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Office of Aviation Safety

Western Pacific Region

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AIRPLANE & ENGINE EXAMINATION

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Santa Paula, California

September 4, 2017

1358 PDT

Boeing Stearman A75N1– N75753

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HISTORY OF FLIGHT

On September 4, 2017, about 1358 Pacific daylight time, a Boeing A75N1 airplane, N75753, was substantially damaged when it impacted a dry river bed near Santa Paula Airport (SZT), Santa Paula, California. The commercial pilot received serious injuries and the passenger received minor injuries. The airplane was registered to and operated by a private individual as a personal flight, conducted under the provision of *14 Code of Federal Regulations Part 91*. Visual meteorological conditions prevailed and a flight plan was not filed for the local flight, which was originating at the time of the accident.

According to the pilot, this was his third consecutive flight that day. After his passenger was secured in the cockpit, the pilot taxied the airplane to runway 22 for departure. The airplane's takeoff roll and departure were uneventful; however, the airplane's climb performance was reduced after the airplane transitioned to its initial climb. As the airplane reached about 500 feet mean sea level, the airplane stopped climbing, so the pilot turned the airplane to the left over the downwind leg of the airport traffic pattern. The airplane then began to sink into a dry riverbed. The pilot completed a stabilized approach and landed flat, but during touchdown the airplane contacted thick brush, nosed over, and came to rest inverted.

A witness reported that the airplane began a left turn about 1/8 of a nautical mile from the departure end of runway 22. Simultaneously, the airplane's pitch attitude gradually increased until the left wing suddenly dropped, but the airplane subsequently returned to a standard rate turn configuration. As the airplane rolled out on the downwind leg of the airport traffic pattern, it began to descend in a nose high attitude. The witness reported that he could not hear the engine, but observed the propeller spinning throughout the airplane's descent.

PERSONNEL INFORMATION

The pilot, age 57, held a commercial pilot certificate with ratings for single-engine land and instrument airplane. The pilot's most recent second class medical certificate was issued on September 29, 2016, which included the limitation, "must wear corrective lenses." According to the pilot, his flight time included 814 hours of total flight time in all airplane, of which 331 hours had been accumulated in the airplane make and model.

AIRCRAFT INFORMATION

According to FAA records, the airplane was manufactured in 1942 and registered to the accident pilot on November 18, 2010. The airplane was powered by a Continental W670-6A, air cooled, 220 horsepower radial engine. Maintenance records indicated that the engine was rebuilt on in accordance with the Continental W670 overhaul manual. At the time of the accident, the engine had accumulated a total of 31 hours total time in service since the airplane's most recent engine rebuild, which took place on April 26, 2016. An annual airframe inspection was completed on September 2, 2016 at a tachometer time of 985 flight hours.

METEOROLOGICAL INFORMATION

The 1355 recorded weather observation at Camarillo Airport, Camarillo, California, included wind 200° at 11 knots, visibility 10 statute miles, overcast 2,300 ft, temperature 26° C, dew point 19° C, and an altimeter setting of 29.92 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest inverted in a dry river bed over sand.

In the day that followed, a witness reported fuel staining in the sand below the fuel tank cap.

ADDITIONAL INFORMATION

Initial Engine Observations

The airplane was recovered and stored by a salvage facility in Santa Paula, California. A postaccident examination of the airplane and engine was completed on November 28 and 29, 2017 by a certificated airframe and powerplant mechanic under the supervision of the Federal Aviation Administration and National Transportation Safety Board.

The airplane was photographed in its post-recovery condition with the wings and tail removed. Fuel staining was observed on the bottom trailing edge of the upper wing aft of the fuel tank. Additionally, the fuel sight gage ball measured about 25 gallons. The ball eventually fell to the bottom of the gage after the gage was struck repeatedly with a pen, indicating a fuel load of 0 gallons. Once the airplane's external condition was documented, the engine cowling was removed.

The engine mounts were unremarkable and the engine case was intact. A visual inspection of the accessories revealed that the left magneto top cover was not fully seated as one retaining screw was not secured and the other retaining screw was found on the lower engine cowl. Additionally, the left magneto P lead nut was finger tight. The right magneto P lead was loosened with a wrench. A white wire sheath on the left magneto distributor displayed a tear.

Continuity of the mixture and throttle controls were confirmed from the cockpit to their respective arms on their carburetor. The mixture control arm moved freely through its cockpit control lever from the lean position to full rich and the throttle moved freely through its control lever the idle position to full throttle. The cockpit throttle lever control column displayed a gap between the lever and the stop when the lever was in the full aft position; however, the lever extended to the throttle column stop when pushed full forward. The carburetor heat lever moved from stop to stop with some restriction.

Examination

The Brackett air filter was removed from the air induction system and did display some plant debris, but was otherwise unremarkable. A visual inspection of the induction tube did not yield any loose matter and the couplings appeared secure.

Each of the engine's 7 forward spark plugs were removed and exhibited normal wear when compared to the Champion check a plug chart with the exception of the no. 4 spark plug, which was oil fouled. The no. 4 cylinder sits at the low point of the engine and was later found to have collected oil.

A thumb compression test was performed for each cylinder in the proper firing order; 1, 3, 5, 7, 2, 4, 6. Each cylinder displayed normal compression with the exception of the no. 3 cylinder, which was low. A compression gage was connected to the no. 3 cylinder, which was pressurized to 80 psi. A total of 4 compression tests were completed and the highest compression attained was 34 psi. During each test, air could be heard bleeding through the exhaust pipe and some through the oil sump. A feeler gage was used to measure the play of the no. 3 cylinder exhaust valve. The valve was measured a total of 5 times and the following values were captured; 0.013, 0.009, 0.007, 0.007, and 0.007 for a total computed average of 0.009 inches. According to maintenance manual, the play should measure 0.010 inches. The mechanic reported that he prefers any deviation to be on the "loose" (high) side.

Fuel System

A total of 2.5 gallons of fuel that resembled 100 low lead aviation grade gasoline were drained through the fuel strainer. The fuel valve moved normally from the ON and OFF position. Fuel flowed through the strainer and exited the fuel sump when the valve was in the ON position and stopped when the valve was moved to the OFF position. The fuel strainer was disassembled and no debris or contaminants were observed in the fuel screen. The carburetor butterfly rotated freely between the lean and rich positions. Fuel was discharged when the butterfly was moved to the full rich position. The unit will be examined at a later date.

The carburetor gaskets were in good condition and the palnuts and bolts were secure.

Flight Control System

The cockpit flight controls were traced to their respective control surfaces at the ailerons, elevator, and rudder.

Engine Test

The airplane tail was secured to a forklift and about 10 gallons of 100 low lead aviation grade gasoline were added to the airplane's fuel tank to facilitate an engine run.

The propeller was turned and 6 shots of primer were delivered to the engine. A fuel leak was discovered at the primer line of the no. 1 cylinder. Visual inspection showed fretting of the prime line and polishing of the exhaust tube next to the prime line. The fuel valve was turned to the ON position, the mixture lever advanced to the full rich position and throttle moved slightly forward of the idle position. The master switch was turned to the ON position, the carburetor heat remained in the OFF position, and the magnetos were turned to the BOTH position. The engine failed to start during this attempt and the subsequent attempt as the throttle was advanced and retarded.

Three additional shots of primer were added to the engine and the same procedure as the previous test was applied to start the engine. Two subsequent and unsuccessful engine starts were attempted.

Subsequent engine start attempts were unsuccessful despite spraying several ounces of 100LL into the induction air tube at the air filter, removing the magneto P leads, and cleaning the spark plugs. Both the cylinder no. 2 front and rear spark plugs fired normally when an engine start was attempted. The cylinder no. 3 rear spark plug also fired, but the cylinder's front spark plug did not display any spark. The ignition harness springs for both the cylinder no. 2 and 3 rear spark plugs fired when the engine starter was engaged.

Ether was added to the air induction at the air filter during a subsequent test, which did not yield any change.

Cylinder No. 3

The cylinder barrel walls and piston face exhibited normal operating signatures and no cracks. The exhaust valve springs were removed and were smooth and normal in appearance. They did not display any corrosion or polishing. The valve stem displayed some wear as it was loose, but the valve seat was unremarkable. A measurement of 0.555 inches was captured at the valve stem about midspan and 0.557 inches at the top of the stem. The valve guide measured 0.563 inches about midspan and about 0.564 at the top. The valve tip displayed a rusty appearance.

Carburetor Examination

The carburetor was examined by a test and overhaul facility with oversight from a Federal Aviation Administration (FAA) inspector. The unit was unboxed in the presence of the FAA inspector and a visual inspection of the carburetor did not show any damage.

The carburetor assembly was split at the mating surfaces and all seals were found to be in good condition. A leak check did not find any leaks and no holes were found in the float. The inlet screen did not display any debris and all linkages were found intact and working correctly.

Magnetos and Ignition harness

The magnetos and ignition harness were removed from the engine accessory case. The right magneto distributor blocks displayed some grease deposits and the left magneto switch wire had been wired to a ground wire through a rubber shielding. Each magneto was placed on a test bench and tested separately after being connected to a sample set of distributor blocks and ignition harness. All 7 electrodes fired continuously as the right and left magnetos were powered up to about 1,500 rpm.

The ignition harness and distributor blocks from the accident airplane were then connected to the right magneto, which normally feeds voltage to the *front* spark plugs through the ignition harness. Spark was observed at each ignition harness coil and as well as each coil elbow. During the harness removal, it was noted that the harness wires had been tie wrapped to the metal shielding between the cylinders and engine case.

A member of the investigative team later discovered a burn spot on the distributor cylinder of the right magneto. It could not be determined if this spot appeared during testing or if the magneto condenser was defective. During the engine examination, it was noted that the right magneto distributor blocks exhibited debris near one of the contacts.



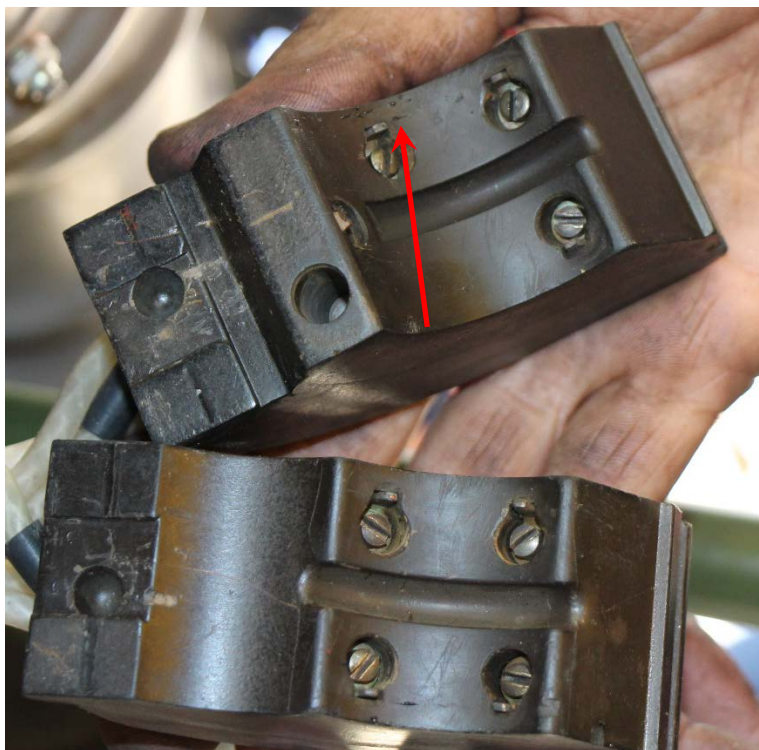
Photograph 1: Airplane Fuselage Prior to Examination



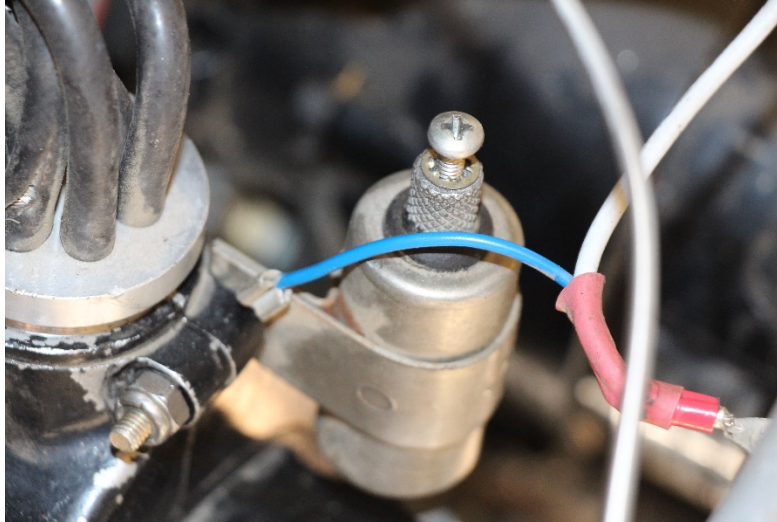
Photograph 2: Airplane Engine Prior to Examination



Photograph 3: Left Magneto Top Cover Retaining Screw



Photograph 4: Right Magneto Distributor Blocks



Photograph 5: Left Magneto Switch Wire



Photograph 6: Front Spark Plugs (7 count)



Photograph 7: Cylinder No. 1 Fuel Primer Line (note tear)



Photograph 8: Right Magneto (note burn spot)