



Advisory Circular

Subject: Child Restraint Systems and Other Seating Devices

Issuing Office:	Standards	Document No.:	AC 605-003
File Classification No.:	Z 5000-34	Issue No.:	04
RDIMS No.:	11194552 v13	Effective Date:	2016-07-18

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1.0 INTRODUCTION

- (1) This Advisory Circular (AC) is provided for information and guidance purposes. It describes an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

1.1 Purpose

- (1) The purpose of this document is to provide operators with information regarding:
- (a) The use of child restraint systems on aircraft;
 - (b) The acceptance of additional child restraint systems manufactured to foreign standards;
 - (c) The use of other seating devices by infants, children, or special needs passengers; and
 - (d) The evacuation of infants and small children.

1.2 Applicability

- (1) This document is applicable to persons operating Canadian aircraft.

1.3 Description of Changes

- (1) Due to the number of changes incorporated in this issue, readers should review the entire document. The major changes are:
- (a) Paragraphs 4.0(6) to 4.0(8) and 4.1(8) to 4.1(11): added information related to the availability of an exemption permitting the acceptance of additional child restraint systems manufactured to foreign standards; and
 - (b) Section 5.0 – Other Seating Devices: added information related to the use of other seating devices on board aircraft.

2.0 REFERENCES AND REQUIREMENTS

2.1 Reference Documents

- (1) 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) Part I, Subpart 01 of the *Canadian Aviation Regulations (CARs) — Interpretation*;
 - (c) Part V, Subpart 21 of the CARs — *Approval of the Type Design or a Change to the Type Design of an Aeronautical Product*;
 - (d) Part VI, Subpart 02 of the CARs — *Operating and Flight Rules*;
 - (e) Part VI, Subpart 05 of the CARs — *Aircraft Requirements*;
 - (f) Chapter 551 of the *Airworthiness Manual (AWM) — Aircraft Equipment and Installation*;
 - (g) Canadian Technical Standard Order (CAN-TSO) C100b — *Child Restraint Systems (CRS)*;
 - (h) CAN-TSO C100c — *Aviation Child Safety Device (ACSD)*;
 - (i) Commercial and Business Aviation Advisory Circular (CBAAC) 0155, 1999-05-06 — *Brace Positions for Impact*;

- (j) Transport Canada Consumer Information Notice, TP 14563, Issue No. 2011-C01 E, 2011-03-30 — *Children’s car seats and booster seats: How long are they safe?*;
- (k) *Motor Vehicle Safety Act* (R.S., 1993, c. 16);
- (l) *Motor Vehicle Restraint Systems and Booster Seats Safety Regulations* (SOR/2010-90);
- (m) National Transportation Agency, Decision no. 208-A-1995, 1995-04-20 – *APPLICATION by Mrs. Vecchiarelli pursuant to subsection 63.3(1) of the National Transportation Act, 1987, R.S.C., 1985, c. 28 (3rd Supp.)*;
- (n) International Civil Aviation Organization (ICAO) Doc 10049, First Edition, 2015 – *Manual on the Approval and Use of Child Restraint Systems*;
- (o) United Nations (UN) Economic Commission for Europe (ECE) Regulation No. 44 Revision 3, 2014-02-27 – *Uniform Provisions Concerning the Approval of Restraining Devices for Child Occupants of Power-Driven Vehicles (“Child Restraint Systems”)*;
- (p) Australia/New Zealand Standard AS/NZS 1754:2013, 2013-06-07 – *Child restraint systems for use in motor vehicles*;
- (q) TÜV Doc. TÜV/958-01/2001 – *Qualification Procedure for Child Restraint Systems for Use in Aircraft*;
- (r) Title 14 of the *Code of Federal Regulations* (14 CFR) part 21, section 21.305(d);
- (s) Federal Aviation Administration Advisory Circular (FAA AC) 120-87C, 2015-09-24 — *Use of Child Restraint Systems on Aircraft*;
- (t) FAA Flight Standards Information Bulletin (FSAT) 05-01, 2005-01-31 – *Use of Orthotic Positioning Devices by People with Disabilities in Aircraft Seats*;
- (u) United States Department of Transportation (US DOT) Report DOT/FAA/AM-65/23, 1965-08 – *Determination of centers of gravity of children, sitting and standing*;
- (v) US DOT Report DOT/FAA/AM-94/19, 1994-09 — *The Performance of Child Restraint Devices in Transport Airplane Passenger Seats*;
- (w) US DOT Report DOT/FAA/AM-01/18, 2001-11 — *Caring for precious cargo, Part I: Emergency aircraft evacuations with infants onto inflatable escape slides*;
- (x) US DOT Report DOT/FAA/AM-05/2, 2005-03 — *Caring for precious cargo, Part II: Behavioural techniques for emergency aircraft evacuations with infants through the Type III over wing exit*;
- (y) US DOT Report DOT/FAA/AM-11/3, 2011-02 – *Aviation Child Safety Device Performance Standards Review*;
- (z) Human Factors: The Journal of the Human Factors and Ergonomics Society, 1979-12-01 – *An Evaluation of Adult Clasp Strength for Restraining Lap-Held Infants*;
- (aa) United Kingdom Civil Aviation Safety Authority (UK CAA) Safety Notice SN-2012/015, 2012-11-08 – *Meru TravelChair – Restraint Device for Disabled Children*;
- (bb) Australian Transport Safety Bureau, Aviation Safety Research Grant Report B2004/0241, 2006-02 — *Child Restraint in Australian Commercial Aircraft*;
- (cc) Civil Aviation Safety Authority (CASA) Civil Aviation Advisory Publication (CAAP) 235-2(2), 2014-01 – *Carriage and restraint of small children in aircraft*;
- (dd) European Union Regulation (EU) No 965/2012 on Air Operations, associated Decision AMC/GM to Part CAT: AMC1 CAT.IDE.A.205, 2014-04-24 – *Seats, seat safety belts, restraint systems and child restraint devices*;
- (ee) European Aviation Safety Agency (EASA) Research Study, EASA.2007.C.28, 2008-11-29 — *Study on Child Restraint Systems*;

- (ff) EASA Safety Information Bulletin No. 2013-06, 2013-05-17 — *Evacuation of Infants*, and
- (gg) International Air Transport Association (IATA), 2015-05 – *Guidance on the Safety of Infants and Children on Board*.

2.2 Cancelled Documents

- (1) Not applicable.
- (2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

2.3 Definitions and Abbreviations

- (1) The following **definitions** are used in this document:
 - (a) **Booster Seat:** means a removable device designed to be used in a vehicle for seating a person whose mass is at least 18 kg (40 lbs), to ensure that the lap strap and shoulder harness fits properly. A booster seat has no in-built harness and may include a shell with base, back and side wings.
 - (b) **Canadian Technical Standard Order:** means a standard of airworthiness for an appliance or part:
 - (i) that is published by the Minister; or
 - (ii) that is published by a foreign state with which Canada has an airworthiness agreement or similar agreement and that is adopted by the Minister and specified in Chapter 537 – *Appliances and Parts* of the *Airworthiness Manual*.
 - (c) **Child Restraint System:** means a removable device that is designed to be used together with the seat of an aircraft specifically to protect and restrain an infant or a child during all phases of flight. The device must be secured to the seat of an aircraft using the aircraft safety belt.
 - (d) **Disabled Person:** means a person, other than an infant with special needs, who, for orthopaedic reasons or because of the person's build or other physical characteristics, is unable to use an infant restraint system, a child restraint system, a booster seat, or an aeroplane safety belt.
 - (e) **Evacuation Aid:** means an escape device used by occupants during the emergency evacuation of an aircraft, such as slides, ramps and slide/rafts.
 - (f) **Forward-facing Seat:** a seat installed within eighteen degrees of the longitudinal axis of the aircraft.
 - (g) **Infant:** means a person under two years of age.
 - (h) **Inversion Test:** means 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.
 - (i) **Oblique-facing Seat:** a seat 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.
 - (j) **Operator:** in respect of an aircraft, means the person that has possession of the aircraft as owner, lessee or otherwise.
 - (k) **Rearward-facing Seat:** a seat installed within eighteen degrees of the longitudinal axis of the aircraft, facing aft.

- (l) **Safety Belt:** means a personal restraint system consisting of either a lap strap or a lap strap combined with a shoulder harness.
 - (m) **Side-facing Seat:** a seat installed in the aircraft where the occupant angle θ relative to the aircraft longitudinal axis is $\theta = 90.0$ degrees, or $\theta = 270.0$ degrees.
 - (n) **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.
- (2) The following **abbreviations** are used in this document:
- (a) **AS/NZS:** Australia/New Zealand Standard;
 - (b) **CAMI:** Civil Aerospace Medical Institute;
 - (c) **CAN-TSO:** Canadian Technical Standard Order;
 - (d) **CARES:** AmSafe child aviation restraint system assembly, part number 4082-1-()-();
 - (e) **CAR:** Canadian Aviation Regulation;
 - (f) **CFR:** Code of Federal Regulations;
 - (g) **CMVSS:** Canada Motor Vehicle Safety Standard;
 - (h) **EASA:** European Aviation Safety Agency;
 - (i) **ECE:** Economic Commission for Europe;
 - (j) **FAA:** Federal Aviation Administration;
 - (k) **FMVSS:** United States Federal Motor Vehicle Safety Standard;
 - (l) **OPD:** Orthotic Positioning Device; and
 - (m) **TCCA:** Transport Canada Civil Aviation.

3.0 BACKGROUND

- (1) Infants and children differ significantly from adults in terms of size and weight, body proportions and anatomy. Current seats 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) Due to their short stature, the standard aircraft lap strap is generally not well suited for the safe restraint of small children (those less than seven years of age or with a body length less than 125 cm (49 in.)). There is a risk that the lap strap will slip into the child's abdominal region in the event of an accident or during turbulence, which could result in severe internal injuries.
- (3) To enhance their safety, infants and children should be restrained in an approved child restraint system that is appropriate to their weight and/or height that can safely accommodate their body structure and is designed for use on board an aircraft or with an aircraft seat.
- (4) Although the use of child restraint systems on board Canadian aircraft is not mandatory, their use has been permitted in Canada since 1990.
- (5) Operational regulations pertaining to the safe transportation of occupants using approved child restraint systems were introduced upon publication of the *Canadian Aviation Regulations* (CARs) in 1996. Sections 605.26 and 605.28 of the CARs establish criteria for the use of passenger safety belts, restraint systems and child restraint systems.
- (6) Subsection 101.01 of the CARs provides a definition of child restraint systems that is limited to only those devices meeting the standards specified in Chapter 551 – *Aircraft Equipment and Installation* of the *Airworthiness Manual*.

- (7) Section 551.501 of the *Airworthiness Manual* contains the standards of airworthiness for the approval of child restraint systems. However, those standards are limited to CAN-TSO-C100b and specified motor vehicle safety standards of Canada and the United States.
- (8) Transport Canada Civil Aviation (TCCA) regularly receives requests from operators and the general public for exemptions and for consideration to permit the use of additional foreign child restraint systems on board Canadian aircraft. However, child restraint systems from other countries and meeting other standards have not previously been permitted as they had not been assessed by the Aircraft Certification Standards Division of TCCA to validate acceptability.
- (9) Following the publication of Transportation Safety Board of Canada Aviation Investigation Report A12Q0216 on a landing accident at Sanikiluaq Airport in Nunavut, in which a lap-held infant was fatally injured, TCCA began to explore ways to increase the range of child restraint systems that parents or guardians can use on Canadian aircraft. The intent is to identify those child restraint systems approved under United Nations standards or by a foreign government that will be deemed acceptable for use on board Canadian aircraft.
- (10) As an interim measure, a national exemption was issued to permit passengers to use a child restraint system meeting certain, specified foreign design standards. The intent is to promote seamless international operations, provide an acceptable level of safety, and facilitate the passenger experience when interlining between domestic and foreign operators.
- (11) Prior to accepting additional child restraint systems identified in the exemption for use on board its aircraft, an operator should assess the impact of such a decision and consider conducting a safety risk assessment to determine how to mitigate any potential safety-related risks.
- (12) Crew members should be made aware of the requirements for the acceptance of child restraint systems on board their aircraft, as well as recommended evacuation procedures.

4.0 CHILD RESTRAINT SYSTEMS

- (1) Depending on its design and intended occupant, child restraint systems may also be referred to as infant restraint systems, convertible restraint systems, or combination systems.
- (2) Infant restraint systems are rearward-facing and intended for an occupant who is unable to walk unassisted and whose mass is less than 10 kg (22 lbs). However, some systems can accommodate occupants of a greater weight. Weight restrictions are specified on the system and may vary from one system to another.
- (3) Child restraint systems are typically forward-facing and intended for an occupant weighing 10 to 30 kg (22 to 66 lbs). However, some systems can accommodate occupants of a greater weight. Weight restrictions are specified on the system and may vary from one system to another.
- (4) Convertible restraint system is a term manufacturers often use to describe restraint systems that can be used as an aft-facing system for infants or as a forward-facing system for children.
- (5) Some manufacturers are marketing a combination child restraint system, which is actually a combination of the child restraint system and the booster seat. When used as a child restraint system, it will include an internal harness system. The internal harness system must be installed, and all child restraint system labelling requirements must be met, to be acceptable for use as a child restraint system in an aircraft. When used as a booster seat, the internal harness system is removed and it is not approved for use as a child restraint system in an aircraft.
- (6) Child restraint systems acceptable for use in Canadian aircraft include those meeting the following design standards:
 - (a) CAN-TSO-C100b or CAN-TSO-C100c;
 - (b) *Canada Motor Vehicle Safety Standard (CMVSS) 213 – Child Restraint Systems*;

- (c) CMVSS 213.1 – Infant Restraint Systems;
 - (d) United States *Federal Motor Vehicle Safety Standard* (FMVSS) 213 – Child Restraint Systems;
 - (e) Australian/New Zealand Standard (AS/NZS) 1754:2013 (or later amendments) – Child restraint systems for use in motor vehicles; and
 - (f) United Nations (UN) Economic Commission for Europe (ECE) Regulation No. 44 Revision 3 (or later amendments) – Uniform Provisions Concerning the Approval of Restraining Devices for Child Occupants of Power-Driven Vehicles (“Child Restraint Systems”) that has been qualified in accordance with German TÜV Doc. TÜV/958-01/2001 – Qualification Procedure for Child Restraint Systems for Use in Aircraft.
- (7) Child restraint systems that do not meet the standards listed in paragraph 4.0(6) may still be eligible for consideration for use on board a Canadian aircraft, provided the following criteria are met:
- (a) The device is approved for use in motor vehicles, manufactured and tested to standards equivalent to those listed in paragraph 4.0(6);
 - (b) The device should be labelled with an associated qualification sign, which shows the name of the qualification organization and a specific identification number; and
 - (c) The qualifying organization should be a competent and independent organization that is acceptable to Transport Canada.
- (8) Parents or guardians of children with child restraint systems referred to in paragraph 4.0(7) may submit a request to have their child restraint system considered for use on board Canadian aircraft by contacting:
- Chief, Aircraft Certification Standards (AARTC)
Standards Branch
Transport Canada Civil Aviation
Ottawa, Ontario K1A 0N5
E-mail: Services@tc.gc.ca

4.1 Labelling Requirements

- (1) Paragraph 605.28(1)(c) of the CARs requires that each child restraint system to be used on board the aircraft have a legible label indicating the applicable design standards and date of manufacture. The following sections provide examples of labels indicating that the child restraint system meets the design standards to be acceptable for use on board a Canadian aircraft.
- (2) 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, which indicates the number of the standard or standards to which the restraint system conforms, namely CMVSS 213 in the case of a child restraint system or 213.1 in the case of an infant restraint system.

Figure 1 – National Safety Mark



Note: XXXX is replaced with the appropriate standard reference, either 213 or 213.1, as applicable. The YYY indicates the authorization number assigned by the Minister, if applicable.

- (3) 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 of these restraint systems.
- (4) However, some Canadian child restraint systems cannot be used in aircraft as a result 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 its use to motor vehicles. Although these restraint systems will have the National Safety Mark, they will also have a label containing the following text: “This Restraint is Certified for Use in Motor Vehicles. This Restraint is Not Certified for Use in Aircraft,” in red lettering. The following is an example of this labelling:

Figure 2 – Example of Labelling for Canadian Restraint System Not Approved for Aircraft



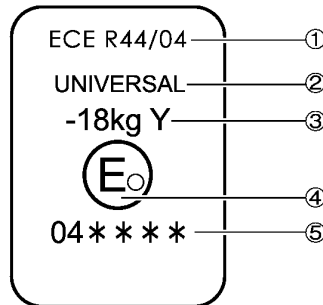
- (5) Canadian Technical Standard Orders (CAN-TSO) C-100b and C-100c contain minimum performance standards for the testing and evaluation of a child restraint system or aviation child safety device intended to provide proper restraint of children in the aircraft environment and that would be suitable 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, subassembly part number, and the CAN-TSO number (e.g. CAN-TSO-C100b or CAN-TSO-C100c).
- (6) Restraint systems manufactured to United States FMVSS 213 must bear two labels that contain the following text: “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,” in red lettering. Typically, the text for these two labels is merged onto a single label. The following is an example of this labelling:

Figure 3 – Example of Labelling Requirement for United States Child Restraint Systems



- (7) 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 use.
- (8) A child restraint system 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. To be acceptable for use on board a Canadian aircraft, the child restraint system must bear two labels: one that reflects UN standard ECE R 44, revision 03 or later and a second that states it is approved for use in aircraft as described in paragraph 4.1(9). The following is an example of the UN ECE labelling:

Figure 4 – Example of ECE R44 Approval Mark



Note: (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 surrounding the letter “E” followed by the distinguishing number of the country which has granted approval; (5) the approval number of the device.

- (9) To be acceptable for use on board a Canadian 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 manufacturer of the child restraint system 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”. The following are examples of this labelling:

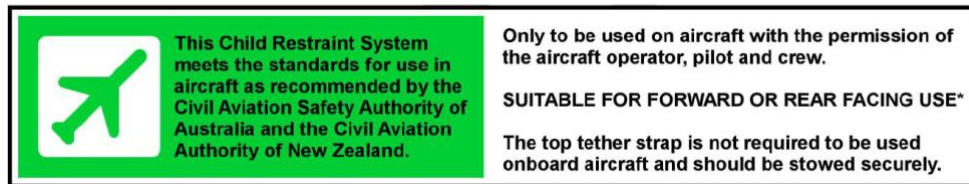
Figure 5 – Examples TÜV Rheinland® Label



Note: The example on the left was in use prior to 2013 while the one on the right has been used since 2013. In either case, the applicable text to note is “For use in Aircraft”.

- (10) A child restraint system manufactured to the Australian/New Zealand Standard AS/NZS 1754:2013 will have labelling similar to that in Figure 6 below indicating that it is acceptable for use on board an aircraft.

Figure 6 – Labelling Requirement for Australian/New Zealand Standard



Note: Child restraint systems certified to AS/NZS 1754 that do not contain this green label are not acceptable for use on board Canadian aircraft as there needs to be an approved means to attach the top tether strap, which is not permitted in Canada.

- (11) The national exemption regarding the acceptance of additional child restraint systems manufactured to foreign standards may be accessed by entering the following search criteria at the TCCA exemption search website:

Select exemption type: Exemption
Search on: Provision
Search for: 605.26(1)

<http://wwwapps2.tc.gc.ca/saf-sec-sur/2/exemptions/>

4.2 Location of Child Restraint Systems in the Passenger Cabin

- (1) When establishing where in the passenger cabin a child restraint system can or cannot be used, operators should take the following into consideration:
 - (a) The recommended location for a child restraint system is at a window seat;

- (b) Child restraint systems should be placed in a seat adjacent to (e.g. next to or closest to) the accompanying parent or guardian, and should be in the same row unless the aircraft configuration does not permit it (e.g. rear seat of a Cessna 172, Piper PA28, Cirrus SR22, etc.);
 - (c) Child restraint systems should not be located in an emergency exit row, nor in a row immediately forward or aft of an emergency exit row;
 - (d) An aisle seat or a cross aisle seat (at a bulk head) that forms part of the evacuation route to exits should not be used for child restraint systems;
 - (e) Aisle seats are not recommended as the occupant of the child restraint system could be injured by a passing person or service cart and the child restraint system may also present an obstruction during an evacuation; and
 - (f) The child restraint system should not prevent or hinder the movement of adjacent passengers or block exits and should not block access to safety and emergency equipment.
- (2) Other locations may be acceptable provided access to the nearest aisle is not obstructed by the child restraint system.

4.3 Installation of a Child Restraint System

- (1) A child restraint system should be installed on a forward-facing passenger seat in accordance with paragraph 605.28(1)(d) of the CARs. This includes installing the child restraint system in the appropriate forward- or rearward-facing direction as indicated on the label for the size of the child.
- (2) A child restraint system should not be installed on a passenger seat that is side-facing, rearward-facing, or oblique-facing. While the manufacturer of the child restraint system may include instructions for installation in other passenger seat orientations, special authority would have to be requested in the form of an exemption.
- (3) A child restraint system should only be installed on an aircraft seat using the type of connecting device for which it is approved. The method of connecting the child restraint system to the seat should be the one described in the child restraint system manufacturer's instructions. All safety and installation instructions should be followed.
- (4) Tether straps, as required in automobiles, are not authorized for use in aircraft. These straps should be securely stowed in the manner described by the manufacturer as an unrestrained tether strap and hook could cause serious injury during turbulence or in the event of an accident.
- (5) Some aeroplanes may be equipped with a safety belt that includes an inflatable lap strap or a combined inflatable lap strap and shoulder harness. A child restraint system should not be installed in a seat equipped with an inflatable safety belt unless the inflation component of the safety belt has been deactivated. The aircraft flight manual or flight attendant manual should document if this is possible and contain details on how to deactivate.
- (6) If a forward-facing child restraint system can be reclined, it should be placed in an upright position during movement on the surface, take-off and landing, or whenever the parent or guardian is instructed to do so by a crew member. 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 should also be returned to the upright position.
- (7) Once a child restraint system is installed, it should remain secured to the aircraft seat during all phases of flight. In addition, the infant or child should be properly secured in the child restraint system whenever passengers are required to fasten their safety belts in accordance with sections 605.25 and 605.26 of the CARs.

4.4 Devices Not Approved for Use as a Child Restraint System

- (1) In 1994, the Federal Aviation Administration (FAA) published a study entitled “The Performance of Child Restraint Devices in Transport Airplane Seats”. The research for the study conducted by the FAA Civil Aerospace Medical Institute (CAMI) involved dynamic impact tests with a variety of devices installed in transport category aircraft passenger seats. The results of this study were used as the basis for prohibiting the use of certain devices on board Canadian aircraft. Subsequent studies conducted by the Australian Transport Safety Bureau and European Aviation Safety Agency produced similar findings.
- (2) The following devices are not approved for use as a child restraint system in an aircraft in Canada:
 - (a) **Infant carrier:** these typically consist of a pouch, which holds the infant close to the wearer’s body. Examples of infant carriers include those marketed under the brand names BabyHawk, BabyBjörn, Ergo, Kelty and Snuggli. While they allow an infant to be carried hands-free, they are carrying devices and not restraint systems and may slip off the adult as a result of flailing during periods of turbulence or an accident. These carriers and other similar-type carriers are not approved for use as a child restraint system in an aircraft and may not be used during movement of the aircraft on the surface, take-off, landing or at any time the safety belt sign is illuminated. 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.
 - (b) **Supplementary loop belt (belly belt):** while similar to a normal adult lap strap (width, material and buckle), this is a belt for infant use that is attached to an adult’s safety belt by feeding the adult’s belt segment through a loop on the infant’s belt. The adult’s belt segments are then fastened together, the infant placed on the adult’s lap, and the infant’s belt is then fastened around the infant’s mid-section. The normal lap strap is designed to sit low across the hips of an adult, which restrains the adult in an accident. However, when used on an infant, the loop belt rests entirely within the infant’s abdominal region, which will likely result in severe internal injuries in an accident. As well, in an accident the infant acts as an energy absorbing element for the adult’s body, which performs a jack-knife movement over the infant in an accident. While the impact loads are reduced for the adult, the load on the infant is further increased due to the crushing forces from the adult torso.
 - (c) **Booster seats:** these devices are used for older children who have outgrown their child restraint system. These devices are not approved for use as a child restraint system in an aircraft as they are not required to meet the inversion testing provisions of the CMVSS, do not have an internal harness system, and must be used with a safety belt consisting of both a lap strap and shoulder harness.

4.5 Carry-on Baggage Control Programs and Child Restraint Systems

- (1) TCCA does not consider a child restraint system to be an item of carry-on baggage when the system is carried on the aircraft as a means of restraining an occupant.
- (2) If the intended occupant does not occupy the system, then the child restraint system is considered to be carry-on baggage and must be properly stowed. For air operators who operate under Subpart 705 of the CARs, the system must fall within the parameters of their approved carry-on baggage control program to be accepted on board, in accordance with section 705.42 of the CARs.
- (3) Operators should consider the weight of the child restraint system when completing weight and balance calculations.

5.0 OTHER SEATING DEVICES

- (1) At the present time and unless otherwise noted, the CARs do not specifically permit or prohibit infants, children, or special needs passengers from using other seating devices that are described in this section.
- (2) Prior to accepting a seating device described in this section for use on board their aircraft, an operator should assess the impact of accepting such a device and consider conducting a safety risk assessment to determine how to mitigate any potential safety-related risks.
- (3) The guidance in this section is specific to seating devices that use the aircraft safety belt as the primary means of restraint. This does not mean that any type of seating device is exempt from the regulations regarding the use of restraint systems and it does not preclude the operator's responsibility from making a safety judgment based on specific compliance with applicable regulations.
- (4) A request for exemption is the appropriate course of action regarding a seating device that does not meet the requirements established in the applicable regulations regarding seat, safety belt and restraint system requirements.

5.1 AmSafe Child Aviation Restraint System (CARES)

- (1) AmSafe has developed a child restraint device for use on board aircraft called the Child Aviation Restraint System (CARES). The device is specifically designed for children weighing between 10 and 20 kg (22 and 44 lbs), and measuring 100 cm (40 in.) or less in height. It uses the existing passenger seat safety belt, and holds the upper torso of the child against the aircraft seat back.
- (2) The CARES device was approved by the FAA for use on commercial aircraft in the United States in 2006, under title 14 of the *Code of Federal Regulations* (CFR) 21.305(d). This device will bear a label stating: "FAA approved in accordance with 14 CFR 21.8(d), approved for aircraft use only" or "FAA approved in accordance with 14 CFR 21.305(d), approved for aircraft use only". The following is an illustration of the AmSafe CARES device:

Figure 7 – AmSafe CARES Device



- (3) TCCA examined the CARES child restraint device and determined that the test criteria and results were acceptable for use of the device on board Canadian aircraft. Where such a CARES device is used, TCCA recommends that it be used within the limitations specified on the device by the manufacturer.
- (4) However, as section 605.26 of the CARs only permits the restraint of an infant through the use of an approved child restraint system or while being held securely in the arms of a passenger, an exemption is required to permit the use of the CARES device for an infant. Such an exemption has been issued to all passengers responsible for an infant for which no child restraint system is provided and are travelling on Canadian registered aircraft. Operators must ensure that the conditions of the exemption are met prior to permitting the use of this device by an infant on board their aircraft.

- (5) Operators can access the national exemption by entering the following search criteria at the TCCA exemption search website:

Select exemption type: Exemption
Search on: Provision
Search for: 605.26(1)(b)

<http://wwwapps2.tc.gc.ca/saf-sec-sur/2/exemptions/>

- (6) For taller individuals with special needs, AmSafe has designed a special version of the CARES device with chest straps that are 10 inches longer than the regular CARES device. The longer straps will accommodate individuals over 137 cm (54 in.) and up to 183 cm (72 in.) in height.
- (7) The CARES device has been certified by the manufacturer for use by children weighing between 10 and 20 kg (22 and 44 lbs). The upper weight limit of 20 kg (44 lbs) for use of the CARES device was established because, with the additional weight of the person attached to the seat back, the seat back would move forward more quickly in an accident scenario. This might pose a risk of injury for the person seated in the seat behind the person using the CARES device (because the seat back moving forward more quickly would mean that it would not be there to attenuate the energy from the impact of the person seated behind the person using the CARES device).
- (8) In order to achieve an acceptable level of safety, the operator should establish procedures to ensure that a person weighing more than 20 kg (44 lbs) who is using the CARES device be located in a passenger seat with no passenger seated behind. Doing so would prevent any unsafe condition for a passenger seated behind the person using the CARES device. A parent or guardian who will attend to the safety of the person during the flight should also accompany the person using the CARES device.

5.2 Booster Seats

- (1) A booster seat is not a child restraint system. Rather, it covers the next period of a child's development once they have outgrown the height and weight limitations of a forward-facing child restraint system and allows a small child to be properly restrained using only the vehicle safety belt. The following are two examples of booster seats:

Figure 8 – Example of a Backless Booster Seat



Figure 9 – Example of a High Back Booster Seat

- (2) Booster seats are designed to allow the use of a safety belt (lap strap combined with a shoulder harness) by children who no longer need a child restraint system. They position the child so that the lap strap is correctly located snug against the child's hips and the shoulder harness is centered across the shoulder.
- (3) For aircraft seats equipped with only a lap strap, use of a booster seat is not recommended as booster seats are designed to be used with both a lap strap and shoulder harness in accordance with the manufacturer's instructions.
- (4) As well, a concern for a backless booster seat used in an aircraft seat is that the effect of seat back break-over and impact of an adult seated behind the child may expose the child occupant to potential abdominal injury due to the combined effects of these forces.
- (5) A booster seat should only be used if it has a high back and is used in conjunction with an aircraft seat that has a safety belt consisting of a lap strap combined with a diagonal shoulder harness. Booster seats sold in Canada will be affixed with the National Safety Mark (see Figure 1), indicating that they conform to CMVSS 213.2.

5.3 Restraint Systems for Disabled Persons

- (1) In 2010, new Canadian regulations were introduced through the *Motor Vehicle Restraint Systems and Booster Seats Safety Regulations* to more closely align the Canadian child restraint and booster seat requirements with those of the United States. This included allowing child restraints for larger children, the introduction of more advanced test dummies for impact testing and additional harmonized testing performance criteria.
- (2) Among the changes introduced was the option for manufacturers of restraint systems for disabled persons to conduct an inversion test as part of the certification process. This test ensures that the restraint system remains attached to an aircraft seat in turbulent conditions and that the occupant of the restraint system is also held in the seat without falling out.
- (3) Installation instructions will be provided by the manufacturer where the system has been certified for use on board aircraft through the conduct of an inversion test. These will include diagrams, instructions for installing the restraint system in an aircraft passenger seat, for restraining a disabled person in the restraint system when it is installed in the seat, and for adjusting the restraint system to fit the person.
- (4) Restraint systems for disabled persons sold in Canada will be affixed with the National Safety Mark (see Figure 1), indicating that the restraint system conforms to CMVSS 213.3.
- (5) While TCCA does not endorse a particular manufacturer's restraint system, the following are examples of systems that had been approved for use in an aircraft in accordance with either CMVSS 213.3 or FMVSS 213:

- (a) 2000 Therapedic™ Integrated Positioning System™ (IPS™) Car Seat
<http://www.columbiamedical.com/special-needs-disabilities-products-details.asp?ProductID=3>
- (b) Special Tomato MPS Car Seat
<http://www.specialtomato.com/#carseat>
- (c) Convoid Carrot 3 Special Needs Car Seat
<http://www.convoid.com/convoid-carrot-special-needs-seat-p-1312-l-en.html>
- (d) Tumble Forms2 Carrie Seating System
http://www.pattersonmedical.ca/app.aspx?cmd=getProduct&key=IF_921002604

5.4 Assistive Seating Devices

- (1) In recent years, TCCA has received requests related to the acceptance for use on board aircraft of assistive seating devices for special needs passengers.
- (2) There are many different forms of these items such as specially designed body supports, upper torso restraints or molded cushions. Typically, these devices are manufactured to meet the unique requirements of the individual and may not be designed or certified to any particular standard.
- (3) TCCA is aware of at least one decision in the Canadian Transportation Agency archives from 1995 that would likely be used as a precedent should a similar accessibility complaint be received by the Agency. In that situation, in-flight personnel insisted that a child be removed from his specially designed body support, which was classified by the air operator's personnel as a "car seat", for take-off and landing, even though the parent insisted that the brace was vital to the child's well-being. As a result, the child suffered considerable distress throughout the flight, even though he was put back into his brace once the plane was airborne.
- (4) The Agency sought clarification from TCCA with respect to any regulations that would require the removal of a body brace during the take-off and landing phases of flight. TCCA advised the Agency that it does not need to approve medical appliances required by travellers on board aircraft and that the device used by the applicant's son was a medical appliance that was required for his safety and health.
- (5) Medical appliances may be permitted provided the aircraft safety belt is used as the primary means of restraint and can be properly adjusted and evenly tightened across the lap of the child or person. This information related to the acceptance of "medical devices" or "medical appliances" discussed in decision 208-A-1995 has been incorporated into some air operator manuals over the years.
- (6) As was the case in 1995, there are currently no Canadian operating regulations that specifically prohibit the use of assistive seating devices by passengers on board aircraft during flight, provided the passenger's safety belt is properly adjusted and securely fastened as per section 605.26 of the CARs.
- (7) While TCCA does not endorse a particular manufacturer's assistive seating device, the following are examples of devices intended for use on board aircraft:
 - (a) Archerwood Cabin Kit – Upper Body Restraint System – An upper body restraint system certified for use on board aircraft in Australia that was also recognized for use on specific aircraft in Canada through the issuance of Canadian supplemental type certificate (STC) SA10-48
 - (b) Crelling Model 27 Harness
<http://www.crelling.com/model-27.html>
 - (c) MERU Travel Chair
<https://publicapps.caa.co.uk/docs/33/Safety%20Notice2012015.pdf>

<http://meru.org.uk/what-we-do/travelchair/>

5.5 Orthotic Positioning Devices

- (1) An orthotic positioning device (OPD) is a device or supportive brace designed to assist people, with weak or ineffective joints or muscles, to position and support themselves in such a way that the aircraft safety belt can be used as an effective and primary means of restraint.
- (2) Generally, an OPD is designed and used to help support and position a person who has:
 - (a) Significant postural asymmetries of the pelvis, trunk, and/or hips that lack flexibility;
 - (b) Significant hyper or hypotonia, spasticity, or mixed athetoid dysfunctions;
 - (c) Absent or impaired sensation in an area of contact with a seating surface; or
 - (d) Past history of, or current pressure ulcer, on an area of contact with a seating surface.
- (3) An OPD may also be used by a person who has difficulty controlling the movement of their body or has muscle spasms that cause their body to extend involuntarily. Some examples of this would include Cerebral Palsy and spastic quadriplegia.
- (4) Each OPD is specifically designed to meet the support needs of an individual and its use is similar to any other medically required assistive or positioning device.
- (5) The person is seated in the OPD while they and the OPD occupy an aircraft seat. In this way, the person is properly positioned in order to use the existing aircraft safety belt as their primary means of restraint while they are using the OPD for support. While an OPD may be equipped with an internal harness to position a person in the device and provide that person with additional security and support, the OPD must not attach to the aircraft seat and simply provides support, not the restraint that is provided by the aircraft safety belt.
- (6) In order to assist both a passenger and air operator personnel in determining the acceptability for use of a particular OPD, the following criteria may be used as guidance:
 - (a) The purpose of the OPD is to ensure that a person who has a medical need for this type of assistive device is positioned properly and safely in order for that person to effectively use the aircraft safety belt as their primary means of restraint by securing it around themselves.
 - (b) A person may use an OPD in any seat on the aircraft, except in an exit row seat, provided that the use of the OPD does not block any passenger's egress from the aircraft.
 - (c) This type of OPD is not intended to be identified, sold or used as a child restraint system.
 - (d) The use of this type of OPD is appropriate and permitted on aircraft and is not prohibited by current regulations.
 - (e) Crew members are not required to know how to operate any internal restraints on the OPD. This is the responsibility of the person who is using the OPD or his/her attendant, if applicable.
 - (f) Crew members are responsible for ensuring that the aircraft safety belt, the primary means of restraint, is used properly.
- (7) While TCCA does not endorse a particular manufacturer's OPD, the following websites contain information regarding the general type of OPD described in this section:
 - (a) Aspen Seating Orthosis (ASO)
<http://www.ridedesigns.com/aspen-seating-clinic>
 - (b) Atlas Seating Orthosis

<http://www.atlas-rehab.eu/products/seating-and-laying-orthosis/atlas-seating-orthosis.html>

- (c) Gillette Seating Orthosis
<http://www.gillettechildrens.org/conditions-and-care/seating-and-mobility-equipment/>

6.0 EMERGENCY EVACUATION PROCEDURES

6.1 Emergency Evacuation Procedures Regarding the Use of Child Restraint Systems or the CARES Device

- (1) When establishing emergency evacuation procedures regarding the use of child restraint systems or the CARES device, TCCA recommends that the operator include the following:
- (a) The occupant of the child restraint system should not be removed from it during preparation for an emergency landing;
 - (b) The occupant of a child restraint system should be braced in accordance with the instructions of the manufacturer of the restraint system, when such instructions are provided; and
 - (c) During an evacuation, the child restraint system should remain installed in the passenger seat and only the occupant should be removed from the aircraft.

6.2 Emergency Evacuation Procedures for Infants

- (1) Researchers from the FAA CAMI, Aerospace Medical Research Division, completed two studies designed to determine the most favourable methods for the emergency evacuation of infants from aircraft.
- (2) The purpose of the first study was to determine the most favourable methods for the evacuation of infants via an inflatable emergency evacuation slide. The purpose of the second study was to determine the most favourable methods for evacuation of infants through a Type III window exit.
- (3) On May 17, 2013, the European Aviation Safety Agency (EASA) published Safety Information Bulletin 2013-06 – *Evacuation of Infants* based on results from these two FAA CAMI studies.
- (4) Evacuation methods with small children over the age of two years would depend on the size of the child. The carrying method when egressing would be those most comfortable for the parent or guardian and the child, at the same time providing adequate protection for the child and ensuring a fast egress from the aeroplane.
- (5) When establishing emergency evacuation procedures for infants, operators should consider including the information contained in the following sections.

6.2.1 Use of an Evacuation Aid with Infants

- (1) When a parent or guardian is using an evacuation aid (e.g. slides or slide/rafts) while carrying an infant or small child, jumping produces faster egress than sitting and sliding.
- (2) The infant should be carried facing the parent or guardian. The carrying positions that provide the most protection for the infant when using an evacuation aid would include:
- (a) Vertical position: The parent or guardian should cradle the head and neck of the infant with one hand and should keep the arms, legs and feet of the infant enfolded as much as possible in his or her arms.

- (b) Horizontal position: The parent or guardian should cradle the head and neck of the infant in his or her arm and should keep the arms, legs and feet of the infant enfolded as much as possible in his or her arms.

6.2.2 Evacuating Through Type III Window Exits with Infants

- (1) The infant should be carried facing the parent or guardian. Vertical carrying is preferred as horizontal carrying of larger infants is more likely to result in striking a part of their body on the exit frame.
- (2) Climbing through the Type III window exit while holding an infant produces faster egress than passing the infant over to another person who has already exited.
- (3) An intention to pass an infant over to another person through the Type III window exit should be coordinated in advance, if possible, as there is no guarantee that someone would help.

7.0 FUTURE DISPOSITION

- (1) TCCA is planning an awareness campaign focused on the risks to which children are exposed while travelling on commercial aircraft. The campaign will be aimed at the aviation industry, to ensure ground agents and crew members, as well as the travelling public, are well informed on permissible mitigation measures.
- (2) TCCA is also planning to initiate an in-depth regulatory examination of the issue of child restraint use on board aircraft.
- (3) TCCA will also continue to participate in and support international efforts to improve passenger safety, particularly through the ICAO Cabin Safety Working Group and follow-on activities with a view to harmonization with international partners.

8.0 INFORMATION MANAGEMENT

- (1) Not applicable.

9.0 DOCUMENT HISTORY

- (1) Advisory Circular (AC) 605-003 **Issue 03**, RDIMS 7458799 (E), 8708516 (F), dated 2013-10-30 – *Child Restraint Systems*.
- (2) AC 605-003 **Issue 02**, RDIMS 6427492 (E), 6433360 (F), dated 2011-06-10 — *Child Restraint Systems*.
- (3) AC 605-003 **Issue 01**, RDIMS 2547442 (E), 3672428 (F), dated 2009-05-29, — *Child Restraint Systems*.

10.0 CONTACT OFFICE

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