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Avro Arrow designer honoured

At 95, Jim Floyd's contributions to aerospace engineering are as enduring as the man himself.

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Design ENGINEERING

James "Jim" Floyd, the designer of the Avro Arrow and the first passenger jet, was honoured at the Canadian Air and Space Museum at Downsview Park on Monday. During his illustrious career, Floyd (95) was involved for more than half a century in aircraft designs. In his early days he worked on the Lancaster bomber, the York transport, the Lincoln and other designs.

Floyd came to Canada in February 1946 to join the newly formed A.V.Roe Canada company (Avro) at Malton Ontario, initially as Chief Design Engineer in charge of the C 102 Jetliner project, then Chief Engineer in charge of all Avro projects, including the CF 100 fighter and the CF 105 Arrow project. He was appointed Vice-president Engineering in 1955.

After the cancellation of the Arrow project he established his own international aviation consulting company and made contributions to many state-of-the-art projects worldwide. He was consultant to the British Ministry of Technology on the Concorde project from 1965 to 1972.

In 1950 he became the first non-American recipient of the Wright Bros. Medal for his work on jet transport technology, specifically the design of the Avro Canada Jetliner, the world's first regional jet passenger aircraft. In 1957 he received the J.D.McCurdy Award for his work on the CF 100 and CF 105 (Arrow) fighter aircraft. For his work on supersonic transport design he was awarded the Royal Aeronautical Society's George Taylor Gold Medal in 1962.
www.casmuseum.org

Avro Canada

Founded 1945-Defunct 1962-Location Toronto, Canada

In 1952, Avro Aircraft Ltd., a Canadian firm located at Malton near Toronto, began to develop a unique, supersonic fighter-bomber aircraft that could takeoff and land vertically, cruise at low altitudes on a cushion of air (also called ground effect) or accelerate to high speeds at higher altitudes. The concept looked promising and the Canadian government agreed to fund the study. However, the contract expired before the study could be completed and the government abandoned the project as too costly.

Work had progressed far enough to interest the Americans. In July 1954, the U. S. government awarded Avro two contracts worth nearly $2 million to continue the study, and Avro added another $2.5 million. The program remained in Canada but was now owned and controlled by the United States. Avro had named it Project Y but the U. S. Department of Defense labeled it Weapon System 606A.

In 1958, when the U. S. Army and Air Force took control of the project, they named the vehicle 'Avrocar' and designated it the VZ-9AV ('VZ,' experimental vertical flight; '9,' ninth concept proposal; and 'AV,' Avro). The Avro VZ-9AV Avrocar had fill some enormous shoes. The Army strategists looked for a subsonic, all-terrain reconnaissance and troop-transport vehicle, something rugged and adaptable that could replace light observation aircraft and helicopters. They wanted a two-man craft that could perform the traditional roles of the cavalry: reconnaissance, counter-reconnaissance, pursuit, harassment and screening. In addition to its own airframe weight, the saucer had to carry 450 kg (1,000 lbs) including the crew.

It also had to hover in ground effect and at higher altitudes, and travel at speeds of about 48.3 kph (30 mph) for at least thirty minutes. In short, the Army wanted a flying jeep.

U. S. Air Force planners wanted something else. They asked for a VTOL aircraft that could hover near the ground, beneath the coverage of enemy radar, and then rocket into the stratosphere at supersonic speeds. To satisfy both services, the Avrocar would require a huge performance envelope and rather naively, Avro engineers believed they could build a supersonic flying jeep. John Frost was chief project engineer for Weapon System 606A, the Avrocar. One of the oddest features of Frost's design was its shape. The entire aircraft was a circular wing shaped much like the ubiquitous Frisbee.

From a distance, the gleaming aluminum Avrocar looked like the flying discs popularized in many Hollywood science-

fiction movies of that era. Frost and his design team powered the aircraft with three gas-turbine engines and the combined
exhaust from these power plants drove a "turborotor" mounted in the center of the vehicle. Turborotor thrust passed
through a combination of annular nozzles and peripheral jets to generate lift and control forces. On paper, the design
promised hovering takeoffs and landings and cruise speeds upwards of 322-483 kph (2-300 mph) at an altitude of 3,040 m
(10,000 ft).
It was thought that eventually, the aircraft could attain supersonic speeds. A scale model of the aircraft was sent to Wright
Field outside Dayton, Ohio, for testing. At first, the test results seemed to confirm Avro's calculations but further review
of the data revealed a serious setback. The jet of air generated by the turborotor to cushion the aircraft near the ground
grew increasingly unstable at altitudes of more than a few feet. The problem could be solved but it would reduce the
craft's high-end performance.
The saucer would probably never fly supersonic. Despite this setback, the Americans decided to stick with the program
and hoped that at least the Army's requirements for a subsonic aircraft could be met. In the fall of 1959 the first completed
Avrocar prototype rolled out onto the taxiway apron at Malton.
Avro was already well advanced on a second prototype. Tests on the first vehicle began, using a special test rig to suspend
the Avrocar in the air. The results led to immediate modifications to the annular nozzles, a key element to the lift and
propulsion of the aircraft. After reworking the nozzle, Avro packed up the Avrocar like an oversize dinner plate and
shipped it to the National Aeronautics and Space Administration (NASA) Ames Research Center at Moffett Field,
California. NASA had a wind tunnel at Moffett big enough to hold the VZ-9AV. Meanwhile, Avro finished the second
prototype and began flight tests, using a safety tether, in September 1959. The first free flight occurred later that winter.