



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.:	03
RDIMS No.:	17469264-V7	Effective Date:	2022-03-14

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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 inform and remind operators of the policy on safety belt and shoulder harness usage on board aircraft, recommended by Transport Canada Civil Aviation (TCCA).
- (2) This document encourages operators 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 and shoulder harness 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.
- (2) To accomplish the above-stated objectives, the AC is structured in the following sections:
 - (a) Main body - provides background and general guidance.
 - (b) Appendix A - Requirements for the installation and use of safety belts and shoulder harnesses.
 - (c) Appendix B - Proper use of safety belts and shoulder harnesses.
 - (d) Appendix C - Turbulence and the use of safety belts.
 - (e) Appendix D - Passenger use of safety belts and restraint systems.
 - (f) Appendix E - Crew member use of safety belts and service-related duties.
 - (g) Appendix F - Applicable regulations.

1.3 Description of changes

- (1) Due to the number of changes incorporated into this issue, readers should review the content of the entire document. The major changes are:
 - (a) the format of the document;
 - (b) information on the use of shoulder harnesses has been added to this document in response to the Transportation Safety Board (TSB) of Canada investigation (A17O0264) to highlight the importance of using of all available components of a safety belt and, if available, shoulder harnesses for all occupants 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.C., 1985, c. A-2)
 - (b) Part I, Subpart 1 of the *Canadian Aviation Regulations (CARs)* – Interpretation
 - (c) Part VI, Subpart 2 of the CARs – Operating and Flight Rules
 - (d) Part VI, Subpart 4 of the CARs – Private Operator Passenger Transportation
 - (e) Part VI, Subpart 5 of the CARs – Aircraft Requirements
 - (f) Part VII, Subpart 2 of the CARs – Aerial Work
 - (g) Part VII, Subpart 3 of the CARs – Air Taxi Operations
 - (h) Part VII, Subpart 4 of the CARs – Commuter Operations
 - (i) Part VII, Subpart 5 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, 2016-07-18 – Child Restraint Systems and Other Seating Devices
 - (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 Seatbelts – Double Click for Safety
 - (o) Transport Safety Board (TSB) of Canada Safety Investigation Report No. A12O0071
 - (p) TSB of Canada Safety Investigation Report A17O0264
 - (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 OK-19-1857, 2020-04-22 – Seat Belts and Shoulder Harnesses – Smart Protection in Small Airplanes
 - (u) United States FAA Publication, 2006-02-23 – Shoulder Harness – Aircraft Restraint Systems, Survival Accidents, & Recommendations
 - (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
 - (x) Interaction Research Corporation Research Report, 1999-01 – Symbol Development: Keep Seat Belt On In Case of Turbulence.

2.2 Cancelled documents

- (1) 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) **Air Operator:** means the holder of an air operator certificate.
 - (b) **Crew Member:** means a person who is assigned to duty in an aircraft during flight time.
 - (c) **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 while in cruise flight.
 - (d) **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.
 - (e) **Flight Crew Member:** means a crew member assigned to act as pilot or flight engineer of an aircraft during flight time.
 - (f) **Infant:** means a person under two years of age.
 - (g) **Passenger:** means a person, other than a crew member, who is carried on board an aircraft.
 - (h) **Safety Belt:** means a personal restraint system consisting of either a lap strap or a lap strap combined with a shoulder harness.
 - (i) **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.
- (2) The following **abbreviations** are used in this document:
 - (a) **AC:** Advisory Circular
 - (b) **CARs:** *Canadian Aviation Regulations*
 - (c) **CASS:** *Commercial Air Service Standards*
 - (d) **FAA:** Federal Aviation Administration
 - (e) **PIC:** Pilot-in-command
 - (f) **TCCA:** Transport Canada Civil Aviation
 - (g) **TSB:** Transportation Safety Board

3.0 Background

- (1) A high percentage of pilot and passenger deaths and serious injuries have occurred in small aircraft accidents and 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 statistics provide substantial evidence that the use of a shoulder harness, in conjunction with a lap strap, can reduce serious injuries to the head, neck, and upper torso for occupants on

board an aircraft, and has the potential to reduce fatalities of occupants in an otherwise survivable accident.

- (3) The TSB has investigated multiple small aircraft accidents in recent years that have resulted in severe injuries and/or fatalities. Results from these investigations revealed that crew members and passengers commonly fasten the lap strap portion of their safety belts, but the use of shoulder harnesses varies widely. Where shoulder harnesses were not installed, or were installed but not worn, serious injuries and fatalities to passengers and crew members resulted.
- (4) In certain aircraft, if a flight crew member becomes injured or is rendered unconscious and that person is not properly secured, they may be projected from their seat, blocking the only operational exit, thus limiting the likelihood of survival for themselves and passengers on board.

4.0 Information management

- (1) Not applicable.

5.0 Document history

- (1) Advisory Circular (AC) 605-004. Issue 02, 2014-11-25 – Use of Safety Belts and Shoulder Harnesses on Board Aircraft
- (2) AC 605-004, Issue 01, 2012-02-01 – Use of Safety Belts by Passengers and Crew Members
- (3) Commercial and Business Aviation Advisory Circular (CBAAC) 0222, 2003-10-08 – Safety Belt Sign Vs Service Related Duties
- (4) CBAAC 0149, 1999-01-06 – Seat Belt Use & Seat Belt Discipline
- (5) Air Carrier Advisory Circular (ACAC) 0070R, 1996-12-16 – In-Flight Use of Seat Belt/Safety Harness – Flight Attendants
- (6) ACAC 0070, 1994-10-25 – In-Flight Use of Seat Belt/Safety Harness – Flight Attendants

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Appendix A — Requirements for the installation and use of safety belts and shoulder harnesses on aircraft

General

- (1) The CARs describe the general use of safety belts and restraint systems for all persons on board an aircraft. Section 605.25 of the CARs states, in part, that “The pilot-in-command of an aircraft shall direct all persons on board the aircraft to fasten safety belts, including any shoulder harness” and requires the PIC to direct all passengers on board to be seated with their safety belts and, if applicable, shoulder harness, 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 PIC 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 shall 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 1, 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 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 small aeroplanes and helicopters have installed shoulder harnesses at all seats for all occupants of the aircraft, aircraft owners, operators 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 the seat structure at a decreased “G” force than required for original certification.
- (7) 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.

Appendix B — Proper use of safety belts and shoulder harnesses

General

- (1) While it is required to wear a safety belt and shoulder harness, where provided, it will not provide full benefits if worn improperly and, in some cases, may result in injuries or fatalities 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 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 one's hip bones, the safety belt 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 interference from the armrest, aircraft controls, or 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.

Appendix C — Turbulence and the use of safety belts

General

- (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 resulted in serious injuries and fatalities to passengers and crew members. Numerous post-accident reports have revealed 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 Collaborative Flight Planning Services (CFPS) or the Aviation Weather Websites (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 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 before, during, and after incidents of turbulence.
 - (d) Dispatchers should plan for, brief flight crew members and proactively provide turbulence forecasts and pilot reports (PIREPs) to flights they are monitoring and pilots should share with crew members and passengers information relating to adjustments in service based on forecasted turbulence.
 - (e) Air operators are encouraged to develop announcements for different severities of turbulence including the estimated time the turbulence may persist, and explain that the safety belt sign will remain illuminated during that time.

Appendix D — Passenger use of safety belts and restraint systems

General

- (1) TCCA encourages operators to take initiative in promoting 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 involves illuminating the safety belt sign only during critical phases of flight, instead of leaving it on at all times. It is believed the safety belt sign should only be illuminated when deemed required by the PIC or according to the air operator's procedures. By doing so, passengers and crew members are more likely to understand and recognize the importance of the safety belt sign and comply with instructions when 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 by the flight deck or in-charge flight attendant when the safety belt is 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 discourage passengers from leaving their seats 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 the use of visual aids such as safety belt extenders, briefing cards and/or pointing to safety belt signs to alert 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, the passenger 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, they should first ensure that the child is properly secured in their child restraint system prior to ensuring that their own safety belt is properly fastened. Transport Canada AC 605-003 — Child Restraint Systems and Other Seating Devices 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), 725.16(1)(b), and 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.

Appendix E — Crew member use of safety belts and service-related duties

General

- (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 PIC 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 when the aircraft is experiencing light turbulence to perform duties related to the passengers on board.
- (2) Procedures for crew member use of safety belts should specify 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 may be 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 open compartment, injuring passengers or crew members. During descent, crew members should concentrate 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 complete service-related duties, including the collection of in-flight service waste, in a safe and timely manner. Determination of the time of notification from the flight deck for the top of descent would depend upon the operator procedures, length of the flight, 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, while 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, their safety belts should remain 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 periods of flight when the safety belt sign is not illuminated.

Appendix F — Applicable regulations

Overview

- (1) Some of the CARs and CASS that are applicable to this document are included in the table below.

Caution: The regulations listed below are not necessarily complete and up to date; and will not necessarily be updated. Air operators and pilots are responsible for compliance with all relevant provisions.

Subject	Provisions of the CARs	Provisions of the CASS
Passenger Briefings and Briefing of Persons other than Flight Crew Members	602.89, 604.85, 705.16(3)	722.16, 722.23, 723.39, 724.34, 725.16, 725.43
Cabin Safety	604.82	
Safety Features Card	604.86	723.39(4), 724.35, 725.44
Seat and Safety Belt Requirements	605.22	
Restraint System Requirements	605.23	
Shoulder Harness Requirements	605.24, 702.44, 703.69, 704.68, 705.75	
General Use of Safety Belts and Restraint Systems	605.25(1), 605.25(2), 605.25(3), 605.25(4)	
Use of Passenger Safety Belts and Restraint Systems	605.26(1)(a)	
Use of Crew Member Safety Belts	605.27	
Flight Attendant Stations		725.41
Flight Crew Member at Controls	705.29(1)	