AA2019-4

AIRCRAFT ACCIDENT
INVESTIGATION REPORT

VANILLA AIR INC.
J A 1 4 V A

May 30, 2019

JTSB Japan Transport Safety Board

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board and with Annex 13 to the Convention on International Civil Aviation is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Nobuo Takeda
Chairman
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

FLIGHT ATTENDANT INJURY BY THE SHAKING OF THE AIRCRAFT VANILLA AIR INC. AIRBUS A320-214, JA14VA AT AN ALTITUDE OF ABOUT 9,100 M (FL300) OVER THE SEA ABOUT 45 KM EAST OF MIYAZAKI AIRPORT, JAPAN AT ABOUT 10:35 JST, AUGUST 27, 2018

May 10, 2018

Adopted by the Japan Transport Safety Board

Chairman Nobuo Takeda
Member Toru Miyashita
Member Yoshiko Kakishima
Member Yuichi Marui
Member Yoshikazu Miyazawa
Member Miwa Nakanishi

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	On Monday, August 27, 2018, an Airbus A320-214, registered JA14VA, operated by Vanilla Air Inc., took off from Kansai International Airport and was flying to Amami Airport, when the aircraft was shaken in flight, a flight attendant fell down and got injured.
1.2 Outline of the Accident Investigation	On September 3, 2018, upon receipt of the report on the occurrence of this accident, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident. Although this accident was notified to the French Republic, as the State of Design and Manufacture of the aircraft involved in this accident, the State did not designated its accredited representative. Comments were invited from parties relevant to the cause of the accident and the Relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of the Pilot in Command (hereinafter referred to as "the PIC"), the First Officer (hereinafter referred to as "the FO") and flight attendants, the QAR (Quick Access Recorder) records as well as radar track records, the history of the flight is summarized below. At about 09:59 Japan Standard Time (JST: UTC+9 hours, all times are indicated in JST on a 24 hour clock) on August 27, 2018, an Airbus A320-214,

registered JA14VA, operated by Vanilla Air Inc. (hereinafter referred to as "the Company"), took off from Kansai International Airport, as scheduled flight 873 of the Company (hereinafter referred to as "the Flight") bound for Amami Airport, with 152 people on board, consisting of the PIC, five other crewmembers and 146 passengers. The Flight was operated by the same crewmembers as the previous flight (departed from Taiwan Taoyuan International Airport and arrived at Kansai International Airport).

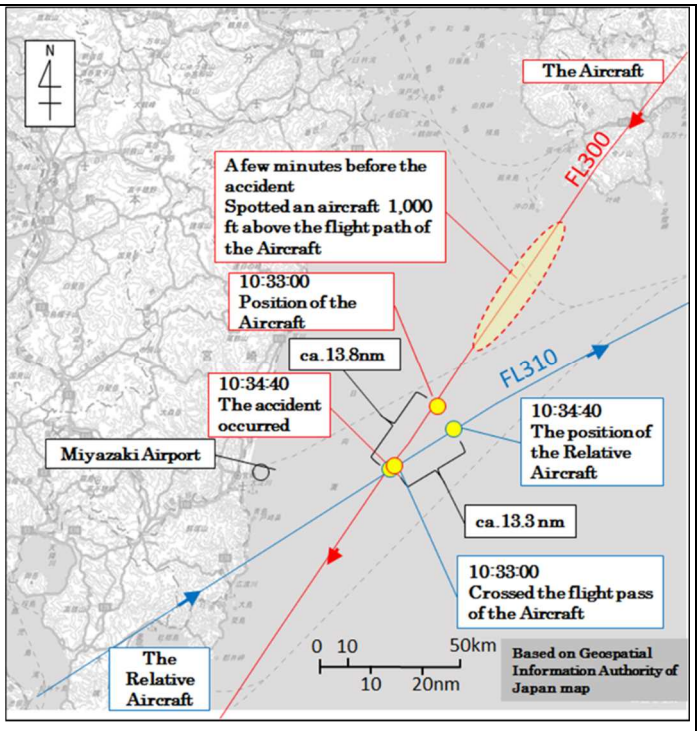


Figure 1: Estimated flight routes of the Aircraft and the Relevant Aircraft

The PIC sat as the PF*1 in the left pilot seat and the FO sat as the PM*1 in the right pilot seat in the cockpit.

Before the previous flight's departure, the PIC had confirmed that the en-route weather conditions of the flight-planned route (Taiwan Taoyuan International – Kansai International – Amami – Narita International) on the day of the accident was mild in the high pressure zone, the winds were generally weak, and no windshear was expected, and during the briefing with the flight attendants he had informed them that there would be no concern about such turbulence that could influence the in-flight service because the weather conditions were generally good on the day.

In addition, before the Flight's departure, the PIC had informed during the briefing with the flight attendants that the weather conditions on the flight route were mild, judging from the weather conditions in Kyushu and Shikoku regions confirmed during the previous flight, and there would be no change about the briefing points from those informed in the previous briefing because there was no change in the wind conditions along the flight route and over the airport according to the latest weather data.

During cruising at FL*2300 toward southwest with autopilot engaged

*1 PF and PM are terms used to identify pilots with their roles in aircraft operated by two persons. The PF (Pilot Flying) is mainly responsible for maneuvering the aircraft. The PM (Pilot Monitoring) mainly monitors the flight status of the aircraft, cross-checks the operation of the PF, and undertakes other non-operational works.
*2 "Flight Level (FL)" refers to the pressure altitude of the standard atmosphere. It is the altitude indicated by value divided by 100 of the index of the altitude indicator (unit: ft) when QNH is set to 29.92 inHG. FL is usually applied when flight altitude is 14,000 ft or above in Japan. E.g., FL 300 indicates an altitude of 30,000 ft.

over the sea off the east of Miyazaki Prefecture after taking off from Kansai International Airport, the PIC and the FO confirmed on the navigation display (ND) and spotted visually that an aircraft (hereinafter referred to as "the Relevant Aircraft") was flying from southwest to northeast at FL310 more than 20 nm ahead of the Aircraft. At this time, it was not possible to visually determine the type of the aircraft because the traffic information on the Relevant Aircraft was not provided from ATC. The PIC decided to leave the seat belt sign OFF, judging that there would be no influence from the wake turbulence because the Relevant Aircraft was flying more than 20 nm away from the Aircraft. While the Aircraft was cruising at FL300, the weather conditions continued to be mild with winds at less than 10 kt and without clouds around the Aircraft.

At 10:33:00, a few minutes after the PIC and the FO had spotted the Relevant Aircraft, it crossed in front of the Aircraft, and at 10:34:40, the Aircraft was suddenly shaken as if to be knocked up from below. At this time, the flight attendant (hereinafter referred to as "the Flight Attendant A"), who was preparing for cleaning in the aft galley after finishing in-flight services, had no time to grab something around her due to a sudden vertical shaking, fell down feeling as if her both feet floated in the air, and hit hard her buttock against the floor. The PIC and the FO felt that the shaking at this time was about the level of the light turbulence*3.

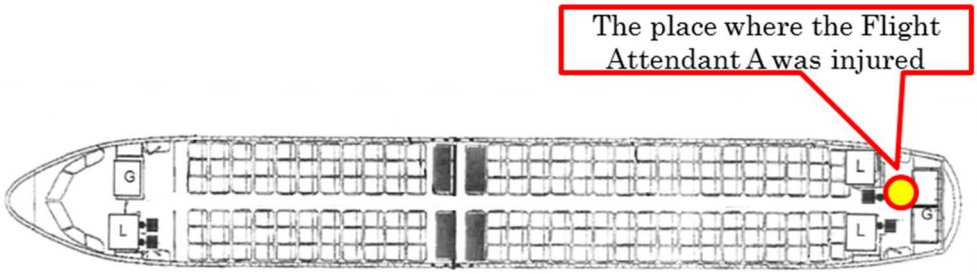
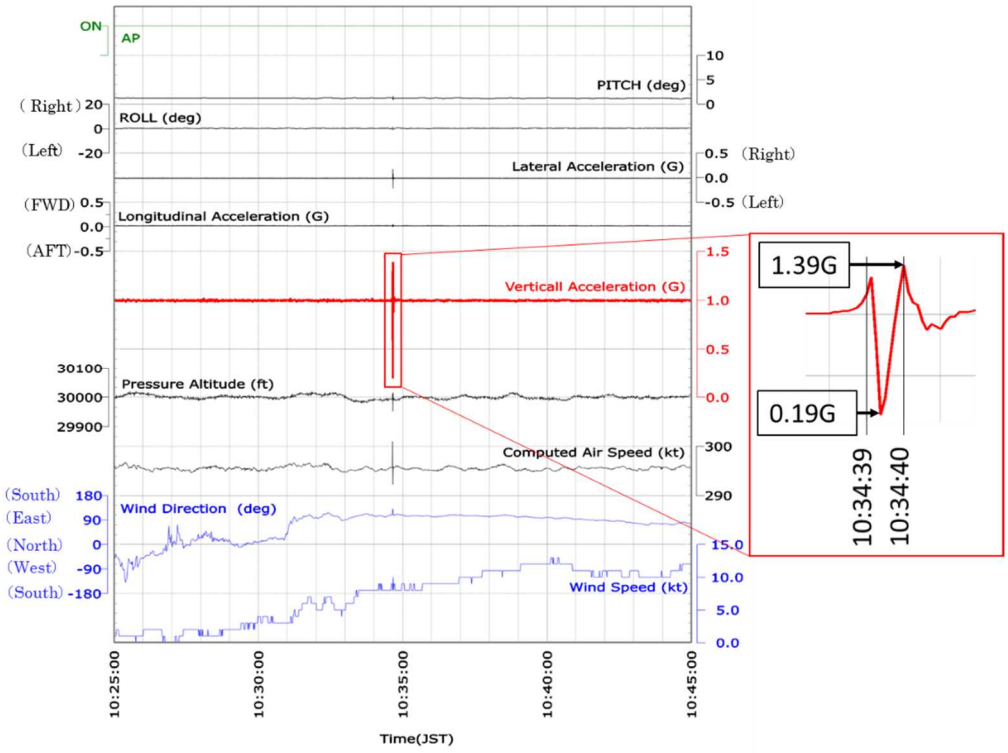


Figure 2: The place where the Flight Attendant A was injured

The Aircraft was shaken only once and soon the shaking stopped, but the PIC turned ON the seat belt sign and instructed the Senior Flight Attendant to confirm the situations in the cabin and report it to the PIC. The PIC turned OFF the seat belt sign again as the PIC received the report that there was no problem in the cabin about 10 minutes after the Aircraft was shaken once. After the seat belt sign was turned OFF, the Flight Attendant A was asked by the Senior Flight Attendant about the situations in the cabin when the Aircraft had been shaken, told the Senior Flight that she had fallen down but all right, even though she was feeling pain in her buttock. And the Flight Attendant A was on board the next flight (Amami – Narita

*3 "Light turbulence" refers to one of the turbulence intensity classes, which momentarily causes slight, erratic changes in altitude and/or attitude, indicates the turbulence level not to feel any difficulty in piloting aircraft. The occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. There is no problem in walking, but caution is required.

	International) that was her last duties on the day. The Flight Attendant A observed carefully her condition during two days off she had from the next day of the accident, but the pain did not go away. In the third day from her fall, she had a duty on board. She thought that her injury was a sort of bruise and it could be cured anytime soon, though still feeling pain, and by making a self-judgment in this way, she continued to work on board. On September 3, the seventh day from her fall, the Flight Attendant A underwent a medical examination at a hospital because the pain in the buttock did not improve, and she was diagnosed with coccygeal fracture. According to the QAR records, from 10:34:39 to 10:32:40, the vertical acceleration fluctuated momentarily in the range between +0.19 G and +1.39 G. When the vertical acceleration fluctuated, there was little change in the attitude of the Aircraft.  Figure 3: QAR records This accident occurred at about 10:35 on August 27, 2018, at FL 300 about 45 km east of Miyazaki Airport (31° 53' 21" N, 131° 56' 05" E).
2.2 Injuries to Persons	Serious injury (coccygeal fracture): One flight attendant
2.3 Damage to Aircraft	None
2.4 Personnel Information	(1) PIC Male, Age 41 Airline transport pilot certificate (Airplane) December 8, 2017 Type rating for Airbus A320 October 1, 2012 Class 1 aviation medical certificate

	Validity	February 19, 2019
	Total flight time	6,787 hours 16 minutes
	Flight time on the same type of aircraft	4,544 hours 56 minutes
	(2) FO Male, Age 27	
	Commercial pilot certificate (Airplane)	June 28, 2013
	Type rating for Airbus A320	November 17, 2016
	Instrument flight certificate	October 24, 2013
	Class 1 aviation medical certificate	
	Validity	October 16, 2019
	Total flight time	1,275 hours 15 minutes
	Flight time on the same type of aircraft	992 hours 57 minutes
2.5 Aircraft Information	Type	Airbus A320-214
	Serial number	7966
	Date of Manufacture	December 14, 2017
	Certificate of airworthiness	No. 2017-038
	Validity	December 14, 2018
	Category of airworthiness	Airplane Transport T
	Total flight time	1,859 hours 45 minutes
	When the accident occurred, the Aircraft's weight and position of center of gravity (CG) are estimated to have been 133,600 lb and 29.8 %MAC*4, respectively, both of which are estimated to have been within the allowable range (maximum take-off weight of 162,039 lb and CG range of 20.07 to 36.4 %MAC).	
2.6 Meteorological Information	According to the Asia-Pacific Surface Weather Chart for 09:00 and the Domestic Significant Weather Prognostic Chart for 10:00 issued by the Japan Meteorological Agency (JMA) on August 27, 2018, The airspace in the vicinity of the accident site was covered with high pressure located in the south of Japan, and no clouds accompanying significant weather were observed. In addition, there were no pilot reports (PIREP) on turbulence within one hours before as well as after the accident in the vicinity of the accident site, also according to the Hourly-Analysis Chart for 10:00, the winds were weak at 5 to 10 kt, and windshear indicating a change in wind direction and wind speed was not observed in the vicinity of the accident site.	

*4 "MAC" refers to the abbreviation of Mean Aerodynamic Chord. It is a wing chord that represents the aerodynamic characteristic of the wing, and indicates the average of when the wing chord such as the rear wing chord is variable. XX % MAC indicates a XX % position from the front of the mean aerodynamic chord.

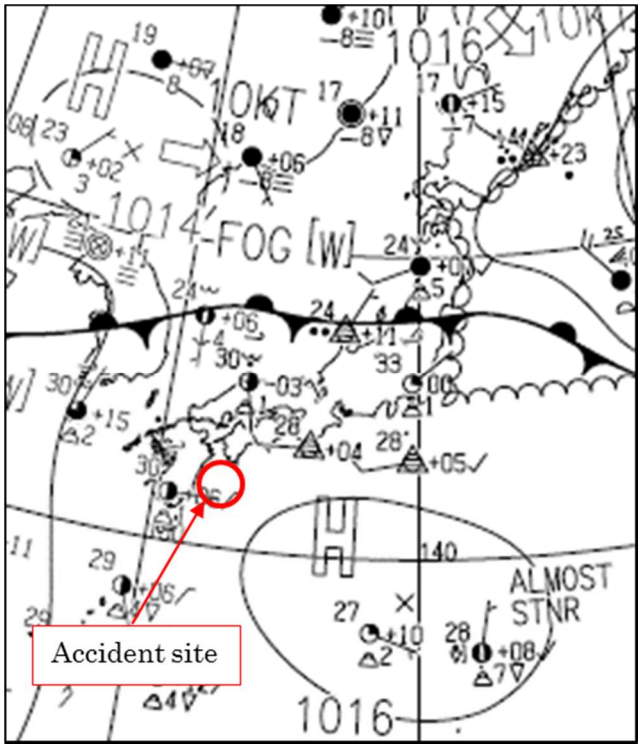


Figure 4: Asia-Pacific Surface Weather Chart (excerpt)
at 09:00 JST on August 27, 2018

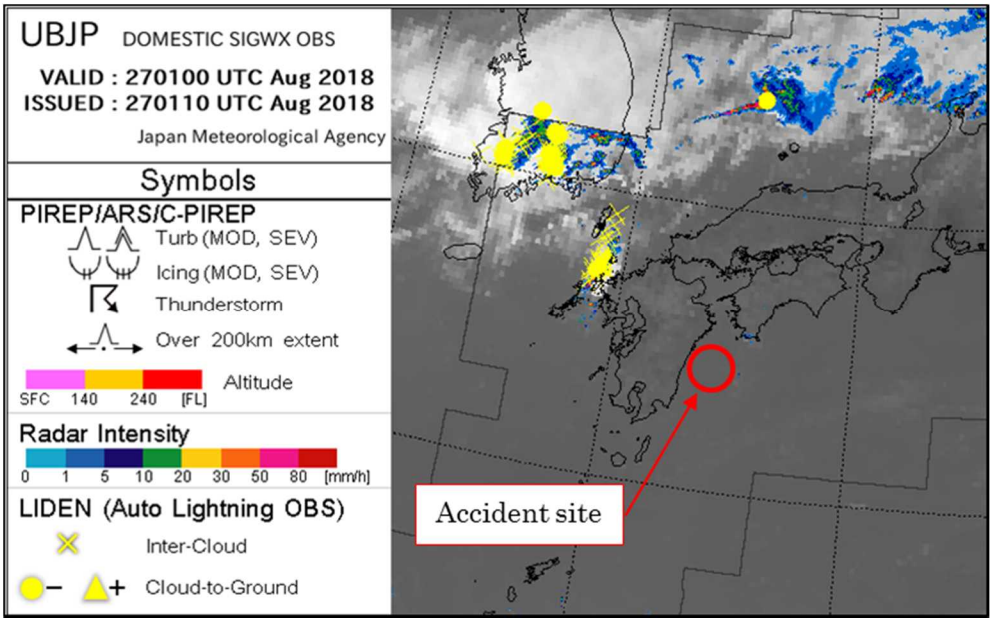


Figure 5: Domestic Significant Weather Prognostic Chart (excerpt)
at 10:00 JST on August 27, 2018

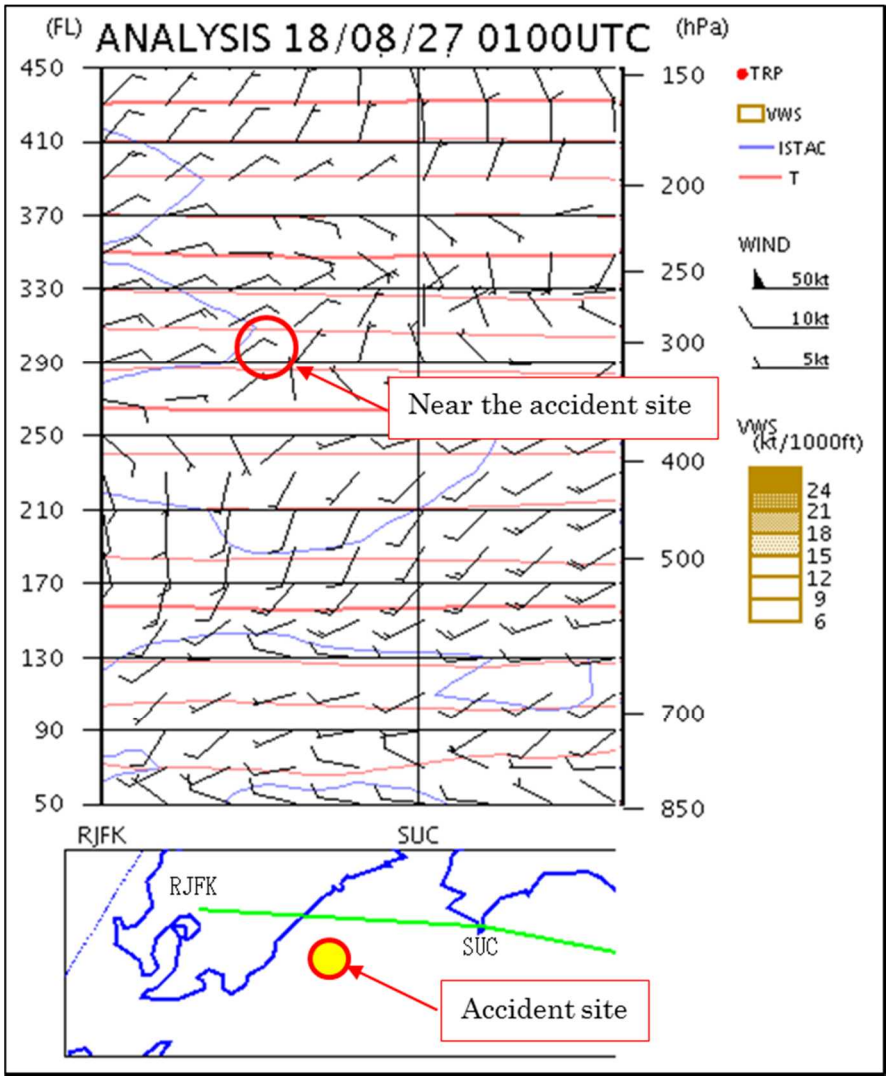


Figure 6: Hourly-Analysis Chart (excerpt / partially edited)
at 10:00 JST on August 27, 2018

2.7 Additional Information

(1) Information on the Relevant Aircraft

According to the radar track records, about one minute 40 seconds before the accident, a Boeing 747-400F (CAL5254) was flying at FL310 from southwest to northeast in such a way as to cross the flight path of the Aircraft. The horizontal distance between the Aircraft and the Relevant Aircraft was about 13.3 nm when the accident occurred.

(2) Information on wake turbulence*5

The Safety Information Bulletin No.2017-10 titled "En-route Wake Turbulence Encounters" (hereinafter referred to as "SIB") issued on June 22, 2017 by the European Aviation Safety Agency has the following description of wake turbulence encounter while flying and cruising flight sectors. (excerpt)

The basic effects of wake turbulence encounter on a following aeroplane are induced roll, vertical acceleration (can be negative) and loss or gain of altitude. The greatest danger is typically the induced roll that can

*5 "Wake turbulence" refers to vortices trailing from the blasts of engines and the wingtips of a preceding aircraft that can impose serious risk on the following aircraft.

	lead to a loss of control and possible injuries to cabin crew and passengers. *En-route, the vortices evolves in altitudes at which the rate of decay leads to a typical persistence of 2-3 minutes, with a typical sink rate of about 400ft/min. Wakes will also be transported by wind.* *Considering the high operating air speeds in cruise and the standard 1000 ft vertical separation in RVSM*[6] airspace, wake can be encountered up to 25 nautical miles (NM) behind the generating aeroplane. The most significant encounters are reported within a distance of 15 NM.* (3) Reporting to the Company The Flight Attendant Manual of the Company stipulates that when flight attendants are injured in the cabin, they shall surely report it to the PIC, even if it is a minor injury, and the Senior Flight attendant shall report it to the Flight Attendant Group, a management division for flight attendants, by a flight report (FR) to be submitted after a duty. Because on the day of the accident, the Flight Attendant A did not report about her pain in the buttock, her injury was not written in the FR which the Senior Flight Attendant submitted.

3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilot	None
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	(1) Weather According to the statement of the PIC, the Asia-Pacific Surface Weather Chart, the Domestic Significant Weather Prognostic Chart, the Hourly-Analysis Chart issued by the JMA, and the QAR records, no clouds accompanying significant weather were observed and windshear was not observed in the vicinity of the accident site during the time when the accident occurred, in addition, there were no PIREPs on turbulence within one hours before as well as after the accident. As the Aircraft continued to fly in stable condition until the accident occurred, it is probable that the weather conditions were stable without atmospheric disturbances such as clear air turbulence; therefore, it was not the weather conditions that triggered the shaking of the Aircraft at the time of the accident. (2) Wake turbulence of the Relevant Aircraft About one minute 40 seconds before the accident, the Relevant Aircraft

*6 "Reduced vertical separation minimum (RVSM)" refers to the operation method by reducing the vertical separation from an original 2,000 feet to 1,000 feet. In the entire Fukuoka FIR, RVSM is applied to all aircraft flying in RVSM airspace at the altitude between FL 290 and FL410.

	crossed 1,000 ft above the flight path of the Aircraft, and the Aircraft was flying 13.3 nm behind the Relevant Aircraft, when the Aircraft was shaken. As described in the SIB issued by the European Aviation Safety Agency, on a flight at an altitude of 1,000 ft lower than the wake generating aircraft, it is possible to encounter wake turbulence up to 25 nm behind the wake generating aircraft, and the most significant encounters are reported within a distance of 15 nm. Judging from the fact that at the time of the accident, the winds were weak and the atmosphere was stable in the vicinity of the accident site, it is probable that wake turbulence from the Relevant Aircraft was not moved by wind but remained along the flight path of the Aircraft as it sank about 1,000 ft in about one minute and 40 seconds. (3) Shaking of the Aircraft It is probable that the timing of the Aircraft's shaking corresponded to the instantaneous fluctuation in vertical acceleration that was recorded on QAR. It is probable that because the winds were weak and the atmosphere was stable condition in the vicinity of the accident site, the weather conditions can be excluded from the factor that had triggered the shaking of the Aircraft that occurred only once; and the shaking of the Aircraft resulted from the Aircraft crossing through the Relevant Aircraft's wake turbulence which remained along the flight path of the Aircraft. It is also probable that the shaking of the Aircraft caused the Flight Attendant A to lose her balance, fall down and get injured in her buttock. (4) Flight attendant's response to the accident The Flight Attendant A fell down during the Flight and had a pain in her buttock, but she made a self-judgment on her injury considering it as a sort of bruise, and did not report it to the Senior Flight Attendant and the PIC, and therefore, the relevant department of the Company was not able to accurately know about her injury. In addition, the Flight Attendant A continued to work on board at her own discretion, although she still felt pain after the injury. It is probable that it may be difficult for the flight attendant to determine whether or not she has suffered injury only by the degree of pain, therefore, it is desirable for them to report the situation, the degree of pain and others to the PIC or the relevant department without hesitation in order to determine objectively whether or not to be able to work as a safety personnel. (5) The PIC's reaction to the accident When spotting the Relevant Aircraft, the PIC judged there would be no influence from its wake turbulence; thus, it is probable that it would be difficult for him to predict accurately the intensity of the influence from the wake turbulence of the aircraft flying more than 20 nm away by taking into consideration the atmospheric state. On the other hand, it is probable that it can be also effective for preventing the recurrence of the similar accidents to actively make in-flight announcements to flight attendants and passengers and raise their awareness on the possible shaking by taking into consideration the possibility to

	encounter wake turbulence up to 25 nm behind the wake generating aircraft during flight in RVSM, as pointed out in the SIB, when the relative positions of its own aircraft and another aircraft are within such a range.

4. PROBABLE CAUSES

In this accident, it is probable that because the Aircraft was shaken during cruising, a flight attendant fell down and got injured.

It is probable that the Aircraft was shaken, because wake turbulence from another aircraft still remained along the flight path of the Aircraft.

5. SAFETY ACTIONS

The Company implemented the following measures to prevent the recurrence of similar accidents.

(1) Issuance of document calling for attention

The Company urgently notified all departure flights of the following information.

a. The lessons learned from the accident
b. How to response when encountering turbulence
c. If falling down or having any body part hit against something, report immediately to the Senior Flight Attendant and confirm continuously whether or not there would be no injury or pain during the debriefing.

(2) Issuance of flight operations safety information

The Company issued safety information on aircraft operation for all flight crew in order to provide the summary of this accident and information on wake turbulence. In addition, during a briefing with the flight attendants, it notified them to make efforts to call for attention and raise awareness by reference to the following items.

a. There is a possibility that the aircraft would be shaken suddenly even if turbulence is not expected.
b. If losing balance, they should prepare for unexpected turbulence by grabbing something to hold and others.
c. From the past accidents related to turbulence, the flight attendants working in the aft cabin tend to suffer an injury in relation to a moment.

(3) Re-education of flight crewmembers

The Company provided knowledge about turbulence for the flight crew of the Aircraft and held a discussion with instructors, and for the flight attendants, it ran a real aircraft simulation on the concrete actions to be taken when encountering turbulence, in order to strongly make them aware of the measures to prevent the accidents caused by turbulence.

(4) Document issuance by a safety manager to all the Company members

The Company issued the document to have flight attendants review the procedures to cope with an encounter with an unexpected shaking as well as to have pilots review the communications and measures to handle the situation when there are any injured persons in the cabin. In addition, it shared information with all the Company members in order to prevent the recurrence of similar accidents.

(5) Additional items for reporting by the flight report (FR)

The Company notified the flight attendants to write in the FR about the summary of the event and the conditions of flight attendants, if encountering turbulence, regardless of whether they

have got injured. Besides, it was added to the Flight Attendant Supervisor[*7] (FAS) standard operating procedure (SOP) that if encountering turbulence, the FAS shall confirm the written contents of the FR with the flight attendant face to face, and check visually the condition of the flight attendant when the FR is submitted.

[*7] "Flight Attendant Supervisor" refers to a person, who belongs to the Fight Attendant Group, in charge of daily instruction and education of flight attendants, and understanding of their proficiency in aviation duties.