



National Transportation Safety Board
Washington, D.C. 20594

Response to Petition for Reconsideration

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In accordance with 49 *Code of Federal Regulations* (CFR) Section 845.41, the National Transportation Safety Board has reviewed the Air Line Pilots Association's (ALPA) petition for reconsideration and modification of the findings and probable cause in the accident involving an Air Virginia (AVAir), Inc., Fairchild Metro III, N622AC, which crashed near Cary, North Carolina, on February 19, 1988 (DCA88MA032).¹ Based on its review of the petition filed January 28, 1993, the Safety Board hereby grants the petition in part.

AVAir operated the above-referenced accident flight as flight 3378. The flight departed runway 23R at Raleigh-Durham International Airport, Morrisville, North Carolina, about 2126 eastern standard time in instrument meteorological conditions (IMC) and was headed to Richmond, Virginia. The first officer was the pilot flying the airplane. The airplane struck water within 100 feet of the shoreline of a reservoir, which was about 5,100 feet west of the midpoint of runway 23R. All 12 persons on board were killed, and the airplane was destroyed. Postaccident examination of the wreckage found the stall avoidance system (SAS) disengage switch in the down, or disengage, position. An intact filament from one of two bulbs of the SAS fault indicator showed evidence of severe stretching, which the original investigation found to be an indication that the bulb was likely illuminated at the time of the accident.

Because the accident aircraft was not equipped with either a cockpit voice recorder (CVR) or a flight data recorder (FDR), no factual evidence existed of the flight crew's discussions during the short flight nor were there any data to provide direct evidence of a specific system or equipment failure or of the airplane's exact flightpath. Consequently, the Safety Board largely based its analysis on an aircraft performance study that was developed using radar data, the examination of the wreckage, and the service history of the SAS on Fairchild Metro series airplanes. On December 13, 1988, the Safety Board determined the probable cause of the accident as follows:

¹ For more information about this accident, see DCA88MA032 at the Safety Board's Web site at <<http://www.nts.gov>>.

The failure of the flightcrew to maintain a proper flightpath because of the first officer's inappropriate instrument scan, the captain's inadequate monitoring of the flight, and the flightcrew's response to a perceived fault in the airplane's stall avoidance system. Contributing to the accident was the lack of company response to documented indications of difficulties in the first officer's piloting, and inadequate Federal Aviation Administration [FAA] surveillance of AVAir.

Then-Board Members John K. Lauber and Joseph T. Nall provided concurring and dissenting statements in which they proposed that the probable cause should read as follows:

The failure of the flightcrew to maintain a proper flightpath in response to an actual or perceived fault in the airplane's stall avoidance system. Contributing to the accident were ineffective management and supervision of flightcrew training and flight operations, and ineffective FAA surveillance of AVAir.

The petitioner states that Members Lauber and Nall both believed that an actual activation of the airplane's SAS could not be ruled out as a cause of the accident "considering the short duration of the flight, the numerous instances of uncommanded SAS activations and the fact that the SAS clutch switch had been disengaged by the crew prior to impact." The petitioner states that ALPA would have supported the probable cause proposed by Members Lauber and Nall. In addition, of the 13 findings in the final report, the petitioner disagrees with the following:

The crew responded to a perceived malfunction in the [SAS] by disengaging the SAS clutch. (finding 7)

Because of possible deficiencies in the SA 226 and SA 227 operating procedures, the crew was not informed that a perceived SAS malfunction does not require an immediate response. (finding 8)

The airplane's flightpath indicated an excessive angle of bank initiated at an altitude that was too low. (finding 9)

The first officer was at the controls of AVAir 3378 and allowed the airplane to descend due to a deficient instrument scan. (finding 10)

The captain did not effectively monitor the flight instruments, possibly because of his response to a perceived SAS fault and the possible degradation of his monitoring capabilities due to his physical discomfort. (finding 12)

Regarding finding 7, the petitioner states that the conclusion is based on the Safety Board's assumption that the SAS fault light illuminated steadily and that illumination of the fault light "eliminated all power to the stickpusher." The petitioner states that this is an incorrect assumption and that "it is still possible for an unwanted pusher activation to occur" with the SAS fault light illuminated.

The Safety Board's original investigation based finding 7 primarily on the examination of the wreckage, which found the SAS clutch switch in the disconnected position and a filament in

one SAS fault indicator bulb to be stretched at impact. The investigation considered that intentional deactivation of the SAS could have resulted in illumination of the SAS fault light. The investigation also considered but ruled out the possibility of an uncommanded stickpusher activation. As noted in the final report, at the time of the accident, the FAA's service difficulty report database indicated eight reports of uncommanded stickpusher activation during takeoff and climb. Although unofficial, there were numerous reports in the Metroliner pilot community that pilots would deactivate the SAS during takeoff and landing to prevent an uncommanded stickpusher event at low altitude. Also, if the flight crew had inadvertently activated the stickpusher, the pilot's expected first response would have been to roll the airplane to wings level and then pull back on the yoke to maintain altitude. The aircraft performance study does not show that this occurred.

Nonetheless, without a CVR and FDR, the Safety Board cannot determine, with any degree of accuracy, what may have caused the SAS fault light to illuminate, even momentarily, before impact. Therefore, the Board deletes finding 7. In addition, because it cannot be determined whether the SAS malfunctioned, the Safety Board also deletes finding 8 as unnecessary.

Regarding finding 9, the petitioner states that the Safety Board assumed that the "aircraft flew a constant radius of turn" and "used an average vertical component of acceleration" in calculations. The petitioner also states that, because of these "oversimplifications," the Safety Board's model of the aircraft's flightpath was unrealistic, which led the Board to believe that the aircraft banked steeply and gradually descended into the ground.

The accident flight departed in IMC, with a reported indefinite ceiling of 100 feet, visibility of 1/4 mile or less (the tower indicated 0 mile visibility), and light drizzle and fog. The original investigation determined that the flight turned to the right at an altitude of 200 feet at air traffic control's request. However, the performance study found that the airplane's bank angle continued to increase to 40° to 45°, which exceeds a standard-rate-turn bank angle of 22°.

The examination of the wreckage found that the airplane had been trimmed for a 157-knot climb speed, which was appropriate. The examination also found that, for a standard rate turn, a pull force of 10 pounds on the yoke would have been required to maintain level flight; for a bank angle of 45°, a pull force of about 40 pounds on the yoke would have been required to maintain level flight. The aircraft performance study also determined that, if the pilot had exerted a backforce sufficient for only a standard rate turn, the airplane's flightpath would have matched the radar data points, and the airplane would have struck the water reservoir. The Safety Board studied the performance data for the Metroliner, the position of the trim, limited radar data, and the position of the initial impact. The aircraft performance study found that the flight crew did not arrest an excessive bank angle. Therefore, no change to finding 9 is warranted.

The petitioner argues that findings 10 and 12 are unsupported because they are based on the Safety Board's "concept of a 'perceived' SAS fault," which the petitioner believes is erroneous. Without the benefit of a CVR or a video recording of the cockpit and without enough evidence of an SAS fault, the Board agrees with the petitioner that these two findings are unsupported. Given the first officer's relatively low time in instrument conditions in the

Metroliner and the captain's reported medical condition, it is not unreasonable to conclude that the crew lost situational awareness in a relatively high workload environment and did not monitor the aircraft's flightpath. The Board maintains that the flight crew did not monitor the airplane's flightpath and did not take corrective action to prevent the accident. Therefore, the Safety Board finds that, as a result of making a turn at low altitude in IMC and in a high-workload environment, the flight crew lost situational awareness and did not reduce the aircraft angle of bank, which would have prevented the loss of altitude. A new finding will be added to reflect this.

On the basis of its reevaluation of the findings from the original accident investigation, the Safety Board determines that the Board's original findings and probable cause should be modified as follows:

- Delete findings 7, 8, 10, and 12;
- Add a new finding that the crew experienced a loss of situational awareness;
and
- Modify the probable cause to reflect views of then-Members Lauber and Nall.

Accordingly, the petition for reconsideration of the Safety Board's findings and probable cause in connection with the aviation accident involving AVAir, Inc., flight 3378, a Fairchild Metro III, N622AC, near Cary, North Carolina, on February 19, 1988, is granted in part. The probable cause and findings are modified to read as follows:

Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was a failure of the flight crew to maintain a proper flightpath. Contributing to the accident were the ineffective management and supervision of flight crew training and flight operations, and ineffective FAA surveillance of AVAir.

Findings

1. The flight crew was properly certificated for the flight.
2. The airplane was properly maintained for the flight.
3. There was no evidence of preexisting damage to the airplane structure or powerplants that could have contributed to the accident.
4. The air traffic control handling of AVAir 3378 was in accordance with applicable standards and regulations.
5. AVAir 3378 took off in lower than standard minimum instrument takeoff conditions caused by the low prevailing visibility. This condition should not have precluded the safe operation of the flight.

6. The company did not take positive action in response to documented indications of difficulties in the first officer's piloting.
7. The airplane's flightpath indicated an excessive angle of bank initiated at an altitude that was too low.
8. The captain should have performed the takeoff cue to the restricted visibility at the time.
9. The flight crew experienced a loss of situational awareness.
10. FAA surveillance of AVAir was deficient and inadequate.

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN and HIGGINS concurred with this petition for reconsideration.