

Aeromotors, LLC

304 East Murray St. Browntown, WI 53522



Repair Station Number: 01MR357Y

EASA Approval Number: EASA 145.6504

07/28/2020

NTSB

Dennis Hogenson

S-ASI

Federal Way, WA 98003

Ref: WPR19LA218

Weldon Fuel Pump Examination

P/N B8120-M S/N 1807225

Dear Mr. Hogenson

This is a report on what was found during the examination of the above referenced fuel pump at Aeromotors on 7/23/2020.

FSDO inspectors Todd Davis and Pete Corrao delivered the pump in a box that had been opened but did not appear to have been unpacked. The pump had been disassembled with the parts being placed in bags. The motor had not been disassembled. Initial inventory revealed that all the parts were present with the exception of the hook end of the retaining ring, which had fractured off. The unusual appearance of the rotor and vanes were noted at this time, they are polished surfaces and they no longer appear polished.

Examination of the retaining ring:

1. Wire diameter 0.055"
2. Diameter at vane contact area on non-hook end 0.045" wear would be 0.010"
3. Diameter at vane contact area on hook end 0.022" wear would be 0.033" The hook portion of the retaining ring had fractured off and could not be found.

Examination of the rotor:

1. Unusual appearance, when examined under the microscope it looks like it's been shot peened.
2. Small amount of buildup material on rotor lobes, looks like galling material from the stator.
3. Drive end and shaft seal areas looked good.

Examination of the relief valve:

1. Normal wear in the relief valve piston. This wear indicates that the pump had operated for a period of time.
2. The pressure plate that the piston is in contact with also has normal wear.

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Examination of the vanes:

1. Unusual appearance, when examined under the microscope it looks like it's been shot peened. One vane had more of this than the other.
2. The edge of the vanes that are in contact with the rotor has very small particle's imbedded. The particles look like galling material from the stator. More prevalent on one vane than the other.
3. Both vanes have wear in the notch for the retaining ring, one to a much greater degree than the other.
4. Both vanes have a burr at the notch for the retaining ring, this would not cause a problem with the operation, but will cause a problem with removal of the vane from the stator.
5. When the vane was placed in the stator with the rotor installed, the worn notch comes almost flush with the bottom of the retaining ring groove in the stator.

Examination of the stator:

1. OEM part, no machining occurred or was needed in order to replace the OEM lip seal with the Aeromotors lip seal.
2. Indication of retaining ring contacting the bottom of the retaining ring groove in the stator.
3. Some galling, material removal in the stator.
4. Indication of the peening on the bottom of the stator, one vane was working the other was not.

Examination of the motor:

1. The motor was disassembled and nothing out of the ordinary was found.
2. Commutator wear is about 0.002" with brush wear of .018" to .020"
3. Weldon did not examine the motor because for them it is an off the shelf part that is simply remove and replace. They may have no one familiar with the internal workings of the motor.

Examination of the other pump parts:

1. Nothing out of the ordinary was found on the remaining parts.
2. The pump had been assembled correctly and appeared to had been operating correctly until the failure point was reached.

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I agree with Weldon when they say that one of the failures of the pump occurs when the vanes lose contact with the rotor, the fuel will simply pass from the pressure side to the inlet side of the pump. This would be considered the failure point of the pump, as it could no longer meet the flow and pressure requirements. In this case the retaining ring and vanes wore to the failing point and the pump continued to be operated even through the output would be questionable. The evidence for this is as follows:

1. The amount of wear of the retaining ring and the vane leaves a gap between the vane and rotor.
2. The retaining ring continued to wear until the hook end fractured off.
3. The hook end of the retaining ring remained in the pump, bouncing around causing the peening appearance and galling material found on the rotor, vanes and stator. The more common scenario that occurs when the hook end of the retaining ring fractures is for it to lock up the rotor, which will burn out the motor until the circuit breaker pops. In this case, that did not happen and the pump continued to be operated with the hook end being bounced in and out of the ports and causing the peening appearance.
4. The hook end of the retaining ring was not found. The remains could have been lost when Weldon opened up the pump or the pump could have been run long enough for the hook to have disintegrated. From the evidence, I believe that it just wore down to nothing. For this to have occurred it would have taken a considerable amount of time.

As an old aircraft accident investigator, I am of course curious and have the following questions that come to mind on this. Please do not feel that you have to answer these, but if you wish to, I will certainly appreciate it.

1. What indications does the operator have that the fuel pump is inoperative?
2. How many fuel pumps has this aircraft had fail?
3. Is the pump intermittent or continuous use?
4. What is the inflight restart procedure in the pilots hand book? I had one accident that had four out of the four restart procedures in the pilots hand book that did not work. If you followed the book it would not start.
5. The engine obviously will run on just the engine driven fuel pump, so the question is why would it not start in the air? How much of a lift (fuel level in tank to pump inlet) is required of the engine driven fuel pump?

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I would also like to point out that the FSDO inspectors already had the majority of the material that they had requested that we produce for them. Our engineering department had provided them with a computer disk with this material a long time ago, so why are they asking for something they already had. They sat hear looking at this material on their lap top. The few items that they did not have we had made copies for them, with the remaining items being deemed no longer necessary.

In conclusion, I feel the evidence found in the pump speaks for itself. The pump was operated for a long period of time after it had reached it's failing point.

If you have any question on this, or wish to discuss it please feel free to contact me at any time.

Sincerely,

[Redacted Signature]

Ole Bartelt

General Manger