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National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: July 7, 1986
In reply refer to: A-86-48 through -50

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

On September 24, 1984, a Piper Model PA-31T3, N9193Y, operating as a scheduled commuter flight, crashed after both engines lost all power while on approach to the William B. Hartsfield Airport, Atlanta, Georgia. On December 12, 1984, another scheduled commuter airplane, a Piper Model PA-31-350, N40790, also crashed when its engines lost power during approach to the Miami International Airport, Miami, Florida. The Safety Board's investigation of these accidents disclosed that the loss of engine power occurred as a result of fuel exhaustion and fuel starvation. In each accident, the airplane was being flown with a marginal supply of fuel in order to accommodate passenger/payload requirements and to adhere to operating gross weight limitations; the fuel load upon departure was estimated using only the electronic fuel quantity gauges; and no alternate, direct means of measuring the fuel quantity, such as a dipstick or a dripstick, 1/ was available.

As a result of its investigation of the September 24, 1984, accident, the National Transportation Safety Board, on November 3, 1985, issued Safety Recommendations A-85-88 through -90 to the Federal Aviation Administration (FAA) regarding the installation of fuel quantity sensors and required maintenance procedures used in the adjustment and calibration of the fuel systems in these airplanes. In connection with the latter issue, the Safety Board recommended that the FAA require the Piper Aircraft Corporation to amend the maintenance manuals for the PA-31T and PA-42 series airplanes to require use of the capacitance type of calibration test set when checking the fuel quantity indication systems for accuracy and to delete any other test procedure. The FAA has not yet indicated to the Safety Board what remedial action, if any, it intends to take regarding this matter. However, the Safety Board continues to believe that a rigorous, high level of maintenance is required regarding the adjustment and calibration of the fuel systems on these airplanes and that the FAA should expedite completion of its investigation of this matter.

Between 1980 and 1985, 14 CFR 135 operators were involved in 53 accidents caused by fuel exhaustion or fuel starvation. Moreover, during the period January 1979 to January 1985, records from the FAA's National Safety Data Branch indicated that 14 CFR 135 operators, as well as 14 CFR 121 operators, were involved in 24 incidents for similar reasons. Although the pilot is often implicated in these occurrences, it should be noted that the nature of air taxi-commuter flight operations often requires that flights be conducted with minimum fuel aboard in order to accommodate the payload weight of passengers and/or cargo. Additionally, because of a lack of availability of fuel at certain

1/ A gauge installed in fuel tanks to measure fuel quantity on the ground without using the airplane electrical system.

locations or because of flight scheduling time constraints, a commuter flight cannot always operate with the airplane's fuel tanks filled to capacity. The result is often a very time-fuel critical flight operation that routinely encounters potential hazards of fuel exhaustion. For example, on March 9, 1983, and again on September 25, 1985, commuter pilots of Cessna 402C airplanes, after departing Freeport in the Bahama Islands, had to ditch their airplanes in the Atlantic Ocean, near Fort Lauderdale, Florida, after running out of fuel.

The FAA, as part of its General Aviation Accident Prevention Program, issued publication No. FAA-P-8740-3, entitled "Time In Your Tanks." The publication provides safety information about fuel management and methods to determine the fuel quantity before flight and states, in part:

Fuel gauges are subject to malfunctions and errors. Therefore, unless restricted by the gross weight or center of gravity limits, it is considered good judgment to "top off" the tanks at fuel stops. If the fuel load must be limited, an accurate measurement can be made by use of a dipstick calibrated for the aircraft.

The Safety Board concurs with this advisory information and believes that complete reliance on electronic fuel quantity systems/gauges, which indicate fuel quantity indirectly and often inaccurately, is a contributing factor to accidents involving fuel mismanagement. Whenever fuel-critical flight operations are conducted with partial fuel loads, an available alternate means of measuring fuel, such as a dipstick or a dripstick, should always be used to enable flight crews to verify, by direct measurement, the partial fuel quantity on board. Such alternate verification of fuel quantity is particularly important in 14 CFR 135 operations since fuel-critical flight operations are conducted frequently. However, many 14 CFR 135 operators do not have such devices available, or if they are available, they do not use them routinely.

The increasing concern regarding the occurrence of fuel exhaustion in 14 CFR 135 operations was highlighted recently by the FAA's Fort Lauderdale, Florida, Flight Standards District Office (FSDO). On May 4, 1986, the pilot of a Cessna 402C with eight passengers aboard encountered fuel exhaustion and made a forced landing without engine power at the Fort Lauderdale-Hollywood International Airport. As a result of that incident, the Fort Lauderdale FSDO, on May 14, 1986, issued the following letter to 14 CFR 135 operators within its jurisdiction:

Dear Operator:

A study of recent incidents involving cases of fuel exhaustion in aircraft operated by FAR 135 Air Carriers indicates that certain steps need to be taken to ensure that aircraft have the necessary fuel to meet the requirements of their proposed flights.

Therefore, this office is requesting that each operator develop a method of visually verifying the amount of fuel on board in lieu of the policy of reliance on fuel quantity indicators. This policy and procedure will be incorporated into the company's operations manual.

We are asking that each operator comply with this request by submitting the proposed procedure to the respective Principal Operations Inspector within 30 days of receipt of this letter.

We would appreciate your immediate cooperation in this matter.

While most manufacturers of commuter type airplanes do not make calibrated dipsticks or dripsticks for the fuel systems in their airplanes, such devices are available for some makes and models of general aviation airplanes through independent aircraft equipment suppliers. The Safety Board believes that the FAA should lend impetus to the continued development and application of such devices. Moreover, for those makes and models of airplanes for which such devices are already available, the FAA should require that they be used whenever flights are initiated under 14 CFR 135 with less than a full load of fuel.

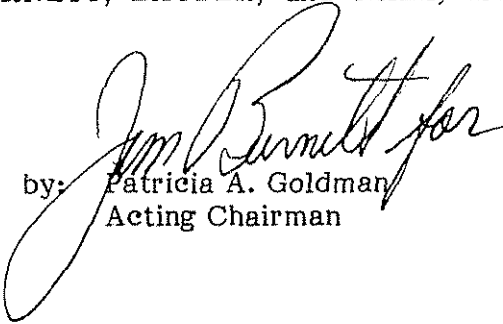
Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Provide an increased level of surveillance of 14 CFR 135 operators to assure the timely and accurate adjustment and calibration of the fuel quantity indicating systems installed in airplanes used by the operators. The capacitance fuel system test box and harness assembly should be required to be used where applicable. (Class II, Priority Action) (A-86-48)

Encourage the continued development and application of fuel tank dipsticks or dripsticks for all general aviation airplanes used in 14 CFR 135 operations that will allow flightcrews to verify directly, accurately, and easily the quantity of fuel on board an airplane before each flight. (Class II, Priority Action) (A-86-49)

Require that air carriers operating general aviation type airplanes under 14 CFR 135 use calibrated dipsticks or dripsticks, when available, to verify fuel quantities on board airplanes if they are initiating flight with less than a full load of fuel. (Class II, Priority Action) (A-86-50)

GOLDMAN, Acting Chairman, and BURNETT, LAUBER, and NALL, Members, concurred in these recommendations.

by: 
Patricia A. Goldman
Acting Chairman