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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 25, 1977

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-77-52 and 53

At 1619, on November 17, 1976, TWA Flight 373 (a B-727), and TWA Flight 516 (a DC-9), almost collided in midair near Appleton, Ohio. As a result of evasive action taken by the pilot of TWA 516, two crewmembers were injured. The National Transportation Safety Board's investigation of the incident revealed that neither the flightcrew of TWA 373 nor the air traffic controller understood or heard correctly each other's message regarding altitude assignment.

Because the Safety Board believed that such a communications problem could have resulted in a midair collision, the Safety Board focused its investigation on the adequacy of actual communications procedures in the air traffic control system. As a result of that investigation, the Safety Board has identified several factors which contributed to the communications problem encountered during the subject incident.

TWA 373 was on a northwesterly heading toward the Appleton (APE) Vortac at flight level (FL) 310; TWA 516 was on a northeasterly heading toward the APE Vortac at FL 270. The aircraft were in both radio and radar contact with the Indianapolis Center's Appleton high altitude sector controller. The controller cleared TWA 373 to descend to FL 280. The crew received the clearance, but they understood the assigned altitude to be FL 230. The first officer promptly acknowledged as follows: "Two three zero TWA three seventy-three." Unfortunately, the controller received only part of the flight's acknowledgment-- "TWA three seventy-three," which he accepted as acknowledgment of proper clearance. Thus, the controller believed that TWA 373 was descending to FL 280, when, actually, the flight was descending to FL 230. The misunderstanding went undetected until after the near collision.

Although examination of the voice transmissions on facility tape recordings revealed that the controller's clearance to FL 280 was intelligible, the Safety Board could not determine how clearly the clearance was received in the cockpit. The tape revealed that the first portion of TWA 373's acknowledgment, which contained the altitude readback, was unintelligible. The latter part, "TWA three seventy-three," was recorded clearly.

The Safety Board believes that the altitude readback was unintelligible because the first word of the message, "two," was spoken simultaneously with keying of the transmitter, and the words "three zero" followed so rapidly that the first part of the acknowledgment was not understood. Furthermore, this unintelligible sound was so short that it is unlikely that a controller would associate the short garbled sound as a possible transmission.

The Safety Board has reviewed the actual communications procedures and practices currently utilized by pilots and controllers. Our review shows that in the subject incident neither the pilot nor the controller violated any mandatory procedure. In fact, the radio procedures used by both pilot and controller were found to be consistent with those widely used in the ATC system. Such communications practices have apparently gained acceptance within the ATC system even though they represent a deviation from the recommended operating practices and procedures that have been set forth in the Airman's Information Manual, (AIM) Part I "Radio Communications Phraseology and Techniques."

Although it has long been a general practice of pilots to read back an ATC clearance, they do not always follow this practice because readback of a clearance is not required. Consequently, a controller would not consider it abnormal for a pilot to acknowledge a clearance or instruction by stating his flight identification only.

Another actual communications practice of pilots, with which controllers are familiar, is the manner in which a clearance is read back to him.

Most pilots usually will repeat the clearance in the same order or sequence transmitted to them by the controller, or with minor variations. However, some pilots repeat their clearance in the reverse order of its transmission. This practice appears to be widespread among pilots and is

also widely accepted by controllers. The Safety Board believes this practice should be discontinued because it deviates from the recommended message format prescribed in the AIM, Part I, "Radio Communications Phraseology and Techniques," which the Safety Board believes is an essential part of the procedures. Moreover, a pilot who reads back a clearance in reverse order increases the chances for undetected error if he does not utilize the prescribed microphone techniques and phraseology recommended in the AIM.

The Safety Board's staff had reviewed your proposal No. AAT-332-76-36, a proposed change to Part I of the AIM regarding altitude/vector readback, and had discussed the proposal with your Air Traffic Service personnel before and after the subject accident. We supported that proposed change to the AIM, Part I, which would state that pilots should read back assigned altitudes and radar vector headings. The Safety Board is aware that the proposed changes have been incorporated in the July issue of AIM, Part I, and we believe they will help to eliminate the communications problem which occurred over Appleton, Ohio. However, these changes alone will not guarantee complete resolution of the problem.

The new procedures as now published, inform pilots that they should read back altitude and radar vector heading assignments. Under these circumstances, a controller should expect to receive a clearance readback from a pilot rather than a simple acknowledgment. However, in order to assure that the new procedures are successful, the Safety Board believes that the controller must be given additional responsibilities. If, for any reason, a controller does not receive a clearance readback from the pilot as transmitted, the controller should be required to ask the pilot to read back the clearance as issued. If that action is not taken, misunderstandings will continue to occur and may remain undetected. Therefore, as a final step to eliminate misunderstandings between pilot and controller regarding altitude or vector assignments, ATP Handbook 7110.65 should be amended to require that the controller ask the pilot for a readback if one is not received.

Although such a requirement may temporarily increase the communications workload of the controller slightly, we believe that when pilots become thoroughly familiar with the new reporting procedures the communications workload will not be significantly greater than it is currently.

Honorable Langhorne M. Bond

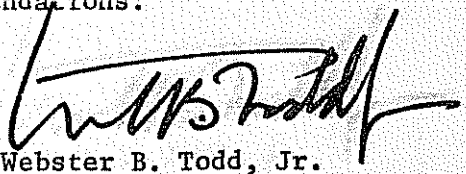
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Based on the foregoing, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Amend the language of ATP Handbook 7110.65 to specify that a controller who issues an altitude assignment and/or a vector heading assignment to an aircraft in flight be required to request readback of the clearance if he does not receive one from the crew. Pilot acknowledgment without readback should not be accepted by the controller. (Class II - Priority Followup)
(A-77-52)

Instruct FAA Air Carrier District Office Chiefs and General Aviation District Office Chiefs to alert their personnel to the circumstances surrounding this incident; and require those facilities to take all appropriate action to assure that pilots are made aware of communications procedural requirements and understand why strict adherence to recommended procedures is essential to safe flight. (Class II - Priority Followup)
(A-77-53)

TODD, Chairman, BAILEY, Vice Chairman, McADAMS, HOGUE, and HALEY, Members, concurred in the above recommendations.


By: Webster B. Todd, Jr.
Chairman