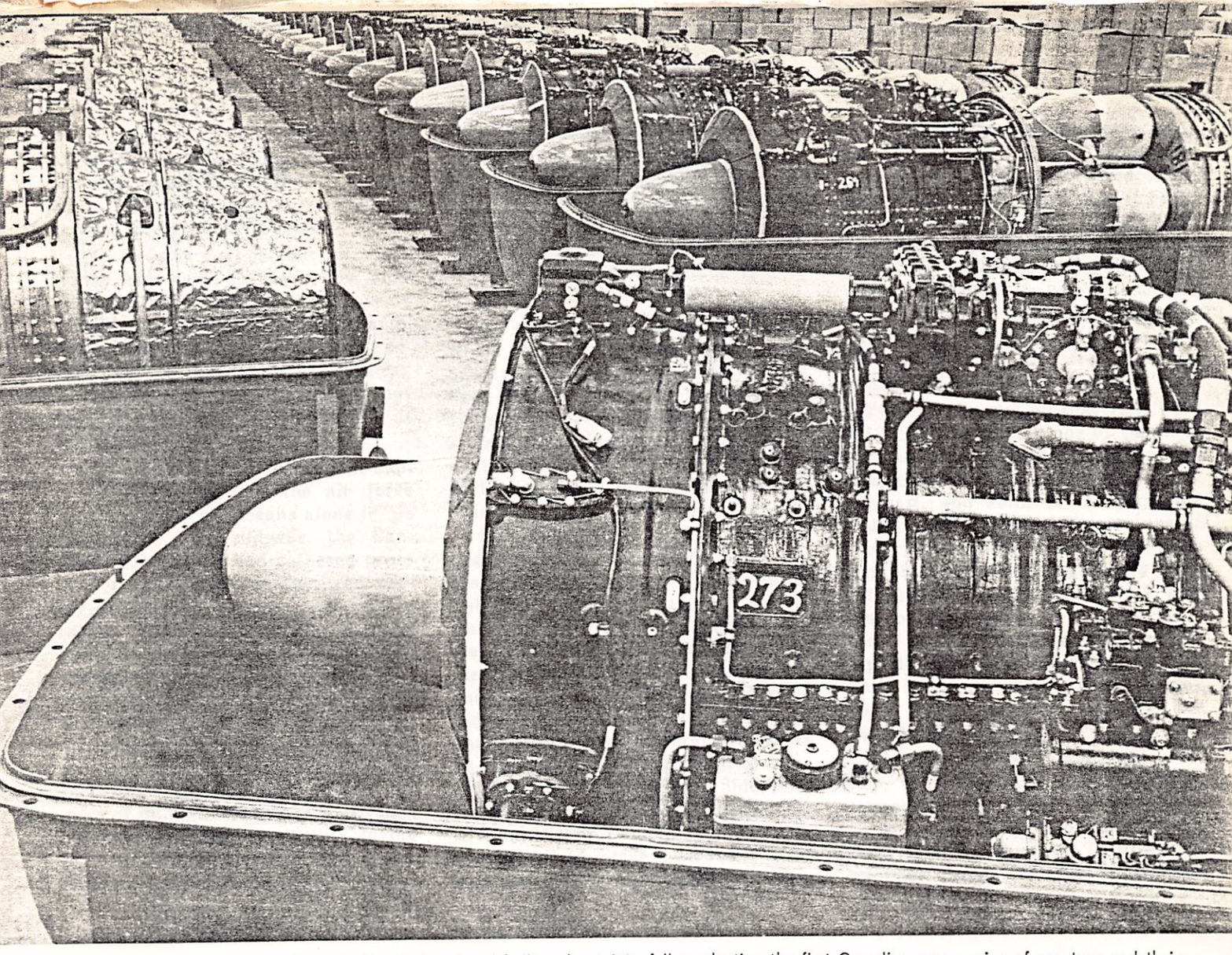
CF-100 Canuck 792 1950-58

Clarence Simonson

ONE day in 1942 a Royal Canadian Air Force officer had a strange and frustrating duty to perform. The Japanese were poised in the Aleutians for a possible sweep down Canada's west coast. The RCAF was desperately short of planes to meet any such attack. Canadian squadrons at home and abroad were operating with second or third line planes or fretting on the ground with no planes at all. Yet this officer had to appear before an aircraft allotment conference of non-Canadians to plead for aircraft which had been built in Canada by Canadians – but, as was usual in Canada, under a licence from the original manufacturer which gave Canada no jurisdiction over the finished product.

He was beaten. The planes were assigned to Russia; Hurricanes, built at Fort William, Ont. Australia, he thought, probably would have been second choice. It turned out later that the Canadian government was able to keep these planes by simply refusing to let them be shipped out of the country in that dangerous time. But nevertheless the lesson was there. The officer said later, "Maybe they did need the planes more than we did. I don't know. But I do know that we needed them very badly. And I realized right then, walking out of that room and feeling every inch a failure, that until we didn't have to tip our hats to anyone to get aircraft when we needed them, we'd never have the air force a first-rate nation really deserves."

A year later, an Englishman landed in Montreal from a York transport. He was of medium height and medium weight, and he looked tired. He had every right. Days and nights for years he had been pushing and shoving at the development and production of a big bomber called the Lancaster. Now they filled each English dusk with their steady, purposeful roar, and some nights in the south of England they seemed to stretch to every horizon as they headed out in swarms for Europe. Still, the closest thing to a real rest that his associates could persuade him to take was this busman's holiday, a look at the Canadian aircraft industry.



"They would wind up ten years later having designed and built and put into full production the first Canadian aero engine of any type and theirs a top-ranking jet . . ."—The Orenda.

What did he find?

"It opened my eyes, I'll tell you. 'If these so-and-sos can do this during a war,' I thought, 'what *can't* they do after?' I thought some more. 'Why shouldn't this country eventually be as important as the U.S.?' No reason at all. But one thing it would need was an aircraft industry of its own — design and development, not just assembling somebody else's stuff. After a while I said to myself, 'Why don't I have a go'?"

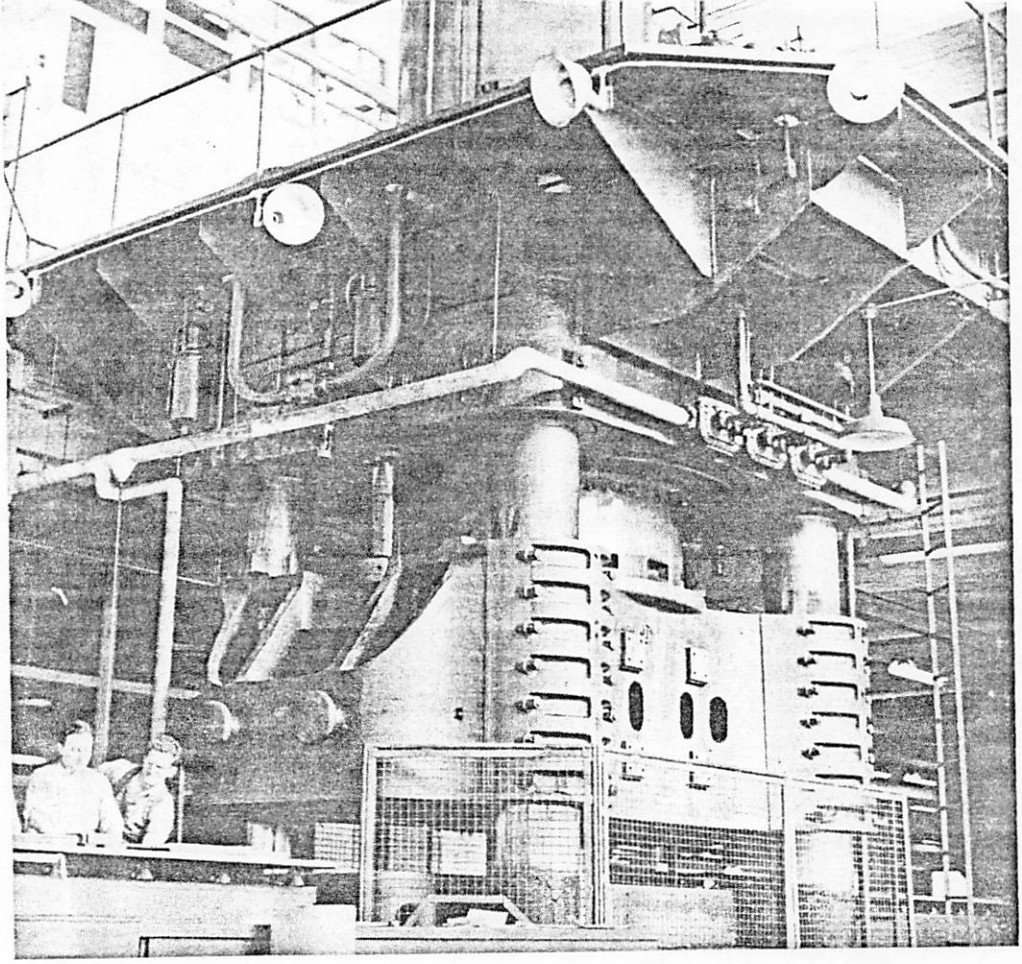
If the courses of men and nations were as direct as recognizing a need and then moving in to fill it, the 10-year story of A. V. Roe Canada Limited and the companies now operating under it could be told very simply indeed. The Englishman with the know-how could get in touch with the frustrated but eager Canadians and say, "Look here, let's get into this thing together." They could go to the government and say, "Look here, sell us an aircraft plant and give us some contracts and we'll hire fifteen thousand people and get a few hundred other Canadian companies building parts for us and get at it."

This all would be done.

And they would wind up ten years later having designed and built and put into full production the first Canadian aero-engine of any type — and theirs a top-ranking jet. They would have designed and built and put into full production the first all-Canadian fighter aircraft, a twin-jet recognized as the best in its class in the world. They would have led North America by five years in the race to get a jet transport into the air, missing only by days the honor of being first in the world. By all these achievements, they would have developed engineering and research facilities that never had existed before in Canada. Using these new skills, they would be getting ready for production of another home-grown fighter designed to fly at supersonic speeds and lead the world. They would have running on the test-beds a new jet engine which eventually will power that new fighter, an engine that opens up exciting new vistas of aero power. And they

"They would have designed and built and put into full production the first all-Canadian fighter aircraft, a twin jet recognized as the best in its class in the world . . ."—The CF-100.

RL 890-1955



In declaring machinery surplus, here was a big question: Would fighters of the future need this 5,000-ton press, bought specifically for bombers? The answer was "yes"—a guess then, a godsend later.

chief test pilot, had been a Lancaster test pilot. For six months he greased Lancasters for storage until in mid-1946 there were aircraft to test again. Ernie Alderton, now Avro Aircraft's industrial relations manager, had been Victory Aircraft's general foreman. His first job under A. V. Roe Canada was to unload personally and by hand a truckload of eight by eight timbers to put under the axles of Lancasters going into storage, to hold the tires off the ground. Murray Willer was one of the six left of hundreds who had been in the service department. He is now Avro's assistant to the vice-president, sales and service. Earle Brownridge, now vice-president, manufacturing, of Orenda Engines, was in the standards department. He was laid off for a couple of weeks. Then he was recalled. His first job then was to assist S. L. Wilson, who had been head of Victory's industrial engineering department, had been left as the sole member of that department, and now holds the same position at Avro Aircraft.

Zoltan S. (Stan) Cyma, who had been chief plant engineer from the days when National Steel Car owned it, remained in that job, and had one of the hardest fights of all. Much machinery owned by the government had to be declared surplus. Included in the first surplus list was a 5,000-ton press which Stan Cyma had picked out and bought specifically for making bomber parts. Only he believed that the fighter of the future would be so big that it would need a press like that, and he fought like a tiger to have it taken off the surplus list. "Thank God he did," Fred Smye said later. "That press saved our lives." For it did turn out that the new fighters indeed needed a press of at least that size.

These and the few hundred others were key people, the originals. (All but 50 of them are still with Avro Aircraft or Orenda Engines, two of the four companies which now make up the A. V. Roe Canada group.) They didn't care what their jobs *had* been. It was the future which interested them. At first they did whatever the new management could find for them to do — storing Lancasters, making forms for plastic hair brushes, fenders for trucks and tractors, designing

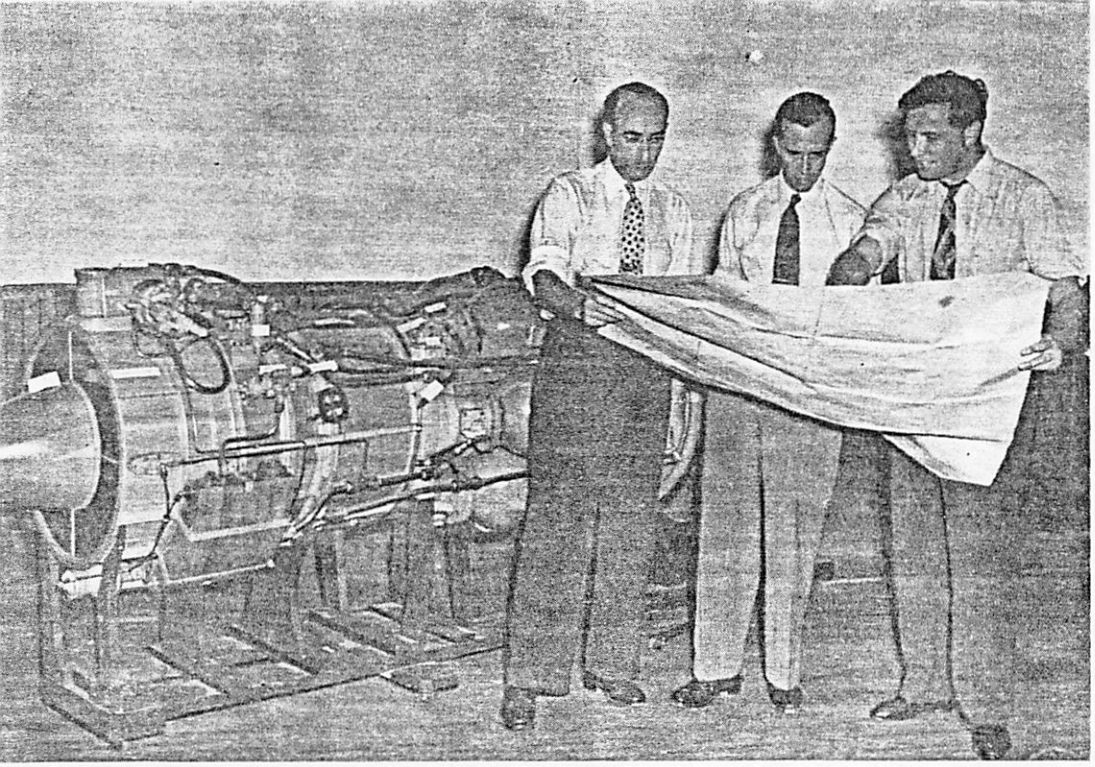
Dave Wagner

Murray Willer

Laurie Marchant

Stan Cyma

Jack Hilton



A. V. Roe Canada's first jet engine was the Chinook. By this wooden mockup are key people Joe Morley, then sales and service manager; Paul Dilworth, first head of the gas turbine group; and Winnett Boyd, project engineer on the Orenda.

an oil furnace, dozens of other small jobs, all visibly removed from the original dream of an all-Canadian aircraft industry, from the ground up.

And then the future began to open out into what it has now become.

Sir Roy was the first president. Chairman of the board was J. P. Bickell. The first directors' meeting was held and the constitution drawn up by J. S. D. Tory, then and still a director. Despite foreign exchange restrictions which made it impossible to send money out of Britain at that time, Hawker Siddeley was able to finance the project entirely by guaranteeing a Canadian bank overdraft of several millions to buy the property and provide working capital. Walter Deisher, a man of high prestige in the Canadian aircraft industry, was brought in from Fleet Aircraft as the first vice-president and general manager. Fred Smye, the catalyst who had helped to fruition so many fervent hopes besides his own, became assistant general manager — sales and contracts. Edgar Atkin came from Avro Manchester as chief engineer, and with him a fair-haired, sandaled young man named Jim Floyd who had worked in the design teams for the Avro Anson, the Lancaster, and the York. All they needed now was work, and by work they meant not so much the aircraft repair and overhaul and storage and conversion jobs which were the company's bread and butter at that time and later, but work which pointed toward the company's original aim — to produce, from drawing board into the air, a Canadian aircraft.

And at this time, early 1946, something happened which provided really the full basic rounding of the company. From as far back as 1943 the government, through the National Research Council and later a crown company called Turbo-Research Limited, had been doing research work on jet engines. Turbo-Research now had a jet engine at the design stage. The government either was going to have to put in a lot more money to produce a prototype jet engine, or drop Turbo-Research altogether. Sir Roy heard that Turbo-Research's future was hanging at the edge of a cliff. He offered to take over Turbo-Research as part of A. V. Roe Canada. This was done.

When the new company was endeavouring to line up business, the Royal Canadian Air Force and Trans-Canada Airlines naturally were the first ports of call. At first, the air force was not encouraging. Its official attitude was really the attitude of almost the whole nation — fed to the teeth with war, up to the neck in surplus materials of war. "We're certainly not going to order any more aircraft," the new company was told. TCA was a little more encouraging. The success of jets in the latter stages of the war interested TCA as it did all airlines. What were the transport possibilities? And a few months later the R.C.A.F. official attitude changed. Remember the officer who had pleaded in vain for Hurricanes in 1942? He'd been Air Commodore W. A. Curtis then. Now he was an air vice-marshal, and vice-chief of air staff. Although it was impossible in the present temper of the government to get much money allotted, the R.C.A.F. asked A. V. Roe Canada to work on the design of a training plane as well as on a twin-jet fighter which would, it was hoped, be powered by the engine Turbo-Research had been working on.

In 1946, these threads all began to come together. Jim Floyd had come to Canada in February, his family (including a week-old son) to follow. He'd done some thinking and preliminary design work on the jet transport idea in England. In June Walter Deisher sent him to Winnipeg to talk with TCA about it again. TCA was still interested. By now the government had agreed in general terms to support the project financially. In September, 1946, design work on the Jetliner began.

Meanwhile, the R.C.A.F. had cancelled design work on the trainer and had revised its ideas about what its first home-grown fighter should be. The first one hadn't got beyond the drawing boards — but had given the design staff a good workout getting it

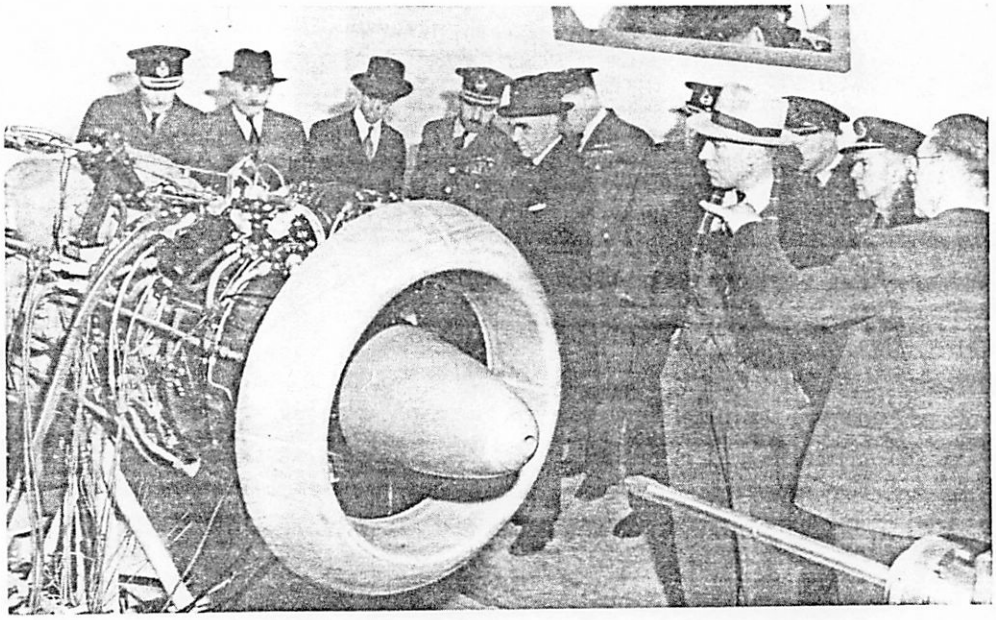
Walter Deisher, right (with G/C Douglas Bader) . . . a man of high prestige in the Canadian aircraft industry was . . . the first vice-president and general manager."

that far. The jet engine on which Turbo-Research had been working to power that original fighter was called the Chinook. It was almost scrapped then, too, as specifications were drawn up for a more powerful engine, the Orenda, to drive the much more powerful fighter, the CF-100. But Paul Dilworth, a dark and slim 1939 graduate of the University of Toronto, 31 in 1946, was head of what then was A. V. Roe Canada's gas turbine group. Some men in the aircraft side had built aircraft. His men had never built an engine. He thought the Chinook would be invaluable as a teething ring, even while work went on with the Orenda, planned to better the best then on the drawing boards in the United States and United Kingdom. Others agreed.

So here you had a brand new company. It was in the most exacting industry of all — the design and development of new aircraft and new engines. It was untried in any one carried-through project. And instead of feeling its way along cautiously with one, in the classic tradition of crawling before you walk, it was up and running with plans for two aircraft and two engines.

In many respects, the projects were closely linked. Engineers who worked on the Jetliner later were important in the design and development of the CF-100. Men who worked on the experimental Chinook engine became the backbone of the production Orenda. Perhaps most important of all, all the varied phases were part of the original dream that went back to when Canadians in uniform and in government first determined that from now on, in aircraft as in most other aspects of a newly-adult nation, we would be our own men. And where previously other nations had added to their strength by the use of Canadian talent, A. V. Roe Canada now set out — like some other Canadian companies — to reverse the flow by creating jobs of challenge and future as high as any nation could offer.

Sometimes, to be sure, the challenge came in very Spartan dress. In design and development work, proof of progress is always the key to getting the finances to carry on. In this sense, the pioneers in any one field do more than could ever be measured for the men who follow, and an example would be to compare the magnificent air-conditioned Orenda Engines plant of today with the walk-up where the child was born. This, for the 85 survivors of Turbo-Research who in 1946 moved from their cold-test laboratory at Winnipeg and their design office in Leaside to become part of A. V. Roe Canada at Malton, was some bare floor space on the top floor of the details building. A few partitions were knocked up in a hurry. There were no blinds on the windows and the place was like a furnace in hot weather. They had a basic design for the Chinook ready at the time of the transfer, dug in on the Orenda, soon took over a plant at Nobel, 160 miles northwest, for testing — and each year when the federal budget was drawn up faced the chance that unless they could prove their progress, government support suddenly would be chopped off.



A button was pushed. In the presence of some of the biggest men in Canadian government and the R.C.A.F., the first Orenda sprang to life.

Thus it was more than a coincidence that the first Chinook ran on March 17, 1948, two weeks before the end of the government's fiscal year. "Fred Smye practically ran from one machine to another picking up parts and delivering them to assembly to help get that engine off on time," one man said later.

They made it with a little more time to spare with the first Orenda — on February 10, 1949. For that one, Winnett Boyd, now an engineering consultant — it was largely "his" engine — was so confident that he didn't even have a private test run before the official one. As a result, some of the biggest men in Canadian government and in the R.C.A.F. were standing in the control room beside the test cell a few minutes before the engine was to run for the first time — when no one could be 100% sure it would go at all. As they looked through the control-room glass at the torpedo-like shape of the first Orenda, the personal involvement was almost greater than could be imagined. This was the company's first major project to reach this stage, the first public bid for the prestige that comes with success. Personal reputations of the gas turbine engineers had been laid on the line, but success or failure also would have an inevitable bearing on the reputation of the company as a whole. Not the least of what was at stake were the hopes of the R.C.A.F. One bystander said, "You could hear knees knocking for half a mile."

A button was pushed. The first Orenda sprang to life. Men who were there say it was a moment they never will forget. This engine was to be proved one of the most successful prototype turbojets ever made. It ran for 477 hours before its first rebuilding job. Later it reached nearly a thousand hours. Perhaps it would have been running yet, but for an accident of almost stupendous simplicity. A technician entered the test-cell to top up the oil. He was wearing a loose white lab coat. In

Harry Keast, aerodynamicist. He'd worked with Whittle, has been important to the Orenda from the start.

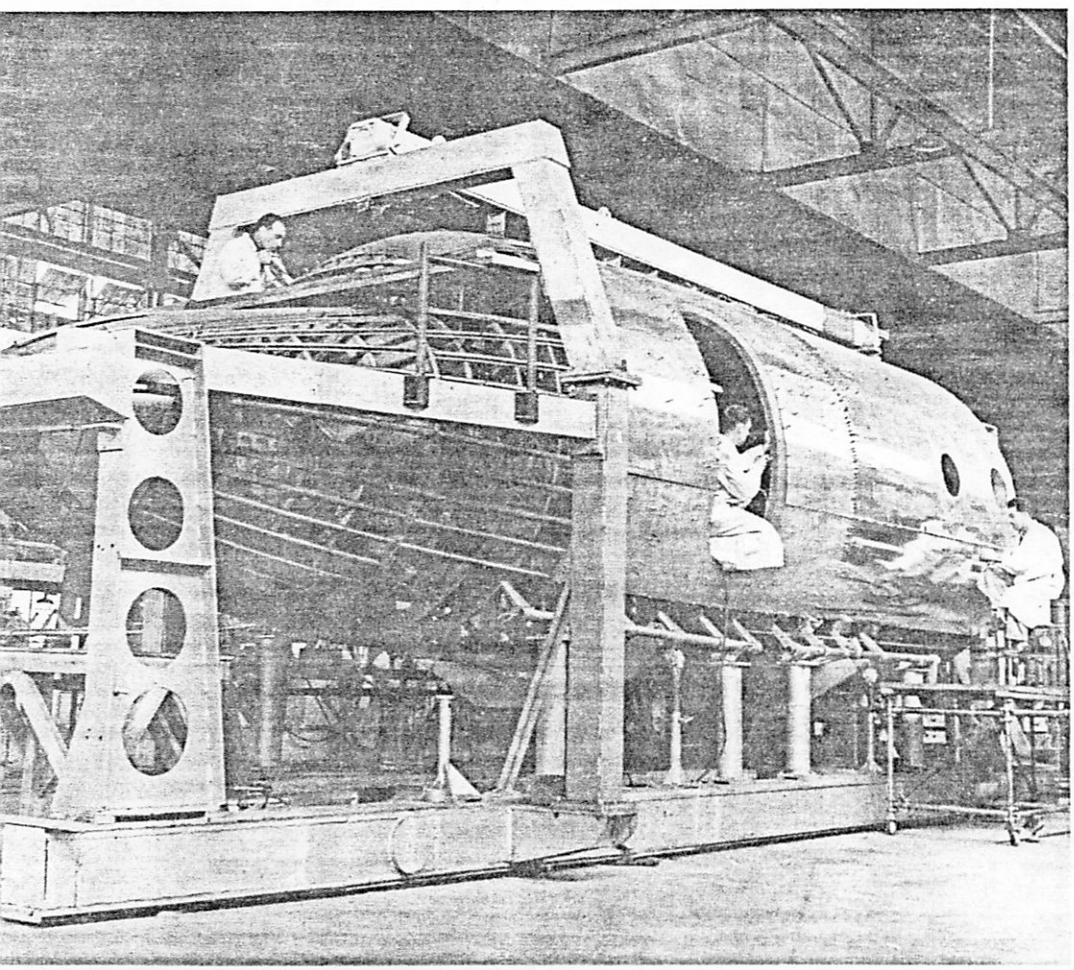
one pocket was a package of Schick injector razor blades. He got too close to the air intake and the coat was sucked in. When the razor blades hit the whirling blades of the compressor there was a grinding crash and Orenda Number 1, for all practical purposes, was no more. The technician lost only his coat and his razor blades.

The Orenda was almost entirely a Canadian effort, with the invaluable exception of aerodynamicist Harry Keast, a man who had worked with Whittle on the first jet engine. The team was made up largely of young Canadians, most of them fresh out of university. Their success had pointed up what can be done when a concept is big enough to keep men of high talent at home. The Jetliner was an example of how an exciting challenge can give a man a new home. Which brings us naturally to Jim Floyd.

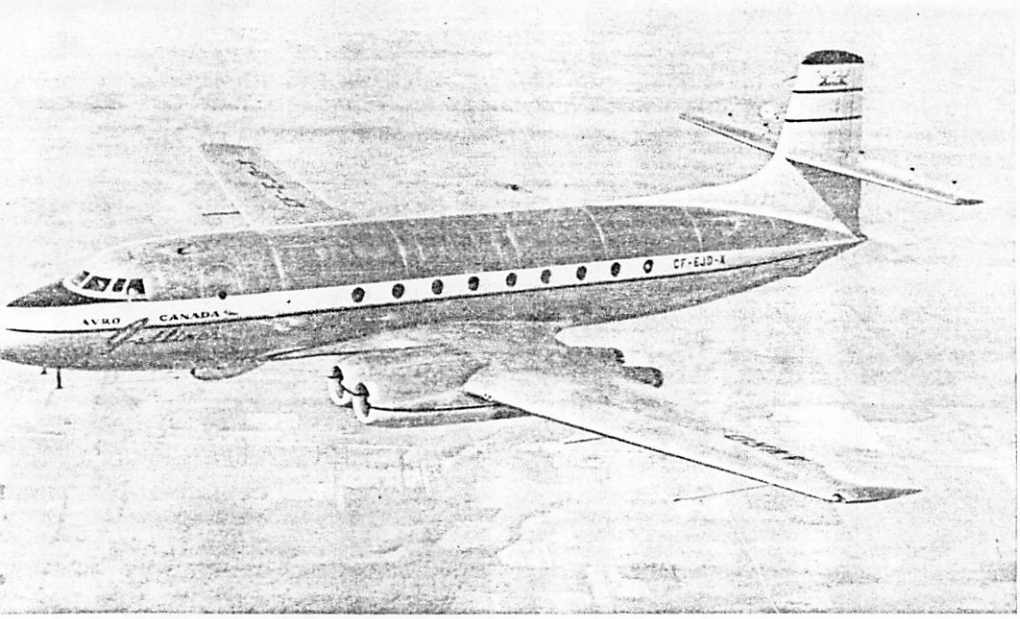
In England, when he was a schoolboy, the air was his romantic frontier, as it is now his scientific frontier. There was a family tradition involved, too. An uncle, Fred Wilkinson of Manchester, had built the first propeller-manufacturing machine for Roy Dobson. In 1930, when Jim Floyd was 16, Avro Manchester was getting together a group of bright schoolboys who wanted to be apprentices and also to be sent to university. He was one of the group. In the thirties, as well as taking university courses, he worked at various places in the Hawker Siddeley Group, usually in some stage of design. By September, 1946, when he began design on the Jetliner, his family had joined him, they had a home in Toronto's Kingsway, and he had an elderly Plymouth to get to and from his work.

His engineering staff of that time was less than 40 people. Today it is over 1,000. They worked on the second floor of the administration building, in sparsely furnished quarters. Projects under development didn't have quite the degree of scientific grandeur they have now, either. One of his associates of that time remembers one day when they had completed a full-scale wooden mockup of the Jetliner. Jim Floyd, after looking at it critically, said, "That nose just won't do." So they got a saw and sawed off the nose, and built on another within a week.

In the spring of 1947 (total A. V. Roe Canada staff 800 now), TCA accepted his design for the Jetliner and he became project designer. In the terminology of the profession, this made the Jetliner "his" airplane. Its general specifications were those of a medium-range transport, tailored specifically to the inter-city needs of TCA. His general concept was that since building a jet transport was itself revolutionary, the design itself should stay as close as possible to the conventional and proved. Even so, one major hitch developed early. He had planned his aircraft to be powered by two Rolls Royce Avons, then being developed. It became apparent that he'd have his aircraft ready long before Rolls Royce had the engines. He'd have to change — but since there were no other jet engines of the Avon size on the horizon, he had to switch to four Rolls Royce Derwents. This meant a complete re-



The Jetliner was built during the daytime, tested at night. Once in the wooden mockup stage, Jim Floyd said, "That nose just won't do." So they sawed it off, built another within a week.



On August 10, 1949, Jetliner test pilot Jim Orrell said, "This time I'll take her right up, all the way." He did, and flew for an hour.

design of the centre section — but the change, he said later, was a good one. It increased the safety factor by lessening the effect of one engine failing.

For two years he worked seven days a week. The aircraft was being built during the daytime, all the varied tests were going on at night, and he had to be there for all of it. Sometimes he grabbed a nap on a cot in the plant hospital. During testing of controls, his mother-in-law came to visit from England. She stayed several months. He saw her four times. His working hours, he says, weren't at all unusual. "Other people worked until midnight or later without even caring whether anyone else knew about it." In that sense, "it wasn't only my airplane, it belonged to everybody who worked on it. I've worked on a few airplanes and I've never before seen such an emotional involvement of everybody concerned. They were going to make it fly, make it a good one, and they did."

The men who had built the first experimental Orendas — or anyone, for that matter, who ever has carried through a tough, long project in any field — could realize how Jim Floyd felt on July 25, 1949, when the Jetliner was ready for final inspection. That meant flight was only days away and less than three years from when pencil was laid to paper, a record people since have called phenomenal.

On July 27 the De Havilland Comet, under test in England, hopped a few feet into the air. Missing by days the honor of having the first jet transport in the world to fly disappointed the Jetliner group, but more substantial trouble drove that out of everyone's mind quickly. At Malton airport, where the Jetliner was to be tested, work on runways suddenly began, leaving only one short strip for engine runs and taxi trials and a short runway for take-off and landing. The weather took a hand, too, with hot sun and temperatures ranging between 90 and 100 each day.

On the day of the first taxi trials, the temperature was 103. Early taxiing went all right under test pilot Jim Orrell. Then he had a consultation with Jim Floyd and his tense companions. Should he take it into the air, the same sort of hop the Comet had made, a few feet and then down again, short runway and all? He'd try.

At 90 m.p.h. the nose wheel came up. Then there were four loud bangs. The aircraft ground to a stop. Floyd and the others raced over. Orrell had decided he didn't have enough room to hop up and get down safely, had applied the brakes, and in the heat and strain all four tires had blown. But there was something encouraging even there — even with blown tires, the aircraft had come to a stop easily and under full control. After more taxi runs the next day, the pilot tried again to get the Jetliner into the air for the same sort of brief hop. This time, as all hands watched with thumping hearts, two tires blew when the brakes had to go on again.

On August 10, 1949, a Wednesday, just after lunch, Orrell said, "This time I'll take her right up, all the way." Jim Floyd was the heart of a silent, almost breathless group as she left the ground. Orrell took her to 500 feet and tested controls. They were fine. He took her to 8,000. He radioed down, "Everything feels wonderful." Jim Floyd's aeroplane flew that time for an hour. A 35-m.p.h. cross wind came up. Orrell brought her down easily, handling beautifully even on the short runway. She rolled to a stop. Jim Floyd went over into a corner and wept.

The third of Avro Canada's first Big Three projects to become operational, the CF-100, perhaps can be described best in terms of the think-

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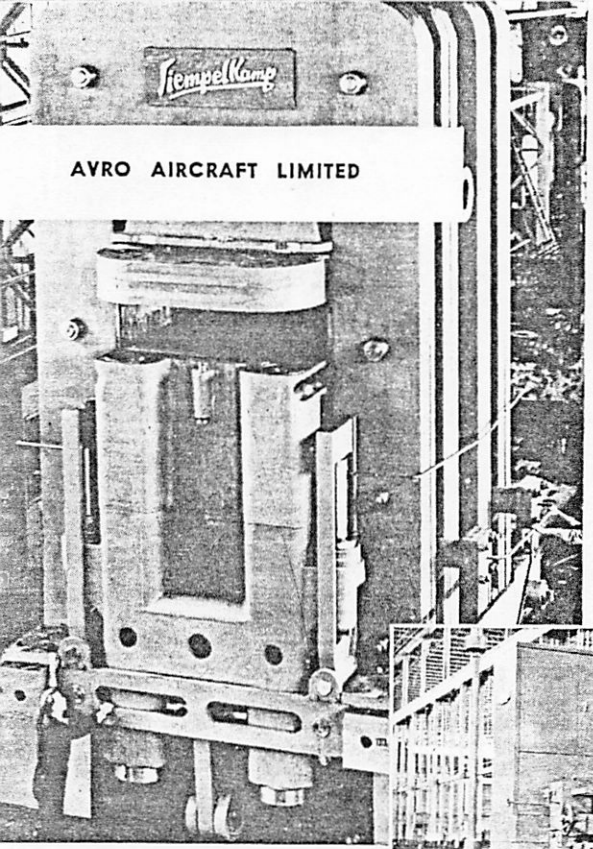
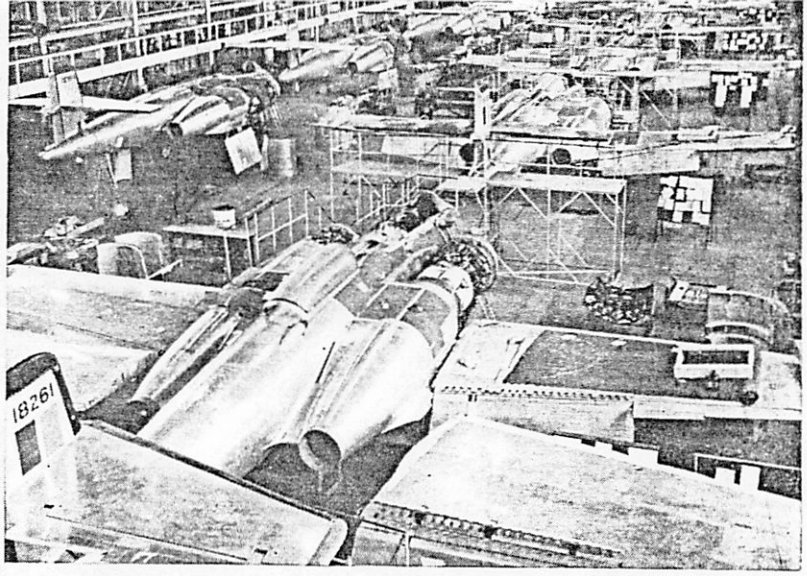
Joe Morley, left, and Jim Floyd watched — silent, almost breathless. From 8,000 feet Orrell radioed down, "Everything feels wonderful."

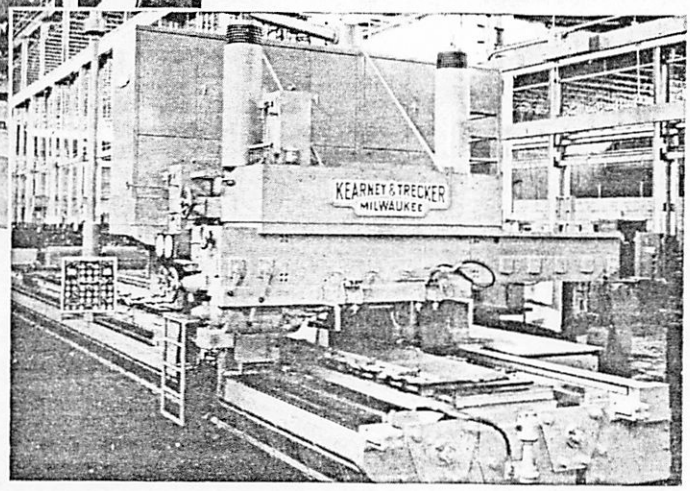
AVRO AIRCRAFT LIMITED



Biggest press of its type on the continent.



CF-100 production line.



The largest skin mill in Canada.

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Product

The A. V. Roe Canada group which was born December 1st ten years ago with 300 employees, today employs 22,000; consists of four separate companies with nine manufacturing and engineering establishments covering a total floor space of 5½ million square feet.

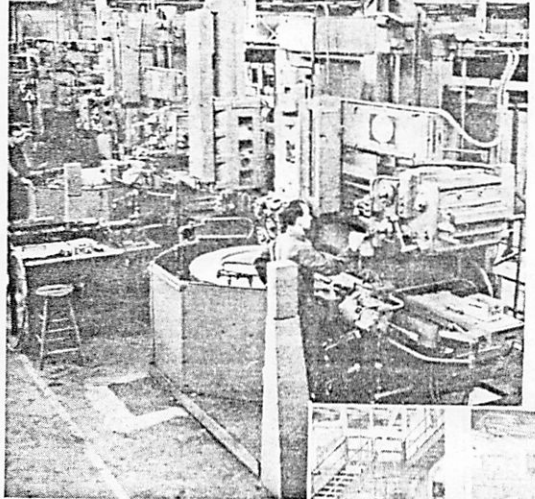
The companies are: Avro Aircraft Limited, Canadian Car & Foundry Company Limited, Canadian Steel Improvement Limited, and Orenda Engines Limited.

Products actually in production or under development along with services include:

Four types of aircraft —— Two gas turbine aero engines——Aircraft repair —— overhaul and

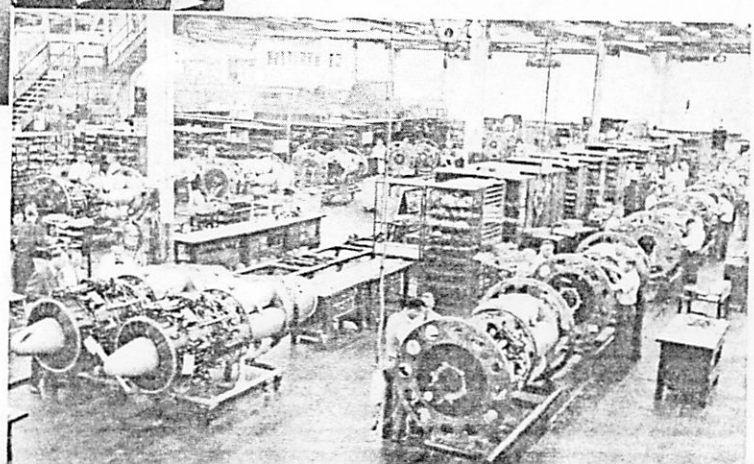
ORENDA ENGINES LIMITED

Broaching machines on stator blade rings.



Vertical turret lathes.

Orenda turbo-jets on the line.



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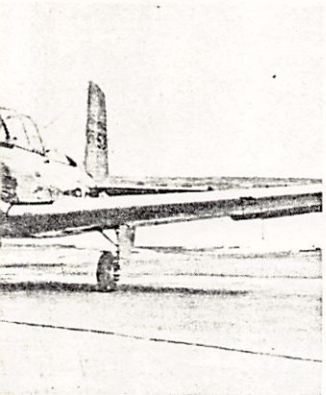
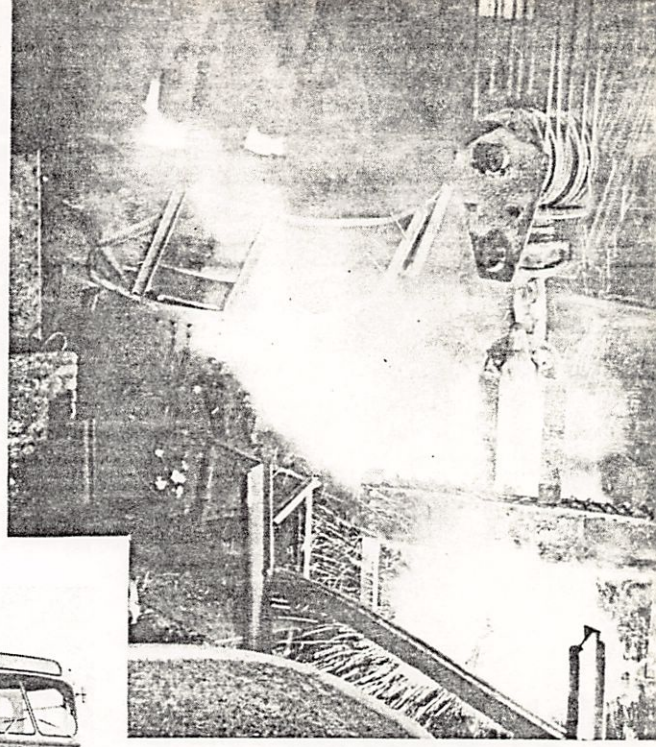


or the R.C.A.F. and U.S.A.F.

Hydro-electric hub casting.



Tapping an electric furnace.

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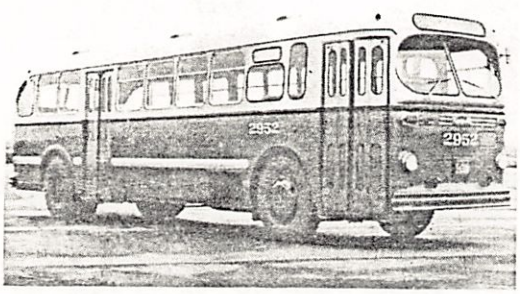
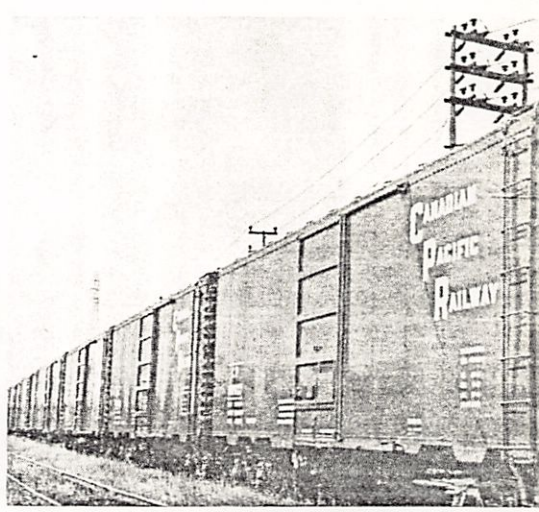


Diesel-powered buses.

Passenger-type coaches.



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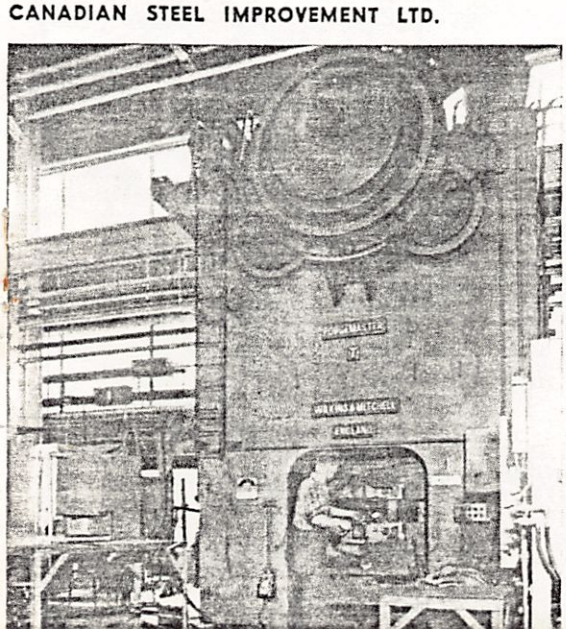
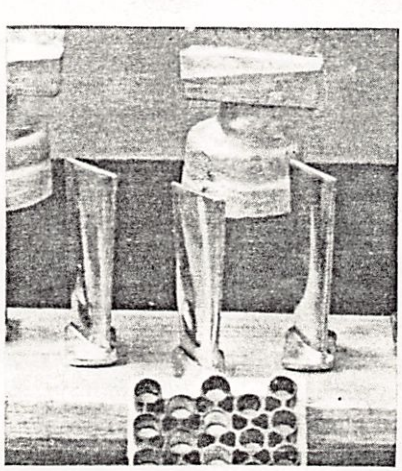
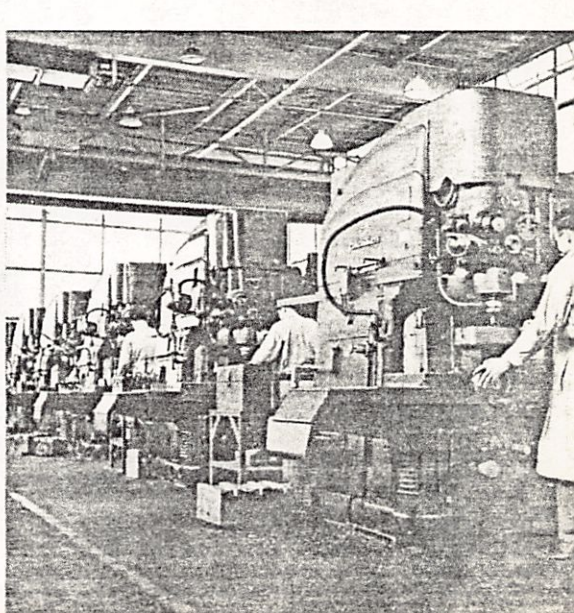


C.S.I.'s 5,000-ton mechanical press.

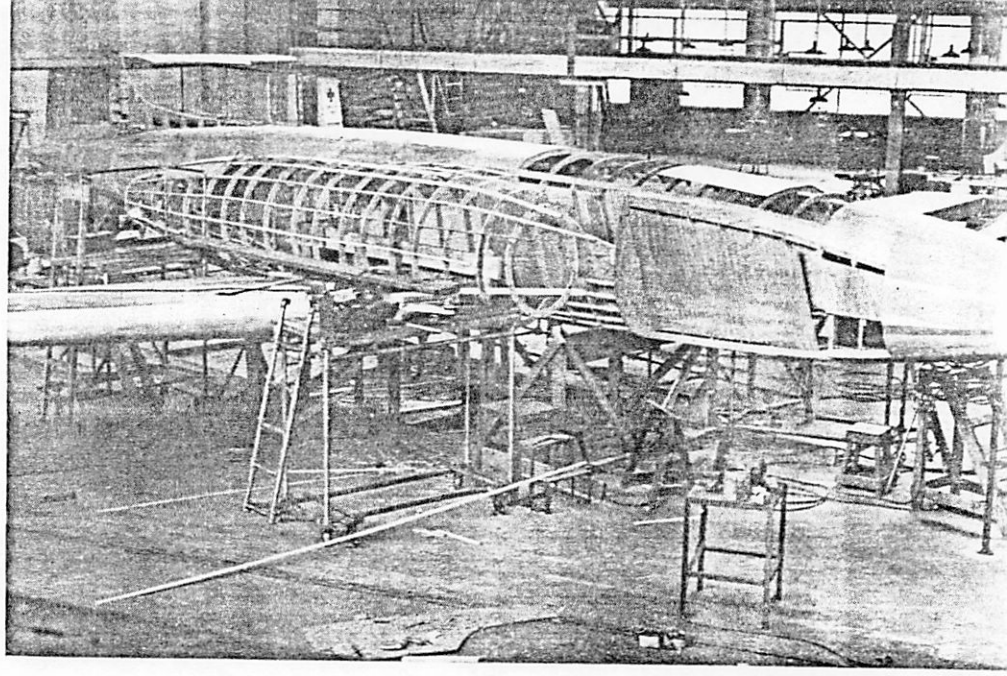


Jet blade forgings and castings.

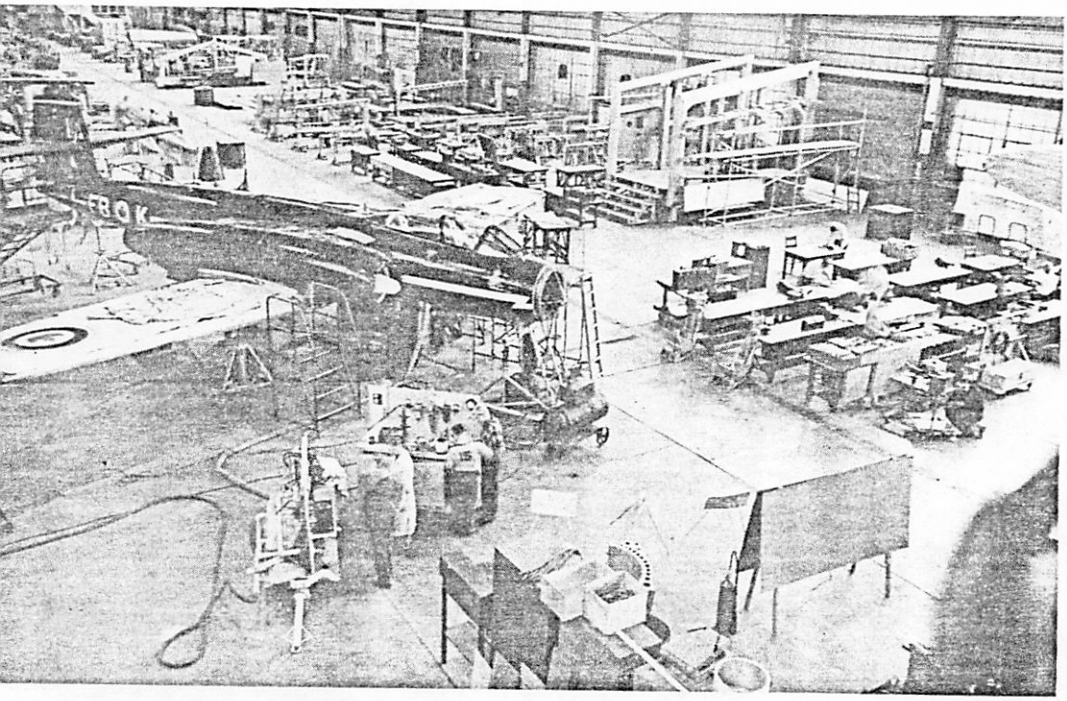


Battery of die-sinking machines.

John Frost, right, project engineer on CF-100.



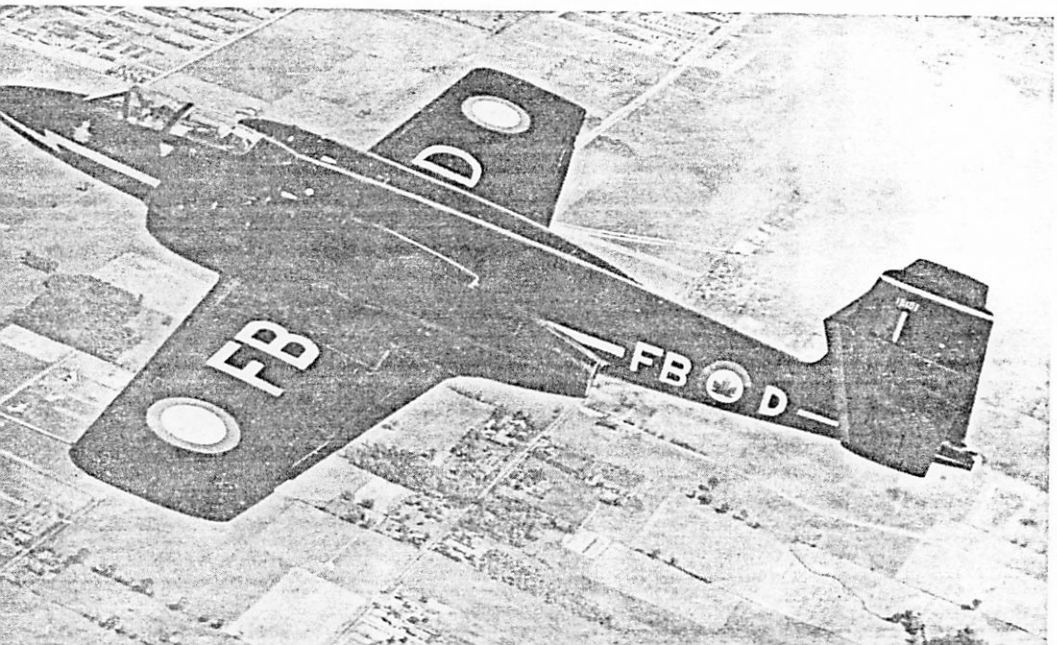
CF-100 wooden mockup— . . . essential stage in aircraft development began in 1947.



Prototype Construction—"The constant for the CF-100 team was their growing aircraft."

ing behind it. At the base was the concept of the kind of first line air force Canada should have. First, it should be defensive. That meant fighters. What kind of fighters? Fighters which could operate in the vast, frigid ranges of the Canadian north, day or night, all-weather, long-range, heavily armored. An air force officer who was in on the planning for the CF-100 said, "First we had a look at the specifications for the best bombers in the world — how high they could fly, and how fast. Then we asked for a fighter which would fly higher, and fly faster." In the House of Commons Mr. Howe, discussing the matter, once said, "There was no plane in existence which, in the estimate of competent military authorities, would be suitable as an all-weather fighter that could be used in the defence of northern Canada. The only alternative was to produce one." Which meant: design one.

It was late in 1946 when preliminary design began on the CF-100. In general terms, it was under Edgar Atkin, as chief engineer. But in June of 1947 the company made an important addition to its design staff. John Frost, a tall and thoughtful young man who had been on the design team of the



Airborne—"January 19, 1950. Bill Waterton took the CF-100 out for its first flight."

revolutionary tailless De Havilland 108 (the Swallow) became project engineer on the CF-100. Again, as in the Jetliner, it was decided to stay as close as specifications would permit to conventional design in an attempt to shorten the length of time needed to get a successful prototype into the air. This meant the CF-100 would have straight wings instead of swept wings or the more advanced delta shape. (The strategy paid off. The CF-100 went into squadron service in 1953 while some of its contemporaries are still having teething troubles.)

As Jim Floyd had with the Jetliner, Frost literally lived with his aeroplane. In the same manner, so did his associates.

The company grew from 1,000 at the end of 1947 to nearly 2,000 at the end of 1949. New Orendas roared on the test beds. The Jetliner startled the continent with its performance. New machinery and equipment came in, new space allotments were made between the now crowding gas turbine and aircraft people, but the constant for the CF-100 team was their growing aircraft. The Rolls Royce Avons which hadn't been ready for the Jetliner were ready for this one, for although Orendas eventually would power the CF-100, a basic concept of aircraft development is to test new aircraft with proved engines, and vice versa, to narrow the search if anything goes wrong.

Late in 1949 Bill Waterton, who would test the prototype, arrived. He was originally from Camrose, Alberta, but he had been a squadron leader in the R.A.F. and was one of Britain's best test pilots—big-moustached and ebullient. He was clambering around the cockpit within half an hour after Edgar Atkin and Don Rogers met him at Malton airport. He moved into John Frost's office. For weeks he went over performance calculations, listened to the predictions of aerodynamicist Jim Chamberlin based on tunnel test results, made a few suggestions for changes in cockpit controls, and on January 17, 1950, took the aircraft out on taxi tests.

For John Frost, the situation now had reached the same pitch that Jim Floyd had faced five months earlier, the Orenda originals six months before that. Frost followed the taxiing aircraft by car, watched through binoculars. During one high speed taxi-

Moment of success: government and air force observers, company officials and the press gathered around Waterton to hear all about the first flight of CF-100 prototype.

"If there was a man who felt that moment of success as deeply as John Frost, he probably was Air Marshal Curtis . . ."—here shown in CF-100's cockpit with Don Rogers.

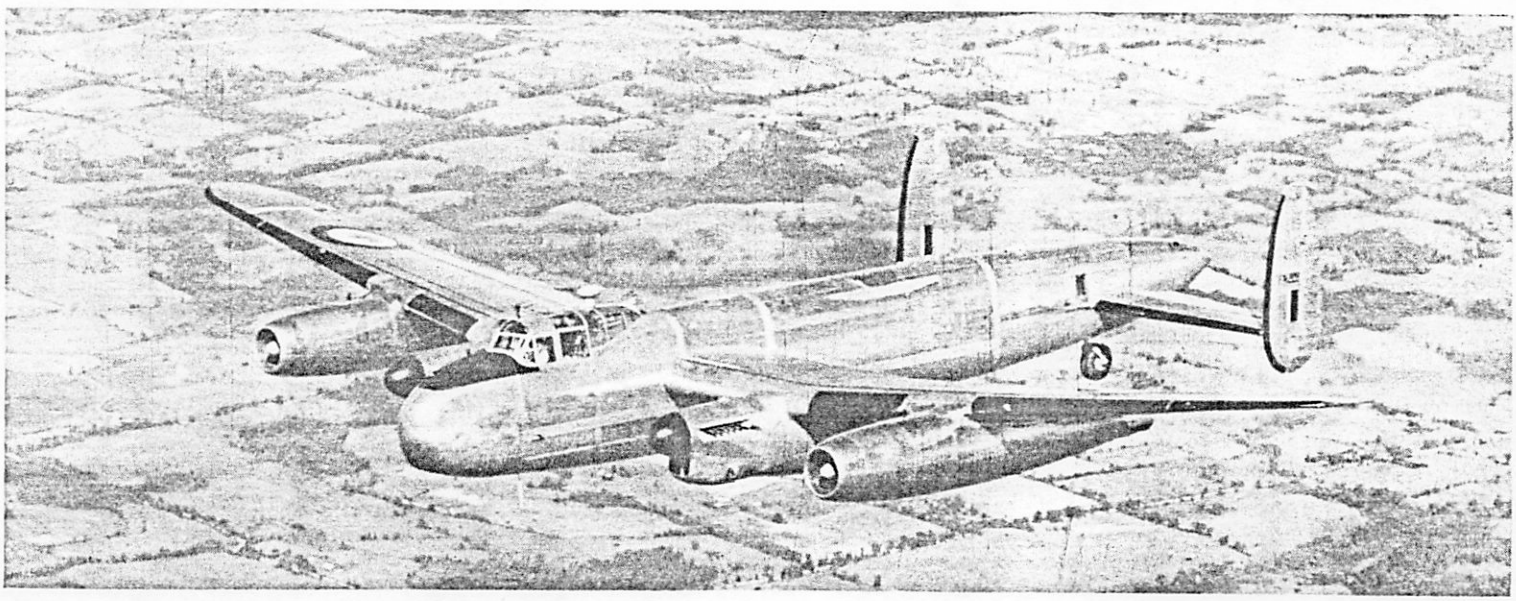
Jetliner on the world's first jet air mail flight; Toronto-New York, April 18, 1950. The U. S. press was congratulatory: "In the race to get a jet liner into the air, Canada won, hands down."

ing test, with the nose off the ground, he caught one minor item which could have been troublesome. The nosewheel door, which opened backward toward the tail, was, as he said later, "trying to close." He had believed that the natural push of air would hold it open, but some capricious play of the airflow was sucking it shut, so that in the air the nosewheel would be trying to come up against a partially closed door. He and Edgar Atkin sketched on the back of an envelope the changes that would be necessary to make it lock open until the nosewheel came up. With this and other minor modifications out of the way, two days later, January 19, 1950, Bill Waterton took the CF-100 out for its first flight.

As he taxied out for take-off, many people watched. Among them were dozens of men from the team that had built the CF-100. Men in the plant left their machines and came to windows or doorways. Outside in that sunny, frosty day of many high hopes and more than a few deep-felt prayers, again were men whose careers and reputations rode with this aircraft. Defence Minister Claxton headed a group of government representatives.

Among several R.C.A.F. officers was Air Marshal W. A. Curtis, by then Chief of Air Staff. When the CF-100 jumped into the air in less than 500 yards, climbed, flew for 40 minutes through the mild assessment of controls and stability which usually characterize first flight, and then came down and braked to a full stop within 450 yards of touchdown, if there was a man who felt that moment of success as deeply as John Frost he probably was Air Marshal Curtis. Less than eight years before, he had walked out of that Hurricane allocation conference knowing that to be sure of good aircraft we'd have to build them ourselves. That day in 1950 with the successful flight of the CF-100 he could know that no R.C.A.F. officer ever would have to face such frustration again.

The Orenda was first flight-tested in this converted Lancaster using two conventional piston engines inboard, two Orendas outboard.



Mike Cooper-Slipper flew an Orenda-Sabre from Toronto to Montreal at 665 mph.

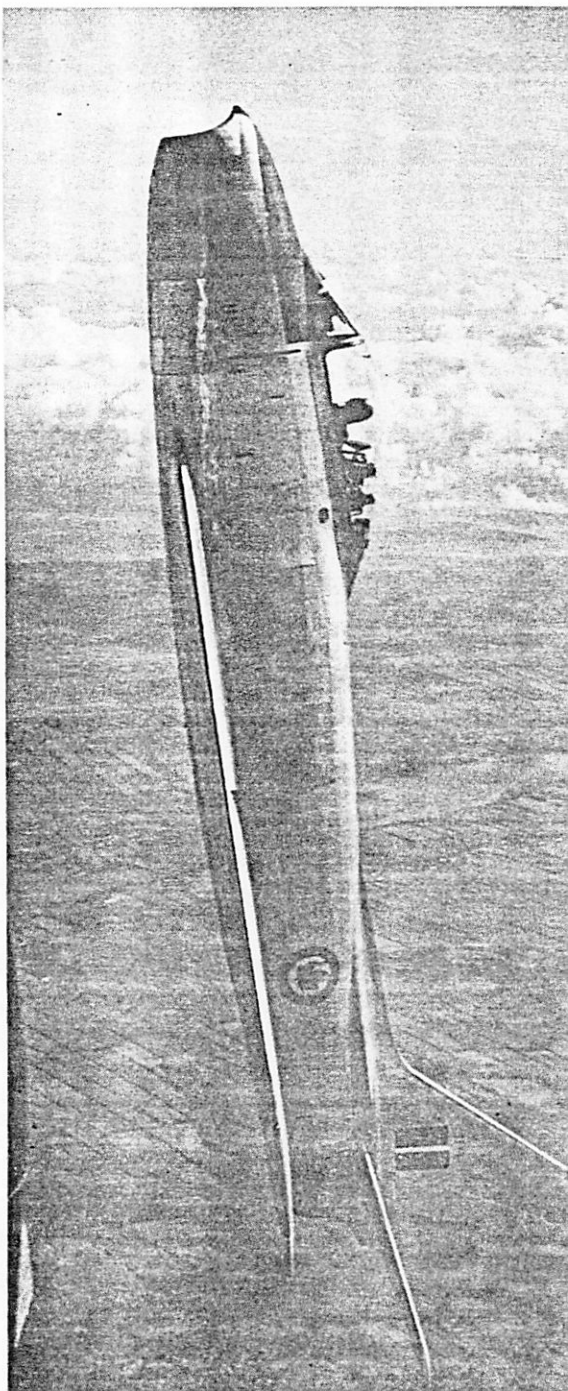
There has been no intention in the foregoing to suggest that the moments of first flight for the Jetliner and CF-100, the moment of bursting life for the Chinook and Orenda were the end of achievement — or, indeed, of disappointment and dismay. These moments could better be characterized as the moment of birth. In fact, there would be times when the people who had built these aircraft and engines would look back like harried mothers to the days when the only problems were good old labor pains.

The Jetliner . . . There are people who, as long as they remember anything, will remember the high emotion of her launching, and the tension-smashing celebration that night at Jim Floyd's home. But a few days later Jim Floyd was hunched over a microphone in deep foreboding, the Jetliner in the air above with main undercarriage gear jammed. He has a tape recording now of his conversation with test pilot Jim Orrell during an hour when they put forth and tried and failed on every possibility for getting the wheels down. Word had gone through the plant like a cold gale that the Jetliner was in trouble. "I don't want to sound maudlin," one man said later, "but it hit every one of us as if we were somehow related to that airplane." Men left their machines and ran outside, and foremen gave up trying to stem the tide and followed. Finally they had to stand there, as Jim Floyd was doing, and watch while Orrell brought her in with only the nose wheel down. There was a sigh as she hit the grass at the runway's end, and a shout of relief as she skidded to a stop only a dozen feet from the airport fence.

Even so, there was a bright side— four bent jet pipes and a caved plating at the rear of the fuselage were the only damage and, as Jim Floyd said later, "it showed us another side of the safety of an aircraft which had no propellers to get in the way in an emergency such as this."

The Jetliner's only real tragedy was of another nature altogether — that of high talent never fully used. In subsequent tests she did everything that was asked of her. With Don Rogers at the controls, the first jet transport captain on this continent, she flew from Toronto to Chicago in 91 minutes; New York to Toronto in 67 minutes; Winnipeg to Toronto in two hours and 33 minutes; Toronto to Tampa in two hours, 58½ minutes; Miami to New York in two hours, 36½ minutes. She did more for the Canadian aviation industry in those flights than any aircraft before or since, with headlines in Los Angeles, New York, Miami and points between. An editorial reprinted in many U. S. newspapers commenting on the first Toronto-New York jet air mail flight on April 18, 1950, grumbled, ". . . and where are we? On the drawing boards." The influential magazine *Air Trails* said, "What happened to the great American aircraft industry? . . . In the race to get a jet liner into the air, Canada won, hands down. . . . .Our hat's off to the Canadians." In mid-1950 Jim Floyd was awarded the coveted Wright Brothers Medal for outstanding aeronautical achievement by the Society of Automotive Engineers. He is the only man of any nationality other than American to win that medal since it was struck in 1928.

With this public enthusiasm, prospects for the aircraft's success commercially seemed of the highest, even though TCA in the meantime had decided not to pioneer jet transport flight. A major U.S. airline was ready to order. The U. S. Air Force watched demonstrations and seemed interested. Then on June 25, 1950, war began in Korea. The Canadian government ordered the Jetliner shelved to concentrate on CF-100 and Orenda. When no one knew whether Korea would explode into another world conflict, this concentration on defence seemed natural enough. But it also allowed other countries to overtake our early jump. The Jetliner flies now, as steadily and speedily as ever, a company plane used in high speed photographic and test work in the development of CF-100's, doing every job well — "an aircraft," as Jim Floyd



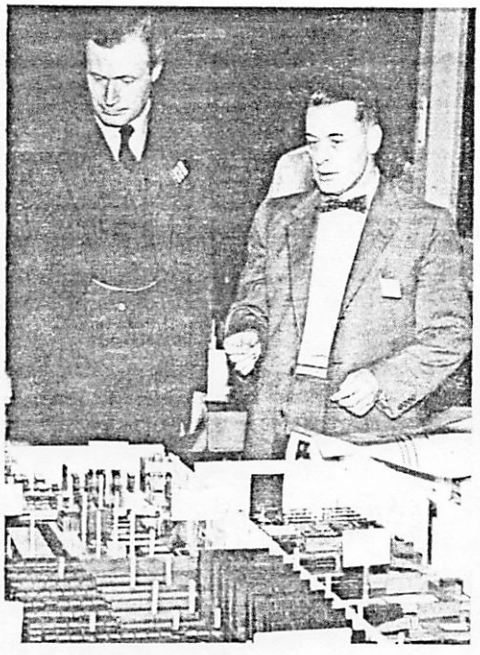
Flying an Orenda-Sabre, Jacqueline Cochrane broke five world records.

"When growth is as fast as this has been, sometimes it is hard for the people involved to see it clearly. But when the Prime Minister goes by,. or Field Marshal Montgomery, or a governor-general, or foreign royalty, or cabinet ministers, or top-ranking air force teams of the U. S. and Britain—they're not just here for the exercise."

General James Doolittle with Fred Smye.

Lt.-Gen. Finn Lambrecht and A/M Curtis.

A/M Sir John Slessor, R.A.F.



Rt. Hon. Duncan Sandys and Harvey Smith.

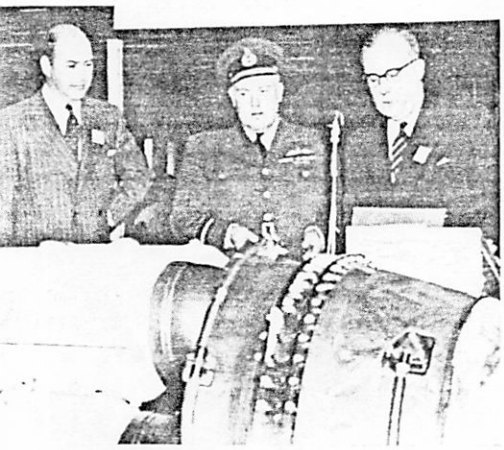
Sir Roy Dobson, A/M Curtis, Field Marshal Montgomery, Crawford Gordon Jr.

The late Hon. Arthur Henderson
Hon. Brooke Claxton.

says now, "just born at the wrong time."

The CF-100 and the Orenda had much more nerve-wracking growing pains. On one flight Waterton, concentrating on his controls, neglected to put his wheels down. In all tests, a company car with direct radio contact to the aircraft stands by, watching through binoculars. As Waterton came in this time, suddenly Jack Cudahy in the control car saw that he was going to land and yelled frantically into the radio, and Waterton put on full power, so low that the jets kicked up dust off the runway. Also, in progressively more demanding testing, the aircraft's center section was found to be too light. After one flight an ominous wrinkling of the metal skin where the wings met the center section told of excessive wing movement. The company acted quickly and forcefully to re-design the center section. Although no man experienced in aircraft design would expect an original to go through and into production without some such trouble, it was a bad time. The bright side was that from re-design to resumed production took only eight months—and that in all other respects, showed off in flight at Ottawa and Washington before some of the most important men in the world's air forces, the CF-100 looked like a champion.

The Orenda also had its normal allotment of new-product troubles. The first three experimental engines ran for a total of nearly 2,000 hours between them with no more than normal modifications. But the first production Orenda came off the test-bed with a cracked ninth stage compressor blade. In the experimental engines there'd been trouble with seventh and eighth stage blades, but never a ninth. That meant hard work. Although trouble with one blade out of nearly 2,000 in such an engine may seem trivial to a layman, there is no more intricate part of a turbojet. Engine blades are subject to specifications finer than those for a watch part. A variation of 1/1000 of an inch on one blade makes a noticeable difference in engine performance.



ford Gordon Jr., A/V.M. Smith, W. R. McLachlan.

Crawford Gordon Jr., Prime Minister St. Laurent, Jim Floyd.

C. Grinyer, W. R. McLachlan, Lord Hives.

A/M Sir William Dixon, R.A.F.

Hon. Lester B. Pearson.

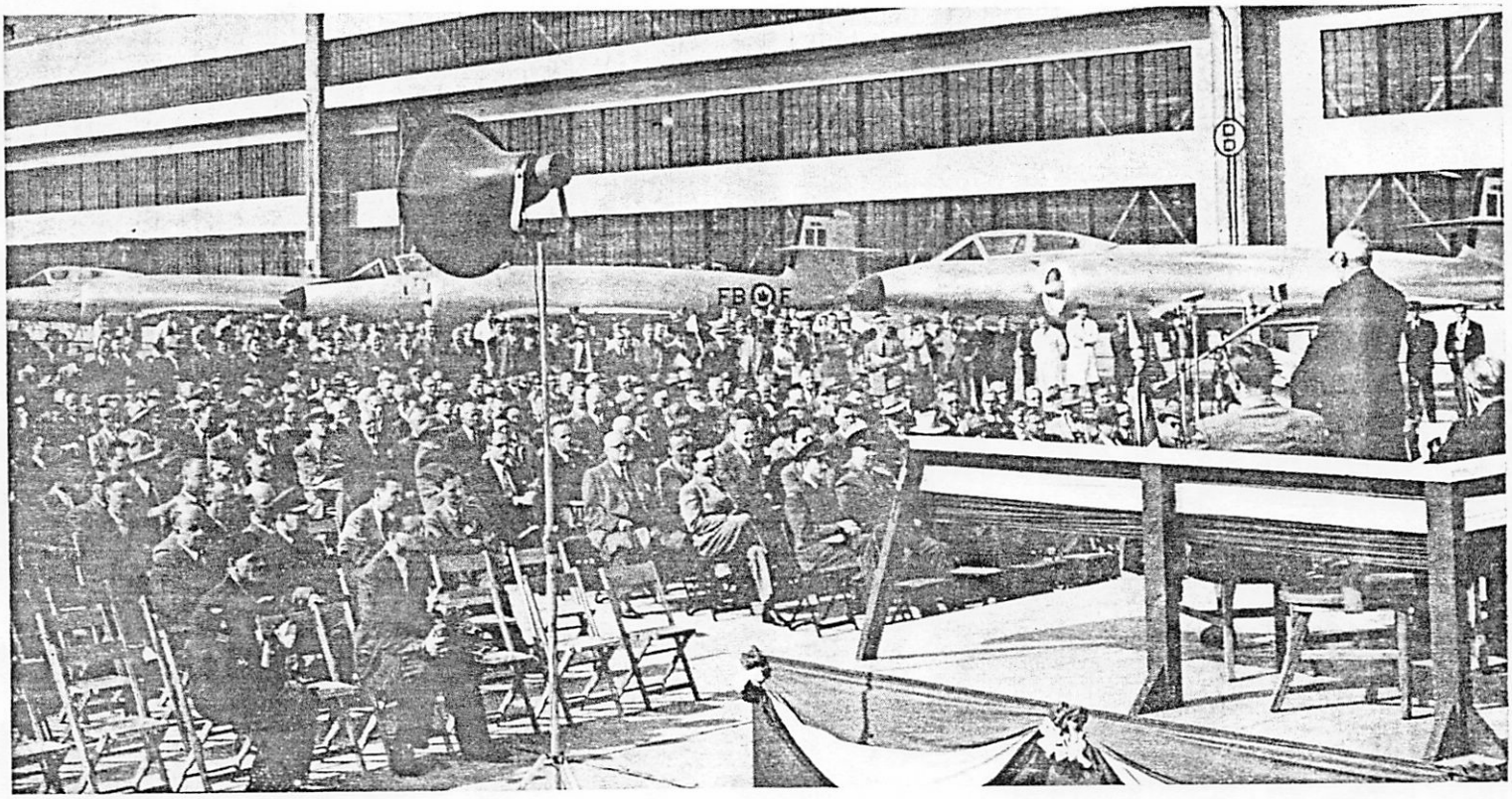
Crawford Gordon Jr., Lord Del'Isle, Dudley V.C.

Walter McLachlan, Earl Brownridge, Hon. J. A. D. McCurdy.

In 1949, when the industry was in the first flush of a general surprise that Canada had produced a top-ranking engine so rapidly, arrangements were made to have an Orenda tested in an F-86 Sabre being built by North American Aviation. The Sabres were also to be built in Montreal by Canadair, under license, perhaps with Orenda engines. In 1950 an Orenda was taken down to the United States to test in a production-line Sabre. At this time the Orenda had never been flight tested. To do this, a Lancaster was being modified to act as a flying test-bed, with two Orendas and two conventional engines. When the arrangements were almost complete for the Sabre test, Sir Roy Dobson put his foot down. "It must fly first in the Lancaster," he said. And almost that very day a forging failed. All high-speed testing had to be stopped and the engines pulled back from the U. S., while a forging technique which was found to have caused failure was modified to prevent a similar happening in the future.

But these were only growing pains. On July 13, 1950, the converted Lancaster — dubbed the Flying Bedstead — took off with Don Rogers at the controls and, using the Orendas, climbed like a Spitfire. In October, in California, the first Orenda-Sabre flight was a success. Later a U. S. pilot in a Sabre powered by an Orenda came from Minneapolis to Toronto in an hour. Mike Cooper-Slipper, a Battle of Britain veteran, now test pilot for Orenda, flew an Orenda-Sabre from Toronto to Montreal at 665 miles an hour. Jacqueline Cochrane, using an Orenda-Sabre, broke five world records. In June, 1951, soon after steelwork began on a vast new Orenda plant, the first flight of a CF-100 using Orenda engines was made successfully, and on October 17 that year C. D. Howe was at A. V. Roe Canada to say:

"It is my privilege today to deliver to the Royal Canadian Air Force a CF-100 military aircraft equipped with twin Orenda engines. The airplane and its engines were



C. D. Howe at Malton October 17, 1951: "It is my privilege today to deliver to the Royal Canadian Air Force a CF-100 military aircraft equipped with twin Orenda engines. The airplane and its engines were designed, developed and built in Canada by Canadian workmen using Canadian materials . . . The aircraft as it stands before us is a notable Canadian achievement . . . a milestone in Canadian industrial development."

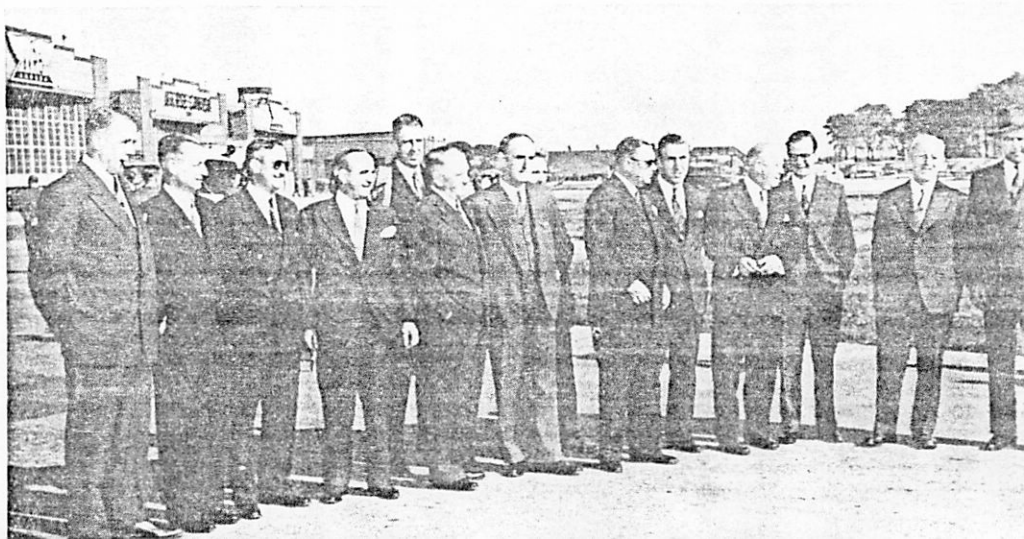
designed, developed and built in Canada by Canadian workmen using Canadian materials. Not only is this the first aircraft to be completely designed, developed and produced in Canada, but the Orenda engine is the first airplane engine to be designed, developed and produced in this country.

"The aircraft as it stands before us is a notable Canadian achievement, marking as it does a new milestone in Canada's industrial advancement."

For some people, that must have seemed something like the end of a dream, and it was. But in another sense, it was establishment of the dream on a permanent basis. Two years ago, about the time that A. V. Roe Canada bought the engine plant, which it had built and had been operating for the government, Hawker Siddeley's Design Council met at Malton. It was the Council's first meeting outside of Britain, and so was a tribute. As Sir Frank Spriggs, managing director of Hawker Siddeley, said, "You have demonstrated beyond question that you can talk with any aircraft or engine design teams in the world."

In a way which applied to A. V. Roe Canada's future, Sir Frank quoted Robert Louis Stevenson: "To travel hopefully is better than to arrive." There seem three distinct bases for that hope as this company travels past its tenth birthday. One is the present corporate structure. The people and the plants they run make up the second. And the third is in the realm of organized dreamland on which, in this business, the first two must rely.

In many ways, among them corporate structure, a company usually progresses in a series of overlapping



In 1953 Hawker Siddeley's Design Council, who never before had met outside Britain, came to Malton — a tribute to A. V. Roe Canada's aircraft and engine design teams.

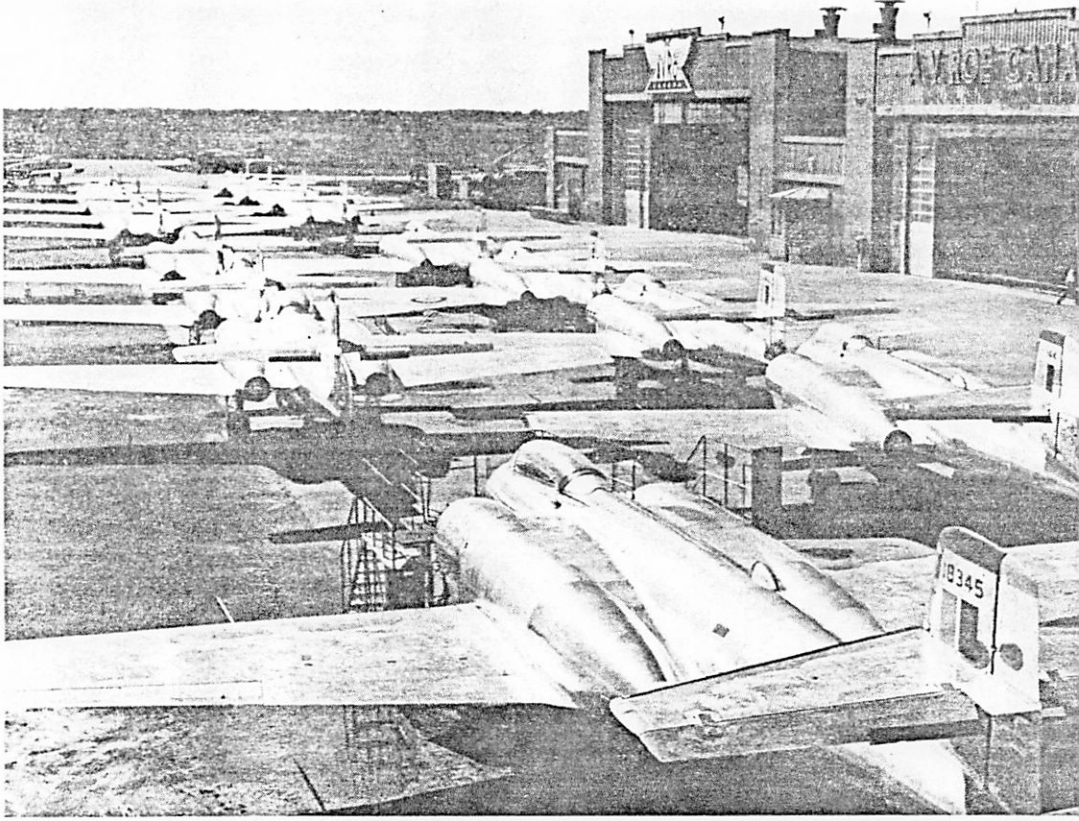
eras. This one's original era began with its creation in 1945. There is every reason for pride in that first era, which ended in 1951 when Walter Deisher retired in ill-health, and Crawford Gordon, Jr., took over as president and general manager, with Sir Roy Dobson becoming chairman of the board.

What was the goal for this second era? Crawford Gordon, then 37, a commerce graduate of McGill, was in a remarkable position to see it clearly. Through his association with private industry, and as one of the dollar-a-year men loaned by industry to the government during war emergencies, he had acquired a breadth of industrial experience which normally would take a lifetime to accumulate.

In the department of munitions and supply during World War II, where he first was director-general of organization and later assistant co-ordinator of production, he'd often seen the tight spots caused by our reliance on others for the basics of our aircraft and other industries. As director-general of industrial conversion in the immediate postwar period, he'd had an intimate look at Canada's new industrial capacity and potential. He had returned to private industry for several years. The government had asked for him on loan again when the Korean war began. In 1951 he was co-ordinator of defence production, and when Sir Roy said, "Come and run this company," he knew what had to be done.

"For nearly six years we've been designing, planning, testing, carrying on intricate research," he said about that time. "We've achieved very ambitious objectives — a Canadian jet engine, a Canadian jet airliner, a Canadian jet fighter. The next step is to produce them in quantity."

In his first days with the company, he wrote down a list of essentials not only for reaching that goal of quantity production, but looking beyond that, far into the future. They were a remarkable combination of theories of industrial technique with those of human relations. Because engines and aircraft were separate products, with separate problems and markets, he wanted them separated into gas turbine and aircraft divisions. Then he would concentrate on the organization of these new divisions — upgrading people to positions of greater responsibility where they could work with a minimum of interference, giving them titles equivalent to these new positions, encouraging them to high objectives through various incentives. He wanted for this company the best men anywhere, but if all else was equal a Canadian would be preferred. He knew that the work force would have to be doubled or more. Such an influx would need housing. So he was one of the prime movers in urging the government's later-adopted plan for defence workers' housing, with low down payments and low interest rates, and hundreds of these houses since have been built near the company's plants.



"As months went by, the production pipeline . . . showed a trickle . . . then a flood. The promise to produce in quantity has been fulfilled."

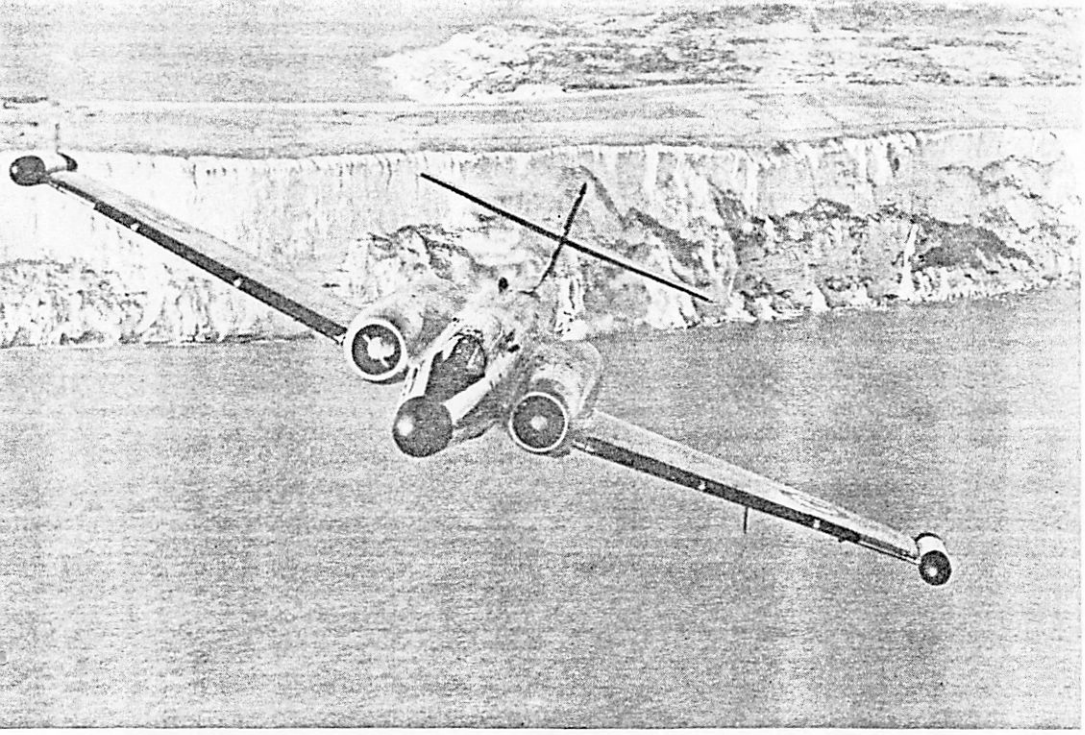
Those were immediate aims. For the future he wanted a diversification of products to reduce the company's reliance on military production. This would mean that A. V. Roe Canada would have to get into the commercial industrial field. It did not take long to reach this goal. Today, four years later, a fifty-fifty balance has been achieved.

First part of these broad plans to go in effect was separating the company into aircraft and gas turbine divisions. Fred Smye became acting general manager, aircraft, and Crawford Gordon acting general manager, engines. The new engine plant was already underway. The aircraft production lines would expand into the space thus vacated. Veterans moved up. New men were added. As months went by, the production pipeline that had been dry showed a trickle; as years went by, a flood. The promise to produce in quantity has been fulfilled.

One way to measure the extent to which the twin intentions of de-centralization and diversification have been fulfilled is to look at what happened later in the company's corporate structure. On December 2, 1954, a day after the ninth birthday of that 300-man outfit in 1945, two new companies were announced with A. V. Roe Canada as the parent company.

Fred Smye became vice-president and general manager, Avro Aircraft. Named to head Orenda Engines was Walter McLachlan, who had joined the gas turbine division in October, 1953, after a distinguished career in private industry and a year on loan to the department of defence production as director of its electronics division.

At the same time, Canadian Steel Improvements Limited, making vital engine forgings, was added to the group — and C.S.I. also makes a wide range of commercial products, including wire and cable applications, and bobbins for the textile trade. And in September, 1955, Canadian Car and



September, 1955; the Farnborough air show in England: "With the air elite of the world to write about, the headlines the next day were about Canada's CF-100 . . .

Foundry was bought and became part of the group. As well as manufacturing aircraft and parts, Can-Car is a leader among manufacturers of railroad rolling stock, autobuses, trolley buses, and heavy castings, with exports to 26 countries. These are obviously big steps toward Crawford Gordon's early aims for wide diversification of company products.

In all this, since that standing start in 1945, Hawker Siddeley has made a permanent investment in Canada of more than $16 millions of capital. In addition, not a cent of profit has been taken out of Canada, all earnings being re-invested in the further development of the company, so that today A. V. Roe Canada Limited's group is one of the largest single British industrial developments in Canada, with 5.4 million feet of floor space and 22,000 employees. Maybe this tenth anniversary will be seen later to have been the beginning of a third era, even greater than the other two.

But fundamentally, for the purposes of *this* ten years, A. V. Roe Canada had meant engines and aircraft—Orenda, CF-100, Jetliner and, farther back, converted Lancasters, Mitchells, Sea Furies. When growth is as fast as this has been, sometimes it is hard for the people involved to see it clearly. But when the Prime Minister goes by, or a governor-general, Field Marshal Montgomery, or foreign royalty, or cabinet ministers, or top ranking air force teams of the U. S. and Britain — they're not just here for the exercise.

A lot has happened. There's been excitement and rapid growth right from the procurement departments, dealing with a thousand Canadian companies now supplying parts we used to buy abroad, to flight testing under Don Rogers of both experimental and production aircraft. Sometimes this department has had 35 aircraft on the line ready to fly, has made as many as 29 test flights in a day, the pilots working each aircraft through a set routine, noting all deviations on a "snag-list" which will be covered before the aircraft is tested again. Until Glen Lynes died in a crash in October, 1955, no production aircraft had been lost in a test. The most serious earlier crash had been in the second prototype CF-100, caused — a board of inquiry decided — by failure of the pilots' oxygen equipment. The R.C.A.F. once made a point of issuing a statement saying that the accident rate now, with jets, is no greater than the one established over the years with many types of aircraft.

On December 18, 1952, Jan Zurakowski dove an experimental Mk. 4 CF-100 through the sonic barrier, the first straight-winged jet in the world to exceed the speed of sound. In September, 1955, he electrified the Farnborough air show in England with his work in a CF-100 powered with twin Orenda 11s. Below, Sir Anthony Eden and Sir Roy Dobson sat together to watch. With the air elite of the world to write about, the headlines the next day were about Canada's CF-100 and Zurakowski.

Behind those headlines, if one only knew where to look, are some good stories. There was the time nearly four years ago that Herb Stangel and a few of the boys decided there must be a better way to check the CF-100's complex electrical system with its maze of junction boxes, relays, switches and motors than crawling around in the belly of the aircraft. They found one — a test bed which contains every bit of equipment found anywhere in a CF-100, including the device for firing rockets. To test any item, they merely put it into the test bed where applicable. It was such a good idea that it's doubtful Avro ever will make another aircraft without first building a test bed. The fourth is now in operation.

And who will forget the day the first production Mk. 4 CF-100 came off the production line? It was September 30, 1953, a date set one year before, and one which one man right on the line, working his head off all that summer, would bet $20 they couldn't make.

A lot of the reasons why that production date was achieved lay in a U.S.-trained Canadian named Harvey Smith. He was a production executive for Kaiser in Detroit in 1952 when Crawford Gordon and Fred Smye were looking for someone who could execute that promise to "produce in quantity". He arrived in Malton in October, 1952, a few weeks before the first production Mk. 3 CF-100 came off the line. The Mk. 4 was in the prototype stage then. It was

. . . and Jan Zurakowski."

nominally a modified Mk. 3, but it was really a totally new aeroplane — of the total of about 15,000 parts, 14,000 would be new. Harvey Smith hadn't been in his job a week before he knew he was faced with one of the toughest production jobs of his career.

The tools and dies to make these new parts were being made in Detroit. "The big thing was to get them to Malton and into action in time," Harvey Smith says now. "No matter how good a man is — and we had plenty of good ones — he can't put a part into an airplane until you make the part and hand it to him." Twice a week or more he or one of his men went to Detroit to prod the 15-odd companies making these tools and dies. Once when a man said he couldn't get the work out on time, and "So what?" Harvey Smith said, "This is what," and took the job away from him that hour, shipped it across Detroit, and got another shop to make it on time. In July they began to arrive at Malton, in train after train and truck after truck. In August, the stream of parts began to flow. On the morning of September 30, Crawford Gordon and Fred Smye went down and shook hands with some of the men who were rolling the first production Mk. 4 off the line — on time.

One man absent from the celebration that day was Harvey Smith, stricken the day before with appendicitis. But in the weeks that followed, the base laid down in a hard year of unremitting labor by himself and his staff showed worth which, to a production man, means much more than getting one plane off the line on time. The goal was one aircraft a day. In the month of October, two were produced; in November, four. By the following June that build-up to the one-a-day planned production peak had been completed. It was a remarkable record, one which men high in A. V. Roe Canada management consider "made the company; it ranks right up there in importance with anything anyone had done before."

Korea started a lot of the heavy pushing. As one engineer said, "Before then we had to prod Ottawa for almost everything. Now they were on our backs wanting everything done the day before yesterday." Twelve CF-100s were ordered a few weeks after the first one flew. The order

Harvey Smith missed the celebration, stricken the day before with appenticitis.

"On Sept. 30, 1953, Crawford Gordon and Fred Smye . . . shook hands with some of the men who were rolling first Mk. 4 off the line—on time."

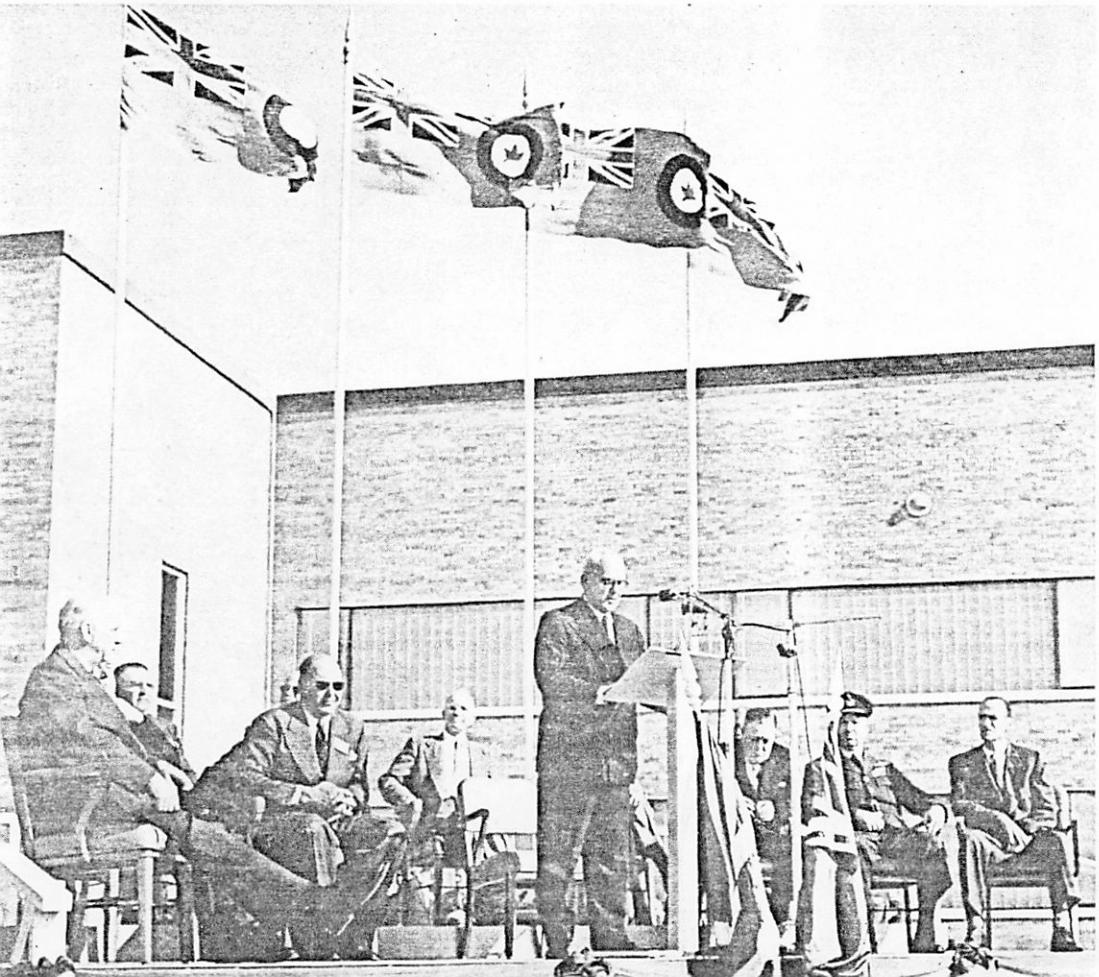
was raised to 124 in a few months, trebled again in another few months. You only have to know a little about "lead" time and priorities to appreciate what this acceleration meant. Now they are the backbone of the R.C.A.F. in Canada and will be in service in Europe in 1956. Maybe one of the major tributes anyone can make to the men under Vice-President Harvey Smith on the aircraft production lines now is that the sales and service department under Vice-President Joe Morley, who joined the company January 1, 1946, as assistant to Fred Smye in sales and contracts, has hundreds to service and lots to sell. Mobile repair parties travel the country, bringing operational aircraft up to date with latest modifications. Field service representatives of the company are stationed at all CF-100 stations. Because a fighting aircraft has to be in a constant state of improvement and modification if the air force flying it wants to stay in business, there are 75 men now who do nothing but work on service manuals.

"The only real difficulty in this department," Joe Morley says, "is that selling a front line aircraft is a very complicated business. One first-rate ally may want planes but have no dollars. One with dollars may be so neutral you don't know whose side he's being neutral on. And under security regulations — this is really a deep one — there are some things we as civilians can't even *tell* customers about our aircraft when we're showing them how good it is, although if they buy one they'll see for themselves."

Orendas, essential part of these CF-100 achievements, also have made quite a few of their own — the Oranda-Sabres in Europe, for instance, the world's top daytime fighter. Americans fly Sabres, too, but only Canadians (and now South Africans) fly Orenda-Sabres. Since these R.C.A.F. pilots in Europe are the direct descendants of the ones who always had to wait longer than their allies for good first-line aircraft, perhaps sometimes now there is the occasional cosmic chuckle from the upper air as these Canadian pilots zoom past their allies at will with engines we made ourselves.

Walter McLachlan, left, with Defence Minister Ralph Campney.

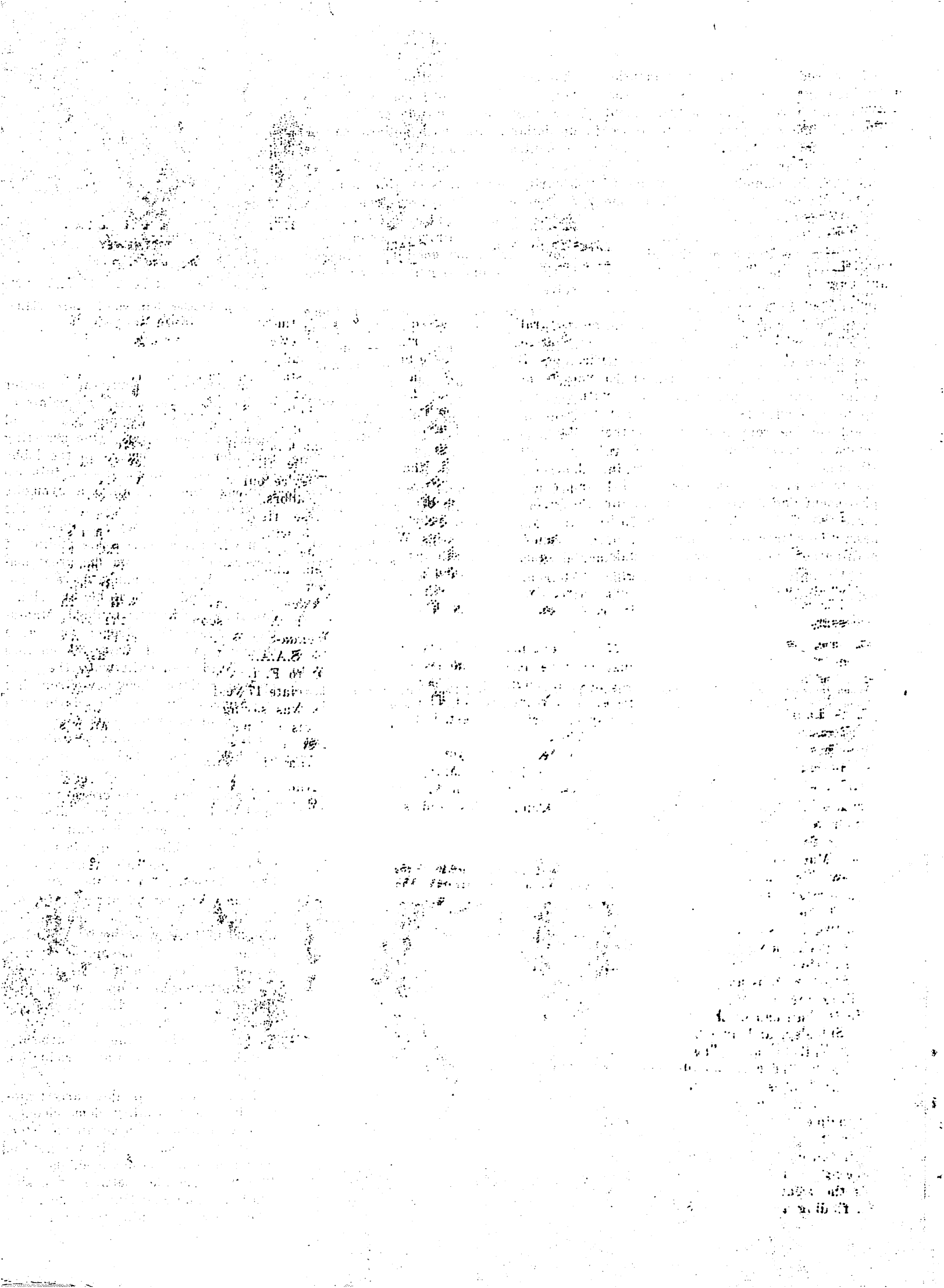
When these men gathered to open the Orenda plant in September, 1952, only 30 engines had been built. Now there are nearly 3,000, in service in Canada, in Europe and South Africa.



The process of building a better engine has several striking points of reference in the Orenda plants and research laboratories. One arresting reminder of the past is in the lobby of the production plant — a full-size Chinook, the beginning, a symbolic miniature of what goes on in the high-roofed plant beyond, where any man will get a remarkable feeling of power and force from the great machines. Even the names have a sonorous sound — Archdale England, Cincinnati Gilbert, Bullard Man-u-trol. There the Orenda has gone through the mill from 30 engines which had been built when the plant opened to almost 3,000 now; from that first one which was shot down by a package of razor blades through more than 4,000 design changes to the one off the line today (which may not be the same as the one for next week).

A great deal of the credit for that production record — and also for the fact that costs constantly have gone down while the Orenda's power rating has gone up — belongs to Earle K. Brownridge. He is 39 now; Orenda's vice-president, manufacturing, under Walter McLachlan. He was 30 in 1946, working in A. V. Roe Canada's estimates department, when someone asked him how he thought an experimental shop for engines should be set up. His written plan was so well received that in a few weeks he joined the ex-Turbo-Research group as assistant production controller.

Perhaps his invaluable early training in the flexibility demanded by jet engine production began then, too, in its development. "If we got on the wrong road, we changed," he says. "We never minded setting up a system today and changing it tomorrow." When he was planning the production



layout for the new engine plant in 1952 one of his basic considerations was to gear everything to this flexibility. "We wanted to be able to put changes on an engine going out the door, if necessary," he says, "and sometimes we do." A measure of the way he feels toward his production men, and vice versa, was to be found the day in 1953 when the plant hit its planned production peak of 100 engines a month. Brownridge promptly began planning to throw a party for the men who had done it. But the prospective guests crossed him up. They organized a party for him, turned up at his house one night with a gift and all the party supplies, and that is how the event was celebrated.

It's quite a plant in other ways, too — precisely air-conditioned because parts that go into jets have to be made so accurately, with test cells so quiet that they can't be heard from a few yards away, everything newly-built for nothing but jet engines and therefore built superlatively well. From the vital outside suppliers come a daily flow of parts. Ninety-two percent are made in Canada; the others are ones which easily could be made here if necessary.

This intricate, constantly-changing nature of the product places strain everywhere; "perhaps particularly on quality control," Walter McLachlan says. "That's Laurie Marchant's department. Because an engine *has* to be right, he has the power to stop anything. He can be over-ruled only by me. And I wouldn't."

What makes changes necessary? Usually improved design, the constant striving for less weight and more power. Much of this is done in Orenda's new Sir Thomas Sopwith Research laboratory near the main plant, named for a man world-renowned in two fields — in aeronautics for his great modern achievements in aviation as well as his pioneering Sopwith Pups and Camels, and in sailing for his great racing career. He is chairman of the board of Hawker Siddeley, and an original director of A. V. Roe Canada. The Sopwith laboratory, under Engineering Vice-President Charles A. Grinyer, institutes a good deal of daring research on the principle, as one man said, "that you can't prove an idea is crazy or not until you check." If a certain material being used is causing trouble, that's the meat of the research engineers, finding a better one. Some changes naturally have caused chain reaction changes in other parts and specifications. But every little bit has been made to help. The Orenda started with a weight of about 2,700, a thrust of 5,800 pounds. Now it weighs 2,400, with a 7,600-pound thrust.

EARLE BROWNRIDGE
—geared to flexibility

CHARLES GRINYER
—no idea is crazy

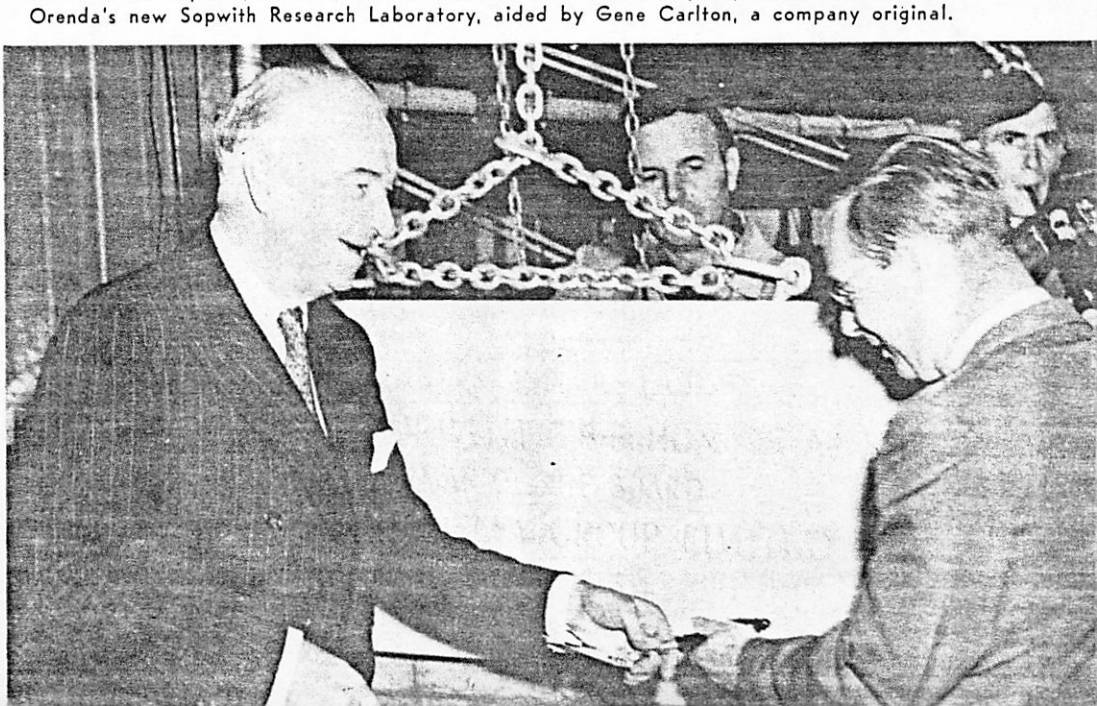
FRANK TRETHEWEY
—an engine to keep sold

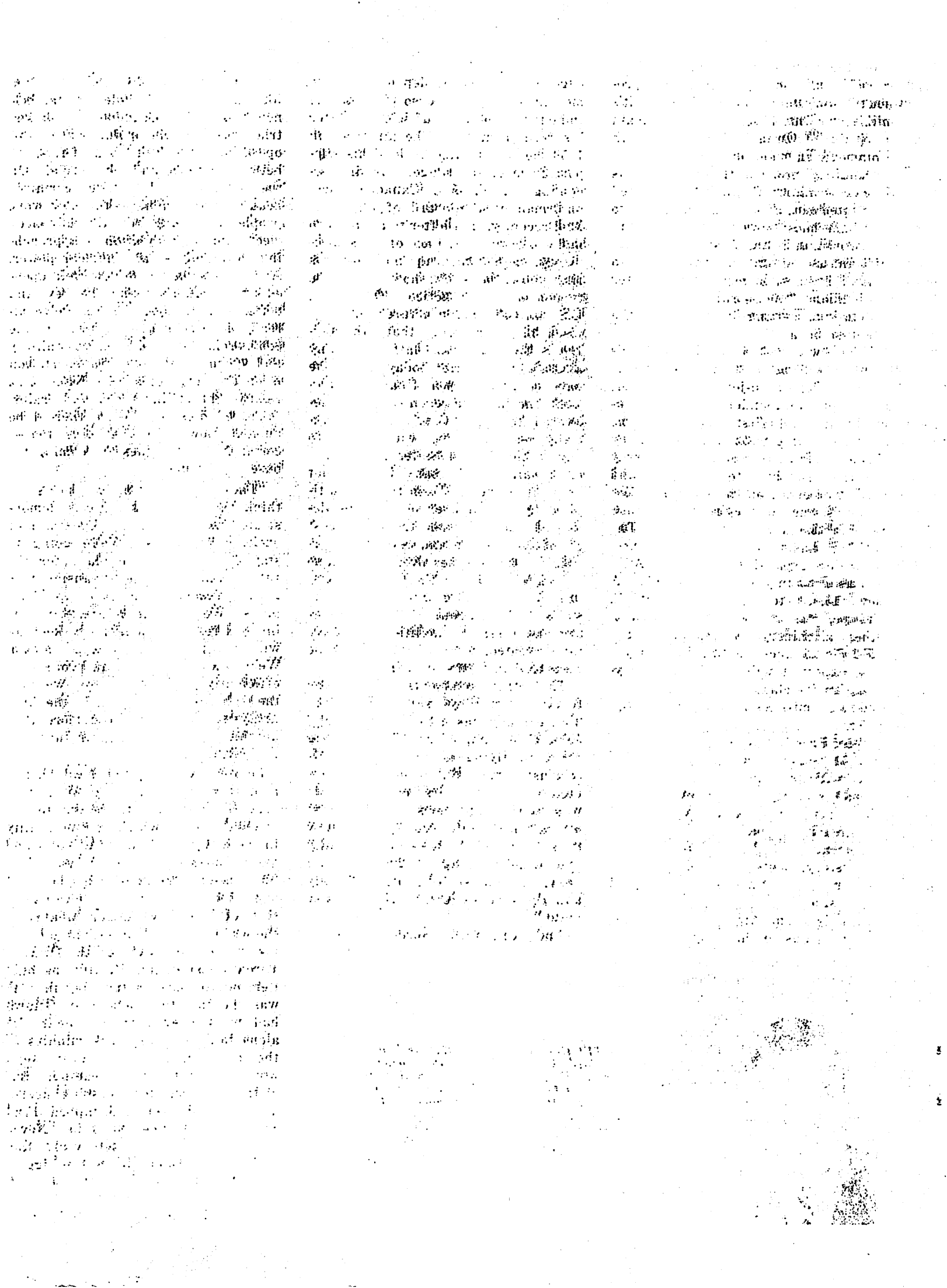
In some ways, the most amazing thing about a jet engine is that any such improvements are left undone after the rigorous routine of design. In the life cycle of five years from design to useful service, as Walter McLachlan says, "You skinny the engine down and run it until it breaks somewhere, fix that part, run it until it breaks somewhere else, fix it, run it again."

Normal engineering safety factors just can't be used at the level of jet engines; an engine that heavy would never get off the ground. The skinnying system, trial and test, is the only way. Then once you have a design that operates safely, you have the equally hard job of making it airworthy — to make it the kind of engine the Orenda sales and service department under vice-president F. L. Trethewey and sales manager Paul Y. Davoud can "keep sold". Their men are stationed wherever Orendas are in service. "They do the double job of helping the R.C.A.F. get the most out of the engine, and of keeping the home plant informed on performance in the field," Mr. Trethewey said. "They're our front window, our ambassadors. They've got to be good." These field service representatives have wide gas turbine backgrounds, some are former R.A.F. or R.C.A.F. men, and they work now in many parts in Canada and also in Britain, France, Germany — and will be in South Africa soon, when the first Orenda-Sabres go into service with the S.A.A.F. Vic Crompton, assistant to F. L. Trethewey and the first associate 17 years ago of Frank Whittle, was saying the other day that it seems a long way back to Whittle's first jet. It's also a long way back to that first Chinook.

And it will be farther next year, and farther again the next. There's

Sir T. O. M. Sopwith, chairman of the board of Hawker Siddeley, lays the cornerstone for Orenda's new Sopwith Research Laboratory, aided by Gene Carlton, a company original.





a policy not to say much about projects now under way. Usually it's military. But here are today's main projects at Orenda and Avro, with comments of men concerned:

Running now on the test beds is Orenda's mighty PS-13. It was started in September, 1953. The goal was to build the most powerful jet engine in the world. It is the first to make significant use of titanium in the race to find lighter, stronger metals. Walter McLachlan: "We're running, busting, rebuilding, getting it ready for the super-sonic age."

The Avro C-105 is Jim Floyd's new aeroplane. It is delta-wing, super-sonic, twin-jet, all-weather. Tooling is well under way for manufacture of the first aircraft by the production line method, instead of by hand-building a prototype. Harvey Smith doesn't have to chase back and forth to Detroit on the tools and dies for this one — they're being made right in the Avro Aircraft plant. The R.C.A.F. has it under order. A new $5 million expansion program at Avro is based mainly on the CF-105. A new 15,000-ton press, bought in Europe, was installed recently with other machinery to help meet the CF-105's advanced design. Fred Smye: "We expect it will be ahead of anything in its class."

Guided missiles are under development.

John Frost's new project, conceived in 1951, is now proceeding under contract with the U.S.A.F. It is subject to such security that few even among plant personnel are allowed within the area it occupies.

Bearing on A. V. Roe Canada's 10-year story, there are perhaps four more related comments which should be considered.

One is from Air Marshal Curtis. Partly because of his personal knowledge of the cost of dependence, few men have contributed so much to the industry's new self-sufficiency. After his retirement from the air force in 1953, he was invited to lend his support from closer range. He did, becoming A. V. Roe Canada's vice-chairman of the board of directors. And recently, in a letter to a man who had criticized the idea of self-sufficiency, he summed up not only his first convictions but how they have turned out in practice. One great U.S. aircraft manufacturer had advised him personally that "the CF-100 is the best gun platform of any aircraft in operation today." And he gave a little-known financial sidelight, the fact that each CF-100 is delivered to the R.C.A.F. at substantially less than we would have to pay in the United States for an aircraft built for the same job, but not doing it so well. When this is multiplied by the number of CF-100s delivered and on order, the whole cost of original design and development is paid for many times over. The same principle applies to the Orenda. And that is not taking into account the skills we have acquired, the engineering and research facilities that have been created, none of which can be measured in terms of cash.

The other comments are on the future. Jim Floyd says, "Our planning already has gone beyond 1970." John Frost amplifies: "The next big thing in flying is vertical take-off. It must come. But it *does* seem reluctant. All the first car had to do was go, without a horse. All the first aircraft had to do was fly. But now it isn't enough to take off vertically and wander along at 200 miles an hour. We must take off vertically and fly supersonically. Not an easy child."

And Crawford Gordon: "We've come a long way and we're going a lot farther — a whole lot farther, now that we've broadened our industrial base to the point where our operations are split about fifty-fifty between defence and commercial. On the aviation side we're certainly heading into avionics—the new word people are using for the advanced electronic stage aviation is approaching so quickly — and nuclear power. And there's the whole new field opened up by titanium and the new and better light alloys. There, we've already done some pioneering. On the commercial side, I believe railway and commercial road transportation is on the verge of a big advance . . . lightweight rolling stock and trains, improved diesels. Maybe there'll be nuclear power in that line too — certainly gas turbines are coming for buses and trucks.

"These are exciting prospects. I think that our company has demonstrated that we *belong* in the realm of exciting prospects. We're going to stay there. We have plans for the future, and we have expansion programs underway to back up those plans. We have the design, engineering and research facilities to keep up with the pack or stay a bit ahead. We've shown that we can produce as efficiently as anyone. And—we have the right kind of people. In the final analysis, that counts for more than anything else. To me, our future is unlimited."

So for every dream behind, there's another one ahead. And this is perhaps a good time to return to the original dream, which became reality in the many hundreds of CF-100s and many thousands of Orendas. Fred Smye must sometimes remember now one afternoon when every man on the staff of A. V. Roe Canada Limited — the whole two of them — held a meeting in a compartment on the Ottawa-Toronto pool train. Really the only item on the agenda that day in 1945 was the fact that nobody in Ottawa had wanted even to say hello, let alone talk business. The minutes of the meeting, had they been kept, would be pretty salty reading. But at the close Sir Roy Dobson chuckled and reached over and tapped Fred Smye on the knee and said, "Never you mind, Fred, in ten years this A. V. Roe Canada will be the biggest company in the Hawker Siddeley Group."

How's that for forecasting?

THE AUTHOR—Scott Young, 37, has had his stories published in most of the principal magazines in Canada, the United States and Britain; and in translations in many European countries. His fourth book, a novel with a background of the Winnipeg flood of 1950, will be published in 1956. Commenting on the A. V. Roe Canada story, Mr. Young said: "The single unhappy part of finishing this story is in realizing that I didn't have room to mention other hundreds of people who made significant contributions to this company."