



# Memorandum

U.S. Department  
of Transportation

**Federal Aviation  
Administration**

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Subject: INFORMATION: Side-Facing Seats on Transport Category Airplanes Date: NOV 19 1997

From: Manager, Transport Airplane Directorate, Aircraft Certification Service, ANM-100 Reply to Attn. of:

To: SEE DISTRIBUTION

This memorandum provides dynamic test requirements and pass/fail criteria for side-facing seats on Transport Category Airplanes. Attached is guidance material, in the form of draft generic issue papers, pertaining to side-facing accommodations. Single occupancy and multiple occupancy ("divans") installations are treated separately, since there are separate approaches to each. These drafts can be used to develop project-specific issue papers.

Amendment 25-64, which adopted § 25.562, provides a means of enhancing occupant protection under more realistic conditions than had previously existed. The requirements contained therein consist of both test conditions and pass/fail criteria.

The dynamic test conditions, in terms of both pulse severity and types of tests currently required, are also considered to be directly applicable to side-facing seats. While it is true that the regulation was written with forward- and aft-facing seats in mind, the orientation of the seat does not change the relevant test conditions, and the rule applies to all seats.

For pass/fail criteria, however, the orientation of the seat may be significant. Injury criteria are currently limited to head, spine, and femur loads. Head injury is evaluated for contact experienced by the head against any aircraft interior installations, and the pass/fail criterion is based on the resultant head acceleration considering all axes of head motion. The lumbar spinal load is an axially compressive load that is primarily evaluated during the 14g, 60° test. The femur load is also compressive, and actually has not proved to be critical thus far. For a side-facing seat, other injury parameters may predominate such that evaluation of those parameters may be necessary to provide an acceptable level of safety.

The first consideration for a side-facing seat is the isolation of one occupant from another. That is, occupants should not rely on the impact with other occupants to provide energy absorption; body-to-body impacts as discussed in the attachment are considered unacceptable. The second consideration is the retention of occupants in the seat and restraint system. Addressing this concern may necessitate providing a means of restraint for the lower limbs as well as the torso. Failure to limit the forward (in the airplane's coordinate system) travel of the lower limbs may cause the occupant to come out of the restraint system or produce severe

injuries due to the resulting position of the restraint system and/or twisting (torsional load) of the lower lumbar spinal column.

A third consideration is limiting the load in the torso in the lateral direction, where human tolerance differs from that for the forward or aft facing directions and other potential injury mechanisms exist. The automotive industry has developed test procedures and occupant injury criteria appropriate for side impact conditions. Their criteria involves limitation of lateral pelvic accelerations, and use of the human tolerance parameter "Thoracic Trauma Index," which is defined in 49 CFR § 571.214. Use of the 49 CFR § Part 572, Subpart F, Side Impact Dummy (SID), rather than the 49 CFR § Part 572, Subpart B, Hybrid II dummy used in the current § 25.562, test is required to evaluate these parameters. This is the best means available at present to assess the injury potential of a sideward impact condition. Such an evaluation is considered necessary to provide an acceptable level of safety for these types of seats.

Other potential injury mechanisms appropriate for aircraft seats may exist. However due to the lack of useful injury criteria for those other potential injury parameters, such as neck loads and lower limb flail, we are not able to specify criteria applicable to those areas at this time. We believe that such criteria may be appropriate, particularly for multiple occupancy installations, however, and intend to pursue their further development.

For single occupancy seats, the criteria provided in the associated attached issue paper have been determined to result in a level of safety equivalent to that provided by the pass/fail criteria in § 25.562 for forward or aft-facing seats. Accordingly, the certification of single occupancy side-facing seats intended to be installed to these criteria should be documented with a special condition in accordance with the provisions and requirements of § 21.16. We recognize that there have been approvals in accordance with § 25.562 that may not match these criteria exactly. While those approvals are still considered valid, any new approvals should use as their initial position the criteria provided here. As experience is gained and additional data are developed, we expect that these criteria will evolve.

For multiple occupancy seating, the best criteria currently available cannot be said to provide an equivalent level of safety for those occupants. Therefore, the only means available for accepting these installations would be through an exemption from the general occupant protection requirements of § 25.785(b). In this case, the associated attached issue paper summarizes criteria that are currently available, and could form the basis for inclusion in a petition for exemption from the noted requirement if an applicant so chooses. Any petition for exemption must also, of course, address why a grant of the petition would be in the public interest, in accordance with § 11.25(b)(5). We would like to stress that a grant of exemption is not automatic, and the applicant must address to the satisfaction of the FAA, why installing multiple occupancy, side-facing seating, in lieu of forward or aft-facing seating with a higher level of safety, is in the public interest.

We intend to continue to refine the compliance criteria for multiple occupancy seating with the goal of establishing an equivalent level of safety and we expect industry to assist in this effort. In the event those criteria may be established, this memorandum will be updated accordingly and the certification of multiple occupancy side-facing seating may then be processed with special conditions in lieu of exemptions. We anticipate that any designs approved under the terms of an exemption in the interim would retain their approval, although each exemption request will be treated individually. Any subsequent designs would be required to comply with the criteria developed, regardless of whether they were intended for installation on the same airplanes.

Any questions may be directed to Jeff Gardlin, telephone 425-227-2136.

ORIGINAL SIGNED BY  
S.R MILLER  
FOR  
Ronald T. Wojnar