

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 11, 1979

Forwarded to:

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

SAFETY RECOMMENDATION(S)
A-79-32 through -34

On December 28, 1978, a United Airlines DC-8 crashed near Portland, Oregon, after fuel exhaustion. As a result of its investigation, the Safety Board believes that the following safety-related findings merit corrective action.

The investigation showed that all four engines stopped because of fuel exhaustion as the aircraft approached Portland International Airport for a landing. An examination of the system components revealed no findings of any discrepancy which would have caused an erroneous fuel-quantity reading on any of the individual tank gages or on the total fuel gage. To the contrary, pertinent cockpit conversation as recorded on the cockpit voice recorder disclosed that 28.8 minutes before fuel was completely exhausted, the flight engineer was aware that only 5,000 pounds of fuel remained. Calculations, based on theoretical fuel consumption rates for the DC-8, showed this to be an accurate figure.

However, later in the flight, after it became apparent to the crew that engine flameout was imminent, the cockpit conversation indicated that the captain may have been confused as to the amount of fuel which actually remained. About 6 minutes before all engines stopped, the captain stated that there was 1,000 pounds of fuel in the No. 1 tank, and the second officer agreed with him.

Additional remarks were made at this same time by the captain describing the gage indication as changing from 1,000 pounds to 0 pounds. Since this gage does not change its indication from 1,000 pounds to 0 pounds directly but decreases in increments of 100 pounds, the captain must have read the gage indication incorrectly. Actually, the indication that he described is that of a gage changing from 100 pounds to 0 pounds.

In addition, the Safety Board learned that United Airlines had recently changed the fuel quantity gages on this aircraft from a direct reading digital-type to a three-figure indicator that must be multiplied by a factor of 100 to get the actual individual tank values. The new total fuel gage, with an identical display of the same three-figure presentation as the individual tank gages, must be multiplied by a factor of 1,000 to get the actual total fuel value.

The Safety Board believes that such a design can cause confusion because of the different scale multipliers that must be used. Unless crews are fully aware of this difference in scale, such an error can easily be made with the new system, especially at times of stress. Although crews can become familiar with the gages through training, an immediate problem exists because the gages are already installed on some aircraft. All crews who use this new fuel-quantity indicating system must be alerted to the possible confusion, or the need for two gage-scale corrections must be removed and one scale made common for all fuel-quantity indicators.

Finally, our investigation of the fuel-quantity measuring and indicating system disclosed that this new system being installed by United Airlines is authorized by Supplemental Type Certificate SA3357WE-D. This STC was issued by UAL under provisions of FAR's 21.431 through 21.493 and FAA Order No. 8110.4. In reviewing this STC, we found no evidence that the document specified precise methods of calibrating the system over its operating range after it was installed on an aircraft. The Safety Board has learned that the system is calibrated in two ways--at empty and at some random value of fuel after the first refueling following the modification. We believe that the FAA should audit this STC, as provided for in the FAR's, to assure its adequacy.

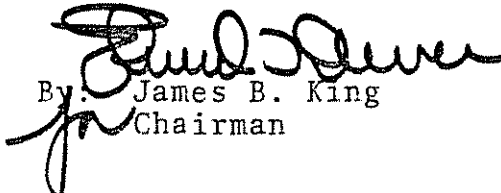
Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue an Operations Alert Bulletin to have FAA inspectors assure that crew training stresses differences in fuel-quantity measuring instruments and that crews flying with the new system are made aware of the possibility of misinterpretation of gage readings. (Class II--Priority Action) (A-79-32)

Emphasize to engineering personnel who approve aircraft engineering changes or issuance of Supplemental Type Certificates the need to consider cockpit configuration and instrumentation factors which can contribute to pilot confusion, such as the use of similar-appearing instruments with different scale factors. (Class II--Priority Action) (A-79-33)

Audit Supplemental Type Certificate SA3357WE-D for completeness, especially in the area of system calibration after installation. (Class II--Priority Action) (A-79-34)

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


By: James B. King
Chairman