

## TORONTO BRANCH

### Annual Video night

NOVEMBER 1996

The final CASI Toronto event for the fall of 1996, the ever popular Annual Video night, was held this year on November 21. It was held at the usual venue, in the auditorium at UTIAS, for the enjoyment of the group of approximately 50 aviation and aerospace enthusiasts present.

Admission was free and complimentary coffee and donuts were available in the cafeteria beginning at 7:00 pm. Also, a "music video" featuring footage of the McDonnell Douglas F-18 Hornet set to popular rock and roll tunes was screened in the cafeteria prior to the start of the main event.

The video showing began in the auditorium just after 7:30 pm. A new upgraded type of projection system was used this year resulting in an improved quality of picture particularly relevant for some of the older video selections. Videos were presented from the libraries of several local aerospace companies including MDCAN, Bombardier-deHavilland and Pratt & Whitney Canada.

The deHavilland Diary featured a look at some vintage aircraft from the '40's and '50's including the Canadian built Chipmunk, the Vampire and the ill fated Comet. The video 767 PTQ (Put Together Quick) was an intriguing fast paced (time lapsed photographic) look at the production line of the Boeing 767. A particular ripple of interest went through the audience as the Air Canada colours were recognized in the paint shop footage. An impressive demonstration of air heavy transport capability and performance was provided in The C17 Globemaster in Operation and nostalgia was evident in a short 10 minute presentation of The Last CF100. This showed the last flight of a CF100, which was then being used as a flying testbed by Pratt & Whitney Canada, before it was presented to the Canadian Armed Forces for static display. There was a quick look at the A4 Skyhawk in operation before taking a 10 minute break.

The first selection following the break was a very fascinating, sometimes hilarious and altogether captivating look at the Ornithopter, the Flapping Wing RC aircraft developed by Dr. J. DeLaurier from UTIAS. Videos of the McDonnell Douglas MD90 during flight test and of the Pratt & Whitney PW4168 engine certification testing followed the ornithopter. At the end of the evening there were far more videos than time available so the audience was given the opportunity to choose the last video for the night from the remaining selection. Nostalgia prevailed as two short

episodes from the Avro archives were chosen. One was on the Avrocar, an early configuration of an air cushion ground vehicle. The second and last presentation was on something today's Canadian aviation enthusiasts can never seem to get enough of, the CF105 Avro Arrow.

The evening concluded at about 9:45 pm with a short word of thanks from the chairman Alex Tsoulis and reminders of the upcoming events for winter '97.

*Karen Bruce*

*Vice-Chairperson*

### Test Flying the Avro Jetliner

JANUARY 1997

The Toronto Branch held its first meeting of 1997 on January 23 in the cafeteria at McDonnell Douglas Canada Ltd. The MDCAN facility, being the former home of Avro Aircraft Ltd., was a fitting location for this meeting. Our guest speaker was CASI Associate Fellow Don Rogers, former test pilot with Avro Aircraft Ltd. and deHavilland Aircraft. The topic of Don's presentation was the Avro Jetliner, and particularly his experiences as chief test pilot for the program.

As people began arriving at MDCAN, it soon became clear that attendance would be well beyond expectations. Anticipating between 40 and 60 people, we were pleasantly surprised when over 120 people arrived to hear Don's presentation. Fortunately, extra chairs were readily available. Attendance may have been boosted by the airing of the CBC's Avro Arrow mini-series just a few days before. Whether this was a factor or not, the evening's attendance sets a record for recent Toronto Branch events.

The evening began with a short welcome from Ray Rogers (Don's son), a long-time employee of MDCAN and currently one of its senior managers. Ray described how a large mural on the walls of the cafeteria, featuring the many aircraft that were built at the Malton facility, recently came to be painted there by a freelance artist. The mural was a fitting backdrop for the upcoming journey into history.

Alex Tsoulis, Toronto Branch Chairman, introduced Don with a brief summary of his colourful aviation career.

Don began his presentation by describing some of the engineering aspects of the aircraft. Intended from the outset to take advantage of the speed capability offered by jet engines, the design team was faced with the requirement that the aircraft needed to be capable of operating from relatively short runways. The wing design was therefore



somewhat of a compromise, with relatively high camber to provide high lift during takeoff. This, combined with a modest wing sweep of 4.5 degrees, gave the aircraft a top speed of about Mach 0.7. A long distinctive fairing was used forward of the wing, to prevent airflow from beneath the fuselage travelling over the centre wing section.

The control surfaces featured a unique split design, whereby the aft portion of the surface was operated with normal pilot input, and the forward portion of the surface was intended for certain extreme conditions. In the case of the rudder, the system was designed to automatically counter for excessive yaw that might be induced by asymmetric thrust. For the elevator, the pilot could adjust the forward portion of the surface to account for a forward c.g. position.

As the aircraft neared completion, there was considerable discussion about who should pilot the aircraft on its first flight. Although Don had flown quite a few hours as a test pilot, all of that time was with production aircraft models. He did not have experience with prototype or jet aircraft. Therefore, he fully supported a plan to have Jim Orrell, chief test pilot for Avro Aircraft in England, travel to Canada to pilot the Jetliner on its first flight. With Don as co-pilot, this first flight was made on August 10, 1949, just two weeks after the first flight of the deHavilland Comet in England.

The aircraft performed and handled very well, and, according to Don, was a great pleasure to fly. An increase in the aileron power assist further improved the aileron "feel", and made the controls very light for the pilot.

Since the first flight was made during the annual plant shutdown, few Avro employees were on hand to witness the event. So for the second flight a couple of weeks later, employees were invited outside to watch. This particular flight was more exciting than anticipated. When preparing to land, Don and Jim found that the main gear would not extend. A variety of alternate methods failed to coax the gear down, so

eventually Jim belly-landed the aircraft on the grass beside the runway. The aircraft suffered only superficial damage, and was back in the air within a couple of weeks, with the cause of the "up-locked" gear also quickly found and rectified.

Public demonstrations began in October of 1950, and in April of 1950 the aircraft made headlines in the U.S. after a flight from Toronto to New York City. This was the first official air-mail flight in North America using a jet transport. A huge crowd was on-hand in New York to see what was, at the time, the only commercial jet transport in North America.

In November of 1950, the aircraft was flown to Chicago for a series of demonstration flights for United airlines. While there, one of the engines sustained FOD damage. The original thought was to send a replacement engine via surface transportation, but eventually the decision was made to fly the aircraft back to Toronto on three engines. This flight was completed without incident.

In the same month, a Toronto-Chicago-New York-Toronto flight was planned. On the Chicago to New York leg, unknown to Don, a controversy was brewing below. The airport manager at LaGuardia was reluctant to give the aircraft permission to land, fearful that its fire-throwing jet engines would damage his runways and terminal buildings. Avro officials were eventually able to convince him to allow the aircraft in, and Don was able to complete the trip.

In January of 1951, the aircraft was flown from Toronto to Winnipeg with a number of pilots aboard from Trans-Canada Airlines (TCA). The pilots were very impressed by the aircraft, and enthusiastic about its potential for airline operations in Canada. Unfortunately, by this time TCA, despite being the major impetus behind the initial development of the aircraft, was beginning to lose interest.

Demonstration flights continued, however, and tentative orders for 10 aircraft were placed by National Airlines in Miami. The U.S. Air Force also placed a tentative order for 20 aircraft to be used in high altitude navigation research, following demonstration flights at Wright-Patterson Air Force base.

Whenever the aircraft was demonstrated, the response from those who flew on or piloted the aircraft was overwhelmingly enthusiastic.

Trouble for the Jetliner began with the outbreak of the Korean War in early 1952. The Canadian Government's concerns about the possible escalation of the conflict, and about problems with the CF-100 aircraft, led to termination of funding for the Jetliner program.

Avro management was intent on keeping the project alive, and reached an agreement with Hughes Aircraft in the



The Avro C-102 Jetliner taking off at Malton, Ontario.



U.S. whereby Hughes would use the Jetliner to flight test the fire control radar under development for the CF-100. Don flew the Jetliner to Culver City in California. He expected to spend one or two weeks getting Hughes pilots checked out on the Jetliner.

Shortly after arriving in Culver City (where the main runway was grass), Howard Hughes, owner of the company and himself an experienced pilot, took the Jetliner up for a familiarization flight. With Don in the right seat, the famous Mr. Hughes completed nine circuits, during which he impressed Don with his flying skills and ability to get the "feel" for the new airplane. After the last landing, much to Don's surprise, Mr. Hughes taxied the Jetliner to the side of the airfield opposite the Hughes Aircraft factory, and ordered that a 24 hour guard be placed around the aircraft. None of the Hughes pilots ever did fly the airplane. Hughes himself continued to fly the aircraft, as did some senior pilots from TWA. Hughes, who owned TWA, was seriously considering ordering the aircraft for his airline.

Don's two week assignment stretched into 6 months, during which time he and the Avro engineer accompanying him were well treated by the well-known multi-millionaire.

Eventually, the Canadian Government got word of the fact that Avro was still trying to market the airplane, and ordered that it be flown back to Toronto. Much to the annoyance of Howard Hughes, Don brought his bird home.

The Jetliner continued to fly however, being used as a chase airplane during the CF-100 program.

On November 23, 1956, Don flew the Jetliner on what was to be its last flight, although he was unaware of it at the time. The Avro maintenance team was getting concerned about possible corrosion and structural degradation of the aircraft, as well as the state of the hydraulic systems, for which there were no replacement parts. Since there was no funding for the program, the decision to ground her became official. Sadly, the aircraft was dismantled shortly thereafter, a fate to be suffered three years later by another of Avro's aircraft.

Don closed his presentation with a video entitled "Too Good To Be True", which described the development and flying career of the Jetliner..

Following a big round of applause from the audience, Karen Bruce, Vice-Chair of the Toronto Branch, presented Don with a book entitled "Our Glorious Century". Afterward, Don made himself available to answer questions at his display, which included models of the Jetliner and numerous unique photographs.

This hugely successful meeting was a great way to kick off 1997 for the branch. Thanks to all those who attended. The Toronto Branch would also like to thank McDonnell Douglas

Canada, a sustaining member of CASI, for allowing us to use their facilities for this meeting. It is the second time in as many years that we have held a meeting at MDCAN, and both meetings have been very successful. Thanks to all of the MDCAN employees who helped to escort guests to and from the cafeteria, and a special thanks to Ray Rogers for helping to organize the event and for assisting us that evening.

*Paul Vanderpol*

## **The CRV7 Rocket Weapons System**

### **MARCH 1997**

On March 5th, 1997 approximately 30 CASI members and guests gathered at the University of Toronto Institute for Aerospace Studies to hear Fred Christie speak about the Canadian developed CRV7 Rocket Weapons System.

Fred Christie is currently Vice President of Engineering and Quality Assurance at Bristol Aerospace. He began his career working at the Defense Research Establishment at Valcartier (DREV) from 1964-1978 where he became Head of the Rocket Section and worked on projects for the CRV7, CL289 and Black Brant Rocket Motor. He obtained his Ph.D. from Laval in 1971 and in 1978 moved on to the Defense Research Establishment, working on projects such as Aerial Targets and Remotely Piloted Vehicles (RPV's). Fred Christie was also involved in the Space Station Program, specifically, the Canada Arm, Mobile Servicing System from 1988-1990.

The CRV7 was originally developed in the early 1970's to accommodate the Canadian Forces needs for an improved 2.75" (70mm) Rocket Weapons System. The basis for design came from the Mk4/40 rocket motor and has been developed over a quarter century to suit the many needs of both, fixed and rotary wing aircraft.

The CRV7 family of rockets began in 1971 through 1978 with the C14, a major step in fixed wing rocket technology. The C14 was fully developed, qualified and tested at Bristol Aerospace. However, work began on the next generation rocket after the realization that reduced smoke emission from the motor was necessary (smoke trails from the rocket tell the enemy where you are!). Thus, the C15 rocket was developed with reduced smoke and less aluminum content in the propellant.

Both the C14 & C15 rocket motor configurations were similar. Made of impact extruded aluminum alloy, they had rolled formed polymer sidewall insulation and three aluminum wrap around fins which were erected via a spring upon firing of the rocket.