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Log 1421

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: March 5, 1982

Forwarded to:

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

SAFETY RECOMMENDATION(S)

A-82-24 and -25

About 0634 Pacific daylight time, May 2, 1980, a McDonnell Douglas Corporation DC-9-80, N980DC, was damaged substantially during a landing on runway 22 at Edwards Air Force Base, California. The accident occurred during a landing in which the flightcrew was using procedures established for the official certification test to determine the horizontal distance required to land and bring the airplane to a full stop as required by 14 CFR 25.125.

The airplane touched down about 2,298 feet beyond the runway threshold. The descent rate at touchdown exceeded the structural limits of the airplane; the empennage separated and fell to the runway. The airplane came to rest about 5,634 feet beyond the landing threshold. Seven crewmembers were on board; one crewmember, a flight test engineer, suffered a broken ankle when the airplane touched down.

The National Transportation Safety Board determined that the probable cause of this accident was the pilot's failure to stabilize the approach as prescribed by the manufacturer's flight test procedures. Contributing to the cause of the accident was the lack of a requirement in the flight test procedures for other flight crewmembers to monitor and call out the critical flight parameters. Also contributing to this accident were the flight test procedures prescribed by the manufacturer for demonstrating the aircraft's landing performance which involved vertical descent rates approaching the design load limits of the aircraft.

Basically, the certification requirements in 14 CFR 25, and more particularly sections 25.101 and 25.125, relate to the determination of horizontal landing distances which are then used in conjunction with the appropriate operational requirements of 14 CFR 121.195 to determine the maximum weight at which the airplane can be landed during air carrier operations for a given runway length. Sections 25.101 and 25.125 specifically state that the procedures established for the certification tests must be able to be consistently executed in service by crews of

average skill; that the methods used must be safe and reliable; that the landing must be made without excessive vertical acceleration; and that the landing may not require exceptional piloting skill or alertness. The Safety Board believes that these requirements, as stated, may be too subjective. All of the airframe manufacturers have established procedures in the context of these regulations which involve a minimum air distance from a point 50 feet above the runway threshold and a touchdown speed below  $V_{ref}$  to produce a minimum rollout distance.

It is understandable that the manufacturers will attempt to demonstrate the shortest landing distance possible and thus maximize the operational specifications of their aircraft. However, the Safety Board notes that the procedures specified and used for these certification tests differ from those used during normal line operations. For example, the procedures established for demonstration of the DC-9-80 landing distances specified that thrust be reduced to idle at 50 feet above ground level and that the rate of descent be reduced to no more than 10 feet per second (600 fpm) or no less than 8 feet per second (480 fpm) at touchdown. Thus, the procedure not only allows but requires that the airplane be landed in such a manner that limit or near limit structural loads (as specified in 14 CFR 25.473) are imposed. The procedures also require skill and precise actions by the test pilots as evidenced by the admitted need to practice before undertaking official tests.

The certification tests for demonstrating airplane structural limits (such as 14 CFR 25.473) are conducted separate from the landing distance tests of 14 CFR 25.125 since these tests have entirely different objectives. There are considerable risks involved in taking an airplane to its structural limits during the landing distance demonstration. Furthermore, it is not necessary to do so when the test objective is to determine operational landing distances.

The Safety Board further notes that another accident occurred on May 14, 1959, when similar procedures were being used to demonstrate the minimum landing distance of the DC-8 airplane during its certification tests. In that instance, the airplane also touched down at an excessive descent rate which resulted in structural failure of the fuselage and separation of the No. 1 engine.

These two accidents indicate that, under current regulations, procedures are being used during certification which are not consistent with line operations so that the distances determined during certification are not actually achievable by a line pilot using accepted operational procedures. Accordingly, the Safety Board believes that this aspect of the certification process should be revised. Section 25.125 should be more specific in terms of approach path deviations, thrust reduction schedules, and maximum allowable vertical acceleration at touchdown. For example, landings equivalent to those resulting from ILS approaches or equivalent to the performance attainable from an autoland system could be established.

The Safety Board recognizes that changes in the landing distance demonstration procedures during certification could result in penalizing the operational specifications of the airplane as they are presently determined using the existing minimum landing distance procedures. For actual line operations on dry runways, a safety margin is currently provided by the operational limitation of 14 CFR 121.195 which requires that the minimum effective runway length be the airplane's landing distance as determined during certification divided by 0.6 (or multiplied by 1.667). The Safety Board's accident investigation experience has not indicated to date that the actual runway lengths used in line operations for dry runways do not afford a proper level of safety. Therefore, the Safety Board recognizes that a change in the aircraft certification criteria specified in 14 CFR 25.101 and 25.125 will necessitate a corresponding review of the operational limitations in 14 CFR 121.195 so that operational specifications are not unjustifiably penalized. Of course, we are not suggesting that current runway length requirements be compromised to the detriment of present levels of safety.

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

Revise the procedures which are currently being used to demonstrate minimum landing distances for compliance with 14 CFR 25.125 for certification of transport category airplanes to: (a) provide a higher margin of safety during certification and (b) establish landing distances which are more representative of those encountered when an airplane is operated during air carrier service. (Class II, Priority Action) (A-82-24)

Upon adoption of revised procedures for demonstrating operational landing distances for compliance with 14 CFR 25.125, review the operational runway length limitations in 14 CFR 121.195 which are applied to certification landing distances so that they do not unjustifiably penalize the operational specifications of airplanes. (Class II, Priority Action) (A-82-25)

BURNETT, Acting Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

  
By: Jim Burnett  
Acting Chairman