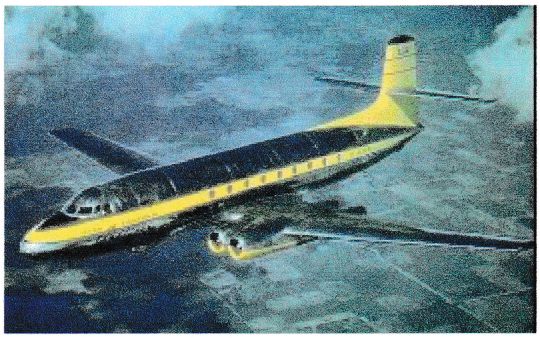
The Avro Aircraft Arrow

The Avro Arrow was an advanced, supersonic, twin-engined, all-weather jet interceptor developed by A.V. Roe of Canada in the 1950's. The federal government's controversial cancellation of the project and subsequent destruction of every existing Arrow has created a design story that seems bound to become a central feature of our national identity. Even putting aside the drama of the story itself still leaves this aircraft as an instructive example of several recurring themes we find in design history. First a few facts.

Driving north from Pearson Airport along Airport Road, you pass on your left a large, rambling industrial complex. Today the name on the building might be Boeing or McDonnell-Douglas, but forty years ago that was Avro Aircraft, the key operation of what at the time was Canada's second largest corporation.



By the time of the Arrow's first flight, Avro had already produced over 600 CF-100's, the first jet fighter designed and built in Canada. Much earlier, in 1949, Avro's Jetliner, at the left, became the first jet transport to fly in North America (it only missed by 14 days being the first in the world!).

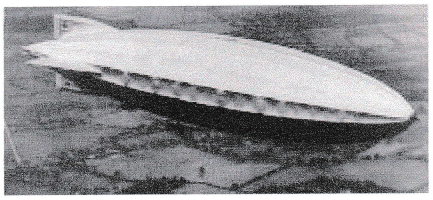
In the early 1950's, at the request of the Royal Canadian Air Force, the Canadian government contracted with Avro to design an aircraft to counter the threat of Soviet Russian bombers attacking from the Arctic. The ambitious project aimed to produce 600 aircraft at $2 million each. To meet the demanding RCAF specifications Avro had the additional challenge of developing a new powerful engine and adapting to a yet to be designed fire control and missile system. Soon production costs grew to $12.5 million per aircraft, due largely to problems with the U.S. company designing the fire control system.

After its first flight March, 1958, the Arrow was soon flying at 1,300 miles per hour, almost twice the speed of sound, and reaching altitudes of 58,000. Forty years later the Canadian Armed Forces CF-18 Hornet is barely able to match this achievement. A simple glance at other 1950's aircraft reveals how the Arrow's startling, innovative shape must have stretched the defense industry's definition of what a fighter plane should look like. And in many other ways beyond its appearance, the Arrow broke new ground by discovering the engineering required to fly a manned aircraft across the sky at twice the speed of sound. The U.S., Britain, and Russia were stunned.

Canada was also stunned. On February 20, 1959 the Conservative government of John Diefenbaker cancelled the Arrow program forcing Avro to terminate the jobs of 14,000 employees. The Department of National Defense inexplicably ordered all plans and aircraft destroyed. Many Avro designers and engineers left Canada, to work elsewhere--notably on the U.S. lunar flight programs and the Anglo-French Concorde.

That such a stunning aeronautical achievement ended so ignominiously, brings us back to that recurring challenge: how can we assess the value of a technically innovative design? The more radically innovative a design appears--the greater the challenge for it to be accepted. Raymond Loewy tried to express this puzzle in his formula the 'Most Advanced Yet Acceptable'. In other words the 'successful' design seems to balance innovation with something reassuringly familiar. Since the Arrow pushed the limits of familiarity, the public began to wonder when they were simultaneously confronted with an alternate, and apparently incompatible, innovate technology--guided missiles.

Was the Arrow obsolete? The day of the Arrow's public roll-out to the public also coincided with Russia's launch of Sputnik, the world's first orbital satellite. With the looming possibility of attack by intercontinental ballistic missiles, politicians feared spending money to protect Canada from the seemingly obsolete manned bomber. The government, when scrapping the Arrow, declared the manned interceptor not only too expensive but also obsolete. They made a mistake. Forty years later the manned bomber continues its role as a terrifying weapon against which Canada has little defence with a handful extraordinarily expensive American built CF-18's.



Was the dirigible obsolete? Canada erred when predicting the obsolescence of the manned bomber. Did Britain and Germany make a similar misjudgment when they abandoned their development of airship technology? Heskett's *Industrial Design* (pp. 188-89) describes the fate of the dirigible. In the 1920's Germany and Britain began to compete in the development of airships. In Heskett's words the ships served as a symbol of "technical achievement at a time when the conquest of the air was still sufficiently recent to be awesome and exciting". The British launched their Imperial Airship Scheme to develop air transport links with Canada and India. In 1930 the privately funded R-100 airship successfully completed a trans-Atlantic round trip between Britain and Canada. You might check the National Aviation Museum in Ottawa for a photo essay on the R-100's visit to Ontario and Quebec. The government sponsored competition, the R101, crashed in France the same year while attempting to reach India. The following year the Imperial Airship program was cancelled. The German Zeppelin program, sponsored by Hitler's National Socialists, for a while was much more successful. But it too ended with the spectacular fiery crash of the 'Hindenburg' (recorded on newsfilm) while it was attempting to dock at Lakehurst New Jersey in 1937.

A recurring pattern? Outguessing technological change can be a risky business. Think today of competing formats for recorded music and video. Beta lost out to VHS. What CD format will survive? Which version of High Definition TV? But the stakes have always appeared much higher for developers of air transport. The guess as to the best technology becomes expensive. In the case of the Arrow, Canada's aircraft industry was at stake. The guess can also become expensive in terms of human lives. Exploding windows of the early British Comet caused several crashes killing hundreds of passengers. Similar loss of life came from the Douglas DC-10's exploding cargo hatches.

If you'd like to follow-up with Arrow WWW sites, try the National Aviation Museum in Ottawa which has a page devoted to the Avro Canada CF-105 Arrow. Another excellent site for photos and for a good Avro summary is David Mackechnie's Avro Canada Archive (the source for the Jetliner photo). Also for photos go to the Canadian Air Force Photo Archive.