Restraint of children – standards changes, advisory material and discussion papers

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Australian Government
Civil Aviation Safety Authority
www.casa.gov.au
Overview

- Quick Review of leadup work
- AS/NZS 1754 & 3629 ‘Child restraint systems for use in motor vehicles’
- CASA Project CS12/23
  - CAAP 235-2(2) ‘Carriage and Restraint of small children in aircraft’
  - AWB 25-## ‘Child Restraint System Installation’
  - Discussion Paper ‘Review of the carriage of Infants and Children in Aircraft’
Quick Review

- Regulations
- Practically, what’s allowed
- International differences of opinion
- Research
Aviation regulations

- CAR 251(1) “….. seat belts shall be worn by all crew members and passengers…..”

- CAR 251(3) “CASA may direct that a type of safety harness….. be worn in place of a seat belt…..”

- CAO 20.16.3 Para.13.2(1) “An infant may be carried in the arms or on the lap of an adult passenger, in a bassinet or in an infant seat…..”

- CAAP 235-2(1) Para 2.1 “An infant carried in the arms of an adult passenger (lap held) must be restrained…..”
Infant Restraint Options

Approved
International Confusion

- FAA (USA) / TC (Canada) / LBA (Germany)
  - Prohibit use of Supplemental Loop Belt

- Confusion for:
  - International travellers in Australia
  - Australian travellers overseas
Australian Aviation CRS testing

- 2011 - CASA/RMIT - A Numerical Investigation into the Crashworthiness of Automotive Child Restraints in Transport Category Aircraft - Phase III
ATSB/HIE/Britax Research

- ATSB Research Grant
- Human Impact Engineering/Britax Australia
- Looked at Fit, Form & Function of AS/NZS 1754 CRS in Airline seats
- Assessed dynamic performance of AS/NZS 1754 CRS in Airline seats
- Assessed dynamic performance of fabric style baby carriers (or lack thereof)
CASA Infant Restraint Projects

- Three phase program – 2005-2012
  - Assessed the contribution of the top tether strap to the restraint performance of a sample of Australian Automotive child restraints in an airline seat.
  - Assessed the performance of ISOfix, LATCH and belt restrained CRS without using a top tether strap including recording lower anchorage loads.
  - Assessed the impact of seat crash performance for adult occupant seated behind a child restraint system.
  - Assessed the performance of lap held (restrained) and seat belt restrained infants.
CASA Infant Restraint Projects

- What is ISOfix?
- Rigid attachment to vehicle
- Universal Child Lower Anchorage – two 6 mm round steel bar loops – 40mm x 25 mm, 280mm lateral centres
CASA Infant Restraint Projects

- What came out of all of this research?
  - Confirmed previous research that children up to ~ four years of age are safer in a Child Restraint.
- Child Restraints
  - That some Australian Automotive Child Restraints Systems can perform adequately in aircraft without the tether strap.
  - Child injury levels reduced with a rear occupant.
  - Adult injury levels increase slightly with CRS installed.
- Lapheld infants
  - Evidence of dangerous interaction between the adult and infant.
  - That nursing a lapheld infant increases adult injury could not be conclusively confirmed.
AS/NZS 1754 & 3629 ‘Child restraint systems for use in motor vehicles’

COMMITTEE CS-085

DR (2012) AS/NZS 1754
(Project ID: 100440)

Draft for Public Comment
Australian/New Zealand Standard

LIABLE TO ALTERATION—DO NOT USE AS A STANDARD

BEGINNING DATE FOR COMMENT: 14 August 2012
CLOSING DATE FOR COMMENT: 16 October 2012

Important: The procedure for public comment has changed – please read the instructions on the inside cover of this document.

Child restraint systems for use in motor vehicles
(Revision of AS/NZS 1754:2010)
AS/NZS 1754 & 3629 ‘Child restraint systems for use in motor vehicles’

- What did CASA ask Standards Australia for?
- That AS/NZS 1754 consider fitment in aircraft as well as in motor vehicles.
AS/NZS 1754 & 3629 ‘Child restraint systems for use in motor vehicles’

- Only Child Restraints made to AS/NZS 1754 may be sold in Australia.
- Only Child Restraints made to AS/NZS 1754 may be used in cars on Australian roads.
- New Zealand allow FMVSS and ECE-R44.
- AS/NZS 3629 is the test method.
Revision to AS/NZS 1754:2010

- Introduction of ISOfix and LATCH
- Introduction of Type A4 restraints (rear facing with in-built harness for children to 30 months)
- Introduction of Type G restraints (forward facing restraint with in-built harness for children 8 to 10 years)
- Introduction of optional low birth weight category for Type A CRS
- Introduction of optional ‘Aircraft Use Criteria’
AS/NZS 1754 ‘Aircraft use criteria’

- Specific frontal dynamic test required in an ‘aircraft test fixture’ to unique a crash pulse without using the top tether.
- Dimensional restrictions
- Stipulates contents and markings for:
  - The instruction booklet
  - The packaging
  - The child restraint
- Limited to Type A1, A2, A4 and B restraints
- CRS meeting criteria are allowed unique branding
AS/NZS 1754:2013 ‘Aircraft use criteria’
The Child Restraint and packaging

This Child Restraint System meets the standards for use in aircraft as recommended by the Civil Aviation Safety Authority of Australia and the Civil Aviation Authority of New Zealand.

Only to be used on aircraft with the permission of the aircraft operator, pilot and crew.

SUITABLE FOR FORWARD OR REAR FACING USE*

The upper anchorage strap is not required to be used onboard aircraft. If not used, stow securely.
AS/NZS 1754 ‘Aircraft use criteria’
Current Status

- Comment period closed 16 October 2012
- AS/NZS 1754:2013 to be published next week.
- CRS for sale in Q4 2013.
CASA Project CS12/23

Operational Guidance (CAAP 235-2)
Airworthiness Guidance (AWB 25-##)
Discussion Paper (DP 1301CS)
CAAP 235-2(2) ‘Carriage and restraint of small children in aircraft’
CAAP 235-2(2) ‘Carriage and restraint of small children in aircraft’

- Operational guidance material
- To generate a revision to CAAP 235-2(1) by providing updated and expanded guidance regarding the carriage of infants and children as required by CAO 20.16.3 Paragraph 13 (and the proposed CASR 91.600/605).
- Applicable to all aircraft operators – General Aviation, Air Transport, and Rotorcraft
CAAP 235-2(2) ‘Carriage and restraint of small children in aircraft’

- New guidance to include:
  - Expanded guidance on lap held infants including the unsuitability of fabric style infant carriers.
  - Slight rewording of guidance on bassinets.
  - The list of acceptable aviation and car standards and products has be updated including information on the ‘Aircraft use’ and ‘Non-Aircraft use’ AS/NZS 1754 CRS.
  - Expanded guidance on the fitment and use of child restraints, including the use of an extension belt to ease installation of child restraints.
  - A new section on kids and airbags.
CAAP 235-2(2)  
Current Status

- Drafted and completed initial internal review (idiot check)
- Formal internal consultation on publication of AS/NZS 1754:2013
- Subsequent release for public consultation (~ June/July 2013)
- CASA website ‘Traveling with children’ will also be updated
‘Child Restraint System Installations’

1. **Effectivity**
   All Australian aircraft.

2. **Purpose**
   To provide guidance on the location and design considerations of Automotive Child Restraint System (CRS) installations.

3. **Background**
   An infant or small child will be both safer and more comfortable in a child restraint than being seated directly in the aircraft seat or on the lap of an adult. CASA has conducted research into the performance of AS/NZS 1754 Child Restraint Systems (CRS) in air transport aircraft seating which has led to the development of this guidance material, changes to CAAP 235-2, and changes to AS/NZS 1754 itself. However, this guidance is equally applicable to General Aviation aeroplanes and rotorcraft.

AS/NZS 1754 has now grown to encompass eight CRS categories (known as Types) and 15 sub-categories, which are summarised in Table 1.

From AS/NZS 1754.2013 and onwards, the standard also considers fitment into aircraft. The standard allows CRS manufacturers to optionally comply with additional criteria that are specifically tailored to enhance fitting to aircraft seats. The criteria include dimensional restrictions, the requirement for aircraft fitting instructions in the instruction booklet and on the CRS itself, and additional dynamic testing that uses only a lap belt, i.e. the top tether strap is not used. If CRS manufacturers comply with these extra criteria, they are able to mark their restraint with the sticker shown in Figure 1. AS/NZS 1754 CRS fitted with this sticker can be installed without any prior modification to the aircraft. The recommendations of this AWB do not apply to these CRS. See the CRS manufacturer's instructions and CAAP 235-2 for guidance on installing this type of CRS.

![Image of CRS sticker]

**Figure 1**

AS/NZS 1754 CRS not bearing the sticker in Figure 1, regardless of age, can still be fitted to aircraft. However, provided they fit in the aircraft seat, they shall...
AWB 25-##
‘Child Restraint System Installations’

- Airworthiness guidance material
- Intended to provide guidance for aircraft modifications
- Provides background to AS/NZS 1754 ‘Aircraft use criteria’
- Principally provides installation guidance on AS/NZS 1754 ‘non-aircraft use’ CRS.
Provides guidance on:

- CRS location in the aircraft, exits.
- Aircraft seat orientations – rear facing, side facing and oblique seating.
- Aircraft seat belt configurations – 2, 3, 4, 5 point.
- upper anchorage strengths, fitting shape, line of action.
- Seats with airbags.
AWB 25-##
Current Status

- Ready for publication
- No formal consultation required for AWBs
- Will be published in conjunction with CAAP 235-2(2)
A Discussion Paper (DP) seeking industry and public comment on the merits and current relevance of:

- CAO 20.16.3 Paragraph 13.1 - that allows two children to sit in one seat, and
- CAO 20.16.3 Paragraph 13.2(1) - with respect to lap-held children.

A public review on contentious child restraint methods in aircraft and new technology availability has been recommended.
Discussion Paper - DP 1301CS aspects - ‘Two kids in one seat’

- CAO 20.16.3
- 13 Carriage of infants and children
- 13.1 Where their combined weight does not exceed 77 kg, 2 children may occupy 1 seat if:
  - (a) seated side by side; and
  - (b) restrained by a lapstrap only; and
  - (c) the seat-belt is adjusted to secure both children at all times when a seat belt is required to be worn.
Research shows this seating configuration to be dangerous.

Principally affects General Aviation, outback operations.

Preparations for DP to include determining if any other NAA allow this.
Discussion Paper - DP 1301CS aspects - ‘Lap Held Infants’

- CAO 20.16.3
- 13 Carriage of infants and children
- 13.2 (1) An infant may be carried in the arms or on the lap of an adult passenger, ....
- When an infant is carried in the arms or on the lap of a passenger in accordance with subparagraph 13.2 (1) the seat belt, when required to be worn, shall be fastened around the passengers carrying or nursing the infant, but not around the infant.
CASA and others have repeatedly shown lap held infants (restrained or unrestrained) are not provided the same level of protection as a non-nursing adult.

There is subjective evidence (research and accident history) to suggest the nursing adult also has a reduced tolerance to injury.

However, removal of this provision will force infants into their own aircraft seat which is also completely inappropriate without a CRS.
A dedicated and complete consultation will provide definition on these two issues.

As a result of this consultation, a proposal as to whether to revise regulations can be considered.
Questions?

"I DON'T KNOW ABOUT YOU, BUT I'M NOT TOO WILD ABOUT THESE NEW CHILD RESTRAINTS."
EASA AD 2013-0020
Do we have a similar problem?
Design & Manufacturing Seminar, Melbourne, 24th May 2013

Mark Bathie – Airworthiness Engineer
- EASA AMOs conducting inappropriate modifications to the belts of dynamically tested seats.
- Material changes – Polyester (~6% elongation) for Nylon (15% elongation).
- Research program confirmed assumptions.
AD Applicability

- All P/N of safety belts and torso restraint systems, installed on any aircraft where dynamically tested seats are required (CS/JAR/FAR 2#.562),
- if safety belts and torso restraint systems have been maintained or repaired after 28 September 2003,
- by maintenance organisations not holding the applicable maintenance data of the relevant approval holders,
- unless they are marked with European Parts Approval (EPA).
Interpretation of Applicability

- CASR 39.001A defines
  - an *airworthiness directive* as (in this case) “(b) a foreign State of Design airworthiness directive issued on or after 1 October 2009”
  - a ‘*foreign State of Design airworthiness directive*’ as “for a kind of …. aeronautical product for which Australia is not the State of Design, means a document, as in force from time to time, that: (a) is issued by the NAA of the State of Design of the …. aeronautical product;”. 
Interpretation of Applicability

- For this AD, the ‘State of Design’ is what complicates the assessment of applicability.
Interpretation of Applicability

- EASA AD 2013-0020 is an AD covering aeronautical products (seat belts).
- The AD is not specific to:
  - any particular belt (i.e. no part numbers listed),
  - where the maintenance organisation is located (i.e. not just European organisations), and
  - generally not any aircraft type or model (i.e. not just European aircraft designs).
Interpretation of Applicability

- However, is specific to:
  - Seat belts fitted to dynamically certificated seats
  - certain belt manufacturers (but not just European manufacturers), and
  - is limited to seatbelts repaired by non-OEM authorised repair stations.
Interpretation of Applicability

- Additionally, due to CASR Part 39:
  - In Australia the AD applicability is also limited to European approved designs.
  - The state of design is the state that approves the design, not where it is manufactured.
  - For seat belts, that means a seat belt approved to:
    - an ETSOA,
    - a belt approved under a ETSO European letter of agreement, or
    - if the belt is approved via the aircraft certification, a belt that is installed on an aircraft of European state of design.
AD Errors

- CASA comments to the PAD:
  - Grammatical errors
  - Errors in applicability – Cessna Caravan
  - Errors are still there in EASA 2013-0020R1
- CASA also argued partially (structural only) compliant aircraft (A319, A321, B737NG, C172R/S, C182S/T) should not be affected by the AD – EASA disagreed.
Has the same problem occurred here?

- CASA investigation started
- Three stage approach
  1. CAR 35/CASR 21.M Authorised Persons
  2. CAR 30 Belt Reweb Organisations
  3. AMOs
- Current Status
  - ALAP sent to 21.M APs 8th April 2013
  - 25% response rate.
  - 3 inappropriate modifications found.
  - Collating list of CAR 30 orgs.
Questions?