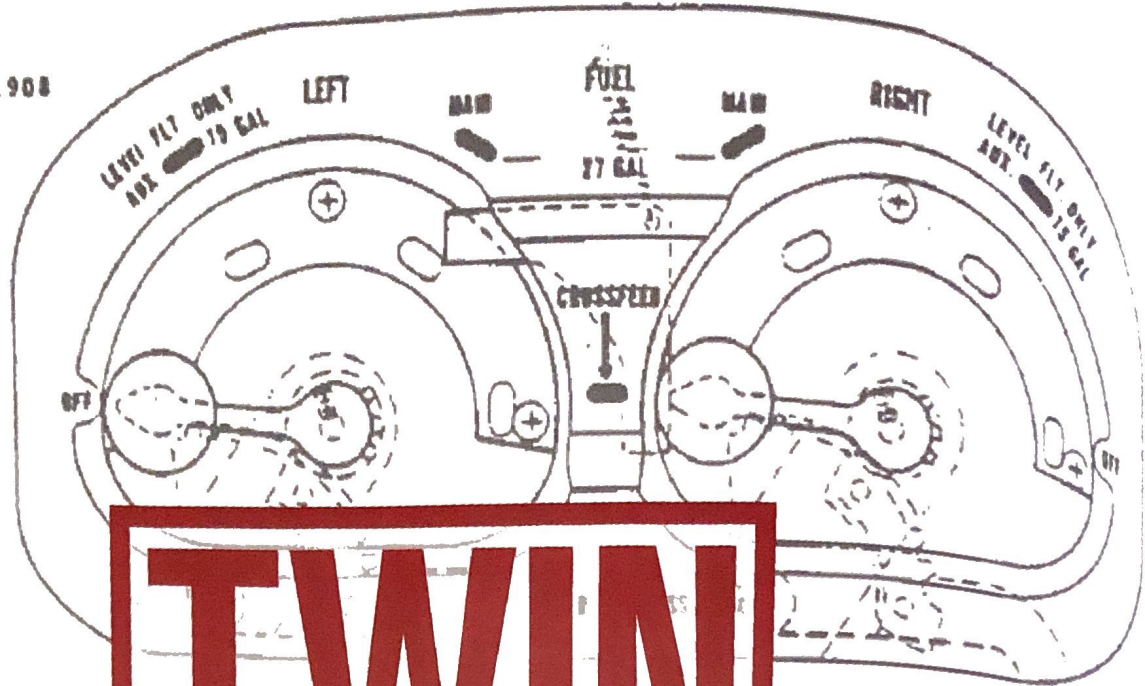
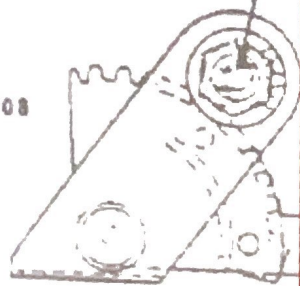


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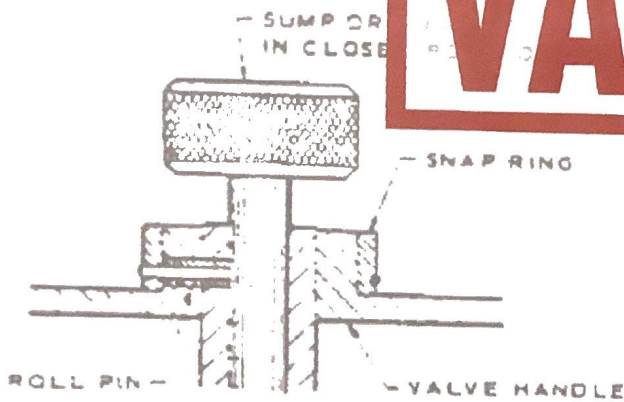
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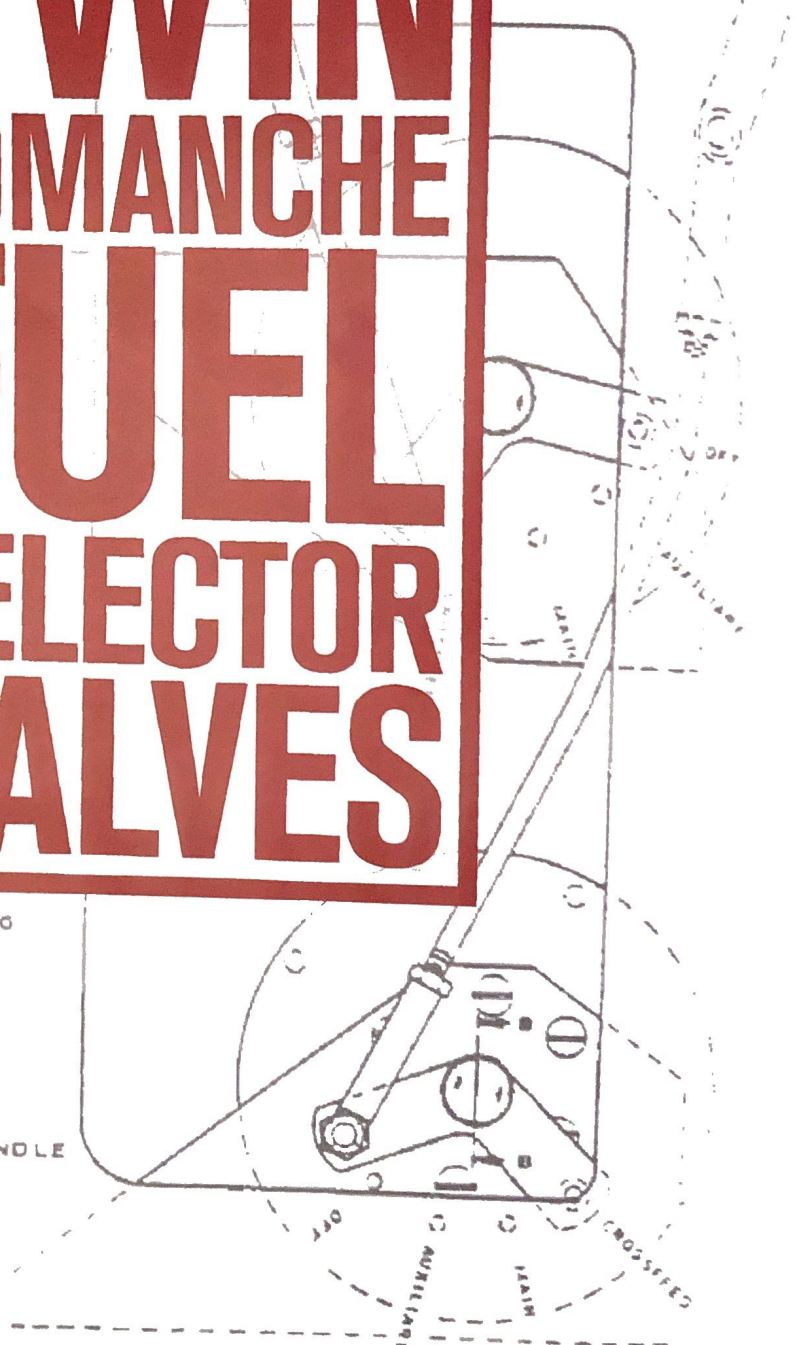


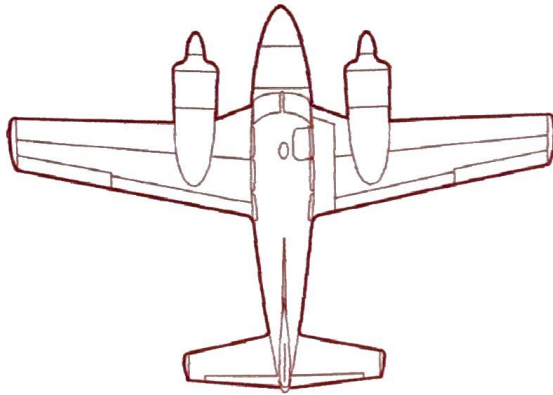
VIEW A

TWIN COMANCHE FUEL SELECTOR VALVES



SECTION B-B





KRISTIN WINTER discusses the Twin Comanche's fuel selector valves, the ADs that apply to them, and how owners can conduct their own valve inspections.

Over the years, Airborne Manufacturing Co., now Airborne Division of Parker Hannifin Corp., was the leader in many types of components used in General Aviation aircraft. Old-timers will recognize Airborne as the main name in dry vacuum pumps for decades.

Airborne was also one of Piper's favored suppliers for fuel selector valves. Piper chose a variant of one of Airborne's valves for the PA-30 Twin Comanche. It was not the most successful component design ever.

Airborne fuel selector valves

The Airborne 1H7-1 and 1H7-2 valves were installed in the original Piper PA-30 Twin Comanches, starting with the 1963 model. The fuel filter is built into the valves, as is the bowl to collect water and other contaminants.

The two valves are mounted in the belly of the aircraft between and just aft of the front seats. A hinged hatch in the floor gives the pilot access to the valves to allow draining of the bowl. This is the only fuel drain point on a Twin Comanche.

The valves have four positions each: OFF, AUX, MAIN, and CROSSFEED. The bowl is drained by the pilot accessing the top of the valve and pulling up on the red knob, allowing the fuel to drain out of the bottom of the aircraft.

Given the positioning, it either takes two people to check for water in the fuel, or the pilot can put a container under the

aircraft to catch the fuel as it drains out. I use a large, rectangular plastic food storage container to catch the fuel, and when not being used for that, it stores my oil spout, gloves, etc. in the back of the aircraft.

As the Twin Comanche has no individual drains for the tanks, draining a cup or so from each of the tanks is highly advisable, as is making sure that the fuel caps seal and the fuel filler access doors seal as well.

The selectors have had three issues over the years. Two minor issues were corrected by AD or service letter. One issue is ongoing and annoying. The ongoing and annoying one is internal corrosion; largely in the form of rust. To understand the rust problem, it is important to understand how the valve works.

Valve function

The body of the selector is divided into two chambers; the upper and the lower. The fuel comes into the upper chamber. The actual mechanism is a somewhat unique design.

It uses a spool with arms in the upper chamber that moves around in the body of the valve when the selector position is changed. This causes an arm of the spool to depress a ball valve. In turn, the ball valve comes off its seat and allows the fuel to flow through one of the input lines.

Once flowing, the fuel goes down a central tube, into the bowl, back up through the filter, and out to the engine.

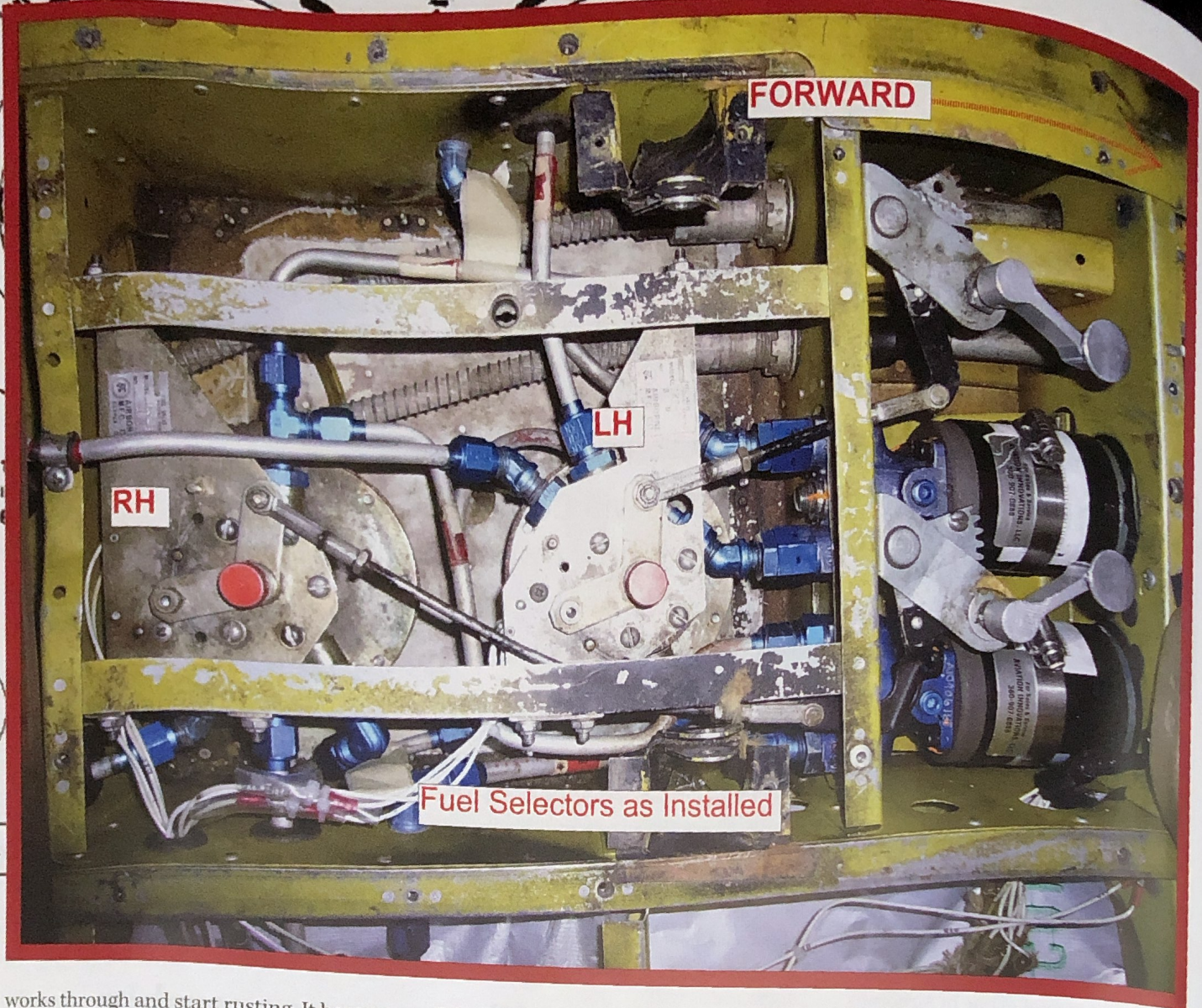
Around the central tube is a filter bypass valve. It is a doughnut-shaped aluminum fitting with a rubber gasket that is pushed up against a central divider which separates the upper from the lower chamber of the valve body. In the event

The entire assembly, including the filter assembly, was originally made of cadmium-plated steel. If water sits on cad-plated steel too long, it works through and start rusting.

that the filter clogs, the bypass valve comes off its seat, and fuel will flow through the four holes that are around the center tube in the central divider.

Corrosion

The corrosion problem is mainly due to material choice and design. The entire assembly, including the filter assembly, was originally made of cadmium-plated steel. If water sits on cad-plated steel too long, it



Fuel Selectors as Installed

works through and start rusting. It became clear fairly quickly that a cad-plated bowl would seriously rust from the inside.

This was fixed with a stainless steel bowl that was made available as a replacement and mandated by AD 83-10-01. This AD also requires cleaning out the fuel bowl and filter every 50 hours.

Unfortunately, the bowl wasn't the only source of rust. The lower cap to the filter assembly catches water, as does the central divider in the body. Also, they can rust where the ball valve seats, which can cause the valves to leak internally.

The early version of the left- and right-hand valves were Airborne Part Nos. 1H7-1 and 1H7-2. The only difference between the two is the top plate by which the valve is mounted and the position on the body of the hose fittings.

To deal with internal leaking (if it is the auxiliary port leaking, it will often cause a transfer of fuel from the aux to the mains), Airborne modified the valves by machining the ports to put an O-ring in as the seat for the ball valve. These valves were designat-

ed the 1H7-7 and 1H7-8. Many of the older valve models have been modified in the field to accept the O-ring.

This change was not a panacea for the problem of internal valve leakage. Continued problems caused Piper to issue Service Letter No. 851. The FAA mandated this letter be followed by issuing AD 79-12-08. This AD requires checking the valve for internal leakage every 50 hours. As AD 83-10-01 also has a 50-hour requirement, they can be done together, and usually are.

Replacing and refurbishing

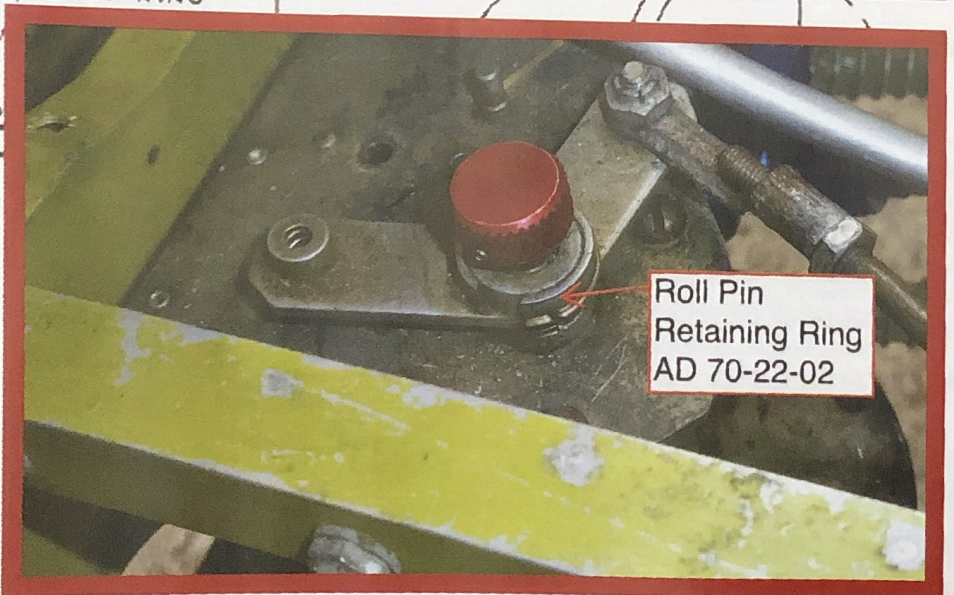
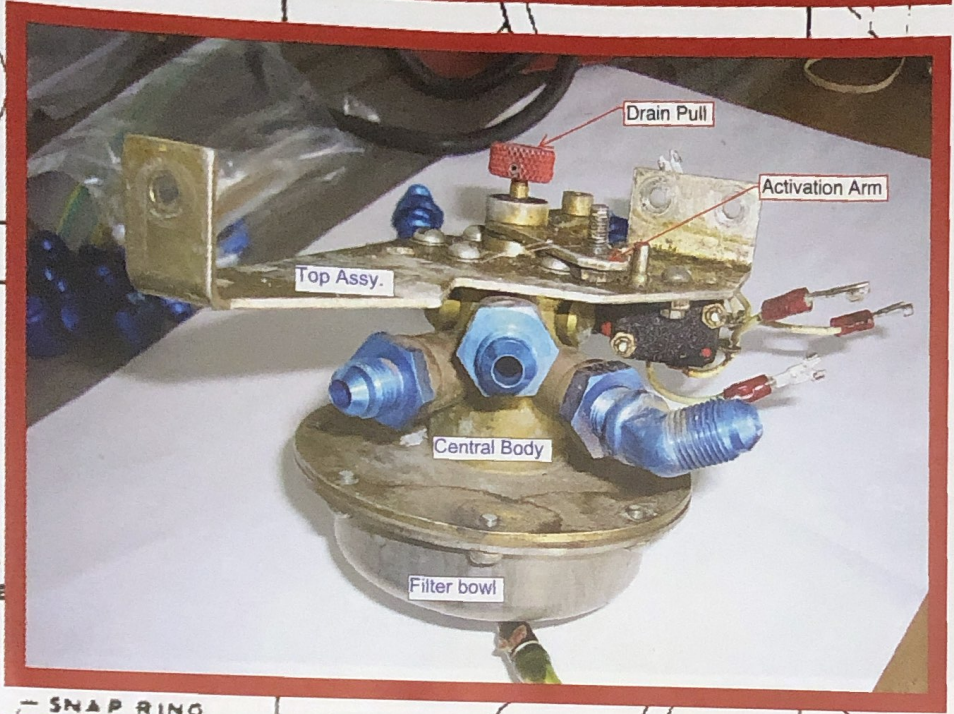
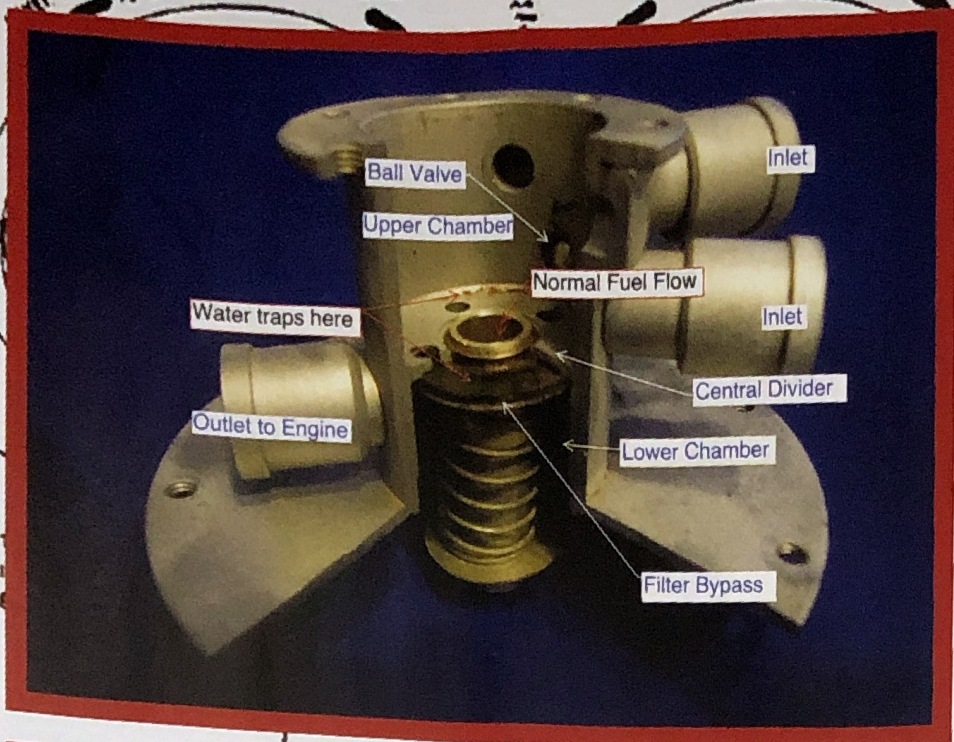
Both the center body and the filter assembly rust. The only complete solution would be a replacement stainless steel body and filter assembly. Parker Hannifin made a stainless steel version available half a dozen years ago for about \$3,200 each. Regrettably, the latest price I saw from Parker Hannifin was \$22,816.50 for one unit. A person can buy an entire Twin Comanche for the price of two of those valves (albeit not a Twin Comanche in great shape).

The realistic repair for corrosion is to have the units disassembled, overhauled, and the parts re-plated. Webco in Newton, Kansas, is the only shop I know with approval to overhaul these units. Last I checked, the price was under \$400.

Other fuel selector problems

There have been a couple of other issues with these fuel selectors, though most have been rectified. One involved the actuating arm and the roll pin that kept it attached to the spool which operates the valve. Needless to say, if the arm becomes disconnected, the pilot can no longer switch tanks. There is a short roll pin that attaches the arm to the axle of the spool. Piper Service Bulletin No. 314A requires the installation of a roll pin retaining ring. The kit is Piper Part No. 760-444.

The FAA thought this was such a good idea that it mandated it with AD 70-22-02. Many aircraft are not in compliance with this AD because the commercial listing of ADs that shops normally use doesn't list this one



specifically for the Twin Comanche. The FAA lists this AD under Airborne Manufacturing, and apparently, no one told the maintenance data aggregators that Piper used Airborne valves.

In addition to the roll pin falling out and leaving the pilot unable to use the fuel selector valve mechanism, early Twin Comanche pilots had some issues getting the selector in the correct position. Piper addressed this with a change to the handle during the 1965 model year. Instead of just pointers, the system now has a metal plate with holes. A pin in the handle drops into in the various positions.

Until someone comes up with an aftermarket stainless steel unit that is affordable, Twin Comanche owners have to deal with the 50-hour ADs requiring checking for internal leakage and cleaning the bowl and filter. Fortunately, the ADs and the FARs allow the owner to do this as preventive maintenance.

Fuel filter maintenance

There are a few things that anyone performing these ADs needs to have handy: a Phillips screwdriver, possibly a slotted screwdriver, a Sharpie marker, a pan to catch the fuel that will inevitably drip out, and some solvent to rinse out the filter assembly. It is a good idea to have a couple of spare gaskets available, though you can reuse them if they are in good condition.

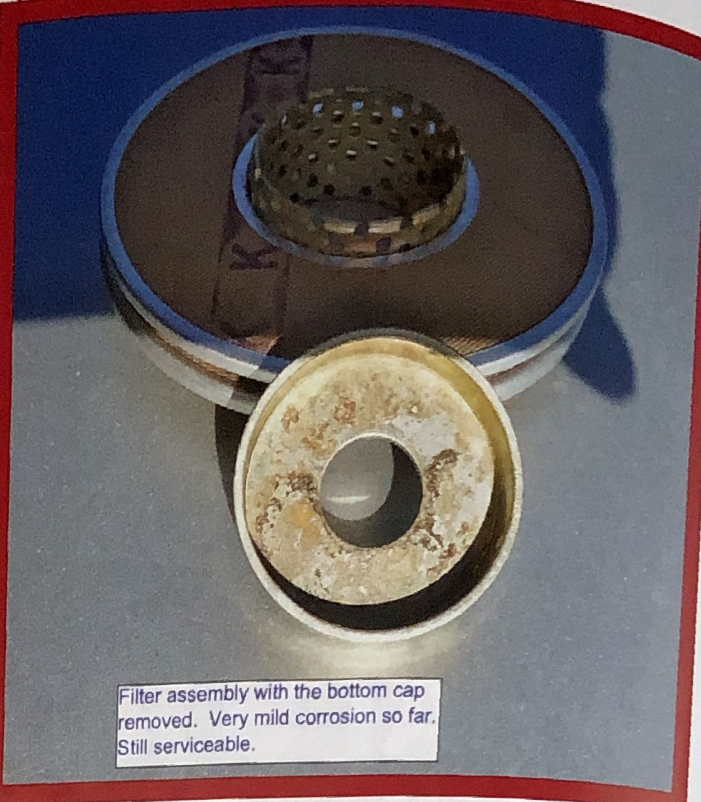
It is also handy to have some jacks to raise the aircraft, so you have some room to work under the belly. There is no need to pick the aircraft up off the gear, or even to use a tail weight. Raising it enough to fully extend the main struts should be enough for all but the biggest people to get under the plane.

Start by putting a pan under the fuel drains on the belly. A shallow pan at least 8-by-12 inches is ideal. Then, turn both fuel selectors to OFF, pull up on the red fuel drain knob, and hold it for a minute or so. Alternately, you can wedge something under the knob to hold it up. This might lessen the fuel bath the plane will try to give you.

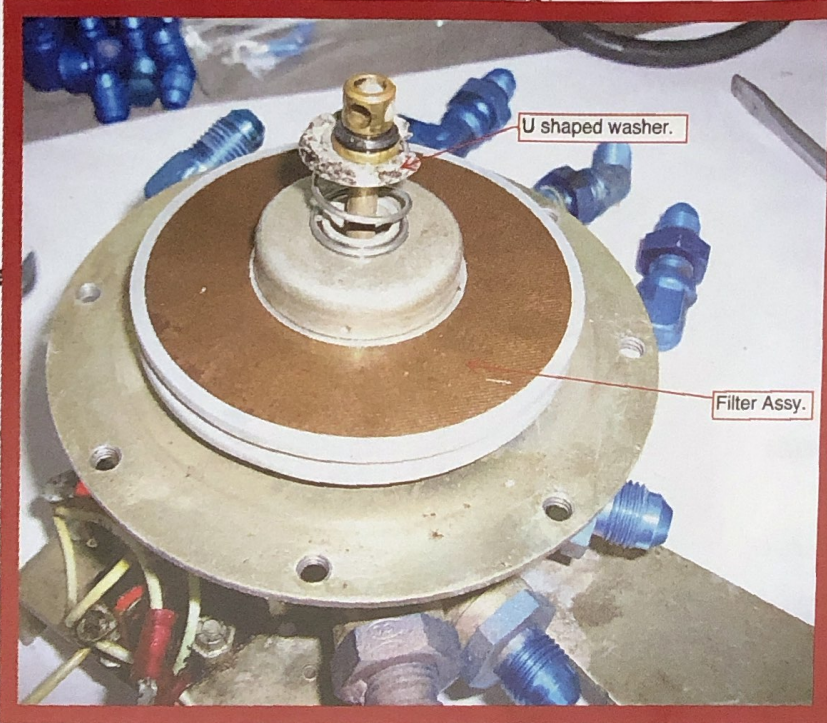
Back under the plane, remove the plate covering the fuel selectors. If not already marked, mark the bowls for location and alignment so you can get them back on correctly. That is what the Sharpie is for.



Control arm rotates and the spool with the four ears walks around pushing in one of the ball valves with each position

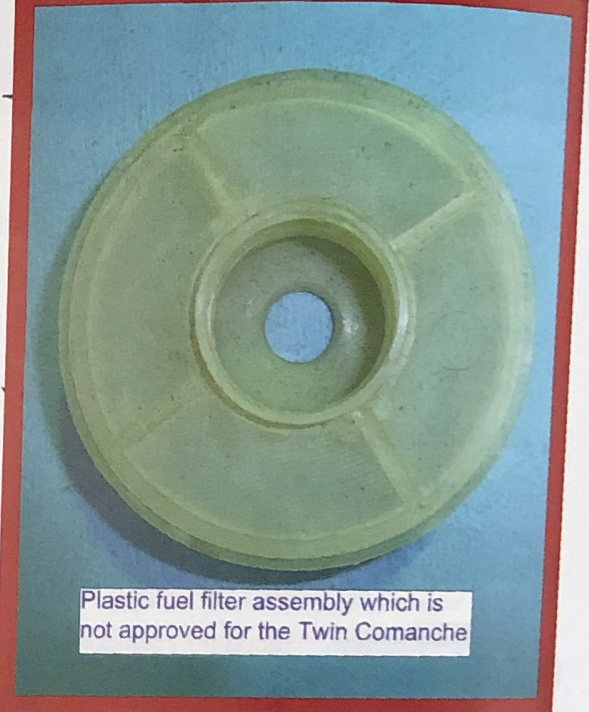


Filter assembly with the bottom cap removed. Very mild corrosion so far. Still serviceable.



U shaped washer.

Filter Assy.



Plastic fuel filter assembly which is not approved for the Twin Comanche

You can now remove the screws holding the fuel bowl to the selector body. When you get down to the last two screws, make sure you are out from underneath the bowl. I have never managed to drain it so completely that some fuel didn't drop out.

Once the bowl is off, you will see there is a slotted washer. It holds the filter assembly and spring in place. There is a depression in the bottom of the washer. To remove the washer, you have to push up against the spring and then remove the washer. This is the second time that the plane will try to give you a fuel bath as the

filter comes down. Clean and inspect in accordance with AD 83-10-01.

One side note here: If you find a plastic filter assembly, you have a problem. Some mechanics substituted these for the approved version. I am not sure where they came from, but they may have been used in some other versions of the valve. However, they are not approved for this valve.

Throw it away and see about getting a correct filter assembly. Piper's price is a bit breathtaking, so ask around. There are Comanche folks who have some available.

For the leak check required by AD 79-

12-08, Piper has a procedure to use while the fuel bowl is still on. An equivalent method is to observe whether there is any dripping after you have cleaned the bowl and filter assembly. If it is still dripping, catch the drips for three minutes and check to see if the drips total less than 1/2 ounce, which is 1 tablespoon.

Frankly, if it is dripping at all, I would flush a cup of fuel or so through from each tank, switch to OFF, and then check if any gunk has dislodged from under the seat. If that doesn't work, a repair is probably in order.

There is no need to pick the aircraft up off the gear, or even to use a tail weight. Raising it enough to fully extend the main struts should be enough for all but the biggest to get under the plane.

Reassembly and documentation

Assuming it has stopped dripping and the filter assembly is clean and all passes muster, you can reassemble. The filter assembly goes on first, followed by the spring, and then, the slotted washer. Next, put on the gasket and filter bowl.

The cork gasket sometimes warps and tries to be difficult. I usually put two screws through the gasket to hold it to the bowl, and then put it up to the selector and start those two screws. Then, I put the rest of the screws in by hand to make sure I have the gasket in the correct position.

Once all the bowls are in place and the screws tightened down snug, but not so tight that it hurts, replace the access panel. Then turn on the fuel to check for leaks and to refill the bowl. Doing it now helps to keep from forgetting the fuel is off and trying to start the plane.

Taking care of these two ADs yourself

can save a fair bit of money, considering that they are 50-hour inspections. Don't forget to make a logbook entry that you did them, along with tach or total time, name, and pilot certificate number. It is kind of a pain to do these, but it is likely to cost \$100 to \$150 to have your favorite shop do it for you.

Don't skip these ADs, as water in the fuel, especially if the plane is outside in the winter, is a serious concern. It also highlights the importance of fuel access door gaskets and fuel caps that seal.

Kristin Winter has been an airport rat for over four decades. She holds an ATP-SE/ME rating and is a CFIAIM, AGI, IGI. In addition, Winter is an A&P/IA and reformed aviation defense attorney. She has over 9,000 hours in various GA aircraft. She owns and flies her Twin

Comanche, "Maggie." She flies professionally, instructs, and provides purchasing and operations consulting. She is currently based in Minnesota, which is where it all started. Send questions or comments to editor@piperflyer.org.

RESOURCES

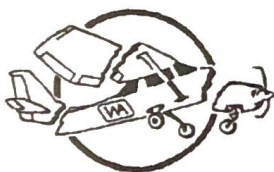
AD 70-22-02
tinyurl.com/70-22-02

AD 79-12-08
tinyurl.com/79-12-08

AD 83-10-01
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