



**NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Western Pacific Region

**WRECKAGE EXAMINATION (SUMMARY OF  
FINDINGS)**

**WPR19LA041**

Due to the federal government shutdown, the NTSB was unable to travel and provide an oversight during the wreckage examination.

The wreckage examination was conducted by the representatives from ATAC (Airborne Tactical Advantage Company) and Lortie Aviation at the ATAC hangar facility aboard MCAS Kaneohe Bay, HI on 9-10 January 2019.

## RECOVERY HISTORY

The aircraft impacted the water in the vicinity of N21.2856 W157.8680 with a water depth of 250 feet. The aircraft impacted the water in an upright, slightly nose low, wings level attitude at 179 knots indicated airspeed. Eyewitnesses reported two external fuel tanks floating momentarily post-impact but reported that the remainder of the aircraft stayed intact and sunk. Following an exhaustive search, the aircraft was located, and extensive salvage operations were conducted to mitigate safety and environmental risks to the public as well as provide as much evidence as reasonably possible for the mishap safety investigation. The salvage operation recovered portions of the cockpit's panels as well as the aircraft's fuselage aft of the front of the engine. The fuselage and engine section were recovered from the water late in the evening of 8 January 2019. Germane to this investigation, the throttle quadrant, LP cock, EGT gauge, RPM gauge, TTC switch, TTC box, and G3X SD card were not recovered.



Wreckage location



Recovered wreckage

## WRECKAGE EXAMINATION

**Cockpit.** The cockpit panels salvaged were investigated. Cockpit switches were generally unreliable either missing, broken, bent, or moved from position. Cockpit gauges recovered all had broken glass with significant damage noted. While heavily damaged, the airspeed gauge was deemed reliable, indicating 179 knots at impact. The degree of damage to the cockpit items recovered was consistent with high impact forces at impact.



Instrument panel



Airspeed gauge

**Engine.** The engine was cut free and removed from the fuselage for evaluation. Following a freshwater rinse, the engine's general integrity was evaluated. It was observed that there was significant corrosion from saltwater exposure, particularly to magnesium components. The engine's compressor blades showed signs of damage from the engine casing being pushed inward upon water impact. However, there were no signs of damage from either internal or external FOD. There were also no "witness marks" in the tailpipe which would have signaled a potential FOD event. The degree of blade impact deflection observed indicates that the blades were turning upon impact, however not likely at full power as there was no "corn-cobbing" of blades as would be expected if the engine were turning at maximum thrust.



Engine

**Inlet guide vanes** The inlet guide vanes were evaluated and were observed to be in the fully closed position. There was significant post-impact corrosion observed.



Inlet guide vanes

**Engine bearings.** Once post-impact corrosion was removed, the engine was rotated by hand and showed no indications of seizure. An engine stage was separated, and the bearing showed no signs of seizure.



Engine bearings

**Fuel control unit (FCU).** The throttle linkage to the FCU was tested and found to move smoothly, indicating no signs of failure (video available upon request). The FCU was removed and one solenoid which rolls the engine back when commanded was tested on site and functioned as designed. The FCU was shipped to Lortie Aviation for full bench testing. The testing was completed on 14 January and the FCU functioned as designed and was assessed to be fully functional.



Fuel Control Unit

**Fuel line.** The fuel line between the FCU and fuel-oil heat exchanger was removed and inspected. The line's gaskets were observed to be in good condition the line was assessed as fully functional.



Fuel line

**Bleed air valve.** There was a large degree of post-impact corrosion around the bleed valve. A light was directed through the top of the bleed air valve and the light was seen on the other side indicating that the bleed valve was in the open position. The bleed valve was removed and cleaned. The bleed valve opened and closed when commanded by hand and was assessed to be fully functional.



Bleed air valve

**N2 line.** The N2 line was inspected for general integrity and no defects were noted. The N2 line was removed and the “spezial” gasket and O-rings were observed to be in good condition with no defects noted and were assessed to be fully functional.



N2 line

**Fuel filter.** The fuel filter was removed and inspected. The fuel filter was clean, with no debris noted, and was assessed to be fully functional.



Fuel Filter

**HP Fuel pumps.** There was significant post-impact corrosion observed in the vicinity of the HP fuel pumps. The pumps were removed, cleaned, and evaluated on site. The fuel pump heads showed no signs of scorching, the presence of which would have indicated air in the fuel line. The pump shaft was observed in good condition. The pumps were turned by hand (video available upon request) and the pumps turned as designed, even pumping residual fuel from the component. The HP fuel pumps were assessed on site as fully functional but were shipped to Lortie Aviation for full bench testing.



Fuel pump

**PV Ram.** The PV Ram was removed and disassembled on site. The PV Ram diaphragm was evaluated and observed to be in good condition with no pinholes or rips. The PV Ram temperature probe was evaluated and was observed to be in good condition with no signs of scorching or burning smell which would have been indicative of a failure. The position of the PV Ram shaft was positively against the stops, indicating without doubt that the IGVs were

commanded “closed” and the bleed valve was commanded “open”. The PV Ram was assessed on site as fully functional, however it was shipped to Lortie Aviation for full bench testing.



PV Ram

**Fuel nozzles.** All eight fuel nozzles were removed. The fuel nozzles showed evidence of post-impact corrosion. The nozzles could not be evaluated on site and were cleaned externally and shipped to Lortie Aviation for testing.

All possible components which reasonably could have resulted in a loss of thrust were inspected and/or tested, with the notable exception of the TTC controller box. It is assessed that even if the TTC controller box had been recovered, it would have been significantly damaged due to being in the nose of the aircraft where it absorbed maximum impact forces. Additionally, even if the TTC controller box survived the impact, it is likely that saltwater exposure would have damaged the electronics and prevented a successful bench test.

All components which were inspected and/or tested which could reasonably have resulted in a loss of thrust were assessed to be fully functional at the time of the accident.