



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region
Date: February 14, 2020

(WPR18FA229)

This document contains 2 embedded photos.

A. ACCIDENT

Location:	Phoenix, Arizona
Date:	August 20, 2018
Aircraft:	Acroduster II, N787WM
NTSB Investigator-in-Charge	Thomas M. Little

B. EXAMINATION PARTICIPANTS

Thomas M. Little
Senior Aviation Accident Investigator
National Transportation Safety Board
Western Pacific Region
Federal Way, Washington

Charles Baxter
Aviation Safety Inspector
Federal Aviation Administration
Flight Standards District Office
Scottsdale, Arizona

Mark Platt
Senior Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

C. SUMMARY

On August 20, 2018, about 0645 mountain standard time, a James E. Causey Acroduster II, experimental amateur-built airplane, N787WM, was substantially damaged following a loss of control and impact with terrain about one-half miles southeast of the approach end of runway 25L at the Deer Valley Airport (DVT), Phoenix, Arizona. Both the front and rear seat certified private pilots sustained fatal injuries. The airplane was registered to a private individual and operated by the pilot who had purchased the airplane two days prior to the accident under the name of Ground Loop Aviation, LLC, Cave Creek, Arizona. The local flight was being operated under the provisions of Title 14 *Code of Federal Regulations* Part 91, and a flight plan was not filed. Visual meteorological conditions prevailed for the flight, which departed DVT about 0625.

On the morning of the accident, the pilots performed 4 uneventful takeoffs and landings using a left-hand traffic pattern for runway 25L at DVT. However, while in the traffic pattern for the fifth landing, and while turning from left downwind to left base, an onboard forward-facing video recorder, which was mounted midway up the support brace that connects the upper and lower left wing panels, captured the airplane's nose pitch up slightly just prior to banking left for left base left. As the airplane continued to turn left, the left wing buffeted then stalled, which resulted in the airplane entering a spin to the left as the nose dropped to about a 45-degree negative deck angle. The pilot was then able to momentarily level the wings, and at the same time decrease the nose-down attitude. However, this was followed almost immediately by the pilot losing control of the airplane when its right wing stalled, which resulted in the airplane entering a right spin in a steep nose-down attitude prior to impact with terrain and objects.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site Examination

Examination of the accident site was conducted on August 20, 2018 by representatives from the National Transportation Safety Board (NTSB) and the FAA. All major structural components necessary for flight were accounted for at the accident site. During the onsite investigation, an undamaged iON Speed-Pro Video Camera, a damaged Appareo Stratus (V2) unit, and a damaged mini iPad. The undamaged video camera was subsequently shipped to NTSB Vehicle Recorder Laboratory for examination and analysis of retained data. All components necessary for flight were accounted for at the accident site. The airplane was recovered to a secured salvage facility for further examination.

The accident site was located at the southwest corner of the intersection of East Deer Valley Drive and North 7th Street, about one-half miles southeast of the approach end of runway 25L. The airplane came to rest upright on a magnetic heading of about 060°. The wreckage field was contained within 50 ft of the main wreckage and consisted mostly of small wing segments. The propeller assembly had separated from the main wreckage and was located on the sidewalk on the south side of the intersection.

2.0 Follow-up examination notes

The following notes for the airframe and engine examinations is the compilation of data generate between the NTSB and FAA IICs for the accident, and the Lycoming Engines Senior Aviation Accident Investigator who performed the field examination of the engine at the facilities of Air Transport, Phoenix, Arizona, on August 21, 2018, with government oversight provided.

2.0.1 Airframe examination notes

The right-wing panels were highly fragmented. The left upper wing panel remained partially attached with impact damage to the aileron and spar. The left lower wing panel was highly fragmented from the midspan to the wingtip. The empennage remained intact with damage observed to both elevator tips.

The engine and forward fuselage structure were crushed aft with most of the damage to the right lower side. The engine sustained impact damage to the induction and exhaust assemblies, and to the accessory section. The landing gear struts were twisted aft about 90°. The forward cockpit floor area was crushed upwards. According to the first responders and medical examiner both 5-point seatbelt assemblies were secured and buckled. The fuel selector handle was found in the 'Fuel 1' (pointed left) position. According to the FAA inspector, the ignition switch was positioned from the BOTH position to the OFF position during the extraction process by first responders.

The ELT was mounted, with some damage to the aft housing. The ELT switch was found in the 'ARM' position. No reported ELT beacon was identified.

Postaccident examination of the airplane and engine failed to reveal any mechanical anomalies that would have precluded normal operation

2.0.2 Engine examination notes

Fuel system

The fuel injection servo was displaced from the engine and the portion that remained attached at the mounting pad was secure. The fracture surface signatures were consistent with overload. The throttle/mixture controls were found securely attached at their respective control arm of the servo. The throttle control arm had been liberated from the servo and exhibited signatures consistent with overload. The nut remained secure and the serrated interface at the mixture arm remained securely mated. The plug on the side of the injector body was secure with the safety wire in place. The servo fuel inlet screen was found properly installed and free of contamination. The fuel injection servo and induction system were examined and observed to be free of obstruction.

The fuel injection servo was disassembled, examined and photographed. The internal diaphragms remained intact. There was no visible contaminants within the fuel cavities and passages of the servo. Fuel was observed within the fuel servo cavities and fuel diaphragm area. Engine oil residue was observed within the air side diaphragm of the servo.

The fuel flow divider (aka: spider) remained secure at the mounting bracket situated at the top of the engine. The fuel lines remained secure at each flow divider fitting and fuel injector at each cylinder. The flow divider was disassembled. There was no evidence of internal mechanical malfunction or obstruction to fuel flow. The diaphragm remained intact and undamaged.

The fuel injection nozzles remained secure at each cylinder with the respective fuel line attached. The nozzles were removed and examined. The nozzles remained free of visible contamination or obstruction to flow. The nozzles at cylinders 3-4 were the two-piece type and the nozzles at cylinders 1-2 were the one-piece type. The nozzles are interchangeable and can be mixed.

The gear-type fuel pump was attached to the engine at the mounting pad. The inlet and outlet fitting at the fuel pump had been liberated due to the absorption of impact energy. The pump was removed. The drive remained intact and free to hand rotate.

Spark plugs: The spark plugs were secure at each position with their respective spark plug lead attached. The spark plugs were removed, examined and photographed. The spark plug electrodes remained mechanically undamaged, and according to the Champion Spark Plugs Check-A-Plug chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation.



Figure 1 - photo of spark plugs

Ignition harness: The ignition harness had sustained varying degrees of damage by impact energy and was not tested. The ignition harness was attached at each magneto and respective spark plug.

Starter: The starter was displaced from the engine and destroyed. The subject starter was not examined.

Alternator: The alternator was detached from the engine and destroyed. The subject alternator was not examined.

Oil system: The oil suction screen was found secure and uncontaminated by any pre-mishap debris. The oil filter and oil cooler thermostatic by-pass valve (vernatherm) were detached from the engine. The oil filter was destroyed by impact energy. There was no evidence observed of any pre-mishap lubrication system contamination found during the examination.

Engine observations

The engine remained attached to the airframe by the engine mount. The engine had sustained significant impact energy damage at the sump/plenum and exhaust system. The starter, alternator and fuel injection servo were liberated from their respective mountings. The number 1-cylinder head had sustained impact energy damage. The damage and crush signatures about the engine suggested an impact angle consistent with a nose low, right wing low attitude. Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction or fire.

The top spark plugs were removed, examined and photographed. The vacuum pump accessory drive cover was removed, and the crankshaft was rotated by hand through the drive pad utilizing a drive tool. The crankshaft was free and easy to rotate in both directions.

"Thumb" compression was observed in proper order on all four cylinders. The complete valve train was observed to operate in proper order and appeared to be free of any pre-mishap mechanical malfunction. Normal "lift action" was observed at each rocker assembly. Clean, uncontaminated oil was observed at all four rockerbox areas. Mechanical continuity was established throughout the rotating group, valve train and accessory section during hand rotation of the crankshaft. The bottom spark plugs were not removed. The combustion chamber of each cylinder was examined through the spark plug holes utilizing a lighted borescope. The combustion chambers and bottom spark plug electrodes remained mechanically undamaged, and there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration consistent with normal operation. There was no oil residue observed in the exhaust system gas path. There was significant ductile bending of the exhaust system components.

The left and right magnetos were displaced from their respective mounting pads. The fracture surface signatures at the magneto-mounting flange were consistent with overload forces. The impact damaged ignition harness was secure at each magneto. Magneto to engine timing could not be ascertained. The magnetos were removed for further examination. Each magneto produced spark at the end of the respective spark plug lead, during hand rotation of the drive. The drives of each magneto remained intact and undamaged.

There was no evidence of pre-impact mechanical malfunctions observed during the examination of the engine.

2.0.3 Propeller examination notes

The metal two bladed constant speed propeller, along with the attached crankshaft flange were displaced from the engine. The crankshaft fracture surface exhibited signatures consistent with torsional overload due to the absorption of rotational energy. The propeller blades remained attached at the hub. Both blades displayed leading edge gouging, torsional twisting, chordwise striations across the cambered surface and trailing edge "S" bending. The tip section of each blade had been torn from the blade and recovered at the accident site.



Figure 2 - photo of damaged propeller blades