

AA2021-6

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**ANA WINGS CO., LTD.
J A 6 4 A N**

October 28, 2021



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.

TAKEDA Nobuo
Chairperson
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.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

- i) In case of being able to determine, the term "certain" or "certainly" is used.
- ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.
- iii) In case of higher possibility, the term "probable" or "more likely" is used.
- iv) In a case that there is a possibility, the term "likely" or "possible" is used.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

CABIN CREW MEMBER INJURY BY SHAKING OF THE AIRCRAFT ANA WINGS CO., LTD. BOEING 737-800, JA64AN AT AN ALTITUDE OF APPROX. 8,200 M (FL270) OVER OZU CITY, EHIME PREFECTURE AT ABOUT 19:30 JST, APRIL 12, 2020

October 8, 2021

Adopted by Japan Transport Safety Board

Chairperson TAKEDA Nobuo
Member MIYASHITA Toru
Member KAKISHIMA Yoshiko
Member MARUI Yuichi
Member NAKANISHI Miwa
Member TSUDA Hiroka

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	<p>On Sunday, April 12, 2020, while a Boeing 737-800, registered JA64AN, operated by ANA Wings Co., Ltd. as a scheduled flight 430 of All Nippon Airways Co., Ltd., as the joint undertaking for transport with ANA Wings, was flying from Fukuoka Airport to Osaka International Airport, the Aircraft shook causing a cabin crew member to fall and sustain an injury.</p>
1.2 Outline of the Accident Investigation	<p>Upon receipt of the notification of the accident occurrence, the Japan Transport Safety Board designated an investigator-in-charge and an investigator on April 13, 2020 to investigate the accident.</p> <p>An accredited representative and an adviser of the United States of America, as the State of Design and Manufacture of the Aircraft involved in the accident, participated in the investigation.</p> <p>Comments were invited from the parties relevant to the cause of the accident and the Relevant State.</p>

2 FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statements of crew members as well as the records of Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR), the history of the flight is summarized as follows.</p> <p>On April 12, 2020 at 19:12 Japan Standard Time (JST: UTC+9 hours; unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock), a Boeing 737-800, registered JA64AN, operated by ANA Wings Co., Ltd. (hereinafter referred to as “the Company”) as a scheduled flight 430 of All Nippon Airways Co., Ltd., as the joint</p>
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undertaking for transport with ANA Wings, with 26 persons in total on board consisting of the pilot in command (PIC), five crew members and 20 passengers took off from Fukuoka Airport for Osaka International Airport.

In the cockpit of the Aircraft, the PIC sat in the left seat as PF*1 and the First Officer (FO) sat in the right seat as PM*1.

Meteorological information crew members confirmed prior to departure predicted that clouds, which developed accompanied by the approach of the low pressure, spread in the lower layers and possible shaking of the Aircraft occurred while flying in the clouds. From the meteorological information the preceding aircraft reported to the Company that it experienced a slight shaking near the cloud top of 25,000 ft and the air current was stable at 27,000 ft, the PIC decided to set the cruising altitude at FL270*2 (approximately 8,200 m). Accordingly, the cruising altitude of the Aircraft was planned to fly above the cloud layers, and encountering disturbance of the air current was not predicted from the meteorological forecasts, etc. At the pre-flight briefing with cabin crew members conducted before departure, the PIC conveyed his or her thoughts to them that seat belt sign would be illuminated during the climbing and descending because of a predictable shaking of the Aircraft while flying in the clouds and it would be turned off for approximately 15 minutes because the Aircraft would be flying above the clouds during the cruising.

After taking off, the Aircraft continued climbing and reached the planned cruising altitude of FL270 above the vicinity of Kunisaki Peninsula at about 19:22. The PIC turned off seat belt sign because it passed through the cloud layers while climbing, there existed no clouds at the cruising altitude, there occurred no disturbance and the airborne weather radar displayed no echo indicating strong rainy areas on the course. At about 19:24, the PIC and FO began to prepare for landing. At about 19:26, after the PIC switched the PF duties with the FO, the PIC announced to the passengers that seat belt sign would be illuminated approximately 10 minutes later because of a possible shaking to encounter while descending in the clouds although the shaking during the cruising would generally be slight.

After the announcement, the PIC commenced the approach briefing with the FO. At about 19:28, the PIC suspended the approach briefing and activated the engine anti-icing system because the PIC visually recognized that the Aircraft was intermittently skimming the thin clouds. The PIC kept seat belt sign off because the air current was stable and the airborne weather radar displayed no echo indicating strong rainy areas at this time. Because

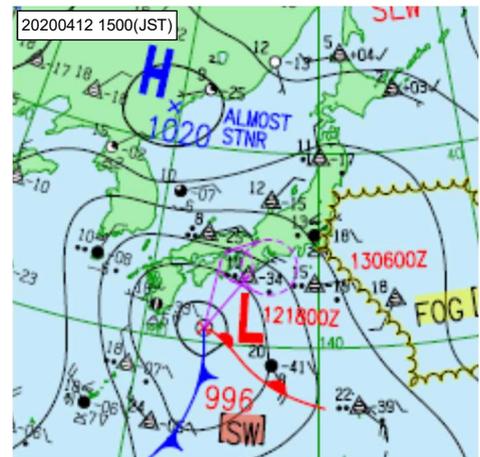


Figure 1 Surface Analysis Chart (excerpt)

*1 “PF” and “PM” are the terms used to identify pilots with their different roles in an aircraft operated by two persons. PF abbreviates Pilot Flying and is mainly responsible for maneuvering the aircraft. PM abbreviates Pilot Monitoring and mainly monitors the flight status of the aircraft, cross-checks the operations by the PF and undertakes other non-operational tasks.

*2 “FL” means a pressure altitude in the standard atmosphere. FL is expressed in the value obtained by dividing the reading on the altimeter (unit: ft) by 100 when the altimeter is set to 29.92 inHg. Flight altitude over 14,000 ft is generally expressed in FL in Japan. For instance, FL200 stands for an altitude of 20,000 ft.

the Aircraft received the instruction from ATC to descend and change the frequency at 19:28:44, the PIC, as PM, commenced communications with ATC. At 19:29:40, in the middle of the communication with ATC, the Aircraft suddenly suffered a fierce shaking twice. Immediately thereafter, the PIC illuminated seat belt sign and took over control of the Aircraft from the FO. Because the Aircraft was flying in the clouds and kept suffering the shaking, the PIC requested ATC for the permission to climb to FL290 for the reasons of flying near the cloud top and suffering the shaking. Although the Aircraft climbed to FL290 after the approval of ATC and avoided the clouds, the Aircraft entered the clouds again and the shaking did not calm down. The shaking lasted until the Aircraft descended to FL190 and reached under the cloud layers.

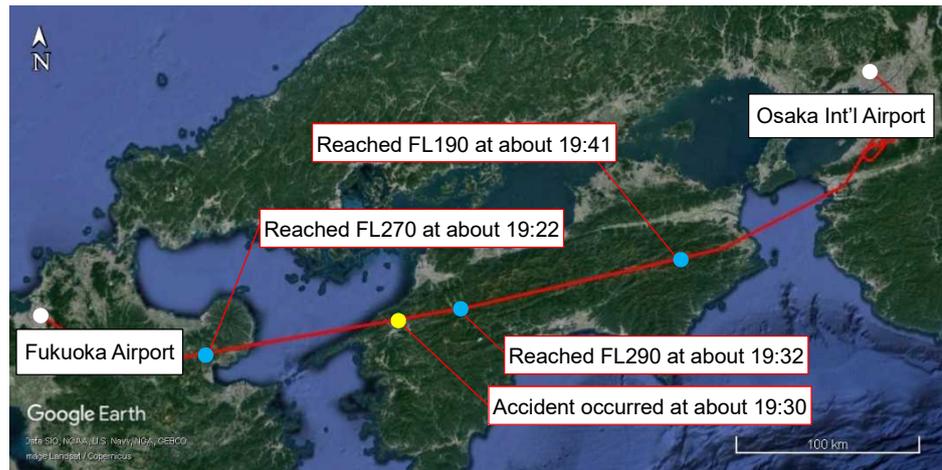


Figure 2 Estimated flight route

When the Aircraft suffered the fierce shaking, all passengers were seated and fastened seat belts and none of them sustained injuries.

Besides, three cabin crew members were in the forward galley and L2 cabin crew member (hereinafter referred to as “the Cabin crew member A”) was in the aft of the airframe. The three cabin crew members in the forward galley escaped injuries by seating themselves or keeping their balance grasping the galley handle in response to the sudden shaking. On the other hand, the Cabin crew member A in the aft of the airframe was standing in front of L2 cabin crew member seat (Figures 3 and 4) facing the seat side at the time of encountering the shaking. At this time, the Cabin crew member A squatted and lowered his or her position to protect from the first shaking. However, he or she encountered the second shaking before being seated and fell on the floor from the left side of the body after his or her body floated in the air with his or her head hitting the ceiling. The Cabin crew member A severely hit the left lower back, left leg and forehead on the floor feeling terrible pains, nevertheless immediately took the seat and fastened seat belt. Then, the Cabin crew member A was asked about the situations by Senior cabin crew member and told that he or she fell by the shaking and was suffering severe pains.



Figure 3 L2 cabin crew member seat (stored)

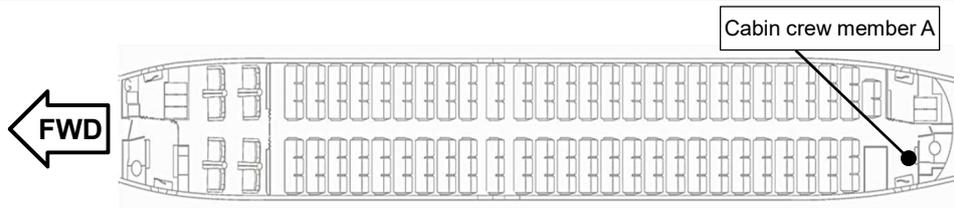


Figure 4 Location of the injured person at the time of Aircraft shaking

After descending to FL190 and the shaking calmed down, the PIC reported to the Company by radio that the fierce shaking occurred skimming the clouds when the cloud top came into the sight during the cruising at FL270 and one of the cabin crew members was injured.

The Aircraft continued the flight and landed at Osaka International Airport at 20:09. After arrival at the airport, the Cabin crew member A was taken to hospital by ambulance and, as a result of the examination, was diagnosed as a partial fracture of the pelvis.

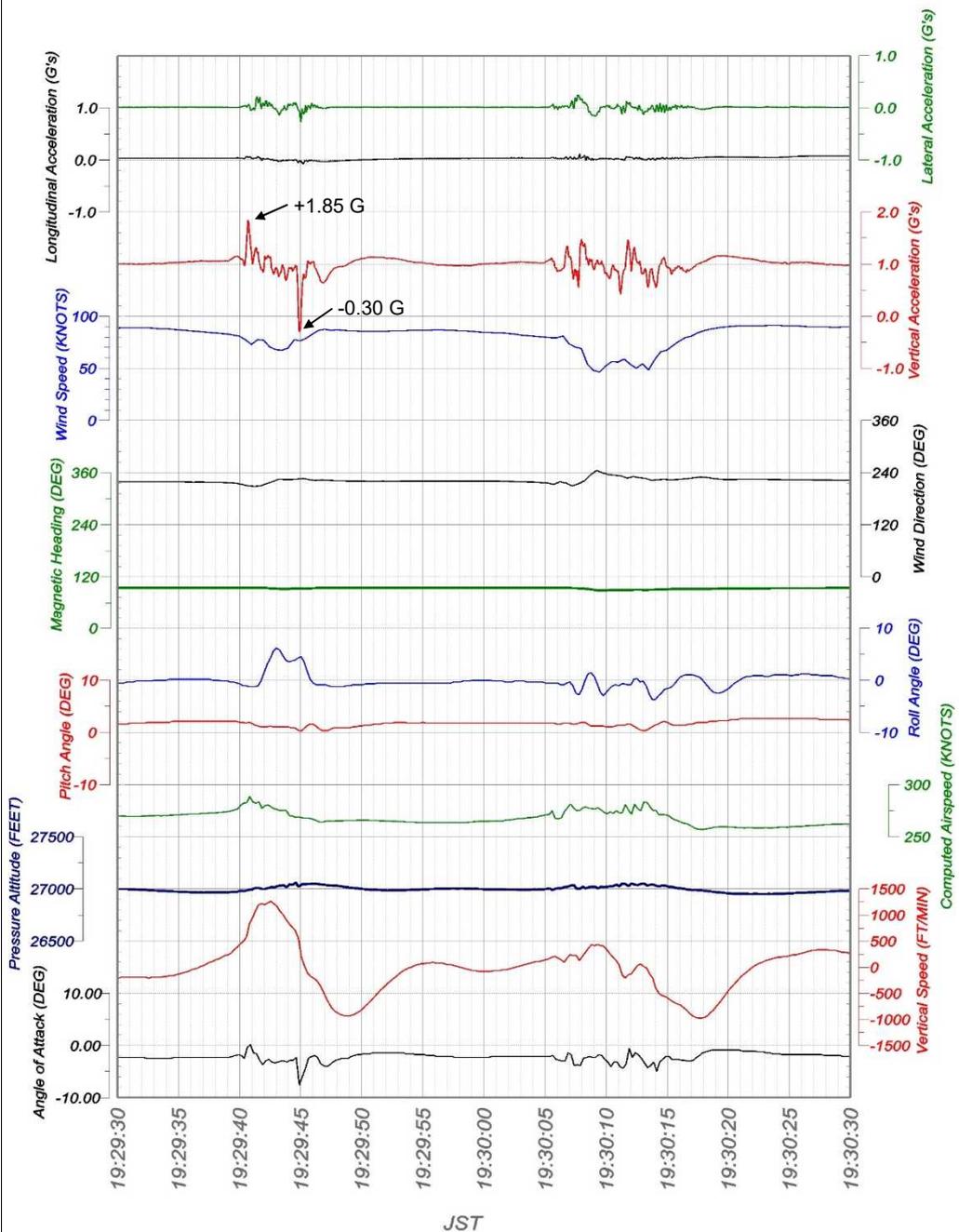


Figure 5 FDR record

	The place of occurrence of this accident was approximately 8,200 m (FL270) over Ozu City, Ehime Prefecture (33°34'59" N, 132°34'51" E) and the time and date were about 19:30 on April 12, 2020.																														
2.2 Injuries to Persons	One cabin crew member was seriously injured (Partial fracture of the pelvis)																														
2.3 Damage to the Aircraft	None																														
2.4 Personnel Information	<p>(1) PIC: age 42</p> <table> <tr> <td>Airline transport pilot certificate (airplane)</td> <td>March 30, 2016</td> </tr> <tr> <td>Type rating for Boeing 737</td> <td>May 26, 2011</td> </tr> <tr> <td>Class 1 aviation medical certificate</td> <td>Validity: February 22, 2021</td> </tr> <tr> <td>Total flight time</td> <td>7,186 hours 19 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>71 hours 26 minutes</td> </tr> <tr> <td>Total flight time on the type of aircraft</td> <td>5,641 hours 21 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>71 hours 26 minutes</td> </tr> </table> <p>(2) FO: age 30</p> <table> <tr> <td>Commercial pilot certificate (airplane)</td> <td>May 22, 2012</td> </tr> <tr> <td>Type rating for Boeing 737</td> <td>September 30, 2015</td> </tr> <tr> <td>Instrument flight certificate (airplane)</td> <td>July 29, 2013</td> </tr> <tr> <td>Class 1 aviation medical certificate</td> <td>Validity: December 1, 2020</td> </tr> <tr> <td>Total flight time</td> <td>3,054 hours 50 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>77 hours 52 minutes</td> </tr> <tr> <td>Total flight time on the type of aircraft</td> <td>2,839 hours 25 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>77 hours 52 minutes</td> </tr> </table>	Airline transport pilot certificate (airplane)	March 30, 2016	Type rating for Boeing 737	May 26, 2011	Class 1 aviation medical certificate	Validity: February 22, 2021	Total flight time	7,186 hours 19 minutes	Flight time in the last 30 days	71 hours 26 minutes	Total flight time on the type of aircraft	5,641 hours 21 minutes	Flight time in the last 30 days	71 hours 26 minutes	Commercial pilot certificate (airplane)	May 22, 2012	Type rating for Boeing 737	September 30, 2015	Instrument flight certificate (airplane)	July 29, 2013	Class 1 aviation medical certificate	Validity: December 1, 2020	Total flight time	3,054 hours 50 minutes	Flight time in the last 30 days	77 hours 52 minutes	Total flight time on the type of aircraft	2,839 hours 25 minutes	Flight time in the last 30 days	77 hours 52 minutes
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2.5 Aircraft Information	<p>Aircraft type: Boeing 737-800, Serial number: 33902</p> <p>Date of manufacture: November 11, 2010</p> <p>Certificate of airworthiness: 2010-037</p> <p>Validity: During the period in which the aircraft is maintained in accordance with the Maintenance Management Manual (All Nippon Airways Co., Ltd.) since November 11, 2010</p> <p>Category of airworthiness: Airplane Transport T</p> <p>Total flight time: 23,911 hours 15 minutes</p> <p>When the accident occurred, the weight and the center of gravity of the aircraft were within the allowable ranges.</p>																														
2.6 Meteorological Information	<p>(1) Meteorological conditions in the airspace of the accident occurrence</p> <p>According to the Meteorological Satellite Image announced at 19:30 on April 12, 2020 (Figure 6), there existed white and deep cloudy areas in the vicinity of the location where the Aircraft shook, and according to the cloud top height analysis of the High-Frequency Satellite Image announced at the same time (Figure 7), the existence of clouds with the cloud top height of 24,000 ft to 30,000 ft was analyzed. Besides, according to the Radar composite maps issued at the same time, generally weak echoes were observed in wide areas in the echo strength (Figure 8), and the echo top height (Figure 9) showed that the echoes at the heights of 7 km (approximately 23,000 ft) to 8 km (approximately 26,000 ft) were scattered in the vicinity of the location where the Aircraft shook and the echoes at the heights of 5 km (approximately 16,000 ft) to 6 km (approximately 20,000 ft) were</p>																														

spreading.

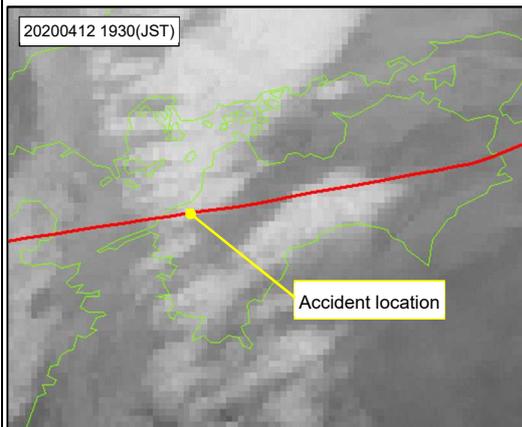


Figure 6 Meteorological Satellite Image (infrared)

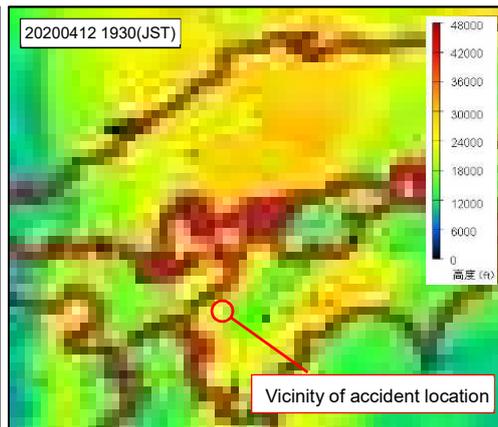


Figure 7 High-frequency Satellite Image (cloud top height)

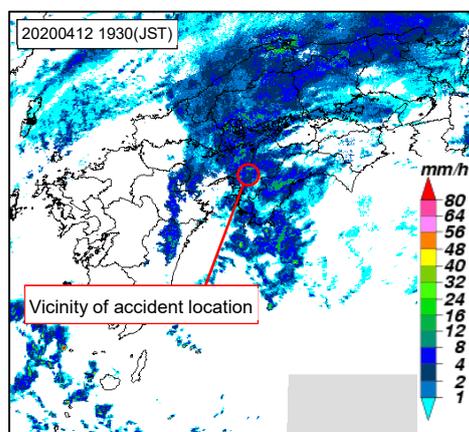


Figure 8 Radar composite map (echo strength)

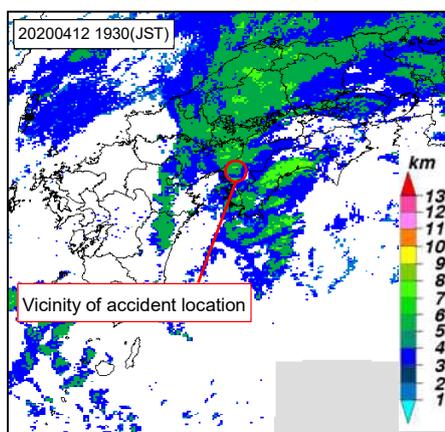


Figure 9 Radar composite map (echo top height)

(2) Natural light conditions at the time of the accident: Dark night

2.7 Additional Information

(1) In preparation for a possible shaking to encounter during the flight, the Company urges passengers by in-flight announcements and safety demonstration video in every flight to secure safety by fastening seat belts while seated even if seat belt sign is turned off.

3 ANALYSIS

<p>3.1 Involvement of Weather</p>	<p>Yes</p>
<p>3.2 Involvement of Pilots</p>	<p>None</p>
<p>3.3 Involvement of Aircraft</p>	<p>None</p>
<p>3.4 Analysis of Findings</p>	<p>(1) Weather From the CVR records and Meteorological Satellite Images (Figures 6 and 7), the clouds accompanied by the disturbance and developed to the altitude close to the cruising altitude are most likely to have existed in the flight route in the vicinity of the location where the Aircraft was shaken. However, it is probable that such strong echoes as ones from which flight crew members could predict the disturbance with the airborne weather radar were not observed because the Radar composite maps (Figures 8 and 9) did not</p>

	<p>observe strongly developed echoes in the vicinity of the accident location.</p> <p>(2) Shaking of the Aircraft</p> <p>The FDR recorded that the vertical acceleration fluctuated between +1.85 G and -0.30 G for approximately eight seconds from 19:29:40. The Aircraft is more likely to have temporarily been flying in the clouds during this period and have fiercely shaken by the disturbance generated by convective activity in the clouds.</p> <p>(3) Meteorological judgements by flight crew members</p> <p>As the Aircraft was in the night flight at dark night when the accident occurred, which requires that judgments on the meteorological conditions be made by the visibility of the stars and lights can be seen in the external monitoring by visual recognition, it is probable that the situations were that detection of the clouds ahead and recognition of the shape of the clouds, etc. were difficult.</p> <p>(4) Response by a cabin crew member</p> <p>It is most likely that the Cabin crew member A, who received the negative gravity acceleration, was unable to avoid floating in the air due to the sudden shaking of the Aircraft, was struck on the floor losing his or her balance when dropped and sustained the injury.</p> <p>(5) Securing safety of passengers</p> <p>When the Aircraft shook fiercely, all 20 passengers were seated and fastened seat belts although seat belt sign was turned off, That is most likely to have contributed to the fact that none of the passengers sustained injuries. This is more likely to have successfully been achieved by the safety measures regularly taken to urge passengers to fasten seat belts anytime while seated.</p>
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4 PROBABLE CAUSES

It is probable that this accident occurred when the Aircraft shook during the flight in the clouds accompanied by the disturbance, and thereby one of the cabin crew members, who was not seated and floated in the air, was struck on the floor losing his or her balance, and sustained the injury.

5 SAFETY ACTIONS

After this accident, the Company has taken measures as described below to prevent recurrence of similar accidents:

(1) To flight crew members

A message from Senior Manager for Flight Operations has been sent and flight safety information, etc. has been issued to secure that the outline of the event has fully been understood and utilization of meteorological information and management of seat belt sign have thoroughly been in place.

(2) To cabin crew members

(i) Flight safety information, etc. has been issued to secure that the outline of the event has fully been understood, and internal documents describing response for the case of encountering turbulence have been updated for thorough understanding.

(ii) Documents have been issued to ensure that in-flight monitoring, while seated depending on the situations, is conducted even if seat belt sign is turned off unless providing in-flight services or taking care of passengers.