



The NStar Chronicle

Merlin Musings

Eightj in a series

Ted Devey

Mightiest Merlins

The 600 and 700 series Merlins were built by Rolls-Royce after the War at their Derby Plant in England. Wartime Merlins were built for military applications in fighters bombers and reconnaissance aircraft at several different plants including Packard of Detroit. The most demanding service was that of the Lancaster Bomber which carried the heaviest payloads of all WWII bombers, including the 12,000 lb Tallboy and the 20,000 lb Grand Slam bombs, and the special rotating depth charges of the Dam Buster raids on the Rhur Valley.

Merlin 622 engines were fitted to the North Stars built at Canadair in Montreal after WWII. I choose to describe the Merlin 622 as the "Rolls-Royce" of all Rolls Royce Merlin engines ever produced. The Merlin 622 was built as a 'Transport engine' for use in long-haul (today read overseas) passenger and freight service. Commercial North Star passenger aircraft were built for Trans Canada Airlines (TCA, now Air Canada), Canadian Pacific Airlines, and British Overseas Airways Corporation (BOAC, who called their aircraft 'Argonauts'). Indeed, these were among the first aircraft to provide extended passenger service well beyond Canadian and United Kingdom borders. Additionally, North Stars were built

for the RCAF 426 Squadron whose role was transport of supplies and provisions, often together with personnel. Spare engine power pack assemblies were positioned at stopover locations in case a Quick Engine Change (QEC) was necessary for replacement of an unserviceable engine. During the Korean War, RCAF North Stars participated in the Korean Airlift. They were based at McChord Air Force Base in Washington, USA, and flew to Japan via a route along Canada's West Coast and the Aleutian Islands. They returned to base via Hawaii.

The transport service Merlin 622s were up to the task of propelling these aircraft over great piston-pounding distances. North Star 17515 at the Canada Aviation Museum, the object of the current restoration project is the sole surviving North Star of this historic series. North Stars were designated as DC-4M or C54-GM, depending on which Douglas airframe was used. The DC-4M was a pressurized aircraft for commercial service. The C54-GM was an un-pressurized aircraft for military service. The M stands, of course, for Merlin.

As previously mentioned, Rolls-Royce named their various series of piston engines after birds of prey, eg. Eagle, Kestrel, Vulture, Merlin, Griffon. Merlin is a sub-species of the Falcon. Because of its substantial role in WWII, Merlin has become history's big name. Merlins were essential in the Battle of Britain in 1940 which was the first and greatest combat occurrence solely in the air during and after the War. Recall Winston Churchill's famous statement, "Never in the field of human conflict was so

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much owed by so many to so few". So much – our freedom today; so many – the world's population; so few – the RAF and RCAF (including American Volunteer) pilots who flew the Spitfires and Hurricanes that defeated Nazi Germany's Luftwaffe and prevented the invasion of Britain in 1940. Britain was, after all the then fortress of democracy in history's darkest time. It was the Merlin engines which powered the Spitfires and Hurricanes flown by the "few" that won the Battle of Britain. This victory is commemorated annually at the Canada Aviation Museum each September, and includes a flypast by a Lancaster escorted by a Spitfire, Hurricane, and Mustang, all Merlin powered.

What about the Merlin 622? The foregoing is a thumbnail attempt to provide a background for the last of the Merlins, the 622 which was substantially beefed up for tough service usage delivering a high percentage of its horsepower capability over long periods of time and distance. The webs in the crankcase that gave strength and rigidity were enlarged. The crankshaft was supplied with sludge traps in the crank journals, the cylinder head-to-cylinder block nuts and studs were modified to allow for thermal expansion of the cast-aluminum components without pulling studs from the casting (aluminum expands more than steel with heat), Supercharger (2-speed, 2-stage) performance was maximized necessitating the fitting of an aftercooler to cool the charge

so as to maintain a high volumetric efficiency. It was the first Merlin to use fuel injection. The fuel was applied to the eye of the supercharger.

Without any doubt, the 622, was the 'ultimate Merlin'. Air racers snapped up surplus Merlin 622s as North Stars were sent to the boneyard because they were excellent engines for racing aircraft. They could be souped up and deliver as much as 3,000 HP over short periods. This is because the 622 is the most rugged of all V-12 engines. Surplus Mustangs converted for all-out racing had their Rolls-Royce Packard Merlins replaced by extensively modified 622s.

The Merlin series of engines was followed by the Griffon which first appeared in 1939. It provided solutions to a number of problems arising in the Merlins which were due mainly to crankshaft torsional vibration under heavy loading. Camshaft and magneto drives were moved to the propeller end of the crankshaft so that advantage could be taken of the flywheel effect of the propeller. This improved the evenness of the ignition and valve timing under heavy loads. Because the Merlin was already under production and aero engines were in urgent demand for aircraft at the War's beginning, Griffon production was delayed until after the war. Jet aircraft were rapidly replacing piston driven planes so the Griffon era was short-lived.

PNSAC

Interview – William A. Morris

My Best Flight Ever

Chris Payne

On the First of July, the North Star and its restoration stalwarts enjoyed many visitors, but the visitor with a tale to tell was William A. Morris.

In 1957, during the Easter holidays, Mr. Morris was in seat 9C on flight 906 of a Pan American World Airways Stratocruiser. This was known as the clipper "Midnight Sun" and was considered the most luxurious airliner ever built. Mr. Morris, now a veteran air traveller, states that it was "the best plane I ever flew in."

To start the first of the giant engines (3500 hp R-4360 Wasp Majors with 28 cylinders in four rows and General Electric BH-4 turbo-superchargers and Curtiss-Electric 16 foot welded steel hollow-blade props) required a connection to the electrical grid of the town of Whitehorse. It has been reported that this dimmed the street lights of the entire town. The flight was Whitehorse to Juneau, Alaska return and

took only a couple of hours.

The Boeing Stratocruiser, known as "the son of the B-29" flew between the mountains on this route, and at one point cruised down low along the Lynn Canal. Mr. Morris enjoyed "... good full-course meals each way, and these were served on china plates with silverware." A spiral stairway gave access to a lower deck lounge which had "...chesterfields all around and a bar with stools and a brass rail – that was luxury!" The fuselage has been described as an inverted figure-eight in cross-section and a spiral staircase gave one access to the lower deck lounge.

"Unlike the North Star it was very quiet." (The Boeing company spent millions in R&D to sound-proof the cabin and berths.) "I was in the army at the time. The fare was \$32.00 round trip with full-course meals – and that was first class all the way."

"Northwest Orient Airlines also flew them. Each passenger relaxed in a big armchair seat."

The Stratocruiser was described in a Pan Am brochure as: "Pan American's Double-Decked Super Strato Clipper PAA Serving All Six Continents"

The Boeing Model 377 Stratocruiser was also known as "The Queen of the Skies."

The return flight out of Juneau was noteworthy: "The pilot had to bank to avoid the hill at the end of the runway." It was suggested that this might have been a 60 degree bank. Mr. Morris stated unequiv-

ocally: "Like heck it was – I was looking straight down!"

The North Star crew extends a cordial invitation to Mr. Morris to visit again during the Classic Air Rallye festivities.

PNSAC Board's Report to Members

5th Annual General Meeting

June 14, 2008

Introduction

The Board met four times since the 4th AGM. Some of the issues noted in our last report have been resolved while others remain with us. We have managed to expand our capacity for restoration work during week days but there is still no prospect of work on week ends. However, steady progress has been made on the North Star restoration, particularly on the number one power plant. Our volunteers have contributed an impressive total of 17,400 hours to the Project. While PNSAC membership in 2007 reached a new high, almost 50 percent so far have failed to renew for 2008. There was a substantial increase in donations to PNSAC. The Museum Corporations' appeal for donations, which included the North Star Trust Fund, produced some additional funds for Project North Star. While we are disappointed that the Museum Corporation still has not pursued corporate support for the Project, the funding available is adequate to sustain restoration work at its present pace for a couple of years.

Treasurer's Report for Year to March 31, 2008

Once again the Association's finances have improved during the last financial year. Memberships have increased and donations have also increased. Memberships are up from \$2,240 to \$2,986 and donations have increased from \$2,215 to \$7,663.

Regular monthly donations continue to be received but have not increased during the last year. These monthly donations provide a regular income to the Association. Members are encouraged to start monthly donations and application forms are available from the Treasurer or the Membership Secretary.

On the expenditure side, there has been much work done at very little cost which means that there

are now substantial funds available in the Association's bank accounts and savings accounts. On June 12, 2008 the cash funds available amounted to \$19,845 (June 1, 2007 \$15,000)

During the last few months arrangements have been made to open a chequing account at TD Canada Trust and a savings account at ING. The bank account with Royal Bank will be closed in the near future. These changes will result in an easier banking process and increased interest income for the Association. On June 12, 2008 the checking accounts had balances in excess of \$3000 and the ING savings account is in excess of \$16,000

The payables for the Association on June 12, 2008 amounted to less than \$1,000

Fund Raising

As noted in our last Report, there are two ongoing fund raising programs for Project North Star. The Association receives donations, as does the Museum Corporation. To date, there has been no appeal for support directed to aerospace companies. However, worthy of note is the continuing donation-in-kind of propeller restoration by Hope Aero.

PNS Aircraft Progress Report 2008

Since the last AGM steady progress has been made on the restoration of the North Star. This can be summarized as follows:

- Nr 1 engine completely disassembled, core engine cleaned, inspected and re-assembled. Waiting for wheel casing and timing and disassembly, cleaning and inspection of supercharger and intercooler. Will remain in yellow rotatable rig till these items are completed.
- Commenced cleaning cockpit and cabin.
- Overhead instrument panel removed, instruments removed, cleaned, repainted and awaiting re-installation

- Some radio equipment removed from cockpit rack and disassembled, cleaned and currently awaiting re-assembly
- Radio Operator's table removed, completely disassembled, new wood installed and re-painted and re-assembled
- Oxygen equipment disassembled, cleaned, inspected, re-assembled and stored
- Number 1 engine propeller has been completely overhauled by Hope Aero, returned and mounted on Nr2 Engine temporarily. Nr 2 Engine propeller removed and shipped to Hope Aero for overhaul. Nr. 1 Engine Propeller was found with pitting corrosion so no longer airworthy but carefully dressed out and filled
- Nr 1 Engine frame completely disassembled from mounting frame, parts removed, cleaned, inspected, repaired where necessary, re-assembled and re-installed in mounting frame. Lower flap actuator doors and sub assembly currently being worked on
- Preparing for North Star exhibit on Canada Day. Nr1 Engine will be displayed in its yellow rotateable jig while Engine frame with accessories will be displayed in blue Engine transport jig

Much of the work completed to date is intensive, requiring a high standard of recovery and demanding patience and meticulous workmanship.

PNS Volunteers

We now have a regular body of volunteers working at the museum during the week. The daily average is about 5 or 6 persons although this varies by day of the week. This steady turn out allows for continuity and experience build-up and permits further recruitment and training. Latest volunteers have proven to be reliable and skillful. Two of our volunteers have accumulated over 1500 hrs attendance and, at the recent CAVM night for volunteers many were awarded for their attendance record.

It is essential for the well being of the Association that we continue to recruit new skilled volunteers for weekdays to pursue our goal of weekend work. By providing skilled, experienced volunteers we can hope to provide potential supervisors for weekend work. We still need a number of volunteers to assist in mundane tasks such as parts research, disposal of surplus material, replacement parts sources and other administrative tasks. We are looking for volunteers ready and willing to take on these tasks.

Training for PNS Volunteers

We have now reached an agreement with CAVM staff that prospective volunteers will be processed as follows:

- Initial security clearance by the Volunteer Coordinator, Johic Nicolas.
- Assessment interview with Program Manager, Mike Irvin.
- If accepted, volunteer contacts the Training Facility and completes WHMIS and Fall Arrest Training.
- On presentation of proof of training, volunteer may commence work at the Museum
- Volunteer pays for his own training, applies for refund from the Museum after 75 hours attendance.

Project North Star The Way Ahead 2008

While it may appear that progress on the restoration of the North Star aircraft is painfully slow, one must recognize that this is a considerable undertaking given the size and complexity of the project. The limitations placed on the volunteers by the Museum have made it difficult to recruit the numbers we would like to see participating. Also the space available and restrictions on what can be done in the Storage Facility make this doubly challenging.

Basically, we will continue with the Treatment Plan as presented by the Museum at the outset of this Project. Our initial goal is to complete the work required on the parts removed from the aircraft, restore them to an acceptable display standard, and store them in the Storage Facility ready to be re-installed on the aircraft. We have reached a number of the objectives in this effort. We are close to completing the first engine build up and assembly back on the quick engine change frame. It will be remounted on the aircraft with the propeller installed. The Museum has acquired suitable scaffolding to permit work to continue on the wings and outside fuselage. There is much hard work to be done to restore the aircraft finished polished surface and repairs where required. This has not commenced due to problems with using chemicals in the Storage Facility. A proposal to work on an enclosed area of the aircraft with forced ventilation to the outside is being formulated and will be presented for consideration.

The remaining outlook for the activity on the North Star remains the same as last year and is repeated here as a reminder.

The interior of the aircraft needs to be cleaned up and all debris and bird remains removed. Then we can start to closely examine the structure and more closely assess the necessary repairs. The main entry door requires removal for inspection, repair and restoration. This is required to improve access to interior of aircraft on a regular basis. To continue using this door in its present condition could lead to further deterioration and possibly, limitation of use.

Based on the completion of parts currently in Bldg 193, more interior parts can be removed from the aircraft for restoration in this building. With the improved rack storage shelves in the Storage Facility we have more storage of completed parts which frees up more space in Bldg 193.

We need volunteers to assist with the search for sources for needed parts. This involves browsing websites which can be done at home.

Membership

In the summer of 2006 PNSAC had only 26 paid memberships. The organization had a long list of volunteers, former volunteers, donors, and, former members. Not much had been done to distinguish the paid members from the others on the list. In late 2006 the Association made a determined effort to gain more paid memberships, as this was where the majority of the funding came from. Memberships were offered at quarterly meetings, during Canada day and at the Classic Air Ralleye. Memberships received after September 1st were rolled over into 2007. Thirty Eight members were enrolled in the fall of 2006, 18 in February, 34 in April, and 14 in July, for a 2007 year total of 104. Of these members, 27 made a donation in addition to the membership fee.

In 2008, 17 enrolled in January, 21 in March, 6 in April and 9 in May, for a total of 53 to date. Of these, 20 made a donation in addition to there membership fee.

Administration

The Association has established an official address by renting a Postal Box near the Canada Aviation Museum. This facilitates the receipt of official correspondence. Efforts continue to make greater use of the computers located in the office at Bldg #193. A second PC is connected to the net and could be used for the management of our photo library, so essential for the provision of current material for the website. The lap top computer used for restoration work is

unreliable and is scheduled for replacement. Some additional software will be needed for these computers, e.g., Excel, Power Point and Photo Management. Shortcomings in some of our administrative practices have been recognized. Beginning immediately, membership cards will be issued to members each membership year. Donations will be acknowledged on receipt.

Communications

The NStar Chronicle is published quarterly and distributed to members. It also is posted on our website. The few comments received have been positive; there have been a number of requests for permission to reprint Ted Devey's articles on Rolls Royce engines. The North Star Kiosk is now on display in the Museum, providing the public with information on Project North Star. Perhaps the most effective communications exercise during the past year was the display of the North Star during Canada Day and again during the Classic Air Ralleye. A promotional pamphlet was printed for these events and several hundred were distributed to visitors to the North Star. The Project North Star web site generates a few inquiries about membership and volunteering, but the visits/hits record shows a steady decline from a peak one year ago. The web master has proposed a complete revision of the site to make it more attractive and easier to administer, especially the posting of material on the site. The Board has approved the revision which will take several months to complete.

Members are reminded that they also are an important part of our communications network and are encouraged to promote our cause at every opportunity. The identification of potential sources of support for our Project would be particularly helpful.

Future Events

The North Star will be on display again this coming Canada day and also during the Classic Air Ralleye 23, 24 August 2008. The Board of Directors will meet on the following dates: Sep 11, Nov 29, and Mar 12. Members' Quarterly Meetings are scheduled for Sep 20, Dec 6, and, Mar 21.

Conclusion

The Association has had another successful year with increases in donations and memberships. We have more volunteers on the job than last year. There has been steady progress on restoration of the North Star and the quality of our volunteers' work has been

excellent. Proposals for the expansion of work to the Storage Facility are being considered. Weekend work remains a priority objective for the Association.

Improvements in our communications are essential for the promotion and continuing support of the Project. The Project North Star website will be upgraded this year. Members are reminded that they can and should be an integral part of the Association's communications network.

The estimated cost of Project North Star is \$500,000. So far the burden of raising these funds

has been placed on individuals. No aerospace company, with exception of Hope Aero, has contributed anything to the Project. This needs to change.

The Board thanks all who have made donations to PNSAC, our volunteers who have given so generously of their time, and all who have assisted the Association in any way. Thank you to Mike Irvin, our Project Manager and the staff at the Canada Aviation Museum for their direction and support.

The Board respectfully submits its report to the members of PNSAC

PNSAC

Miscellany

Photographs

Photos in figures 1 to 10 by Chris Payne.



Figure 2: Arrow shirt



Figure 1: July 01 2008



Figure 3: Pilot window



Figure 4: Bill Tate on tour duty



Figure 7: Rolf and son



Figure 5: Restoration underway



Figure 8: Johic and friend



Figure 6: Framed!



Figure 9: Ted ... and visitor

Newsletter distribution

The NStar Chronicle is delivered to members by e-mail or by regular post to members not having e-mail addresses.

Annual General Meeting

The Association held its 5th AGM in the Bush Theatre at the Canada Aviation Museum on June 16, 2008. The Minutes for the 4th AGM were approved as were the Financial Statements dated March 31, 2008, prepared by Roger Pritchard, Professional Corporation, Certified General Accountant. The Association's financial state was substantially improved over the past year due to increases in membership, donations, and a reduction in expenditures. Refer to the Board of Director's Report to Members at page three for more details on Association activities over the past fiscal year and plans for the future.

Elections for the Board of Directors were held. The changes proposed by the Board were: accept resignations of Dorothy Barker, Social Secretary, after almost five years as a Board Member, and, Thomas Mulvihill, Membership Secretary, due to the pressure of his consulting business. Tim Timmins, Jim Riddoch, Keith Penny and Gary Dupont would continue to serve. Bruce Gemmill would replace Tom Mulvihill as Membership Secretary. There were no other nominations.

Keith Wilkins served the Association as Corporate Secretary since its inception: incorporation, registration as a charity, and, preparing by-laws. Now he finds that he does not have time to participate in Association affairs. Roger Button of Hall, Ray and Button, volunteered to replace him and was duly appointed Corporate Secretary.

Roger Pritchard was appointed as auditor for the next fiscal year.

Lockheed Martin's donation

Lockheed Martin has donated a laptop computer and several accessories to PNSAC. They will be used to store photos and technical data for easy access at the restoration work stations. Emery Gal, member and Lockheed Martin employee, arranged for the donation.

Project Northstar Web site

The webmaster has started upgrading the website. It will take several months to complete the process.

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Newsletter

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PNSAC Newsletter¹ email address:
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¹This newsletter is typeset using L^AT_EX². The style package used for the newsletter (PNSAC.sty) is a modification of GRASSnews.sty belonging to the Geographic Analysis Resources Support System (GRASS). The modification was made possible by kind permission of the Editor-in-Chief of GRASS-News.