

1999



THE STORY OF THE AVRO ARROW

from Dream to Legend

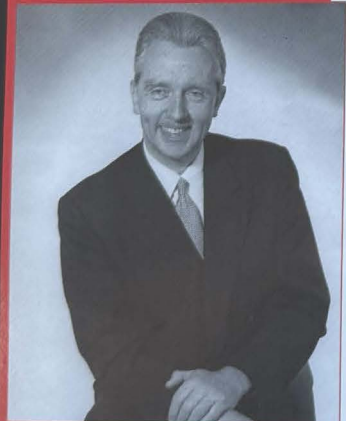


**JAN ZURAKOWSKI AND JIM FLOYD AT THE 40TH ANNIVERSARY DINNER
CELEBRATING THE FIRST FLIGHT OF THE AVRO ARROW**

"JIM FLOYD THROUGH THE YEARS"



As a young engineer in the early days at A.V. Roe Canada-1947.



In 1956 as VP and Director of Engineering Avro.



*Induction into Canada's Aviation Hall of Fame on June 3, 1993.
Photograph by Don Evans.*

Jim Floyd and The Avro Arrow

It started as a dream in 1953 when the RCAF issued a specification for a supersonic fighter aircraft that called for a level of performance well beyond that being considered by aircraft designers worldwide. A machine that was to go into combat at Mach 1.5 and have exceptional manoeuvrability at 50,000 feet without losing speed or altitude. A seemingly impossible dream, but one that came to fruition on March 25, 1958 when Jan Zurakowski test flew the CF-105 Avro Arrow for the first time. It was designed and built in Canada by a team of dedicated engineers and workers. Men and women who came to be known as Arrowites.

That wonderful machine designed, built and flown at Malton, Ontario against tremendous odds both in the engineering field and the political arena, was eventually ordered destroyed on Black Friday February 20, 1959 by politicians who had a vision of Canada that perhaps did not match the aspirations of the Canadian public, and certainly not those people in the Canadian aviation community both military and commercial, who had visions of an industry that would be second to none in the world.

The Engineering team at Avro was led by Vice President J.C. Floyd, known in the aviation industry around the world as Jim Floyd.

Jim Floyd was born in Manchester England in October 1914, graduating from the Manchester College of Technology in 1934. He was employed at A.V. Roe in England and worked under one of the greatest aviation designers of the time Roy Chadwick. Jim was a design engineer helping to design the Anson, Manchester, Lancaster, York, and Tudor aircraft. He recalls being asked by Chadwick to design the twin fins for the Manchester bomber, but his drawing did not suit Chadwick and so after several attempts Chadwick sat down and sketched what he wanted. Jim thought it looked like an egg, so with the specifications given to him by the aerodynamics office his final drawing exactly resembled an egg. That "egg fin" design with only slight changes became one of the most recognizable features on the thousands of Lancasters and derivatives, such as the Lincoln, Shackleton, York and Lancaster aircraft.

At one point Jim was loaned to Hawker Aircraft of Kingston in Surrey, to work for the great aircraft designer Sydney Camm who produced the Hawker Hurricane and other famous aircraft. While at Hawkers Jim received a letter from Roy Chadwick putting forward a proposal for a salary increase from four pounds five shillings per week to four pounds ten shillings per week (\$9.00). A good deal in those days. This was apparently to ensure his return to Avro. During the time spent at Avro in the engineering office Jim met the love of his life, his future wife Irene and at the present time, in Jim's own words "we have now survived almost fifty-eight years of a great partnership".

Jim recalls that there were only two people in A.V. Roe's aerodynamics department in England, and never more than three engineers in the Initial Projects Office where he spent much of his time, and he often wondered how so much was achieved with so few people. Yet from the time that Roy Chadwick told them what he wanted on the Avro York transport, to the time of its first flight, was less than twelve weeks. All of this without the benefit of modern technology and computers.

By the age of 29 he was Chief Project Engineer in the Avro design office in Yorkshire, working on advanced projects including the application of the new jet engine technology to civil transport aircraft.

Jim's first trip to Canada was one to remember because it was in February 1946 aboard a TCA XPP (Lancaster) transport. He had a two day delay in the Azores because of a burst tire on landing for a refueling stop. Then a day's wait in Montreal for a DC 3 flight to Toronto, with a night on a bench in a drug store in North Bay, all due to bad weather in Toronto, eventually arriving by train in a snowstorm. He had come to Canada to talk to TCA about his design for a thirty six seat transport aircraft for Trans-Canada Airlines, and had told his wife Irene that they would stay for about one year. That was 52 years ago and they are still here!

Jim Floyd was appointed Chief Design Engineer for A.V. Roe Canada in 1946, and project C-102 Jetliner was underway. Again records were made because it took only just over two years from the release of the first drawings to the test flight on August 10, 1949. This was just two weeks after the DH Comet flew in England, but it was the first Jet Transport in North America, and the first Regional Jet in the world to fly.

Jim Floyd was awarded the Wright Brothers Medal in 1950 for his work on the subject of jet powered passenger aircraft, the first non-American to receive the award. However the Jetliner success was not appreciated by the Canadian Government and with the advent of the Korean war, absolute priority was instead given to the production of the CF-100 fighter aircraft, and in 1952 Jim was appointed Chief Engineer to form a team of engineers to rejuvenate the lagging CF-100 program. He was later promoted to Vice President Engineering. The Jetliner was used as a photo-shop during the test flight program of the CF-100, and despite the declared interest of TWA, National Airlines and the US Air Force, it was never put into production and was destroyed in December 1956. The record-breaking flights of the Jetliner into the United States brought international recognition and respect for Canada's engineering ability.

The story of the Avro CF-105 Arrow is well documented in this calendar, and after its demise brought about by Mr. Diefenbaker's Conservative Government, Jim Floyd went to England with some of his team. In 1962 he established his own consulting firm and for 18 years worked with airlines and aviation companies world wide. He was consultant to the British government on the SST Concorde project during the eight years of its development, and after his retirement in 1980, returned to the Canada he loved, having become a Canadian citizen in 1951.

During his long career in aviation he has received numerous awards, Fellowships, and Medals of distinction. In 1958 he gave the British Commonwealth Lecture to the Royal Aeronautical Society in London England, on the subject of the design and development of the Arrow. In March of 1961 he was invited to give the Roy Chadwick Memorial Lecture, to the Royal Aeronautical Society. He talked about problems encountered in his SST studies and the design of a "No Boom" supersonic transport aircraft. His paper entitled "Some Current Problems Facing the Aircraft Designer", is still considered an all-time classic design reference and was featured at a unique gathering of International aviation professionals at the University of North Dakota in September 1988, more than 27 years after he had written it! For this paper, he was presented with The George Taylor Gold Medal by the Royal Aeronautical Society in 1962.

Jim Floyd was inducted into Canada's Aviation Hall of Fame on June 3, 1993, with the following citation "His outstanding accomplishments as an aeronautical engineer, manager and leader and his superb organizational skills in the field of aeronautical engineering have been of lasting benefit to Canadian Aviation". This was an honour so well deserved, but he told me that he can only accept these honours on behalf of the men and women of his team, who made it all possible.

For her 75th birthday Jim presented his wife Irene with a ticket for a flight on the supersonic Concorde. This reflected the changes in aviation since he first came to Canada in that old Lancaster so many years before, but it also reflected the important part that Jim Floyd played in forming the face of aviation throughout the world.

Now retired he spends most of his time encouraging young Canadians to remember the achievements of Canada and to go forward and emulate the traditions laid down by his team.

After Black Friday that team spread their influence throughout the aviation and space industry across the world, and as Jim has often said "One thing is sure, Canada will never see the likes of that great team again."

Norm Etheridge
Norm Etheridge, Author

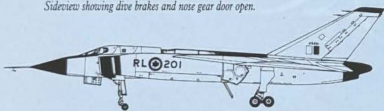
COMPANY OFFICIALS AND GUESTS ADMIRE THE AVRO ARROW AT "ROLL OUT"



January

SUNDAY MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY SATURDAY

Sideline showing dive brakes and nose gear door open.



3 1948
The lineage of the CF-105 Arrow came from the CF-100, and a swept wing version under consideration, C-103, C-104 and C-105.

4 1953
After studying various wing areas from 1,000 to 1,400 square feet the final design submitted to the RCAF was C-105/1206, a delta wing aircraft with a wing area of 1,225 square feet.

5 1959
Spud Potocki flew RL25201 twice this day with an undercarriage borrowed from RL25205, as the original undercarriage of #201 was condemned by Dowty the manufacturer as unsafe to fly.

6 1940
Roy Chadwick, Chief Designer of AV Roe Co. Ltd. chose men to design the four engine Manchester bombers (Lancaster). One was Jim Floyd who in later years was designer of the C-102 Jetliner, and VP Engineering of the CF-105 Arrow.

7 1954
During the design stage of the CF-105 great care was needed in the selection of the materials being used. At supersonic speeds the skin temperatures rose dramatically. The higher the speed the greater the heat.

8 1954
At supersonic speeds the temperatures could rise to exceed 250° F and the strength of the materials could be drastically and dangerously reduced. Sound caused by jet engines and airflow also weakened structure.

9 1954
In the design of the Arrow the four degree anhedral of the wing was not for any aerodynamic purpose, but only to allow a shorter undercarriage to be used.

10 1958
During early engine running a special Thermindex oil resistant temperature sensitive paint was applied in the engine bays. Changes in colour would allow readings within 15° F to be assessed after engine shut down.

11 1959
RL25205 made its first and only test flight, piloted by Spud Potocki. It lasted forty minutes, but was terminated with one engine shut down due to an oil pressure warning indication. Eventually it was proven to be a test case, engine O-ring leaking in the gear box.

12 1950
Data for designing Delta winged aircraft was available from Avro in the U.K. following flights of the experimental Avro 707 series of aircraft.

13 1958
In early January satisfactory low speed taxi tests up to 100 knots were carried out. The drag chute failed to operate on three out of five attempts, requiring modifications to be made.

14 1958
During high speed taxi tests Jim Zurawski found that the nose of the aircraft veered on the runway in windy conditions, due to the nose undercarriage door being open.

15 1958
It was necessary to carry out extensive modifications to the nose undercarriage system to make the nose gear door close with the undercarriage in the down position.

16 1958
On high speed taxi tests the brakes overheated, because they were designed for lower gross weight and speed. After stopping the aircraft Jim Zurawski had to get out quickly as the tires could explode. New type brakes had to be installed.

17 1959
Spud Potocki carried out further damper system, and elevator hinge movement tests on RL25201, finding no problems in a flight that lasted one hour.

18 1997
CBC TV broadcast a two part program called "The Arrow" which loosely told the story of the Avro Arrow. Dan Aykroyd played Crawford Gordon, President & GM of AV Roe Canada. It was rebroadcast on December 28 and 29 by popular demand, and re-introduced the fable of the "phantom Arrow".

19 1956
A decision made early in the program was that there would be no prototype aircraft made. Each aircraft manufactured would be with production tooling. This was known as the Cook-Craigie method.

20 1959
On its 10th flight RL25203 was flown at Mach 1.7 by Spud Potocki to check out the aircraft with a modified elevator system.

21 1953
Following the approval to proceed with AIR 7-3, testing of various models was carried out in wind tunnels. Low speeds were tested at the National Aeronautical Establishment (NAE) in Ottawa.

22 1963
Jim Floyd was awarded a Fellowship of the American Institute of Aeronautics and Astronautics.

23 1953
The wind tunnel program was also carried out at the Cornell Laboratories in Buffalo, the N.A.C.A. Langley Field, and the supersonic tunnel at the Massachusetts Institute of Technology, involving some 4,000 runs and in excess of 4,000 hrs testing time.

24 1959
FILA Jack Woodman flew RL25201 for the 1st and 5th mins. to carry out control damper check. Poor weather restricted tests to low level flight, but he reported a great improvement in handling since his last flight.

25 1957
Don Rogers was the Manager of the Test Flight Department for Avro Aircraft. He had been a Test Pilot for Victory Aircraft at Malton testing Lancasters, and then as Chief Test Pilot for Avro, flew the Oranda powered Lancaster, C-102 Jetliner and the CF-100 Canuck aircraft.

26 1998
It was announced that Don H. Rogers was to be inducted into Canada's Aviation Hall of Fame on June 12, 1998.

27 1959
Spud Potocki continued his testing of the damper systems of RL25201 on an uneventful flight lasting one hour.

28 1957
A Canadian crew went to the U.S. Air Force Strategic Air Command in Wichita, Kansas, to be trained as the flight crew for a Boeing B-47 aircraft.

29 1957
The crew consisted of Mike Cooper-Slipper, Chief Test Pilot, Len Hobbs, Pilot, Johnny McLaughlin, Flight Engineer. The training course lasted 10 weeks.

30 1953
During wind tunnel tests, it was found that drooping the wing leading edge, prevented leading edge breakaway at high angles of attack. This system was used on Avro Vulcan in the U.K.

31 1959
Spud Potocki flew RL25201 twice this day, to get an extension of the "Flight Envelope".

The Pathway to the Arrow...

In 1938 a new company The National Steel Car Corporation Aircraft division was formed at Malton, Ontario. The first contract that it obtained was to build the Westland Lysander for the RCAF. The first Canadian Westland Lysander flew on August 16, 1939 piloted by Leigh Caprol. In all, a total of 225 Lysanders were built and delivered.



Avro senior engineers working out the design details on the Arrow. L to R, Bob Lindley-Chief Engineer, Jim Floyd-VP Engineering, Guest Hale-Chief Project Engineer, Jim Chamberlin-Chief of Design.



Avro Arrow 25201 showing anhedral of the wing, allowing a shorter landing gear to be fitted.



Avro Arrow RL25201 showing nose gear door open, prior to modification to eliminate veering on runway.



Avro Arrow RL25201 streaming drag chute after high speed taxi test.

AVRO ARROWS RL25201, 202, 204 ON FLIGHT LINE



February

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 1959 The last flight of F/Lt Jack Woodman RCAF in an Arrow was in RL25203 when he carried out an RCAF lateral and longitudinal control damper check that he found satisfactory.	2 1959 On the 4th flight of RL25204, Peter Cope had to land at RCAF Base Trenton. The only landing of an Arrow away from Malton. A T.C.A. Viscount had blocked the runway at Malton.	3 1959 Who took RL25204 back to Malton from Trenton with gear down? Peter Cope did not. Records show that it was Spud Potocki. Was this perhaps the "phantom" Arrow that avoided the cutting torch after Black Friday?	4 1955 Full sized engineering mock ups of the Arrow were built. The first was of wood with metal formers. It was numbered CF-206, and was used for various test installations.	5 1956 The RCAF evaluation took place on the wooden mock up and included an assessment of a metal mock up of the weapon bay.	6 1959 Spud Potocki flew RL25201 on February 7 to test roll and sideslip. He obtained a speed of Mach 1.3.
7 1959 On flight No.6 of RL25204 Spud Potocki attained a speed of Mach 1.5, but was limited to this because of a rudder system problem. This was the last flight of #204.	8 1946 Jim Floyd arrived in Toronto by train in a snowstorm after a hectic journey from England. To start his career in Canada he joined Edgar Atkin, Chief Engineer of A.V. Roe Canada Ltd.	9 1956 A full sized metal mock up, made from detail tools, was given No. 25-400 and was used for various tests, and to train production crews, who were to build the first flying aircraft.	10 1984 A plaque with citation and the name of J.C.Floyd, signed by Mission Commander Vance Brand was carried on US Shuttle Challenger. Mission 41B, Feb. 3 to Feb. 11.	11 1946 Jim Floyd's first job at A.V. Roe Canada was Chief Technical Officer, setting up new departments (Stress and Aerodynamics), until June 1946.	12 1959 A second RCAF pilot, F/Lt. Norm Ronaason, nearly flew an Arrow. He had completed cockpit familiarization training and taxi tests. Before Black Friday he taxied an Arrow out for flight but a mechanical problem caused its cancellation.	13 1959 To keep Avro employees conversant with company affairs, a twice monthly Avro Newsmagazine was issued. The last issue dated February 13, 1959 contained an article by J.A.D. McCurdy, about Canada's first powered flight, and RL25204's visit to Trenton.
14 1956 A design team from Canada's experimental engineering department, under Mike Telford was given the task of designing the pylon and nacelle for the Boeing B-47 to be used to test the Orenda Iroquois engine.	15 1956 Canada's main problem was designing a retractable cover on the nacelle to prevent the engine windmilling in flight when the engine was not in use.	16 1956 A USAF B-47 S/N: 51-2051 arrived at the Canadian plant at Cartierville. This aircraft was modified over the next year to be the flight test bed for the Orenda Iroquois engine. 2,000 lbs of photo recorders, oscillographs, and telemetry equipment were installed in the bomb bay.	17 1956 To modify the Boeing B-47, the rear fuselage had to be double skinned for extra strength and extra bulkheads and longerons were fitted. 800 pounds of ballast was fitted in the nose to compensate for the weight of the Iroquois.	18 1959 The only non-pilot to fly in the Arrow was D.E. (Red) Darrah. He flew with Spud Potocki in RL25203 on February 19, to fine tune the "Fly by Wire" system.	19 1959 In the afternoon Spud flew RL25201 to reach a speed of Mach 1.7. This was the last flight of the Arrows. Ironically RL25201 was the first and last Arrow to fly.	20 1959 BLACK FRIDAY. At 11 AM Prime Minister Mr. John Diefenbaker announced the cancellation of the Avro Arrow and the Orenda Iroquois engine project. Crawford Gordon, President & G.M. of Avro made a statement to the employees.
21 1959 With the announcement of Black Friday 14,000 workers were laid off. The company contacted the government, hoping for some alternative solution, but they were ignored. In addition 35,000 other workers at sub-contractors also lost their jobs.	22 1959 All items, drawings and anything connected with the Arrow whether at main base or at sub-contractors had to be destroyed. It appeared that the government tried to make out that the Arrow had never existed.	23 1959 The first Avro Arrow Mk.2 RL25206 had its Orenda Iroquois Engines S/N's 115 and 116 installed and the aircraft was nearing completion, almost ready for flight when cancellation descended.	24 1959 Mr. Diefenbaker stated "That the Arrow was an outstanding success, but would have been obsolete by the time it was ready for squadron use, and no one advocates building buggies in the age of motor cars."	25 1959 At cancellation, five Mk.1 Arrows had been completed and flown. Twenty nine Mk.2 Arrows were in different stages of construction.	26 1959 It was reported that if Mr. Fred Sneye wouldn't order the destruction of the completed Arrows, the Government would send in the army to do it, and so on April 22, 1959 he gave the order to destroy the six aircraft.	27 1957 Canada modified the Boeing B-47's Co-pilots station to incorporate the controls of the Iroquois engine, and converted the Navigator's position in the nose of the aircraft to the Flight Test Engineer's position.
28 1957 During its stay in Canada the Boeing B-47, modified by Canada as the Iroquois flying test bed, was designated as a CL-51 aircraft.						



Avro Arrow RL25204 on the ramp at RCAF Trenton. The only time an Arrow landed away from Malton.



Spud Potocki and "Red" Darrah after flight in Avro Arrow RL25202. Darrah was the only non pilot to fly in an Arrow.



Avro Arrow RL25206 under construction.



The last flight of an Avro Arrow was on February 19, 1959 by RL25201. Pictured in climb with afterburners on.

The Pathway to the Arrow...

At the same time that the Westland Lyander was in production a second contract was obtained by the National Steel Car Corporation Aircraft Division, to manufacture 80 sets of center sections and wings for the Hanley Page Hampden bomber. The fuselage was being built at Fleet Industries in Fort Erie. The first H.P. Hampden bomber was flown on August 8, 1940 at St. Hubert in Montreal by "Red" Lyburner. A total of 160 of this type were built in Canada, 80 of which were assembled and tested at Malton.



PILOT ASSISTED INTO COCKPIT OF AVRO ARROW RL25204 IN TRENTON



Search

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 1959	2 1959	3 1959	4 1961	5 1959	6 1959
	At the time of the cancellation of the Arrow and Iroquois program, the Iroquois engine had flown and been tested in the Boeing B-47 aircraft for 31 successful hours.	After the cancellation of the project, mechanics arrived at Malton from Boeing to remove the Iroquois engine from the B-47 and return the A/C to a Ferry Flight condition for its return to the U.S.	The Boeing B-47 previously used as a test aircraft for the Iroquois engine was flown back to the Davis Mountain Air Force Base near Tucson, Arizona, by Mike Cooper-Slipper and his crew, where it was scrapped.	Jim Floyd was invited to give the Roy Chadwick Memorial Lecture to the Royal Aeronautical Society. His paper was entitled "Some Current Problems Facing the Aircraft Designer". (See May 10, 1962 and September 5, 1988).	Completion of Avro Arrow Mk.2, RL25206 had been scheduled for February 20, 1959 with RCAF acceptance due in March 1959.	At the termination of flying the Avro CF 105 Arrow, Jan Zurekowski had flown 23 hrs. 45 mins on three of the aircraft.
7 1959	8 1959	9 1959	10 1959	11 1959	12 1959	13 1958
At the termination of flying the Avro CF 105 Arrow, W. "Spud" Potocki had flown 34 hrs. 35 mins on all five of the aircraft.	At the termination of flying the Avro CF 105 Arrow, Peter Cope had flown 5 hrs. 25 mins on three of the aircraft.	At the termination of flying the Avro CF 105 Arrow for the RCAF, F/Lt Jack Woodman had flown 6 hrs. 45 mins on three of the aircraft.	Premier Frost of Ontario asked for a review of how much financing was required to keep the Iroquois alive to save some of the jobs being lost because of the termination of the project.	It was estimated that 4 to 5 million dollars would be required to complete the certification. Federal Government assistance would be needed but they refused to help.	After the cancellation of the Arrow project, General Electric wanted to purchase the completed aircraft on a straight commercial deal. The Government refused.	The normal fuel capacity of the Arrow Mk.1 was 2987 Imperial gallons, with 2508 Imperial gallons useable. The fuel capacity for the Arrow Mk.2 aircraft was to be 3,297 Imperial gallons.
14 1960's	15 1989	16 1957	17 1958	18 1958	19 1956	20 1956
To increase the range of the proposed Arrow Mk.2A and Mk.3, extra fuel would have been available by adding fuel tanks in the vertical fin.	Jim Floyd was appointed Director of International Hypersonic Research Institute USA. This work was later taken over by NASA.	The various test rigs for the Electrical, Hydraulic, Landing Gear systems, etc. were installed and air supplied through heat exchangers allowed temperatures to be raised to 250° F or reduced to -65° F; testing the systems through any temperature ranges anticipated.	The Canadian Government contracted with Canadair, Douglas Aircraft, and Bendix Aviation to supply 900 Sparrow Mk.2 air to air missiles.	The Mk.2 missiles were 151 inches long, 8 inches in diameter, and weighed 389 lb. They were powered by an Aerojet engine with solid fuel that could develop 7,800 lb. thrust, with a burn time of 1.85 seconds.	A mock up of the pilots cockpit was made and mounted on a truck at the correct angle and height so that pilots could check the visibility for flight and taxiing.	Originally this mock-up had no radar nose but one was added later when more data was available.
21 1959	22 1955	23 1959	24 1990	25 1958	26 1958	27 1958
Repairs to RL25202 were nearly completed and the installation of the Hughes XMA-1c Fire Control system was progressing. All parts of the system were due to arrive from Hughes on the 20th March, and the aircraft would have been ready for flight by the end of March.	Fire at the Avro flight test hangar destroyed Avro Lancaster FM 209 the Orinda flight test aircraft, and two CF-100 (18111 & 18348) and a Sabre (23034) aircraft.	When the Arrow project was cancelled Avro suggested selling RL25201/3/4 to the government of the UK as research aircraft, to help speed up the development of the Concorde. This was declined by the Canadian government.	The first annual dinner of the Aerospace Heritage Foundation of Canada was attended by 200 people, and Jan Zurekowski was given the Foundation's "Jim Floyd Award" for outstanding lifetime achievement in Canadian Aerospace.	First flight of the CF-105 Arrow RL25201 piloted by Jan Zurekowski at Malton, Canada. Take off time was 09:51 and it flew for 35 minutes with only minor snags. A great success.	For the first test flight 18 camera stations were located around Malton and in chase planes. RCAF Pilot F/Lt Jack Woodman in a F86 Sabre had a movie camera on his helmet. Test Pilot Spud Potocki piloted a CF-100 with a photographer on board.	One of Jan Zurekowski's complaints was that there was no timepiece in the aircraft. Other snags were to do with micro switches connected to the nose undercarriage doors.
28 1958	29 1957	30 1959	31 1958			
On his return from the First Test Flight, Jan Zurekowski was lifted shoulder high by the jubilant "Aviators" in celebration. His "Snag List" was framed.	Prior to the first flights, the CF105 Arrow weighed in with only an error of 62 pounds compared with its original estimated weight, and within 0.25% of the estimated Center of Gravity position.	Aircraft Arrow Mk.2 RL25207 was expected to be completed by the end of March and RCAF acceptance scheduled by May 1959.	In a General Election called by Mr. Diefenbaker, leader of a minority government, the Conservative party received a big majority, which meant bad news for the Avro Arrow program.			



Jan Zurekowski preparing to climb a ladder into a CF-100 aircraft prior to the first flight of RL25201 Avro Arrow.



Jan Zurekowski stepping into the cockpit of RL25201 Avro Arrow for its first test flight.



Avro Arrow RL25201 in the circuit above the Malton Avro plant prior to landing.



Avro Arrow RL25201 landing after its first test flight. Note the dive brakes are deployed.

The Pathway to the Arrow


The Avro Anson (Faithful Annie) was designed by Roy Chadwick, Chief Designer of A.V. Roe in England. During World War II this type was built at the National Steel Car Corporation Aircraft Division at Malton, where they manufactured about fifty percent of the aircraft including the fuselage, and then assembled the completed plane. A total of 736 Anson Mk.2 were built, with the Jacobs engines, and 17 of the British type Ansons were also completed. They were used extensively in the British Commonwealth Air Training Plan, where a total of 4413 Ansons of all types were flown.



THE AVRO ARROW RL25201 IN FLIGHT



April

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>Frontview clearly showing engine air intakes.</p> 				<p>1 1958</p> <p>The second test flight of RL25201 was flown by Jan Zurekowski, but due to the nose wheel door not closing properly the flight was limited to 250 knots, and 30,000 ft.</p>	<p>2 1959</p> <p>Avro Arrow 2 RL25208 was expected to be completed in April 1959 and RCAF acceptance scheduled for July 1959.</p>	<p>3 1958</p> <p>On the third flight of RL25201 Jan Zurekowski flew supersonic to Mach 1.1 for the first time. Flight time 1 hr 5 minutes.</p>
<p>4 1958</p> <p>Flight number three of RL25201 was made to assess the handling at supersonic speeds. Jan climbed to 15,000 feet, then ignited the afterburners and climbed to 40,000 ft before passing through Mach 1.</p>	<p>5 1953</p> <p>Credit must go to the Orenda Iroquois engineering team for the engine development. They were C. Griener, VP and Chief Engineer, H. Keast, Assistant Chief Engineer, B. Avery, Chief Design Engineer, and Dr. A. Murawski, Chief Experimental Engineer.</p>	<p>6 1950</p> <p>Jan Zurekowski joined the Gloster Aircraft Co. as Chief Experimental Test Pilot, and flew Meteor jet fighters, and also gained experience on the delta winged Gloster Javelin.</p>	<p>7 1952</p> <p>Jan Zurekowski left Gloster Aircraft. He landed in Canada on 21st April and joined AV Roe Canada Ltd. the next day as a test pilot. He was involved in the CF-100 development, and the CF-105 Avro Arrow program.</p>	<p>8 1958</p> <p>Because of its Delta configuration, there was not a flap system on the Arrow and to assist in slowing the aircraft down after landing, a drag chute had to be deployed.</p>	<p>9 1956</p> <p>During the initial modification of the Boeing B-47 at Canadian, the new pylons and nacelle were built around an Orenda 14 engine, but later a mock up of the Iroquois was used.</p>	<p>10 1958/59</p> <p>In all flights of the Arrow a telemetry system was used to record over 200 different readings from the aircraft systems.</p>
<p>11 1958/59</p> <p>All the information from the readings of the aircraft systems, was transferred to the onboard telemetry system located in the armament bay and then transmitted to the ground station.</p>	<p>12 1958/59</p> <p>By the use of the telemetry system's instantaneous recording and the passing of engineering data and information in "real time", reduced the total amount of flight testing time required.</p>	<p>13 1938</p> <p>Ground was broken at Malton Airport Toronto, for the manufacturing plant of the Aircraft Division of the National Steel Car Corporation. This became Victory Aircraft Ltd, and then AV Roe Canada Ltd, and then AV Roe Canada Ltd. This is where the Avro Arrow was born.</p>	<p>14 1958</p> <p>The fourth flight of RL25201 flown by Jan Zurekowski, was O.K. for the first 20 mins. but a power supply to the ground telemetry unit failed, although the airborne system continued to function. (April 15, 1958)</p>	<p>15 1957</p> <p>The Boeing B-47 now modified by Canadian to carry the Orenda Iroquois engine, was flown to Malton, Ontario, by Mike Cooper-Slipper and his crew.</p>	<p>16 1957</p> <p>The take off from Cartierville by the B-47 was difficult because there was no chance to abort as the runway was so short.</p>	<p>17 1958</p> <p>Jan Zurekowski flew RL25201 on its fifth flight, for photographic purposes and Angle of Attack measurements. He climbed with afterburners on.</p>
<p>18 1958</p> <p>On the seventh flight of RL25201, Jan Zurekowski made history by flying at 1,000 miles per hour at 50,000 ft. in level flight. Jan had flown the sixth flight earlier in the day to Mach 1.25</p>	<p>19 1951</p> <p>James (Jim) Floyd, Design Engineer for the C-102 Jetliner, and subsequently the Vice President Engineering of the CF-105 Arrow, was presented with the Wright Brothers Award. The first non-American to receive it. (April 18)</p>	<p>20 1959</p> <p>The Arrows were lined up on "Death Row". With deep regret Fred Smye gave the orders to a crew of Avro workers to disassemble the six Avro Arrows. Crown Assets then gave the destruction and sale of the scrap to Lax Brothers of Hamilton. (April 22)</p>	<p>21 1959</p> <p>On his way home, Jan Zurekowski saw a flat bed truck with pieces of metal on it. He made out the paint numbers 201. It was RL 25201 on its way to the scrap yard. (April 25)</p>	<p>22 1958</p> <p>For familiarization, F/Lt. Jack Woodman who was the RCAF acceptance test pilot, and the only RCAF pilot to fly the Arrow, flew RL25201 to Mach 1.4 on its eighth flight.</p>	<p>23 1958</p> <p>For his first flight in the Arrow, Spud Potocki the Avro Experimental Test pilot flew RL25201 on its ninth flight, for 45 minutes. It was the last flight in the first phase.</p>	<p>24 1958</p> <p>At the end of phase one, the CF-105 Arrow had flown nine flights with a total of 6 hrs 30 minutes flying time. Five flights exceeded Mach 1, the speed of sound.</p>
<p>25 1958</p> <p>Reporting after the first phase of flying was complete, Jan Zurekowski thought that the landings were satisfactory but at a higher speed than anticipated due to restricted pilot's view ahead.</p>	<p>26 1957</p> <p>While flying in Canada testing the Orenda Iroquois engine, the Boeing B 47 carried the RCAF Maple Leaf roundel, and had Dayglo paint with X 059 painted on its vertical fin.</p>	<p>27 1958</p> <p>When the new Conservative Government under Prime Minister Diefenbaker was formed, George Pearkes V.C. was Minister of Defense, and Raymond O'Hartley, a timber grader became Minister of Defense Production.</p>	<p>28 1953</p> <p>During wind tunnel tests at supersonic speeds it was found that a notch in the leading edge of the wing, with a forward extension, controlled the airflow to prevent "Pitch up".</p>	<p>29 1953</p> <p>The notch controlled the airflow over the wing at all airspeeds, whereas a "wing fence" used on subsonic aircraft, was only effective during smaller airspeed ranges, and caused more drag.</p>	<p>30 1962</p> <p>Sir Roy Dobson Chairman of the Hawker - Siddeley Group moved a motion to change the name of AV Roe Canada Ltd. to Hawker-Siddeley Canada. Dobbie started AV Roe Canada Ltd. in 1945, now no longer in existence.</p>	



Jan Zurekowski raised shoulder high by jubilant Avro workers following first test flight.



Avro Arrow RL25201 in flight with a turn to port and with landing gear extended.



Avro Arrow RL25201 taxiing after test flight.



Avro Arrow aircraft lined up on "Death Row" for destruction after Black Friday.

The Railway to the Arrow...

On November 5, 1942 the National Steel Car Corporation Aircraft Division was taken over by the Canadian Government as a Crown Company and renamed Victory Aircraft Ltd. Its purpose was to build the Avro Lancaster Mk.X bomber, similar to the British Mk.3 but with a lot of North American content. The first, KB 700 was flown on the August 1, 1942 by Ernie Taylor, and it was known as the "Rhur Express". A total of 430 aircraft of this type were built at Malton including KB 899 "The Spirit of Lisowel", shown here.

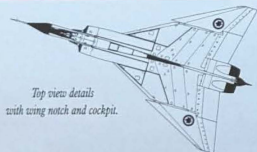


A PLAN VIEW OF THE AVRO ARROW SURROUNDED BY VIEWING PUBLIC, AT THE OFFICIAL ROLL OUT



May

SUNDAY MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY SATURDAY



Top view details
with wing notch and cockpit.

2	1953	3	1953	4	1953	5	1953	6	1953	7	1951	8	1955
<p>The design of the PS13 engine was undertaken as a private venture by Avro, without any military sponsorship, but based on the requirements of specification AIR 7-3 with regard to performance of Mach 1.5 at 50,000 ft.</p>													
9	1953	10	1962	11	1954	12	1958	13	1957	14	1957	15	1957
<p>The International Nickel Company of Canada, developed a high temperature alloy, that could be cast into turbine blades so there was no need for air-cooled turbine blades.</p>													
16	1961	17	1958	18	1957	19	1955	20	1956	21	1954	22	1957
<p>After Black Friday Avro continued to work on the VZ-4V Avrocar prototype. (Flying Saucer). Pilot Spud Potocski made its first untethered flight.</p>													
23	1953	24	1953	25	1958	26	1957/58	27	1959	28	1985	29	1985
<p>The WCAP Specification AIR 7-3 was issued, to become the basis for further studies into a supersonic all-weather aircraft to replace the CF-100.</p>													
<p>The only other Orenda Iroquois engine known to exist is in the National Aviation Museum in Ottawa, Ontario.</p>													
<p>The Engineering drawings for the Avro Arrow Mk.2 were released to Production.</p>													
<p>Jim Floyd departed Canada for England. (See August 24)</p>													

The Pathway to the Arrow...

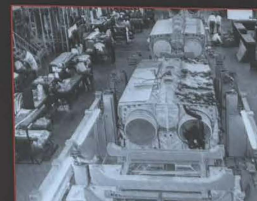
The second and third Lancasters built, KB 702 and KB 703, were converted to transport aircraft for the Canadian Government Trans-Atlantic Service (CGTAS) and given civilian Trans-Canada Airlines registrations CF-CMT (TCA 101) and CF-CMU (TCA 102). Six other Lancasters KB 729, KB 730, and FM 184-187 were converted at a later date for Trans-Canada Airlines as Lancaster XPP aircraft.



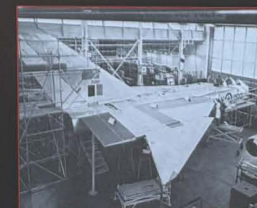
The inner wing being lowered onto the fuselage. Note the joint at the center line to give structural strength.



The first inner wing now assembled to the first fuselage.



Complete center section units and final marry-up installations in the foreground.



View of metal mock-up nearing completion. No. 25000 ready for dummy. Pratt & Whitney J75 engine laying on floor.

AVRO ARROWS RL25201 AND RL25203 WITH WINTER DAYGLO DURING MAINTENANCE



June

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 1944	2 1993	3 1993	4 1984	5 1975
		Between March 1944 and January 1945 Jan Zurakowski was on the first Empire Test Pilots training course at Boscombe Down in the U.K.	Jim Floyd was made a "Companion of the Order of Flight" by the City of Edmonton.	Jim Floyd was inducted into Canada's Aviation Hall of Fame. The citation said: "His outstanding accomplishments as an aeronautical engineer, manager, and leader, and his superb organizational skills in the field of aeronautical engineering have been of lasting benefit to Canadian aviation".	Jim Floyd was made an Honorary Patron of the Elsie Gregory MacGill Memorial Foundation. Elsie Gregory MacGill was the first Canadian woman to obtain a Master's Degree in Aeronautical Engineering.	While participating in CBC "Front Page Challenge" Jan Zurakowski was asked if any crime was involved in the destruction of the Arrows. He hesitated about answering, but in a speech on March 24, 1990, he said that the total destruction of technical records could be classified as a crime.
6 1997	7 1958	8 1958	9 1955	10 1957	11 1958	12 1958
Jim Floyd and Jan Zurakowski were made Honorary Citizens of the City of Wetaskiwin, in Alberta.	Jan Zurakowski took RL25201 on its tenth flight, which was marred by a problem. The nose undercarriage door would not retract, which meant flying at only low speeds. Also damper problems occurred.	During take off Jan Zurakowski had problems with polarity reversal of the AFCS sensor. This could have caused the Arrow to be uncontrollable, but Jan disconnected the AFCS and took over manually, and saved the aircraft.	Jim Floyd was awarded a Fellowship of the Royal Aeronautical Society in England.	A General Election resulted in Mr. Diefenbaker's Conservative party winning a minority government, over Mr. St. Laurent's Liberal party by seven votes, resulting in a serious outlook for the Avro Arrow. Diefenbaker, a "patriotic lawyer", was more concerned with social affairs, than with defense matters.	On test flight of RL25201 Jan Zurakowski, had problems during landing. After the parachute had been deployed the aircraft went off the runway and all three landing gear oleos snapped off.	Investigation of the crash found that the left hand landing gear had not fully extended, and the wheel bogie was not in line for landing.
13 1958	14 1946	15 1958	16 1953	17 1955	18 1955	19 1955
Jan Zurakowski said that if there had been warning lights on the landing gear to show that there was a problem to the bogie, perhaps he could have avoided such a severe accident.	Jim Floyd was Chief Design Engineer (Transports) for A.V. Roe Canada from 1946 until June 1951, in charge of the Jetliner project	Test firing of the Sparrow 2 missiles at Point Magu were carried out by CF-100 Mk.5 aircraft. Only one, fired by Avro Test Pilot, Lorne Ursel on June 10, was a partial success. The missile stayed locked onto the target although the initial stages of the flight were erratic. All other firings failed.	During preliminary phases of the CF-105 design it was decided that great data could be obtained from free flight models. It was estimated that 1/8th scale models would give correct information at low levels compared with aircraft at altitude.	At Point Petre, nine tests were made plus two others at Langley Field, U.S.A. They were fired by a Nike rocket at an angle of 45° and achieved Mach 1.7 in flight. (see December 5)	The first four were crude models with an approximate representation of the CF-105. Separation was made by drag as the rocket expended its thrust after 3 seconds.	The last seven more sophisticated and representative models were fitted with 16 channels of telemetry for specific lateral and longitudinal stability tests.
20 1955	21 1957	22 1957	23 1957	24 1956	25 1951	26 1951
After one test over Lake Ontario the model continued to transmit information even after it had skipped on the surface of the water after its flying was completed	When planning the development program for the CF-105 it was realized that Canada could not afford 50 development aircraft. The first five aircraft were to be Mk.1 with Pratt and Whitney J75 engines. These were to be used for test flying, contractor compliance trials and Fire Control system development.	The next ten aircraft, Arrow Mk.2's to be powered with the Orenda Iroquois engine, would be used in the Avro Development program, contractor's testing, and Iroquois engine development.	The next twenty one aircraft were to be used for RCAP evaluation, for all aspects of the specification requirements, performance and handling. All Weather operation, and operational suitability, prior to squadron delivery.	The first official 50 hr Pre-Flight Rating Test was carried out on the Orenda Iroquois PS 13 engine.	To meet operational requirements an interim CF-103 A/C, a C-100 S with swept back wings was started with the making of jigs, tools and wooden mock up. The government authorized two prototypes to be built. A planned first flight was rescheduled for June 1953 due to priority of CF-100 Mk.3.	Wind tunnel tests proved it could not drive supersonically and because of the planned late delivery time, the CF-103 program was cancelled in December 1951, and the study for the C-105 commenced. (See May 23, 1953)
27 1958	28 1957	29 1980	30 1959			
Two CF-105 Arrows never flew at the same time, although two flew on the same day. There was only one set of telemetry equipment available for each flight, and it was considered unwise to fly without telemetry on board the aircraft.	Prior to the Conservative election win of 1957, Mr. C.D. Howe was "Minister of Everything" in the Liberal Government. Although he supported Canadian aviation he was a harsh critic of the Arrow project. With the Liberal loss he was gone.	A book titled "Avro Arrow", The Story of The Avro Arrow From its Evolution to its Extinction, was published by The Boston Mills Press. The initial edition of 2,000 copies sold out in 14 days. Later editions of 25,000 were sold.	Only two of the five Avro Arrows were flown by all four Test Pilots. RL25202 and RL25203			

The Pathway to the Arrow...

After World War II and starting in 1946 many Avro Lancasters were modified for peace time roles in nine different versions for the R.C.A.F. at the Malton factory, now known as A.V. Roe Canada, and at de Havilland in Downsview. One, FM 213 that had been a Maritime Reconnaissance aircraft was eventually de-commissioned and sold as a war memorial to the Royal Canadian Legion at Goderich, Ontario. It now flies as the only flying version of the Canadian built Lancaster, named and dedicated as the Mynarski Memorial Lancaster VR-A. It was rebuilt at Hamilton by a team of volunteers with Norman P. Etheridge as Project engineer responsible for its overhaul.



Final adjustments being made ready to launch Free Flight model No. 8 on a Nike rocket booster



Technicians putting test strain gauges on a free flight model during manufacture.



Avro Arrow RL25201 after crash during landing at Malton, all oleos broken.



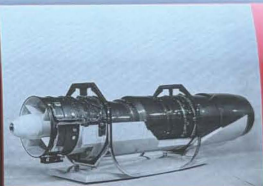
CF-100 Mk5 aircraft equipped with Sparrow Mk.2 missiles for test firing at Point Magu, later called RCAP Ultra West.

AT ROLL OUT, A VIEW OF AVRO ARROW RL25201 FROM RIGHT HAND REAR



July

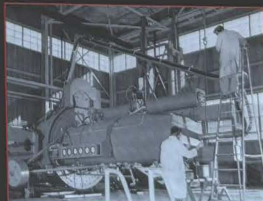
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 1958 There are no recorded flights of the CF-105 Arrow during the month of July.	2 1953 This month, a directive issued by the Department of Defense Production authorized the design study of an aircraft to meet Specification Air 7-3. The project was given Number CF-105. The start of the Arrow Project.	3 1956 The afterburners of the Oreanda Iroquois PS 13 were tested for the first time.
4 1954 As there was no single engine available with enough power to enable the Arrow to perform to specifications it was decided to have twin engines. It would also give a safety margin if one engine failed.	5 1951 Jim Floyd was appointed as Works Manager and "Trouble Shooter" to get the CF-105 aircraft into the squadrons. He was promoted to Chief Engineer in January 1952.	6 1954 The original engines planned for the Arrow were the Rolls Royce RB 166 but they would not be available in time. Then it was to be Curtis-Wright J67, but that US Air Force program was discontinued. Finally a proven Pratt & Whitney J75 was chosen until the Oreanda Iroquois was ready.	7 1957 The Pratt and Whitney J75 used on the first five Arrows could only produce 12,500 pounds thrust, compared with the planned thrust of 19,500 pounds of the Oreanda Iroquois to be used by the Arrow Mk.2.	8 1962 The Canadian Government purchased 66 McDonnell CF-101 fighters for 260 million dollars. Added to 200 million dollars paid for the Bomarc missiles, 130 Arrows could have been completed, and put into service.	9 1962 The first RCAF McDonnell CF-101 Voodoo fighter squadron No.425 moved to its permanent base at Bagerville, PQ after re-equipping at Namao, Alberta.	10 1938 A letter to Roy Chadwick, from Alliot Verdon Roe suggested that the tail of an aircraft is of no practical value, and an aircraft without a tail should be built. Chadwick was too busy with the Manchester. The Vulcan, and Arrow proved A.V. Roe correct.
11 1954 Because the basic CF-105 design was frozen on the basis of stability and control predicted from theory, production drawings on glass cloth were issued to the Manufacturing Department, to proceed with making jigs, and tooling.	12 1950 Mike Cooper-Slupper in his early days at Avro became the Test Pilot for Lancaster Mk.10, FM 209 fitted with the Oreanda engines in its outboard pods.	13 1950 Lancaster Mk.10, FM 209 made its initial test flight with the Oreanda engines. Don Rogers was Captain, Bill Wildfong and Walter Bellan were the engineers. It flew for 30 minutes.	14 1956 It was announced that a contract was signed between Oreanda and the Canadian Government to produce 11 pre-production Iroquois Engines.	15 1953 In the early stages of design, Avro worked on the principle that a known weapon control system the Hughes M.G. 3 and the Falcon missiles would be used, on the CF-105.	16 1953 The RCAF Air Staff insisted on specifying the ultimate in fire control systems, the RCA Astra 1 and a new missile, neither of which were even in the design stage.	17 1953 To introduce these systems in the Arrow meant a large increase in production cost to change the nose of the aircraft to accommodate a radar dish of 38 inches from the 23.5 inches originally designed.
18 1953 The Air Staff also decided that it would be nice if the new weapons system for the Avro Arrow could be designed and built in Canada.	19 1959 Eventually the RCAF determination to use the Astra and the Sparrow missile turned out to be the Achilles Heel of the Arrow project, because of escalating costs.	20 1959 When the Arrow project was cancelled, in part due to the cost of the weapons system, it was noticed that the RCAF just stood back and let it happen, without a single official comment.	21 1950's Investigation was carried out by Avro as a feasibility study to see if it was possible to have Zero Length Launching (ZELL).	22 1950's It was assumed that a zero launch operation could be set up in any location within a 24 hr period, and the Arrow could take off without any ground run.	23 1950's The aircraft would be set up on an inclined ramp. It would require two Jato rocket units attached to the fuselage, to give a total thrust of 308,000 lb. including the engines take off power of 44,000 lb.	24 1950's It was calculated that at launch an aircraft weight of 88,200lb, including rockets would take 2 seconds from zero to 108 knots, and 3 seconds to 165 knots, when control of the aircraft would be effective.
25 1950's At an acceleration of 3G the total launch time would be 3.7 seconds when the rockets would be expended and could be jettisoned.	26 1953 Harvey Smith, joined Avro as Production Chief, and had a daily "parts count meeting" to ensure that the parts flow was adequate to meet production demands. During the reorganization on January 2, 1955 he became Vice President of Manufacturing.	27 1957 The first official 100 hr endurance run was carried out on the Oreanda Iroquois PS 13 engine. It was not at full power, but at a reduced thrust of 18,750 lb.	28 1958 In the early days of test flying the flight path was over Southern Ontario. Due to sonic booms disturbing residents, the flight path was moved north to a less populated area.	29 1958/59 Sonic booms were made in 31 of the 66 flights made by the Arrows.	30 1954 Today was the last flight of Lancaster Mk.10 aircraft FM 209 before it was destroyed by fire at the Malton hangar. It had flown over 500 hrs test flying the Oreanda engines.	31 1950's Planned data for developed Mk.3 Arrow with Iroquois Mk.3 engine was: Take Off power 60,000 lb thrust with afterburner; Max speed, 2,000 MPH. at 40,000 ft; Combat speed, Mach 2.5 at 68,000 ft.



Oreanda Iroquois on a stand.



Mock up of a Pratt & Whitney J75 engine used for installation tests.



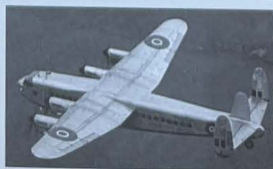
The fuel system test rig was used to simulate any condition of flight that the Arrow might encounter.



The electrical system test panel can simulate the Arrow electrical system and test any installed components.

The Railway to the Arrow...

A modern transport was required for the CGTAS and 50 Avro 685 Canadian Aero York aircraft were ordered. Only one was built in Canada. FM 400 was flown on November 14, 1944 by Ernie Taylor and delivered to the U.K. as G-ALBX. It was used on the Berlin airlift, but was lost in 1949 after 467 trips.





August

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 1958 Arrow RL25202 flew for the first time with Jan Zurekowski at the controls. It flew for 1 hr 35 min, at subsonic speeds up to 30,000 ft. altitude.	2 1958 To make testing easier for the pilots, a new electro-hydraulic nose steering actuator was installed in RL25202, instead of the cable-operated system in the first Arrow.	3 1958 During flight testing the Arrows were painted with various paint schemes, with Dayglo being used. When flying in the North, the Arrows would carry this paint to help locate it if it crashed in the snow.	4 1958 In the case of the Arrows under flight test, they were also painted with Dayglo in specific areas to help the observers focus on those special locations while in flight.	5 1958 When RL25203 flew it had the Red Ensign flag painted on its fin. This was the only Arrow to carry this Canadian emblem.	6 1953/54 A test rig made for the fuel system, had to be able to investigate the pressures and flow of fuel under any condition of flight that the Arrow might encounter.	7 1957 When the Arrow was designed, it should be remembered that modern technology of micro-chips and solid state components was not available, and the electronics depended on vacuum tubes and heavy wiring.
8 1958/59 Most Arrow test flights were carried out at a weight in excess of that designed for the Arrow Mk.2 missions, because of the heavier Pratt and Whitney J75 engines installed.	9 1958 Single engine testing of the Arrow was necessary to test the flight characteristics with one engine shut down. With the J75 engines it was acceptable, but varied, depending on the weight and configuration of the aircraft at the time of the test.	10 1958 Single engine landings were satisfactory, even with an occasional burst of power from the afterburner. Control was attributed to the function of the A.F.C.S.	11 1959 The CF-105 Arrow became a breeding ground for experienced Aeronautical Engineers. After Black Friday many engineers became available to world wide demand.	12 1959 Jim Chamberlin, Chief of Design, left Canada to lead a team of 25 engineers to assist NASA in the development of the Mercury project.	13 1915 Jim Chamberlin was born in Kamloops, B.C., and went to the Arrow project by way of Noorduyn in Montreal, and the Arrow C-102 Jetliner. He died in Houston, Texas in 1981.	14 1962 While at NASA, Jim played a major role in the design of the Mercury capsule that put John Glenn into orbit, on February 20, exactly three years after Black Friday. In a New York City parade he was in a car following John Glenn as they celebrated that achievement.
15 1965 His other work was on the Gemini project, and he was involved in the Apollo Moon Landing. Jim received the NASA Gold Medal for this work.	16 1959 Mario Pesando, Chief of Project Research at Arrow, went to RCA H.Q. in Massachusetts to work on the Saturn V project to launch astronauts to the moon.	17 1959 Carl Lindlow formerly Project Manager on the Arrow, went to Boeing and became Project Engineer on the Saturn S-1 and Saturn S-1B rocket proposals.	18 1959 John Hodge became Flight Director of the Mercury, Gemini and Apollo spacecraft.	19 1959 Ted Roberts was in charge of the trajectory group in Mission Control and was largely responsible for the design of the Mission Control Center at NASA's Houston Space Center.	20 1959 Fred Mathews became a back up Flight Director to Chris Kraft and was in charge of flight monitoring and the flight controllers at tracking stations around the world.	21 1959 Owen Maynard became Chief of the Systems Engineering Division on the Apollo spacecraft, and played a major role in the development of the Lunar Module Eagle which placed Neil Armstrong and Buzz Aldrin on the moon in July 1969.
22 1959 Robert Lindley joined McDonnell Aviation and was in charge of their work on the Gemini Spacecraft for NASA. He later joined NASA on the Shuttle program, becoming Director of Engineering for manned space flight.	23 1958 On his second flight Jan Zurekowski flew RL25202 at supersonic speed for the first time to Mach 1.5 from Georgian Bay to Lake Erie, also carrying out Damper checks, to prove the effectiveness of the damping systems.	24 1959 Jim Floyd and some members of his Arrow Canada Team went to the original facilities studies for Concorde. Jim Floyd later established his own consulting company and was consultant on the Concorde for the British Government.	25 1958 Mr. G. Pearks V.C. Minister of Defense flew to Washington for meetings with the U.S. Secretary of State for Defense Neil McElroy to try to save the Arrow program with U.S. involvement. He got a sales pitch for the Bomarc missile, and an offer to sell Canada off the shelf American interceptor aircraft.	26 1958 Jan Zurekowski flew RL25202 twice this day at supersonic speeds obtaining Mach 1.62 on the first flight and Mach 1.7 on the second.	27 1958 Jan Zurekowski flew RL25202 around the Ottawa area for telemetry checks and obtained the speed of Mach 1.5.	28 1958 Jan Zurekowski made a second telemetry flight to Ottawa in RL25202 at a speed of Mach 1.72, and made a circuit of Ottawa's Upland airport before returning to Malton.
29 1958 On August 28 Spud Potocki also flew RL25202 for A.F.C.S. handling checks and obtained speed of Mach 1.7.	30 1954 Mike Cooper-Slipper was the first pilot to join Arrow after WW II. He went on to be the test pilot for the Boeing B-47 Dreads Troquois test aircraft.	31 1954 One important design feature of the Arrow was to have a very thin wing, and yet be able to achieve the large internal fuel tank capacity required.				

The Railway to the Arrow...

With the war in Europe over, Tiger Force for the war against Japan was initiated, and the Avro Lincoln, a highly modified version of the Lancaster was planned as the spearhead. One Avro Lincoln Mk XV bomber, FM 300 was built at A.V. Roe Canada and test flown by Ernie Taylor on October 25, 1945. WW II had ended and the need for other aircraft was over.



Jan Zurekowski signs for Avro Arrow RL25202 prior to its first test flight.



Jan Zurekowski flying Avro Arrow RL25202.



Mechanics looking into tail of Avro Arrow RL25203. Note size of jet pipes, RL25202 is parked behind.



The four test pilots who flew the Avro Arrows, "Spud" Potocki, Peter Cope, F/Lt Jack Woodman, and Jan Zurekowski.



September

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 1958 To cover Contractor Compliance Trials, a special auto observer was installed in the armament pack of RL25203 to record air speed, rpm, temperatures, pressures, and fuel quantities.	2 1958 This auto observer used a camera in the armament pack, to record the instruments on the test flights.	3 1958 At Point Mugu, renamed Ultra West for the RCAF's detachment in California, S/L W.A. Speck flying CF-100 S/N 18638 made their first Sparrow 2 air launch.	4 1958 The CF-100 aircraft were being manufactured at Avro at the same time as the Arrow until the final CF-100 S/N 18792 was completed and delivered.
5 1988 The paper entitled "Some Current Problems Facing the Aircraft Designer", first given in March 1961 by Jim Floyd, was featured at a unique gathering of International aviation professionals at the University of North Dakota, 27 years after its first presentation.	6 1958 The Arrow RL25202 was ready to give a demonstration at the Canadian National Exhibition Air show but had to be cancelled due to poor weather.	7 1945 When Sir Roy Dobson planned the purchase of Victory Aircraft Ltd. Mr. Fred Smye a native of Hamilton, became A.V. Roe's first employee as Assistant General Manager. He stayed with Avro until after Black Friday 1959. He died in Portugal in 1985.	8 1958 The front cover of Readers Digest for September showed two Arrows in formation. Another picture showed Avro Arrow RL25201 centered over Niagara Falls. Both were faked photographs.	9 1958 The first taxi tests were carried out on RL25203, and the A.E.C.S. was checked at the same time.	10 1958 The Sparrow Mk 2 missile had a fully active radar guidance system which combined both receiver and transmitter. This was intended to allow it to fly independently to a target after being launched.	11 1958 The second and last launch of the Sparrow Mk2 missile by the RCAF, at Ultra West, was carried out. The RCAF returned to Canada because of the Sparrow cancellation. (see October 23, 24)
12 1957 John Plant, ex-RCAF Air Vice Marshal was brought in to be V.E. and G.M. of Avro Aircraft Ltd. and then became President. Fred Smye became Executive VP. Aeronaautical of Avro Canada Ltd.	13 1958 On the eighth flight of RL25202 carried out on August 14, Jan Zurekowski was to test the A.E.C.S. but a telemetry failure caused termination of the flight.	14 1958 Flying RL25202 on its 9th flight Jan Zurekowski obtained Mach 1.36, at 50,000 feet the highest speed he achieved during his Arrow test flying. He also included maneuvering tests at supersonic speed.	15 1972 RCAF Bomarc missile squadrons No. 446 and 447 were disbanded and their missiles returned to the U.S.A. to be used at target drones. Perhaps a firing end for the Arrow replacement.	16 1958 This day's flying by Jan Zurekowski on RL25202 investigated the effects of buffeting and Dutch Roll. Zurekowski sustained 2.0G's at Mach 1.2.	17 1958 A meeting between Mr. Diefenbaker and Crawford Gordon, President of Avro, turned into a table thumping shouting match. Crawford had reportedly been drinking, and had to wait two hours for the meeting. It lasted 20 minutes.	18 1958 In this meeting Crawford Gordon demanded assurance that the Avro Arrow would not be cancelled. Some historians feel that this helped Diefenbaker to make up his mind.
19 1956 Engine development running time for the Orenda Iroquois PS 13 has now reached 1,000 hrs.	20 1957 At an unveiling of the Orenda Iroquois engine it was announced that an agreement had been signed by the Curtiss Wright company of the U.S.A. to build the Iroquois under license, once the engine was certified.	21 1957 The French government were also interested in buying 200 Iroquois engines at a cost of \$200,000 per engine for their Mirage Mk 4 aircraft once the engine was in full production.	22 1958 Jan Zurekowski test flew RL25203 on its acceptance flight and exceeded the speed of sound at Mach 1.2.	23 1988 Jim Floyd was awarded a "Lifetime of Achievement Award" by the Aerospace Industries Association of Canada. (September 22)	24 1958 In a Press Release statement Prime Minister Diefenbaker announced changes in the Air Defense system. Bomarc missiles, would be purchased, and the Arrow and Iroquois production cut back, as there was no need for as many manned aircraft. (September 23)	25 1958 Mr. Diefenbaker also announced that development of the Arrow and Iroquois would continue until March 1959 when a final review would be made. The Sparrow 2 missiles and the Avro 1 Fire Control Systems were cancelled.
26 1958 During this flight in RL25202 Jan Zurekowski flew at subsonic speeds to test the Pritch damper of the A.E.C.S.	27 1958 On 26 September Jan Zurekowski flew RL25202 to Mach 1.55 on the second test of the day. This would be his last flight as an active Arrow pilot. He remained associated with the Arrow but only as an advisor to the flight program.	28 1958 F/Lt. Jack Woodman flew RL25202 for the RCAF to check the handling of the aircraft for speeds up to Mach 1.7 at 50,000 ft.	29 1958 Spud Potocki also flew RL25202 on the 28th September to Mach 1.55, and tested the aircraft to 3G's at Mach 1.3 at 36,000 ft.	30 1952 A new engine plant was opened by Orenda, in an area adjacent to the main Avro plant to build Orenda engines and the new Orenda Iroquois PS 13 engine.		



Jan Zurekowski flew RL25203 on its acceptance flight over Mullton. Note the wear rods below fuselage.



Avro Arrow RL25204 under maintenance.



Avro Arrow RL25203 on a take off run. Note the Canadian flag painted on its fin. The only Arrow painted this way.



The Avro Arrow RL25201 flying above the clouds.

The Pathway to the Arrow...

The Avro C-102 Jetliner was designed by Jim Floyd and his Engineering team. Despite various set backs due to the unavailability of the designated engine, the Rolls Royce A7 65 Avon and having to substitute the less powerful Rolls Royce Dorewest engine, it first flew on August 10, 1949. It was flown by Jimmy Orrell and Don Rogers, with Bill Baker as Engineer. It was the first jet transport to fly in North America, second in the world by a few days to the D.H. Comet and first Regional jet transport in the world to fly. On December 10, 1956, even though TWA, National Airlines, and the U.S. Air Force were interested in buying some for commercial and military use, the project was terminated. The nose section of the Jetliner remains in the National Aviation Museum, Ottawa.



AT ROLL OUT THE SPECTATORS WERE ALLOWED TO INSPECT AVRO ARROW RL25201



October

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 1958	2 1958
					Spud Potocki took RL25203 for its second test flight and attained the speed of Mach 1.7.	After the cancellation of Avro's FCS and the ordering of the Bomarc missile, Fred Smye went to Washington to see Assistant Secretary of State of the USAF and obtained agreement that the US would provide the Hughes MX1179 FCS to Canada at no cost. A saving of half a million dollars per aircraft.
3 1958	4 1957	5 1958	6 1958	7 1958	8 1957	9 1958
Spud Potocki flew RL25202 at subsonic speeds to investigate pitch oscillation. The same day Peter Cope joined the Flight Test team and flew RL25201 on a familiarization flight for 65 minutes up to Mach 1.5 at altitude of 50,000 ft. Not bad for a beginner.	Official Rollout of the CF105 Arrow. It was unveiled by The Hon. G.R. Pearkes VC, Minister of National Defense, but the event was overshadowed by the launch of the Russian "Sputnik".	Spud Potocki flew RL25201 on its first flight after it was repaired following its accident. The flight lasted 1 hr. 20 mins. and was subsonic.	Peter Cope flew RL25203 on a flight to test out the new 1A tailcones at speeds of Mach 1.7 and 50,000 ft. The new cones were longer than the originals.	On October 5th Spud Potocki flew RL25202 on a test of all the dampers to a speed of Mach 1.45.	At the Official Roll out of the CF-105 Arrow on October 4, one of those in attendance was John A. D. McCurdy, who flew the first powered heavier than air machine in Canada.	Jim Floyd gave the Fourteenth British Commonwealth Lecture "The Canadian Approach to All-Weather Interceptor Development" at the Royal Institution in London.
10 1957	11 1957	12 1958	13 1958	14 1957	15 1951	16 1958
Another person at the Official Roll Out was Sir Roy Dobson, Chairman of the Board of Avro Canada. He was awarded a knighthood in 1945 for his service to aviation.	Presiding over the Official Roll Out ceremonies was Mr. Fred Smye, Executive Vice President Aeronautical A.V. Roe Canada Ltd. He had been a member of Avro since 1945 when Roy Dobson formed A.V. Roe Canada Ltd.	The Canadian Government authorized continuing the Arrow project for one year to the extent of \$175 million. The order for Arrow production was now eight prototypes and twenty nine pre-production aircraft.	After his visit to Washington on October 2, Mr. Smye went to the Minister of Defense Production Mr. O'Hurley in Ottawa with the U.S. offer of support in writing but it was turned down.	It was a great achievement for Avro Engineering to release the initial production drawings in June 1955, and to achieve "Roll out" on October 4, 1957. A period of only 28 months.	Crawford Gordon represented A.V. Roe Canada on the official handing over of the first CF-100 to the RCAF on October 17, 1951. He had been appointed President of the company and played an important part in the Arrow saga. F. Smye became Exec. VP.	Spud Potocki flew RL25203 to carry out fuel consumption and low level speed checks at subsonic speeds.
17 1958	18 1958	19 1958	20 1957	21 1958/59	22 1957	23 1957
F/Lt. Jack Woodman flew RL25203, but undercarriage door problems on the starboard side, caused only slow speed gear down checks to be attempted.	After maintenance, Spud Potocki, accompanied by a Sabre chase plane, flew RL25203 to check the retraction of the undercarriage. The Sabre's pilot reported all O.K. and Spud then flew to supersonic speeds.	F/Lt. Jack Woodman again flew RL25203, but he had to abort at Mach 0.95 as a red warning light appeared on the instrument panel.	To allow some "feel" for the pilot on pulling "g" with the A.F.C.S. on, an artificial load system was designed for the control column.	At supersonic speeds airloads on flying control surfaces are extremely high, and a pilot could not move the controls without assistance. This was achieved by hydraulic powered actuators.	As a safety precaution all control surfaces were moved by two hydraulic actuators, with pressures being supplied from different pumps. In the event of a failure of one source the other would assume full control.	In the design of the Arrow a 4,000 PSI hydraulic system was required. This was the first system of this force ever to fly, and it was years before another aircraft was equally equipped.
24 1957	25 1952	26 1952	27 1958	28 1958	29 1958	30 1958
To use this system Dowty, the manufacturer had to make test equipment that enabled the various actuators, valves etc. to be tested and certified for flight.	An evaluation team led by W. Com. R. Foothill visited countries of the Western Alliance looking for aircraft to replace the CF-100. They even looked at the F-101 Voodoo, but there was no aircraft available to meet Canada's very special needs.	It was this F-101 Voodoo that Canada would purchase 10 years later to replace the Avro Arrow and the Bomarc missile, and designate it as the CF-101 Voodoo.	Spud Potocki flew RL25204 on its initial test flight. An undercarriage warning light indicated that it was not locked up, although the chase plane confirmed that it was. With the landing gear lowered Spud flew for 1.1 hr. to use up fuel and carry out other tests.	Spud Potocki also flew RL25202 on October 27 to Mach 1.5 at 42,000 ft. while checking out the A.F.C.S.	On the first flight of the day Spud Potocki flying RL25202 carried out Flutter checks at Mach 1.7.	Spud Potocki made a second test flight on RL25202 on Oct. 29 at Mach 1.8 also carrying out Flutter checks.

The Railway to the Arrow

When it was needed to test fly the Avro Orenda jet engine, an Avro Lancaster Mk.10, FM 209, was modified and a pair of the Avro Orenda engines were mounted in the outboard pods. It first flew as a test bed on July 13, 1950 with Don Rogers as pilot and engineers Bill Wildfang and Walter Bellan. It flew over 500 hrs testing the Orenda engines with Don Rogers and Mike Cooper-Slipper sharing the flight duties. Its final flight on July 30, 1954 was Don Roger's 56th trip. It was destroyed in a hangar fire March 22, 1955.



Official "Roll Out" of the first CF-105 Avro Arrow RL25201. Note the notch in the wing for air control.



Official Roll Out, VIP's on the podium with Hon. G.R. Pearkes VC, Minister of National Defence speaking.



Avro Arrow RL25201 being towed.

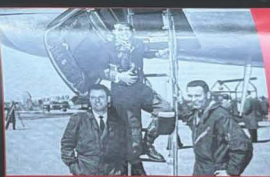


Rear view of CF-105 Avro Arrow RL25201.



November

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	<p>1 1957</p> <p>A demonstration run of the Orenda Iroquois P13 engine carried out for representatives of the Canadian Government obtained a thrust reading of 19,000 lb.</p>	<p>2 1945</p> <p>An agreement was made by C.D. Howe representing the Canadian Government, to sell Victory Aircraft Ltd. a Crown Corporation, to Sir Roy Dobson (Dobbie) Managing Director of A.V. Roe, England, representing the Hawker-Siddeley Group of companies, effective December 1, 1945.</p>	<p>3 1945</p> <p>Victory Aircraft Ltd. closed its doors for the last time on November 3, 1945. Key personnel were advised to be ready for recall, to form the nucleus of the new company A.V. Roe Canada. (See December 1, 1945).</p>	<p>4 1958</p> <p>At the maximum production of the Arrow it was revealed that 650 Canadian firms were involved producing 38,000 parts for the aircraft, in addition to Avro and Orenda.</p>	<p>5 1958/59</p> <p>During test flying the Arrow, rods were attached to the rear fuselage so that by measuring wear of the rods, it could be determined how close the tail came to the ground on take-off.</p>	<p>6 1957</p> <p>An air conditioning system had to be installed in the Arrows to keep the pilots and electronic equipment cool. It had the capacity to produce a ton of ice per hour.</p>
<p>7 1958</p> <p>While Peter Cope was flying RL25203, the air conditioning system failed and only delivered cold air and snow. He had to be helped out of the cockpit as he was so cold.</p>	<p>8 1958</p> <p>Spud Potocki flew RL25202 at subsonic speeds to test the new modified elevator. Parallel servo and feel trim to the rear was not satisfactory.</p>	<p>9 1957</p> <p>Because the Iroquois was attached to the right rear fuselage of the Boeing B-47, and toed five degrees upwards, the thrust of the engine was not in the center line of the aircraft and it was necessary to run two aircraft engines on the left wing to counteract the Iroquois thrust.</p>	<p>10 1958</p> <p>On flight No. 22 of RL25202 Spud Potocki, flew at Mach 1.98 at 50,000 ft. from Lake Superior to Ottawa. This was the highest speed recorded in the Arrow project. (Nov 11)</p>	<p>11 1958</p> <p>On landing, the aircraft skidded off the runway collapsing the right oleo, with the right wing tip touching the ground. It was thought that Spud had applied too much brake locking the wheels, but the telemetry showed that the elevators had moved 30 degrees down at touchdown.</p>	<p>12 1958</p> <p>There were no official photographers to record the accident of November 11, but three young aviation buffs were on the field without permission, and photographed the incident. The company processed the film. Did the youngsters ever get paid?</p>	<p>13 1957</p> <p>The Orenda Iroquois engine was run at altitude for the first time in flight, attached to the Boeing B-47 aircraft flown by Mike Cooper-Slipper and crew.</p>
<p>14 1958</p> <p>The flight of RL25202 on November 11 was the last flight of this Arrow as it was not repaired before Black Friday.</p>	<p>15 1997</p> <p>A group of enthusiasts were planning to salvage the free flight models of the Arrow fired by Nike rockets into Lake Ontario at Point Pelee.</p>	<p>16 1958</p> <p>At the time of cancellation of the Sparrow Mk 2 missile, Canada in their new plant had produced only two missiles and modified five others built by Douglas Aircraft.</p>	<p>17 1957</p> <p>To help in the reflight of the Orenda Iroquois engine in flight and at altitude, a system unique in the aviation industry, was the use of oxygen, which gave an excellent result.</p>	<p>18 1959</p> <p>After the demise of the Arrow, fate was not kind to Crawford Gordon, who had been President of Avro Canada in the turbulent years. He was fired from his job and died at an early age in 1967. Perhaps the effects of that dreadful experience hastened his death.</p>	<p>19 1993</p> <p>At a Testimonial Dinner in Toronto in 1993, Jim Floyd received an award from the Aerospace Heritage Foundation of Canada.</p>	<p>20 1958</p> <p>During the only recorded full power test of the Iroquois engine attached to the B-47, a loud bang came from the engine, and a lot of vibration occurred. Dust was produced in the cockpit, and the engine was shut down with emergency procedures. The chase plane reported smoke but no fire.</p>
<p>21 1958</p> <p>Inspection after the engine explosion, showed that a turbine blade had failed passing through the nacelle and into the aircraft fuselage, luckily not causing any structural damage.</p>	<p>22 1958</p> <p>Spud Potocki flew RL25204 on its second test flight of a general nature for 65 minutes.</p>	<p>23 1958</p> <p>Because the weight of the Pratt and Whitney J75 engine was greater than the proposed Orenda Iroquois engine, hulls had to be carried in the Arrow nose cone, to correct the balance, on all flights of the early aircraft.</p>	<p>24 1958</p> <p>Phenomenon called "Intake Buzz" caused the roundels and Maple Leaf to be distorted on the fuselage of the Arrow during flight. It was caused by interaction of the airflow over the engine air intakes and buckling of the adjacent skin. A heavier skin cured the problem.</p>	<p>25 1958</p> <p>On one flight Spud Potocki burned out his brakes on the landing run. He left the cockpit by sliding over the nose of the Arrow, and dropping to the ground after hanging from the nose probe.</p>	<p>26 1957</p> <p>Tests of the Martin Baker ejection seat were carried out at Malton from a static test aircraft. The seat and dummy were ejected backwards and caught in a net fired between two 60 ft. towers.</p>	<p>27 1957</p> <p>During the first tests of the ejection seat from the static aircraft it was found that the legs of the dummy fouled the instrument panel.</p>
<p>28 1996</p> <p>A full sized wooden model of the CF-105 Arrow was made by Allan Jackson for the CBC TV program called "The Arrow" that was aired in January 1997. At the roll out it brought back many nostalgic memories.</p>	<p>29 1954</p> <p>The N.A.E. questioned Avro's drag estimates. If proven correct the Arrow would not fly supersonically. DND called for a slow down on production until independent verification.</p>	<p>30 1958</p> <p>RL25204 was flown by Spud Potocki on its third flight to clear previously reported snags. He obtained a speed of Mach 1.2.</p>				



Crew of Boeing B47 aircraft trained in the USA. Captain Mike Cooper-Slipper standing on the steps of the B-47 with Johnny McLaughlin (L) Flight Engineer and Pilot Len Hobbs.



Boeing B47, X059, Canadian CL52, flying over Malton airport, fitted with Orenda Iroquois engine.



Avro Arrow RL25202 during the landing at Malton which resulted in a crash.



Avro Arrow RL25202 in crashed position with right landing gear broken, and with drag chute still attached.

The Pathway to the Arrow...

Canada's first jet fighter, the Avro Canada CF-100 Canuck, first flew on January 19, 1950, piloted by Bill Waterton Chief Test Pilot of Gloster Aircraft of England. The first two aircraft were powered by the Rolls Royce Avon engines. The first Avro Arrow powered CF-100 flew its test flight on June 20, 1951, and during the next 10 years 692 CF-100 aircraft of various marks were built and delivered, and became the backbone of the RCAF Fighter Command. Of these, 53 CF-100 Mk.5 aircraft were struck off RCAF strength in 1957 and assigned to the Belgian Air Force.



NOSE SECTION OF AVRO ARROW Mk2 RL25206 AND AN ORENDIA IROQUOIS ENGINE ON DISPLAY AT THE NATIONAL AVIATION MUSEUM, OTTAWA, ONTARIO



December

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 1945 A.V. Roe Canada Ltd. was formed and took over the facilities of the Victory Aircraft Ltd., Malton, Ontario with about 400 key personnel. Mr. J.P. Bickell, Chairman of the Board, Sir Roy Dobson, President, Walter Decker, Vice President and General Manager, and Mr. Fred Smye, Assistant General Manager.	2 1957 The Martin Baker Ejection seat was tested at a site in SW Utah, USA, on a ramp two and a half miles long with the test dummy in a seat of a rocket driven sled, and ejected over a cliff.	3 1957 An early test failed. The dummy with its chest full of test equipment was ejected but the main chute failed to open. Later tests were successful.	4 1957 The first engine ground running with the Pratt and Whitney J75 on RL25201 commenced, in very cold weather.
5 1954 The first free flight model of the Arrow was launched at the Canadian Armament Research Establishment at Point Pelee to evaluate the technique for launch separation, telemetry and tracking. (See June 19)	6 1957 It would take approximately eight seconds to eject from the Arrow. Consideration was given to ejecting the pilot to eject both crewmen which would drastically reduce escape time.	7 1957 Iroquois engine runs were conducted at NACA laboratories in Cleveland, Ohio, with air heated up to between 240° F and 340° F for simulated altitude and speed. Tests completed January 1958. Over 100 hrs. of running time was used.	8 1957 Prior to the first flights the pilots were subjected to tests in a flight simulator. The computer was fed various aerodynamic parameters setting up flight conditions, checking how pilots could handle different situations.	9 1957 According to the simulator the Arrow was unflyable. Zurawski lasted only a short time. Potocki reached 8 seconds.	10 1957 They stopped using the simulator, and after the Arrow was flown they reprogrammed the computer and found that the simulator now agreed that they could fly the Arrow.	11 1958 Spud Potocki flew RL25201 at subsonic speeds to check the operation of the undercarriage doors, while the gear was in the "down" position, and to test the new modified elevator controls.
12 1957 Avro test pilots ferried two Avro CF-100 Mk.5 aircraft S/Nos. 18638 and 18639 to Point Mugu California, a US Navy base, in preparation for test launching of the Sparrow Mk.2 missiles. A team of 50 Avro personnel were also sent.	13 1954 NACA in Washington was used to resolve concerns about the drag estimates between Avro and NAE. NACA agreed with Avro's findings and DND issued reinstatement of fast pace production.	14 1954 The engine designed for the CF-105 Arrow had its first successful start in the Orendia test cell. It was the Iroquois engine S/N No. X101. (December 15)	15 1958 Spud Potocki flew RL25201 to test the flight damper systems, but had to restrict his flight due to an "unsafe undercarriage" indication. (see December 20 & 21)	16 1955 Just one year after the first test run, a maximum thrust of 19,000 lbs. was achieved by the Iroquois in a sustained run, a remarkable achievement.	17 1958 The first preproduction Orendia Iroquois engine was delivered to Avro, and used for trial installation in the Arrow Mk.2 wooden mock-up.	18 1957 Both Pratt & Whitney J75 engines installed on RL25201 were run together for the first time by Jan Zurawski, prior to the test.
19 1957 Jim Floyd was presented with the J.D. McCurdy Award by the Canadian Aeronautical and Space Institute. (December 20) "The responsibility for the many decisions which had to be made in the design stages of such an aircraft (Arrow) rested to an unusually large degree on Mr. Floyd"	20 1958 In the flight of RL25201 by Spud Potocki the chase planes reported a gap between the right undercarriage door and the wing, and the undercarriage failed to lock up. The tests were abandoned.	21 1958 During flight of RL25201 by Spud Potocki, the right undercarriage door again failed to lock up. (See January 5, 1959)	22 1958 The second preproduction Orendia Iroquois engine was delivered to Avro. (December 21).	23 1954 A.V. Roe Canada Ltd. was divided into two separate companies. The aircraft division, Avro Aircraft Ltd. with Fred Smye as VP and G.M., Orendia Engines Ltd. with Walter McLachlan as VP and General Manager. C. Gordon became President and later Chairman of both companies.	24 1957 Taxi trials for RL25201 started on Christmas Eve. A great Christmas present for all the crews.	25 1958 The 1958 Trans Canada (McKee) Trophy was awarded to Jan Zurawski for his test flying of the Avro Canada CF-105 Arrow, and for his contribution towards world recognition of Canadian aeronautical achievements.
26 1972 It was announced that Jan Zurawski would be inducted into Canada's Aviation Hall of Fame in June 1973.	27 1958 During the trials in the wooden mock-up for the Arrow Mk.2 Iroquois engine installation it was shown that the engine could be removed and reinstalled in less than thirty minutes.	28 1961 The first RCAF Bomarc missile unit, No.446 (SAM) Squadron was formed at North Bay, Ontario. This was John Diefenbaker's answer to the Arrow.	29 1977 In his book "Over Canada" John Diefenbaker admits he was relieved for having the complete Arrow prototypes reduced to scrap, but claims that he had no knowledge whatsoever of this action. If he was not responsible, who was?	30 1997 The only parts to escape from the delays which can be seen at the National Aviation Museum in Ottawa. It contains the nose section of Avro Arrow RL25206 and an undercarriage oleo.	31 1958 Avro Canada went to the Government with a firm price for the Arrow in quantity: 3.5 Million each for 100 aircraft, complete with engines, fire control system and all technical support. (The bargain of the century).	

The Railway to the Arrow...

Prior to the RCAF issuing Specification AIR 7-3 in April 1953 A.V. Roe Canada had already been investigating an aircraft design to replace the CF-100. In July 1948 a C-100S design was considered. It was a swept back wing and tailplane version of the CF-100, but powered by two Turbo Research TR9 engines. Later in 1949 a second design was considered and designated as C-100D, similar to the C-100S but designed for supersonic speed, and later another design was called a C-104. In December 1950 A.V. Roe submitted a reworked version of the C-100S, now called the C-103, as the RCAF The Government ordered two prototypes and included a full sized wooden mock-up. Work commenced in February 1951 but the project was cancelled later in the year when wind tunnel tests showed that it could not achieve supersonic speed. In June 1952 A.V. Roe Canada submitted other designs: the C-1041 and C-1042 delta platforms with one or two engines. The final design submitted by Jim Floyd was the modified version of the C-1042, but was now designated as the C-105. The start of the CF-105 Avro Arrow.



Sir Roy Dobson formed A.V. Roe Canada in 1945 becoming its first President.



Avro Arrow RL25205 being prepared for its first and only flight.



The Boeing Bomarc missile obtained by Canada to replace the Avro Arrow, is on display at CFB Edmonton.

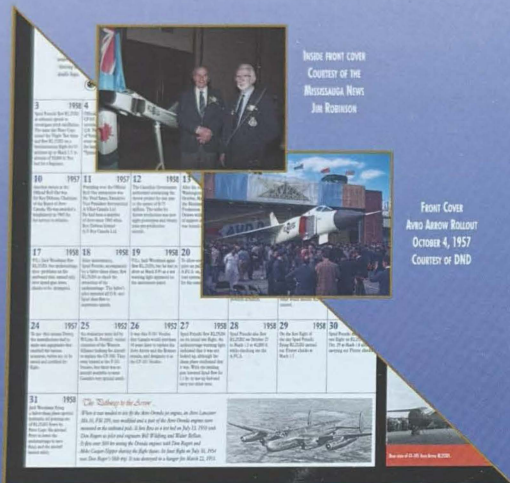


McDonnell CF-101B Voodoo, considered unsuitable in 1954, but 66 aircraft were purchased in 1961, replacing the Bomarc missile.

The Story of the Avro Arrow

- EVENTS CALENDAR
- HISTORICAL ANECDOTE FOR EACH DAY
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- NEW FOR 1999:
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HISTORICAL DATES 1953 TO 1959
THE PATHWAY TO THE ARROW



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JAN ROBINSON

FRONT COVER
AVRO ARROW ROLLOUT
OCTOBER 4, 1957
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COMPILATION OF DAILY ANECDOTES AND PHOTOGRAPHS

— NORM ETHERIDGE



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ADLIN GROUP INC.
MISSISSAUGA, ONTARIO
905-542-1100

JANUARY						
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AUGUST						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

NOVEMBER						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

DECEMBER						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					