



Water contamination of Aviation Fuel



Piston engines don't run well on water or anything other than what they're designed to burn.

Therefore:





References



Federal Aviation
Administration



FAA
Aviation Safety

SPECIAL AIRWORTHINESS INFORMATION BULLETIN

SUBJ: Aircraft Fuel System; water contamination of fuel tank systems on
Cessna single engine airplanes

SAIB: CE-10-40
Date: July 27, 2010



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject:

WATER IN AVIATION FUELS

Date: 12/10/85

Initiated by: AFS-340

AC No: 20-125

Change:



Aerospace Consulting

Dror Artzi





- Water contaminated fuel affects safety of flight because it could cause an engine to run rough or cause an engine failure.
- In either case, these circumstances could further lead to a **forced landing** or a **crash**.
- Therefore a **positive detection** with emphasis upon the case of a clean fuel sample is mandatory.

The dangers can be life threatening.



Aircraft engines will tolerate a small amount of free water

30ppm = 30 gram per 1000 Kg.

Is usually considered to be the maximum



Positive detection of water contaminated fuel is essential and even critical

To understand why positive detection is so important, it is necessary to understand that :

water can be introduced into an aircraft's fuel tank in several ways.



There are four primary sources for water contaminated fuel.

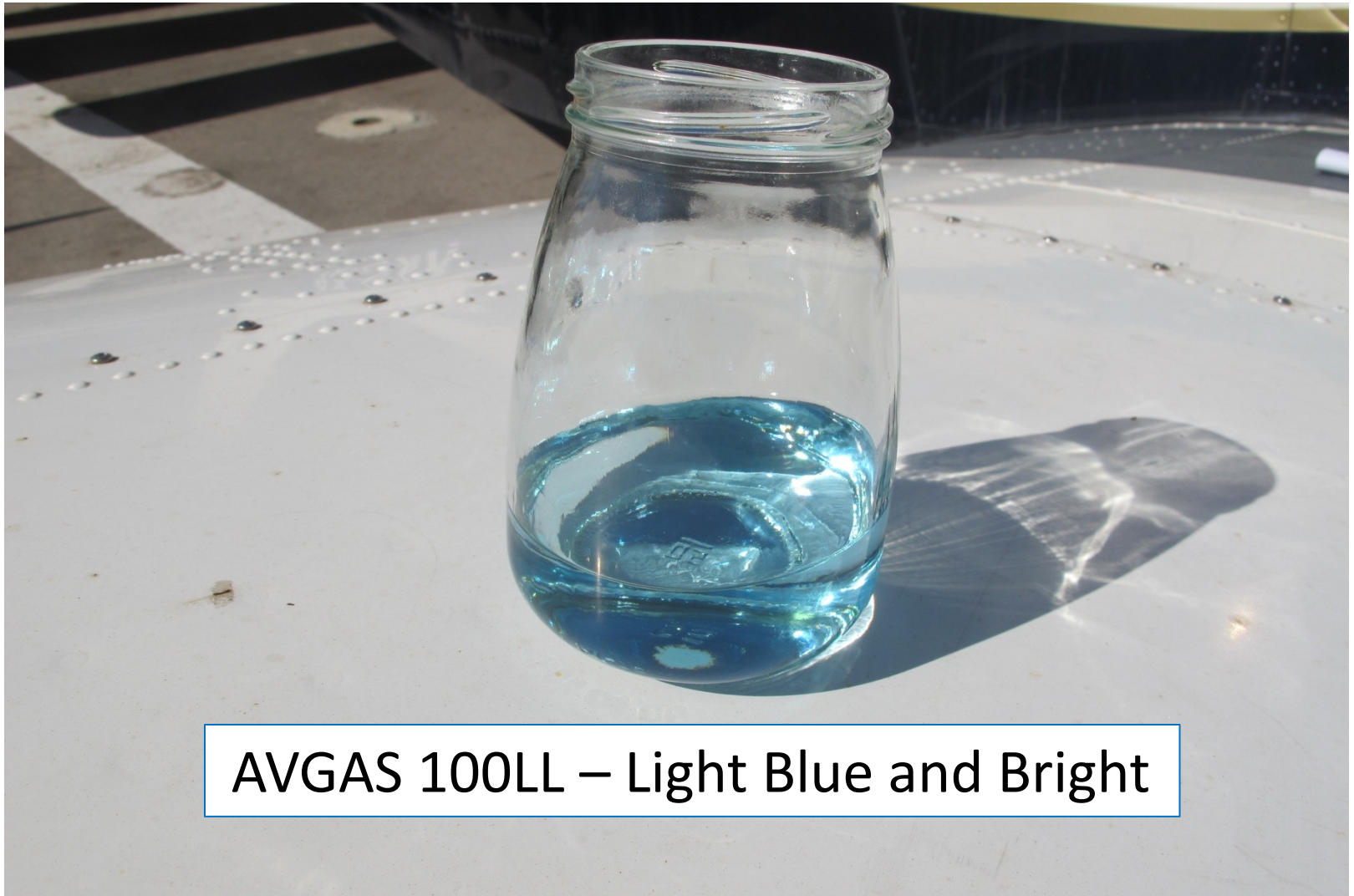
One source is a fuel tank's **filler neck** where fuel is added to a tank. Water from **rain** and from **washing** an aircraft can enter a tank through its filler neck if it's not properly sealed with a fuel cap.

Fuel can also be contaminated from **condensation** that occurs within a fuel tank. Over a period of time, condensation could introduce a hazardous quantity of water.

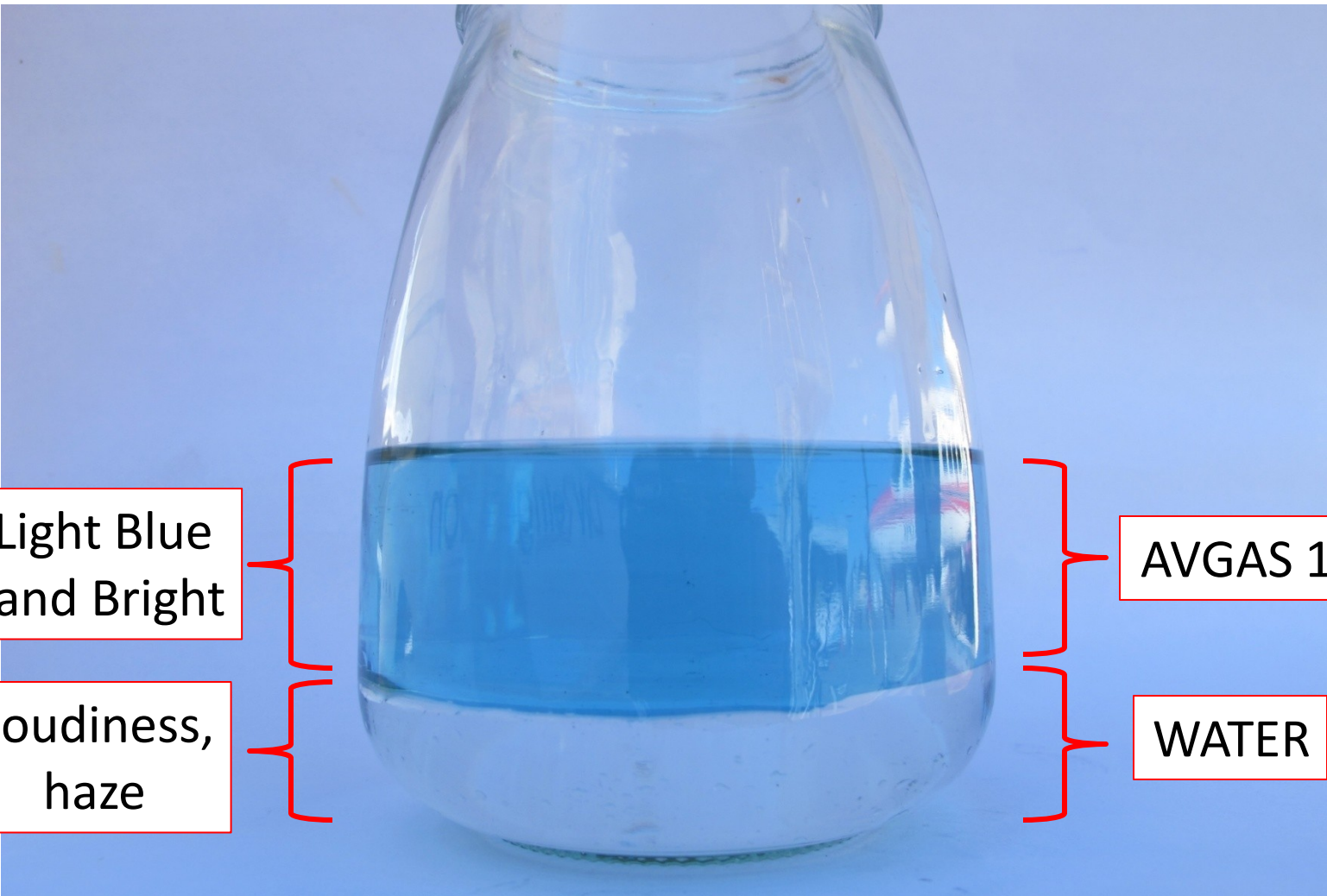


Additionally, water contamination can occur from a **contaminated fuel source** during a refueling process. Fuel trucks and fuel storage tanks are susceptible to water contamination.

Finally, **sabotage** in the absence of proper security is another means by which water contamination can be introduced into an aircraft's fuel system



AVGAS 100LL – Light Blue and Bright



Light Blue
and Bright

The image shows a clear glass bottle, likely a 1-gallon container, filled with a liquid. The liquid is divided into two distinct horizontal layers. The upper layer is a vibrant, clear blue, while the lower layer is a pale, milky white. Red curly braces on either side of the bottle group the descriptive text labels to their corresponding liquid layers. The background is a solid, light blue surface.

AVGAS 100LL

cloudiness,
haze

WATER



AVIATION FUEL COLORS			
FUEL GRADE	COLOR	USAGE	COMMENTS
AVGAS 100/130	GREEN	MOST LIGHT PISTON ENGINE AIRCRAFT	WILL CAUSE SPARK PLUG FOULING DUE TO HIGH LEAD CONTENT
AVGAS 100LL	BLUE	MOST LIGHT PISTON ENGINE AIRCRAFT	LOWER LEAD VERSION OF ABOVE
AVGAS 82 UL	PURPLE	MOST LIGHT PISTON ENGINE AIRCRAFT	LOWER LEAD VERSION OF ABOVE
JET A/A1	STRAW OR CLEAR	TURBINE/ DIESEL AIRCRAFT	DISTINCTIVE SMELL, NOT TO BE USED IN SPARK IGNITION ENGINES
DIESEL/BIODIESEL	CLEAR	DIESEL AIRCRAFT	DISTINCTIVE SMELL, NOT TO BE USED IN SPARK IGNITION ENGINES
AG DIESEL	RED	DIESEL AIRCRAFT	DISTINCTIVE SMELL, NOT TO BE USED IN SPARK IGNITION ENGINES





Federal Aviation
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Preflight Action

As pilot in command, you have the responsibility to determine that your aircraft is properly serviced. Check your aircraft before each flight and be sure you have the correct type of fuel.

This practice may save your life!

Take the time to inspect your aircraft thoroughly.



Good preflight procedures:

- Be sure all of the fuel and oil tank caps and covers are installed and secured properly after you visually check the fluid level.
- Observe the **color** and **odor** of the fuel as you check the tank.
 - 100LL has a blue tint, while jet fuel is clear or yellowish.
 - Avgas also evaporates much more readily than jet fuel.
 - 100LL has a distinctive odor.
 - If line personnel refuel your aircraft, observe the process to ensure that the proper fuel is used.





➤ Let water settle

- Water is by far the most common contaminant in aviation fuel. Because water is denser than avgas, it will settle to the lowest part of the tank.
- A number of factors – among them tank construction, the amount of water and the degree to which it's diffused in the fuel – determine the time it takes for this to happen.
- In general, allow 15 to 20 minutes after refueling for any water to settle.



Take a generous fuel sample after allowing time for contaminants



That way any contaminants will have some time to settle to the fuel tank sumps before you check them.



➤ Sump early, sump often

- Sample each fuel drain
- Before your first flight of the day
- After every refueling
- Any other time you suspect that contaminants may have entered the tanks.
- Continue draining until you get a clean sample.
- If you've drained a large amount of contaminated fuel, it's probably a good idea to have the fuel system inspected





- If contamination is observed , take further samples until the fuel appears clear, and **gently rock the wings** and lower the tail to the ground (or raise the tail and let back down on tail draggers) to move any additional contaminants to the drain points.
- Take repeated samples from all drain locations until all contamination has been removed. If contaminants are still present, do not fly the airplane.
- Have qualified maintenance personnel drain and purge the fuel tank system. Remove all evidence of contamination prior to further flight.



When checking fuel for contamination, always hold up against a contrasting object.





Double Check





**FAA
Aviation Safety**

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- Take proper precautions to preclude water from entering into your fuel tank system from an external source (washing, rain, snow, sleet, etc.).
- Regularly check all external entry sites (caps, access panels, etc.)
 for evidence of water ingress into the fuel tank system.
- When possible store the airplane indoors.
- If stored outdoors or exposed to wet conditions (washing, rain, snow, sleet, etc.), examine the fuel tank system drains for contamination more frequently.
- Pay particular attention to airplanes that have been externally cleaned and/or refinished also.



- Take precautions to preclude water migration in the fuel tank system from an internal source (free water coming out of solution).
- Keep fuel tanks full when the airplane will not be operated regularly.
- Keep fuel tanks full between flights, provided weight and balance limitations permit.
- Limit the fuel tanks exposure to large temperature fluctuations as much as possible.
- If the airplane has been exposed to sustained wing low of unusual attitudes of a fuel tank has been run dry, sump contaminants may have migrated throughout the fuel tank system.



During annual or 100-hour inspections do the following

- Check fuel caps, cap gaskets, cap adaptors, cap adaptor gaskets, fuel filler neck to adaptor sealer, fuel gage transmitter gaskets, gage transmitter access covers, and upper surface inspection covers for condition, proper sealing, security, alignment, etc. Ensure to service and clean these areas, replacing parts as necessary.
- Drain and flush the fuel strainer and carburetor bowl completely.



- Inspect the interior of metal fuel tanks for signs of corrosion, which may indicate water contamination.
- Inspect the interior of bladder tanks for wrinkles, broken or missing hangers, etc.
- If signs of contamination are found, alert the owner and fuel supplier of your findings for corrective action.



In Conclusion

- **Flight personnel.** The owner/operator of an aircraft should be intimately familiar with the fuel system of the aircraft.

This familiarity should include the knowledge of the specific requirements for the **prevention, detection, and elimination of water** in the aircraft fuel system.



- **The pilot -in-command** has the final responsibility to determine that the aircraft is properly serviced.
- An important part of the preflight inspection is to drain aircraft fuel tank sumps, reservoirs, filters, and other fuel system drains to assure that the fuel supply is free of water.
- Since water in fuel accounts for a major share of fuel quality accidents, pilots should make it a practice to include this check beginning with the next preflight inspection.



Be sure that you are using the Proper Fuel



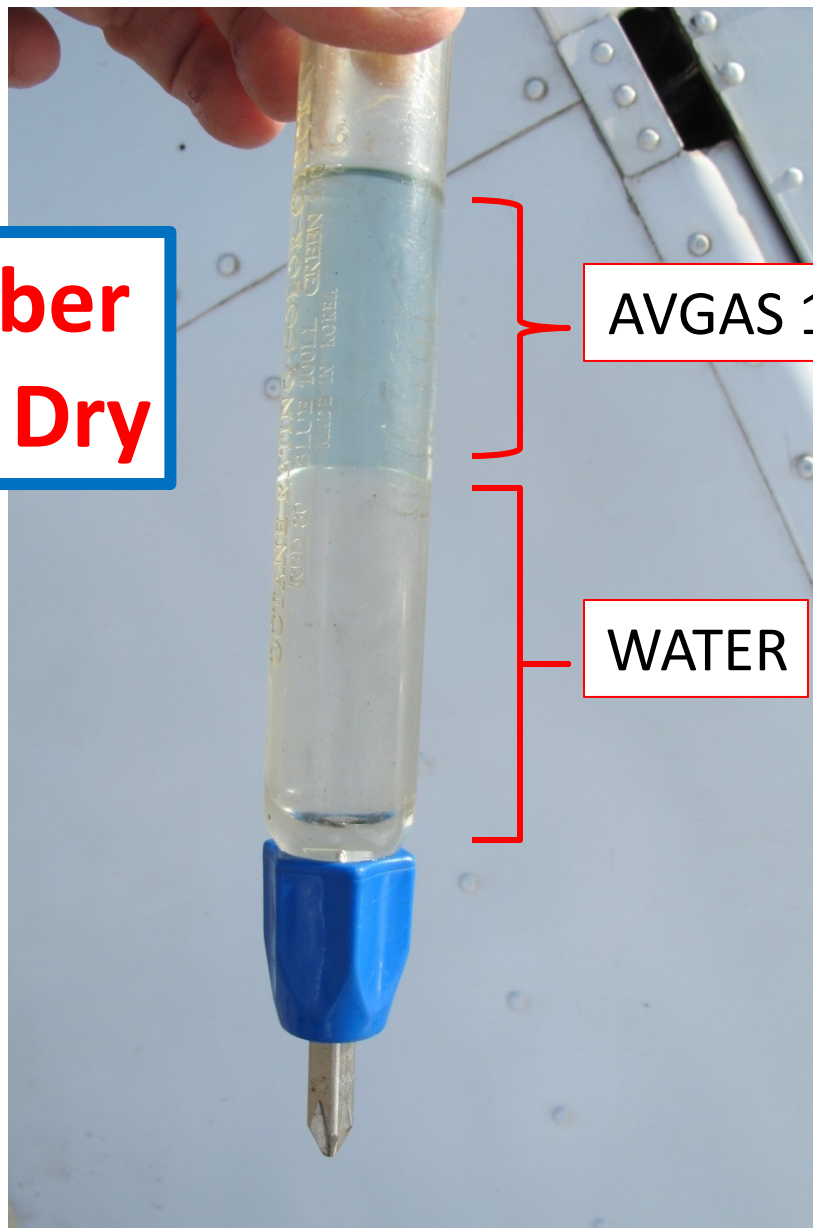


Double check that fuel caps are fastened securely.





**Remember
Bright is Dry**

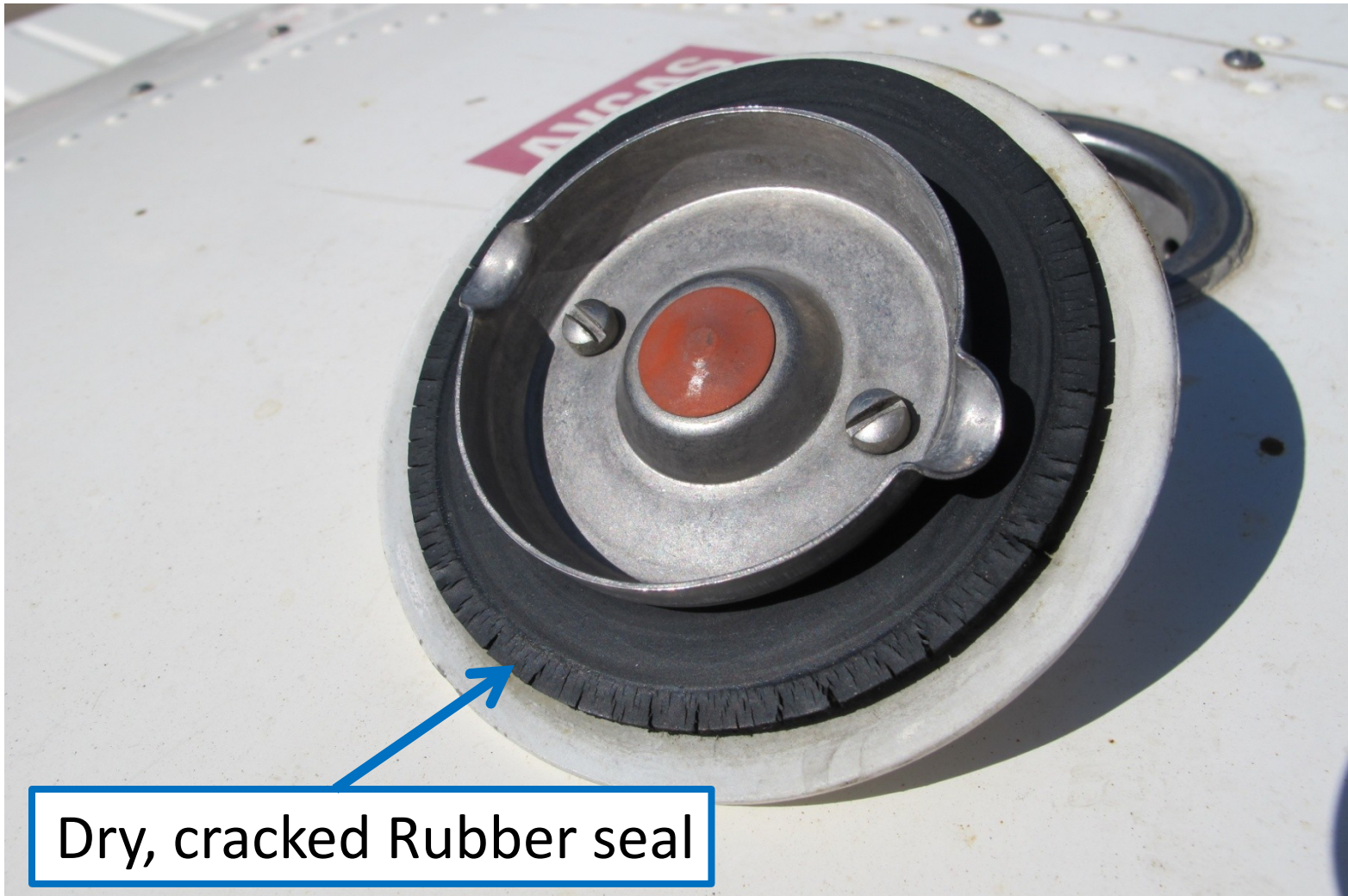


AVGAS 100LL

WATER



Questions ?



Dry, cracked Rubber seal

