AIRCRAFT ACCIDENT INVESTIGATION REPORT

AIRCRAFT DAMAGE DUE TO COLLISION WITH A VEHICLE

ALL NIPPON AIRWAYS CO., LTD.

BOEING 767-300, JA603A

NARITA INTERNATIONAL AIRPORT, JAPAN

AT ABOUT 07:38 JST, JANUARY 25, 2023

August 30, 2024
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 ACCIDENT INVESTIGATION

1.1 Summary of the Accident	On Wednesday, January 25, 2023, a Boeing 767-300, JA603A, operated by All Nippon Airways Co., Ltd., landed at Runway 34L at Narita International Airport, and turned toward its Spot during taxing within the apron, however, slid on the icy surface of the Spot and collided with a ground service equipment parking in the vicinity, resulting in damage to the airframe.
1.2 Outline of the Accident Investigation	On January 25, 2023, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and three other investigators to investigate this accident. An accredited representative of the United States of America, as the State of Design and Manufacture of the aircraft involved in the accident, participated in the investigation. Comments on the draft Final Report were invited from the parties relevant to the cause of the accident. Comments on the draft Final Report were invited from the Relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of the pilot in command (PIC) and the first officer (FO), and the records of flight data recorder and the cockpit voice recorder, the history of the flight is summarized as below: A Boeing 767-300, JA603A, operated by All Nippon Airways Co., Ltd.,

departed from Hongkong International Airport as a scheduled flight 8512 of the company (a cargo flight) and landed on Runway 34L at Narita International Airport on January 25, 2023, at 07:34 Japan Standard Time (JST: UTC + 9hrs, unless otherwise stated all times are indicated in JST on a 24-hour clock). In a cockpit, the pilot in command (PIC) sat in the left seat as PF[*1] and the First Officer (FO) sat in the right seat as PM [*1]. After landing, the aircraft vacated the runway at taxiway A5 and taxied toward Spot 222 via taxiway W7, taxiway W and W5NGWY (upper right in Figure 1).

Visually confirming something like whitish ice and wet areas on the taxiway while taxiing, the PIC felt the taxiway surface was slippery, but thought that it was possible to stop safely by slowing down sufficiently and carefully turning to the Spot.

At the time of entering the Spot, thinking that turning along the Aircraft Stand Lead-in Line with a large rudder application as usual might cause the aircraft to slide, the PIC started to have the aircraft turn right short of the Aircraft Stand Lead-in Line. At this time, the ground speed of the aircraft was 7 kt. (See Figure 1, 1, Figure 2, 1)

The aircraft entered the Spot until its nose gear was on the part of the straight line of the Aircraft Stand Lead-in Line, and further turned to a heading of 046° along the Aircraft Stand Led-in Line, when its steering became ineffective. At this time, the ground speed of the aircraft was 4 kt. (Figure 1, 2, Figure 2, 2)

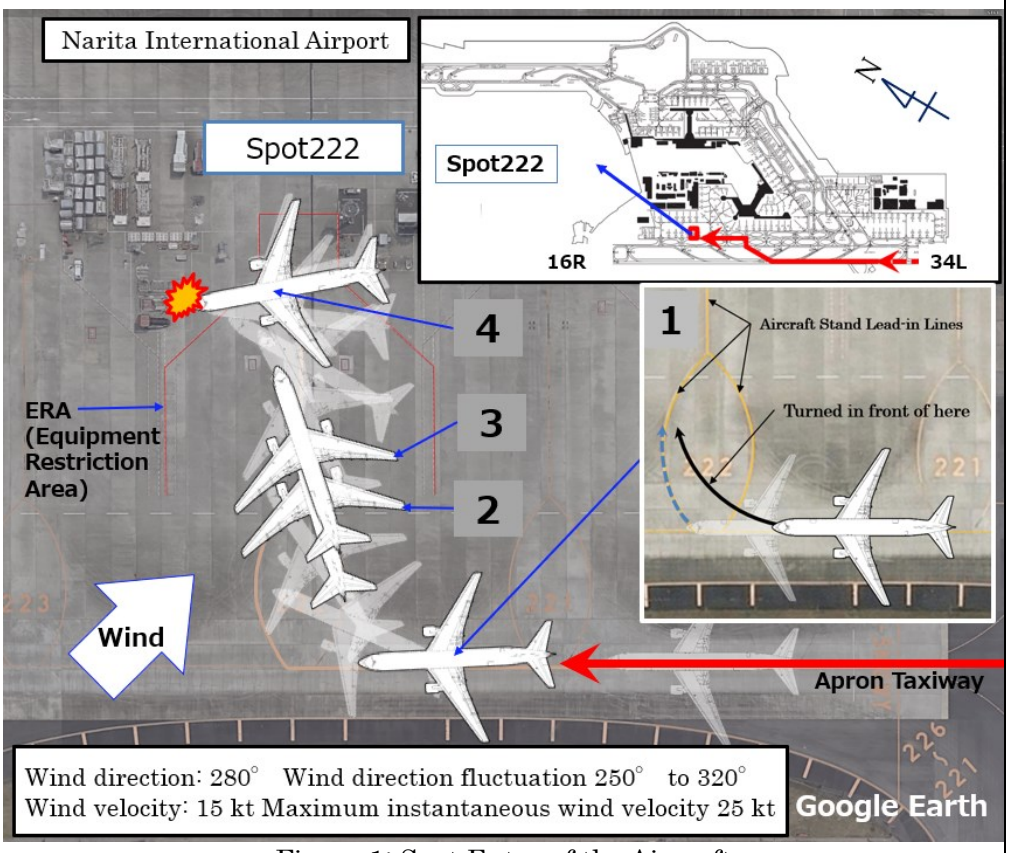


Figure 1: Spot Entry of the Aircraft

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

The PIC fully depressed the right and left brake pedals to stop the aircraft but was unable to stop it. Immediately after that, thinking the collision with the ground service equipment and others was unavoidable, in order to reduce the impact at the time of the collision, the PIC tried to reduce the aircraft speed with the reverse thrust by moving the reverse thrust lever to the reverse idle position, but the aircraft's tail veered to the right direction, and its airframe started to slide on the Spot while rotating counterclockwise, making it impossible to control the taxiing of the aircraft, although the brakes were applied. (Figure 1, 3, Figure 2, 3)

The aircraft continued to slide on the Spot while rotating counterclockwise, the lower surface of the nose had hit a ground service equipment that parked in the vicinity of the Spot when the heading direction deflected to 322°, came to a stop. (Figure 1, 4, Figure 2, 4, Figure 3)

After the aircraft came to a stop, following the hand signal to stop the engine by the ground operator seen ahead, the PIC operated the parking brake and stopped the engine.

This accident occurred at 07:38 on January 25, 2023, on the Spot at Narita International Airport (35° 46' 05" N, 140° 22' 41" E),).

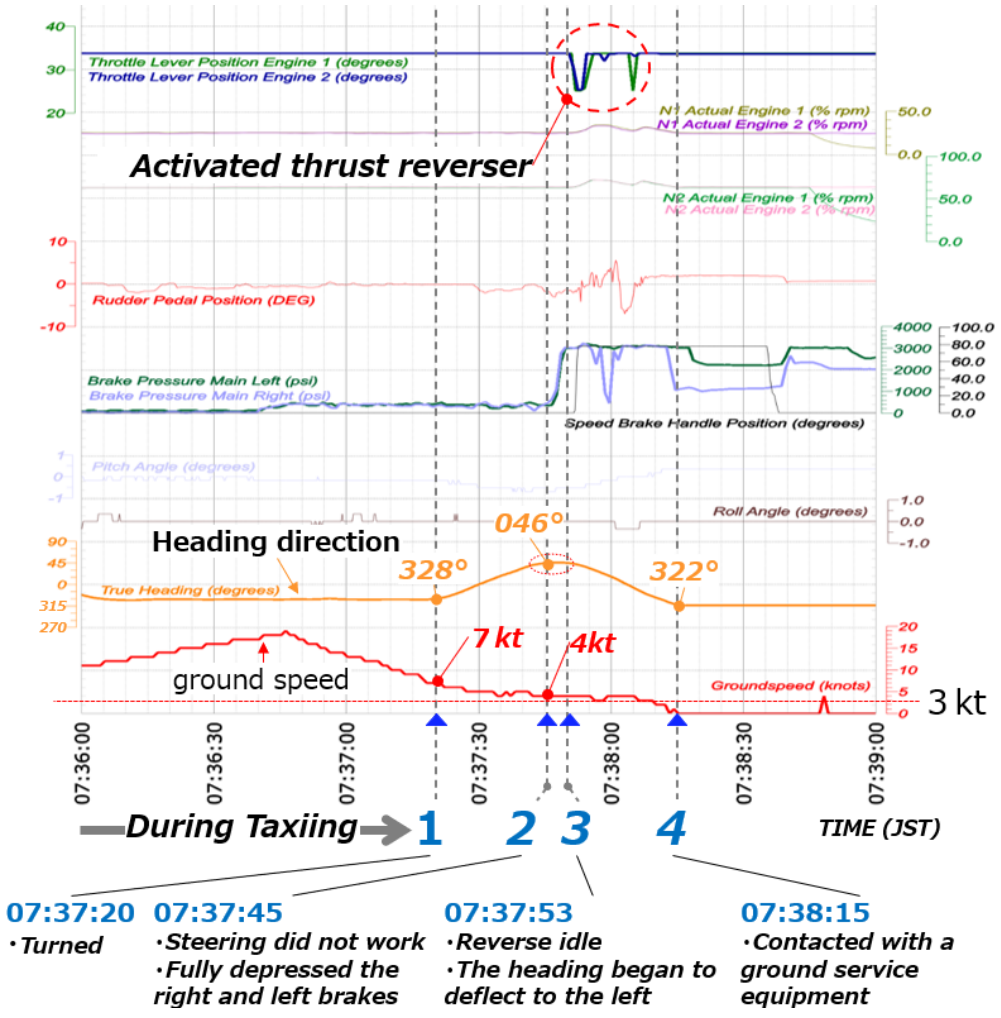


Figure 2: Records of Flight Data Recorder

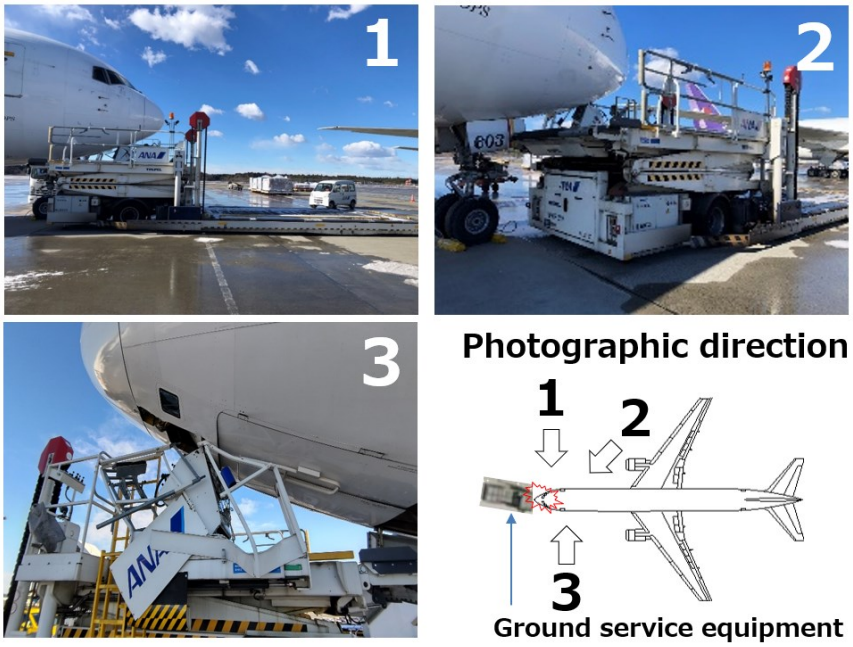
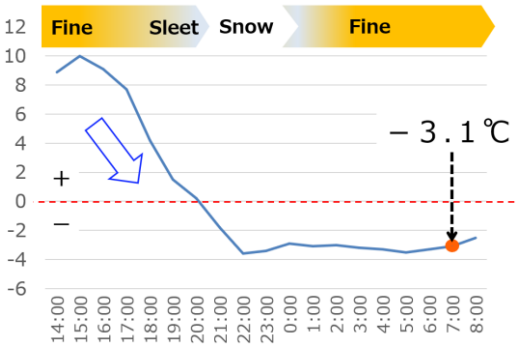
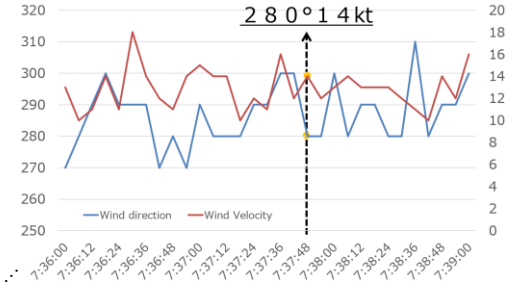


Figure 3: The Aircraft After Stopping and the Ground service equipment.

2.2 Injuries to Persons	None
2.3 Damage	(1) Extent of Damage: Substantial damage Radome, forward pressurization bulkhead, lower skin panel of fuselage, forward access door, nose landing gear door and others were damaged. (Attached Figure) (2) Damage to the Ground Service Equipment (Figure 3) The driver seat and control console were damaged and deformed, and the console handrail was deformed and broken.
2.4 Personnel Information	(1) PIC: Age 52 Airline transport pilot certificate (Airplane) April 12, 2006 Type rating for Boeing 767 April 28, 1998 Class 1 aviation medical certificate Validity May 26, 2023 Total flight time 14,188 hours 16 minutes Flight time in the last 30 days 50 hours 02 minutes Total flight time on the type of the aircraft 4,490 hours 19 minutes Flight time in the last 30 days 50 hours 02 minutes (2) FO: Age 43 Commercial pilot certificate (Airplane) January 26, 2006 Type rating for Boeing 767 May 27, 2015 Instrument flight certificate (Airplane) January 27, 2006 Class 1 aviation medical certificate Validity February 6, 2024 Total flight time 8,683 hours 58 minutes Flight time in the last 30 days 31 hours 26 minutes Total flight time on the type of the aircraft 4,089 hours 38 minutes

	Flight time in the last 30 days 31 hours 26 minutes
2.5 Aircraft Information	(1) Aircraft type: Boeing 767-300 Serial number: 32972 Date of manufacture: April 25, 2002 Certificate of airworthiness: No. 2002-011 Validity Period since May 17, 2002, the Maintenance Manual (All Nippon Airways Co., Ltd. or other carriers which use this Aircraft in their joint projects with ANA) has been effective. (2) Weight and Balance When the accident occurred, the weight and position of the center of gravity of the aircraft were within the allowable ranges.
2.6 Meteorological Information	(1) Aviation Routine Weather Report (METAR) and Landing Forecast at Narita International Airport 07:30 Wind direction: 280°, Wind velocity: 15 kt, Maximum instantaneous wind velocity 25 kt, Wind direction fluctuation 250° to 320°, Prevailing visibility: 10 km or more Clouds: Amount 1/8, Type Cumulus, Cloud base 3,000 ft Temperature: -3 °C, Dew point: -18 °C Altimeter setting (QNH): 29.91 inHg No Significant changes. (2) Weather and Temperature (Figure 4) According to the estimated weather distribution around Narita International Airport, on the day before the accident, the weather was fine until 18:00, it was sleeting at 19:00, snowing from 20:00 to 23:00, and fine after 00:00. According to the observation data (hourly) AMeDAS(Automated Metrological Data Acquisition System) at the airport, the temperature started to decrease from 15:00 on the day before the accident, after 21:00, sub-zero temperatures continued, and the temperature at 07:00 immediately before the occurrence of the accident was -3.1 °C.  Figure 4: Weather and Temperature (3) Wind Direction and Wind Velocity (Figure 5) According to the observations measured by the anemometer installed at the place closest to the Spot (approximately 398 m from the end of Runway 16R side to the runway side, approximately 142 m west side of the runway centerline,  Figure 5: Wind Direction and Wind Velocity

	and ground height about 10 m), when the aircraft tail began to slide to the right direction, the wind direction and wind velocity were 280° and 14 kt, respectively.
2.7 Additional Information	(1) Aircraft Status After this accident, the mechanics of the company confirmed the integrity of the aircraft's landing gears, steering, brakes and engines, but found no failure. (2) Taxiing (Turn) According to AOR*2 for Boeing 767-300 aircraft, created by the company, general precautions when turning on slippery surface with snow are stated as follows: *1. Introduction* *In winter season several operational difficulties, such as takeoff and landing performance deterioration due to contaminated runways and airframe icing problems, occur. As for taxiing on slippery surface, the loss of ground maneuverability likely increases the difficulty to maintain the intended track. Evaluation of ground maneuverability on slippery surface were conducted using flight simulator. Based on the evaluations some recommendations about ground maneuvering on slippery surface are presented in the followings.* *2. Recommendations About Ground Maneuvering On Slippery Surface* *1. Make turn in slow speed* *Directional controllability on the slippery surface depends on taxi speed very largely. In the simulator evaluations the intended tracking were not achieved by nose gear steering under the speed higher than about 3 kt. When taxing on slippery surface taxi speed should not be high even for straight courses (it should be about 10 kt or less) and should be reduced early enough to attain a desirable low speed before commencing turn.* *2. Apply differential braking appropriately* *Even when Directional Control by Nose Gear Steering is difficult, Differential Brake may be effective, therefore Differential Brake shall be used, as necessary.* *3. Differential thrust should not be recommenced* *The use of differential thrust to assist turn on slippery surface likely cause an over control due to the slow response of engine thrust to power lever inputs. Therefore, the use of differential thrust is not recommended. Furthermore, in the case of changing engine power it should conducted carefully and slowly not to make thrust differences among engines.* *Ground maneuverability is deteriorated not only by surface slipperiness but also by wind conditions and surface slopes, etc. In the case that these hazardous conditions are combined, careful operations are*

*2 AOR, which stands for Airplane Operations Reference, refers to flight reference materials such as the supplementary or commentary on the airplane operations manual.

required. However, when it seems that the taxiing is not possible anymore under those conditions, do not hesitate to stop the taxiing and request the ground supports.

(3) Anti-icing Measures for Aprons

According to the statements of ground operators in charge of the aircraft, at about 06:30, the surface on the Spot was in icy conditions.

Therefore, the person responsible for the ground operations for the aircraft (hereinafter referred to as the "Airside Supervisor") thought that the surface conditions might adversely affect the safe stop by the aircraft and coordinated the change of Spot allocation. However, as the surface on the Spot that could be changed to was also icy as well, thus, the Airside Supervisor decided not to change the Spot, but to scatter anti-icing agents on the Spot.

At about 06:50, being instructed by the Airside Supervisor, the ground operator sprayed a total of approximately 10 kg of anti-icing agents into the area of the right and left of about 1 meter along with the approximately 61-m-long Aircraft Stand Lead-in Line in the Spot, and within the area where the ground service equipment was working. (Figure 6)

The Airside Supervisor reported to the company's airport management personnel at the airport (hereinafter referred to as "the Duty Manager") that if the anti-icing agents spraying operation was not completed by the time when the aircraft started to enter the Spot, the aircraft may be required to stop short of the Spot. After that, the aircraft had to execute a go-around due to the crosswind limitation at landing, therefore, the time for the anti-icing agents spraying operation was able to be ensured and the operation was completed by the aircraft's arrival at the Spot.

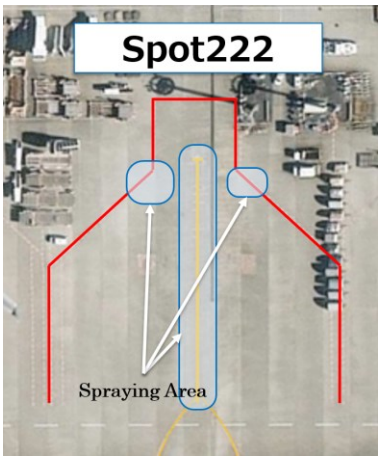


Figure 6: Spraying Area of Anti-icing Agents

Thinking that although there were some frozen areas that could affect the aircraft's taxiing control, entering the Spot slowly would make it possible for the aircraft to come to a stop safely, the Airside Supervisor reported to the Night Duty Supervisor that the Spot was ready to accept the aircraft but in such a condition that it was desirable for the aircraft to enter the Spot with fully reduced speed (hereinafter referred to as "Precautions for use of Spot").

The company's "Airport Handling Procedures" stipulates the snow removal measures as follows:

8.1.4.4 Management of Snowfall

5-3, Arrangement for the removal of snow from the apron

The Station Manager or the airport management personnel works in coordination with the Operations Coordinator and the airside personnel as he or she tries to be constantly aware of a snow removal operation alert and of relevant conditions such as the state of snowfall and snow removal operation on the apron to make sure that snow is removed from

	the apron before block-in, enabling aircraft to safely come to a stop. When the apron is found to require snow removal operation, and either a public authority, etc. is requested to perform snow removal or a decision has been made to perform snow removal by ourselves, note that, even when it may not be possible to remove snow from the entire surface of the apron, it must be ensured that snow is removed from the lines of aircraft movement and from around the positions where tires come to a stop (including the main gear stop positions) so that aircraft may safely come to a stop. However, it did not stipulate specific procedures for checking and sharing conditions that would affect aircraft taxiing control such as aircraft being able to safely come to a stop, and the specific methods for spraying anti-icing agents including its spray range. (4) Providing Information to Flight Crewmembers during Operations According to the company's Standard Operation Control Manual, the information that could affect the taxiing of aircraft was to be provided to the flight crewmembers in flight operations via ACARS *3 or the company's radio by the operation support personnel (hereinafter referred to as the "Operations Assistant") under the direction of the Duty Manager. According to the records on the ACARS, the information on slippery surface with snow and others in the "Runway Surface Condition Assessment and Reporting*4" for Runway 16R/34L as of 05:30 was provided to the aircraft's flight crewmembers, but in which the information on the slippery surface conditions on the Spot was not included. And the information on the Spot conditions was not provided even by the company radio. The Airside Supervisor reported to the Duty Manager that the Spot was ready as spraying anti-icing agents was completed, and the Precautions for use of the Spot, however, the Duty Manager did not instruct the Operations Assistant to relay the latter information to the aircraft's flight crewmembers. According to the statement of the Duty Manager, despite of having received the Precautions for use of the Spot from the Airside Supervisor, based on the information that the Spot was ready, the Duty Manager did not recognize that the surface conditions of the Spot might affect the taxiing control of aircraft, but was paying more attentions to other arriving aircraft that could be subject to the crosswind limitation during landing due to strong winds rather than the Spot conditions. (5) Runway Surface Condition Assessment and Reporting According to the Aerodrome Operational Management Procedures that Narita International Airport Corporation (hereinafter referred to as the "Airport Corporation") established based on the Airport Operation Service Guideline stipulated by the Civil Aviation Bureau of the Ministry of Land,

*3 ACARS stands for Aircraft Communications Addressing and Reporting System. It is equipment for providing the information necessary for an aircraft's flight from the ground to the aircraft and vice versa, via digital data communication.

*4 "Runway Surface Condition Assessment and Reporting" refers to assessment and evaluation of surface conditions which are performed by the airport management offices and others as part of an inspections when aircraft maneuvering areas are covered with snow or ice.

	Infrastructure, Transport and Tourism, runway condition assessment shall be conducted when the taxiway and/or apron are covered with snow or ice and shall be disseminated through NOTAM. According to the record of the Runway Surface Condition Assessment and Reporting (hereinafter referred to as the "Assessment Report") at the assessment time of 05:50, the results of the assessment of snow and others and the measurement of a friction coefficient (hereinafter referred to as the "Assessment and others") made on taxiway W and W7, on which the aircraft taxied, were described as Poor*5, however, there had been no records about aprons including the Spot. According to the Airport Operation Service Guideline stipulates, the Assessment and others on taxiway and/or apron are generally stipulated as follows: a. The Assessment and others shall be made when the snow and ice (contaminated) coverage is expected to be more than 10 % area of the relevant taxiway and/or apron. However, taking into consideration the taxiing situation of airplanes and the snow removal operation plan and others set by each airport, the taxiway and/or apron to be assessed can be identified in advance in coordination with relevant organizations. In this case, for the relevant taxiway and apron, it shall be notified by the aeronautical information publication (AIP), and the assessment of another taxiway and/or apron can be omitted. If there are taxiway and/or apron that should be assessed but could not be assessed, the names of the relevant taxiway and/or apron shall be described as unmeasured in the Assessment Report. b. When it is certain that the results of the Assessment and others should affect aircraft operations, the procedure to issue a NOTAM shall be performed promptly, based on the contents put in the Assessment Report. In the AIP, there were no descriptions about identifying taxiway and/or apron which the Airport Corporation would conduct the Assessment and others. According to the statement of the person in charge at the Airport Corporation, the person in charge understood that the snow removal operations and spraying anti-icing agents for aprons shall be performed by the operators who use spots, the operator had grasped the surface conditions, therefore, the Airport Corporation had not made the Assessment and others for the aprons or recorded about the unmeasured aprons in the Assessment Report, which was required by the Aerodrome Operational Management Procedures. In addition, the Aerodrome Operation Service Guideline did not

*5 "Poor", which means that the conditions of TWY and/or apron are not good, indicates, in Japan, the conditions where TWY and/or apron that friction coefficient (μ) is less than 0.26 or "SLUSH" (Significantly melted or watery snow in such that water drops when grabbing it with a hand or water splashes when stamping on it) with a depth greater than 3 mm relative to the surface covers over 25%.

	stipulate that the Airport Corporation should record unmeasured aprons in the Assessment Report. (6) Snow Removal Operations and Spraying Anti-icing Agents On December 5, 2022, the Airport Corporation held the Coordination Meeting on Snow Plan for Narita International Airport Restricted Areas where aviation companies, the Narita Airport Office of the Tokyo Regional Civil Aviation Bureau and Narita Aviation Weather Service Center participated in and stipulated the following criteria for starting snow removal operations. *＜Criteria for starting snow removal＞* *・The runway surface is wet or covered by less than 12 mm of snow, and the temperature is -4℃ and below or expected to be -4℃ and below.* *・The runway surface is covered with more than 12 mm of snow.* *However, taking into consideration the decision made in the Coordination Meeting, snow conditions and aircraft operations, there may be some cases where the airport management personnel may judge that snow removal shall be required without being constrained by the criteria above.* Understanding that in the vicinity of spots at the airport, the snow removal operation and spraying anti-icing agents shall be performed by the aviation companies using the spots, the Airport Corporation had explained in this Coordination Meeting, as follows: a Each aviation company shall perform snow removal operations using small snowplows (a board-like device attached to a vehicle for the purpose of snow removal) provided by the Airport Corporation. b Each aviation company using the spots shall spray anti-icing agents placed in various locations in the airport, as necessary. According to the specifications of the anti-icing agents, the spray volume is, for example, 100 g/㎡ after snowfall, and 30 to 50 g/㎡ before snowfall.

3. ANALYSIS

(1) Taxiing (Turn)

The JTSB concludes that it is certain that while turning toward the Spot, the aircraft slip on the icy surface on the Spot and the PIC became unable to control the taxiing of the aircraft, thus the aircraft collided with a ground service equipment parking around the Spot, resulting in damage to the airframe.

Since no failure in equipment was found, and before the aircraft started sliding, no incorrect flight operation by the flight crewmembers were confirmed, the reason that the PIC became unable to control the taxiing of the aircraft was most likely because the steering and brakes of the aircraft became unable to work properly due to its sliding on the icy surface.

The aircraft slid on the surface because the taxiing speed of the aircraft when starting to turn toward the Spot was not probably the one to cope with the surface conditions on the Spot. In addition, the aircraft rotated counterclockwise after starting to slide, because the aircraft's vertical stabilizer and others was possibly pushed to leeward due to influence by winds blowing from left rear with respect to the aircraft's travel direction, to which the icy surface more likely contributed.

Icy surfaces affect aircraft taxiing control due to reduced coefficient of friction, therefore, it is

desirable for aircraft to taxi on the surface that has improved by snow removal operation to a state where aircraft taxiing control would not be affected.

However, aircraft may sometimes taxi on the surface of runways and others whose conditions have not been improved enough or are worse than previously reported, therefore, it is important for flight crewmembers to consider the wind and surface conditions comprehensively and make decision more carefully based on the objective and latest information obtained from AIP and Operations Assistant and others.

In addition, for the safety of ground operators and ground service equipment, flight crewmembers should avoid using the thrust reverser to stop their aircraft within spot even after their aircraft has started sliding on the surface.

(2) Surface Conditions on Spot

The JTSB concludes that the surface conditions on the Spot had not probably been fully improved for the aircraft to taxi despite of the snow removal operations and spraying anti-icing agents performed by the ground operators in charge of the aircraft because the aircraft slid on the Spot.

The surface conditions on the Spot had not been fully improved, because within the Spot, the anti-icing agents were sprayed only part of the spot surface over which the aircraft's tires passed, in addition, the amount of the sprayed anti-icing agents was less than the one applied after snowfall as specified in the anti-icing agents' specifications, thus, the inappropriate spray range and amount of the anti-icing agents probably contributed to it.

The company did not stipulate the specific spray procedures such as the spray range, amount and timing of the anti-icing agents. It is important for the company to stipulate the specific spray procedures for the anti-icing agents to ensure the spot surface conditions are suitable for aircraft to taxi safely.

(3) Providing Information to Flight Crewmembers

The JTSB concludes as follows:

At the time of entering the Spot, the flight crewmember of the aircraft was on alert thinking that the aircraft might slid on the surface but did not reach a decision on reducing the speed of the aircraft or moving the aircraft to the Spot by towing. This flight crewmember's decision was probably influenced by the fact that they had not been provided the information on the Precautions for use of the Spot.

The information on the Precautions for use of the Spot was not provided to the flight crewmembers because the Duty Manager did not instruct the Operations Assistant to relay the Precautions for use of the Spot to the flight crewmembers. In addition, it is probable that the Duty Manager did not instruct to provide the Precautions for use of the Spot because upon receiving the information that the Spot which had been required waiting initially was ready, the Duty Manager was unable to recognize that the surface conditions on the Spot might affect the aircraft's taxiing control although having received the Precautions for use of the Spot from the Airside Supervisor.

The surface conditions on the Spot were not informed accurately to the Duty Manager probably because the company did not stipulate the procedures to confirm and share the conditions that would affect aircraft taxiing control among persons in charge. It is desirable for the company to consider the methods enable to achieve a common understanding among the persons in charge.

It is important for those who support aircraft operations by the Operation Assistant and others from the ground to ensure to provide timely the flight crewmembers with the information not limiting to the surface conditions of Spots but could affect aircraft taxiing control.

(4) Taxiways and aprons Assessment and Others

The JTSB concludes as follows:

In the AIP, regarding the airport, there are no descriptions that the taxiway and/or apron to be assessed by the Airport Corporation shall be identified. Therefore, the Airport Corporation needs to conduct the assessment and others for all taxiways and/or aprons, record unmeasured taxiway and/or apron in the Assessment Report, if any, and promptly the information concerning assessment of taxiway and/or apron is notified by NOTAM, however, there were no records about the unmeasured aprons in the Assessment Report, thus, it is certain that accurate information on the aprons had not been notified by NOTAM to the relevant personnel.

With the accurate understanding the procedures based on the Airport Operation Service Guideline, regarding the condition of the aprons, the Airport Corporation is required to undertake assessments properly and provide the relevant personnel of aircraft companies and others with accurate information while keeping in mind that the apron condition is the information necessary for the flight crewmembers of aircraft taxiing on the snow-covered surface to judge carefully.

In addition, when a taxiway and/or apron assessment reveals that the surface conditions will affect the taxiing of aircraft, it is important for the Airport Corporation to consider including the operation restrictions of the relevant facilities and take measures necessary for aircraft to taxi safely such as snow removal, spraying anti-icing agents and others.

4. PROBABLE CAUSES

The JTSB concludes that it is certain that the probable cause of this accident was that while turning toward the Spot, the aircraft slid on the icy surface on the Spot and the PIC became unable to control the taxiing of the aircraft, thus the aircraft collided with a ground service equipment parking around the Spot, resulting in damage to the airframe.

The aircraft slid on the icy surface probably because the surface conditions on the Spot had not been fully improved for the taxing of the aircraft, and its taxiing speed was not the one to cope with the surface conditions on the Spot.

The surface conditions on the Spot had not been fully improved because the spray range and amount of the anti-icing agents were inappropriate, which probably contributed to it. In addition, the aircraft's taxiing speed was not the one to cope with the surface conditions on the Spot probably because the information that would affect the taxiing of aircraft was not provided to the flight crewmembers of the aircraft from the ground.

5. SAFETY ACTIONS

5.1 Safety Actions Required	As shown in 3. ANALYSIS, it is important for the company to stipulate the specific spray procedures for the anti-icing agents to ensure the spot surface conditions are suitable for aircraft to taxi safely. In addition, it is important for those who support aircraft operations by the Operation Assistant and others from the ground to ensure to provide timely the flight crewmembers with the information not limiting to the surface conditions of spots but could affect aircraft taxiing control.
5.2 Safety Actions Taken after the Accident	(1) Actions taken by All Nippon Airways Co., Ltd. The Safety Manager of the company issued a notice to call for attention to ensure the safety in a slippery ramp area to all relevant heads in the company as of the date of this accident.

	The company took the following actions for winter operations in fiscal year 2023. 1. Established standards and others for judgement whether or not to enter a spot. At each airport, in case of judging that it is dangerous for aircraft to taxi, it was decided that entering the spot should be prohibited. In addition, the spray range of the anti-icing agents was specified, and education and training were provided to all concerned. 2. Providing information to flight crewmembers It was decided that in case that entering spot is deemed dangerous or the surface on spot is frozen, the Operation Assistant should provide the relevant information to the flight crewmembers. 3. Snow removal or spraying anti-icing agents around Aircraft Stand Lead-in Line The company requested the Airport Corporation to perform snow removal and spraying anti-icing agents around Aircraft Stand Lead-in Lines connecting to spots. (2) Actions taken by the Airport Corporation 1. In the Service Operations Manual for Operations Management Department, it was stipulated that the assessment of the aprons should be properly conducted and recorded in accordance with the Guidance for Runway Surface Condition Assessment and Reporting*6, and re-education was provided to members of the Operations Management Department. 2. Based on the result of the assessment and others of the aprons, the measures such as spot closure, snow removal, spraying anti-icing agents were considered from various perspectives, in addition, the standards for judgement about necessary measures were specified in the Service Operations Manual for Operations Management Department so that the company members would be able to judge about necessary measures promptly. (3) Actions taken by the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism In the conferences and other organized by the Civil Aviation Bureau, the Civil Aviation Bureau shared the measures and others about this accident taken by the company and the Airport Corporation with aviation companies and airport offices. In addition, it was informed airport management offices across the country to cooperate with aviation companies and others serving their airports and discuss the measures for winter operation based on the environment and actual operations at their own

*6 The "Guidance for Runway Surface Condition Assessment and Recordings" is a document issued by the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism to provide specific methods for inspection and runway surface condition assessment based on the Airport Operation Service Guideline.

	airport.

Attached Figure: Damage to the Aircraft