RECORD OF EXAMINATION

Mitchell Gallo
Aviation Accident Investigator
Central Region

Participants: Frank Fortmann; San Antonio Flight Standards District Office
John Butler; Lycoming Engines
Charles Little; Piper Aircraft, Inc.

NTSB Accident Number: CEN17FA139

Narrative:

According to a Federal Aviation Administration (FAA) inspector from the San Antonio Flight Standards District Office (SAT FSDO), the mechanic stated that he watched but did not work on the airplane, all work was performed by the pilot and the pilot's brother-in-law. The inspector stated that the mechanic was not allowed to perform maintenance services at BAZ due to a lack of insurance.

The mechanic used an inspection checklist that was not the inspection checklist in the Piper Cherokee Service Manual. It is unknown if the mechanic and the pilot had, and made use of, the Piper Cherokee Service Manual during the inspection of the airplane.

According to the FAA inspector, the pilot's brother-in-law stated they knew the mechanic's annual inspection cost was much lower than the costs by aircraft repair facilities in the area.

The mechanic invoiced the pilot for the owner assisted annual inspection for 9.5 hours of labor.

The pilot's brother-in-law stated that the pilot had previously landed at the airport "several times" because the airplane received 2-3 annual inspections at 30TX.

According to a pilot logbook entry dated December 21, 2016, the pilot received his last flight review, which was in a Piper PA-28R-200, N9394N, and had a flight duration of 1.1 hours. The entry did not have a flight review endorsement by the flight instructor that provided the review. The flight review entry was the last flight entry in the pilot logbook.

The pilot had no FAA record of any previous accidents, incidents, or enforcement actions.

The mechanic was doing business as Langston Aviation. The mechanic held an airframe and powerplant mechanic certificate with inspection authorization. The most recent application for renewal of his certificate was dated March 17, 2017, by an FAA Inspector from the San Antonio Flight Standards District Office. The renewal was based upon his maintenance of aircraft over a two-year period prior to the date of application, which was March 16, 2017. The mechanic stated on his application that the of number aircraft alterations during the first year and second year were 1 and 3, respectively. The number of annual inspections during the first year and second year were 27 and 23, respectively. The only provided listing by the mechanic of these aircraft was for a period from April 1, 2016 to March 31, 2017. The list contained 23 aircraft with their registration numbers and serial numbers, which are in the public docket of this report.

The mechanic had no FAA record of any previous enforcement actions.

The 1971 model Piper PA-28-140 airplane was purchased by the pilot and his brother on November 3, 2010 and the aircraft registration was accepted on February 9, 2011

Since 2011, all of the annual inspections, which were performed every year, were signed by the mechanic that had signed off the last annual inspection, dated March 27, 2017.

The airplane was powered by a Lycoming O-320-E3D, serial number L-46554-27A, case number 4865, engine that underwent its last overhaul by the engine manufacturer dated June 29, 1988, at an engine total time of 1,945.45 hours. The engine underwent its last overhaul, which was performed by an airframe and power plant mechanic, dated May 29, 1998, at an engine total time of 2,991.8 hours and a tachometer time of 4,236.2 hours.

The Hobbs meter and tachometer indications at the accident site were 889.5 hours and 5,063.7 hours, respectively.

Lycoming Service Instruction No. 1009AZ stated, in part”

> Engine deterioration in the form of corrosion (rust) and the drying out and hardening of composition materials such as gaskets, seals, flexible hoses and fuel pump diaphragms can occur if an engine is out of service for an extended period of time. Due to the loss of a protective oil film after an extended period of inactivity, abnormal wear on soft metal bearing surfaces can occur during engine start. Therefore, all engines that do not accumulate the hourly period of TBO specified in this publication are recommended to be overhauled in the twelfth year.

A review of the engine and airframe logbooks revealed that the magnetos, exhaust, fuel and oil lines, and carburetor had not been replaced/overhauled since the engine’s last overhaul.

The airplane weight and balance, dated October 2, 2002, stated the airplane had an empty weight of 1,347.95 lbs and a useful load of 802.05 lbs, the pilot’s weight listed on his last airman medical certificate of 165 lbs, and a fuel load of 34 gallons (aviation fuel has an approximate weight of 6 lbs/gallon).

The Airplane Flight Manual (AFM) provided landing distance versus density altitude information for the only the following conditions: flaps at 40 degrees, power off, paved level runway, no wind, maximum braking, short field effort, airplane gross weight of 2,150 lbs. Based upon the density altitude at 1535,

the landing distance at gross weight was about 550 feet and the landing distance over a 50-foot obstacle was about 1,100 feet.

FAA safety publication, On Landings Part II, FAA-P-8740-12 (2008), Runway Surface, stated:

> "Runway surface make a big difference on landing long because it plays a big role in braking.
>
> A dry, concrete runway offers one of the best braking surfaces, a runway covered with wet, clear ice offers the worst braking surface. Most other conditions fall somewhere between the two."
>
> "Grass is a much less effective braking surface. Wet or frost-covered grass is even worse."

Runway 18 was the only runway at the non-towered, privately-owned airport. The runway was grass covered with bare areas of dirt. The runway grass length following the accident was measured to be about 2-3 inches. The runway exhibited a downslope and a rise of about 5 feet from the last 20 feet of the runway.

The airport owner stated that he has a 1,000-gallon tank that contained 100 low lead aviation fuel for the airport. The 1,000-gallon fuel tank was equipped with a sediment filter and a water filter. There was no sediment or water contamination noted when the filters were examined.

The airplane was completely submerged and inverted in an 18 to 20-foot-deep pond that was about 80 to 100 feet from with the departure end of the runway 18. While inverted, the airplane nose was toward the direction of the runway. The bottom of the fuselage had a longitudinal tear along its left side that extended from the firewall to the left wing trailing edge consistent in width with a round barbed wire metal fence post, which was bent over about 30°toward the pond. About the upper 8 inches of the post exhibited paint transfer from the airplane.

The airplane cockpit/cabin door had been opened by a diver using the top and side latches. Post-accident examination of the door latches revealed that the door was able to be opened using the top and side latches. There was no binding of the door during its opening or closing.

Runway 18 examination revealed the approximate touchdown point was about 807 ft from the departure end of the runway. Ground scars consistent with skidding from the main landing gear wheels were present along the last 300 feet of runway 18. There was a ground scar that preceded the post consistent with the airplane tail tie- down, which was broken off the airplane. The barbed wire fence was not attached to the airplane nor was it wrapped around the propeller. The wing flaps were in the 40°extended position.

One blade of the two-bladed metal propeller exhibited spanwise scratches that were angled about 20 to 45° relative to the blade chord, consistent with rotation. The second blade was straight. Neither blade exhibited S-shaped bending that was consistent with torque.

Cockpit examination of airplane revealed that the magneto key switch was in the both position, master switch was in the on position, the auxiliary fuel pump switch was in the on position, and the engine primer was in and locked. The cockpit throttle control was near the idle position, and the cockpit mixture control was about ¾ forward of the idle cut off position. The cockpit flap selector and in the 40° position. The shoulder harness for the left seat pilot seat was stowed to its ceiling retainer.

Examination of the flight control system confirmed flight control continuity from all the controls surfaces to left and right seat cockpit flight controls. The tailcone cover did not exhibit accident impact damage. All the eight tailcone cover retaining screw holes along the longitudinal axis of the airplane had vertical cracks below from the hole edges and through the cover. Half of the eight tailcone cover screws that were perpendicular to the longitudinal axis of the airplane exhibited a dark brown color consistent with long-term corrosion and non-recent removal. The screw heads were stripped. The tailcone was removed to expose the underlying flight control system components, which were rudder cable ends, the stabilator trim screw, the stabilator screw/tab links, the stabilator hinge points, and the rudder trim assembly. These components exhibited a dry appearance consistent with a lack of lubrication, and according to the Piper Cherokee Service Manual, the components are to be lubricated every 100 hours with MIL-L-7870 and Aero Lubriplate lubricants.

Examination of the electrically driven fuel pump revealed that it operated with no mechanical anomalies when tested on the airplane by the turning the airplane master switch and auxiliary fuel pump switch on and by removal and connection of the pump to an automotive battery. Testing of the pump prior to its removal from the airplane revealed that the cockpit fuel pressure gauge was inoperative.

The three-position cockpit fuel selector control handle was positioned to the left fuel tank. The fuel selector handle did not turn freely using hand pressure through repetitive selections to the left fuel tank, right fuel tank, and off positions. The cockpit fuel selector had to be placed in a vice and a wrench was used to remove the fuel selector plug (plastic) valve, with difficulty, the selector for the valve body. The valve stem exhibited a dull white color consistent with oxidation. The valve body did not display obstruction to the attached ports for the fuel lines and did not display obstruction when the valve was selected to all three positions.

The airplane emergency locator transmitter (ELT) was not present in the airplane and ELT's retaining hardware was undamaged and in an open/unretained position. Part 91.207, Emergency Locator Transmitters, stated in part that no person may operate a U.S.-registered civil airplane unless there was an attached approved ELT. A person may operate an airplane without an ELT if it was an airplane that was newly acquired and was being ferried for its installation and ferry an airplane with an inoperative ELT from a place where repairs or replacements cannot be made to a place where they can be made. There was no aircraft logbook entry stating that the ELT was not installed.

Examination of the engine revealed that the fuel and oil lines were intact. The engine sump contained liquid consistent in appearance with that of engine oil and water. The top and bottom plugs were removed, and the engine was rotated through and rotating by hand. During rotation, air was drawn into and expelled through the spark plug holes. Engine continuity to the accessory section, valve train, and drive train was confirmed. The spark plugs each had their electrodes intact and displayed features of normal operation as depicted in Champion Aerospace Aviation Service Manual V6-R, August 2014, Electrode Conditions.

The engine driven fuel pump was removed and actuated by hand pressure. The subsequent actuation produced suction and expulsion of air through the pump inlet and outlet ports. Disassembly of the pump revealed that the pump diaphragm did not exhibit failure, and there was no debris.

The air inlet hose leading to the carburetor was SCAT hose (air duct hose commonly used for heating and cooling), which was the incorrect part for the application and installation. The hose did not exhibit

impact damage and was collapsed. The correct part for the installation was a rigid air intake hose. According to the Airplane Parts Catalog, dated April 10, 2013, Section 6, Powerplant Group, page 6-9, the correct part number was: part number 99849-003, Hose-Carburetor air intake.

The right exhaust pipe bolt leading to the heat exchanger/muffler could not be unscrewed, and the pipe had to be cut for the heat exchanger to be examined. The heat exchanger housing had two repairs, one of which was a weld and the second was a riveted square metal patch. The heat exchanger exhaust was blocked about 50 percent with fractured internal heat exchanger pieces. The fracture surfaces of the blockage were brown in color, consistent with long-term preexisting fracture. The Piper Cherokee Service Manual stated that the heat exchanger/muffler is to be replaced at or near 1,000-hour time-in-service.

The engine timing was 27°before top dead center (TDC); the engine data plate specified an engine timing of 25°TDC. The left magneto (Slick Magneto, model 4371, serial number 01120168) was manufactured in 2001, and the right magneto (Slick Magneto, model 4250, serial number 7090045) was manufactured in 1970. The left magneto did not spark, and the right engine magneto did not turn freely and exhibited corrosion of its bearing.

The magnetos were examined under the supervision of the FAA inspector from the SAT FSDO at Navajo Accessories Inc., San Antonio, Texas. The left magneto exhibited corrosion on the impulse coupling, and the unit was non-functional. The rotor was worn and had flat spots. The points were seized and non-functional. The right magneto rotor and bearings exhibited corrosion, the capacitor wire was pinched and broken, the points were seized, and the coil was "obsolete." Both magnetos were issued red tags as not serviceable by the repair station.

The flexible fuel line leading to the carburetor was hardened and difficult to bend using hand pressure. The fire sleeve for the flexible fuel line was removed exposing its date code showing that it was manufactured in 1971. According to the airplane service manual, the flexible fuel lines are to be replaced or overhauled as required or at engine overhaul. The Piper Cherokee Service Manual stated that flexible fuel lines are to be inspected at 100-hour intervals and replaced as necessary, and the 100-hour inspection is a complete inspection of the airplane, identical to an annual inspection. The manual stated to replace the engine flexible hoses (fuel, oil, etc.) as required; but not to exceed 1,000 hours time-in-service, eight years, or engine overhaul, whichever comes first and no fluid hose may exceed 20 years time-in-service.

Examination of the carburetor was performed at RLB Accessories, Addison, Illinois under the supervision of the National Transportation Safety Board Investigator-In-Charge. The examination of the carburetor revealed that the throttle arm shaft was loose due to wear. The fuel screens did not contained debris. The float was a metallic brass float that exhibited a float travel of about half of the required 7/32-inch travel. The repair station representative stated that the brass float should have been replaced in accordance with a service bulletin issued about 1990. The carburetor needle valve had the incorrect cotter pin installed. The gap distance between the throttle body valve in a closed position to carburetor throat body was 4/1000 inch but should have been about 20/1000 inch. The carburetor drain plug had safety wire in place. The repair station representative stated that the that engine should have been washed but was not washed as part of annual inspection based on external condition of carburetor. The representative stated the condition of the carburetor should have resulted in the engine operating with a rich fuel mixture.

The Owner's Handbook, Section IV, Emergency Procedures, Power Off Landing stated, "…Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these."

The Airplane Flying Handbook (FAA-H-8083-3B), Chapter 8, Emergency Approach and Landings (Simulated) stated:

> "Instructors must stress slipping the airplane, using flaps, varying the position of the base leg, and varying the turn onto final approach as ways of correcting for misjudgment of altitude and glide angle.
>
> Eagerness to get down is one of the most common faults of inexperienced pilots during simulated emergency landings. They forget about speed and arrive at the edge of the field with too much speed to permit a safe landing. Too much speed is just as dangerous as too little; it results in excessive floating and overshooting the desired landing spot. Instructors must stress during their instruction that pilots cannot dive at a field and expect to land on it."

Mitchell Gallo