

LANCASTER FM159 FLOOR RESTORATION

NOV 2014-JUNE 2016

By Dr. Brian J. Taylor DVM

Restoration Crew:	Greg Morrison AME	team leader
	Brian J Taylor DVM	fabrication and assembly
	Terry Moynihan	woodworking
	Ben Schwartz	welding and fabrication
	Dan Hawken	fabrication and lightening holes

Goals:

- replace wooden walkway aft of bomb bay
- build solid floor to replace H2S opening
- restore and make the downward identification lamps (IFF) operational
- install ammunition ducts to tail turret
- make repairs to damaged skin and formers
- remove and replace fairing on belly aft of bomb bay
- fabricate and install step over starboard ammunition duct at door
- fabricate and install steps to above bomb bay
- repair and install Elsan in war time location

PART 1 INVESTIGATION

This project originated as a plan to remove the wooden walkway and fill in the opening in the floor where the H2S radar was located. The floor panels were removed in this area by grinding off each rivet. Once these panels were removed it revealed extensive corrosion in the location of the post war Elsan. This subsequently lead to the removal of the three outer fairing panels located immediately aft of the bomb bay. This then revealed a wooden lattice support structure that had badly rotted. A decision was made at this point to restore the rest of the floor back to the horizontal stabilizer.

PART 2 CLEANING AND FABRICATION

After removing all of the floor panels it revealed extensive debris and superficial corrosion. All of the support structure under the floor was then cleaned with scotch brite pads and dental picks to get into every crevice. The downward identification lamps and wire harness were removed at this time for restoration.

The two partial missing former sections for the H2S opening had to be made. Greg Morrison made two cardboard templates which were then replaced with plywood prototypes. The plywood formers were then placed in situ and modified as to line of sight with the fuselage. The templates then were sent to Chinook Aviation for the manufacturing of the aluminum former sections and intercostals needed to bridge the H2S opening. Dan Hawken our local machinist extraordinaire created lightening holes in the former and intercostal pieces.

Our woodworking expert Terry Moynihan took on the arduous task of making a new wood lattice support structure for the bomb bay fairing. This piece had to be laminated and curved to match the compound curvature of the underside of the Lancaster fuselage. He did such a superb job that he was requested to make two more for the British Lancasters NX611 "Just Jane" and BBMF PA474.



Skin corrosion under fairing



Skin corrosion



Debris and corrosion under old floor panel

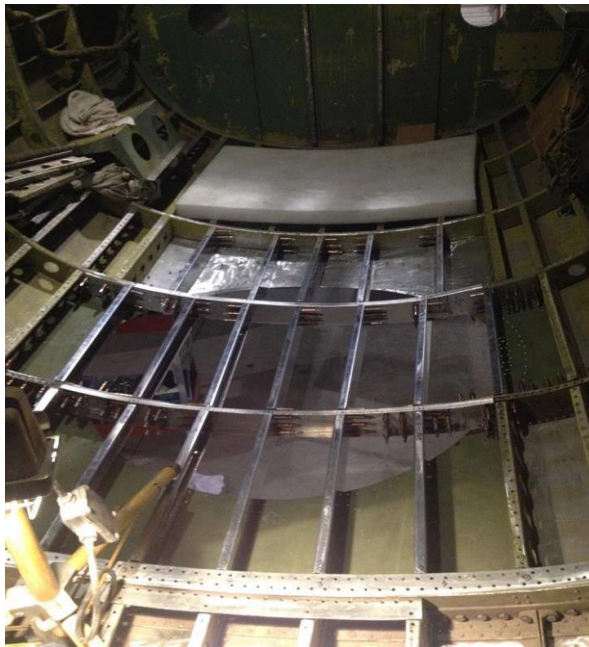
At this point the project split into two components. Greg Morrison began fitting the new formers and intercostals. Each piece had to be hand fitted and trimmed to fit. New connecting brackets had to be made for each end of the new pieces. These were then cleco clamped together to ensure proper fit. The whole structure was then taken apart to be primed and have lightening holes made by Dan Hawken. Once all the pieces were ready Greg then riveted them in place and installed floor shims where needed.



Cleaning mid floor section



Greg fitting intercostals



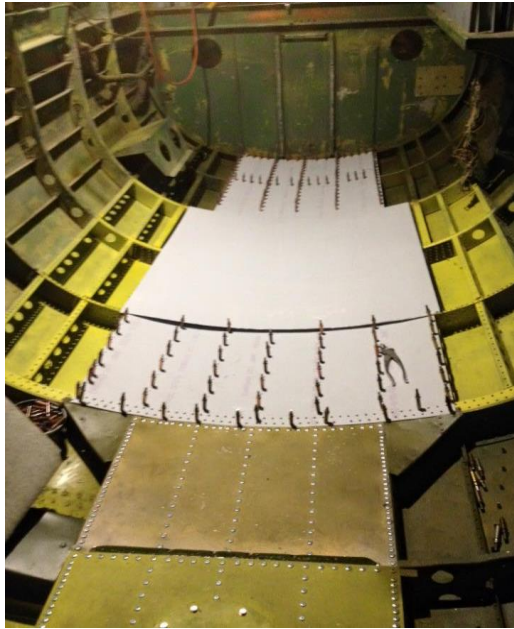
New pieces cleco clamped

My task was to copy each floor panel that was removed and fabricate new ones. Each old piece was used as a template by cleco clamping it down over a new sheet of aluminum. Every rivet hole was drilled and then the parts were cut and trimmed to exact size. All of the rivet holes and sheet edges were then deburred from both sides. The centre floor area was covered with 0.040" aluminum and the outer floor pieces and the fairing was made from 0.032" aluminum. A total of 14 parts were made. The new floor over the H2S opening had to be made by back drilling through the new formers and intercostals. A large circular part was made for the outer skin covering the H2S opening.

The whole floor area was then primed with zinc phosphate as were the parts to be installed. At this point we decided to move the Elsan (chemical toilet) further aft to its war time location just ahead of the horizontal stabilizer. On this floor panel rivnuts were installed ahead of time to allow us to secure the toilet to the floor later on.



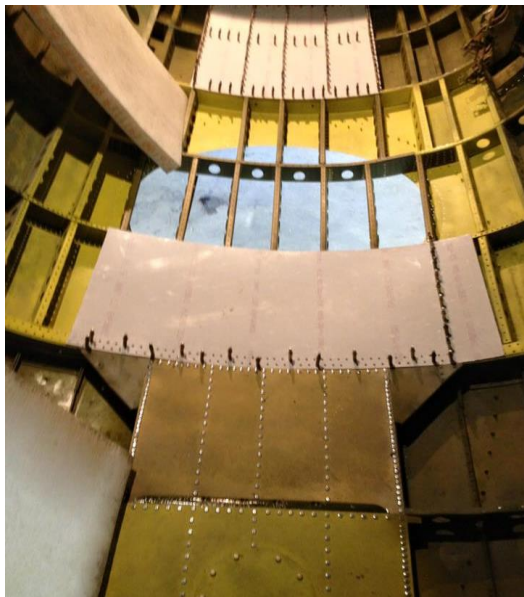
Floor primed



Back drilling new panels



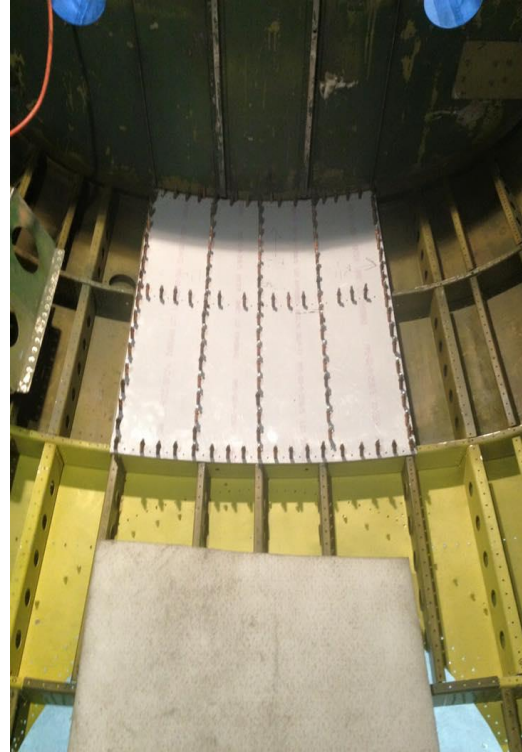
Building fairing



Rough fitting of floor panels



Aft floor panel showing rivnuts for Elsan

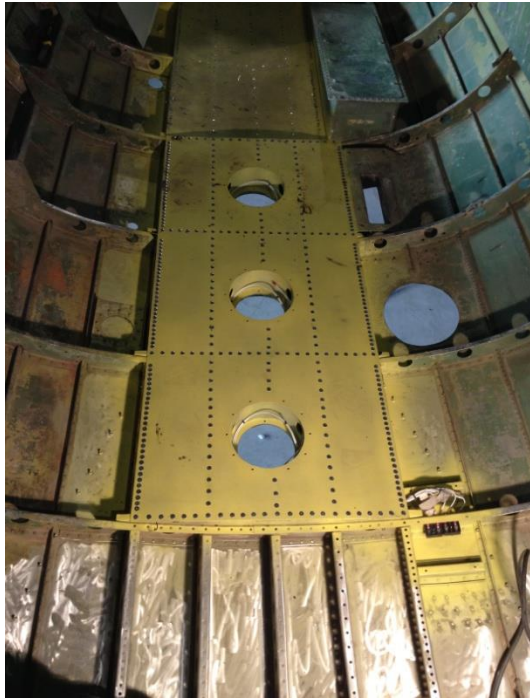


Forward panel up against bombay

DOWNWARD IDENTIFICATION LAMPS (IFF)

Since the floor was being removed a decision was made to make the downward identification lamps operational. The old wiring and some of the fixtures were badly corroded. Greg made up a new wire harness from the lights to JB9 (junction box). I managed to rebuild the lights using parts available from the museum. I installed the new wire harness and fixtures and then began the arduous task of tracing the wiring through the whole aircraft forward to the main distribution panel. New connections were made in the panel at breaker No5. From here, wires were traced forward to the pilot's panel light switches and Morse Code switch. This was a major task that involved checking many circuits to establish continuity.

I was able to source a supply of light bulbs from England that had the correct configuration to fit the receptacles. They even worked! Shane Chipchase was able to cut coloured glass lenses to fit in the lamps-red, green and amber.



IFF floor panel installed



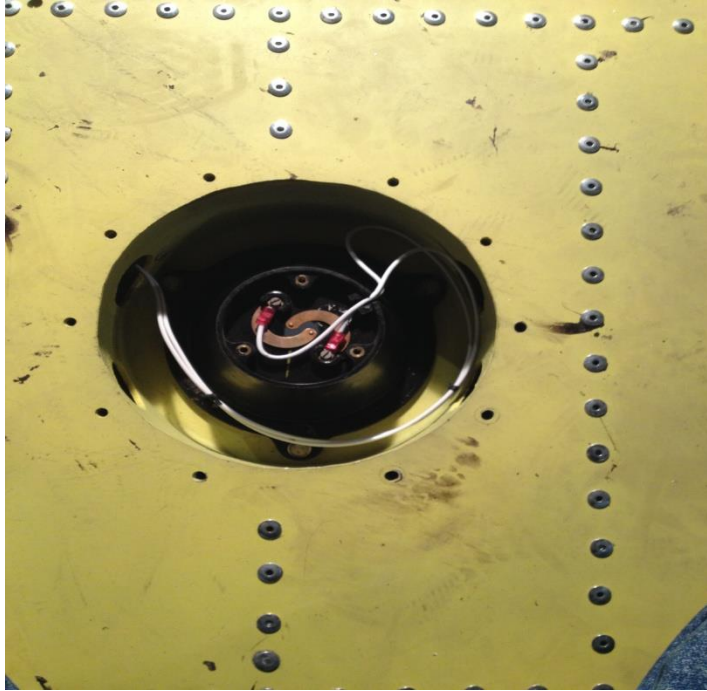
IFF wire harness in place



IFF lights in place



IFF lights operational



IFF fixture inside view

RE-ASSEMBLY

The first step and most challenging was to attach the wooden lattice that supports the fairing aft of the bomb bay. To achieve the proper fit Greg used cargo straps that went around the whole fuselage to hold it in place for drilling. The 3 fairing skins had to be attached at the same time as the #8 bolts went through the skin and lattice and floor. The 3 skins were fastened with solid rivets and the #8 bolts.

The round outer skin piece that covered the H2S opening was secured with solid rivets. Rivnuts were preplaced in the floor to allow the future installation of the H2S fairing.

The remaining assembly involved riveting down 10 individual floor pieces with a combination of 1/8 and 3/16 pull rivets. Proseal was applied to all the intercostals and formers to improve the floor seal and prevent movement.

The whole floor was then prepped and primed with zinc phosphate. Once dry, two coats of wing walk were applied to improve the grip for visitors going through the aircraft.



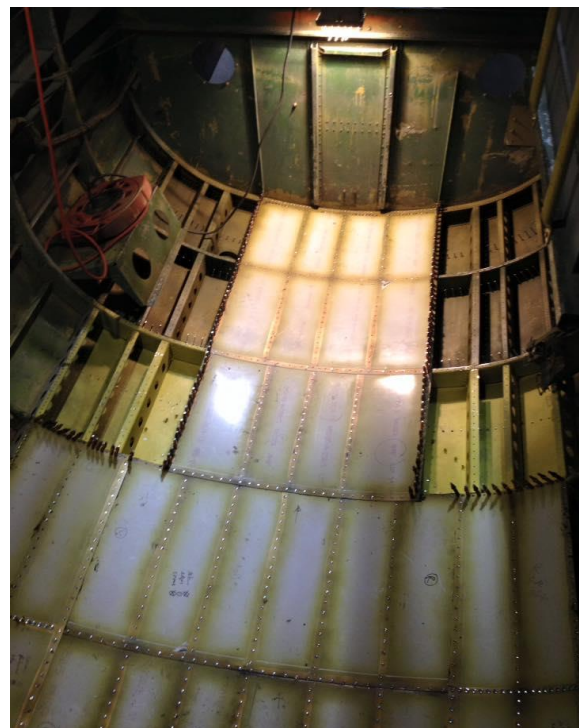
Wooden frame and H2S outer skin in place



Wooden frame being drilled



Fairing installation



Forward floor section



Floor primed



Step over ammo duct



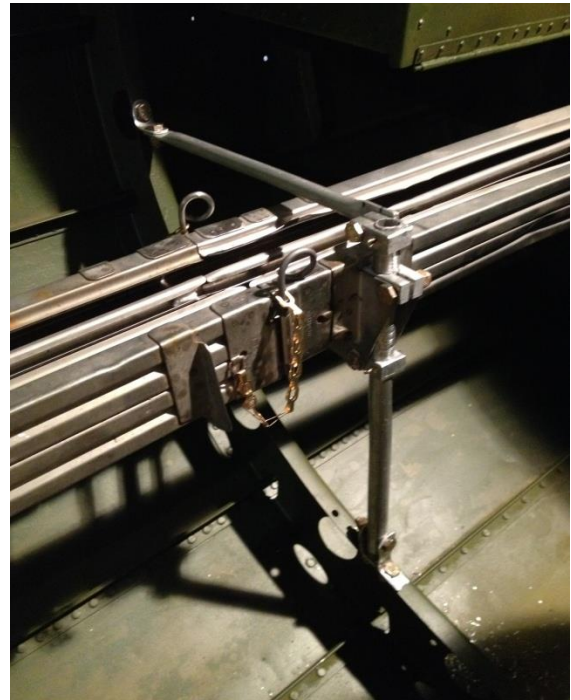
Finished floor with new stairs

Ben Schwartz fabricated and installed stairs that lead from the tail section to over the bomb bay. A newly fabricated step was also installed at the door to protect the starboard side ammunition duct that runs under the door opening. These steps were all completely built from scratch as no drawings existed for their fabrication.

AMMUNITION DUCTS

The museum had about 80% of the ammo ducts that feed ammunition from the ammo boxes at the aft end of the bomb bay to the rear turret. Some of the missing pieces were purchased from Peter Whitfield in Ontario.

I then replaced most of the hardware in the individual pieces as most of these were severely corroded. Dan Hawken and Greg fabricated some of the missing brackets and hardware needed to install the ammunition ducts. I then assembled the pieces in the aircraft and began the arduous task of mounting them using war time plans showing which formers to secure them to.



Ammunition duct mounts



Starboard ammo duct



Brian Taylor installing port ammo duct

SUMMARY

This project was completed entirely by volunteers with all repairs being made to airworthy standards. The estimated time was about 600 man hours of volunteer time and 3000 rivets! Many thanks to all of those involved in the project.