



ERA15LA091

Bimini, Bahamas

December 22, 2014

Cessna 172M

N12182

NTSB AIRFRAME AND ENGINE EXAMINATION

51 Embedded Photographs

January 28, 2015

PARTICIPANTS IN THE EXAMINATION

Shawn Etcher
Air Safety Investigator
National Transportation Safety Board
Ashburn, VA

HISTORY OF FLIGHT

On December 22, 2014, about 1150 eastern standard time, a Cessna 172M, N12182, experienced a total loss of engine power during cruise flight near South Bimini, The Bahamas. The pilot subsequently ditched the airplane in the Atlantic Ocean. The commercial pilot was not injured and the airplane sustained substantial damage to the fuselage. Visual meteorological conditions prevailed and a visual flight rules (VFR) flight plan had been filed for the flight, which departed from Chub Cay International Airport (MYBC), Chub Cay, Berry Island, The Bahamas, about 1105 with an intended destination of Ft. Lauderdale Executive Airport (FXE), Ft. Lauderdale, Florida. The airplane was registered to and operated by Red Barn LLC under the provisions of Title 14 Code of Federal Regulations Part 91, as a personal flight.



Photo 1: Left Side of Airplane - Post Recovery



Photo 2: Right Front Side of Airplane - Post Recovery



Photo 3: Aft View of Remaining Airplane - Post Recovery



Photo 4: Wings - Post Recovery

ENGINE INFORMATION

Engine Manufacturer: Lycoming Engines

Engine Model Number: O-320-E2D

Engine Serial Number: RL-23940-27E

Recent Annual Inspection: September 19, 2014

Total Airframe Time in Service at the most Recent Annual Inspection: 9622.4¹

Time Since Last Overhaul: 705.9²

¹ As of the most recent Annual Inspection Dated September 19, 2014 with a Hobbs of 6188.1

² As of the most recent 100-hour inspection which was dated December 11, 2014

Time Since Last Overhaul on Scene: 729.9³
Installed on Aircraft: June 27, 2013
Tachometer on Scene: 3096.4
Hobbs Meter on Scene: 6337.5
Total Airframe Time at Accident: 9771.8 hours



Photo 5: Airframe Data Plate



Photo 6: Engine Data Plate

INITIAL EXAMINATION AS RECEIVED

The engine examination was conducted at Florida Air Recovery in Ft. Pierce, Florida. The airframe and engine were examined and the following discrepancies were noted:

- The propeller was removed, prior to recovery, from the flange and no impact damage or tensile overload was noted that would have resulted from the propeller being separated at impact
- The right and left wings were removed by the recovery company to facilitate transport
- The right wing aileron and approximately one-half of the left wing aileron were absent and unable to be located during recovery
- The left wing fuel cap was absent and not located; however, according to personnel of the recovery company the wing tanks were unbreached and contained an undeterminable amount of fuel
- The tail section aft of the aft cargo bulkhead had been separated, the damage is consistent with the tail being cutoff with a saw to facilitate transport; however, the recovery company reported that the tail was removed prior to their arrival
- Both main landing gear tires were removed and not located
- The engine cowling was removed and not located
- Both doors were removed and not located
- The cabin seats were removed and not located, the pilot seat had been removed but was with the airplane
- Several access panels in the cabin floor area were removed
- No Emergency Locator Transmitter (ELT) was located
- At the request of the Investigator In Charge, the engine was drained of as much water as could be drained and diesel fuel was added to the engine through the spark plug openings immediately upon recovery to dry land. The engine was rotated through by hand to

³ Determined via utilization of Hobbs Meter; Tachometer time recorded on December 11, 2014 subtracted from Tachometer found on scene was 18.8. Added to last recorded TSO equals 724.7 hours since overhaul.

distribute the diesel fuel to minimize corrosion. Recovery personnel reported that during the rotation of the propeller flange, compression was noted on all four cylinders.

DETAILED EXAMINATION

Airframe Examination

The airframe was examined and the above items were noted as absent. During the examination burn marks were noted on the left wing near an access panel and the wing light. Recovery personnel stated that when separating the wings smoke was observed exiting the wing areas. Removal of the fuel cap revealed a light blue color similar in smell to 100LL aviation fuel. They further reported that due to the smoke and risk of fire they concentrated on the extinguishing of the possible flames and not about the amount of fuel that exited. They further stated they could not speculate how much fuel was on board but that fuel was present and appeared free of debris.



Photo 7: Top side of Left Wing - Post Recovery



Photo 8: Remaining Portion of Left Aileron - Post Recovery



Photo 9: Topside of Right Wing - Post Recovery



Photo 10: Bottom Outboard of Right Wing - Post Recovery



Photo 11: Burn Mark on Bottom Side of Left Wing – Post Recovery



Photo 12: Right Wing Flight Control Cable with Recovery Cut Marks



Photo 13: Left Wing Flight Control Cables with Recovery Cut Marks



Photo 14: Fluid Extracted from Fuel Strainer

Cockpit

The cockpit was examined and the fuel selector was selected to the "Left" fuel tank. The mixture, throttle, and carburetor heat were in, which was associated with a full rich mixture, full power setting, and carburetor heat "OFF." The dual rocker master switch was in the "ON" position. The flaps setting could not be determined; however, the flap indication on the wing was in the full "UP" or flaps retracted setting. All of the light switches, except for the landing light switch, were in the "OFF" position. The magneto switch was in the "OFF" position. No circuit breakers were found tripped. Fuel Primer switch was in and secured. The ELT cockpit activation switch was in the "ON" position. The airspeed indicator exhibited water intrusion and indicated about 100 knots. Avionics By-Pass switch was in the "OFF" position. The transponder was set to "7600" and also set to "ALT;" however, no radio or frequency could be ascertained due to the salt water intrusion. The left front (pilot seat) seatbelt was unbuckled and exhibited minimal webstretching. The right front seat belt remained attached to the floor structure and had no web stretching noted.

Flight control cable continuity was confirmed from the rudder pedals to the tail section just aft of the aft cargo bulkhead where the cables had been cut during the removal of the tail section at some time prior to recovery. Elevator cable continuity was confirmed from both control columns aft to the tail where the cables had been cut during the removal of the tail section sometime prior to recovery. Aileron cable continuity was confirmed from both control columns to the wing attach area at the fuselage where it had been cut for transport during recovery, and from those

cable cuts to the respective aileron attach point; however, due to the absence of the right aileron operation of that aileron could not be determined.



Photo 15: Fuel Selector Valve - Left Tank Selected



Photo 16: Magneto Switch in "OFF" Position



Photo 17: ELT Switch in "ON" Position as Found



Photo 18: Left (Pilot) Seatbelt as Found - Post Recovery



Photo 19: Hobbs Meter as Found - 6337.5



Photo 20: Tachometer as Found - 3096.4

Engine Examination

The engine was examined and the cooling baffles were removed to facilitate examination. All cylinders appeared normal . The preservation diesel fuel was drained. The spark plugs from all cylinders were removed. However, due to corrosion, likely from saltwater intrusion, manual

rotation of the engine crankshaft was unable to be conducted and thumb compression could not be confirmed to any cylinders. All sparkplugs were examined and exhibited extensive saltwater damage. The cylinders were removed and examined which revealed saltwater corrosion and evidence of marine life. Following removal of the cylinders the crankshaft was rotated by hand utilizing the propeller flange. Rotation exhibited slight binding which was likely due to saltwater corrosion; however, the crankshaft was intact and rotated when turned by the propeller flange. The magnetos and vacuum pump were removed to expose the rear accessory pad gears and rotation was confirmed to the gears when the crankshaft was rotated by hand at the propeller flange. The rear accessory pad was disassembled to examine the gearing mechanism which revealed saltwater corrosion throughout but no other mechanical abnormalities were noted.



Photo 21: Cylinder No. 1 and 3 as Found - Post Recovery



Photo 22: Cylinder No. 2 and 4 as Found - Post Recovery



Photo 23: Propeller Flange as Found - Post Recovery



Photo 24: Cylinder No. 1 and 3 after Removal of Cylinder Barrel



Photo 25: Cylinder Nos. 2 and 4 after Removal of Cylinder Barrel



Photo 26: Crankshaft as Viewed Through Cylinder No. 4



Photo 27: Gear in Accessory Gear Pad on Rear of Engine as Found



Photo 28: Rear side of Accessory Pad

Cylinder No. 1

Cylinder No. 1 remained attached and exhibited corrosion on the forward side of the cooling fins, as well as sand, pebbles, and salt throughout the cooling fins. During removal, the cylinder head was partly adhered to the cylinder barrel wall due to corrosion. Following the separation of the cylinder from the engine case revealed no scoring on the cylinder wall. The inside of the cylinder barrel, the cylinder head, connecting rod, and attach point at the crankshaft revealed extensive salt water corrosion.



Photo 29: Cylinder No. 1 Components after Removal



Photo 30: Cylinder No. 1 Barrel after Removal

Cylinder No. 2

Cylinder No. 2 remained attached and exhibited corrosion at the cylinder base and carry through bolts. During removal, the cylinder head was partly adhered to the cylinder barrel wall due to corrosion. Following the separation of the cylinder from the engine case revealed no scoring on the cylinder wall. The inside of the cylinder barrel, the cylinder head, connecting rod, and attach point at the crankshaft revealed extensive salt water corrosion.



Photo 31: Cylinder No. 2 Components after Removal



Photo 32: Cylinder No. 2 Barrel after Removal

Cylinder No. 3

Cylinder No. 3 remained attached and exhibited corrosion at the cylinder base and carry through bolts. During removal, the cylinder head was partly adhered to the cylinder barrel wall due to corrosion. Following the separation of the cylinder from the engine case, revealed no scoring on the cylinder wall. The inside of the cylinder barrel, the cylinder head, connecting rod, and attach point at the crankshaft revealed extensive salt water corrosion.



Photo 33: Cylinder No. 3 Components after Removal



Photo 34: Cylinder No. 3 Barrel after Removal

Cylinder No. 4

Cylinder No. 4 remained attached and exhibited corrosion at the cylinder base and carry through bolts. During removal, the cylinder head was partly adhered to the cylinder barrel wall, due to corrosion. Following the separation of the cylinder from the engine case revealed no scoring on the cylinder wall. The inside of the cylinder barrel, the cylinder head, connecting rod, and attach point at the crankshaft revealed extensive salt water corrosion.



Photo 35: Cylinder No. 4 Components after Removal



Photo 36: Cylinder No. 4 Barrel after Removal

Carburetor

The carburetor remained attached to the engine; was removed and examined. There was no damage noted; however, corrosion was noted on the butterfly valve. The valve was operated by hand with no binding noted; water was noted excreting while the valve was manually manipulated.. The carburetor was disassembled and the floats appeared normal in appearance with no deformation noted. The carburetor was found with about one-half cup of water present and no fuel was noted, combined with the water.



Photo 37: Carburetor Valve as Found

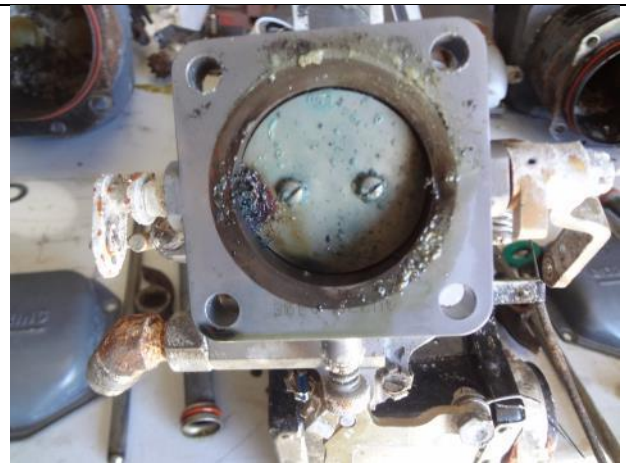


Photo 38: Carburetor Butterfly Valve after being Manually Manipulated



Photo 39: Fluid Found in Carburetor



Photo 40: Carburetor Floats as Found after Removal

Oil Cooler

The oil cooler remained attached to the firewall and baffling. The lines to the oil cooler remained secured. It had been manufactured by Pacific Aerospace Oil Cooler; however, no discernable part or serial numbers could be ascertained. The cooling fins were free of debris. The cooler exhibited saltwater corrosion damage but was otherwise unremarkable.



Photo 41: Oil Cooler as Found

Spark Plugs

The top and bottom spark plugs were removed. They were Tempest UREM40E sparkplugs. The sparkplugs exhibited extensive saltwater corrosion but otherwise, the sparkplugs were unremarkable.



Photo 42: Top Sparkplugs



Photo 43: Bottom Sparkplugs

Magnetos

Left Magneto

The left magneto remained attached to the mounting pad. The left magneto was a Slick Magneto, Model Number 4371; Serial Number 14051518. The unit was rotated by hand; however, due to corrosion no spark was noted, otherwise the unit was unremarkable.



Photo 44: Left Magneto



Photo 45: Left Magneto Gear with Corrosion

Right Magneto

The right magneto remained attached to the mounting pad. The right magneto was a Slick Magneto, Model Number 4370; Serial Number 14050574. The unit was rotated by hand; however, due to corrosion no spark was noted, otherwise the unit was unremarkable.



Starter

The starter remained attached to the engine. The manufacturer was SkyTec and the Model Number was 149-12LS and a Serial Number was F2L-481332. The unit exhibited corrosion but was otherwise unremarkable.



Alternator

The alternator remained attached to the engine. The manufacturer was Kelly Aerospace and the unit was unremarkable.



Photo 49: Alternator Post Removal

Vacuum Pump

The vacuum pump was manufactured by Rapco Part number 215CC; Serial Number 152222. The unit rotated smoothly by hand; however, water was observed exiting from the exhaust port, and the unit was unremarkable.



Photo 50: Vacuum Pump

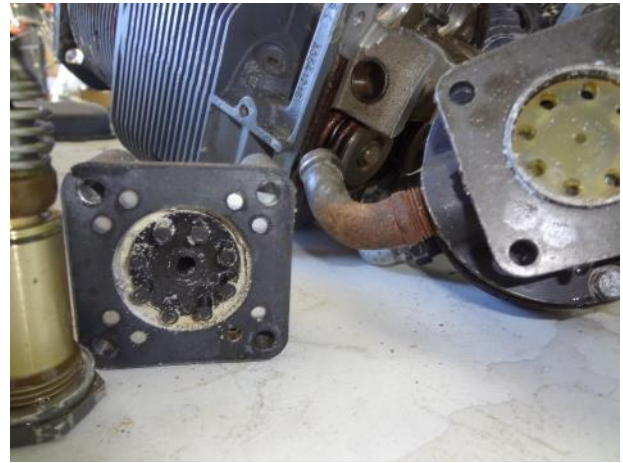


Photo 51: Vacuum Pump with Exposed Mechanism – After Being Disassembled

SUMMARY

Although several parts of the airplane were unable to be located; United States Coast Guard video showed the airplane intact, when first located in the water. Examination of the engine and airframe did not reveal any abnormalities or malfunctions that would have precluded normal operation. Although the recovery company reported some fuel igniting when separating the wings, no fuel was found in the fuel strainer or carburetor. Although the pilot reported that the engine lost total power at 10,500 feet, the transponder was set to 7600, which is to be utilized for a loss of radio communication. The magneto switch was in the "OFF" position, the carburetor heat was "CLOSED" and the fuel selector valve was in the "LEFT" fuel tank position. Although the pilot reported, in writing and through the owner, that he followed the emergency checklist, it appears that some items were omitted. However, considering the examination of what remained of the airframe and the engine there was nothing noted, with either, that would have precluded normal operation. Although fuel was noted being ignited by the recovery company it is possible

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that the fuel that ignited was the fuel that would be considered unusable. At the time of the examination and accurate amount of fuel that may have been in the fuel tanks had not been conclusively determined.

FUTURE ACTIVITIES

None are planned at this time for this engine. The engine and what remained of the airframe will be returned to secure storage at Florida Air Recovery in Ft. Pierce, Florida in preparation for release by the National Transportation Safety Board IIC.