

# Why Does My Airplane Smell Like It Has Been Drinking?

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**T**here are three things that you will probably never hear a pilot say. The first is, "I don't like to talk about my airplane." The second thing you are not likely to hear is, "I want to buy a small watch with no features." And the last, which is the real reason for this article is, "I just can't believe how cheap it is to fly."

It is not cheap to fly and one way airplane owners could reduce the cost of flying is to use automobile gasoline (autogas) in their airplanes. One could think that all the airplane owner has to do is buy the supplemental type certificate (STC) for a buck per horsepower, post a couple of placards, install an Adel clamp, bring fuel to the airport from the local filling station, and let the cost savings roll in. The flaw in chapter 1 of the "Airplane Owner's Guide to Riches" is the introduction of ethanol in autogas.

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## Who Decided To Put Booze in Gasoline?

The federal government has not mandated the addition of ethanol to autogas; however, some legislative actions and air quality mandates have resulted in

ethanol being added to autogas. Some of the reasons for ethanol in autogas are:

- On December 19, 2007, the President signed the Energy Independence and Security Act of 2007, which requires the use of 15 billion gallons of grain/corn-based ethanol (renewable fuel) by 2015.
- Individual states are free to develop their own ethanol fuel-blending laws. Some states are introducing legislation mandating 10 percent ethanol-blending in all grades of auto fuel. This action is not to meet U.S. Environmental Protection Administration (EPA) oxygenate standards, but rather to meet the demands of local/national ethanol producers or other mandated EPA emission requirements.
- Individual fuel producers are free to add oxygenates to fuels to meet other EPA mandatory emission and benzene cap requirements in high density population areas, or to comply with state law.

## What Stops Me From Using Autogas With Ethanol?

There are two primary reasons an airplane owner cannot use autogas with ethanol. For one, the autogas

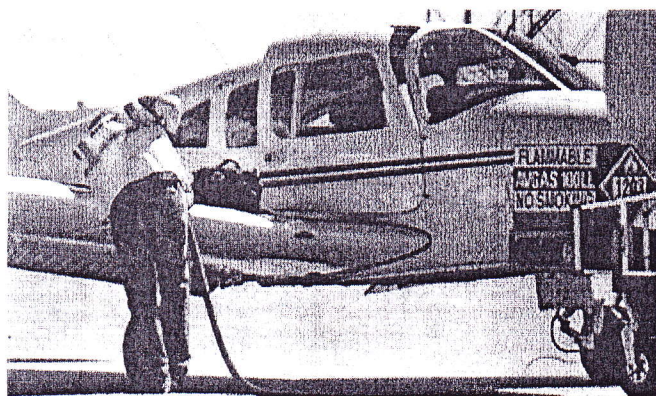
STCs for general aviation aircraft prohibit the use of autogas containing ethanol. And, two, it can be dangerous.

The first point says the STC prohibits the use of autogas with ethanol. So, what's the worst thing that can happen? The prohibition exists because of the second point. The use of ethanol as a fuel is not inherently dangerous, but using ethanol in an airplane not designed to use ethanol can be very dangerous. The primary concerns of using ethanol in airplanes not designed for its use are:

**Volatility:** The addition of alcohol to autogas adversely affects the volatility of the fuel, which could cause vapor lock. The volatility of the fuel is its tendency to vaporize, which is directly related to its vapor pressure. The higher the vapor pressure of a liquid at a given temperature, the higher the volatility and the lower the normal boiling point of the liquid. This means a higher tendency to form vapor at a given temperature. Literally, the fuel will "boil" at a lower temperature and form bubbles in the fuel system. Bubbles in the fuel system can result in a power loss.

**Compatibility:** Alcohol present in autogas is corrosive and not compatible with the rubber seals and other materials used in aircraft, which could lead to fuel system deterioration and malfunction. The compatibility of the fuel system with its fuel is critical for safe operation. Corrosion of aluminum fuel tanks can occur when water separates from the autogas that contains ethanol and then pools. Another compatibility issue is the "swelling" of rubber and plastic parts.

**Phase separation:** Alcohol present in autogas is subject to phase separation, which occurs when the fuel is cooled as a result of the aircraft's climbing to higher altitude. Phase separation is when a combined liquid separates into two different liquids. Think of an oil and vinegar salad dressing; when the dressing is shaken, the oil and vinegar combine. As the salad dressing sits, the oil and vinegar separate.



A similar situation exists when autogas with ethanol is combined with water. The presence of ethanol in autogas allows an amount of water to be absorbed, rather than remaining separate. There is a limit to how much water can be absorbed by autogas with ethanol, and the limit is dependent on the amount of ethanol in the autogas and the temperature of the fuel. If the water that has been absorbed by the autogas with ethanol separates, a layer of water and ethanol will form below the autogas. This water and ethanol blend is not the fuel an airplane engine likes to burn, so at least a partial, if not complete, power loss may occur.

At 60°F, approximately 0.6 ounces of water can be absorbed by a one-gallon blend of 90 percent gasoline and 10 percent ethanol before the water will begin to phase separate. If the temperature cools to around 32°F, 20 percent of the total water present in the fuel will separate. On a 48-gallon fuel system, this means approximately six ounces of water could collect and go through the fuel system. The certification rules only require a sediment bowl (gascolator) capacity of one ounce for every 20 gallons. It doesn't take a degree in advanced math to see that this situation could lead to a problem.

### What Do I Do?

Each airplane owner using autogas is responsible for determining that there is no ethanol in the autogas. On October 27, 2006, FAA issued [Special Airworthiness Information Bulletin \(SAIB\) Number CE-07-06](#), which discusses ethanol in autogas and also contains a simple procedure to test for ethanol in autogas. To read this SAIB, go to: [www.faa.gov/aircraft/safety/alerts/SAIB](http://www.faa.gov/aircraft/safety/alerts/SAIB).

If you cannot find autogas that is free from ethanol, then you must use another approved aviation fuel. In almost all cases, this would be 100LL aviation fuel. The increased cost of 100LL is much less than the cost of fixing an airplane if the engine decides to lose power at an inopportune time. As the old pilot adage goes, "Takeoffs are optional, but landings are mandatory." The bottom line is to know what fuel you are using and for all of us: "Let's be careful out there." ✈️

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