

AA2013-3

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**UNITED AIRLINES
N 2 2 4 U A**

March 29, 2013



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.

Norihiro Goto
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 UNITED AIRLINES BOEING 777-200, N224UA (UNITED STATES OF AMERICA) AT AN ALTITUDE OF APPROX. 23,000 FT, ABOUT 150KM NORTH OF NARITA INTERNATIONAL AIRPORT AT 14:18 LOCAL TIME, JULY 5, 2012

March 08, 2013

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Shinsuke Endoh
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Yuki Shuto
Member	Keiji Tanaka

1. PROCESS AND PROGRESS OF THE INVESTIGATION

On July 12, 2012, the Japan Transport Safety Board received an accident notification, and then designated an investigator-in-charge and two investigators to investigate this accident. An accredited representative of the United States of America, as the State of Design, Manufacture, the Operator and Registry of the aircraft involved in this accident, participated in the investigation. Comments from parties relevant to the cause of the accident and the relevant State were invited.

2. FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statements of the Pilot In Command (PIC), the First Officer (FO) and the Flight Attendant (FA) who was serious injured, the history of the flight is summarized as follows.</p> <p>On July 5, 2012 at 12:55 JST (UTC+9 hours), a Boeing 777-200, registered N224UA, operated by United Airlines took off from Incheon International Airport (Republic of Korea) for Narita International Airport (Japan) as a scheduled Flight 890, with 256 persons on board, consisting of the PIC, 11 other crew members, and 244 passengers.</p> <p>In the cockpit, the PIC sat in the left seat as the PM (pilot monitoring: pilot mainly in charge of duties other than flying) and the FO sat in the right seat as the PF (pilot flying: pilot mainly in charge of flying).</p> <p>The PIC and the FO found a small cumulonimbus to the right of</p>
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course very close to LIVET (waypoint) as the aircraft was descending to FL230 before LIVET. The cumulonimbus with its cloud top being low at approximately 24,000-25,000 ft, did not appear to be developing. The aircraft's weather radar displayed only green weak weather returns. They did initiate a slight turn to avoid it. After that, it became apparent they needed to go further left to avoid it; therefore, they started to make a deviation flight to the left after receiving permission from the air traffic controller.

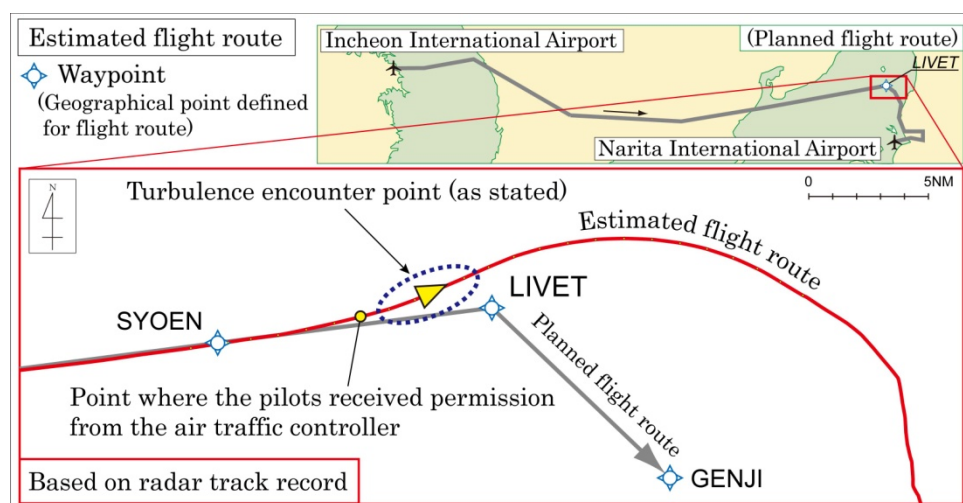
The aircraft entered the cloud while it was going around the outside of the green return at FL230, and encountered a moderate turbulence. Though the aircraft emerged from the cloud quickly and jolt over a period of approximately five seconds, it experienced two rapid shakes at the same time.

At the time on the pre-flight weather briefing, no significant weather including turbulence was forecasted to affect the flight on their route. And, no information regarding a significant weather was reported during the flight either. Shortly after the aircraft started descent, the PIC turned on the seat belt sign for the passengers as part of the approach and landing phase of flight. He did not, however, give instructions to be seated nor inform the FAs of any information about the turbulence because he did not expect any significant turbulence on the descent phase. Also, he did not feel a need to seat the FAs during the deviation from cumulonimbus because he did not expect any significant turbulence only light turbulence during the deviation.


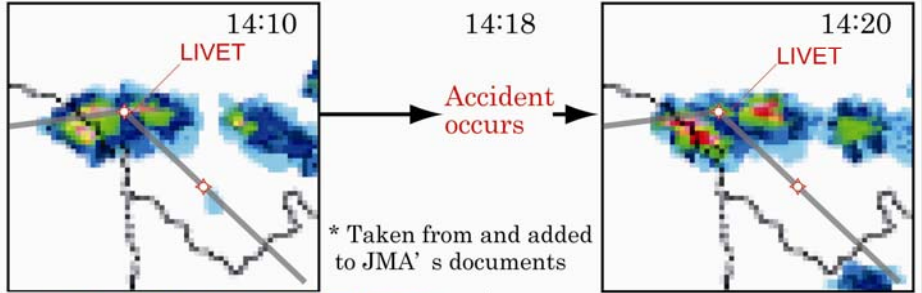
The four FAs working in the rear galley were thrown into the air and against the floor two times in succession due to the sudden shaking of the aircraft. Consequently, one of them was seriously injured, and the other three sustained minor injuries.

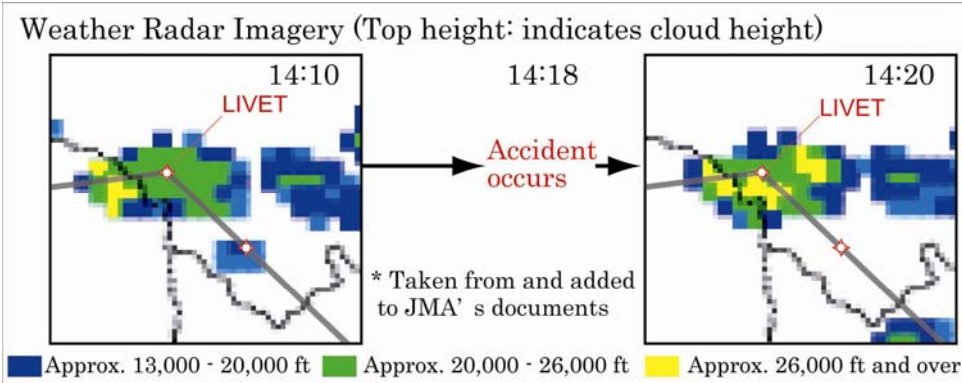
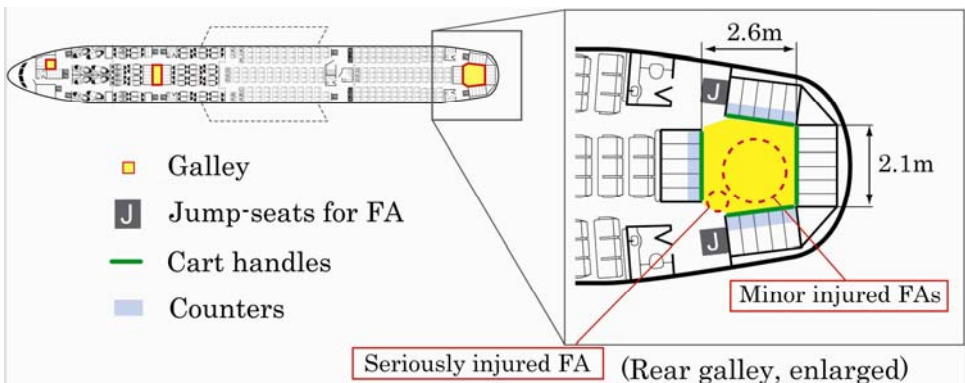
The accident occurred at 14:18 at an altitude approximately 23,000ft over about 150km north of Narita International Airport.

The aircraft landed at the airport at 14:44.



<p>2.2 Injuries to Persons</p>	<p>Serious injury: 1 FA Minor injury: 3 FAs</p>
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2.3 Damage	None
2.4 Personnel Information	<p>PIC Male, Age 58 Airline transport pilot certificate June 6, 1979 Type rating for Boeing 777 April 23, 2010 Class 1 aviation medical certificate Validity: Until September 5, 2012 Total flight time 15,404 hr 00 min Total flight time on the type of aircraft 1,594 hr 00 min</p> <p>FO Male, Age 41 Airline transport pilot certificate April 28, 1994 Type rating for Boeing 777 March 13, 2007 Class 1 aviation medical certificate Validity: Until December 29, 2012 Total flight time 10,411 hr 00 min Total flight time on the type of aircraft 2,901 hr 00 min</p>
2.5 Airplane Information	<p>(1) Type: Boeing 777-200 (Serial number: 30225, Date of manufacture: December 7, 2001) Certificate of airworthiness: No. ODARF300064NM Validity: Until September 30, 2012</p>  <p>(2) The aircraft was equipped with a digital flight data recorder (DFDR) and a cockpit voice recorder (CVR), but the data recorded at the time of the accident was overwritten and not retained due to the time spent in confirming the accident.</p>
2.6 Meteorological Information	<p>(1) General Weather Conditions The atmosphere was in an unstable condition in eastern and northern Japan from the afternoon through the night due to the passage of a trough accompanied by a cold of minus nine degrees C or less in the vicinity of an altitude 5,500 m, and convective clouds such as cumulonimbus and cumulus developed in several places.</p> <p>(2) Weather Radar Imagery around occurrence point (Strength and Top Height) According to the Weather Radar Imagery at 14:10: before the accident occurred, and 14:20: shortly after the accident occurred, the echo strength increased during this period as its top height reached 26,000 ft and over.</p> <div data-bbox="464 1697 1433 2094"> <p>Weather Radar Imagery (Strength: indicates precipitation intensity)</p>  <p>* Taken from and added to JMA' s documents</p> <p>mm/h (JMA: Japan Meteorological Agency)</p> </div>

	<p>Weather Radar Imagery (Top height: indicates cloud height)</p>  <p>(3) Prognostic Chart of Significant Weather (for domestic use)</p> <p>No significant weather including turbulence was forecasted to affect the flight on their route.</p>
<p>2.7 Rear Galley</p>	<p>Handholds designed specifically for the shaking of the aircraft were not equipped in the rear galley where the four injured FAs were working. Fixed objects such as the counters and the cart handles stored in the lower part of the galley on four sides were available to hang on as substitute for handholds. All of the carts had been stored when the accident occurred. The rear galley had more space than the other galleys did in the aircraft, thus making the FAs and the fixed objects, which were substitute for handholds, slightly far apart.</p> 
<p>2.8 FAs' Response to the Accident</p>	<p>The FAs were engaged in such tasks as final checks and cleanup before landing. The FAs working in places other than the rear galley sat in the jump seats, hung onto the nearby objects or sat down on the floor when the aircraft was shaken. On the other hand, the FAs in the rear galley were unable to hang onto the fixed objects around them as it shook heavily.</p>
<p>2.9 Additional Information</p>	<p>(1) Aircraft's weather radar displays</p> <p>The Company's Flight Operations Manual contains the following description: <i>(excerpt)</i></p> <p><i>Chapter 14, Section 50 Airborne Radar</i></p> <p>WEATHER RADAR REFLECTIVITY DISPLAYS</p> <p><i>Weak Echo(Green Display)</i></p> <p><i>If an echo is green only (assuming no attenuation and/or severe</i></p>

	<p><i>thunderstorm shapes), it can be consider non-hazardous throughout. Expect light turbulence, with a slight chance of moderate turbulence, but no chance of severe.</i></p> <p>(2) How to respond to unexpected turbulence</p> <p>The Company’s Flight Attendant Operations Manual contains the following description: <i>(excerpt)</i></p> <p><i>Chapter 2, Turbulence</i></p> <p><i>Unexpected Turbulence</i></p> <p><i>If moderate or greater turbulence is encountered unexpectedly:</i></p> <p><i>Flight attendants must stop, drop, and hold on – sit on the floor, in the nearest customer seat or jumpseat. Securely fasten seat belts (and shoulder harnesses, if applicable).If no empty seat is available, sit on an armrest or sit on the floor and hold on to a stationary object.</i></p>
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3. ANALYSIS

3.1 Involvement of Weather	Yes
3.2 Involvement of Pilots	Unknown
3.3 Involvement of Airplane	None
3.4 Analysis of Findings	<p>(1) It is unclear whether the operations by the pilots were involved in the accident, because the data from DFDR and others was not available.</p> <p>(2) Flight Crew members’ Judgment on the Weather</p> <p>It is highly probable that the PIC and the FO judged that there would be no turbulence and others to affect the flight, based on the weather briefings before and during the flight. Judging from the fact that the cumulonimbus discovered before LIVET did not appear to be developing, with its cloud top being low, and the fact that it was indicated as a weak return on the weather radar display, it is highly probable that they judged that they did not expect any significant turbulence to affect the flight only light turbulence during the deviation from cumulonimbus, and they did not inform the FAs of any information about the turbulence.</p> <p>(3) Development of Cumulonimbus</p> <p>It is highly probable that the cumulonimbus the aircraft avoided had developed quickly immediately before the time of the accident. The PIC and the FO stated that the aircraft encountered turbulence when it just entered the cloud, and then it emerged from the cloud quickly. Therefore, it is probable that the aircraft took detour the cumulonimbus to avoid it, but was forced into a part of the cloud which had developed rapidly, and then encountered its disturbance.</p> <p>(4) Injured FAs’ Response to the Shaking of the aircraft</p> <p>The four FAs working in the rear galley were thrown into the air</p>

by the sudden shaking of the aircraft. As regards to this having occurred, whereas the PIC did not inform them of the turbulence beforehand and there was no symptom regarding the turbulence, it is probable that they were unable to hang onto the fixed objects around them because the rear airframe sank suddenly.

It is considered somewhat likely that the FAs could have responded to the shaking of the aircraft if the PIC had informed them of some information about the turbulence.

4. PROBABLE CAUSES

It is highly probable that the accident occurred when the FA in the rear section of the aircraft was seriously injured because it was shaken heavily.

It is probable that the aircraft was shaken heavily because it was unable to avoid the cumulonimbus which had developed so rapidly, and then entered a part of the cloud.

It is probable that the FA was seriously injured because she was unable to hang onto the fixed objects around her when the aircraft was shaken suddenly.

5. REFERENCE

After the occurrence of this accident, United Airlines strengthened the contents of Flight Attendant Operations Manual (UNEXPECTED TURBULENCE).