

## Auxiliary Fuel Pump's Pressure Variations

V1b aj

The following inquiry prompted development of this document:

*...so I have installed the spare (auxiliary fuel pump). It's a bit quieter, but seems to fluctuate pressure more than the old one. The old pump used to "pulse" somewhat on occasion, but I figured it was because of its age. The new one, though I haven't flown with it yet, pulses between 10 and 14 PSI, oscillating every one second or so. I don't recall that being normal. Any thoughts? Maybe it won't do it with the engine running. Haven't tried yet. I did adjust the pressure up and down, but it still pulses a bit. Maybe the seals are dry and will loosen up with time?*

*(IBDA Member)*

### **Re: Aux Pump Pressure Variations**

It's likely "sticky balls." If so - AND THE PROBLEM IS THERE WHEN THE ENGINE IS RUNNING (*see later in text*) - pulling that lower (wet) section, carefully disassembling and cleaning the guts with MEK (being careful to NOT get any on the non-metal seals/gaskets/packings), then reassembling with a THIN film of "Fuel Lube" (or EZ Turn brand) sealant on the packings and parting surfaces will likely take care of it. But, before doing that...

The disclaimer: Please understand all information and opinion contained herein is subject to your A&P's or A&P/IA's review and approval prior to taking action. Not having seen your plane, nor the specific issue, and depending solely on a spoken or written description, I can speak only to the theoretical. Your actual issue should be observed, analyzed and appropriate actions confirmed by your authorized A&P or IA.

REMEMBER: FUEL PRESSURE FINAL ADJUSTMENT MUST ACHIEVE THE CORRECT PRESSURE WITH THE ENGINE RUNNING. The engine-driven mechanical pump's pressure adjustment (relief) has an effect on the overall pressure. An aux pump can be adjusted to a particular psi, but it must be checked when the engine is running. Pressure will generally vary by several pounds when running vs. not running. Some operators report increased pressure, some report lower. Be assured it will vary and so you must make final adjustments to achieve the correct fuel pressures for a running engine. The desired pressure for a running engine with the electric pump "ON" is usually 12-15 psi. It's usually set at 1+ psi over engine-pump-only pressure so you can visually confirm the pump's operation when you toggle it on for takeoffs and landings.

### **The Big Question**

The big question is "How large are the pressure variations with the new aux pump?" *If* the current changes in pressure are no more than 2-4 psi and *if* the variation is consistent regardless of which tank is selected, I'd simply monitor the

situation and see if the "sticky balls" free themselves soon. If that's going to occur, it will happen within a couple of hours of fuel flow.

If it's 5 psi or greater fluctuation, or that lesser 2-4 psi fluctuation hasn't gone away after a couple of hours of operation, I'd service the "wet" section of the pump to be sure the pressure regulating ball/spring and the check valve ball/spring combinations are able to move freely. That "sticky balls" service would be a start. Then, see how it's behaving. If the problem remains, you can troubleshoot the fuel system to identify what may be changing during operation.

If cleaning the aux pump's spring/ball assemblies doesn't stabilize the pressure while the engine's running, there are two other less-likely possibilities:

### **Alternate Possibility One**

There is a relief valve on the engine-driven mechanical fuel pump. (It's on the body of the engine-driven pump, adjusted with a slotted shaft that's locked in place with an outer jam nut.) If that relief/pressure adjustment valve has some debris and the orifice is "fluttering," the same effect could occur since it also influences the fuel system pressure. That engine-driven pump's regulator problem is generally noticeable during major changes in engine RPM (with the aux pump OFF) since the engine pump needs to relieve more output/higher pressure at higher RPMs. If the operator is not seeing those pressure fluctuations during flight or ground operations when just the mechanical pump is operating, then it's not that pump's relief/adjustment valve.

However, if he does see *similar* variations during mechanical-pump-only operations (not likely to be identical psi variations since only the slightly-lower-pressure mechanical pump is operating), then it's likely that the mechanical pump's relief assembly or impeller seal is acting up. I do not have experience in overhauling the guts of that pump assembly. If procuring a yellow-tagged exchange unit, it MUST be EXACTLY the same part number AND dash number. There are other models of the same pump that vary only by dash number. THEY WILL NOT WORK in our application (that's been learned the hard way). Although they carry the same p/n except for dash numbers, the input and output ports and relief valve configurations are different. All numbers - including dash numbers - must match exactly.

### **Alternate Possibility Two**

Another, but least likely, possibility is that a supply or return line is partially obstructed and is cycling between being open or partially obstructed. We have supply and return for each tank, thus four lines to the selector plus two lines to/from the engine: 1) One to the aux pump, then the gascolator, ultimately supplying the engine pump and from there to the carb and; 2) One from the carb, returning excess fuel to the selector and thence to the supplying tank.

If it's one of those tank lines from/to the selector, you'll see the pressure variation when one of the tanks is selected, and no variation when on the other. Or, if it's

the lines to the aux pump/gascolator/engine pump or from the carb back to the selector, it will show the same varying pressures regardless of which tank is selected *and will show up even when operating on only the engine-driven pump.*

### **Be Conservative – and Safe**

Some things to keep in mind when considering the Birddog fuel system and fuel pressures:

Per the Bendix PS-5C pressure carburetors manual, our carburetor requires a minimum of 9 psi to operate. And that will require a properly-operating electric auxiliary fuel pump if the engine-driven pump fails. Both the Army and Air Force pilots' manuals say failure of the engine-driven fuel pump calls for immediately turning on the auxiliary pump to restore pressure, then landing at the nearest base.

Given the age of our systems, carbs, and likely inaccuracies of our old fuel pressure gauges, be conservative! If fluctuation takes pressures to less than 9 psi, I'd sort out the problem *right now*; before there's sudden silence.

So, see how things look with the engine running. Don't be surprised when you have to adjust pressure to bring it in line with the fuel pressure specs.

Hope this is of some help... Good Luck!

V1b  
aj  
04/2013