Log 2350

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 22, 1992
In reply refer to: A-92-59 through -65

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On January 30, 1991, a British Aerospace Jetstream BA-3101 airplane, operated under 14 Code of Federal Regulations (CFR) Part 135, by CCAir, Inc., as USAir Express flight 4743, crashed on its final approach to runway 19 at Beckley Airport, West Virginia. The twin turboprop commuter hit the runway after a steep descent and was destroyed. The 2 crewmembers and 17 passengers survived, but some of them sustained serious injuries. The commuter airplane was on a scheduled passenger flight from Charlotte, North Carolina, to Beckley, West Virginia.

The captain recalled noting a speed of 130 knots when he sighted the runway environment (approach lights), and he directed the first officer to select the final flaps setting (50 degrees). An airframe buffet followed, and the airplane pitched into a steep descent. The flightcrew and passengers recalled looking "straight down on the runway." The captain stated that he applied full back pressure on the control column and pulled the aircraft to a flat attitude as it impacted on the centerline of the runway. The evidence showed that the main wheels splayed outward, the struts collapsed, and the propellers and underbelly baggage pod struck the runway. The airplane was destroyed when it hit the ground. It slid 3,600 feet to a stop, igniting a fuel fire under the center wing section. That fire was extinguished by airport crash fire rescue personnel.

Safety Board investigators examined the aircraft and found no mechanical or instrument anomalies, except for maintenance items previously documented before the flight, including an inoperative airframe deicing system. The investigators determined that both engines were probably developing normal power and that the weight and balance of the airplane were within allowable limits at the time of the accident. The flightcrew was properly certificated, medically qualified and had received proper rest prior to assuming duty.

On a scheduled switch of airplanes at Charlotte, the captain accepted the airplane with the knowledge that the airframe deicing system was inoperative. This maintenance discrepancy was identified in the Minimum Equipment List (MEL) as limiting flight to conditions free of known or forecast icing. The captain stated to Safety Board investigators,

"there was no icing conditions forecast." However, a recent hourly sequence report for Beckley, which was available to the captain, noted overcast, rain, and a surface temperature of 42 degrees at the airport. This report should have alerted him to the likelihood of encountering icing conditions approaching Beckley and should have prompted him to obtain more complete information as would be contained in an area forecast. The flight, conducted under instrument flight rules (IFR), encountered light icing as it descended into Beckley. The captain told Safety Board investigators that he "felt the aircraft could handle it" and elected to continue, stating that based on his latest weather report, icing would not be a problem. He said that upon entering the final phase of the approach (passing the final approach fix inbound) he recalled that the icing had increased "significantly," and he informed the first officer that they would fly at a higher than normal approach speed.

Another CCAir BA-3100 airplane had successfully flown an instrument approach to runway 19 at Beckley, landing approximately 5 minutes earlier. The flightcrew told investigators that they had encountered 3/4 to 1-1/2 inches of rime icing during the descent and approach. The captain told Safety Board investigators that he had activated "the boots on the approach;" however, the first officer stated that they had not been activated. A dead-heading company BA-3100 pilot seated in the center seat, first row, and observing through an open door, also stated that he could not recall seeing the airframe deicing system activated. After discharging passengers, that aircraft was parked outside from midnight to 5:30 AM at which time airport service employees deiced the airframe in preparation for departure. Those employees stated that they found 1 inch of rime ice on the empennage surfaces, but no ice adhering to the wing surfaces. The Safety Board did not determine the airspeeds used or whether the flightcrew of this airplane used the 50-degrees flap setting. While the crew of the earlier flight apparently did not encounter flight control difficulties during the approach and landing, the Safety Board believes that the steep pitch down of flight 4743 was caused by an undetermined amount of ice that collected on the airplane's aerodynamic surfaces during its descent.

On December 26, 1989, a BA-3101 Jetstream, operating under the provisions of 14 CFR Part 135, crashed short of the runway at Pasco, Washington, following a high rate of descent on an instrument approach in icing conditions. The investigation revealed that the flightcrew may have experienced a high work load, having joined the approach course inside the final approach fix, and attempted to join the glideslope from well above the normal altitude. The airplane was destroyed, and the two pilots and four passengers received fatal injuries. The evidence indicated that the airplane was between 50 and 60 degrees nose down when it struck the ground. Because this extreme attitude was well outside the normal flight attitude, the Safety Board concluded that it could only have occurred following a loss of control by the flightcrew. As in the flight 4743 accident, the airplane that crashed at Pasco had descended through conditions that could have produced an accumulation of as much as 1 inch of rime ice on the leading edges of the wing and empennage. Although the phenomenon is straightforward and well understood by the Federal Aviation Administration (FAA), the Safety Board believes that some pilots may not fully appreciate the aerodynamic principles that lead to flight control problems with tailplane ice accumulation. In the report of the Pasco accident, the Safety Board analyzed the phenomenon of "tailplane icing" as it can affect the flight control of the BA-3100 airplane as follows:

The longitudinal stability of any airplane depends primarily upon the relationship of the lift produced by the wing, the weight, and the aerodynamic force produced by the horizontal stabilizer. Because the position at which the resultant lift vector acts on the airplane is normally aft of the center of gravity, the combination of the lift and weight forces alone results in a nose-down pitching moment that must be balanced by a downward force at the tail. The aerodynamic force produced by an airfoil depends on the angle at which the relative airflow impinges on the airfoil, known as the angle of attack (AOA). To produce an upward force, the airflow must impinge on the lower surface of the wing (a positive AOA). Conversely, to produce a downward force, the relative airflow must impinge on the upper surface of the horizontal stabilizer (a negative AOA).

In airplanes like the BA-3100 that have a nonmovable horizontal stabilizer, the stabilizer is attached to the fuselage at an angle of incidence[1] that permits an optimum relationship between the wing and stabilizer angle of attack (AOA) for the airplane's allowable ranges of wing flap configurations and airspeeds. This relationship includes the downward deflections, known as downwash, of the airflow as it passes over and behind the wing. This downwash changes with wing AOA and flap extension. The aerodynamic force produced by the stabilizer is modulated by the deflection of the elevator to maintain the longitudinal balance and to maneuver the airplane. However an accretion of ice on the leading edge of the stabilizer will degrade its aerodynamic efficiency so that under some conditions it may fail to produce the downward force needed to maintain stabilized flight.

The Safety Board believes that the pitchover of both the Pasco airplane and flight 4743 occurred because the selection of 50 degrees flaps led to a sudden reduction in the downward force of the stabilizer. When the airplane was reconfigured from 20 degrees flaps to 50 degrees flaps, the downwash effect behind the wing increased. Further, the pilot would most likely have lowered the nose to reduce the wing AOA to maintain constant lift and steady flight path on the approach as the flaps extended. The combined effect of wing downwash and AOA change would have increased the negative AOA on the horizontal stabilizer. Because the AOA at which stall would occur was reduced as a result of ice accretion, the change in AOA accompanying flap extension was probably sufficient to cause a partial or full stall of the tailplane.

The pitchdown tendency of a BA-3100 with ice on the leading edge of the horizontal stabilizer when flap configuration is changed was demonstrated during flight tests conducted by British Aerospace after the Pasco, Washington, and Beckley, West Virginia, accidents.

Unlike the flightcrew at Pasco, the flightcrew of flight 4743 were able to level the airplane by applying full up elevator before striking the runway. The Safety Board believes that the pitchover of the flight 4793 airplane was less severe, probably because of the difference in the airspeed at which the flaps were extended to 50 degrees, and the amount and characteristics of the ice that had accumulated on the stabilizer.

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[1] Angle of incidence is the angle between the chord of the airfoil and the longitudinal axis of the airplane.

During interviews of other pilots of BA-3100 airplanes, the Safety Board learned of three other instances of airplane pitchover when 50 degrees flaps were selected during flight in icing conditions. The flightcrews either recovered from steep nose-down attitudes by applying full power or by adding power and reducing the flap extension to 20 degrees. The interviews revealed that the crews found ice remaining on the empennage surfaces following these incidents, but found no abnormalities during maintenance tests of the deicing system. The pilots reported that they had operated the airframe deicing system in the manual mode, but they could not state positively that they had activated both the wing and tail positions of the manual switch.[2]

Following issuance of the report on the Pasco, Washington, accident, the Safety Board issued four safety recommendations to the FAA, on November 19, 1991, two of which pertained to the certification of airplanes, as follows:

> A-91-87
> Amend the icing certification rules to require flight tests wherein ice is accumulated in those cruise and approach flap configurations in which extensive exposure to icing conditions can be expected, and require subsequent changes in configuration, to include landing flaps.
>
> A-91-88
> Review the airframe icing certification data for existing Part 23 and Part 25 airplanes to verify that the flight profiles examined included ice accumulated at those cruise and approach flap configurations in which extensive exposure to icing conditions can be expected, with subsequent changes in configuration, to include landing flaps. Require additional flight tests as necessary.

The intent of these recommendations was to ensure that the certification of airplanes for flight into icing conditions adequately addressed the airplane's susceptibility to adverse flight characteristics, such as those apparent in the Pasco, Washington, and Beckley, West Virginia, accidents.

The FAA generally agreed with these recommendations, referring to initial efforts to address the phenomena of tailplane icing in an international workshop conducted in November 1991. On May 10, 1992, the Safety Board classified Safety Recommendation A-91-87 as, "Open--Acceptable Alternate Response," and A-91-88 as, "Open -- Acceptable Response." The Safety Board looks forward to any tangible actions that will result from this effort. In addition, the Safety Board believes that the circumstances of the Beckley, West

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[2] The airframe deicing switch, in manual operation, requires the pilot in the left seat to press and hold the rocker switch in the "wing" position for approximately 5 seconds and then press and hold the same rocker switch in the "tail" position for 5 seconds. This mode is recommended for light and moderate airframe icing. An automatic cycle, on a separate switch, is intended for severe icing conditions.

Virginia, accident and the information obtained from pilots during the subsequent investigation illustrate other safety issues that warrant remedial actions. These issues include: (1) flightcrew training in winter operations and emphasis on the interpretation of weather conditions, as well as the potential hazard of both wing and tailplane ice accumulation; (2) modification of the BA-3100 wing flaps system, deicing system control, and ice detection components; and (3) the level of FAA surveillance of Part 135 operator training programs.

Flightcrew Training

The flightcrew of flight 4743 obtained a printout of weather for their intended route of flight from the company computer system[3] that included only the Beckley surface observations (SA) and terminal forecasts (FT). Although this information was the latest available, SAs and FTs are not suitable for determining the existence of icing conditions. The captain told Safety Board investigators that he accepted the airplane with an inoperative deicing system based upon this information. Also, two area forecasts (FAs)[4] issued by the National Weather Service (NWS) that were valid for the time and route of the flight were available from either the FAA Flight Service Station or the company's computer system. Both of these FAs, issued from Boston and Miami, respectively, mentioned light and occasional moderate rime and mixed icing in clouds and precipitation above the freezing level. Following the accident, the captain said that he was not aware of the availability or content of the FAs. The Safety Board believes that this additional information may have influenced his decision to conduct the flight without deicing equipment.

The Safety Board found that other CCAir pilots and USAir station personnel were unfamiliar with the function of an FA. The Safety Board believes that this lack of knowledge about the availability of weather products for preflighting purposes indicates a deficiency in the operator's ground training program that should be addressed.

The pilots involved in this accident also indicated that CCAir pilots were generally unaware of the hazards associated with empennage icing even though a British Aerospace crew manual, dated December 15, 1987, which cautioned that "ice build-up on the tailplane leading edge may cause strong nose down trim change when the flaps are lowered," had been provided by the operator. The Safety Board believes that this lack of awareness may

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[3] CCAir, operating as USAir Express, uses the on-line computerized weather and operational database known as USAir Pacer system.

[4] The FA provides an overview of weather conditions that could affect aviation operations within the United States. It serves as a flight planning and pilot weather briefing aid for use by general aviation pilots, civil and military aviation operations, the NWS and the FAA. The FA consists of 5 sections: hazards/flight precautions, synopsis, icing, turbulence, and significant clouds and weather. Source: Weather Service Operations Manual, Ch. D-20.

be widespread among commuter air carrier pilots since most commuter pilot educational materials and training programs address the icing hazard in the context of premature stall of an airplane's wing, and little or no emphasis is placed on the effect of ice on the empennage.

Subsequent to this accident, the FAA issued an Airworthiness Directive (AD) that limited the airspeed at which flaps 50 degrees may be extended on the BA-3100. The AD also limited flap extension to flaps 20 degrees when ice is visible on any part of the airplane. The Safety Board believes that these actions, combined with knowledge of the Pasco and Beckley accidents, have probably increased pilot awareness of the problem. However, the Safety Board believes that this awareness will increase only if the operators of all airplanes with similar designs emphasize the tailplane icing hazard in their training programs.

BA-3100 Aircraft Modifications

The flaps 20 degrees limit imposed by the AD issued subsequent to these accidents will provide more margin for preventing tailplane stall than the 50 degrees flap limit. However, the flaps 20 degrees limit will also result in higher touchdown speeds and require longer runway stopping distances on potentially icy runways. British Aerospace developed and offered, at no cost to the operators, a kit that would limit flap extension on the BA-3100 to 35 degrees, the same as the flap extension limitations currently on the BA-3200. According to British Aerospace, the flaps 35 degrees limit would provide an adequate safety margin against tailplane stall when landing in icing conditions, without an appreciable increase in the runway stopping distance. In addition, full extension to the flaps 70 degrees position ("flap dump" after landing) is not available from a flaps 20 degrees setting. The modification limiting flaps to 35 degrees does permit the flaps 70 degrees option.

Safety Board investigators also determined from interviews with about 20 pilots from CCAir and other operators that the procedures for operating the airframe deicing system were inconsistent and not always in accord with those contained in the airplane's flight manual. Although the procedures were not a factor in this accident, one of the Safety Board's concerns relates to the pilot's deicing system switches that provide for both automatic and manual operation. The automatic cycle is intended for severe icing conditions. Thus, it is likely that the manual mode, recommended for light and moderate icing conditions, is used most frequently. The manual switch is a three-way rocker switch that must be depressed and held in either the "wing" or "tail" position to activate the boots on the respective surfaces. Because the switches are on the captain's skirt panel, where they are obscured from his view by the control yoke, the captain must divert his attention to locate the manual switch, an action that is inconsistent with optimum scanning techniques and possibly is disorienting. Furthermore, the Safety Board believes that a workload interruption may result in a failure to complete the tail deicing cycle. The Safety Board believes that a preferable design would provide for a complete deicing cycle for both the wing and empennage with a single actuation of the switch.

The Safety Board is also concerned that pilots may not be using one additional tool

available to them to detect ice. The wing leading edge observation light illuminates the wing on the captain's side and therefore the captain must interrupt his scan and other duties, or transfer control of the airplane to the copilot, as he observes the wing. Furthermore, the switch for the light is mounted on the rear of the overhead panel, in a row of rocker-type light switches that includes navigation, strobe, landing and taxi lights. The pilot normally locates this switch by looking up and rotating his head. If the captain in the left seat activates the switch, he would have to move his head to the right, up, back, down, and fully left to view the wing, actions that could lead to vertigo.

FAA Surveillance

Safety Board investigators examined CCAir's operational procedures and pilot training records for cold weather operations, and conducted interviews of the FAA-assigned Principal Operations Inspector (POI) and his assistant to determine the nature and extent of FAA oversight of the carrier's training program. No evidence was found indicating that the company had included emphasis on cold weather operations or aircraft anti-deicing systems in recurrent training sessions or in special training courses in preparation for the 1990-91 winter season. In addition, the company did not issue any cold weather operating bulletins, notices, or other handouts to its pilots on anti-deicing subjects.

Safety Board interviews with the POI indicated that his surveillance of the carrier in preparation for the 1990-91 winter season was limited to an informal discussion of cold weather operations with company management in the late summer of 1990. The POI was not rated in the BA-3100 and was not required to be, but the assistant POI was rated in the airplane. Neither inspector recalled ever attending company-conducted classes or pilot briefings on weather operations or BA-3100 anti-deicing system operation. The assistant POI stated that he had not been in contact with the company for 7 months prior to the accident. The last correspondence to CCAir found in Flight Standards District Office or operator files on the subject of cold weather operations was dated in the fall of 1989.

The Safety Board believes that neither the CCAir winter operations training program nor the surveillance by the FAA of the operator's training in these operations was adequate to ensure at least the minimum level of flightcrew preparation for winter operations.

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

> Amend FAA Order 8400.10, Volume 3, Chapter 7, Section 2, Parts 121/135, "Weather Information Systems," Paragraph 1425, to specify that Principal Operations Inspectors ensure that operators under 14 CFR Part 135, who elect to use a weather information system, make available to flightcrews, as well as to dispatch and/or flight control personnel, weather products listed under Section 2 that are appropriate to their flight operations. Principal Operations Inspectors should ensure that initial and recurrent flightcrew training include the use of computerized weather systems, if such systems are

a source of flightcrew weather information. (Class II, Priority Action)(A-92-59)

Issue an Air Carrier Operations Bulletin directing all Principal Operations Inspectors having surveillance responsibility of operators of BA-3100 airplanes to alert operators of the danger of unanticipated and abrupt tailplane stall during changes in flap configuration as a result of horizontal stabilizer ice accumulation. (Class II, Priority Action)(A-92-60)

Issue an Air Carrier Operations Bulletin directing all Principal Operations Inspectors to examine the meteorological training curricula of 14 CFR Part 135 operators under their purview and ensure that they provide adequate information regarding icing conditions and cold weather operating limitations applicable to their particular aircraft, as well as preflight and in-flight deicing procedures. Class II, Priority Action)(A-92-61)

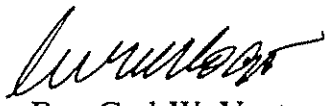
Require British Aerospace, Inc. to show, by flight test, that the limitation to flaps 35 degrees, currently incorporated into all BA-3200 airplanes and available in kit form for installation on BA-3100 airplanes, provides an adequate safety margin against tailplane stall in icing conditions; and if the margin is adequate, require operators of BA-3100 airplanes to install the flap extension limitation modification on the airplane. If the margin is inadequate, require appropriate changes to assure its adequacy. (Class II, Priority Action)(A-92-62)

Review the adequacy of ice protection and detection controls on BA-3100 and BA-3200 airplanes with regard to the placement or redundancy of switches and lights for proper cockpit coordination, instrument scan, and accessibility to both pilots; and require appropriate modifications as necessary. (Class II, Priority Action)(A-92-63)

Issue an airworthiness directive, applicable to airplanes using pneumatic airframe deicing systems, requiring that the control switches for these systems be modified so that a single manual activation of the switch will allow a complete cycle of the wing and tail leading edge deicing system. Require that models of these airplanes currently in service be retrofitted with this modification. (Class II, Priority Action)(A-92-64)

Issue an airworthiness directive applicable to two-pilot airplanes operating under the provisions of 14 CFR Part 135 that use leading edge ice detection lights, such as the BA-3100 and BA-3200, requiring that leading edge ice detection lights be installed to illuminate both wings. Require that models of these airplanes requiring two pilots be retrofitted with this modification. (Class II, Priority Action)(A-92-65)

Acting Chairman COUGHLIN, and Members LAUBER, KOLSTAD, HART and HAMMERSCHMIDT adopted these recommendations.



By: Carl W. Vogt
Chairman

National Transp ion Safety Board
Washing. D.C. 20594

Brief of Accident

File No. - 0478 1/30/91 BECKLEY,WV A/C Reg. No. N167PC Time (Lcl) - 2355 EST

----Basic Information----
Type Operating Certificate-COMMUTER
Name of Carrier -USAIR EXPRESS
Type of Operation -SCHEDULED,DOMESTIC,PASSENGER
Flight Conducted Under -14 CFR 135
Accident Occurred During -LANDING

Aircraft Damage
DESTROYED
Fire
ON GROUND

Injuries	Fatal	Serious	Minor	None
Crew	0	1	0	1
Pass	0	12	3	2

----Aircraft Information----
Make/Model - BRITISH AEROSPACE 3101
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 15200
No. of Seats - 21
Eng Make/Model - GARRETT TPE-331
Number Engines - 2
Engine Type - TURBOPROP
Rated Power - 940 HP
ELT Installed/Activated - YES/YES
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - COMPANY
Method - TELETYPE
Completeness - PARTIAL,LMTD BY PILOT
Basic Weather - IMC
Wind Dir/Speed- 330/013 KTS
Visibility - 1.500 SM
Lowest Sky/Clouds - PART OBS
Lowest Ceiling - 200 FT OVERCAST
Obstructions to Vision- FOG
Precipitation - DRIZZLE
Condition of Light - NIGHT(DARK)

Itinerary
Last Departure Point
CHARLOTTE,NC
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Apch/Lndg - ILS-COMPLETE

Airport Proximity
ON AIRPORT

Airport Data
RALEIGH COUNTY MEMORIAL
Runway Ident - 19
Runway Lth/Wid - 6750/ 150
Runway Surface - ASPHALT
Runway Status - WET

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
COMMERCIAL,ATP,CFI
SE LAND,ME LAND
Instrument Rating(s) - AIRPLANE

Age - 28
Biennial Flight Review
Current - YES
Months Since - 2
Aircraft Type - 3100

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT
Flight Time (Hours)
Total - 5000
Make/Model- 3400
Instrument- 300
Multi-Eng - 3500
Last 24 Hrs - 6
Last 30 Days- 76
Last 90 Days- 231
Rotorcraft - UNK/NR

----Narrative----
ACFT WAS DISPATCHED WITH INOP AIRFRAME DEICE SYS, THO AN OPNL DEICE SYS WAS RQRD FOR FLT IN KNOWN ICG CONDS. DRG DSCNT TO LND, ACFT ENCTRD LGT ICG CONDS. CAPT BELIEVED ACFT COULD "HANDLE IT" & CONTD DSCNT. AS HE BGN ILS FINAL APCH, HE NOTED SGFNT INCR OF ICE ACCUMULATION & USED HIGHER THAN NML APCH SPD. AS FULL (50 DEG) FLAPS WERE SET, ACFT BGN BUFFET & PITCHED NOSE DWN. CAPT CORRECTED WITH FULL BACK PRES ON CTL COLUMN, BUT ACFT LNDD HARD, GEAR COLLAPSED & ACFT SLID ABT 3600' TO A STOP. NO PREIMPACT MECH ANOMALY WAS FND, EXCEPT FOR INOP DEICE SYS. INV REVEALED PLTS HAD RCVD PRINTOUT OF WX FM CO COMPUTER SYS WITH SFC OBS & TRML FCST, BUT NO AREA FCST (FA). PLTS & GND PSNL WERE NOT AWARE THAT FA WAS AVAIL AT CO WX TRML. FA FCSTD LGT & OCNL MOD RIME & MXD ICG IN CLDS & PRECIP ABV FRZG LVL. WX DTRTD, BUT PLTS DID NOT REQ INFLT WX INFO OR PIREPS. FLT MNL NOTED TAILPLANE ICE MAY CAUSE NOSE DWN TRIM CHG WITH FLAP EXTN. THERE WAS EVIDENCE OF TAIL PLANE STALL. LACK OF CO TRNG IN COLD WX OPNS, DEFICIENCIES IN USE OF DEICING SYS, & LACK OF FAA SURVEILLANCE.

File No. - 0478 1/30/91 BECKLEY,WV A/C Reg. No. N167PC Time (Lcl) - 2355 EST

Occurrence #1 IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation DESCENT - NORMAL

Finding(s)
1. PREFLIGHT BRIEFING SERVICE - IMPROPER USE OF - PILOT IN COMMAND
2. INADEQUATE TRAINING - COMPANY/OPERATOR MANAGEMENT
3. INADEQUATE SURVEILLANCE OF OPERATION - FAA(ORGANIZATION)
4. ANTI-ICE/DE-ICE SYSTEM - INOPERATIVE
5. OPERATION WITH KNOWN DEFICIENCIES IN EQUIPMENT - PERFORMED -
6. WEATHER CONDITION - ICING CONDITIONS
7. FLIGHT INTO KNOWN ADVERSE WEATHER - CONTINUED - PILOT IN COMMAND
8. STABILIZER - ICE
9. WING - ICE

Occurrence #2 LOSS OF CONTROL - IN FLIGHT
Phase of Operation APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Finding(s)
10. LOWERING OF FLAPS - PERFORMED -
11. AIRCRAFT CONTROL - NOT POSSIBLE -
12. REMEDIAL ACTION - ATTEMPTED - PILOT IN COMMAND

Occurrence #3 HARD LANDING
Phase of Operation LANDING

Occurrence #4 COMPLETE GEAR COLLAPSED
Phase of Operation LANDING

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident was: FLIGHT INTO KNOWN ADVERSE WEATHER CONDITIONS BY THE PILOT, WHICH RESULTED IN ICE ACCUMULATION ON THE AIRCRAFT AND SUBSEQUENT LOSS OF AIRCRAFT CONTROL (TAIL PLANE STALL) AS THE FLAPS WERE FULLY EXTENDED. FACTORS RELATED TO THE ACCIDENT WERE: THE PILOT'S INADEQUATE USE OF THE PREFLIGHT BRIEFING SERVICE, INADEQUATE TRAINING PROVIDED TO THE PILOTS BY COMPANY/MANAGEMENT PERSONNEL, INADEQUATE SURVEILLANCE BY THE FAA, AND ICING CONDITIONS.