

AA2017-9

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

JAPAN AIRLINES CO., LTD.

J A 3 2 2 J

December 21, 2017



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

**JAPAN AIRLINES CO., LTD.
BOEING 737-800, JA322J
PASSENGERS INJURIES
AT THE EMERGENCY EVACUAION
AT NEW CHITOSE AIRPORT, JAPAN
AT AROUND 15:10 JST, FEBRUARY 23, 2016**

November 22, 2017

Adapted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakahashi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
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Member	Keiji Tanaka
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SYNOPSIS

<Summary of the Accident>

On Tuesday, February 23, 2016, a Boeing 737-800 registered JA322J and operated by Japan Airlines Co., Ltd, as a scheduled flight 3512 of the company, after being pushed back from an apron, was holding to taxi on a taxiway in order to depart from New Chitose Airport to Fukuoka Airport. Snow started to fall suddenly. The captain decided to move to the designated apron in order to remove the ice and snow from the aircraft. When the aircraft had stopped on a taxiway where the aircraft was moving because snow became harder, odd smells and smoke were generated within the cabin and the flame was confirmed at rear of No.2 engine (right side). Because of these, at around 15:10, an Emergency Evacuation was conducted through the evacuation slide at the Taxiway T2.

There were 165 people in total aboard the aircraft, consisting of the captain and five other crewmembers and 159 passengers. During this Emergency Evacuation, one passenger suffered serious injury and two passenger suffered minor injuries.

The aircraft was not damaged.

<Probable Cause>

In this accident, it is probable that while holding on the taxiway to taxi following the heavy snowfall, odd smells and smoke were generated within the cabin, following these events, because the flame from rear of No.2 engine was continued, the flight crew conducted the Emergency Evacuation from the aircraft. At the time, a passenger descended the slide, fell down to the ground from the hip of the passenger and suffered serious injury.

Regarding the occurrences of odd smells and smoke in the cabin and the continuation of the flame at the rear of No.2 engine, it is probable that the Heavy Snow became intense due to the rapid weather deterioration, and because the icing was set at fan blades and low pressure compressor, the engine oil was leaked into inside of the engine and the oil vaporized into the cabin and the leaked oil was accumulated within in the tailpipe to catch the fire.

The abbreviations used in this report are as follows;

AOM	: Aircraft Operating Manual
APU	: Auxiliary Power Unit
CAM	: Cabin Attendant Manual
CVR	: Cockpit Voice Recorder
CC	: Combustion Chamber
CVT	: Center Vent Tube
EICAS	: Engine Indication and Crew Alerting System
ENG	: Engine
FCSOV	: Flow Control and ShutOff Valve
FAR	: Federal Aviation Regulation
FDR	: Flight Data Recorder
HPC	: High Pressure Compressor
HPT	: High Pressure Turbine
LPC	: Low Pressure Compressor
LPT	: Low Pressure Turbine
OAT	: Outside Air Temperature
OCC	: Operations Control Center
OM	: Operations Manual
PA	: Public Address
PF	: Pilot Flying
PIC	: Pilot In Command
PM	: Pilot Monitoring
PRSOV	: Pressure Regulator and ShutOff Valve
RVR	: Runway Visual Range
SW	: Switch
TAF	: Terminal Aerodrome Forecast

Unit Conversion List:

1ft	: 0.3048m
1kt	: 1.852km/h (0.5144m/s)
1lb	: 0.4536kg
1inHg	: 33.86hPa

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1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Tuesday, February 23, 2016, a Boeing 737-800 registered JA322J and operated by Japan Airlines Co., Ltd, as a scheduled flight 3512 of the company, after being pushed back from an apron, was holding to taxi on a taxiway in order to depart from New Chitose Airport to Fukuoka Airport. Snow started to fall suddenly. The captain decided to move to the designated apron in order to remove the ice and snow from the aircraft. When the aircraft had stopped on a taxiway where the aircraft was moving because snow became harder, odd smells and smoke were generated within the cabin and the flame was confirmed at rear of No.2 engine (right side). Because of these, at around 15:10, an Emergency Evacuation was conducted through the evacuation slide at the Taxiway T2.

There were 165 people in total aboard the aircraft, consisting of the captain and five other crewmembers and 159 passengers. During this Emergency Evacuation, one passenger suffered serious injury and two passenger suffered minor injuries.

The aircraft was not damaged.

1.2 Summary of the Accident Investigation

1.2.1 Investigation Organization

On February 23, 2016, the Japan Transport Safety Board designated an investigator-in-charge and three investigators to investigate this accident.

1.2.2 Representatives of the Relevant State

An accredited representative of United States of America, as the State of Design and Manufacture of the Aircraft involved in this accident, participated in this investigation.

1.2.3 Implementation of the Investigation

February 23 to 25, 2016	On-site investigation, aircraft examination and interviews
March 22, 2016	Interviews
April 19 to 22, 2016	Teardown investigation of both engines
September 28, 2016	Investigation of an evacuation slide of the same type equipped on the aircraft

1.2.4 Comments from the Relevant to the Cause of the Accident

Comments were invited from parties relevant to the cause of the accident.

1.2.5 Comments from the Relevant State

Comments were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On February 23, 2016, a Boeing 737-800 registered JA322J (hereinafter referred to as “the Aircraft”), operated by Japan Airlines Co., Ltd, (hereinafter referred to as “the Company”) was on a schedule to depart from New Chitose Airport (hereinafter referred to as “the Airport”) to Fukuoka Airport as a schedule flight 3512 of the company.

There were 165 people in total aboard the Aircraft, consisting of the captain and five other flight crewmembers and 159 passengers. The captain was sitting in the left pilot seat as a PF¹ and the Co-pilot was sitting in the right pilot seat as a PM¹.

The history of the flight up to this accident were summarized as follows, based on the records of Flight Data Recorder (hereinafter referred to as “FDR”) and Cockpit Voice Recorder (hereinafter referred to as “CVR”), and the records of ATC Communication, and according to the statements of the flight crewmembers, the controller of the Chitose ATC Squadron (hereinafter referred to as “the Controller”) and a passenger.

2.1.1 History of the Flight based on ATC Communications Records, and the Records of FDR and CVR

Around 14:00	Flight crewmembers conducted a takeoff briefing. At the takeoff briefing, the Captain told the Co-pilot that he planned to have an engine run-up (operation to increase rpm) on the runway prior to takeoff.
14:34	The Aircraft was pushed back from the Aircraft parking spot (hereinafter referred to as “the Spot”)
14:37	No.2 engine was started.
14:38	After starting No.1 engine, Engine Anti Ice Systems ² for both

¹ PF (Pilot Flying) and PM (Pilot Monitoring) are the terms used to identify pilots by their different roles in aircraft operated by two persons. The PF is mainly responsible for controlling the aircraft. The PM mainly monitors the flight status of the aircraft, cross-checks about the PF operation, and undertakes other than flight controlling.

² “Engine Anti Ice System” is a system to prevent freezing by utilizing a compressed air of high temperature and high pressure from the engine to warm the cowl parts at the engine inlet.

engines and Wing Anti Ice System³s were switched “ON”. The flight crewmembers mutually confirmed that the snowfall became severe.

14:39 The Aircraft requested a taxiing to a Ground Control Position (hereinafter referred to as” the Ground”) of Chitose Aerodrome Control Facility, but was instructed to hold.

14:41 The Aircraft cancelled the taxiing to the Ground in order to receive a de-icing work.

14:43 The Aircraft requested a taxiing to Spot 20 to the Ground in order to receive a de-icing work.

14:44 The Ground instructed to detour (TaxiwayH5 (hereinafter referred to as “H5”, respectively) – Taxiway D6 – Taxiway H6 – holding before Taxiway J), after instructing to hold because an aircraft was at the front of the Aircraft and vehicles was working to remove snow at Taxiway T2 (hereinafter referred to as “T2”, respectively) and H5 once.

14:45 to 47 The thrust lever of the Aircraft was moved and N1⁴ was increased. The maximum value of N1 which was recorded on the FDR was 39.4 %.

As the Ground instructed the Aircraft to hold right before H5 and the Aircraft stopped right before H5,

14:49 to 51 As the Ground instructed the Aircraft to turn right and taxi toward the Spot 20 via T2. The thrust lever was moved and the N1 increased. The maximum value of N1 which was recorded on the FDR was 37.8%.

14:52 The Aircraft stopped at T2 due to poor visibility because the heavy snow was falling.

14:54 The Aircraft, using the Company radio (hereinafter referred to as “the Radio”), reported to the ground personnel of the company at the Airport that the Aircraft was unable to taxi due to a poor visibility because of heavy snow and where about of the Aircraft,

³ “Wing Anti Ice System” is a system to prevent freezing by utilizing the compressed air of high temperature and high pressure from the engine to warm leading edges of wings.

⁴ “N1” in this report means the engine rotation speed of engine low pressure shaft (fan, Low Pressure Compressor (LPC) and Low Pressure Turbine (LPT)). Setting the design value of maximum continuous rotation speed 100 %, N1 expressed in “%” for the engine mounted on the aircraft. Whereas, “N2” means the engine rotation speed of engine high pressure shaft (High Pressure Compressor (HPC) and High Pressure Turbine (HPT)).

- and requested a towing vehicle.
- 14:55 An auxiliary power unit (hereinafter referred to as the “APU”) was turned ON.
- 14:56 Amount of oil in No.1 engine and No.2 engine started to decrease.
- 14:57 A call tone of the intercom was ringing.
- 14:58 The co-pilot recognized the odd smells within the cockpit and requested a consent from the captain. The cabin attendant reported an occurrence of odd smells in the cabin to the flight crew. APU was turned OFF.
- 14:59 The cabin attendant reported to the flight crew that a smoke was generating around the center of the cabin and the captain instructed the cabin attendant to confirm a source of the smoke and to check through the cabin.
- 15:00 An air-conditioning unit (hereinafter referred to as the “PACK”, see 2.5.3 for details) equipped on right and left, were OFF, respectively.
- The captain instructed the co-pilot to perform the Smoke or Fumes Removal checklist.
- 15:01 The cabin attendant reported to the flight crew that as the results of checking through the cabin, it was not possible to identify the source of smoke, the smoke filled the cabin near its center, and no fire were seen at the engine because the heavy snow obscured the visual.
- 15:02 The cabin attendant reported to the flight crew that the odd smells and smoke in the cabin started to be mitigated.
- The captain reported to the Ground that because the interior of the Aircraft had the odd smells generating, there would be a possibility of an Emergency Evacuation.
- 15:04 Rpm (N1 and N2⁴) of No.2 engine started to decrease.
- 15:05 The co-pilot turned OFF BUS TRANSFER SW⁵ as following the checklist. And then, because the captain regained his visual, he told the co-pilot to start taxiing again.
- 15:06 The thrust lever of the Aircraft was moved forward and CVR

⁵ “BUS TRANSFER SW” means a switch to change the power supply source, automatically, depending on operating status of multiple generators mounting on the aircraft.

stopped the recording at same time as No.2 engine stopped.

15:09 FDR stopped the recording. The pilot declared the state of emergency via emergency frequency and reported an outbreak of fire from No.2 engine and an Emergency Evacuation.

During the time zone mentioned above based on the records of CVR and ATC communications, two aircraft which were holding to depart at apron area cancelled a pushback because those required the de-icing works due to the sudden intense snowfall other than the Aircraft, six aircrafts on Taxiway become unable to taxi and one aircraft out of these six had occurrences of odd smells. Later an investigation revealed that this aircraft with occurrence of odd smells was the same type with the accident aircraft.

2.1.2 Statements of Flight Crewmembers, ATC Controller and Passengers

(1) The Captain

At the pre-flight briefing on 13:00, there were no forecast of snow at about the time to depart and no significant rainfall was indicated (rain cloud and others). The flight dispatcher did not make a remark.

After the pushback, from the time about to start engine, snow started to fall. Because the snowfall was getting stronger while holding for taxiing, the Captain consulted with the Co-pilot and decided to have the de-icing works. As the result of coordinating with the ground personnel at the Airport, the work would be done at the Spot 20.

The Ground instructed a long detour route because another aircraft was in front of the Aircraft. During the taxiing, the Ground instructed a temporary holding, then instructed to change the route to enter T2 directly. During the taxiing on T2, because of poor visibility due to heavy snowfall, it became hard to identify a Taxiway centerline, therefore, the captain judged that it was dangerous to taxi, and stopped near a point slightly exceeding the spot 22.

Because the snowfall did not decrease, the captain instructed the co-pilot to request a towing vehicle via the Radio, then the captain turned APU on in order to prepare for the towing. Later on, odd smells and smoke generated in the cockpit and at the same time, the Chief Cabin Attendant reported the odd smells and smoke generated in a cabin, too, to the captain. Because none at the instrument panel indicated any abnormalities, the captain instructed the cabin attendant to investigate the cause. As a temporary measure for the odd smells and smoke, the captain implemented "OFF" for the PACK and recirculation fan (see details

described in 2.5.3) which are parts of checklist relating to the smoke and gas and with due consideration to the possible causes of odd smells and smoke, the APU which was turned on right before the report of odd smells and smoke was returned to be OFF. Then, confirming the checklist relating smoke and gas again, the captain operated the BUS TRANSFER SW which was not executed to be off. Because of the smoke generated in a cabin, the captain reported the Ground that there might be an emergency evacuation to be conducted.

Since the odd smells and smoke were mitigated and the visibility was improved as the Spot 20 became visible, after stopping the engine following his moving the Aircraft to the Spot 20, he decided that setting the passenger steps in place was better than waiting for a towing vehicle, so he moved the thrust lever, but the both engine did not respond. As moving the thrust lever for several times, No.2 engine was stopped suddenly. At the time, because the instruments did not display the FIRE, while he was executing the Engine Failure or shutdown checklist, a cabin attendant reported an emergency contact about the fire from No.2 engine. Changing the checklist to Engine Fire or Engine severe damage or Separation, pulled No. 2 Fire SW⁶. At this time, because the instrument did not indicate the display of Fire or others, a fire extinguishing media was not discharged. However, the cabin attendant reported again that the fire was not out.

Because the both engine could not be controlled to operate, a fire was broke out from the engine and the cause of odd smells and smoke was unknown, for the safety of the passengers, the captain consulted with the co-pilot, decided to conduct an emergency evacuation and instructed the cabin attendants and passengers. After performing the Evacuation checklist, he was about to step out from the cockpit, but the door was blocked by baggage which the passengers attempted to carry out, so the door opened only by half. The captain waited in order not to block the path for passengers to evacuate and for most of the passengers completing the evacuation, then pushed door open to step out to the cabin. After that, the captain checked the cabin, then evacuated.

The cold weather operation has the regulation to increase the engine rpm within 30 minutes from the engine starting time, however, it did not take less than 30 minutes for this case from the engine starting time to the emergency evacuation. While snow falls severely, an aircraft has to run-up the rpm every 10 minutes as the regulation, but because the captain was handling the situation of smoke

⁶ By conducting "Pull the Fire SW", the fuel supply to the engine corresponding the SW shall be cut off, then the bleed from the engine, power generation, PACK and Oil pressure are turned OFF. Turning to left or right after pulling the SW injected the fire extinguishants.

generated in the cabin about 10 minutes from the engine starting time, this operation to run-up the rpm was not carried out.

(2) The Co-pilot

The pre-flight briefing did not include forecast of snowfall.

On the way from T2 to the Spot 20, because snowfall started to be heavy and the taxiway centerline become indistinguishable, we stopped. While the Aircraft was stopping, we requested a towing vehicle via the Radio, but because the Radio wave state was poor, it took a long time to communicate through the Radio.

After turning APU on as preparing for the towing, he noticed the odd smells. At the same time, he felt stimulations to his eyes and saw something looked like a haze. And then, setting OFF of PACK and re-circulation fan, based on their own decision, APU was set OFF. Around the same time, a cabin attendant reported the odd smells and smoke.

Explaining the situation to the Ground, he also conveyed that there was possibility for them to conduct an emergency evacuation. And at same time, he performed the checklist relating smoke and gas, but at halfway through the checklist because the odd smells and smoke was mitigated, and visibility was recovered, he decided to resume to taxi. However, moving the thrust lever could not have any responses at the both instruments for right and left engines, then No.2 engine stopped. While performing the Engine Failure or shutdown checklist, as a cabin attendant reported that the fire could be seen out of No.2 engine, the checklist in use was changed to use Engine fire or Engine severe damage or Separation. Cabin attendant reported again that she could still see the fire and suggested that it might be better to carry out an emergency evacuation.

The co-pilot considered the possibilities of Tailpipe Fire⁷, but he decided that it is better to conduct the emergency evacuation, performed the checklist and evacuated.

(3) Chief Cabin Attendant (L1; the left front)

After the pushback, while thinking about that the Aircraft did not start to move for some times, cabin attendants received a contact from the cockpit to return to the spot in order to receive the de-icing work. Then, they received the message that because the Aircraft could not move due to poor visibilities caused by the sudden and heavy snowfall, they would hold there. Almost simultaneously, L1 cabin

⁷ “Tailpipe Fire” means abnormal burning generated by igniting the surplus oil when the oil exists at the rear of engine interior at the time of start/stop of engine, also called “Torching”. If the supply of the fuel were cut off, the fire will be extinguished, naturally. The fire will not spread to the aircraft in general.

attendant felt the strange smell as well as the cabin attendant next to her felt, therefore she reported to the captain right away.

While conducting the cabin announcement, the cabin attendant reported to the captain as soon as recognizing smoke-like haze near the center of the Aircraft. All of cabin attendants investigated everywhere within the cabin upon receiving the instruction from the captain to investigate the cause of smoke. Visual inspection was done even for the engine but there was no abnormality. The cabin attendants controlled the cabin (panic-control) and instructed passengers to cover nose and mouth, and stay low, as using PA and natural voices.

When the cabin attendant told the captain that the smoke was thinning but they were not able to identify the cause of the smoke, she was told that the Aircraft would be moved to the spot 20. After that, the light in the cabin suddenly went off. When she asked the captain why, the captain answered because the engine automatically halted.

After the light went off, the cabin attendant in charge of the right rear door (R2) reported that passenger witness a flame from No.2 engine. Right after that, the cabin attendant in charge of the left rear side door (L2) also reported that she witnessed a red flame at No.2 engine. Then, because the captain told about to conduct the emergency evacuation, immediately L1 cabin attendant called the cabin attendant in charge of the front right side door (R1) from the center of the Aircraft. Just after that, the captain issue the emergency evacuation via cabin announcement.

At the time of emergency evacuation, calling out in loud voice, "No baggage!!" but there were many passengers who carried their baggage, she confiscated the baggage as guiding the passengers. The baggage were piling up in front of the cockpit door. She instructed the helpers to pull up the passengers slid down and urged them to move far away from the Aircraft. Also, when the senior people were about to slide, she called the helper again to pull and support the passengers right before the senior people starting to go down the slide.

Around the time to complete the evacuation of all passengers, the captain and the co-pilot came out from the cockpit and joined cabin attendants.

The chief cabin attendant instructed the cabin attendant in charge of the right front door to make a record of all event and the time of what occurred in the cabin.

(4) Cabin Attendant (R1: the right front)

At 14:57, sensing the smells being not normal, the chief cabin attendant reported to the flight crews via intercom.

At 15:05, a power failure was occurred in the cabin, at 15:06, the captain instructed the emergency evacuation, at 15:07, as checking the outside through the window of R1 door, opened the door.

While inflating the slide, called out in loud voice to unfasten the seatbelt and leave the baggage. At the time to start the evacuation, the cabin attendants chose male passenger as a helper. During the emergency evacuation, the cabin attendants guided the passengers to line up in all exit equally. When a passenger requiring a special attention such as an infant going down, called out to make sure the helper to assist. There were passengers to try to carry out the baggage, if the cabin attendants tried to remove all baggage, the line to evacuate would be clogged. So, they left the small baggage with passengers and confiscated only the big one to evacuate the passengers as many as possible.

At the end, crews evacuated after checking the cabin, it was 15:15 when the evacuation of all people on board were completed.

(5) Cabin Attendant (L2; the left rear)

As a passenger told L2 cabin attendant that “the flame was coming out from the engine”, as peeping at No.2 engine through the window in right side of the last low, she was able to confirm a vertically long small flame at under-side of left rear of the engine, and so she reported to the captain as an emergency. The chief cabin attendant suggested “it is better to instruct the emergency evacuation” to the captain.

At the emergency evacuation, L2 cabin attendant instructed mostly to leave the baggage, but since so many passengers were carrying the baggage, she took only the one she could take and left it at the place where it did not disturb the evacuation.

(6) Cabin Attendant (R2: the right rear)

When a passenger told R2 cabin attendant that “I can see a flame from the engine”, R2 cabin attendant peeped at No.2 engine through the window to confirm, but she could not see the flame. According to the passenger, it was like “Orange-colored flame, but it was increasing or decreasing, and now gone”. As R2 cabin attendant checked again from other locations, but she could not confirmed the flame.

As the captain instructed the emergency evacuation, after checking the no flame could be seen through the window on R2 door, there was no fuel leakage and there was a space to inflate the slide, R2 cabin attendant opened the door. Because due to the Aircraft structure, it is not possible to confirm the engine from the window on R2 door, so after opening the door, as she visually checked No.2 engine, she could

identify the small orange-colored flame at under-side of left rear of the engine. Wide flame without a height was about the size of 1/8 of the engine perimeter. R2 cabin attendant judged that there was no problem for an evacuation, so she started the emergency evacuation.

When cabin attendants instructed to leave the baggage, some passengers were following the instruction. But some did not follow the instruction, so R2 cabin attendant took the baggage from those trying to carry out the baggage.

(7) The Ground Controller

The Ground Controller received a request of pushback from the Aircraft, but as a snowplow vehicle was at the back of the Aircraft, the Ground Controller instructed the Aircraft to hold for one or two minutes. When the pushback to the Aircraft was started, the cloud was spreading from west-northwest. When the pushback was completed and stopped, the Ground Controller lost the sight of the Aircraft due to snowfall. The snowfall became so intense that the control tower lost the most of visibilities.

As the Ground Controller received the request from the Aircraft to taxi to the Spot 20 in order to have de-icing work, the Ground controller instructed the snowplow vehicles around the Aircraft to retreat, then instructed the Aircraft to taxi via the taxiway T1 and T2 to the Spot 20. However, when the Aircraft came to the back of the Spot 20, the Aircraft reported that because the visibility was so poor due to the increasing snowfall and the flight crew could not see even 50 m ahead, they hold the Aircraft there, so the Ground Controller instructed the Aircraft to hold there. There were some other airplanes stranded because of the snow. After five minutes passed, the Ground Controller received the report from the Aircraft that an odd smells was generated in the cabin. Later on, as we received the request from the Aircraft that because the visibility was getting better, the flight crew wanted to taxi the Aircraft to the Spot 20, the Ground Controller approved the request. The Ground Controller did not know whether the Aircraft moved or not, but after some time, the flight crew of the Aircraft declared the state of emergency and a fire broken out from No.2 engine via emergency frequency.

As the snowing became calmed, and the Ground Controller could confirm the Aircraft by visual again, all passengers had already evacuated.

(8) The Passenger (Serious injury)

When the passenger noticed something unusual, the cabin was dark and a cabin attendant was announcing “Do not stand up”. After several similar announcements, it changed to “Please hurry to vacate”.

The passenger headed to the right front emergency exit with carrying a bag, but cabin attendant told the passenger to leave the baggage, so the passenger left the bag and evacuated.

Two helpers were on both side and at the bottom of evacuation slide, their attentions were on an infant following the passenger, so they did not pull the passenger up when the passenger fell down and fell forward from the hip of the passenger first. Nearby people helped the passenger to stand, then the passenger climbed into the ground vehicle which came to help.

This accident occurred on T2 at the Airport (42°46'59"N, 141°40'57"E) at around 15:10 on February 23, 2016.

(See Appended Figure 1 Estimated Taxing Route Diagram, Appended Figure 2 Records of FDR, Photo 1 The Accident Aircraft)

2.2 Injuries to Persons

One passenger suffered serious injury (fractured) and two passengers suffered minor injuries.

2.3 Damage to the Aircraft

None

2.4 Personnel Information

2.4.1 Flight Crewmembers

(1) The Captain	Male, Age 48
Airline transport pilot certificate (Airplane)	October 22, 2004
Type rating for Boeing 737	April 30, 1999
Class 1 aviation medical certificate	validity; July 5, 2016
Total flight time	9,385 hours 20 minutes
Flight time in the last 30 days	58 hours 33 minutes
Total flight time on the type of aircraft	3,286 hours 44 minutes
Flight time in the last 30 days	58 hours 33 minutes
Emergency rescue training date	September 15, 2015
(2) The Co-pilot	Male, Age 36
Commercial pilot certificate (Airplane)	February 1, 2006
Type rating for Boeing 737	February 28, 2013
Instrument flight certificate	October 2, 2006

Class 1 aviation medical certificate	Validity; May 10, 2016
Total flight time	4,731 hours 49 minutes
Flight time in the last 30 days	64 hours 5 minutes
Total flight time on the type of aircraft	1,327 hours 16 minutes
Flight time in the last 30 days	64 hours 5 minutes
Emergency rescue training date	February 12, 2016

2.4.2 Cabin Attendants

(1) Chief Cabin Attendant	Female, Age 32
Assigned location	L1
Total on-duty time	6,014 hours 51 minutes
Emergency rescue training date	July 1, 2015
(2) Cabin attendant (R1)	Female, Age 27
Assigned location	R1
Total on-duty time	933 hours 51 minutes
Emergency rescue training date	May 15, 2015
(3) Cabin attendant (L2)	Female, Age 23
Assigned location	L2
Total on-duty time	601 hours 25 minutes
Emergency rescue training date	October 5, 2015
(4) Cabin attendant (R2)	Female, Age 28
Assigned location	R2
Total on-duty time	2,655 hours 06 minutes
Emergency rescue training date	November 10, 2015

2.5 Aircraft Information

2.5.1 Aircraft

Type	Boeing 737-800
Serial Number	35351
Date of Manufacture	August 10, 2009
Certificate of Airworthiness	2009-051
Validity	the applicable period for which the maintenance management manual (JAL Engineering) is subject to the permission issued pursuant to the Article 113-2 of the Civil Aeronautics Act from October 1, 2009;
Category of Airworthiness	Aeroplane Transport T

Total flight time	16,086 hours 54 minutes
Flight time after the Periodic inspection (14A inspection implemented on February 20, 2016)	17 hours 48 minutes

(See Appended Figure 3 Three Angle View of Boeing 373-800)

2.5.2 Engine

(1) No.1 engine

Type	CFM International CFM56-7B24/3
Serial Number	802485
Date of Manufacture	July 19, 2009
Total use time	16,086 hours 54 minutes

(2) No.2 engine

Type	CFM International CFM56-7B24/3
Serial Number	802486
Date of Manufacture	July 20, 2009
Total use time	16,086 hours 54 minutes

The engine of the Aircraft is dual spool turbofan engine and consisting of fan, low pressure compressor (LPC), high pressure compressor (HPC), combustion chamber (CC), high pressure turbine (HPT) and low pressure turbine (LPT).

The high temperature and high pressured compressed air used for the air-conditioning units and others are bled from HPC and are provided to each system via valves (PRSOV) which adjusts air-pressure and temperature.

2.5.3 Air-conditioning System

The air-conditioning system equipped to the type of an aircraft cools the high temperature and high pressure compressed air which is bled from engine by PACK to control cabin temperature and ventilate. Also, Recirculation System is equipped and in order to mitigate the compressed air amount from engine, about 50% of the cabin air is circulated by the circulation fan to ventilate the cabin.

The inlet of the air-conditioning system has valves (FCSOV) and turning OFF the PACK at cockpit has this valves close.

2.5.4 Bearing Sump and Center Vent Tube

In the engine equipped to the Aircraft, a bearing which supports rotation axes of a high pressure shaft and low pressure shaft is covered with the bearing sump which filled

with lubrication oils to mitigate rotation friction. The bearing sumps were installed respectively at the fore and aft. With installations of seals to the parts which axes and bearing sumps are touching, high pressured air from the compressor are used to increase pressure of air at outside of the seals (the side of bearing sump) and the pressure of air at inside of the seals are released through center vent tubes (hereinafter referred to as “CVT”) to the barometric pressure to keep an inner pressure low in order to prevent the oil leakage from the bearing sump through the seals. The high pressured air from the compressor was supplied to outside of the fore bearing sump and at the same time to outside of the aft bearing sump, via a duct at outside of the low pressure shaft.

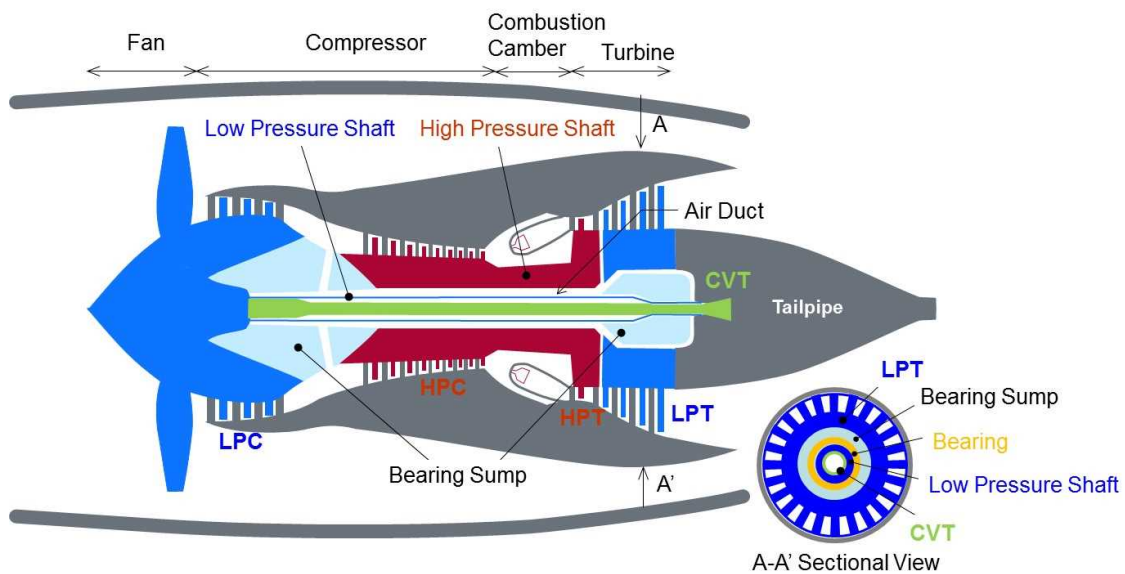


Figure 1 Schematic Diagram of the engine of the same type

2.6 Meteorological Information

2.6.1 General Weather Conditions

The weather condition announced by Sapporo District Meteorological Observatory at 10:48 on the day of the accident are as follows (excerpts);

- (1) Advisory for the regions of Ishikari, Sorachi, Shiribetu

Please keep to pay attention to the icing on the electrical lines and likes by a wet snow till the evening of 23rd.

- (2) General Weather Conditions for the regions of Ishikari, Sorachi, Shiribetu

On 23rd, the pressure trough including low pressure will pass the Hokkaido, and in the evening it will be a winter type weather pattern.

2.6.2 Terminal Aerodrome Forecast and Aeronautical Weather Observations at the Airport

(1) Terminal Aerodrome Forecast

Terminal Aerodrome Forecast (TAF) of the Airport announced at 10:52 on the day of the accident are as follows:

From 10:00 to 15:00 on 24th the following day

Wind direction 160°; Wind velocity 6 kt; Visibility 10 km or more

Cloud : Amount FEW⁸, Cloud base 1,000 ft

Amount BKN⁹, Cloud base 2,500 ft

From 11:00 to 13:00, it changed to 350° for Wind direction and 14 kt for Wind velocity, and it stayed on.

From 21:00 to 24:00, it changed to 2,000 m for the visibility and light snow flurries for the weather for a while.

From 6:00 to 12:00 on 24th the following day, the visibility was 1,500 m, the weather was light snow flurries and the amount of cloud was between FEW (cloud base; 300 ft) and BKN (cloud base; 700 ft) for a while.

(2) Aeronautical weather observations

Routine Aviation Weather Observation (METAR) and Special Meteorological Observation (SPECI) of Aviation Weather issued at the Airport on the day of the accident from 14:00 to 15:13 were as shown in Table 1.

(3) Other meteorological information

According to the Echo of the Doppler radar¹⁰ installed at the Airport, at the time of the accident, the precipitation intensity was 0.3 to 4.0 mm/hr over the accident site.

(See Appended Figure 4 Meteorological Condition)

⁸ Amount of cloud is indicated, “FEW” for 1/8 to 2/8.

⁹ Amount of cloud is indicated, “BKN” for 5/8 to 7/8.

¹⁰ “Doppler radar” is installed in order to detect low level wind shear and microbursts by applying the Doppler Effect to detect a movement of precipitation (speed of air current).

Table 1 Aviation Weather Observations

Time (hr / mnts)	14:00	14:30	14:35	14:38	14:41	14:49	14:53	15:00	15:03	15:06	15:13	
Wind Direction (°)	120	100	90	80	350	340	340	320	330	330	340	
Wind Velocity (kt)	4	6	5	5	6	9	10	16	15	13	9	
Wind Variable (°)	30 -190	-	-	350 - 120	-	-	-	-	-	-	-	
Visibility (m)	10 km or more	4,900	2,300	1,500	900	200	200	200	300	300	300	
Current weather	Light snow flurries	Light snow flurries	Light snow flurries	Light snow flurries	Snow flurries	Snow flurries	Snow flurries Snow pellet	Snow flurries Snow pellet	Severe Snow flurries Snow pellet	Severe Snow flurries	Severe Snow flurries	
Cloud	Amount Type Cloud base (ft)	1/8 Stratus 1,000	1/8 Stratus 1,000	1/8 Stratus 1,000	1/8 Stratus 800	Unknown 800	Unknown 300	Unknown 300	Unknown 200	Unknown 300	Unknown 300	Unknown 300
	Amount Type Cloud base (ft)	7/8 Cumulus 1,500	7/8 Cumulus 1,500	7/8 Cumulus 1,500	7/8 Cumulus 1,500	-	-	-	-	-	-	-
Temperature (°C)	2	2	2	2	2	0	-1	-1	-1	-1	-1	
Dewpoint (°C)	-2	-2	-1	-2	-1	-1	-1	-1	-1	-1	-1	
Altimeter Setting	29.98	29.98	29.98	29.98	29.98	29.98	29.98	29.99	29.99	29.99	29.99	
Remarks		Visibility of the direction from East to Southwest; 10 km or more	Visibility of the direction from East to Southwest; 10 km or more	Visibility of the direction from East to Southwest; 10 km or more								

2.6.3 Meteorological Information relating to the Airport obtained by the Flight Crewmembers at Pre-flight Briefing

At the pre-flight briefing, the weather information of the Airport obtained by the flight crew of the Aircraft was as follows;

(1) Terminal Aerodrome Forecast (TAF)

The same information as shown in 2.6.2 (1)

(2) Routine Aviation Weather Observation (METAR)

13:00 Wind direction 150°; Wind velocity 5 kt;

Wind direction variable 110 to 180°

Visibility 10 km or more

Cloud: Amount FEW, Type Stratus, Cloud base 1,000 ft

Amount BKN, Type Cumulus, Cloud base 1,500 ft

Temperature 1°C; Dew point -2 °C

Altimeter setting (QNH) 30.00 inHg

(3) Images of Doppler radar for Airport Weather

Based on the Doppler radar for Airport Weather at 13:19, the precipitation intensity was confirmed to be from 0.05 to 1.0 mm/hr.

Furthermore, after the flight crew of the Aircraft had obtained the information above mentioned, the ground personnel of the company did not provide additional

meteorological information.

(See Appended Figure 4 Meteorological Condition)

2.6.4 RVR

RVR is the greatest horizontal distance that a pilot in the Aircraft aligned the runway centerline can see a surface marking or lights representing the runway centerline.

RVR of the Airport are observed at four locations in total, which are at both touchdown zone at the runway 01L/19R, near the midpoint of the runway and touchdown zone at the runway 01R at height of about 2.5 m from the surface of the runway.

RVR values (one minutes mean value of the observations per every 15 seconds) observed near the touchdown zone at the runway 19R which is closest to the accident site are as shown in Figure 2. The accident site was about 700 m to about 250° direction from the observation point.

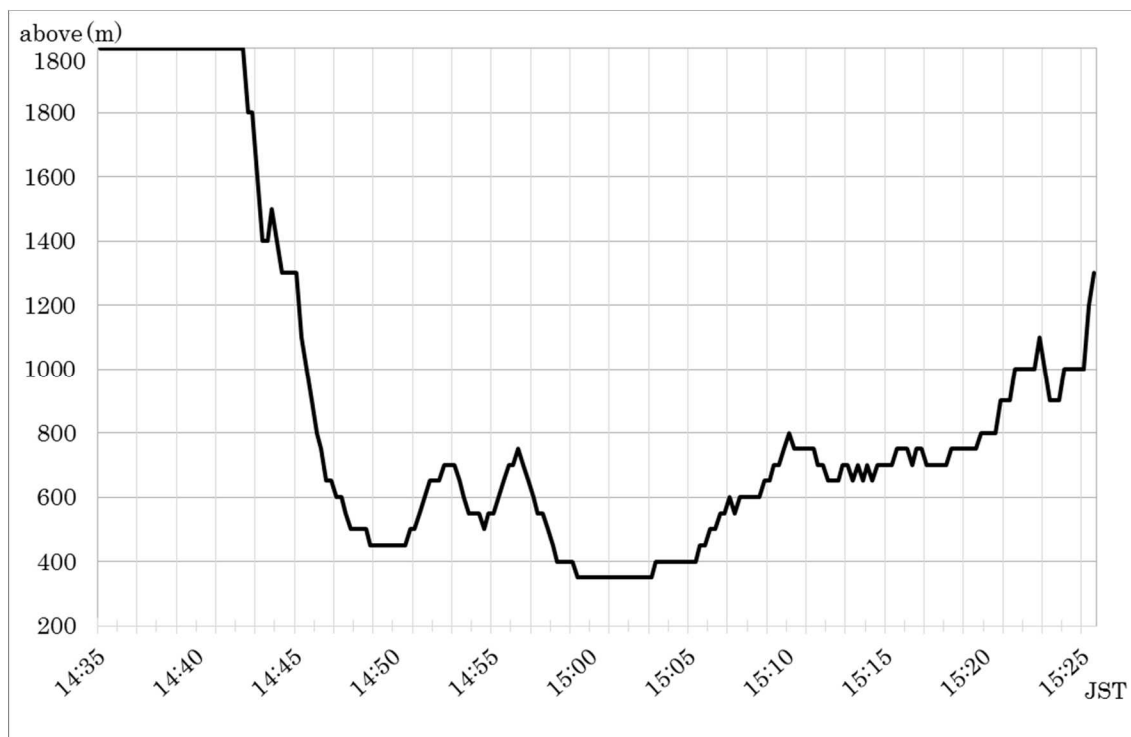


Figure 2 Data of the RVR value on the runway 19R

2.6.5 Information regarding Meteorological Term

Based on criteria regarding the aviation weather observations set by Japan Meteorological Agency, an intensity for rain and snow was set as follows;

Table 2 Intensity criteria regarding the aviation weather observation

Strength Phenomena	measurement	Light (-)	Moderate	Heavy (+)
Rain Shower Freezing Rain	Precipitation Intensity	Instantaneous strength 0.0 mm/h or more Below 3.0 mm/h	Instantaneous strength 3.0 mm/h or more Below 15.0 mm/h	Instantaneous strength 15.0 mm/h or more
Snow Snow flurries	Precipitation Intensity	Instantaneous strength 0.0 mm/h or more Below 1.0 mm/h	Instantaneous strength 1.0 mm/h or more Below 3.0 mm/h	Instantaneous strength 3.0 mm/h or more
	Visibility	Roughly 1,000 m or more	Roughly 200 or more Below 1,000 m	Roughly below 200

2.7 Information regarding the Flight Recorder

The Aircraft equipped the CVR which could record for about two hours and FDR which could record for about 25 hours. The records at the time of the accident occurred which FDR had up to 15:08 and CVR up to 15:06, were saved.

Time calibration for CVR was implemented by comparing the time recorded in FDR, the ATC communications recorded in CVR and VHF radio signal transmitter recorded in FDR.

2.8 Information on the Accident Site and the Aircraft Investigation and others

2.8.1 Accident Site

The Aircraft stopped along the taxiway centerline on T2 at the rear of the spot 22 with the head facing to northwest.

As shown in Figure 3, all emergency exits of the left front door, the right front door, the left rear door and the right rear door of the Aircraft were opened, the slides were inflated. Furthermore, the emergency exits of the both side near the middle of the cabin were not used.

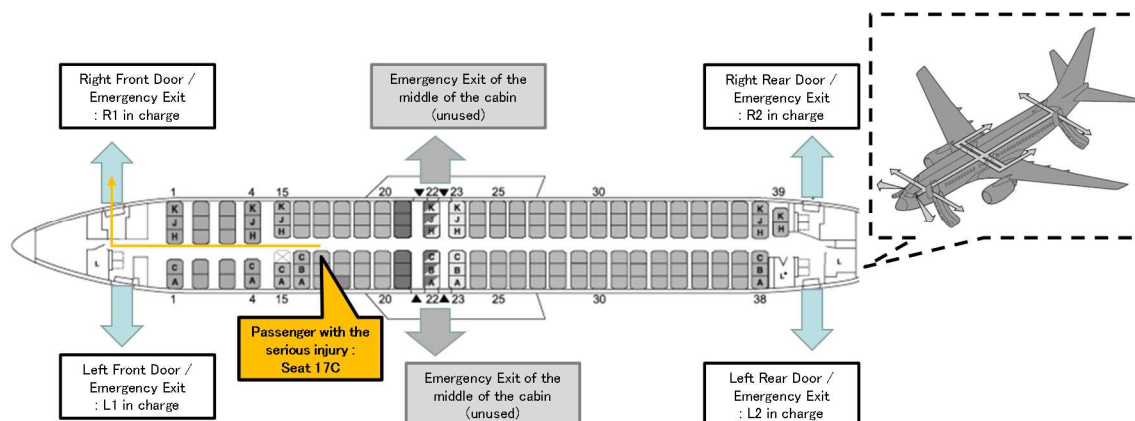


Figure 3 Location of Emergency exit and Allotments of cabin attendants

L1 cabin attendant at the left front door, R1 cabin attendant at the right front door, L2 cabin attendant at the left rear door and R2 cabin attendant at the right rear door were deployed respectively and opened the door in charge. The passenger who suffered serious injury sat on the seat number 17C and evacuated from the right front door.

Furthermore, the overhead bin that stores the carry-in baggage had many of doors opened and were in state which the baggage had been carried out.



Photo A Cabin after the Emergency Evacuation

2.8.2 Facts confirmed by the Aircraft

Investigation and others

At the Aircraft inspection after the accident and the teardown inspection of the engine, the following conditions were confirmed;

- (1) The items confirmed at the both engines
 - Icing on the backside of fan blade and the inlet parts of LPC
 - Icing on LPC blades and the periphery of the back steps of LPC
 - Attachment of engine oils on HPC blades
 - Attachment of engine oils on the downstream side of PRSOV
 - (2) The items confirmed at No.2 engine
 - Accumulated oils inside of the tailpipe
 - Attachment of soot containing engine oils component on the tailpipe
 - Attachment of soot and engine oils on the front steps of No. 1 bearing
 - Attachment of soot and engine oils on the back steps of No. 5 bearing
 - Traces of high temperature air flowing from the aft to fore inside of CVT
 - Attachment of soot and engine oils inside of air duct
 - (3) Other information
 - Amount of oil recorded in EICAS
(No.1: 63%, No.2: 74%)
 - Attachment of engine oils inside of PACK duct
- (See Photo 2 Conditions of the Aircraft Components)

2.9 Rules, Regulations and Materials of the Company

2.9.1 Rules stipulated by the Company regarding the winter flight operation

AOM-SP. 16 Engine Anti-ice Operation – On the Ground

Engine anti-ice must be selected ON immediately after both engines are started

and remain on during all ground operation when icing conditions exist or are anticipated, except when the temperature is below -40°C OAT.

(omitted)

AOM-SP. 16 Taxi-Out

(omitted)

When engine anti-ice is required the OAT is 3°C or below, do an engine run up to minimize ice build-up. Use the following procedure:

Check that the area behind the airplane is clear.

Run-up to a minimum of 70% N1 for approximately 30 seconds duration at intervals no greater than 30 minutes.

If airport surface conditions and the concentration of aircraft do not permit the engine thrust level to be increased to 70% N1, then set a thrust level and time at that thrust level as high practical.

Note: When operating in conditions of heavy snow, run-ups to a minimum of 70% N1 for approximately 1 second duration at intervals no greater than 10 minutes enhance ice shedding.

AOM-B. 103 Holdover Time¹¹

Note: Intensity of Snow / Snow Grain / Snow Pallets is judged by visibility with reference to the table below.

The use of RVR is not permitted for determining the snowfall intensity.

Snowfall Intensity Conversion Table

Time of Day	OAT(°C)	Visibility[meter (statute mile)]			
		Precipitation (Snowfall Intensity)			
		Heavy	Moderate	Light	Very Light
Day	Above -1	≤ 800(1/2)	800(1/2) < and ≤ 1,600(1)	1,600(1) < and < 4,000(2 1/2)	4,000(2 1/2) ≤
	-1 and below	≤ 400(1/4)	400(1/4) < and ≤ 1,200(3/4)	1,200(3/4) < and ≤ 2,400(1 1/2)	2,400(1 1/2) <
Night	Above -1	≤ 1,200(3/4)	1,200(3/4) < and ≤ 2,800(1 3/4)	2,800(1 3/4) < and < 4,000(2 1/2)	4,000(2 1/2) ≤
	-1 and below	≤ 800(1/2)	800(1/2) < and ≤ 2,400(1 1/2)	2,400(1 1/2) < and < 4,000(2 1/2)	4,000(2 1/2) ≤

The Company had no experience of the case for odd smells and smoke to be generated in a cabin due to icing inside of a cabin prior to this accident.

2.9.2 Rules regarding the operations at the time of Emergency and Failure, stipulated by the Company

B737-800 AOM of the company has the following description as a checklist

¹¹ “Holdover Time” means the duration of anti-icing fluid effect and it could be varied depending on a type of de-icing fluid and the weather condition.

performed by the flight crew at the time of Emergency and Failure (excerpts);

(1) Engine Fire

8.2 ENGINE FIRE or Engine Severe Damage or Separation

(omitted)

4 Engine fire switch

(affected engine).....ConfirmPull

To manually unlock the engine fire switch, press the override and pull.

5 If the engine fire switch or ENG OVERHEAT light is illuminated:

Engine fire switchRotated to the stop and hold for 1 second

(omitted)

(2) Generation of smoke, fire or fumes

8.8 Smoke, Fire or Fumes

(omitted)

4 Establish crew and cabin communications.

5 BUS TRANSFER switch OFF

(omitted)

9 RECIRC FAN switches (Both) OFF

10 APU BLEED air switch OFF

11 Anytime the smoke or fumes become the greatest threat:

>> Go to the Smoke or Fumes Removal checklist on page 8.16

(omitted)

8.16 Smoke or Fumes Removal

1 Do this checklist only when directed by the Smoke, Fire or Fumes checklist.

(omitted)

4 Choose one :

◆ Both PACK switches are OFF: >> GO to step 5

◆ A single or both PACK switch(es) are in AUTO: >> Go to step 6

(omitted)

2.9.3 Rules regarding the transmission of flight information stipulated by the Company

(1) OM of the Company has the following description regarding an operation of Company Radio handling all kind of business communications between aircrafts and ground personnel, or among the aircraft stations (excerpts);

8-2-3 Operation of Company Radio

(Omitted)

5. *Except for reasons of emergency, safety or operational necessity, no transmission shall be directed to an aircraft during both periods between block out and 5 minutes after takeoff, (omitted).*

(2) Dispatcher Manual stipulated by the Company has the following description regarding remarks at the time of transmitting the flight information from the ground personnel to the flight crew (excerpts);

Handling of the operational information to the crew

When the operational information which is occurred or obtained after the BRIEFING, the operations officer/operations assistant shall promptly transmit it to the crew. If he or she cannot carry out it, contact to an OCC dispatcher so that the dispatcher is able to communicate with crew certainly.

2.9.4 Rules regarding Emergency Evacuation stipulated by the Company

(1) Cases that may develop into serious situation and abnormal situation;

OM of the Company lists the following five cases as unusual occurrences that may require immediate evacuation.

- *Aircraft fire*
- *Dense smoke in cabin*
- *Unusual aircraft attitude during takeoff or landing*
- *Sensation of unusual sounds or impact*
- *Leakage of fuel*

Furthermore, one of the following irregularities, which is considered to develop into serious situation, has occurred, the emergency evacuation shall be commenced.

- *Fire (including unusual smoke)*
- *Fuel leakage*
- *Serious damage to the fuselage*
- *Submersion (at the time of ditching)*

(2) Regulation regarding responsibilities and duties of the flight crew at an emergency evacuation;

OM of the Company has the following description regarding responsibilities and duties of the flight crew at an emergency evacuation. (excerpts)

7-2 Responsibility in an Emergency

7-2-1 In the Air

(Omitted)

8. *The PIC shall try to inform himself of the situations in the cabin as well as possible, when notified of an emergency in the cabin by any attendant.*

Also, AOM for B737-800 stipulated by the Company has the following description regarding the duties of the flight crew at the emergency evacuation (on the Ground) (excerpts);

The Captain

1. *Make decision on method of emergency evacuation, set up necessary procedure and give necessary instructions.*
2. *Give instructions to all passengers on board and move to aft cabin. (As a standard procedure, join with L2 and R2 duty.)*
3. *When all possible assistance for passengers has been rendered, leave the airplane.*
4. *Direct passengers to go to a safety zone.*

The Co-pilot

1. *Assist captain.*
2. *Join with L1 or R1 duty. When all possible assistance for passengers in forward cabin has been rendered, leave the airplane*
3. *Direct passengers to go to a safety zone.*

(3) Manual for Cabin Attendants regarding Emergency Evacuation

CAM (Cabin Attendant Manual) SAFETY stipulated by the Company has the following description regarding Emergency Evacuation, which regulates the procedure that cabin attendants should execute.

5.10 *Emergency Evacuation*

(Omitted)

Commencement and execution of an emergency evacuation shall be under the authority of the PIC. In case where no immediate instructions were given by the PIC or his subordinate after the aircraft has come to a complete stop, and furthermore, one of the following irregularities, which is considered to develop into serious situation, has occurred, the Cabin Attendant shall effectively commence and execute the emergency evacuation, trying to notify the PIC or his subordinate of the impending situation.

— *Fire (including unusual smoke)*

(Omitted)

Before commencing evacuation, each crew member shall check outside the aircraft, especially, the height from the ground, distance from the fire or the

condition of the waves in order to guide passengers to exits available.

Each crew member shall instruct passengers to leave from the aircraft immediately after stepping off the evacuation slide.

5.11 Guidelines: for Emergency Evacuation

(Omitted)

While the Slide/Raft is inflating, instruct passengers to unfasten seatbelt, not to carry out baggage, stay back and remove sharp edged object like high heels which will be damaged the slide.

Instruct passengers to evacuate when confirming that Slide/Raft completely inflates. Direct the passengers to the exit.

Instruct following things in a clear voice with gesture. The place of the exit, not to carry out baggage, to remove sharp edged objects like high heels which will be damaged the slide, to inflate a life vest at the exit and etc.

(Omitted)

5.13 Non-Normal Situation Guidelines: Ground Evacuation

This section provides Cabin Attendants with recommended guidelines for emergency land evacuation.

Note 1: Cabin crew may be faced with unique evacuation scenarios. In such cases the Cabin Crew must assess the overall situation to decide the best course of action to ensure a safe and rapid evacuation of passengers and crew.

Note 2: It is not possible to cover all conceivable evacuation scenarios with one set of procedures. It is extremely important for flight attendants to assess each emergency situation and exercise their best judgment in how to evacuate the passengers safely in minimum time.

(Omitted)

5.14 Emergency Evacuation Guidelines

- Communicate with the flight deck.*
- If time permits, use the PA to:*
 - Brief the passengers (exits, protective positions, and other information, as required)*
 - Assign helpers.*
 - Order the removal of high heels and other sharp edged objects.*

(Omitted)

- Assess continually conditions inside the aircraft and on the slide to ensure passenger flow is maintained.*

Furthermore, this manual speculates that cabin attendants keep the exit

path clear to prevent interfering with passenger evacuation, direct passengers to evacuate giving them guidance and assistance at the assist space before or after all exits, after commencing the evacuation. Helpers would be requested to slide down the slide prior to other passengers, pull off the following passengers and send them away from the Aircraft.

(4) Training for flight crews and cabin attendants

Flight crews and cabin attendants shall take the emergency rescue response training on a regular basis for once a year regarding emergency equipment and emergency evacuation procedure stipulated by each regulation at a classroom learning and practical training based on the Qualification Manual (for flight crews) and (for cabin attendants), and the flight crews and cabin attendants of the Aircraft took the specified training as described in 2.4.1 and 2.4.2.

(5) Publicity Method for the emergency evacuation of the company

As public information, the Company inform the safety information including the contents relating to the emergency evacuation like “do not carry out baggage at the emergency evacuation”, “sit upright when sliding down the slide” and “the assist by helpers at the bottom of the slide” to passengers as using the safety video (demonstrated by cabin attendant if the aircraft does not have the video equipment) and safety leaflet.

Furthermore, the Company informs the contents of the emergency evacuation including the tasks of helpers by using the homepage of the company and the in-flight magazine as other means.

(See Photo 3 Notifying methods relating to the emergency evacuation by the Company)

2.10 Information on Fire and Fire Extinguishing Works

2.10.1 Character of Fire confirmed

As described in 2.1.2, the flame was confirmed near the tailpipe at rear of No.2 engine and the size of the flame was changing sequentially. As the condition of flame was confirmed by cabin attendant at the emergency evacuation, the flame was about one-eighth of the engine periphery and wide but not so tall. Furthermore, the rear edge of No.2 engine is located approximately 15 m away from the R2 evacuation slide.

2.10.2 State of Fire Extinguishing Rescue Works

The response actions, the activities and others of the New Chitose Airport administrative office of the East Japan Civil Aviation Bureau at the site after the

occurrence of the accident were summarized as follows, according to the records of the office:

Upon receiving the report from ATC personnel at 15:10, a personnel in charge of a fire-fighting control room of Airport Administrative office dispatched fire-fighting vehicles and a fire-fighting command vehicle. The vehicles arrived at the site at 15:12, but because they could not confirm the flame at the Aircraft, they did not perform a fire extinguishing works, they checked that the emergency evacuation of the passengers was conducted by many people concerned in the Company and they waited as standby for a possible fire on the spot.

After the emergency evacuation of the passengers, vacating away and transportation of the passengers were performed by the people concerned in the Company including the cabin attendants. Furthermore, regarding a transport of the injured passengers, ambulances from the fire department headquarters of Tomakomai City and Chitose City were taking charge of receiving a request of dispatch.

2.11 Additional Information

2.11.1 Guideline relating to Emergency Evacuation issued by the Civil Aviation Bureau

The detailed guidelines of the Operations Manual which was issued by the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism contains the following description as a safety information which should be made well known to passengers prior to the flight regarding the measures that the air transport operators should carry out at the case of emergency (excerpts):

10-8 Safety Information and likes which should be made well known (limiting to the aircraft which has a seating capacity of above 30)

(1) Contents of Safety Information

The provision of information to the passengers who will be on board an aircraft shall be speculated to be carried out by: P. A. system (passenger addressing system) in cabin, signs and others; ① demonstrated by a cabin attendant (how to wear a life vest and others), ② video broadcast (Safety Information in general, excluding an aircraft where no video system is available), ③ Safety leaflet (Safety Information in general). Furthermore, as the safety information which should be made well known to passengers, at least, the items listed in Appended table should be included;

	<i>Contents of Description (Excerpts)</i>	<i>Video</i>
<i>Emergency Evacuation</i>	<i>① Start to evacuate following the instruction from the cabin attendants after</i>	

	<i>the complete halt of the aircraft</i>	
	<i>② Prohibition of carrying baggage out</i>	○
	<i>③ Remove high-heeled shoes.</i>	
	<i>⑤ Keep in low position at a cabin with full of smoke</i>	
	<i>⑧ How to slide down on the evacuation slide</i>	○
	<i>⑨ Helper at the bottom of the evacuation slide and speedy vacating away from the aircraft</i>	○

(Note) 1. The circle marks in the most right column indicates the items which all companies should have the video recorded, and the video is required to finish to broadcast prior to a takeoff, therefore since the broadcasting duration should be within three to four minutes, recording all items mentioned above could not be done.

2. Regarding the video, it should be add to refer the safety leaflet other than the items above mentioned.

3. How to slide down the evacuation slide should have the following added:

- ① Do not carry out baggage.
- ② Sit upright in order to see the bottom point of sliding down.

Furthermore, regarding helpers at the the emergency evacuation, the paragraph has descriptions to speculate the operating procedure manual to ensure to have helpers to assist a safe evacuation.

2.11.2 Evacuation Slide

(1) Specification of the slide equipped on the Aircraft

As the major specification of the evacuation slide equipped on the Aircraft, the model is the type to descend one by one and major materials are urethane rubber with partial aluminum coating. When the emergency exit opened, the evacuation slide stored in a folded state will be inflated and deployed automatically. In specifications, the time to deploy should be within 4 seconds.

(See Photo 4 Slide of the same type installed on the Aircraft)

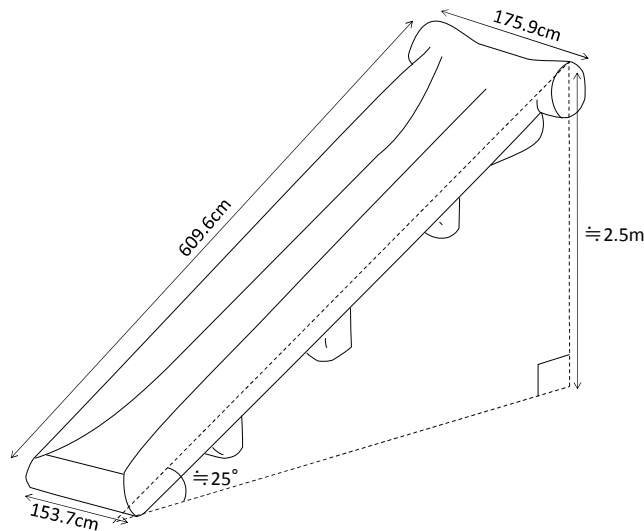


Figure 4 Schematics of the Evacuation Slide equipped on the Aircraft

(2) Requirement of the Slide

Annex 8 to the convention of International Civil Aviation provides the following definitions (excerpts);

4.1.7.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the airplane.

The Aircraft was categorized as Aircraft Transport T for the category of airworthiness and the equipment requirement of the evacuation slide are set forth in the third section 4-7 of the Airworthiness examination guidelines in Japan, and also Part 25 Subpart D Emergency Provisions of Federal Aviation Regulations (FAR) in the United States of America. The emergency equipment like the evacuation slide and likes equipped on the aircraft shall be specified in order to increase the survival rate by a rapid evacuation at the emergency.

Major requirements for the performance and function of the evacuation slide are listed as follows; the slide must be deployed automatically, it must start to be deployed before the exit opened in full, it must reach the ground even though any of landing gears of the aircraft have been broken, it must be deployed even with the gust of 25kt blown from the most disadvantaged direction, after the deployment, one helper could assist passenger to evacuate and it must pass the examination of the five continuous deployment and inflation. Furthermore, as the whole system to evacuate at the time of emergency including the evacuation slide, it must be

established for all passengers using exits at only one side either left or right to complete the evacuation within 90 seconds, having the participants of the passengers with specified ages or sex, in complete darkness, as a demonstrated case.

3. ANALYSIS

3.1 Airman Competence Certificate and Aviation Medical Certificate

The captain and the co-pilot held both valid airman competence certificate and valid aviation medical certificate.

3.2 Airworthiness Certificate

The Aircraft had a valid airworthiness certificate and had been maintained and inspected as prescribed.

3.3 Involvement of Weather

As described in the Table 1 on 2.6.2, at the Airport snow flurries changed from light snow flurries was starting at 14:41 and then severe snow flurries started to fall from 15:03. And then, the severe snow flurries continued to fall up to 15:13 after the occurrence of the accident. Also, the prevailing visibility was 10 km or more at 14:00, but at 14:49, the visibility became 200 m. Furthermore, as shown in Figure 2 in 2.6.4, it is highly probable that since the RVR value of the runway 19R decreased by 1,000 m or more from 14:43 to 14:50, the visibility was deteriorated as the snowfall intensified within the short time at the Airport.

Based on the FDR records as expressed in Appended Figure 2, the outside temperature (OAT) of the Aircraft was exceeding - 1°C at the time zone of the occurrence of the accident, based on the Table 1 as shown in 2.6.2(2), from the time that the visibility became 200 m at 14:49 to the occurrence of the accident, the visibility was below 800 m. according to the statements as described in 2.1.1 and 2.1.2(1), (2) and (7), it is probable that the visibility was so deteriorated at about 14:52 that the taxiway centerline about 50 m at front could not see due to the severe snowfall.

According to the Snowfall Intensity Conversion Table for Holdover Time stipulated in AOM-B103 of the Company as described in 2.9.1, it specifies to be heavy snow when the visibility is 800 m or less at the state of day and outside temperature higher than - 1°C.

Based on these, it is probable that the weather condition around the Aircraft was changed to the heavy snow till about 14:49, and it is highly probable that it had been

snowing heavily from 14:52 when the Aircraft became unable to taxi due to poor visibility to 15:05 when the pilot decided to restart the taxiing as the visibility recovered.

Furthermore, as described in Table 1 of 2.6.2. (2), it is highly probable that since the temperature was the same as the dew point at - 1°C after 14:53, it was easy for a weather condition to have icing.

3.4 Situation of the Engine

3.4.1 Influence of Icing

At the Aircraft investigation after the accident, as described in 2.8.2(1), it was confirmed that the icing were generated on fan blades and LPC of No.1 engine and No.2 engine of the Aircraft. Moreover, as described in 2.1.1, amounts of engine oil from both engines started to decrease at 14:56. It is probable that this decreases of engine oil amounts were caused by the leakage of the oil from inside of bearing sump to LPC, because the airpressure at outside of bearing sump seal could not be kept high due to the decreases of air inflow amount into engine by the icing on fan blades and LPC.

Furthermore, as described in 2.8.2 (2), traces of high temperature air flowing through inside of CVT from the rear to forward and soot and engine oil inside of air duct were confirmed. It is probable that these events were caused by the mixing with engine oil leaked from the bearing sump when the heated air from inside at rear of engine were sucked in and reversed from rear to front through the air duct and CVT described in 2.5.4, because the air inflow amount decreased from outside at front.

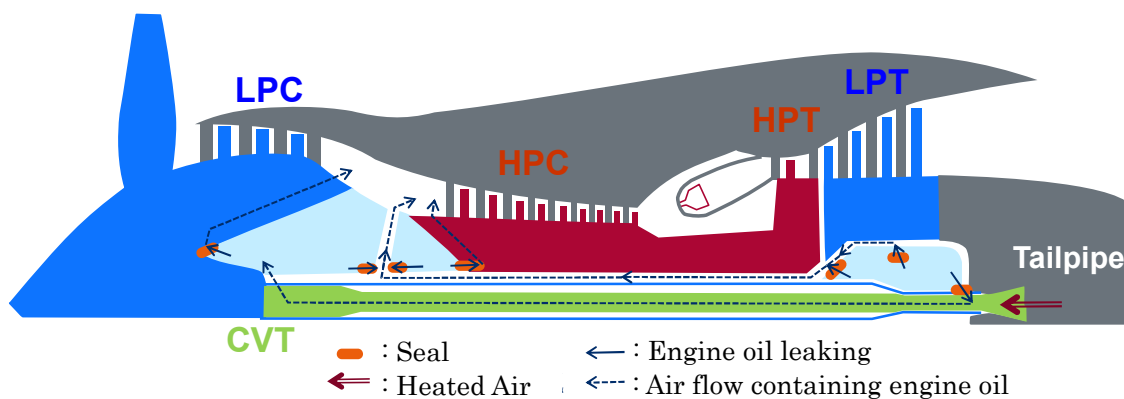


Figure 5 Flow chart of engine oil at the time of the accident

It is probable that because it is considered that the engine oil was leaked into LPC and as described in 2.8.2 (3), it is confirmed that the engine oil was attached to inside of the PACK duct, the engine oil leaked into LPC was mixing with the compressed air bled from HPC described in 2.5.2 and as via PRSOV and PACK it flew into the cabin in fog like condition, it generated the odd smells and it looked like smoke. Due to this, it is

probable that when the flight crew shut off the PACK and recirculation fan as a temporary measure, due to the halt of the inflow of the mixed air with engine oil to the cabin, the odd smells and smoke were mitigated.

3.4.2 Stop of No.2 engine

As described in 2.1.1, the engine rotation speed of No.2 engine started to decrease at 15:04, after operating the thrust lever forward at 15:06, the rotation speed dropped suddenly and stopped the No.2 engine.

As described in the preceding paragraph, it is highly probable that because the air inflow amount into the engine decreased due to the icing on fan blades and LPC, the fuel air ratio in the engine combustion room became inappropriate and the rotation speed started to decrease. Later on, it is highly probable that because the thrust lever was moved in spite of the unstable condition of engine performance, deviation of the fuel air ration from the combustion range caused the No.2 engine stopped.

3.4.3 Flame at the rear part of the Engine

As described in 2.1.1, 2.1.2 (3) and (5), the cabin attendant could not confirm the flame at the engine prior to the No. 2 engine stopped, and confirmed the small red vertically long flame at the lower rear left of the No.2 engine after the No.2 engine stopped. Also, as described in 2.8.2 (2), as the accumulated oil was confirmed at the tailpipe, and the engine oil component was confirmed within the soot attached at the tailpipe. Based on these, it is probable that regarding the flame from the rear of the engine, as the part of leaked oil described in 3.4.1 was discharged via CVT into the tailpipe, because of the stop of the engine, the engine oil remained at inside of the tailpipe was ignited by its exposure to the heat of tailpipe.

3.5 Process up to the Emergency Evacuation

3.5.1 Pre-flight Briefing

As described in 2.6.3, the information obtained by the flight crew at the pre-flight briefing did not include the forecast for snowfall, moreover, as the precipitation intensity was 0.05 to 1.0 mm/hr according to the echoed image by Doppler Radar, the intensity of this echo was light to moderate of snow or snow flurries based on Table 2 shown in 2.6.5. Furthermore, as described in 2.1.2 (1) and (2), at the pre-flight briefing, the flight dispatcher did not inform any remarks regarding weather and as described in 2.1.1, since there were other aircrafts to cancel the pushback in order to receive the anti-icing and de-icing work, it is probable that it is difficult for flight crews to expect the Heavy Snow

or rapid deterioration of the weather at the time of the pre-flight briefing.

As described in 2.9.3, it is regulated for the ground personnel shall pass the information required for the safety to flight crews, however, as described in 2.6.3, it is highly probable that the flight crews could not obtain the additional information relating to the weather from the ground personnel. As described in 2.9.3, it is regulated that the flight information generated after the pre-flight briefing should be passed from the ground personnel to the flight crews as soon as possible, on the other hand, during the time from Block-out till five minutes after a takeoff, no communication to an aircraft was allowed as a principle, however, it shall not apply for the cases of emergency, the cases required for the safety and the cases to the communication of the information required for the flight. It is somewhat likely that the ground personnel did not see the Heavy Snow as this exceptional event. On the other hand, it is probable that even there was no additional information provided by the ground personnel, the flight crew could make a judgment of the rapid changes to the Heavy Snow in the weather based on the surrounding situation as a result.

3.5.2 From Starting Pushback up to T2

According to the flight history described in 2.1.1, the statements of the flight crews and the ATC personnel and the Table 1 shown in 2.6.2(2), it is highly probable that the snowfall started to become stronger after finishing the pushback for the Aircraft, shortly afterward, it became really heavy. The flight crews recognized that the snowfall was getting stronger at 14:38 which was one minutes after the start of No.2 engine, but as described in 3.3, it is probable that at this moment the snowfall could not be categorized as Heavy Snow.

The Aircraft started to taxi to the Spot 20 designated for receiving the anti-icing and de-icing work on seven minutes after the start of both engines and stopped short of H5 temporarily according to the ATC instruction. After this, the Aircraft restarted the taxiing, it is highly probable that it stopped on T2 at about 14 minutes after the start of both engines due to poor visibility because of heavy snowfall. The maximum value of N1 which was recorded by FDR during the taxiing of the Aircraft was about 40%, but it was not possible to determine whether this rise of the engine rotation speed during the taxiing had effects on de-icing inside of the engine or not.

3.5.3 From the Aircraft stopped on T2 up to No.2 engine stopped

As described in 2.1.1 and 2.1.2, because of the poor visibility such that the taxiway centerline could not be identified, the captain felt the risk of continuing the taxiing, the

Aircraft stopped on T2 at 14:52 and requested the towing via the Radio. As described in 3.3, at this moment, it is highly probable that the Aircraft was under the Heavy Snow. At about six minutes after the stop on T2, odd smells and smoke were generated in the cabin, in response to this the captain turned off PACK and recirculation fan, and performed the checklist relating to the smoke, fire and gas generation described in 2.9.2. As described in 2.1.2(1), at the moment, because the captain felt that the time was not passing so much since the engine started, it is somewhat likely that he did not feel the need to perform the Engine Run-up every 30 minutes. Furthermore as described in 2.9.1, Note in AOM for B737-800 instructs that under the Heavy Snow Engine Run-up (70% N1 or more for about one second) should be carried out on interval of 10 minutes or less, but when performing Engine Run-up, it was necessary to check the safety for rear of an aircraft and confirm the reliabilities of braking, under the states of stopping on the taxiway at back of the Spot due to poor visibility because of snowfall and the ATC tower could not confirm the Aircraft visually, it is probable that it was difficult for the Aircraft to conduct the Engine Run-up.

Furthermore, it is probable that the flight crews of the Aircraft could not realize that the odd smells and smoke were generated due to the icing inside of the engines. As described in 2.1.2 (1), as applying temporary measures to the odd smells and smoke generated in the cabin, the odd smells and smoke were mitigated, however it is highly probable that the cause of event could not be identified. It is probable that because there were no shared experience of the generated odd smells and smoke within a cabin affected by icing inside of the engines, it was involved that there were no dissemination among flight crews regarding the effects by icing inside of engine and the background reasoning why establishing procedures for Engine Run-up of AOM described in 2.9.1.

About 13 minutes after the stop on T2, it is probable that because the visibility started to recover, the odd smells and smoke was mitigated but still remained, and the coordination with the ground personnel via the Radio would take a time, as the captain made up mind that it was better to taxi to spot in rather than waiting for towing vehicle, he operated the thrust lever to restart the taxiing.

As described in 2.1.1 and as analyzed in 3.4.2, it is highly probable that because at 15:04 about 12 minutes after the stop on T2, No.2 engine rotation speed started decrease, the performance became unstable, at 15:06, due to the operation of the thrust lever by the captain, the air-fuel ratio within the engine combustion room was deviated out of the combustion range, therefore No.2 engine stopped at the same time.

3.5.4 From No.2 engine stopped up to the emergency evacuation

As described in 2.1.2, the flight crew performed the Engine Failure or Shutdown Check List after No.2 engine stopped, however because he received the report of flame at rear of No.2 engine from the cabin attendant, he had changed to perform the Engine fire or Engine severe damage or Separation Check List and pulled Engine fire SW, but he received the report again from cabin attendant, that the flame at rear of No.2 engine was not distinguished. Regarding these, as described in 3.4.3, it is probable that because the reported flame was the ignited engine oil inside of the tailpipe, shutting off the fuel supply by pulling Engine fire SW could not distinguish the flame, moreover, since the flame was not occurred inside of engines, the instrument did not have any indication for fire. Furthermore, it is highly probable that since there was no indication for fire on instrument panel, the flight crew did not shoot the fire extinguisher as following the AOM procedure described in 2.9.2(1).

It is probable that the captain made up mind to conduct the emergency evacuation with due consideration of safety for the passengers, with his judgment of the event that could be spread to the significant event described in 2.9.4 (1), because the odd smells and smoke were generated and the flame at rear of No.2 engine continued while he sensed that he could not control both engines.

3.6 Emergency Evacuation

3.6.1 Situation at the Emergency Evacuation

As described in 2.1.2 and 2.8.1, regarding the confirmation of the flame of No.2 engine by the cabin attendants and passengers in the cabin of the Aircraft, the captain instructed the cabin attendants to conduct emergency evacuation upon receiving the report from the cabin attendant.

It is highly probable that each cabin attendant, after checking the outside situation of the exit in charge, opened the emergency exit and the evacuation slide was deployed.

As described in 2.1.2(6), it is highly probable that even the R2 cabin attendant checked the engine twice through the cabin window, the flame was not confirmed, therefore, based on the procedure described in 2.9.4 (3), after checking the situation of emergency exit, she opened the door in her charge. After the door opened, it is highly probable that when the R2 cabin attendant had checked the flame again, she could confirm it, but as described in 2.10.1, because the flame was only about 1/8 of the engine periphery with not so much height and located about 15 m from the R2 emergency slide, she assessed that it was possible to evacuate from the right rear door in her charge so she guided the passengers.

As described in 2.1.2, at the time to guide passengers to emergency exits, it is highly probable that each cabin attendant instructed that “not to carry out baggage”, “to leave the slide quickly once on the ground” and others, as well as calling out the passengers who were possible helpers around the exit to pull out the passenger from slide bottom as following helpers and urged them on leaving the Aircraft. While carrying out the evacuation of the passengers, each cabin attendant was guiding and helping the passengers to slide down the evacuation slide, but as described in 2.8.1, it is highly probable that since so many of passengers opened the overhead bin to carry out baggage and attempted to slide down the slide with baggage, each cabin attendant took measures to confiscate their baggage.

As described in 2.1.2(3) and (4), the R1 cabin attendant recorded the event that occurred at the cabin in a chronological manner, based on the statements, the time when the odd smells and smoke were occurred and the report to the flight crew was made and the time when the power supply to the cabin halted were 14:57 and 15:05. These were almost the same as the time recorded in CVR described in 2.1.1, therefore, it is probable that the times recorded by the cabin attendant were correct ones. Based on the statements in 2.1.2 (4), since the captain instructed the emergency evacuation at 15:06 and the time when all passengers left the Aircraft was at 15:15, it is probable that the time required from the instruction of evacuation to the time to complete the evacuation were about nine minutes.

As described in 2.1.2 (8), it is highly probable that the passenger who suffered the serious injury evacuated from the right front door without baggage under the guidance and instruction by the cabin attendant. On the ground, two helpers who had requested from the cabin attendant were helping the passengers to evacuate at the both side of the right front slide as pulling up the passengers and urging them to leave the Aircraft, but it is probable that the passenger who suffered the serious injury could not receive sufficient assist, as the body of the passenger jumped forward, hit ground from the hip of the passenger and suffered the injury as the passenger was sliding down the slide. As described in 2.9.4(5) and 2.11.1, when passengers slide down the slide, the instruction is to sit upright. It is probable that keeping the body upright is to have the visual of landing point in order to make an easy landing, furthermore, keeping upper body upright prevents the evacuator body from jumping out of the slide and helps the helper to assist. It was not possible to determine what kind of posture the injured passenger took at the evacuation.

3.6.2 Actions by the flight crews and the cabin attendants

(1) Actions by the flight crews

As described in 2.1.2(1), after the emergency evacuation was started, the captain completed the checklist for Emergency Evacuation and attempted to move from the cockpit to the cabin. But, as described in 2.1.2(1) and (3), the baggage which the forward cabin attendant confiscated from passengers near the exit were piled up at the space in front of the cockpit door in order not to clog the evacuation route for passengers. Because the captain feared the risk that his opening the door could cause the baggage to clog the evacuation route and to obstruct the evacuation of passengers, he did not push the door to open by force. It is probable that after almost all of passengers slid down the evacuation slide, the captain entered the cabin by opening the door with his full force, where baggage piled up further more against it.

As described in 2.9.4 (2), the roles of the flight crews are to grasp the situation of the cabin at the time of emergency and after the deciding the emergency evacuation, to move to the cabin to control the evacuation of all and do the best to assist the passengers to evacuate with cabin attendants after completing the Emergency Evacuation checklist immediately. However, because the flight crews moved to the cabin after almost all of passengers evacuated, it is probable that they could not control the evacuation of all and could not assist the evacuation of passengers as regulated in AOM. Furthermore, it is somewhat likely that the instruction concerning the safety which passengers should pay attention or should comply at the emergency evacuation like not carrying the baggage were not communicated in appropriate or effective manners.

(2) Actions by the cabin attendants

Each cabin attendant, at the emergency evacuation based on the manual stipulated by the company as described in 2.9.4(3), was positioning at the assist space located near the emergency exit, and was conducting to guide passengers to go down the slide. Among the action they took, they were expected to keep the control within the cabin at the emergency evacuation including to instruct for passengers not to carry baggage and likes, instruct the helper, allot the passengers to each exit and coordinate the interval for passengers to slide down.

As described in 2.1.2, each cabin attendant had instructed passengers not to carry baggage, but so many of passengers attempted to go down the slide with baggage, it is probable that each cabin attendant had to remove baggage from passengers near the exit, at the time, it is probable that the cabin attendant let some passengers go down with not so big baggage in order to prioritize speedy evacuation

than removing the baggage.

3.6.3 Informing passengers about the Emergency Evacuation,

Concerning the items which passengers should comply with like how to deal the life vest, not to carry out baggage at the emergency evacuation and others on the fiscal year of 1982, the aircraft accidents investigation commission (current: the Japan Transport Safety Board) published “a proposal regarding the evacuation of the people aboard the aircraft, the rescue and others (Proposal No.3 on January 24, 1983)” to the Ministry of Transport (current: Ministry of Land, Infrastructure, Transport and Tourism). On September 1996, at the aircraft accident occurred at New Tokyo (current: Narita) International Airport by a Boeing 747-400 registered JA8902, operated by Japan Airlines Co., Ltd. three passengers suffered serious injuries at the emergency evacuation. Upon receiving the occurrence of the accident, the Civil Aviation Bureau of Ministry of Transport established “Study Group concerning the passenger guidance from an aircraft at the emergency evacuation (later, changed the name to “Committee concerning the passenger guidance from an aircraft at the emergency evacuation”) where the experts, air carriers, the travel and tourism industry and the Civil Aviation Bureau participated, and published the circular notes that contained the plan to enrich the safety information as well-known to all passengers aboard an aircraft in February 1998, and the provision of the system to ensure the helpers at the emergency evacuation (Ku-Ko No. 106 on February 24, 1998).

At present, as described in 2.11.1, each air carrier of this country follows the Operations Manual Assessment Guidelines by stipulating as a company rule to inform passengers prior to the flight regarding that not to carry out baggage at the emergency evacuation, to sit upright when sliding down the emergency slide, and to assist at the emergency as the safety information.

However, the aircraft accidents or the aircraft serious incidents occurred after February 1998 when the circular notes mentioned above were published, and among these there were occurrences of four cases which passengers carried out baggage at the emergency evacuation, as follows; (1) in May, 1998, Boeing 747-400 registered N179UA operated by United Airlines at New Tokyo International Airport, (2) in August, 2005, Airbus Industrie A330-303 registered VH-QPE operated by Qantas Airways at Kansai International Airport, (3) in August, 2007, Boeing 737-800 registered B18616 operated by China Airlines (Taiwan) at Naha Airport, and (4) in January, 2013, Boeing 787-8 registered JA804A operated by All Nippon Airways at Takamatsu Airport.

Based on these mentioned above, it is desirable for each airline company and the

Civil Aviation Bureau to plan how to make the general users thoroughly well known about the safety information at the emergency evacuation with its reasoning like use of high-heeled shoes or baggage could damage the slide to be unusable, and how to promote more sound understanding and awareness.

Furthermore, it is desirable that passengers should make oneself well aware of the safety information like not to carry out baggage, an appropriate use of the slide and other notices which the air carriers inform to the general users to execute safe evacuation immediately, and should understand and act as it is extremely important to follow the instruction from flight crews and cabin attendants in order to save own life and others at the emergency evacuation.

4. PROBABLE CAUSES

4.1 Summary of the Analysis

(1) The captain and co-pilot held valid airman competence certificates and valid aviation medical certificate. The Aircraft had a valid airworthiness certificate and had been maintained and inspected as prescribed. (3.1, 3.2)¹²

(2) When the Aircraft stopped on T2, it is highly probable that the meteorological condition of around the Aircraft changed rapidly to Heavy Snow and tended to generate icing. (3.3)

(3) It is probable that because the airpressure at outside of the bearing sump could not be increased due to the icing on fan blades and LPC, and the decreased air inflow amount, the engine oil leaked from the bearing sump into inside of the engine and the oil vaporized into the cabin and caused to generate the odd smells and smoke. (3.4.1)

(4) The icing at the fan blades and LPC of the Aircraft engine caused the decreases in inflow amount of air into the engine and the engine was resulted in unstable condition. It is highly probable that because the thrust lever was operated, the air fuel ratio was deviated out of the combusting range and No.2 engine was stopped. (3.4.2)

(5) It is probable that a part of engine oil leaked into the engine drained into inside of the tailpipe and was ignited because of its exposure to the heat of tailpipe. (3.4.3)

(6) It is probable that it was difficult for the flight crew to expect the rapid weather deterioration and Heavy Snow since the ground personnel told no information concerning snow or remarks and the additional weather information, but based on

¹² The number listed in each sentence end of this clause, indicates a main clause number of #3, Analysis” concerning the description of the each sentence.

the situation, it was possible for them to assess the rapid change of weather to Heavy Snow. (3.5.1)

(7) About 14 minutes after the start of both engines, the Aircraft stopped on T2 due to poor visibility because of Heavy Snow. It is highly probable that when the Aircraft stopped on T2, the Aircraft was under Heavy Snow. The operation under Heavy Snow requires Engine Run-up at interval of 10 minutes or less, at the time of this accident, under the situation of the Aircraft it is probable that it was difficult for the Aircraft to operate the Engine Run-up. It is highly probable that the flight crews of the Aircraft could not identify the cause of odd smells and smoke. It is probable that it involved the facts of not informing the reasoning to set the procedure for Engine Run-up and the effects of icing into inside of engine to the flight crews. (3.5.2, 3.5.3)

(8) It is probable that while the captain sensed the inability to control both engine, because the odd smells and smoke were generated and the fire at rear of N0.2 engine did not stop, considering the safety of passengers, he made a decision to conduct the emergency evacuation. (3.5.4)

(9) When each cabin attendant guided passengers to emergency exit, they instructed passengers not to carry baggage and requested helpers to assist, but it is highly probable that since so many passengers attempted to go down the slide with baggage in their hands, the cabin attendant had to act to confiscate the baggage. (3.6.1)

(10) It is highly probable that that because the pilot feared the risk to obstruct the evacuation route of passengers if he moved the piled up baggage at front of the cockpit door, he entered into the cabin after the almost all of passengers went down the slide. Because of this, it is probable that the flight crew could not take a command on the evacuation and conduct to assist the passengers. Furthermore, it is somewhat likely that the safety instruction which the passengers should comply or pay attention to at the time of evacuation like not to carry out baggage could not be transmitted in an effectively and timely fashion based on these. (3.6.2)

(11) It is desirable that the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism and each airline company should inform the public including passengers of the safety information at the emergency evacuation with its reason for the settings and study how to promote the more sound understanding and awareness. It is desirable that passengers should make oneself well aware of the safety information which the air carriers inform to the general users to execute safe evacuation immediately, and should understand and

act as it is extremely important to follow the instruction from flight crews and cabin attendants in order to save own life and others at the emergency evacuation. (3.6.3)

4.2 Probable Cause

In this accident, it is probable that while holding on the taxiway to taxi following the heavy snowfall, odd smells and smoke were generated within the cabin, following these events, because the flame from rear of No.2 engine was continued, the flight crew conducted the Emergency Evacuation from the Aircraft. At the time, a passenger descended the slide, fell down to the ground from the hip of the passenger and suffered serious injury.

Regarding the occurrences of odd smells and smoke in the cabin and the continuation of the flame at the rear of No.2 engine, it is probable that the Heavy Snow became intense due to the rapid weather deterioration, and because the icing was set at fan blades and low pressure compressor, the engine oil was leaked into inside of the engine and the oil vaporized into the cabin and the leaked oil was accumulated within in the tailpipe to catch the fire.

5. SAFETY ACTION

5.1 Safety Actions Taken after the Accident

5.1.1 Safety Actions taken by the Company

The Company took the following safety actions after the accident;

(1) Actions taken for icing on engine and odd smells

1. Inform all of the flight crewmembers regarding the reason to set AOM-SP16.

When ice or snow is accumulated inside of an engine, as the amount of air flow inlet decreases, the efficiency for a Compressor lowers and the pressure for seal decrease, the engine oil might leak out. It is possible for the leaked out oil to be the cause of odd smells and smoke within a cabin through PACK, and if the state stays on, it could become Tailpipe Fire.

2. Clarify the criteria for Heavy Snow and revise the procedure for Engine Run-up of the same type of an aircraft.
3. Make ground personnel well know about that when sensing unexpected significant weather like Heavy Snow, one has to provide the information to the flight crews as soon as possible.

(2) Actions taken for Emergency Evacuation

1. Revision of the safety video;

For the Safety Instruction Video of the Company, it was revised to have the

contents to enable to enhance the awareness among passengers regarding how to assist the evacuation at the bottom of the slide and why one should not carry baggage to evacuate.

Furthermore, plan to make a complete revision of the contents to enhance the awareness of passengers more.

2. Adding the contents to the periodic rescue training carried out by cabin attendants;

Regarding the emergency evacuation at the periodic rescue training, add the contents of demonstration done by an instructor about how to act when passengers rush to an exit with baggage in their hands and how to have passengers not to bring their baggage to an exit.

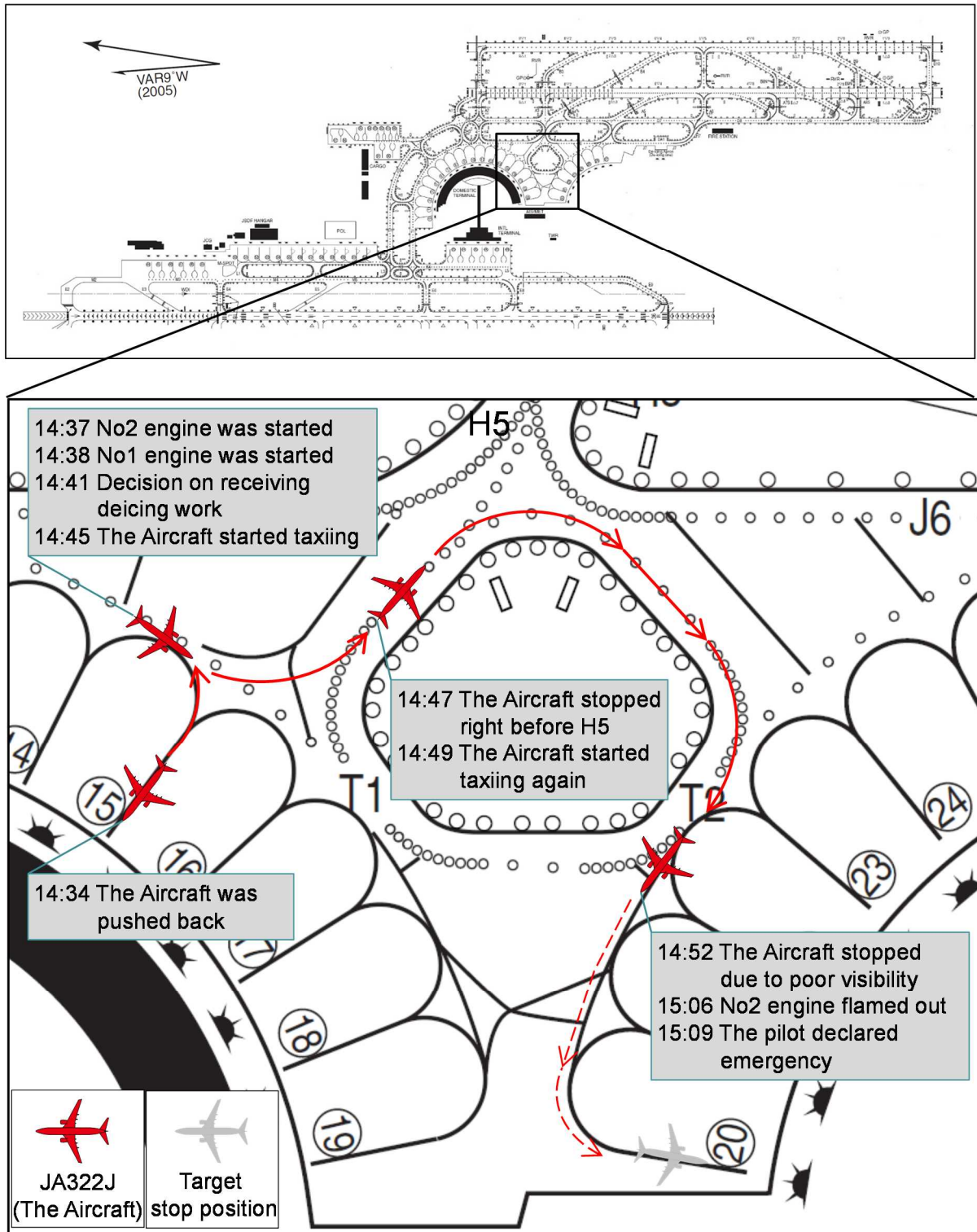
3. Implementation of educations concerning the emergency evacuation for the group staff of the company;

To the group staff of the company, implement the educations of basic knowledge and the simulator trainings of the evacuation slide regarding how to help cabin attendants at the emergency evacuation, successively.

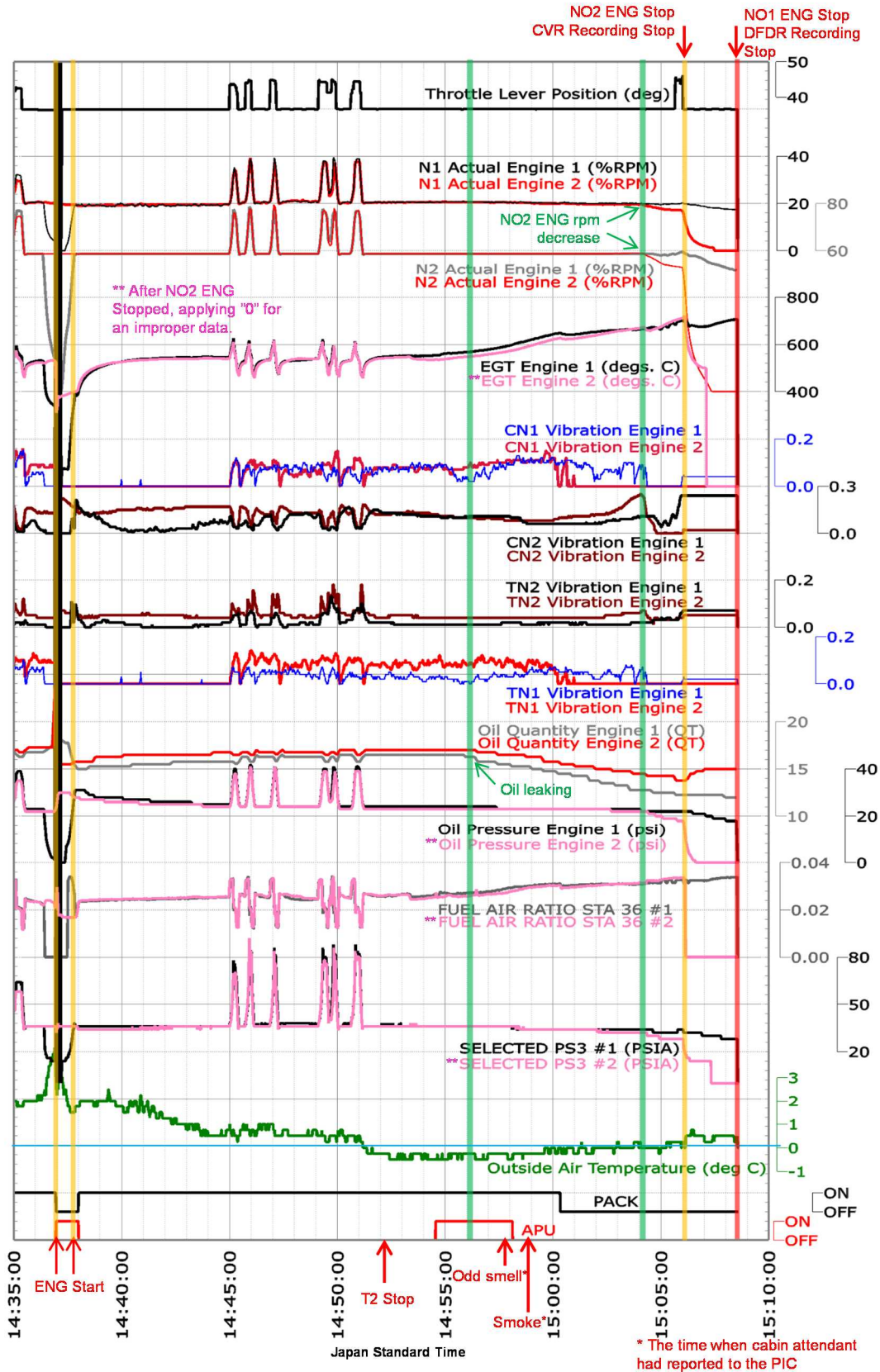
5.2 Safety Actions Considered Necessary in Future

As described in 5.1.1, the Company carried out the revision of Safety Instruction Video concerning the emergency evacuation as a safety measure after the Accident, and planned the measures to promote the awareness of passengers regarding the safety information like passengers should not carry baggage when evacuating. However, for the emergency evacuation like this accident, considering possibilities for other companies to have similar accident, it is desirable that the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism and the air carriers should inform the general users of the safety information at the emergency evacuation with its reason for the settings and study how to promote the more sound understanding and awareness.

Appended Figure 1 Estimated Taxiing Route Diagram

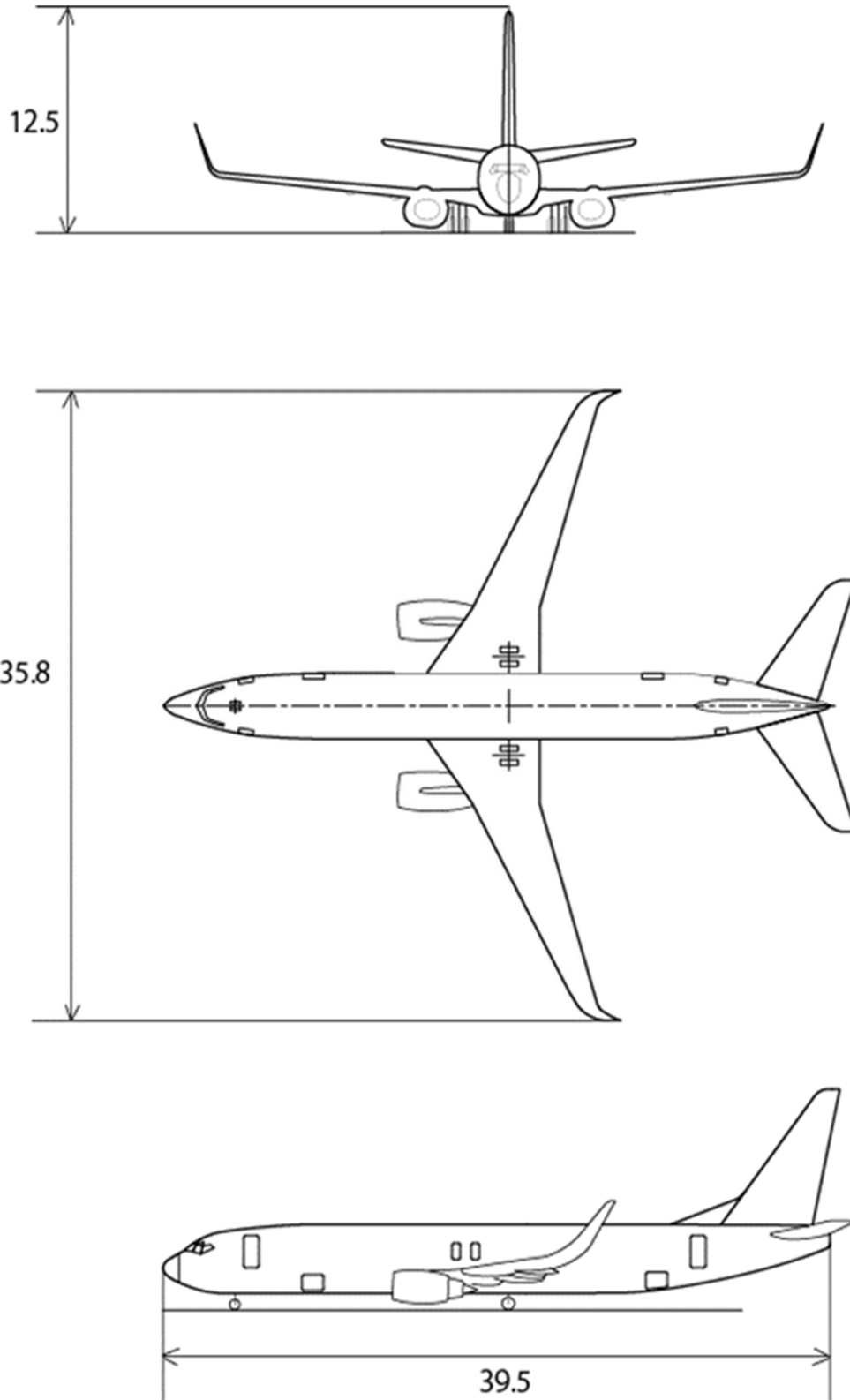


Appended Figure 2 Records of FDR

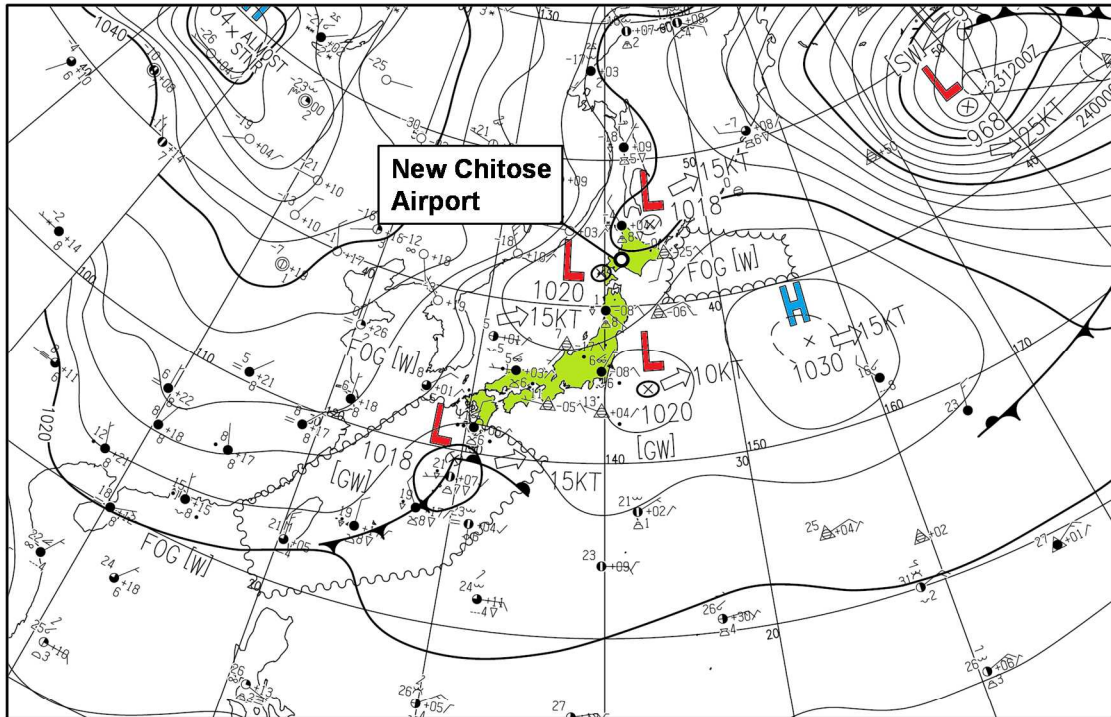


Appended Figure 3 Three Angle View of a Boeing 737-800

Unit: m

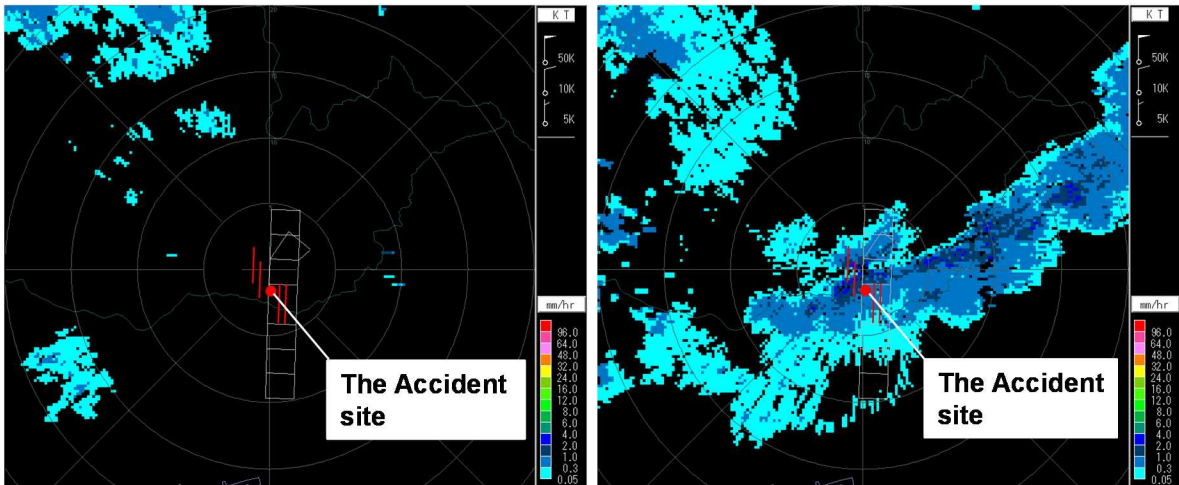


Appended Figure 4 Meteorological Condition



Surface Weather Chart (9:00 on February 23, 2016)

Doppler Radar (intensity) for New Chitose Airport



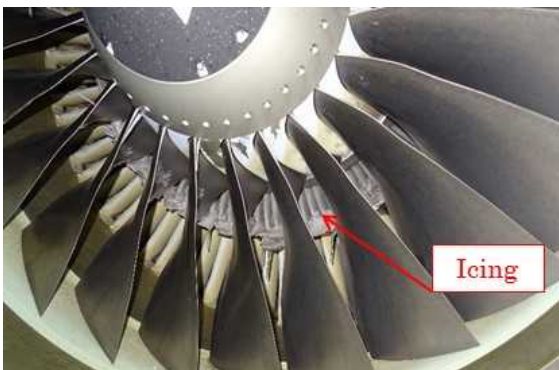
13:19 on February 23, 2016

15:10 on February 23, 2016

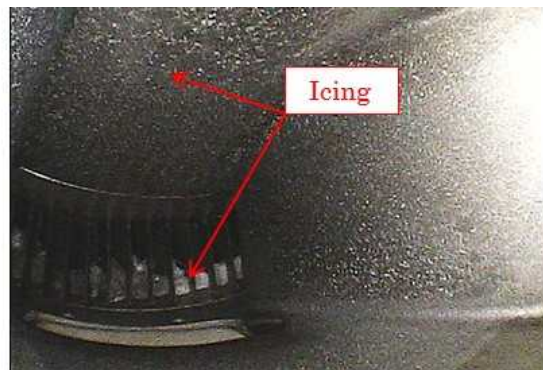
Photo 1 The Accident Aircraft



Photo 2 Conditions of the Aircraft Components



Fan blades of No.2 Engine



Rear Stage of LPC of No.2 Engine



Inside of tailpipe of No.2 Engine



PRSOV(at side of No.2 Engine)

Photo 3 Notifying methods relating to the emergency evacuation by the Company

安全のしおり Safety Instructions **737-800**

禁止事項 Prohibited Matter

離着陸時 Take-off and Landing

緊急時 In Emergencies

脱出時の注意 For Evacuation

安全のしおり Safety Instructions **737-800**

非常口および緊急脱出 Emergency Exits and Evacuation

緊急着陸時 (Ground)

緊急着水時 (Ditching)

皆様の安全のために For Your Safety

非常口座席のお客さまへ

非常口に座している列の座席に着席いただくお客さまには、万一の場合、緊急脱出時の援助をお願いいたします。そのため、以下のすべての項目を満たすお客さまに限りご着席いただくこととなります。

1. 満15歳以上の方(15歳未満の方はご着席いただけません)
2. ご搭乗に際して付き添いの方や係員のお手伝いが必要としない方
3. 航空機ドアの開閉など、緊急脱出の援助を実施することができる方
4. 脱出手順の案内および乗務員の指示を理解し、ほかのお客さまへ口頭で伝えられる方
5. 緊急脱出時に同乗者の援助をする必要がない方
6. 緊急脱出時の援助を実施することに同意する方

援助の内容は、援助が必要となった時、以下のような項目のなかから、乗務員が具体的に指示させていただきます。

- 乗務員が非常口を完全に開放するまでの間、ほかのお客さまを制止すること
- 乗務員の指示に従い、機外が安全であることを確認して非常口を操作し解放すること
- 脱出スライドが膨らんだ後、ほかのお客さまを速やかに脱出させること
- 脱出スライドまたは脱出口下において、後から脱出するほかのお客さまを援助すること
- 速やかに機体から離れて速くへ避難するよう声をかけること
- そのほか(必要に応じ、乗務員が具体的に指示させていただきます)

ご搭乗後、早い機会に備え付けの「安全のしおり」をよくお読みください。上記の援助を実施できない、または援助を実施することに同意しないお客さまは非常口に座している列の座席にお座りいただけませんので、係員もしくは乗務員にお知らせください。

国土交通省航空局

JAPAN AIRLINES

※一部、脱出スライドのない機材もございます。

TS41070 (SEP.13)

① HTV / R

EXIT SEATING
IF YOU ARE ASSIGNED TO AN EXIT ROW SEAT

You will be required to assist our crew members in the case of an emergency evacuation. For this reason, please note that emergency exit row seats are limited to passengers who satisfy all the conditions below.

1. Aged 15 years or above (assignment is not permitted for minors under 15 years of age).
2. Does not require the assistance of an escort or staff.
3. Is capable of assisting in an emergency evacuation, such as opening or closing an aircraft door.
4. Can understand evacuation procedures and crew's instructions, and verbally convey such information to other passengers.
5. Does not have to assist an accompanying passenger in an emergency evacuation.
6. Consents to providing assistance in an emergency evacuation.

Our crew members will provide you the directions to perform some of the following tasks.

- Keep other passengers away from the Emergency Exit Door until the crew member securely opens it.
- Follow the crew members' instructions. Open the Emergency Exit Door after confirming the safety outside the aircraft.
- After the escape slide fully inflates, have other passengers evacuate as quickly as possible.
- Assist other passengers after evacuating from the aircraft.
- Direct other passengers to move away from the aircraft immediately.
- Others (Crew members will instruct other tasks when they are necessary).

Please read the safety instructions leaflet in your seat pocket at your earliest convenience after boarding. Those who are unable to perform or who do not wish to perform the tasks listed above are not permitted to be seated at the Emergency Exit Row Seats. Please inform the crew members to have your seat reassigned.

Thank you for the cooperation.
Civil Aviation Bureau
Ministry of Land, Infrastructure, Transport and Tourism

JAPAN AIRLINES

※ There are some aircrafts which are not equipped with emergency slides.

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Photo 4 Slide of the same type installed on the Aircraft



The slide of the same type(front view)



Grounding part



The slide of the same type (as stored in door)