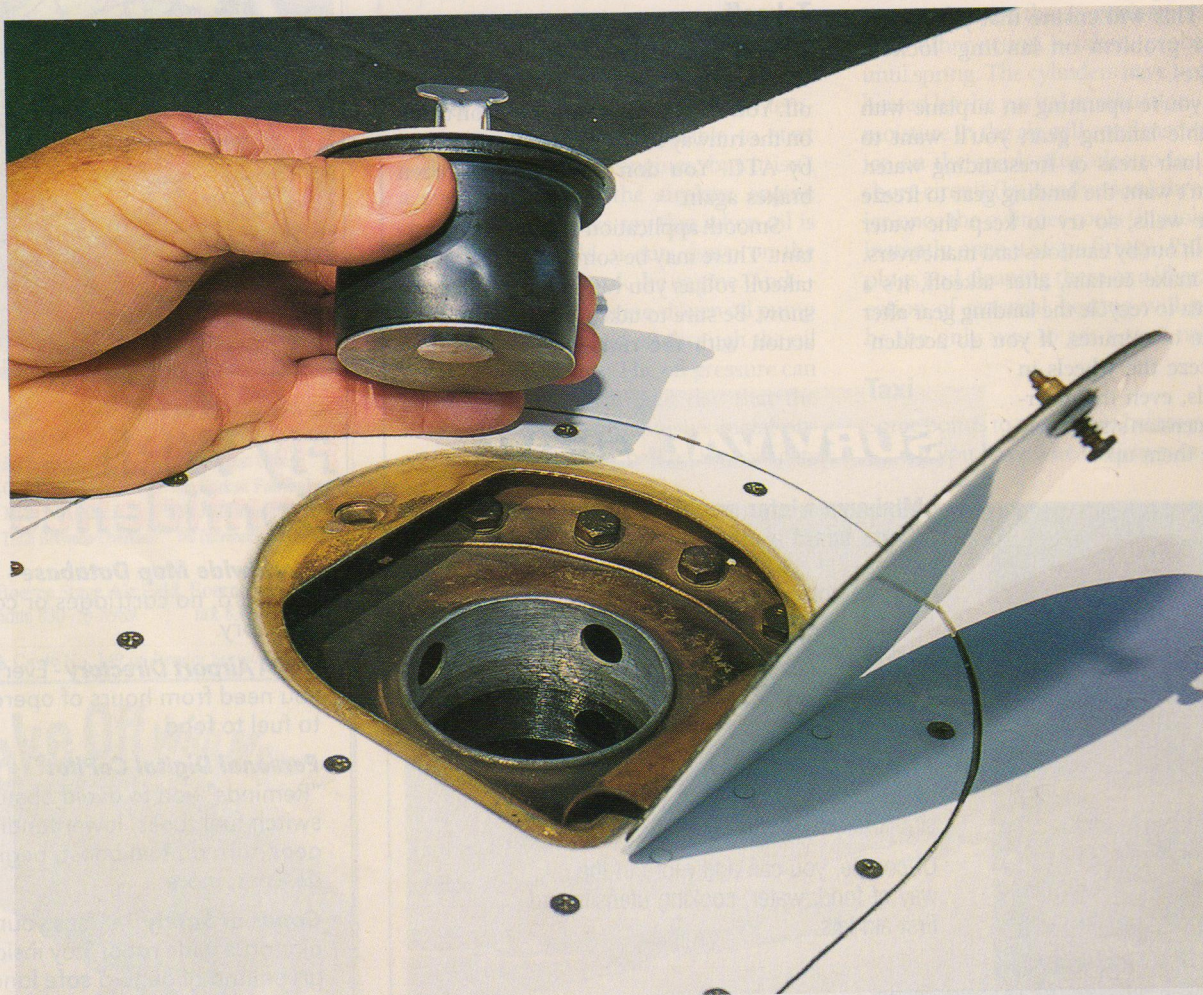


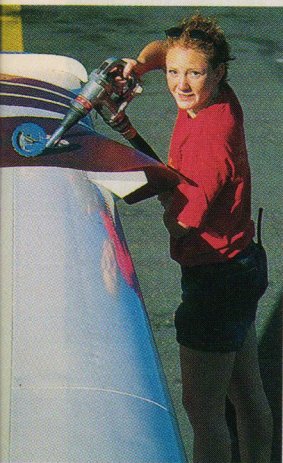
BY DALE SMITH



AVGAS 101:

An Aviation Fuel Primer

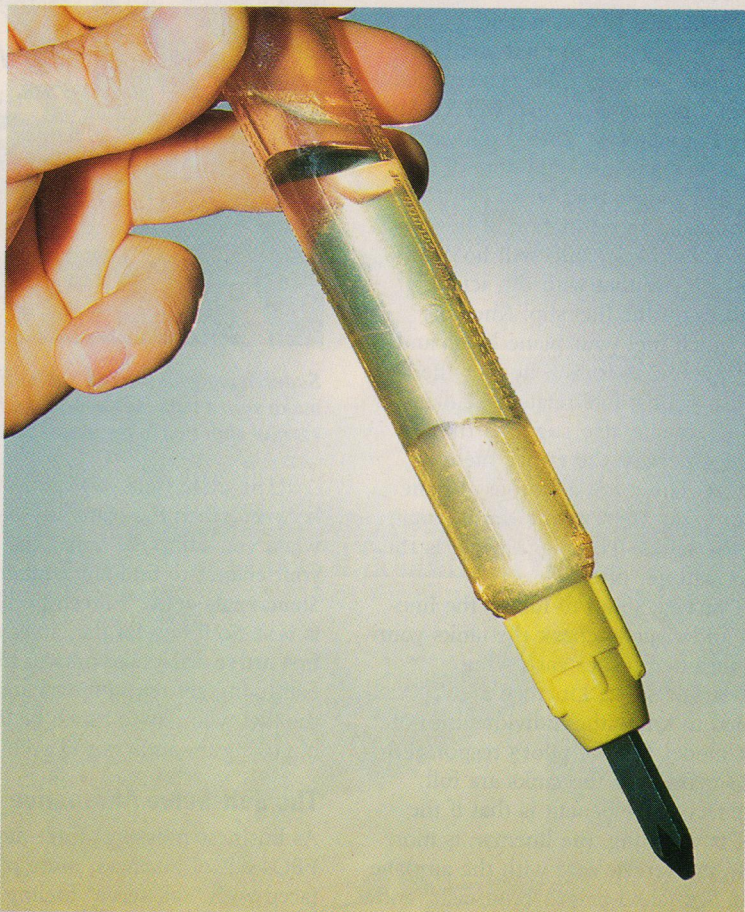
Fuel costs enough—you might as well get the most from it



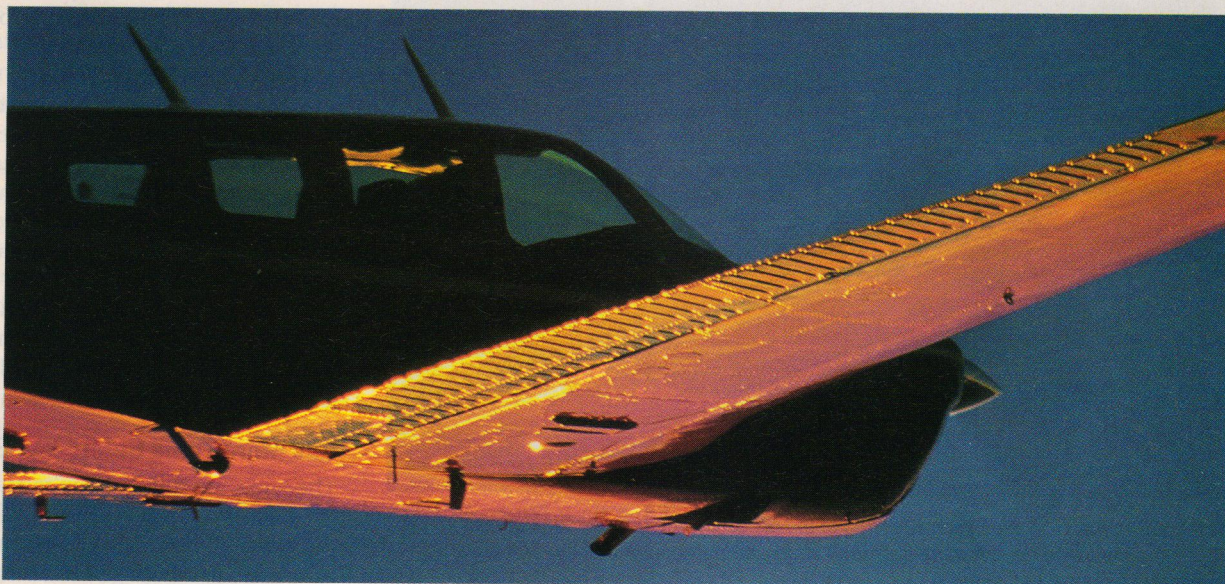
It happens all too often: Some guy packs his family into a small plane and heads off on vacation, only to run out of gas and become the lead story on the nightly news. And every time, pilots across the country shake their heads and say in unison: "How can you be so stupid?"

Well, according to statistics provided by the AOPA's Air Safety Foundation, the "fuel stupidity" bug bites an average of one pilot a week. Sure, a few accidents are caused by some type of fuel system failure. Maybe a fuel pump goes bad or a fuel line gets clogged. But too many accidents are traceable right back to pilots simply reaching the end of their fuel before they reach the end of their flight.

Nobody takes off with the intention of having an accident. But the majority of pilots routinely take off without a thorough understanding of exactly how much fuel is in their aircraft and the right ways to ensure that they get the most out of the fuel they do have.



Sampling the fuel for both impurities and color is important, but no more critical than checking the quantity of fuel on board before a flight.



It All Starts At The Pump

Let's face it: We're all way too nonchalant when it comes to fueling our aircraft. We taxi up to the FBO and trust that the lineman knows and will follow the right procedures to put fuel in our airplanes. That's where a lot of problems begin.

"Pilots need to take a much more proactive approach to their aircraft's fuel needs," advises John Steuernagle, V.P. of Operations for the AOPA's Air Safety Foundation. "One good way to start is to make a mental note of what your fuel gauges read when you shut down. Make an estimation of how many gallons the tanks will hold and then compare that with the actual numbers on the fuel slip. Knowing how much fuel your plane holds and how much it uses each hour is the best defense against fuel-related accidents."

Steuernagle also suggests that pilots supervise the entire fueling process. There are a couple of benefits to being there while the lineman fills the tanks. The biggest one is the tanks will get filled.

"Don't be afraid to follow the lineman and visually check the tanks yourself after he finishes each wing," Steuernagle says. "Linemen aren't trained to know the individualities of each model. It's the pilot's responsibility to make sure the tanks are full."

A secondary benefit is that if the pilot is watching, the lineman is more likely to exercise care with the airplane itself. Scratched paint, "hose rash" and dropped fuel caps are a lot less likely if you're standing there.



Supervising your aircraft's refueling has a number of benefits. Your second set of eyes can make sure a tank isn't overlooked for a top-off, and your presence can motivate a little more careful attention to the entire operation.

"The more time you can leave between when the plane is fueled and when you sump the tanks, the better your chance to find any contaminants," Steuernagle adds. "Fifteen to 30 minutes is best. So if you fill the tanks when you first arrive, then take time to hit the bathroom, get refreshments and pay for the fuel, you have a much better chance of getting the junk out of your fuel."

The Self-Serve Alternative

As business pressures force smaller FBOs out of business, more pilots are faced with "self-serve" fueling. And while it's almost as simple as filling the family SUV, there are a couple of pre-

cautions you need to keep in mind.

"Contamination is the biggest danger associated with self-fueling," explains Kurt Hartwig, V.P. and general manager of Eagle Fuel Cells. "Take a second to look at the fuel nozzle itself. If pilots drag the nozzle across the ground, it picks up all kinds of dirt and stuff. Always carry a rag in your pocket to wipe the nozzle off before you stick it in the tank."

Hartwig says that another reason to examine the nozzle is to look for sharp edges. "I've seen nozzles with pretty sharp edges on them. If the pilot isn't careful when inserting it in the tank, he or she could damage the tank itself. This is especially critical when you have bladder tanks. Most have pads at the bottom, but you can still cut through it. It's a very expensive mistake."

Proper grounding procedures are also critical. Before you even think about fueling your aircraft yourself, learn the right way to ground. Fuel passing through the hose builds up a considerable amount of static electricity. Ungrounded, the resulting discharge can quickly ruin your day. Static electricity is another reason why you should never use a plastic container to fuel an aircraft. Always use metal cans and make sure they're grounded.

One More Thing Before You Go

The tanks are full and you're ready to go. Right? Wrong. Whether you filled the tanks an hour, a week or a month ago, a detailed preflight is essential,



If a flight will require full fuel, your attention to the fill-up can ensure the fuel level is all the way up to the top of the tank. A mere half-inch short could translate into several missing gallons from your total fuel supply.

AVGAS 101

especially if your aircraft spends its time out in the weather.

“Your airplane can give you a lot of clues to the possibility of contaminants in the fuel system,” Steuernagle notes. “Most contaminants are introduced through the fuel caps themselves. Winter is especially hard on them. Ice can easily build up around the filler caps, and water can seep into any cracks that may have formed in the rubber

seals. So each time you remove the cap to check the fuel level, take a second to inspect the filler cap’s seal for dirt and damage. If there’s any question, have your A&P change the seal.”

Winter winds can also cause ice to form in and around the fuel drains. If you encounter iced-up drains, don’t try to melt them with a lighter. Instead, move the aircraft into a heated hangar until the ice melts, then be extra attentive to the fuel samples you take from the tank. Make sure the water came from outside the tank.



Every fuel sampling should include a final check of the valve to be sure fuel has ceased flowing once the sampler has been removed.

If you're on a cross country, take a minute to wipe any accumulated moisture off of the fuel drains after you shut down. Slush can splash up and freeze on the drains in the time it takes to taxi in and refuel, especially if you try to follow the 30-minute wait period from top-off to sump check. Also, take a second to check for ice on vented fuel caps and on the fuel air vents themselves.

Summertime has its challenges, too. Aside from heavy rains that can force water into those leaky fuel caps, the extremely high temperatures found on asphalt ramps can cause fuel to expand in the tank and drain off through the vents. Then, when you climb to colder altitudes, the fuel will contract, leaving you with much less fuel than you thought you had at takeoff. Just keep an eye on those fuel gauges. Look for quick drops and start planning the next fuel stop long before you need it.

The Lowdown On Leaning Procedures

"Leaning procedures are the single worst operating technique for most pilots," says Rick Moffett, V.P. of Engineering for Textron Lycoming. "Most students aren't taught how to do it, and the ones that are don't use proper procedures." For example, Moffett explains, pilots often want to start adjusting the mixture much too soon. Most pilots don't wait until the air-

The mixture control can have a big impact on your wallet and your engine. Lean the engine for optimum fuel flows and safe engine temps.

plane has stabilized in cruise flight.

Full rich is used during takeoff and climb, or any time the power setting is 75% or higher. The only amendment to that rule of thumb is when you're taking off from an airport that's above 5,000 feet density altitude or when you encounter extremely high ambient temperatures. Thinner air can cause the fuel/air mixture to get so out of whack that it reduces power output. Careful manipulation of the mixture control can actually help you increase your engine's output.

Another situation where leaning can be a benefit on the ground is during long taxis or hold times prior to takeoff. Proper leaning at idle power settings can save both fuel and carbon build-up on engine components. Just make sure you fully enrich the mixture before you begin your takeoff roll.

"The *Pilot's Operating Handbook* (POH) provides the best overall guidelines for the right way to lean an engine," Moffett adds. "A lot of people will argue that the settings are way too conservative, but you have to remember that the average pilot doesn't have the experience to successfully fine-tune the leaning procedure. By staying within the published procedures, a pilot can't cause any harm to the engine. Experimenting with settings too far outside the parameters can cause considerable damage to the engine."

Proper leaning procedures do more than just save fuel; they're the only way you're going to get the published range numbers that you used for your flight planning. If your plane has a published 1,000-nm range, you aren't going to come close with the mixture pushed all the way in.

If you're not comfortable with leaning—and a lot of us aren't—spend some time with the *POH* and then schedule an hour or so with your instructor. Will it make you a better pilot? Maybe. Will it help keep you from becoming a fuel-related accident statistic? For sure.

For more information on proper fueling and leaning techniques, contact the AOPA Air Safety Foundation at (800) 638-3101, or visit Textron Lycoming's Website at www.lycoming.com and search for Service Instruction No. 1094D.