

McLennans Diving Service

- Marine Contractors

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To Martin Dawson
Department of Crown Lands

From Alan McLennan
Project Manager

12th June 2022

LTMP Inspection of ex-HMAS Adelaide wreck April/May/June 2022

McLennans Diving service (MDS) inspected ex-HMAS Adelaide to carry out the requirements of the Long-Term Monitoring and Management Plan (LTMP) for structural condition monitoring. This report covers the requirements of that Plan and includes inspection of the barred off areas in the upper superstructure and Ultrasonic Thickness (UT) testing of the six Monitoring locations. MDS Divers carried out the survey of the wreck on April 2nd, 3rd, and 9th 2022 and then in blocks from May 2nd to 6th and June 6th to 10th, 2022.

The Dive Team was supervised by David Allchin and Alan McLennan with the five divers Daniel Fell, Zoe Pocklington, Stafford Malapa, Ben Davis, and Robbie Buck. All the divers hold ADAS Part 2 or 3 qualifications and are experienced naval ship inspectors. The team operated from the 2C surveyed vessels "Sea Hunt", "Sea Runner" and "Cape Diver" The diving method was a combination of SCUBA buddy pairs, SCUBA using AGA Divator masks with hard wired voice communications, and SSBA using KM28 helmets with hard wired voice communications. Also used was the Deep Trekker Revolution ROV.

The inspection this year was complicated by two periods of record rainfall and heavy seas in January and February. This produced large muddy outfalls from the Hawkesbury River which impacted the wreck by depositing silt internally and breaking off sections of the hangers.

Executive Summary

The vessel has not changed its position and no deterioration has been observed to the steel hull. The aluminum superstructure has deteriorated badly. Two sections of the hanger wall were removed as part of this work. Flood waters deposited silt into a compartment on 01 deck. The aluminum panels and frames are in an advanced state of decay and further collapses can be expected. A new opening was cut into the starboard wall to allow current flow through the space to remove the silt.

Results of the survey

Hull Integrity –

The vessel can be divided horizontally into two halves. The top half is the aluminum superstructure and the lower half below the main deck is the steel hull.

The Steel Hull - The lower half of the vessel below the main deck has suffered little deterioration since the sinking. This continues to be the case. No corrosion, cracking or displacement of fittings was observed on the outside or inside of the steel hull. All entrance ways inspected were clear. All long-term monitoring points were inspected, and no deterioration was found since our last inspection. These locations were:

- the Missile launcher opening,
- the Forward screen,
- the Hangar frames.
- the Transom

The Aluminum Superstructure - The upper half of the vessel has continued its steady rate of deterioration. There is very widespread corrosion. The outer sheeting is heavily corroded along the welds to the stringers and frames and in the center of the panels. The frames are heavily corroded at the frame connections. The corrosion is not uniform. Some panels are highly corroded, and some appear to be unaffected.

The aluminum panels and frames are welded to the steel hull along a 100mm high vertical steel flat bar that extends at right angles from the main deck. These aluminum panels and frames have commonly broken at this joint. The aluminum superstructure has reached a state of deterioration where additional panels would be expected to be broken out with every large swell event.

There have been numerous new openings created into the aluminum superstructure along the 01-deck by the swell surge. These are shown in the attached drawing. In general, when these panel break out, it is a clean break, and no further attention is required.

MDS found two swinging panels in the hanger area. One panel formed the inside wall of the port hanger. The second swinging panel was on the starboard hanger outer wall. The details of these two panels and their removal follow below.

Swinging Panel 1 – Port Hanger - Interior wall. – This wall once formed the inboard wall of the port hanger. On one side of it was the port hanger, and on the other was the central access companionway from the flight deck. This wall was broken along the joint to the steel hull and was swinging between a pipe stub and a railing. It was held in place by its connections to the upper decks. The swinging wall dimensions were 14 metres long by 2.5 metres high. Initially MDS believed the swinging part of the wall extended to the top of 02 deck. However, upon closer inspection it was realized that there was a second companionway above the lower one, and the bearers that supported this upper floor were in sound condition. Together with the 02 deck this companionway forms a box shape which appears to be stable

Swinging Panel 2 – Starboard Hanger –Exterior wall – Most of the outer starboard hanger wall has already blown out and washed away. This panel was 6 metres high and up to 2 metres across. It was being held in position by parts of the outer sheeting.

Removal of the swinging panels

MDS were asked to remove these swinging panels by the Department of Crown Lands. This was done during two stints from May 2nd to 6th and June 6th to 10th, 2022. The method used was to cut through the critical frames and stringers supporting the panels, so that the swell surge would break them free. The tools used were a variety of hydraulic circular saws operated by the divers using SSBA diving equipment.

The result was that both walls were broken free and only tidying up was required upon returning to the site on June 6th.

Present State of the Remaining Hangers

The entire port hanger washed away in March 2021. The starboard hanger roof is still intact, but 90 percent of the starboard outer wall and its frames are missing. The starboard roof is intact but extremely corroded. There is a significant amount of weight still supported by the roof. This includes the roof panels and beams, but also the overhead lifting beam and pulley, and various ventilators and fittings on O2 deck. This roof is certain to collapse soon, as very little is left holding it up.

The central companionway is attached to the flight deck observation compartment. This is a strong point holding up what remains of the hangers. Now that the port side wall is gone, the upper companionway on O1 deck is cantilevered over the lower companionway and all the remaining weight is supported by the interior starboard hanger wall. See Figure 7. This wall now receives the full force of the swell surge from port and starboard. I expect that soon this wall will also break along the join to the steel hull, and then the entire hanger structure will collapse.

Siltation in the forward Spaces

The two large compartments below the bridge on O1 deck and the main deck, both accumulated a large amount of silt and sediment deposited by flood waters from the Hawkesbury River. These compartments have the unusual feature of having only aft facing entrances. They are large spaces with the second entrance not visible from the first entrance. It was found that the rooms rapidly “silted out” if a diver entering the spaces and moved carelessly. In a “silt out” the exits were no longer visible. The Department of Crown Lands directed MDS to cut an opening in the compartments to allow the silt to exit the compartment.

On further examination it was found that the compartment on O2 deck had “self-cleaned” itself of light sediment since our initial examination due to better water passage through this space.

The space on the main deck remained full of thick silt, so an opening was cut on the starboard side, right behind the weather shield. The opening dimensions were 1.7 metres high and 0.8m wide. The opening extended upwards from the main deck and was positioned between two frame members.

When the panel was removed a rush of water commenced flowing through the opening

taking a large cloud of silt with it. An inspection the next day revealed that much of the silt had now left the compartment and MDS expect it to empty of silt over the next week.

Barred Off areas – The 32 barred off areas on Page 25 of Annex A of the LTMMP were examined and all bars were found to be in place except for the destroyed Hangar Catwalks and Captain’s Bathroom.

Vessel List and Trim - The vessel remains at the same list as in previous years at approximately 4 degrees to port. This was determined by use of digital depth gauges on the gunwales amidships and a spirit level placed on the hangar deck. The trim of the vessel was also unchanged. The sand level was similar to previous years with the sand being very close to the vessel’s seagoing waterline. The duckbill on the transom was just under the sand and the bow was buried to the tip of the keel.

LTMMP Monitoring Locations –Thickness Testing

In addition to visual monitoring, the locations were also thickness tested at three separate points close to the monitoring point. The method used was as follows at each area to be measured:

- An area was selected for testing and its position was recorded.
- An area 100mm in diameter was scraped clean.
- An Olympus 26MG ultrasonic thickness gauge with a 60-metre-long probe cable was used to measure the metal thickness. The probe was placed on the cleaned area and the diver notified the surface team by two-way voice communications.
- When a stable reading was achieved the Diving Supervisor recorded the thickness and told the diver to move to the next location.
- The thickness test results were recorded in the table below

Location – Main Deck except for Location 6	Frame Number	Recorded thickness (mm)			
		Nominal	2020	2021	2022
1 – Hangar Deck – 300mm aft of the centre pillar –	335	6.35	6.79	6.8	6.68
2 – 300mm off the change in shape at waist on the port side -	180	7.95	7.73	7.68	7.70
3) 300mm off the change in shape at waist on the starboard side -	180	7.95	8.01	8.08	7.99
4) 300mm off the base of the weather shield – port side	100	6.35	7.53	6.88	7.20

4) 300mm off the base of the weather shield – port side	100	6.35	6.51	6.5	6.45
5) 300mm off the missile launcher opening	85	9.52	10.9	9.57	9.58
6) Base of main mast 02 deck	Too corroded to measure				



Figure 1: The diver placing the Olympus MG26 probe on a cleaned location for a thickness test. Note the grey paint still intact. See Figures 20 to 25 below that show the excellent condition of the steel hull.

LTMMP Monitoring Locations – Visual Monitoring

The Divers made note of the monitoring items listed in the LTMMP Locations 1 to 6.

- Location 1 – The hull plating on the forecastle just aft of where the GMLA launcher. There has been no deterioration in this area.
- Location 2 – Amidships at the base of the forward weather screen (where the superstructure and hull are bonded together) – There is no visible deterioration in this area. There is no sign of any separation between the forward screen and the hull.
- Location 3 - At the vertical midpoint of the main masts – The mast appears to be in a similar condition as 2021. The entire main mast was examined however the mast is heavily encrusted with marine life restricting a detailed examination. There appears to be no sign of cracking or deformation. All parts of the mast remain straight and true. The base of the mast was also closely examined, and no sign of cracking or deformation were observed.
- Location 4 – The connections of the masts to the 02 deck. There is no sign of any deterioration in the legs. No cracking or deformation was observed. However, the aluminum plating that the legs pass through has severely corroded.
- Location 5 – The hull plating on the transom – The transom area has changed very little since the sinking.
- Location 6 – Where the helicopter hangars are attached to the hull. The port side hanger broke away completely in March 2021. The entrance to the central companionway is still intact and the roller door opening to the starboard hanger.
- Internal Debris – The internal openings were clear of debris when last inspected on June 10th 2022. Since our last inspection there is an increased number of loose fittings such as floor mats, panels, cupboards which are laying loose inside the vessel but are not currently blocking any access ways or impeding divers.

Moorings

Both Special Markers were intact and in position. All four mooring buoys were in position and had been recently replaced. They were all in good condition.

Marine Life

The marine life is bountiful and diverse. There are numerous ecosystems being supported by the wreck site. The type of ecosystem depends on the depth of water. The mast still holds dense plant life. The lattice work mast of the wreck still attracts many schooling bait fish such as the Yellowtails, and predator fish such as Kingfish, Cobia, and John Dory. There has been a noticeable increase in the quantity and size of Wobbegong sharks lying about the ship. In most of the internal compartments we found a Wobbegong. The proximity of these creatures may cause distress to inexperienced divers when swimming through enclosed spaces in the wreck.

Additionally, this year we noted the regular presence of a seal and hammerhead sharks on the surface.

Safety for Recreational Divers

The wreck has reached a state of deterioration which means that the panels and frames in the aluminum superstructure will fail regularly. This creates new risks for recreational divers, especially the inexperienced. These risks include entrapment, snags, crush injuries and disorientation. The most important control for diver safety is training and supervision. The provision of detailed briefings and divemaster services with local knowledge will greatly reduce the risk to inexperienced divers. Verification of competency (VOC) through certification and logbook checks will also enhance safety. MDS recommends that extra vigilance be given to the above points in view of the deterioration in the vessel.

Recommendation for Further Structural Modification

The starboard hanger roof is certain to fail soon. It is a spectacular space to dive through, but it is held up by very little, and has a surface area of 142 sq metres. This means it is subject to tremendous forces from the swell surge. It is suspended six metres above the main deck, so when it falls it will be with great force. MDS recommends that Crown Lands considers deliberately dropping this roof to the main deck now, rather than waiting for it to fall. It will be easier and possibly cheaper to drop the roof now than to deal with the tangled mess that may be left after it collapses.

Conclusion –

All parts of the LTMMP were completed. Additional work was undertaken to remove the two swinging panels in the hanger area and to release accumulated silt under the bridge.

The wreck has reached a state of deterioration that means that the aluminum superstructure panels and frames are subject to failure and being washed away. The most likely item to fail next will be the starboard hanger. MDS recommends action be taken now to remove the hanger.

Thank you for asking us to undertake this inspection. Please find following drawing and photos that illustrate the points made in this report. Also, in the accompanying email find links to videos shot during this survey.

Kind Regards

Alan McLennan
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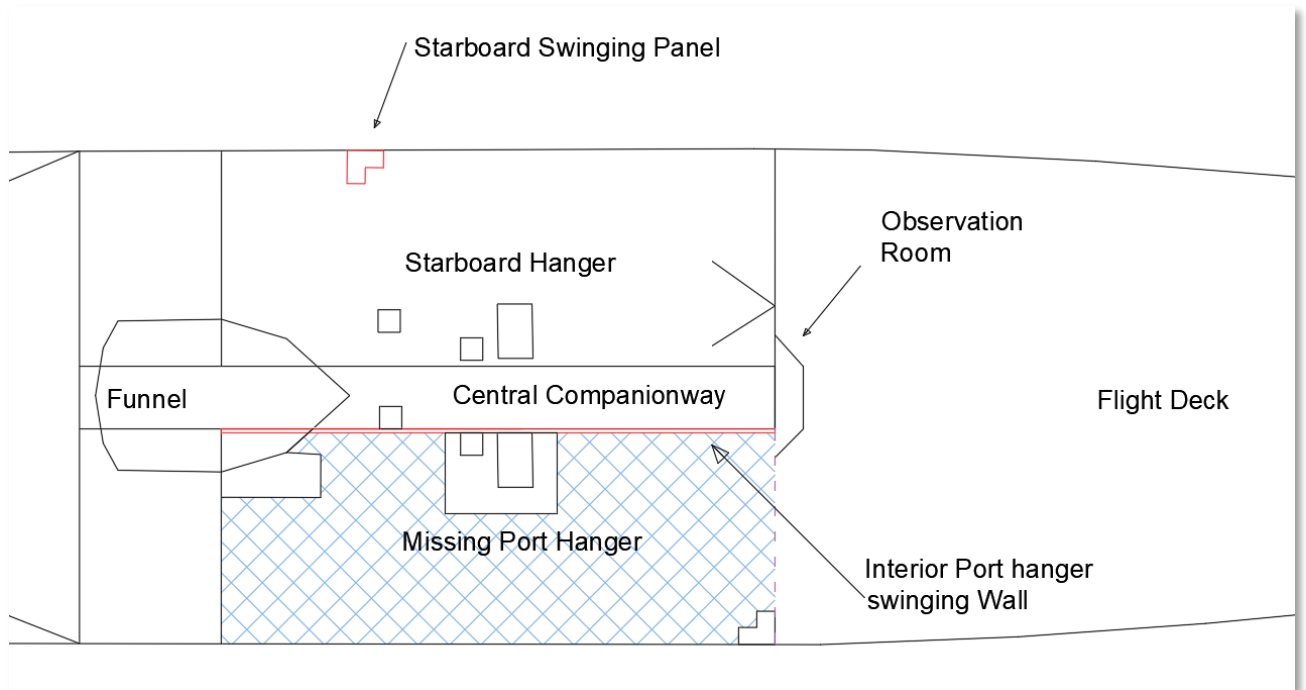


Figure 2: A plan view of the hangers showing the location of the swinging panels that were removed in red. The blue hatched area is missing.

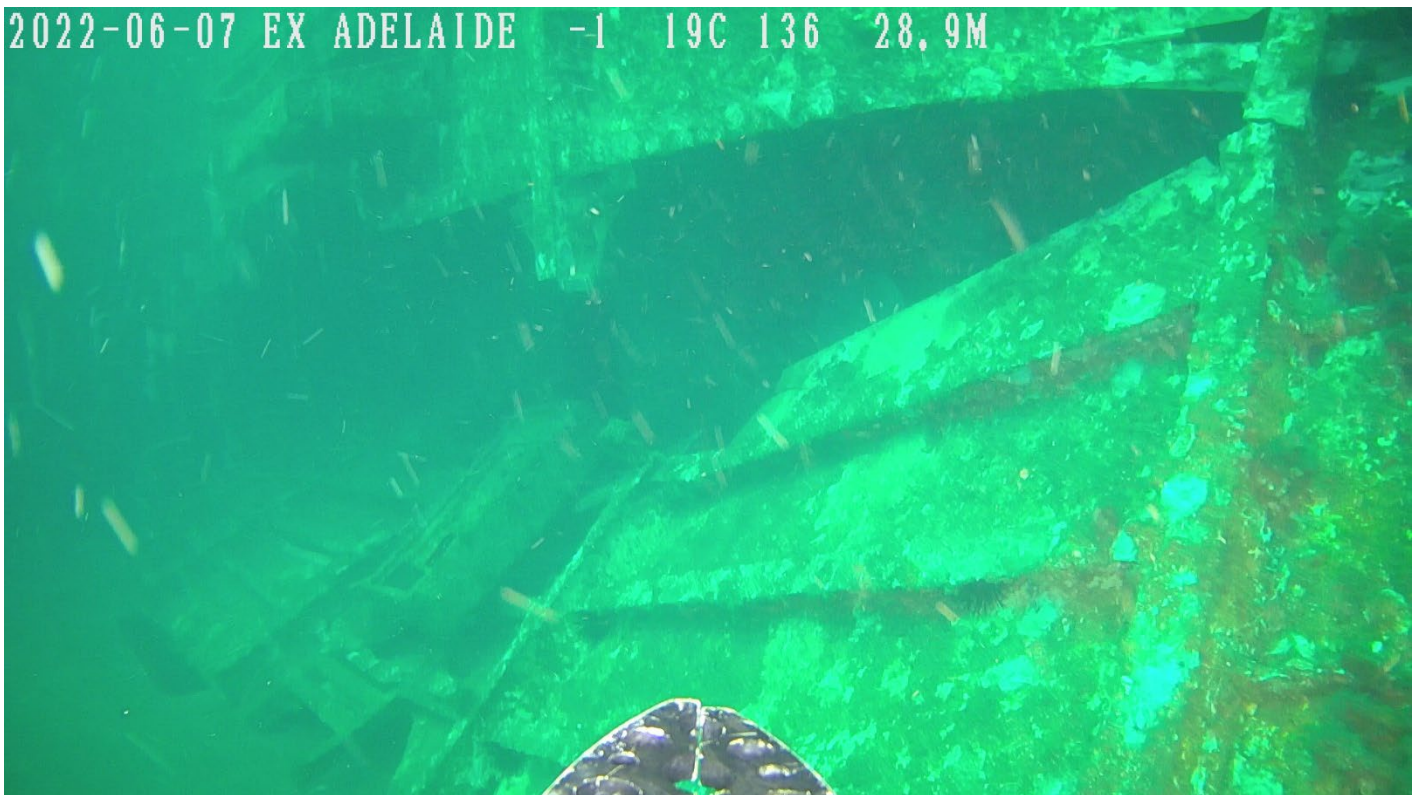


Figure 3: The interior port hanger wall after it collapsed. The remaining hanging portions were dropped to the main deck.



Figure 4: A view out of the starboard hanger through the missing hanger outside wall. Note the lifting beam and pulley in place



Figure 5: The panel on the starboard wall of the starboard hanger that was removed. There is no support for the starboard hanger

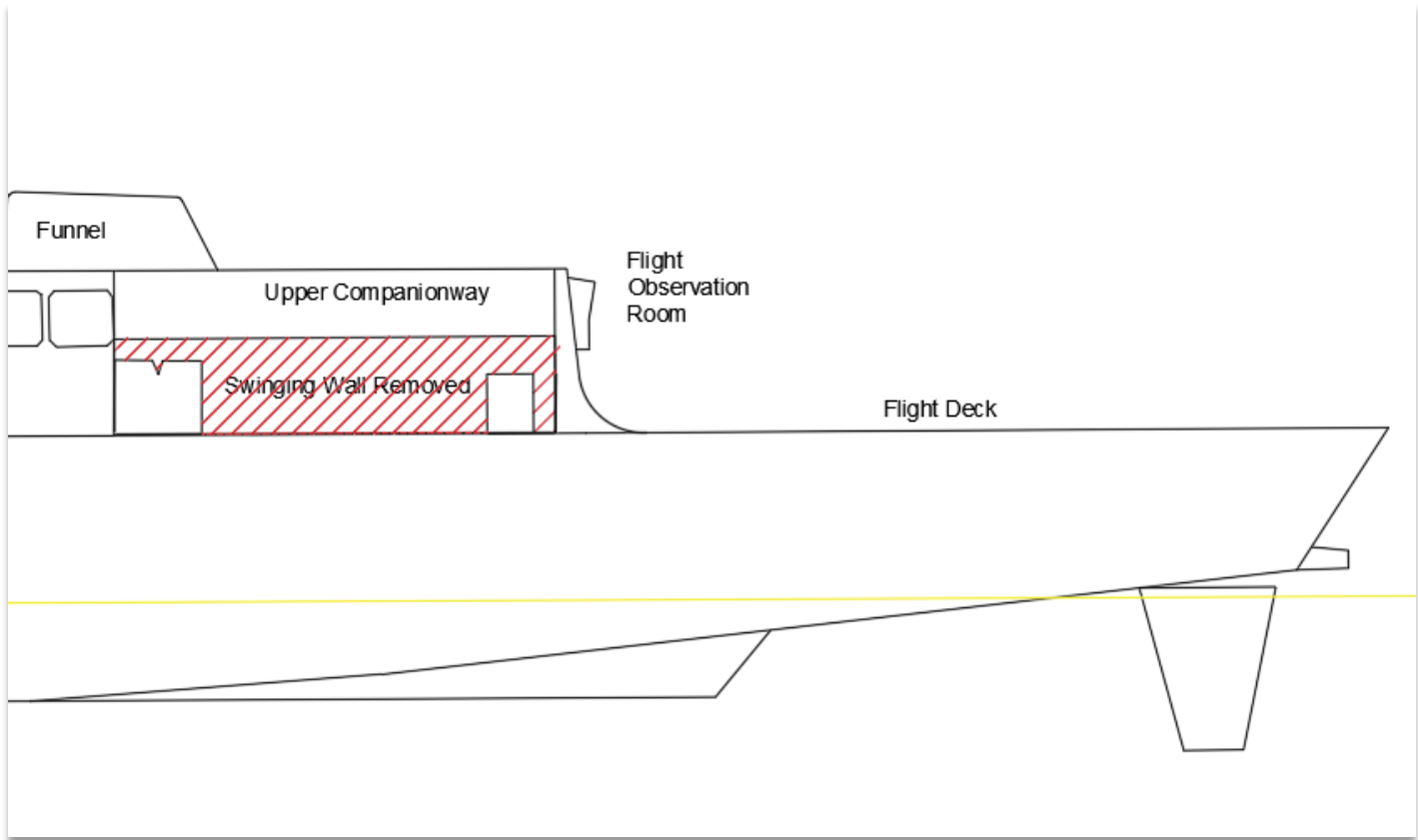


Figure 6: A view of the port side hanger. The hanger is missing. The red hatch shows the swinging wall that was removed



Figure 7: The separated hanger wall to the left and the 100mm high steel stub on the main deck that it was welded to. The aluminum superstructure is breaking off along this seam in many places on the main deck.

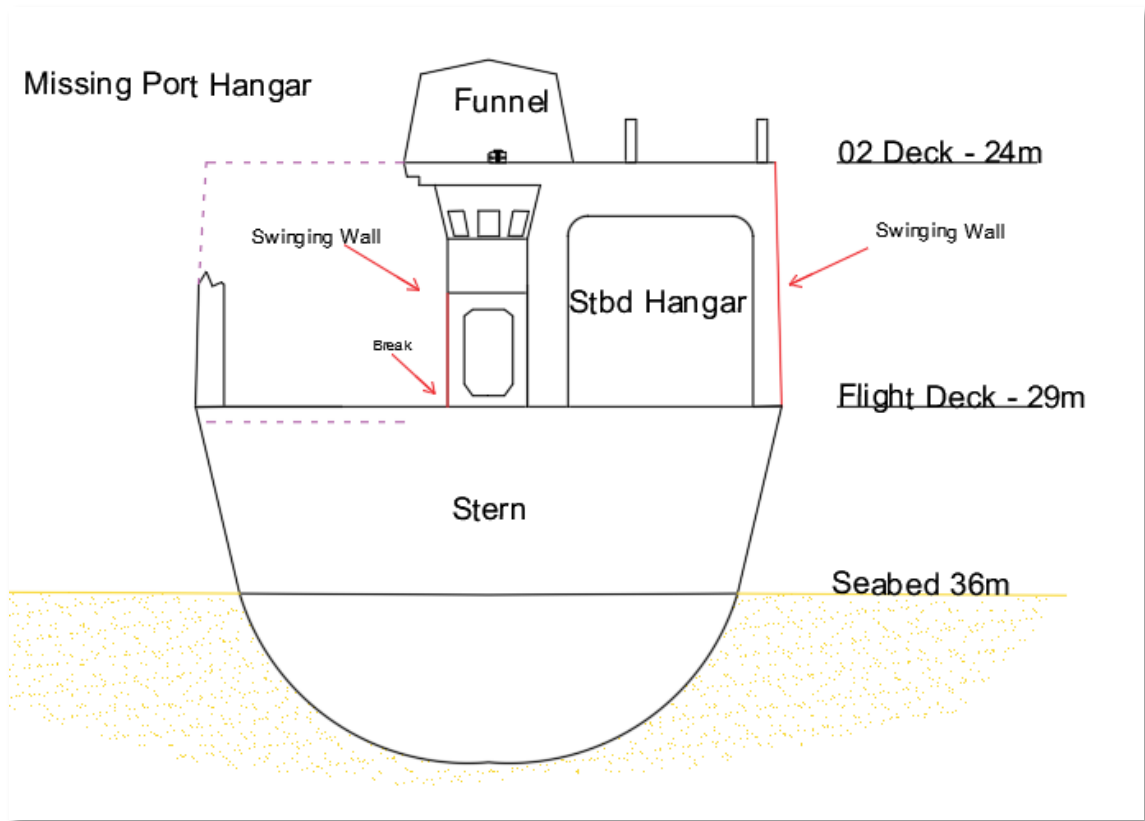


Figure 8: A view of the stern looking forward. The swinging panels that were removed are shown in red



Figure 9: Looking up at the roof of the central companionway. This is the floor of the 01-deck companionway. The interior hanger wall was to the left.

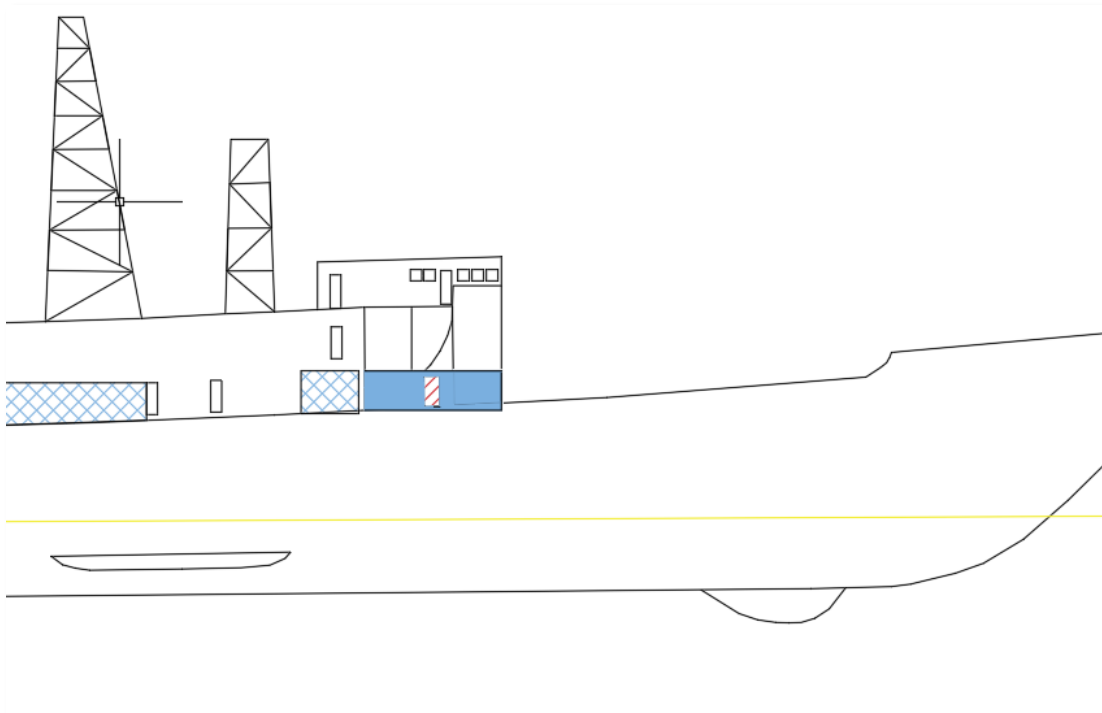


Figure 10: The starboard side of the bridge showing the large compartment (in solid blue) that was full of silt. The red hatch represents the new opening that was cut into the wall to allow the silt to be released. The blue hatched areas are walls that are already blown out.



Figure 11: The opening cut into the outer starboard wall shown above measuring 1700mm by 800mm



Figure 12: A wide view showing the Flight Deck Observation room and the missing port hanger. The collapsed interior hanger wall is in the bottom left corner. The starboard hanger is to the right.



Figure 13: A similar view to the one above of an FFG when in service, showing the flight deck and observation room. The door below the observation is the entrance to the central companionway.



Figure 14: Looking aft at the remaining hanger roof with the funnel to the left, and ventilators in the distance. The removed swinging wall is at the bottom right



Figure 15: Looking aft towards the end of the hanger roof, the missing port hanger is on the right. The starboard lifting davit is to the right. This davit can be seen to the right in Figure 13.



Figure 16: Typical internal wall extreme corrosion



Figure 17: Another view of typical internal wall extreme corrosion. The corrosion is not uniform.



Figure 18: Typical corrosion holes in 02 deck behind the bridge

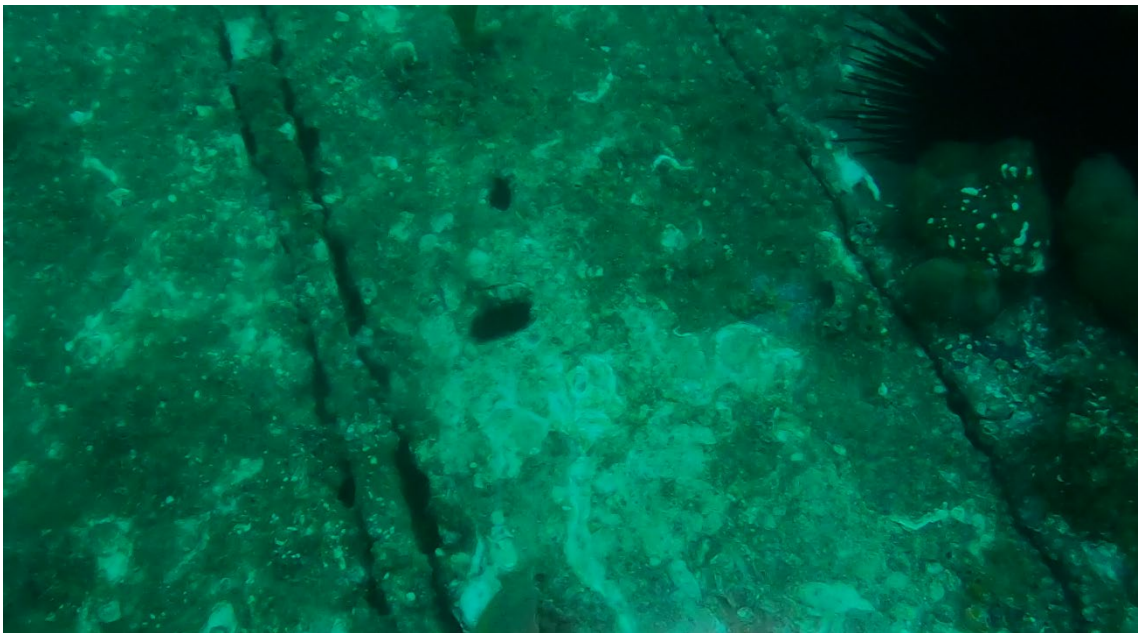


Figure 19: Typical corrosion along the weld lines of frames to panels. Note that the frames have completely separated from the panels



Figure 20: Thickness testing point on the main deck amidships starboard side. The steel is still painted and no corrosion is present. This is the case for all thickness testing points on the main deck



Figure 21: Thickness testing point port side main deck. Note the steel plate stub where the 01deck aluminum wall has broken along the weld seam to the steel deck. The red circle highlight the point where a frame was welded.

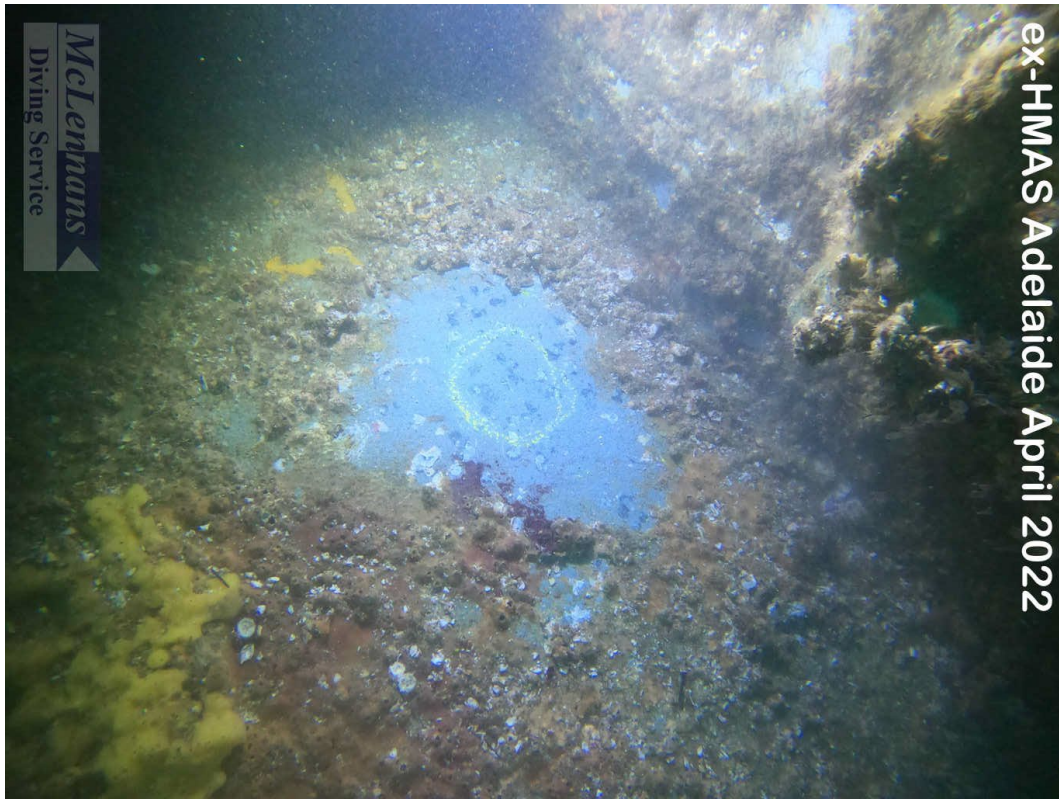


Figure 22: Thickness testing point at the base of the weather shield - starboard side

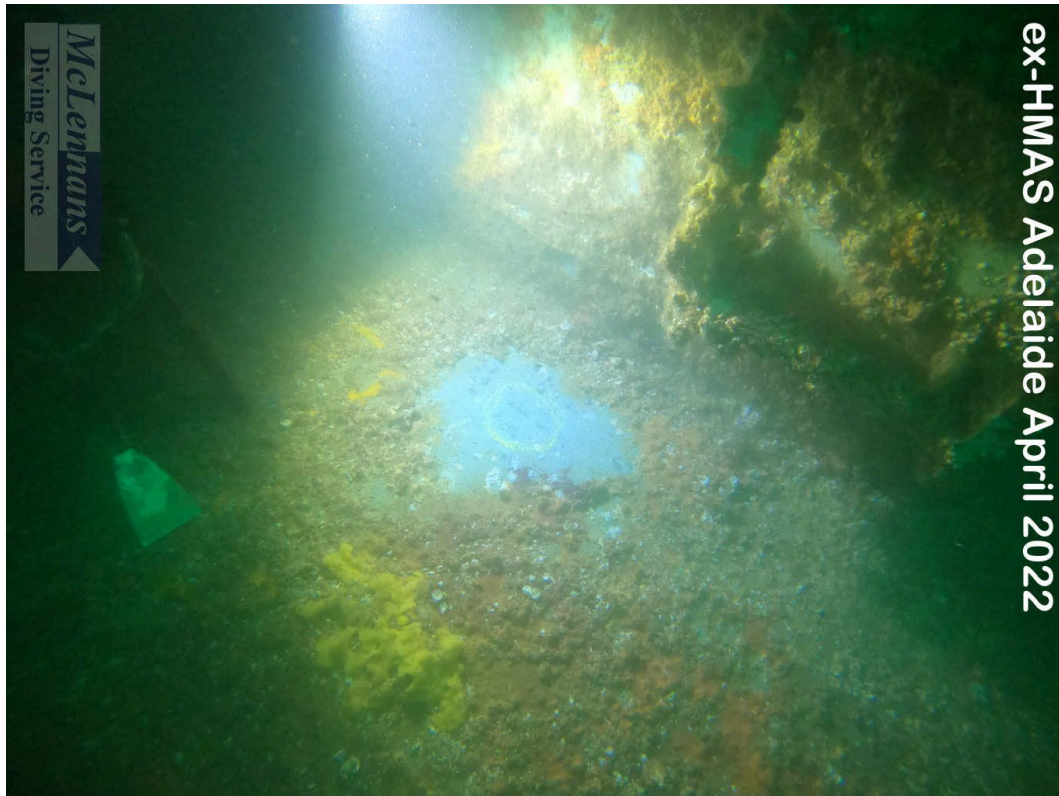


Figure 23: Thickness testing point at the base of the weather shield - port side



Figure 24: thickness testing location on the flight deck



Figure 25: Thickness testing location at the Missile Launcher



Figure 26: All barred off areas examined had entry bars in place



Figure 27: All barred off areas examined had entry bars in place



Figure 28: All barred off areas examined had entry bars in place



Figure 29: All barred off areas examined had entry bars in place



Figure 30: The number of wobbegong sharks has increased markedly. The sharks are generally docile but may cause stress in inexperienced divers especially in enclosed places. They are known to bite if molested.



Figure 31: Wobbegong at the bridge



Figure 32: Wobbegong in 01 deck



Figure 33: Wobbegong in 02 deck



Figure 34: The "Captain's chair" on the bridge has mostly collapsed since 2021



Figure 35: Typical silt deposits in the enclosed compartment on the main deck behind the weather shield. A panel that was opened on the starboard side which should clear this out.



Figure 36: Typical silt disturbance in the enclosed compartment in 01 deck before the starboard wall was opened. The enclosed compartment silted up very easily.



Figure 37: The silt build-up in the enclosed compartment against the starboard wall. This is the location that the opening in figure 10 was made



Figure 38: Diver gas control panel and communications box



Figure 39: Diver Dan Fell ready for water with attendant Ben Davis. The vessel in the background is carrying the hydraulic power pack and saw.