



Flight Operations Briefing Notes Cabin Operations Turbulence Threat Awareness

I Introduction

During a flight it is common for aircraft to encounter turbulence. Turbulence is the leading cause of injury to passengers and cabin crew in non-fatal accidents.

Initiatives can be taken to reduce turbulence-related injuries, with little or no financial cost to the operator.

The aim of this Briefing Note is to:

- Increase cabin crew awareness of the hazards of turbulence
- Provide strategies to enable the cabin crew to effectively manage the cabin during turbulence
- Help cabin crewmembers to ensure safety in the cabin and prevent turbulence-related injuries.

II Background Information

Statistical Data

Turbulence-related injuries to cabin crewmembers occur much more frequently than turbulence-related injuries to passengers, because cabin crewmembers are constantly working in the cabin.

IATA, Safety Trend Evaluation, Analysis and Data Exchange System (STEADES) performed a study of turbulence-related injuries to cabin crewmembers.

Analysis revealed that from January 1st 2004 to December 31st 2004 there were 232 reported cases of turbulence-related injuries to cabin crewmembers, and that:

- 64% of the injuries were due to cabin crewmembers not being secured during turbulence
- 44% of the injuries occurred in the galley
- 9% of these incidents resulted in serious injury to cabin crewmembers.

In the majority of these cases, cabin crewmembers were lifted off the floor, or lost their balance, resulting in foot, ankle and back/spinal injuries.

Other cabin crew injuries were due to loose items in the cabin, such as trolleys.



Figure 1

Damage to cabin ceiling panel during turbulence

Turbulence Definitions

The levels of turbulence are defined and described as follows:

- **Light Turbulence:**

Light turbulence momentarily causes slight, erratic changes in the aircraft altitude or attitude:

- Passengers may feel a slight strain against seat belts
- Liquids are shaking but are not splashing out of cups
- Trolleys can be maneuvered with little difficulty.

- **Moderate Turbulence:**

Moderate turbulence, causes rapid bumps or jolts:

- Passengers feel definite strain against seat belts
- Liquids are splashing out of cups

- Trolleys are difficult to maneuver
- It is difficult to walk or stand in the cabin.
- **Severe Turbulence**
Severe turbulence causes large abrupt changes in the aircraft altitude and attitude:
 - Passengers are forced violently against their seatbelts
 - Items fall or lift off the floor
 - Loose items are tossed about the cabin
 - It is impossible to walk.

III Turbulence Management

III.1 Crew Communication and Coordination

Two-way communication between the cabin crew and the flight crew is necessary in order to manage turbulence and prevent turbulence-related injuries. There are Standard Operating Procedures (SOP's) that can be implemented to enable the flight crew and the cabin crew to improve communication and effectively manage the aircraft and the cabin during turbulence.

For example, use common terminology when communicating the severity of turbulence:

- **Light turbulence**
- **Moderate turbulence**
- **Severe turbulence.**

Using common terminology ensures that the flight crew and the cabin crew share a common understanding of the level of turbulence expected. This enables the cabin crew to perform the appropriate actions and duties, to effectively manage the cabin during turbulence.

Note:

On large aircraft, it is possible that the forward section of the aircraft will experience less turbulence than the aft section of the aircraft. Therefore, the flight crew may not be aware of the level of turbulence experienced in the aft section of the cabin.

It is important that the cabin crew inform the flight crew of turbulent conditions in the cabin during the flight.

Anticipated Turbulence

The flight crew should be briefed on the en-route weather as part of the preparation for the flight. Therefore, the flight crew can be aware of possible areas of turbulence that are forecast for the flight.

The preflight briefing between the flight crew and the cabin crew should include information about the areas of turbulence expected during the flight, and the procedures to be applied in the case of turbulence, for example:

- If areas of turbulence are forecast during the flight
- Estimated time until reaching the area of turbulence
- The severity of the expected turbulence (i.e. light, moderate or severe turbulence)
- The actions that the Captain wants the cabin crew to perform when turbulence is expected
- The signal that flight crew will give to the cabin crew to indicate that the aircraft is no longer going through turbulence (for example, by calling the cabin crew via the cabin interphone, or Passenger Address (PA)).

Unanticipated Turbulence

During the flight, the aircraft may encounter areas of turbulence that were not forecast.

For example, Clear Air Turbulence (CAT), which usually occurs at high altitudes, during cruise the aircraft, may suddenly enter an area of turbulence. Clear Air Turbulence can be forecast but cannot be detected by the aircraft radar, so there is often no warning.

When an aircraft encounters, or is about to encounter, moderate or severe turbulence there may be little or no time for preparation.

If the flight crew turns on the FASTEN SEAT BELT signs and makes an announcement for "all passengers and crew to fasten seat belts immediately", the cabin crew should:

- Immediately sit down and secure themselves (if a crew seat is not near or is not available, the cabin crewmember should use a passenger seat)

Note:

If the turbulence occurs during the cabin service, active the brake on the trolleys.

- Instruct passengers via the PA to fasten their seat belts
- Stay seated until advised by the flight crew or until the FASTEN SEAT BELT sign is switched off.

If time permits before the turbulence encounter, the flight crew should advise the cabin crew:

- How much time is available to secure the cabin
- The level and expected duration of the turbulence encounter
- How the flight crew will inform the cabin crew that the aircraft is no longer going through turbulence (for example, by calling the cabin crew via the cabin interphone, or Passenger Address).

III.2 Cabin Crew Personal Safety

As previously mentioned, turbulence-related injuries to cabin crewmembers are more frequent than turbulence-related injuries to passengers

Cabin crew should be aware of the types of hazards in the cabin that can cause harm during a turbulence encounter. When a cabin crewmember loses balance during a jolt, they may injure themselves by striking armrests, ceiling video screens or in-flight entertainment equipment connected to passenger seats.

Federal Aviation Authority (FAA) Advisory Circular 120-80A recommends that training courseware should be used to increase cabin crew awareness of their vulnerability during moderate and severe turbulence encounters. It is recommended to use real scenarios and interviews with cabin crewmembers that have experienced moderate to severe turbulence, in order to demonstrate that “turbulence can be stronger than you are”.

Balancing Safety and Service

The role of cabin crew requires that both safety and service duties be performed during the flight.

It is important that Operators develop strategies that can enable the cabin crew to effectively manage both safety and service duties.

For example, if turbulence is anticipated to occur after takeoff or during approach, the cabin service can be adapted according to the flight conditions: If turbulence is expected near the destination, starting the cabin service earlier will give the cabin crew sufficient time to correctly secure the cabin before approach.

Cabin crew should not risk injury by continuing cabin service during moderate or severe turbulence. If the turbulence is too intense, the cabin crew should:

- Inform the Purser and the flight crew
- Stop the cabin service
- Secure themselves as quickly as possible.
- The cabin crew should be seated without delay, whether or not they have been instructed to do so by the flight crew.

III.3 Cabin Management

It is possible that loose objects, such as passenger baggage, or service equipment, such as trays, trolleys, etc. become projectiles, and cause injury to cabin crewmembers and passengers during turbulence.

Operators should develop and implement strategies to enable the cabin crew to efficiently manage the cabin, in order to ensure safety and prevent turbulence-related injuries. Some practices can be applied to assist the cabin crew, for example:

- Ensuring that trolleys do not remain unattended in front of exits, outside the galleys, or in the aisles during cabin service
- Frequently checking the cabin during the flight to ensure that:
 - The cabin is kept tidy, in order to limit the amount of loose objects, such as glasses and trays
 - Passenger baggage is not left in the aisles
 - All the overhead stowage compartments are closed during the flight.

If the cabin crew implements the above-mentioned strategies, they will need less time to secure the cabin in the case of turbulence.

III.4 Galley Management

Many cabin crew injuries occur in the galley areas. These injuries are mostly due to galley equipment or objects that are not secured, for example:

- Trolleys that remain in the galleys without the brakes being applied
- Galley compartments that are not correctly latched and closed, falling from their stowage, and, spilling their contents
- Bottles, coffee pots, and service items falling of the galley countertops.

After each service, the cabin crew should:

- **Stow** trolleys in their correct stowage
- **Set** the trolley brake to on, when the trolley is not being moved
- **Close and lock** the doors of trolleys and stowage compartments immediately after each use
- **Stow** service equipment that is not in use
- **Stow** service equipment that is in use in a drawer so that it can be easily stowed in the event of turbulence
- **Use** the latches provided on coffee/beverage makers to keep coffee pots secured, in order to prevent hot contents from spilling.

Cabin crew should never use the galley standard units as a seat or a ladder. The galley standard units should be in their correct location, closed and latched when not in use.

Securing the galley after each service and restraining all equipment after each use, means that less time is needed to secure the galley in the event of turbulence. Therefore, this enables the cabin crew to secure themselves rapidly and prevent injuries.

III.5 Passenger Management

The most effective way to prevent passenger and cabin crew injuries during turbulence is to “sit down and buckle up”.

The best way to help prevent turbulence-related injury is to use seat belts. The flight crew and cabin crew should encourage the use of seat belts and the importance of passenger compliance with the FASTEN SEAT BELT signs.

Flight safety organizations recommend that, during the after takeoff announcement, the flight crew and cabin crew should advise passengers to always keep their seat belts fastened while seated.

When the FASTEN SEAT BELT sign comes on during the flight due to turbulence, a Passenger Address (PA) must be made to advise passengers to return to their seats and fasten belt, until the seat belt sign has been switched off.

When the FASTEN SEAT BELT sign comes on in-flight due to turbulence, the cabin crew must:

- Make an announcement to advise passengers to return to their seats and fasten their seat belts until the Captain has turned the seat belt sign off
- Walk through the cabin and check that all passengers are seated with their seat belts fastened
- Make periodic announcements when the FASTEN SEAT BELT signs are on for a long time, or when passengers do not comply with the FASTEN SEAT BELT signs.

Note:

When the FASTEN SEAT BELT signs remain on for reasons other than turbulence, the effectiveness of the FASTEN SEAT BELT sign is reduced for passengers and cabin crew.

III.6 Post Turbulence

When the turbulence is over, the flight crew will advise the cabin crew that they can resume their cabin duties.

After moderate to severe turbulence, the cabin crew must check the cabin for damage and passenger injuries. The cabin crew should provide first aid treatment to injured passengers or crewmembers, and reassure passengers if necessary.

In addition, the Purser must report the cabin status to the flight crew.

IV Operational and Human Factors involved in a Turbulence Encounter

Analysis of in-service events has revealed that the operational standards are not always effective or applied. For example:

- The cabin crew does not follow the flight crew's instructions to be seated during turbulence
- The cabin crew does not have sufficient training to understand the hazards associated with turbulence
- The Operator has no Standard Operating Procedures (SOPs) to enable cabin crew to effectively manage turbulence encounters
- Communication between the flight crew and the cabin crew is not effective: The cabin crew and the flight crew do not use the same terminology, resulting in information that is not accurate which may lead to errors in communication
- Ineffective communication with passengers: The cabin crew does not stress to passengers the importance of complying with the seat belt sign during turbulence.

V Turbulence-related Injuries - Prevention Strategies

Operators can apply the following prevention strategies in order to help reduce the risk of turbulence-related injuries:

- Develop Standard Operating Procedures (SOP's), that include:
 - Communication between the flight crew, the cabin crew and passengers
 - Specific procedures for anticipated and unanticipated turbulence encounters
 - The duties of the cabin crew before, during and after a turbulence encounter.
- Emphasize the importance of the flight crew and cabin crew preflight briefing, that should include the following subjects:
 - Anticipated areas of turbulence during the flight
 - The importance of keeping the flight crew informed of the conditions in the cabin.
- Use standard terminology when referring to the severity of a turbulence encounter, to ensure that all cabin crewmembers and flight crewmembers understand the meaning and the required actions
- Encourage the use of seat belts. During the after takeoff passenger announcement, the cabin crew should advise passengers to use their set belts during the flight, and request that passengers keep their seat belts fastened at all times when seated
- Provide effective training for cabin crew on how to increase their personal safety and passenger safety during turbulence

- Increase cabin crew awareness regarding the use and location of handrails throughout the cabin, or equipment that cabin crew could use to hold on to in the event of turbulence
- Train cabin crewmembers to effectively use the Passenger Address (PA) system and other types of communication with passengers during turbulence to ensure safety.

VI Summary of Key points

- Operators should review previous turbulence incidents from flight reports, cabin crew reports, interviews etc. This information should be analyzed in order identify some of the causes of turbulence-related injuries. This will enable the Operator to review procedures and training, in order to prevent turbulence-related injuries.
- Operators should develop Standard Operating Procedures (SOPs) to enable the cabin crew to effectively manage the cabin and galleys during turbulence.
- Operators should encourage the use of seat belts. This is the most effective preventive measure for protecting cabin crew and passengers from turbulence-related injuries.
- Operators should encourage the cabin crew to be aware of their own safety during turbulence.

VII Associated Flight Operations Briefing Notes

The following Flight Operations Briefing Notes can be read to complete this information:

- **Effective Briefings for Cabin Operations**

VIII Regulatory References

- JAR-OPS 1.1015 – Cabin Crew Training Standards
- JAR-OPS 1.1000 – Senior Cabin Crewmembers
The JAR publications can be found on: <http://www.jaa.nl/>.
- FAA Advisory Circular – AC 120-88A - Preventing Injuries Caused by Turbulence - <http://www.airweb.faa.gov/>.

IX Additional Reading Materials / Websites References

- IATA – Training - Cabin Operations Safety Toolkit - Turbulence Management - <http://www.iata.org/training/toolkit/>
- Flight Safety Foundation – Publications – Cabin Crew Safety Bulletins - <http://www.flightsafety.org/home.html>
- Flight Safety Australia – May/June 2006 - <http://www.casa.gov.au/fsa/>
- FAA – Fire and Cabin safety - International Fire and Cabin Safety Research Conference – Conference Proceedings from 2004 – Operational Issues - Cabin Readiness for Turbulence - Ken Larcher and Cynthia L. Corbett - <http://www.fire.tc.faa.gov/>.

This FOBN is part of a set of Flight Operations Briefing Notes that provide an overview of the applicable standards, flying techniques and best practices, operational and human factors, suggested company prevention strategies and personal lines-of-defense related to major threats and hazards to flight operations safety.

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