Federal Aviation Administration

PAFI-RTP-010 Rev 0

PAFI Fuels – Fuel Sump Valves

Fuel Sump Valve Test

PAFI-RTP-010

PAFI Rig #10 Fuel Sump Valve Test

Rev No.	Rev Date	Affected Pages	Description of Revision
New	4/16/2025	All	Initial Release
0	6/12/2025	All	Review

Purpose

To execute dynamic evaluation of aircraft sump valves with unleaded aviation fuels, particularly G100UL and UL100E as compared to 100LL.

Background

During PAFI 1 Rig 3, Dynamic Rig Testing, one of the component types tested were a collection of aircraft sump valves. The valves were manually actuated daily while continuously exposed to the test fuels under ambient conditions. The test ran for 30 days and at the end of the testing, failures with individual test fuels as compared to 100LL were observed. This test was determined to be probative and discriminative in evaluating the material compatibility of the aircraft sump valves.

Test Parameters

Test Hardware

The hardware selected as representative of the industry at the time are shown in the following table. There are four types of valves represented. This does not preclude testing additional fuel valves at this time, should they be suggested.

A minimum of one valve each per fuel is required. However, experience suggests that two each of the valves per fuel is prudent.

Supplier	MFG	Part number	O-ring type	Notes
McFarlane	Curtis Superior	CAA-1800	MS29513-007	1/8” NPT, Flush mounted Push operation
McFarlane	SAF-AIR	3750	MS29588	3/8”-24 UNF Not flush mounted Push operation
Aircraft Spruce	Cessna	S2485-1	MS29513-011	
Aviall	Parker/Shaw Aero	72-478	N/A	Aviall PN 492-361 For Piper A/C Lightening Proof Push and twist

Figure 1 - Drain Valve CAA-1800 Drain Valve 3750 Drain Valve S2485-1

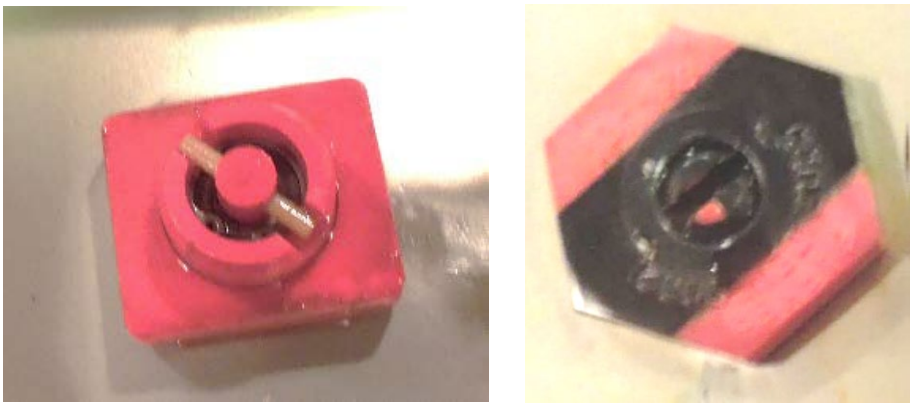

Figure 2 - Drain Valve 72-487 Inside and Outside of Tank

Support Hardware

"Fuel Tank" Analog

A tank into which the valve receiver can be installed is required. One means which has been successfully used is a 1/3 rectangle chafing dish. The pan is conducive to the installation, non-reactive, and has a lip which can be used for 'hanging' the tanks. Because of the protrusion of the drain valves and the need to access the valves to actuate them, this hanging is necessary. The 1/3 size is large enough to accommodate the four valves, and to hold sufficient fuel for the exposure.

"Fuel Tank" Analog Lids

In order to minimize the evaporation of the test fluids, some type of cover is required. If the 1/3 chafing dishes are used, the matching stainless-steel covers should provide sufficient coverage. Given the volatile nature of G100UL, however, a more positive seal may be required.

Figure 3 - Fuel Tank Analog and Lids

Fuel Containment

A means of catching and containing any fuel spills up to and including the entire "fuel tank" contents is recommended.

Rig Preparation

All of the individual drain valves may be installed into a single fuel tank. To accomplish this, a hole is drilled into the fuel tank and a matching fitting as appropriate to each of the fuel drain valves is welded into place. The drain valves are then installed. Lack of leakage needs to be confirmed on each installation.

Figure 4 - Installed valves - inside the tank

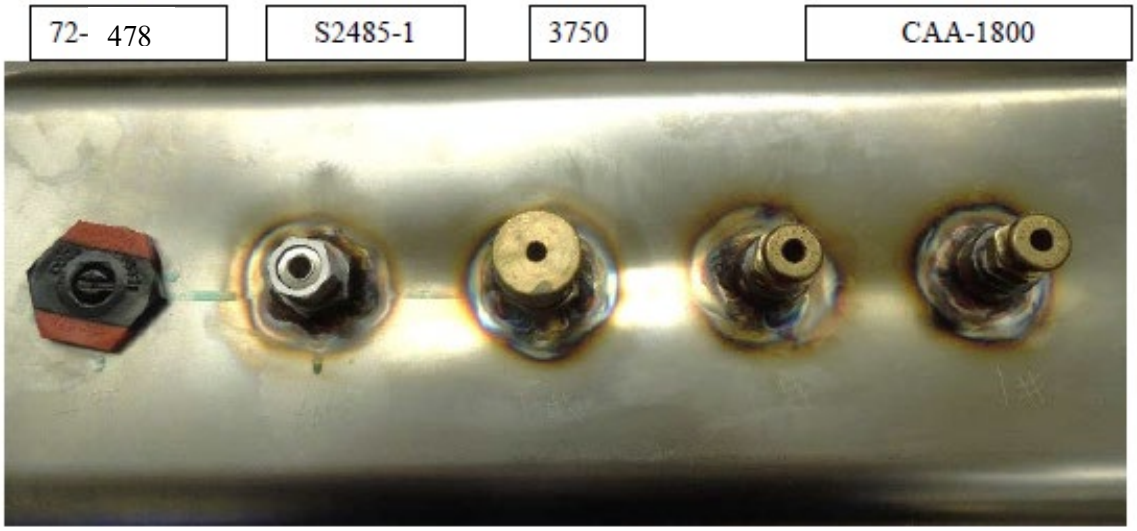

Figure 5 - Installed valves - Exterior of the tank

Figure 6 - Installed valves – underside

Test Profile

The test pans are filled with two to three inches of test fuel and the drain valves are actuated daily for 42 days. Test pans should be placed in accordance with local regulations. Test temperature is ambient.

Test

Once per day the values are actuated. Record date and time, and observe the following:

- The presence of full typical fuel flow when actuated
- Any static leakage while the valves are closed
- Any difficulty in actuation (opening or closing)

Because of the volatile nature of the fuels, static leakage may only be visible as discoloration and staining on the valve, and/or as drip marks below the tank.

Confirm the tanks remain filled with fuel. Add fuel if necessary and record the addition.

Note:

- If a valve begins leaking from the threads within the first 24 hours, attempt to tighten and stop the leaks, note the fix, and keep going.
- If the leak is in the threads and begins within the first week, try to tighten it, note it, but consider the results compromised (unless error is attributable to operator action).
- If it happens after the first week, tighten it, let it go to completion, but do not use the data.

- If the leak is other than in the installation, this will be an indication of a fail and the testing on that valve is complete.
- If the valves are installed per figures 5 and 6 in a single tank, remove the failed valve and retain it for evaluation. Install a plug or other means as necessary to seal the tank and continue testing so the remaining valves are not impacted by a loss of fuel.

Pass/Fail Criteria

The fuel valves shall not experience leakage or any restriction/inability to be operated greater than that experience by the valves exposed to 100LL.