the OBSERVAIR
Ottawa Chapter Newsletter
Canadian Aviation Historical Society

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CHAIRMAN'S MESSAGE

If you were lucky enough to be in France at the 100th Anniversary of the Battle of Vimy Ridge ceremony or if you watched it live from home, you would have seen a fly-past of five First World War replica biplanes. The aircraft were four Nieuport 11s, and one SE-5a from the Vimy Flight Association (VFA). A pair of Sopwith *Pups* belonging to the VFA were on static display as they had not passed the required 25 hours of testing and clearance time to earn special dispensation from Transport Canada or France.

The five biplanes were piloted by Air Canada Boeing 777 Captain Larry Ricker, A320 Captain Peter Thornton, retired Air Canada pilots Allan Snowie and Dale Erhart, and RCAF Captain Brent Handy from 15 Wing Moose Jaw, Saskatchewan.

To make Vimy Flight possible required the support of numerous organizations and individuals behind the scenes. The Sopwith *Pups* were built by volunteers and Air Cadets at the Canadian Museum of Flight. The seven biplanes were flown from their home in Langley, British Columbia, to Lille, France, with the help of one of the Royal Canadian Air Force's CC-177 *Globemaster IIIs*. Ground crew worked tirelessly to keep the aircraft of Vimy Flight in the air, including working through Saturday night and into Sunday morning to repair the damaged undercarriage of the SE-5a so it could be flown that afternoon over Vimy Ridge.

The Vimy Flight Association's aircraft are safely stowed in the CC-177 *Globemaster III*. © Major Holly-Anne Brown

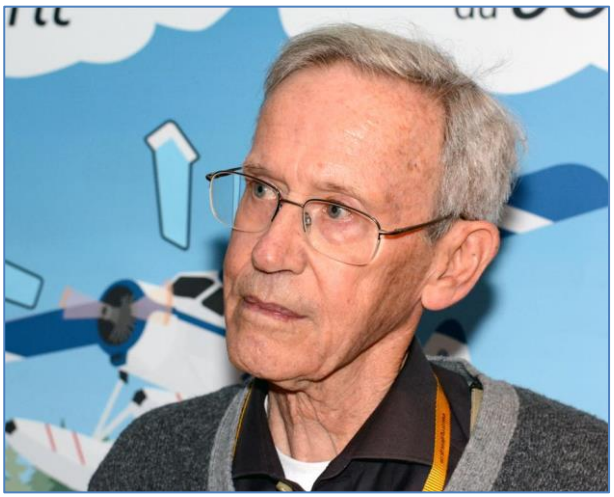
You will be able to see the Vimy Flight at various appearances across Canada this summer before it returns to Langley. All seven biplanes are expected to participate in the Canada Day flypast here in Ottawa. You can also see the replica Nieuport 11s this fall on CPAC as part of the final episode of the three part documentary, narrated by Dan Akroyd, called *A Nation Soars*. The first two episodes can be viewed here: http://www.cpac.ca/en/programs/cpac-special/episodes/48536182

Kyle Huth
Chairman

The Observair is the newsletter of the Ottawa Chapter, Canadian Aviation Historical Society (CAHS), and is available with membership. Membership fees are payable in September.
Any material for *The Observair* newsletter should be directed to the Editor: Colin Hine

All matters relating to membership should be directed to the Secretary/ Treasurer: Mat Joost
https://www.facebook.com/CAHSOttawaChapter/

PAST MEETING: Colin Hine – *TAGS: A U.S./Canada Development Project; Fly-By-Wire Helicopter Flight Control in the Early 1970s*



Colin Hine © Rod Digney

Some 34 members and guests found us in the Avro *Arrow* classroom of the Canada Aviation and Space Museum (CASM) for the Thursday, 30 March 2017 meeting of the CAHS Ottawa Chapter to see and hear yours truly, Colin Hine, speak about his time with Boeing Vertol working on the Tactical Aircraft Guidaance System (TAGS) project.

The TAGS concept had originated from a U.S. Army AVLABS, later to be replaced by the U.S. Army Air Mobility Research and Development Laboratory (AMRDL), request to the Massachusetts Institute of Technology's (MIT) Charles Stark Draper Laboratories to help them find a way to simplify the pilot's burden when operating military helicopters in a tactical environment. Helicopters were inherently unstable, even with stability augmentation systems engaged, and the attrition rate for tactical helicopters operating in Vietnam at that time was very high. The Draper Labs came up with a concept known a Velocity Vector Flight Control. Simplistically, this meant that a pilot would command the ship in terms of forward and lateral velocity, rate of climb and rate of turn directly, rather than in terms of collective pitch, cyclic pitch, foot pedal yaw commands. Translation from velocity vector commands to rotor swash-plate commands required complex real-time computation capability. Theoretically, this could make it possible for a truck driver with minimal flight training fly a helicopter.

The concept required introduction of a range of new sensors and controls, including inertial velocity sensors, gyro sensors, a new range of pilot controls and, of course, computers. While some forms of computing had been deployed in auto pilot systems at this point, providing computers in a full authority link between the pilot and the helicopter had never been considered before.

Boeing Vertol became involved in the early days of the project almost by accident. The team at MIT had elected to use an old Piasecki tandem rotor helicopter (*a YH-16 I believe*), and they required Boeing Vertol's expertise to maintain and modify it. Other organizations involved included AC Sparkplugs, later to become Delco Electronics (a division of General Motors), who provided inertial components, gyros, etc.

The U.S. Air Force prototype Piasecki YH-16A *Transporter*. The program was abandoned after the crash of the second prototype. © U.S. Air Force photo from the USAF Aeronautical Systems Center History Office, Public Domain.

The TAGS helicopter, *Chinook* CH-47B, 66-19138, seen after it was transferred to NASA, where it was used for a variety of advanced digital flight control system developments. © NASA

As time progressed, Boeing Vertol and Delco came together with a proposal to U.S. AVLABS to develop a prototype TAGS helicopter incorporating Delco's Carousel IV inertial navigation system and other sensors aboard a U.S. Army *Chinook* helicopter – a CH-47B. AVLABS did not have sufficient funding at the time, but later the team was able to launch a modestly sized ($100K) definition phase project during which IBM Federal Systems Division was brought aboard to consider using one of their new generation of militarized microcomputers.

The definition phase documentation included an updated proposal costing out the design, development, and testing of the prototype system. Total costs for the proposed project exceeded funding limits available from AMRDL, so the feasibility of operating the program under a defence cost sharing agreement with Canada was explored, and eventually an agreement with the Canadian

Department of Industry Trade and Commerce was signed. The Canadian Government placed several conditions on the project in order to ensure that significant industrial benefits would accrue to Canada. These included having a Canadian company as prime contractor; as well the final assembly flight test phases of the program were to be executed in Canada.

The outcome of the definition phase included a triple redundant full authority digital flight control system that connected to the existing manual flight control system using electromechanical servo actuators and clutches to engage and disengage the system from a safety pilot's position. Adjustable mechanical stops were to be placed on the actuators so that the flight envelope of the helicopter could be explored progressively and eventually the mechanical limits would be removed allowing the flight control system to operate at full authority in all axes. The triple redundant system permitted one failure to be tolerated. Control inputs from the evaluation pilot's position would be made through a multiple axis sidearm controller. Rate sensors with automatic disengagement limits were also installed on the servo actuators to avoid the possibility of catastrophic failures.

The prime contract was awarded to CAE Electronics in Montreal. One of the benefits that would accrue to CAE would be the creation of a six degree of freedom moving base simulation of the Chinook helicopter that would lead to future international sales. CAE also agreed to develop the sidearm controller. Menasco, formerly Abex, of Montreal was selected to develop the servo actuators. Bids solicited from Canadian firms (including Canadair) to conduct final assembly and flight testing phases of the program were all much too high and eventually Boeing Vertol agreed to accommodate the program at its Boeing Canada facility in Arnprior. Employees there were already experienced working on Labrador tandem rotor helicopters and this was an added advantage.

The velocity vector flight control concept required the development of advance flight control algorithms and these were developed by Boeing Vertol engineers using a digital simulator at their facility in Philadelphia. Consultation and guidance was provided by the MIT Draper Labs team. IBM then programmed the algorithms developed by Boeing. This was quite an achievement given the size of the CP-2 memory at this time (16Kb).

MIT also agreed to provide technology transfer to Boeing as a part of the contract. Yours truly was one of the recipients of this technology transfer and I spent several interesting weeks at the MIT Draper Labs in Cambridge learning about some of the work they had originally performed for U.S. AVLABS.

Boeing Vertol engineers provided CAE information on the TAGS flight control algorithms, as well as other information on *Chinook* helicopter flying characteristics, and Boeing test pilots assisted CAE by evaluating the performance characteristics of their simulator. One of the goals of the project was to "fly" each test mission on the simulator at CAE before conducting the mission on the aircraft. It took longer than anticipated to complete the basic helicopter simulation, particularly due to the complexities involved with simulating helicopter operation in ground effect. So things did not work out quite as expected; in fact flight test results were often used to help verify simulator performance. Nonetheless, CAE eventually achieved a high quality six degree of freedom moving base simulation and this was sold in the U.S., as well as other countries flying *Chinook* helicopters.

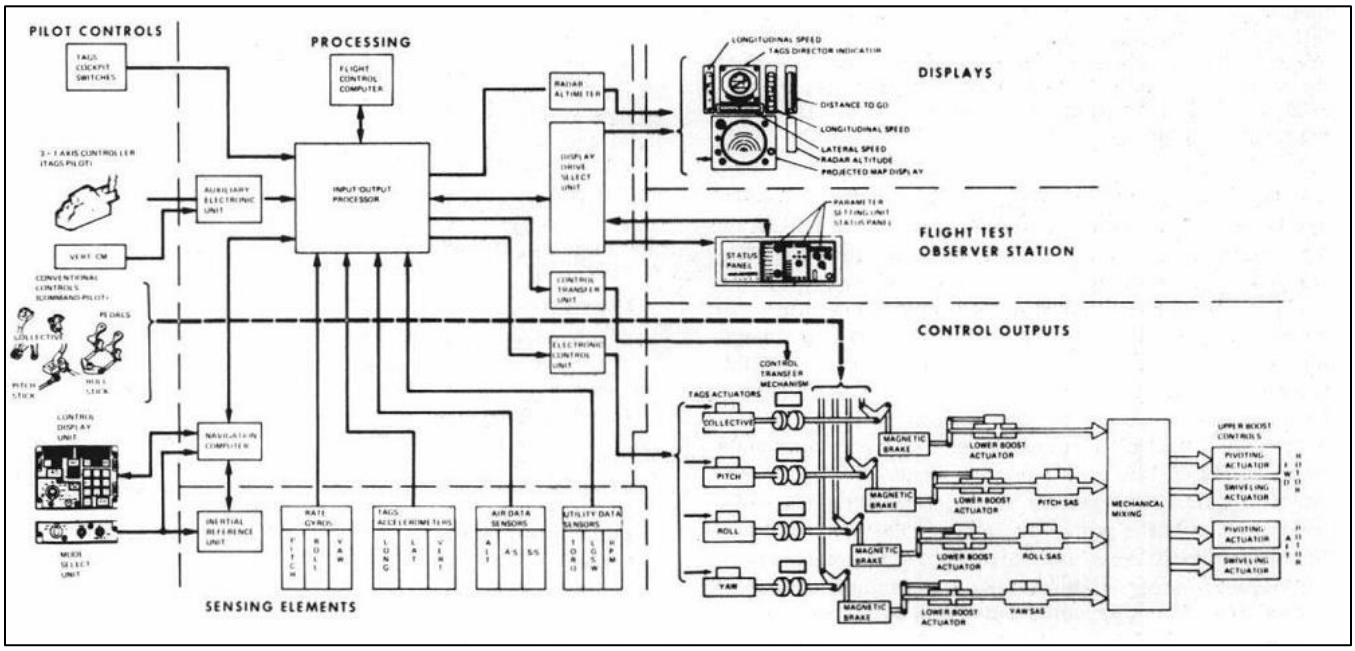
When the action moved to Boeing Canada's Arnprior facility, a team of engineers, technicians, and flight test personnel, along with their families in many cases, made the move from Philadelphia to Arnprior for a long duration assignment. My personal role on the project remained as systems engineer, but I picked up additional responsibility as analytical observer during flight tests. Advanced development work continued at Arnprior as special needs dictated by the flight test phases of the project were addressed. Two U.S. Army CH-47B helicopters were made available to the project, but eventually only one of these actually flew. The second helicopter ended up as a hangar queen, a source of spares to keep the first helicopter airborne.

TAGS is a full-time, full-authority electrical flight control system designed to provide extensive stabilization of the flight path while maintaining pilot-in-the-loop control. Redundancy management is implemented in software as a result of TAGS hardware design. The triplex system provides continued operation after a single equipment failure and isolation and identification of the equipment malfunctions. To achieve this, several techniques were utilized, including median value selection, computer synchronization, individual unit self-test, majority voting logic, and special signal-level-limiting and tolerance-testing techniques.

The control loops are designed to provide automatic trim; that is, the pilot's steady-state control position is only dependent on the appropriate flight condition and not on the required swashplate position. The control system provides longitudinal and lateral speed hold, rate-of-climb and altitude hold, and turn rate or heading hold on a continuous basis. The trim hold is ground referenced at low speed and air-mass referenced at high speed. Phasing functions blend the control functions smoothly from ground to air-mass reference as air speed increases. The pilot can perform basic manoeuvres with single-axis command inputs. The velocity command and inertial navigation properties of the system fully expand the IFR capability of the helicopter to encompass all VTOL operations.

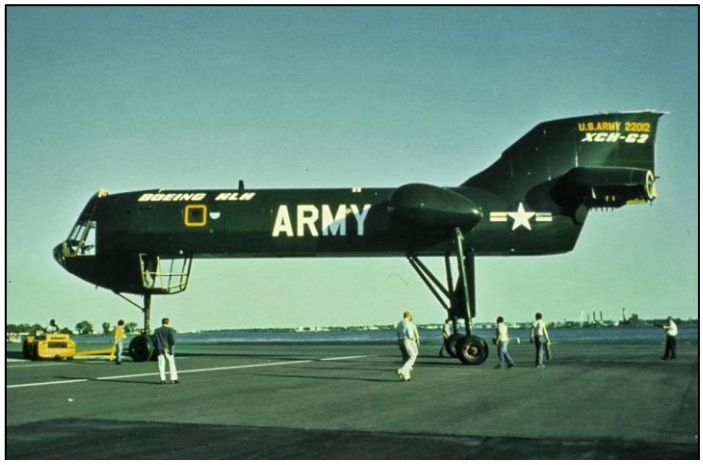
For a given control input, the flight path can be commanded in any manner because of the freedom in the design associated with using a digital computer – remember this project took place in the later 60s and early 70s, so the concept was still pretty revolutionary. The pilot applies four-axis velocity command inputs that are essentially uncoupled. The pilot commands longitudinal speed, lateral speed, and coordinates turns with the right hand through a 3-axis sidearm controller, and vertical speed with the left hand through a vertical controller.

The TAGS hardware can best be described through its six functional groups: the pilot control inputs, sensing elements, signal computation and processing, control output, pilots' displays, and flight-test-observer station. The majority of the hardware is in a triplex configuration that includes electrical and hydraulic power supplies. The configuration block diagram (*sorry for the poor quality*) shows the redundancy levels of functional units. Each of the three flight control computers is linked with the remainder of the system through an input/output processor (IOP) that performs signal conversion and provides the capability to interchange data between the triplex channels. A complete group of sensors (one of each functional type) is dedicated to each channel. However, all sensor inputs are distributed to all three computers, with data acquisition initiated and synchronized under computer control.



TAGS Hardware Configuration

The TAGS pilot generates commands which are combined with the sensor feedbacks and digitally processed to form flight-control commands. These actuator commands back-drive the conventional helicopter controls. In this way, mechanically-linked conventional controls and separate conventional helicopter displays constitute a backup to the TAGS which is available on a full-time transient-free basis. The control transfer system is designed to operate on an axis-by-axis basis.



Boeing Vertol XCH-62 prototype Heavy Lift Helicopter (HLH)
© Boeing Helicopters

Boeing Vertol Model 347 prototype helicopter © Boeing Helicopters

During flight testing, the TAGS system demonstrated excellent characteristics and ultimately it was evaluated over a substantial portion of the CH-47B flight envelope. I was actually an observer on the flight when limits were first opened up allowing full authority fly-by-wire operation. Nothing particularly exciting happened but we did get some interesting surprises as we progressively explored the flight envelope.

Much of the technology developed for TAGS was later used during development of the XCH-62 Heavy Lift Helicopter (HLH) and the HLH demonstrator logged more than 300 hours of flight time. A prototype Boeing Model 347 helicopter was modified to become the first genuine fly-by-wire helicopter in the world. It logged a total of 1,000 flight hours.

Ultimate flight safety of TAGS was to be a function of the triple system which would have fail-operational integrity through voting and switching logic. During early developmental flight testing, a system was devised whereby control authority was limited as necessary to permit safe reversion to conventional CH-47 flight control and recovery by a safety pilot in the event of system instability or failure.

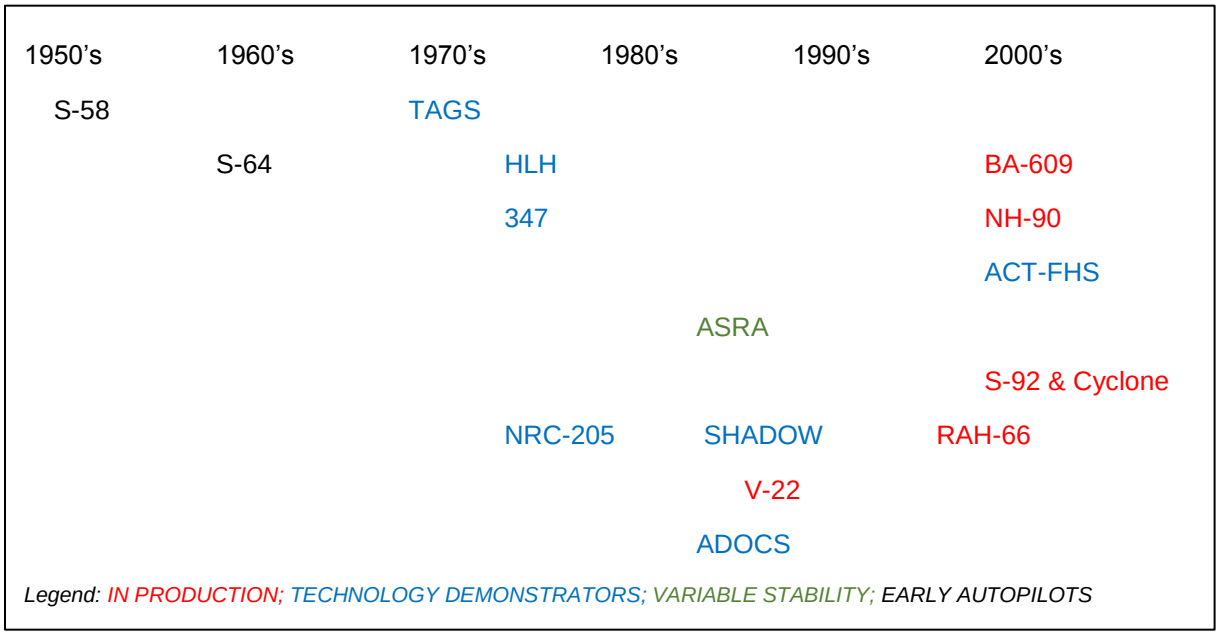
The method used to provide suitable reversion to conventional control was to back-drive the conventional cockpit controls through an electrically actuated hydraulically-operated friction-plate clutch for each control axis. To avoid control command transients during reversion, the rate-stabilised (SAS) conventional cockpit-control positions appropriate to the flight conditions were retained by keeping conventional SAS active during TAGS flight. SAS activity produces rate stabilisation differentially in the conventional control system; this was compensated for in TAGS control computations. The method by which the SAS motions were accommodated was to subtract their effect and to replace the stabilizing functions by different high-frequency loops appropriate to the TAGS system requirements.

The Tactical Aircraft Guidance System was evaluated over a substantial portion of the CH-47 envelope. Although the system development and evaluation was not totally completed, the feasibility of a full-authority fly-by-wire digital flight control system was demonstrated. TAGS is a significant advance in helicopter automatic flight control; it demonstrated very good response combined with extensive stabilization and trim hold.

The test program demonstrated the first full authority redundant fly-by-wire digital flight control system installed in a helicopter. This was the first redundant system to employ software techniques for voting and switching on signal inputs and command outputs.

Unique digital computational techniques were developed such as derivative rate limiters (a redundancy management device that provides transient suppression in the event of a hard-over sensor failure) and transient-free switching techniques (which permit smooth switching between flight modes).

It must be said that a flight control system like TAGS proved difficult for an experienced pilot to fully accept because the manner in which the pilot velocity commands are translated into cyclic and collective control commands by the designer do not necessarily conform to the manner in which a conventional helicopter pilot would translate them. They would likely be quite acceptable to a novice pilot under training – *or to that theoretical truck driver with minimal flight training!*



Key developments in helicopter flight control system technology over 50+ years.

The steps taken by the TAGS program were impressive given the state of the art in digital computing technology at the time of the project. Sadly, the Canadian Government decided to withdraw its support from the program before it was completed. The TAGS helicopter was transferred to MIT Draper Laboratories and they completed flight testing from their site at Bedford, Massachusetts. This helicopter was later transferred to NASA, where it was used for a variety of advanced digital flight control system developments for a number of years.

And that, my friends, is how I came to live in Canada!

Colin Hine
Editor

RAMBLING THROUGH RECORDS

Some time ago Paddy Gardiner asked me about the Donegal Corridor; what was it, and how did it come about? I found a little information in Wikipedia; then on one of my favourite websites, **RAF Commands** (http://www.rafcommands.com/forum/), a forum where one can find the most unlikely experts, I was not disappointed, and found a lot more information.

Although this is chiefly an Irish matter, there is a significant Canadian connection. From time to time during the Second World War, Nos. 422 and 423 RCAF Squadrons were based at Lough Erne, a lake in Northern Ireland. A glance at the map shows that in order to reach the Atlantic to conduct their anti-submarine patrols, their Short *Sunderland* flying boats would normally be expected to fly northwards then west, to avoid County Donegal, which lay in neutral Irish territory. However, it is apparent that these aircraft would typically take a short cut, across the County.

Donegal (Ballyshannon) Corridor © photobucket.com

More than one Allied aircraft crashed in this area, or in adjacent County Kerry. Among the casualties was *Sunderland* NJ175 of No. 422 Squadron. On 12 August 1944, the aircraft lost its starboard outer propeller soon after takeoff. Even after dropping its ordnance and dumping fuel, it could not maintain height and an attempted crash landing failed. The aircraft struck a rise, turned on its back and broke in two; the forward section caught fire. Three of the twelve crewmen perished: the captain, Flight Lieutenant Evan Campbell Devine of Orillia; Flying Officer Roy Thomas Wilkinson of Toronto (third pilot); and Flight Sergeant John Reginald Forrest, home town uncertain (WOP/AG). In the year 2000, a memorial stone was unveiled near the site. Earlier, on 31 January 1944, *Sunderland* flying boat DW110, of No. 228 Squadron, from Castle Archdale, crashed near Brockagh, County Donegal, killing seven and injuring five. Among the dead was Flight Sergeant Arthur Gerald Green, RCAF, of Toronto.

The last patrol of a *Sunderland* from No. 210 Squadron RAF flies out from the Donegal Corridor at war's end, June 1945. © castlearchdale.net

During the Second World War and in the period leading up to it, Irish neutrality proved to be a tremendous handicap to the Allied cause. Britain maintained naval bases in the country (so-called Treaty Ports) until 1938, when they were surrendered to the Irish Free State. The British were soon to regret this concession. The government of Éamon de Valera not only refused Royal Navy access to the bases, but also blocked access by ocean-going tugs that might have saved merchant ships. I recall reading in the novel, *The Cruel Sea*, written by Nicholas Monsarrat, what bitterness this engendered in British mariners.

Interestingly, in the north of the Irish Free State, a different practice was being adopted. I use the word "practice" advisedly, because "policy" would imply a formal, legalistic approach. The Irish authorities closed their eyes to the British aircraft passing back and forth through Donegal. To the extent that anything official occurred, there was a meeting in January 1941 between de Valera and Sir John Maffrey, the British representative in Dublin, allowing Lough Erne-based flying boats to fly across a four-mile stretch of neutral territory, from Belleck (County Fermanagh) to Ballyshannon (County Donegal), but only for air-sea rescue missions.

The first official flight along the Corridor took place on 21 February 1941 by a *Stranraer* of No. 240 Squadron. Conditions of the concession included that flights should be made at a "good height" and that aircraft should not fly over the military camp at Finner. However, these conditions were virtually ignored by both sides. Indeed, the *Catalina* of No. 209 Squadron which located the battleship *Bismarck* in May 1941 was based at Lough Erne and passed through the Donegal Corridor.

This "nod and wink" policy with respect to Free State neutrality proved to be very flexible; for all practical purposes the boundaries were informally extended well beyond those originally defined; certainly the Irish Air Corps made no attempt to enforce them. When questioned about his "benevolent neutrality," de Valera refused to answer on the grounds of "national security."

Officially, the Irish Government buried the practice as deeply as possible. Martin Gleeson, responding to my query on **RAF Commands**, wrote:

> For Irish historians this is a difficult subject to properly explain due to lack of official documentation. On the Irish side much was either not written down or the relevant paperwork was later destroyed. There is certainly more in British archives but I have not examined these sources.

He then made a remarkable observation:

> There is a wonderful official series of many volumes published in recent years, titled *Documents on Irish Foreign Policy*. These contain copies of all the extant important documents relating to Irish foreign policy. An excellent resource of primary material for Irish historians, but I cannot find one mention of the Donegal Corridor.

Memorial in Ballyshannon, unveiled by Sean Slevin, a Local Defence Force wartime member.
http://www.donegaldiaspora.ie/place/donegal-corridor

This is an amusing example of deliberate national amnesia. Nonetheless, the existence of the Donegal Corridor was acknowledged in 2007 with the unveiling of a plaque on a Ballyshannon bridge.

Hugh Halliday

The Last RCAF *Canso* Flying Boat

April 6, 1962 – The RCAF's last Consolidated PBY-5A *Canso* flying boat, belonging to No. 162 Squadron, at Downsview, Ontario, took flight for the last time during a squadron reunion.

No. 162 Squadron flew *Cansos* throughout the war; the squadron sank five U-Boats and one of its members, Flight Lieutenant David Hornell, was awarded the Victoria Cross. After the war, the RCAF used Cansos for search and rescue, Arctic survey, and other transport roles.


Undated file photo of a post-war RCAF search and rescue *Canso*.
© DND Archives

Pubs & Mags

Airliner World (March 2017) - 11pp. on the British Antarctic Survey and their de Havilland Canada Twin Otter and Dash-7 aircraft operations.

Bill Clark

YOW*za* – Images of recent sightings at Ottawa's Macdonald-Cartier International Airport (MCIA) (YOW)

This page is contributed and coordinated by CAHS Ottawa Chapter member Rod Digney

Rod's Recollections – Spotting at Ottawa-area Airports

The following notes and images were originally sent to me by Rod Digney for inclusion in the CAHS Ottawa Chapter Facebook page. Due to some technical issues we have had difficulty posting them so we are including them here for your interest.

Tuesday, 28 March 2017 marked the 60th anniversary of the first flight of the Canadair CL-28 *Argus* when 20710 lifted off from Cartierville Airport at Montreal. Based on the Bristol *Britannia* airframe, Canadair built 33 examples of the massive maritime patrol and reconnaissance aircraft that served with the RCAF and CAF until being struck off strength in 1980-81. They were replaced by the Lockheed CP-140 *Aurora*. Most were scrapped, but five complete aircraft are preserved in Canadian museums. The occasional visits to YOW by the noisy Argus throughout its operating life were always welcomed by plane spotters. (All photos: Rod Digney)

CAF CP-107 *Argus* Mk.2 10728 arrives on YOW's Runway 32 for the Air Expo air show at CFB Uplands, 12 September 1975.

CAF CP-107 *Argus* Mk.2 10728 on static display at Air Expo at CFB Uplands, 13 September 1975.

CAF CP-107 *Argus* Mk.2 10728 exits Runway 07 during a transient visit to YOW, 9 May 1978.

My favourite *Argus* shot – CAF CP-107 *Argus* Mk.1 10717 performs at an air show at CFB Trenton, 23 September 1978. Preserved at CFB Greenwood, NS, today.

Last built and last flown – a well-worn and very dirty *Argus* 10742 makes a final pass over YOW's Runway 32 before its final landing at Rockcliffe for preservation at the National Aviation Museum (now CASM), 10 February 1982.

The Blake James MacGregor MG-65

The Canadian Bushplane Heritage Centre (CBHC) in Sault Ste. Marie, Ontario, unveiled a new addition to their collection last November, a homebuilt MacGregor MG-65. This aircraft was built in Mount Hope, Ontario, in 1960 by aircraft engineer Wilmer MacGregor, and while wearing Canadian registration CF-RCZ starred (alongside Blake James) in the 1969 National Film Board (NFB) short film *Blake*. Nominated for an Oscar and winning an Etrog Award (now called a Genie Award), *Blake* was directed by legendary filmmaker Bill Mason. James and Mason were both filmmakers and friends, James having done several animated NFB shorts, including one about Wop May.

For those who haven't seen the NFB film, *Blake* follows Blake James as he escapes from the workaday world into the world of biplanes and adventure. Without a radio or navigational equipment, James flew CF-RCZ across Canada using roads and landmarks for navigation. For us here in Ottawa, the scenery of *Blake* should look familiar; much of it was shot locally in the Gatineau Hills or over the St. Lawrence River. There is a particularly amusing scene where James, short of fuel, lands unannounced at Montreal's Dorval Airport (YUL) to be greeted by fascinated pilots, ground crew, and officials. Taking on fuel amidst Air Canada Vickers Vanguards and Douglas DC-8s, James and CF-RCZ are soon back among the clouds.

Screen capture of CF-RCZ from *Blake*. © NFB

The MacGregor MG-65 would change hands many times, ending up in Indiana being offered for sale on EBay in 2015. That's where Andy Gelston found and purchased the aircraft, donating it to the CBHC on behalf of James. Blake James, Andy Gelston, and Bill Mason's daughter Becky were all on hand for the unveiling. *Blake* can be viewed for free from the National Film Board website: https://www.nfb.ca/film/blake/

Kyle Huth
Chairman

Find us on: facebook

CAHS OTTAWA CHAPTER FACEBOOK PAGE

At this month's Project (*aka* Prayer) Group Meeting, we discussed some of the merits of our new Facebook page. There are certainly mixed feelings on the subject: a few firm believers on the general value of Facebook as a research and information tool and others who do not use social media applications like Facebook.

We currently have more than 50 page followers, only a few of whom are CAHS Ottawa Chapter members. Some followers visit the page regularly and occasionally post comments. Some of the posts have been visited almost 100 times, so there is definitely some interest.

Despite only limited use by Chapter members to-date, I intend to continue posting to the page. It has important value as it will likely attract a younger audience and hopefully encourage local visitors to consider attending our meetings and perhaps joining the Chapter.

We will hopefully see more interest by members in visiting the page for updates during the summer break when there is no newsletter! You are encouraged to give it a try, even if this is the only reason you use Facebook. It is relatively easy to protect one's privacy as a Facebook user, so security should not be a significant issue. I would appreciate hearing members' views on this issue, feel free to contact me.

The Ottawa Chapter Facebook page can be accessed at: https://www.facebook.com/CAHSOttawaChapter/. I will maintain a link to the Chapter's Facebook page, as well as a link to the website, in future issues of *the Observair*.

Colin Hine
Editor

NEXT MEETING OF THE OTTAWA CHAPTER CANADIAN AVIATION HISTORICAL SOCIETY

ONE LAST PRESENTATION OF AERONAUTICAL TREASURES

CHRIS TERRY

Out of retirement after some arm twisting, Chris Terry will join us for – *as he calls it* – one last presentation of aeronautical treasures he has seen since he last joined us in February 2014. This year's aeronautical travelogue includes visits to the Glenn Curtiss Museum (Hammondsport, NY), the National Soaring Museum (Elmira, NY), the College Park Aviation Museum (College Park, MD), the Museum of Army Flying (Middle Wallop, UK), the Farnborough International Airshow (2014), the Western Museum of Flight (Torrance, CA), the Western Antique Aeroplane and Automobile Museum (Hood River, OR), the Evergreen Aviation and Space Museum (McMinnville, OR), the RAF Museum (Cosford, UK), and a magical afternoon at the Sproat Lake water bomber base on Vancouver Island with the magnificent Martin Mars, plus many more.

LOCATION: Bush Theatre, Canada Aviation and Space Museum, Rockcliffe

DATE/TIME: Thursday, 27 April 2017, 1930 Hours

LANDING FEES: $1.00

Meetings include guest speakers, films, slide shows, coffee and donuts

Visitors and guests are always welcome