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Misfueling

When we think about the risks associated with aviation fuel, the first thing that usually comes to mind is the possibility of a fuel exhaustion incident—an engine failure and subsequent forced landing. That concern is not unwarranted: An average of nearly three aircraft per week suffer damage due to fuel exhaustion or starvation. Running out of gas is not, however, the only fuel-related worry for pilots.

Misfueling

Simply put, misfueling is the introduction of an improper fuel into an aircraft's tanks. The consequences of misfueling can range from the benign (fuel system drainage) to the expensive (engine replacement) to the disastrous (engine failure shortly after takeoff). Given simple precautions, *all are easily preventable*. Although the frequency of misfuelings has declined dramatically with the widespread adoption of color-coded wing decals and standardized fuel nozzles and receptacles, the potential for trouble still exists—and, as we'll see, may increase in the coming years.

Why do misfueling incidents happen? There are many reasons, but a contributing factor in most incidents is a lack of pilot oversight. A recent survey indicated that, while 67% of pilots oversee their airplane's oil changes, and 50% are present when a tire is aired up, *only 39% attend the fueling of their aircraft*. While this may seem surprising at first glance, it makes sense within the context of a normal fuel purchase. Think about it: How many times have you landed, jumped out of the airplane and—in a hurry to get going—told the FBO to "just top it off"? For many of us, it's standard operating procedure. We assume that sumping the tanks prior to departure is insurance enough against fueling errors.

That may not always be true, though. *The blending of two different fuels within the tank can mask the color and smell distinctions that would normally signify a problem*. Also mistaken is the assumption that a misfueled engine will fail to start, or will run poorly. In many cases, the engine may seem to run normally for quite some time—long enough to lure the pilot into a false sense of well-being.

Fueling Checklist

If you can't rely exclusively upon a preflight inspection to alert you of problems, what can you do? There are a few simple steps that you should follow every time you fuel your aircraft:

Ordering

✔ When ordering, specifically state the fuel grade and quantity you want—i.e., "Please top off both tanks with 100LL."
✔ Get a "readback" of your fuel order from the FBO employee who took it.
✔ Fuel order forms are often color-coded for positive identification: Avgas = RED; Jet = BLACK.

Fueling

✔ Be present at *each and every* refueling of your aircraft. Confirm the specific fuel grade again with the line service professional.
✔ Actively observe the fueling process. If something doesn't seem right, speak up immediately.

✔ Match the fuel truck or fuel island color-coding with the color of the wing fueling decal. The color-coding is standardized: Avgas = RED; Jet = BLACK.
✔ Check to see that the fuel nozzle is compatible with the aircraft's fuel filler. Avgas nozzles are small and round (Figure 1), while jet fuel nozzles are larger and flattened like a duck's bill at the end (Figure 2).

Standardized fuel color-coding

Payment
✔ When paying, verify that the fuel grade and quantity on the invoice match what you ordered. Many invoices and receipts are now distinctively marked to further identify the fuel grade delivered.

Preflight
✔ Visually check the tanks for quantity and fuel color. Drain a sample from each tank sump. Check for water and other contaminants, and note the fuel smell and color. *100LL has a light blue tint, while jet fuel is clear or yellowish in color.*
✔ Jet fuel does not evaporate as quickly as avgas, and has a distinctive, heavier odor.
✔ If you have ***any*** doubts about the type of fuel in your tanks, DO NOT DEPART.

New Concerns
Any aircraft misfueling is potentially serious, but the greatest danger for most general aviation pilots occurs when a gasoline engine is serviced with jet fuel. It's not desirable to do so, but most commercial turbine engines can be run on avgas within the limits listed in the POH. The inverse is not true. *Gasoline engines cannot be run on jet fuel.* Without fuel of a certain octane rating, a gasoline engine will be damaged or destroyed by detonation. Jet fuel has no special anti-detonation properties: It will, quite literally, cause a gasoline engine to self-destruct.

During the 1970s and '80s, a rash of misfueling incidents prompted the adoption of several safety precautions, including color-coded wing and fuel truck decals and special fuel nozzles and filler openings for jet fuel. Although these steps greatly reduced the misfueling of gasoline engines with jet fuel, such incidents still need to be eliminated completely.


Figure 1: Avgas nozzle


Figure 2: "Selective fill" port and jet fuel nozzle

The recent introduction of diesel engines for general aviation holds new potential for misfueling trouble. Aviation diesel engines are designed to run solely on jet fuel: Unlike most turbines, they *cannot* be run safely on avgas. This is a potentially serious problem, because avgas dispensing nozzles fit easily into the large-diameter refueling ports used in diesel aircraft. One possible solution may be the development of a new "selective fill" diesel/turbine refueling port that is incompatible with avgas nozzles (Figure 2). Until new measures are taken, however, owners of diesel-powered aircraft should be particularly cautious when refueling.

Learn more about fuel safety and other topics by visiting the AOPA Online Safety Center
www.aopa.org/asf/safety_topics.html

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