

SP-20
Log. 1749

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: October 16, 1985

Forwarded to:

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-85-77 through -80

On February 25, 1984, a Piper Model PA-23-150 Apache, N2160P, crashed at Bluefield, West Virginia, while the pilot was attempting to land at the Bluefield Airport after having declared an emergency due to an engine failure. Both persons aboard the airplane were killed. The Safety Board's investigation of the accident disclosed that the left engine fuel strainer contained icy slush and that the engine failure probably was caused by fuel starvation due to ice-blockage of the fuel flow.

In the standard Apache, a 36-gallon nylon and neoprene main fuel cell is located outboard of each engine, and auxiliary cells, such as were installed in N2160P, may be installed optionally in the outboard sections of the wings. Neither the main nor the auxiliary cells (if fitted) in Apache airplanes are provided an individual fuel line drain valve. Fuel sampling or sumping to detect and remove water during preflight must be accomplished through the main fuel strainers located in the inboard sides of the main wheel wells. In order to sample fuel from each cell, the fuel selector valve in the cockpit must be positioned alternately to each of the main and auxiliary fuel cells while the fuel strainer is being drained. In the case of the more remotely located auxiliary fuel cells, allowance must be made for additional drainage time and fuel flow to ensure that any residual or free water in these cells is removed. The Apache Pilot's Operating Handbook, however, states only that the fuel strainers should be drained regularly; there is no explicit procedure outlined to ensure adequate drainage and sampling of individual fuel cells which takes into account the differences in the drainage time of the auxiliary cells.

The Piper Aztec, the successor design to the Apache, incorporates individual drain valves for each fuel line on the airplane which are located near the main fuel strainers. This system obviates the need for the pilot to reposition the fuel selector valve in the cockpit to sample each cell.

Investigation of 11 other accidents since 1975 involving Piper Apache airplanes disclosed water in the fuel. These 11 accidents and the February 25, 1984, accident resulted in six fatalities and one serious injury. In view of these accidents, the Safety Board believes that individual fuel line drain valves, similar to those in the Aztec airplane, should be installed in the Apache to improve the effectiveness of fuel sampling and sumping. Additionally, supplemental service and operating information regarding fuel sampling procedures for Apache airplanes is necessary whether the drain valves are modified or not to ensure removal of residual or free-standing water during preflight procedures.

While proper fuel sampling and sumping during preflight is essential in preventing the formation of ice due to the presence of residual or free water in the fuel, it will not eliminate completely the hazard of ice blockage of fuel flow. Under certain conditions, e.g., high humidity conditions on the ground followed by flight at high altitude and low temperature, water in suspension or in solution also may precipitate as ice or ice crystals. Since water in suspension or in solution is not removed by sumping, the formation of ice or ice crystals due to such water must be prevented by adding anti-icing additives, such as isopropyl alcohol or ethylene glycol monomethyl ether (EGME) to the fuel. Both additives absorb water and enable the gasoline and water to pass through the entire fuel system. Isopropyl alcohol has the additional effect of reducing the freezing temperature of the mixture. Teledyne Continental Motors and Avco Lycoming approve of the use of both additives in their engines, subject to approval by the respective airframe manufacturers.

Explicit service and operating information regarding anti-icing fuel additives is essential to the safety of winter flight operations. Many single-engine and multiengine turbocharged and high-performance airplanes operate for relatively long periods at high altitude and low temperatures where the formation of ice in the fuel is a potential hazard. As a result, in 1979, the Cessna Aircraft Company (Cessna) issued Service Information Letters SE 79-30 and ME 79-2, "Use of Fuel Additives for Cold Weather Operations," which provided detailed instructions for mixing additives with the fuel in single-engine and multiengine piston-powered airplanes, respectively. Cessna also provides similar cold weather operating information in both single-engine and multiengine pilot operating handbooks. In 1983, the Mooney Aircraft Corporation (Mooney) issued Service Instruction M-20-64 regarding cold weather use of isopropyl alcohol in Mooney M-20 series airplanes. However, this operating information has yet to be included in Mooney pilot operating handbooks. The Piper and Beech Aircraft Corporations have issued no service or operating information regarding use of anti-icing fuel additives in their piston-powered airplanes.

Since 1975, the investigations of 50 airplane accidents disclosed there was ice in the fuel system of the airplane. These accidents have resulted in 15 fatalities and 13 serious injuries. As a result, the Safety Board believes that Piper, Beech, and other airplane manufacturers who have not already done so should issue to owners and operators of existing airplanes service and operating information regarding the use of fuel additives in piston-powered airplanes for cold weather operation and should include similar information in the pilot operating handbooks of all newly manufactured airplanes. Additionally, the subject of fuel additives for cold weather operation should be addressed in an article in the Federal Aviation Administration's Advisory Circular No. 43-16, "General Aviation Airworthiness Alerts."

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an Airworthiness Directive requiring the installation of individual fuel line drain valves in Piper Apache Model PA-23-150, PA-23-160, and PA-23-235 airplanes. (Class II, Priority Action) (A-85-77)

Require the Piper Aircraft Corporation to publish service and operating information fully describing preflight fuel sampling procedures applicable to Piper Apache Model PA-23-150, PA-23-160, and PA-23-235 airplanes, including in the case of airplanes fitted with optional auxiliary fuel cells, specific procedures which take into consideration the difference in drainage time required for lines for the auxiliary fuel cells. (Class II, Priority Action) (A-85-78)

Require that Piper, Beech, and other airplane manufacturers who have not already done so issue service and operating information regarding the use of fuel additives in piston-powered airplanes for cold weather operation and incorporate this information in the pilot operating handbooks of all newly manufactured airplanes. (Class II, Priority Action) (A-85-79)

Publish an article in Advisory Circular No. 43-16, "General Aviation Airworthiness Alerts," regarding the use of fuel additives in cold weather operation. The date of publication should be chosen to ensure the most effective use of the information. (Class II, Priority Action) (A-85-80)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.

By: Jim Burnett
Chairman