

**Exemption No. 9486**

**UNITED STATES OF AMERICA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION  
RENTON, WASHINGTON 98057-3356**

In the matter of the petition of

The Boeing Company

for exemption from § 25.562(b)(2) of Title 14, Code  
of Federal Regulations

**Regulatory Docket No. FAA-2005-20049**

**GRANT OF EXEMPTION**

By letter B-H320-2004-0074, dated December 8, 2004, Mr. Edgars A. Kupcis, Manager, Certification, Certification Programs, 66-ZB-H320, The Boeing Company, P.O. Box 3707, Seattle, Washington 98124-2207, petitioned for exemption from § 25.562(b)(2), Title 14, Code of Federal Regulations (14 CFR), as amended by Amendment 25-64. The proposed exemption, if granted, would permit relief from the floor warpage testing requirement for flightdeck seats on the Boeing Model 787 airplanes.

**The petitioner requests relief from the following regulations:**

Section 25.562(b)(2), Amendment 25-64, requires the floor tracks used to attach the seat to the floor be misaligned with respect to the adjacent seat tracks by at least 10 degrees vertically (i.e., out of parallel) with one rolled 10 degrees. The misalignment is used during the forward loading dynamic test condition and applies to both crew and passenger seats.

**ANM-05-138-E**

**The petitioner supports its request with the following information:**

“The Boeing Company hereby petitions for an exemption from the Floor Pitch and Roll Requirements of 14 CFR 25.562(b)(2) (Amendment 25-64) for Flight Deck Seats on the Boeing Model 7E7.

“The Boeing Model 7E7 will be the next Boeing aircraft that will comply with the requirements of 14 CFR 25.562, as agreed to in the G-1 Issue Paper (Project # TC6918SE- T). As documented in [several prior exemptions] cited, previous Boeing models have demonstrated an acceptable level of safety for flight deck crew members without the inclusion of the floor warpage testing requirements of 14 CFR 25.562(b)(2).

“14 CFR 25.562(b)(2) states that, “...where floor rails or floor fittings are used to attach the seating devices to the test fixture, the rails or fittings must be misaligned with respect to the adjacent set of rails or fittings by at least 10 degrees vertically (i.e. out of parallel) with one rolled 10 degrees.”

“The preamble to Amendment 25-64 states that, "Crash investigations have shown that localized cabin floor deformation can occur in survivable crashes. This has been confirmed by the controlled impact demonstration and drop tests involving transport category airplanes. The inability of some seats to accommodate such deformations, remain in place, and restrain the occupants can contribute significantly to degree of injury during a crash. The simulated floor attachments to deformations that could occur in an actual crash."

“The preamble also states the benefit of this amendment is believed to be that, " ... some lives are expected to be saved that otherwise may not have been."

“14 CFR 25.562(b) makes no distinction between passenger and crew seats, while the evidence mentioned in the preamble is based on passenger seats only. There is evidence showing that floor warpage has not been a significant factor in flight deck seat failures during survivable crash conditions.

“In reference [prior exemptions], the FAA previously stated:

“• ‘Amendment 25-64 was intended to correct observed design deficiencies in seats and seat restraint systems. There was no intention of restraining the seat beyond the ultimate strength of the structure.’

“• ‘There are several potential head impact areas in the cockpit. For certain configurations, testing with floor warpage could give unrealistic indications of head injuries. Warping seats which have narrow bases (9 or 10 inches) places the pilot's upper torso and head in an unrealistic initial position. It could even be unconservative by virtue of placing the pilot's head closer to the object, resulting in a lower indicated value of the head injury criteria (HIC). Even if floor distortion should occur late in the impact pulse during actual crash conditions, due to inertial forces the pilot's head strike area should not be significantly altered. The FAA therefore considers the more realistic head strike path should start from the upright position.’

“• ‘Although some cockpit floor distortions have been observed after accidents, there has not been a problem with flight deck seat separations due to floor buckling on narrow body and larger

airplanes which have a minimum of 40 inches of frangible structure between the flight deck floor and the lower fuselage contour. The FAA now considers that requiring testing of pilot seats with floor warpage cannot be justified on narrow body and larger airplanes. The FAA is currently developing a proposal to amend the regulations accordingly.’

“Considering the FAA's prior findings, the following arguments support an exemption from the floor warpage test requirements for the 7E7 flight deck seats:

“• The Model 7E7 will incorporate new TSO-C127a approved flight deck seats, whose design will be largely based on existing dynamically tested and approved flight deck seats.

“• The 7E7 individually- and floor-mounted flight deck seats will incorporate narrow seat bases, as compared to typical passenger seats. Testing the flight deck seats with floor warpage could place occupants in an unrealistic and unconservative initial position relative to potential head impact areas in the flight deck.

“• The 7E7 floor structure is comparable to the 777 floor structure in stiffness (see attached Boeing proprietary rationale). In addition, the 7E7 floor structure is similar in overall span, and incorporates beams and intercostals supporting the floor web in the locations below the floor-mounted flight deck seats, similar to other narrow body and larger airplanes. The 7E7 floor structure therefore provides a resistance to warpage comparable to aircraft for which exemption from the floor warpage testing requirement has already been granted.

“• The rule applies to testing of seats, not to the floor structure itself.

“The FAA acknowledged in the preamble to Amendment 25-64 the likelihood of seats designed to meet this amendment costing more to manufacture and therefore to purchase, as well as increasing the airplane operating cost due to weight increase. In order to justify the increased costs, it must be expected that some lives will be saved that otherwise may not have been. This does not appear to be the case for flight deck seats. These increased costs create an economic disadvantage for the Boeing Model 7E7 without a commensurate expectation of saving lives that otherwise may have been lost.

“Granting of this exemption is in the public interest because it will:

“1. Not adversely affect flight safety

“2. Improve the efficiency of the Boeing Model 7E7

“3. Tend to reduce air transportation fares

“4. Improve the potential for sales to foreign operators, which in turn improves the U.S. balance of payments

“Based on the above justification and the precedent set on the [previous] models, Boeing requests exemption from the rail misalignment and roll test requirements of 14 CFR 25.562(b)(2) for Flight Deck Seats on the Boeing Model 7E7.”

A summary of the petitioner’s supporting information appeared in the Federal Register on February 3, 2005. No comments were received in response to the notice.

**The FAA's analysis/summary is as follows:**

The petitioner's request for relief from the requirement to misalign the seat tracks is limited to the Boeing Model 787 flightdeck seats. These seats are individually mounted single seats with both vertical and horizontal adjustments to accommodate the differences in the size of crewmembers. Crew seats are required to be fairly rigid in order to withstand the pilot reaction forces from the flight controls. While it is conceivable that too much flexibility in the seat mounting structure could interfere with the safe operation of the airplane, some flexibility in the seat attachment is considered necessary to conform to likely floor distortions during crash conditions.

The FAA has reviewed the arguments presented by the petitioner in support of the exemption and agrees that the service history of flightdeck seats on larger airplanes supports the petitioner's request. Although some flightdeck floor distortions have been observed after accidents, there has not been a problem with flightdeck seat separations due to floor buckling on narrow body and larger airplanes, which have a minimum of 40 inches of frangible structure between the flightdeck floor and the lower fuselage contour. As noted by the petitioner, the FAA has previously stated that requiring testing of pilot seats with floor warpage cannot be justified on those airplanes. However, these statements, and all of the available data, are for airplanes of conventional, metallic construction. We also note that, while the rule does focus on testing of seats and not the floor, the capability of the floor was instrumental in limiting the scope of the testing to just seats.

The Boeing Model 787 is an all-composite construction, for which there is no in-service data. Because of this, and because the type certification requirements do not contain standards for the overall crashworthiness of an airframe, the FAA has written special conditions applicable to the Model 787. These special conditions prescribe performance standards to ensure that the all-composite fuselage construction does not reduce the crashworthiness inherent in conventional designs. Since filing their petition, Boeing has been engaged in an extensive program to characterize the overall crashworthiness of the Model 787 and show compliance with the special conditions. Based on the progress to date in characterizing overall structural response to impact, the FAA now has enough information to grant an exemption from the requirement to test flightdeck seats with floor warpage, to permit certification of the Boeing Model 787.

In consideration of the foregoing, I find that a grant of exemption is in the public interest, and will not adversely affect safety. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator (14 CFR § 11.53), The Boeing Company is hereby granted an exemption from the floor warpage testing requirements of 14 CFR § 25.562(b)(2), Amendment 25-64 to the extent required to permit type certification of the Boeing Model 787 for seats mounted in the flightdeck. The following limitations apply to this exemption:

1. This exemption is limited to the Boeing Model 787 airplanes and applies only to the seats in the flightdeck.

2. The flightdeck seats are exempted from compliance with the 10 degrees of track misalignment required under § 25.562(b)(2). Compliance with all other requirements of § 25.562 is required.

Issued in Renton, Washington, on September 11, 2007.

/s/

Ali Bahrami  
Manager, Transport Airplane Directorate,  
Aircraft Certification Service, ANM-100