IN MEMORIAM

William L. Turner

(1925 – 2000)

W. L. (Bill) Turner, a founding member and Director of the Aerospace Heritage Foundation of Canada (AHFC), died unexpectedly while in hospital in Toronto on Tuesday, June 13, 2000. Bill was a Director of the Canadian Astronomical Society, now the Canadian Aeronautics and Space Institute (CASI). He was also an early member and past Director of the Canadian Aviation Historical Society (CAHS), the U.S. National Space Society, the international Association of Old Crows (military intelligence) and the Air Force Association of Canada. Bill joined the RCAF in 1943, and after one year and three weeks before his parade to receive wings as a "Wireless Navigator" in Mosquito crews, he was transferred into the Canadian Army. Apparently, the RCAF was then overstrength, and to reinforce Canadian losses in Europe, the government automatically transferred 11,000 airmen trainees into the Army. Bill, now in the Army, spent another year in Military Intelligence at Camp Borden and Camp "X" in Whitby. In 1989, he retired from an engineering and marketing management career of 44 years in Canadian aerospace industries. He was widely recognized as one of Canada's pioneers in space programs, and had an unbelievable network of people, not just in North America but the world. After retirement, he spent countless hours as an enthusiastic, dedicated volunteer member of many organizations. He strongly felt the importance and necessity of "passing on the torch", the message. Bill became a meticulous archivist and historian, participating with the Canadian Space Agency and many Canadian/U.S. aerospace associations to present the history of Canada's unique aviation and space contributions to the public. Bill was invited to lecture at educational institutions. He had a special affinity with students of Marc Garneau Collegiate in Toronto, where he loved to speak on aerospace. Within a few sentences, and seeing his smile, students immediately knew that this was not just another talk but the real thing, and for a short time, Canadian aerospace achievements came alive, worthy of pride. Bill probably never intended to influence anyone, yet many he did, young and old, over the years, in his own manner and style. He loved his family, especially his grandchildren, and he treasured his friends. At all times, he was a true Canadian patriot with a realistic, positive outlook on life, with rock-solid values and principles. Truly, Bill Turner will be missed by all whose lives he touched.

Aeronews

Cold Lake Air Base Renamed

JANUS JURAKOWSKI received another honour. The Aerospace Engineering Test Establishment at the Canadian Air Force Base, Cold Lake AB, opened officially with appropriate pomp and ceremony, and was re-named in his honour. And so it should be. For it honoured a professional test pilot who was closely connected with the Avro Arrow and who made the first successful flight in this advanced intereceptor. Zurakowski, a resident of the Barry's Bay area and a resort owner, in his usual unassuming way, said he is not quite sure just how it is that the test facility was named after him. Perhaps because there was no better person of professionalism and character that symbolized Canadian aerospace. The Office of Air Force Heritage and History in Winnipeg accordingly recorded this event in its annals and passed this information to *Pre-Flight*.

Aircraft with Feathers?

WELL, MAYBE SORT OF. According to Geoffrey Lilley, a professor emeritus of aeronautics and astronautics at the University of Southampton, England. According to the magazine *Discovery*, Lilley has been intrigued by the silent flight of owls for a long time. As any bird watcher knows, owls fly ever so quietly that their prey do not sense that they are doomed. So Lilley, with true research zeal, decided to look at owl flight patterns. He did this quite systematically, beginning with many videos of owls in flight, taken in a wind tunnel environment. And interestingly, the owls seemed to be cooperative! He then began to study these videos, hoping to acquire a better understanding of owl flight dynamics. This is not to satisfy his curiosity. Lilley hopes that this knowledge will help aero-engineers to design quieter and better aircraft.

What he has found so far, is that serrated feathers on the front edges of owl wings funnel air smoothly over the wings. This reduces the noise of rushing air, easily picked up by highly sensitized prey. Each wing has a scarflike, fringed back edge that prevents the abrupt air-pressure changes and noise, as those produced by an aircraft's rigid wings. So by adding serrations and fringes to aircraft wings, he thinks a quieter plane can be built.

This would be boon to the industry, since noise always is a problematic factor. Lilley contends that engine noise abatement has gone as far as it can go. Additional reduction created by aircraft in flight has to come off the airframe. *pf*

Pre-Flight

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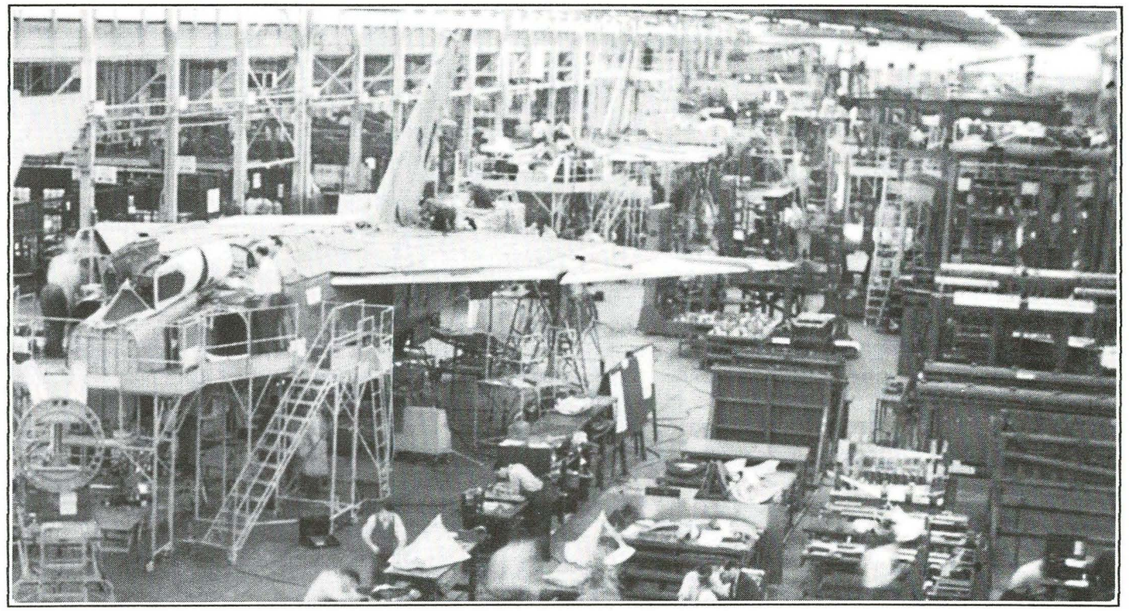

Palmiro Campagna, **P. Eng.**

Rebuilding the Arrow?

February 20, 2000 marked 41 years since the date of the cancellation of the Avro Arrow program. The debate as to whether the decision was valid or insane still rages and is oquite often used as an example for modern programs facing a similar fate. Lately, though, there has been a move afoot to rebuild and actually fly the Arrow once again. In this age of men having walked on the moon and laptop computers achieving phenomenal power, many are likely to say rebuilding the Arrow should be possible, without realizing the technical complexities involved. The real question is whether it is indeed feasible. From an emotional perspective, rebuilding the Arrow makes good copy. Newpapers and magazines across

(continued on p. 2)

FOUNDED 1989

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FROM THE PRESIDENT

I thank all members who entrusted me with their proxy.
At the AGM, we said goodbye to five AHFC Directors.
BILL TURNER, Director of Archives/Education, who passed away June 13th. Details on page 4 of *PF*.
ROSS DeGRANDIS, assistant to the treasurer, tendered his resignation due to work commitments.
KEMP WATSON, originator of our website.
BERYL FAIRCHILD, secretary.
We welcome three new Directors.
GLEN BEAUCHAMP, who has agreed to act as Secretary. Glen is part of the Lancaster team and is an accomplished photographer.
DITA VADRON has volunteered her marketing and communication talents.
KEITH McCLARRY, aviation background and also a member of TAM.
On June 16th, the Board of Directors passed a motion which removed the concept of AHFC building an Arrow replica, and committed AHFC to closer cooperation with the Toronto Aerospace Museum, such as shared projects and loan of AHFC artifacts.

Arrow, *cont'd.*

the country have carried the story. Emotion aside though, issues need to be addressed by anyone considering joining in such an endeavour. Over the years, a number of pieces of the Arrow have been unearthed. One plan was to use these to reconstruct the entire aircraft. This idea seems to have been abandoned and for good reason. First and foremost is the fact that not all the necessary parts are available. Secondly, refurbishing 41-year-old parts, many of which were uniquely designed, would prove an impossible challenge without the necessary tooling, all of which was destroyed when the project was concelled. Reassembling them into an airworthy supersonic fighter makes the task that much more improbable. Even if a warehouse of brand new parts was discovered, each would have to be inspected to the original drawings and most would need to undergo testing to ensure integrity.

The latest concept now is to rebuild the Arrow using modern materials and the latest in cadcam computer design techniques. Supporting this plan is the contention that a number of the original drawings exist.

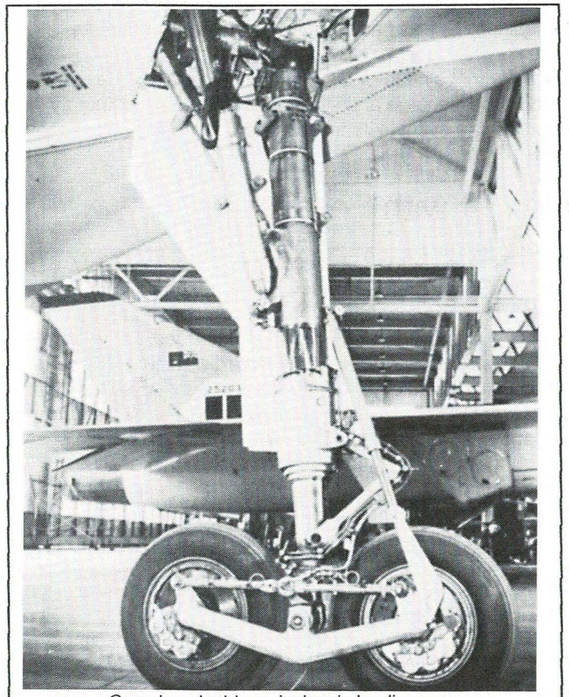
There is one significant problem here, which is not being recognized. It would not matter if all the original drawings existed. Those drawings were developed based on engineering calculations and computations and thousands of hours of testing, for the characteristics of the existing materials of the day. Changing those original materials and replacing them with modern ones whould obviate all those original drawings. Everything would have to reclaculated and re-tested from scratch. Centre of gravity, weight, drag and thermal coefficients and load and stress factors would all change, to name a few. It took over a thousand of the world's top engineers, technicians and technologists to design and prepare the original parts and drawings. If it were such a simple task using today's computing power, the major aircraft builders would not be spending hundreds of millions of dollars in aircraft development. The fact is re-designing from scratch is not a simple task and never has been.

(cont'd on p. 3)

Arrow, *cont'd from p. 2*

Engines represent the next big dilemma. It has been suggested that modern engines would be used. One has only to look back at the real Arrow to understand the cost and engineering impact on design with respect to altering the engine types from the originals. With different engines and new materials, the result could be made to look like an Arrow but it would not be an Arrow.

What would it cost to build an aircraft from scratch for a one of prototype? The word astronomical comes to mind. According to audit from 1959, the original research and development on the airframe and engines was just over $200 million dollars. One can well imagine what would be required today. Remember that this is a supersonic aircraft, not a 1950s roadster.



Complex, double-swivel main landing gear.

Assuming the money was available, who would redo the design and testing? Volunteers? An individual considering involving himself in such a project must ask if volunteers with the requisite aeronautical background had been recrited for the team. How many specialsts would it take? How many hours would be required? Who are the skilled artisans that would actually do the work of manufacture and assembly? There has been mention that students would be allowed to donate their time and talent for the cause. Who would supervise them? What safety measures would have to be put into effect? Again, if building a supersonic fighter was a simple task that one could complete with volunteer assistance, why has Canada not begun rebuilding modern fighters for the world? Why again do the aircraft giants in the United States and elsewhere form consortia to get the job done?

"... the result could be made to look like an Arrow but it would not be an Arrow."

Rebuilding a flyable 77 foot long supersonic aircraft requires a lot of specialized tooling for final and sub-assembly, not to mention the floor workspace. Who will provide this workspace? The original Arrow required specialized wind tunnel testing. Where would this be done today?

In such a scheme, funding is obviously an issue. There could likely come a point in time when the decision would need to be made to cut losses and not proceed. Has such a time been stipulated? What would happen to any accumulated funding to that point? Is there a backup plan? Finally, the aircraft would require flight certification. Proof would be needed that the aircraft was built to all pertinent standards in order to satisfy Transport Canada requirements. Configuration control of the thousands of drawings needed to recreate the design would be required. In the end, the aircraft would not be the Arrow and what would be the consequence if it crashed on initial flight? Who would shoulder the responsibility?

Rebuilding a supersonic aircraft that looks like the Arrow is definitely possible, but anyone considering joining in such a venture should consider the points raised here as a minimum. And don't forget that a pilot wouild need to be trained also.

Bon chance!

Note:

Palmiro Campagna is an engineer by profession and works for the Department of National Defence in Ottawa. He has written two editions of "Storms of Controversy: the secret Arrow files revealed." Both editions have exploded the myth that design flaws, cost overruns, or obsolescence had triggered the demise of the Arrow. He has put in countless hours of research through now-declassified files, resulting in his books, which can be purchased and read by anyone. PRE-FLIGHT extends its thanks for his thoughts and comments on the highly complex, well-nigh impossible endeavour of attempting to duplicate a flying Arrow.The Toronto Aerospace Museum has started to build a full-scale external model of the Arrow, which when completed, will give viewers an idea of the heft of this Canadian interceptor.

Arrow replica, cont'd from p. 3

citizen or corporation to donate what was needed. The first flow of funds occurred in November, but with assurity of these funds, personal credit cards were used for interim purchases.

A suggested initial **schedule** was prepared for the fabrication, assembly and finishing of the Replica. Since the volunteer labour was such a major determinant for the schedule, it was a hope-filled exercise. The cockpit 'tub" was progressing led by Joe Foster; the structure for the Nose Section was started, under the leadership of Bruno Quattrin; the Outer Wings, having undergone some redesign, were underway, led by Mike Dias - things were looking good. An estimated completion date of late 1999 was possible - but not probable. Many revisions to the schedule would occur.

Time devoted to the project by the volunteers was increasing, with the many components underway and some volunteers coming in daily. As word spread about the Replica, folks from various locations in Canada made inquiries on how they might help. Hence, it was that components and parts commenced to be fabricated in home workshops in Charlottetown P.E.I., Halifax, Nova Scotia, Burlington and Wallaceburg, Ontario.

In late 1999, Ken Laver, President of Messier-Dowty of Canada, visited the project, and being impressed that things were happening with the project, offered to undertake the fabrication of the simulated Landing Gear - both Nose and Mains. This was a significant corporate contribution, from the company which designed and constructed the original Arrow Main Landing Gears.

It was in early 2000, when the **Nose Section** [Sta 292.0 fwd.] was coming together as the first major component for the Replica. This structure, the most contoured part of the Arrow, was nearing completion, including the Electronics Bay by Mike Holland and Radome led by Peck Duff. The structure was moved from its assembly jig onto a mobile support frame and the cockpit "tub", with its completed canopies and windshield, was inserted in place. Skinning operations were in 'full swing', under the leadership of Peter Allnutt, and more volunteers were happily working to get this section ready for the CNE 2000. On August 17,2000 the Nose Section took its first "flight" outside the TAM - being transported by a donated low bed tractor-trailer to the CNE. This public display of the Arrow replica was very well received both by the press and the people. It showed itself very well as a work-in-progress, with clecos holding some skins temporarily in place and some skins missing.

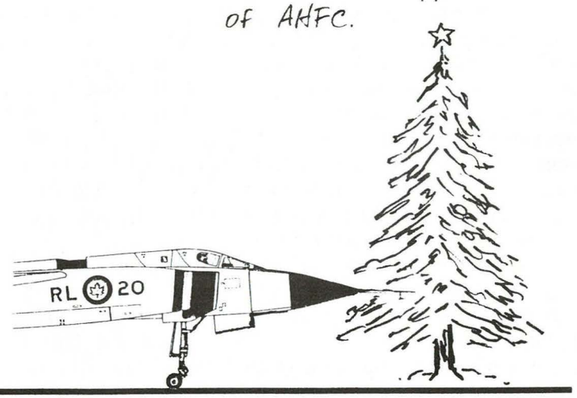
By September 7th, the Nose Section was back in its "nest" ready to be worked on towards its completion. The missing skins were prepared and assembled; the detailing within the cockpits continued; fine finishing of the radome and the pitot tube were all getting attention. New volunteers, from the CNE exposure, were quickly deloyed in new teams to start the design-ready Fuselage Sections. Even with the increased work effort the schedule was slipping. A **target** for the fall of 2001 was now quite possible, with continuous volunteer labour and increasing space for the fabrication and assembly of the project.

And the story continues . . .

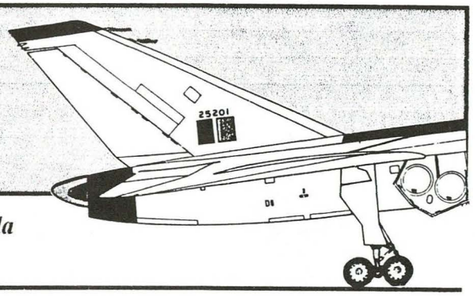
Postscript:

I worked as a draftsman on the Arrow, drawing electrical circuits, panel and wiring installations. One memorable assignment, for a colleague and myself, was to measure all the wires and record them by their size. We did this work on the wooden mockup and the actual length of wire in the Arrow was over 12 miles. On Black Friday in 1959, AVRO and Canada gave me my most memorable birthday present: no job. This event changed my life, as it did many others, in that I got connected with the TTC Design Office and the development of the Bloor-Danforth and University Subways. Transportation planning became a major interest, so I undertook Civil Engineering at the UniversityWaterloo, graduating in 1966. A stint with a planning consultant followed, then various positions at the Department of Highways (now Ministry of Transportation). After 25 years at the MTO Office, I retired.

And on the occasion
of the holiday season -
a Merry Christmas et Joyeux Noel
from the Board of Directors,
to
members, friends and supporters
of AHFC.



Pre-Flight



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TORONTO AEROSPACE MUSEUM

Claude Sherwood, P.Eng.

Building the ARROW Replica

Located on the former CFB Downsview property in one of the many buildings is "the new kid on the block" of museums, the Toronto Aerospace Museum (TAM). Nearby are aircraft companies (Bombardier et al.), business, government, and industries of various sizes and sorts - and also our Foundation (AHFC). TAM is dedicated to displaying all historic aviation and space activities within the Greater Toronto Area (GTA). TAM is an authorized Category "B" Museum in Canada, located in the historic building where the De Havilland Mosquito was built. Its formation, development and operations are fully supported by volunteers. A few years ago, TAM decided that it was time to display Canada's most significant aviation achievement, the AVRO Arrow, to be seen in its full-size magnificence. This is now a major project and it has brought together former AVRO and Orenda workers and Arrow enthusiasts to complete this replica. It has brought together business, industries and corporations. When the project is completed, the public will see and learn and wonder at the Arrow and be proud of the rich aviation and space heritage of the GTA and Canada.

pf

In the beginning (June 1997), the Toronto Aerospace planned to have as its central attraction a full size replica of the Avro Arrow 25203.

This objective has been pursued since its establishment at the former CFB Downsview. In February 1998, after getting a TAM brochure at the Aviation World bookstore, an e-mail reply from the CEO, Robin Murray, invited me to come to the TAM and discuss how I might help. From the brochure, I knew of the planned replica Arrow project. Thinking it might be of interest, I took with me a 1/10 scale drawing I had of the general layout of the Mark I Arrow. These original prints of the Arrow elated Robin, who had been searching for such details. His immediate desire was to reproduce them, without damaging the originals. This proved fruitless, as the forty-year-old prints were faded and delicate. After our first meeting, I realized that little had been done to actually plan for the construciton of the replica. So I sat down and drafted a report on my thoughts on how this major project could be accomplished. This initial concept report was given to Robin a few days later and was well received. Robin, having had ambitious suggestions from engineers in the past, sought out an evaluation of the approach from Bombardier structural engineers. They concurred with the conceptual fabrication methods and cautioned that there were specific points of high stress that required careful attention. Later, in February, I met Robin again and we discussed starting the project. He would undertake the project directorship and I would be chief engineer. So the TAM Replica Arrow Project was born.

(cont'd on p. 2)

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FROM THE PRESIDENT

October was a busy month for AHFC. At the monthly meeting of Directors, Olanda Hastings from the TAM Board visited to express its appreciation of the support TAM was receiving from AHFC and to resolve some of the problems that had arisen.

On October 20 - 23, Vice-President Frank Harvey and I attended the Canadian Aeronautical Preservation (CAPA) Association Conference in Winnipeg. This organization is the umbrella for Canadian aerospace museums and groups such as AHFC, a total of 33 members. Highlights of the conference included:

- An agreement to create a Memorundum of Co-operation and Understanding to be signed by all CAPA members. This will create a national program for conservation, programing, artifact loans, etc.
- The Department of Defense (DND) briefed members on new rules for disposal of surplus aircraft, following some underhanded practices by a person who, it turns out, was not a recognized museum.
- Members agreed to put the CAPA logo on their web sites and letterheads.
- Significant interest was shown in our Arrow Model Recovery Project (AMRP) and the technical difficulties we have encountered.

The Big News is that attendance at this conference would not have been possible except for a generous donation from *WestJet* Airlines, which provided two free airline tickets for each CAPA member group. AHFC members should take a good look at *WestJet* for in-country travel plans, both east and west.

On October 25 - 26, Al Sablatnig and I travelled to Ottawa for discussions with the Canada Aviation Museum (CAM) and the Canadian Conservation Institute (CCI) on the Arrow Model Recovery Project (AMRP) and conservation, preservation plus good museum practice. Much practical support was provided by both agencies.

Our hats off to Mr. Chris Terry, Director-General of the Canada Aviation Museum, for facilitating this important meeting. Our sincere thanks to his staff and those from CCI who gave us the benefit of their experience.

Arrow replica *cont'd.*

The **original design** criteria used in my approach was quite simple and achievable. The Arrow replica was to be a full scale, non-flying, accurate replication of the Arrow 25203 with no active systems. It was to have the structure segmented for ease of fabrication and tear-down, if that was ever necessary. The outside shape and details were to be replicated to museum quality, with the wheel wells and cockpit areas fully detailed for visual accuracy. The replica's materials were to be squared steel tubing for the basic structure, with aluminum sheet as skins and some fibreglass components where necessary. As this replica was to be a static display model, limited loading conditions were to be considered.

(cont'd on p. 3)

Arrow replica, cont'd from p. 2

As time passed, numerous additonal design criteria were applied. Many thought the control surfaces should be functional for realism, so a compromise was to make the control surfaces as separate components which were to be frozen to structure, but could, if desired later, be freed and modified for operation. As well, it was desired that the replica Arrow should have some form of self-contained power that would allow it to taxi at a slow speed. This would make the roll-out ceremony more dramatic. With this criteria, it was also necessary to have directional and braking controls. This desired internal system was explored and design details developed by Bill Tee, a former AVRO and de Havilland technician. Later still, it was felt that it would enhance the static display if some dynamic features could be included while the replica was in TAM. Hence, details were developed to have a simulated Sparrow missile deployed from the weapons pack, with access doors and missile positioning arms activated by electrical actuators controlled from a floor console. In similar fashion, the speed brake panels were fabricated to be activated.

To become a reality, much had to be organized for this major project. Not only were drawings required, volunteer workers, corporate sponsors and some funding, were all necessary for success. Engineering details for the replica fabrication were started both at home and in a second floor "Arrow Headquarters" at TAM. In May 1998, an initial general meeting was held for all who were interested in this project. About 40 enthusiasts attended and many were anxious to get started. As a result, a number of component leaders were identified and a volunteer pool was started. Many contacts were made by Robin to solicit corporate help for the project and a substantial number responded with materials and services gratis. A listing of these corporations are displayed in TAM to give these generous corporations some credit. Funding was also pursued on many fronts. Small sums were donated by individuals and corporations and government support programs were asked for financial help.

Materials were essential to construct the Replica Arrow. The original concept for the TAM Arrow structure was to use 1" squared steel tube with an aluminum skin. But that was changed by generosity. Out of a presentation on the project to the Toronto Model Engineers Assoc. came the offer of stainless steel tubing from Associated Tube Industries, of Markham. They manufacture such tubing and had some surplus which, in March 1998, 7000' of 1"x0.6" tube and 3000' of 1"x 0.25" tube were delivered. Later in August 1999, another substantial donation was received. Alcan Aluminium of Canada shipped 250 sheets of 0.040" aluminum - enough for all of the Replica's skin .

Equipment for project progress was still limited within the TAM. Additional TIG welding equipment was required and Associated Tube Industries gave us one of their standby Hobart TIG units. Later on, Lincoln Electric of Canada, in Leaside, made a long term "demo" loan of one of its TIG units. Fortunately, we had two experienced volunteer welders to commence the actual assembly of the first major structural component - the Nose Section.

Claude Sherwood and the Arrow replica.

Progress was steadily being made on the Replica from August 1998, as the Cockpit "tub" was underway. This simulated cockpit sub-assembly would be later inserted into the structure of the Nose Section. Joe Foster, a practicing Dentist and pilot, provide the leadership in the fabrication of the "tub" - which included the full outfitting of the pilot's and navigator's areas, the clam-shell canopies and windshield.

In early 1999, the organization of the project changed somewhat. Robin Murray left the project for other pursuits, and since the Replica Arrow was so important to the TAM and the volunteers, I undertook the responsibilities of the Project Director. At about the same time, a retired ex-AVRO engineer, Stan Porter, joined the Engineering "team" with talents and experience in structural and general aircraft design. Later on, an active volunteer, Paul Cabot became the Project Production Manager, to marshal the volunteer forces into teams, support and encourage progress on the many component assemblies.

Funding for the project was sparse until mid-1999. In April 1999, an agreement was signed with the Millennium Bureau of Canada that they would provide a grant to fund a portion of the Replica Arrow Project under their Canadian Millennium Partnership Program. This grant of $35000. was a welcome contribution from the Federal Government. These funds would allow the purchase of incidental materials and equipment/tools required for project progress, rather than having to wait for some benevolent

(cont'd on p. 4)

AIR FORCE

LGen Lloyd Campbell Appointed CAS

by Kristina Davis
photos by MCpl Rob Kazakoff

Pilot retention and new equipment top the list of challenges facing the Air Force, says Lieutenant General Lloyd Campbell, CMM, CD, Canada's new chief of the air staff (CAS).

LGen Campbell succeeded LGen David Kinsman, CMM, CD, as CAS and commander of Air Command at a ceremony July 21st 2000 at the Canada Aviation Museum in Ottawa. Held among the historical aircraft on display, the succession was marked by the passing of the Air Command flag and a signing of scrolls to formally effect the change of command between these general officers.

LGen Lloyd C. Campbell, CMM, CD

LGen Campbell began his career as a navigator before his selection for pilot training in 1969. In July 1971 he was posted to Baden-Soellingen, where he flew CF-104 Starfighters for three years. In 1992 he returned to Europe to assume command of 4 Wing and CFB Baden-Soellingen. He was the last officer to command these two units before their disbandment in July 1993.

Standing in front of a Starfighter on display at the museum, LGen Campbell said pilot retention was a priority. "It's not a problem of attracting people in the first place, it's being able to retain them in the long term," he said.

As pilots retire from Air Canada and elsewhere, he sees a large demand for Air Force pilots and other specialists in the private sector. New equipment, including maritime helicopters to replace the Sea King, also tops his list of priorities.

Defence Minister Art Eggleton paid tribute not only to the outgoing CAS, but also to all air force men and women for their outstanding contribution to Canada and the world during a time of increased workloads and reorganization. He attributed much of their success to outstanding leadership. "LGen Kinsman not only met, but surpassed, the challenge of leadership," he said.

Le lgén Lloyd Campbell est nommé CEMFA

par Kristina Davis
photos par cplc Rob Kazakoff

Le nouveau Chef d'état-major de la Force aérienne (CEMFA), le lgén Lloyd Campbell, explique que parmi les défis qu'il doit relever, les priorités consistent à retenir les pilotes et à obtenir du nouveau matériel.

Le 21 juillet, le lgén Campbell a remplacé le lgén David Kinsman à titre de CEMFA et commandant du Commandement aérien lors d'une cérémonie au Musée national de l'Aviation à Ottawa.

La cérémonie de relève tenue au milieu d'aéronefs historiques expo-sés, et ponctuée de la remise du drapeau du Commandement aérien et la signature de parchemins, a entériné formellement la passation de commandement entre ces officiers généraux.

le lgén Lloyd Campbell, CMM, CD

Le lgén Campbell a commencé sa carrière comme navigateur avant d'être sélectionné pour la formation de pilotage en 1969. En juillet 1971, il a été affecté à Baden-Soellingen, où il a piloté des CF-104 Starfighter pendant trois ans. En 1992, il est retourné en Europe en vue d'assumer le commandement de la 4e Escadre et de la BFC Baden-Soellingen. Il a été le dernier officier à commander ces deux unités avant leur dissolution en juillet 1993.

Debout devant un Starfighter exposé au musée, le lgén Campbell a indiqué que le maintien de l'effectif des pilotes constituait une priorité. « Ce n'est pas difficile d'attirer les gens au départ, mais il faut les garder à long terme », a-t-il remarqué.

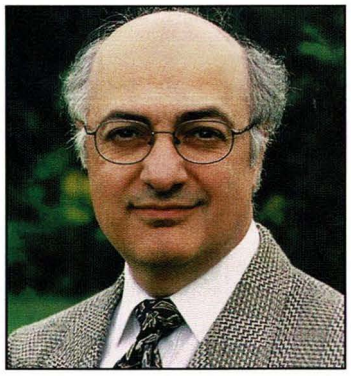
À mesure que les pilotes prennent leur retraite d'Air Canada et ailleurs, il prévoit une forte demande dans le secteur privé pour les pilotes et autres spécialistes de la Force aérienne. Une autre priorité consiste à obtenir du nouveau matériel, y compris des hélicoptères maritimes en remplacement des Sea King.

Le ministre de la Défense nationale, M. Art Eggleton, a rendu hommage non seulement au chef sortant, mais aussi à tous les hommes et à toutes les femmes de la Force aérienne pour leur contribution extraordinaire au Canada et au monde entier durant une période de réorganisation et de travail accru. Il a

guest editorial

Rebuilding the Arrow?

by Palmiro Campagna, P.Eng



March 25th 2000 marked 42 years since the date of the first flight of the Avro Arrow. The debate on whether the decision to cancel the project was valid or not still rages. Lately though, in addition to the building of a static display for museum purposes, there has been a separate move afoot to rebuild and actually fly an Arrow replica. Funding for this venture is now being sought from "Arrowheads" or Arrow enthusiasts and support groups across Canada as noted in Canadian Newspapers.

Many will say that rebuilding the Arrow to fly should be possible, not realizing the technical complexities involved. The question is whether it is indeed feasible. From an emotional perspective, rebuilding a flying replica of Canada's pride of the aviation industry makes compelling news. Newspapers and magazines across the country have carried the story. Emotion aside though, issues must be addressed by anyone considering supporting such an endeavour.

Over the years, a number of components of the original Arrow prototypes have been unearthed. One plan was to use these to reconstruct the entire aircraft for flight. This idea was abandoned for good reason, mainly that not all the necessary parts are available. Additionally, refurbishing 41-year-old components, many of which were uniquely designed, would prove an impossible challenge without the necessary tools and dies, all of which were destroyed when the project was cancelled. Even if a warehouse full of brand new parts were to be discovered, each would need to be inspected to the original drawings and most would require testing to ensure integrity. Aircraft components have a definite shelf-life which cannot be altered.

The latest concept is to rebuild the Arrow using modern materials and the latest in computer design techniques. The contention is that a number of the original drawings exist. But it would not matter if all the blueprints existed as those drawings were developed based on engineering calculations and computations and thousands of hours of testing, for the characteristics of the existing materials of the day. Replacing those original materials with modern ones would obviate all those original drawings. Everything would have to be re-calculated and re-tested from scratch. Centres of gravity, weight, drag and thermal coefficients and load and stress factors would all change – to name just a few. It took over a thousand of the world's top engineers, technicians and technologists to design and prepare the original parts and drawings. If it were such a simple task using today's computing power, the major aircraft builders would not be spending hundreds of millions of dollars in aircraft development.

Engines represent the next dilemma. It has been suggested that modern engines would be used. One has only to recall the original Arrow to understand the cost and engineering impact on design with respect to altering the engine types from the originals. With different engines and new materials, the result could be made to look like an Arrow but it would not be an Arrow.

What would it cost to build a supersonic aircraft from scratch for a one-off prototype? The word "astronomical" springs to mind. According to audit records from 1959, the original research and development on just the airframe and engines was over $200 million. One can only imagine what would be required today.

Assuming the money was available, who would redo the design and testing? Volunteers? How many specialists would it take? How many hours would be required? Who are the skilled artisans that would actually do the work of manufacture and assembly? There has been mention that engineering students would be allowed to donate their time and talent for the cause. Who would supervise them? What safety measures would have to be put into effect? If building a supersonic fighter was a simple task that one could complete with volunteer assistance, why has Canada not begun rebuilding modern fighters for the world?

Rebuilding a flyable 77-foot-long supersonic aircraft requires a great deal of specialized tooling for final and sub-assembly, not to mention a great deal of floor space. Who would provide this workplace? The original Arrow required specialized wind tunnel testing. Where would this be done? What about the design, installation and testing of power, flight control, avionics and electro-hydraulic systems, to name just a few? Answers to these questions are crucial in seriously considering such a rebuild.

In such a scheme, funding is obviously an issue. There would no doubt come a time when the decision would need to be made to cut losses and not proceed. Has such a time been stipulated? What would happen to any accumulated funding to that point? Is there a back-up plan?

Finally, the aircraft would require flight certification. Proof would be needed that the aircraft was built to all pertinent Transport Canada requirements. Configuration control of the thousands of drawings needed to recreate the design would be required. In the end, the aircraft would not be the Arrow and what would be the consequence if it crashed on initial flight? Who would shoulder the responsibility?

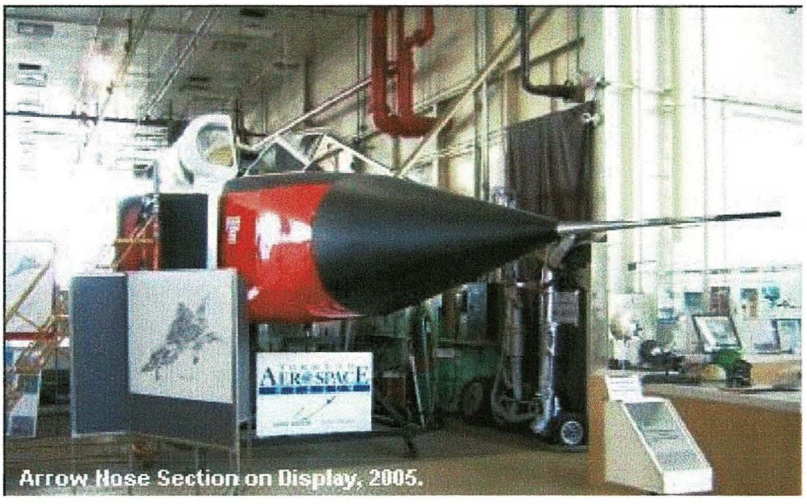
Rebuilding a supersonic aircraft that looks like the Arrow is definitely possible, but anyone who might consider supporting such a venture should consider the points raised here as a minimum. And the doubts raised here should be resolved even before addressing the question of who would fly the aircraft.

(Ed note: Palmiro Campagna of Ottawa is a federal civil servant and is the author of "Storms of Controversy: The Secret Avro Arrow Files Revealed.")

RL. 867-2005

The TAM Replica Arrow Project

Specifications | Engineering | Production | Progress Photos | Avro Arrow Story



Arrow Nose Section on Display, 2005.

The following account is based on detailed information kindly provided by J. C. Sherwood. P. Eng. (Ret.). Claude is a past Chairman of TAM, and also the Chief Engineer of the TAM Replica Arrow Project.

Introduction

In February 1998, Claude Sherwood was invited - by Robin Murray, then CEO of the Museum - to come to the TAM to discuss how he might help with the planned project to build a full-size Replica of the Avro CF105 Arrow. After their first meeting, Claude outlined on paper his thoughts on how this major project could be accomplished. This initial concept report was well received, and subsequently evaluated by Bombardier structural engineers, who concurred with the conceptual fabrication methods. Later that month, they discussed starting the project, which Robin would undertake to direct while Claude would be the Chief Engineer. And so the TAM Replica Arrow Project was born.

Replica Specifications

The Arrow Replica was to be a full scale, non-flying, accurate replication of Arrow #25203, with no active systems, and the structure segmented for ease of fabrication. The outside shape and details were to be replicated to museum quality, with wheel wells and cockpit areas fully detailed for visual accuracy. The Replica was to be made from squared steel tubing for the basic structure, with aluminum sheet as skins and some fibreglass components, as required.

Over time, additional design criteria were added. For example, some thought the control surfaces should be functional for realism, so, as a compromise, the control surfaces were made as separate components, but frozen to the structure, which could later be freed and modified for operation, if desired. Later still, it was felt that it would enhance the static display if some dynamic features could be included. Hence it was decided to have a simulated Sparrow II Missile deployed from the Weapons Pack, with the access doors and missile positioning arms activated by electrical actuators controlled from a floor console.

The finish for the Replica was to include the overall gloss white colour, with the various areas in day-glo and flat black paint [see image below]. The many markings, symbols and signs were to be created and applied.


The Arrow Replica's Nose Section, freshly painted, in 2003.

Engineering Features

Owing to the unfortunate lack of the original Arrow drawings, many small scale reference drawings, published and unpublished (i.e. donated) were used to derive the shapes and details to accurately replicate the Arrow. Some of these drawings provided different dimensions for similar details and this gave rise to 'judgement calls' on which to use. Photographs were also invaluable in providing proportions and minute details for the accuracy we were seeking.

The structure was originally intended to make use of squared mild steel tubing, to be cut, shaped and welded. However, **Associated Tube Industries**, of Markham, Ontario, generously indicated they had available a quantity of 1" x 0.6" and 1" x 0.3" stainless steel tubing which we could have for the project. This donation was enormous, for it dramatically influenced design details and, most importantly, allowed work on the project structure to begin immediately.

Alcan Aluminium Limited offered us some sample sheets to determine our exact specs. for the aluminum skin materials. Further, they followed through with ALL the aluminum sheet materials needed for the Replica.

The intended fabrication technique was to use blind countersunk rivets to fix the aluminum skins directly to the shaped stainless steel structure. There were a lot of rivets needed, but, again, corporate generosity came through when **Avdel-Textron of Canada**, a prime source for aircraft fasteners, provided the project with 100,000 of the exact rivets we needed.

Additional urgently needed welding equipment was supplied by **Lincoln Electric Company of Canada Ltd.**. Other generous corporations contributed: for example, **Air Liquide Canada Ltd.**, Toronto, providing welding supplies; **Bombardier Aerospace** providing tools and equipment; **The Metal Place Inc.**, of Mississauga, providing steel plate and heavier steel tubes, and **Samuel, Son & Company**, Mississauga, providing sheet stainless steel. In all, over 30 corporations were involved in supporting our on-going efforts.

The Replica is constructed in separate sections to facilitate ease of assembly and potential disassembly. The Fuselage is made in five sections: Nose Section, Centre Section, Duct Section, Engine Section, and Tail Section. The large wing has four major components - Left & Right Inner Wings, joined at the centreline, and Left & Right Outer Wings; then the large Fin and Rudder is a separate assembly. All of these components were constructed in the 'Project Hanger' at the TAM.

Other important components include the Landing Gear, which **Messier-Dowty of Canada** kindly offered to manufacture for us. Dowty also designed and built the original Arrow Main Landing Gear.

Stress analysis was another extremely important consideration, to ensure the Replica would have a sound structure with no possibility of failure for any movement of the display. A colleague of Claude, **Stan Porter**, another retired engineer with design experience on the Arrow and other aircraft, made a multitude of calculations for the design loading conditions and the resulting structural details at all connections throughout the Replica. Most of the wing design details were established by Stan.

The internal structure was simply a space frame of tubes welded at their joints with frequent use of gussets to strengthen the joints.

The Nose Section was started first, as it was the most complex and curvaceous. Its initial sub-assembly was a separate component called the "Cockpit Tub", which would slip into the section structure before skinning. The full section structure was established as a space frame sized to take profiled aluminum forms on which the skins were applied. The Radome was fabricated in fiberglass over a shaped foam mold. **The Centre section** was designed to have the upper main structure separate from the Weapons Pack. **The Duct** and **Engine Sections** followed in sequence and the completion of the fuselage by the **Tail section** included the Stinger structure and Tailpipes.

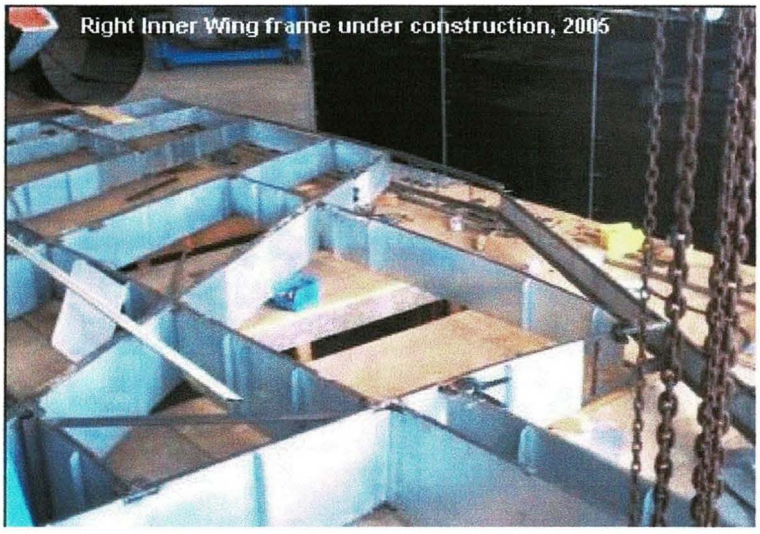
Each fuselage section was designed with a central box structure that followed its centreline with a truss configuration between frames at the break points. This approach allowed the sections to be fabricated separately and then bolted together. It also allowed stress loadings to be efficiently distributed throughout the replica.

The Outer Wing components underwent considerable design development to achieve the best method of construction as well as ensuring required joint strength in such a thin structure, it being very important that these cantilevered wings not droop, even under a heavy load. The resulting design utilized stainless tubes as load-bearing caps and stainless sheet shear-web for the spars and ribs. Gussets and welded joints completed the connections to make a very strong structure. The leading edges were made with aluminum forms to maintain their correct airfoil shape. Skinning of the wing surfaces involved, initially, smoothing the shape of the spars and ribs with auto body filler, then fitting and riveting the large aluminum panels. The skinning of the leading edge was more complicated since the nose radius of the skin had to be pre-bent to ensure the correct contours. Aileron panels were built as separate units, attached with a large piano hinge and heavy steel arms fixed to the structure, thereby ensuring they are 'frozen' controls. In future, should control movement be desired, these steel arms can be removed and an actuator installed. Fiberglass blister forms were replicated to cover these external 'actuator' parts.

The Inner Wing panels are the 'backbone' of the Arrow structure, since they sustain all flight and standing loads. As a result, more robust steel was used for these components. Standard square steel tube 1"x1" with a 0.10" wall thickness was used for the primary spars and ribs. Secondary structural

members were made with smaller stainless tube. Joints were also more robust in design using 0.25" steel plates inserted into milled slots on the adjacent heavy steel tubes, fillet welded for strength. Skinning was somewhat easier since these wing areas were quite flat, allowing larger panels to be used. Handling these rather heavy panels presented a challenge, but volunteer ingenuity prevailed.

The Fin, to which the large rudder panel is attached, is a structure of similar size and design to an Outer Wing panel. It too is a very thin cantilevered structure, and was designed to withstand 20 mph wind loadings if necessary. The stainless steel tubes again were used as caps and 0.02 stainless sheet formed the shear webs to give it strength and integrity. As with the ailerons, the rudder is attached with 1" piano hinge sections and held 'frozen' by rods and pins.


Right Inner Wing frame under construction, 2005

Production Features

From the Toronto Aerospace Museum's beginning, a Replica Arrow was desired as a central display of this great Canadian technological achievement. To accomplish this a full-sized Replica Arrow had to be produced. Many individuals and organizations had talked about doing exactly this - but little or no actual work had been started. So it was, that in February '98, a decision was made to move on with a concept of an 'all-volunteer' production, rather than wait for a windfall of money to manufacture an Arrow.

Production of the Replica Arrow started in August 1998, with a team moving quickly to fabricate the "Cockpit Tub". Under the leadership of **Joe Foster**, a local practicing dentist and aircraft enthusiast / builder, the first team of volunteers got to work. This component needed a stable wooden assembly frame, on which the metal formers and sides, making up the shape of the "tub", were fastened together with rivets. This sub-assembly of the Replica Arrow progressed nicely over time and was a featured display in the TAM Booth, at the 1999 CNE.

The next major component to get started was the Nose Section structure, including the radome, pitot tube, electronics bay, cockpit and intake structures. In November 1999, **Bruno Quattrin**, a retired electrical contractor, and his colleague **Issidora Spinato**, a retired machinist, became dedicated volunteers whose efforts, averaging three days each week, fabricated the Nose Section with all of its

curves and complexities. The "Cockpit Tub" was installed and the entire Nose Section was placed on a mobile transporter, to allow for convenient movement. This first collective assembly gave a big push to morale and our progress. With the expert help of **Peter Allnut**, a retired Air Canada staffer, and a dedicated crew of volunteers, the skinning operation on this section gave life to the 'bones' of the Replica. Finishing touches, which are always fussy details, were completed by **Ted McLelland**, a TTC bus driver, and **John Trollup**, a retired craftsman. Also during this period, the Intake entry shapes were developed , by **Bernard Dodd**, a retired aircraft worker; the Radome was fabricated, by **Peck Duff**, a retired mechanical engineer. Careful surface finishing and painting of these fiberglass components was ably done by **Michael Lord**, an auto repairer and detailer. Cockpit canopies, shaped in fibreglass on foam, were completed and installed by **Joe Foster**. So impressive was this section that it was taken by transport [free] to be displayed at the 2000 CNE. [The first "flight" of the Replica]

On the return of the Nose Section, the detailing of the cockpit areas was started. **Peter Us** and **Ben Mucke** performed their 'magic' and produced a simulated pilot's cockpit outfitted with a realistic instrument panel, side panels for switches, fuses, radios and controls. Similarly, they outfitted the navigator's cockpit with its realistic installations. As the cockpits are intended for public viewing, their extraordinary volunteer effort will be enjoyed by all Museum visitors.

In late 2000, work started on the remaining Fuselage sections and again Bruno and Issy were the prime movers on the Duct and Engine sections structures. The Centre Section framing and assembly, which included the separate Weapons Pack, was led by **Carlo Bonfiglio** and **Neil Dellanderea**. For each of these fuselage sections a new skinning crew of **Bob Jones** and **Elvis Bidinot** started. They established an efficient process of shared talents to ensure skinning operations kept pace with the structural assembly.

The Weapons Pack was built with stainless tubing welded into frames and beams that were later assembled for final welding operations. Since the Replica was to have a dynamic display of a Sparrow II missile being deployed, doors were needed and a full-scale missile constructed. The fabrication of the missile doors was undertaken by **John Trollup** and **Ted McLelland**, who produced finely finished moveable doors. The hardware to allow the model Sparrow missile to be deployed was built by **Wilson Baker**, of Sackville N.S.. These many parts were mounted and electro-mechanical actuators, to lower and retract the doors and missile, was skillfully installed by **Bruno Quattrin**.

The Outer Wing panels spars and ribs were fabricated, initially under the leadership of **Mike Dias**, and later of **Alan Stummer**. These items were assembled on a number of specially leveled wooden tables, providing a stable surface to hold the components in place for welding and subsequent skinning operations.

The Tail Section, which included the Tail Pipes and the 'stinger', the structure between the Tail Pipes, were built by a number of eager volunteers. Initially, a team of Bombardier engineer trainees worked on the curvaceous 'stinger' part. Later on, other volunteers continued the work and then carried on with the completion of the Tail Pipes by **Peck Duff**. These components were fabricated with aluminum skins, but were treated by **Michael Lord** with a paint composition to give them the blackened appearance of the real parts.

The Inner Wings were constructed from robust 1" square steel tubes. Special milling operations were required for the many 1/4" steel joining plates used for the Inner Wing panels and also joining them to each Outer Wing. Since these wing panels were the 'backbone' of the Replica, serious stress analysis

was undertaken by **Stan Porter**. The resulting calculations allowed Stan to design joint connections to sustain the highest loads estimated for the Replica.

A number of smaller parts were also undertaken by interested 'out-of-town' volunteers, who represent the best of volunteering, since they worked generally alone with very sketchy drawings and yet willingly produced parts that were necessary for the completion of the Replica.

These volunteers included **George Brittain**, in Wallaceburg, Ontario, **Metalcraft Spinning & Stamping Ltd.**, of Brampton, **Sheldon Richie,** in Wallaceburg, Ontario, **Joe Foster**, **Ivan Franchi**, of Burlington, Ontario, and **John Mahler**.

Other small parts, such as simulated hydraulic actuators, control valves and brackets were produced by **Jim Michin** and **Alan Green**, both retired machinists in areas around Toronto.

Painting of the finished sections of the Replica was provided by workers at **Bombardier Aerospace** within the Bombardier paint shops, as another volunteer effort. These operations were co-ordinated through **Dave Pollock**, the manager of Bombardier's paint shops. All of the paint to be used on the Replica was donated by **SICO Inc. [Paint Division]**, through their representative **Jeff Snyder.** We are truly indebted to ALL these people for their expertise and dedication on this project.

Funding for any such undertaking is essential to purchase various supplies when they are needed and not have to wait for another benevolent donor. Some donations were gathered in "boxes" at the Museum from those who were visiting and had some spare coins. Still other donations came through the mail from folks who lived far away and just wanted to help. Our biggest cash donation came as a grant from the **Federal Government's Canadian Millennium Partnership Program**. A grant of $35,000 was made available to the Replica project based on the fact that it was a significant project to celebrate Canadian technical achievements in the last millennium and that other donor partners would be found to support this project.

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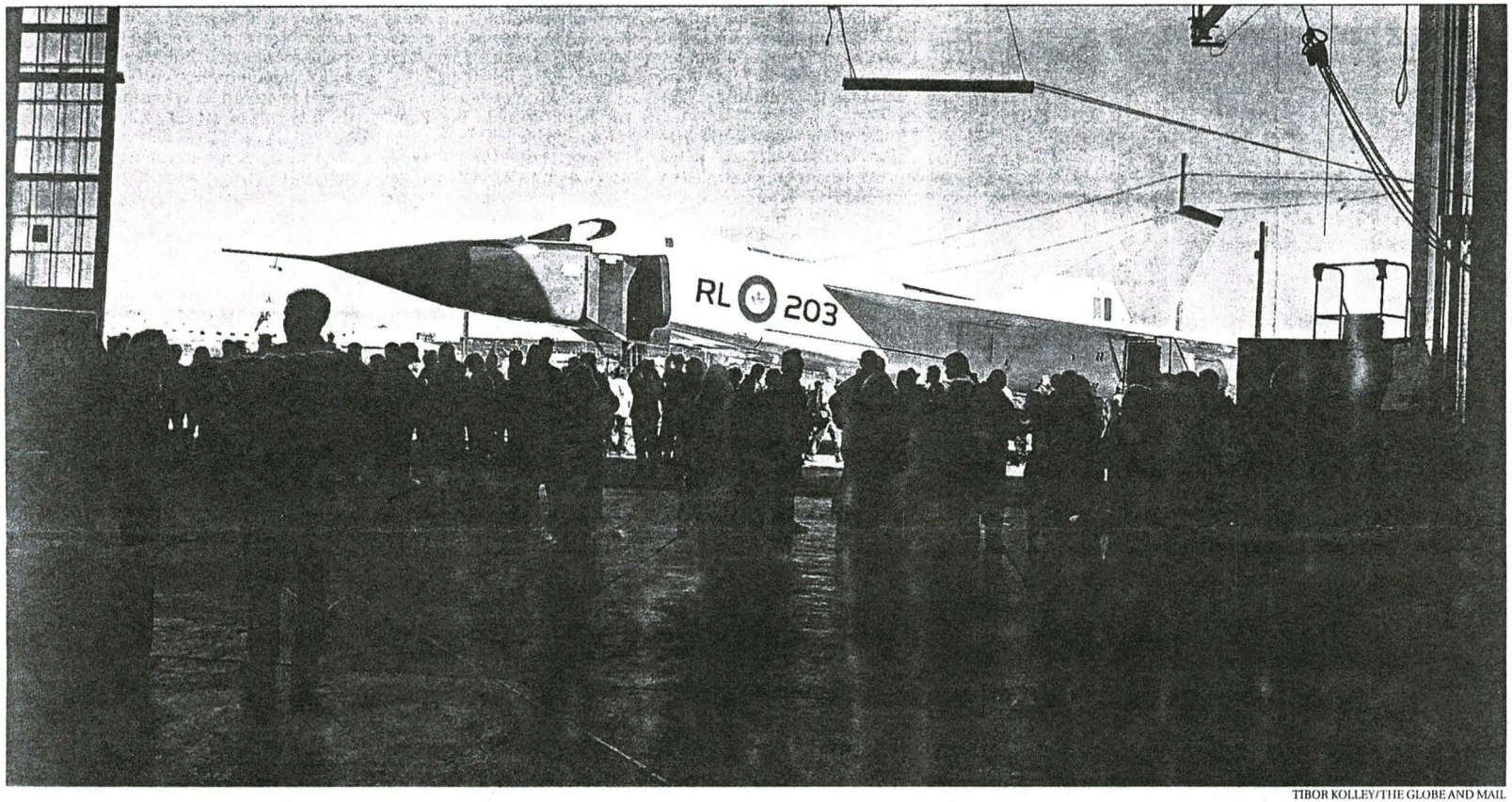
HE GLOBE AND MAIL

NAL NEWSPAPER ■ FOUNDED 1844 ■ GLOBEANDMAIL.COM ■ MONDAY, OCTOBER 9, 2006

Replica of legendary fighter jet draws a crowd



TIBOR KOLLEY/THE GLOBE AND MAIL

People crowd around during yesterday's official unveiling of the Avro Arrow replica at the Toronto Aerospace Museum in Downsview Park. The full-scale model took eight years to complete.

47 years later, it's still Arrow dynamic

BY JEFF GRAY, TORONTO

The Avro Arrow, the made-in-Canada supersonic jet fighter controversially grounded by prime minister John Diefenbaker in 1959, has lived on as a national myth of greatness lost.

But yesterday, the myth came to life for more than 2,000 people who flocked to see the Arrow — actually a 24-metre, full-size replica of it — unveiled to gleam in the summer-like sunlight outside the Toronto Aerospace Museum.

Located in an old airplane factory at Downsview Park in the city's northwest , the little-known museum's exacting replica of the legendary plane took 140 volunteers eight years to make by hand, with the help of corporate sponsors and donations. It had to be reconstructed using mostly second-hand documents, as most of the original designs and five test models were mysteriously ordered destroyed.

Hundreds of people —many of them self-confessed "Arrowheads" or semi-obsessive fans of the doomed aircraft —crowded around the mock jet yesterday. Gawking at the aircraft, which was designed to defend the Arctic from a Soviet nuclear attack, they hoisted children into hatches from underneath, marvelled at the intricate landing gear and stroked the smooth underside of the delta wingspan.

Museum officials expect similar numbers today.

Many of the mostly male crowd who came to see the aircraft believe it was not just Mr. Diefenbaker who killed the project for its cost, which was in the hundreds of millions of dollars. They see the behind-the-scenes work of the Americans, who, the story goes, could not stand competition from a superior jet in the hands of even a close Cold War ally.

"I have seen it, as a small boy, fly over my house," remembered 62-year-old Alex Chasczewski of Oshawa, who was 12 when the Arrow was flight tested near Toronto. "... When you hear engines like that, it sure gets your attention."

Asked why he thought the government killed the plane, believed to be the fastest on Earth at the time, he replied: "The big boys put pressure on Ottawa."

See ARROW on page A7

2006-867-121

'Arrowheads' point to U.S. to explain fighter jet's sudden death

ARROW *from page A1*

He said his computer's screensaver for the past 15 years has been a picture of the Arrow landing at Canadian Forces Base Trenton. "It was beautiful. They had ladders against it and the fuel lines hooked up to it, and the snowbank behind it."

Standing back from the crowd was Dean Halaj, 31, dressed in a khaki flight suit, with a *Top Gun* pin on his lapel and a patch commemorating the birth and death dates of the Avro Arrow on his chest. Taking in the model plane through his aviator shades, he said he grew up in Malton, near what is now Pearson International Airport, where the Arrow was tested.

He, too, blames the United States and remarked that many who worked for the manufacturer, A. V. Roe, later went on to work at the U.S. National Aeronautics and Space Administration.

"If history was a little different . . . we could have had our own space centre here," said Mr. Halaj, who is studying to be a police officer.

Ted Hodges, 53, came from Belleville, about two hours east of Toronto, just to see the unveiling. "I'm a fanatic," he said, reminiscing about hearing sonic booms overhead as a boy, something he realized years later had been made by the Arrow.

As his daughter Michelle, 20, who has a model Arrow in her room, snapped pictures, he blamed the airplane's demise on partisan bickering. "It's politics. It was a Liberal initiative. When the Conservatives were elected with a majority government, they canned it. They destroyed everything."

TIBOR KOLLEY/THE GLOBE AND MAIL

Rick Jones and Bernie Lehman hold a radio-controlled model of the Avro Arrow at the Toronto Aerospace Museum yesterday.

A thin man with white hair and wrinkled skin interrupted. "They didn't destroy everything," he said. "I took some of the drawings home." He was Ralph Marsh, 74, a draftsman for the cockpit and the needle-like nose cone of the plane. He said he defied orders and took home copies of his plans when the project was killed in 1959.

"We were crushed," he said of the day when Mr. Diefenbaker told the Commons the project was finished. He has since donated the smuggled plans, about a dozen drawings in all, to the museum.

Mr. Marsh, like many who worked on the Arrow, left Canada. He flew in from San Jose, Calif., just to see the reborn jet. "I'm absolutely delighted with the replica," he said.

In addition to the full-size replica, museum-goers watched a two-metre-long remote control replica Avro Arrow fly overhead.

The little plane, which lets out a leaf-blower buzz instead of sonic booms, is the pride and joy of hobbyist Bernie Lehman. Its fuselage was autographed by the Arrow's chief designer, James Floyd.

Mr. Lehman, 64, who runs a trucking company, said one of his Scarborough neighbours was actually a test pilot on the Arrow project, but ended up working as a janitor after the plane was killed. He said he saw his remote-control version as a tribute to those who worked on the aircraft. "As long as my Arrow is flying, we'll keep the dream alive."

At yesterday's ceremony, local MP and Liberal Party leadership candidate Ken Dryden addressed the crowd, saying the Arrow was a symbol of Canadian achievement and a plane with a "storied history."

Monte Kwinter, the local Liberal MPP and Minister of Community Safety, alluded to the "still very murky" reasons the Diefenbaker government killed the jet, which he said was "a landmark for Canada."

The full-size replica project was spearheaded by the museum's volunteer chief executive officer, Claude Sherwood, 68, who was a draftsman for the Arrow.

Calvert hints at side deal

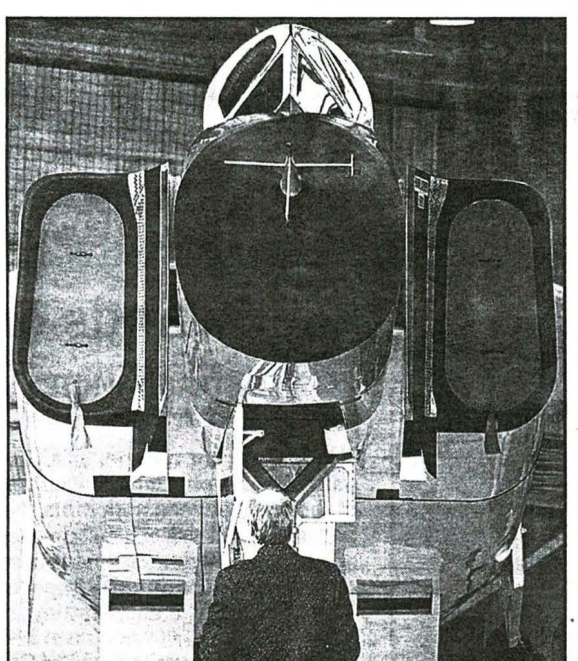
REGINA (CP) — If the Stephen Harper government backs away from its election promise to remove oil revenue from the federal equalization formula, Saskatchewan wants a deal with Ottawa outside the program, Premier Lorne Calvert said yesterday.

Calvert said he is concerned by the prime minister's suggestion this week that changes to the revenue-sharing program may not be ready in time for the next budget.

"They're building a spring budget, we've had the assurance we're going to have it in this budget, then let's have it," Calvert said.

Equalization is the federal program that calculates the fiscal capacity of each province and makes payments to the poorer jurisdictions so they can provide similar levels of public service at competitive tax rates.

Generic export of Tamiflu OK'd



— ADRIAN WYLD, CP

EXACT REPRODUCTION ... A man looks at a replica of the Avro Arrow at the Toronto Aerospace Museum yesterday. It'll be unveiled to the public Oct. 8.

Builders cherish Arrow jet replica

By IAN ROBERTSON
Sun Media

TORONTO — The crowd was smaller than it was 49 years ago — when hundreds gathered at Malton Airport to watch the Avro Arrow's debut — but for those who had helped to build the pride of Canada's sky, the glistening replica said it all.

"A lot of people didn't think Canadians would be building something like that," retired aircraft engineer Stan Porter said of what had been a state-of-the-art jet interceptor.

"Its job was shooting down Russian bombers."
– Stan Porter, retired aircraft engineer

"Its job was shooting down Russian bombers," Porter said this week as sliding doors at the Toronto Aerospace Museum rolled open to reveal a full-scale, non-flying metal look-alike.

After seven years of development at the nearby Avro Aircraft plant, the real plane was brought down by the federal government on Feb. 20, 1959.

All five models that had been flown over two years were cut up along with an almost-complete sixth Arrow and two others that were taking shape.

Museum CEO Claude Sherwood said the stand-in was built so visitors of all ages can "stand beside it and feel its majesty."

The replica was built with a $35,000 federal grant, $15,000 in donations and materials from 50 sponsors.

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Public eyes Arrow return

TORONTO (CP) — Nearly 50 years after it was first unveiled, the Avro Arrow made a long-awaited return yesterday at the Toronto Aerospace Museum.

The full-scale model of the Avro CF-105 Arrow went on display for public viewing over the Thanksgiving weekend.

About 150 volunteers spent eight years constructing the 24-metre-long replica, using photographs, scraps of blueprints, old schematics and memories.

The Canadian government commissioned the plane as a long-range fighter to protect against Soviet bombers.

On Oct. 4, 1957, the public got its first look at the aircraft and the Arrow's first test flight followed a year later.

In 1959, the program was cancelled because of rising costs.

ALEX UROSEVIC/SUN MEDIA

The official full-scale replica of the Avro Arrow was unveiled for the public yesterday at the Toronto Aerospace Museum.

Awards and Recognitions

Going back to 1996, Onley received the Clarke Institute Award 'Courage to Come Back', for dealing with polio, with its disabilities. In 1997, he was inducted into 'The Terry Fox Hall of Fame' for his ongoing contribution to advance the causes of people with disabilities. He considers these quite an honour.

In 2003, he was awarded an Honorary Doctorate of Law from Canada Christian College. In 2005, Onley was appointed Chair of the Accessibility Standards Advisory Council to the Minister of Community and Social Services. He was named by Toronto Life as one of the "Torontonians Most likely to Succeed". Its prediction was correct.

In May 2006, as Ontario's first disabled television broadcaster, he was one of the first inductees into Scarborough's 'Walk of Fame'.

A Friendly, Open Style

People have noted that Onley does not cultivate a specific style of meeting people, whether privately or professionally. As the saying goes, he is what you see. It seems to be his nature to be available, to find the time to speak to and with people, and as a result, people with him. For example, he was able to get Steve MacLean, the astronaut, to talk about Canadians walking on the moon within 15 years, for example. Onley freely speaks about the things that inspire him, that excite him, that he finds important. Furthermore, he somehow manages to find time to listen.

He still remembers a former science professor, John Colman, and the comment he wrote at the bottom of the final page of his last (A) essay: "You must always try very, very hard to put down on paper the thoughts I know you have in your head." These words have stayed with him over the years, whether a report, submission or article, and whether he has met this standard. As a father, Onley repeated this wise advice to his three sons, Jonathan, Robert and Michael. It is wisdom that has stood the test of time.

Going Down the Road: Five Years

On Wednesday, September 5, 2007, standing in front of the Speaker's chair, David Charles Onley was sworn-in as the Lieutenant-Governor of Ontario for a term of five years. Many will recall his words and his goal: opening doors for people with disabilities of all kinds. "The final steps to accessibility for an individual to achieve their potential may simply depend on another person's strong arm and an open mind. I am asking each and every one of you today to be that person." These words are significant in today's less caring society.

And Rounding Out ...

David Onley is still extremely active in his church in Pickering and community organizations: The Canadian Foundation for Physical Disabled Persons and The Muki Baum Association. Though he keeps up to date with the latest in politics, especially now that he is there in an official capacity, he is not particularly interested in actual political office. He presently has an almost full list of activities which, you can be sure, will require his full and undivided attention.

Including finally sitting aloft, upfront in a glider: holding the control solumn, searching for updrafts, helps, enjoying the silence and peace and, of course, the security of Charles Petersen in the back seat. Petersen is from Freedom's Wings Canada, which helps persons with disabilities learn to fly.

The Arrow Connection

It is with special pleasure to recall Onley making both a significant suggestion and challenge: to construct a full-scale replica of the Arrow. This was back in 1987 at the 'Avro+30 Dinner'. He knew it would take many years and many dollars to complete. Five years later, when he was the president and one of the founding members of the Aerospace Heritage Foundation of Canada, he proceeded to write an open letter to all members of the Foundation. In it, he realistically presented a difficult but attainable goal, urging all members to participate.

The full-scale replica of the Arrow can be seen at the Toronto Aerospace Museum at the former Canadian Air Force Base Downsview, Toronto. It is an amazing reproduction of an amazing aircraft, and David Onley, Ontario lieutenant-governor, saw this vision in his mind's eye back in '87.

We too extend our congratulations to David Onley, one of the founding members,, the first President of our Foundation and now the Lieutenant-Governor.

Members Matter

All 2007 and a few 2008 membership cards have been completed and sent out. You should receive them shortly. The delay? A computer glitch, what else. If any paid-up member has not received their membership card for 2007, please drop me a note and I will take care of it immediately. I will now concentrate on the gifts several members have requested for their donations. Thanks for your patience.

Nick **Nicholas Doran**, *Membership*

Pre-Flight

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Vol. 18, No. 5 **September - October 2007**

"NO GREAT CAUSE IS EVER LOST OR WON, THE BATTLE MUST ALWAYS BE RENEWED AND THE CREED MUST ALWAYS BE RE-STATED."

(Quote from the remarks by David C. Onley at the 30th Anniversary Dinner of the First Flight of the Avro Arrow)

The Honourable David C. Onley, Lieutenant-Governor of Ontario
& Mrs. Ruth Ann Onley

Founded 1989

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From the President

It is my pleasure to congratulate the Honourable Lieutenant-Governor of Ontario, David Onley. David was a founding member and first president of the Aerospace Heritage Foundation of Canada.

On the front page is David's famous challenge to all of us at the Arrow+30 Dinner. This challenge was taken up by the Toronto Aerospace Museum in building the splendid full-scale replica of RL203.

In the past months, I have made presentations to historical societies and interested groups on aircraft manufacturing and testing in Malton during the years 1938 to 1960, including the CF-105 Avro Arrow.

Frank

The Honourable David C. Onley, O. Ont. Lieutenant-Governor of Ontario

There was a collective nodding of heads in agreement, when on Tuesday, July 10, 2007 in Calgary, Prime Minister Stephen Harper announced the appointment of David C. Onley as Ontario's newest Lieutenant-Governor. "David Onley is a respected author, broadcaster and tireless champion for persons with disabilities. Through this work, he has demonstrated the qualities needed for such an important position," stated the Prime Minister. "He has loyally served the province and his country in a number of roles, and I'm confident as Lieutenant-Governor, he will continue to do so."

Onley was on his way home in the pouring rain when his cell phone rang. "I just had reached the top of the Don Valley Parkway and there was no place to pull over," he recalls. "And when the Prime Minister of your country calls, all you can try to do is stay in the same lane, avoid any fender-benders and have a meaningful conversation, which I did. Thankfully, the 'no cell phone in your car' legislation had passed yet," he said. Onley saw his posting as a distinct privilege and blessing to have been given this vote of confidence by the Prime Minister.

With this announcement, Premier Dalton McGuinty of Ontario thanked the outgoing lieutenant-governor James Bartleman and then congratulated Onley. "David Onley, through his work as a journalist and as an advocate for the disabled, has dedicated himself to helping make our province a stronger and fairer society where everyone can be at their best."

When asked how it all came to be, Onley explained. "Last summer, I was approached by (CP24 anchor) Ann Rohmer, our colleague, who was representing a number of people who felt that I should allow my name to stand as the next Lieutenant-Governor, I thought about it very hard. Obviously it's not something you suddenly decide to apply for one morning. Something I never, ever considered. But as Ann and other people came to me and expressed why they thought I would make a good Lieutenant-Governor, I started to think about it very seriously. Spent the whole summer thinking about it and last fall decided, okay, I would let my name stand."

Onley, *cont'd.*

His name not only stood; it stood above the rest and with the backing of some prominent friends, David Onley was chosen for the prestigious post. He joined illustrious predecessors like Hilary Weston, Henry Jackman, Lincoln Alexander. In a way, it was an inspired choice by the Prime Minister. Some may see the position as purely ceremonial, but David has an agenda he intends to pursue that's close to his heart.

He is a man with a mission as his words attest. "I really want to be the compelling and driving force to help make this province a more accessible place," he vows. "I believe there's an enormous amount of generosity and goodwill out there as aging boomers dealing with elderly parents suddenly realize if you make something accessible for someone with a disability, you made it more accessible and safer for everybody."

Onley effectively uses leg braces, special walking canes and an electric scooter to get around. As lieutenant-general, he realizes his new job will involve not only being in Toronto, but also visiting all over the province. The locations will need to be accessible; new assistance technology will facilitate the entry of buildings and include the Ontario government's twin-engine propeller aircraft. Onley entered the Legislature with dignity and greater ease. by an recently upgraded path to the side entrance.

On September 5, 2007 the official swearing-in ceremony took place, followed by the inspection of the honour guard. Television viewers were able to view the impressive pomp and ceremony in realtime detail. As to the front entrance to the legislature with its a 22 step stone staircase? For now, the south-west entrance is officially being designated the south-west accessible entrance to Queen's Park.

Children and Role Models

Onley has a special spot in his heart for children with physical and intellectual disabilities. Speaking to them at Scarborough's Variety Village, he pledged to be a role model for them and to champion the rights of disabled He stressed, "I know what is needed is somebody who can identify with many of the children right here." He added that Canada has been fortunate in the last generation to have disabled heroes such as Terry Fox and Rick Hansen to admire. As a boy, the only disabled role model he had to look up to was former U.S. President Franklin D. Roosevelt. "And he had been dead a for a long time." Onley continually set aside time over the years championing the rights of the disabled and participating in a host of charities. Because of these ongoing efforts, he was recognized by government's, including education and community organizations.

The Road from Midland

Born in Midland and growing up in Scarborough, Onley was stricken with polio at the age of three and became partially paralyzed from the neck down. After graduating from Scarborough's Heron Park and Fairmont Junior public schools and Midland Avenue Collegiate Institute, he attended University of Toronto Scarborough, where he was student council president. He graduated in 1975 with an Honours B.A. in Political Science, including a Certificate in Canadian Politics. He admits these were some of the best years of his life, when the new campus was being built, along with lasting traditions. Students were part of this. Onley states that he has wonderful memories. Then there was his interst in law, which he subsequently took at the University of Windsor; this academic interest lasted but a year.

He decided to write a novel about a topic that in the '80s was in the news almost continually, space exploration. Onley wrote 'Shuttle: A Shattering Novel of Disaster in Space.' It was published in 1982 and became a best seller. There was a practical spinoff to the research and writing he did preparing for this novel. He became a knowledgable commentator on the NASA space program at the time and so, he was a frequent guest on radio and television.

An On-Air Personality

The day Onley got his first professional job at the Toronto radio station CFRB to host a feature called a "Step Ahead" in the early 1980s, he told a colleague, "I can't believe this has happened to me." It certainly did, and he went on to become one of the first on-air personalities with a physical disability in Canada. In 1984, he was hired by Moses Znaimer, founder of Citytv because he could do the job. Disability was secondary. He joined CablePulse24 as a science and technology specialist, then becoming a CablePulse 24 live newsreader. He was anchor and host of the weekly "Home Page." and stayed with the station for 22 years.

Life as a television reporter/host may sound exciting and certainly stimulating. Onley sees it more like working in a hospital ER: routine, with burst of high demand activities from late-breaking news, good and bad. Both had to be reported informatively but respectfully, especially where families were involved. Satisfaction, comes from reporting on a newsworthy item, and if possible, with insight and information. In some important ways, his greatest satisfaction comes from being one of the first news persons in Canada with a physical disability. He feel that life is an ongoing learning experience, No time is ever wasted when learning and contributing.

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Avro Arrow to spread wings in new museum

As scrapped technological wonder hits milestone, reno at Downsview site will give replica more room

JASON MILLER
STAFF REPORTER

Newton Mills was speechless when, 50 years ago, he got the heart-wrenching news that plans to complete the world's most technologically advanced supersonic interceptor aircraft were coming to an abrupt end.

But yesterday Mills, now 86, gazed in adoration at the massive replica of the CF-105 Avro Arrow at the opening of the new Canadian Air and Space Museum — formerly the Toronto Aerospace Museum — 50 years after he worked in the pipe shop during the Arrow's production. He was joined by several other air and space enthusiasts to celebrate the museum's relaunch and the Arrow's 50th anniversary since it was grounded in 1959 by political forces.

"What a waste of ingenuity," Mills said about the decision to scrap the Arrow, which cost some 40,000 jobs and put paid to one of the most advanced planes of its era and one considered decades ahead of its time.

But now, Mills said, the museum's expansion and revitalization plans will preserve memories of the legendary aircraft so fans can relive its history in a more engaging setting.

The only full-scale Arrow replica in existence, it sits in a cluttered environment, jammed up next to parts of a soon-to-be assembled Lancaster bomber.

Housed in the former de Havilland aircraft factory at Downsview Park, the museum is home now to 12 vintage aircraft of various sizes that fight to coexist in the limited exhibition space.

Claude Sherwood, the museum's CEO and former Avro employee, said a lack of space to properly showcase exhibits is one of the museum's major drawbacks as it struggles to serve the more than the 20,000 visitors who now pass through the doors each year. He says the museum is struggling to get funding to grow, and wants to occupy a vacant building adjoining the de Havilland heritage building — if they can scrape the rent together.

"The Arrow won't be jammed into this space," he said. "It will have a space available so people can have a good viewing of it and appreciate it better.

MICHAEL STUPARYK/TORONTO STAR

Newton Mills, 86, listens to speeches yesterday at the Canadian Air and Space Museum in Downsview near a replica of the Avro Arrow, which he worked on in the 1950s. The plane's cluttered environment is about to change.

"The displays," he added, "need to be more professional, because up to now we've been working on a shoestring budget."

Lieutenant Governor David Onley said that could all change with the museum's $2 million campaign to fund the much-needed expansion.

Onley added that it's only fitting that the museum's launch tied in with the centennial national celebration of the first powered aircraft flight, by Douglas McCurdy, when he flew the Silver Dart in Baddeck, N.S., back on Feb. 23, 1909.

"The prime expansion of the museum from a Toronto focus to a national theme will also mean that both the Arrow and the ongoing Lancaster bomber refurbishment will finally have a permanent home that all Canadians can be proud of," he said.

The expansion received a thumbs up from actor and pilot Harrison Ford, who sent a congratulatory message by video. Ford is an avid pilot and owner of a de Havilland Beaver aircraft, the world's first successful short-takeoff-and-landing airplane.

Harrison Ford video

To view Harrison Ford's video, go to thestar.com/gta

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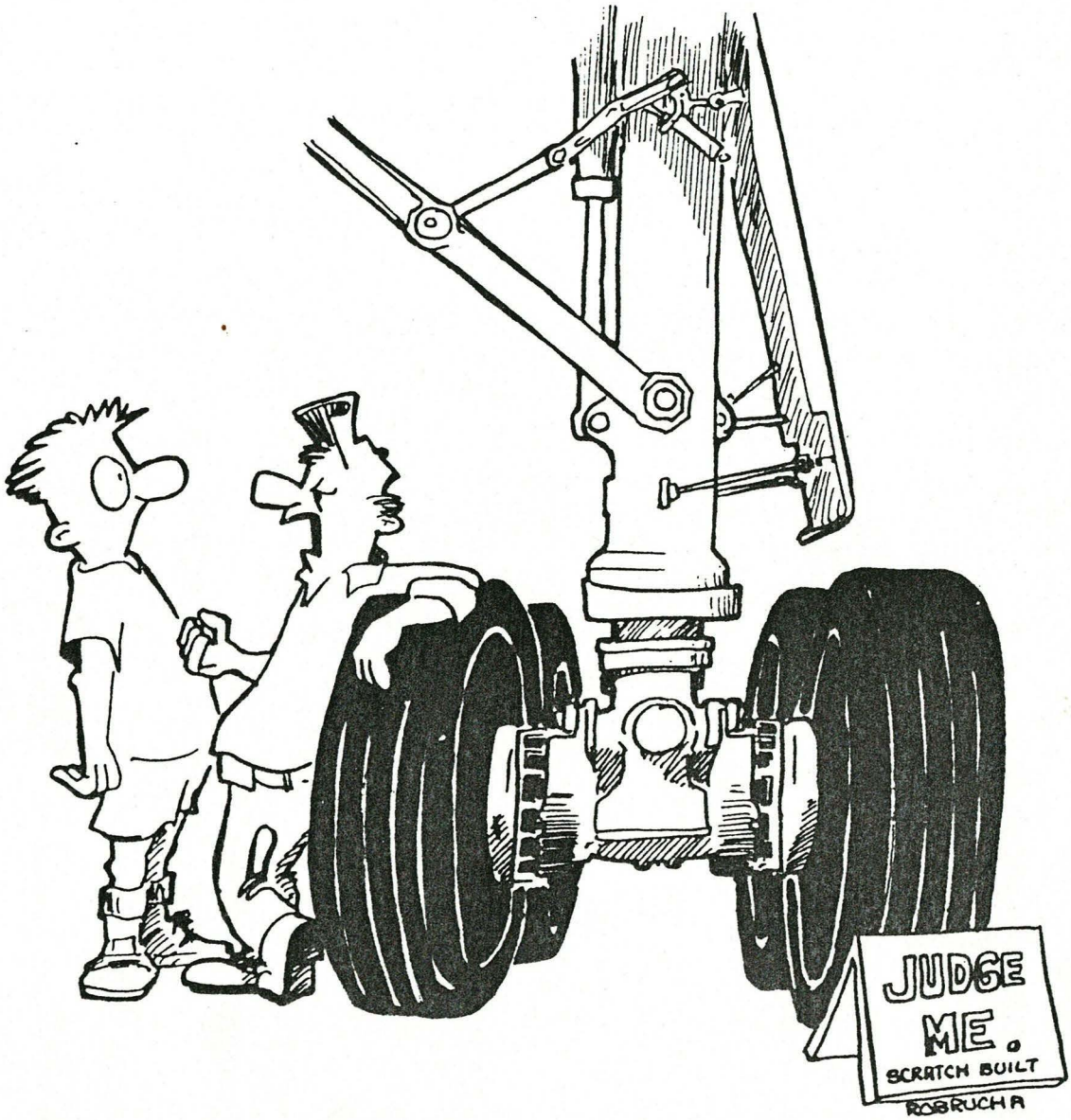

"Actually, it started in a bar when this guy sez' to me, 'I bet you can't..."

ROBRUCHA