National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594

DCA22MA193

SEARCH AND RECOVERY

Group Chair's Factual Report

February 16, 2023

A. ACCIDENT

Location: Freeland, WA
Date: September 4, 2022
Time: 1509 Pacific Daylight Time (PDT)
2209 Coordinated Universal Time (UTC)
Airplane: de Havilland DHC-3 Otter, N725TH

B. SEARCH AND RECOVERY GROUP

Group Chair	Clinton R. Crookshanks National Transportation Safety Board Aurora, Colorado
Member	Van S. McKenny IV National Transportation Safety Board Los Angeles, California

C. DETAILS OF THE INVESTIGATION

1.0 Initial Response

Initial responders to the accident site included several private citizens, the United States Coast Guard (USCG), Island County Sheriff's Office, Washington Department of Fish and Wildlife (WDFW), Customs and Border Patrol, and Tulalip Tribes. Private citizens recovered one floating victim and several pieces of floating debris that were turned over to the sheriff's office. The USCG continued search and rescue operations for about 24 hours after the accident. WDFW continued searching the area for evidence of the wreckage the day following the accident using onboard fish finding sonar equipment. A WDFW diver deployed on a sonar target identified at 47° 59.402 N, 122° 34.732' W with the approval of the NTSB. The target was identified as a large glacial erratic, a glacially deposited rock differing from the type of rock native to the area.

2.0 Wreckage Search

2.1 WDFW Search

On September 6, 2022, the group chair deployed with WDFW on their 30 feet long North River patrol boat equipped with Furuno fish finding sonar and multibeam sonar to search the waters of Mutiny Bay near the last automatic dependent surveillance-broadcast (ADS-B) location of the airplane. No obvious targets were identified that were consistent with airplane wreckage after searching an area about 1 nm north-south by 0.5 nm east-west. The WDFW also performed a search of Mutiny Bay for items of floating wreckage that were reported by a citizen with no result.

2.2 NOAA Search

On September 7, 2022, the National Oceanic and Atmospheric Administration (NOAA), Office of Coast Survey, Acting WA Navigation Manager contacted the NTSB Western Pacific Regional Office offering assistance. The group chair deployed with the NOAA Navigation Response Team-Seattle on September 8 on their 34 feet long aluminum survey boat, *S3006*, outfitted with a Kongsburg EM2040C multibeam sonar and an EdgeTech 4125 side scan sonar. The side scan sonar was mounted on a pole on the port side of the vessel. The survey team scanned an area of the seafloor about 1.9 miles long by 0.75 mile wide surrounding the area of the last ADS-B return from the airplane and the location of a recovered floating victim (Figure 1). Multiple possible targets were identified during real time examination of the side scan and multibeam returns. At the end of the day the sonar data was downloaded for post processing. The NOAA surveyors discovered during post processing that the side scan sonar data was corrupted so they focused on the multibeam sonar data. NOAA compared the recorded multibeam sonar data to a dataset gathered in 2012 of the same area and focused on the differences between the two datasets. NOAA provided the NTSB with information on 4 groups of targets that were distinctly different from the previous data. The most promising target was about 70 feet north-northwest of the last ADS-B return and was about 65 feet long by 16 feet wide by 11.5 feet high (Figure 2) and at a depth about 200 feet.

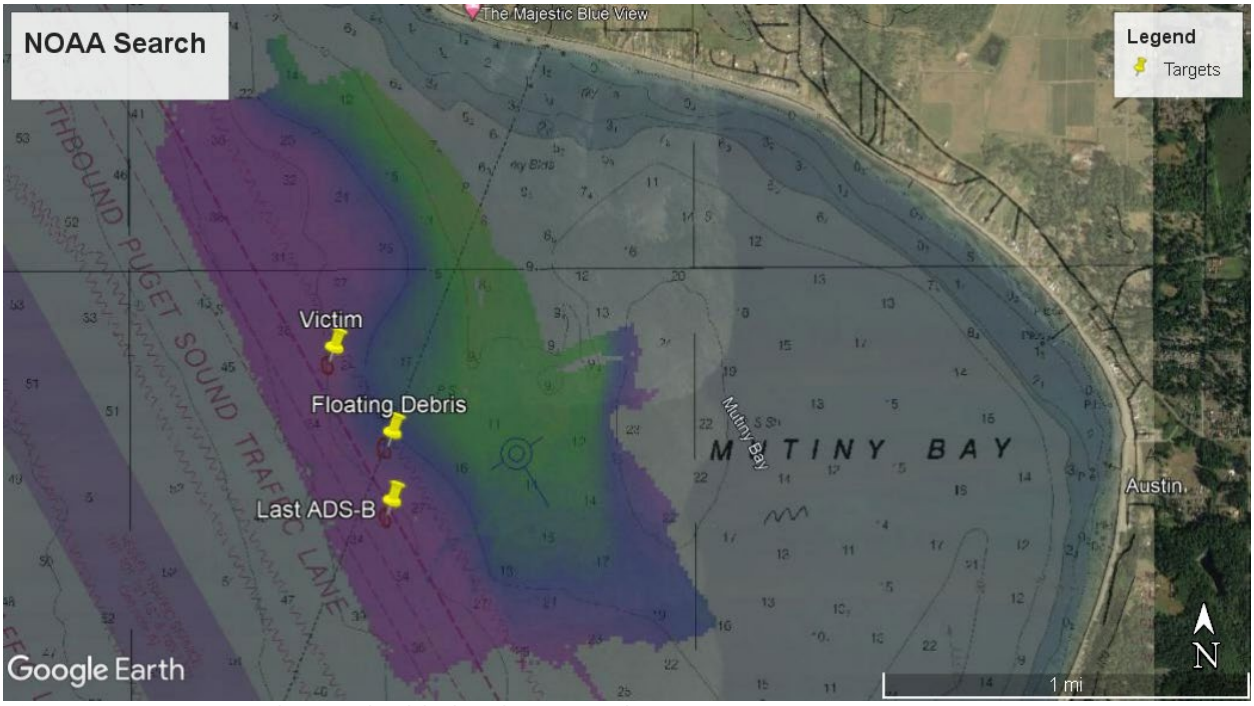

Figure 1. NOAA search area (highlighted), September 7, 2022

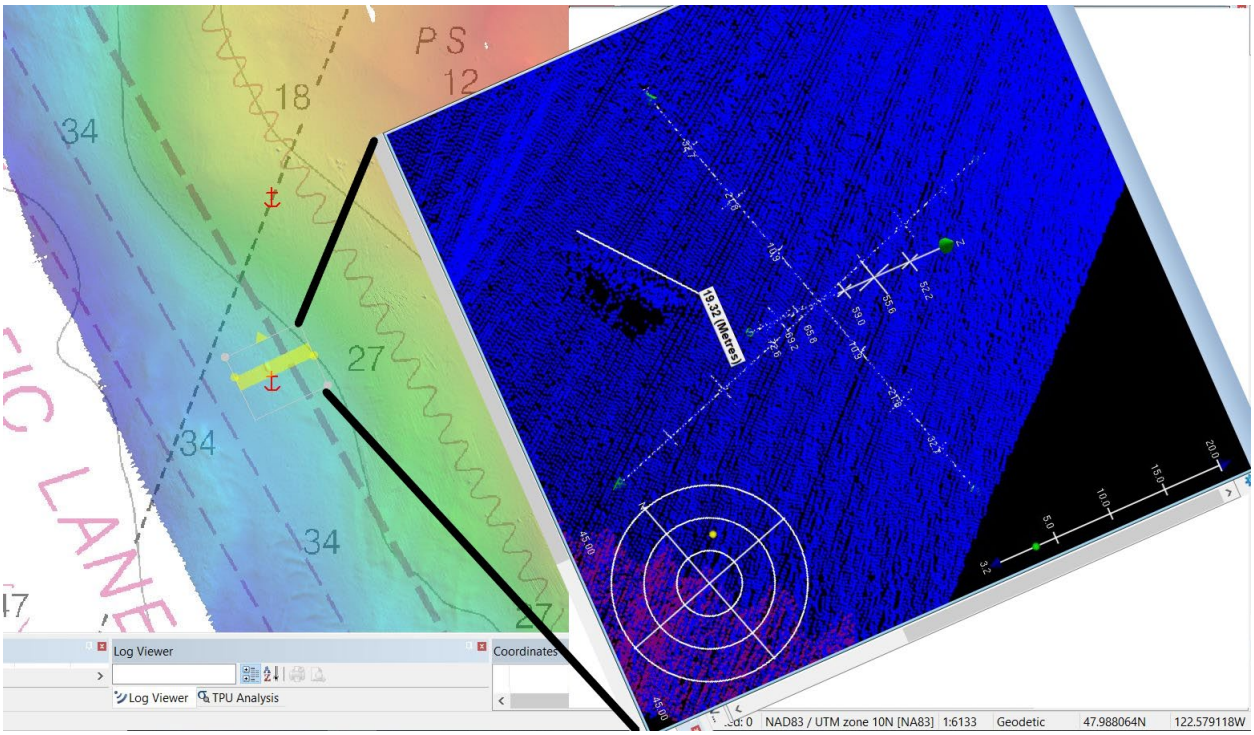

Figure 2. Large target on seafloor identified by NOAA

The NOAA Office of Response and Restoration, Emergency Response Division also provided the NTSB with a drift model for any airplane debris using the measured current data in the Mutiny Bay area, data points for the last ADS-B return, recovered floating debris locations, and floating victim recovery location that were input into their Salish Sea Operational Forecast model. The analysis showed that any floating debris or lightweight sinking debris would be carried northwest at the time of the accident.

2.3 Remote Operated Vehicle (ROV) Research

The NOAA target information suggested that there was a large piece of wreckage on the seafloor that required positive identification so the group chair began researching local federal agencies, state agencies, and private contractors for a suitable ROV that could perform a visual search of the target given the tidal current conditions at the location. Contact was made with the Army Corps of Engineers, Washington Department of Transportation, Coastal Sensing, Inc., and Inner Space Exploration. None of the ROVs identified had the ability to operate with the tidal currents in the area that peaked from 3-5 knots.

2.4 UW-APL Search

The University of Washington Applied Physics Laboratory (APL-UW) contacted the NTSB the evening of September 8 to offer assistance. The scientists and engineers at APL-UW had developed and tested a Multi-sensor Towbody (MuST) for

use in detecting unexploded ordinance on and below the seafloor. The MuST is a flyable underwater platform equipped with an EdgeTech 2205 high-resolution side scan sonar and an EdgeTech Buried Object Scanning Sonar (EBOSS) broadband, sediment-penetrating 3D synthetic aperture sonar (SAS) (Figure 3) that is towed behind a research vessel. The group chair deployed with the APL-UW team onboard the *R/V Jack Robertson* to examine the large target identified by NOAA. The group made multiple passes over the target to gather data while observing the sonar returns in real time. At the conclusion of the day, the group agreed with about 70% confidence that the large target was consistent with a section of airplane wreckage. Additional debris was scattered in a debris field mostly north of the large target but was not the focus of the scanning. Post processing of the data was performed, and APL-UW supplied the group chair with numerous sonar images of the target (Figures 4 and 5). The group agreed with about 95% confidence that the target was consistent with a section of airplane wreckage. The APL-UW staff also supplied the group chair with a list of possible other targets in the debris field.

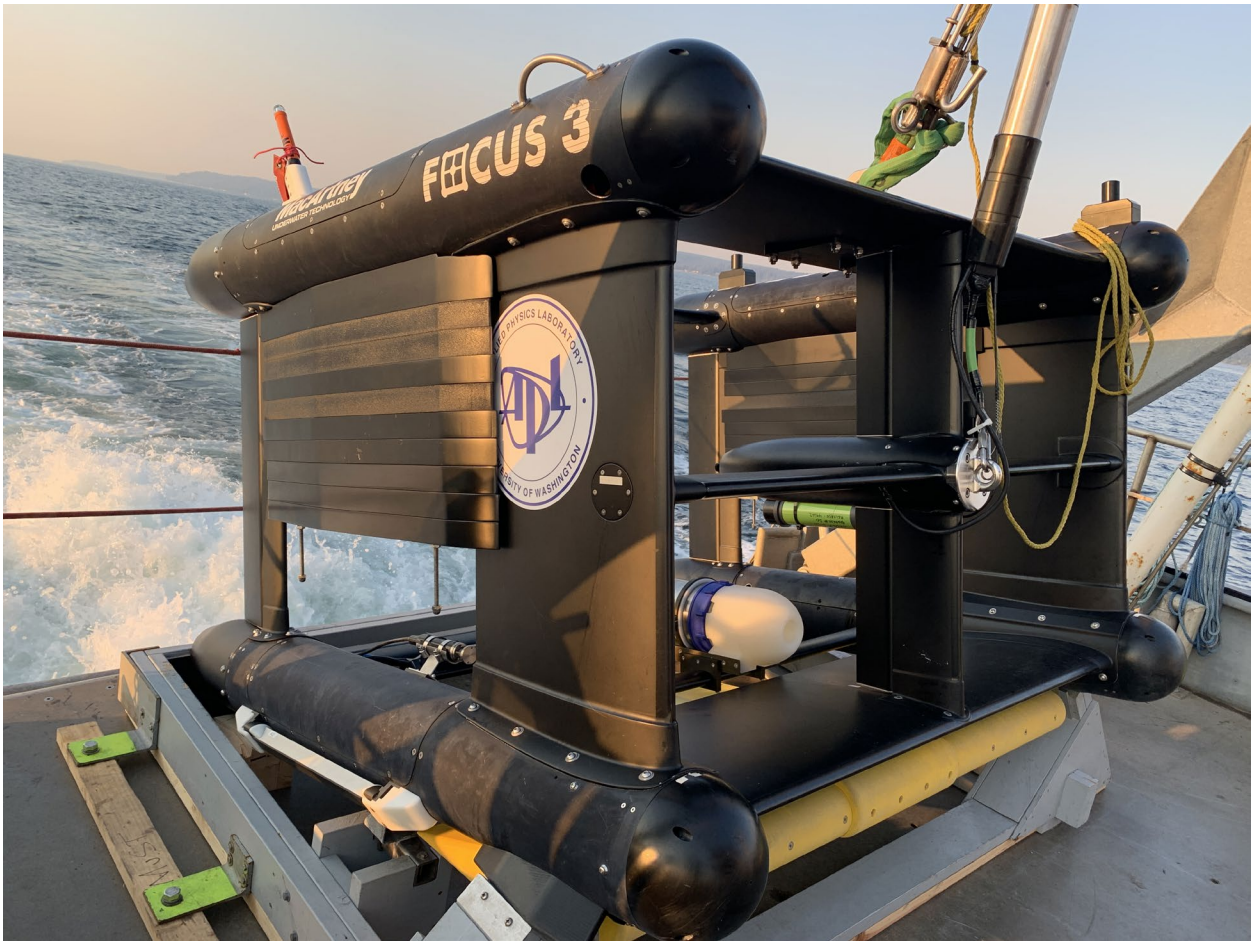

Figure 3. APL-UW Multi-Sensor Towbody (MuST)

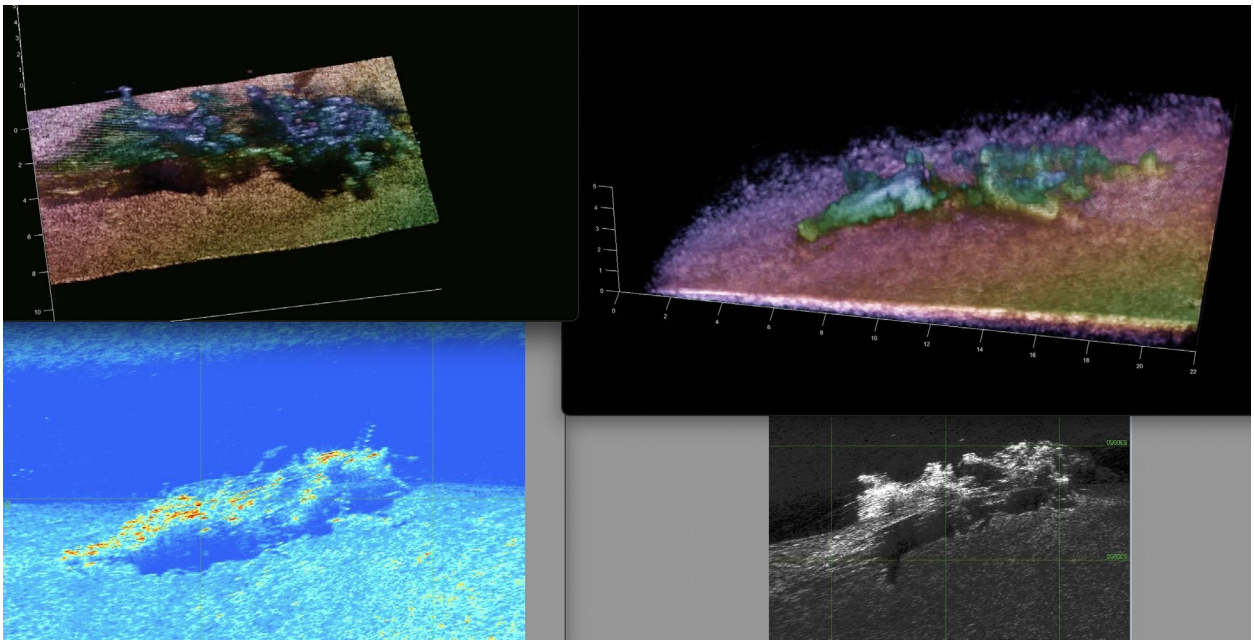

Figure 4. MuST sonar images of large target on seafloor

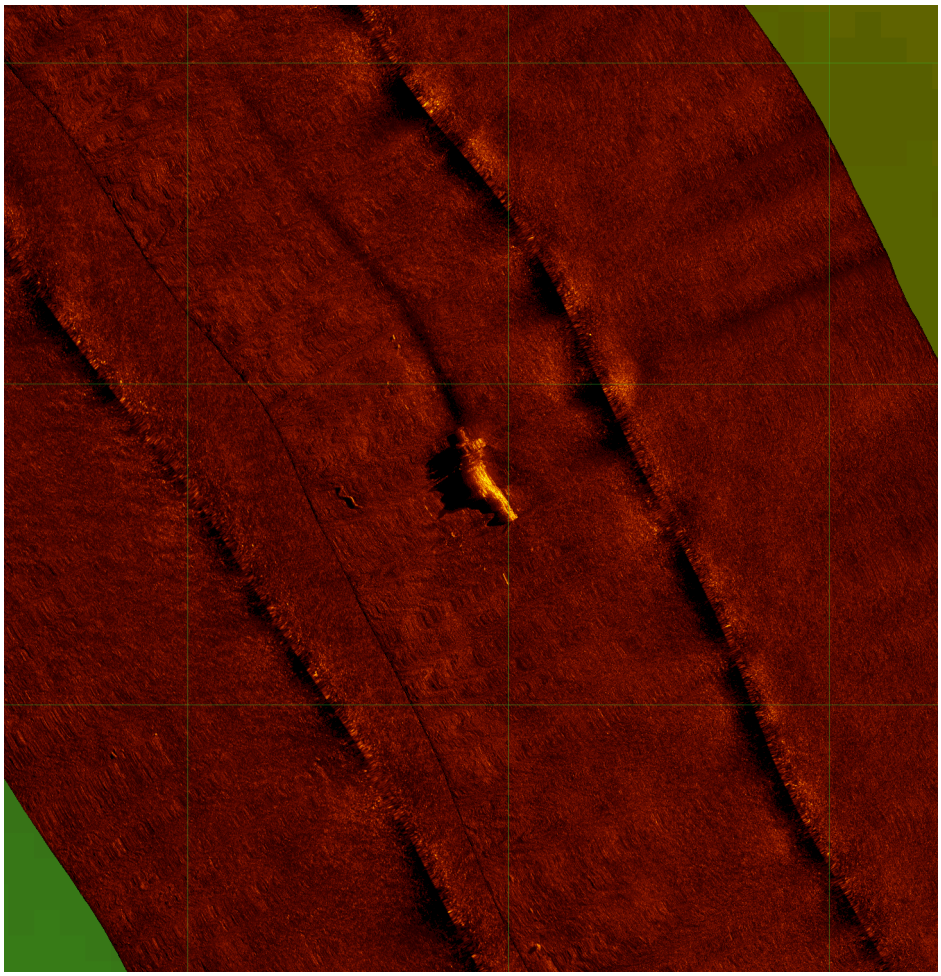

Figure 5. Side scan sonar image of large target on seafloor

3.0 Wreckage Recovery

Following the identification of the wreckage on the seafloor the group chair began planning for recovery.

3.1 Planning

Information was solicited on the equipment, availability, and timing from the US Navy Supervisor of Salvage and Diving (SUPSALV) and Global Diving and Salvage. Global information was provided by a representative of the victim's families since they had previously contacted them. The NTSB elected to activate a Memorandum of Understanding (MOU) with SUPSALV for them to recover the airplane wreckage. The necessary federal agency agreement for intergovernmental reimbursable activity documents and a letter of request were supplied to SUPSALV on September 15, 2022. This was followed by the transfer of $1.6 million from NTSB to SUPSALV on September 16, 2022, to fund the recovery operation.

SUPSALV utilized the services of a contractor for the vessels required for the work. Pacific Pile & Marine supplied the *Derrick Barges (D/B) Mister Ed* and *Lush* with the tugs *Gretchen H* and *Jennifer H*. The Deep Drone 8000 ROV (Figure 6) and support equipment was mobilized on the *D/B Mister Ed* and the *D/B Lush* was outfitted with a crawler crane for wreckage retrieval. A refrigerated container was mobilized on the *D/B Mister Ed* for storage of any victim's remains recovered.

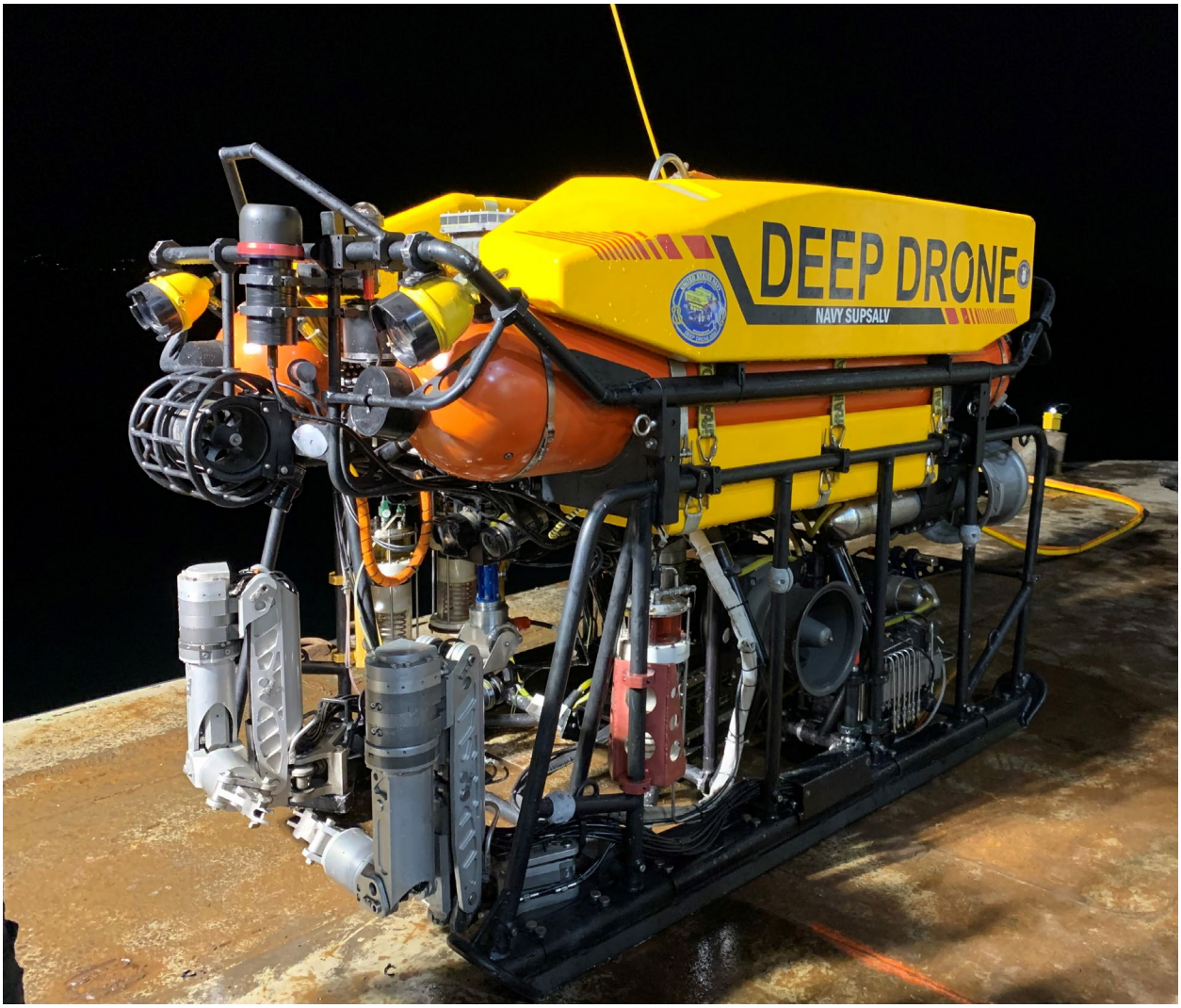

Figure 6. Deep Drone 8000 ROV

The Deep Drone 8000 ROV is a 4,100 lb vehicle designed for the Navy by Phoenix International. The ROV is controllable in all six degrees of freedom by the pilot and is equipped with a Kongsberg 375-675 kHz scanning sonar for target detection and two 7-function manipulator arms. One high-definition color camera and several other standard definition black and white cameras were installed. The ROV and all support equipment were shipped from the Phoenix facilities in Largo, Maryland, and mobilized on the barges at the Pacific Pile and Marine facilities in Seattle.

3.2 Recovery Operation

The barges were tugged into position on September 26, 2022, lashed together, and moored on a four-point anchor system. The recovery operation began the morning of September 27 with 5 ROV operators, two NTSB investigators, multiple barge personnel, and multiple coroner/sheriff personnel for victim recovery for a 12-

hour shift. The second shift was comprised of the same number of personnel with the exception that one FAA investigator replaced one NTSB investigator. Operations continued around the clock until the afternoon of September 30. The ROV was only able to be deployed during the slack tide times with bottom times ranging from 1 to 3 hours depending on the tidal current speed.

The ROV was deployed for the first time on September 27 at 0900 PDT for a survey of the main wreckage location identified by APL-UW. Visibility in the water was limited to about 10-15 feet during most of the operation. Investigators identified the left wing with fore flaps attached first (Figures 7 and 8). About 40 feet northwest of the left wing was a large area of wreckage that contained most of the fuselage, the upside down empennage (Figure 9), the right wing, and the floats. All the wreckage was highly fragmented and crushed. The left and right elevators were not attached to the horizontal stabilizer. During the initial survey it was discovered that one of the barge anchor lines was laying on the main wreckage (Figure 10). Following the dive, it was decided to have the anchor line reset so it wouldn't interfere with recovery operations.

Figure 7. Left wing inboard end on seafloor

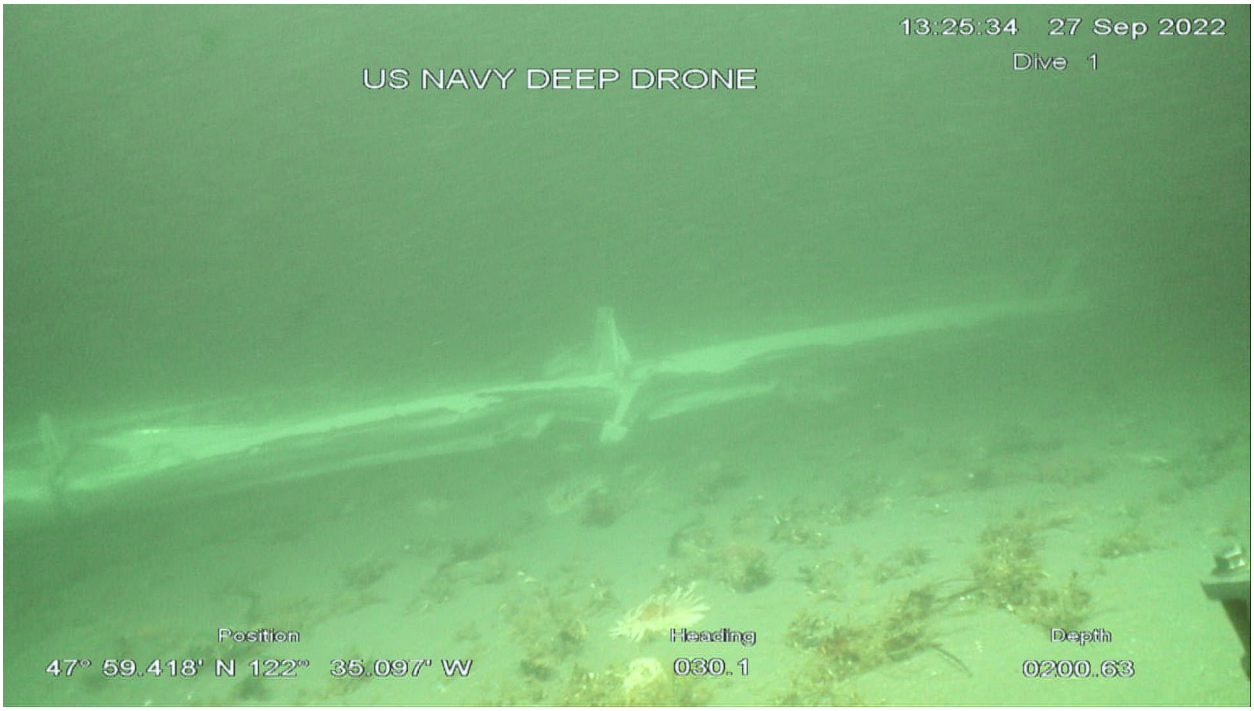

Figure 8. Left wing outboard end on seafloor

Figure 9. Empennage upside down on seafloor

Figure 10. Right wing and float wreckage on seafloor with anchor cable

The barge crew reset the northwest anchor after the initial survey. On the second dive it became evident that the main wreckage had been moved by the anchor line and was in a completely different orientation than before. Specifically, the empennage was now situated in an upright position on the seafloor (Figures 11 and 12). The right side of the horizontal stabilizer was now partially attached to the empennage, deformed down against the vertical stabilizer, and rotated leading edge aft. On this dive the separated engine (Figure 13), separated right elevator (Figure 14), and human remains were also identified. The decision was made to recover the accessible remains before proceeding with rigging the main wreckage or other wreckage recovery. A basket with the accessible remains was recovered the afternoon of September 28. The ROV then rigged the separated engine and recovered it to the barge the afternoon of September 28. The main fuel tank was identified the evening of September 28 on Dive 7 (Figure 15).

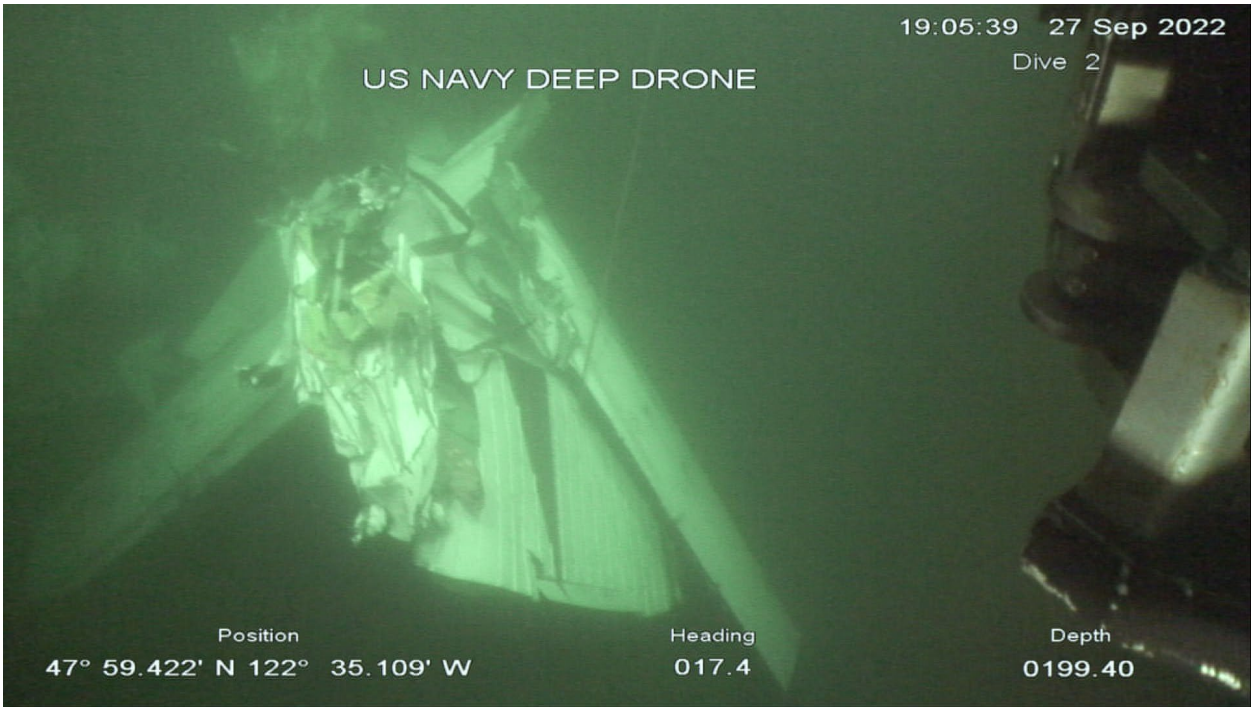

Figure 11. Empennage upright on seafloor

Figure 12. Empennage upright and right side of horizontal stabilizer on seafloor

Figure 13. Engine on seafloor

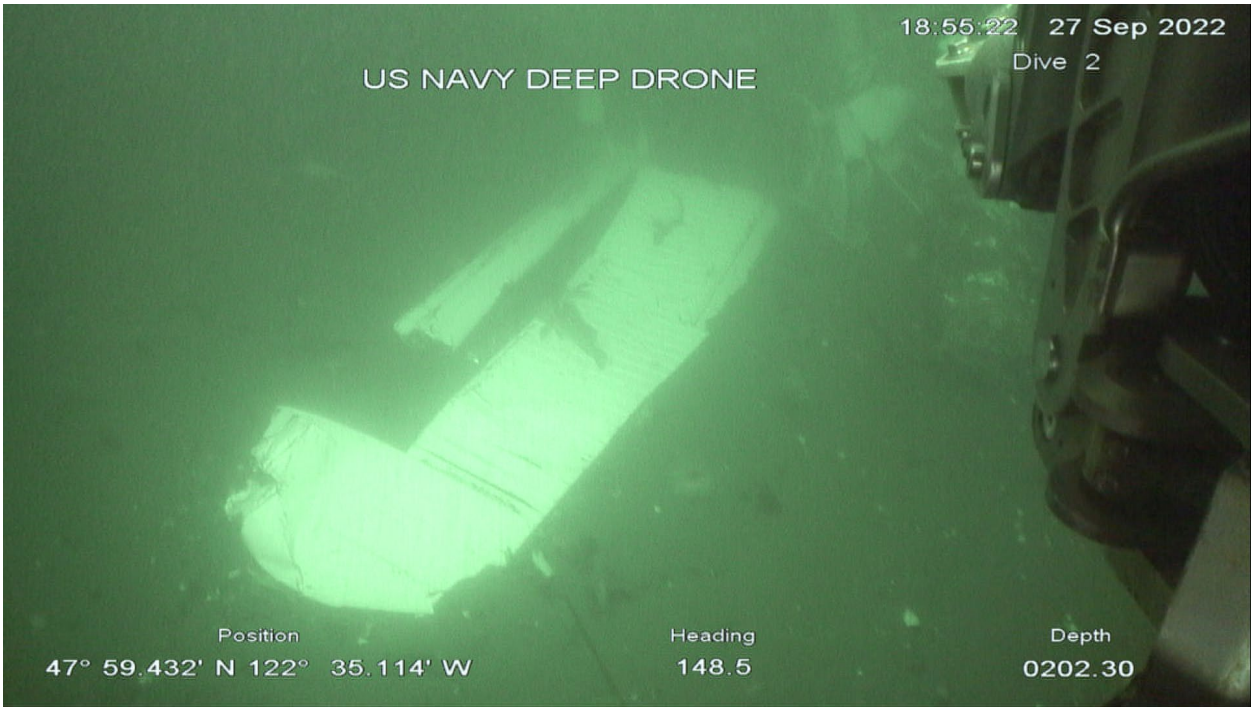

Figure 14. Right elevator on seafloor

Figure 15. Main fuel tank on seafloor

The main wreckage was rigged with a chain around the aft fuselage forward of the vertical stabilizer in a choke configuration and a chain around the root area of the right wing in a choke configuration. The two chains were rigged to a third chain in a choke configuration. The rigging was connected to the crane hook by the ROV on the morning of September 29. The ROV developed a leak in the electronics compensator and had to be recovered before the lift to repair the leak. Therefore, the ROV did not observe the lift of the wreckage. The empennage broke the surface first and as it was lifted the group discovered that the rigging on the left wing had slid most of the way off and only the empennage flight control cables were holding the forward fuselage and floats to the empennage. An additional lifting rope was wrapped around the forward fuselage and floats and connected to the crane whip line for lifting onto the deck of the Mister Ed (Figure 16).

Detailed examination of the wreckage showed that a majority of the fuselage, empennage and the floats were recovered. The empennage consisted of the vertical stabilizer and attached rudder, the ventral fin, and the left side of the horizontal stabilizer. The right side of the horizontal stabilizer did not remain attached. About 1-½ floats were recovered. One victim was recovered in the fuselage wreckage.

Figure 16. Main wreckage being lifted onto barge

The following 5 ROV dives were concentrated in the debris field to identify and recover additional key items of interest. The left elevator (Figures 17 and 18), right elevator, propeller hub with two attached blades, one separated propeller blade, a section of fore flap, a section of aft flap, a section of wing strut, and the rudder tip cap and balance weight were recovered on September 29 and 30 along with several smaller items of wreckage. The left elevator trim tab and aft control rod were intact and attached during the initial survey and the control rod had a bend near the aft end. During recovery, the ROV grabbed the aft control rod fracturing it near the forward end.

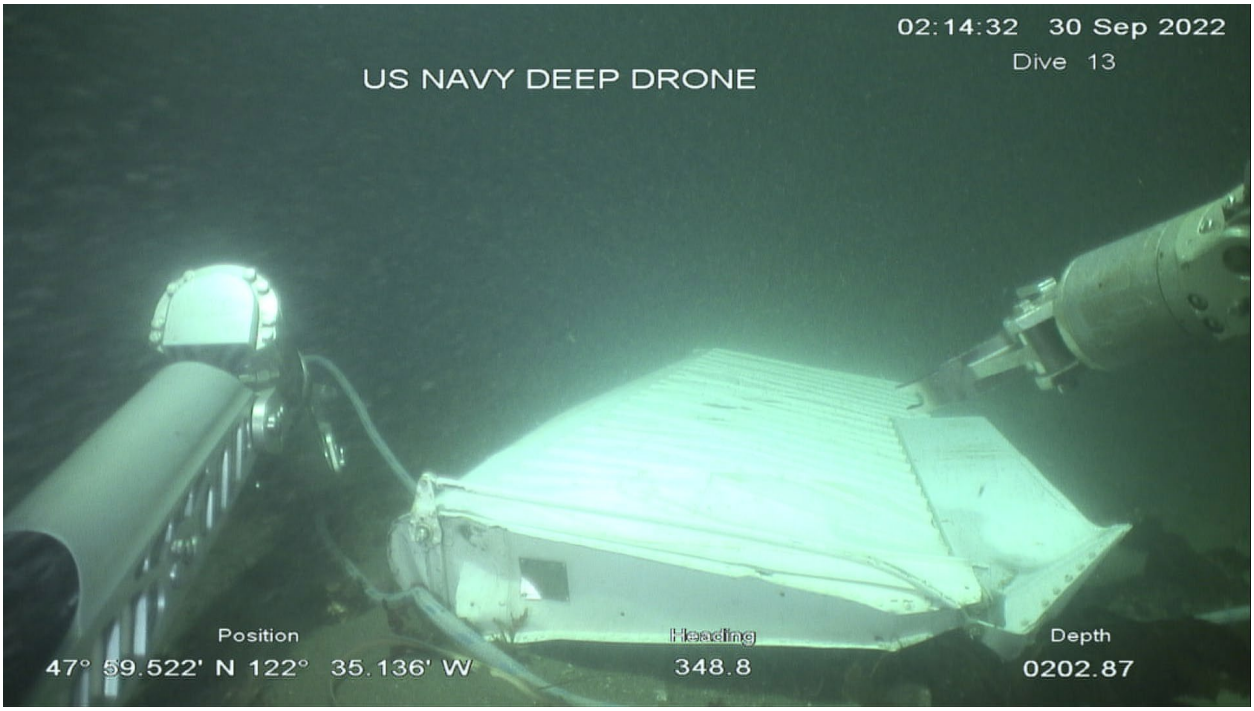

Figure 17. Left elevator on seafloor

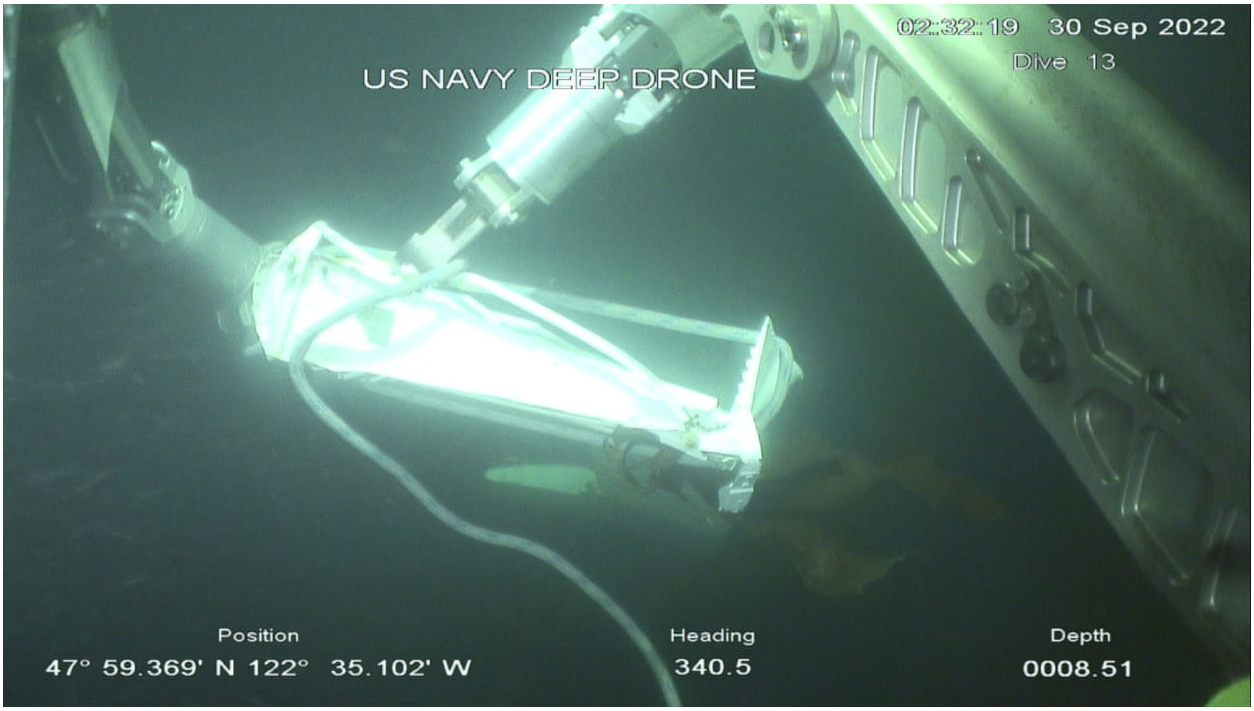

Figure 18. Left elevator being recovered

The last 2 ROV dives on September 30 expanded the search area beyond the main debris field in an attempt to locate the left wing and right horizontal stabilizer previously identified in the debris field. The area bounded by the 4 barge anchors was searched visually and with the ROV onboard sonar set at 200m resolution. The left wing and right horizontal stabilizer were not identified. An area about 1,200 feet northwest-southeast by about 700 feet northeast-southwest centered on the main wreckage location was surveyed (Figure 19). The wreckage diagram (Figure 20) was created using the recovered locations of the identified parts.

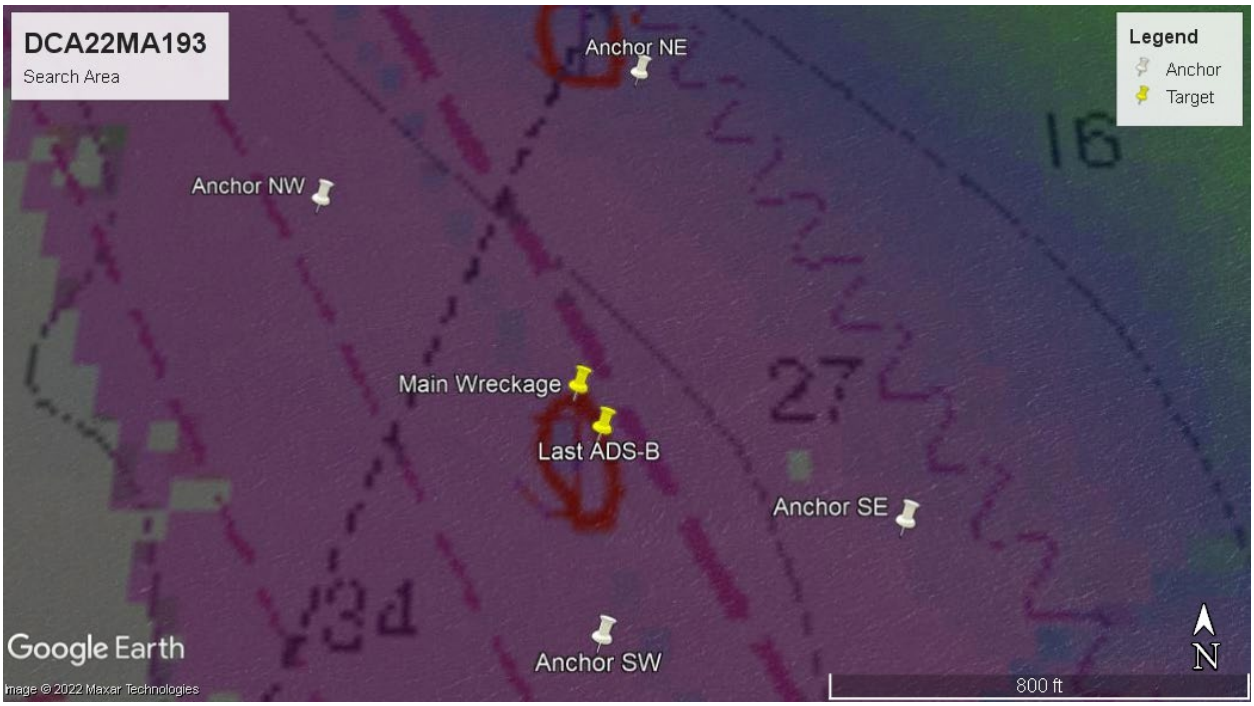

Figure 19. ROV search area

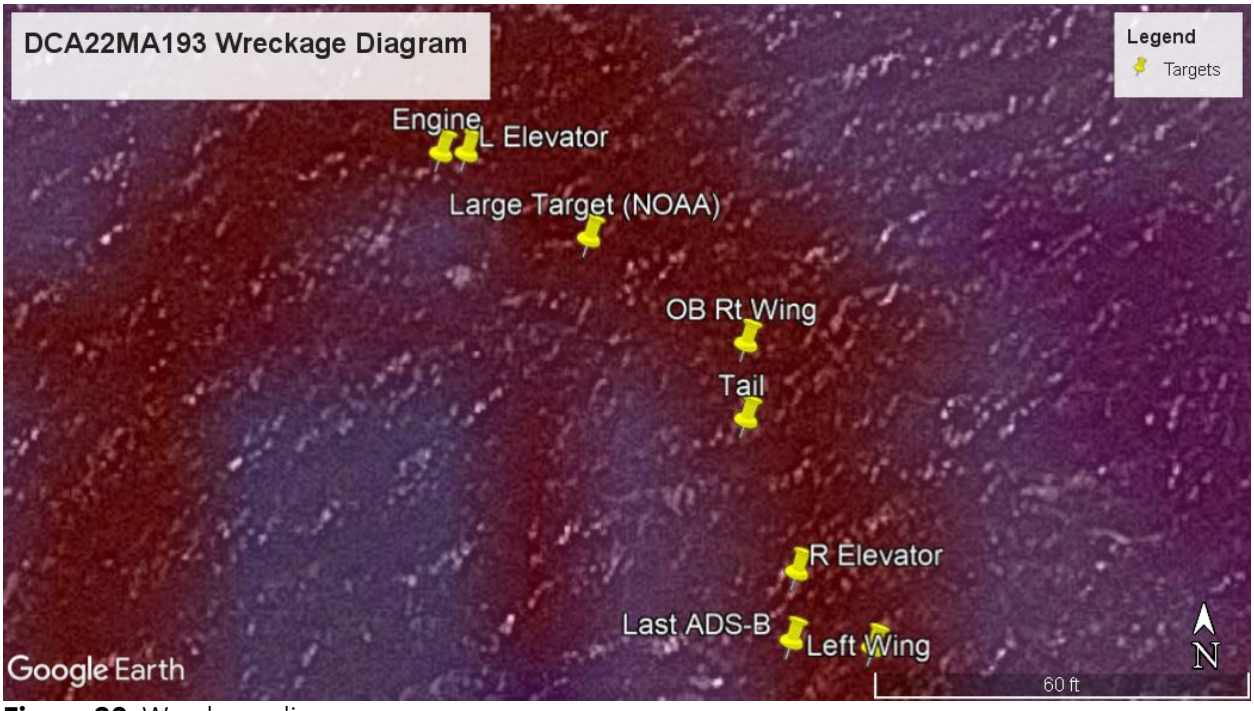

Figure 20. Wreckage diagram

ROV operations commenced on September 27 about 0900 and concluded on September 30 about 1130. ROV dive logs showed that there were 17 dives conducted with a total bottom time of about 26 hours. Following recovery operations, the barges were tugged to the Pacific Pile and Marine facilities in Seattle. The

wreckage was transferred to AvTech for storage on October 3 and the SUPSALV equipment was demobilized.

17 dives, 26 hours of bottom time (20.5 with video)

Dive 1 9/27 1245-1305, 1315-1400 65 min
Dive 2 9/27 1820-1950 90 min
Dive 3 9/28 0120-0220, 0715-0805 60 min, 50 min
Dive 4 9/28 0805-0950 105 min
Dive 5 9/28 1315-1330, 1345 engine recovered 15 min
Dive 6 9/28 1410-1535 85 min
Dive 7 9/28 1845-2055 130 min
Dive 8 9/29 0110-0435 205 min
Dive 9 9/29 0755-0810 rope in thruster 15 min
Dive 10 9/29 0830-0857 crane connected low oil on ROV 27 min
Main Wreckage recovered 9/29
Dive 11 9/29 1345-1725 video started at 1450, propeller rigged and lifted 220 min
Dive 12 9/29 2045-2130 basket lifted 45 min
Dive 13 9/30 0150-0235 right elevator recovered 45 min
Dive 14 9/30 0300-0320 left elevator recovered 20 min
Dive 15 9/30 0345-0435 strut recovered 50 min
Dive 16 9/30 0910-0935 south search, flap recovered 25 min
Dive 17 9/30 1055-1135 north search 40 min

Submitted by:

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