AI2023-4

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

Peach Aviation Limited
J A 8 0 6 P

April 27, 2023

Japan Transport Safety Board

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 prevent future accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

TAKEDA Nobuo
Chairperson
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.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

i) In case of being able to determine, the term "certain" or "certainly" is used.
ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.
iii) In case of higher possibility, the term "probable" or "more likely" is used.
iv) In a case that there is a possibility, the term "likely" or "possible" is used.

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

CASE EQUIVALENT TO LANDING ON A RUNWAY USED BY OTHER AIRCRAFT
PEACH AVIATION LIMITED, AIRBUS A320-214, JA806P
ON RUNWAY 34L (RUNWAY A)
AT TOKYO INTERNATIONAL AIRPORT
AT ABOUT 01:03, NOVEMBER 30, 2019

April 7, 2023
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 SERIOUSS INCIDENT INVESTIGATION

1.1 Summary of the serious incident	On Saturday, November 30, 2019, an Airbus A320-214, JA806P, operated by Peach Aviation Limited, was making a landing approach to Runway 34L at Tokyo International Airport with a landing clearance, during which a work vehicle entered the runway.
1.2 Outline of the serious incident investigation	The occurrence covered by this report falls under the category of Article 166-4, item xvii of the Regulation for Enforcement of Civil Aeronautics Act of Japan (Order of the Ministry of Transport No. 56 of 1952), prior to revision by the Ministerial Order on Partial Revision of the Regulation for Enforcement of Civil Aeronautics Act (Order of Ministry of Land, Infrastructure, Transport and Tourism No. 88 of 2020), as the case equivalent to "Landing on a closed runway or a runway being used by other aircraft or attempt of landing" as stipulated in item (ii) of the same Article, and is classified as a serious incident. On December 2, 2019, upon receiving a call of the occurrence of the serious incident, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this serious incident. Although this serious incident was notified to the French Republic as the State of Design and Manufacture of the airplane involved in this serious incident, the State did not designate the accredited representative and others. Comments on the draft Final Report were invited from the parties relevant to the cause of the serious incident, the Japan Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism and the Relevant

	State.

2. FACTUAL INFORMATION

2.1 History of the Flight

Figure 1: The airplane

Figure 2: The work vehicle

According to the statements of the Captain of Airbus A320-214, JA806P (See Figure 1), operated by Peach Aviation Limited, the person in charge of training in the main contractor who had received the order for the pavement surface measurement work in the Tokyo Airport Office of the East Japan Civil Aviation Bureau from the Airport Engineering Division of the Civil Aviation Bureau, two subcontract workers (hereinafter referred to as “Worker A” or “Worker B”, or “Workers” when both workers are referred to with no distinction) who were in the work vehicle (See Figure 2), Air Traffic Controllers at Tokyo Airport Traffic Control Tower (hereinafter referred to as “Controller(s)"), and Air Services Flight Information Officer (hereinafter referred to as “Flight Information Officer"), as well as records of the airplane’s flight data recorder and the GPS recoding data installed in the work vehicle, and air traffic control (ATC) communications records, the history of the serious incident is summarized as follows: (See Figure 3)

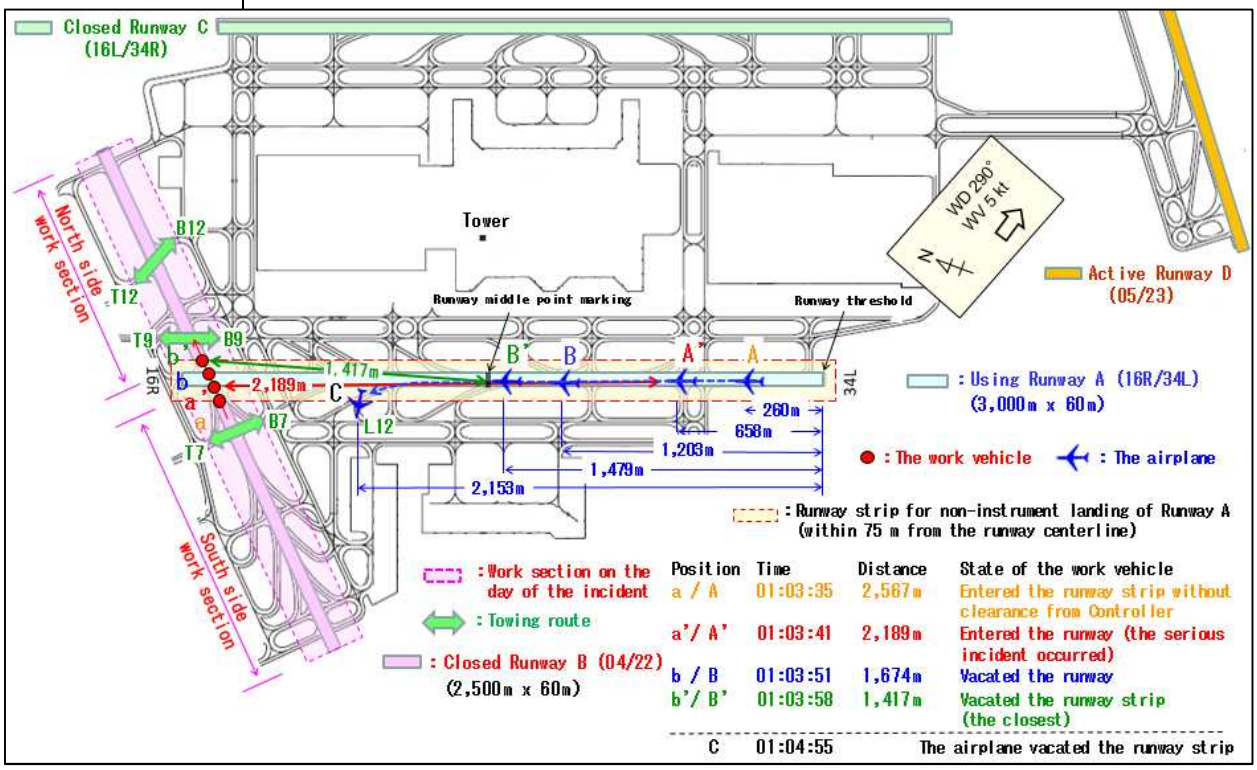


Figure 3: Position of the aircraft and the work vehicle

At 23:30 (JST: UTC+9 hours; unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock) on November 29, 2019, Runway B (04/22) at Tokyo International Airport was closed for the planned night work, Workers got on the work vehicle and started the pavement surface measurement work for the south side work section of Runway B.

In the same as Runway B, Runway C (16L/34R) was also closed for a construction, but Runway A (34L/16R), which crosses with Runway B, and Runway D (05/23) were being active for landing and taking off of the overnight flights.

In addition, on Runway B, three towing routes (between Taxiway B7 connecting to Runway B and T7, between Taxiway B9 and T9, and between Taxiway B12 and T12) were established in order that the aircraft towed by a towing car, departures and arrivals that use Runway A could cross Runway B.

At 00:56:37 on November 30, 2019, Worker A, the field manager of the Work, requested a clearance for crossing B7 towing route*1 to Controller in order to move to the north side work section of Runway B while checking the daily work schedule report. Controller instructed the work vehicle to hold short of B7 towing route and first allowed two departures heading for Runway 16R through B7 towing route to pass through.

Around 01:00, the airplane was entering a landing phase, with the captain in the left pilot seat and the Co-Pilot in the right pilot seat, for Tokyo International Airport as a scheduled Flight 808, with a total of 170 people on board, consisting of the captain, five crewmembers and 164 passengers.

At 01:00:04, when the airplane reached the point of about eight nm from Runway 34L, Controller visually recognized that Runway 34L was cleared and confirmed that there was no request for crossing Runway A (34L/16R) from the work vehicle, etc., and then issued a clearance for landing on Runway 34L to the airplane.

At 01:02:00, as recognizing that Controller's clearance should be necessary as for only the three towing routes indicated in green on the closure co-ordination diagram (see Figure 5 mentioned later) that was added to the daily work schedule report, Worker A requested a clearance for crossing B7 towing route to Controller again, and started crossing it after receiving the clearance.

At 01:02:08, the airplane reached the point of about three nm to Runway 34L.

At 01:02:55, Worker A once had their vehicle hold short of Runway A and reported to Controller that they finished crossing B7 towing route. Controller visually recognized that the work vehicle held short of Runway A, and temporarily took away his eyes from the work vehicle in order to instruct other

*1 "Towing route" means a transverse path that is set on the runway by connecting between the installed taxiways on the left and right sides of the runway when a runway is closed for constructions and others. Even when the runway is closed, the towing route will not be closed, therefore, aircraft (towed and self-propelled) are able to cross the runway through the towing route.

	aircraft. At 01:03:31, when the airplane passed through the Runway 34L threshold, the flight crewmembers judged that there would be no problem for landing as the runway was being recognized visually. Worker A confirmed that the intersection part between Runway A and Runway B was painted in red that means a closure in the closure co-ordination diagram added to the daily work schedule report. And at 01:03:35 (the position relations between the work vehicle and the airplane is shown in a/A in Figure 3) when the airplane passed through 260 m from the Runway 34L threshold, without requesting Controller to give him clearance for crossing Runway A, Worker A let the work vehicle enter the runway strip (within 75 m from the runway centerline) for non-instrument landing of precision approach of Runway A (Runway incursion*2) (Distance between the airplane and the work vehicle: 2,567 m). After that, Worker A visually checked for aircraft using Runway A at the shoulder of Runway A (30 to 35 m from the runway centerline), however at 01:03:41 (the position relations between the work vehicle and the airplane are shown in a'/A' in Figure 3), he started crossing Runway A without noticing the airplane immediately before the touchdown (at 658m after passing the threshold of Runway 34L). At 01:03:43, the airplane landed and reverse thrust was initiated. At 01:03:51 (the position relations between the work vehicle and the airplane is shown in b/B in Figure 3), when the airplane passed in front of the halfway marking (at 1,203 m after passing the Runway 34L threshold), the work vehicle vacated Runway A. At 01:03:58 (the position relations between the work vehicle and the airplane is shown in b'/B' in Figure 3), when the airplane passed immediately before the halfway marking (at 1,479 m after passing the Runway 34L threshold), the work vehicle reached the boundary of the runway strip of Runway A. At that point, the distance between the airplane and the work vehicle was 1,417 m. As Controller was visually checking the airplane and its surroundings from the airplane landing on Runway 34L to its vacating the runway to Taxiway L12, Controller did not notice that the work vehicle passed the intersection part between Runway A and Runway B. At 01:04:27, Controller instructed one of two departures which were holding short of Runway 16R for departure to enter Runway 16R and wait there. At that time, the work vehicle requested to Controller for the clearance to cross the B9 and B12 towing routes located beyond crossing Runway A, therefore, Controller learned that the work vehicle had crossed Runway A without obtaining the crossing clearance, and warned them over the radio to contact Controller when crossing the runway. At 01:04:55, the airplane vacated the runway strip of Runway A via

*2 A Runway Incursion is any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft ("Doc 9981, Procedures for Air Navigation Services − Aerodromes (PANS-Aerodromes)", Third edition, 2020, ICAO, p. I-1-1)

	Taxiway L12. The crewmembers of the airplane had never recognized visually the work vehicle from its entering to its vacating the runway strip. The serious incident occurred on Runway A at Tokyo International Airport (35'33"31 N, 139'46"11 E) at 01:03:41 on November 30, 2019
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	None
2.4 Personnel Information	(1) Captain Age 30 Airline transport pilot certificate August 20, 2019 Class 1 aviation medical certificate Validity August 15, 2020 Total flight time 4,251 hours 26 minutes (2) Worker A Age 61 Attendance date for In-house safety training course for construction in restricted areas November 6, 2019 Worker B Age 35 Attendance date for In-house safety training course for construction in restricted areas November 6, 2019
2.5 Aircraft Information	(1) The airplane Type of aircraft: Airbus A320-214 Serial number: 5384 Date of manufacture: November 27, 2012 (2) Work vehicle Type: Ordinary motor vehicles Color: Open white The work vehicle was running with its vehicle marking flag displayed and the yellow flashing light equipped on the roof turned on.
2.6 Meteorological Information	The observation data in the aviation aerodrome routine meteorological report at the airport at around the time of the serious incident was as follows: 01:00 Wind direction 290°, Wind velocity 7 kt, CAVOK, Temperature 6°C, Dew point 0°C, Altimeter setting (QNH) 30.24 in.Hg
2.7 Additional Information	(1) Education for Workers The Safety Management Regulation for Tokyo International Airport Restricted Area stipulates that any person who intends to obtain the vehicle operation permission for construction shall receive the secondary education*3 from those who have attended a construction safety training course by Flight Information Officer. On November 6, 2019, Workers received their education from the person in charge of education in the main contractor, who had attended the training

*3 "Secondary education" means that an educational person in charge and others who attended the construction safety training course by Flight Information Officer teaches the contents of the construction safety training course to those who enter the construction site.

course provided by Flight Information Officer, based on the materials of the Tokyo International Airport Restricted Area Construction Safety Training Course prepared by Tokyo Airport Office (hereinafter referred to as "Construction Safety Training Course Materials") and the other materials which the main contractor prepared for the pavement surface measurement work. However, neither of the two materials included the description saying "At the intersection part between Runway A and Runway B, even with the clearance to enter the one runway, the clearance to enter the other runway shall be obtained."

In addition, the clearance (51 m) between the aircraft moving on the taxiway and the obstacles was applied to the towing routes installed on the runways. The materials included descriptions that when a work vehicle crosses the towing route, it shall hold once at the position of 51 m from the centerline of the towing route, obtain Controller's clearance for crossing, and cross the runway. And as such the education was provided to Workers.

On the other hand, regarding runways, the work vehicle must not enter the Landing Strip without Controller's clearance in order to ensure the vertical separation between the take-off / landing aircraft and the work vehicle, however, both materials did not include neither descriptions nor explanation given during the education class about it.

For this reason, on the towing route, Worker A stopped once at the position as instructed, and crossed the towing route after obtaining Controller's clearance, however, after crossing Towing Route B7 located in front of Runway A, he entered the runway strip of Runway A without Controller's clearance, proceeded into its shoulder part, and then stopped once.

(2) Responses to the incident occurred on November 5, 2019

At Tokyo International Airport, during the night time on Tuesday, November 5, 2019, 25 days before this serious incident occurred, there was an incident where the work vehicle of the different contractor other than those involved in this serious incident, was measuring the closed Runway B, crossed the intersection part between the using Runway A and the closed Runway B without Controller's clearance. At that time, there was no aircraft involved in this incident, therefore, the Tokyo International Airport Safety Committee of Tokyo Airport Office (hereinafter referred to as "Safety Committee") conducted the investigation to prevent the recurrence.

According to the investigation by Safety Committee, the workers at that time who were driving the work vehicle misunderstood that the intersection part between Runway A and Runway B was also closed when Runway B was closed, thus they thought it was not necessary to make a radio contact with Controller. Based on this, Safety Committee analyzed that workers' understanding of runway operations was insufficient, thus Flight Information Officer revised Construction Safety Training Course Materials to add precautions for crossing the intersection part between Runway A and Runway B, and at 08:25 on November 29, sent an email to the construction supervisor in Tokyo Airport Office requesting that they should be informed to prevent a

	recurrence. Construction Safety Training Course Materials revised at that time included the added descriptions that even if either Runway A or B is closed, when entering the other runway, clearance from Controller is required, and the intersection part between Runway A and Runway B must not be crossed without permission as "points to note for working under operational restriction based recent cases" with drawings. However, the subject and text of the email described only "Update of Construction Safety Training Course Materials" and "Conversion of taxiway J/K crossing passages into service lanes"; and "Revised Safety Training Course Materials (Total 42 pages)" and the "Newly operated service lanes (Total seven pages)" are attached together in one archive file titled as "November 2019 version of Safety Training Course Materials for the Construction within the Restricted Areas"; and there was no description that alerted for crossing the intersection part between Runway A and Runway B. At 18:42 on November 29, Worker A received this email via the main contractor, but he did not think it was important, and started the pavement surface measurement work for the day without reading added Construction Safety Training Course Materials. (3) Experience at the time of training riding in the work vehicle together with the instructor On November 15 and 26 when the situation of runway operations was similar to that occurred in this serious incident (Runway B was closed, Runway A was being active), Worker A experienced crossing Runway A at the time of training riding in the work vehicle together with the instructor of the main contractor. When providing the training to Worker A, the instructor of the main contractor saw another vehicle crossing the runway without making radio contact with Controller. And as he received a question from Worker A asking "It looks like many are crossing the runway without radioing Controller, but is that OK? "*4, to which he answered saying "After all, it's a runway, so let's make radio contact." The pavement surface measurement work at the time of the serious incident was the first one for Worker A to do without the instructor of the main contractor on the vehicle. (4) Information which Workers and parties concerned with aviation were referring to Flight Information Officer created a weekly closure planning map and informed multiple construction supervisors such as the Facility Operation Management Officer and others of it. The Facility Operation Management Officer transferred the weekly closure planning map to the main contractor, and instructed them to create a closure coordination diagram. The main

*4 A single control clearance given to the lead vehicle may allow to cross the runway as a convoy containing several subsequent vehicles.

contractor instructed Worker A to create the closure coordination diagram related to the pavement surface measurement work based on the weekly closure planning map, and submitted the created closure coordination diagram to the Facility Operation Management Officer. The Facility Operation Management Officer attached the closure coordination diagram to the NOTAM* [5] Issuance Coordination Document, and requested Flight Information Officer to go through the issuance procedures for the NOTAM related to the closure of "apron taxiways and aircraft stand taxilanes in addition to the maneuvering areas such as runways and taxiways, and towing routes included" (hereinafter referred to as "aircraft maneuvering areas, etc."). Worker A created a daily work schedule report added with the closure coordination diagram and submitted it to Controller, Flight Information Officer and Airport Security and Disaster Prevention Division after the check by the main contractor and the Facility Operation Management Officer.

Worker A referred to the closure coordination diagram in the daily work schedule report and carried out the pavement surface measurement work while checking the closure situation of runways and taxiways. (See Table 1)

Table 1: Reference information

Name	Description	Preparer
Weekly closure planning map	This illustrates the closure plan for aircraft maneuvering areas, etc., and is updated monthly.	Flight Information Officer
Closure co-ordination diagram	This illustrates the aircraft maneuvering areas, etc. which will be closed for a construction. This was prepared by Worker A at the direction of the main contractor and submitted to the construction supervisor (Facility Operation Management Officer for this pavement surface measurement work). When the construction supervisor requests Flight Information Officer to issue NOTAM, the closure coordination diagram is attached the NOTAM Issuance Coordination Document. The closure coordination diagram is also added to the daily work schedule report.	Main contractor
NOTAM	NOTAMs are delivered to make the information related to operational restriction of runways and others to the parties	Aeronautical Information

* [5] NOTAM are one of Aeronautical information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, and are distributed by means of telecommunication of the Civil Aviation Bureau which cannot be provided in a timely manner with either Aeronautical Information Publication (AIP) or AIP Supplement. According to the nature or timing of the information, the Aeronautical information is published by being classified into AIP, NOTAM or Aeronautical Information Circulars (AIC).

	concerned with aviation such as operators, and the Civil Aeronautics Act stipulates a pilot-in-command shall confirmed aeronautical information including NOTAMs before his/her departure. Flight Information Officer who received the NOTAM Issuance Coordination Document shall request Aeronautical Information Service Center to create and issue NOTAM.	Service Center
Daily work schedule report	When working within the restricted area of an airport, the person carrying out the work shall include information on the details of the work and the closure of facilities such as runways in the daily work schedule report, and is supposed to submit it to the parties concerned such as Flight Information Officer and Air Traffic Controller. The closure coordination diagram is used as an attachment of daily work schedule report.	Worker A

(5) Awareness of Workers

Workers referred to the closure coordination diagram in the daily work schedule report, and carried out the pavement surface measurement work while checking the closed status of runways and taxiways. In the closure coordination diagram, Runway B was filled in red meaning a closure, while towing routes were marked as arrows in green color (in black color in the weekly closure planning map) meaning aircraft maneuvering routes. However, because the intersection part between Runway A and Runway B was filled in red same as the closed Runway B without any arrows like those for the towing routes, Workers thought that the intersection between the runways were closed and clearance from Controller was necessary only for these three towing routes. After first receiving Controller's clearance for crossing the B7 towing route, Worker A was going to receive clearance again when to cross the B9 towing route which is beyond Runway A. (See Figure 3, 4 and 5)

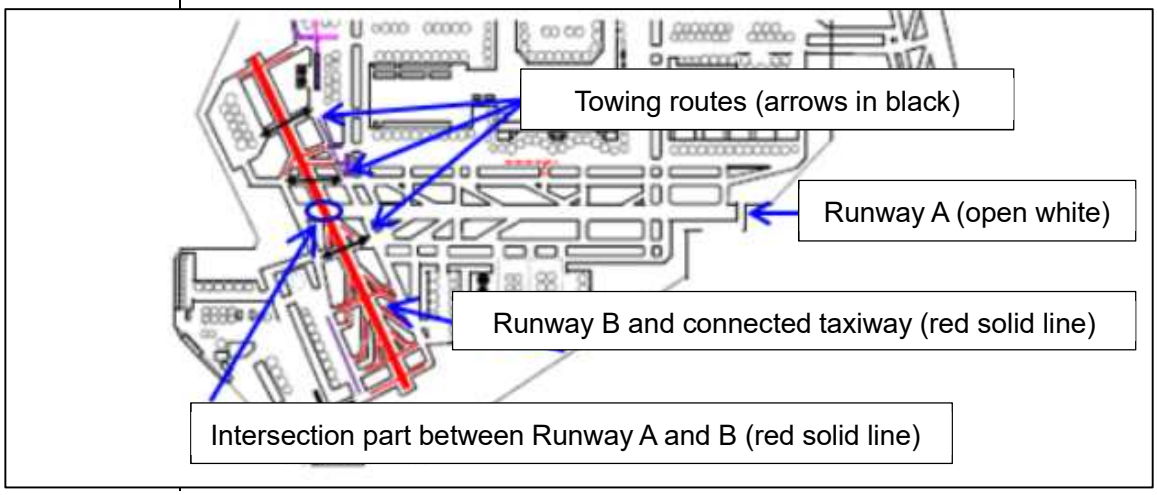


Figure 4: Weekly closure planning map（Excerpt from November 29, 2019）

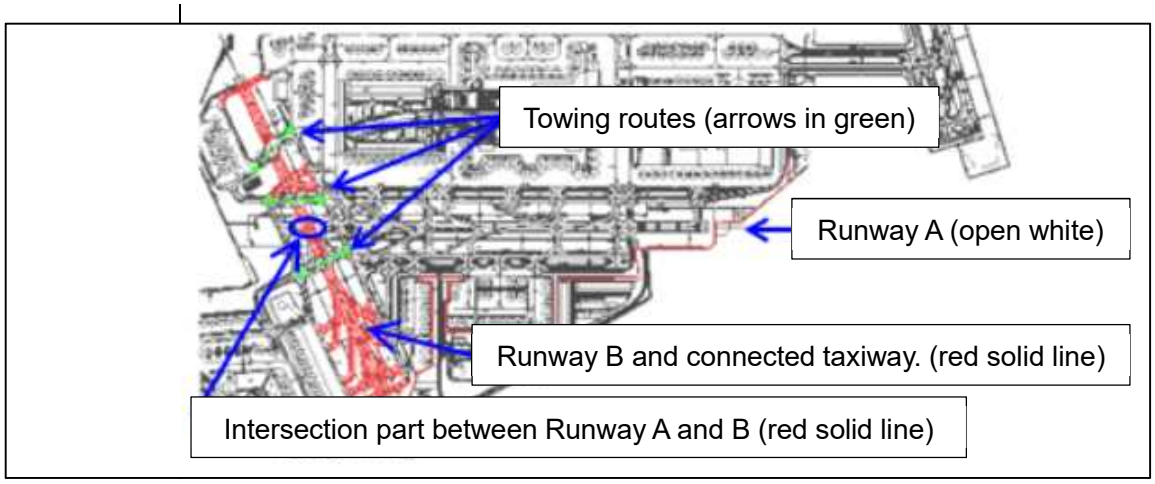


Figure 5: Closure co-ordination diagram (Excerpt from November 29, 2019)

(6) NOTAM for closing Runway B and its connected Taxiway

When this serious incident occurred, at Tokyo International Airport, the following NOTAM (including graphic NOTAM) concerning the closing of Runway B and its connected Taxiway had been issued, but Runway A intersecting with Runway B was been active for take-off and landing, NOTAM concerning the closure for Runway A had not been issued. (See Figure 6-1, 6-2)

NOTAM on the runway closure

261612 RJAAYNYX
(5283/19 NOTAMN
Q)RJJJ/QMRLC/IV/NBO/A/000/999/3533N13947E005
A)RJTT B)1911011430 C)1911292100
D)01 03-05 07 08 10-12 14 15 17-19 21 22 24-26 28 29 1430/2100
E)RWY 04/22-CLSD DUE TO MAINT
RMK/1.AVBL CROSS RWY 04/22 VIA TWY OTHER THAN CLSD TWY
2.SEE AIP RJTT AD2.23

Meaning of NOTAM (only the text in blue is excerpted)
From 23:30 on November 29 to 06:00 the next day (Japan Standard Time), runway 04/22 will be closed for maintenance work.
Remarks/1. It is possible to cross runway 04/22 via other than the closed taxiway.

The graphic was created based on the assumption by the Civil Aviation Bureau since the storage period had expired.

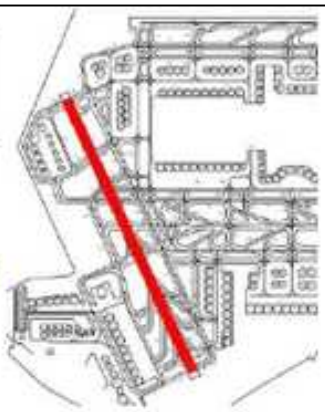
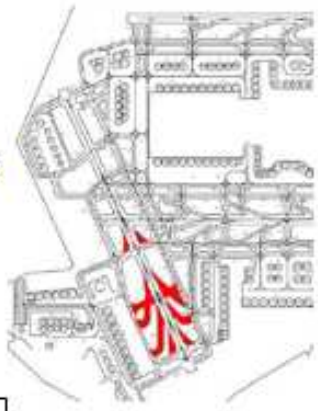


Figure 6-1: NOTAM concerning the closing of Runway B

NOTAM on the taxiway closure

261654 RJAAYNYX
(5284/19 NOTAMN
Q)RJJJ/QMRLC/IV/NBO/A/000/999/3533N13947E005
A)RJTT B)1911011430 C)1911292100
D)01 03-05 07 08 10-12 14 15 17-19 21 22 24-26 28 29 1430/2100
E)TWY B3 B4 B5 B6 B8 T3 T4 T5 T6 T8-CLSD DUE TO MAINT

Meaning of NOTAM (only the text in blue is excerpted)
From 23:30 on November 29 to 06:00 the next day (Japan Standard Time), taxiway B3 B4 B5 B6 B8 T3 T4 T5 T6 T8 will be closed for maintenance work.



The graphics were created based on the assumption by the Civil Aviation Bureau since the storage period had expired.

080907 RJAAYNYX
(5889/19 NOTAMN
Q)RJJJ/QMRLC/IV/NBO/A/000/999/3533N13947E005
A)RJTT B)1911121430 C)1911292100
D)12 15 19 22 26 29 1430/2100
E)TWY B1 B2 B10 B11 B14 T1 T2 T11 T14-CLSD DUE TO MAINT

Meaning of NOTAM (only the text in blue is excerpted)
From 23:30 on November 29 to 06:00 the next day (Japan Standard time), taxiway B1 B2 B10 B11 B14 T1 T2 T11 T14 will be closed for maintenance work.

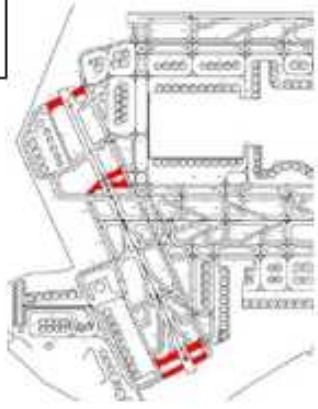


Figure 6-2: NOTAM concerning the closing of Taxiway connected Runway B

	(7) Requirements for Construction Entry, etc. in the Guidelines for Airport Operations Service The Japan Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism has stipulated the "Guidelines for Airport Operations Service" and obliges airport administrators to establish safety regulations pertaining to entry and vehicle use in aircraft maneuvering area, etc., and procedures for their approval and vehicle operation permit. In the Guidelines for Airport Operations Service, there are two types of access permits: one is the access approval and vehicle operation permit for aircraft mechanics, their assistants, and persons required to enter and exit the restricted areas due to their main duty, and the other is those for persons involved in such as construction, other than those required to enter and exit the restricted areas due to their main duty. The Guidelines for Airport Operations Service stipulate that the vehicle operation permit conditions for standard access permit holders are stipulated to limit to those who have taken a training course by the airport administrator and passed the test, while the conditions for vehicle operation permission for construction related access permit are stipulated only as complying with standard access permit, and conditions for permission are not clearly specified. (8) Safety management system The Tokyo International Airport Safety Management Manual stipulates that the Safety Committee shall specify risk source at the Airport as many as possible and collect Airport related safety information from such as construction workers who are not directly related to aircraft operations in addition to staff members of Tokyo Airport Office, persons engaged in duties related to or directly supporting aircraft operations, despite named or anonymous, through safety management activities such as safety report box and such as daily meetings for the risk management in order to assess the risk, and that risk mitigation measures shall be considered and taken as necessary. According to the Japan Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, the safety information posted in the safety report box at Tokyo International Airport is supposed to be put out as SMS (Safety Management System) news of Tokyo Airport Office, as necessary, to share the information, however, over the past five years, there have been one or two cases of use per year (no cases in the past two years including the year when a serious incident occurred), and there was no information related to runway crossing without clearance.

3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilot	None
3.3 Involvement of Aircraft	None

3.4 Additional Involvement	Involvement of airport administrator: Yes
3.5 Analysis of Findings	The JTSB concludes that it is highly probable that in this serious incident, while the airplane was making approach to Runway A at Tokyo International Airport with a landing clearance, a work vehicle entered and crossed the runway without clearance from Controller, which caused the airplane to land on the runway where the work vehicle was present. Probable contributors to the fact that the work vehicle entered and crossed the runway without clearance from Controller are as follows: Workers did not understand sufficiently that clearance from Controller shall be necessary for crossing the runway; and the intersection part between Runway A and Runway B was indicated as closed status in the closure co-ordination diagram in the daily work schedule report, which they referred to. (1) Workers' understanding regarding runway crossing The JTSB concludes that in the material prepared by the contractors, there was a description about the permission procedure for crossing towing routes, but not that clearance shall be necessary even when crossing runways, therefore, teaching rules in the secondary education was more likely insufficient. The reason why there was not a descriptions that clearance shall be necessary even when crossing runways in the material prepared by the contractors is probably because in Construction Safety Training Course Materials prepared by Flight Information Officer, there was no description about the specific rules when to cross runways, which describe that at the intersection part between Runway A and Runway B, even if clearance for entering the one runway is obtained , that for entering the other runway shall be required. Regarding the fact that there was no description about specific rules in Construction Safety Training Course Materials, it is probable that the Materials were not updated because the risk of unauthorized crossing runways by a working vehicle at intersection between Runway A and Runway B did not become clear until the November 5 serious incident. After the serious incident occurred on November 5, Tokyo Airport Office updated Construction Safety Training Course Materials to add precautions for crossing the intersection part between Runway A and Runway B, but which was not well communicated to Workers. This is probably because the email regarding this matter was transmitted to them on the day of the serious incident, and its content and expression did not indicate that any urgent confirmation be required. In addition, Workers were clearly taught about the hold position for crossing towing routes, but not about that for crossing runways, which more likely was contributing factors to the work vehicle entering the runway strip of Runway A and proceeding into its shoulder part with no clearance from Controller. It is necessary for Tokyo International Airport to install markings that

	serves as a reference for the location of the boundary of the runway strip and make it known to the parties concerned in order to make the Construction workers aware of the runway strip boundaries. (2) Runway expression meaning a closed status that resulted in misunderstandings The JTSB concludes that the reason why Worker A crossed the runway without clearance at the time of this serious incident in spite of learning in the training together with the instructor that clearance shall be necessary when crossing not only towing routes but also runways was probably because in the closure coordination diagram attached to the daily work schedule report, although towing routes were marked as arrows in green color, the intersection part between Runway A and Runway B was filled in red meaning a closure, therefore, Workers misunderstood that it was unnecessary for the intersection part to obtain clearance. The intersection part between Runway A and Runway B was filled in red meaning a closure in the closure coordination diagram, because the weekly closure planning map was referred to and copied, when the diagram was created. The intersection part in the weekly closure planning map was filled in red, probably because the weekly closure planning map is used for the NOTAM Issuance Coordination Document intended for Operators, however, it was not sufficient for the information intended for the construction workers, in addition, as failures were not exposed despite the repeated use of the same road map for long time, Flight Information Officer did not notice the risk possible for Workers to misunderstand the road map. On the other hand, it is certain that Tokyo Airport Office staff members, aircraft operators and those who are required to enter and exit the restricted areas due to their main duty were understanding that, Runway A was being active regardless of how it was described in the closure co-ordination diagram because they judged the runway operations status by checking the NOTAM for the runway closing, and knew that the NOTAM concerning the Runway A closure had not been issued. It is necessary to well consider the possible risk of misunderstanding by the construction workers and then how to describe the intersection part between Runway A and Runway B in the weekly closure planning map and the closure co-ordination diagram be elaborated. (3) Requirements for access to the aircraft maneuvering area, etc. and construction areas The JTSB concludes that the principle to ensure the safety in the aircraft maneuvering area, etc. and the construction areas was not shared between standard access permit holders and the construction workers, which more likely contributed to the background of this serious incident. As standard access permit holders are engaged in activities directly supporting aircraft operations, in the restriction areas, it is required for them to always put priority on aircraft operations so as not to impede the on-time operation of aircraft, and carry out their work without restricting operations

while keeping a close watch on movement of aircraft.

On the other hand, generally the construction workers do not often have gotten used to the work within the restricted area, thus it is required for the airport administrator to principally close the construction area, restrict aircraft operations, and take measures in order that the construction workers can concentrate on their work.

From this, a clear distinction should be made between the Vehicle Operation Permit Conditions for standard access permit holders to operate a vehicle in an active aircraft maneuvering area, etc., and those for construction workers to operate a vehicle in the closed aircraft maneuvering area, etc., within a construction area not used by aircraft.

On the other hand, when a construction vehicle enters the active aircraft maneuvering areas, it is necessary to require the same safety measures as those of vehicle operation permit conditions for the standard access permit holders.

Therefore, in order that parties concerned with aviation and construction workers would be able to share common awareness, it is necessary that the requirements for access to the aircraft maneuvering area, etc. and construction areas shall be specified as follows and make them known thoroughly to all parties concerned:

a. The aircraft maneuvering area, etc. within the construction area shall be closed for aircraft not to enter.
b. Work vehicles shall not be allowed to enter the aircraft maneuvering area, etc. without clearance from such as ATC facilities.
c. When a construction vehicle enters the aircraft maneuvering area, etc., the same safety measures as those of vehicle operation permit conditions for the standard access permit holders shall be required.

(4) Promotion of safety management system at Airports

The JTSB concludes that the fact that after the similar incident on November 5, the email message on safety actions had not been quickly informed to the construction workers, then this serious incident occurred, indicates it is important for safety management activities to not only consider and establish safety actions but also ensure the effectiveness.

In addition, although other incidents related to runway crossing without clearance might have occurred, only two cases or less per year were posted in the safety report box placed by Tokyo Airport Office and there was no information related to runway crossing without clearance. Therefore, it is important to continuously manage developing the systems and operations that will enable to actively absorb information on the discomfort and difficulty of doing things that were seen and heard by all the parties concerned including construction workers and promptly make the best use of the information for on-site improvements.

(5) Risk assessment

The JTSB concludes that at 01:03:35, when the airplane passed the Runway 34L threshold for 260 m, the work vehicle entered the runway strip of

	Runway A without receiving clearance from Controller. At 01:03:41, when the airplane passed the Runway 34L threshold for 658 m and immediately before the touchdown, the work vehicle entered Runway A, which resulted in this serious incident. It is certain that at this time, the distance between both was 2,189 m. At 01:03:58, when the airplane passed the Runway 34L threshold for 1,479 m (just before the halfway marking), the work vehicle reached the boundary of the runway strip of Runway A, and the airplane and the work vehicle came closest to each other at a distance of 1,417m. Based on these factors, according to ICAO "Manual on the Prevention of Runway Incursions," the severity of risk for this serious incident certainly falls in the "Category C (An incident characterized by time and/or distance to avoid collision)". (See Attachment: Severity Classifications of Runway Incursions)

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of this serious incident was that when the airplane was making a landing approach to Runway A at Tokyo International Airport with a landing clearance, a work vehicle entered and crossed the runway without clearance from Controller, which highly probably caused the airplane to land on the runway where the work vehicle was present.

Probable contributors to the fact that the work vehicle entered and crossed the runway without clearance from Controller are as follows: Workers did not understand sufficiently that clearance from Controller shall be necessary for crossing the runway; and the intersection part between Runway A and Runway B was described as a closed status in the diagram they referred to.

5. SAFETY ACTIONS

5.1 Safety Actions Required	As described in "3. ANALYSIS", it is necessary for the parties concerned to consider and implement the safety actions regarding such as the education/qualification management for the construction workers, how to describe in the drawing to be used, the hold positions when entering runways, and safety management activities.
5.2 Safety Actions Taken	(1) The Japan Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism has revised the Guideline for Airport Operations Service, specifying that any of the following conditions must be met when construction workers enter the aircraft maneuvering area, etc. to drive a vehicle there. (Revised on December 15, 2021, enforced on April 1, 2022) (Summary) a. Those who shall take and pass the training course and test specified by the airport administrator. b. Those who shall have held the vehicle operation permit for the Airport within the past one year. c. Those who shall meet the following conditions as a person not impede the safety operation of aircraft.

	(a) There shall be no restrictions related to aircraft operations in the construction work area where to operate a vehicle (including passages leading to work sites involved in such as construction.). (b) When the construction work area where to operate a vehicle includes the aircraft maneuvering area, etc., such relevant areas shall be closed. In addition, when the construction work area, where to operate a vehicle, is connected to the aircraft maneuvering area, etc., safety measures shall have be taken to prevent persons involved in such as construction from accidentally entering the aircraft maneuvering area, etc. (c) The person who will obtain the vehicle operation permit shall submit the documents that prove he or she has the knowledge required to operate a vehicle in the restricted area. d. The vehicle operator shall drive a vehicle being led by the vehicle operated by the person who has taken and passed the training course and test, or shall drive a vehicle being accompanied by and under the guidance of the said person. (2) Tokyo Airport Office has taken the following safety actions (Summary). a. After this serious incident, Flight Information Officer informed the relevant section of Tokyo Airport Office supervising the construction to ensure that the main contractor and subcontractors shall thoroughly observe the following: "When carrying out the work involving the closure of Runway A or Runway B, at the intersection part between Runway A and Runway B, even the entering clearance is obtained for the one runway, the other runway shall not be entered without permission, and the entering clearance from Controller is required, (even when Runway A and Runway B are closed at the same time, clearance from Controller is required for crossing the intersection part)." b. The Safety Management Regulation for Tokyo International Airport Restricted Areas and Operational Restrictions Implementation Procedures for Aircraft Movement Areas, etc. were revised as follows (Regulation: revised on September 30, 2021, enforced on October 18, 2021, Implementation Procedures: revised on September 30, 2021, enforced on October 1, 2021); (a) It required construction vehicle drivers to take a safety training course and examination. (Regulation: Article 55) (b) The driving qualifications of those who have taken Construction Driver Training Course and passed the test shall not apply to "vehicle operation on and around the active runways", and in principle, it shall be prohibited for construction workers to enter the vicinity of the active runways. (Regulation: Article 55) (c) Work and vehicle travel at and around the intersection part of Runway A and Runway B shall only be performed during the closed hours of both runways, except when the standard ID card holder drives or guides. (Implementation Procedures: 5. (1))

c. It was decided that in addition to stipulating that internally illuminated safety cones shall be installed at locations where construction workers are not allowed to enter the active runways without clearance from Controller (for safety reasons, ten meters further away from the runway strip boundary), a " temporary hold position marking " shall be placed on the shoulder of the runway (see Figure 7) as a guide to the location of the cones, and all construction workers shall be informed of this through safety training courses and other means.

Temporary hold position marking (white dashed line)

Internally illuminated safety cones

Figure 7: Temporary hold position marking and safety cones

d. It was conspicuously stated at the intersection part between Runway A and Runway B on the weekly closure planning map that clearance from Controller shall be required to cross the intersection part, and the color of the intersection part painted in red was changed to an open white. (See Figure 8)

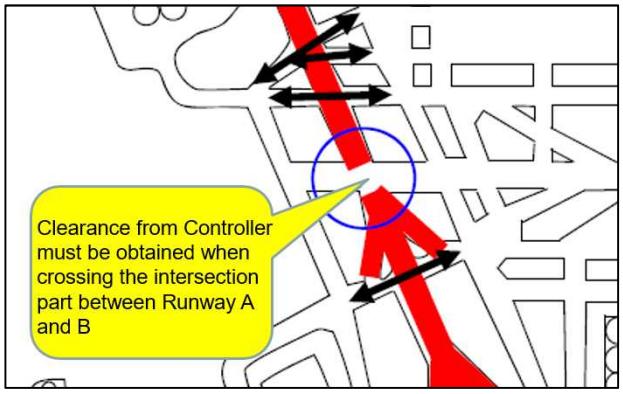


Figure 8: Improvement of descriptions on weekly closure planning map

e. When the intersection part between Runway A and Runway B in the active runway is described as a closed status in the submitted daily work schedule report, Flight Information Officer shall not accept the daily work schedule report, but provide guidance and make correction.

f. It was decided that the intersection part between Runway A and Runway B shall be circled on the Runway Restriction Record Document, and clearly stated that clearance from Controller shall be required to drive through the intersection part., and that the Runway Restriction record Document shall be used to alert each Construction Supervision Officer about the intersection part during the nighttime joint briefing, and the Construction Supervision Officer shall also brief the workers on site.

(3) The main contractor has taken safety actions (Summary) as follows:

a. It was decided that all workers, including employees and contractors involved in the work at Tokyo International Airport, shall be given detailed explanations of important points in the Safety Training Course

	Materials for the Construction within the Restricted Areas of Tokyo International Airport, and a confirmation test shall be conducted. b. It was decided that they will create a work plan where the active runways are not be crossed and taxiways are not crossed as much as possible, as well as wireless communication points and points requiring safety considerations are illustrated.

Attachment

Severity Classifications of Runway Incursions

Severity classifications described in ICAO "the Manual on the Prevention of Runway Incursions" (Doc 9870) are as described in the table below

Table 6-1 Severity classification scheme

Severity classification	*Description*** 1
A	*A serious incident in which a collision is narrowly avoided.*
B	*An incident in which separation decreases and there is significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.*
C **2	*An incident characterized by ample time and/or distance to avoid a collision.*
D	*An incident that meets the definition of runway incursion such as the incorrect presence of a single vehicle, person or aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.*
E	*Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.*

＊＊1 See the definition of "incident" of Annex 13.

＊＊2 Shaded to show the pertinent classification of the serious incident.