

**Exemption No. 7811**

**UNITED STATES OF AMERICA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION  
RENTON, WASHINGTON 98055-4056**

In the matter of the petition of

**Embraer Empresa Brasileira de Aeronautica  
S.A.**

for an exemption from § 25.785(b) of  
Title 14, Code of Federal Regulations

**Regulatory Docket No.  
FAA-2001-9337**

**PARTIAL GRANT OF EXEMPTION**

By letter dated March 20, 2001, Paulo C. Olenski, Certification Manager, Embraer Empresa Brasileira de Aeronautica S.A., Av. Brigadeiro Faria Lima 2170, 12227-901 – Sao Jose dos Campos SP, Brazil, petitioned the Federal Aviation Administration on behalf of Embraer Empresa Brasileira de Aeronautica S.A. for an exemption from § 25.785(b) of Title 14 Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would permit relief from the general occupant protection requirements for multiple-place side-facing seats on the Embraer Model EMB-135BJ Legacy airplanes.

**Sections of the Federal Aviation Regulations (FAR) Affected**

Section 25.785(b), Amendment 25-64, requires general occupant protection for occupants of multiple-place side-facing seats that are occupied during takeoff and landing.

**Petitioner's Supportive Information**

“The FAA Memorandum, “Side Facing Seats on Transport Category Airplanes,” dated 19 November 1997 and the FAA “Draft Issue Paper - Petition for Exemption,” dated 12 November 1997 states that the FAA's Draft Issue Paper for side-facing divans is “guidance material” that can be used to develop project-specific Issue Papers.

“The side-facing seat/divan certification criteria outlined by these documents are recognized by this petition, but are modified to tailor the criteria to the current state-of-the-art. It is recognized that these documents specify occupant protection criteria that are in addition to the requirements of FAR 25.562. Body-to-Body Contact, Thoracic Trauma Index (TTI), Lateral Pelvic Acceleration, and Shoulder Strap Loading are additional occupant protection criteria introduced for side-facing seats/divans. Since 1997, industry progress has been made to accomplish the desired certification task by use of an alternate set of criteria.

“The FAA Memorandum proclaims that for multiple occupancy seating, the best criteria 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). 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). Therefore, any side-facing seat/divan designed for installation into the Embraer EMB-135BJ (Legacy) would require establishment of a specific certification basis via the Issue Paper & Exemption process.”

### **Petitioner’s Background Information**

“Since the release of the FAA Memorandum and Draft Issue Paper in 1997, the industry has made substantial progress in the field of multi-place side-facing divan design and installation certification. Single and multiple occupancy side-facing seat/divan installations are being certified for derivative and fully compliant aircraft. Project specific Issue Papers (or their equivalent) have been developed to establish the unique certification bases for these side-facing products due to the lack of published regulations and the need to tailor the certification to the specific aircraft needs. For side-facing seats/divans designed for installation into a fully compliant aircraft such as the EMB-135BJ, an Issue Paper is prescribed to provide the technical path for establishing the product certification basis. The Issue Paper is then incorporated into a Petition for Exemption from the requirements of § 25.785(b). The Exemption, once granted, ultimately provides the certification path for the side-facing seat/divan manufacturer and installer.

“Past industry experience has led to the development of multi-place side-facing divan certification criteria more advanced than what was originally presented by the FAA in 1997 (see References). These criteria are specifically suited to assess the structural capabilities of the seats/divans separate from the occupant protection capabilities governed by the installations. Furthermore, they provide a means of creating installation limitations to be used by the seat/divan installers when configuring the cabin interiors. These installation limitations provide the means to assess the potential effects on occupant protection pertaining to the varying cabin arrangements. The proposed certification criteria are presented below to establish an acceptable means of safety for side-facing seat/divan installations.

“Petitioner's proposed side-facing seat/divan certification criteria:

- “1) Side-facing divans must meet the provisions of FAR 25.562, Amendment 25-64.
- “2) Occupant Retention: Acceptable occupant retention must be verified during dynamic testing. For the occupant seated in the forward-most seating position of a single or multi-place divan installation, the pelvis must not translate past the structural forward edge of the divan when subjected to the dynamic test pulse prescribed in FAR 25.562(b)(2).
- “3) Body-to-Body Contact: Contact between the head, shoulder, torso, and/or pelvis of one Anthropomorphic Test Dummy (ATD) with an adjacent seated ATD is not allowed during the tests conducted in accordance with FAR 25.562(b)(1) and (b)(2). Incidental contact of the feet, legs, arms, and/or hands that will not result in incapacitation of the occupants is acceptable. Contact during rebound is acceptable. Should multi-divan installations introduce longitudinal occupant centerline spacing lesser than was dynamically tested to satisfy this body-to-body contact criterion, additional substantiation will be required to assess body contact for this reduced occupant spacing.
- “4) Thoracic Trauma Index (TTI): TTI for all side-facing occupants must be substantiated if occupant torso contact is present. Should occupant torso contact exist, TTI must be substantiated by dynamic test or rationale based upon previous testing of a similar design/installation. When conducting a dynamic test to obtain a TTI value, an appropriate test device capable of recording a TTI value should be used. TTI must be less than 85g as defined by 49 CFR 572, Subpart F. If it can be shown from known occupant movement data that an occupant's torso will not be contacted up to the maximum test load, a TTI measurement is not required based on this absence of torso contact. Torso contact during rebound is acceptable and need not be measured.
- “5) Lateral Pelvic Acceleration: Lateral pelvic acceleration for all side-facing occupants must be substantiated if contact with the occupant's pelvis is present. Should occupant pelvic contact exist, lateral pelvic acceleration must be substantiated by dynamic test or rationale based on previous dynamic testing of a similar design/installation. When conducting an actual test to obtain a lateral pelvic acceleration value, an appropriate test device capable of recording such a value should be used. The lateral pelvic acceleration for each occupant must not exceed 130g. Pelvic acceleration data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) Part 571.214, Section S6.13.5.
- “6) Shoulder-Strap Loads: Because FAR 25.562 (c)(1) is for crew seats only, shoulder strap (harness) loads are required to be measured for these side-facing

seats/divans capable of being occupied by passengers. Single strap tension loads must not exceed 1750 pounds per individual strap. If dual straps are used, the total strap tension load must not exceed 2000 pounds.

- “7) Occupant Movement Envelope (OME): An OME must be established to be used for each occupant seated on the side-facing seat/divan installation. The OME must encompass the movement of the ATD head, leading shoulder, torso, and pelvis. It must be increased in size to account for a range of occupant sizes. The OME must be referenced to a structural point on the divan that can further be referenced to an installation point on the aircraft. This reference point information is used to accurately position the OME to assess occupant protection for various installations. The OME establishes a "stay out zone" for satisfying occupant protection and body interaction criteria. Should one or more interior components be installed within the OME to predict occupant contact, substantiation for head strike and the occupant protection requirements identified in 2) through 6) is warranted.
- “8) Required Structural Tests: The following structural tests are required for each side-facing seat/divan configuration. If a multiple-place divan installation is comprised of single- and multiple-place divan types installed adjacent to one another, then each divan type must be structurally substantiated per the Test 1 and 2 conditions below. Note that all seating positions are to be occupied for testing.
- “1. Quantity one 14g minimum vertical test per FAR 25.562(b)(1) with Hybrid II ATD(s).
  - “2. Quantity one 16g minimum longitudinal test per RBHA 25.562(b)(2) with Hybrid II ATD(s).
- “9) Occupant Movement Envelope (OME) Testing: To establish the OME, quantity one 16g minimum longitudinal test per FAR 25.562(b)(2) without floor deformation, with zero degree yaw, with no end conditions, and with Hybrid II ATD(S) must be accomplished.
- “Each divan type may be tested to establish unique OMEs. Alternatively, the OME test may be accomplished on the divan type that produces the critical OME to substantiate less critical divan types (e.g. 2-place divan tested to substantiate 1-place divan). The critical OME (largest occupant movement envelope caused by greatest divan deflection) may then be used for all divan types to assess occupant protection for each seat position of the multiple place divan installation.
- “10) Occupant Protection Assessment Tests: These tests are conducted in accordance with FAR 25.562(b)(2) with no floor deformation and with zero or 10 degrees of yaw induced to yield critical occupant contact with the component(s) being evaluated

for occupant protection. ATDs should be selected to appropriately evaluate the injury potential (see below).

“Should armrests between occupants, end closures, seats, and/or other divans be installed within any OME, substantiation of body-to-body contact and occupant protection is warranted. Hybrid II ATDs may be used to assess Occupant Retention, Body-to Body Contact, Lateral Pelvic Acceleration, and HIC (head injury criterion). To assess TTI, an appropriate Side Impact Dummy may be used that is capable of recording the TTI value. When substantiating TTI via an actual dynamic test with a Side Impact Dummy, a body-to-body contact assessment can also be made during this test using a Side Impact Dummy in all seating positions that predict torso contact. An additional test with Hybrid II ATDs is not required to assess the body-to-body contact for these installations where the Side impact Dummies are utilized. All tests are to be conducted with enough divan occupancy to assess the required occupant protection criteria (i.e., redundant assessments need not be made on an entire divan installation that repeats occupant protection assessments for multiple positions).

- “(11) Divan Installation Requirements (End Closures and Padding): End closures (armrests, partitions, bulkheads, cabinets) inherently present injury potentials to the occupants seated in the side-facing seats/divans due to occupant contact. Therefore, no requirement should exist to have end closures present at the forward end of the divan installation. The FAA has previously ruled that restraint systems can effectively restrain the occupants in the forward direction if the requirements of 2) above are met (see Reference 1). End closures at the rear end of the divan may assist in occupant retention due to the common phenomenon that exists for occupant movement when body-centered lap belt anchorages are used. This anchorage scheme often allows the aft-most occupant of the divan installation to move off of the rear end of the divan installation during the rebound phase of the event. This rebound occupant movement is generally at a considerably lower velocity as compared to the forward impact velocity. Therefore, a requirement to have an end closure at the rear end of the divan installation is acceptable to aid in occupant retention in the less critical occupant movement direction. The end closure need not be attached to the divan and need not be required to meet the structural requirements of FAR 25.562. The mere presence of the end closure installation is sufficient to find compliance with this requirement.

“The 2 inch padding requirement for occupant contact with interior components specified by the FAA's 1997 FAA Draft Issue Paper CI-1 should also not be required if adequate occupant protection can be substantiated (i.e. acceptable TTI, Lateral Pelvic Acceleration, and HIC values recorded for occupant contact).”

“The competitive nature of the business aviation industry requires all companies to comply with standardized test methodologies. The FAA has allowed injury criteria exemptions and/or regulatory relief for side-facing seats to Embraer aircraft's competitors, as well as exemptions for fore- and aft-facing seats. Embraer believes that the test plan defined within this request significantly increases the level of safety for occupants in side-facing seats. It allows for reasonable seat certification costs, and allows Embraer to compete in the market and offer our customers the type of aircraft interior they demand.

“Therefore, additional occupant injury requirements are unnecessary, in some cases not applicable, and impose an undue burden on Embraer and its customers. As in the case of the already established exemptions, granting this Petition for Exemption would be clearly in the public interest as it allows efficient and safe carriage of executives in the sought for environment which would otherwise not be possible. Without the granting of this exemption the sales opportunity for the Embraer Model EMB 135BJ - Legacy would suffer, because the typical and highly desirable VIP type configurations with private and comfortable seating arrangements could no longer be realized.”

### **Notice and Public Procedure Provided**

A summary of the petition was published in the Federal Register on April 18, 2001, (66 FR 20022). No comments were received.

### **FAA's Analysis of the Petition**

The applicant's petition for exemption from § 25.785(b) is based on the FAA memorandum “Side-Facing Seats on Transport Category Airplanes,” dated November 19, 1997. This memorandum provides dynamic test conditions and pass/fail criteria for side-facing seats on transport category airplanes.

- (1) The dynamic test conditions criteria. In terms of both pulse severity and types of tests currently required, these criteria are also considered 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.
- (2) The pass/fail criteria. For these criteria, however, the orientation of the seat may be significant. Injury criteria are currently limited to head, spine, and femur loads. Head impact 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 degree 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 are considered unacceptable.

The second consideration for a side-facing seat 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 can 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.

The third consideration for a side-facing seat is limiting the load exerted on the torso in the lateral direction, where human tolerance differs from that for the forward- or aft-facing directions and where potential injury mechanisms exist. The automotive industry has developed test procedures and occupant injury criteria appropriate for side impact conditions. Their criteria involve 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 572, subpart F, Side Impact Dummy (SID), rather than the 49 CFR 572, subpart B, Hybrid II Dummy used in the 14 CFR 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, the FAA is not able to specify criteria applicable to those areas at this time. The FAA considers that such criteria may be appropriate, particularly for multiple occupancy installations, and intends to pursue their further development.

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 vehicle available for accepting these installations would be through an exemption from the general occupant protection requirements of § 25.785(a) prior to Amendment 25-72, or § 25.785(b) after Amendment 25-72.

The following summary of the criteria from the FAA draft issue paper "Dynamic Test Requirements for Side-Facing Divans (Sofas)," dated November 12, 1997 (an attachment to FAA memorandum "Side Facing Seats on Transport Category Airplanes," dated November 19, 1997), provides the basis of the petition for exemption.

1. Proposed Injury Criteria

- (a) Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side-facing seating. Head injury criteria (HIC) assessments are only required for head contact with the seat and/or adjacent structures.
- (b) Body-to-Body Contact: Contact between the head, pelvis, or shoulder area of one seated Anthropomorphic Test Dummy (ATD) and the adjacent seated ATDs is not allowed to occur during the test conducted in accordance with § 25.562(b)(1) and (b)(2). Incidental contact of the legs, feet, arms and hands that will not result in incapacitation of the occupants is acceptable. Contact during rebound is allowed.
- (c) Body-to-Wall/Furnishing Contact: If the sofa is installed aft of a structure such as an interior wall or furnishing that may contact the pelvis, upper arm, chest, or head of an occupant seated next to the structure, then a conservative representation of the structure and its stiffness must be included in the tests. The contact surface of this structure must be covered with at least two inches of energy absorbing protective foam, such as ensolite.
- (d) Thoracic Trauma: Testing with a Side Impact Dummy (SID), as defined by 49 CFR part 572, subpart F, or its equivalent, must be conducted and thoracic trauma index (TTI) injury criteria acquired with the SID must be less than 85, as defined in 49 CFR part 572, subpart F. Side impact dummy TTI data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) part 571.214, section S6.13.5.
- (e) Pelvis: Pelvic lateral acceleration must not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS part 571.214, section S6.13.5.
- (f) Shoulder Strap Loads: Where upper torso straps (shoulder straps) are used for sofa occupants, tension loads in individual straps must not exceed 1,750 pounds. If dual straps are used for restraining the upper torso, the total strap tension loads must not exceed 2,000 pounds.

## 2. General Guidelines

- (a) All side-facing seats require end closures.
- (b) All seat positions need to be occupied for the longitudinal tests.
- (c) For the longitudinal tests, conducted in accordance with the conditions specified in § 25.562(b)(2), a minimum number of tests will be required as follows:

- (1) One test will be required with one SID ATD in the forwardmost position and Hybrid II ATD(s) in all other positions, with undeformed floor, no yaw, and with all lateral supports (armrests/walls).
- (2) One test will be required with one SID ATD in the center seat and Hybrid II ATD(s) in all other positions, with deformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls). This could be considered the structural test as well.
- (d) For the vertical test, conducted in accordance with the conditions specified in § 25.562(b)(1), Hybrid II ATDs will be used in all seat positions.”

The FAA may refine the compliance criteria for multiple occupancy side-facing seating to establish an equivalent level of safety. This may include additional injury criteria related to neck loads or other injury mechanisms. The guidance will be updated accordingly, and the certification of multiple occupancy seating may be processed with special conditions in lieu of exemptions.

Embraer has proposed several changes to the criteria for the certification of side-facing seats. One of the changes is the body-to-body contact criteria that is used for certification of similar designs based on dynamic testing. Embraer proposed that for body-to-body contact when installations introduce longitudinal occupant centerline spacing that is less than that previously tested, additional testing is required to certify the new spacing. The FAA partially agrees with the Embraer proposal. However, in a design in which the occupant spacing is changing, the structure of the seat and the restraint attachments locations are also changing. The effects of all changes to the seat/restraint system need to be considered when determining the acceptability of certification by analysis to previously certified seat/restraint systems.

For TTI, Embraer has proposed that if, there is torso contact during testing, TTI measurement must be taken and must meet the criteria. However, if there is no contact with the occupant’s torso, no TTI measurements are needed. Also, Embraer has proposed that torso contact during rebound is acceptable and TTI need not be measured. The FAA concurs with the Embraer proposed changes.

For lateral pelvic acceleration, Embraer has proposed that if contact with the occupant’s pelvis is present, lateral pelvic acceleration measurements must be taken and must meet the criteria. However, if there is no contact with the occupant’s pelvis, no lateral pelvic acceleration measurements are needed. The FAA concurs with the Embraer proposed changes.

Embraer has proposed that the multiple-place divan installation is comprised of single- and multiple-place divans installed adjacent to one another. The applicant would need to

demonstrate by test that there is no interaction between individual seats. Without this testing the FAA can not accept the Embraer proposal to test the divans as individual seat modules.

The applicant has proposed to establish an occupant movement envelope (OME) for each occupant seated on the side-facing divan installations. As discussed above, the development of the OME must demonstrate that there is no interaction between individual seats and occupants by test. Without this testing the FAA can not accept the Embraer proposal to test the divans as individual seat modules and OMEs. Since Embraer has not provided this data the FAA can not accept the proposal at this time. However, if Embraer can provide the data to support their proposal, the concepts of modular seating and OME could be used for follow-on certification efforts without the need to revise this exemption.

The applicant contends that the requirement to have end closures at the forward end of the divan should be eliminated. We partially concur, and will modify the criteria so that Embraer may supply either end closures or some other means of restraint to prevent the occupant from moving laterally off the seat. End closures that are attached to the seat and end closures not attached to the seat that are required to restrain an occupant must meet the structural requirements of § 25.562.

Embraer has proposed that the 2-inch padding for contact surfaces installed forward of side-facing seats should not be required because compliance with the requirements of thoracic trauma index (TTI), lateral pelvic acceleration, and head injury criteria (HIC) result in an acceptable contact surface. The FAA does not agree with the applicant's position concerning the elimination of the 2 inches of padding. The dynamic test is only one test event and as such the contact area is limited area. The applicant did not address the issue of different contact points on the contact surface. The area contacted by an occupant could be more rigid than the area contacted during the test. However, if the test was conducted without the 2-inch padding and met all of the requirements of TTI, lateral pelvic acceleration, and HIC, and the applicant demonstrated that the contact surface was homogeneous, the 2-inch padding requirement for contact surfaces installed forward of side-facing seat could be eliminated.

The applicant has proposed that the longitudinal test for occupant injury consideration should be conducted with zero or 10 degrees of yaw induced to yield critical occupant contact with the component(s) being evaluated for occupant protection. The FAA concurs with the applicant's proposal.

### **The Partial Grant of Exemption**

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest and will not affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator,

Embraer Empresa Brasileira de Aeronautica is hereby granted a partial exemption from the requirements of 14 CFR 25.785(b) for the general occupant protection requirements for occupants of multiple-place side-facing seats that are occupied during takeoff and landing in any Embraer EMB 135BJ - Legacy airplanes.

The following limitations apply to this exemption:

1. The airplane must not be operated for hire, or offered for common carriage. This provision does not preclude the operator from receiving remuneration to the extent consistent with 14 CFR part 125, 14 CFR part 91, and subpart F, as applicable.
2. Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side-facing seating. The head injury criteria (HIC) assessments are only required for head contact with the seat and/or adjacent structures.
3. Body-to-Body Contact: Contact between the head, pelvis, or shoulder area of one Anthropomorphic Test Dummy (ATD) and the adjacent seated ATDs is not allowed during the test conducted in accordance with § 25.562(b)(1) and (b)(2). Incidental contact of the legs, feet, arms and hands that will not result in incapacitation of the occupants is acceptable. Any contact between adjacent ATDs is acceptable during rebound.
4. Body-to-Wall/Furnishing Contact: If the side-facing divan is installed aft of a structure such as an interior wall or furnishing that may contact the pelvis, upper arm, chest, or head of an occupant seated next to the structure, then a conservative representation of the structure and its stiffness must be included in the tests. In most cases, the representation of the structure would be more rigid and have less deflection under load than the actual installation on the airplanes. The contact surface of this structure must be covered with at least 2 inches of energy absorbing protective foam, such as ensolite. However, if the test was conducted without the 2-inch padding and met all of the requirements of the thoracic trauma index (TTI), lateral pelvic acceleration, and head injury criteria (HIC), and the applicant demonstrated that the contact surface was homogeneous, the 2-inch padding requirement for contact surfaces installed forward of side-facing seat could be eliminated.
5. Thoracic Trauma: Thoracic trauma index (TTI) injury criteria must be less than 85, as defined in 49 CFR part 572, subpart F. TTI data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) part 571.214, section S6.13.5. Should occupant torso contact exist, TTI must be substantiated by dynamic test or rationale based upon previous testing of a similar design/installation. If it can be shown from known occupant movement data that an occupant's torso will not be contacted up to the maximum test load, a TTI measurement is not required based on this absence of torso contact. Torso contact during rebound is acceptable and need not be measured

6. Pelvis: Lateral pelvic acceleration for all side-facing occupants must be substantiated if there is pelvic contact during testing. Should occupant pelvic contact exist, lateral pelvic acceleration must be substantiated by dynamic test or rationale based on previous dynamic testing of a similar design/installation. When conducting an actual test to obtain a lateral pelvic acceleration value, an appropriate test device capable of recording such a value should be used. Pelvic acceleration data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) Part 571.214, Section S6.13.5. Pelvic lateral acceleration must not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS part 571.214, section S6.13.5.

7. Shoulder Strap Loads: Where upper torso straps (shoulder straps) are used for side-facing divan occupants, tension loads in individual straps must not exceed 1,750 pounds. If dual straps are used for restraining the upper torso, the total strap tension loads must not exceed 2,000 pounds.

8. Seat Positions: All seat positions need to be occupied by ATDs for the longitudinal tests.

9. Occupant Retention: All side-facing divans require end closures or other means to prevent the occupant from moving laterally off the end seat.

10. Longitudinal Tests: For the longitudinal tests conducted in accordance with the conditions specified in § 25.562(b)(2), a minimum number of tests will be required as follows:

a. One test will be required with ATDs in all positions, with undeformed floor, with all lateral supports (armrests/walls), and with zero or 10 degrees of yaw induced to yield critical occupant contact with the component(s) being evaluated for occupant protection. For configurations with a wall or bulkhead immediately forward of the forward seat position on the sofa, a Side Impact Dummy (SID) or equivalent ATD will be used in the forward seat position and a Hybrid II ATD(s) or equivalent will be used for all other seat locations. For configurations without a wall or bulkhead immediately forward of the forward seat, Hybrid II ATDs or equivalent will be used in all seat locations.

b. One test will be required with Hybrid II ATDs or equivalent in all positions, with deformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls). This could be considered the structural test as well.

11. Vertical Test: One test will be required, conducted in accordance with the conditions specified in § 25.562(b)(1), Hybrid II ATDs or equivalent will be used in all seat positions.

Issued in Renton Washington, on June 14, 2002.

/s/Ali Bahrami

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Ali Bahrami

Acting Manager

Transport Airplane Directorate

Aircraft Certification Service, ANM-100

