



# The NStar Chronicle

## Merlin Musings

Thieth in a series

*Ted Devey*

### Overhauling a Merlin 622 (3)

Having mounted the Cylinder Blocks with Heads attached, these assemblies were fastened to the Upper Crankcase and the nuts were 'torqued' to the values specified in the Overhaul Manual. The camshafts were left off the Heads until the Wheelcase was overhauled and refastened to the rear of the crankcase, as this provided the drives to the camshafts. Rotation of the crankshaft without the piston running afoul of depressed valves was allowed.

### Wheelcase

The Wheelcase (fig. 1.0.1) contains gearing and shafting running in several directions to operate various units mounted on the engine. It's drive is accepted from the rear of the crankshaft; two shafts run upwards at 30 degrees to the vertical, one to each camshaft; horizontally to each of two magnetos; downward to drive the oil pressure lubricating oil pump, two scavenging oil pumps and the main coolant pump; vertically up from the starter motor; and aft to the supercharger. The Wheelcase was carefully dismantled, cleaned and re-assembled and then mounted to the end of the crankcase. Camshafts

were then fitted in accordance with the timing procedure as laid down in the Rolls Royce Overhaul Manual. Overhauled magnetos were fitted and the ignition was timed to the crankshaft. The Wheelcase is a 'jack of all drives' serving various ancillary units needed to run the engine.

### Intercooler

There are no moving parts in this unit as the fuel mixture at high temperature from the Supercharger passes through heat exchangers inside the case so as to cool it before going into the engine induction system. This allows the engine volumetric efficiency to remain under high operating powers on long flights. The intercooler has its own cooling system comprising a circulating pump, a radiator and the intercooler itself.

### Supercharger Drive

This is a two-stage turbine driven from the crankshaft via the supercharger drive as described above. The two-stage rotor is delicately balanced and the unit as a whole is precision built. Several fuel-related units are mounted on the Supercharger such as the fuel de-aerator, boost control, accelerator pump, and the fuel injector nozzle which directs aviation fuel into the eye of the supercharger first-stage.

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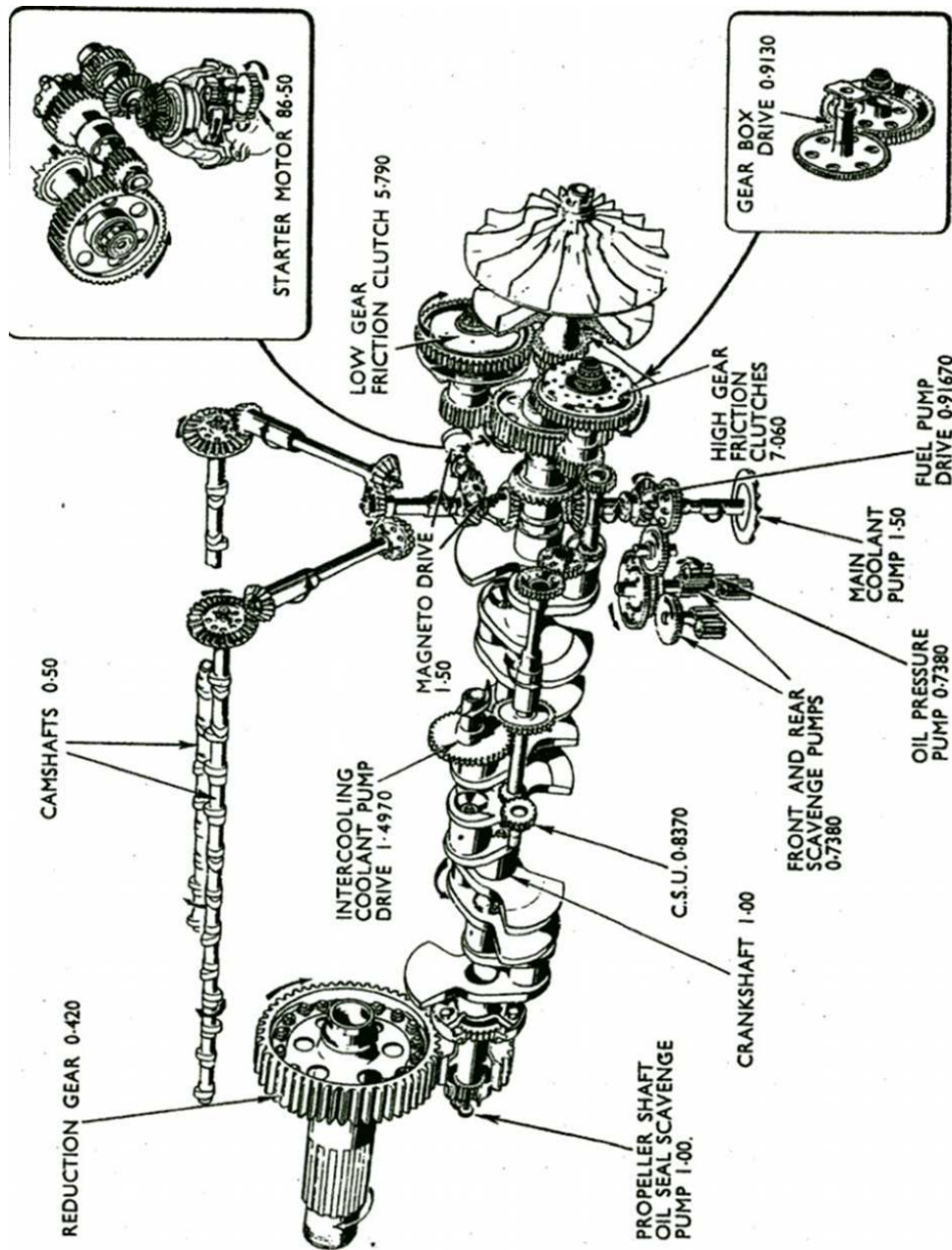


FIG. 8. Gear train

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Figure 1.0.1: Wheelcase

## Final Assembly

The partially assembled engine was removed from the rotary frame and re-mounted onto the Power Pack minus the supercharger and intercooler. The many connections between the core engine and the Power Pack were made. These included cooling (3 systems: main engine, intercooler, and, lubricating oil to the 3-core radiator assembly at the front of the Power Pack), fuel and lubricant to the airframe through the bulkhead connectors, as well as fire-extinguishing facilities.



Figure 1.0.2: Power pack with connectors ready for remounting of the engine

Many of the connections were achieved with considerable difficulty due to access problems through the engine support framing of the Power Pack and various pieces mounted thereon which are auxiliary to the engine but not on it.

## Harrowing Tales

*Drew Hodge – as told to Chris Payne*

I was based at an RAF hospital in Wiltshire, a place called Princess Alexandra's Hospital RAF Wroughton, near Swindon, and I worked in the Biomedical Engineering department. There were probably about eight or nine of us in the department. We looked after medical equipment at our hospital and at RAF stations in Wales, the southwest and central England. We'd go down to Cornwall, and then into Wales, Anglesey and up as far as Stafford and Southport just north of Liverpool. But we also had

A decision was made earlier to remove the Supercharger from the engine before transferring the engine to the rotary frame so as to make the rotary frame shorter. This was a grave error in that the engine had to be returned to the Power Pack without the Supercharger and the Intercooler which proved to be difficult to mount to the engine after its return to the Power Pack. If the engine could have been completed before transferring it to its frame many connecting pipes and hoses could have been assembled and wirelocked conveniently with the ability to rotate the engine frame. It is planned to extend the rotary frame so as to accommodate the Supercharger in the overhaul of the remaining three engines.

## Some Observations

We regard the overhaul of Engine #1 as Merlin 101. There was so much to learn in many regards, removal procedures, unit storage awaiting overhaul, disassembly, cleaning/component-replacement, re-assembly of units and of the engine, connections, sequences, taking pictures and organizing them in the computer etc. We anticipate that the remaining three engines will take much less time than the 3 and 1/2 years that it took for number one. Number 4 should be "duck soup"!

At the time of writing this, remaining to be done is the return of this Power Pack to its place on the aircraft and the removal of number two for overhaul.

The difficulties being encountered in completing the final assembly of the engine and Power Pack are being resolved through the patience, perseverance and good nature of the Merlin Crew, Ed Hogan, Peter Houston, and, Jon Tasseron.

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the responsibility of providing biomedical engineering services on board aircraft for casualty evacuation. We did what was called aeromedical evacuation. We were part of an aeromed team, and when the team was called out to bring back British service people or their dependents from anywhere in the world, and they needed life support equipment, we would go along with them.

The team was led by a doctor, usually an anaesthetist from Wroughton, and was made up of several nurses and aeromed attendants, and one of us from biomedical engineering. We would go in whatever was going that way – Hercules, VC-10s (10 Sqn, RAF Brize Norton). The Hercules C-130s were based at

RAF Lyneham. Occasionally we would go to Northern Ireland, so we would pick up an Andover from Benson, or something like that, and fly out to Aldergrove.

When the Falklands war started, Easter 1982, I was living off the station and installing my first kitchen. I remember standing on a ladder, putting up tiles, and the news was running on the TV behind me. I heard the news that the Sheffield had been hit, and then a few hours later I got a phone calling saying that our team was on standby for aeromed evacuation. (The Sheffield sank a few days later.) All the casualties from the Falklands came back through our hospital. Wroughton was very close to Lyneham and Brize Norton which were, and still are, the big RAF transport stations. After the Sheffield, we began to see navy personnel pass through the hospital. They were suffering from flash burns and had their arms and forearms, and sometimes their heads, covered with bandages. Serious cases were taken directly to specialized hospitals, usually civilian hospitals.

The hospital ships started picking up casualties after the land invasion had started. The hospital ship – Uganda, a converted cruise ship – would pick up casualties from the field hospitals in the Falklands and take them to Montevideo, Uruguay. And then there were regular casualty evacuation flights from Wroughton that went down to Uruguay by way of Dakar, in Senegal, Ascension Island, in the middle of the Atlantic, and then Uruguay. These were VC-10 flights from Brize Norton. We would meet the hospital ships in Montevideo and load up the VC-10s with casualties. Half the aircraft held stretcher casualties and half were walking casualties, and an area of the aeroplane was set up as a basic intensive care area. The flight I was on brought back serious casualties from the Fitzroy-Bluff Cove incident that involved Sir Galahad and Sir Tristram (Royal Fleet Auxiliary landing ships), LSLs carrying the 1st Bn. Welsh Guards, part of the 5th Infantry Brigade. Many of the Welsh Guards became casualties. Sir Galahad was hit by 250kg bombs dropped by A4-B Skyhawks. Three bombs hit Sir Galahad, igniting ammunition and fuel. The particular casualty that was on my aircraft was Simon Weston, a Welsh Guardsman from a mortar platoon who was very badly burned.

Previous aeromed flights down to Montevideo were unmolested by the Argentinians until one VC-10 was said to be carrying Harrier spares. The VC-10s were marked with red crosses so they weren't supposed to be carrying spares such as that, so when we were there, we were actually under guard all the time. I'd heard from previous people – colleagues who had gone down before me – that the guards were kind of funny. In fact, one was armed with a blunderbuss! We stayed at a hotel in Montevideo

while we waited for the Uganda to dock. We finally loaded our casualties and the VC-10 taxied out to the runway. We began our takeoff run, and then there was a very loud bang. One of the turbine blades had broken off and gone through one of the engines. The pilot managed to stop the aircraft safely on the runway before taking off. We sat there for quite a while, not knowing what to do. I was sitting beside the loadmaster and I think he was waiting for an evacuation order, but that just wasn't practical. After what seemed a long time, we taxied back to the ramp, unloaded all the casualties and took them back to the hospital ship. We were stuck in Montevideo for almost a week. The hotel in Montevideo was amazing – all marble and brass. The steak I had there was incredibly good! And probably Argentinian beef too. In fact, I took home some Argentinian wine. What looked to me like WWII vintage black Citroens were a common sight on the streets of Montevideo – and this was 1982! A replacement engine arrived on another VC-10, but they decided that we would swap aircraft and take the new VC-10 back home.

The route back to Brize took us to Ascension Island again to refuel, and from Ascension we flew directly to Brize. NASA had a tracking station on Ascension (on top of a mountain directly above the airfield), and I remember the runway being a longish runway between cliffs. Certainly I remember the takeoff run when we came back full of casualties, that it seemed extremely long. It seemed as if we were taking off through a railway cutting. The joint USAF and RAF facility on Ascension is called Wideawake Airfield. There's a small civilian settlement there, and the island itself is volcanic with lots of black rock around. We stayed one night there on the way out, and the drinks were very cheap. There was a little bit of concern about casualty evacuation flights south of Ascension because of the discovery of the Harrier spares earlier. Would these flights be respected as a Red Cross flights, or would they be considered legitimate targets? Any sorties south of Ascension were considered to be in the combat zone, not the same as the exclusion zone that extended for 200 miles around the Falkland Islands. By the time I was there, the buildup on Ascension had been completed. The RAF now flies direct to the Falklands because they bought Tristars after the war so that they could reinforce the Falklands if they needed to.

I've read that the British military learned a lot about joint service activities during the Falklands War. I think the Air Force, the Navy, Special Forces, and Royal Marine Commandos had experience working together before the conflict, but there were problems with communications and process and procedures when the Army became part of the Task Force. The main work of taking back the islands on the ground was done by the paratroop regi-

ments - 2 and 3 Para - and by the Royal Marine Commandos. That there were two LSLs with troops still embarked during daylight hours with no air cover is quite something, really. I read about an incident involving a Rapier (surface-to-air) detachment. A guy pressed the button to fire at the A4s as they came in to attack the troop ships at Fitzroy, but nothing happened. There was a Harrier combat air patrol, but that was diverted by Argentinian Mirages. I believe four A4s made the attack, led initially by a Lear jet to help with navigation. The Royal Navy had two LPDs in the Falklands. LPDs had better air defenses, but they were considered too valuable to risk away from San Carlos Water, so they weren't used to support the Fitzroy landings. They were not in the area so there was very little air cover for the disembarking troops.

Prince Andrew was flying a Sea King helicopter in operations from HMS Invincible at the time of the Falklands War, including recovering people from the water at Fitzroy. The helicopters used the downwash from their rotors to blow the smoke away from the ships.

I've heard that the military population of the Falklands is now higher than the civilian population. The RAF has a large station there now, RAF Mount Pleasant. Shortly after the war there was a lot of trouble with land mines. The minefields were poorly mapped. A lot of sheep were blown up as a consequence. The fighting stopped in June of '82, but there wasn't an official end to the war until many years later. Two Victoria Crosses were awarded during the war, one to the commander of 2 Para, and the other to a sergeant in 3 Para. There were also a number of records set by the RAF - by Vulcan bombers for the longest bombing sortie to date - and the RAF's Nimrods played a big role as well. I think the Vulcan's record has been broken since 1982 by USAF aircraft during one or both of the conflicts in the Gulf. Most of the old VC-10 fleet are now tankers. They're not transports anymore.

I had an earlier aeromed flight to the U.S., to Florida by way of Washington, D.C., also on a VC-10, also for casualty evacuation. A British serviceman had broken his neck in Belize. It was too expensive to leave him in a hospital in America, so they flew a

VC-10 out. It broke down, so I had a week in Washington. We flew down to Homestead Air Force Base, picked him up, brought him back.



Figure 2.0.1: Lassa fever Aeromed team at Wideawake airfield, 1985

I went to the Ascension Islands a second time after the war, taking an RAF-built transit isolator for transporting patients with highly infectious diseases. A nurse had contracted Lassa fever in West Africa. We went to Ascension Island initially, strangely enough, then flew to Freetown in Sierra Leone. And we were standing on the runway in rubber suits and gas masks and we picked up the nurse with Lassa fever, put her in the transit isolator and took her to Ham Green Hospital in Bristol. The landing in Bristol was the smoothest landing that I've ever had in a VC-10. The aeroplane was flown by a Canadian exchange pilot. We landed at Filton Airfield, which was where the Concorde was built and flown from. The pilot wanted to give the patient a smooth landing, I suppose, and he did, but he landed a long way down the runway and we almost ran off the end off the runway. But it was definitely the smoothest landing I've ever had! That was my last trip to Ascension Island.

When I left the RAF, we went to Africa and did some voluntary work. And when we came back from Africa, I had no job. My wife's parents were living in Montreal at the time (late '80s), and they saw a job advertised at CHEO. I applied and came to Ottawa. I did about six years at CHEO, and then moved into technical writing for various software companies. I'm back at CHEO now, back in biomed

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# New volunteer: first impressions

Mike Lomas



Figure 3.0.1: Mike Lomas peers in awe at the 17515's restored #1 power plant

A few months ago I registered with TV Ontario's Get Involved volunteer program. It's an initiative in which folks with some kind of useful skill set can register with TVO to offer their expertise for free to all kinds of not-for-profit organizations. In my case, I offer writing and communications skills having scribbled for magazines, marketing firms, and more recently websites, for a number of decades.

No sooner said than done and Tim Timmins, President of PNSAC, contacted me, inviting me to consider writing about the restoration of RCAF North Star 17515. "Sure, why not" I said. Now, after Tim's briefing and a number of tours of the workshops and aircraft, I'm suffering not so much from "information overload" as feeling in awe of the historical significance of this aircraft, the committed volunteers involved, and extraordinary restoration process underway.

To be honest, my initial reaction on viewing 17515 on the tarmac was to wonder, "why bother?" Surely, I thought, there are more unique looking specimens in the Canada Aircraft Museum's collection ... ranging from wondrous wood-'n'-wire contraptions to battle-proven fighters that seem poised to take flight. Then, at a risk of being quickly shown to the exit door, I voiced that very thought out loud with some of the PNSA volunteers. Wow! The reaction was swift.

"This is the only remaining specimen of its type

in the world," one said.

Another: "It served with the RCAF in the Korean War, in NATO and the United Nations in the UK and Europe, on humanitarian missions, and in weather stations up north."

"It was the first long range transport aircraft produced in Canada, a major milestone in Canada's aviation industry, part of our aviation heritage."

"And for commercial airlines such as Trans Canada Airlines, Canadian Pacific Airlines, and British Overseas Airways, it was a major player in putting them into the international league."

"When this is finished and ready to accept visitors," one observed, "it will be the only aircraft in the museum you will be able to walk inside – from cockpit to tail. It's going to be very hands-on visitor friendly."

Okay, enough said. I get the message.

Another impression I have gathered over the past few weeks is something to do with volunteer's commitment. Or is it stubbornness? Dedication? Or tenacity? I am not sure.

When I look at the guys in the workshop I see a high level of concentration, a focus, an intensity. And you can tell it is fun, they're having a ball, joking as they interact. There's enthusiasm in the air. It's obviously something worthwhile accomplishing. There's a tone of pride when someone in the workshop shows me a clean-looking part within a very complex assembly and says, "Look at this. You should've seen it before we took it out and cleaned it up."

Another aspect I am in awe of is the extraordinary restoration process, the detailed, comprehensive written and photographed documentation step-by-step, part-by-part, and especially the "before and after" photographs that are, as they say, "worth a thousand words."

I read status reports such as this one: "Gallery Crew Seat – Jan 07, seat photographed, digital and 35 MM photos for record; seat started disassembled, noted spring missing from recline mechanism; removed seatbacks, lower covers and frames," etcetera. I asked Tim why all this documentation is necessary. "A hundred years from now," he said, "curators and technologists can look back and know exactly what was done and how it was done."

Then I read a Condition Report from a few years back by Mike Irvin: "Fuselage exterior is dirty with streaking throughout, numerous small dents and scratches throughout, minor oil canning throughout aluminum surface."

And how about this one: "Cockpit and galley interiors are extremely dirty, dusty and covered with

bird droppings throughout 100%; paint throughout cockpit and galley is in poor condition, severe flaking and paint loss 70% throughout. Numerous dead birds throughout," etcetera. But they wouldn't use the word "etcetera." No way, that's too vague.

Well, the condition of the 17515 certainly doesn't seem to have deterred restoration expert Mike or the crew of volunteers he guides, instructs and motivates so well. Members of Project North Star are getting things done. No, not lick-a-de-split, more slow but sure.

Another surprise. The other day Tim gave me a list of what's done and what's to do. Apparently, since about 2005, the items removed, stripped and replaced or stored includes instruments, crew seats, heaters, wheels, the nav desk, drift meter, rad desk,

radar indicator, Loran, propellers, and #1 power plant. That sounds simple, doesn't it? Simple it ain't. So far, there are twenty-thousand volunteer hours involved in achieving that. Laborious, detailed, exacting work every step of the way.

And what's left to do? The flight desk; power plants two, three, and four; landing gear; and the air frame. And there's painting and replacing of fabrics on control surfaces.

With all this achievement, I look forward to the day visitors from far and wide are lined up, eagerly waiting to come board a piece of Canada's aviation history. Then the 17515 will truly get the recognition to make it a resounding success.

Well, that's my impression.

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## Project North Star – Progress Report

*Jim Riddoch*

The aircraft is now repositioned in the Storage Facility where it will remain until next Spring

### Nr 1 Engine

Currently the QEC (Quick Engine Change) Assembly is in final stages of re-build requiring only the last sub-assembly, the two-stage intercooler, to be installed. However, some difficulties are being experienced in installing, securing and wire-locking pipes, conduits and ground straps due to limited space and access, as well as questions regarding their exact location and attachment. Improved photo-capturing and documentation will be required for initial disassembly of Nr2 Engine to avoid this problem in the future.



Figure 4.0.1: The last connections are the most difficult

### Cowlings

The remaining engine cowlings are almost complete, having been cleaned, inspected and repaired as necessary and reformed in fixtures, as required. Those not already installed on the QEC have been packaged and stored for re-installation at a later date.

### Auxiliary Gearbox and Generator

This sub-assembly has now been completed and is ready to be installed on Nr1 Engine Bulkhead.

## Nr1 Engine Bulkhead

The bulkhead has been thoroughly cleaned, stencils recorded and removed, fittings and attachments cleaned and reassembled as necessary. It is now ready for the installation of Auxiliary Gearbox and Generator. Stencils will need to be repainted prior to Nr1 Engine being re-mounted.

## Nr4 Engine Propeller

The last propeller and spinner have been removed, disassembled and packaged for shipping to Hope Aero for overhaul. Completing Nr 4 prop will be a major milestone for the project.

## Cockpit Area

Considerable effort has gone into removal of insulation, stripping, cleaning and removal of corrosion, where applicable, of the cockpit ceiling, sidewalls and flooring. The cockpit floor panels have been removed and temporary wooden panels installed to permit continuing work in the area. New floor wooden panels are being constructed from templates and drawings. All areas have been cleaned and reprimed, and a final topcoat paint applied in the original colors.



Figure 4.0.2: Murray Beauluia is building replacement sections for the cockpit floor

The control columns, rudder pedals and centre console must still be removed for cleaning and overhaul. This work will be accomplished during the winter.

The side cockpit windows have been removed and are currently in the Shop for overhaul.

There is still the forward radio rack to be stripped, cleaned and painted, and some areas on the sidewall behind the radio rack have corrosion and need to be addressed. Repainting of the radio rack will necessitate considerable masking off to avoid overspray. This will be addressed next Spring.

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# PROJECT NORTH STAR

Website: [www.projectnorthstar.ca/](http://www.projectnorthstar.ca/)

## DONE!

## TO DO!

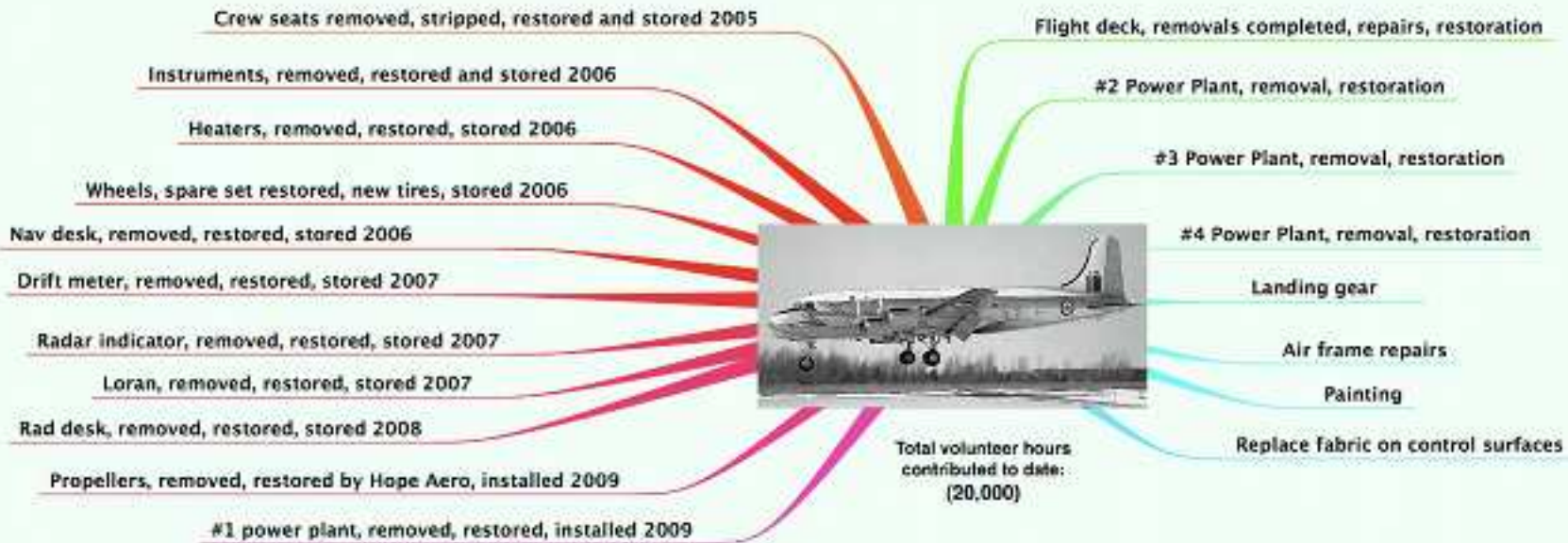


Figure 4.0.3: Chart showing completed tasks and tasks still to be done

# Miscellany

John M. Bouza, the newly-appointed Executive Director of the recently-established foundation that will raise funds for the Science and Technology Museum Corporation, was a guest at the Members Meeting on 12 September. He spoke to members about his responsibilities, explaining that the foundation would be raising funds for three museums: The Canada Aviation Museum, the Agriculture Museum and the Science and Technology Museum. However, the North Star Trust Fund would be maintained and donors would still have the option of directing their donations to this fund. He outlined a few of his ideas for attracting donors for projects such as the restoration of the North Star. For example, recognition and credit for support could and should be on prominent display, encouraging others to contribute as well. It was evident that John Bouzy intends to launch a new era of fundraising for the Museum Corporation.

## Photographs

*Photos in this section by Chris Payne.*



Figure 5.0.1: Certificates of Appreciation were presented to Bruce Gemmill (left-2000 volunteer hours) and to Ed Hogan (1000 volunteer hours) at the Members Meeting on 12 September



Figure 5.0.2: John Corby searches for the missing link



Figure 5.0.3: Rolf Geiger checks out # 2 engine

## Newsletter distribution

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

## PNSAC schedule of events for 2010

- 25.Mar – Board meeting
- 10.Apr – Members meeting
- 27.May – Board meeting
- 12.Jun – Annual General Meeting
- 12.Jun – Board meeting
- 01.Jul – Canada Day at the Museum
- 09.Sep – Board meeting
- 18.Sep – Members meeting
- 18.Nov Board meeting
- 04.Dec – Members meeting

Member's Meetings are held in the Bush Theatre at the Canada Aviation Museum

## Fighter Aircraft Production – World War II

- Spitfire – 20231
- Hurricane – 14533
- P 40 – 13733
- Thunderbolt – 15579
- Hellcat – 12275
- Corsair – 12681
- Mustang – 9293
- Aircobra – 9558
- Messerschmitt 109 – 35000
- Messerschmitt 110 – 6100
- Focker Wulf 190 – 13367

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