Advisory Circular

Subject: Use of Safety Belts and Shoulder Harnesses On Board Aircraft

Issuing Office: Civil Aviation, Standards

Document No.: AC 605-004

File Classification No.: Z 5000-34

Issue No.: 02

RDIMS No.: 9538621-V7

Effective Date: 2014-11-28

TABLE OF CONTENTS

1.0 INTRODUCTION ........................................................................................................... 2

1.1 Purpose ....................................................................................................................... 2

1.2 Applicability ............................................................................................................... 2

1.3 Description of Changes ............................................................................................ 2

2.0 REFERENCES AND REQUIREMENTS ....................................................................... 2

2.1 Reference Documents ............................................................................................... 2

2.2 Cancelled Documents .............................................................................................. 3

2.3 Definitions and Abbreviations ................................................................................. 3

3.0 USE OF SHOULDER HARNESS .............................................................................. 4

3.1 Use of Shoulder Harnesses in Small Aircraft ............................................................. 4

3.2 Requirements for the Installation and Use of Shoulder Harnesses on Aircraft ............... 5

3.3 Proper Use of Safety Belts and Shoulder Harnesses .................................................... 6

4.0 TURBULENCE AND THE USE OF SAFETY BELTS .................................................. 6

5.0 PASSENGER USE OF SAFETY BELTS AND RESTRAINT SYSTEMS ....................... 7

6.0 CREW MEMBER USE OF SAFETY BELTS AND SERVICE RELATED DUTIES ............. 8

7.0 INFORMATION MANAGEMENT ................................................................................. 9

8.0 DOCUMENT HISTORY ............................................................................................... 9

9.0 CONTACT OFFICE ................................................................................................... 10
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 remind operators of the need to establish procedures regarding use of safety belts and shoulder harnesses on board aircraft and to inform operators of the procedures for use of safety belts and shoulder harnesses recommended by Transport Canada Civil Aviation (TCCA).

(2) This document encourages operators to take initiatives to promote passenger and crew member use of safety belts and shoulder harnesses during flight and emphasizes the importance of using all available safety belt components, including the shoulder harness if affixed to the aircraft.

(3) This document is also intended to promote and support the use of the safety belt sign as a warning function and to deter unproductive and misleading safety belt use policies that may dilute its effect.

(4) Lastly, this document is intended to provide clarification regarding the performance of service related duties by flight attendants when the safety belt sign is illuminated during critical phases of flight and during turbulence.

1.2 Applicability

(1) This document applies to all operators of Canadian-registered aircraft.

1.3 Description of Changes

(1) Information on the use of shoulder harnesses has been added to section 3.0 of this document in response to a Transportation Safety Board (TSB) of Canada investigation (A12O0071) to highlight the importance of the installation and use of shoulder harnesses for all occupants in small aircraft.

(2) Minor formatting and editorial amendments have also been made throughout this document.

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 VI, Subpart 02 of the CARs — Operating and Flight Rules;

(d) Part VI, Subpart 04 of the CARs — Private Operator Passenger Transportation;

(e) Part VI, Subpart 05 of the CARs — Aircraft Requirements;

(f) Part VII, Subpart 02 of the CARs — Aerial Work;

(g) Part VII, Subpart 03 of the CARs — Air Taxi Operations;
(h) Part VII, Subpart 04 of the CARs — Commuter Operations;
(i) Part VII, Subpart 05 of the CARs — Airline Operations;
(j) Chapter 551 of the Airworthiness Manual (AWM) — Aircraft Equipment and Installation;
(k) Transport Canada Advisory Circular (AC) 605-003, 2013-10-30 — Child Restraint Systems;
(l) Transport Canada Publication (TP) 12295, Revision 03, 2000-01 — Flight Attendant Manual Standard;
(m) TP 12296, Edition 02, 2008-04 — Flight Attendant Training Standard;
(n) TP 185 – Aviation Safety Letter (ASL), 4/2013 — Shoulder Harnesses and Seat Belts – Double Click for Safety;
(o) Transportation Safety Board (TSB) of Canada, Occurrence No. A12O0071;
(p) International Air Transport Association (IATA) Cabin Operations Safety Toolkit — Turbulence Management;
(q) United States Federal Aviation Administration (FAA) Advisory Circular (AC) 120-88A, 2006-01-19 — Preventing Injuries Caused By Turbulence;
(r) United States FAA AC 21-34, 1993-04-06 — Shoulder Harness – Safety Belt Installations;
(s) United States FAA AC 91-65, 1986-08-04 — Use of Shoulder Harness in Passenger Seats;
(t) United States FAA Publication AM-400-90/2, 2004-05 — Seat Belts and Shoulder Harnesses – Smart Protection in Small Airplanes;
(v) United States FAA Information for Operators (InFO) 11001, 2011-01-06 — Seat Belt Use and Passenger Injuries in Turbulence;
(w) Joint Safety Analysis Team (JSAT) Analysis and Results, 2001-01-12 — Turbulence JSAT; and

2.2 Cancelled Documents

(1) As of the effective date of this document, the following document is cancelled:

(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) **Crew Member**: means a person assigned to duty in an aircraft during flight time.
   (b) **Critical Phases of Flight**: includes all ground operations involving taxi, take-off and landing, and all other flight operations conducted below 10,000 feet, except cruise flight.
(c) **Flight Attendant**: means a crew member, other than a flight crew member, who has been assigned duties to be performed in the interest of the passengers in a passenger-carrying aircraft.

(d) **Flight Crew Member**: means a crew member assigned to act as pilot or flight engineer of an aircraft during flight time.

(e) **Infant**: means a person under two years of age.

(f) **Operator**: means the person that has possession of an aircraft as owner, lessee or otherwise.

(g) **Passenger**: means a person, other than a crew member, who is carried on board an aircraft.

(h) **Restraint System**: means a general term for occupant safety systems such as a safety belt, shoulder harness, inflatable restraint system, child restraint system, or any other strap, webbing or similar device designed to secure a person in an aircraft.

(i) **Safety Belt**: means a personal restraint system consisting of either a lap strap or a lap strap combined with a shoulder harness.

(j) **Shoulder Harness**: means any device that is used to restrain the upper torso of a person and that consists of a single diagonal upper torso strap or dual upper torso straps.

(k) **Small Aircraft**: means an aeroplane having a maximum permissible take-off weight of 5,700 kg (12,566 pounds) or less, or a helicopter having a maximum permissible take-off weight of 2,730 kg (6,018 pounds) or less.

(2) The following **abbreviations** are used in this document:

(a) **AWWS**: Aviation Weather Web Site (Nav Canada);

(b) **CAR**: Canadian Aviation Regulation;

(c) **CASA**: Civil Aviation Safety Alert;

(d) **CASS**: Commercial Air Service Standard;

(e) **CRM**: Crew Resource Management;

(f) **FAA**: Federal Aviation Administration;

(g) **TCCA**: Transport Canada Civil Aviation; and

(h) **TSB**: Transportation Safety Board.

### 3.0 USE OF SHOULDER HARNESSES

#### 3.1 Use of Shoulder Harnesses in Small Aircraft

(1) A high percentage of pilot and passenger deaths and serious injuries in small aircraft accidents have been attributed to the pilot’s head making contact with the aircraft’s control yoke, instrument panel or other parts of the flight deck structure, or the passenger’s head making contact with the seat in front of them. This is due to the unrestrained upper body flailing around in the absence of a shoulder harness during the crash sequence.

(2) Accident experience has provided substantial evidence that the use of a shoulder harness in conjunction with a safety belt can reduce serious injuries to the head, neck, and upper torso of aircraft occupants and has the potential to reduce fatalities of occupants involved in an otherwise survivable accident.
3.2 Requirements for the Installation and Use of Shoulder Harnesses on Aircraft

1. The Canadian Aviation Regulations (CARs) describe the general use of safety belts and restraint systems for all persons on board an aircraft. Section 605.25 of the CARs requires the pilot-in-command to direct all persons on board the aircraft to be seated with their safety belts fastened during movement of the aircraft on the surface, during take-off and landing, during turbulence, and at any time during the flight that the pilot-in-command or the in-charge flight attendant considers it necessary that safety belts be fastened.

2. The definitions of “safety belt” and “shoulder harness” in Subpart I of the CARs are included in section 2.3 of this document. The definition of “safety belt” recognizes that two configurations of personal restraint systems continue to exist on Canadian-registered aircraft; those fitted with only a lap strap, and those consisting of both a lap strap and shoulder harness. To provide for the safety of the user, where a shoulder harness is affixed to the aircraft, it should be worn.

3. Whether or not an operator of an aircraft is required to have installed a shoulder harness available for use will depend on the type of aircraft, the orientation of the seat and, in some instances, the age of the aircraft. Section 605.24, as a general aircraft equipment requirement, requires shoulder harnesses for all seats on the flight deck or front seats of the aeroplane, other than small aeroplanes manufactured before July 18, 1978. For helicopter operations, shoulder harnesses are required on all normal or transport category helicopters manufactured after September 16, 1992. For commercial air services, sections 702.44, 703.69, 704.68 and 705.75 set out when a safety belt must consist of both a lap strap and a shoulder harness.

4. The design requirements for new aircraft require that the seat and restraint system be designed to protect each occupant during an emergency landing situation when proper use is made of the seats, safety belts, and shoulder harnesses provided.

5. Pilots of some aeroplanes have pointed out that the layout of the instrument panel and controls make it difficult to reach those controls when wearing a shoulder harness. Similarly, helicopter pilots involved in long line operations have pointed out that twisting sideways to monitor the load is very uncomfortable and unmanageable when wearing a shoulder harness. If an installed shoulder harness has a tendency to interfere with the pilot or crew member’s duties, the operator should consider having it replaced. Inertia reel shoulder harnesses allow for greater freedom of movement and may reduce the likelihood of the occupant unfastening it during flight. As well, some helicopter models now have the capability to be retrofitted with crew seats that have swivelling capability specifically for long line operations.

6. While TCCA recommends that all light aeroplanes and helicopters have installed shoulder harnesses at all seats for all occupants of the aircraft, aircraft owners and maintenance personnel are cautioned not to make attachments to, or otherwise modify, seats from original certification without proper engineering and maintenance approval. Attachments or modifications to seat structures that have not been approved may increase load factors and metal stress which could in turn cause failure of seat structure at a decreased “G” force than required for original certification.
TCCA also recommends that installed safety belts and restraint systems be inspected in accordance with the manufacturer’s schedule or the approved maintenance standard. All observable tearing or fraying should be promptly reported to maintenance personnel as this can reduce the design protection of the entire safety belt.

3.3 Proper Use of Safety Belts and Shoulder Harnesses

(1) While it is important to wear a safety belt and shoulder harness where provided, it will not provide full benefits if worn improperly and, in some cases, may even cause injury in a serious impact.

(2) Crashworthiness tests have shown that slack in a restraint system should be minimized as much as possible while being worn. During impact, the occupant’s body continues to move until the slack is taken out of the restraint system, but then must abruptly halt to catch up with the forces of the aircraft. The restraint should be adjusted as tightly as one’s comfort will permit to minimize potential injuries.

(3) The safety belt should sit low on the hip bones so that the belt loads will be transferred to the skeletal system. Otherwise, internal injuries can result if the belt is placed across the abdomen. If the belt is positioned on one’s thighs rather than the hip bones, it cannot effectively limit the body’s forward motion.

(4) Shoulder harnesses can consist of a single diagonal upper torso strap, similar to those used in automobiles, or dual upper torso straps. The straps should not rub against a person’s head or neck. Not only is this uncomfortable, but it can also cause neck injuries during an impact.

(5) Single diagonal shoulder harnesses should be positioned so that the torso’s center of gravity falls within the angle formed by the shoulder harness and the lap strap portion of the safety belt. Otherwise, a person’s torso could slip out of the shoulder belt during impact and compromise their protection. The lap strap buckle should also be positioned on the side of the occupant’s hip. This differs from the central location of the buckle when only a lap strap is available for use. The buckle should also be unlatched without any interference at all from the seat armrest, aircraft controls, or the interior wall of the aircraft.

(6) If the shoulder harness consists of dual upper torso straps fastened to the lap strap near the centre of the body (i.e. a four-point harness), the upper torso straps will tend to pull the lap strap up off the person’s hip bones. This may lead to internal injuries during an impact. It is important that the lap strap be positioned low on the hips and tightened properly in order to resist the upward pull of the upper torso straps, reducing the risk of internal injury.

(7) Alternatively, if the shoulder harness consists of dual upper torso straps along with a tie-down strap from the buckle to the center-forward edge of the seat (i.e. a five-point harness), it should be adjusted to remove all of the slack when the restraint is used.

(8) TCCA reminds all aircraft operators of the regulatory requirements to wear safety belts, including a shoulder harness, if installed. TCCA strongly encourages the use of safety belts and shoulder harnesses at all times when the aircraft is in motion.

4.0 TURBULENCE AND THE USE OF SAFETY BELTS

(1) In-flight turbulence is the leading cause of in-flight injuries to passengers and crew members. There have been accidents and incidents over the years involving clear air turbulence that have resulted in serious injuries and fatalities to passengers and crew members. Numerous post-accident reports reveal that while the safety belt sign was on when the aircraft hit turbulence, passengers and crew members had not been wearing their safety belts. These post-accident reports highlight the importance of keeping safety belts fastened throughout the flight while seated.
(2) Crew member training, pre-flight planning, in-flight situational awareness, post-flight debriefing and safety system reporting are key elements in reducing the likelihood of in-flight injury caused by turbulence. The following procedures are recommended by TCCA:

(a) Pilots should visit Nav Canada’s Aviation Weather Web Site (AWWS) for current turbulence reports prior to each flight.

(b) Initial and recurrent crew member training programs should include turbulence scenarios to practice quick response to in-flight turbulence procedures. Training should include procedures for the stowage of service carts during periods of turbulence.

(c) Crew resource management (CRM) training for crew members should address turbulence response. Communication and coordination among crew members is a critical component of an effective response to turbulence or a threat of turbulence. CRM training should encourage a coordinated crew response prior to, during and after a turbulence encounter.

(d) Dispatchers should proactively provide ride reports to flights and pilots should share these ride reports with crew members and passengers related to any adjustments in service based on forecasted turbulence.

(e) Crew members should personalize safety belt announcements with anticipated turbulence severity and the approximate time and an explanation that the safety belt sign will remain illuminated during that time.

5.0 PASSENGER USE OF SAFETY BELTS AND RESTRAINT SYSTEMS

(1) TCCA encourages operators to take initiatives to promote passenger use of safety belts during flight. For instance, some operators request that passengers remain seated with safety belts fastened, even when the safety belt sign is not illuminated. Passengers who use the lavatory facilities when the safety belt sign is not illuminated are asked to fasten their safety belts upon returning to their seats. TCCA views this approach as a positive method of promoting passenger safety.

(2) Another approach taken by some operators in an attempt to keep passengers in their seats is through the use of the safety belt sign at all times during the flight. The unnecessary illumination of the safety belt sign may have a negative effect on passenger safety, which air operators should be aware of. The safety belt sign should be illuminated only when required; during critical phases of flight, turbulence, or when the pilot-in-command considers it necessary to do so for safety reasons. By doing so, passengers and crew members are more likely to understand and realize the importance of the safety belt sign and comply with the instructions when it is illuminated.

(3) Due to the difficulty of enforcing mandatory use of safety belts during all phases of flight, TCCA recommends that operators be proactive in promoting passenger use of safety belts and enhance efforts aimed at encouraging passengers to remain seated and belted at all times. The following procedures are recommended by TCCA:

(a) An announcement should be made from the flight deck or in-charge flight attendant when the safety belt sign is first turned off during flight, explaining the hazards associated with turbulence and that the best protection against unanticipated turbulence related injuries is through the constant use of safety belts.

(b) Passengers should also be advised of what they should and should not do if the safety belt sign is turned on. Crew members should caution passengers not to get out of their seat to open overhead bins when the safety belt sign is illuminated. It is important to educate passengers that the illumination of the safety belt sign is not “routine” and that it is in fact a warning function.
(c) In addition to oral announcements, operators might consider use of visual aids such as safety belt extenders, briefing cards and/or pointing to safety belt signs for alerting special needs passengers during safety belt checks.

(d) For flights that occur at night, crew members should instruct passengers to fasten their safety belt over their blankets so that the crew member can verify that the sleeping passenger is secure. This will help prevent the passenger from being disturbed if turbulence is encountered during the night.

(e) All aircraft operators are encouraged to promote information sharing through company safety reporting systems to analyze and continuously improve procedures and strategies for compliance with safety belt policies.

(4) Section 605.26 of the CARs describes the requirements for passenger use of safety belts and child restraint systems. If a passenger is responsible for an infant that is being lap held, he or she should first ensure that their own personal safety belt is properly fastened, and then hold the infant in their arms in the burping position (i.e. facing inwards on their chest). If a passenger is responsible for an infant or a child that is using an approved child restraint system, he or she should first ensure that the child is properly secured in their child restraint system and then ensure that his or her own safety belt is properly fastened. Transport Canada AC 605-003 — Child Restraint Systems provides detailed information on the use of child restraint systems on aircraft.

(5) TCCA reminds all aircraft operators of the requirement to include information on the use of safety belts and shoulder harnesses in the standard safety briefing to passengers prior to take-off. The applicable requirements can be found in paragraphs 602.89(1)(b) and 604.85(1)(b) of the CARs, and subparagraphs 722.23(1)(a)(iii), 723.39(1)(a)(ii), 724.34(1)(a)(ii), 725.43(1)(a)(ii) of the Commercial Air Service Standards (CASS). Where safety features cards or supplemental briefing cards are provided, they shall include information on each type of safety belt or shoulder harness installed for passenger use, including when to use, and how to fasten, tighten and release them.

6.0 CREW MEMBER USE OF SAFETY BELTS AND SERVICE RELATED DUTIES

(1) Operator procedures for crew member use of safety belts should reflect Section 605.27 of the CARs which states that crew members are required to be seated at their stations with their safety belts fastened during take-off and landing, when the pilot-in-command so directs, and in the case of flight attendants, when the in-charge flight attendant so directs. Paragraph 605.27(2)(b) of the CARs permits flight attendants to be away from their station where the aircraft is experiencing light turbulence when performing duties related to the passengers on board.

(2) Procedures for crew member use of safety belts should include that safety belt signs be illuminated during critical phases of flight. All service related duties should end at this point and all subsequent actions of crew members shall be related to the safety of the aircraft or of the passengers on board. While service related duties such as the distribution of coats to passengers may save time on the ground, it hinders safety by compelling passengers to keep the coat on their lap, or unfasten their safety belt to put it on or to stow it in an approved location at a time when it is unsafe to do so. The safety of all occupants then becomes an issue as opening closets and overhead compartments during critical phases of flight can generate other safety hazards. Items that may have shifted during flight can fall out of the compartment being opened, injuring passengers or crew members. During descent, crew members should be concentrating on securing the cabin and passengers for landing, rather than completing service related duties.

(3) By limiting duties to those related to safety, crew members have sufficient time to secure the cabin, prepare themselves for take-off or landing by taking their assigned station, fastening and adjusting their safety belt and completing their silent review without risk of injury.
(4) Should the safety belt sign need to be illuminated prior to the descent and landing phases (e.g. during light turbulence) and if it is still safe and acceptable to perform service related duties, it is imperative that crew members are aware of when the descent phase will commence in order to allow sufficient time to complete service related duties, including the collection of in-flight service waste, in a safe and timely manner. The determination of the time of the notification from the flight deck for the top of descent would depend upon the operator procedures, the length of the flight, the type of aircraft, and the amount of work to be performed in the cabin. This may be achieved in a method best suited for the operation, such as an announcement from the flight deck, use of chimes, or an interphone call.

(5) Should the safety belt sign be illuminated while crew members are providing service, an explanation should be given periodically to passengers explaining why the passengers need to be seated with safety belts fastened, even though the crew members are not. An announcement should also be made when flight attendants are not able to continue service due to the severity of turbulence. This would explain to passengers the absence of service or flight attendant presence in the cabin, which could lead to unnecessary use of call bells or passengers leaving their seats to seek non-urgent assistance. Once the threat of turbulence has expired, the safety belt sign should be turned off. An announcement should be made informing passengers that although the threat of turbulence has passed, they should keep their safety belts fastened to prevent injuries from unexpected turbulence.

(6) Crew members should be encouraged to lead by example and keep their safety belts fastened at all times while seated or at rest, including during periods of flight when the safety belt sign is not illuminated.

7.0 INFORMATION MANAGEMENT

(1) Not applicable.

8.0 DOCUMENT HISTORY

(1) Advisory Circular (AC) 605-004, Issue 01, 2012-02-01 — Use of Safety Belts by Passengers and Crew Members;

(2) Air Carrier Advisory Circular (ACAC) 0070R, 1996-12-16 — In-Flight Use Of Seat Belts/Safety Harness – Flight Attendants;

(3) Commercial and Business Aviation Advisory Circular (CBAAC) 0149, 1999-01-06 — Seat Belt Use & Seat Belt Discipline; and

(4) CBAAC 0222, 2003-10-08 — Safety Belt Sign Vs Service Related Duties.
9.0 CONTACT OFFICE

For more information, please contact:

Standards (AART)

Phone: 1-800-305-2059 or 613-993-7284
Fax: 613-957-4208
E-mail: AARTinfodoc@tc.gc.ca

Suggestions for amendment to this document are invited, and should be submitted via:
AARTinfodoc@tc.gc.ca.

Original signed by

Aaron McCrorie
Director, Standards, Civil Aviation