



## Civil Aviation Advisory Publication

January 2014

CAAPs provide guidance, interpretation and explanation on complying with the *Civil Aviation Regulations (CAR)* or Civil Aviation Orders (CAOs).

This CAAP provides advisory information to the aviation industry in support of a particular CAR or CAO. Ordinarily, the CAAP will provide additional 'how to' information not found in the source CAR, or elsewhere.

A CAAP is not intended to clarify the intent of a CAR, which must be clear from a reading of the regulation itself, nor may the CAAP contain mandatory requirements not contained in legislation.

**Note:** Read this advisory publication in conjunction with the appropriate regulations/orders.

# Carriage and restraint of small children in aircraft

## This CAAP will be of interest to

This Civil Aviation Advisory Publication (CAAP) applies to:

- Operators and owners of passenger aircraft
- Pilots in Command and other crew members
- Passengers.

## Why this publication was written

This CAAP has been prepared by the Civil Aviation Safety Authority (CASA) to provide advice relevant to regulations 235 and 251 of the CAR and more particularly to paragraph 13 of CAO 20.16.3—Air Service Operations - Carriage of Persons. This publication details acceptable means of restraint for infants and small children, including (i) lap-held infants, (ii) 'car-type' infant seats, and (iii) aviation harnesses; that may be used instead of the normal methods of carriage of persons in Australian passenger aircraft.

## Status of this CAAP

This is the second revision of this CAAP and supersedes CAAP 235-2(1).

## For further information

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### 1. The relevant regulations and other references

- Subregulation 235 (7), regulation 251 and 309A of CAR
- CAO 20.16.3

### 2. Acronyms

<b>AS/NZS</b>	Australian/New Zealand Standard
<b>CAAP</b>	Civil Aviation Advisory Publication
<b>CAO</b>	Civil Aviation Order
<b>CAR</b>	Civil Aviation Regulations (1988)
<b>CASA</b>	Civil Aviation Safety Authority
<b>CMVSS</b>	Canadian Motor Vehicle Safety Standard
<b>CRS</b>	Child Restraint System
<b>FAA</b>	Federal Aviation Administration (USA)
<b>FMVSS</b>	Federal Motor Vehicle Safety Standard (USA)
<b>TSO</b>	Technical Standard Order (USA)

### 3. Definitions

**BOOSTER SEAT** – A *Child Restraint System* that contains no in-built harness. The principal aim of the device is to enhance the positioning of the seat's harness on the *child*. It may be a simple cushion or plinth through to a shell with base, back and side wings.

**CHILD** – A *passenger* who has reached their third but not their thirteenth birthday (Paragraph 2 of CAO 20.16.3).

**CHILD RESTRAINT SYSTEM** – A device that interfaces with the aircraft seat and is designed to accommodate and restrain, or enhance the restraint of, an *infant* or small *child* sitting independently in their own aircraft seat. Paragraph 13 of CAO 20.16.3 refers to this type of device as an 'infant seat'.

**EMERGENCY EXIT** – means an external door, hatch or window on an aircraft intended for use by passengers or crew in an emergency.

**INFANT** – A *passenger* who has not reached their third birthday (Paragraph 2 of CAO 20.16.3).

**LAP-HELD INFANT** – An *infant* carried in the arms or on the lap of an adult *passenger*. The *infant* does not have their own aircraft seat and must be restrained by a *Supplemental Loop Belt*.

**OBLIQUE FACING SEAT** – A term given to a sub-category of *side facing seat* that is oriented approximately 45° to the aircraft's longitudinal axis.

**PASSENGER** – A person who is not a crew member (Paragraph 2 of CAO 20.16.3).

**RESTRAINT** – A device designed to safely retain a *passenger* during turbulence or a sudden deceleration. A restraint may be a *Seat Belt*, *Safety Harness*, *Child Restraint System*, etc.

**SAFETY HARNESS** – A webbing based occupant restraint consisting of at least three anchor points restraining both the pelvis and upper torso.

**SEAT BELT** – A webbing based occupant restraint consisting of two anchor points restraining the pelvis. Also commonly known as a 'lap belt'.

**SIDE FACING SEAT** – A seat rotated more than 18° from the aircraft's longitudinal axis (more generally found at 90°).

**SUPPLEMENTAL LOOP BELT** – A webbing-based infant restraint device, consisting of two loops of webbing designed to interface with the aircraft *seat belt*, being worn by the adult holding the infant. Also commonly known as an 'infant loop belt' or 'belly belt'.

### 4. Directions under Regulation 251 of CAR

4.1 Subregulation 251 (1) of CAR requires that, during take-off, landing and at other specified times of flight, all occupants shall be restrained by a seat belt. Subregulation 251 (3) of CAR provides for alternate occupant restraint methods, in lieu of a seat belt.

4.2 Paragraph 13.2 of CAO 20.16.3 permits, as an alternative to the aircraft seat belt, an infant to be carried in the arms or on the lap of an adult passenger, or in a bassinet or infant seat, in accordance with the conditions specified in paragraphs 13.3, 13.4, 13.5 and 13.6 of CAO 20.16.3. However, in all these situations, the requirement of subregulation 251 (1) of CAR for all occupants to be restrained remains applicable.

4.3 See Section 13 of this CAAP for special situations where circumstances may preclude a child wearing a restraint.

## 5. Location onboard the aircraft

5.1 If the aircraft has an aisle: window seats, or the middle seats in the central row of a two-aisle aircraft, are the preferred locations for infants or small children. Aisle seats are not recommended as they could easily be injured by a passing person or galley cart.

5.2 Infants and children should not be carried in a row that has direct access to an emergency exit unless no other seating arrangement is possible (subparagraph 13.2(4) of CAO 20.16.3).

5.3 Forward and aft facing seats are appropriate for children and lap-held infants.

5.4 Side facing and oblique seats are generally inappropriate for children. Airworthiness requirements for side facing and oblique seating require a harness or energy absorbing rest to support the arms, shoulders, head, and spine of the occupant. If a safety harness is fitted, being designed for the average sized adult, it may not support a small child in the correct way.

5.5 Side facing and oblique seats fitted with an energy absorbing rest or airbag system may be appropriate for children and/or lap-held infants. Flight crew should check the aircraft documentation.

5.6 Child restraint systems (CRSs) should only be used in approved seating orientations. In accordance with paragraph 13.5 of CAO 20.16.3, a CRS should never be installed in a side facing or oblique facing seat.

## 6. Restraint of a lap-held infant

6.1 A lap-held infant must be restrained, but the adult seat belt must not be fastened around both adult and infant (refer to subregulation 251(1) of CAR and subparagraph 13.2(2) of CAO 20.16.3). During an emergency landing sequence, the restraining loads of the adult would be transferred from the lap belt through the infant causing serious or potentially fatal injuries to the child.

6.2 A device known as a 'Supplemental Loop Belt' provides an additional seat belt with a stitched loop through which the adult lap belt is passed. The seat belt is fastened around the adult, and the Supplemental Loop Belt is then separately fastened around the infant. This is the only device which is approved for a lap-held infant during the times specified in subregulation 251 (1) of CAR.

6.3 The Supplemental Loop Belt was developed from the Extension Belt used for the larger adult passenger by adding a stitched loop of webbing. Without the stitched loop, the webbing of an Extension Belt would be twisted out of plane when passed through the adult belt and around the infant, and would tend to pull the adult belt's release buckle out of alignment. An Extension Belt without a stitched loop is not acceptable for use as a Supplemental Loop Belt.

6.4 With a lap-held infant restrained by a Supplemental Loop Belt, the adult holding the infant is not provided with an equivalent level of protection to that of a separately seated adult during a severe but potentially survivable accident. The Supplemental Loop Belt is even less effective for the infant as their skeletal structure is unable to cope with any significant load from the 5 cm wide webbing, and the crushing forces applied by the adult torso. While the Supplemental Loop Belt will provide adequate restraint of an infant during turbulence or mild longitudinal emergency loading, such as a rejected take off; to provide an equivalent level of protection for both the adult and infant, it is recommended that any infant be seated in an individual child restraint system in a separate passenger seat.

6.5 Fabric style infant carriers are not suitable as a restraint for an infant. While they allow a child to be carried hands free, they are carrying devices not restraint systems. Testing has shown they fall well short of the required strength and additionally come off the adult during flailing in a typical impact sequence. Furthermore, they should not be used in conjunction with a Supplemental Loop Belt because the restraining action of the belt will be detrimentally altered, with the possibility of increased injury to the child.

## 7. The use of bassinets

7.1 Infants less than 6 months old are unsuitable for an aircraft seat or a forward facing car-type child seat. A rear facing reclined seat or other means to allow the infant to lie down is required.

7.2 Rear facing or convertible car-type infant seats are addressed in section 10 below.

7.3 Bassinets have often been offered by airlines to permit a lap-held infant to rest during flight. However, installations have not been approved for use during take-off or landing. Common installations for bassinets have them mounted to a bulkhead immediately ahead of the passenger seat. The bassinet is stowed for take-off and landing as it would otherwise interfere with an emergency evacuation.

7.4 A bassinet or other device mounted separately to a passenger seat would only be acceptable if the installation has been shown to provide protection for the infant, does not interfere with any other safety aspect of the aircraft, and has been approved to this effect.

## 8. The use of child restraint systems

8.1 A CRS is the preferred method of restraint for an infant.

8.2 Paragraph 13 of CAO 20.16.3 permits an infant to be carried in a separate approved CRS fastened to a passenger seat.

8.3 A child up to age 4 years would also be more effectively protected if seated in a CRS. If the CRS features a moulded seat, the child will also be more comfortable than sitting in the aircraft seat. Once a child reaches approximately 4 years of age, 18kg or 100cm high, an aircraft seat becomes appropriate.

8.4 The child must be within the weight/height/age limits defined by the operating instructions or placarded limits of the device.

8.5 The CRS may be an aviation based restraint system or a car-type. See sections 9 and 10 of this CAAP for more information on the respective systems.

8.6 Operators or passengers may supply a CRS. The option of using a CRS on a particular flight is a matter between the operator and passenger. Passengers are advised that in accordance with regulation 309A of CAR, the Pilot-in-command or the aircraft operator has the final decision regarding the carriage of items, and their function, onboard the aircraft. Agreement regarding the use of a CRS should be sought with the aircraft operator before the flight, preferably at the time of booking.

8.7 The condition and maintenance of a CRS is the owner's responsibility. The CRS should be serviced in accordance with the manufacturer's instructions.

## 9. The use of an aviation child restraint

9.1 An aviation based CRS has been designed specifically for aircraft and optimised to interface correctly with the aircraft seat.

9.2 Those CRSs designed specifically for aircraft applications that are currently acceptable are:

- any CRS certificated to Federal Aviation Administration (FAA) Technical Standards Order (TSO) TSO-C100, TSO-C100a, TSO-C100b, or TSO-C100c
- any CRS certificated to European Aviation Safety Agency ETSO-C100b
- the Type 2040-1 Carechair, manufactured by Aviation Furnishings International Limited as accepted by the Civil Aviation Authority (UK)
- the Skykids® Child Seat, manufactured by Innovint Aircraft Interior GmbH as accepted by the Luftfahrt-Bundesamt (Aviation Authority of Germany)
- the CRS-2000 PlaneSeat™, manufactured by DME Corporation, certified to US 14CFR 571.213
- the Kidsflysafe Inc. CARES™ harness, manufactured by Amsafe, certificated by the FAA to Federal Aviation Regulations 21.305(d)
- any child restraint system that is integral with, and certificated as a part of, the aircraft seat.

9.3 New products are constantly being developed. Contact CASA if an aviation based product is not covered by the list in section 9.2 above.

## 10. The use of a car-type child restraint in an aircraft

10.1 Some car-type CRSs are suitable for use on aircraft.

10.2 A rear facing CRS could be a capsule type and is suitable for the younger infant who is unable to sit upright. There are also “convertible” seats which can be rear facing and then forward facing when the infant develops. Due to their design, these CRSs are usually larger, and may not physically fit into some aircraft seats, particularly in the smaller regional aircraft. Check with the aircraft operator or the pilot before your flight.

10.3 A forward facing CRS with integrated harness is suitable for infants over 6 months who can sit upright by themselves. The integrated multi-point harness is designed to restrain over a larger portion of the developing child’s body.

10.4 A booster seat covers the next period of a child’s development and allows a small child to be properly restrained by the vehicle’s lap/sash restraint. For aircraft seats with only a lap belt, a booster seat is not recommended. A booster seat is only acceptable if it is used in conjunction with an aircraft seat that has a 3 point safety harness (single shoulder strap). A booster seat could possibly be used in a seat with a 4 point safety harness (symmetrical shoulder straps) providing the CRS headrest does not obstruct the correct placement of the shoulder straps on the child.

10.5 Those car-type CRSs currently acceptable for use in Australian aircraft are:

- CRSs complying with Australian/New Zealand Standard (AS/NZS) 1754 which are secured in the aircraft in a manner consistent with the CRS’s design criteria. See paragraph 10.7 below

- CRSs accepted by the FAA as meeting Federal Motor Vehicle Safety Standard (FMVSS) No. 213. CRSs meeting FMVSS No. 213 shall have two markings: “This Restraint is Certified for Use in Motor Vehicles and Aircraft” in red lettering and “This child restraint system conforms to all applicable Federal motor vehicle safety standards”
- CRSs approved to Canadian Motor Vehicle Safety Standard (CMVSS) No. 213 entitled “Child Restraint Systems” or CMVSS No. 213.1 entitled “Infant Seating and Restraint Systems”
- CRSs meeting European Safety Standard requirements of ECE Regulation 44.

10.6 If the securing of a car-type CRS (rearward facing, forward facing or booster seat) in an aircraft involves more than using just the aircraft’s lap belt or safety harness, the design of the installation must be approved.

10.7 CASA and Standards Australia collaborated to modify AS/NZS 1754 to consider the CRS fitment in aircraft. CRSs certified to AS/NZS 1754:2013 and onward, can meet additional criteria relevant to use onboard aircraft. These criteria include installation with only the use of the aircraft seat belt. Such CRSs have labelling similar to that in Figure 1 below. CRSs certified to AS/NZS 1754 that do not contain this label are still acceptable for use onboard aircraft provided there is an approved means to attach the top tether strap. See section 11 of this CAAP for further details on specific installation details.

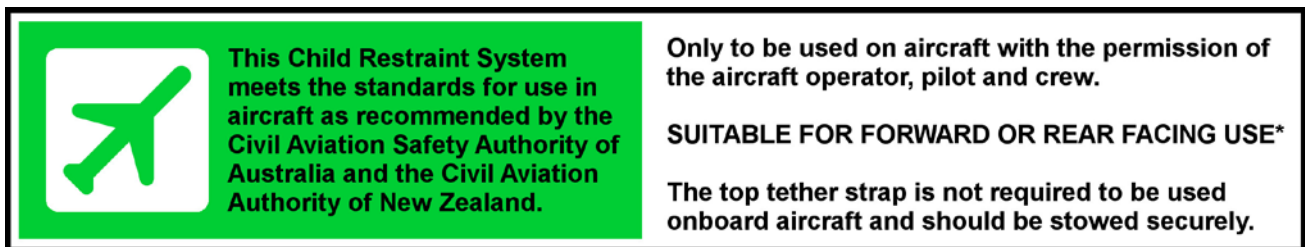


Figure 1

\* may be certified for Forward or Rear facing use, Forward only use or Rear facing only use.

## 11. Fitting a child restraint

11.1 CRSs should not be positioned so any passenger needs to pass them to get to an aisle unless that passenger is part of the family or traveling group and this configuration is required to allow adequate parental supervision and support during an emergency.

11.2 The CRS is not to be located in a row that has direct access to an emergency exit.

11.3 The CRS should not obstruct access or passageways to any emergency exit.

11.4 A CRS should only be used in approved orientations. Under no circumstances should a CRS be installed in a side facing or oblique facing seat (Paragraph 13.5 of CAO 20.16.3).

11.5 CRSs should be installed in accordance with the CRS manufacturer's instructions.

11.6 AS/NZS 1754 CRS labelled as acceptable for use on aircraft (see section 10.7 and Figure 1 above) may have installation procedures for aircraft that differ from installation in a motor vehicle:

- Seat belt paths through the CRS may be different to those used to restrain the CRS in a motor vehicle.
- Baby capsules may have special belt paths that are only used when fitting the CRS to an aircraft seat which may be hidden to avoid misuse in motor vehicles.

- Top tether straps should be secured in the manner provided by the manufacturer. An unrestrained tether strap and hook could cause serious injury during turbulence or an accident.
- Refer to the CRS manufacturer's instruction booklet and the labelling on the CRS itself for procedures to be followed whilst using onboard aircraft.

11.7 AS/NZS 1754 CRS not labelled as acceptable for aircraft use may still be used on aircraft provided the aircraft is fitted with an effective and approved anchor point for the top tether strap.

11.8 If the aircraft seat back can recline, recline the seat back and attach the CRS. Thereafter, the backrest should be positioned upright again. This procedure can ensure better tightening of the CRS on the aircraft seat.

11.9 If an armrest is fitted to the aircraft seat and it can be raised; installation of the CRS will be made easier by allowing greater access to the CRS and aircraft seat belt. It is permissible to leave an armrest in the upright position for flight if it cannot be lowered because of the CRS width, providing the CRS does not project into an adjacent seat position or an aisle.

11.10 Supplemental to CRS manufacturer's instructions, any aircraft seat belt or harness that contains a manual length adjustment should be tensioned firmly and without any slack. Those harnesses, or portions of the harness, with an inertia reel should be installed by pushing the CRS into the seat and allowing, or assisting, the inertia reel to retract the webbing as far as possible. If the inertia reel has a locking function, it should be used.

11.11 The use of an Extension Belt may ease the installation of a forward facing CRS being fitted to an aircraft with Lift-the-Flap type seat belt buckles. It also negates issues with releasing Lift-the-Flap buckles when they reside within the back of the CRS after tensioning. Any Extension Belt used in this procedure should be supplied by the aircraft operator, as only they can ensure the seat belt is compatible with the Extension Belt. The installation procedure is as follows:

- (a) Reduce the length of the adjustable half of the seat lap belt to as short as practical.
- (b) Extend the length of the Extension Belt and fasten it to the fixed length portion of the lap belt.
- (c) Install the CRS into the aircraft seat. Thread the Extension Belt/fixed lap belt portion through the CRS in accordance with the CRS instructions and fasten to the adjustable portion of the lap belt.
- (d) Tighten the Extension Belt to make the CRS secure. See Figure 2 below.
- (e) To remove the CRS, release the accessible buckle on the side of the CRS.



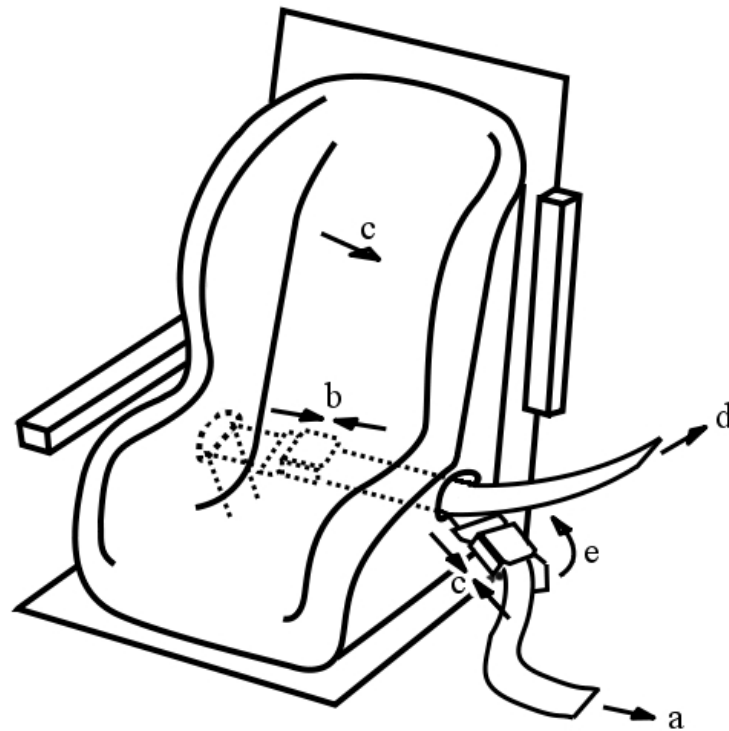


Figure 2

11.12 Extension Belts may also be required for the installation of some baby capsules/rearward facing restraints due to the length of belt required. Again, any Extension Belt used in this procedure should be supplied by the aircraft operator, as only they can ensure the seat belt is compatible with the Extension Belt.

11.13 Each CRS shall remain secured to a passenger seat during all phases of flight, unless it is properly stowed when not in use.

11.14 Many forward facing car-type CRSs have recline facilities. These may or may not be approved for use onboard aircraft. If approved for use, it is recommended that for takeoff and landing the CRS is orientated to the most upright position. During cruise flight it is acceptable to recline the CRS for the child's comfort, however, at times when aircraft seat backs are required to be upright, it is recommended the CRS also be moved to the upright position, if practical.

## 12. Seats with airbags

12.1 Both General Aviation and Air Transport aircraft are now being fitted with frontal collision airbags. These airbags may be fitted to all seats in the cabin or just a specific few. They are being fitted to some new aircraft and even retrofitted into existing aircraft.

12.2 A child who is old enough to be restrained by the aircraft seat belt (see Section 8.3 of this CAAP) will be safely protected by the airbag. The current aircraft airbag technology mounts the airbag in the seat belt itself, rather than the structure in front of the occupant like in a motor vehicle. Because of this design feature, the nature of the airbag is to inflate up or away from the occupant, thereby nullifying the issues associated with children and car airbags. An advantage of this type of airbag system is that it provides essentially equivalent protection to a wide range of occupant statures.

12.3 The pilot in command or operator should check whether a Supplemental Loop Belt is compatible for use with a seat belt containing an airbag before allowing a lap-held infant to be seated and restrained in that aircraft seat. If in doubt, the infant and responsible adult should be relocated or the infant restrained in a different manner.

12.4 A CRS should not be installed in a seat that contains an active airbag. However, while the CRS is used, the airbag may be temporarily deactivated for that seat. The Aircraft Flight Manual or Cabin Operations Manual should document if this is possible and contain details on how to achieve this. Because one safety system (the airbag) is being replaced by another (the CRS), deactivation is permissible.

### 13. Restraint in special circumstances

13.1 In special operations, such as aeromedical, the use of a restraint may conflict with the immediate medical needs of a child. In these circumstances, alternate means, such as humidicribs, need to be considered, which provide as much crash protection to the child and other occupants as is possible within the restrictions of the child's condition. Any such non-compliance or alternative compliance with the regulations must be granted with a specific exemption or approval of procedures to address the situation. (Refer exemption CASA EX40/2002).

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