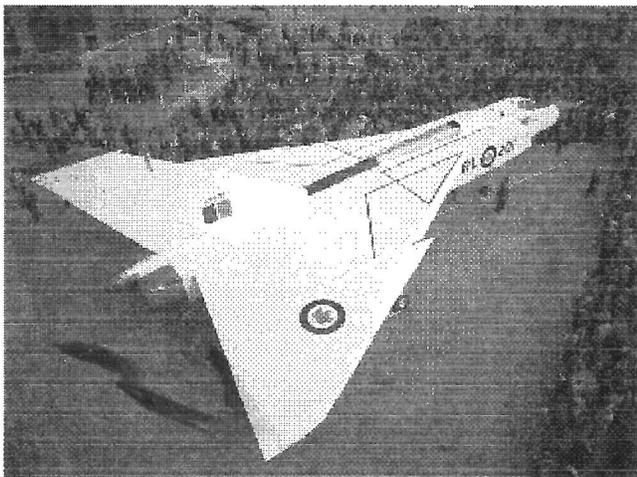


## The Roll-out of the Avro Arrow

By Bill Zuk

On October 4, 1957, the same day as the Sputnik I was revealed to the world, another important event was taking place in Malton, Ontario at the Avro Canada plant. After years of design and construction, Avro was finally able to showcase their remarkable new interceptor project. The Avro CF-105 Arrow roll-out took place in front of a huge audience. Representatives from the military, government and the aviation industry mixed with Avro plant employees to make up a crowd of 12,000.



With the words ringing from the podium, the Hon. George Pearkes, Minister of National Defence announced "I now have the pleasure of unveiling the Avro Arrow, Canada's first supersonic aircraft, a symbol of a new era for Canada in the air" As each person strained to look at the hangar doors as curtains parted, a striking, delta-winged "dart" was wheeled into public view. Spectators spontaneously began applauding and scrambled for a better view as the

Arrow rolled forward.

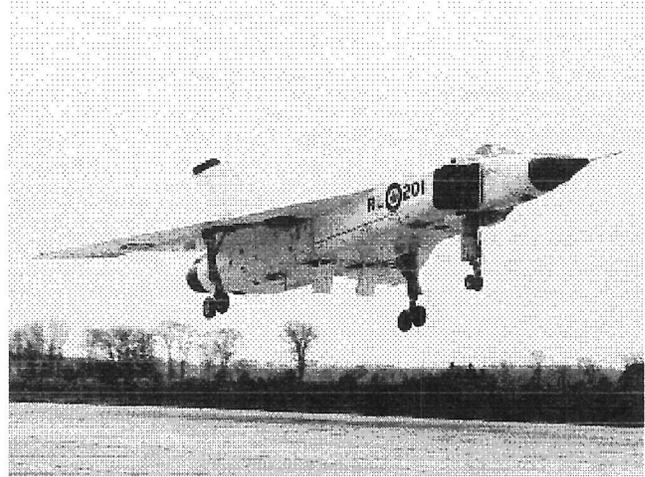
This was merely the official ceremony. For most knowledgeable observers, the CF-105 Avro Arrow had already been an object of much attention. RL-201 was the first of a planned series of 100 aircraft. "201" would take only 28 months from the release of the first blueprints to its roll-out, but the story had begun much earlier.

Designed to RCAF specifications in 1953 that called for a twin-engine, two seat interceptor capable of protecting the Arctic frontier of Canada, the Avro Arrow was remarkable in its execution. Unlike its subsonic predecessor, the CF-100 Canuck, the Arrow represented an advanced technological achievement. Developed by A.V. Roe of Canada, its origins stem from the innovative research and design programs carried out by the company in the 1940s. The high wing delta aircraft, powered by Canadian-designed Iroquois engines (26,0100 lb. thrust in afterburning mode), far exceeded the design specifications.

The Avro CF-105 Arrow was one of the world's most advanced fighter aircraft during

the 1950s. The developed Arrow Mk. II would have been capable of Mach 2.4 speeds--remarkable for 1959! An innovative approach was also undertaken by the Avro Company to establish production tooling from the outset, resulting in the first Arrow reaching completion status on October 4, 1957.

RL-201 was the first of five Arrow Mk.IIs that would fly as prototypes for the series. Carrying Pratt and Whitney J-75s, the initial production batch still were fascinating hints of the future. Utilizing a complex "fly-by-wire" control, an advanced weapons system and remote ground-controlled operation, the Arrow was, arguably, the most advanced fighter aircraft of its day.



In all, 66 test flights totalling 70 hours, 30 minutes were completed by all five aircraft between March 25, 1958 and February 20, 1959. On that date, the Diefenbaker government, citing high costs and the government's new commitment to missile rather than manned aircraft defence, cancelled the program. Three months later, the government also ordered that all aircraft completed, including RL-206, the first Arrow Mk. II, and all partially completed Arrows on the assembly line, be destroyed.

This decision by the government was further bolstered by demands that all evidence of the CF-105's existence, including tools, dyes, drawings and photographs also be destroyed. The Avro Company completed the destruction, but not surprisingly, the Arrow remains alive in people's memories, along with the few fragments of the aircraft that had been preserved.

An earlier design from the Avro Company was the Avro C-102 Jetliner, North America's first jet airliner, designed in Canada by James Floyd. This aircraft first flew on 10 Aug. 1949, exceeding 800 km/h, the first flight of a jet transport in North America, second in the world to the de Havilland Comet jet airliner that made its first flight on 27 July 1949. In April 1950, the Avro Jetliner made the first international jet-transport flight in North America, from Toronto to New York. The Jetliner aroused much interest in the United States and was one of the outstanding aeronautical achievements of its day, but it never saw production.

Trans-Canada Airlines, Canada's premier airline, had been interested in the Jetliner during its design phase but lost interest even before the first flight as it was clear that the jet could not compete on longer, more profitable routes. In the Cold War atmosphere, the powerful Minister of Reconstruction in Canada's government, C.D. Howe, insisted that the Avro Company concentrate on their other jet program, the

CF-100 fighter. Even the RCAF, the first air force to operate jet transports, ordered two de Havilland Comets in November 1951. After no sales were generated in foreign markets, the Avro Jetliner was sold for scrap in 1956. Today, only the nose section and engines survive in the National Aviation Museum.

Avro's main jet programs in the 1950s were based on the CF-100 Canuck (the name "Canuck" was considered inappropriate at the time for a fighter), the first jet fighter designed and built in Canada. After 4 years development, it first flew Jan 1950. The CF-100 became operational in April 1953 and served 10 years in NORAD and NATO squadrons (692 were eventually built with 53 sold to Belgium).

The Avro CF-100 was a long-range, all-weather interceptor equipped with 2 Avro designed and built Orenda engines. It was the first military aircraft wholly designed and built in Canada. While the Avro CF-100 was not as fast as contemporary fighters, its good climb rate, excellent radar, twin-engined reliability and all-weather capability made it suitable for defence in the extreme conditions of the Canadian North and in West Germany.

Two Avro CF-100 Canucks are preserved in the National Aviation Museum, one in the Calgary Centennial Planetarium, one at the Western Canada Aviation Museum and others in parks and bases across Canada including The Air Command HQ Air Heritage Park in Winnipeg.

In the 1950s, Canadian and American air-defence organizations were integrated under the NORAD Agreement along with the completion of a continental radar defence network. Previously, the Canadians and Americans had foreseen the requirement for an interceptor of advanced design that could effectively exploit the advantages of this system. The RCAF was depending on the next development from the Avro Company--the Arrow. Encouraged by A.V. Roe's success in developing the Avro CF-100 Canuck and recognizing the need for an aircraft to counter the threat of Soviet bombers over the demanding Canadian North, the next Avro design was the company's most complex and sophisticated project. Enthusiastic RCAF officers, defence scientists and defence-industry officials had persuaded the Liberal government by Dec. 1953 to authorize two prototype airframes of an advanced supersonic interceptor. It was anticipated that a production run of up to 600 aircraft, costing \$2 million apiece was needed.

### **The AIR 7-3 Supersonic All-Weather Interceptor Aircraft Specification**

- Operate from a 6000 ft. runway
- A range of 6000 nautical miles
- Capable of accelerating to Mach 1.5
- To have a crew of two, a pilot, and a navigator.

- Carry an advanced weapon system with an advanced targetting system
- Capable of operating in Canada's harsh environment
- Manoeuvre at 50,000 ft. while pulling 2G
- Two engines

During the design phase, the Avro Company led by dynamic CEO, Crawford Gordon, undertook the expensive development of the Arrow's engine, and fire-control and missile systems, with estimated costs rising to \$12.5 million per aircraft. Test flights indicated that, with the proper engines, the plane could well be the world's fastest and most advanced interceptor. However, doubts in the military and the government over the role of the Arrow mounted and the government's order shrank to 100 and unit costs rose.

The potential of the Avro Arrow was realized by Avro's chief test pilot, Janusz Zurakowski. In 1945, he had tested Britain's first jet operational fighter, the Gloster Meteor. Zurakowski came to Canada in 1952 to work for A.V. Roe Canada. He broke the sound barrier in an Avro CF-100 -- the first Canadian aircraft to reach that speed. Zurakowski flew the the first flight of the Avro Arrow on March 25, 1958 and exceeded 1600 km/h on the seventh flight of RL-201. Jan Zurakowski was awarded the McKee Trophy in 1958 primarily for his work on the CF-105 program.

Other events were soon to overtake the Avro Arrow. In Oct. 1958, to cut costs, the newly elected Progressive Conservative government of John Diefenbaker reviewed the Avro Arrow program that had been considered a Liberal government "pet" project. The Diefenbaker government terminated Canadian fire-control and missile development, and renewed efforts to sell the aircraft to the United States, just when the US was promoting Bomarc missiles and the USSR's launch of an ICBM missile was raising doubts about the priority of the Soviet bomber threat.

NORAD (North American Air Defence Agreement), announced on 1 Aug 1957, and renamed "North American Aerospace Defence Command" in 1981, integrated the air-defence forces of the United States and Canada under a joint command at Colorado Springs, Colorado. The agreement had occasionally been a focus of controversy. PM John Diefenbaker and Minister of National Defence George Pearkes, just installed in office, hastily accepted the advice of the Canadian military and agreed to integrate the RCAF with the USAF for the air defence of the continent.

Bomarc missiles had been proposed by the Diefenbaker Cabinet as an adequate deterrent. The cost-effective (but greatly flawed) Bomarc was greatly resented by supporters of the CF-105 Avro Arrow. As Crawford Gordon launched a last-ditch effort to keep the Arrow project going, it was clear there was considerable resistance in the Diefenbaker government to continue with the costly development of the Arrow.

After efforts at selling the Arrow again failed, the project was officially cancelled by Prime Minister Diefenbaker on 20 Feb. 1959 (known as "Black Friday" at Avro). A.V. Roe Company directors led by Crawford Gordon fired nearly 14,000 employees. The government ordered all plans and prototypes (RL-201 - 205 had flown) destroyed; and many Canadians bemoaned the devastation of Canada's aircraft industry, the resulting flight of scientists and engineers to the United States, and Canada's renewed dependence on the Americans for military aircraft.

From 1949 when the Avro Arrow was initially proposed until the Canadian government's cancellation of the project in 1959, the Avro Arrow program was one of great promise but unfulfilled objectives. It was undoubtedly one of the most advanced jet interceptors in the world, but owing to the prohibitive costs of development, it was an extremely costly military venture for Canada. With changing political and military policy considerations that emerged in the late 1950s, the Avro Arrow was doomed. The cancellation was a disaster for the military aviation industry in Canada and practically ensured that future military aircraft would have to be purchased abroad.

Although two Bomarc missile bases were built in Canada, in the next decade, 3 American fighters were procured as the next generation of Canadian fighter aircraft. CF-104 Starfighters (1961) and CF-5 Freedom Fighters (1968) for deployment in Europe and CF-101 Voodoos (1961) became replacements for the CF-100s in 1961. The CF-104s and CF-5s were manufactured under licence by Canadair. Both types reflected the tremendous impact of modern technology. The CF-104 was one of the fastest planes in the world and became the CAF's mainline fighter in NATO.

These fighter aircraft were replaced in 1982 by the McDonnell Douglas CF-18, a versatile, twin-engined fighter with a maximum speed of Mach 1.8 and a built-in capability for subsequent additions in avionics and armaments. Heavily computerized and armed with a cannon as well as missiles, the CF-18 is a modern weapons system likely to remain in the first rank of combat aircraft for years to come.

Today, the Avro Arrow only remains as a memory although there are some sections of Arrow Mk.II RL-206 (nose, front landing gear and definitive Avro Iroquois engine) preserved in the National Aeronautical Collection in Ottawa. In a quirk of fate, the Avro Arrow sits near the chopped up nose section of the Avro Jetliner, another unrealized dream of Canadian aeronautics.



## **Arrow Mk. I (with Pratt & Whitney J-75 Engines)**

- Wingspan: 50'-0"
- Length Overall: 77'-9.65"
- Height: 21'-3"
- Engine Thrust: 12 500 lb (dry static)
- 18 500 lb (wet static)
- Fuel: 2897 Imperial Gallons
- 2508 Imperial Gallons Usable
- Crew: 2 (pilot and navigator/radar operator)
- Armament: None (flight test only)

## **Arrow Mk. II (with Orenda Iroquois Engines)**

- Wingspan: 50'-0"
- Length Overall: 77'-9.65"
- Height: 21'-3"
- Engine Thrust: 19 250 lb. (dry static)
- 26 000 lb. (wet static)
- Fuel: 2897 Imperial Gallons
- 2508 Imperial Gallons Usable
- 500 Imperial Gallon External Tank Available
- Crew: 2 (pilot and navigator/radar operator)
- Armament: 4 Sparrow IID missiles in rapid change package

*Bill Zuk is an amateur aviation historian and writer whose interest in the Avro Arrow is long-standing. Currently a Teacher-Librarian in St. Vital School Division, he is also an active member of a number of associations involved in literature and libraries. When the Straight Arrow production team began work in Winnipeg, Bill asked for and received permission to chronicle the making of the Arrow film for various publications.*



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[\*\*http://www.achq.dnd.ca/roundel/jun96/rollout.htm\*\*](http://www.achq.dnd.ca/roundel/jun96/rollout.htm)

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