Addendum 4

to Operations Group Chairman's Factual Report - 2

DCA94MA076

submitted
March 10, 1999

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

March 10, 1999

FOURTH ADDENDUM TO OPERATIONAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA94MA076

A. ACCIDENT

Operator: US Airways, Inc. (formerly USAir, Inc.)
Location: Aliquippa, Pennsylvania
Date: September 8, 1994
Time: About 1904 Eastern Daylight Time
Airplane: Boeing 737-300, N513AU

B. OPERATIONS GROUP

Chairman: Benjamin A. Berman
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C. ADDENDA

1. Operations Group Chairman's notes on postflight briefing for the Boeing flight test of June 4, 1997

According to Boeing, the purposes of the flight test were to gather information for simulations and verify the 737-300 simulator package. This test was a Boeing activity and was not conducted under National Transportation Safety Board procedures. The Safety Board participated as an observer. Other parties to the USAir flight 427 investigation were also invited to observe.

During the postflight briefing, the two Boeing test pilots who conducted the flight described the handling of the airplane when they applied full left rudder with the test airplane configured similar to the flight 427 accident airplane (190 knots and flaps 1). One pilot described how the airplane would initially respond to aileron inputs and begin to roll out of the rudder-induced bank attitude, but by pulling back on the control column and adding some vertical g load, the recovery could be arrested and the airplane would hang in a sideslipping bank. The test pilot said that he did not apply additional aft column inputs at these moments, but he said that these would have caused the airplane to "roll into the rudder." He concluded, "You can control roll rate with the control column." The other Boeing test pilot said of the control inputs required to perform a recovery from full rudder input, "There is some technique required between the g and the roll."

The test crew affirmed that the Boeing M-CAB and computer simulation models incorporated this tradeoff between vertical g and roll control, but the simulator showed this effect at a greater g load than the actual airplane. (Thus, the actual airplane was somewhat more subject to loss of roll control from aft control column input, compared to the simulator.) They said that the Boeing simulation would need to be modified based on the flight test results.

The pilots stated that when they initiated the event at 190 KIAS and then allowed the airspeed to increase to about 220-225 KIAS (sacrificing altitude as necessary to maintain airspeed, the airplane recovered easily. The pilots reported that when they initiated the event at higher airspeeds, the airplane was easier to control, and recovery was accomplished with less roll. The test pilots indicated that the amount of altitude lost during the recoveries varied, but that with a prompt response and good technique, control could be regained with a loss of less than 500 feet. They also indicated that if they had not had to comply with the vertical load factor restrictions imposed for the tests they would have been able to recover with less lost altitude.

The flight test pilots indicated that when the airplane was configured at higher flap settings at the initiation of the event, recovery was easier, although the airframe experienced considerable vibration.

2. Assessment of air carrier compliance with AD 96-26-07

During July 1998, the Safety Board conducted an assessment of the implementation of AD 96-26-07 by U.S. air carrier operators of the B-737. Of the 13 air carriers contacted by the Safety Board, 12 provided information.

The results indicated that during 1998, 6 (50 percent) of the responding air carriers were providing B-737 flightcrews with a flight simulator demonstration of crossover (the overpowering of roll flight controls by rudder input.) The remaining 6 air carriers had no documented simulator training on crossover. Of the 12 responding carriers, 4 (33 percent) were providing flightcrews a specific demonstration of the crossover speed in the flaps 1 configuration.

According to the information provided to the Safety Board, 8 (66 percent) of the 12 responding air carriers provided simulator training to flightcrews on the jammed rudder procedure, while 4 (33 percent) provided no simulator training on this procedure. Of the 8 air carriers that trained crews on the jammed rudder procedure, 5 carriers required instructors to continue the procedure at least to the step of selecting the System B flight control switch to "Standby Rudder," while 3 did not specify the extent to which the procedure was to be performed or terminated the jammed rudder malfunction with disengagement of the yaw damper.

The results indicated that 10 (83 percent) of the responding air carriers had implemented a minimum maneuvering airspeed for the Flap 1 configuration (aircraft weight 110,000 pounds) of at least 190 knots (4 of the air carriers had increased the Boeing-recommended block speeds by 10 knots and were requiring pilots to use at least 200 knots as the minimum airspeed for Flaps 1). The remaining 2 air carriers were using slower minimum maneuvering speeds specified for each 10,000-pound increment of airplane weight. For Flaps 1/110,000 pounds gross weight, these two carriers were using a minimum maneuvering speed of 158 and 164 knots, respectively.

3. List of attachments

Attachment A: Letter of December 9, 1998, from John W. Purvis, Boeing Commercial Airplane Group (3 pages).

Attachment B: Letter of December 4, 1998, from Captain Herb LeGrow, Air Line Pilots Association (1 page).

Attachment C: Boeing Company, *Operations Manual Bulletin for USAir, Inc.*, Number USA-17, February 17, 1997 (14 pages).

Attachment D: Excerpts from *Boeing 737-300 Airplane Flight Manual* (3 pages).

Attachment E: Federal Aviation Administration, Flight Standards Information Bulletin for Air Transportation 98-03, "Recognition of and recovery from unusual attitudes and upsets caused by reverse rudder response involving Boeing 737's," January 29, 1998 (3 pages).

Benjamin A. Berman
Operations Group Chairman