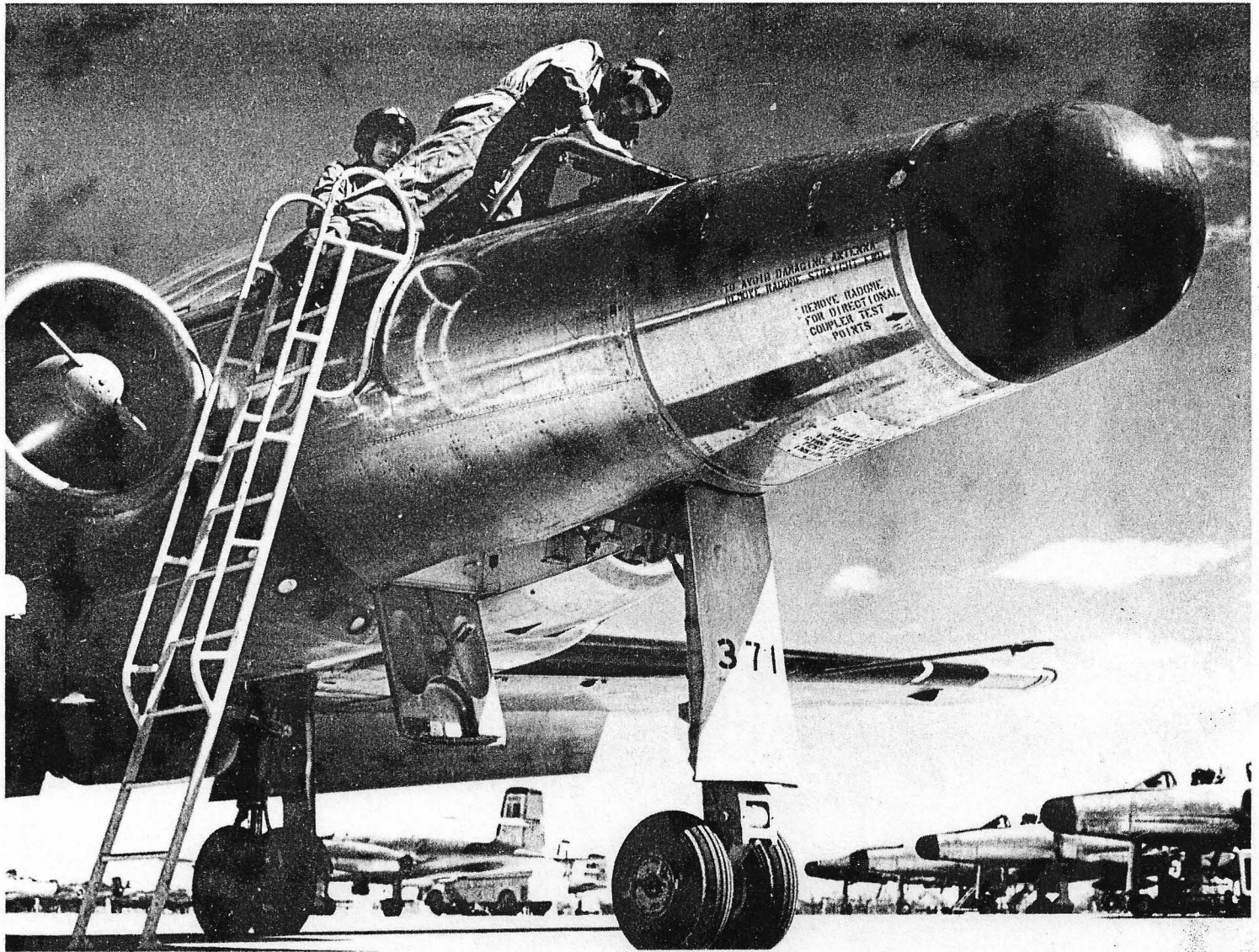


the CF-100

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Courtesy of Orenda Division, Hawker Siddeley Canada Ltd.

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THE CF-100

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The story surrounding that truly remarkable
and unforgettable aircraft - the CF-100 -
published by the Malton Branch 528 of the
Royal Canadian Legion in commemoration of
the unveiling of Serial Number 18682 in
Wildwood Park, Mississauga, on Saturday,
October 5th, 1974.

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; the R.C.A.F. was desperately short of planes. 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 licence from the original manufacturer which gave Canada no jurisdiction over the finished product.

He lost. The planes were assigned to Russia. It turned out later that the Canadian Government was able to keep these planes. Nevertheless, the lesson was there. The officer said later, "I realized right then 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 deserved."

A year later, an Englishman landed in Montreal from a York transport. He looked tired. He had every right. Days and nights for years he had been pushing and shoving the development and production of a big bomber called the Lancaster. The closest thing to a real rest he could be persuaded to take was this busman's holiday - a look at the Canadian aircraft industry. His name was Roy Dobson. What did he find?

"It opened my eyes, I'll tell you. 'If these so-and-sos can do this during a war, what can't they do after? Why shouldn't this country eventually be as important as the U.S.?' But one thing it would need was an aircraft industry of its own - design and development - not just assembling somebody else's stuff."

Certainly one factor in all that happened later was that the air force man wasn't alone in his frustration. By mid-war, the Canadian government had gathered in its vital regions of production and supply young men of very high calibre. Aircraft production was one of their chief fields of operation. In dozens of plants, Canada made aircraft designed and developed by the British and Americans. We were almost completely dependent on these allies for vital parts. It was a manufacturing - assembly operation, and it was good. It had to be, to turn out more than 16,000 aircraft during the war. But these men, and others in government, didn't like at all the farm-team feeling they got when the Canadian aircraft plants faltered or slowed because the flow of gearboxes or engines or armament from another country faltered or slowed. Not much could be done about it in wartime, except to determine that it must never happen again.

One of these young men - most of whom worked under Munitions and Supply Minister C.D. Howe - was Fred Smye. In 1943, he was 27 and director of aircraft production. One November day in 1943, he met Roy (later Sir Roy) Dobson, the man behind the Lancasters, and managing director of A.V. Roe Manchester. A few days later as a tour of Canadian plants progressed, Fred Smye heard the first hint that Sir Roy thought Canadians should have their own self-sufficient aircraft industry. From that moment on, Fred Smye would never let go of the idea. Sir Roy had even decided where it could be done. When he visited the crown-operated Victory Aircraft

plant in Malton, a Lancaster was rolling off the line. Perhaps it made him feel at home. "That's it," he said to himself.

Basically, the government was anxious to get out of the aircraft business as soon as the war's end would permit, and Sir Roy was anxious to get that Malton plant. In the early summer of 1945, the war in Europe over, he came to Canada again. In a series of Ottawa meetings a basis of agreement was reached with C.D. Howe, representing the government. The Victory Aircraft plant would be taken over on a rental-purchase plan. Present contracts for production of Lancasters and Lincolns would be the backbone of the new company at first.

By now, Fred Smye was in Montreal as assistant general manager of a Crown company - Federal Aircraft. He resigned to become the first employee of the as yet unnamed company. On August 1st, 1945, Fred moved into an office at Malton. And then, before a final agreement could be signed, the Japanese war ended, and the government cancelled all the contracts for Lancasters and Lincolns.

Weeks dragged by. Eventually Sir Roy came back to Canada. There was something of Canadian history in his meeting with C.D. Howe in the minister's office in Ottawa. Mr. Howe gave Sir Roy a chance to back out of the original arrangement. Aircraft plants in early summer had employed 80,000; now they had 8,000, and prospects for the industry seemed grim.

Sir Roy returned to Malton with Fred Smye. There were discussions - but not on whether it should be done, but how. They decided that a small part of the Victory plant - the office building and the first bay - would be enough for a start. In Ottawa, Sir Roy met again with Mr. Howe. Fred waited in a hotel room until they returned. Sir Roy walked in, threw his briefcase on the bed and said, "Remember we were only going to take part of it?"

"Yes," Smye said.

"Well, I wound up with the whole damn thing!"

The "whole damn thing" at that time certainly wasn't the most promising set-up in the world. Some areas had an almost eerie atmosphere. Once 9,600 people had worked there, day and night, and one Lancaster a day had rolled off the line. Now machines and tools stood exactly where they had been left on cancellations of contracts. When A.V. Roe Canada Limited took possession on December 1st, 1945, three hundred people were the survivors of that once great working force.

Constitution of the company was drawn up by J.S.D. Tory, who had handled the legal aspects of all the negotiations. Sir Roy was the first president. Walter Deisher was brought in from Fleet Aircraft

as the first vice-president and general manager. Fred Smye became assistant general manager. Edgar Atkin came as chief engineer, and with him, a young man named Jim Floyd who had worked on the design of the Avro Anson, the Lancaster, and the York. All they needed now was work which pointed to the company's original aim - to produce from drawing board into the air, an all-Canadian aircraft.

About this time, early in 1946, something happened. A Crown company named Turbo-Research Limited had brought a jet engine to the design stage. The government was either going to have to put in a lot more money to produce a prototype engine, or drop Turbo-Research altogether. Sir Roy heard of this and offered to take the company over as part of A.V. Roe Canada. This was done.

As the company began to move, the Royal Canadian Air Force and Trans-Canada Airlines naturally were the first ports of call. At first the air force was not encouraging; T.C.A. a little more so. They were interested in the transport possibilities of the jet engine. Then a few months later the R.C.A.F. official attitude changed. Remember the officer who had pleaded for aircraft in 1942? He was W.A. Curtis, now an Air Vice-marshal, and vice-chief of the air staff. The R.C.A.F. asked A.V. Roe Canada to design a twin-engined fighter which would, it was hoped, be powered by the Turbo-Research engine.

The threads were coming together. Jim Floyd had done some thinking and preliminary design work on the jet-transport idea. Trans-Canada Airlines was still interested. With government support, design work on the Jetliner began in September 1946.

Meanwhile, the Royal Canadian Air Force revised its ideas about what its first home-grown fighter should be. Work on the first one hadn't got off the boards, but had given the design staff a good workout getting that far. The jet engine worked on was called the Chinook. It was almost scrapped too, as specifications were drawn up for a much more powerful engine, the Orenda. But the Chinook eventually proved to be an invaluable teething ring while work went on with the Orenda, planned to be better than the best on the drawing boards in the United States and the United Kingdom.

The first Chinook surged to life on March 17th, 1948, with Fred Smye practically running from one machine to another picking up parts and delivering them to assembly to get her off on time.

With the first Orenda, on February 10th, 1949, project engineer Winnett Boyd was so confident that he didn't even have a private test run before the official one. 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 be

run for the first time. One bystander said, "You could hear knees knocking for half a mile."

A button was pushed. The first Orenda sprang to life. It was a moment never to forget. This engine was to be proved one of the most successful turbojets ever made. It ran for 477 hours before its first rebuild. Later it reached nearly a thousand hours. Then, a technician entered the test-cell to top up the oil. He was wearing a loose lab coat. In one pocket was a package of razor blades. He got too close to the air intake and the coat was sucked in. When the razor blades hit the whirling compressor blades there was a grinding crash and Orenda Number 1, for all practical purposes, was no more. The technician survived!

The Orenda was destined to drive a powerful world-beating fighter, designated the CF-100.

In the spring of 1947, Trans-Canada Airlines accepted Jim Floyd's design for the Jetliner. He became project designer, which made the plane "his". The concept was that since building a jet-propelled transport was itself revolutionary, the design itself would be as close as possible to the conventional and proved. The policy paid off.

The men who built the first Orendas could realise how Jim Floyd felt on July 25th, 1949, when the Jetliner was ready for final inspection, phenomenally less than three years from when pencil was laid to paper. On the day of the first taxi trials, the temperature was 103°. Test pilot Jim Orrel pondered. Should he take her into the air a few feet and then down again, short runway and all? He'd try.

At ninety miles per hour the nose wheel came up. Then there were four loud bangs. The aircraft ground to a halt. Orrel had decided he didn't have enough room to hop up and get down again safely. He had applied the brakes, and in the heat and strain all four tires had blown. But there was something encouraging even there - the aircraft had come to a stop easily and under full control.

On August 10th, 1949, Orrel said, "This time I'll take her right up, all the way." Jim Floyd was the centre 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 8000 feet. He radioed down, "Everything feels wonderful." Jim Floyd's airplane flew that time for an hour. Orrell brought her down easily, handling beautifully, even on a short runway. She rolled to a stop. Jim Floyd went over into a corner and wept.

The next of Avro Canada's big projects to become operational, the CF-100 can be described best in terms of the thinking 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 armoured. One Air Force officer was to say, "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 faster." In the House of Commons, Mr. Howe said, "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 June of 1947, John Frost was to join the staff and become 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.

As Jim Floyd had with his Jetliner, Frost literally lived with his aeroplane. In the same manner, so did his colleagues. Meanwhile, Orendas roared on the test beds. The Jetliner startled the continent with its performance.

Late in 1949, Bill Waterton, who would test the first CF-100 prototype, arrived. An Albertan, he had been a squadron leader in the Royal Air Force and was one of Britain's best test pilots. He was clambering around the cockpit within half an hour of being greeted at Malton airport. He moved into John Frost's office. He poured over performance calculations, listened to aerodynamicists, and suggested changes in the layout of cockpit controls. On January 17th, 1950, Bill Waterton took the CF-100 for its first flight, powered by two proven Rolls-Royce Avons.

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.

When the CF-100 jumped into the air in less than 500 yards, climbed, flew for forty minutes through the mild assessment of controls and stability that usually characterize a 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 aircraft allocation conference knowing

that to be sure of good aircraft we'd have to build them ourselves. The day in 1950 with the successful flight of the CF-100 he could expect that no R.C.A.F. officer ever would have to face such frustration again.

On June 25th, 1950, war began in Korea. The Canadian government ordered the Jetliner shelved to concentrate on the 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 in jet transportation. The Jetliner flew as steadily and speedily as ever, but as a company plane, used in high speed photography and test work in the development of CF-100's, doing every job well - "an aircraft," as Jim Floyd said, "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. As he came in, a ground observer saw that he was going to land and yelled frantically into the radio, and Waterton put on full power, so low that his jets kicked up dust off the runway. Also, in progressively more demanding testing, the aircraft's centre section was found to be too light. After one flight an ominous wrinkling of the metal skin where the wings met the centre-section told of excessive wing movement. The Company acted quickly and forcefully to redesign the centre section. The bright side was that redesign 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. In 1949, when the industry was in the first flush of a general surprise that Canada had produced a top-ranking engine so quickly, 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 for tests 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 engine testing had to be stopped, and all the engines pulled back from the U.S., while a forging technique which was found to have caused the failure was modified to prevent a similar happening in the future.

But these were only growing pains. On July 13th, 1950, the converted Lancaster 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 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 Montreal to Toronto at 665 miles per 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 17th 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 designed, developed and built in Canada by Canadian workmen, using Canadian materials. Not only is this the first aircraft to be designed developed and produced in Canada, but the Orenda 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."

Then a lot began to happen. There was 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.

On December 18th, 1952, Jan Zurakowski dove an experimental Mark 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 display in a CF-100 powered with twin Orenda II's. With the air elite of the world to write about it, the headlines the next day were about Canada's CF-100 and Zurakowski.

And who will forget the day the first production Mark 4 CF-100 came off the line? It was September 30th, 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. But they had. And the goal was now one aircraft a day. In the month of October, two were produced; in November, four. By the following June the buildup to the one-a-day planned production peak had been completed. It was a remarkable record. It ranked right up there in importance with anything anyone had done before.

Orendas, essential to the CF-100's achievements, also made quite a few of their own - the Orenda-Sabres in Europe, for

instance, the world's top daytime fighter. Other Orendas went to Columbia, South Africa and West Germany. Americans flew Sabres, too, but only Canadians flew Orendas-Sabres. Since these R.C.A.F. pilots in Europe were the direct descendants of the ones who always had to wait longer than their allies for good first-line aircraft, perhaps sometimes there was the occasional cosmic chuckle from the upper air as these Canadian pilots zoomed past their allies at will with the engines we had made ourselves.

While the CF-100 and the Orenda rolled from the line in hundreds, Project Study 13, leading to design and development of Orenda's mighty Iroquois engine was under way. The goal again was to build the most powerful jet engine in the world. It was the first to make significant use of titanium in the race to find lighter, stronger metals. The Iroquois roared to life in December, 1954.

Emerging concurrently was the CF-105, Jim Floyd's new airplane, the Arrow. She was a delta-wing, supersonic, twin-jet, all-weather interceptor. Fred Smye said, "We expect it will be ahead of anything in its class." The first Arrow took to the air on March 25th, 1958.

Both Arrow and Iroquois were to die young on the morning of February 20th, 1959. But, that's another story!

Today, the most tangible fruit of the labours of everyone involved lies in the CF-100 and its powerplant, the Orenda. A total of 692 CF-100's had poured off the line, including two prototypes and 53 Mark 5 aircraft for the Belgian Air Force. And 3,806 Orenda engines were built. A few of each remain.

It is therefore with pleasure that the members of Malton Branch 528 of the Royal Canadian Legion, in collaboration with the Royal Canadian Air Force Association, present to the citizens of Mississauga as a lasting tribute to the frustrations, pains, skills and daring of those who conceived, developed, built and flew these fine aircraft, serial number 18682 of the CF-100 series.

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Acknowledgement

The foregoing is an abbreviated and updated version of "The Way Up" written by Scott Young and published in the winter 1955 issue of Jet Age in commemoration of the tenth anniversary of A.V. Roe Canada Limited. The adaptation has been reproduced with the kind permission of Mr. Young and the company, now Hawker Siddeley Canada Ltd.