

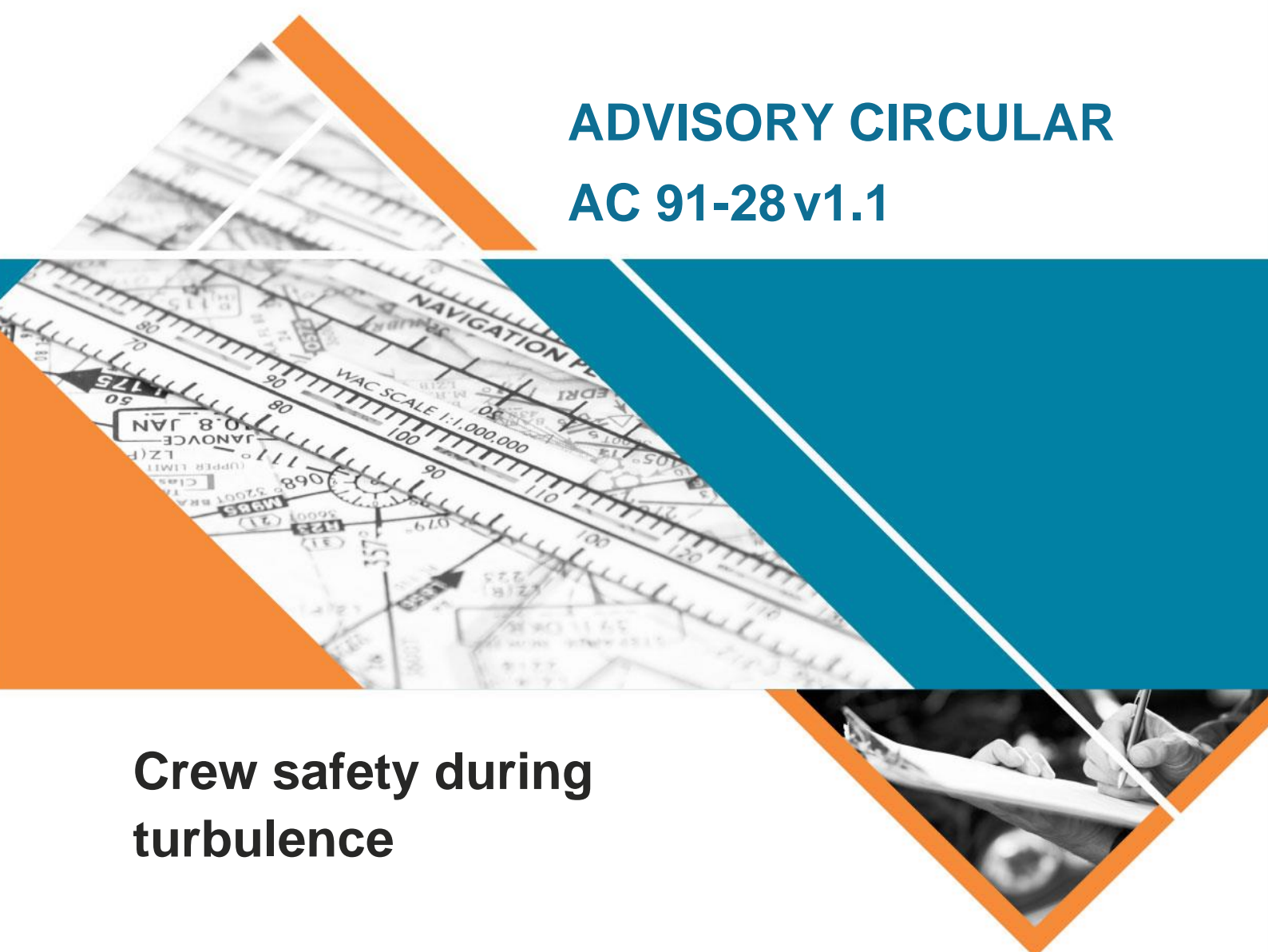


ADVISORY CIRCULAR

AC 91-28 v1.1

Crew safety during turbulence

Date September 2024
File ref D24/387289



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

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

Audience

This advisory circular (AC) applies to:

- aircraft operators
- crew members.

Purpose

This AC provides guidance to operators and their crew members regarding regulation 91.535 of the *Civil Aviation Safety Regulations 1998 (CASR)*. The purpose of the AC is to assist with establishing procedures regarding turbulence management as it relates to crew coordination and communication, as well as the performance of safety and service-related duties by crew during turbulence or when turbulence is expected.

For further information

For further information, contact CASA's Operations Standards (telephone 131 757).

Status

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

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

| Version | Date | Details |
|---------|----------------|----------------------------|
| v1.1 | September 2024 | Minor referencing updates. |
| v1.0 | August 2021 | Initial AC. |

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

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1 Reference material

1.1 Acronyms

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

| Acronym | Description |
|---------|---|
| AC | Advisory Circular |
| ATSB | Australian Transport Safety Bureau |
| CASA | Civil Aviation Safety Authority |
| CASR | <i>Civil Aviation Safety Regulations 1998</i> |
| CRS | child restraint system |
| FAA | Federal Aviation Administration |
| IATA | International Air Transport Association |
| PIC | pilot-in-command |
| SMS | safety management system |
| TC | Transport Canada |
| TSB | Transport Safety Board of Canada |

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this AC and the civil aviation legislation, the definition in the legislation prevails.

| Term | Definition |
|-------------------|---|
| cabin crew member | A crew member who performs, in the interests of the safety of an aircraft's passengers, duties assigned by the operator or the pilot-in-command of the aircraft but is not a flight crew member |
| Crew member | A person is a crew member of an aircraft if the person is carried on the aircraft and is: <ul style="list-style-type: none"> (a) a person: <ul style="list-style-type: none"> (i) who is authorised by the operator of the aircraft to carry out a specified function during flight time relating to the operation, maintenance, use or safety of the aircraft, the safety of the aircraft's passengers or the care or security of any cargo which may affect the safety of the aircraft or its occupants; and (ii) who has been trained to carry out that function; or (b) a person who is on board the aircraft for the purpose of: <ul style="list-style-type: none"> (i) giving or receiving instruction in a function mentioned in subparagraph (a)(i); or (ii) being tested for a qualification associated with a function mentioned in subparagraph (a)(i); or (c) a person authorised by CASA under these Regulations, or by the operator, to carry out an audit, check, |

| Term | Definition |
|-----------------------------|---|
| | examination, inspection or test of a person mentioned in paragraph (a) or (b). |
| crew station | For a crew member of an aircraft, means a position on the aircraft that is designed and equipped to enable the crew member to carry out the crew member's assigned duties on the aircraft. |
| critical phases of flight | The period of high workload on the flight deck; normally the periods between the beginning of taxiing until the aircraft is on the route climb phase, and between the final part of descent to aircraft parking. |
| exposition | (a) for an Australian air transport operator, means: <ul style="list-style-type: none"> (i) the set of documents approved by CASA under regulation 119.075 in relation to the operator, and (ii) if the set of documents is changed under regulation 119.085, 119.095 or 119.105, or in accordance with the process mentioned in regulation 119.100—the set of documents as changed, or (b) for an ASAO, means: <ul style="list-style-type: none"> (i) the set of documents approved by CASA under regulation 149.080 in relation to the ASAO, or (ii) if the set of documents is changed under regulation 149.115 or 149.120, or in accordance with the process mentioned in paragraph 149.340(i)—the set of documents as changed. |
| operator | of an aircraft, means: <ul style="list-style-type: none"> (a) if the operation of the aircraft is authorised by an AOC, a Part 141 certificate or an aerial work certificate—the holder of the AOC or certificate; or (b) otherwise—the person, organisation or enterprise engaged in aircraft operations involving the aircraft. |
| PA system | Passenger address system |
| restraint | A device designed to safely restrain an occupant in their seat to prevent injuries resulting from inertia forces or other in-flight forces, such as turbulence. A restraint may be a seatbelt, safety harness or approved child restraint system. |
| safety harness | A webbing-based restraint consisting of at least three anchor points restraining both the pelvis and upper torso. |
| seatbelt | A webbing-based restraint consisting of two anchor points restraining the pelvis. |
| shoulder harness | Any device that is used to restrain the upper torso of a person and consists of a single diagonal upper torso strap or dual upper torso straps. |
| threat and error management | The process of detecting and responding to threats and errors to ensure that the ensuing outcome is inconsequential, i.e. the outcome is not an error, further error or undesired state. |

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

| Document | Title |
|----------------|-------------------------------|
| 91.535 of CASR | Crew safety during turbulence |

International Civil Aviation Organization documents

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

Many ICAO documents are also available for reading, but not purchase or downloading, from the ICAO eLibrary (<https://elibrary.icao.int/home>).

| Document | Title |
|----------------|--|
| ICAO Doc 10086 | Cabin Crew Safety Training Manual (second edition) |

Advisory material

CASA's advisory materials are available at <https://www.casa.gov.au/publications-and-resources/guidance-materials>

| Document | Title |
|----------|-----------------|
| AC 91-16 | Wake turbulence |

Other

| Document | Title |
|--|---|
| ATSB Aviation Safety Bulletin AR-2008-034 | Staying Safe Against Inflight Turbulence, 30 June 2008 |
| ATSB Educational Fact Sheet AR-2008-034 | Staying Safe Against Inflight Turbulence, 2 nd edition, March 2014 |
| ATSB Transport Safety Report AO-2013-181 | NW of Noumea La Tontouta International Airport, New Turbulence event involving a Boeing 777-3ZGER, VH-VPE, 472km Caledonia, 23 September 2013 |
| FAA Advisory Circular AC 00-30C | Clear Air Turbulence Avoidance, 22 March 2016 |
| FAA Advisory Circular AC 120-48A | Communication and Coordination between flight crew members and flight attendants, 27 January 2020 |
| FAA Advisory Circular AC 120-88A | Preventing injuries caused by turbulence, 19 November 2007 |
| TC Advisory Circular AC No. 605-004 | Use of safety belts and shoulder harnesses on board aircraft, Issue No. 2, 28 November 2014 |
| TSB Aviation Investigation Report A15F0165 | Severe Turbulence Encounter, Air Canada Boeing 777-333ER, C-FRAM Anchorage, Alaska, 85 nm ENE, 30 December 2015 |
| TSB Aviation Investigation Report | Loss of control ExpressJet Airlines Embraer EMB-145LR, N16954 London, Ontario, 53 NM W, 5 September 2014 |

| Document | Title |
|-----------------|--------------|
| A14O0165 | |

2 Introduction

2.1 Safety during turbulence

- 2.1.1 Turbulence is the leading cause of in-flight injuries to crew and passengers. This AC provides guidance to assist operators in developing procedures to meet the requirements of 91.535 of the *Civil Aviation Safety Regulations 1998 (CASR)* regarding crew safety during turbulence.
- 2.1.2 Turbulence is caused by the relative movement of disturbed air through which an aircraft is flying and responsible for the abrupt sideways and vertical jolts that passengers can experience during flight. Its origin may be thermal or mechanical, and it may occur either within or clear of cloud.
- 2.1.3 When air masses with different speeds, direction or temperatures meet each other, such as a warm or cold front, a thunderstorm, air flowing over or around mountains, or near jet streams, turbulence is likely to occur¹.
- 2.1.4 Crew members in the cabin are at greater risk of injury during turbulence as they are moving around the cabin and are not always seated at a crew station or in a seat with a seatbelt fastened.
- 2.1.5 There have been accidents and incidents involving clear air turbulence that have resulted in serious injuries and fatalities to passengers and crew. Numerous post-incident reports reveal that, while the seatbelt sign was illuminated when aircraft encountered turbulence, passengers and crew members had not been wearing their seatbelt. Post-incident reports highlight the importance of keeping seatbelts fastened throughout the flight while seated.
- 2.1.6 Applying appropriate turbulence management strategies can result in fewer incidents or accidents. Comprehensive information pertaining to operating procedures, along with the application of turbulence management in practical training scenarios, will assist operators with the effective management of turbulence.
- 2.1.7 Crew member training, pre-flight planning, pre-flight briefing, 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.
- 2.1.8 Operators are encouraged to promote information sharing through safety reporting to analyse and continuously improve procedures pertaining to turbulence management and strategies for compliance with seatbelt policies.

¹ ATSB Staying safe against turbulence AR-2008-034.

3 Categorising turbulence

3.1 Turbulence types

- 3.1.1 Thunderstorm turbulence - Turbulence associated within and in the vicinity of thunderstorms or cumulonimbus clouds. A cumulonimbus cloud with hanging protuberances is usually indicative of severe turbulence.
- 3.1.2 Clear air turbulence - High level turbulence (above 15,000 ft) not normally associated with cumuliform cloudiness. Typically, windshear turbulence even when in cirrus clouds.
- 3.1.3 Mountain wave turbulence - Turbulence because of air being blown over a mountain range or a sharp bluff causing a series of updrafts and downdrafts.
- 3.1.4 Thermal turbulence - Localised columns of convective current (a rising column of warm air) resulting from surface heating or cold air moving over warmer ground. For every rising current, there is a compensating downward current usually slower in speed since it covers a broader area, causing turbulence.
- 3.1.5 Frontal - Turbulence caused by lifting of warm air, a frontal surface leading to instability, or the abrupt wind shift between the warm and cold air masses.
- 3.1.6 Temperature inversion turbulence - Even though a temperature inversion produces a stable atmosphere, inversions can cause turbulence at the boundary between the inversion layer and the surrounding atmosphere.
- 3.1.7 Mechanical turbulence - When the air near the surface of the Earth flows over obstructions such as bluffs, hills, mountains, or buildings, the normal horizontal wind flow is disturbed and transformed into a complicated pattern of eddies and other irregular movements.
- 3.1.8 Wake vortex turbulence - Turbulence which is generated by the passage of an aircraft in flight, principally caused by wing tip vortices. It is generated from the point when the nose landing gear of an aircraft leaves the ground on take-off and ceases when the nose landing gear touches the ground during landing. This type of turbulence is significant because wing-tip vortices decay quite slowly and can produce a significant rotational influence on an aircraft encountering them for several minutes after they have been generated.

3.2 Turbulence intensity

- 3.2.1 Light Chop - Slight, rapid, and somewhat rhythmic bumpiness without appreciable changes in aircraft altitude or attitude.
- 3.2.2 Light turbulence - Slight, erratic changes in aircraft altitude and/or attitude. Occupants may feel a slight strain against seatbelts. Unsecured objects may be displaced slightly. Cabin service may be conducted, and there may be little to no difficulty walking.
- 3.2.3 Moderate chop - Rapid bumps or jolts without appreciable changes in aircraft altitude or attitude.
- 3.2.4 Moderate turbulence - Changes in aircraft altitude and/or attitude occur, but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed.

Occupants feel definite strain against seatbelts; unsecured objects are dislodged; and cabin service and walking are difficult.

- 3.2.5 Severe - Large, abrupt changes in aircraft altitude and/or attitude. Usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Occupants are forced violently against seatbelts; unsecured objects are tossed about; and cabin service and walking are impossible.
- 3.2.6 Extreme - Aircraft is violently tossed about and is practically impossible to control. May cause structural damage.

4 Turbulence threat and error management

4.1.1 Applying threat and error management will assist in managing crew safety during turbulence events. The following information provides examples of threats, errors and undesired states relevant to turbulence related injuries.

4.1.2 Threats may include:

- Inadequate seatbelt policy.
- Inadequate standard operating procedures.
- Anticipated and unanticipated turbulence.
- Service-related duties.
- Operational pressure.
- Service equipment and equipment restraining device.
- Galley-specific threats, such as carts, bins, countertops, protruding latches and hot liquids.
- Cabin-specific threats, such as overhead bins, partitions and armrests.

4.1.3 Errors can include:

- Crew members do not secure themselves during turbulence.
- Crew members standing during a critical phase of flight.
- Handling errors, such as leaving service equipment unrestrained and handling hot liquids during turbulence.

4.1.4 Undesired states:

- Crew unsecured in turbulence.
- Equipment unrestrained cabin or galley.
- Hot liquids in cabin or galley during turbulence.
- Passenger unrestrained in the lavatory.
- Prolonged seatbelt sign presentation.

5 Education and training

5.1 General

- 5.1.1 Crew safety during turbulence² can be enhanced by providing comprehensive training in turbulence prevention and management.
- 5.1.2 Effective training will incorporate a variety of methods, such as simulated scenarios, lessons learned from investigative bodies, and interviews with crew members who have experienced turbulence events, to highlight the potential adverse consequences.
- 5.1.3 It is recommended that the information contained in sections 5.2 to 5.5 of this chapter be highlighted in the education and training crew receive.

5.2 Crew coordination and communication

- 5.2.1 Coordination and communication among all crew members is a critical component of managing turbulence events and should not be limited to only pre-flight briefings.
- 5.2.2 Close coordination between flight crew and other crew members will facilitate the timely completion of service related tasks and preclude the exposure of crew to potential injury during known or anticipated encounters with turbulence.
- 5.2.3 The importance of human factors/non-technical skills training to ensure a coordinated crew response before, during and post a turbulence event cannot be overstated. All crew members, regardless of position or experience, need to have the confidence to identify and communicate when turbulence has the potential to effect safety.
- 5.2.4 Team performance can be optimised by:
 - using standard phraseology so that meaning and intent are never in doubt.
 - using standard operating procedures so that all crew members know what to expect.
- 5.2.5 Ensuring crew awareness of:
 - the consequences of communication errors, such as vague, inaccurate descriptions and nonstandard phraseology regarding turbulence
 - the importance of flight crew informing other crew members of anticipated turbulence during the pre-flight crew briefing, as notification en-route may come too late to prevent injury.
- 5.2.6 The benefits of an effective pre-flight briefing between flight crew and other crew members that addresses the following:
 - potential of turbulence encounters during each sector of the flight
 - intensity of turbulence expected³
 - expected duration of the turbulence and how resuming inflight duties will be communicated
 - the importance of keeping flight crew informed of the conditions in the cabin

² Regulation 91.535.

³ Refer to chapter 3.2 of this AC.

- actions the pilot-in-command (PIC) wants other crew members to undertake any time turbulence is expected
- methodology for communicating to the cabin the onset or worsening of turbulence e.g. cabin interphone or PA system
- phraseology for other crew members to communicate the severity of turbulence
- commitment to using standard operating procedures and phraseology during a turbulence encounter.

5.2.7 If flight into forecast turbulence is unavoidable, prompt notification to other crew members is crucial to their safety.

5.3 Crew are not invincible

5.3.1 The overarching objective throughout all training is to ensure that crew members are confident, competent, and in control while conducting activities in the cabin. However, during a turbulence event, the most suitable initial response is self-preservation. Crew-member awareness of their vulnerability during more intense turbulence events is essential to ensure their safety.

5.4 Recognition of denial reflex

5.4.1 Crew members are educated to recognise and avoid the denial reflex. Crew members are also made aware of the ways that human psychology might play into a turbulence event and serve to increase the risk of injury. For example, on a short flight, with little time to complete cabin service, crew members might be less conservative regarding their personal safety than on a longer flight that has no time constraints. Crew members may also increase their risk of injury and compromise their personal safety by aiming to adhere to routine procedures normally accomplished on every flight, such as completing seatbelt compliance checks, rather than by responding to the non-routine situation that a turbulence event presents.

5.5 Increasing crew and passenger safety

5.5.1 Training should demonstrate to crew members how to increase safety by identifying the tools available to them in a turbulence event. For example, effective use of the PA system and other methods of communication; the location of handholds through the aircraft (or equipment that could be used as a handhold); and how to secure a service cart or an entire galley in minimum time.

6 Turbulence prevention and management procedures

6.1 General

6.1.1 The following considerations are relevant when developing procedures for the management of turbulence to ensure crew safety⁴:

- the definition of turbulence types and intensity
- anticipated and unanticipated turbulence
- crew communication and coordination
- stages of flight e.g. take-off, cruise, descent and final approach
- turbulence duration and conditions inside the aircraft
- PED use during turbulence
- management of assistance animals during turbulence
- post turbulence management
- human factors and prevention strategies
- managing complacency
- turbulence reporting.

6.2 Crew coordination and communication

6.2.1 During turbulence it is important to promote effective communication between the flight crew and other crew members regarding the use of the seatbelt sign as the environment in the cabin may be very different to the environment in the flight deck. Whenever they consider it appropriate, crew need to be confident requesting illumination of the seatbelt sign by the flight crew.

6.2.2 When the seatbelt sign remains illuminated for prolonged periods of time for reasons other than protection from a turbulence encounter, its effectiveness can diminish for crew in the cabin and passengers. Crew should feel free to communicate with flight crew about the need to illuminate the seatbelt sign continuously.

6.2.3 The following crew coordination and communication procedures are commonly used for managing inflight turbulence events:

- Where there is upcoming expected turbulence, the flight crew informs the senior cabin crew member (where applicable), and the senior informs the remainder of the cabin crew to ensure that mitigation measures and/or service level adjustments are carried out as required.
- When turbulence is encountered, the flight crew directs appropriate action via the senior cabin crew member (where applicable). If the in-flight service is to be discontinued, all carts, galleys and cabin equipment are to be secured, while checks are undertaken to ensure that passengers are seated with their seatbelts fastened.
- If advised, crew take their seats and fasten harnesses as soon as is reasonably practicable.

⁴ Regulation 91.535.

- If at any time the crew experience uncomfortable turbulence without notice from the flight crew, they immediately take their seats and inform the flight crew.
- Crew advise the flight crew of turbulence being encountered in the cabin. This may be particularly significant on large aircraft types.
- The flight crew proactively communicate turbulence advisories to the crew and passengers using the interphone, PA system and seatbelt signs.

Note: Reliance solely on the seatbelt sign is not appropriate.

- Flight crew utilise a positive signal for when crew may commence their duties after take-off, and when they should be seated and secured prior to landing.
- If the seatbelt sign needs 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 duties, crew members are given clear instructions when the descent phase will commence.

6.3 Crew safety and service-related duties

6.3.1 When establishing procedures regarding crew safety and service-related duties, it is recommended that consideration be given to the following:

- In addition to the times crew members must be seated at their station with their seatbelt/harness fastened (during take-off and landing and when the PIC so directs⁵), crew are also seated and secured when the senior cabin crew member so directs and at any time the crew member determines it is necessary for their safety.
- The seatbelt sign is illuminated during critical phases of flight, all service-related duties are ceased at that time and all subsequent actions of crew members relate to the safety of the aircraft or the passengers on board.
- Limiting duties to those related to safety during critical phases of flight ensures crew members have sufficient time to secure the cabin and prepare themselves for take-off or landing without risk of injury e.g. taking their assigned station, fastening and adjusting their seatbelt/harness and completing a silent review.
- Service-related duties, such as the distribution of coats to passengers, may hinder safety by compelling passengers to keep the coat on their lap or unfasten their seatbelt to put it on or to stow it in an approved location. 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 e.g. items that have shifted during flight can fall out of the compartment being opened, injuring passengers or crew members.
- Providing clear details regarding those circumstances when the seatbelt sign is illuminated and crew members are able to continue to conduct service-related duties, and how this is managed where circumstances change and crew members need to be seated and secured.
- A requirement for an explanation to be periodically given to passengers explaining why they need to be seated with seatbelts fastened at times when the crew members are not.
- Giving an announcement to passengers to explain the absence of service or crew member presence in the cabin when crew are not able to continue service due to

⁵ Regulation 91.555.

turbulence. Announcements such as these help to prevent the unnecessary use of call bells or passengers leaving their seats to seek non-urgent assistance.

- Encouraging crew members to lead by example and keep their seatbelt/harness fastened at all times while seated or at rest, including during periods of flight when the seatbelt sign is not illuminated.
- All service items are properly stowed and secured when not in use

6.4 Managing the descent phase

6.4.1 The following considerations are relevant when establishing procedures in relation to turbulence and the descent phase of flight:

- Crew duties at different stages of the descent (e.g. commencement, when the fasten seatbelt sign is illuminated and when crew are required to be seated and secured) are clearly defined with the focus on safety-related duties, such as securing the cabin and passengers.
- The aircraft begins to enter an area more likely to be affected by weather and wake turbulence events as it descends, and it is a time of high workload both in the flight deck and the cabin. Effective standard operating procedures will help to mitigate the reduced opportunities for communication between the cabin and flight deck at this time and will ensure crew are seated and secured prior to landing.
- The timing of the notification from flight crew for the top of descent is appropriate to the length of the flight, the type of aircraft, crew procedures and the amount of work to be performed in the cabin.
- Crew are advised by flight crew when the descent phase will commence to ensure there is sufficient time to complete service-related duties in a safe and timely manner, including the collection of in-flight service waste.
- The notification is made using a method best suited for the operation, such as an announcement from the flight deck, use of chimes, and/or an interphone call.

6.5 Passenger safety and promoting voluntary seatbelt use and compliance

6.5.1 Although not part of the obligation in CASR 91.535, the protection of passengers inflight can have an impact on crew duties that affects crew member safety during turbulence.

6.5.2 Due to the difficulty of enforcing the use of seatbelts during all phases of flight, it is recommended that operators be proactive in promoting passenger use of seatbelts and enhance efforts aimed at encouraging passengers to remain in their seats with their seatbelts fastened unless it is necessary to move about the cabin.

6.5.3 Where operators are developing procedures in this regard, the following considerations may assist:

- Prompt and clear turbulence advisories from flight crew with specific directions to crew and to passengers e.g. directions to be seated with seatbelts fastened and to secure cabin service equipment, as conditions require.
- Effective communication and direction from crew to passengers to be seated with seatbelts fastened when required.

- When the seatbelt sign is extinguished during flight as part of normal operations or when the threat of turbulence has expired, an announcement is made by flight crew or the senior cabin crew member explaining the hazards associated with turbulence and that keeping their seatbelts fastened will help prevent injuries from unanticipated turbulence.
- Encouraging the use of an approved child restraint system (CRS) that is appropriate for the occupant's size and weight to secure an infant or small child and ensuring the infant/child is secured in the CRS any time the seatbelt sign is illuminated.
- Advising passengers responsible for an infant/child using a CRS that they should ensure that the infant/child is properly secured in their CRS, and then ensuring that his or her own seatbelt is properly fastened.
- Advising passengers what they should and should not do if the seatbelt sign is illuminated e.g. not to get out of their seat to open overhead lockers when the seatbelt sign is illuminated, to remain seated and ensure their seatbelt is fastened.
- Use of visual aids, such as briefing cards and/or pointing to seatbelt signs, in addition to verbal announcements, when relaying information to special needs passengers about actions that need to be taken when managing turbulence events.
- For flights where it is expected that passengers will sleep, instructing passengers to fasten their seatbelt over blankets to assist crew in verifying that a sleeping passenger is secure if turbulence is encountered during the flight.

6.5.4 Practices that may assist with improving passenger compliance with seating and seatbelt instructions from crew members include:

- Safety demonstrations, briefings and reminders illustrating the benefits of using effective turbulence practices.
- Educating passengers that the illumination of the seatbelt sign is not routine and is a warning function.
- Implementing verbal and written advice to passengers that CASA regulations require them as individuals to comply with crew member instructions regarding the seatbelt sign.
- Articles in airline publications and/or information on safety information cards encouraging passengers to engage in effective practices, such as keeping seatbelts fastened at all times.
- Prior to descent or early into descent, depending on conditions, flight or other crew members announcing to passengers that the seatbelt sign will be illuminated in 10-15 minutes and that any personal needs requiring movement in the cabin should be met before that time. This practice underscores the requirement to comply with the seatbelt sign.

7 Monitoring and improvement

7.1 Reporting

- 7.1.1 Incident reports provide operators with an opportunity to more accurately predict areas that encounter turbulence which can then be conveyed to crew, personnel responsible for developing crew procedures, and passengers.
- 7.1.2 It is recommended that incidents of moderate and severe turbulence are reported by crew so that post-incident investigations can be conducted, and continuous safety improvements realised. Incidents relating to light turbulence can also be useful in identifying routes that are more likely to encounter turbulence.

7.2 Safety management system (SMS)

- 7.2.1 It is important for operators with an SMS to continually monitor and investigate safety-related incidents that pertain to turbulence events.
- 7.2.2 Where trend analysis provides clear evidence of injuries following turbulence due to ineffective standard operating procedures, it is imperative that a risk assessment be undertaken, and revised procedures be put in place to reduce the chance of injury.
- 7.2.3 Information that is useful when conducting analysis includes:
- length and route of the flight
 - time of the year
 - phase of flight
 - aircraft type
 - type(s) of injuries sustained by crew members
 - type(s) of injuries sustained by passengers
 - adequacy of crew member communication and coordination
 - adequacy of operator procedures.