



AEROSPACE RECOMMENDED PRACTICE

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ARP 682B

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SAFETY LAP BELTS (FOR CIVIL TRANSPORT AIRCRAFT)

1. PURPOSE

This Aerospace Recommended Practice (ARP) provides recommendations intended for standardization of safety lap belts without hindering the development of new, improved design. The purpose is not to specify the design methods or specific mechanism to accomplish the objectives.

2. INTRODUCTION

The safety lap belt, or seat belt, consists of all components of the restraining device, exclusive of the seat or berth structure.

- 2.1 Lap belts are provided for the protection of human occupants of aircraft during takeoffs and landings, during flight and for planned and unplanned emergency conditions.
- 2.2 A lap belt's prime function is to retain the occupant within his seat or berth, without in itself endangering the occupant during or immediately after an incident.
- 2.3 To encourage maximum use during flight, the lab belt shall provide adequate comfort and ease of adjustment.

3. DETAILED RECOMMENDATIONS

- 3.1 Requirements of the current FAA Technical Standard Order for safety belts (TSO-C22) shall be considered as minimum requirements only.
- 3.2 The strength of the lab belt and its components shall be sufficient to preclude failure under loads equal to the design ultimate load of the seat and its structural attachments under both static and dynamic loading conditions.
- 3.3 Elongation of any portion of the lap belt (other than that associated with a device designed for energy absorption) due to crash loading shall be held to a minimum so that the deceleration of the seat and occupant are approximately equal and to reduce submarining under the belt and to minimize rebounding.
- 3.4 The attachments of the lap belt shall permit alignment of the belt with the fixed anchorages in such a manner that stress levels will not exceed design limits of the attachments and anchorages during decelerative loads imposed by the occupant.
- 3.5 The portion of the lap belt in contact with the occupant's body shall be flexible, shall have no sharp, cutting edges, and shall be approximately two in. (51 mm) in width.
- 3.6 The buckle (locking-unlocking device) shall be minimal in size, light-weight, easily operable by the user in the most unfavorable position of his body with respect to the seat, and shall have no features which might be injurious to the occupant.

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- 3.7 The design of the lap belt and buckle shall be such that its locking, unlocking and adjustment operations will be obvious without the need for printed instructions. It shall be possible to unlock the buckle quickly without having to see the release device. It shall not be possible to engage the fingers under the wrong side of the release device. A recessed push-button release may present difficulty in operation for occupants with limited manual dexterity and is not recommended.
- 3.8 To prevent "snap" loads being imposed on the occupant's body and the lap belt and anchorages, the lap belt shall be designed in such a manner as to encourage its use in snug contact with the occupant's body.
- 3.9 The locking of the lap belt shall be positive and obvious. The lap belt shall be incapable of being inadvertently used in a partially locked (unsafe) condition.
- 3.10 Release (unlocking) of the lap belt shall be easily accomplished regardless of the occupant's body attitude (hanging inverted or on side, etc.) and shall involve a single motion with one hand.
- 3.11 Release of the lap belt shall be possible by use of either hand using no more than one finger and/or thumb, after limit loading while a 250 lb (113 kg) occupant is hanging inverted in the belt.
- 3.12 Release of the lap belt shall result in immediate separation (or opening) of the belt without requiring further action by the occupant.
- 3.13 The design of the lap belt shall minimize the possibility of inadvertent release through accidental contact with the user's body, apparel, or any component of the seat.
- 3.14 The lap belt shall not loosen or open inadvertently due to acceleration imposed on the belt itself, such as that resulting from acceleration of loose belt ends.
- 3.15 Release of the lap belt by other than manual means shall not be acceptable.
- 3.16 The lap belt and fittings shall be designed in such a way that improper installation is highly improbable.

4. SAFETY LAP BELT RETRACTORS

The following additional detail criteria are recommended for belts with retractors:

- 4.1 The retracting device shall be an integral part of the lap belt assembly and shall not impair the safety, comfort, or convenience of the seated passenger.
- 4.2 The retracting device shall not reduce the ultimate strength or degree of restraint provided by the lap belt alone.
- 4.3 It shall not be possible to fasten the lap belt around the occupant without having the retractor(s) lock.
- 4.4 The retractable lap belt shall be simple to use and capable of operation by the occupant without special or verbal instructions.
- 4.5 Neither normal nor emergency operation and use of the lap belt buckle shall be affected adversely by the retractor (see 3.10 and 3.12).
- 4.6 The retracting device shall not permit nor require mechanical adjustment by the passenger.
- 4.7 The device shall be designed to minimize the possibility of entry of objects or materials that can be detrimental to the safe operation of the belt assembly or retracting unit.

Ø 4.8 Non-inertia locking-type retractors.

4.8.1 The retracting device shall be self-operating and shall lock automatically after the buckle has been fastened and shall provide positive restraint as required in paragraph 3.

4.8.2 The retracting device shall lock in all positions, from the fully extended position down to the non-
Ø looking zone, in increments not to exceed 1/2 in. (13 mm). Not more than 1/2 in. (13 mm) of belt extension shall be attributable to the retractor device with application of ultimate load.

4.8.3 After locking of the buckle and retraction of excess slack, the retractor shall not loosen, nor creep to excessive tightness.

Ø 4.9 Inertial locking type retractors are not recommended.

NOTE: The lap belt attachment points are a function of ARP 750, Passenger Seat Design - Commercial Transport Aircraft. The portion of the lap belt in contact with the occupant's body (when seated) shall cross the hips at an elevation angle of 50 deg (± 5 deg). The seat belt centerline shall pass through the plane of the compressed cushion or seat 2.5 in. $\pm .5$ (63 mm ± 13) forward of the seat reference point. See Fig. 1.

5. NOTES

5.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this document.

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