

1432

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 28, 1982

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

} SAFETY RECOMMENDATION(S)

A-82-6 through -15

As a result of its continuing investigation of the crash of Air Florida Flight 90, a Boeing 737-222 (N62AF), about 1601 e.d.t. on January 13, 1982, the National Transportation Safety Board believes that immediate corrective action is needed in the area of cold-weather operations procedures. The aircraft had departed from runway 36 at Washington National Airport in moderate to heavy snowfall and low visibility. The aircraft failed to achieve a sufficient rate of climb, struck the 14th Street Bridge about 4,500 feet from the departure end of the runway, and crashed into the Potomac River. Seventy-four of the 79 persons aboard the aircraft were killed either on impact or by drowning, and 4 persons in automobiles on the bridge were killed when the vehicles were struck by the descending aircraft.

A weather observation taken within 15 minutes after the accident indicated that the visibility was 3/8 mile in snow, the temperature and dewpoint were both 24°, and the wind was from 020° at 13 knots. The evidence gathered to date shows that about 45 minutes had elapsed between the final deicing of the aircraft's aerodynamic surfaces with an ethylene glycol/water solution and the takeoff. During the 45-minute period, an additional 0.7 to 1.0 inch of snow had accumulated. Therefore, the Board's continuing investigation is focusing on, among other factors, those which could have affected the aircraft's takeoff and climb performance. These will include the effect of a runway contaminated by snow or slush on takeoff acceleration, the extent to which aerodynamic lift is degraded by contaminated airfoils, and the possible effects of engine nacelle and pressure probe icing.

In previous Safety Recommendations (A-80-112 through A-80-114), the Safety Board has expressed concern about the lack of knowledge of operators and flightcrews regarding the inability of deicing fluid to protect against icing from precipitation following deicing. We were pleased by the FAA's issuance of Air Carrier Operations Bulletin No. 7-81-1 and the proposed research and development study referenced in your February 11, 1981, letter to the Board. However, we now believe that more positive and immediate actions are needed to provide safe operations during the current winter months. Bulletin No. 7-81-1 advises principal inspectors to request operators to review their deicing and anti-icing procedures for

adequacy. The Safety Board does not believe that this approach has obtained the needed results. Rather, the FAA must actually review prescribed procedures and those actually used by all air carrier maintenance and dispatch personnel, and flight crews who routinely conduct cold weather operations to assure (1) that they are provided with sufficient and accurate information regarding proper deicing procedures and (2) that they are alerted to misconceptions regarding the anti-icing effectiveness of these procedures.

Additionally, the Safety Board's review of a number of air carrier operations manuals indicates that some do not contain information regarding the potential degradation in takeoff acceleration which can result from snow, slush, or water on the runway. More significantly, all operators of similar model aircraft apparently do not have standard, optimum procedures regarding the use of engine anti-ice during ground operation and takeoff. The preliminary investigation of the Air Florida accident indicates that the engine anti-ice system was OFF at the time of impact, and the Safety Board has not yet determined whether the engine anti-ice system had been used during the pre-takeoff ground operation.

Without regard to whether the ground operations had been conducted using engine anti-ice, the Safety Board is concerned that ice accumulation on the JT8D engine inlet pressure probe (PT2) could have affected the function of the engine pressure ratio (EPR) indicator to the extent that the crew was presented with a false indication of takeoff thrust when the engine reached some lower thrust level. Recent discussion with another air carrier has recently disclosed that an abnormal number of takeoffs have been rejected by pilots of B-737 and B-727 aircraft because of problems with EPR indications during the recent cold weather. In all of these instances, pilots stated that both ground operations and the attempted takeoff were conducted with engine anti-ice ON and operating and in all cases the takeoff was rejected because the EPR indication failed to reach takeoff values. Preliminary discussions between our engineering staff, a representative of the engine manufacturer, and air carrier engineering personnel indicate that, with a blocked PT2 probe, the EPR indicator will give an indication that thrust is higher than actual with engine anti-ice OFF and that is lower than actual with anti-ice ON. Any inaccurate indication of thrust level presents the obvious hazard of a rejected takeoff on a slippery runway. However, an indication of higher than actual thrust can be even more hazardous if a pilot referencing the EPR gage for setting engine thrust attempts to accelerate and take off with insufficient thrust.

Most of these pilots stated that before they attempted takeoff, they had been required to taxi or hold behind other aircraft while awaiting takeoff clearance and that engine thrust levels sufficient for effective anti-icing could not be achieved because of the low coefficient of friction of the taxiway, runup pad, and runway surfaces. Icing problems may occur more often as a result of the more frequent ground delays being experienced during the rebuilding of the ATC system. Therefore, we believe that all flight crews should be immediately alerted to the dangers of engine inlet pressure probe icing, the effect of anti-ice usage on erroneous thrust indications, the absolute requirement to cross-check all engine instruments during the application of takeoff power, and the importance and significance of the requirements of 14 CFR 121.629(b). ^{1/}

^{1/} 14 CFR 121.629(b) states, "No person may takeoff an aircraft when frost, snow, or ice is adhering to the wings, control surfaces, or propellers of the aircraft."

We also believe that FAA tower and ground control personnel should be informed of the greater-than-normal icing potential which exists when an aircraft encounters lengthy ground delays and the potential for thawing and refreezing when an aircraft is required to taxi or hold near another aircraft's engine exhaust. Further, controllers should implement the gate-hold provisions of the Facilities Operations and Administration Manual 7210.3F, Paragraph 1232. 2/

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

Immediately notify all air carrier operators of the potential hazard associated with engine inlet pressure probe icing, and require that they provide flightcrews with information on how to recognize this hazard and requiring that flightcrews cross-check all engine instruments during the application of takeoff power. (Class I, Urgent Action) (A-82-6)

Immediately review the predeparture deicing procedures used by all air carrier operators engaged in cold weather operations and the information provided to flightcrews to emphasize the inability of deicing fluid to protect against reicing resulting from precipitation following deicing. (Class I, Urgent Action) (A-82-7)

Immediately review the information provided by air carrier operators to flightcrews engaged in cold weather operations to ensure comprehensive coverage of all aspects of such operations, including the effects of a runway contaminated by snow or slush on takeoff, and methods to be used to obtain maximum effectiveness of engine anti-ice during ground operations and takeoffs. (Class I, Urgent Action) (A-82-8)

Immediately require flightcrews to visually inspect wing surfaces before takeoff if snow or freezing precipitation is in progress and the time elapsed since either deicing or the last confirmation that surfaces were clear exceeds 20 minutes to ensure compliance with 14 CFR 121.629(b) which prohibits takeoff if frost, snow or ice is adhering to the wings or control surfaces. (Class I, Urgent Action) (A-82-9)

Immediately issue a General Notice (GENOT) to all FAA tower and air carrier ground control personnel alerting them to the increased potential for aircraft icing during long delays before takeoff and when aircraft operate in proximity to each other during ground operations in inclement weather, and encouraging procedural changes where possible so that the controllers implement the gate-hold provisions of the Facilities Operations and Administration Manual 7210.3F, paragraph 1232. (Class I, Urgent Action) (A-82-10)

Document the effect of engine inlet pressure probe blockage on engine instrument readings and require that such information be added to approved aircraft flight manuals. (Class II, Priority Action) (A-82-11)

2/ Paragraph 1232(a) states, "The objective of gate-hold procedures is to achieve departure delays of 5 minutes or less after engine start and taxi time...Implement gate-hold procedures whenever departure delays exceed or are expected to exceed 5 minutes.

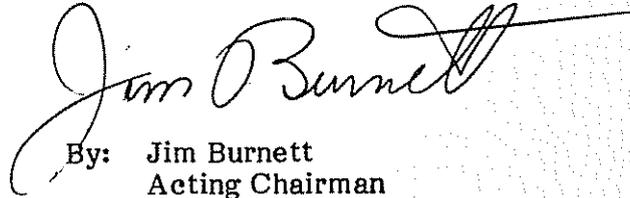
Amend Advisory Circulars 91-13c, "Cold Weather Operation of Aircraft," and 91-51, "Airplane Deice and Anti-Ice Systems," to discuss in detail the effects and hazards associated with engine inlet pressure probe icing. (Class II, Priority Action) (A-82-12)

Revise the air traffic control procedures with respect to aircraft taxiing for takeoff, holding in line for takeoff, and taking off to provide for increased ground separation between aircraft whenever freezing weather conditions and attendant aircraft icing problems exist. (Class II, Priority Action) (A-82-13)

Expand the training curricula for air traffic controllers and trainees to assure that instruction includes the hazards associated with structural and engine icing of aircraft. (Class II Priority Action) (A-82-14)

Immediately disseminate the contents of this safety recommendation letter to foreign operators involved in cold weather operations. (Class I, Urgent Action) (A-82-15)

BURNETT, Acting Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

A handwritten signature in cursive script that reads "Jim Burnett". The signature is written in dark ink and is positioned above the typed name and title.

By: Jim Burnett
Acting Chairman