



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

December 15, 2020

AIRFRAME AND ENGINE EXAMINATION

WPR19LA320

This document contains 11 embedded photos.

A. ACCIDENT

Location: Montgomery Gibbs Executive, San Diego, CA
Accident Date: 9/24/2020
Aircraft: Great Lakes 2T-1A-2 N3617L
NTSB IIC: James Bledsoe

B. EXAMINATION PARTICIPANTS:

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C. SUMMARY

Initial investigation work was conducted remotely due to COVID-19 travel restrictions. An examination of the airframe and engine was conducted at Southwest Recovery in Chino, CA on October 15, 2020. The results of the examination are inconclusive for this accident. In addition, no evidence of preimpact mechanical malfunctions were noted during this examination.

D. DETAILS OF THE INVESTIGATION

Airframe Examination

On September 24th, 2020 while attempting to glide back to the airport following a loss of engine power, the airplane stalled and impacted the ground adjacent to the North perimeter fence of the Montgomery-Gibbs Executive airport in San Diego, CA. A nearby warehouse with video surveillance was able to capture the impact. The wreckage was located on a side street between the airport perimeter fence and a warehouse building. Multiple trees of various heights up to 60 feet were along the fence line in the immediate vicinity of the wreckage. The airplane was situated in an upright, nose-down attitude, on a heading of approximately 020° magnetic, which was approximately perpendicular to the local terrain slope. The wreckage was very tightly contained, all major components retained their approximate relative design locations, and only a few window, door, and cowlings fragments were not contained in the main wreckage. Those fragments were less than about 20 feet from the wreckage.

The airplane was transported to Southwest Recovery in Chino, CA. Although the airplane was significantly damaged it was transported in its entirety. Status of any personal items were unreported.

Cockpit Documentation. The airplane had 919.2 hours showing on the Hobbs and 2110.18 on the TACH. The Lycoming AEIO-360-B1G6 serial number L-19414-51A had 29.28 hours since major overhaul. All engine controls, (throttle, propeller, and mixture) in the front seat were in the aft position..

WRECKAGE AND IMPACT INFORMATION

Upon initial inspection of the wreckage it was found that the propeller struck a hard surface almost directly center of the nose cone and separated from the crankshaft of the engine.

The engine suffered significant impact damage and was torn from most mounting points, the exhaust was crushed, and the fuel servo was broken away from the oil sump. The main crankcase was intact and received minor impact damage.

AIRFRAME

FUSELAGE. The fuselage received significant crushing forces and deformation in the front portion but remained partially intact maintaining minimal survivable space for the CFI and trainee. All major components from the fuselage were located on site.

RIGHT WING. The biplane wings received significant damage especially to the lower wings. The right upper wing separated and folded up and over on top of the lower wing. All major components from each wing were located on site.

LEFT WING. The left wings suffered significant impact damage with deformation to upper and lower wings. All major components from each wing were located on site.

EMPENNAGE. The empennage received significant impact damage. The right side was fully intact but the left side received major impact damage. All major components from the empennage were located on site.

MAIN LANDING GEAR (MLG). MLG was crushed and folded underneath the fuselage.

ENGINE NACELLE. Significant damage to the forward portion of the airplane resulted in crushing type damage to the engine nacelle consistent with the high rate of descent impacting the ground with some forward motion. This portion of the airplane appears to have absorbed most of the impact forces since the airplane came to rest upright.

PROPELLOR. It was found that the propeller struck a hard surface almost directly center of the nose cone and separated from the crankshaft of the engine. The separation from the crankshaft

occurred approximately one-inch rear of the propeller flange radius and approximately one-half inch forward of the front face slinger radius parallel to the nose seal. The propeller governor tested favorably although the shaft adaptor was broken from impact.

FLIGHT CONTROLS. Flight control continuity checks were not conducted because the pilots reported no anomalies with the flight controls.

INSTRUMENT PANEL. No pre-accident anomalies found.

Emergency Locator Transmitter (ELT). The ELT was installed but did not activate for unknown reasons.

ENGINE. The engine suffered significant impact damage and was torn from most mounting points, the exhaust was crushed and the fuel servo was broken away from the oil sump. The main crankcase was intact and received minor impact damage.

All eight spark plugs were removed and found to be fine wire type plugs, dry with color showing normal operation consistent with the champion spark plug reference chart.

Visual inspection through all spark plug holes revealed no scoring and appeared normal, pistons were slightly oiled but intact. Air pressure was applied to each cylinder which confirmed normal crankshaft rotation. By applying air pressure to each cylinder confirmation of crankshaft rotation was successful.

The feed line from the fuel servo and fuel line to the fuel pressure gauge contained no obstructions. The fuel lines from the flow divider to each cylinder were blown through with the injectors attached with no obstructions noted. The number three-cylinder injector line was broken in close proximity to its injector as a result of impact damage.

Both the main feed in fuel line and the fuel line from the fuel pump to the fuel servo had a small amount of fuel remaining which exhibited color and odor consistent with as AVGAS. The fuel line from the fuel pump to the servo suffered impact damage but both fuel lines attached to the fuel pump were confirmed to not have obstruction or blockage. All fuel lines appeared to be sufficiently tight when removed. The fuel pump lines were re-attached to the fuel pump and tested by actuating the fuel pump plunger by hand. This test adequately pumped fuel at a normal rate.

After removing the four rocker covers the inspection of the rocker arms revealed the correct positions for intake and exhaust valves. There were no abnormal signs of wear or heat signatures, the number four exhaust push rod and tube suffered impact damage, but the remaining push tubes and rods were intact and straight. All valves and valve springs were intact and did not appear hung up or stuck, they did not show any signs of abnormal wear or heat signatures. The number two and four cylinders were removed to access the internals of the main crankcase. The number four-cylinder intake tube suffered impact damage and was torn out of its hose coupling. Cylinder break away torque was normal and tight upon removing each cylinder.

The pistons and rings looked normal with no abnormal wear or heat signatures; the piston rings were not stuck in their ring lands and minimal carbon was noted on the piston tops. The cylinder barrels showed signs of glazing and minor corrosion with minor traces of oil consistent with an engine break in process.

With the internals of the main crankcase accessible, no signs of abnormal wear or heat signatures were found. The crankshaft was fully intact and all four connecting rods were intact and attached, the numbers two and four connecting rods rotated on the crankshaft freely with no binding. The camshaft and lifter bodies were intact and verified by rotating the crankshaft by hand verifying the camshaft was timed correctly with the crankshaft. The camshaft rotated with the crankshaft and the numbers one and three lifters actuated with the lobes of the camshaft.

The lifter body faces showed signs of minor premature wear (spalling) but were intact and would not have caused a performance issue. The counterweight, pins, plates and cir-clips were intact and in position. Minor corrosion was noted on all internal parts, connecting rods, camshaft lobes and lifter bodies.

The remaining two cylinders, numbers one and three, were removed and were found to be in the same condition described for the numbers two and four cylinders. All hydraulic lifters and caps were removed from the lifter bodies in which small traces of corrosion was found. Slightly more so on the intake side than the exhaust. The hydraulic lifters were drained of oil and function checked showed no abnormalities.

ELECTRICAL. The magnetos remained installed on the engine and intact post impact. The attached ignition harness suffered impact damage and multiple harness leads were cut. With the ignition switch in the on position and using the intact number two ignition lead from both the right and left magneto the engine was rotated to top dead center. Number two cylinder was verified that both magnetos sparked with the impulse coupling. Both magnetos impulse couplings snapped with in one degree of each other exactly at top dead center indicating magneto to engine timing correctly set. Installed magnetos were Slick 4371 left and right with lag of 20 degrees. Magneto to engine timing for this particular engine model would be 25 degrees.

The magnetos were removed, and the nuts were found torqued sufficiently. Rotating both magnetos by hand showed that the impulse couplings were functioning correctly with sufficient spark production. A battery powered hand drill was used to rotate the magnetos up to speed and sufficient spark was noted on each remaining intact ignition lead. Spark plugs were attached and also verified to show sufficient spark during this test. Overall, the magnetos proved to function normally with no abnormalities. The gears in the rear case were found to be intact and properly engaged with the turning of the crankshaft. It was verified that the fuel pump plunger was in place and working normally with no binding or abnormalities.

FUEL SYSTEM. This aircraft is equipped with an electrical auxiliary fuel pump which was removed and tested using a 12-volt aircraft battery. With power applied the auxiliary fuel pump performed normal transferring fuel from one container to another. The RSA-5AD1 fuel servo part number 2524682-8 was ripped away from the oil sump and was significantly damaged during impact.

The mixture control arm broke off and came to rest on the ground next to the airplane. It separated in two places, both from the broken servo mixture control arm and from the quick release ball. The mixture control arm appeared to be sheared off of the mixture shaft from impact forces. Using the orientation of the roll pin to line up the mixture control it was determined the mixture setting was at 3/4 full rich setting. The mixture control shaft was able to be moved and no binding was detected. Both the mixture and throttle control arms utilize quick release ball end connections. The connection to the control cable has a spring-loaded socket that fits over a ball joint bolt into each control arm on the fuel servo. There is no additional security on this type of control connection, enough side load force given on these connections could easily pry them loose from their ball. Again, the mixture control arm was separated in two places, one at the mixture control arm at the servo and again at the ball joint then connecting to the mixture cable assembly. This ball joint appeared to be slightly bent which could have occurred during the separation of it from the shaft connection. It is unknown if the bent ball joint pre-existed the accident making it easier for the shaft end to separate.

The fuel servo was connected in line with the electric boost pump for a test. During a follow on test, fuel was transferred and it was noted that the fuel servo operated comparatively to a freshly overhauled fuel servo. With further disassembly it was found that the mixture and throttle control valves were intact and in correct positions. The fuel servo finger screen was clean with no obstructions.

The fuel servo's diaphragm section was disassembled, both diaphragms were intact and verified serviceable. The diaphragm shaft and ball were in position, intact and seated normally. There were nominal traces of oil found on the air inlet side of the diaphragm which is normal for an updraft system in break in process.

The aircraft fuel system was further inspected, it was noted that 18 Gallons of AVGAS were purchased prior to departure from Gibbs Flying Service 24SEP2020@1615PDT. Fuel capacity is 27.4 gallons. This aircraft was equipped with a 26-gallon main fuel tank mounted center in the upper wing feeding a 1.4-gallon header tank in the fuselage behind the firewall with 26.7 gallons useable. The main upper tank was found ruptured on the left-hand side, the filler cap located top forward left was in place and intact. No fuel was found in the main upper tank but the screens in all lines from the main tank to the header were visible and no contaminates or obstructions were found. The main fuel tank vent valve was removed and checked, no anomalies or blockages were witnessed. All fuel lines were blown through with no restrictions.

The fuel selection control lever to the pilot and copilot seats suffered impact damage but were in the off position at the time of the inspection. It was found that due to the impact damage the fuel selector valve was difficult to actuate to the on position but substantially easier to actuate to the off position. The control lever was removed from the selector valve which was then actuated by hand which operated and functioned normally. The header tank had a small amount of fuel left inside of it which looked and smelled like Avgas. When the main fuel drain petcock was opened, remaining fuel drained which was verified as AVGAS.

PHOTO EXHIBIT



Figure 1 - Photo 1 - N3617L Front, courtesy of Airport Ops



Figure 2 - Photo 2 of 11, N3617L Left Side, courtesy of Airport Ops



Figure 3 - Photo 3 of 11, N3617L, courtesy of Airport Ops



Figure 4 - Photo 4 of 11 N3617L Right Side, courtesy of Airport Ops



Figure 5 - Photo 5 of 11, N3617L Propellor, courtesy of Airport Ops



Figure 6 - Photo 6 of 11, N3617L Empennage, courtesy of Airport Ops



Figure 7 - Photo 7 of 11, N3617L Empennage, courtesy of Airport Ops



Figure 8 - Photo 8 of 11, N3617L Mixture Control Arm, courtesy of Airport Ops

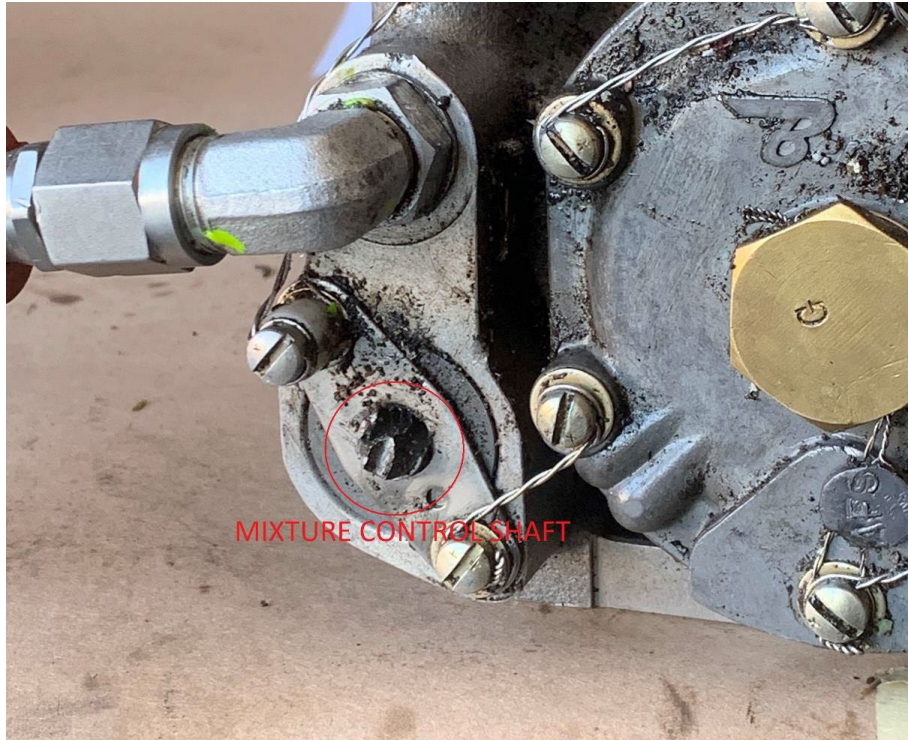


Figure 9 - Photo 9 of 11, N3617L Broken Mixture Control Shaft, courtesy of NTSB



Figure 10 - Photo 10 of 11, N3617L Bent Ball Joint, courtesy of NTSB



Figure 11- Photo 11 of 11, N3617L Propellor, courtesy of Airport Ops