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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 28, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-75 through -76

About 11:27 p.s.t., on January 20, 1981, Cascade Airways Flight 201, a Beech 99 operating from Moses Lake to Spokane, Washington, crashed about 4.5 miles southwest of Spokane International Airport. The aircraft crashed while the pilot was making a localizer approach to runway 3. Seven people were killed, including the flightcrew, and two passengers were injured seriously.

Flight 201 was operating under 14 CFR Part 135.99; under this regulation two pilots were required and the company's flight manual required specific crew coordination procedures. However, neither the regulations nor company procedures required interphone communication in the operation, and none was provided between the captain and first officer on Flight 201.

After the accident, the Safety Board took noise measurements in the cockpit of a Cascade Beech 99 to the right of the captain's head. Measurements were taken in flight at 95 percent rpm with 1,100 ft/lbs of torque; the noise level was 97 dB(A). 1/ These measurements agree in general spectral shape and level with Beech 99 cockpit noise measurements taken by the Beech Aircraft Corporation. The speech interference level between the captain and the first officer was calculated at 85.5 dB(A). Speech interference values indicate the sound pressure at which the speech signal must be at the listener's ear for a given noise condition in order to be heard reliably. Noise experts agree that in this particular noise environment, face-to-face communication is difficult and falls in the voice range between shouting

1/ The human ear is not equally sensitive at all frequencies. Therefore, for measurement purposes, a weighting scale is used to alter the sensitivity of the sound level meter with respect to frequency so that the instrument is less sensitive at frequencies where the ear is less sensitive. The A-weighting scale, dB(A), is the most widely used in noise control.

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and maximum vocal effort. 2/ Furthermore, noise data submitted to the Safety Board by the Beech Aircraft Corporation indicated that the Beech 99 cockpit noise level during approach is 94.1 dB(A). This value, although lower than that in flight, still yields a noise level in which face-to-face verbal communication is difficult and requires a vocal effort of shouting or greater. Therefore, both in flight and during approach, the Beech 99 aircraft cockpit noise levels preclude effective verbal communication.

Further evidence of communication difficulty was provided by the captain of Flight 201 himself who had previously told his colleagues that he did not talk very much in the cockpit because he believed the Beech 99 cockpit noise levels precluded normal speech. Therefore, when the crew of Flight 201 may have been attempting to detect and correct an operational/navigational problem and unhampered crew coordination was essential, the cockpit noise levels could have interfered with verbal communication.

The cockpit noise level in the DeHavilland DHC-6 was cited by the Board in its report NTSB-AAR--80-1, in which the first officer was quoted with respect to the difficulties experienced with intra-cockpit communication without the use of headsets and interphone. These same views were expressed by other DHC-6 pilots. In its analysis, the Safetv Board specifically stated that the first officer's performance in the accident should be considered in light of a number of factors including the noisy cockpit. Although not directly related to ambient cockpit noise, the Safety Board measured the loudness of the ground proximity warning system (GPWS) in its investigation of the National Airlines Boeing 727 in Pensacola, Florida, on May 8, 1978. It determined that the loudness of this system had impeded verbal intra-cockpit communication.

A recent National Aeronautics and Space Administration (NASA) study found that flightcrews who communicated less frequently in the cockpit were apt to make more performance errors than crews who communicated more often. 3/ It may be true that in normal operations flightcrews develop and use hand or body signals as a means of communication so that verbal communication is not necessary. However, a crisis or emergency situation demands unambiguous information and efficient transfer of information between the pilots. The Safety Board believes that the noise levels measured in the Beech 99 aircraft preclude efficient, unambiguous verbal communication.

The Safety Board is concerned that cockpit noise levels are loud enough to interfere with verbal communication between flight crewmembers. Currently, there are no certification standards for maximum allowable cockpit noise levels for face-to-face verbal communication.

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

> Establish for aircraft used in commercial operation the maximum cockpit noise levels which will permit adequate direct voice communication between flight crewmembers under all operating conditions. (Class II, Priority Action) (A-81-75)

2/ There are established relationships for face-to-face speech communication in noise environments. Noise experts are in general agreement as to the communication difficulties in various noise environments at various speaker-listener distances.

3/ Foushee, H.C. (NASA-AMES Research Center) and Manos, K.L. (U.S. Air Force Academy), Cockpit communication patterns and the performance of flightcrews. FORUM- The International Society of Air Safety Investigators. Spring, 1981, pg., 19-20.

Require the installation and use of crew interphone systems in the cockpits of those aircraft in which noise levels reach or exceed the maximum level established for adequate direct voice communication between flight crewmembers under all operating conditions. (Class II, Priority Action) (A-81-76)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-81-075	1	AAR-86-06	9/30/1986	Bar Harbor Airlines Flight 1808 Beech BE-99, N300WP	Auburn	ME	8/25/1985

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A-81-076	1	AAR-86-06	9/30/1986	Bar Harbor Airlines Flight 1808 Beech BE-99, N300WP	Auburn	ME	8/25/1985