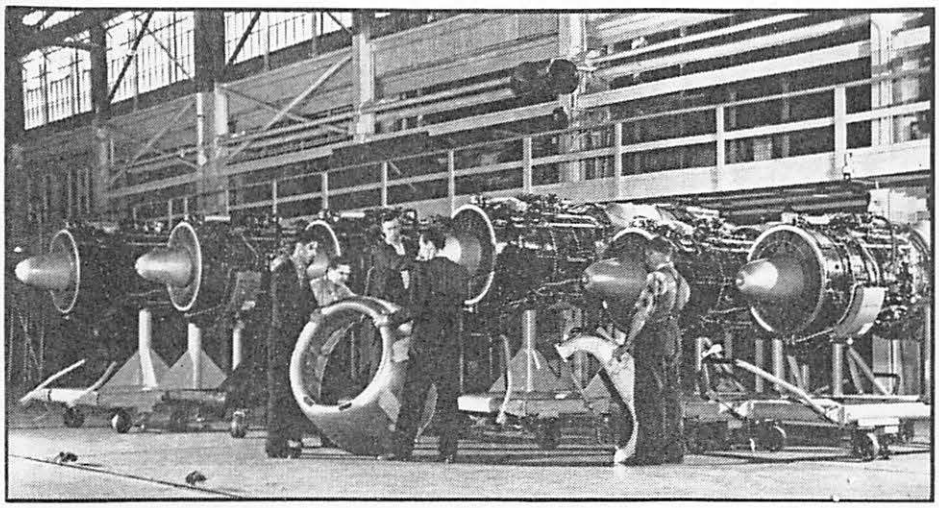
While the rapid and efficient production of Orendas will depend on the co-ordinated efforts of thousands, the three men chiefly responsible for the job are:

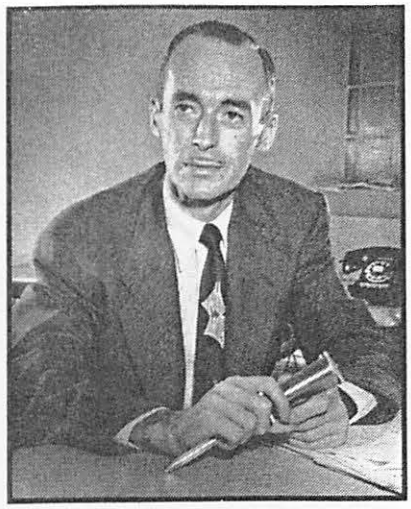
Thomas S. McCrae—general manager of the Gas Turbine Division, Mr. McCrae was appointed to his present position last December. As one of the foremost aero engine engineers in the U.S., he came to Avro Canada from GMC's Allison Division, where he had been assistant director of engineering. Born at Melrose, Massachusetts, in 1904, Mr. McCrae received his formal education at Bates College, Lewiston, Maine, and Boston University. He joined the Curtiss Airplane & Motor Company in Buffalo in 1925 and worked on the development of the Curtiss D-12 Conqueror, the Super Conqueror, the Challenger, and the Chieftain engines. He joined General Motors in Detroit in 1931 and then transferred to the Allison Division of this company in 1936, becoming assistant chief engineer in 1939.

Douglas W. Knowles—chief engineer of the Gas Turbine Division, Mr. Knowles took over this post shortly after the recent resignation of Paul Dilworth. Previously he had been chief development engineer. Mr. Knowles has played a prominent role in the development of a gas turbine industry in Canada. He studied engineering at the University of Toronto and, following his graduation, was sent to England by NRC to study gas turbine aero engines at Power Jets Limited. On his return to Canada he became associated with Turbo Research Limited (the crown company which preceded Avro Canada's Gas Turbine Division). He has been successively head of laboratory design, chief test engineer, and chief development engineer of the Division and its predecessor company.

Zoltan S. Cyma—chief plant engineer of the Gas Turbine Division. Mr. Cyma joined Avro Canada's predecessor, the National Steel Car Company Limited, in 1941. Since then, down through the days of Victory Aircraft, he has been responsible for the planning of the company's facilities. A graduate with a Master's Degree in mechanical engineering from the University of Lwow in Poland, he received the Polish Civil Award for long and outstanding service in that country's aircraft industry. For six years he was works manager of the Podlaska Wytwornia Samolotow (National Aircraft Manufacturing Plant) near Warsaw. Prior to leaving Poland in 1939, he was delegated by the Polish government to take over licenses for development and manufacturing with aircraft firms in France, Italy, Czechoslovakia, Germany, and Great Britain.

About the new plant itself—located about a half mile from the main Avro Canada plant on Malton Airport, near Toronto, the Engine Division covers approximately ten acres and has 462,000 square feet of production space. Added to this is 67,000 square feet to house storage facilities, inspection, raw materials and pre-operations; 34,000 square feet for engine test cells; 70,000 square feet for service buildings and a 50,000 square foot extension





SEVERAL OF THE PRE-PRODUCTION RUN OF ORENDAS ARE AT LEFT. RIGHT IS T.S. McCRAE, G.M. OF AVRO'S GAS TURBINE DIV.

already under construction for assembly and overhaul. The building is designed so that it can be expanded on short notice to double its size.

Of strictly permanent-type construction, the plant is a structural-steel-reinforced brick structure. Its acres of floor are made of 12-inch-thick double-reinforced concrete, giving a 3,000 lb. test base. The roof (there is 22 feet of headroom) is composed of precast concrete slabs, cork insulation and standard roof insulation. This apparently elaborate roof is designed to prevent excessive heat loss (or penetration), an important point in this air-conditioned plant. Because of the precise manufacturing operations involved in fabricating engines, almost the entire plant (12,000,000 cu. ft.) is kept at a constant 73°F. summer and winter. The standards room, where inspection instruments are checked, is kept at 69°F. plus one degree, and relative humidity cannot exceed 45%.

The air conditioning system can handle 81,000 cu. ft. of air per minute in each of the building's eight zones. At present, three 600 ton refrigeration units—with a reserve capacity to take care of any plant expansion—are installed. Fans are part of the system to keep the air moving in the zones.

The air conditioning requirement ruled out windows in the plant—the only windows are to be found in the two-storey administration block at the front of the plant. The elimination of windows also made it somewhat easier to provide uniform lighting throughout the plant. The lighting is exceptionally good (34-40 foot candles at the working level) and is provided by some 13 miles of fluorescent fixtures.

Canadian Pratt & Whitney

SOMEWHAT smaller than the Avro Canada plant, but paralleling it in importance is the 340,000 square foot Canadian Pratt & Whitney Aircraft aero engine plant at Jacques Cartier, approximately one mile from this same firm's engine overhaul and repair centre at Longueuil, P.Q. In one way at least, the establishment of the P & W plant is even more commendable than that of the Avro Canada plant—the former was projected and financed through Canadian Pratt & Whitney's own efforts, whereas the Avro Canada plant is a Government financed and owned facility, managed by Avro Canada on behalf of the Department of Defence Production.

First engine to go into production at the new plant is the R-1340 Wasp, currently in use in the Harvard, T-6G, and SNJ—family of trainers, the de Havilland Otter, the CanCar Norseman, and the Sikorsky S-55 helicopter. These engines will be delivered for military and civil use in Canada, the U.S., and other NATO nations. The first engine is expected off the production line before the end of the year, which would indicate that the program is ahead of schedule.

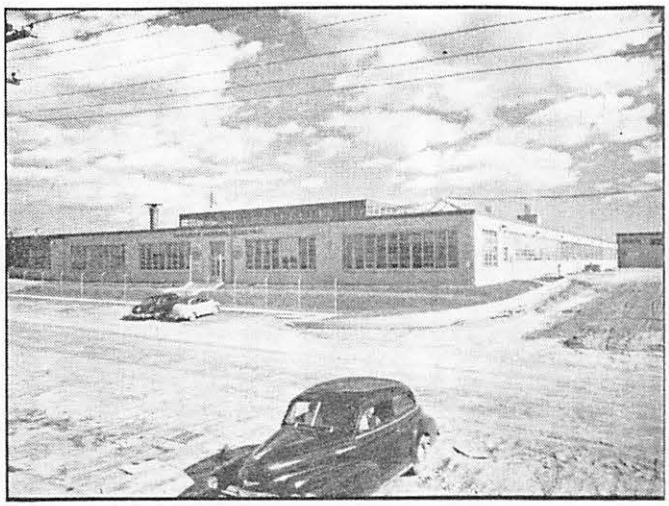
The contract with the Department of Defence Production called for delivery of the first five engines six months after receipt of all necessary equipment. As it is, though there have been delays in the delivery of machine tools, the first engine will be off the line about three months ahead of time, and the other four will follow well within the schedule. Initial production will be upped month by month until an agreed steady production rate is achieved. While this rate has not been revealed, it has been disclosed that the plant has a capacity of some 300 units per month.

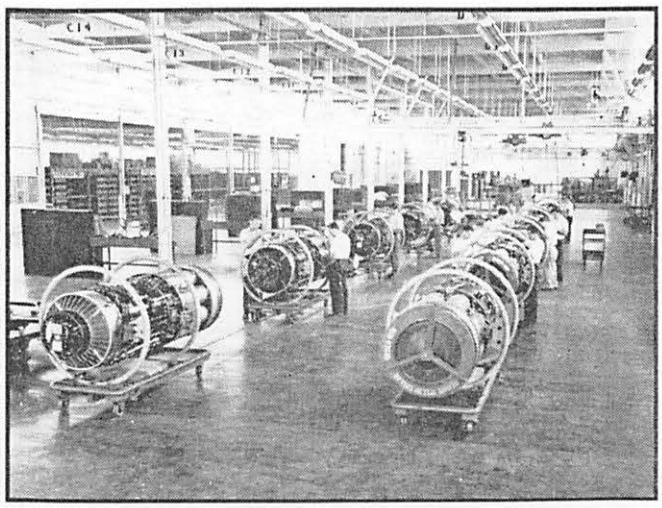
Capacity to Spare: According to Ronald T. Riley, president of Canadian Pratt & Whitney Aircraft, the present production schedules for R-1340's use only a portion of the new plant. When added production is needed, output can be stepped up substantially. The Canadian firm has established an organization capable of producing a wide range of aircraft engines and parts, and plans are already under way to develop production of Pratt & Whitney engines and parts other than the R-1340 (including gas turbines).

Large by any standards, the new plant is of steel, brick, and tile construction, designed for rapid expansion in an emergency. The master plan covers four times the present space, and was scaled down to the initial project in such a way as to require minimum rearrangement in future plant expansion. Such services as test cells, power house, electric power substations, water storage and pumping facilities, railroad sidings, etc., will not have to be moved with the addition of new units to the plant.

Three of the four engine test houses will be for testing production engines. The fourth will be used for proof and development testing. The test houses have been designed to be readily adaptable to other engines, including the largest reciprocating engines and gas turbines.

Planned by T. Pringle & Sons and built by Anglin-Norcross (Quebec) Limited in line with the most modern





LEFT IS CANADIAN GENERAL ELECTRIC'S NEW AXIAL TURBOJET CVERHAUL BASE. INTERIOR AT RIGHT SHOWS J-47'S ON THE LINE

design practices, the new plant is mostly of one level construction. The office portion of the building is on two levels, 480 feet by 60 feet. The top floor houses manufacturing offices and general executive offices of the company, while the ground floor is occupied mainly by the cafeteria, personnel and employment offices.

Flexible Layout: The factory floor is open with columns on 40-foot centres, providing maximum flexibility and allowing machining lines to run in either direction. Other features includes fluorescent lighting throughout plant and offices. Wood block flooring throughout the factory, with its foot-easy qualities, dampens vibration and provides a dust free surface under the heaviest of loads.

Total area of the development, including landscaped area and parking spaces, covers approximately 23 acres, less than 15% of Canadian Pratt & Whitney's more than 165 acres.

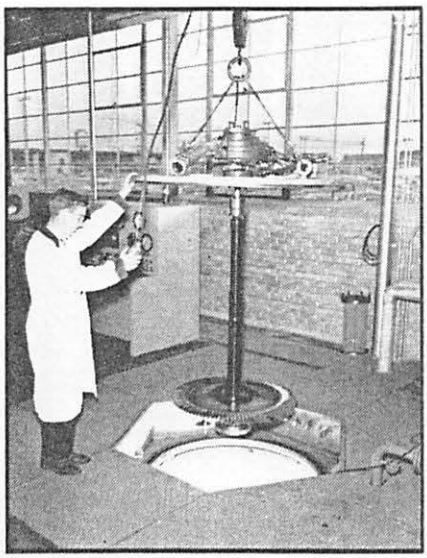
The company's building-to-operation schedule is impressive. Within two weeks of obtaining the original letter of intent from DDP to build Wasp engines, the architects had been chosen. That was on March 2, 1951. Ten days later an option was obtained on the land. Soil was first broken on June 7 and the last of the steel was in place by January 11 of this year. A month later, a pre-fabricated concrete roof covered the open skeleton of steel and brick. By the end of February work had progressed sufficiently to provide storage space for machine tools. The first production operation was started on May 12, when the first lathe started cutting metal.

Key man in the Canadian P & W Manufacturing Division is John W. R. Drummond, vice-president, manufacturing.

Axial Overhaul Base

ALTHOUGH it is not the first gas turbine engine overhaul centre in Canada (de Havilland has been operating one for the overhaul of Goblins since late in 1949), the new Canadian General Electric Downsview Works is nevertheless the first such facility for axial flow engines. Until its opening some months ago, General Electric J-47 engines from the RCAF's Sabres were sent down to the U.S. for overhaul.

This was, or at least it could have been, a fantastically lengthy and costly procedure. Any one engine took six months from the time it was shipped to the U.S. until it was returned to Canada. Even a longer time was involved if the RCAF did not keep a steady flow of engines going to the overhaul centres in the U.S. Like any other pipeline, this one worked best when it was kept full all the time. To keep it full, however, required an enormous number of engines, and to tie up engines in this manner is naturally quite costly. In actual fact, the RCAF was recently able to work out a temporary agreement with the USAF whereby RCAF engines in need of overhaul were exchanged for already overhauled USAF engines.



G.E. TURBINE SPIN PIT

While the new plant is overhauling J-47's only at the present time, current RCAF plans call for it to become also the main centre for the overhaul of Orendas. The plant will, of course, overhaul only those engines in use in aircraft in Canada; those from the Air Division will go to Bristol Aeroplane Company, which has elaborate overhaul facilities in the U.K.

At present, the Downsview Works has about 72,000 square feet of floor space and employs 100 persons. Like other defence facilities which are being constructed at various points across the land, it is housed in a substantial steel, brick and concrete structure, readily adaptable to rapid expansion. Construction was first started in March of 1951, and the first engine was overhauled within 18 months of this date.

The plant contains all the facilities necessary to disassemble, repair and overhaul, re-assemble and test the complete engines and their accessories.

Like the Orenda plant, the Downsview Works is owned by the Canadian Government, but it is operated by Canadian General Electric, which was responsible for all the planning required to bring the overhaul centre into being. Works manager is D. L. Davis.