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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: February 14, 1986

In reply refer to: A-86-20

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D. C. 20591

On December 12, 1985, an Arrow Airlines, Inc., (Arrow) McDonnell Douglas DC-8-63, N950JW, crashed shortly after takeoff from Gander, Newfoundland, Canada, where it had stopped to refuel on a military contract flight from Cairo, Egypt, to Fort Campbell, Kentucky. The flightcrew of N950JW were operating under 14 CFR Part 121 rules as flight MF128R from Cairo to Ft. Campbell via Cologne, West Germany, and Gander. All 248 passengers, who were soldiers from the U.S. Army 101st Airborne Division, and the crew of 8 were killed in the impact and postcrash fire. The Canadian Aviation Safety Board (CASB) is directing the ongoing investigation to determine the cause of the accident. The National Transportation Safety Board is participating in the investigation under the aircraft accident investigation provisions of Annex 13 of the International Civil Aviation Organization.

Per Arrow procedures, the flightcrew used an "Adjusted Weight Units Loading System" which indicates a weight figure of 42,500 pounds for a planned load of 250 passengers and entered this figure on the load sheet. This weight represented a standard "average" weight per passenger of 170 pounds, including carry-on baggage. The Adjusted Weight Units Loading System is described in Arrow Flight Operations Bulletin No. 85-22, issued October 31, 1985, with an effective date of November 15, 1985. The bulletin states, in part, that, "This procedure shall be used on all passenger operations of DC-8 aircraft operated by Arrow Air, Inc." It further states, "The Adjusted Weight Units Loading System takes the place of the Weight and Balance Form, Load Manifest, or other system previously used for passenger operations." In general, this method provides the flightcrew a rather simplified system for calculating airplane weight and balance data for takeoff and landing performance. The system incorporates a loading table for use by the flightcrew from which "adjusted weight units" are taken and entered on the load sheet for passenger, baggage/cargo, and fuel weights. Simple addition of the various values leads to a total airplane weight and a center-of-gravity value.

The Safety Board examined bulletin No. 85-22 and found that it contains no method for calculating weight and balance for a passenger load that deviates from the standard average weight. However, Arrow's DC-8 Airplane Operating Manual, Weight and Balance Section, prescribes that, "actual passenger weight should be used when large groups of passengers are carried whose average weight does not conform to the Normal Standard Weight. For example, a group of large athletes, or a plane load of men would exceed the average. . . ." Also, Arrow's Operations Specifications, which were approved by the Federal Aviation Administration (FAA), state that, "Actual passenger weights are normally used." It is unclear at this time how the flightcrew of N950JW could have complied with the requirements of the manual or operations specifications because

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bulletin No. 85-22 apparently superseded all other weight and balance systems in effect at Arrow for DC-8 passenger operations and because no forms or loading tables were provided for calculating weight and balance when nonstandard passenger loads, such as troops, were carried. The investigation has not established how Arrow obtained approval from the FAA for the provisions of bulletin No. 85-22 without including a method for weight and balance calculations for actual passenger weights that deviate from the standard average weights. Several airlines use the Adjusted Weight Units Loading System; however, they incorporate provisions for both average and actual passenger weight calculations.

The instructions contained in Arrow's DC-8 Airplane Operating Manual are consistent with the provisions of FAA Advisory Circular (AC) 120-27A, "Aircraft Weight and Balance Control," which provides guidance to operators to establish an "approved" weight and balance program under 14 CFR Part 121. AC 120-27A contains instructions for development of weight and balance procedures to be included in an operator's operations specifications. The procedures must show that the method used will demonstrate that the airplane is properly loaded and will not exceed approved weight and balance limitations. The instructions contain provisions for both average and actual passenger weight calculations.

The investigation has revealed that the standard average weight of 170 pounds used by the flightcrew of N950JW is considerably lower than the actual weight of the passengers and carry-on baggage carried aboard the accident flight. This conclusion is supported by the following evidence:

1. From U.S. Army records, it was determined that the average ante-mortem weight of the passengers (without uniform) was about 164 pounds.
2. The carry-on baggage carried on the accident airplane nearly filled the baggage holds of the two Boeing 737 airplanes used to shuttle the troops from their base in the Sinai Desert to Cairo, where they boarded N950JW.
3. N950JW transported a group of soldiers from the United States to Cairo on December 10/11, 1985. The U.S. Army determined that the actual weight of the passengers and carry-on baggage of that flight was 54,726 pounds, or about 219 pounds average weight per passenger. These troops were of comparable age and size to those aboard the accident flight. It was not established whether that weight information was given to the flightcrew.
4. Witnesses have stated that the amount of carry-on baggage on flight MF128R from Cairo exceeded the amount on the inbound flight to Cairo, presumably because the passengers were required to wear civilian clothes upon departure from Cairo and they carried aboard their field uniform (fatigues, helmet, boots, weapon, etc.). Witnesses also have stated that, during the stop at Gander, additional carry-on items were purchased.

Although the U.S. Army estimated the weight of each passenger departing on flight MF128R from Cairo as 210 pounds, including carry-on baggage, investigators have not located the precise documentation provided to the flightcrew in Cairo before departure. The CASB investigators currently estimate that the actual weight of each

passenger carried on the accident airplane was at least 220 pounds, including carry-on baggage. Calculating the weight of the passengers based on this weight figure results in a passenger weight of 54,560 pounds at Cairo, Cologne, and Gander, about 12,000 pounds in excess of the takeoff weight used by the accident flightcrew. This excess is based solely on revisions to passenger and carry-on baggage weight figures and does not consider possible errors involving the weight of baggage carried in the cargo holds.

Although the investigation has not, at this time, reached definitive conclusions regarding the effects of these weight discrepancies on the takeoff performance of the accident airplane, or their relationship to the cause of the accident, there are obvious performance penalties and safety issues involved in such operation. Further, the Safety Board, as well as the CASB, is concerned that flightcrews of other operators carrying military personnel on charter or contract flights, or on other flights on which passenger loads are not representative of the standard average weight, may be using the procedures apparently used by Arrow flightcrews.

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

Issue an Air Carrier Operations Bulletin to all Air Carrier Operations Inspectors directing them to: (1) review the operations specifications and associated operational documents for carriers under their jurisdiction to verify that the provisions for use of actual weights, versus average weights, are complete and accurate, and clearly understood, and (2) reemphasize to each air carrier the need to use actual weights for passengers if the passenger complement dictates. (Class II, Priority Action) (A-86-20)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, Member, concurred in this recommendation.


By: Jim Burnett
Chairman