Australian Government
Civil Aviation Safety Authority

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AC 91-18 v1.1

Restraint of infants and children

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Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Audience

This Advisory Circular (AC) applies to:

- operators and owners of passenger aircraft
- crew members
- passengers.

Purpose

This AC provides guidance regarding the requirements of regulation 91.560 of the *Civil Aviation Safety Regulations 1988* (CASR) and the Part 91 Manual of Standards (MOS) relating to the restraint of infants and children.

The purpose of the AC is to:

- assist operators with the development of policy and procedures for the acceptance and use of restraint systems on board the aircraft
- provide information on manufacturing standards for child restraint systems (CRS)
- provide information on the use of child restraint systems by infants, children, and special categories of passengers.

For further information

For further information, contact Flight Standards Branch (telephone 131 757).

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

Status

This version of the AC is approved by the Branch Manager, Flight Standards.

Note: Changes made in the current version are annotated with change bars.

Version	Date	Details
v1.1	November 2021	Minor updates in relation to infant supplemental loop belts, associated with the amendments to the Part 91 MOS implemented by the Part 91 MOS Amendment Instrument 2021 (No. 1).
v1.0	June 2021	This AC replaces CAAP 235-2(2) - Carriage and restraint of small children in aircraft

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1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	Advisory Circular
ADREP	accident/incident data reporting system
AS	aerospace standard
AS/NZS	Australian/New Zealand standard
ATD	anthropomorphic test dummy
ATSB	Australian Transport Safety Bureau
ATSO	Australian technical standard order
CAMI	Civil Aerospace Medical Institute (FAA)
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
CAAP	civil aviation advisory publication
CMVSS	Canadian motor vehicle safety standard
CRS	child restraint system
CSB	cabin safety bulletin
EASA	European Aviation Safety Agency
ETSO	European technical standard order
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FMVSS	federal motor vehicle safety standard
ISOFIX	international standard for attachment points for child safety seats in cars
LATCH	lower anchors and tethers for children
LODA	letter of design approval
MOS	manual of standards
MPS	minimum performance standards
MTOW	maximum take-off weight
NAA	national aviation authority
SAE	Society of Automotive Engineers
SARPs	standards and recommended practices

Acronym	Description
SMS	safety management system
STC	supplemental type certificate
TC	type certificate
TSO	technical standard order
TSOA	technical standard order authorisation

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Adult	A person who has turned 13 years of age.
Automotive child restraint system	A child restraint system that meets the requirement of one of the following: • AS/NZS 1754:2013 Child restraint systems for use in motor vehicles • Federal Motor Vehicle Safety Standards (FMVSS) No. 213 • Canadian Motor Vehicle Safety Standard (CMVSS) No. 213 • European Safety Standard requirements of ECE Regulation 44.
Aviation child restraint system	A child restraint system that is approved by CASA under Part 21 of CASR.
Bassinet	A device for accommodating an infant, which may attach to existing fittings on bulkheads, and is intended for use in flight but not during taxi, take-off and landing. Certain such devices may be certified for use in turbulence. Use of the device is restricted by infant size and weight.
Booster seat	A device that contains no built-in harness. The principal aim of the device is to enhance the positioning of a motor vehicle safety harness on a child. It may include a base, back and side wings.
Breakover seat	A passenger seat with a breakover assembly that allows the seat-back to pivot forward past its normal upright position under abnormal situations where G-force loads are directed against the seat-back. In such cases, the seat-back will “breakover” in a controlled manner to minimise damage to the seat and injury to a passenger seated aft of the seat who may be thrown against the seat-back during an emergency event.
Cabin crew member	A crew member who performs, in the interests of the safety of an aircraft’s passengers, duties assigned by the operator or the pilot in command of the aircraft but is not a flight crew member.
Child	A person who has turned two years of age but has not turned 13.
Child restraint system	Any device, other than a seatbelt, that is designed specifically to protect and restrain an infant or child during all phases of flight. It typically has an internal harness and belt combination. The device needs to interface with the aircraft seat. This includes devices that are secured using the aircraft seatbelt, as well as systems that secure the device to the aircraft seat.
Crew member	A person is a crew member of an aircraft if the person is carried on the aircraft and is: a. a person: i who is authorised by the operator of the aircraft to carry out a specified function during flight time relating to the operation, maintenance, use or safety of the aircraft, the safety of the aircraft’s passengers or the care or security of any cargo that may affect the safety of the aircraft or its occupants, and? ii who has been trained to carry out that function, or? b. a person who is on board the aircraft for the purpose of: i giving or receiving instruction in a function mentioned in subparagraph (a)(i) above, or ii being tested for a qualification associated with a function

Term	Definition
	mentioned in subparagraph (a)(i) above, or c. a person authorised by CASA under these Regulations, or by the operator, to carry out an audit, check, examination, inspection or test of a person mentioned in paragraph (a) or (b).
Critical phases of flight	The period of high workload on the flight deck; normally the periods between the beginning of taxiing until the aircraft is on the route climb phase, and between the final part of descent to aircraft parking.
Direct access	A direct route or passage from a seat to an exit from which a passenger can proceed without entering an aisle or passing around an obstruction.
Emergency exit	Door, window, or any other type of exit (e.g. tail cone exit) used as an egress point to allow maximum opportunity for cabin evacuation within an appropriate time.
Emergency exit row seating	Each seat in a row of seats located at an emergency exit, with direct access to the exit.
Exposition	For an Australian air transport operator, means the set of documents approved by CASA under regulation 119.075 of CASR in relation to the operator and, if the set of documents is changed under regulation 119.085, 119.095 or 119.105, or in accordance with the process mentioned in regulation 119.100, the set of documents as changed. Essentially, the exposition is a document or set of documents describing how an organisation operates safely (often referred to as the operations manual).
Forward-facing seat	A seat installed within 18 degrees of the longitudinal axis of the aircraft, facing forward.
Infant	A person who has not turned two years of age.
Infant sling	A device consisting of a pouch which holds an infant close to the wearer's body. It is also referred to as a vest.
Inversion test	A test that measures the safety of a child restraint system by installing it on a representative aircraft passenger seat equipped with an aircraft lap strap and rotating the seat to the inverted position (upside down) and through a full 360-degree rotation. The aircraft passenger lap strap must keep the child restraint system in place, and the dummy must not fall out of the child restraint system.
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	Seats installed in the aircraft where the occupant angle relative to the aircraft longitudinal axis is other than those described for forward-facing, rearward-facing or side-facing seats.
Operator	• if the operation of the aircraft is authorised by an AOC, a Part 141 certificate or an aerial work certificate—the holder of the AOC or certificate, or • otherwise—the person, organisation or enterprise engaged in aircraft operations involving the aircraft.
Passenger	In relation to an aircraft, means a person: • who:

Term	Definition
	○ intends to travel on a particular flight on the aircraft, or ○ is on board the aircraft for a flight, or ○ has disembarked from the aircraft following a flight, and • who is not a crew member of the aircraft for the flight.
Pilot in command	In relation to a flight of an aircraft, means the pilot designated by the operator of the aircraft as being in command and charged with the safe conduct of the flight.
Rearward-facing seats	Seats installed within 18 degrees of the longitudinal axis of the aircraft, facing aft.
Restraint	A device designed to safely restrain an occupant in their seat to prevent injuries resulting from inertia forces or other in-flight forces, such as turbulence. A restraint may be a seatbelt, safety harness or approved child restraint system.
Safety harness	A webbing-based restraint consisting of at least three anchor points restraining both the pelvis and upper torso.
Seatbelt	A webbing-based restraint consisting of two anchor points restraining the pelvis.
Side-facing seats	Seats installed into the aircraft where the occupant angle relative to the aircraft longitudinal axis is 90.0 degrees, or 270.0 degrees.
Supplemental loop belt	A belt for infant use that is attached to an adult seatbelt by inserting the adult's segment through a loop in the infant's belt. The infant is restrained by an abdominal belt attached to the adult's seatbelt. It is also referred to as a belly or loop belt, or infant seatbelt.
Tether strap	A device that is secured to the rigid structure of a child restraint system and fitted with a hook that transfers the load from the child restraint system and its occupant to the user-ready tether anchorage.

1.3 References

Regulations

Regulations are available on the Federal Register of Legislation website https://www.legislation.gov.au/

Document	Title
91.560 of CASR	Restraint of infants and children
Division 20.2, Chapter 20 of the Part 91 MOS	Restraint of infants and children

International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from http://store1.icao.int/

Document	Title
(ICAO) Doc 10002, 2nd Edition, 2020	Cabin Crew Safety Training Manual
(ICAO) Doc 10049, 2nd Edition, 2019	Manual on the Approval and Use of Child Restraint Systems
(ICAO) Doc 9859, 4th Edition, 2018	Safety Management Manual

Advisory material

CASA's advisory circulars are available at http://www.casa.gov.au/AC

CASA's Civil Aviation Advisory Publications are available at http://www.casa.gov.au/CAAP

Document	Title
CASA CSB 1	Seatbelt and harness serviceability

Other material

Document	Title
Australia/New Zealand Standard AS/NZS 1754:2013, 2013-06-07	Child restraint systems for use in motor vehicles
Australian Transport Safety Bureau, Aviation Safety Research Grant Report B2004/0241, 2006-02	Child Restraint in Australian Commercial Aircraft
Federal Aviation Administration Advisory Circular (FAA AC) 120-	Use of Child Restraint Systems on Aircraft

Document	Title
87C, 2015-09-24	
Transport Canada, Advisory Circular (AC) 605-003 Issue 04, 2016-07-18	Child Restraint Systems and other seating devices

2 Introduction

2.1 Background

2.1.1 Proper use of restraints is one of the most basic and important factors in surviving an accident, whether it is in a motor vehicle or on board an aircraft. Accident investigations and scientific dynamic testing have indicated that it is not possible for a parent to physically restrain an infant or child, especially during sudden acceleration or deceleration, unanticipated or severe turbulence, or impact. The use of CRS provides an equivalent level of safety to infants and small children as that afforded to adult passengers wearing seat belts[1].

2.1.2 Research into child safety and CRS has concluded that infants and small children are at higher risk of sustaining injuries if they are not properly secured in a suitable device that has been approved for use on board the aircraft. The use of certain types of devices, not specifically designed for use with an aircraft seat, does not provide the same level of safety as the use of a CRS approved for use on board aircraft (both to the occupant and to other passengers who occupy their own seats). Studies[2] on this subject include, but are not limited to:

- Federal Aviation Administration (FAA) — The Performance of Child Restraint Devices in Transport Airplane Passenger Seats (conducted by the Civil Aeromedical Institute (CAMI) and published in 1994)
- Australian Transport Safety Bureau (ATSB) — Child Restraint in Australian Commercial Aircraft (conducted by Human Impact Engineering and Britax Childcare Pty Ltd. and published in 2006), and
- European Aviation Safety Agency (EASA) — Study on Child Restraint Systems (conducted by TÜV Rheinland Kraftfahrt GmbH and published in 2008).

2.1.3 Infants and children differ significantly from adults in terms of size and weight, body proportions and anatomy. Seats and restraints on passenger aircraft are designed and tailored to the anatomical structure of an adult; they are not specifically designed to accommodate infants or children under a certain weight and/or height.

2.1.4 Proper use of restraints is one of the most basic and important factors in surviving an accident, whether it is in a motor vehicle or on board an aircraft. Accident investigations and scientific dynamic testing have indicated that it is not possible for a parent to physically restrain an infant or child, especially during sudden acceleration or deceleration, unanticipated or severe turbulence, or impact. In such scenarios, an infant or small child who is not restrained in a CRS may suffer serious or fatal injury.

[1] ICAO Doc 10049 Manual on the approval and use of CRS, second edition 2019.
[2] ICAO Doc 10049 Manual on the approval and use of CRS, second edition 2019.

2.1.5 To enhance their safety, it is recommended that infants and small children be restrained in an approved CRS that is appropriate to their weight and height, and is designed for use on board an aircraft. Some CRS are specifically designed for fitment to an aircraft seat and others such as motor vehicle seats are approved to be used in aircraft.

3 Infants and children

3.1 Restraint of a lap-held infant

3.1.1 A lap-held infant must be restrained[3]. However, the adult seatbelt must not be fastened around both adult and infant. 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.

3.1.2 A device known as a 'supplemental loop belt' provides an additional seatbelt with a stitched loop through which the adult lap belt is passed. The seatbelt is fastened around the adult, and the supplemental loop belt is then separately fastened around the infant.

3.1.3 A supplemental loop belt does not require an approval under the airworthiness regulations. It should be manufactured with the same techniques and the same materials as approved seatbelts and should include a stitched loop of webbing to attach the loop belt to the adult seatbelt. An extension belt without a stitched loop is not acceptable for use as a supplemental loop belt. Without the stitched loop, the webbing of an extension belt would be twisted out of the horizontal plane when passed through the adult belt and around the infant, and it would tend to pull the adult belt's release buckle out of alignment. FAA TSO-C22: Safety Belts, and SAE AS8043: Restraint Systems for Civil Aircraft, may be used to inform supplemental loop belt design and manufacture. Operators may also seek advice from approved design and production organisations on suitable supplemental loop belt designs and manufacturing techniques.

3.1.4 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 or 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 experienced in 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.

[3] Regulation 91.560 of CASR and subsection 20.03(1) of the Part 91 MOS.

3.2 Restraint of two children occupying one seat

3.2.1 Two children may occupy one seat and be restrained by one seatbelt, provided the following applies[4]:

- the children are seated side-by-side
- their combined weight is not more than 77 kg
- the seatbelt is a lap belt that restrains both children in the seat when fastened.

3.2.2 It is recommended that the seatbelt be fastened and adjusted without slack.

[4] Part 91 MOS, sub-section 20.03(2)

4 Child and infant restraint systems

4.1 Use of child restraint systems

4.1.1 A CRS is the preferred method of restraint for an infant and small children.

4.1.2 A CRS is any device, other than a seatbelt, that is designed specifically to protect and restrain an infant or child. It typically has an internal harness and belt combination and interfaces with the aircraft seat.

4.1.3 The CRS may be an aviation-based restraint system, or an automotive-type system.

4.1.4 The suitability of a particular type of CRS is based not only on the infant or child's weight and height, but also on compliance with manufacturer specifications and instructions. As a guide, it is recommended that children whose weight is less than 26 kg (60 lbs.) and whose height is less than 125 cm (49 in.) occupy an approved CRS[5].

Note: Weight restrictions presented in this AC are provided as examples and may be subject to variations in order to comply with the design and limitations of the CRS. More information on this subject follows below.

4.1.5 A child would also be more effectively protected if seated in a CRS until they reach a height and weight where the aircraft seat becomes appropriate.

4.1.6 The child must be within the weight, height, and age limits defined by the operating instructions or placarded limits of the CRS to ensure the restraint performs as intended.

4.1.7 Once a CRS is installed, it is recommended that it remain secured to the aircraft seat during all phases of flight and the infant or child is properly secured in the CRS prior to movement on the surface, take-off or landing, and whenever directed by the crew.

4.1.8 Many forward-facing automotive-type CRS have reclining facilities. These may or may not be approved for use onboard aircraft. If approved for use, the following considerations are relevant:

- the CRS is orientated to the most upright position during movement on the surface, take-off and landing, or whenever instructed to do so by the crew
- during cruise flight, it may be acceptable to recline the child restraint system for comfort; however, at times when aircraft seat backs are required to be upright, the child restraint system is also returned to the upright position.

4.1.9 Operators are encouraged to address the option of using a CRS on a flight in their policy and procedures and provide that information to passengers.

4.1.10 It is also recommended that passengers be made aware of the following where CRS are to be used on board:

- the condition and maintenance of a passenger-supplied CRS is the passenger's responsibility
- the CRS should be serviced in accordance with manufacturer instructions.

[5] Source: ICAO Doc 10049 Manual on the approval and use of CRS, second edition 2019.

4.2 Child restraint systems for infants or children with special needs

4.2.1 Most individuals using CRS on aircraft are young children, typically weighing 26 kg (60 lbs.) or less. However, there are some people who, because of physical challenges, need the support and security that a restraint system provides to travel safely on aircraft.

4.2.2 It is recommended that the operator's procedures address the following regarding the use of CRS for passengers with special needs:

- The CRS is weight and height-appropriate and capable of supporting the infant or child without impeding access to exits in an emergency.
- Crew are aware that older children may use a properly approved CRS that is appropriate for that child's size and weight.

Note: There are several CRS approved for use on aircraft specifically designed for larger children who are physically challenged.

4.3 Medical transportation

4.3.1 In special operations, such as medical transport operations, the use of a restraint may conflict with the immediate medical needs of an infant/child. In these circumstances, alternate means, such as humidicribs/incubators (neonatal intensive care units), need to be considered.

4.3.2 Qualified medical personnel may need to accompany the infant or child.

5 Aviation child restraint systems

5.1 Aviation child restraint systems suitable for use on board aircraft

5.1.1 Aviation CRS means a child restraint system that is approved by CASA, or by the NAA of a recognised country, and has been designed specifically for aircraft and optimised to interface correctly with the aircraft seat.

5.1.2 The CRS designed specifically for aircraft applications that are currently acceptable are as follows:

- CRS certificated to Federal Aviation Administration (FAA) Technical Standard Order (TSO) TSO-C100, TSO-C100a, TSO-C100b, or TSO-C100c or later approved TSOs.
- CRS certificated to European Aviation Safety Agency (EASA) European Technical Standard Order ETSO-C100b or later approved ETSOs.
- Type 2040-1 Carechair, manufactured by Aviation Furnishings International Limited as accepted by the Civil Aviation Authority (UK).
- Skykids® Child Seat, manufactured by Innovint Aircraft Interior GmbH as accepted by the Luftfahrt-Bundesamt (Aviation Authority of Germany).
- CRS-2000 PlaneSeat™, manufactured by DME Corporation, certified to US 14CFR 571.213.
- The Kidsflysafe Inc. Child Aviation Restraint System (CARES™) harness, manufactured by Amsafe, certificated by the FAA to FAR 21.305 (d).
- Any child restraint system that is integral with, and certificated as a part of, the aircraft seat, via TSO, ATSO, supplemental type certificate or other recognised airworthiness approval acceptable to CASA.

5.1.3 Depending on its design and the intended occupant, a CRS may be rearward facing, forward facing, or a combination system.

5.1.4 Rearward facing CRS are typically intended for an occupant who is unable to walk unassisted and weighs less than 10 kg (22 lbs). However, some rearward-facing CRS can accommodate occupants of a greater weight. Weight restrictions are specified on the device and may vary from one CRS to another.

5.1.5 Figure 1 below shows an example of a rearward facing CRS.

Figure 1: Rearward facing CRS

5.1.6 A forward-facing CRS is typically intended for an occupant weighing 10 kg to 30 kg (22 lbs. to 66 lbs.). However, some forward-facing CRS can accommodate occupants of a greater weight. Weight restrictions are specified on the device and may vary from one CRS to another.

5.1.7 Figure 2 below shows an example of a forward-facing CRS.

Figure 2: Forward-facing CRS

6 Automotive child restraint systems

6.1 Suitability of automotive child restraint systems for use on board aircraft

6.1.1 A CRS designed for a motor vehicle may or may not be compatible, in fit or function, with aircraft seats and, in some cases, cannot be installed properly and may not perform as intended on board an aircraft.

6.1.2 These devices are not configured to be fully compatible with an aircraft seat (break-forward seat backs, no attachment point for a tether strap etc.), nor are they fully tested with aircraft seats in mind.

6.1.3 The lack of available space between armrests (width of seat base) and the lack of space between two rows of seats (seat pitch) are two reasons a motor vehicle CRS may not fit on board a particular aircraft.

6.1.4 The width between the armrests of an aircraft seat depends on the location and style of the armrests. Some motor vehicle CRS do not fit between the armrests, particularly on seats with seat trays stowed in the armrests. In addition, the dimensions of the available seat base (on which the CRS rests) may differ between motor vehicles and aircraft. The typical seat pan of an aircraft is smaller and narrower than that of a motor vehicle.

6.1.5 The seat pitch or the available space between two rows of seats may also be an issue and particularly significant for aft-facing CRS as they are further reclined and take up more horizontal space.

6.1.6 The inability to be effectively installed using existing aircraft seatbelts may render motor vehicle CRS ineffective on board an aircraft. The location of anchor points can also be problematic. This includes the location of the aircraft seatbelt attachment to the aircraft seat, as a CRS must move forward until the belt path angle allows for belt tension forces to restrain the device.

6.1.7 The installation method and the available manoeuvring space for installing a CRS in aircraft differ from the motor vehicle environment. Parents usually stand outside the motor vehicle and can position themselves on either side of the CRS to attain the best possible position for installing the device.

6.1.8 CRS installation frequency may pose a problem. In motor vehicles, the CRS is usually installed and left in the same position for several months, or the base remains installed when the rest of the device is removed. In an aircraft, the CRS is only installed for a flight segment.

6.2 Automotive child restraint systems currently acceptable for use on board aircraft in Australia

6.2.1 Currently, there are some automotive CRS that are acceptable for use in Australian aircraft. These are:

- CRS complying with Australian/New Zealand Standard (AS/NZS) 1754 secured in the aircraft in a manner consistent with the CRS design criteria. Also refer to sub-sections 7.1.3 and 7.1.4 below
- CRS accepted by the FAA as meeting Federal Motor Vehicle Safety Standard (FMVSS) No. 213. CRS meeting FMVSS No. 213 must 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'
- CRS 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”
- CRS meeting European Safety Standard requirements of ECE Regulation 44.

6.2.2 If the securing of an automotive-type CRS (rearward facing or forward facing) in an aircraft involves more than using the aircraft lap belt or safety harness, the design of the installation must be approved by a Part 21M of CASR authorised person, Part 21J of CASR ADO or a Part 2.425 of CASR delegate.

7 Labelling

7.1 Label applicability

7.1.1 CRS used on board aircraft should have a legible label indicating the applicable design standards and the date of manufacture.

7.1.2 The following sub-sections provide examples of labels indicating that a CRS meets the design standards to be acceptable for use on board an Australian aircraft.

7.1.3 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 later can meet additional criteria relevant to use onboard aircraft. These criteria include installation with only the use of the aircraft seatbelt. Such CRS have labelling like that in Figure 3 below:

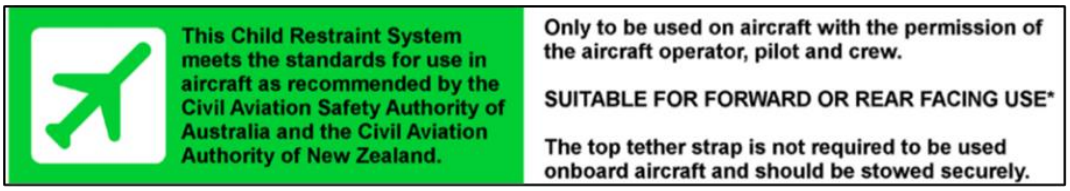

Figure 3: CRS certified to meet additional criteria relevant to use on aircraft

Note: The asterisk on the label indicates that it may be certified for forward or rearward-facing use, forward-facing only use, or rearward-facing only use.

7.1.4 CRS certified to AS/NZS 1754 that do not feature on the label in Figure 3 above are still acceptable for use on board aircraft, provided there is an approved means to attach the top tether strap. Figure 4 below is an example of an AS/NZS 1754 label:

Figure 4: CRS certified for use on aircraft with an approved means to attach the top tether strap

7.1.5 In accordance with the Canadian Motor Vehicle Restraint Systems Standard and Booster Seats Safety Regulations, restraint systems that are manufactured or sold in Canada must be affixed with the National Safety Mark in Figure 5 below. This mark indicates the number of the standard(s) to which the restraint system conforms usually CMVSS 213 in the case of a child restraint system, or 213.1 in the case of an infant restraint system.

Note: In Figure 5 below, “XXXX” is replaced with the appropriate standard reference (either 213 or 213.1), as applicable. The “YYY” in the centre of the label indicates the applicable authorisation number assigned by the Minister.

Figure 5: Canadian National Safety Mark template

7.1.6 Canadian-manufactured infant and child restraint systems do not require a separate label indicating certification for use in aircraft, as the successful completion of an inversion test (to simulate turbulent flight) is a requirement for both restraint systems.

7.1.7 However, some Canadian child restraint systems cannot be used in aircraft because of designs that make them easier to install in motor vehicles. Because their designs make them incompatible with an aircraft seat, these restraint systems will contain a label limiting their use to motor vehicles. Although these restraint systems will have the National Safety Mark, they will also have a label containing the following text in red lettering: 'This Restraint is Certified for Use in Motor Vehicles. This Restraint is Not Certified for Use in Aircraft' as shown in Figure 6 below.

Figure 6: Example of labelling for Canadian restraint system not approved for aircraft use

7.1.8 Canadian Technical Standard Orders (CAN-TSO) C-100b and C-100c contain minimum performance standards for the testing and evaluation of a child restraint system or aviation child safety device intended to provide proper restraint of children in the aircraft environment and which would be suitable for use during all phases of flight. A system or device manufactured in accordance with CAN-TSO must be permanently and legibly marked with at least the manufacturer’s name, the subassembly part number, and the CAN-TSO number (e.g. CAN-TSO-C100b or CAN-TSO-C100c).

7.1.9 Restraint systems manufactured to meet United States FMVSS 213 must bear two labels that contain the following text in red lettering: 'This child restraint system conforms to all applicable Federal Motor Vehicle Safety Standards' and 'This Restraint

is Certified for Use in Motor Vehicles and Aircraft'. Typically, the text for these two labels is merged onto a single label as shown in Figure 7 below.

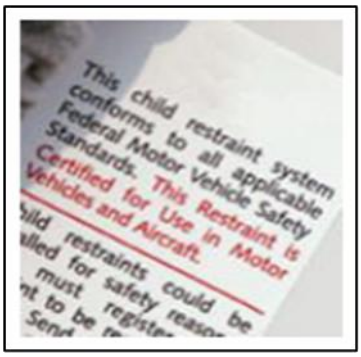

Figure 7: Example of labelling requirement for a United States CRS

7.1.10 In the United States, regulations require a separate statement certifying the restraint system for use in aircraft, as American manufacturers are only required to conduct an inversion test if the manufacturer wants to certify the system for aircraft.

7.1.11 A CRS manufactured to the UN ECE standard will bear an international approval mark consisting of a circle surrounding the letter 'E' followed by the distinguishing number of the country that has granted approval as shown in Figure 8 below.

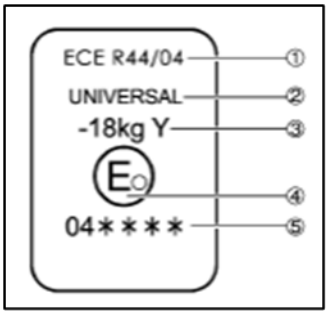

Figure 8: ECE R44 approval mark template

7.1.12 To be acceptable for use on board an Australian aircraft, the UN ECE 44 child restraint system must have also been subject to the Qualification Procedure for Child Restraint Systems for Use in Aircraft (TÜV Doc.: TÜV/958-01/2001). The numbered information shown in Figure 8 above is:

1 - The ECE regulation number and revision series number.
2 - The child seat category.
3 - The mass range for which the child restraint has been designed (the symbol 'Y' in the case of a device containing a crotch strap).
4 - A circle surround the letter 'E' followed by the distinguishing number of the country which has granted approval.
5 - The approval number of the device.

7.1.13 The manufacturer of the CRS will have been issued a certificate by TÜV Kraftfahrt GmbH (Germany), and the child restraint system will have a label stating 'For use in Aircraft'. Figure 9 below contains examples of this labelling. The example on the left-hand side was in use prior to 2013; the example on the right-hand side has been used since 2013. In either case, the applicable text to note is 'For use in aircraft'.

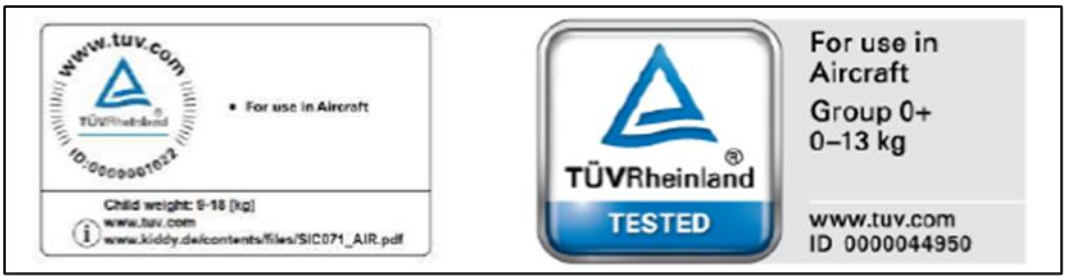

Figure 9: Example of labelling of TUV Rheinland

7.2 Child restraint systems not referenced

7.2.1 New products are constantly being developed. It is recommended that contact be made with CASA if an aviation-based product is not covered in the above-mentioned list.

7.2.2 Parents or guardians of children who require further information may contact CASA Airworthiness Engineering Branch:

E-mail: airworthiness.engineering@casa.gov.au
Phone: 131 757

8 Devices not approved for use as a child restraint system

8.1 Booster seat

8.1.1 A booster seat is a device that contains no built-in harness. 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. The principal aim of the device is to enhance the positioning of a motor vehicle safety harness on a child. It may include a base, back and side wings.

8.1.2 This type of device shown at Figure 10 below is not suitable for use as a CRS on board aircraft.

Figure 10: Example of a booster seat

8.2 Infant carrier

8.2.1 These typically consist of a pouch as shown in Figure 11 below, which holds the infant close to the wearer's body. These carriers and other similar-type carriers are not approved for use as a CRS in an aircraft and may not be used during movement of the aircraft on the surface, take-off, landing or at any time the seat belt sign is illuminated.

8.2.2 While they allow an infant to be carried hands-free, they are carrying devices and not restraint systems, and may slip off the adult because of flailing during periods of turbulence or an accident.

8.2.3 Many infant carriers also include a caution to parents that the carrier is not meant for holding infants in motor vehicles and should not be used in place of a child restraint system that meets FMVSS, CMVSS, ECE, AS/NZ, ISO or other internationally accepted standards, as applicable.

Figure 11: Example of an infant carrier

8.3 Bassinets

8.3.1 Bassinets are typically offered by operators 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.

8.3.2 Bassinets are not considered CRS. They should not be used during critical phases of flight including taxiing, take-off and landing[6].

8.3.3 Unless the device has been approved for use during turbulence, it is recommended that an infant be removed from a bassinet in the event of turbulence and parents be made aware of the need to remove and restrain the infant under these circumstances. Bassinets are to be used in accordance with the manufacturer instructions.

8.3.4 A bassinet or other device mounted to something other than 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.

[6] Regulation 91.560(1) of CASR

9 Child restraint system location and installation

9.1 Child restraint system location

9.1.1 In developing procedures for the location of CRS in the aircraft, it is recommended that the operator define where CRS can and cannot be installed and identify preferred locations.

9.1.2 Relevant considerations include:

- the CRS cannot block emergency exits or access to safety and emergency equipment
- the CRS cannot be located in an emergency exit row or aisle seat
- the CRS cannot obstruct access or passageways to an emergency exit
- not locating the CRS in the seat row immediately forward or aft of an emergency exit row
- identifying window seats as preferred locations
- locating the CRS in a seat next to, or closest to, the accompanying responsible person in the same row unless the aircraft configuration does not permit it
- not positioning the CRS where any passenger needs to pass it to get to an aisle, unless that passenger is part of the family or traveling group and this configuration is required to allow adequate supervision and support during an emergency.

9.1.3 While a window seat is generally the preferred location for a CRS, other locations may be acceptable, provided the CRS does not block the egress of any passenger, including the accompanying responsible person, to the aisle used to evacuate the aircraft.

9.1.4 The operator's evacuation procedures will also need to be considered and the location of CRS restricted accordingly. Examples include:

- where evacuation procedures or instructions to passengers include the removal and placement of emergency exit hatches in the row forward or aft of the emergency exit row, CRS are not permitted in those rows
- if an aircraft has breakover seats in the row forward of an exit to create space for a crew member as part of their evacuation procedures, or to create a wider evacuation path for passengers, CRS are not located in that row
- an aisle seat or a cross aisle seat (at a bulkhead) that forms part of the evacuation route to exits is not used for CRS.

9.2 Installation of child restraint systems on aircraft

9.2.1 When developing procedures for the installation of CRS on the aircraft, the following sub-sections provide relevant considerations.

9.2.2 Responsibility for installation:

- identifying persons with responsibilities in relation to the installation of CRS and defining the responsibilities of each e.g. passenger, crew, ground operations

personnel, engineers. This may depend on whether the passenger or operator is providing the CRS.

9.2.3 Manufacturer criteria and instructions:

- to ensure the CRS performs as required, ensuring it is installed on the aircraft seat in accordance with the manufacturer criteria and instructions
- manufacturer instructions may include the type of connecting device for which the CRS is approved, and installation for forward- and rearward-facing CRS in relation to:
  - forward-, rearward-, side- and oblique-facing aircraft seats
  - seats equipped with an inflatable restraint/airbag
  - seats which can accommodate seatbelt extensions
  - seats with unique designs.

9.2.4 Aircraft seat and CRS orientation:

- the CRS is only used in approved orientations and as indicated on the label for the size of the child
- forward-facing CRS are installed on forward-facing passenger seats. They may be installed on rearward-facing passenger seats if fitted in the same direction as the passenger seat on which they are positioned, and if stated in the manufacturer criteria.
- rearward-facing CRS are installed on forward-facing passenger seats

CRS are not installed on side or oblique-facing seats unless otherwise stated by the manufacturer.

9.2.5 Aircraft seat design:

- if the aircraft seat back can recline, it is reclined before attaching the CRS and then the backrest positioned upright again. This can ensure better tightening of the CRS on the aircraft seat.
- if an armrest is fitted to the aircraft seat and it can be raised, installation of the CRS will be made easier by raising the armrest to allowing greater access to the CRS and aircraft seatbelt. Providing the CRS does not project into an adjacent seat position or an aisle, it is permissible to leave an armrest in the upright position for flight if it cannot be lowered because of the CRS width.

9.2.6 Seats with airbags:

- a CRS is not installed on a seat with an airbag unless the airbag is deactivated or if the airbag, when activated, does not create a hazardous situation for the CRS occupant. Section 10 of this AC provides further information.

9.2.7 Installation procedures that differ to motor vehicle installation:

- CRS certified to AS/NZS 1754 and labelled as acceptable for use on aircraft as described in sub-section 7.1.3 of this AC may have installation procedures for aircraft that differ from installation in a motor vehicle

- the importance of referring to the CRS manufacturer instruction booklet and the labelling on the CRS itself for procedures to be followed while in use on board aircraft is highlighted to persons assigned installation responsibilities
- different installation procedures may include:
  - seatbelt paths through the CRS that differ to those used to restrain the CRS in a motor vehicle
  - baby capsules that 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
  - the importance of securing top tether straps in the manner provided by the manufacturer due to the risk of serious injury caused by an unrestrained tether strap and hook during turbulence or an accident.

9.2.8 Aircraft seatbelts and extension belts:

- supplemental to CRS manufacturer instructions, any aircraft seatbelt or harness that contains a manual length adjustment is tensioned firmly without any slack
- for harnesses, or portions of the harness with an inertia reel, installation is achieved 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, the locking function is used
- the use of an extension belt may ease the installation of a forward-facing CRS to an aircraft with 'Lift-the-Flap' type seatbelt 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 is supplied by the aircraft operator to ensure the seatbelt is compatible with the extension belt. The installation procedure is as follows:
  - reduce the length of the adjustable half of the seat lap belt to as short as practical
  - extend the length of the extension belt and fasten it to the fixed length portion of the lap belt
  - 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
  - tighten the extension belt to make the CRS secure as shown in Figure 12 below
  - to remove the CRS, release the accessible buckle on the side of the CRS

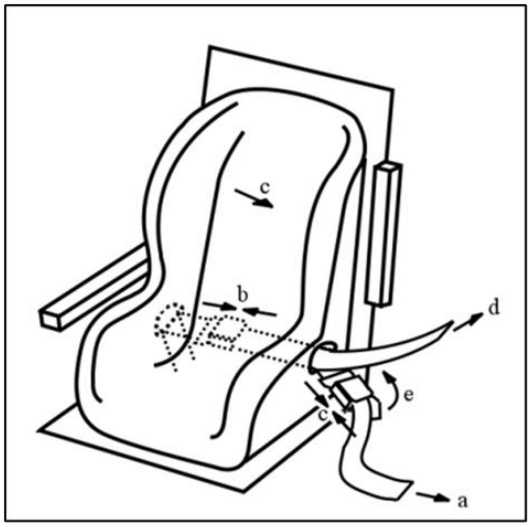

Figure 12: Tightening the extension belt to secure a CRS

- extension belts may also be required for the installation of some baby capsules and rearward facing restraints due to the length of belt required. Any extension belt used in this procedure is supplied by the operator to ensure the seatbelt is compatible with the extension belt.

– once installed, it is recommended that the CRS remain secured to the aircraft seat during all phases of flight.

10 Seats with airbags

10.1 Child restraint systems and lap-held infants in seats with airbags

10.1.1 An inflatable restraint is a design feature installed on a passenger seat restraint system that contains an integrated inflatable airbag. The system may include an inflatable lap strap, or a combined inflatable lap strap and shoulder harness.

10.1.2 Certain late model aircraft used for air transport are fitted with this system. The airbags may be fitted to all seats in the cabin, or just a specific few. They may be fitted to some new aircraft and retrofitted into existing aircraft.

10.1.3 A child who is old enough to be restrained by the aircraft seatbelt will be safely protected by the airbag. An airbag mounted in the seatbelt itself inflates 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 essential equivalent protection to a wide range of occupant statures.

10.1.4 It is highly unlikely that a supplemental loop belt used to restrain a lap-held infant would be compatible for use with a seatbelt containing an active airbag. This is due to the proximity of the infant to the inflating airbag, which would likely cause injury when the airbag rapidly inflates. Before allowing a passenger and lap-held infant to be seated and restrained in an airbag-equipped aircraft seat, the operator needs to consult the manufacturer of the seatbelt airbag system. If there is any doubt, it is recommended the passenger and lap-held infant not be allocated a seat with an active airbag, or the infant be restrained in a different approved manner.

10.1.5 It is not recommended that CRS be installed in a seat with a seatbelt that contains an active airbag. However, while the CRS is used, the airbag may be temporarily deactivated for that seat. Because one safety system (the airbag) is being replaced with another (the CRS), deactivation is permissible. The operator should document whether deactivation is possible and, if so, detail how to achieve this. Consideration should also be given to other requirements that may be affected by deactivation e.g. airworthiness requirements contained in the Dispatch Deviation Guide.

10.1.6 Airbags may also be fitted to bulkheads or seat backs. In determining whether a CRS can be fitted to seats at these locations, the same considerations would apply in relation to the compatibility of the CRS for use with an active airbag and, if not, whether deactivation is possible.

11 Operator policy and procedures

11.1 Policy and procedures for the use of child restraint systems

11.1.1 To ensure a common understanding among passengers and the operator's personnel, it is recommended that the operator's policy and procedures for the use of CRS address the following:

- acceptable methods of restraining infants and children on board the aircraft
- CRS approved for use on board
- identifying approved and prohibited CRS
- CRS acceptance and refusal policies
- responsibilities for the provision, acceptance and installation of CRS
- permitted and preferred locations in the cabin
- CRS installation
- requirements for accompanying responsible persons e.g., installing the CRS (where applicable), securing the infant or child in the CRS, releasing the infant or child from the CRS
- considerations related to special circumstances, e.g., passengers travelling with more than one infant or child or an infant or child with special needs
- the use of CRS in normal, abnormal and emergency situations.

11.1.2 Providing passengers with access to the relevant information prior to travel will assist with their understanding of, and compliance with, operator procedures and requirements.

11.2 Normal, abnormal and emergency procedures

11.2.1 Normal operating procedures for crew and other persons with responsibilities in relation to the use of CRS on board the aircraft would include:

- acceptance and seat allocation of CRS
- installation on board
- passenger briefings
- crew verification that the CRS is approved for use on board the aircraft, correctly installed and not located where it could impede other passengers in an emergency or cabin crew from carrying out their duties. Consideration should be given to completing this prior to door closure for departure.

11.2.2 It is recommended that the following information regarding the CRS be provided to the accompanying responsible person(s), in addition to the general passenger safety briefing prior to departure:

- when the CRS occupant is required to be secured e.g., certain phases of flight, when the seatbelt sign is illuminated, or when directed by crew
- securing the infant or child in turbulence

- securing the infant or child in the event of an anticipated emergency landing or ditching
- in the event of an emergency, removing the infant/child form the CRS and leaving the device behind.

11.2.3 Abnormal and emergency procedures regarding infants/children in CRS would include:

- the actions to be taken by crew and responsibilities of the accompanying responsible adult in the event of an abnormal or emergency situation
- briefings to be provided to the accompanying responsible adult in an anticipated emergency landing/ditching and evacuation, for example:
  - instructions to secure the infant/child in the CRS until the evacuation commences
  - instructions to remove the infant/child from the CRS and leave the device behind during the evacuation.