AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

SHORTAGE OF FUEL QUANTITY
REQUIRING URGENT MEASURES
BOEING 767-300, JA614J
JAPAN AIRLINES CO., LTD.
AT AN ALTITUDE OF ABOUT 13,000 FT
OVER APPROXIMATELY 78 KM SOUTH-SOUTHWEST
OF NEW CHITOSE AIRPORT
AT AROUND 09:28 JST, JULY 12, 2023

February 7, 2025
Adopted by the Japan Transport Safety Board
Chairperson TAKEDA Nobuo
Member SHIMAMURA Atsushi
Member MARUI Yuichi
Member SODA Hisako
Member NAKANISHI Miwa
Member TSUDA Hiroka

1. PROCESS AND PROGRESS OF THE AIRCRAFT SERIOUS INCIDENT INVESTIGATION

1.1 Summary of the Serious Incident	On Wednesday, July 12, 2023, a Boeing 767-300, JA614J, operated by Japan Airlines Co., Ltd., took off from Tokyo International Airport as a scheduled flight 585. While flying after executing a go-around for two times at Hakodate Airport, the destination aerodrome and changing its destination to New Chitose Airport, the aircraft declared a situation of emergency due to shortage of remaining fuel and landed at New Chitose Airport.
1.2 Outline of the Serious Incident	The occurrence covered by this report falls under the category of "Shortage of fuel requiring urgent measures" as stipulated in Article166-4, item (xiii) of the Regulation for Enforcement of the Civil Aeronautics Act of Japan (Order of the Ministry of Transport No.56 of 1952) and is classified as a serious incident. On July 13, 2023, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two other investigators to investigate this serious incident. An accredited representative of the United States of America, as the State of Design and Manufacture of the aircraft involved in the serious incident, participated in the investigation.

	Comments on the draft Final Report were invited from the parties relevant to the cause of the serious incident and the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Serious Incident	According to the statements of the pilot in command (PIC), the pilot in training to regain the crew qualification (hereinafter referred to as "the Trainee"), the captain qualification holder who was monitoring the status of the Trainee (hereinafter referred to as "the captain-qualified pilot"), and the dispatcher as well as the records of the flight data recorder (DFDR), ACARS*1 , the air traffic control (ATC) communications and the radar tracking, the history of the flight is summarized as follows:  Figure 1: Boeing 767-300 (1) Up to the Take-off On July 12, 2023, a Boeing 767-300, JA614J, operated by Japan Airlines Co., Ltd., was scheduled to fly as a scheduled flight 585 with 258 persons on board in total, consisting of the PIC, eight other crewmembers, and 249 passengers. The three flight crewmembers including the PIC, the Trainee and the captain-qualified pilot (hereinafter referred to as "the Flight Crew") commenced a pre-flight briefing from 06:10 (JST: UTC + 9hrs, unless otherwise stated all times are indicated in JST on a 24-hour clock) and confirmed the weather and aeronautical information with the company's system. According to the terminal aerodrome forecast (TAF) *2 of Hakodate Airport issued at 02:09, where the destination, the Flight Crew confirmed that a visual meteorological condition *3 was forecasted at around the aircraft's estimated time of arrival at the airport (08:55) even if it was forecasted the deterioration of the prevailing visibility and low clouds from 03:00 to 08:00 temporarily. The Flight Crew judged that there would be no need to load additional fuel based on their confirmed weather and aeronautical information, the PIC entered into the system that the PIC would agree with the proposed flight plan with New Chitose Airport as the alternate airport.

*1 "ACARS" is an abbreviation for Aircraft Communications Addressing and Reporting System and is a system that provides necessary flight information from aircraft to the ground and from the ground to aircraft via the ARINC communications network as an air-ground digital datalink system.

*2 "Terminal Aerodrome Forecasts (TAF)" is an aerodrome forecast that the Japan Meteorological Agency issued four times a day for aircraft operations for 38 airports nationwide and is valid for 30 hours.

*3 "Visual meteorological conditions" refers to conditions in which the provided flight visibility for each aircraft type and airspace can be maintained and no clouds within the provided distance from the aircraft. In addition, when taking off or landing at an airport within a controlled zone (airspace near airports, etc. designated by the Minister of Land, Infrastructure, Transport and Tourism in a public notice for the safety of air traffic) or at an airport outside the controlled zone designated by the Minister of Land, Infrastructure, Transport and Tourism, it refers to meteorological conditions in which the ground visibility and cloud height are equal to or greater than the provided values.

	In addition, when setting FMS[*4] before the flight, the Flight Crew entered the minimum diversion fuel (MDF)[*5] on the flight plan, which was specified to ensure upon arriving at the destination in the Operations Manual (OM)[*6], into the item of "RESERVES". The aircraft took off from Tokyo International Airport at 08:00 bound for Hakodate Airport, with the PIC as PF[*7] in the left seat, the Trainee as PM[*7] in the right seat, and the captain-qualified pilot in the observer's seat. (2) Up to the First Go-around During cruising the Flight Crew obtained the ATIS information[*8] and confirmed that at Hakodate Airport, the landing runway was Runway 12 and the ILS Z[*9] approach was in use. The PIC instructed the Trainee to set the FMS for the landing. When the Trainee completed the settings, the PIC confirmed the setting contents personally and conducted the briefing before the landing. Moreover, it was necessary to set the decision altitude[*10] of 392 ft (decision height[*11] of 300 ft) according to the company's regulations instead of the decision altitude of 309 ft (decision height of 217 ft) as indicated in the ILS Z approach in the company's route manual[*12], since the flight was performed by a trainee seated in the right pilot's seat who was not qualified to fly the aircraft. At this time, the remaining fuel at the time of landing as calculated by FMS was 10,800 lb, as specified in the flight plan. At approximately 08:35, the aircraft commenced its descent, and at 08:45, it started radio communication with the Hakodate Radar Approach Control Facility (hereinafter referred to as "Hakodate Radar"). After flying direct to KANTA (waypoint) on the standard terminal arrival route, the aircraft was instructed to fly direct to PATRA (waypoint) and descend to an altitude of 4,000 ft and was then cleared for the approach to Runway 12 with the ILS Z approach. At 08:45:58, Hakodate Radar transmitted to the aircraft that the information symbol for the latest ATIS was F (See Table 1-1), to

*4 "FMS" stands for Flight Management System, which assists flight crew members with navigation, performance, fuel monitoring and cockpit displays.

*5 "Minimum diversion fuel (MDF)" means the fuel quantity required to fly from the destination to an alternate airport (alternate fuel) plus the final reserve fuel (see 2.7(8)).

*6 "Operations Manual (OM)" is a document in which the company establishes the concrete items of flight standards related to the company's commercial air operations based on the operations regulations to ensure the safe and smooth operation of flights.

*7 "PF" and "PM" is a term for identifying a pilot from role sharing in an Aircraft controlled by two people, PF stands for Pilot Flying, mainly manipulates the aircraft and PM stands for Pilot Monitoring, mainly performs monitoring of flight condition of the aircraft, and makes cross check of operation of PF and operations other than maneuvering.

*8 "ATIS information" refers to information provided to aircraft departing from and arriving at aerodromes, information including approach procedures for the airport, runways in use, aerodrome conditions, weather information, and others. To identify the information issued, alphabets from A to Z are added as information codes.

*9 "ILS Z" is a designation that identifies each ILS approach procedure when two or more ILS approach procedures are established for the same runway. Runway 12 at Hakodate Airport has two ILS approach procedures with different routes to the final approach fix, called "ILS Y" and "ILS Z."

*10 "Decision altitude" means the altitude above mean sea level at which a go-around must be performed when visual references required for approach and landing are not sighted when conducting a precision approach or a non-precision approach with vertical path information.

*11 "Decision Height" is the height from the threshold elevation when the precision approaches, or non-precision approaches with vertical direction information is conducted.

*12 "Route Manual" is part of the company's operations rules and contains information about airports, routes, and others.

which the aircraft responded that it would confirm the information.

At 08:51, the company's operation coordinator*13 at Hakodate Airport informed the aircraft via ACARS that the preceding arrival aircraft, which landed at 08:36, had visually confirmed the visual reference necessary for landing at an altitude of 800 ft.

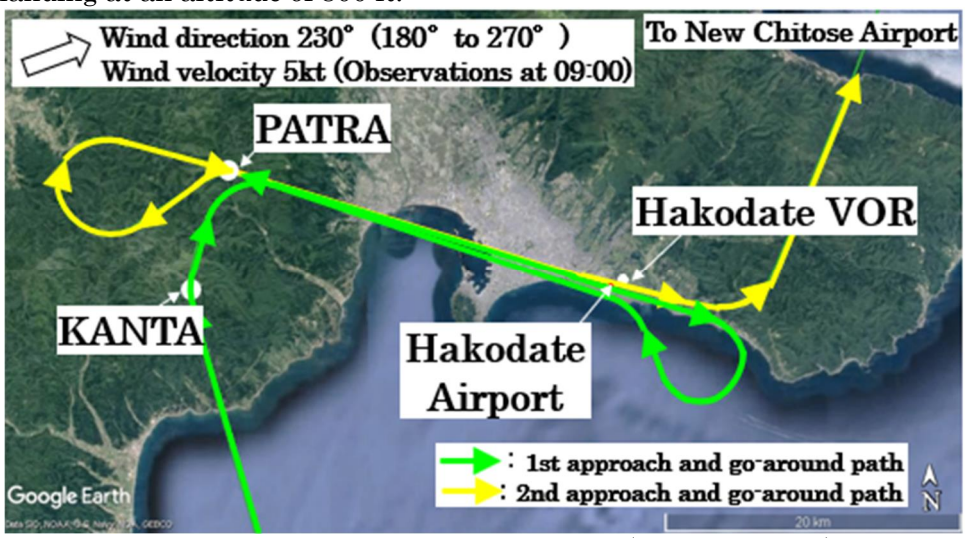

Figure 2: Estimated Flight Route (DFDR Records)

At 08:56:21, the aircraft started radio communication with the tower control position of the Hakodate Airport Traffic Control Tower (hereinafter referred to as "Hakodate Tower") as instructed by Hakodate Radar. Hakodate Tower cleared the aircraft to land on Runway 12.

The PIC executed a go-around with the autopilot because the PIC was unable to see the required visual references to approach and land when the aircraft reached the decision altitude. At 09:00:57, it was recorded on the DFDR that the aircraft's auto throttle mode had changed to go-around mode. During the go-around, the PIC sighted the approach lights when the altitude slightly decreased before the aircraft transitioned to climb.

(3) Up to the Second Go-around

At 09:01:11, the aircraft started radio communication with Hakodate Radar as instructed by Hakodate Tower.

At 09:03:22, when Hakodate Radar asked the aircraft about the plan after that, the aircraft asked for the Runway Visual Range (RVR) *14 and the observation value of the ceilometer*15. Hakodate Radar provided the aircraft with the information of the cloud amount and base for each cloud layer such that 2,000 m or more in RVR, 1,200 ft of the ceiling*16, in addition, FEW*17

*13 "Operations coordinator" is a ground personnel operation who assists Pilot-In-Command(PIC: A pilot who is responsible for the operation and safety of an aircraft during flight), flight dispatcher, and others in flight operation management tasks and is stationed at an airport designated by the company.

*14 "Runway Visual Range (RVR)" means the maximum distance at which runway surface markings, runway lights or runway centerline lights can be seen on the runway, and is the value observed by a RVR transmissometer.

*15 "Ceilometer" refers to a cloud height measurement device, which is a device to measure cloud base height by the time emitted laser beam into the sky will return after reflecting by clouds.

*16 "Ceiling" means the height above ground or water of the lowest cloud base of a cloud layer that covers 5/8 or more of the entire sky and is less than 6,000 m (20,000 ft) above ground or water.

*17 "FEW", "SCT" and "BKN" are codes used in weather reports to report the apparent proportion (cloud amount) of the entire sky covered by a cloud layer. "FEW" indicates a cloud cover of 1/8 to 2/8, "SCT (Scattered)" 3/8 to 4/8, and "BKN (Broken)" 5/8 to 7/8. When the cloud cover is 8/8, it is expressed as "OVC (Overcast)".

300 ft, SCT[*17] 600 ft, and BKN[*17] 1,200 ft.

At 09:04:33, Hakodate Radar informed the aircraft that the holding was available, not over Hakodate VOR[*18] published in the approach procedure after the go-around, but over PATRA, and the aircraft requested to hold over the position. Hakodate Radar cleared the aircraft to fly direct to PATRA and instructed the aircraft to hold over there at 4,000 ft, and the aircraft read it back.

The PIC instructed the Trainee to enter the settings in the FMS to fly direct to PATRA and hold over there and to obtain the latest ATIS information. In addition, the PIC asked the captain-qualified pilot to obtain the ATIS information for New Chitose Airport and collect information from the company's operation coordinator at Hakodate Airport via the company radio.

The captain-qualified pilot called the operation coordinator at Hakodate Airport via the company radio, but it was the dispatcher, who was monitoring the flight status of the aircraft in the integrated operation control for centralized management of all flights, responded to it (hereinafter referred to as "Dispatcher A). Dispatcher A informed the aircraft, saying "The ceiling has been low in about 30 minutes and is fluctuating between 100 and 400 ft."

The Flight Crew discussed the matter between the three of them and decided to make a second approach to the airport for the following reasons: weather conditions met the requirements for commencing an approach; the PIC sighted the approach lights during the first go-around; the second approach would be expected without delay as there was little traffic at that time at Hakodate Airport; the remaining fuel calculated by FMS was over 8,400 lb that was the Minimum Diversion Fuel (MDF) in the flight plan when entering the settings for landing Runway 12 via ILS Z approach. In addition, the Flight Crew also considered applying a lower decision altitude by switching between the Trainee and the captain-qualified pilot. However, considering that changing seats in this situation was not allowed by the company's OM, and the fuel consumption to make the aircraft's situation available to change seats would reduce the possibility of landing at Hakodate Airport, they decided to make the approach without changing seats.

Because the Flight Crew recognized that the remaining fuel was approaching the MDF, and that it could result in the MINIMUM FUEL (See 2.7 (7)) situation when changing the destination to New Chitose Airport if a go-around would be also required on the second approach, they planned to make an approach after reaching PATRA without holding over the position.

At 09:10:58, Hakodate Radar informed the aircraft of the weather information observed at 09:08 (See Table 1-2). At 09:11:58, the aircraft informed Hakodate Radar that it was ready for approach and requested an approach clearance after passing PATRA. Hakodate Radar instructed the

*18 VOR stands for VHF omni-directional radio range.

aircraft to maintain at an altitude of 4,000 ft until PATRA and cleared it to make the ILS Z approach to Runway 12. The aircraft read back the approach clearance and advised that it would immediately change its destination to New Chitose Airport if it was required to execute another go-around. Hakodate Radar advised the aircraft to follow the go-around procedure published in the approach procedure at the time of executing the go-around and informed that Hakodate Radar planned to provide radar-guidance to New Chitose Airport, and the aircraft acknowledged it. The PIC remembered that the remaining fuel after landing, which was calculated by FMS, while the aircraft was flying southwest after passing PATRA, was just under 9,000 lb.

At 09:15:32, the aircraft started radio communication with Hakodate Tower, and obtained the information on RVR (over 2,000 m) and clouds (Cloud amount: BKN and Cloud base: 400 ft) at 09:15:49.

At 09:17:16, Hakodate Tower cleared the aircraft to land on Runway 12, and provided it with the information on RVR (over 2,000 m) and prevailing visibility (2,300 m) as well as clouds (Cloud amount: BKN and Cloud base: 300 ft) at 09:17:26.

The aircraft reached the decision altitude, but the PIC was unable to sight the visual references required for approach and landing, therefore executed go-around maneuver again. At 09:19:35, it was recorded on the DFDR that the aircraft's auto-throttle mode changed into the go-around mode.

(4) Up to New Chitose Airport

At 09:20:44, the aircraft started radio communication with Hakodate Radar as instructed by Hakodate Tower. Hakodate Radar instructed the aircraft to maintain a heading of 110° and an altitude of 5,000 ft, starting the radar-guidance to New Chitose Airport. After that, Hakodate Radar delivered the aircraft the ATC clearance to New Chitose Airport and instructed it to maintain an altitude of 11,000 ft.

At 09:22:50, the aircraft started radio communication with Chitose Terminal Control Facility (hereinafter referred to as "Chitose Radar") as instructed by Hakodate Radar, and was instructed to climb to an altitude of 13,000 ft. In addition, Chitose Radar advised that the landing runway at New Chitose Airport was 19L and Chitose Radar planned to provide radar-guidance to PUNCH (Waypoint) (See Figure 3), the intermediate approach fix for the ILS Z approach procedure.

The PIC instructed the Trainee to set the FMS for landing on Runway 19L with the ILS Z approach via PUNCH. When the Trainee completed the settings for the approach, it was found that the remaining fuel at the time of landing calculated by FMS could be below the final reserve fuel of 4,200 lb.

At 09:27:54, the aircraft declared a situation of fuel emergency to Chitose Radar by transmitting "MAYDAY FUEL", and informed that there was fuel left to fly for 35 minutes.

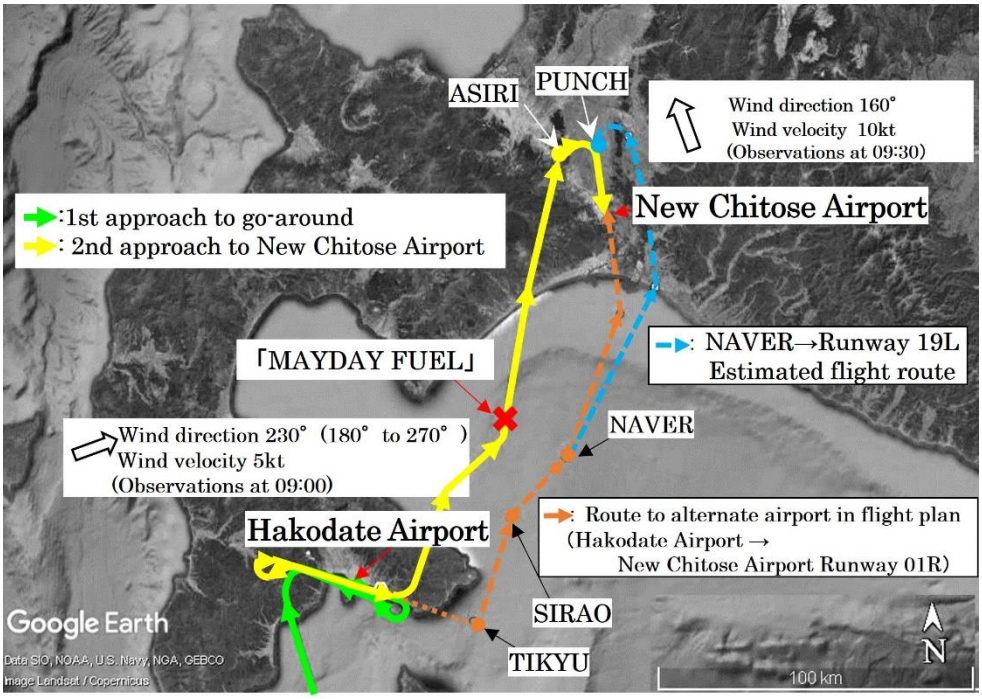

Figure 3: Estimated Flight Route
(Hakodate Airport→New Chitose Airport)

At 09:28:38, Chitose Radar informed the aircraft that Chitose Radar was going to provide radar-guidance to ASIRI (Waypoint) (See Figure 3) , the initial approach fix for the ILS Z approach procedure for Runway 19L from the west side of New Chitose Airport.

At 09:31:03, Chitose Radar transmitted to the aircraft that Chitose Radar was going to provide the aircraft with radar-guidance to the final approach course for the ILS Z approach procedure to Runway 19R, and

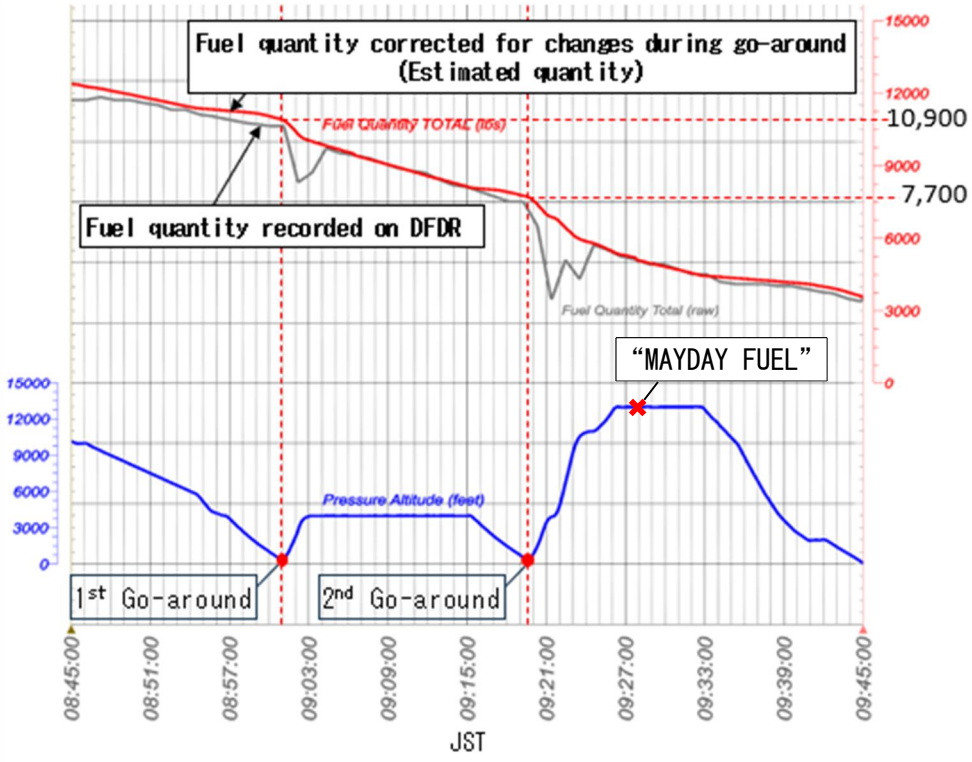

Figure 4: Changes in the Quantity of Fuel Recorded on the DFDR

	confirmed with the aircraft if Runway 19R was acceptable for its landing at 09:31:34. The PIC, who was temporarily in charge of ATC communications, asked Chitose Radar if it would be possible to land on Runway 01, and Chitose Radar responded "STANDBY (Hold transmission of your message until we call you)." At this time, the aircraft was flying at 13,000 ft about 25 nm (approximately 46 km) south of New Chitose Airport, thus when making an ILS approach to Runway 01R, there was a possibility that the approach could be unstable due to the relationship between altitude and distance, therefore, there was a discussion among the Flight Crew that Runway 19R was better for landing. At 09:32:05, when Chitose Radar confirmed the aircraft whether it requested to land on Runway 01, the aircraft requested landing on Runway 19R, and Chitose Radar responded that it understood. At 09:39:41, Chitose Radar instructed the aircraft to descend to an altitude of 2,000 ft and change to heading 090°. After that, at 09:39:53, EICAS*19 message "LOW FUEL"*20 was displayed before Chitose Radar cleared the aircraft to make an ILS Z approach to Runway 19R. The Flight Crew deleted the EICAS message without performing the check list because its display was self-evident from the situation at that time upon checking that there was no fuel leakage. At 09:40:58, the aircraft started radio communication with the tower control position of the Chitose Airport Traffic Control Tower and landed on Runway 19R at 09:45. When the aircraft arrived at the apron and the PIC checked the fuel quantity indicator, it indicated 3,000 lb. The serious incident occurred at about 09:28 on July 12, 2023, at an altitude of about 13,000 ft over approximately 42 nm (approximately 78 km) south-southwest of New Chitose Airport (42° 09' 31" N, 141° 15' 40" E).
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	None
2.4 Personnel Information	(1) PIC: Age 52 Airline Transport Pilot Certificate (Airplane) July 23, 2008 Type rating for Boeing 767 April 12, 2006 Class 1 Aviation Medical Certificate Validity October 1, 2023 Total flight time 13,331 hours 13 minutes Flight time in the last 30 days 16 hours 04 minutes Total flight time on the type of aircraft 9,729 hours 10 minutes

*19 "EICAS" stands for Engine Indicating and Crew Alerting System and means a system with integrated functions that display the operating conditions of the engines and various systems and notify pilots of abnormalities in message format when abnormal conditions occur.

*20 "LOW FUEL" is an EICAS message displayed when the usable fuel quantity in the left or right fuel tank becomes less than approximately 2,200-2,400 lbs.

	Flight time in the last 30 days 16 hours 04 minutes (2) Trainee: Age 52 Airline Transport Pilot Certificate (Airplane) July 7, 2008 Type rating for Boeing 767 April 12, 2006 Class 1 Aviation Medical Certificate Validity December 7, 2023 Total flight time 11,800 hours 08 minutes Flight time in the last 30 days 0 hours 00 minute Total flight time on the type of aircraft 8,701 hours 18 minutes Flight time in the last 30 days 0 hours 00 minute (3) Captain-qualified pilot: Age 57 Airline Transport Pilot Certificate (Airplane) July 7, 2003 Type rating for Boeing 767 February 6, 2002 Class 1 Aviation Medical Certificate Validity June 29, 2024 Total flight time 14,391 hours 31 minutes Flight time in the last 30 days 53 hours 04 minutes Total flight time on the type of aircraft 9,876 hours 07 minutes Flight time in the last 30 days 53 hours 04 minutes
2.5 Aircraft Information	(1) Aircraft type: Boeing 767-300 Serial number: 33851 Date of manufacture: December 8, 2005 Certificate of airworthiness: 2009-132 Validity : During a Period in which the aircraft identified above is maintained in accordance with JAL Engineering Co., Ltd.'s continuing airworthiness maintenance program approved under Article 113-2 of the Civil Aeronautics Act. Total flight time 50,254 hours 11 minutes (2) Quantity of Fuel Onboard The fuel of 22,600lb, which could meet the requirement specified in the Civil Aeronautics Act and the company's operations manual (OM), were onboard. (3) Weight and Balance When the serious incident occurred, the weight and the position of the center of gravity of the aircraft were within the allowable range. (4) The aircraft was equipped with the DFDR with 25 hours or more recording capability and the cockpit voice recorder (CVR) with two hours or more recording capability as required by Article 149 of the Regulation for Enforcement of the Civil Aeronautics Act of Japan. As the aircraft continued to operate without these recorders being removed before this occurrence was classified as a serious incident, although the records at the time of this serious incident were preserved on the DFDR, the CVR records were overwritten and erased.

2.6 Meteorological Information

(1) Surface Analysis Chart

According to the preliminary weather chart at 09:00 on July 12 (See Figure 5), as a stationary front was extending from the Tohoku Region to the Japan Sea, a low pressure with central pressure of 998 hPa was slowly moving eastwards over the west of Hokkaido.

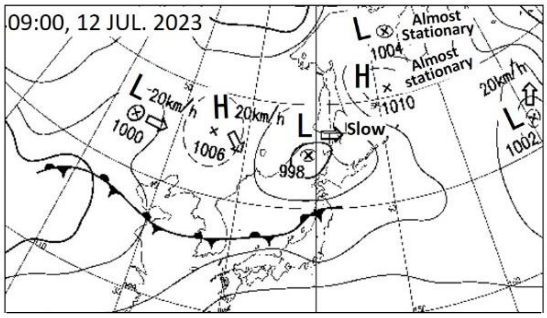

Figure 5: Preliminary Weather Chart at 09:00, July 12 (Excerpt)

(2) Weather commentary information

The weather commentary information for Hakodate Airport issued at 05:00 on July 12 stated that "fog, mist and low clouds may occur in some area due to humid air currents and drop in temperature." in the general weather outlook for the Hokkaido Region. In addition, the time series forecast for Hakodate Airport is as shown in Figure 6, and between 9:00 and 15:00 (red-colored-framed part), the prevailing visibility was forecasted to be 10 km or more and the ceiling to be 1,500 ft.

Sequential Forecast: 06:00-24:00, 12 JUL. 2023

UTC			~00	~03	~06	~09	~12	~15
Wind	Direction(°)		220	220	220	250	240	240
	Speed(kt)		11	6	6	3	6	4
	RWY12	Cross(kt)	10	5	5	1	4	2
		Tail(kt)	4	2	2	2	4	2
Visibility(m)			3000	9999	9999	4000	4000	9999
Ceiling(ft)			600	1500	1500	600	600	600
Weather						RAIN	RAIN	RAIN
Temperature(℃)			22	22	22	22	22	21

WindSpeed(kt)	Cross(kt)	Tail(kt)	Visibility(m)	Ceiling(ft)	Weather
34~	25~	10~	~900	~100	TS
25~33	20~24	-9~9	1000~3100	200~900	RAIN
			3200~4900		RASN/SNRA
~24	~19	~-10	5000~	1000~	SNOW

Figure 6: Sequential Forecast from 06:00 to 24:00 on July 12

(3) The TAF for Hakodate Airport that the Flight Crew confirmed before the departure were as follows. Note that the wind direction is the true bearing.

a. TAF

Announced at 02:09 on July 12, Validity: from 03:00 on July 12 to 09:00 on July 13

Wind direction: 220°, Wind velocity: 11 kt,
Prevailing visibility: 10 km or more
Cloud: Amount FEW, Cloud base height 600 ft,
Amount BKN, Cloud base height 1,500 ft
TEMPO[*21], between 03:00 and 08:00
Prevailing visibility: 3,000 m, Weather forecast: Mist
Cloud: Amount FEW, Cloud base height 300 ft,
Amount BKN, Cloud base height 600 ft
TEMPO, between 15:00 and 21:00

*21 "TEMPO" is a change indicator used when temporary fluctuation in weather conditions occurs within the forecast period, each of which does not last at or more than one hour, and the total duration of the forecast conditions after fluctuating is less than 1/2 of the forecast period.

Prevailing visibility: 4,000 m,
Weather forecast: Light showers of rain. Mist
Cloud: Amount FEW, Cloud base height 400 ft,
Amount BKN, Cloud base height 600 ft,
Amount FEW, Cloud base height 2,500 ft,
Cloud type: Cumulonimbus
TEMPO, between 21:00 on July 12 and 03:00 on July 13
Cloud: Amount FEW, Cloud base height 400 ft,
Amount BKN, Cloud base height 600 ft

In addition, the TAF at around the estimated time of arrival of the aircraft at New Chitose Airport, the alternate airport on the flight plan, forecasted south-easterly winds and visual meteorological conditions.

(4) The weather information provided by the ATIS at Hakodate Airport when the Aircraft made two recovery runs at Hakodate Airport was as shown in Table 1. The ATIS information at Hakodate Airport is updated every hour. However, it will be updated whenever there is a significant change in meteorological phenomena and others and the observation results meet the criteria for conducting special observations. Note that the wind direction is the magnetic bearing.

Table 1-1 ATIS Information at Hakodate Airport (C to G)

Information code (Observation time)			C (08:00)	D (08:04)	E (08:09)	F (08:42)	G (08:47)
Wind direction (°)			250	250	250	Variable	250
Wind velocity (kt)			05	04	04	02	03
Wind direction fluctuation(°)					220 to 280		200 to 300
Prevailing visibility *22 (km or m)			6	4,900	3,100	3,200	5,000
Current weather			Light shower of rain	Light shower of rain, Mist	Light shower of rain, Mist	Light shower of rain, Mist	Light shower of rain, Mist
Clouds	1st Layer	Amount	FEW	FEW	FEW	FEW	FEW
		Base	300	300	300	300	300
		Type	Stratus	Stratus	Stratus	Stratus	Stratus

*22 "Prevailing visibility" is expressed in "km" when it exceeds 5 km and in "m" when it is at or below 5,000 m.

	2nd Layer	Amount	SCT	SCT	SCT	SCT	SCT
		Base	2,500	2,500	2,000	600	500
		Type	Cumulus	Cumulus	Cumulus	Stratus	Stratus
	3rd Layer	Amount	BKN	BKN	BKN	BKN	BKN
		Base	9,000	9,000	9,000	1,500	1,500
		Type	Altocumulus	Altocumulus	Altocumulus	Stratus	Stratus
Temperature (°C)			21	21	21	21	21
Dew point (°C)			21	21	21	21	21
Altimeter setting (QNH) (inHg)			29.61	29.61	29.61	29.61	29.61

Table 1-2 ATIS Information at Hakodate Airport (H to L)

Information code (Observation time)			H (09:00)	I (09:04)	J (09:08)	K (09:15)	L (09:24)
Wind direction (°)			230	220	220	220	230
Wind velocity (kt)			04	04	04	04	04
Wind direction fluctuation(°)			180 to 270	180 to 250	180 to 260		
Prevailing visibility (km or m)			6	4,900	3,100	2,300	1,400 R12/ P2000N*23
Current weather			Light shower of rain	Light shower of rain, Mist	Light shower of rain, Scattered fog, Mist	Light shower of rain, Scattered fog. Mist	Light shower of rain, Scattered fog. Mist
Clouds	1st Layer	Amount	FEW	FEW	FEW	FEW	FEW
		Base	300	300	100	100	100
		Type	Stratus	Stratus	Stratus	Stratus	Stratus
	2nd Layer	Amount	SCT	SCT	BKN	BKN	BKN
		Base	600	600	400	300	300

*23 "R12/P2000N" is an abbreviation indicating RVR and indicates that the RVR value of runway 12 is at or above 2000 m and has no changing tendency.

		Type	Stratus	Stratus	Stratus	Stratus	Stratus
	3rd Layer	Amount	BKN	BKN	BKN	BKN	BKN
		Base	1,200	1,200	1,000	800	800
		Type	Stratus	Stratus	Stratus	Stratus	Stratus
Temperature (°C)			21	21	22	22	21
Dew point (°C)			21	21	21	21	21
Altimeter setting (QNH) (inHg)			29.61	29.61	29.61	29.60	29.60

2.7 Additional Information

(1) Meteorological Information

Chapter 3 Operational Control and Standards of the company's OM states as follows:

3.3 METEOROLOGY

3.3.1 Meteorological Information to Be Used

Meteorological information means weather reports, analysis, forecasts and any other statements relating to existing or expected weather conditions. Meteorological information to be used in judging weather conditions shall meet the following requirements.

1. Meteorological information to be used in Japan shall be those prepared by the Japan Meteorological Agency, or the organizations authorized thereby.

(Omitted)

2. Meteorological information shall be those prepared as late as practicable.

3.3.2 The Use of Meteorological Information

ICAO standards with respect to meteorological information are provided on the basis that the obligation of a Contracting State is for the supply and that the responsibility for the use of such information rest with the user. Keeping the above policy in mind, PIC and the Dispatcher should draw a conclusion on interpretation of weather conditions after checking the hole of latest meteorological information available.

(2) Approach

Chapter 6 Weather Minima*24, 6.3.3 Approach and Landing of the company's OM states as follows: (Excerpt)

6.3.3.1 Initiation of the approach

In case of approaches under instrument approach

*24 "Weather Minima" means the lower limit of meteorological conditions at an airport and others when passing a specific point at an altitude higher than the approach ceiling altitude when landing under instrument flight procedures, in which the meteorological conditions at that airport and others, are such that an approach for landing at that airport and others can be continued.

procedures, the final approach[*25] *may be initiated if and when the reported meteorological information satisfies the following requirements:*

6.3.3.1.2 When touchdown RVR[*26]*value is not reported*

The value of reported ground visibility (VIS) or CMV [*27] *shall not be less than that of the Landing Minima*[*28]*and 800 m.*

(Note: When the ground visibility is reported as a pair of minimum and maximum values, PIC shall judge that the weather condition is better than Landing Minima or not taking into consideration the values, the directions of visibility and the approach type etc.

(Omitted)

6.3.3.2 Continuation of the approach

6.3.3.2.1

After initiating the final approach satisfying the above-described requirements in 6.3.3.1 Initiation of the approach, the approach may be continued until reaching the DA or MDA irrespective of the weather observation report values afterward.

In addition, at the time of the occurrence of the serious incident, the Trainee was seated in the right pilot seat, therefore RVR 1,200 m or VIS 1,200m was the lower limit for initiating the approach according to the company's regulations.

(3) Operating Category of the Company

The company established the flight categories to share awareness among flight crewmembers, dispatchers, and personnel in charge of airports regarding the views of flight operations related to weather conditions and others, the following descriptions are included in the company's SUPPLEMENTARY DOCUMENTS[*29], Chapter 3 Operational Control, 3.2 Flight Planning.

3.2.2.6.2 Operating Category

Operating category	*Situation*
G (GOOD)	*Conditions that do not require special*

*25 "Final Approach", according to the company's OM, refers to the portion of the instrument approach from the point that the glideslope intersects with the altitude shown on the chart for each approach procedure in the route manual to the decision altitude. In the case of the ILS approach procedure for runway 12 at Hakodate Airport, the starting point of the final approach is the point where the glideslope intersects with the altitude of 3,000 ft shown on the chart.

*26 "Touchdown RVR" refers to the RVR near the touchdown zone.

*27 "CMV" is an abbreviation for Converted Meteorological Visibility and is a converted ground visibility value obtained by multiplying the observed ground visibility (prevailing visibility) value by a certain multiplier depending on the operational status of aeronautical lights and whether it is day or night.

*28 "Landing Minima" refers to the minimum operational conditions consist of the approach limit altitude, applicable minimum weather conditions and visual references required at the approach limit prescribed for an aircraft intending to land with the instrument approach procedure. The approach limit altitude and minimum weather conditions are separately published for each instrument approach procedure.

*29 "SUPPLEMENTARY DOCUMENTS" means the manual established by the company containing supplementary information necessary for the provision of the company's flight operations related services.

	consideration, such as weather, ATC[*30] *or NOTAM*[*31].
N (NORMAL)	*Cases where there is a possibility of holding due to transient bad weather, etc., but it is judged that landing to the destination can be made by loading sufficient extra fuel*[*32].
A (ALERT)	*When it is determined that it is necessary to consider diversion due to bad weather, etc.*

(4) Preparation and Finalization of Flight Plan

On July 11, based on the TAF forecast for the period from 15:00 on July 11 to 21:00 on July 12 and other weather information, the person in charge of the weather entered the operating category "G" into the company's system for flights on the following day, July 12.

The night shift dispatcher confirmed the TAF forecast for the period from 21:00 on July 11 to 03:00 on July 13 and other weather information as well as the number of passengers and the data on onboard cargo and started to prepare a flight plan for flights on the following day, July 12. Based on the TAF information at the aircraft's estimated time of arrival at Hakodate Airport and the PIC's qualification requirements, the dispatcher considered that it would be possible to land using an ILS approach and maintained the aircraft's operating category as "G". On the other hand, based on the weather information including TAF and others, the dispatcher selected New Chitose Airport as the alternate airport and entered it into the company's system, considering that the weather conditions at Aomori Airport, which had been assumed as the alternate airport, might be lower than the weather minima to be applied to an alternate at around the aircraft's estimated time of arrival at Aomori Airport.

Subsequently, based on the TAF and other weather information forecast for the period from 03:00 on the 12th to 09:00 on the 13th, the dispatcher who was in charge of the shift reviewed and revised the flight operation category for that day, and decided to keep the aircraft's flight category at "G".

As the Flight Crew had checked the weather information, including the TAF, and decided that there would be no problem with the flight plan presented, the flight plan was finalized by entering into the system the PIC consented to the flight plan.

(5) Onboard Fuel of the Aircraft

According to the flight plan at the time of the occurrence of the serious incident, the onboard fuel quantity of the aircraft was 22,600 lb. In addition,

*30 "ATC" is an abbreviation of Air Traffic Control.

*31 "NOTAM" is a type of aviation information containing temporary information or information required to be transmitted quickly.

*32 "EXTRA FUEL", according to the company's OM, refers to fuel that is loaded when the PIC and the dispatcher determine that adding fuel can be expected to improve operational efficiencies, such as when deemed necessary depending on weather forecasts for the destination or alternate aerodromes.

the remaining fuel quantity when landing at Hakodate Airport was planned at 10,800 lb including the fuel required to fly to New Chitose Airport as the alternate airport (Alternate Fuel: 4,200 lb) and to hold in the air for 30 minutes at 1,500 ft over New Chitose Airport (Final Reserve Fuel: 4,200 lb).

(6) The Route and Fuel to the Alternate Airport in the Company's Flight Plan

The company specifies the runway to be used at an alternate airport in advance when making a flight plan, it is unable to modify when making a flight plan.

At the time of the serious incident, the alternate fuel was calculated assuming to land on Runway 01R at New Chitose Airport via the route consisting of TIKYU(Waypoint), Y13(RNAV Route), SIRAO(Waypoint), Y139(RNAV Route), and NAVER(Waypoint) (Refer to Figure 3) in the flight plan of the aircraft.

Besides, the company's route manual lists the route and distance to alternate airports and runways for each airport for reference, and the manual 2.1 COURSE & DISTANCE TO ALTERNATE AIRPORTS (FOR REFERENCE), revised on June 15, 2023, and effective at the time of this serious incident, states the following (Excerpt):

From HAKODATE(HKD/RJCH[*33]*.)*

To	*RWY*[*34]	*Routing*	*DIST*[*35]
CTS/RJCC[*33]	*01R*	*TIKYU Y13 SIRAO Y139 NAVER*	*102*

(7) Fuel Management

3.2.4.4 Use of Fuel of the company's OM states as follows:

Regardless of the fuel classification in the flight plan (including changed flight plan), the PIC shall exercise proper discretion in management of the fuel on board in favor of a safe and efficient operation. At least Minimum Diversion Fuel (Final Reserve Fuel in case of not select alternate airport.) must be secured at the destination.

Chapter 3 Operational Control and Standards, 3.26 FUEL MANAGEMENT of the company's OM SUPPLEMENT[*36] states as follows: (Excerpt)

3.26.1 Check fuel consumption status and respond to anticipated situations

1.From the viewpoint of early detection of Fuel Leak and proper management of remain fuel, the following fuel consumption status will be checked at appropriate intervals.

A. Fuel consumption by comparison with flight plan

*33 "HKD/RJCH" and "CTS/RJCC" indicate Hakodate Airport and New Chitose Airport, respectively, which are the three-digit airport codes designated by the International Air Transport Association (IATA) and the four-digit airport codes designated by the International Civil Aviation Organization (ICAO).

*34 "RWY" means a runway.

*35 "DST" means a distance and the unit is nautical mile (NM).

*36 "OM SUPPLEMENT" is an appendix to the OM to supplement, explain, and show concrete practices for the contents of the OM.

B. It is determined whether the flight can be continued with the guideline that the remain fuel at the destination does not fall below at least the Minimum Diversion Fuel (Final Reserve Fuel when alternate airport is not selected).

(Omitted)

However, after the Top Of Descent, regardless of the above, even if the remaining fuel at the destination is expected to be less than the MDF due to changes in circumstances, appropriate measures shall be taken depending on the situation including continuation of flight to the destination.

(Omitted)

3.26.3 MINIMUM FUEL Advisory

The PIC shall advise ATC of "MINIMUM FUEL" in the following case.

・When having committed to land at a specific aerodrome, the PIC calculates that any change to the existing clearance to that aerodrome may result in landing with less than the planned final reserve fuel.

"MINIMUM FUEL" does not indicate an emergency situation or a need for traffic priority.

3.26.4 Declaration of MAYDAY FUEL

The PIC shall declare ATC of a situation of fuel emergency to request for traffic priority in the following case. At the time the PIC should notify ATC of a fuel remaining in minutes.

・When the calculated usable fuel predicted to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

The PIC shall declare a situation of fuel emergency by broadcasting "MAYDAY MAYDAY MAYDAY FUEL" or "MAYDAY FUEL".

The Flight Crew checked the fuel consumption status and others by comparing the remaining fuel on the flight plan with the remaining fuel that the FMS calculated. In addition, the Flight Crew had entered MDF (8,400 lb) into the FMS as the planned remaining fuel to use as a guide for fuel management. If the fuel remaining at the destination calculated by the FMS falls below the planned remaining fuel entered into the FMS by flight crew members, the message of "INSUFFICIENT FUEL" will be displayed on the FMS control display unit.

Besides, the Flight Crew managed the fuel with the understanding that the aircraft loaded the Alternate Fuel by assuming a landing on Runway 19L and decided whether or not to make the second approach at Hakodate Airport by estimating the fuel remaining at the time of landing at New Chitose Airport if the destination was changed to New Chitose Airport.

Based on the aircraft's weight and weather conditions used in flight

planning, the company estimated the fuel consumption for landing from NAVER to runway 01R and runway 19L, which were 700 lb and 2,200 lb respectively.

(8) MAYDAY FUEL

The Aeronautical Information Publication (AIP) ENR 1.5-6, 1.7 FUEL EMERGENCY described as follows:

> *1.7.1 A pilot shall declare a situation of fuel emergency by broadcasting "MAYDAY MAYDAY MAYDAY FUEL" or "MAYDAY FUEL", when the remaining usable fuel supply suggests a need for traffic priority to ensure a safe landing.*
>
> *1.7.2 When a pilot declares a situation of fuel emergency, the pilot should notify ATC of a fuel remaining in minutes.*

And ICAO Annex 6 Chapter 4 describes as follows:

> *4.3.7.2.3 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel predicted to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.*

Besides ICAO Annex 6 defines final reserve fuel as the fuel quantity calculated based on the weight upon arrival at an alternate airport or the destination airport if an alternate airport is not required, and the fuel quantity required to fly at holding speed for 30 minutes at an altitude of 450 m (1,500 ft) above the airport elevation under the international standard atmosphere in the case of aircraft equipped with turbine engines.

(9) Preservation of CVR Records

Chapter 9 MISCELLANEOUS, 9.10.1 Preservation of Flight Data in the Event of an Accident or Serious Incident etc. of the company's OM states as follows: (Excerpt)

> *1. When an accident, serious incident or the situation may be realized as accident or serious incident occurs, necessary steps should be taken to preserve the cockpit voice recorder (CVR) and the digital flight data recorder (DFDR) information for the purpose of later analysis to verify the cause(s) of the accident or the serious incident etc. and to prevent the recurrence.*

In addition, in the company's OM Supplement, Chapter 5 CREW, 5.7 MISCELLANEOUS, there is the description "*When declaring MAYDAY FUEL, it falls under situations (Serious Incident) specified in Article 76-2 of the Civil Aeronautics Act and Article 166-4 of the Regulation for Enforcement of the Civil Aeronautics Act*".

Upon arrival at New Chitose Airport, the Flight Crew asked the company if they could continue the flight. As the company had not concluded that this event would fall under the serious incident at the time of receiving the report from the Flight Crew, the company replied that they could continue the flight. The integrated operations control determined that the aircraft could continue to be used based on the above company's conclusion.

	As a result, the aircraft continued to operate without removing the CVR. (10) CVR Recording Time Under Article 149 of the Regulation for Enforcement of the Civil Aeronautics Act of Japan, the aircraft was equipped with and operated a CVR that records at least two consecutive hours of audio. On the other hand, the Regulation for Enforcement stipulates those airplanes with a maximum takeoff weight exceeding 27,000 kg and whose initial airworthiness certificate was issued after January 1, 2022, when used for air transportation purposes, must be equipped with and operated by a CVR-capable of recording more than the most recent 25 hours of audio.

3. ANALYSIS

(1) About the Weather

The JTSB concludes that it is most likely that the dispatcher and the Flight Crew planned the flight while judging that the weather conditions at the estimated time of arrival of the aircraft at Hakodate Airport would not be conditions to prevent the aircraft's landing, based on the weather information, including the TAF issued by the Japan Meteorological Agency (JMA). However, it is highly probable that the weather conditions of the airport when the aircraft attempted to land were worse than the forecasted weather conditions by the JMA.

(2) The First Approach to Hakodate Airport

The JTSB concludes that the aircraft most likely had the code F ATIS information because it responded it would check when it was informed that the information had been issued from the Hakodate Radar. In addition, the Flight Crew probably judged that the landing would be possible even if the trainee sat in the right seat, who would have to apply a high decision altitude, because the information was at or above the minimum weather conditions for approach and landing and the preceding arriving aircraft had sighted visual references necessary for landing at an altitude of 800 ft, and therefore began the approach.

However, it is highly probable that when the aircraft reached the decision altitude, there were clouds with a cloud base height of 300 ft observed in the ATIS information at or later than 08:00 on the final approach path, and therefore the PIC was unable to see the visual references required for landing and the aircraft made a go-around. Besides, based on the DFDR records, it is estimated that the remaining fuel at the start of the go-around was approximately 10,900 lb.

(3) The Second Approach to Hakodate Airport

The JTSB concludes that the Flight Crew more likely judged to be able to land at Hakodate Airport and commenced the second approach because the TAF confirmed before the departure forecasted visual meteorological conditions from 08:00 onwards, and although there was information from Dispatcher A regarding fluctuation in the ceiling, the latest ATIS information indicated that the weather conditions were suitable for commencing an approach, the PIC was able to see the approach lights during the first go-around, and the remaining fuel after landing calculated by the FMS was not below the MDF. However, the actual weather conditions were worse than the Flight Crew had anticipated as clouds with a lower cloud base than during the first approach were observed in the ATIS information issued at or after 09:00, therefore, it is most likely that the PIC was unable to sight the visual references necessary for landing at the decision altitude

and performed another go-around. Besides, based on the DFDR records, it is estimated that the remaining fuel at the start of the go-around was approximately 7,700 lb.

(4) Declaration of Emergency

The JTSB concludes as follows;

The company specifies the runway beforehand to be used at the alternate airport when preparing the flight plan, and at the time of this serious incident, the aircraft was loaded with alternate fuel sufficient to land on runway 01R at New Chitose Airport, as specified beforehand. On the other hand, the Flight Crew believed that the amount of alternate fuel required for landing on runway 19L at New Chitose Airport, which requires more fuel than landing on runway 01R, was on board. It is most likely that the Flight Crew attempted two approaches to Hakodate Airport after judging that they would be able to secure final reserve fuel even if they changed the destination and landed on runway 19L at New Chitose Airport by managing the fuel using the amount of remaining fuel displayed on the fuel quantity indicator and FMS, including the amount of fuel necessary for landing on runway 01R at New Chitose Airport.

It is most likely that because the aircraft had been managed the fuel by the Flight Crew under the assumption that the aircraft was loaded with alternate fuel necessary in case of landing on a runway other than the one that was the basis for the alternate fuel calculation in the flight plan, found out that the remaining fuel at the time of landing at New Chitose Airport would be below the final reserve fuel when the FMS was set to land on runway 19L during the flight changing the destination from Hakodate Airport to New Chitose Airport, and declared an emergency.

Regarding that the aircraft attempted two approaches at Hakodate Airport and made two go-arounds, it is most likely that the weather conditions at the airport were worse than the weather information provided by the JMA and the Flight Crew's expectations based on that information.

(5) Fuel Management

The JTSB concludes that it is more likely that the Flight Crew recognized that the remaining fuel would be close to the MDF even if the aircraft could have landed at Hakodate Airport, therefore they planned to make the second approach via a shorter route and attempted to reduce fuel consumption so that the remaining fuel would not be below the final reserve fuel even at the time of landing at New Chitose Airport by informing ATC facilities of the destination change to New Chitose Airport in advance when the go-around was necessary again.

However, the alternate fuel in the flight plan was calculated assuming that the aircraft would land on Runway 01R at New Chitose Airport, and the fuel consumption required for landing at Runway 19L where the Flight Crew had assumed the landing at the time of the serious incident could possibly be 1,500 lb more than the alternate fuel in the flight plan.

The Flight Crew used the MDF in the flight plan as a guide to determine when to change the destination, but its operation requires a correct understanding of the requirements for calculating fuel when planning a flight. It is more likely important for flight crew members to confirm the runways in use at the alternate airport in the flight plan by checking the data from the first destination airport to the alternate airport described in the flight plan, or to confirm the runways at the alternate airports for each airport that the company expresses as reference in the route manual. On the other hand, the company should remind its flight crew about the method for calculating alternate fuel for flight plans and the company is also more likely to need to consider

more effective methods of providing information that will enable its flight crew to easily check the information they need to plan and operate flights.

(6) Preservation of CVR Records

The JTSB concludes that in the investigation of the serious incident, the CVR records were more likely to become important information to analyze the decision-making process of the Flight Crew and learn the lesson for preventing the recurrence of similar events afterward. However, before this occurrence was classified as a serious incident, the aircraft continued to operate, and the records of CVR at the time of the serious incident, which was recordable for 2 hours of audio, had been overwritten and erased.

The company's response regarding the preservation of CVR records at the time of this occurrence was probably different from those specified in the company's operation standards, therefore, the company is required to remind all personnel involved in the operations about the standards for preserving CVR records at the time of a similar event.

In addition, in order to prevent the loss of factual information for accident or serious incident investigations due to the overwriting of CVR records, all aircraft that are not required to be equipped with CVRs capable of recording more than 25 hours of audio under Article 149 of the Regulation for Enforcement of the Civil Aeronautics Act of Japan should also be equipped with CVRs capable of recording more than 25 hours of audio.

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of the serious incident was most likely that because the aircraft had been managed fuel by the Flight Crew under the assumption that the aircraft was loaded with alternate fuel necessary in case of landing on a runway other than the one that was the basis for the alternate fuel calculation in the flight plan, found out that the remaining fuel at the time of landing at New Chitose Airport would be below the final reserve fuel when the FMS was set to land on runway 19L during the flight changing the destination from Hakodate Airport to New Chitose Airport., and declared an emergency.

5. SAFETY ACTIONS

5.1 Safety Actions Required	As described in ANALYSIS, it is necessary for the company to remind flight crew members about how to calculate alternate fuel in the flight plans again.
5.2 Safety Actions Taken after the Serious Incident	Measures Taken by the Company (1) Revised the OM to state that "at least the final reserve fuel specified in the flight plan must be available at the time of landing" regarding fuel usage, and known to flight crew members, ground operating personnel, and others. (2) Revised the description regarding the method of alternate fuel in the route manual and known to flight crew members. a. Decided to calculate the alternate fuel assuming the runway with a longer flight distance up to landing at the alternate airport after changing the destination except for some airports. b. Clearly described that 10 nm is added to the distance from the destination to the alternate airport shown in the flight plan

	as the calculation correction value for the fuel consumption. (3) Preservation of Records Confirmed among all persons in charge that taking action afterward upon taking preservation measures including CVR and DFDR when a similar event occurs.