

Final Report

BOEING B777-200, REGISTRATION 9V-SQL TURBULENCE ENCOUNTER

18 JANUARY 2019

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Transport Safety Investigation Bureau
Ministry of Transport
Singapore

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The Transport Safety Investigation Bureau of Singapore

The Transport Safety Investigation Bureau (TSIB) is the air and marine accidents and incidents investigation authority in Singapore. Its mission is to promote aviation and marine safety through the conduct of independent investigations into air and marine accidents and incidents.

The TSIB conducts air safety investigations in accordance with the Singapore Air Navigation (Investigation of Accidents and Incidents) Order 2003 and Annex 13 to the Convention on International Civil Aviation, which governs how member States of the International Civil Aviation Organization (ICAO) conduct aircraft accident investigations internationally.

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GLOSSARY OF ABBREVIATIONS

CS	Chief Steward
FDR	Flight Data Recorder
FO	First Officer
OFP	Operational Flight Plan
PF	Pilot Flying
PIC	Pilot-in-Command
PM	Pilot Monitoring
QAR	Quick Access Recorder
UTC	Coordinated Universal Time
VWS	Vertical Windshear

SYNOPSIS

On 18 January 2019, a B777-200 aircraft encountered turbulence while enroute from Melbourne, Australia to Wellington, New Zealand.

As a result of the turbulence encounter, a passenger sustained a fractured right femur (thighbone). The flight continued to Wellington. Due to the nature of the injury, the passenger had to remain on the aisle during the landing in Wellington.

The Transport Safety Investigation Bureau classified this occurrence as an accident.

AIRCRAFT DETAILS

Aircraft type	:	B777-200
Operator	:	Singapore Airlines
Aircraft registration	:	9V-SQL
Numbers and type of engines	:	2 Rolls Royce Trent 800
Date and time of incident	:	18 January 2019, about 2319 UTC
Location of occurrence	:	Enroute from Melbourne, Australia to Wellington, New Zealand
Type of flight	:	Scheduled Passenger
Persons on board	:	261

1 FACTUAL INFORMATION

All times used in this report are Coordinated Universal Time (UTC) unless otherwise stated.

1.1 History of the flight

1.1.1 A Boeing 777-200 aircraft departed Melbourne Airport, Australia, at about 2143 UTC for Wellington Airport, New Zealand, on 18 January 2019. The flight crew consisted of a Pilot-in-Command (PIC) and a First Officer (FO). The PIC was the Pilot Flying (PF) and the FO the Pilot Monitoring (PM).

1.1.2 During pre-flight preparation, the PIC noted from the Operational Flight Plan (OFP) that there was possible turbulence enroute. He briefed the cabin crew of the possible turbulence and reminded them to take the necessary precautionary actions, including suspension of service and securing themselves to a seat.

1.1.3 At about 2300 UTC when the aircraft was cruising at Flight Level (FL)¹ 410, the aircraft encountered mild clear air turbulence² and the flight crew turned on the fasten seatbelt signs³.

1.1.4 Meals were being served to the passengers when the fasten seatbelt signs were turned on. The cabin crew carried out the cabin safety checks to ensure that passengers returned to their seats and fastened their seatbelts. After ensuring all passengers were seated with their seatbelts fastened, the cabin crew resumed the meal service.

1.1.5 At about 2319 UTC⁴, towards the end of the meal service and while the cabin crew members were housekeeping the galley, the aircraft experienced a stronger turbulence, during which the aircraft lost height for a moment. A female passenger in the economy cabin, who was on her way back to her seat after visiting her daughter a few rows away⁵, felt being lifted momentarily in the air when the aircraft lost height. As her feet contacted the cabin floor again, she felt an intense pain in her right leg and she could only alleviate the pain when she was lying face-down.

1.1.6 According to the cabin crew's post-flight report⁶, they were informed of the

¹ Flight level (FL) is an aircraft's altitude expressed in hundreds of feet.

² The weather radar was not indicating any cloud formations in the vicinity.

³ When the flight crew turn on the fasten seatbelts signs, the fasten seatbelt signs in the cabin are illuminated with a chime tone.

⁴ Based on data from the aircraft's Quick Access Recorder (QAR).

⁵ The passenger told the investigation team that the fasten seatbelt signs were not turned on when she left her seat to visit her daughter. QAR data indicated that the fasten seatbelt signs had been turned on for about 19 minutes.

⁶ The post-flight report was raised after flight and the timing of the incident was based on the recollection of the cabin crew. The actual time of the event may be slightly earlier or later.

injured passenger at about 2325 UTC and the Chief Steward (CS) went to her assistance. When the weather conditions had improved, the fasten seatbelt signs were turned off at 2332 UTC. Then, a doctor travelling on board came to attend to the injured passenger and administered pain killers to her. The cabin crew informed the flight crew of the injured passenger and that she was being attended to by a travelling doctor.

- 1.1.7 Although the option of telemedical service⁷ was available, the In-flight Manager of the cabin crew decided⁸ not to avail himself of this option, given that the aircraft was about to begin its descent to Wellington.
- 1.1.8 When the aircraft started its descent into Wellington Airport, the flight crew requested the cabin crew to ready the cabin for landing. The cabin crew attempted to move the injured passenger to a seat for the landing. However, the injured passenger felt an acute pain in her leg whenever the cabin crew attempted to move her. After several attempts, the doctor advised to let her lie on the aisle for landing.
- 1.1.9 The PIC agreed to the advice from the doctor and arranged for medical service for the injured passenger upon the aircraft's arrival. The cabin crew laid pillows and blankets around the injured passenger to prevent any further injury. In addition, the CS sat in a passenger seat next to the injured passenger to monitor her condition during the landing.
- 1.1.10 The flight continued to Wellington Airport and landed without further incident. Medical service personnel transferred the injured passenger to a local hospital for further medical assistance.
- 1.2 Injuries to persons
 - 1.2.1 One passenger sustained a fractured right femur (thighbone).
- 1.3 Damage to aircraft
 - 1.3.1 There was no damage to the aircraft.
- 1.4 Personnel information
 - 1.4.1 Pilot-in-Command (PIC)

⁷ Telemedical service is remote practices of medicine, including diagnosis and treatment, used inflight by means of satellite communication. Cabin crew communicate the nature of an inflight medical situation to medical experts on the ground, who then make a diagnosis and recommend treatment or a course of action to be taken by the patient or others on board the aircraft.

⁸ The operator's cabin crew procedures for handling an inflight medical situation specify that cabin crew shall make use of telemedical service even if medical personnel on board have come forward to assist. Nonetheless, during training, cabin crew are trained to exercise discretion, taking into consideration the severity of the medical situation and any need to give priority to safety related duties.

Gender	Male
Age	49
Licence	Air Transport Pilot License
Issuing Authority	Civil Aviation Authority of Singapore
Licence validity	31 October 2019
Medical certificate	Class ONE Medical Certificate Restriction: Nil Operational Proviso: Holder shall wear corrective lenses that correct for near vision
Total flying experience	14,700 hours
Total hours on B777	8,703 hours
Flying in last 24 hours	7 hours 11 minutes
Flying in last 7 days	23 hours 31 minutes
Flying in last 28 days	75 hours 33 minutes
Flying in last 90 days	240 hours 28 minutes

1.4.2 First Officer (FO)

Gender	Male
Age	32
Licence	Multi-Crew Pilot License
Issuing Authority	Civil Aviation Authority of Singapore
Licence validity	31 March 2019
Medical certificate	Class ONE Medical Certificate Restriction: Nil Operational Proviso: Holder shall wear corrective lenses that correct for distant vision
Total flying experience	1,747 hours
Total hours on B777	1,747 hours
Flying in last 24 hours	7 hours 11 minutes
Flying in last 7 days	18 hours 42 minutes
Flying in last 28 days	72 hours 34 minutes
Flying in last 90 days	236 hours 49 minutes

1.5 Aircraft information

1.5.1 There was no reported defect of the fasten seatbelt signs during this flight.

1.6 Meteorological information

1.6.1 The Operational Flight Plan (OFP) contained Vertical Windshear (VWS)⁹ values enroute. For the cruise phase of this flight, the VWS values were between one and five. The flight crew interpreted these values as possible light to moderate turbulence.

1.7 Flight recorders

1.7.1 The aircraft's Flight Data Recorder (FDR) and Quick Access Recorder (QAR) were successfully downloaded and available to the investigation team for analysis.

1.7.2 The recording of the aircraft's Cockpit Voice Recorder (CVR) at around the time of the turbulence was not available for analysis by the investigation team as it had been overwritten.

1.7.3 **Figure 1** below illustrates the vertical acceleration recorded by the QAR from five minutes before the fasten seatbelt signs were turned on during the cruise phase until the time the signs were turned off. The largest variation of vertical acceleration recorded was between 1.62G and 0.7G within three seconds at 2319 UTC.

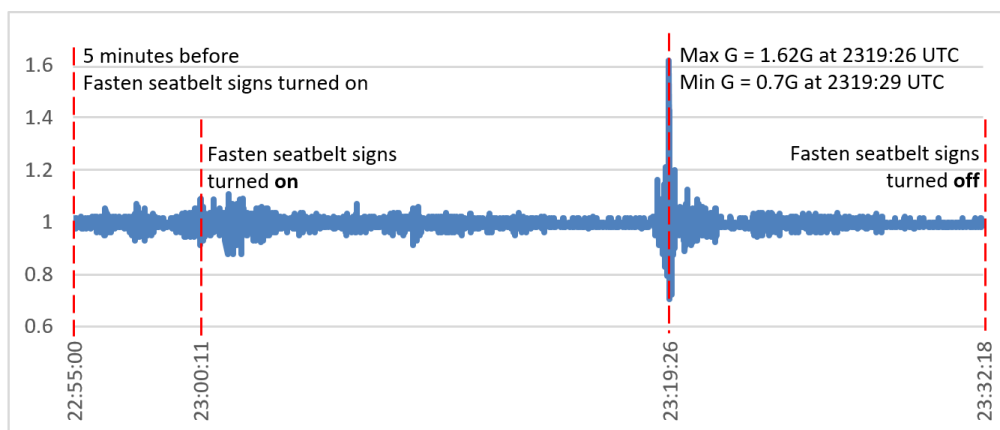


Figure 1: Variation of vertical acceleration recorded during cruise

1.8 Additional information

1.8.1 According to the operator's safety and emergency procedure, when the aircraft is experiencing light turbulence and the fasten seatbelt signs are turned on, cabin crew members are required to, among other duties:

⁹ Vertical Windshear (VWS) is a forecasted vertical windshear value between two waypoints in the route section of an OFP. The value ranges from 1 to 10, with 1 being the weakest and 10 being the strongest.

- Make appropriate passenger announcement,
- Carry out cabin safety checks for compliance with the fasten seatbelt signs (this entails cabin crew members walking down the aisle, when it is safe for them to do so, to ensure passengers are seated and have fastened their seatbelts), and
- Monitor passengers who are in the toilets and who may need assistance

1.8.2 The cabin crew members told the investigation team that when the fasten seatbelt signs were turned on at 2300 UTC, they performed duties listed above but did not notice any passengers standing or in the toilets.

2 ANALYSIS

2.1 Turbulence

2.1.1 The flight crew had been aware of possible turbulence enroute. At about 2300 UTC, after encountering mild clear air turbulence, the flight crew turned on the fasten seatbelt signs.

2.1.2 As illustrated in **Figure 1**, there were no other notably high vertical acceleration recorded during cruise when the fasten seatbelt signs were turned on other than the one recorded at 2319 UTC. Thus, the investigation team correlated the turbulence at this instance (i.e. 2319 UTC) to the time when the passenger was injured.

2.1.3 The fasten seatbelt signs had been on for about 19 minutes when the stronger turbulence occurred that caused the injury to the female passenger who had left her seat to visit her daughter in another part of the cabin.

2.1.4 This occurrence served as a reminder that clear air turbulence could happen any time and passengers do well to heed the fasten seatbelt signs when they are illuminated.

2.2 Passenger lying on the aisle during landing

2.2.1 The pain of the injured passenger was such that she could not be moved to be seated for the landing. As moving the injured passenger may induce even more injury, the flight crew had practically no choice but to perform the landing with her lying on the aisle and without any securing device on her, although pillows and blankets were laid around her to prevent any further injury and a cabin crew member was seated next to her to take care of her during the landing.

2.2.2 The operator had no operating procedure on securing a passenger in a lying position during landing. It may be desirable for the operator to look into whether it would be practical to secure a passenger in a lying position.

3 CONCLUSIONS

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- 3.1 The injured passenger had sustained the injury when a stronger turbulence occurred while she was returning to her seat after visiting her daughter in another part of the cabin notwithstanding that the fasten seatbelt sign was on. The flight crew had been aware of possible turbulence enroute and had turned on the fasten seatbelt sign some 19 minutes before.
- 3.2 The injured passenger had to be left lying on the aisle for landing due to the nature of the injury. The operator had no equipment to secure a person in such a position.

4 **SAFETY ACTIONS**

Arising from discussions with the investigation team, the airline operator has taken the following safety actions.

- 4.1 The airline operator has included this occurrence as a discussion item at its Cabin Crew Safety Forum in September 2019.
- 4.2 The airline operator has sent a reminder to cabin crew members on turbulence handling.
- 4.3 The airline operator has started using this occurrence as a case study at regular cabin crew engagement sessions.

5 SAFETY RECOMMENDATIONS

A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.

- 5.1 It is recommended that the operator develop a contingency plan for a situation where a person on board is unable to be seated and secured during landing. [TSIB Recommendation RA-2019-007]
- 5.2 It is recommended that the regulator require the operator to develop a contingency plan for a situation where a person on board is unable to be seated and secured during landing. [TSIB Recommendation RA-2019-008]