log #24180

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 28, 1994

In reply refer to: A-94-74
through -76

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On January 3, 1992, about 0545 eastern standard time, CommutAir flight 4821, a Beechcraft 1900C airplane, descended into a wooded hillside near Gabriels, New York, while the flightcrew was conducting an instrument landing system (ILS) approach to runway 23 at the Adirondack Airport in Saranac Lake, New York. The flight was operating in accordance with Title 14 Code of Federal Regulations (CFR) Part 135, to provide USAir Express scheduled passenger service from Plattsburgh, New York, to Newark, New Jersey, with intermediate stops in Saranac Lake and Albany, New York. The first officer and a nonrevenue passenger were fatally injured in the crash; the captain and a revenue passenger survived, and the airplane was destroyed.

The airplane was not equipped with a flight data recorder, nor was it required to be, and the cockpit voice recorder was so severely burned that it could not provide any accident investigation data. Thus, the Safety Board's analyses of the circumstances leading to the accident were derived from survivor interviews, aircraft position data recorded by the air traffic control radar, weather information, and the examination of the airplane's wreckage. The analyses indicated that the flight approached the localizer inbound course to Saranac Lake about 17 nautical miles (nmi) from the runway threshold at an altitude of 6,000 feet. The airplane initially passed through the localizer beyond the angle that would produce a full-scale deflection of the cockpit ILS instrument localizer needle before a correction back to the localizer course was evident. After reintercepting the localizer, several more course corrections were evident as the airplane bracketed the localizer. When the airplane initially intercepted the localizer, it was approaching the glideslope from below. When about 13 nmi from the runway threshold, the airplane passed through the glideslope and a descent was initiated. For the next 5 nmi, the airplane remained above the glideslope. When about 8 nmi from the runway threshold, and about 2 nmi from the final approach fix (FAF), the descent was steepened, and the airplane passed rapidly through the glideslope and the normal full-scale "fly-up" zone. The rate of descent reached 2,000 feet per minute (fpm). The airplane passed the FAF at an altitude of 3,000 feet, 600 feet below the published minimum altitude for the FAF. Radar data were lost near the FAF; however, the location of the crash site 3.9 nmi from the runway threshold and elevation about

2,280 feet (626 feet below the center of the glideslope) indicate that the descent was continued until impact.

In an interview immediately after the accident, the captain could recall no mechanical problems and stated his belief that the airplane was on the glideslope with the localizer and glideslope needles nearly centered throughout the descent. The examination of cockpit instruments at the wreckage site and later in a laboratory revealed witness marks of the glideslope deviation needles near the on-glideslope position. Other flight instruments provided altitude and course indications that were consistent with the approach path.

The Safety Board, in assessing the probable cause of the accident, noted the captain's premature descent below the FAF minimum altitude and his failure to establish a stabilized approach. However, the Safety Board examined and did not exclude the possibility that the glideslope indication observed by the captain was unreliable as a result of precipitation static (P-static) interference. P-static interference is caused by the electrostatic charge built up on an airplane as it passes through particulate matter suspended in the air. The particulate matter usually is in the form of rain, snow, or ice. The weather conditions during the descent were conducive to fog or freezing fog. Normally, as an airplane passes through such conditions, an electrical charge builds up on surfaces impinging the air, but the charge is conducted through the airplane structure to static discharge wicks on the trailing edge of wing and empennage surfaces and passes harmlessly into the air. If, however, there is no conductive path to airplane structure (the electrical ground), the charge can build on electrically isolated surfaces until it reaches the potential for arcing from an isolated surface to another part of the airplane. P-static may be first evident to pilots as static sounds heard over radio receivers, but it also has the potential to interfere with navigational radio reception and the display of glideslope or localizer information in the cockpit, as demonstrated by tests conducted by the Safety Board after the accident.

During the investigation of the accident, evidence was found of an inadequate electrical ground path between the radome and the fuselage on five (of eight) other Beechcraft 1900C airplanes in the CommutAir fleet. After the testing, it was noted that pin-hole sized burn marks created during P-static testing appeared to be identical to those observed before the tests on the radomes of several of the Beechcraft 1900C airplanes in the CommutAir fleet. Tests conducted after the accident indicated that sufficient electrical charge could have built in the existing weather conditions to produce an electrostatic discharge (arcing) that is typical of P-static interference. In the Beechcraft 1900C, the glideslope antenna is covered by the radome. The radome is painted with an anti-static paint and grounded by 12 mounting screws that attach the radome to the fuselage. The radome from the accident airplane was damaged to the extent that only two of the 12 radome mounting screw holes could be examined. While those holes showed possible evidence of an inadequate ground path from the radome to the fuselage, the evidence that an inadequate ground path existed on the accident airplane was not conclusive. The postaccident tests showed that arcing between the radome and the fuselage could affect the glideslope signal, causing deviation of the glideslope needle toward a centered (on glideslope) indication and other unreliable cockpit instrument indications.

Instrument flight training manuals and the FAA Airman Information Manual discuss static noise only in the context of interrupting communications and some low frequency navigation aids. The FAA Instrument Flying Handbook, AC61-27C, similarly states, "Signals in the higher frequency bands are static free." Although P-static has generally been associated with frequencies below 300 megahertz (MHz), Safety Board tests showed that while P-static was most intense at lower frequencies, the radio interference created from radome arcing was also found at frequencies above 900 MHz. The glideslope signal for the Saranac Lake ILS approach would be sensitive to interference at a frequency of about 329 MHz.

The FAA issues Technical Standard Orders (TSOs) to specify minimum performance standards for avionics equipment. The navigation equipment tested in connection with the CommutAir accident was manufactured to the standards of TSO-C40b. The TSO referred to the Radio Technical Commission for Aeronautics (RTCA) document DO-160A, dated January 25, 1980, for "Environmental Conditions and Test Procedures for Airborne Equipment." The original provisions of DO-160A did not specify testing of an entire navigation system, including production antenna reception, or testing in an operational radio frequency interference (RFI) environment. Although the technical standard was subsequently revised with the introduction of DO-160B and DO-160C, to adopt testing of an integrated avionics system, the Safety Board is concerned to find that the exposure of a TSO-C40b-approved avionics system to an electrical arc induced localizer and glideslope errors in navigation displays.

The Safety Board also considered the possibility that ice buildup on the airplane's aerodynamic surfaces could have affected the performance of the airplane. However, the Board did not find evidence to substantiate an aircraft controllability problem nor was such indicated by the captain in his postaccident interview.

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

> Issue an airworthiness directive applicable to Beechcraft 1900C airplanes to require regular inspections or modifications to assure the proper electrical ground of the conductive nose radome coating to the metal airframe. (Class II, Priority Action)(A-94-74)
>
> Review avionics certification test requirements to assure adequate attention to the potential effects of precipitation static, to include exposure to broadband interference caused by an open electrical discharge. (Class II, Priority Action) (A-94-75)

Provide advisory information to pilots that static noise heard on navigation or communications radio frequencies may be a warning of incipient precipitation static electrical interference with navigation instrument displays. Revise the Airman's Information Manual and Instrument Flying Handbook to address the characteristics of and hazards posed by precipitation static. (Class II, Priority Action)(A-94-76)

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HAMMERSCHMIDT, and HALL concurred in these recommendations.

By: Carl W. Vogt
Chairman

National Transpo. ›n Safety Board
Washingto. ›.C. 20594

Brief of Accident

File No. - 1046 1/03/92 GABRIELS,NY A/C Reg. No. N55000 Time (Lcl) - 0546 EST

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

Aircraft Damage
DESTROYED
Fire
ON GROUND

	Injuries			
	Fatal	Serious	Minor	None
Crew	1	1	0	0
Pass	1	1	0	0

----Aircraft Information----
Make/Model - BEECH 1900C
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 16000
No. of Seats - 21

Eng Make/Model - P&W PT6A-65B
Number Engines - 2
Engine Type - TURBOPROP
Rated Power - 1100 HP

ELT Installed/Activated - YES/YES
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - COMPANY
Method - TELETYPE
Completeness - FULL
Basic Weather - IMC
Wind Dir/Speed- CALM
Visibility - 2.000 SM
Lowest Sky/Clouds - 500 FT
Lowest Ceiling - 500 FT OBSCURED
Obstructions to Vision- FOG
Precipitation - NONE
Condition of Light - NIGHT(DARK)

Itinerary
Last Departure Point
PLATTSBURGH,NY
Destination
SARANAC LAKE,NY

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

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
ADIRONDACK
Runway Ident - 23
Runway Lth/Wid - 6573/ 150
Runway Surface - ASPHALT
Runway Status - N/A

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

Age - 30
Biennial Flight Review
Current - YES
Months Since - 5
Aircraft Type - 1900C

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT

Flight Time (Hours)

Total	7700	Last 24 Hrs	0
Make/Model	3700	Last 30 Days	60
Instrument	3800	Last 90 Days	180
Multi-Eng	3800	Rotorcraft	UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
ON IFR ARRIVAL, FLT 4821 WAS CLEARED TO INTERSECTION 17 NE OF AIRPORT AT 6000', THEN FOR ILS RUNWAY 23 APPROACH. RADAR SERVICE WAS TERMINATED 6.5 EAST OF INTERSECTION. RADAR DATA SHOWED THAT FLIGHT CROSSED & THEN BRACKETED LOCALIZER. FLIGHT INTERCEPTED GLIDE SLOPE FROM BELOW ABOUT 7 MI OUTSIDE OF OUTER MARKER & THENCE DEVIATED ABOVE GLIDE SLOPE. ABOUT 2 MILES OUTSIDE OF MARKER, FLIGHT WAS AT A FULL FLY DOWN DEFLECTION WHEN IT ENTERED A DESCENT VARYING FROM 1200 TO 2000 FPM. AIRCRAFT STRUCK WOODED MOUNTAIN TOP 2.0 MI INSIDE OF OUTER MARKER (3.9 MI FROM RWY) AT ELEVATION OF 2280'. MINIMUM ALTITUDE AT MARKER WAS 3600'. GLIDE SLOPE ELEVATION AT POINT OF IMPACT WAS APRX 2900'. EVIDENCE WAS FOUND OF INADEQUATE ELECTRICAL GROUND PATH BETWEEN RADOME & FUSELAGE WHICH, WHEN COMBINED WITH EXISTING WEATHER CONDITIONS, MAY HAVE PRODUCED ELECTROSTATIC DISCHARGE (PRECIPITATION STATIC). ALTHOUGH POST-ACCIDENT TESTS WERE NOT CONCLUSIVE, THE SAFETY BOARD BELIEVES THAT THE GLIDE SLOPE INDICATIONS MIGHT HAVE BEEN UNRELIABLE DUE TO PRECIPITATION STATIC INTERFERENCE.

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Occurrence #1 IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

Finding(s)
1. LIGHT CONDITION - DARK NIGHT
2. WEATHER CONDITION - CLOUDS
3. WEATHER CONDITION - STATIC DISCHARGE
4. COMM/NAV EQUIPMENT,GLIDE SLOPE RECEIVER - UNRELIABLE
5. IFR PROCEDURE - IMPROPER - PILOT IN COMMAND
6. MONITORING - INADEQUATE - COPILOT/SECOND PILOT
7. MINIMUM DESCENT ALTITUDE - NOT MAINTAINED - PILOT IN COMMAND
8. TERRAIN CONDITION - MOUNTAINOUS/HILLY
9. PROPER ALTITUDE - NOT MAINTAINED - PILOT IN COMMAND

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident was: FAILURE OF THE CAPTAIN TO ESTABLISH A STABILIZED APPROACH, HIS INADEQUATE CROSS-CHECK OF INSTRUMENTS, HIS DESCENT BELOW SPECIFIED MINIMUM ALTITUDE AT THE FINAL APPROACH FIX, AND FAILURE OF THE COPILOT TO MONITOR THE APPROACH. FACTORS RELATED TO THE ACCIDENT WERE: WEATHER CONDITIONS AND POSSIBLE PRECIPITATION STATIC INTERFERENCE, CAUSED BY INADEQUATE GROUNDING BETWEEN THE RADOME AND FUSELAGE THAT COULD HAVE RESULTED IN UNRELIABLE GLIDE SLOPE INDICATIONS.