



AIRFRAME AND ENGINE EXAMINATION FACTUAL REPORT

NTSB ACCIDENT NUMBER: ERA18FA150

ACCIDENT DATE: May 22, 2018

ACCIDENT LOCATION: Chesapeake, Virginia

AIRCRAFT REGISTRATION/ TYPE: N6177W/ Piper PA 28-140

BRIEF NARRATIVE

On May 22, 2018, about 0728 eastern daylight time, a Piper PA-28-140, N6177W, was destroyed when it impacted terrain near Chesapeake, Virginia. The commercial pilot was fatally injured. The personal flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91. Day instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the flight, which departed from Chesapeake Regional Airport (CPK), Chesapeake, Virginia, about 0726, and was destined for Republic Airport (FRG), Farmingdale, New York.

INVESTIGATION INFORMATION

The airplane was photographed at the accident site by the investigator-in-charge (IIC) on May 22, 2018. On May 23, 2018, the NTSB-IIC, an NTSB investigator observer, 3 FAA inspectors, an engine manufacturer investigator from Lycoming Engines, and an investigator from Piper Aircraft examined the airplane at the accident site. On May 23-24, the engine was examined at the accident site and at a hangar at CPK. The airplane was recovered and transported to a storage facility in Clayton, DE on May 24, 2018. Additional investigative tasks were performed on the vacuum system and instruments. The findings are found in this report.

AIRFRAME EXAMINATION

The main cabin area including all seats and instrument panel were destroyed and consumed in the post impact fire. Flight control continuity was established except for impact related separation of the aileron control chain. The flap handle was found in the flap retracted position.



Photo 1: View of the airplane at the accident site

The cockpit section was fire damaged. A separated vacuum gyro was found and disassembled. An electrical gyro was found loose in an instrument casing that was fire damaged. An airspeed indicator was

found indicating 175 knots. The throttle, mixture, and other cockpit control knobs and were consumed by fire.

The fuel selector valve received impact damage and the handle was separated. The valve was removed, and low-pressure air was applied to the engine side and air was noted coming out of the right tank aft port. The valve was disassembled, and the right tank and engine outlet port were open.

The left wing leading edge was compressed aft. The fuel tank was breached. The fuel cap remained in place. The fuel tank screen was separated and free from blockage. The left main gear was bent aft and was destroyed.

The left aileron was buckled but remained attached and the balance weight remained attached. The bellcrank remained in its relative position and both cables remained attached. The aileron stops were in place. The balance cable continuity was established from the left bell crank to the right. The four feet outboard section of the flap was separated and found a few feet aft of the wing. The inboard section received fire damage and remained in the flap up position.

The right wing was destroyed in the post impacted fire. The span of the leading edge was consumed by fire and compressed aft and down. The fuel tank was destroyed, and the fuel cap was found in the debris. The main gear separated from the fuselage. The right aileron, balance weight, and bellcrank remained attached. Both aileron cables remained attached to the bell crank and the aileron stops were in place.

The four feet outboard section of the flap was separated and found a few feet aft of the main wreckage. The inboard section received fire damage and remained in the flap up position. The empennage received impact damage. The vertical stabilizer had no major visible damage. The rudder was attached and was buckled. The rudder horn, stops and rudder cables remained attached.

The left side of the stabilator and stabilator trim tab were buckled. All stops were in place and no repetitive damages noted on the stops. Both cables remained attached to the stabilator balance weight. Stabilator trim drum display approximately 7 upper thread approximately 1 inch which is consistent with a slight nose up trim position.

ENGINE EXAMINATION

Basic Engine Information:

Engine Model: O-320-E2A

Engine Serial Number: 1-14148-27

The engine remained attached to the firewall. The vacuum pump was observed at the accident site attached to the accessory section of the engine but missing one of two assembly screws holding the unit together. The single screw that was installed was finger tight (See Additional Investigative Information Section).



Photo 2: View of engine at the accident site

Thumb compression was observed on all 4 cylinders along with continuity to all intake and exhaust valves. The engine crankshaft rotation was confirmed by mechanically rotating vacuum pump drive gear. The carburetor was found separated from the engine and fractured at the attach point to the engine. The throttle plate was found still attached and operated freely throughout its range of motion using throttle arm and cable.

The carburetor fuel inlet screen was found clean and free of debris. The oil suction screen was found clean and free of debris. The spark plug coloration was consistent with a normal engine combustion. The fuel pump sustained fire damage from the post impact fire. Both magnetos were found with the engine. The left magneto sustained impact damage cracking at the attach flange. The right magneto was found secure to the engine. Both magnetos exhibited signs of fire damage and could not be further tested for spark at the terminal leads.

The propeller was found attached to the engine in a nose down attitude. One blade of the 2 blade, fixed pitch, aluminum propeller was found above ground with an “S” bend shape. The remaining blade was found below ground level and below the engine. The leading edge showed signs of leading-edge polishing along its center length along with gouges of varying depth.

ADDITIONAL INVESTIGATIVE INFORMATION

Vacuum Pump

A dry-air vacuum pump was found attached to the accessory section of the engine. The pump was photographed, removed from the engine, and disassembled by the investigative team. Subsequently, on October 1st, 2018 the pump was examined by a representative from Aero Accessories Inc., a vacuum pump manufacturer, in Gibsonville, North Carolina, under the supervision of a FAA inspector. The following are findings from the examination of the pump.

Identification of Pump

The pump matched the characteristics of an Aero Accessories 3215CC dry-air vacuum pump. The pump's identification card was fire damaged, and no other markings were legible on the pump.

Examination of the Pump's Components

The pump's casing, housing ends, and rotor were consistent with Aero Accessories components. Fretting of the stator and end covers indicated that the pump ran with the missing casing screw for an undetermined amount of time. The stator as found was assembled correctly. However, the six stator vanes were not consistent with Aero Accessories manufactured stator vanes.

The condition of the body/ stator was consistent of one that was severely worn. Inspection of the stator vanes indicated that replacement vanes were installed after the pump was manufactured. The vanes were worn on the sides and very loose in the rotor slots and were looser than what is acceptable during overhaul or new manufacturer for a pump. The internal examination revealed no indication of damage, other than fire damage.

The pump exhibited no indication that it failed to operate during the flight. Even though the remaining casing screw was loose and the other missing, there was no indication of mechanical damage or breaking up or seizing of the rotor or vanes. The damage to the drive components/shear coupling appeared to be entirely fire related. The inspection found that the stator and rotor had been installed correctly during the last assembly of the pump. Aero Accessories Inc. issues no overhaul manual for the Aero 3200 series pumps.

Photographs of the Vacuum Pump and Components



Photo 3: Vacuum Pump attached to the engine. Note the right casing screw was found missing.



Photo 4: Vacuum Pump Gear Drive.



Photo 5: View of Stator from Vacuum Pump



Photo 6: View of vanes removed from vacuum pump

Testing of a Pump with One Screw

Upon the request of the NTSB investigator-in-charge, Aero Accessories Inc. bench tested an Aero 3215CC dry-air vacuum pump with one fastener/casing screw missing. The manufacturer reported that the air pump operated normally, and no discrepancies were noted.

Maintenance Logbook Entry

A copy of the airplane's maintenance records (See Maintenance Records Docket Item) provided by the pilot's family revealed that on February 7, 2017, a discrepancy was noted with an inoperative dry-air pump. The record stated that a dry-air pump, part number 211CC, serial number, 126363, was replaced with a new dry-air pump, RAP 215CC, serial number A62097. The manufacturer Rapco, Inc., reported that the pump (S/N A62097) was produced on April 18, 2016 and was tested on a FAA certified bench test. Rapco Inc. reported that the warranty card for this pump was not returned. The maintenance records contained no other entries, or invoices, regarding an Aero Accessories AA3215CC vacuum pump.

Standby Vacuum System

The airplane was equipped with a Precise Flight, Inc. Vacuum System, which was a manually activated standby vacuum system (model SVS V, P/N 09072). During the onsite examination, a pull cable was found near the shuttle valve, but the cable had separated from its attach point. The cable pull was consistent with overload and the push pull cable was not attached to the manual valve. The shuttle valve remained attached to its engine mount. On June 20, 2018, the investigator-in-charge examined the shuttle valve at the recovery facility in Clayton, Delaware. Pneumatic air was blown through the shuttle valve while it was submerged in water. Air bubbles were observed exiting the entry and exit valve holes.

Vacuum and Electrical Gyro Examination

The primary attitude indicator's gyro and housing, and the gyro from the standby electrically powered attitude indicator were sent to the NTSB's Material Laboratory in Washington, DC. Reference the Materials Laboratory Factual Report in the public docket.

Submitted by:

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