Synopsis of an Engine Failure (again)

Generation 4 Jabiru 3300L, S/N33L 146

Sonex #271, N157SX

Robert E. Barber

May 5, 2019

On October 19, 2024, a Jabiru 3300, S/N 33L146, in service in Sonex S/N #271, N157SX, suffered a catastrophic engine failure. This is a report of what was found and the subsequent determinations. The goal of this report is to enlighten other users, and bring attention to a potential risk.

Background

The engine was new in 2019, installed June 9th 2019. It Ran normally for about 124 hrs, where lead buildup necessitated a valve lapping on Cylinder 4. The same thing occurred on Number 3 at 154 hrs. At 176 hr, all valves were lapped and cleaned. After this, the engine ran normally through 300 hrs.

Event Description

On the 19th of October, as departing the Dillard Ranch Fall "Critters Lodge" Fly-in, N157SX took off normally, and after flying downwind in a full power climb, proceed on course for home after leaving the end of the downwind leg. As N157SX was approximately 1 mile past the end of the arrival end of the runway, and at about 2000 ft AGL, the engine failed in a manner I was, uhm…, familiar with. There was enough altitude and distance, so I shut the engine down within a few seconds. Landing was uneventful and normal afterwards (aside from the copious amount of sweat). The aircraft was transported home the following day by trailer.

The MGL Enigma recorded the event, and the relevant data is plotted in Figures 1 through 4 below. Failure occurred at 151 seconds, and engine RPM, EGT's, CHT's, and oil temperature and pressure.

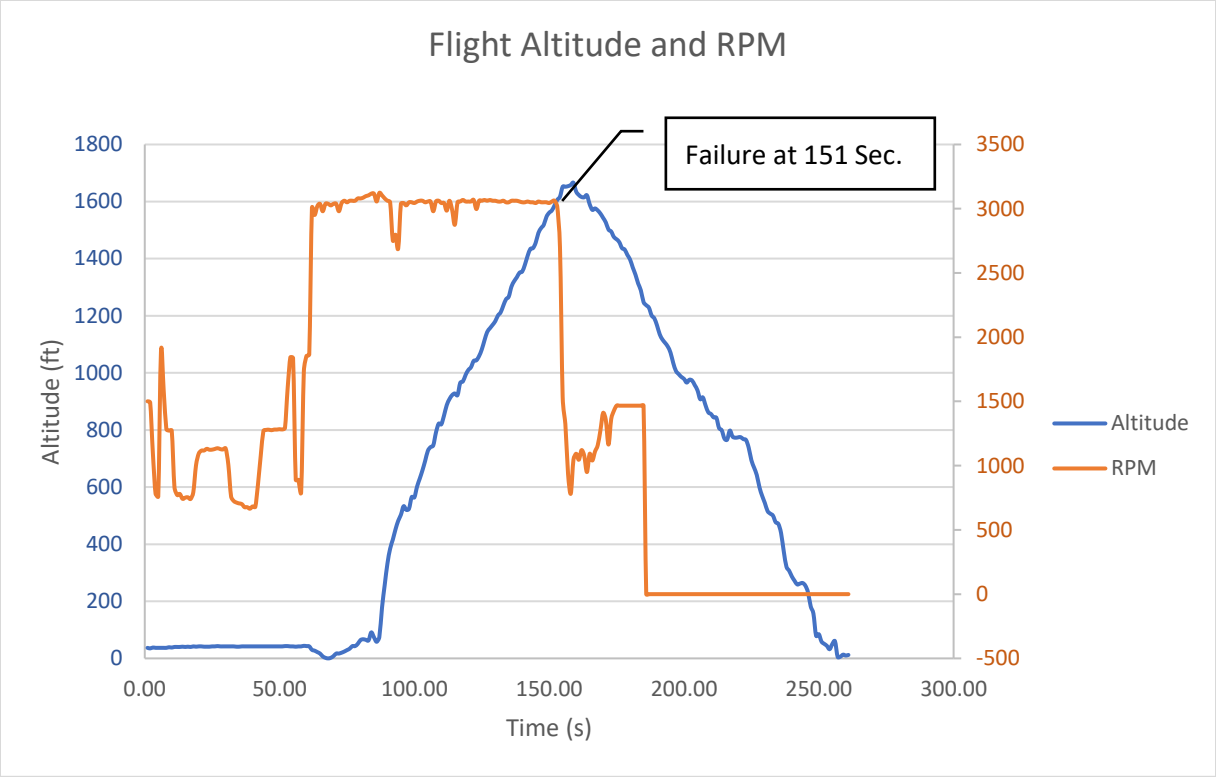

Figure 1. Flight Data recorded. RPM and Altitude

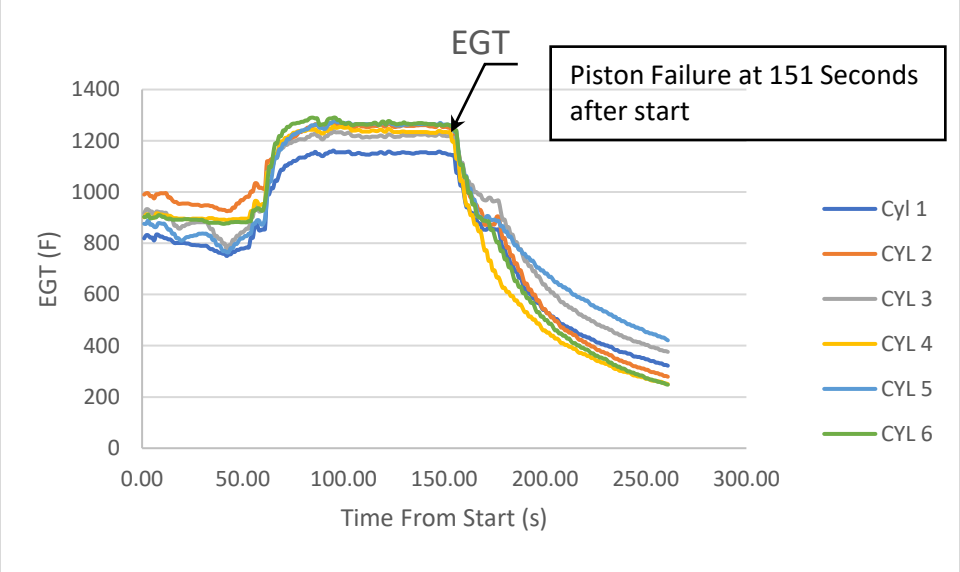

Figure 2. EGT during flight

In Figure 2, the reduction in EGT Temperatures corresponds to engine failure. This behavior is also apparent in Cylinder Head Temperatures.

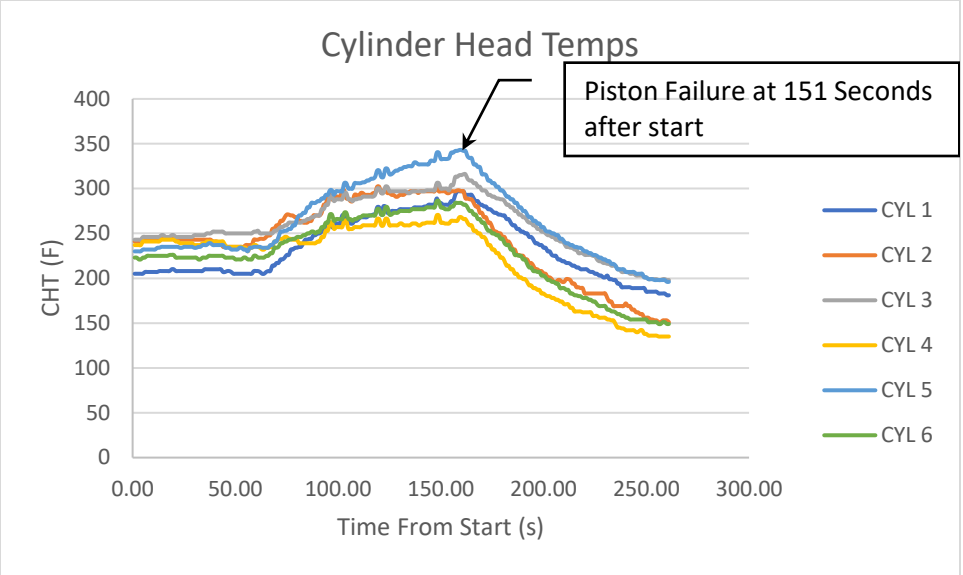

Figure 3. CHT

Figure 3 shows the CHT for all cylinders. Note the CHT for #4 dropping at almost the same time and rate as all cylinders after the failure.

Figure 4 shows a continuing rise in oil temperature post failure, but the temperature is not excessive.

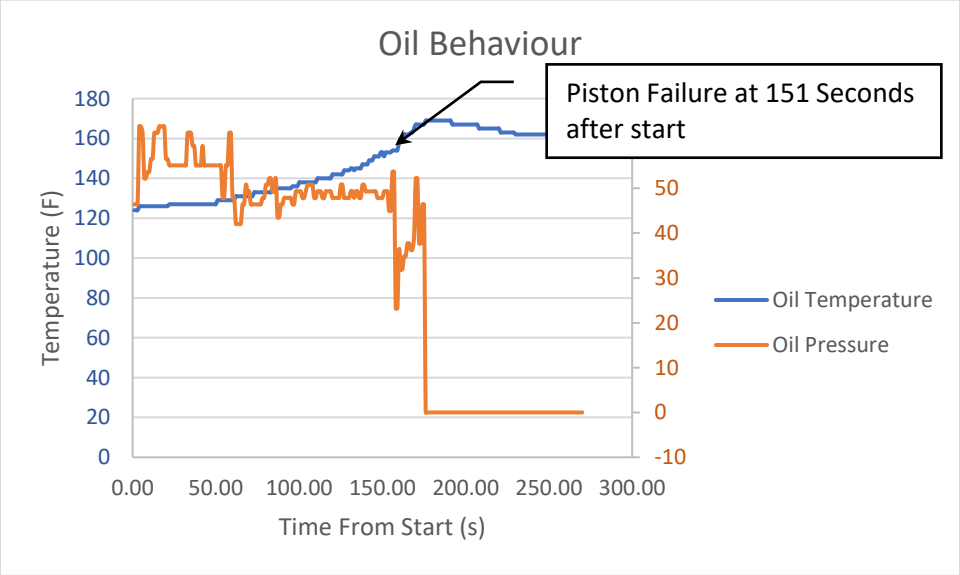

Figure 4. Oil temperature and pressure.

As can be seen in all engine data shown, the entire flight lasted a little over 2 minutes. The drop in RPM associated with the failure can be clearly seen. The first minute was devoted to taxiing. The engine appears to operate normally… until it didn't.

Post Mortem

Post failure examination was done in hopes to find the root cause of the failure. Pictures were taken via a scope, and are presented below. It is clear that without the steel cylinders, the rod will destroy the surrounding architecture much more quickly. It is also clear that the valves did not fail, as both of them are in place. Without the engine continuing to run, as in the previous failure (thankfully), the piston did not reduce itself to aluminum granola.

Figure 5. Bent over Rod and ring remains

Figure 6. Valve with chunk of Piston

Figure 7. Both Valve are still in the head.

Figure 8. Top of Cylinder at base.

Figure 9. In sump. Not as much "Granola". Probably due to shutting down the engine quickly.

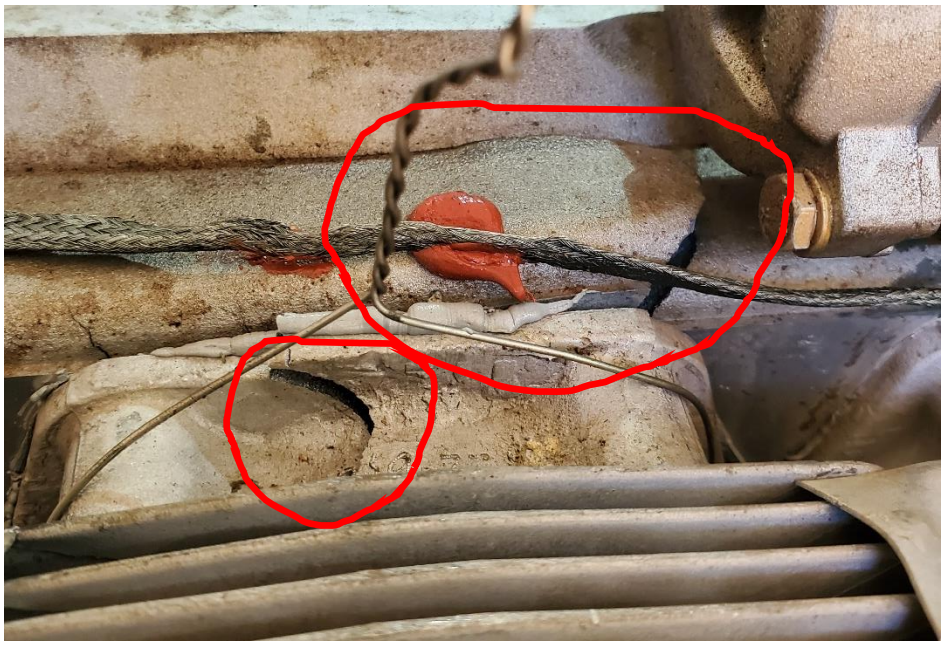

Figure 10. Outside, top of engine, looking at #4.. Note large cracks.

I elected not to open the engine beyond scoping through the spark plug holes. Instead, I took it to Arion Aircraft to let them look through it. It was discussed the engine was not likely rebuildable, but since it stopped so quickly that damage to remaining cylinders was not likely. The case is not usable, but the remainder, sans the cylinder and associated rod appear OK.

Results from Arion and Jabiru:

I delivered the engine in person so I might pick the brains of Nick Otterback and his mechanic as to the possible cause. While he could not say with certainty, he noted that several engines used in testing in Australia had developed cracks in the pistons at a prescribed 300 hr teardown. The flaw was found and changes made. The question becomes was my engine in the serial number range to have the flawed pistons. After a couple of weeks of digging about, it was determined it was indeed in the range. Was the piston failure due to this small design flaw? Maybe, but there is no evidence to support this. If this was a hypereutectic piston, it could also have been a casting flaw, or some other microscopic defect not caught by QC. However, because the engine was within the range of serial numbers consistent with their testing, Jabiru offered to replace my engine with a newer, freshly rebuilt engine, even though my engine was outside of the warranty period. I am very grateful for this.

Is Jabiru going to issue an SB or AD for this? I suspect they will, but I have not heard anything to that effect yet.

Conclusions

I love Jabiru Engines. They are lightweight, smooth, powerful, and sound awesome. And for them to step up and replace the engine like this says a lot about the company. They want to do good by their customers.

I hope someone finds this useful.

All the best,

Robert E. Barber

N157SX (Sexy Hexy), S/N 271, 1300+ hours.

Doing dumb stuff in the sky…