NTSB

SAFETY ALERT

National Transportation Safety Board

Pilots: Fueling Mistakes

Learn how to detect if your aircraft has been misfueled

The problem

Misfueling can occur for a variety of reasons and typically results in a complete loss of engine power, which may lead to serious injuries and/or death.

- While fuel nozzles and fuel fillers are designed to prevent misfueling, our investigations have found numerous modifications that can allow misfueling to occur. For example, aviation gasoline (avgas) nozzles are small and round and fit into smaller opening fuel filler ports while jet fuel nozzles are larger and flattened like a duck's bill, requiring a larger fuel filler port (see figures 1 and 2). However, our investigations have shown that some fixed base operators (FBOs) are modifying their jet fuel nozzles with the smaller avgas nozzle or other smaller type nozzle, such as the round jet spout nozzle, to more easily fuel smaller turbine helicopters. These non-standard jet fuel nozzles can easily fit into the smaller filler ports of aircraft that require avgas and allow for misfueling to occur.

Figure 1. Photograph of an avgas nozzle.

Figure 2. Photograph of Jet A fuel nozzle.

- When an aircraft is modified from using a reciprocating engine (avgas) to a turbine engine (jet fuel), some supplemental type certificates (STCs) have not required that the fuel filler port size be changed accordingly. As a result, line personnel have had to make accommodations such as installing an avgas fuel nozzle or round jet nozzle on a jet fuel truck to allow jet fuel into the smaller

avgas fuel filler port. These STC modifications can lead to fueling confusion because the same model or similar looking aircraft may now have different fuel requirements.

- Once the wrong fuel is pumped into an aircraft, identifying that misfueling has occurred can be difficult, if not impossible, to detect.

Related accidents and incidents

The NTSB has investigated accidents involving misfueling, and they show the importance of pilots and line personnel maintaining vigilance when aircraft are fueled. The following accident summaries help to highlight the issues involved:

- During takeoff, both engines of a Cessna 421C lost power. The airline transport pilot and two passengers sustained injuries in the forced landing. The pilot had landed the previous night and requested 40 gallons of fuel be added to each tank. Line personnel incorrectly fueled the airplane with Jet A by rotating the nozzle and dispensing at a reduced pressure so that the fuel would go into the avgas fuel port because line personnel used this procedure on two other airplanes that were based at the airport that had been modified with turbine engines. However, the STC for the modification did not require that their fuel filler openings be modified to the standard Jet A nozzle. (CEN09LA145)

- During climbout, a Cessna 421B's engines lost power. The pilot was seriously injured and two passengers sustained injuries during the forced landing. The pilot had requested that the airplane's tip tanks be topped off with fuel the day before. The fuel tanks were placarded for avgas. However, line personnel mistook the airplane for a similar one that required Jet A fuel and refueled it from a Jet A fuel truck that had been permanently modified with a round nozzle to provide easier access for other aircraft serviced at the airport. The round nozzle also fit the avgas filler port opening of the Cessna. Before departure, the pilot sumped the fuel and it appeared that the airplane had been correctly refueled with avgas; however, he signed a receipt indicating that the airplane had been refueled with Jet A. (CEN15LA199)

- During climbout, the engine of a Canadian-registered Piper PA 46-350P requiring avgas lost power and the pilot was fatally injured during the attempted emergency landing. A fuel log showed that the airplane had been incorrectly refueled with Jet A before takeoff. (WPR15LA111)

- During the initial climb, both engines of a Cessna 421C lost power. The pilot, two medical crewmembers, and one patient were fatally injured following impact with terrain. The pilot had requested that the airplane be refueled with 40 gallons of fuel. Photographs of the airplane before the accident showed that the fuel tanks were placarded for avgas. Because the airport also serviced helicopters with smaller opening fuel filler ports that actually required Jet A fuel, one of the nozzles on the Jet A fuel truck had been permanently modified with a round nozzle to provide easier access for these aircraft. The pilot was present when the airplane was misfueled with Jet A fuel instead of the required avgas and signed a fuel ticket indicating that the airplane had been fueled with Jet A fuel. (CEN14FA462)

What can pilots do?

- Always tell line personnel your aircraft's registration number, what type of fuel your aircraft requires, and which tanks to fuel. Then verify that the correct fuel is being provided.
- Ensure that your fuel placards are correct, in the appropriate location, and easy to read. Placards can degrade over time due to environmental exposure.
- Be alert to the fact that line personnel may not be aware of the fueling requirements of your specific aircraft since STC modifications may replace a reciprocating engine with a turbine engine. Additionally, if an airport services smaller turbine helicopters, the fuel nozzles may have been modified so that the Jet A fuel dispenser is equipped with an avgas or round jet spout nozzle.
- Although Jet A fuel and avgas have distinct odors, colors, and evaporation properties, remember that a visual check alone may not detect that Jet A fuel and avgas have been mixed. The mixture can appear to be just avgas.
- Many pilots who have had misfueled aircraft have signed fuel receipts showing the wrong fuel was used. Use the receipt as an added safety check in ensuring that your aircraft was fueled with the correct fuel.

Interested in more information?

- The National Air Transportation Association provides training through its Safety 1st General Aviation Misfueling Prevention Program for pilots, line personnel, FBO general managers, and customer service representatives.
- The AOPA Air Safety Institute's "Fuel Management" Safety Spotlight offers safety education about misfueling, including its "Misfueling Safety Brief," and downloadable fueling cards (printing charges apply).
- The Twin Cessna Flyer organization wrote an article, "Misfueling Epidemic," in the August 2015 issue of its magazine that discusses misfueling prevention methods.
- The General Aviation Manufacturers Association has provided guidance on appropriate placarding to avoid misfueling and continues to research and work with industry on the safety issue.
- The NTSB made a series of safety recommendations in the 1980s (A-82-140, A-82-141, and A-86-135) to prevent aircraft misfueling.

The NTSB's Aviation Information Resources web page, www.ntsb.gov/air, provides convenient access to NTSB aviation safety products. The reports for the accidents referenced in this safety alert are accessible by NTSB accident number from the Aviation Accident Database link, and each accident's public docket is accessible from the Accident Dockets link for the Docket Management System. The safety recommendation letters referenced in this alert can be accessed from the Safety Recommendations link. This safety alert and others can be accessed from the Aviation Safety Alerts link.