

AA2019-2

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**SPRING AIRLINES JAPAN CO., LTD.
JA03GR**

March 28, 2019

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.

Kazuhiro Nakahashi

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

CABIN ATTENDANT INJURY BY THE SHAKING OF THE AIRCRAFT OVER ASO CITY, KUMAMOTO PREFECTURE, JAPAN AT ABOUT 13:38 JST, OCTOBER 22, 2017

SPRING AIRLINES JAPAN CO., LTD.
BOEING 737-800, JA03GR

February 22, 2019

Adopted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakahashi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
Member	Yuichi Marui
Member	Keiji Tanaka
Member	Miwa Nakanishi

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	<p>On Sunday, October 22, 2017, a Boeing 737-800, registered JA03GR, operated by Spring Airlines Japan Co., Ltd., took off from Narita International Airport with 134 people on board, consisting of the Pilot in Command, five other flight crew members and 128 passengers. The aircraft was shaken while it was flying toward Saga Airport, and one cabin attendant was injured.</p>
1.2 Outline of the Accident Investigation	<p>On October 27, 2017, upon receipt of the occurrence of this accident, the Japan Transport Safety Board (JTTSB) designated an investigator-in-charge and an investigator to investigate this accident.</p> <p>An accredited representative 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 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 statement of the Pilot in command (hereinafter referred to as “the PIC”), the First Officer (hereinafter referred to as “the FO”) and cabin attendants as well as the QAR (Quick Access Recorder) records, the history of the flight is summarized below.</p> <p>At 12:14 Japan Standard Time (JST: UTC+9 hours, all times are</p>
---------------------------	--

indicated in JST on a 24 hour clock) on October 22, 2017, a Boeing 737-800, registered JA03GR, operated by Spring Airlines Japan Co., Ltd. (hereinafter referred to as “the Company”), took off from Narita International Airport, as the Company scheduled flight 701 (hereinafter referred to as “the Flight”) bound for Saga Airport. The PIC sat as the PF*1 in the left pilot seat and the First Officer (hereinafter referred to as “the FO”) sat as the PM*1 in the right pilot seat in the cockpit.

During the flight plan before departure, the PIC had anticipated that the Flight of the Aircraft, including arriving at Saga Airport, would be operated under bad weather conditions due to the influence of Typhoon No.21 and the front. The PIC had informed the cabin attendants during the pre-flight briefing that the seat belt sign would be turned off only during cruising flight, and instructed them not to leave their seats for a safety confirmation of the passengers’ seat belt fastening status but to confirm it by making an in-flight announcement.

During cruising at FL*2360, the PIC told the cabin attendants that he would turn on the seat belt sign before initiating a descent and instructed them to finish all the required works before it. Therefore, the cabin attendant assigned to the left side of the aft cabin (hereinafter referred to as “Cabin attendant A”), who had finished all the required works before the seat belt sign was turned on, got seated in the rear facing attendant seat at the left side of aft cabin (hereinafter referred to as “L2 seat”) after fastening her seat belt with shoulder harness.

At about 13:25, the PIC turned on the seat belt sign and the Aircraft initiated a descent from FL 360 in the auto pilot mode. Soon after starting a descent, the Aircraft began to be shaken. At about 13:32, while flying around OOITA (waypoint) at FL 226, the Aircraft started to fly into the clouds. The PIC flew the Aircraft while checking the echo of the clouds seen on its flight route by weather radar, but did not find a strong cloud echo that would force him to change the flight route.

At about 13:34, while flying in around FL180, the wind direction and speed changed from the southeastern wind at a speed of about 50 kt to calm wind conditions, and changed again to the westerly wind at a speed of about 35 kt while flying just before ASONO (waypoint).

At about 13:38, at an altitude of around 12,200 ft, the Aircraft was shaken badly. The PIC started to decrease speed by changing the speed setting from 280 kt to 250 kt. The Cabin attendant A and the cabin attendant seated in the rear facing attendant seat at the right side of aft cabin (hereinafter referred to as the “Cabin attendant B”) confirmed each other vocally and visually that their seat belts were fastened tight and low around their hip.

*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 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 200 indicates an altitude of 20,000 ft.

Against the intense shaking, the Cabin attendant A grabbed the bottom of the seat with her left hand and planted her feet firmly on the floor to prevent her body from floating, in addition, she grabbed the frame of the galley with her right hand so that she would be able to confirm the safety of the passengers if looking backward. (See Figure 1.)

Immediately after that, the Aircraft was greatly shaken again at an altitude of around 12,000 ft, when the Cabin attendant A hit her buttock hard against the seat surface, and said “Ouch, painful” involuntarily. The Cabin attendant B was hearing that voice of her.

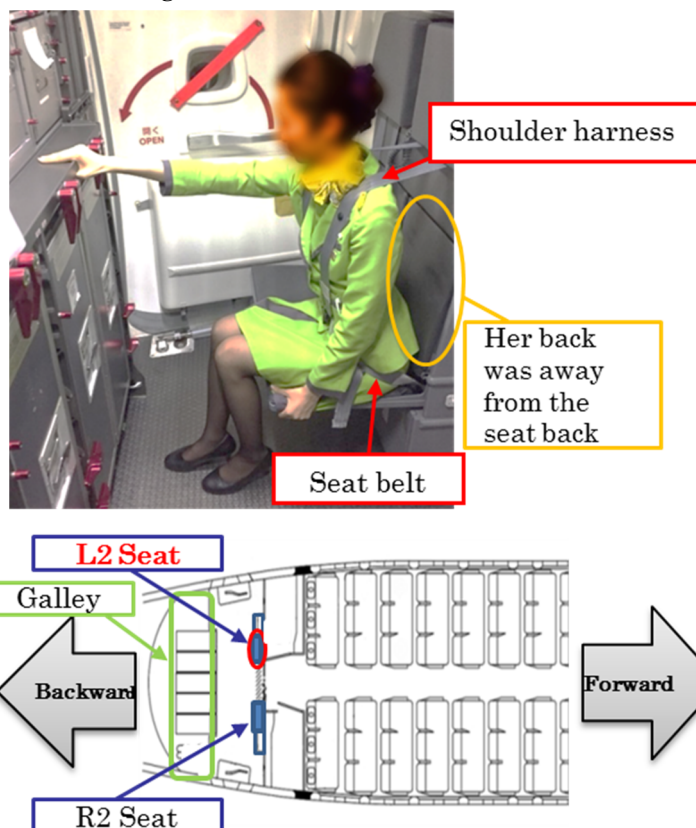


Figure 1 Seating posture (posed by a cabin attendant of the same physical build with the Cabin attendant A)

The PIC and the FO felt that it was the same shake when encountering an ordinary turbulence*3. The Aircraft continued to be shaken intermittently until at an altitude of around 10,000 ft.

At about 14:01, the Aircraft landed on Runway 29 at Saga Airport.

After the passengers disembarked, when the PIC confirmed the condition of the passengers and all cabin attendants with the Chief Cabin Attendant to see whether there were any injured persons, he was reported that there were no abnormalities found.

The Cabin attendant A was feeling pain in her lower back but judged that

*3 “Turbulence” refers to the current of the air that causes the aircraft to be shaken due to the turbulence of the atmosphere. The degree of the given shake is different depending on the aircraft type and its speed. The intensity of the turbulence is mainly based on the pilots’ experience of shaking, which is classified into “Light”, “Moderate” and “Severe”.

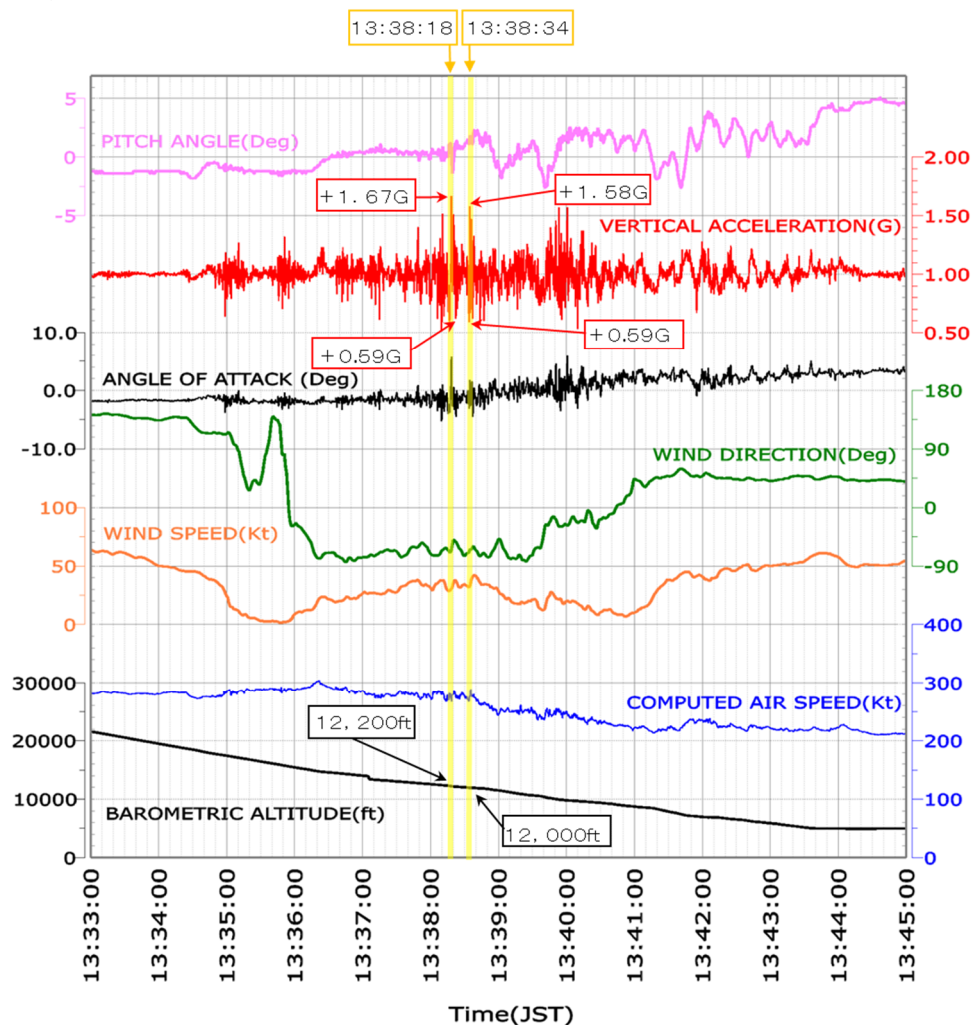
it was transient, and without reporting about it to the Chief Cabin Attendant she continued to be on board the next flight that was her last duties on the day. As she felt pain in her lower back when carrying something heavy or being seated, she tried to cure herself from injury after returning home.

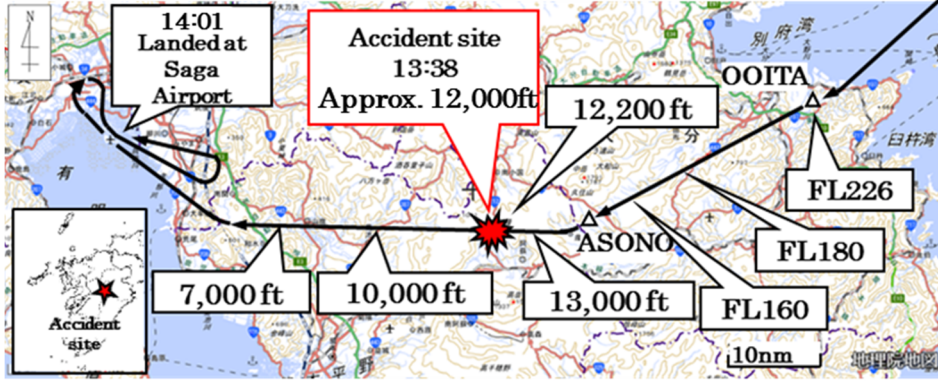
The Cabin attendant A had a home stand-by duty as a replacement on October 23. She had a little pain in her lower back and observed carefully the condition of her lower back.

The Cabin attendant A had a duty on board on October 24. As she did not feel a strong pain in her lower back, she was going to work and picked up the heavy bag containing manuals, when a severe pain was running through her lower back. Arriving at work and reporting the pain in her lower back, she was instructed to have a medical examination at a clinic in Narita International Airport. In the examination, the doctor in charge told her that there was no major damage to the pelvis, but she would have to consult a specialist if the pain would not go away.

On October 26, in the orthopedic examination, she was diagnosed as having a serious lumbar compression fracture.

This accident occurred at about 13:38 on October 22, 2017, at an altitude of around 12,000 ft over Aso City, Kumamoto Prefecture (33° 00' 40" N, 131° 03' 11" E).



	<p style="text-align: center;">Figure 2 QAR records</p>  <p style="text-align: center;">Figure 3 Estimated flight route</p>
2.2 Injuries to Persons	One cabin attendant was seriously injured with a lumbar compression fracture.
2.3 Damage to Aircraft	None
2.4 Personnel Information	<p>(1) PIC Male, Age 63 Airline transport pilot certificate (Airplane) November 21, 2000 Type rating for Boeing 737 March 29, 2012 Total flight time 14,142 hours 53 minutes Flight time on the same type of aircraft 2,360 hours 47 minutes</p> <p>(2) FO Male, Age 40 Airline transport pilot certificate (Airplane) May 29, 2017 Type rating for Boeing 737 November 16, 2007 Total flight time 7,025 hours 31 minutes Flight time on the same type of aircraft 6,820 hours 22 minutes</p>
2.5 Aircraft Information	<p>(1) Type: Boeing 737-800 Serial number: 41272 Date of Manufacture: February 26, 2014 Total flight time 6,390 hours 49 minutes It is highly probable that both of the weight of the aircraft and the position of the center of the gravity (CG) were estimated to have been within the allowable range when the accident occurred.</p> <p>(2) The Aircraft was equipped with a flight-data recorder and a cockpit voice recorder, but those data recorded at the time of the accident had been overwritten and thus erased.</p>
2.6 Meteorological Information	<p>(1) General weather conditions According to the excerpt from the Asia-Pacific Surface Weather Chart (See Figure 4) at 09:00 JST on October 22, 2017, in Japan it was widely raining from Kyushu to Tohoku, especially heavily in the Kinki and Tokai region because the autumnal rain front was activated along with Typhoon No. 21 that was moving northward.</p>

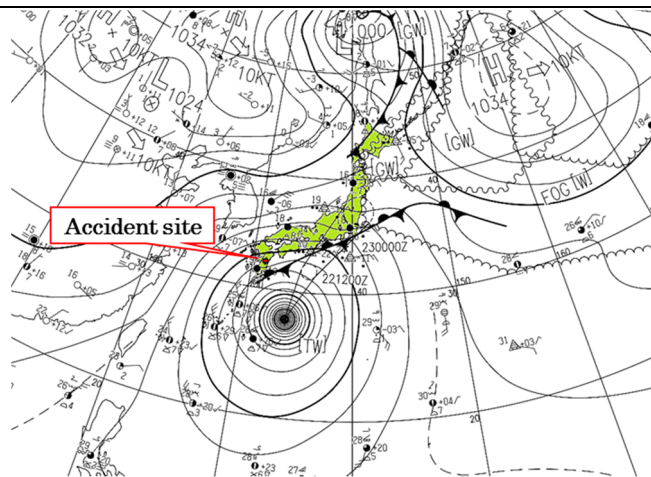


Figure 4 Asia-Pacific Surface Weather Chart as of at 09:00 JST on October 22, 2017

(2) Upper layer wind conditions

According to the excerpt from the wind profiler (time elevation cross section, 10 minutes observation data, elements, vertical wind shear*4) at Oita in the vicinity of the accident site (See Figure 5), the wind direction and speed had changed from an east-southeast at a speed of 30 kt to a north-northwesterly wind at a speed of 30 kt between an altitude of around 17,000 ft and around 13,000 ft.

The vertical wind shear of the horizontal wind was observed to have changed about 10 kt to 12 kt per 1,000 ft at an altitude of around 12,000 ft.

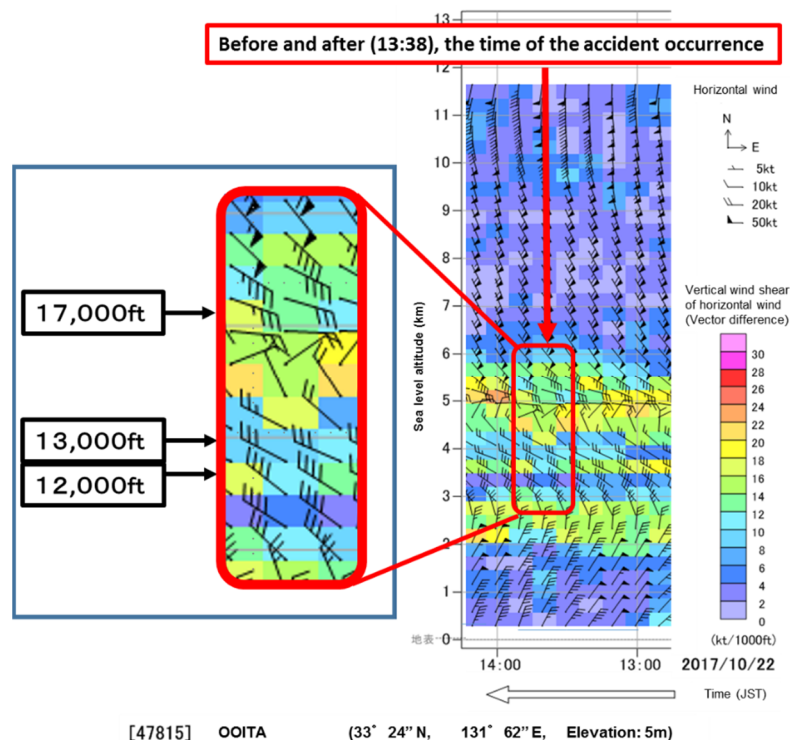


Figure 5 Excerpt from the wind profiler at Oita as of October 22, 2017

*4 “Vertical Wind Shears :VWS” is a difference between the upper layers wind and lower’s one, converted into the difference per 1,000ft, for the wind direction and velocity at locations obtained through wind analysis. In response to altitude change, the more wind direction or velocity or both of them vary, the bigger VWS value becomes.

2.7 Additional Information	<p>(1) According to the QAR records, after the Aircraft initiated the descent, around the time when passing around FL160, the vertical acceleration began to fluctuate in a short cycle. Especially, at 13:38 when passing an altitude of around 13,000 ft, the fluctuation range of the vertical acceleration was wide, from 13:38:16 to 13:38:18 when passing around an altitude of 12,200 ft, it fluctuated between +0.59 G and +1.67 G, and at 13:38:34 when passing an altitude of around 12,000 ft, it fluctuated between +0.59 G and +1.58 G. The fluctuation in a short cycle continued until at an altitude of around 7,000 ft.</p> <p>(2) The Company’s Manual for Cabin Attendant stipulates that when cabin attendants are injured or become sick during flight duties, they shall report it to the Chief Cabin Attendant, who shall report it to the PIC including such information as the location where they have got injured or become sick, specific part of body in terms of injury or sickness body, the extent of injury and illness, and probable causes of the injury and illness.</p>
----------------------------	--

3. ANALYSIS

3.1 Involvement of Weather	Yes
3.2 Involvement of Pilot	None
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	<p>(1) Vertical acceleration’s fluctuation in a short cycle</p> <p>It is probable that the reason why the vertical acceleration’s fluctuation in a short cycle continued from around FL160 to an altitude of around 7,000 ft was because the Aircraft passed the air space where the turbulence was generated. It is probable that the turbulence occurred due to the large vertical wind shear caused by a radical change in wind speed and direction.</p> <p>(2) Major shaking of the Aircraft</p> <p>At 13:38, the QAR recorded two major shakings of the Aircraft. Based on this, it is probable that at this moment, the Aircraft encountered the turbulence and was shaken badly.</p> <p>(3) Condition of the Cabin attendant A at the time of injury</p> <p>It is probable that because after the first major shaking of the Aircraft, the Cabin attendant A and the Cabin attendant B confirmed each other vocally and visually that their seat belts were fastened firmly at around their lower back, there would be no looseness in their fastened seat belts and thus, their bodies would not be greatly away from the seat surface at the time of the second shaking.</p> <p>However, the Cabin attendant A hit her buttock hard against the seat surface by the second major shaking and said, “Ouch, painful”; therefore, judging from this, it is probable that the Cabin attendant A got injured at this moment.</p> <p>(4) Seating posture of the Cabin attendant A at the time of injury</p> <p>It is probable that because the Cabin attendant A caught hold of the frame of the galley with her right hand, she was seated with her head bent</p>

	<p>forward and her back off the seat back. (See Figure 1.)</p> <p>Because the Cabin attendant A was seated in such a posture, it is somewhat likely that when an upward impact was inflicted upon her buttock due to the strong shaking, which increased the stress on her lumbar spine, resulting in a lumbar compression fracture.</p> <p>(5) Action taken by the Cabin attendant A</p> <p>The Cabin attendant A continued her duties on board the next flight despite her injury suffered at the Flight, however, it is probable that she should have promptly reported her injury to the Chief Cabin Attendant in accordance with the Company's Cabin Attendant Manual.</p>
--	---

4. PROBABLE CAUSES

<p>It is highly probable that in this accident, because during descent, the Aircraft encountered the turbulence caused by a radical change in wind speed and direction and was shaken badly, one cabin attendant, who was seated in the rear facing attendant seat at the left side aft cabin after fastening her seat belt, hit her lower back hard, resulting in a lumbar compression fracture.</p> <p>It is somewhat likely that the reason why one cabin attendant suffered a lumbar compression fracture at the time of the shaking of the Aircraft despite her fastening seat belt firmly was that she was seated with her head bent forward and her back off the seat back, in addition to the fact that she hit her lower back hard due to the strong shaking, leading to the increase of the stress on her lumbar spine.</p>

5. SAFETY ACTIONS

<p>The Company implemented the following measures to prevent the recurrence of similar accidents.</p> <p>(1) Measures taken by the Flight Operations Department</p> <p><a> As its initiative to prevent the recurrence of similar accidents, the whole Flight Operations Department in the Company shared the information including the overview of the accident, the information on past flights that encountered turbulence, the introduction of accidents, events and initiatives related to accident-preventive measures in other companies, the understanding of signs and characteristics of turbulence occurrence, and others.</p> <p> “The accident prevention during encounters with turbulence” was additionally stipulated as annual priority items for training and checks in the fiscal year 2018. According to this stipulation, the Company shall confirm the operation, the handling and the information sharing with flight crew members in the cabin during encounters with turbulence in the check.</p> <p>(2) Measures taken by the Cabin Department</p> <p><a> All cabin attendants were notified of the overview of the accident and the following measures as safety information in the Cabin Department.</p> <p> The rules on duties for cabin attendants were revised and “Precautions at the time of seating” was newly added. Accordingly, the education was provided for all the cabin attendants.</p> <p><Contents></p> <p>Be seated in the way that your back contacts with the back of the seat. Be fully careful keeping in mind a possible sudden turbulence, impact and others when you have to leave your</p>
--

seat or you are in such a condition that your back has to be off the back of the seat in order to confirm the conditions of the cabin and others.

<c> All cabin attendants were notified again of “Warm-up exercise” as an exercise to prevent injury and instructed to do the exercise before and during their duties on board.

- (3) The check list was revised to ensure that the health conditions are properly reported when cabin attendants leave work, and they have started to act according to the revised check list.