	DISPOSITION OF PUBLIC COMMENTS ON DRAFT POLICY STATEMENT ANM-03-115-30, SIDE-FACING SEATS ON TRANSPORT CATEGORY AIPRLANES	
Commenter	Comment	Disposition
Mike Oleson, President, Oleson Technologies, Inc.	Having been involved as a DER with the testing and certification of the original 16G multi-place side facing divan for the GV and subsequent divan certifications for the BBJ, Global Express, Legacy, and B777, I can say that the proposed criteria has eliminated much of the "fat" due to simply having more test data to support the FAA's position. The criteria for the single-place side-facing seat is more straightforward and elimination of the padding requirement will allow for more occupant shoulder room in the lavatory areas with 16G side-facing lavatory seats. I must say, though, that exemptions written to remove some of these same criteria have already been granted by the FAA prior to the release of the newly proposed criteria…This has led to less complex divan certification programs.	The FAA agrees that this proposed policy will streamlining certification of side-facing seats. A summary of the streamlining benefits is provided below this disposition table.
Mike Oleson, President, Oleson Technologies, Inc.	Issue: Body-to-Wall/Furnishing Contact (Side-Facing Divans: Issue Paper CI-1) Proposed Change: Rewording of Section 1(e): Change to - " . . . a conservative representation of the structure and its stiffness may be included in the tests in lieu of using the actual furnishing . . . " Justification: Requiring a conservative furnishing representation that must be included in the tests does not leave room for using the actual component. Also, if the wall and/or furnishing is used as part of the restraint system, it would have to be proven to be capable of withstanding the loads prescribed in 14 CFR 25.562(b)(2) per the newly proposed criteria. Hence, a conservative representation would not allow for this assessment of the actual furnishing strength per 14 CFR 25.562(b)(2).	The FAA concurs with the commenter, but will use the following wording to provide further clarity: "…the structure or a conservative representation of the structure and its stiffness must be included in the tests."
Mike Oleson, President, Oleson Technologies, Inc.	Issue: Occupant Retention (Side-Facing Divans: Issue Paper CI-1) Proposed Change: Rewording of Section 1(g): Change to - "All side-facing seats require end closures or other means to prevent the ATD's pelvis from translating beyond the end of the seat structure at any time during testing." Justification: Industry standard lap and shoulder restraint systems have been used on FAA certified 16G divans to prove adequate occupant retention by limiting the forward translation of the ATD's pelvis to not break the structural end plane of the divan seating position. By doing so, the ATD is supported by the seat. The head, shoulder, torso, and limbs	The FAA concurs and will revise the memo to specify that the "ATD's pelvis" must not translate beyond the end of the seat.

	were allowed to translate past the end of the divan. Upon rebound, these body parts generally returned to a position on the divan which would allow for occupant egress. The current wording of Section 1(g) leads the reader to believe that no part of the ATD can translate beyond the end of the divan. No restraint system other than a full height rigid wall would be able to accomplish this. The historic installations of a multi-place side-facing divans in executive aircraft are with armrest cabinets installed adjacent to the divan structure ends. The newly proposed criteria should not eliminate this standard installation configuration. I suggest that this be studied in more detail for a possible rewording of this section.	
Mike Oleson, President, Oleson Technologies, Inc.	Issue: Section 2(b) longitudinal testing options to assess occupant protection (Side-Facing Divans: Issue Paper CI-1) Proposed Change: Reword Section 2(b) for clarification Justification: The third bullet states that the test can be conducted with or without floor deformation. The fourth bullet states that many occupant injury tests can be considered the structural test as well. This allowance is not consistent with the historical philosophy that structural testing is generally conducted to where occupant "off-loading" is not possible such that maximum stress can be delivered to the seat structure. The new proposed policy states that if end closures are used to retain the occupant, then they should be designed to withstand the load conditions of 25.562. Here, off-loading onto the end closure furnishing would be part of the seat design proven by structural testing. Conversely, if an end closure furnishing is not required to retain the occupant, then any contact of the restrained occupant with any interior structure (that is not considered part of the restraint system) would tend to off-load the divan structure to not critically stress the divan structure. Therefore, this test could not be considered the structural test for the divan. I believe that the option to use any occupant protection test (where occupant contact is made with an interior component not considered part of the seating system) as the structural test should not be allowed. This will ensure proper evaluation of the divan structure without the influence of the specific aircraft interior. Additionally, the fourth bullet includes wording, "It is considered acceptable since an exemption is sought in lieu of compliance with part 25." Technically, an exemption is being sought only for 14 CFR 25.785(b) and not all of Part 25. Hence, 25.562(b)(2) still applies to side-facing divans and the requirement still exists to critically test the divan structure.	The statement “This allowance will permit many occupant injury tests to be considered the structural test as well.” is considered sufficient. This statement does not indicate that the occupant injury test will always be usable as a critical case structural test as well, but that the FAA is allowing more flexibility in the occupant injury test setup so that “many” of these tests can be designed to cover the critical structural test case also. If the occupant injury test configuration does not satisfy the structural test requirements, independent structural testing is also required. The FAA concurs that these exemptions will be applicable to the occupant injury criteria of § 25.785(b) only and not the structural requirements of multiple-place side-facing seats. The memo has been revised to prevent any confusion in regard to this. Part 25 requires that dynamic seat tests (or rational analysis based on dynamic tests) must demonstrate that the seat installation (not the seat itself) meets the § 25.562(b) dynamic loading conditions. Hence, it is acceptable for an interior furnishing, which is not part of the seat or its restraint system, to be included in the critical case structural test and provide off-load capability due to ATD contact. However, this test would only substantiate the seat when installed in its tested configuration, i.e., when the seat is installed next to the interior furnishing as tested.
UK CAA	UK CAA believes that Neck Injury Criteria is perhaps the most critical of	The FAA has assessed existing neck injury criteria and has determined that

	all injury criteria for sideways facing impacts. Neck Injury Criteria is addressed in papers from the automotive industry. CAA would therefore like to request whether FAA would like to comment on why they have not included Neck Injury Criteria in the proposed Policy.	research is necessary to identify appropriate criteria for side facing seats in aviation. The FAA is currently conducting research and will determine a course of action after its completion.
Dassault Aviation	Dassault Aviation supported FAA proposed policy changes with respect to the following: - Removal of limitation in regards to incidental contact of a leg, foot, arm or hand. - Removal of two inch padding requirement - Allowance of restraint system, as opposed to end closures, to prevent occupants from translating off of the seat. - Removal of test with SID in the center seat place to obtain TTI data.	N/A
Dassault Aviation	Memo Wording: "Pre-test floor deformation for these items which are not attached to the seat is not required, but can be included in the test if the resultant geometric relationship of the seat and the additional item would otherwise reduce the effectiveness of the item" Dassault proposal is to add the following: "Only the items designed to restrain the occupant have to be deformed" Dassault comments: In the business jet the wall/furnishing are not always installed just ahead of the most forward ATD, however a head impact on the bulkhead can occur. Does it mean that the bulkhead aids in restraining the occupant? For Dassault the bulkhead is a load path but cannot be considered as a restraint system.	The proposed wording is not considered appropriate since it implies that floor deformation should be applied to all items (e.g., end closures, walls) which contribute to restraining occupants. The FAA considers that the application of floor deformation should not be dependant on whether or not an item contributes to restraining an occupant. The intent of floor deformation is to assure a degree of flexibility in the seat structure and floor attachments. Floor deformation is not required for items other than seats; however, if floor deformation for another item helps the relationship of a seat and that item during testing, the FAA would allow floor deformation for the other item also.
Dassault Aviation	Memo Wording: "The draft issue paper of the 1997 memorandum for multiple occupancy seating has been revised to reflect this guidance and is attached…." "(c) Thorax Trauma: If the torso of an ATD at the forward most seat place impacts seat and/or adjacent structure during testing, Thoracic Trauma Index (TTI) injury criterion must be substantiated….TTI data must be acquired with a Side Impact Dummy (SID), as defined by 49 CFR Part 572, Subpart F, or its equivalent.." Dassault proposal is as following: "…TTI data must be acquired with a Side Impact Dummy (SID), as defined by 49 CFR Part 572, Subpart F, or its equivalent ***or with more appropriate Side Impact Dummy***" Dassault comments: The SID, as defined by 49 CFR Part 572, Subpart F, was inappropriate for F2000 side-facing sofa longitudinal tests, because it does not include any shoulder frame. In a side impact involving a car, the	The FAA concurs and has incorporated the proposed wording, with minor editorial changes.

	restraint of the passenger and the action of the shoulder harness are not considered. When considering F2000 sofas, the location of the attachment of the shoulder harness i.e. inertia reel, is well below the shoulder level. The restraint of the upper torso and of the head, in the dummy's lateral direction, is only possible if it is combined with a compression load in the spine. That compression is introduced by the harness in the shoulder structure. The test performed at the CAMI in July 98 shows clearly that the SID does not react to any load on the shoulder and is thus inappropriate for this particular facing sofa longitudinal tests.	
GAMA	<u>Novel Design:</u> FAA states under the "Relevant Past Practice" portion of draft policy ANM-2003-115-30 that *"Side-facing seats are considered a novel design for transport category airplanes that include Amendment 25-64 in the certification basis, and were not considered when those airworthiness standards were first promulgated. Hence, the existing regulations do not provide adequate or appropriate safety standards for occupants of side facing seats"* GAMA believes this statement does not accurately account for the extensiveness and results of the program FAA, NASA and industry accomplished when they developed the current dynamic performance standards for civil aircraft seats. Historical documents that report on the development of these dynamic standards, including FAA's own reports, NTSB Safety Reports and SAE Technical Papers, clearly demonstrate that the entire program was data driven. According to FAA, *"Realistic dynamic performance standards for aircraft seats which emphasize occupant protection, and which were based on a comprehensive analysis of full-scale aircraft impact tests, parametrical studies using crash dynamics computer programs, accident data analyses, and dynamic test programs of aircraft seats have been defined."* Following FAA's risk management principals, the resulting regulations did contemplate all seating orientations and aimed to produce the greatest practical improvement in occupant protection. In the complete safety picture, side facing seats are a relatively small population among all aircraft seats. However, they are not novel in aviation design, reference the 1945 CAR 04 rule 04.38220(c) which applies to "…forward, sideward and rearward facing seats." Under this and CAR 4b/FAR 25 regulations, many side-facing seats have been successfully designed and installed in transport category airplanes although their total count among all aircraft seating is small. As FAA is aware, they are more extensively used in military airplanes. Industry is concerned with FAA's assertion that adequate and appropriate	Side-facing seats were not considered in the development of § 25.562. The extensive research for supporting the promulgation of this rule was conducted to address forward and aft facing seats and to understand the capability of traditional main deck floor-type structure for reacting dynamic seat loads. Side-facing seats were not considered, particularly with regard to appropriate injury criteria. Prior to Amendment 25-64, part 25 did not contain definitive injury criteria for protecting seated occupants during a dynamic event. Hence, part 25 was considered adequate for addressing seats of all orientations, and side-facing seats were approved. However, Amendment 25-64 was promulgated to provide seated occupants an improved level of safety considering a dynamic event. The FAA codified § 25.562(c) with occupant injury criteria that is sufficient for forward and aft facing seats only. Side-facing seats are considered novel to § 25.562(c) for this reason. Subsequent to Amendment 25-64, the FAA developed criteria for single-place side-facing seats that provides occupants of these seat an equivalent level of safety to that provided to occupants of forward/aft facing seats. Single-place side-facing seats installations have been certificated to this criteria by special conditions. For multiple-place side-facing seats, the FAA initiated an R&D program to develop appropriate injury criteria. Exemption have been granted to allow these seats to continue to be installed on airplanes while the FAA completes its research. These exemptions require that the currently available injury criteria be met for these seats. The main criteria for which research is still being conducted is neck injury criteria. In the event that this criteria is established, future exemptions will not be justified, and multiple-place side-facing seats will be required to meet special conditions which provide an equivalent level of safety to that provide by other seats. The FAA policy memo on side-facing seats, dated November 19, 1997, explains this issue. The occupant injury criteria which has been established for side-facing seats

	safety standards do not exist in current FAR 25 for side-facing seats. In addition, industry is concerned about FAA's statement that "…*for multiple occupancy seating, the best criteria available cannot be said to provide an equivalent level of safety* (to those seated in forward facing seats) *for those occupants."* FAA has not provided a clear and complete justification for its assertions. Nowhere in this proposed policy or it's referenced materials has FAA justified it's contentions using the current regulations, the exhaustive rule development history, and accident and injury data. GAMA is concerned that the FAA may be using policy to implement a regulatory change by labeling side-facing divans as "novel", thereby circumventing general rule-making procedures, cost benefit analyses and the public scrutiny required for regulation change. It also appears that the Transport Directorate is not following the Aircraft Certification Services Director's mandate (reference the October 2, 2003 GAMA Technical Policy Committee meeting) that new rules and policy will be data driven. Please consult Mr. Ali Bahrami who also attended the October 2, 2003 meeting. It would appear that the Transport Directorate is attempting to develop policy not based on proper data analyses. Therefore, GAMA would appreciate a complete explanation of how FAA determines the design of side facing seats to be "Novel" and how the current rules do not properly account for the appropriate level of occupant protection when occupants are seated on side-facing seats during TTL.	has been data driven. The current criteria has been established based on NTSHA criteria and FAA CAMI research. The FAA is currently conducting research to develop appropriate neck injury criteria based on testing using cadavers.
GAMA	<u>Criteria for Multiple Occupant Side-Facing Seats:</u> A revision is requested to clarify those situations where the combination of the seat and seat belts are capable of restraining the occupant in a side-facing configuration to meet the dynamic loads without the aid of any other barrier. The draft policy currently states "*Note that items such as end closures, walls or furnishings, whether attached to a seat frame or not, that aid in restraining seated occupants must be designed to meet the dynamic load conditions of § 25.562. These items are part of the seat restraint system and therefore must comply with § 25.562(a) which states the following:"* GAMA proposes that the FAA revise the statement to read as follows: "*Note that* ***unless it is demonstrated that the seat and seat belts alone are sufficient in restraining the occupant under dynamic loads,*** *items such as end closures, walls or furnishings, whether attached to a seat frame or not****,*** *that aid in restraining seated occupants must be designed to meet the*	The FAA concurs with the comment and has revised the document using the proposed wording, with minor editorial changes.

	dynamic load conditions of § 25.562. These items, ***if considered an integral part of the seat restraint system,*** *must comply with § 25.562(a) which states the following:"*.	
GAMA	Femur Loads: The Proposed Injury Criteria sections for both the Petition for Exemption for side facing divans and Proposed Special Condition for side facing seats state that "*All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side-facing seating*". This includes pass/fail criteria for femur loads required by §25.562(c)(6), which is generally intended for occupants in forward facing seats. Numerous tests at FAA's CAMI facility have shown that the femur load is not a critical parameter for side-facing seats. The general orientation of the occupant's femur in a side-facing seat in relation to the motion of the occupant during the impact will not result in any significant axial compressive load in the femur such that it could exceed 2,250 lbs. In an effort to further simplify the requirements, GAMA requests that the proposed injury criteria be revised to exclude § 25.562(c)(6).	The FAA agrees that extensive seat testing has shown that the femur loading criterion would typically not be exceeded. For this reason, draft AC 25.562-1B allows femur loads to not be recorded in individual tests if compliance can be shown by rational, comparative analysis using data from previous tests. Hence, the FAA considers it acceptable to find compliance with § 25.562(c)(6) without obtaining new test data and from simple inspection, and as a result, verifying compliance with § 25.562 is not considered onerous. The FAA believes that § 25.562(c)(6) should continue to be included in this policy memo to cover any atypical future design (e.g., a seat which would allow excessive body rotation resulting in axial compression of the femur when impacting structure.)
GAMA	Critical Contact Angle: The fourth bullet in paragraph (b) of Section 2 "General Guidelines" of the Exemption for Side-Facing Divans states that "*the test must be conducted with either no yaw or 10 degrees yaw away from the critical contact angle*". Industry requests the FAA provide an explanation and a formal definition for the "critical contact angle", what it pertains to, and how the applicant is suppose to make a determination on the relevance of the critical angle to occupant injury.	The FAA concurs that the term "critical contact angle" is not clear and has revised the memo to addressed issue.
GAMA	Multiple Yaw Tests: The Proposed Special Condition General Test Guidelines, Section 2(a), for the single-place side-facing seat specifies a 0-degree/no yaw condition for the proposed SID ATD test to evaluate TTI and pelvic acceleration. However, paragraph (b) requires another test be performed with the 10-degree yaw configuration using a Hybrid II ATD. GAMA believes this imposes an unnecessary burden by requiring multiple yaw conditions to be evaluated. Industry experience is that testing with the "10 degree yaw condition" does not appreciably affect the outcome of the test. The "no-yaw" condition requires the manufacture of additional test fixtures and complicates the accommodation of the test set-up on the dynamic test sled. This requirement produces unnecessary additional testing and certification expenses. Also, the General Test Guidelines in the Petition for Exemption,	Special conditions must be established that evaluate the most critical occupant injury and structural test conditions. The test in paragraph 2(b) addresses the structural test condition of § 25.562(b)(2) which must be conducted per this rule using a Hybrid II ATD or equivalent, at 10 degrees yaw and with deformed floor. The test in paragraph 2(a) evaluates the TTI and pelvic lateral acceleration occupant injury criteria using a Side Impact Dummy (SID). TTI data is gathered in only the lateral direction by the SID. In order to evaluate the critical case for TTI, the test must be conducted with no yaw and no floor deformation. The no yaw condition aligns the SID's lateral direction with the deceleration vector caused by the impact, and thus provides worse case TTI data. Conducting the test without floor deformation prevents the ATD from being incorrectly positioned during the impact. Note that this requirement is

	Section 2(b), for the side facing divan states in bullet four to conduct the longitudinal test with either no yaw or 10 degrees yaw for evaluating occupant injury. However, the text of the Memo states "The FAA has found that an acceptable level of safety can be provided to justify an exemption without a test with a SID in the center seat place and by obtaining occupant injury data with floor deformation and with the seat yawed 10 degrees". In view of the forgoing, GAMA proposes the FAA revise the test to evaluate occupant injury for the single side facing seat to allowed it be conducted with either no yaw or 10 degrees yaw and with floor deformation or without floor deformation.	consistent with previous special conditions for side-facing seats. The commenter mentioned that industry experience is that tests with the 10 degrees yaw does not appreciably affect the outcome of the test. The FAA considers that sufficient data is not available to support this conclusion and a revision to the policy memo which addresses all single-place side-facing seats. Section 21.16 requires that special conditions provide "a level of safety equivalent to that established in the regulations" and therefore these special conditions require the tests to evaluate the most critical occupant injury condition. However, sufficient occupant injury criteria has not been establish to allow special conditions to be issued for multiple-place side-facing seats, so the FAA is granting exemption for these seats. Exemptions may be granted that do not meet "a level of safety equivalent to that established in the regulations." As a result, the FAA has allowed TTI and pelvic lateral acceleration data to be gathered at 10 degrees yaw.

Relief Provided by Proposed Side-Facing Seat Policy
(Comparison of Proposed and 1997 Memorandums)

The proposed policy for side-facing seats provides significant relief from the previous side-facing seat memo "Side-Facing Seats on Transport Category Airplanes," dated 11/19/97. The relief it provides is as follows:

<u>Multiple-Place Side Facing Seats (Divans)</u>

- The occupant injury test was modified to allow it to be conducted with floor deformation and at 10 degrees yaw. This will allow occupant injury data to be gathered from the structural seat test and reduce the minimum number of required tests from 2 to 1 in many cases.

- A limitation was deleted that required a Side Impact Dummy, in lieu of the typical § 25.562 test dummy, be placed in the center seat place. This test configuration had been required to determine that an acceptable level of thorax protection existed from a collision with an armrest or other barrier installed just forward of the center seat place. However, tests have demonstrated that these armrests are not structural barriers that contribute significantly to thorax injury.

- A limitation was deleted that required two inches of padding on the surface of structure contacted by an occupant subjected to the dynamic load of § 25.562 since Thoracic Trauma Index, Head Injury Criterion and lateral pelvic acceleration criteria will be met.

- The 1997 memo required end closures to prevent occupants from translating off the end of the side-facing seat. The proposed memo allows end closures or "other means", such as seat belts, to prevent this.

- A limitation was deleted that did not allow incidental contact of a leg, foot, arm or hand that would result in incapacitation of an occupant. This relief is considered acceptable because this type of contact has not been a concern in previous tests.

Single-Place Side-Facing Seat

- A limitation was deleted that required two inches of padding on the surface of structure where an occupant could contact it when subjected to the dynamic load of § 25.562 since Thoracic Trauma Index, Head Injury Criterion and lateral pelvic acceleration criteria will be met.

Summary for Multiple-Place Side-Facing Seat	
1997 Memo	**Proposed Memo**
Two tests in most cases.	One test in most cases.
Test must be conducted without floor deformation and no seat yaw.	Test may be conducted with or without floor deformation and with no seat yaw or 10 degrees seat yaw.
Side Impact Dummy required in center seat place to determine if thorax injury will occur.	May use standard test dummy in center seat place and does not require evaluation of thorax injury at this location.
2" of padding on surface forward of seat	No padding
Requires end closures to prevent occupants from translating off seat.	Requires end closures or other means to prevent occupants from translating of seat
Evaluation of incidental contact of leg, foot, arm and hand	No evaluation
Summary for Single-Place Side-Facing Seat	
1997 Memo	**Proposed Memo**
2" of padding on surface forward of seat	No padding