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# ***THE GAMGRAM***

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## **No. 47 HOW DOES WATER GET INTO AN AIRCRAFT? PART 1**

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If any of you figure out a way to make water burn, please call us. We'd be happy to help you make use of this knowledge. Until then, I think we can all agree that it is not a good idea to put it into aircraft fuel tanks. This is the first part in a two part series.

Many people just do not understand how water can get into an aircraft and therefore do not understand what they can do to prevent such contamination. Some do not realize how often it happens, and that it can happen to them. We are not talking about a drop or two, we are talking about gallons or even hundreds of gallons.

In our industry we have procedures for checking certain things, but many people do not know why they are performing these checks or what can happen if they do not. Unfortunately, a lack of understanding often leads to complacency, and this can lead to disaster.

In case you are not getting the point, EVERY YEAR LIVES ARE PUT AT RISK BECAUSE REFUELING COMPANIES LIKE YOURS DON'T THINK IT CAN HAPPEN TO THEM! In every case, after the event the operator is shocked and disbelieving. The common comment is, "I thought it couldn't happen here; we have a good QC program, do all the tests and use a good fuel supplier." The same thing CAN happen to you, no matter how good you think your quality control is. The following are examples of how water has gotten to aircraft. Surely there are other additional ways for this to happen; this is not a complete list of every possible cause.

1. On top of virtually all truck tanks, there is what we call "roll-over protection". This amounts to a dike or dam around the vents and manways. The idea is to prevent damage to these items if the truck rolls over upside down. To drain rain water (or melting snow) from this area, hoses are run down from the corners of the enclosure. Unfortunately, inspection of these drain hoses is often ignored as "no big deal", and they plug with debris (or even ice).

Well it is a very big deal. This has caused many incidents where gross amounts of water (up to 250 gallons) were put into aircraft. I personally spoke to a man who drained 150 gallons of water from an airliner. How did it get into the tank? If the water can't drain off, it "pools" up to 8" (or even more) deep. If the manway or vent seals fail, it goes directly into the storage tank. Even if the seals do not leak, when you engage the PTO to pump, the vent (which is submerged in water) opens allowing the water to enter the tank.

Check the drain hoses and manway gaskets and the filter separator water controls. Sump tanks and vessel sumps.

2. The snow had accumulated at an airport, and due to warm days and cool nights, the snow melted during the days and refroze at night. This allowed several inches of water to cover the area where the underground tank was buried. The gauging hatch or the test cable port gasket for the floating suction leaked. Water went directly into the storage tank. The filter separator water controls at the fuel farm and refueler truck both failed. An aircraft crashed.

**GAMMON TECHNICAL PRODUCTS INC.**  
2300 HIGHWAY 34 MANASQUAN, N.J. 08736  
**PHONE: 732-223-4600 FAX: 732-223-5778 WEB: WWW.GAMMONTECH.COM**

This has also happened in warm climates during strong rains or floods. In one case, all of the fuel floated out of the tank and the tank completely filled with water.

Check your tank top connections for a tight fit and proper gaskets; sump your tanks and vessels. Make sure the sample is fuel and not pure water. Check water controls, tank sumps and vessel sumps daily.

3. The ground-water level was high and a structural problem caused a leak in the underground storage tank. Fuel did not leak out, water leaked in. The pilot or engineer of an aircraft being fueled later happened to notice that a fuel tank level indicator suddenly went from almost empty to full in the blink of an eye. If he had not noticed this, caused by an electronic gauge not calibrated for the high conductivity and mass of water, a catastrophe would certainly have occurred. Still, over 300 gallons of water was drained from the aircraft.

Test your water controls and take extra samples from the truck and aircraft sump if the slightest hint of unusual water risk is present.

Tank tightness testing is not just for environmental reasons. If you notice your storage tank levels increasing or not decreasing as expected, double check your tank sump. In this case the water float on the truck had a severed wire and the fuel farm had a failed water float.

4. A new man was assigned to fill the aircraft lavatory water tank. He was not familiar with the particular aircraft and put the water into the overwing fueling connection. It was only caught because his supervisor knew a Beechcraft King Air will not hold 150 gallons of potable water.

The fueling operation is not the only way to get water into the aircraft.

5. The aircraft was being refueled when the refueler cargo tank went empty. The lineman left both of the fuel tank caps off and drove back to the fuel farm for more fuel. He could not refuel because they were unloading a transport trailer (bridger). His shift ended and he went home, forgetting to finish. It rained the next two days and only due to the pilot's preflight check was the error discovered.

When you open a cap, do so only to insert a nozzle. Close it before you depart for any reason, even to do a small task such as picking up a dropped item. ALSO - If you notice that the cap does not fit tightly, indicating a possibly failed gasket, notify the pilot. Rain water frequently enters aircraft fuel tanks through leaky tank caps.

6. Upon completing a new arm of the hydrant system, a "hydrotest" was performed. To do so, the system was filled with water and pressurized. When no leaks were detected, the system was drained and purged at high flow rates with fuel prior to being commissioned for fuel use. Due to an imperfect purge, and a broken wire on a water probe over 50 gallons of water was placed onto a jetliner. Even though the wing tanks were sumped prior to flight as a special precaution, the water was not discovered until the engines performed unevenly in flight and a precautionary landing was made. It turned out the sump sample was pure, clear water, but looked like clean, dry fuel and the jar smelled like fuel from previous sampling.

Carry coffee, tea, "food coloring" or other water based or soluble material with you and drop some into fuel samples. If it sinks to the bottom as a drop, you have fuel. If it dissolves, you have a problem. Do not accept a clear and bright test alone as proof that the sample is good, clean fuel. It can be bad, clean water.

Test your water controls and take extra truck and aircraft sump samples if the slightest hint of unusual water risk is present.