

Record of Tear down Investigation

Name: Aircraft registered to Spirit Air, Inc
Address: [REDACTED]
Phone: [REDACTED]
Date: July 13, 2016
Description: N7748U Post-accident engine tear down.

On July 11, 2016 an engine tear down was performed by Lenny Skunberg of Lenny's Airmotive, Lenny's assistant and me. I allowed Karl Wilson, the Director of Maintenance for Gem Air, LLC to observe the teardown. Gem Air, LLC is the operator of the aircraft.

1. The aircraft fuselage was moved from the locked storage hangar to Lenny's maintenance hangar. The evidence tape that had been placed on the cowling at the request of the NTSB was still intact. The tape was cut by me and the cowling removed.
2. Overall damage appeared to be to the Right horizontal stabilizer, a wrinkle in the lower empennage skin immediately aft of the cabin, damaged nose wheel and some propeller and spinner damage.
3. The aircraft wings had been removed to facilitate recovery from the accident scene. The DOM stated that approximately 10 gallons of fuel was drained from the Left wing fuel tank and 8 from the Right wing fuel tank and the fuel gauge works. However, that statement could not be verified due to the wings having been removed.
4. The fuel vent was blown into and found to be clear. Operation of the vent could not be verified because the wings were not on the aircraft.
 - a. The Left wing fuel cap was in good condition. The gasket showed minor cracking on the outside edge and the plastic shim was installed between the gasket and the cap mating surfaces. The sealing surface of the gasket appeared to be smooth on both top and bottom of the gascket. The filler neck showed no signs of corrosion. The cap fit on the tank with normal hand pressure and locked in place aligning the raised tabs into the wind.
 - b. The Right wing fuel cap was in good condition. The gasket showed deep cracking on the outside edge and the assembly was missing the plastic shim that is normally installed between the gasket and the cap mating surfaces. The sealing surface of the gasket appeared to be smooth on both top and bottom of the gascket. The filler neck was very badly corroded and pitted. The cap fit on the tank with normal hand pressure and locked in place aligning the raised tabs into the wind.
5. The OEM in-line fuel strainer assembly had been removed and replaced with a different unit installed on the firewall in the same position and manner as the original. This unit does not have the provision for draining the sump from the cockpit via a push-pull control. The push-pull control that would have been used to drain the OEM sump had been removed.
 - a. The fuel strainer was drained by pushing the drain valve installed on the bottom of the fuel strainer. Most of what drained from the fuel strainer was water. The in-line fuel bowl is made of what appears to be milled aluminum. It is attached to the head which holds the screen, also made of milled aluminum, by aligning the tabs on the head and bowl and turning the bowl ¼ turn. The bowl is then safetied to the head by inserting a diaper pin into the aligned holes in the head and bowl.

The bowl was removed. The screen was found to be clean and the bowl had a small amount of contaminants in it but showed no sign of corrosion. (The amount of water that was drained from the bowl would have filled the bowl approximately $\frac{3}{4}$ or more but no measurement of the water was made.) See Note 1 below.

6. The fuel lines were secure and in good condition.
7. The in-line fuel strainer screen was free from contaminants.
8. The carburetor (Model MA-3SPA, Part # 10-4895-1) was secure and showed no signs of leaks. The carburetor finger screen was removed and found to be free from contaminants. The drain plug was removed from the carburetor bowl and a normal amount of fuel drained from the bowl. The fuel was clean and contained no water or other contaminants. The fuel was light blue in color which is consistent with 100LL aviation gasoline.
9. Engine decowled.
10. The Throttle control, mixture control and carb heat control moved freely with no binding or abnormal noises. All controls traveled from stop to stop and were rigged so that the control arm reached the stop slightly before the control knob bottomed out on the panel. Having this slight cushion in the cockpit is standard procedure and gives the pilot some assurance that the control arm is at the stop.
11. Engine oil was checked. It contained 8 quarts and was clean and normal in appearance. The oil filter was removed, cut open and examined. The filter media showed no signs of metal contamination.
12. The upper spark plugs were removed. The electrodes showed little wear and the gap appeared to be correct. Minor lead fouling was present.
13. The cylinders were examined with a borescope. All cylinders showed heavy lead deposits but no cylinder wall scoring. Cylinder #1 had a small chip in the exhaust valve which is also indicated by the compression test noted in item 15.
14. Ignition switch is confirmed in off position.
15. Performed compression test. Differential compression test set had been calibrated on 03-06-2016. The Master orifice tool allows cylinder compression to be as low as 58 PSI. #1 59 #2 67 #3 72 #4 74 #5 74 #6 76 All cylinders checked over 80 psi. The #1 cylinder was leaking into the exhaust which would be consistent with the small chip noted during the borescope inspection. The #5 cylinder was leaking into the exhaust a slight amount. The other 4 cylinders had no leaks and tested normally.
16. N/A
17. The lower spark plugs were removed and showed heavy amounts of lead fouling with #1 and 6 having the heaviest deposits. Inserted key into ignition switch and turned switch to BOTH. Rotated propeller by hand to check operation of magnetos, ignition leads and spark plugs. All leads gave off a bright spark when the magneto impulse coupling

snapped. The spark plugs were installed on the leads and all gave a normal amount of spark when the impulse couplings snapped.

18. Both magnetos, Slik Model 6364, were secure with P leads and ground wires securely connected.
19. To check the P lead continuity the ignition switch was turned to OFF and key removed. Rotated the propeller by hand, no spark was noted. P leads and ignition switch functioned normally.
20. No other anomalies found during the teardown inspection.
21. Propeller appeared straight with minor damage to the leading edge of the propeller from what appears to be contact with fence type wire while rotating.
22. Through 27. Since the wings had been removed the engine run was not performed due to safety concerns. I saw no reason that the engine would not start and run normally if fuel was supplied. The engine mount frame and rubber isolators appeared to be in normal condition for the age.

NOTE 1: An interview with the student pilot found that the only drains that were sumped on the aircraft during the pre-flight were the wing drains. The student stated that he did not know there was another drain and the instructor had never showed him another drain. The instructor stated that he performed the preflight after the student and drained the wings and fuel strainer and he thought the student had found a small amount of water in the LF wing but did not drain the fuel strainer. No other water was noticed by the pilots during the pre-flight.

The interviews were conducted as follows; I interviewed the student pilot on 07-15-2015. Due to workloads I was unable to interview the instructor until 07-20-2016. In the days between the interviews the student and instructor were still performing flight training and may have spoke about the interview. During the interview with the student, he stated that they were now flying a 182 and the instructor showed him that when you pull the knob to drain the fuel strainer you look on the ground where the fuel drained to check for bubbles and water. The instructor told me that either he or the student catches the fuel from the strainer while the other pulls the knob.

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