



RECORD OF COMMUNICATIONS

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Date: October 26, 2018
Person Contacted: Mr. Jack Norris (builder/owner/pilot)
NTSB Accident Number: WPR17LA148

Narrative: The following information are verbatim extracts of several email Q&A exchanges between the NTSB and the pilot on the noted dates:

8/3/17

NTSB Questions

I didn't document the other sensor in the fuel system line that was situated between the mechanical fuel pump and the carb. It's the silver cylindrical unit top center in the pic, and labeled "fuel psi" in your schematic

Can you tell me the item name, make, & model please?

Owner Response

It is a fuel pressure sender.

The model designation is: LPS-02 0-30psi sender

I purchased from GRT Avionics. I don't have any information on the OEM. I surmise it is not GRT Avionics.

I installed the unit during the flight test period to ascertain the problem with the engine surging. It is installed between the fuel pump and the carb. The pressure sensor was of little use as I found out later that the accuracy was +/- .5 psi.....and the fuel pressure range on the Jabiru mechanical fuel pump is .5-1.0 psi. So, it's only function was determine if there was fuel pressure. I installed it and fed it to the EIS 6000. It was a few pages back in the EIS displays...and other than a cross verification of RPM between EIS and EFIS during the incident, I did not take a look at the fuel pressure reading. After I installed the fuel pressure sensor and determined that it's level of accuracy obviated it as a good source of actual PSI I continued my troubleshooting...which culminated in the replacement of the defective fuel pump.

8/4/2017 (1)

NTSB Question(s)

Do you recall the capacity of each fuel tank?

Were the tanks integral (of the wing material) or bladder or something else?

Did the fuel tank pickups or lines have any finger- or other screens prior to the two in-line filters?

Owner Response(s)

The tanks are separate units that slide into a cavity in each wing. They each are 20 gallons. There is a fitting on each tank on the inboard side. A filter screen goes into that fitting and then the hose attaches to it.

8/4/2017 (2)

NTSB Question(s)

Some Qs about the 'HACman' mixture control

What person, organization, or info prompted the installation of this device?

- a. Was it installed during the original build or subsequent?
 - a. If subsequent, when/how many hrs?
- b. Who physically installed & plumbed it?
- c. Who physically Inspected/Ok'd it?
- d. Was it (or its plumbing) ever disconnected (eg for mx access) after it was installed ?
 - a. If so, when & by whom?
- e. Please describe your procedures for using it
- f. Do you have any specific recollections of your use of it on the accident flight, either before or after the engine problem, or post-accident?

Owner Response(s)

- a. Recommended by Greg Hobbs. It is used by many of the Lightning builders.
- b. It was installed on the original build. I replaced a defective unit during the test phase.
- c. I installed the HACman . The first HACman was defective. The replacement unit appeared to work as intended. I used it at higher altitudes to increase the EGT temperatures to an optimal range (near 1400degF).
- d. I physically inspected it.
- e. The only time it was disconnected was during replacement of the defective unit. The defective unit was evidenced on September 22, 2016 on a transition training flight. My instructor turned it 1/2 turn counter-clockwise and the engine lost power. He turned it back to the full clockwise position and the engine regained power. Engine hours ~24.3. The defect was identified during the next several days and I installed a new unit on September 28, 2016. Install was completed at 24.5 hours.
- f. The HACman changes the fuel/air ratio. In the full clockwise position, the unit is "off". To engage the HACman, you turn it counterclockwise to it's stop which is the maximum "lean". Typically, engaging the HACman to max would increase EGT 25-40degF. I would turn the HACman to lean one cylinder to just below 1400degF. Cylinder #5 was usually the first cylinder to reach desired temperature first.
- g. I did not use the HACman during the accident flight. I normally would not engage the unit until I reached a cruise altitude. I flew on July 6, 2017 and collected some data in advance of changing the prop pitch. The maximum lean I was able to achieve was 1381degF on cylinder #5. This was at 9400 msl. This is lower than the range (1395-1400)that I had previously achieved during use in 2016 after I replaced the

defective unit. I made a mental note, but had not pursued further investigation. It could have been barometric pressure/air density/etc.

I did not change the HACman position post-accident.

OIL-

1-2 quarts is surprising. If the engine had seized, there would be zero rpm. Low on oil would have caused the cylinder head temperatures to climb rapidly if it was starving for lubrication. They were in normal operating range (no alarms).

1. On a 3.7 quart max....1 quart is a lot....so 1-2 quarts range has a huge margin of error.
2. Residual oil will be in the oil cooler—1/3 quart and the Oil filter....so together perhaps 1/2 quart.
3. There was no indication of oil dripping from the fuselage when it was lifted off the ground to put on the trailer.
4. During the pre-flight the oil indication was mid-range on the dipstick. I believe that's 3-3.25 quarts. I'm religious with my oil checks, so I'm extremely confident that it was in range.
5. Oil Pressure and Oil temperatures were in the operating range. That was one of the checks I made on the instruments upon loss of power. They had been in normal operating range from the beginning of the flight.
6. There is a potential that the collapse of the nose gear might have hit the oil quick drain.....but, I didn't observe any oil leakage at the time of the accident.

8/8/2017

NTSB Question(s)

Any idea what was wrong w the original HACman, except as indicated by the prob had by the instructor?

FYI we found no evidence of oil starvation internal to the engine- all components were well lubricated, with no thermal distress or scoring/wear, and the oil was fresh & clean

The 1-2 qts is an estimate based on how much we got in a 5 gallon bucket. I didn't measure it b/c of the aforementioned lack of any indication that lack of oil was an issue

Owner Response(s)

I do know the problem with the previous HACman. It had been placed on the new parts shelf in error.

It had been installed on a previous Lightning and the builder had attempted to operate it as a linkage mixture control.....he pulled it back hard. This had been observed by Dan Hobbs during that owner's build. The HACman has a sleeve that is epoxied in place (my visual inspection and assumption). When the installed turned the HACman counter-clockwise, it apparently disturbed the partially broken epoxy seal some more.

I believe that if had it been turned further counter-clockwise during the aforementioned training flight, it may have broken loose at that time. As previously noted, the engine regained power when he expeditiously returned it to the "OFF" position.

Upon my next start sequence a couple of days later is when the HACman failed. I could not keep the engine running with choke, partial throttle or electric fuel pump on. The brass sleeve had broken free. That's when I replaced the HACman with a new unit.

In reviewing my notes, I forgot to mention by others in 2016. They had heard a ticking sound when I was taxiing or during a take-off/landing. The ticking sound disappeared (reported as near eliminated) after the replacement of the defective fuel pump. I attributed the noise and its elimination to the incorrect pin length (defective pin was longer). I never observed the ticking sound. Greg Hobbs noted that (this July just before the accident) when doing the static runs, he detected the return of the ticking. I am curious if the camshaft pin was inspected with the mechanical pump?

10/18/2018 (1)

NTSB Question(s)

- A. Was the carburetor the make/model supplied with the engine?
- B. If not, why was it different?
- C. Do you recall every re-jetting or adjusting the jets on the carburetor?
- D. If so, why & how, & what guidance or assistance did you have/use?

Owner Response(s)

A. Yes, no change to carburetor. It was the OEM Bing supplied with the engine. It did have a HACman installed which is used to lean out air/fuel mixture at altitude. It was not engaged at the time.

B. N/A

C. No change in jetting on the carburetor.

D. N/A

10/18/2018 (2)

NTSB Question(s)

You stated that the fuel pump pushrod was overly long, and discovered/replaced at about 33 hrs

Do you recall how that was discovered (I know the engine ran rough) and did you ever get any explanation of why it was too long?

Did you buy the engine direct from Jabiru, or was it finished & sold through a third party vendor?

Owner Response(s)

I purchased the engine through the dealer which came from Jabiru USA directly.

With respect to the mechanical fuel pump replacement, I had proceeded through a series of troubleshooting steps to ascertain why the engine was exhibiting the "surging" and not reaching

full power.

These included: replacement of fuel filters, changing of the propeller pitch (the full power/rpm data point) and installation of a fuel pressure sensor. Unfortunately, I later discovered from the sensor provider that the effective accuracy of the device was +/- .5 psi. Given the max pressure was .7psi....the sensor was effectively....useless.

At that juncture I removed the mechanical fuel pump to ascertain if it might be a contributor. What I discovered was the actuator arm (a cast piece) was bent and a small bright spot indicated the point of contact on the actuator was minimal. I then cross-referenced the length of the rod between the fuel pump and the camshaft. It was out of specification, i.e. too long. I was unable to determine a manufacturer on this pump.

Jabiru USA had the pump replaced. It was of German manufacture. I presume it came directly from Jabiru. The camshaft pin met the engine manual specifications for length. The actuator for the pump diaphragm was straight, not bent. I never received an explanation as to why the fuel pump was defective. I also don't know what, if any impact the extra length might have had on the camshaft lobe. We certainly know that the diaphragm actuation was a contributor to the problems given the poor contact from the bent casting. Given the surging and power problem was eliminated by the replacement, one or both of the defects caused that problem.

My next analysis is pure deduction and not derived from a full knowledge of facts. The engine, as received in the shipping crate, was stamped "CAM-IT". It is my understanding that this company was a sub-contractor for Jabiru and built engines to Jabiru's specifications. I believe that Jabiru cancelled their contract with CAMIT (sp?) and that my engine was one of the last engines manufactured for Jabiru for sale in the USA.

The defective fuel pump could well have been sourced by CAM-IT at a lower cost than the specified OEM model. That is conjecture on my part, but could explain it being different than the Jabiru replacement unit that I installed.

Early in my flight testing I had experienced a problem early on with a HACman that was defective. It was replaced with one that worked fine (~25 hours. It was only briefly tested as I hadn't been flying at high altitude).

During my rapid troubleshooting scan I did not observe the HACman out of position.

10/24/2018

NTSB Question(s)

FYI, the initial test results (which I'm seeking more detail on) caused the involved personnel to conclude some type of problem with carburetor "jetting"

I circled back for more detail, plus Jabiru Australia input

Re the "CAM-IT" issue, can you please send me any documentation re who you purchased the engine from (with date) and I'll try to dig into that aspect -maybe as you say there was a QC problem

Also, I suspect that you already did this, but what did the Jabiru/Lightning user forums have to say about the long pushrod and about CAM-IT
If you didn't do that, maybe some queries there by you would help us

Owner Response(s)

I will go back to my files and see what I have on CAM-IT.

I did not involve myself in a user forum. Greg Hobbs has been involved with over 50 builds and was the key source for discussion on the topic. I will explore the existence of a forum. Mechanically, the short term affects would damage the fuel pump and the long term effects causing excessive wear on that section of the camshaft. Enough force to cause a deformation on the camshaft or effect the bearing? I don't know. I don't believe that was a factor on the engine side of the equation (vice fuel delivery).

10/26/2018 Follow Up Response

I've reviewed the following forums and find no reference to the fuel pump shaft pin. The PPRUNE forum was circa 2004-2006 pre-dating the end of CAMit

jabiru.net

pprune.org

EAA Forum

I attempted to get into the Jabiruowners forum to no avail.

I'm including pictures of packing list and the CAMit run-in ticket that came with the engine. The run-in was completed 11/20/2014.

Jabiru announced on/about October 13, 2016 that CAMit was no longer building engines for them.