



Federal Aviation Administration

Memorandum – Inspector Statement

Date: July 16, 2018
To: Office Manager SO11
From: Danny A. Cox [REDACTED]
Subject: Engine Teardown Lycoming O-435-1

On June 14, 2018 at approximately 1740 local time, a Stinson aircraft, Model L-5 make a Force landing into Lake Strom Thurman in Thomson Georgia. The cause of the accident was due to engine failure, the pilot was able to escape from the aircraft prior to sinking approximately 30 feet under water.

The pilot Mr. William Edward Lux, certificate number, [REDACTED] was flying his Stinson L 5 at approximately 2200 feet above Lake Strom Thurman in Thomson Georgia. Mr. Lux stated he looked down at the oil temperature and oil pressure, the oil temperature was increasing toward red line as the oil pressure was decreasing, shortly after noticing those indications the engine stop.

On June 15, 2018 at 05:30 I arrived at Lake Strom Thurman at 07:00 Chief Deputy Ronnie Williamson of the Sheriff Department of McDuffie County, at 07:45 Mr. Jon Gridley, owner of SEA TOW arrived to asset the recovery operation to bring the aircraft up from the bottom of the lake. Mr. William Lux (pilot) showed up approximately 08:30 and providing me with details that lead up to the aircraft ditching into the lake. At approximately 09:30, Department of Natural Resources arrived and provided a boat to transport Mr. Lux (owner) and I out to the site were the aircraft was laying on the lake bottom.

At approximately 1700, the aircraft was removed from water for inspection, after walking around the aircraft I attempted to rotate the propeller by hand to see if the engine crankshaft would rotate at which time, it was determine that the engine was locked up and the propeller was at the 10 and 4 O'clock positon. Looking in the logs the aircraft had an annual September 14, 2018 with tach reading 6113.2, tach reading on aircraft as of June 15, 2018, 6123.8 a total of 10.6 hours since annual inspection which during that inspection all cylinders had been removed for maintenance. The logs also revealed there had been two prop strikes on the engine since overhaul with no prop strike teardown inspections performed.

NOTE

AD 2004-10-14, Prop Strike Inspection does not apply to this engine.

Aircraft placed on a flatbed truck, transported to Thomson-McDuffie airport and placed in hanger for further inspection.

On July 10, 2018, three inspectors traveled to Thomson-McDuffie airport to perform an engine teardown to find the cause of the engine failure on the Stinson aircraft, model L5. Augusta Technical College a CFR 14 Part 147 Mechanics School assisted in the teardown. The teardown found that the engine crankshaft broke at the number two crank pin causing the engine to lock up.

Addition damage found on the number one and number two cylinders caused by the crankshaft breaking and allowing the number two connecting rod and piston to make contact with the number one rod and skirt on the number one cylinder. In addition to the break at the number two crankpin there was another crack working across the area just aft of the number one main bearing.

Inspectors' statement

10-11 July 2018: I was dispatched to Thomson-McDuffie Regional Airport (HQU) to assist in the engine tear down analysis Lycoming O-435-1 for N45TX, Stinson L-5 airplane, serial numbered 1144-17397. Upon initial inspection of the aircraft engine it appeared all linkage and controls to the engine were installed and no damage noted. The left Magneto leads were loose to finger touch and the #6 lead was not installed and laying loose against the engine firewall. The engine was locked up and could not be turned by hand. We slowly started removing all the accessory components and tubing from the engine to prepare for disassembly. During this process the starter was removed and we noticed the starter drive gear retaining nut was missing and there appeared to be aluminum debris in the engagement end of the starter. The engine data plate was not on the engine at the time of this inspection.

After draining the engine of oil and lake water we again tried to turn the engine over but was still not able to rotate the crankshaft from either end. We started at the #1 cylinder for disassembly by removing the valve cover and then rocker arms. We attempted to remove the cylinder (jug) but were unable to slide it off the piston due to internal damage. At this point, we noticed extreme deformation within the crankcase and noticed the crank appeared to be broken. Further disassembly revealed the crankshaft had sheared roughly 9 inches aft of the forward bearing. Upon further inspection of the crankshaft, another large crack was found 3 inches forward of the catastrophic failure point and the crankshaft appeared to be bent. The thrust nut was removed from the shaft with slight pressure and proper torques could not be substantiated. This Thrust nut should be 375 foot pounds of torque.

The aircraft logbooks revealed two propeller replacements completed in 2002 due to propeller damage. According to the logbook entries On June 8, 2002, compliance with Prop Strike AD 91-14-22 using an Alternate Method of Compliance (A.M.O.C) as annotated. The A.M.O.C. states that because the O-435 series engine crankshaft utilizes a completely different design for attachment of the crankshaft gear than what the AD requires that AD-91-14-22 does not apply to the O-435 direct drive series and provides relief for this specific engine serial number. No record of a crankshaft Non-destructive Inspection was found in any of the maintenance records.


Kenneth G. Helms
Aviation Safety Inspector

July 12, 2018

On July 10-11, 2018, Inspector Danny Cox, Inspector Kenneth Helms and I participated in an engine teardown at Thomson-McDuffie Regional Airport (HQU) on N45TX, a Stinson L-5 airplane, serial numbered 1144-17397, which had been involved in an accident at another location. General information was provided that during flight the engine suddenly stopped running which led the pilot to conduct an emergency landing in a lake. The airplane subsequently sank approximately 30 feet to the bottom.

Before the engine teardown began, the installed and visually undamaged propeller was tested for rotational movement and was found to have almost none, which indicated that the engine had an internal problem. First, the number one cylinder was disconnected from the engine case. There was obvious damage to the right hand engine case half where the piston rides and to the cylinder. The number one piston was still connected to the crankshaft but had received substantial damage causing the piston to crack and part of the piston bottom edge to be missing. The cylinder edge was damaged to the point that the piston could not be removed for further inspection but the piston was able to freely slide inside the cylinder. Next, the number two cylinder was disconnected from the engine case. The number two connecting rod was found not connected to the crankshaft. The connecting rod link was still attached to the rod by one bolt. The other bolt was still in place but had been damaged from the nut being pulled off the threads which then allowed the rod to become unattached from the crankshaft. The connecting rod was bent and the number two piston was severely damaged but was still able to freely move inside the cylinder. After the number one and number two cylinders were removed, the crankshaft became visible. It was now apparent that the crankshaft had split apart just aft of where the number two piston connects to the crankshaft. The camshaft had received substantial damage just above where the crankshaft separated which caused the camshaft to be bent to the point that it was now immobilized and would not allow rotation of any components aligned with it. Next, the thrust nut had to be removed in order to separate the engine case halves. The thrust nut is located behind the propeller, forward of the engine case and treaded onto the front of the crankshaft. The amount of torque required to loosen the thrust nut was not precisely measured, but was significantly less than the 375 foot pounds the engine overhaul manual calls for upon installation. This was determined because no special tools were needed and little effort was applied to loosen the thrust nut. Once the engine case was split and the crankshaft was removed, an additional crack was found just aft of where the crankshaft sits in the forward most bearing, inside the engine case. This crack ran almost the complete width of the crankshaft, but had not fully separated. The engine crankshaft bearings were inspected and did not seem to be misaligned, which would have starved the crankshaft of lubrication. After all the engine components were inspected, it was determined that the crankshaft was the primary location of the engine failure and that all other damage to the internal engine components was secondary.

A review of the logbooks showed that the last engine overhaul was performed on March 29, 1994. On June 8, 2002, the aircraft propeller had received damage and been replaced. Then on September 16, 2002, another propeller replacement was performed due to propeller damage. On June 8, 2002, a write up was entered for complying with Prop Strike AD 91-14-22 using an Alternate Method of Compliance (A.M.O.C). The A.M.O.C. states that because the O-435 series engine crankshaft utilizes a completely different design for attachment of the crankshaft gear than what the AD requires to be

inspected, that AD-91-14-22 does not apply and provides relief for this specific engine serial number. The last annual was completed on September 17, 2017, which found the airplane to be in an airworthy condition. No record of the crankshaft being inspected could be found after the engine overhaul on March 29, 1994.



During the engine teardown, additional issues were noted. While performing a general visual inspection of the engine, the left hand Magneto was found with the number six ignition wire disconnected. On the left hand side of the engine, the fuel primer line was loose at the T-fitting. While inspecting the starter, it was discovered that it did not have a nut installed on the stud that attaches the spring and gear mechanism to the it. The starter seal was also damaged and parts of it were missing. The nut was later found undamaged inside the engine accessory gear that the starter engages and pieces of the seal were found inside the engine. At this time, these additional issues found do not seem to have caused the engine failure.



Zachary Andrade
Aviation Safety Inspector

July 12, 2018