

AA2021-2

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**ALL NIPPON AIRWAYS CO., LTD.
J A 8 0 8 A**

February 18, 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.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

PASSENGERS INJURY BY THE SHAKING OF THE AIRCRAFT
ALL NIPPON AIRWAYS CO., LTD.
BOEING 787-8, JA808A
AT AN ALTITUDE OF APPROX. 5,500 M
OVER CHENGDE CITY, HEBEI PROVINCE,
THE PEOPLE'S REPUBLIC OF CHINA
AROUND 20:24 JST, AUGUST 15, 2019
(AROUND 19:24 LOCAL TIME, AUGUST 15, 2019)

January 22, 2021

Adopted by the 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 INVESTIGATION

1.1 Summary of the Accident	<p>On Thursday, August 15, 2019, a Boeing 787-8, registered JA808A, operated by All Nippon Airways Co., Ltd., took off from Tokyo International Airport for Beijing Capital International Airport as a scheduled flight 963. The aircraft shook while flying, and two passengers were seriously injured and two cabin crew members sustained minor injuries.</p>
1.2 Outline of the Accident Investigation	<p>On August 22, 2019, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident because the People's Republic of China, as the State of Occurrence, delegated the whole of the conducting of the investigation to JTSB pursuant to the provisions of ICAO Annex 13.</p> <p>An accredited representative of the People's Republic of China, as the State of Occurrence, and an accredited representative and an adviser of the United States of America, as the State of Design and Manufacture of the aircraft involved in this accident, participated in the investigation.</p> <p>Comments were invited from parties relevant to the cause of the accident and the Relevant States.</p>

2. FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statements of crewmembers and passengers, and records of flight recorder (EAFR*¹) of the aircraft, the history of flight is summarized as follows.</p> <p>On August 15, 2019 at 17:29 Japan Standard Time (JST, UTC+9 hours, hereinafter the same), a Boeing 787-8, registered JA808A, operated by All Nippon Airways Co., Ltd. (hereinafter referred to as “the Company”), took off from Tokyo International Airport for Beijing Capital International Airport as a scheduled flight 963. There were 225 people on board the aircraft, consisting of the pilot in command (PIC), 10 crewmembers, and 214 passengers. In a cockpit of the aircraft, the PIC sat in the left seat as the PF*² and the First Officer (FO) sat in the right seat as the PM*².</p> <p>The PIC and the FO were flying the aircraft while paying attention to the weather conditions because they confirmed the weather information before departure and knew that thunderstorm would occur at around 21:10, its scheduled arrival time around the destination, Beijing Capital International Airport.</p> <p>While the aircraft was cruising over the Inner Mongolia Autonomous Region of China, the PIC and the FO confirmed with airborne weather radar and visual observation that there were locally developed cumulonimbus and strong echo en route from DABMA to SABEM. The PIC decided to set the heading to 230° around UPNAT after obtaining a clearance from the air traffic control (ATC) and fly avoiding the cumulonimbus to the south side.</p>
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*¹ “EAFR” stands for Enhanced Airborne Flight Recorder. This is an integrated flight recorder with the functions of flight data recorders (FDR), Cockpit Voice Recorders (CVR) and data link recorders.

*² PF and PM (are the terms used to identify pilots by their different roles in aircraft controlled by two persons. PF stands for Pilot Flying, who is mainly responsible for maneuvering the aircraft. PM stands for Pilot Monitoring, who mainly monitors the flight status of the aircraft, cross-checks operations by the PF, and undertakes other non-operational work

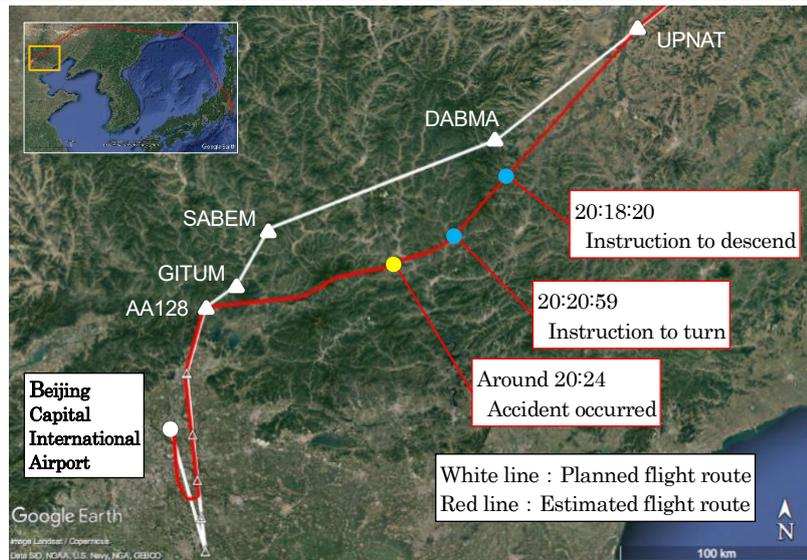


Figure 1: Estimated flight route

After changing its heading, the aircraft was flying in thin clouds spreading to the south of the cumulonimbus, but the airborne weather radar did not display any cloud echo on the course and there was no disturbance, therefore, the PIC flew the aircraft with the fasten seat belt sign turned off. After that, at 20:18:20, the aircraft started descending after receiving an instruction from the ATC to descend to 3,600 m. At 20:20:59, the aircraft made a right turn while continuing to descend because of having received from the ATC an instruction to change the heading to the right to go straight to GITUM and pass it at an altitude of 3,600 m in order to avoid flight restriction area. When the Aircraft moved beneath the clouds during descent, the airborne weather radar did not display any cloud echo, but cumulus clouds were gathering down below, therefore, the PIC informed the senior cabin crew member in the cockpit that the fasten seat belt sign would be turned on as shaking would be expected. After the senior cabin crew member left the cockpit, the PIC stopped temporarily descending and maintained level flight at an altitude of about 5,500 m between cloud layers in order to fly away from the cumulus clouds gathering down below. However, judging that it would not be able to avoid the towering cloud top, the PIC turned on the fasten seat belt sign at 20:23:33. The aircraft instantaneously shook violently when closely skimming the cumulus cloud top at 20:23:58.

The fasten seat belt sign was turned on in the same time as the senior cabin crew member returned to the forward galley from the cockpit, and very soon the aircraft encountered intense turbulence. For this reason, the senior cabin crew member could neither inform other cabin crew members that the PIC told the fasten seat belt sign would be turned on as shaking was expected, nor make a PA announcement to alert the passengers. In addition, when the Aircraft encountered the turbulence, eight cabin crew members out of nine did not sit down and away from their seats in order to take care of passengers, or take safety actions in

accordance with the Company's operations manual, such as storing and securing articles, and two cabin crew members lost their balance and sustained minor injuries.

When the fasten seat belt sign was turned on, Passenger A, who was in line for the restroom waiting and standing in front of the lavatory (L3), encountered shaking, then, lost the balance, fell to the floor, and injured the right foot. In addition, when the fasten seat belt sign was turned on, the other Passenger B was sitting down in the lavatory (R4) and encountered shaking, and suffered an injury to the loin as the upper body was strongly squeezed longitudinally.

The aircraft continued to fly, and landed at Beijing Capital International Airport at about 20:52.

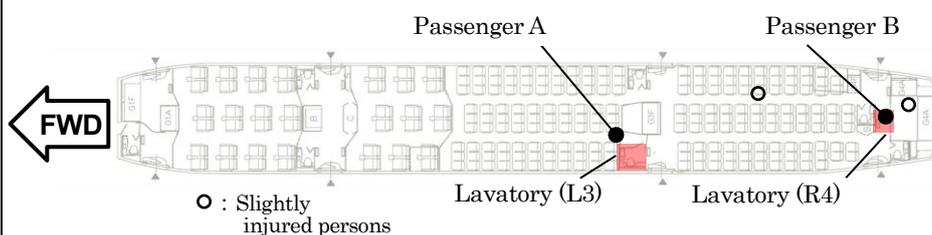


Figure 2: Locations of the injured when the aircraft shook

According to the aircraft's EAFR records (Figure 3), which indicate the vertical acceleration was greatly fluctuated between +2.16 G and +0.37 G instantaneously for about two seconds from 20:23:58.

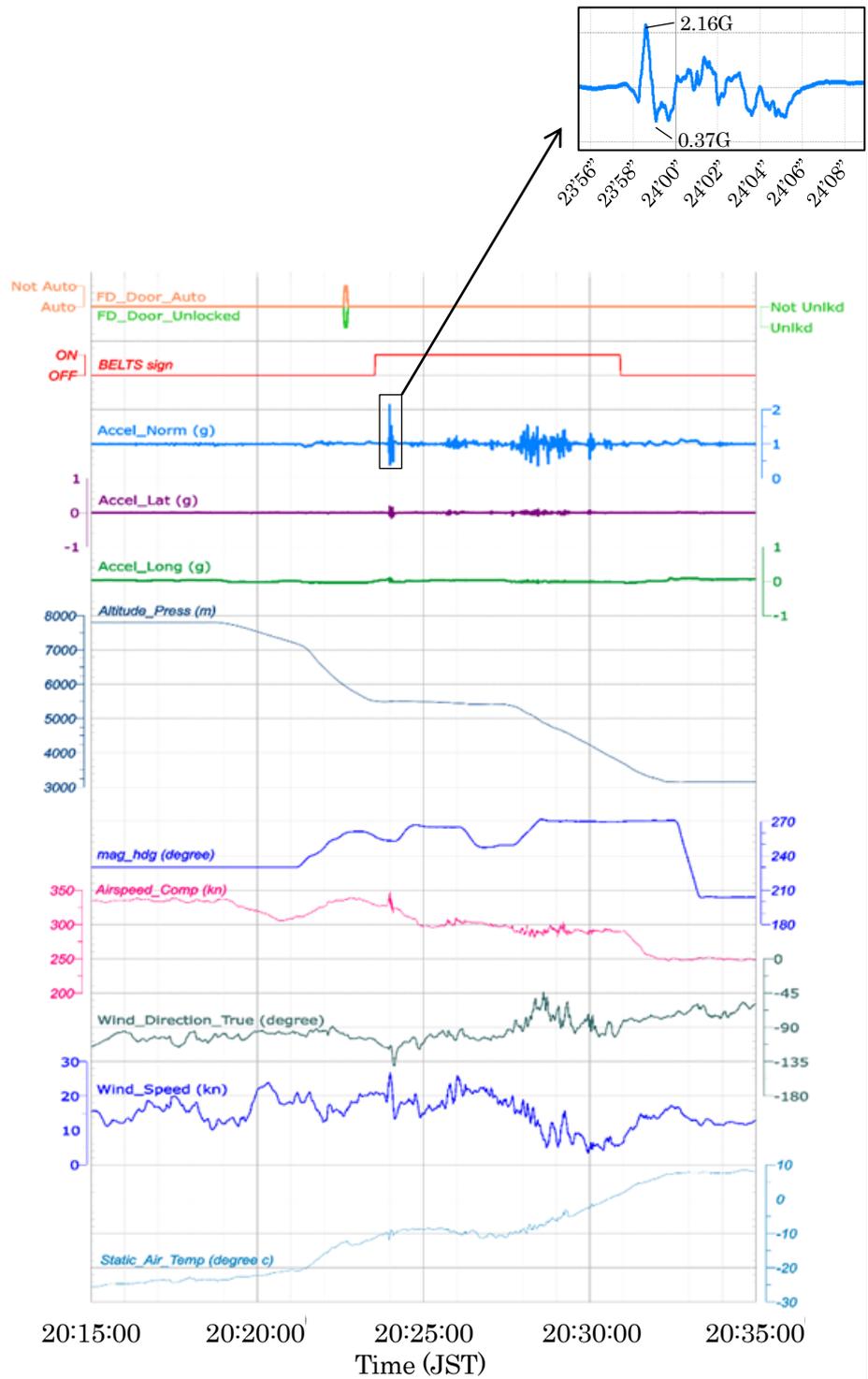
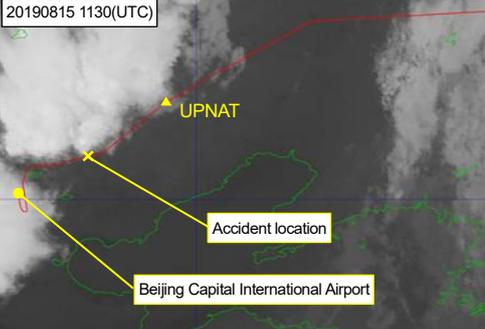
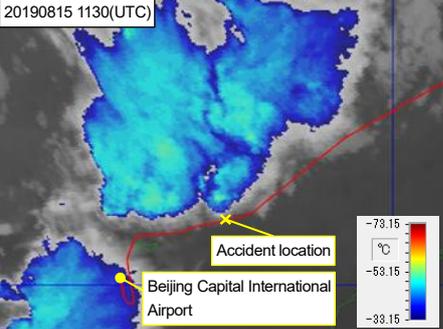
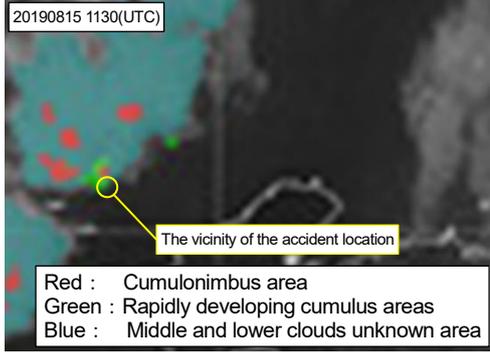


Figure 3: EAFR records

The accident occurred around 20:24 on August 15, 2019, at an altitude of approximate 5,500 m over Chengde City, Hebei Province, the People's Republic of China (Latitude 40°50'43" N and Longitude 117°55'08" E).

2.2 Injuries to Persons	(1) Two passengers were seriously injured. Passenger A (Right foot avulsion fracture) Passenger B (Lumbar compression fracture) (2) Two cabin crew members sustained minor injuries.																														
2.3 Damage to the Aircraft	None																														
2.4 Personnel Information	<p>(1) PIC: Male, age 54</p> <table border="0"> <tr> <td>Airline transport pilot certificate (airplane)</td> <td>March 28, 2001</td> </tr> <tr> <td>Type rating for Boeing 787</td> <td>January 12, 2012</td> </tr> <tr> <td>Class 1 aviation medical certificate</td> <td>Validity: July 21, 2020</td> </tr> <tr> <td>Total flight time</td> <td>15,432 hours 29 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>57 hours 30 minutes</td> </tr> <tr> <td>Total flight time on the type of aircraft</td> <td>4,523 hours 59 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>57 hours 30 minutes</td> </tr> </table> <p>(2) FO: Male, age 34</p> <table border="0"> <tr> <td>Commercial pilot certificate (airplane)</td> <td>March 17, 2011</td> </tr> <tr> <td>Type rating for Boeing 787</td> <td>June 21, 2019</td> </tr> <tr> <td>Instrument rating (airplane)</td> <td>March 18, 2011</td> </tr> <tr> <td>Class 1 aviation medical certificate</td> <td>Validity: April 3, 2020</td> </tr> <tr> <td>Total flight time</td> <td>4,331 hours 17 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>51 hours 52 minutes</td> </tr> <tr> <td>Total flight time on the type of aircraft</td> <td>77 hours 31 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td>51 hours 52 minutes</td> </tr> </table>	Airline transport pilot certificate (airplane)	March 28, 2001	Type rating for Boeing 787	January 12, 2012	Class 1 aviation medical certificate	Validity: July 21, 2020	Total flight time	15,432 hours 29 minutes	Flight time in the last 30 days	57 hours 30 minutes	Total flight time on the type of aircraft	4,523 hours 59 minutes	Flight time in the last 30 days	57 hours 30 minutes	Commercial pilot certificate (airplane)	March 17, 2011	Type rating for Boeing 787	June 21, 2019	Instrument rating (airplane)	March 18, 2011	Class 1 aviation medical certificate	Validity: April 3, 2020	Total flight time	4,331 hours 17 minutes	Flight time in the last 30 days	51 hours 52 minutes	Total flight time on the type of aircraft	77 hours 31 minutes	Flight time in the last 30 days	51 hours 52 minutes
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2.5 Aircraft Information	<p>Aircraft type: Boeing 787-8, Serial number: 34,490, Date of manufacture: November 21, 2011 Certificate of airworthiness: 2012-017 Validity: During a period in which the aircraft is maintained in accordance with the Maintenance Management Manual (All Nippon Airways Co., Ltd.) since April 16, 2012 Category of airworthiness: Airplane Transport T Total flight time: 19,312 hours 32 minutes 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>Based on the Meteorological Satellite Images (Figure 4 and 5) announced by the Japan Meteorological Agency (JMA) at 20:30, the cumulus-like clouds swelling like a hump covered around the flight route of the aircraft. In addition, according to the Convective Cloud Information (Figure 6) announced at the same time, the area where the aircraft shook was near the rapidly developing cumulus areas including cumulonimbus area.</p>																														

		
	<p>Figure 4: Meteorological Satellite Image (infrared)</p> <p>Figure 5: Meteorological Satellite Image (coloring processed* 3)</p>	
<p>2.7 Additional Information</p>	 <p>Figure 6 : Convective Cloud Information</p> <p>(1) When the fasten seat belt sign of the aircraft is turned on, the chimes ring to inform that the sign has been turned on, followed by an automatic announcement in Japanese and English urging passengers to fasten the seat belts. In addition, in the aircraft, a cabin crew member made an in-flight announcement in Chinese urging passengers to fasten the seat belt following the automatic announcement.</p> <p>(2) The Company’s Operations Manual specifies the measures taken by crewmembers in order to prevent an accident causing injury to persons in the cabin due to turbulence. It stipulates that when turbulence is expected the PIC must communicate well with cabin crew members beforehand, and must turn on the fasten seat belt sign when it is considered dangerous to the safety of passengers and cabin crew members.</p> <p>In addition, the Company’s operations manual stipulates that when the fasten seat belt sign is turned on, cabin crew members should return to their seats immediately upon completing essential safety measures, and should ensure that all the passengers have had their seat belts fastened through Passenger Address system (PA) and others.</p> <p>(3) In the Company’s manual for cabin crew members, as the preventive measures against an accident causing injury in the cabin, it is described that when turbulence is expected, before the fasten seat belt sign is turned on, the PIC or cabin crew members have to provide the passengers with information in advance if possible through PA or orally.</p>	

*3 By coloring the Meteorological Satellite Image (infrared) of the JMA in accordance with the deference of the brightness temperatures, it highlights the low-temperature ranges, and indicates that the lower the temperature, the higher is the altitude of the cloud top.

3 ANALYSIS

3.1 Involvement of Weather	Yes
3.2 Involvement of Pilots	None
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	<p>(1) Weather</p> <p>It is highly probable that because the meteorological satellite image displayed that there were vertically developed tall cumulus with low brightness temperature and high cloud top in the vicinity where the aircraft shook, these clouds were associated with vigorous convective activity. It is probable that strong disturbance relating to the convective activity occurred near the cloud top of the cumulus where the aircraft closely skimmed.</p> <p>(2) The shaking of the aircraft</p> <p>According to the EAFR records, the vertical acceleration was greatly fluctuated between +2.16 G and +0.37 G instantaneously for about two seconds from 20:23:58, and it is probable that at this time, the aircraft skimmed the cumulus cloud top and shook violently due to strong disturbance. It is highly probable that because of this shaking, two passengers and two cabin crew members were injured.</p> <p>(3) Turning on the fasten seat belt sign</p> <p>The aircraft changed its heading to fly avoiding the cumulonimbus; however, it is probable that because unexpectedly the aircraft received an instruction from the ATC to change the heading in order to avoid flight restriction area, it was not able to fly far enough away from the significant weather area. For this reason, the PIC turned on the fasten seat belt sign without being able to give the cabin crew members and passengers ample notice about the expected shaking.</p> <p>It is probable that in case of making requests to the ATC to coordinate significant weather avoidance route, pilots should confirm whether it is flyable route by providing the ATC with information as much detail as possible, such as the heading, the deviation from the planned route (distance to offset) and the expected distance to proceed after the deviation required to avoid the significant weather area, which is useful to judge pre-emptively the timing or the necessity of whether to turn on the fasten seat belt sign and provide safety information to people in the cabin.</p>

4. PROBABLE CAUSES

It is probable that this accident occurred because the aircraft shook violently when flying near the cumulus cloud top, causing two passengers who were not in their seats sustained serious injuries.

5. SAFETY ACTIONS

The Company took the following measures to prevent the recurrence of similar accidents after this accident.

(1) Flight operations department

The Company provided the flight crew with the newly issued flight safety information and others in order to ensure that each crewmember knows the outline of the accident and understands how to respond to turbulence.

(2) Inflight services department

- ① Through internal communication, the Company provided the cabin crew members with the information on the measures to be taken when the fasten seat belt sign is turned on, which are stipulated in *Cabin Attendant Manual* in order to ensure that they thoroughly understand them.
- ② The Company revised *Announcement Manual* so that cabin crew members make a PA announcement to urge the passengers to go to the lavatory earlier in order not to have the passengers leave their seats during 30 minutes before landing of international flight.
- ③ By focusing on the injury prevention of the passengers and cabin crew members as the theme for safety promotion, the Company ensured that cabin crew members raise their awareness about securing the safety of the passengers or themselves who are not in their seats at the time of encountering turbulence.

(3) Creation of inflight safety video

In order to call additional attention to the passengers, the Company decided to create an inflight safety video to visualize specific examples of conduct at the time of encountering a sudden shaking of the aircraft.