

March 2, 2019 CAHS Toronto Chapter Meeting

Topic: The de Havilland Comet – “The Canadian Story”

Speaker: Martin Keenan, Historian

Reporter: Gord McNulty

It was a pleasure to introduce Martin Keenan, who is no stranger to the CAHS Toronto Chapter. A former Treasurer, Martin has been a member of the Chapter since 2003. His excellent, well-illustrated presentation on the Comet was the sixth he has given to the Chapter, with the most recent being a well-received history of the Schneider Trophy Seaplane Races last March.



Speaker Martin Keenan
Photo - Jennifer Keenan

Martin obtained his BSc. from the University of Guelph in 1989. After working in the industrial water treatment and motion picture film processing industries, he joined Petro-Canada in 1996. Since 2000 he has been a Product Specialist for Petro Canada Lubricants Research and Development, dealing with the formulation and manufacture of lubricating greases. He is a member of the Society of Lubrication and Tribological Engineers, and is an instructor at the Advanced Grease training course at the annual National Lubricating Grease Institute conference.

Martin became an aviation enthusiast as a result of a family trip to the first Canadian Warplane Heritage International Air Show held in 1975 at Hamilton. He encountered Voodoos, Harvards, Mustangs, Corsairs and other warbirds for the first time. Martin is a published aviation author and photographer. His material has been published by *Flypast*, *Aeroplane*, *Classic Wings* and other publications.

Martin's presentation was held on the 50th anniversary of the first flight of the Aerospatiale/BAC Concorde supersonic airliner, from Toulouse, France, on March 2, 1969. Like the Concorde, the de Havilland D.H.106 Comet, as the world's first turbojet-driven airliner, represented a monumental change in commercial air travel. The Comet story began during the Second World War. The U.S. led in versatile cargo/passenger aircraft like the Douglas DC-3/C-47; the DC-4/C-54 Skymaster; and the Lockheed C-69/L-649 Constellation. Britain, meanwhile, concentrated on fighters and heavy bombers. However, Britain foresaw the need for an advanced airliner to penetrate a post-war civil market that would be dominated by American airliners and filled with thousands of surplus military transports.

Martin traced development of the Comet to late 1942, when Britain formed the Brabazon Committee, which recommended four and later five types for postwar production. The Comet was the committee's most exotic proposal. It took advantage of Britain's edge in jet engines exemplified by the de Havilland Goblin that powered the D.H.100 Vampire. Four centrifugal Ghost engines were chosen. Less rotund axial flow engines were preferable, but axial designs were still uncertain.



Vampire

The aircraft, named the Comet after the D.H.88 Comet racer of the 1930s, was first flown officially by chief pilot John Cunningham on July 27, 1949. Just two weeks later, another promising groundbreaker, the Avro Canada C.102 Jetliner, made its first flight from Malton on August 10. Development of the Comet included long-distance and endurance flights, and tropical trials. Cabin pressurization at 40,000 feet was tested. A global trendsetter in speed, the Comet broke new ground but it also faced unprecedented engineering challenges. As newsreels recorded with great excitement, “the eyes of many nations were focused upon it.” Orders from airlines around the world were eagerly anticipated. One such airline was Canadian Pacific Airlines.



Comet 5301 Near CFB Trenton



RCAF Comet 5301



RCAF Comet 5301 at Keflavik-Iceland



Dan-Air Comet 4C in a museum setting



Comet 5302 Participating in an Air Defense Exercise



BOAC Transatlantic Service with the Comet4



D.H.106 Comet 1A RCAF 5301 Calgary, 1953
(Jack McNulty Collection)



Gloster E.2839 Imperial War Museum



Comet Prototype at Hatfield - Note Square Windows

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COMET

JETLINERS

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CPA, serving routes that TCA was unable or uninterested in serving, had secured authorization for flights from Vancouver to Australia and to Tokyo, as well as Hong Kong and China. CP flew the Canadair Four (North Star) but it posed problems with range and cabin noise. CP founder Grant McConachie, who saw the Comet prototype at the 1949 Farnborough Air Show, identified it as a high-tech answer for CP's trans-Pacific routes. He convinced the CP Board to order two Comet 1As for service between Honolulu and Sydney, Australia. On Dec. 15, 1949, CP became the second airline to order the Comet. The Comet 1A was an upgraded Comet 1, with 44 seats compared to 36 to 40 in the Comet 1, higher maximum takeoff weight, and greater fuel capacity. Even with that, the range wasn't enough to fly the Vancouver-Honolulu route, so CP planned to use the Douglas DC-6B. The Comet would operate from Sydney, flying to Auckland, NZ; Fiji; and then to Honolulu with a fuel stop on Canton Island, to connect with DC-6 flights from Vancouver.

The first Comet 1A to fly was CF-CUM of CP, making its first flight on August 10, 1952. CP's second Comet, CF-CUN, first flew on Dec. 25, 1952. It was ready for acceptance in February, 1953. CP crews conducted familiarization flying with de Havilland crews in preparation for service. CPA was really enthusiastic about entering the jet age. Their operations manager told an engineering society that the Comet's higher speed would enable CP to do the work of two DC-4s. CP issued a timetable showing that Comet service from Honolulu to Sydney would begin on Apr. 29, 1953. It was named CF-CUN "Empress of Hawaii"

The route included stops at Beirut, Karachi and Singapore. Tragically, CF-CUN never arrived in Australia. Departing from Karachi on March 3, 1953, the Comet ran off the end of the runway, crashed into an embankment and was destroyed by fire. All six passengers and five crew died. The Empress of Hawaii thus had the sad distinction of being the first jet airliner involved in a fatal crash. The accident was caused by an over rotation on takeoff, possibly due to it being the crew's first night takeoff, causing a partial stall of the wing, and excessive drag. The captain seemed to realize the trouble and lowered the nose, but there wasn't enough runway left to recover. The required fix was a complete alteration to the leading edges of the fences on the wings, a modification retrofitted to all other Comets. CP never took delivery of CF-CUM. It was sold to BOAC. Still enthusiastic about the Comet, CP ordered the Comet 2 and 3 series. However, it never offered the Comet in commercial service.

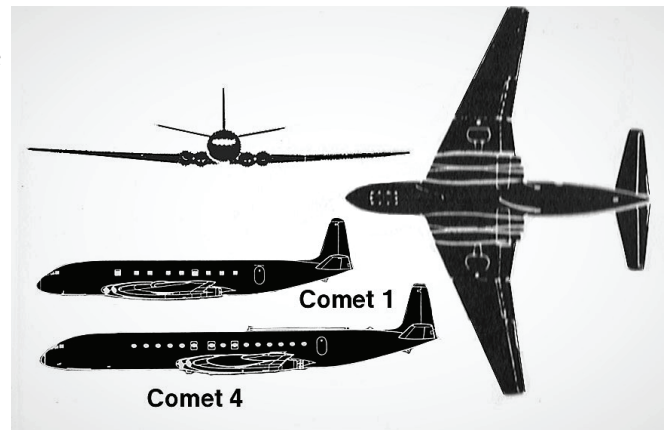
In April 1951, the second Comet prototype was handed to BOAC's Comet Unit for route proving trials and crew training. The two prototypes were followed in January 1951, by the first production Comet 1, G-ALYP, generally known as "Yoke Peter." On May 2, 1952, BOAC inaugurated the world's first commercial jet air service when "Yoke Peter" flew from London to Johannesburg. In 1953, the French airline, Union Aeromaritime de Transporte, and Air France, operated the Comet 1A. The Comet was taking the world by storm, cutting long-distance flight times literally in half.

The RCAF, meanwhile, became interested in the Comet in 1951. The North Star fleet was heavily engaged in trans-Pacific airlift during the Korean War. More transport capacity was urgently needed. Group Captain Lewis Leigh, then RCAF Director of Air Operations, worked with 'Punch' Dickins at de Havilland Canada to propose Comets for the RCAF. In addition to more transport capacity, the Comet could simulate the performance of jet bombers to assist in early warning radar training. The federal cabinet was interested in acquiring more North Stars but Canadair had stopped production in 1949. Constellations and DC-6s were considered but Comets would be cheaper and could be delivered relatively promptly. An initial requirement for four was reduced to two when a pair of Comet 1As were ordered in November 1951.

In January 1952 an RCAF team including G/C Leigh went to the U.K. They made flights in the Comet with de Havilland test pilots, were impressed with the aircraft, and arranged that DH carry out initial training of RCAF Comet aircrew and groundcrew. The first RCAF Comet, 5301, made its first flight on Feb. 1, 1953.

When it was taken on strength on March 14, 1953, the RCAF became the first air force in the world to operate jet transports. The second Comet, 5302, was handed over on April 13, 1953.

412 Squadron crews flew long-distance flights to Johannesburg and Singapore, setting a few speed records. The first trans-Atlantic jet transport flight was made May 29, 1953, when 5301 flew to Ottawa via Keflavik and Gander. The aircraft almost immediately embarked on a trans-Canada tour to display it and evaluate how the Comet would fit into the air traffic control system.



Comet 3-view Comets 1 & 4

The Comet was a sensation almost everywhere, apart from the U.S. After a visit to Idlewild Airport in New York, the Toronto Star reported the airlines had quietly asked the RCAF to use “suitable alternate landing fields in future,” supposedly for noise reduction. Comet 5302 made its delivery flight to Canada later in 1953 and the fleet settled down. The most significant task was scheduled trans-Atlantic services to Canadian forces in Europe. The Comet was reserved for high-priority passengers. If you didn’t qualify, you flew on a noisy, unpressurized North Star. Comets performed impressively, with a cruising speed of 460 mph, ceiling of 40,000 feet, and range of 2,500 miles.

A second fatal accident, in May 1953, claimed 43 passengers and crew when a BOAC Comet broke up in a thundersquall after leaving Calcutta. Nonetheless, by the end of 1953, Comet 1s and 1As were in service with four airlines, one air force, and the longer range Comet 2 was in production. It had more powerful, axial flow Avon engines. BOAC ordered 12 Comet 2s for south Atlantic services. A larger Comet 3 with enough range for North Atlantic services was being built. The Comet 3 received the ultimate accolade in commercial aviation by entering the American market. Pan American had ordered three of them, noise concerns be damned.

Then, more tragedies in 1954 doomed the Comet 1 in commercial service. On January 10, BOAC Comet “Yoke Peter” broke up in mid-air over the Mediterranean with the loss of 35 passengers and crew. On April 8, South African Airlines Comet “Yoke Yoke” disintegrated with the loss of 21 passengers and crew. The Comet’s Certificate of Airworthiness was withdrawn.

Investigation of the crashes involved the wreckage of “Yoke Peter,” instrumented flight trials with BOAC Comet “Able Victor” (the former CP CF-CUM), Comets “Yoke Riser” and “Yoke Sugar,” that underwent ground fatigue testing. Another Comet was subjected to water testing by the RAF Establishment at Farnborough. About 70 per cent of the wreckage of “Yoke Peter” was recovered and reconstructed in a hangar at Farnborough. Examination of the remains concentrated on a section at the top of the fuselage, with two square hatches to accommodate direction finding radio antennas. This section had failed. The resulting explosive decompression caused “Yoke Peter” to disintegrate in mid-air.

Fatigue cracks had spread from rivet holes around the windows. The design had originally called for the reinforcement around the windows and hatches to be riveted and glued, but the actual construction had been riveted only. Also, the rivet holes had been punched rather than drilled, which worsened the cracking. Metal fatigue wasn’t fully understood when the Comet was designed. In 1949, the Air Registration Board required that pressurized aircraft had to withstand twice the cabin pressure an aircraft would encounter in service. De Havilland went beyond this, designing the Comet cabin to withstand

two and a half times the pressure. They tested a full-size cabin to twice the maximum pressure. Cycling pressure tests were done and they kept repeating cycles until it failed. The failures didn't occur until 16,000 cycles, far more than what was anticipated to be the fatigue life of the aircraft. They figured it would be good for 10,000 cycles.

The hulls of "Yoke Peter" and "Yoke Yoke" failed at a far lower number of cycles, after about 1,000 cycles. In fact, the pressure tests had given a misleading indication of durability. By pumping the fuselage to twice the pressure, the slight stretching had cold warped the aluminum and strengthened it. In the subsequent long cycle tests, the fuselage they tested was far stronger than the real one would have been.

All airline orders for the Comet 2 were cancelled. The fuselage of aircraft in production was redesigned to address metal fatigue issues. Comets flew with the RAF in transport and electronic intelligence roles until 1975. The Comet 3 was redesigned as the Comet 4. After very extensive testing, including water tank testing, it first flew on April 27, 1958. On Oct. 4, 1958, the Comet finally entered trans-Atlantic service with BOAC.

Four years were lost recovering from the tragedies of 1954. De Havilland's lead was overtaken as Pan American started trans-Atlantic Boeing 707 service only three weeks later on Oct. 25, 1958. The 707 and the Douglas DC-8 were larger, faster, longer range and more cost-effective than the Comet. Even BOAC was forced to order 707s to remain competitive.

The two RCAF Comets, withdrawn from service after the 1954 disasters, were initially stored at DHC in Downsview and later at RCAF Uplands. They were then rebuilt in a fashion similar to the Comet 2. The two aircraft were ferried unpressurized to Britain in May 1956. Modifications were finished in the summer of 1957, including round windows. They were designated Comet IXB. Crews were sent to de Havilland for training, including round trip flights to South Africa. The two Comets were flown back to Canada on Sept. 26, 1957 and resumed operations in November 1957. One duty was simulating threats for RCAF Air Defence Command and occasionally USAF Air Defence Command. The Comet would simulate an attack by a Soviet bomber flying at 30,000 feet, being subjected to interception by up to 12 CF-100s. This duty was transferred to more specialized electronic countermeasures aircraft.

RCAF Comets were primarily used for services between Canada and No. 1 Canadian Air Division in Europe. They normally flew from Ottawa to Gander or Goose Bay and after refuelling, they would fly to Marville in France. Westbound flights were Marville to Keflavik, then on to Ottawa with a fuel stop at Goose Bay or Bagotville. A southern route was also flown via the Azores if the weather was suitable. The Comet also operated VIP flights. The interior could be refitted to provide a luxurious suite for the prime minister, cabinet ministers and even Queen Elizabeth (in October 1961).

The RCAF considered acquiring the Comet 4, but the Canadair Yukon was chosen to replace the Comet. RCAF trans-Atlantic Comet services operated until March 1962, when the Yukon was introduced. Comets were flown intermittently until August 1963. The Comets were officially retired from 412 Squadron on Oct. 1, 1963 and flown to Mountainview.

Eventually, RCAF 5301 was cut up at Mountainview. 5302 was sold and ferried to Hamilton Civic Airport as CF-SVR. It remained at Mount Hope for almost two years, and was periodically fired up and taxied. It was eventually given a U.S. registration and ferried to Miami in January 1968. It was supposedly going to Peru, but never went farther than Miami. It was cut up in 1975.

De Havilland built 74 Comet 4s before production ceased. The career of the Comet 4 with international airlines was relatively brief. But when BOAC retired its Comet fleet in 1966, two were purchased by British charter operator Dan-Air. They converted it to a single-class configuration, seating five passengers

across instead of four. They packed up to 120 people in the jetliner. Dan-Air's Comets were perfectly suited to the evolving market for cheap flights to sunny destinations. Dan-Air quickly obtained surplus Comets and had 49 at one point. Even by the standards of the time, the Comet wasn't particularly fuel-efficient. Dramatic increases in fuel prices hurt Dan-Air's economics and they began to phase out the Comet. However, some Comets in Dan-Air's fleet flew through the 1970s. Martin recalled enjoying "a grandstand view of the world's last fleet of operating Comets" from the window of a Wardair Boeing 747 arriving at London Gatwick in 1979. Dan-Air's Comet operations ended in November 1980, but RAF Comets flew until 1996.

Given the importance of the Comet, it's unfortunate that so few original Comets have survived. One original Air France Comet 1A, later rebuilt as a 1XB, as part of a recovery effort flown by the RAF, survives in BOAC colours at the RAF Cosford Museum in England. The de Havilland Aircraft Museum at Salisbury Hall has an original Comet 1A fuselage with the original windows, and also the nose section Comet "Able Victor," originally the other CP Comet. The Canada Aviation and Space Museum has the nose section of Comet RCAF 5301 and also a good general history of the Comet on its website. One Comet 2, and six Comet 4s, are in various locations in England, Scotland, the U.S. and Germany.

On behalf of the Chapter and guests, I presented Martin with a gift in appreciation of a superb presentation on the fascinating Comet story.



Shown here is CF-CUM being prepared for delivery to Canadian Pacific Airlines. Following the crash in Karachi of CF-CUN, it was returned to the Royal Aircraft Establishment and later BOAC. It never flew for CPAL.

For further information on the Comet Airliner in CPA and RCAF service please refer to the following four websites:

https://www.airteamimages.com/de-havilland-comet_CF-CUN_canadian-pacific-airlines-281942-196829_82201.html

https://www.airteamimages.com/de-havilland-comet_CF-CUM_canadian-pacific-airlines-281942-196829_114941.html

<http://www.c-and-e-museum.org/marville/other/maother-7.html>

For the archive of photos and anecdotes about the RCAF Comets:

<https://documents.techno-science.ca/documents/CASM-AircraftHistories-deHavillandComet.pdf>