



Policy Letter (PL)

Side-Facing Seats - Transport Category Aeroplanes

File No	5009-32-0	PL No.	525-003
RDIMS No.	506007-V1	Issue No.	01
Issuing Branch	Aircraft Certification	Effective Date	2003-12-01

1.0 INTRODUCTION 2

1.1 Purpose 2

1.2 Guidance Applicability..... 2

1.3 Description of Changes..... 2

1.4 Termination..... 2

2.0 REFERENCES 2

2.1 Reference Documents 2

2.2 Cancelled Documents..... 2

3.0 BACKGROUND 2

4.0 DISCUSSION 3

5.0 DEFINITION OF THE BASIS OF CERTIFICATION 3

6.0 HEADQUARTERS CONTACT..... 5

1.0 INTRODUCTION

1.1 Purpose

This Policy Letter (PL) provides guidelines concerning the application of airworthiness standards required for the approval of side-facing seats on transport category aeroplanes which were type certificated on the basis of Chapter 525 of the Airworthiness Manual (AWM) at Change 2; Improved Seat Safety Standards.

1.2 Guidance Applicability

This document is applicable to Headquarters and Regional Aircraft Certification personnel, including delegates.

1.3 Description of Changes

This document is a revision of Aircraft Certification Policy Letter (ACPL) No. 21, Issue No. 1. It has been revised to meet the formatting and numbering requirements in accordance with Staff Instruction (SI) GEN-002. The policy content of the former ACPL No. 21, Issue No. 1 remains relevant, consequently, no changes have been made to content of this document.

1.4 Termination

This document does not have a terminating action. It will, however, be reviewed periodically for suitability of content.

2.0 REFERENCES

2.1 Reference Documents

It is intended that the following reference materials be used in conjunction with this document:

- (a) *Aeronautics Act*, R.S. 1985, c. A-2;
- (b) SI GEN-002 – *Introduction to Aircraft Certification Guidance Material*;
- (c) SI 500-004 – *Special Conditions – Airworthiness (SCA)*;
- (d) Federal Aviation Administration (FAA) Information Memorandum dated November 19, 1997;
- (e) Generic FAA Issue Paper CI-X dated November 12, 1997 – *Dynamic Test Requirements for Single Place Side-Facing Seats*;
- (f) Generic FAA Issue Paper CI-1 dated November 12, 1997 – *Dynamic Test Requirements for Side-Facing Divans (Sofas)*; and
- (g) FAA Exemption No. 6881 dated April 1, 1999.

Note:

The documents referenced in (e), (f) and (g) above are posted on the “What’s New” page of the Transport Canada website under the Aircraft Certification Branch, Engineering Division, Occupant Safety and Environmental Systems section.

2.2 Cancelled Documents

As of the effective date of this document, ACPL No. 21, Issue No. 1 is cancelled.

3.0 BACKGROUND

Section 525.562 of the AWM at Change 2, introduced standards for the enhancement of occupant protection under more realistic conditions than had previously existed. The requirements contained therein consist of both test conditions and pass/fail criteria.

Note:

Improved Seat Safety Standards is part of Federal Aviation Regulation Amendment 25-64 that was adopted at Change 2 by Chapter 525 of the AWM.

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

Note:

The contents of this document are based on an FAA "Information Memorandum", dated Nov. 19, 1997 on the same subject.

4.0 DISCUSSION

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 except for rebound.

The second consideration is the retention of occupants in the seat and restraint system. Addressing this concern may necessitate 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 involve limitation of lateral pelvic accelerations, and use of the human tolerance parameter "Thoracic Trauma Index," which is defined in U.S. Regulation 49 Code of Federal Regulations (CFR) 571.214. The use of the U.S. Regulation 49 CFR Part 572, Subpart F, Side Impact Dummy, rather than the 49 CFR Part 572, Subpart B, Hybrid II Dummy used in the current section 525.562 of the AWM tests 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 aviation authorities are not able to specify criteria applicable to those areas at this time. It is believed that such criteria may be appropriate, particularly for multiple occupancy installations and pursuance of further criteria development is contemplated.

5.0 DEFINITION OF THE BASIS OF CERTIFICATION

Single and multiple occupancy ("divan") installations will be treated separately, since there are separate approaches to each situation. Also as a result of the continuing development of knowledge in the area of human-injury criteria, project-specific issue papers will be developed to

define the applicable airworthiness standards for the approval of side-facing seats until such time as the conditions are understood well enough that they can be incorporated into standards.

For single occupancy seats installed aft of a padded structure, such as an interior wall or furnishing, that will support the pelvis, upper arm, chest and head of an occupant seated next to the structure, the criteria available has been determined to result in a level of safety equivalent to that provided by the pass/fail criteria set forth in section 525.562 of the AWM for forward or aft-facing seats. Accordingly, the type certification basis of single occupancy side-facing seats should be specified in a SCA. The Generic FAA Issue Paper CI-X may be used as a starting point but Headquarters should be contacted regarding the contents of the SCA as outlined in SI 500-004. It is recognized that some former approvals issued in accordance with section 525.562 of the AWM may not match these criteria exactly. While those approvals are still considered valid, any new approvals should use as their initial position the criteria presently known. As experience is gained and additional data are developed, it is expected that these criteria may evolve. It should be noted that single occupancy seat designs which were not installed aft of a suitable structure have not been approved to date.

For multiple occupancy seating, the best criteria currently available cannot be said to provide an equivalent level of safety for those occupants. Therefore, an appropriate means for accepting these installations would be through an exemption from the general occupant protection requirements of subsection 525.785(b) of the AWM. In this case, an issue paper which summarizes the criteria that are currently available (FAA Generic Issue Paper CI-I can be used as a starting point), which could form the basis for inclusion in a petition for exemption from the noted requirement, if an applicant so chooses, will be developed in consultation with Headquarters. Any petition for exemption must also, of course, address why a grant of an exemption in accordance with section 5.9(2) of the *Aeronautics Act* would be in the public interest, and not likely to affect aviation safety. It should be stressed that a grant of exemption is not automatic, and the applicant must address to the satisfaction of Transport Canada, why installing multiple occupancy, side-facing seating, in lieu of forward or aft-facing seating would be in the public interest, and not likely to affect aviation safety.

Transport Canada intends to continue to refine, in collaboration with the FAA and the Joint Aviation Authorities, the compliance criteria for multiple occupancy seating with the goal of establishing an equivalent level of safety. Also, the authorities expect industry to assist in this effort. In the event those criteria become further developed, this document will be updated accordingly and the certification of multiple occupancy side-facing seating may then be processed with special conditions in lieu of exemptions. It is expected 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 airplane types.

Any questions may be directed to the Aircraft Certification Branch, Engineering Division, Occupant Safety and Environmental Systems section.

6.0 HEADQUARTERS CONTACT

For more information please contact:

Policy Standards Coordinator (AARDH/P)

Phone: (613) 990-3923

Facsimile: (613) 996-9178

E-mail: AARDH-P@tc.gc.ca

Original signed by Maher Khouzam

Maher Khouzam
Chief, Regulatory Standards
Aircraft Certification Branch