

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 24, 1978

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-78-50

The National Transportation Safety Board is concerned by two accidents within the past 2 months involving the Ted Smith Aerostar (Piper Aerostar). On July 18, 1978, an Aerostar 600 crashed while on approach to Jacksonville, Florida, after the pilot reported that he had lost power on both engines. No further details of the accident are known at this time.

On May 26, another Ted Smith Aerostar, 601P, was ditched in Lake Anna, near Bumpass, Virginia, after power was lost from both engines. The aircraft had departed West Palm Beach, Florida, and was en route to Dulles International Airport on an IFR flight plan. Before leaving West Palm Beach, the aircraft was serviced with 129 gallons of 100-octane fuel, and, according to the pilots, all three fuel tanks were full. En route the aircraft cruised at 17,000 feet until reaching the vicinity of the Flat Rock VOR near Richmond, Virginia, where it was cleared to descend to 9,000 feet. During the descent, the left engine fuel flow fluctuated and power was lost from the left engine. About 2 minutes later, the right engine also lost power.

According to the pilots, their fuel gauges indicated about 49 gallons of fuel remaining when the power was lost, and the low-level light for the fuselage tank did not illuminate.

The National Transportation Safety Board's investigation of this accident is continuing; however, preliminary data indicate that the loss of power from both engines was caused by fuel starvation. The circumstances surrounding the accident are similar to several other accidents and incidents reviewed by the Safety Board.

In fact, as a result of several accidents and incidents involving fuel starvation to one or both engines, the Safety Board was reviewing the Aerostar fuel system at the time of this accident. During our review, we found that in most of the accidents and incidents fuel-quantity indicating systems and fuel management procedures were involved. Additionally, our review indicated that design changes to the fuel tank vent system, wing fuel tanks, and the fuel-quantity indicating system would improve the Aerostar fuel system.

The Safety Board reviewed a copy of the report and recommendations made by the FAA Special Certification Review Team on the Ted Smith Aerostar Model 600 series aircraft's fuel system, which was completed in August 1977. The suggestions and recommendations made by the Special Certification Review Team were nearly identical to those that resulted from our review. These conclusions follow:

Fuel Tank Vent System

The current wing tank fuel vent valve will not function properly with more than 162 gallons of fuel. Depending on temperature changes and fuel demand, this could result in either an overpressure or a negative pressure in the wing tanks. Carried to extremes, structural damage to the wing or uneven fuel feeding may result as fuel is drawn from the wing tank.

A modified vent system valve is being considered, to which an overpressurization relief and an underpressure relief feature have been added. As soon as the reliability of the modified vent system valve which incorporates the overpressure and underpressure relief features has been established, an AD requiring its incorporation in the vent system should be issued for all 600 series aircraft.

Flight Test Evaluation

Information obtained from the reported accidents indicates that some in-flight situations need further investigation to determine whether additional operating procedures or special techniques are necessary. The following is a minimum listing of in-flight evaluations.

- o Demonstrate in-flight restart of an engine after fuel tank exhaustion.

- o Determine wing tank fuel which becomes unavailable to the engines during normal angles of climb and descent, and with one engine out.
- o Evaluate proper functioning of new fuel tank vent valve. (Does fuel feed evenly from wing tanks?)

Product Improvement

The following subjects are areas which need to be improved to further improve the level of safety of the Aerostar Model 600 series airplanes.

Fuel-Quantity Indicating System

The current fuel-quantity indicating system has been a contributing factor to the majority of the accidents by giving either erratic or erroneous fuel-quantity readings. The fuel system should be studied immediately to determine what refinements and improvements are necessary to give accurate fuel-quantity indications throughout most of the flight envelope. The shortcomings which should be corrected are: (1) The very limited aircraft attitudes at which fuel-quantity can be read with any degree of accuracy, (2) the mathematical calculations which must be accomplished to arrive at the quantity of fuel in the fuselage tank, and (3) the inability to accurately read fuel quantities greater than 150 gallons.

Internal Wing Tank Baffling

Any uncoordinated flight can cause fuel to shift in the wing tanks giving inaccurate fuel-quantity readings and possibly unporting the fuel tank outlet making large quantities of fuel unavailable to the engines. It is recommended that the compartment in which the wing tank outlets are located be isolated from the rest of the fuel tank by closing the lightning holes in the ribs and installing one-way flapper-type check valves to permit the fuel to flow easily into this compartment but to prevent the fuel from flowing outboard during uncoordinated flight maneuvers.

Changes to Federal Aviation Regulations, Part 23

As a result of the design review of this airplane, the following changes are recommended for the current Federal Aviation Regulations, Part 23:

FAR 23. 1337(b)

It is recommended that the requirement be made for the fuel-quantity indicator to read accurately throughout the entire range of the indicator. It is conceded that the most important requirement is for the indicator to read accurately as the fuel quantity approaches zero, but proper flight planning and coping with emergencies can depend on knowing the quantity of fuel on board the airplane at all times within an acceptable degree of accuracy.

FAR 23.1305

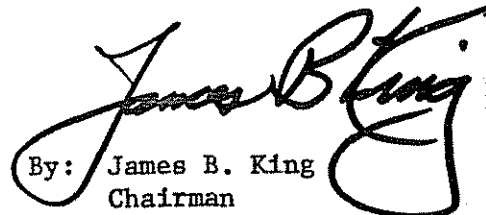
A means of low-fuel warning should be required on general aviation aircraft. Small, single-engine airplanes are less sophisticated and have fewer advisory systems than the more expensive multiengine airplanes and, consequently, are in greater need of this aid than the larger airplane.

The Safety Board is aware that Airworthiness Directive 77-26-04 was prompted by two of the recommendations made by the Special Certification Review Team. We are also aware of the Emergency Airworthiness Directive dated July 7, 1978. However, we continue to believe that other actions are necessary to insure that the problem of fuel starvation in this aircraft is solved.

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

Expedite the actions indicated by the Special Certification Review Team in August 1977, as detailed above, to insure that the necessary changes are implemented on production aircraft, and by Airworthiness Directive on those aircraft in service at an early date. (Class I Urgent Action) (A-78-50)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendation.


By: James B. King
Chairman