



Canada's First Supersonic Aircraft

AS we reported last week, the Avro CF-105 Arrow, the new delta all-weather two-seat fighter, was unveiled on October 4 at Malton, Ontario. As Defence Minister George R. Pearkes, V.C., pulled a cord, a yellow curtain parted to reveal the gleaming white delta-wing fighter. The aircraft was pulled out of the production bay, where the second unpowered aircraft could be glimpsed, and three CF-100s, a Mark 4, 5 and 6, flew low overhead. This was the first public appearance of the Canuck Mk. 6, which carried four yellow air-to-air Sparrow missiles and had elongated nacelles for its afterburners.

Mr. Fred T. Smye, president and general manager of Avro Aircraft, and Air Marshal Hugh L. Campbell, C.B.E., C.D., B.Sc., L.I.D., the new Chief of the Air Staff, spoke briefly. Mr. Pearkes said he hoped the Arrow will eventually be taken into use in R.C.A.F. squadrons. He thought it was not necessarily the last manned fighter, and that guided missiles and aircraft are complementary, rather than competitive.

In side elevation, the Arrow looks rather like a scaled-up Fairey F.D.2. Although there has been an exchange of information with the Fairey company, the design owes more to the delta experience of A. V. Roe and Co., of Manchester, and to the extensive wind-tunnel testing and rocket firing done in Canada and the United States.

The design is conventional, both aerodynamically and structurally. Mr. G. Hake, project designer for the Arrow, described the solutions for the various problems as straightforward, and sometimes self-evident. One of the greatest problems in an aircraft operating over such a large speed range is to make the air intakes reasonably efficient over the entire

speed range. This has been tackled by bleeding off the boundary layer through an array of holes immediately in front of the air intakes. This air passes through a duct which is vented immediately below and just behind the intake. The thin wing has a 60° sweepback, a notched, saw-tooth leading-edge and wing fences. Behind the cockpit is an efflux for the air-conditioning system. Directly behind this vent is an unpainted titanium shroud, followed by a long, dielectric housing. Considerable use has been made of titanium and stainless steel, mainly for the engine shroud and similar hot spots.

Two Martin-Baker Mk. 5 ejection seats are fitted. Avro regards the escape problem as a major project in itself, and has been investigating clothing and physiological problems, among others, in conjunction with the R.C.A.F.'s Institute of Aviation Medicine, as well as R.A.F. and U.S.A.F. agencies.

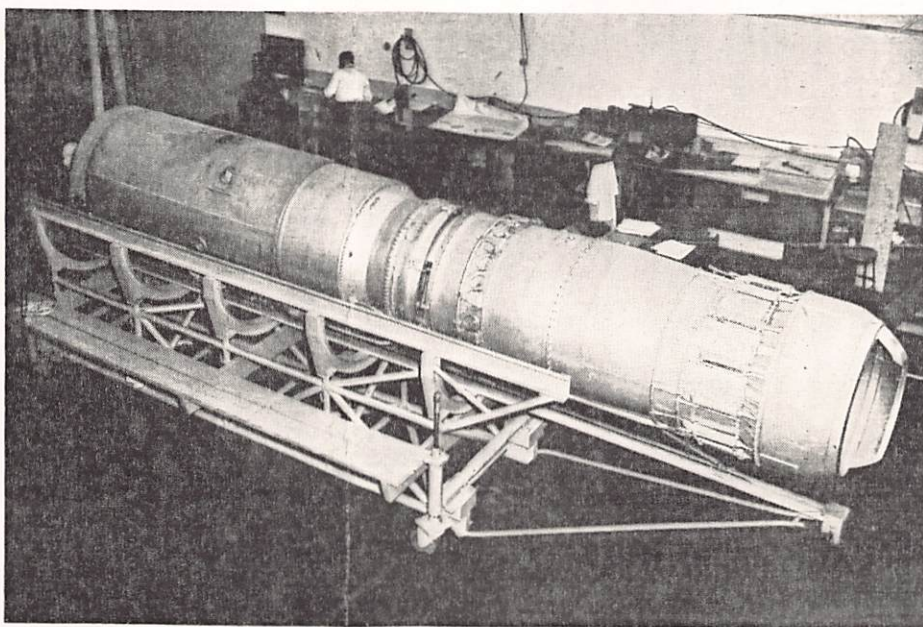
Although the first aircraft, 25201, is white, future aircraft may be unpainted. The paint was used largely for effect, though some have suggested it might ease the kinetic heating problem. The paint's weight and the maintenance it will require are likely to discourage its use.

The detachable weapons bay, larger than the bomb bays of a Superfortress, will house test instrumentation. Later it will carry Sparrow 2 guided missiles, which will be lowered one at a time for firing, or cameras or nuclear bombs. If we understood Mr. Smye correctly, bombers could be destroyed at a height of 75,000 ft., although the aircraft's ceiling is about 63,000 ft.

Far from being a hand-built prototype, the Arrow 1 was built to close tolerances on production tooling. Several possible

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A mock-up of the Pratt & Whitney J75 turbojet on its engine-installation trolley. This engine powers the first CF-105 Arrow and will also be installed in the following three aircraft, after which it will be replaced by the Orenda Engines' Iroquois turbojet which was designed for the Arrow. The Iroquois is soon to fly in a modified B-47.



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configurations had been suggested to the R.C.A.F. before the design was agreed upon in the spring of 1954. Detailed production drawings were issued from the outset. To ensure that these would require the minimum of changes, extensive aerodynamic and stability tests were made. Fuel, hydraulic, control and air-conditioning systems were duplicated in the experimental shop, then run and cleared on the ground. Development costs have amounted to \$200,000,000 which Avro hopes will be spread over a production order. If the flight tests are successful the comprehensive tooling will permit the aircraft to be put into production with a minimum of delay.

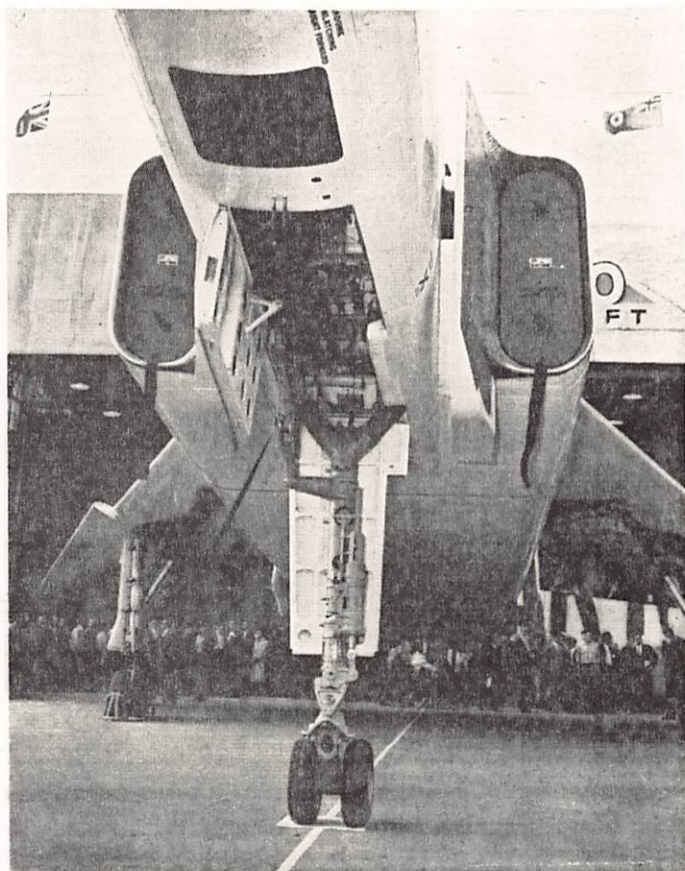
The Arrow carries the Astra I integrated flight-control and fire-control system developed by the Radio Corporation of America. The main undercarriage legs are of special high-tensile steel and were developed by Dowty Equipment, of Ajax, Ontario, which is a member of the British Dowty Group of companies.

Because it is undesirable to test a new aircraft and new engine simultaneously, the first four aircraft at least will have Pratt & Whitney J75 engines with afterburners, rather than the Orenda PS-13 Iroquois for which the type was designed. At one time Rolls-Royce R.B.106 and Wright J67 engines were to have been fitted, but neither was ready in time. The Iroquois has not yet flown in its Canadair-modified B-47 Stratojet test bed.

The Arrow's power/weight ratio is so high that taking off on existing runways is no problem, but a drag chute for landing is needed. The rate of climb is so high that rockets were not considered necessary, although they could easily be fitted. Mr. Smye said that the noise would not be as intense nor of as long duration as that from the Douglas DC-8. No sound suppressors are used, of course.

The R.C.A.F. decided to develop its own supersonic fighter when no known project met its requirements. The Convair F-102 and F-106, the only aircraft in the general area, have much less range, less armament and only one engine. The R.C.A.F. wanted a two-seat, twin-engined fighter with more firepower and capable of Mach 2.5, the range of the CF-100 (about 2,000 miles) and a ceiling of 60,000 ft.

Mr. Smye said he was not convinced that the Arrow was the last manned fighter. Although his firm had not started on the design of a successor, he thought there would be one. Aircraft would be Canada's primary defence, even in two or three years, when the Arrow might be in squadron service. It is hoped that the first flight will be made by the end of this year, while the second aircraft is about three months behind the first. Jan Zurkowski and other Avro test pilots have spent some time at Convair's Palmdale, Calif., plant flying the F-102 Delta Dagger.—N.A.M.



Howard Levy photographs

ARROW CLOSE-UPS.—Above, this view of the nose-wheel bay shows the air-intake boundary-layer-bleed side walls. Below, left, a very neat twin-wheel bogie has been devised by Dowty Equipment of Canada to retract into the Arrow's extremely thin wing. Below, another view of the main-wheel unit, which also shows the wide leading-edge slot and deep sawcut.

