AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

ATTEMPT OF LANDING ON A RUNWAY

BEING USED BY OTHER AIRCRAFT ETC.

CHINA POSTAL AIRLINES LLC

BOEING 737-800, B-5156

KANSAI INTERNATIONAL AIRPORT

AT ABOUT 05:33 JST, JULY 20, 2023

June 7, 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 SERIOUS INCIDENT INVESTIGATION

1.1 Summary of the Serious Incident	On Thursday, July 20, 2023, at Kansai International Airport, after receiving a landing clearance from an air traffic controller, a Boeing 737-800, B-5156, operated by China Postal Airlines LLC, attempted to land on Runway 06L being used by a vehicle for runway inspection.
1.2 Outline of the Serious Incident Investigation	The occurrence covered by this report falls under the category of "attempt of landing on a runway being used by other aircraft etc." as stipulated in item (ii), Article166-4 of the Regulation for Enforcement of Civil Aeronautics Act of Japan (Order of the Ministry of Transport No.56 of 1952), and is classified as a serious incident. On July 21, 2023, upon receipt of the notification of the serious incident, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this serious incident. The People's Republic of China, as the State of Registry and the State of the Operator of the aircraft involved in the serious incident designated its accredited representative.

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

2. FACTUAL INFORMATION

2.1 History of the Serious Incident

According to the statements of the captain and the co-pilot of Boeing 737-800, B-5156, operated by China Postal Airlines LLC, the driver of the inspection vehicle (hereinafter referred to as "Vehicle A") in charge of the Runway 06R/24L (hereinafter referred to as "Runway A"), the driver of the inspection vehicle (hereinafter referred to as "Vehicle B") in charge of the Runway 06L/24R (hereinafter referred to as "Runway B"), the air traffic controller in charge of the tower control position (hereinafter referred to as "the Tower"), the air traffic controller in charge of the ground control position (hereinafter referred to as "the Ground"), and the air traffic controller in charge of the coordinator position (Flight Data) (hereinafter referred to as "the FD") at the Kansai Airport Traffic Control Tower at the time of the serious incident, as well as the records of the drive recorder installed in Vehicle B, ATC communications, dedicated phone communication, radar track and Multilateration system[*1], the history of the serious incident is summarized as follows:

Figure 1: The aircraft

Figure 2: Vehicle B

(1) On the day before the occurrence of the serious incident, the Tower, the Ground and the FD were on the night shift from 19:30 Japan Standard Time (JST: UTC+9 hours; unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock), the Tower and the Ground started to provide the aerodrome control services from about 21:00, and the FD from about 21:40 at the Airport Traffic Control Tower. The Ground was the head of this night shift at the Airport Traffic Control Tower.

*1 "Multilateration system" is a system designed to locate an aircraft's position by receiving signals sent out from air traffic control transponders on board the aircraft at multiple receiving stations installed at an airport.

On the day of the serious incident, the Tower, the Ground and the FD were relieved for rest or other duties and left the Airport Traffic Control Tower at about 00:30, then returned to the Airport Traffic Control Tower by about 05:20 and started to provide the aerodrome control services at the tower control position, the ground control position and the coordinator position, respectively.

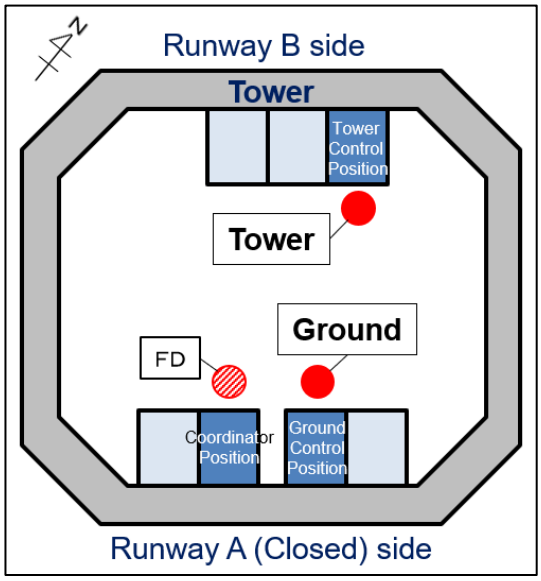

Figure 3: Seating Positions at the Airport Traffic Control Tower

The aircraft took off from Shanghai Pudong International Airport on a scheduled cargo flight at 03:53, with four people on board, consisting of the captain and three crewmembers, and was flying to Kansai International Airport (hereinafter referred to as "the Airport").

Vehicle A was conducting the scheduled inspection of Runway A and its vicinity area (hereinafter referred to as "the 1st Airport Island") from 05:05, and Vehicle B conducting that of Runway B and its vicinity area (hereinafter referred to as "the 2nd Airport Island") from 04:44.

Vehicle B started the inspection performed back and forth along Runway B from its northeast side at 05:15. As there came an arriving aircraft during the inspection in the going direction, Vehicle B vacated the runway once as instructed by the Ground, after the arriving aircraft landed on the runway, at 05:28, Vehicle B restarted the inspections after receiving a clearance to enter the runway again. On the other hand, Vehicle A started the inspection performed back and forth along Runway A from its northeast side at 05:21. Runway A had been closed for maintenance from 00:00 as planned. During the inspection, Vehicle A and Vehicle B were communicating with the Ground on the same ground control frequency. The radio call code of Vehicle A was "Operation 3" and those for Vehicle B was "Operation 4".

(2) On the day of the serious incident, at the Airport, firefighting and rescue exercises (described later in 2.7 (2)) conducted by the airport operator (Kansai Airports) was scheduled. When the exercises were conducted, multiple fire engines would occupy Runway B for a certain period of time, thus the Airport Traffic Control Tower had to carefully give permission for the exercises to be conducted in order to avoid timing conflicts with aircraft take-offs and landings on the runway. Therefore, the Ground as the head at the Airport Traffic Control Tower felt a significant psychological pressure knowing the planned exercises when

	going on this night shift on the previous day. When the Ground started working at the ground control position, half of the planned number of exercises scheduled for the day had not yet been conducted. In addition, due to lightning strikes on the previous night, there occurred a failure in the radio navigation aid near the Airport. As the navigation aid is used when the missed approach procedure of an ILS approach is implemented, on the day of the serious incident, arriving aircraft were supposed to make not a usual ILS approach but an RNP approach*2. However, when requested by an arriving aircraft, an ILS approach was available after designating an alternative procedure in case of missed approach. At 05:28, the operation center of Kansai Airports informed the Airport Traffic Control Tower that the firefighting and rescue exercises would be terminated as the schedule was curtailed. Requesting an ILS approach instead of an RNP approach to Kansai Radar Approach Control Facility*3, the aircraft received an ILS approach clearance for Runway B at 05:28. Noticing that the aircraft was making a different approach from the planned RNP approach from the information indicated on the tower situation display*4, the Tower informed the Ground and the FD of that situation. The Ground, as the head at the Airport Traffic Control Tower, asked the FD to confirm the situation with the Radar Approach Control Facility, however, the Ground remained concerned about the aircraft's approach procedure until the confirmation was received. The Ground was also concerned about the timing when Vehicle B should be vacated from the runway for the aircraft's landing. The Tower was thinking that there would be no problem if Vehicle B continued the runway inspection as the aircraft was sufficiently far away from the runway. At 05:30, a towing vehicle*5 called the Ground and requested clearance to proceed from the 1st Airport Island to the 2nd Airport Island. The Ground needed to take a little time to make a decision as assuming several scenarios by taking into consideration the following situations: Assuming that there were restrictions (described later in 2.7 (1)) on the taxiway connecting the 1st Airport Island and the 2nd Airport Island (hereinafter referred to as "Connecting Taxiway"), the arriving aircraft landed on Runway B was moving to the apron in the 1st Airport Island; the aircraft was planned to also move to the apron in the 1st Airport Island after the landing on Runway B following that arriving aircraft; the

*2 "RNP approach" is a type of approach using satellite-based navigation systems; whereas instrument landing systems used for ILS approach use radio signals from ground-based radio facilities, satellite-based navigation systems used for RNP approach use radio signals from satellites.

*3 "Kansai Radar Approach Control Facility" refers to the ATC facility to provide the terminal radar control service and approach control service mainly for departing/arriving aircraft at the Airport and nearby airports.

*4 The "tower situation display" refers to a screen at an airport traffic control tower that can display radar information used to confirm the position of aircraft in the control zone and surrounding areas. It can be used when confirming the position of aircraft flying in and around the control zone and when providing necessary information to aircraft, and at the same time when this can be judged to be necessary for performing ATC services.

*5 A "towing vehicle" refers to a vehicle that tows and moves an aircraft on the ground.

Ground should determine the timing when to return the traffic flow on the Connecting Taxiway whose restrictions were lifted at 05:30 to the normal. Considering those, the Ground decided not to issue a clearance for the towing vehicle to proceed to the 2nd Airport Island and instructed it to hold short of the parking spot of that arriving aircraft in the 1st Airport Island.

At 05:31:00, the aircraft established communication with the Tower (at Position ① in the upper left of Figure 4). As Vehicle B was still inspecting the runway, the Tower did not issue a landing clearance to the aircraft and instructed it to continue the approach. At this time, the Tower visually confirmed that Vehicle B was about to approach the southwest end of Runway B and decided to have Vehicle B vacate from the runway at the timing of its completion of the inspection in the going direction.

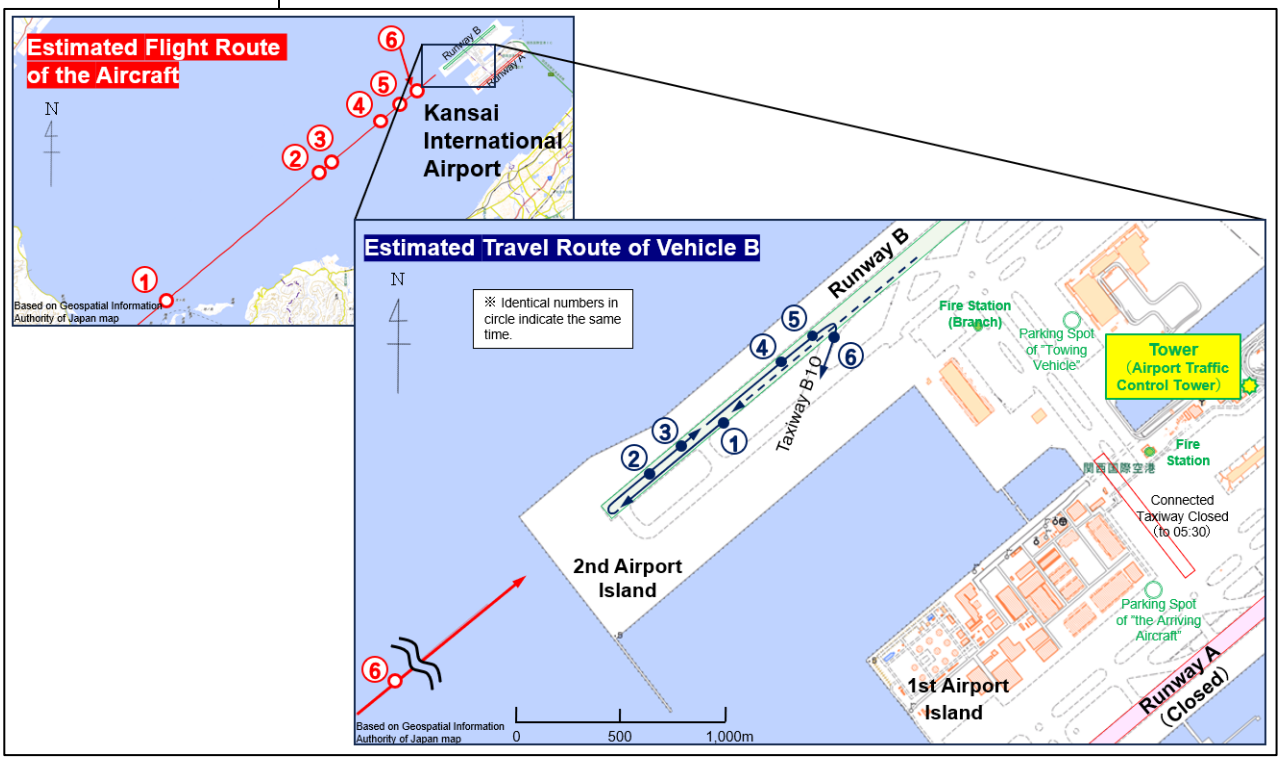

Figure 4: Situation at the Time of Occurrence of the Serious Incident

(3) At 05:33:30, Vehicle A called the Ground with its own radio call sign (Operation 3) (at Time ② in Figure 4). Despite responding to Vehicle A, "Operation 3, go ahead", when hearing the word "Operation", the Ground thought reflexively that Vehicle B (Operation 4) had called, thus looked toward Runway B side. Confirming the position of the aircraft, the Ground found the aircraft approaching Runway B than expected. Vehicle A reported to the Ground, saying "Vacated Runway A" with its current position. As thinking that Vehicle B vacated Runway B as completing the runway inspection, the Ground read back only saying "Roger, vacated runway". When looking back toward the Ground in order to make coordination for Vehicle B to vacate the runway, the Tower heard

the report about vacating the runway over the speaker, but did not recognize which inspection vehicle the report came from. The FD also heard the report through the speaker that a vehicle vacated the runway, but did not recognize which inspection vehicle it came from.

Actually, the Ground received the report about vacating the runway from Vehicle A and read it back to Vehicle A, but as believing that the Ground was communicating with Vehicle B, the Ground immediately informed the Tower that Runway B was clear. Upon receiving the information, although the Tower was unable to visually recognize Vehicle B that would have vacated Runway B, as not visually recognizing Vehicle B on the runway including the area near the runway's southwest end where the Tower had last saw it, the Tower issued a landing clearance to the aircraft at 05:33:43 (at Position ③ in the upper left of Figure 4).

The driver of Vehicle A felt something wrong with the Ground who had only read back saying "Roger, vacated runway" without clearly specifying which runway Vehicle A vacated unlike usual radio communication, however, proceeded to request the Ground to give a permission for inspecting Runway A's parallel taxiway and others. In response to this, at 05:33:49, the Ground instructed Vehicle A to hold as there was an arriving aircraft. The driver of Vehicle A further felt strange that because there would be an arriving aircraft, the Ground did not give a permission for inspecting Runway A's parallel taxiway, despite their closure.

(4) When the Tower issued the landing clearance to the aircraft, Vehicle B was conducting the inspection in the returning direction and was proceeding in the same direction as the aircraft approach direction. Also feeling strange when hearing the Ground's holding instruction to Vehicle A, the driver of Vehicle B confirmed the situation of aircraft in the vicinity with a mobile device. Noticing that an arriving aircraft was approaching the runway its own vehicle was inspecting, the driver of Vehicle B opened the window to visually confirm the location of the arriving aircraft. Thinking that it would be enough time to vacate the runway even after confirming the situation with the Ground, thus at 05:34:41, the driver of Vehicle B confirmed with the Ground to see whether Vehicle B should vacate from "the runway" where it was running for the inspection (at Position ④ in the lower right of Figure 4). The Ground thought this confirmation call was made by Vehicle A, and informed Vehicle A that it did not need to vacate the runway. In respond, Vehicle B once again asked the Ground if it would be allowed to vacate "Runway B" where it was running for the inspection. As noticing the confirmation call was from Vehicle B, therefore, the Ground instructed Vehicle B to vacate the runway at 05:35:00 (at Position ⑤ in the lower right of Figure 4). Upon receiving the instruction, Vehicle B was heading toward the nearest Taxiway B10 as fast as possible. At 05:35:18, Vehicle B vacated Runway B (at Position ⑥ in the lower right of Figure 4).

	Immediately after instructing Vehicle B to vacate the runway, the Ground informed the Tower that Vehicle B might be still on the runway. Upon receiving the information, the Tower checked on Runway B again, and saw Vehicle B being about to vacate the runway toward Taxiway B10. Shortly afterwards, the Tower visually confirmed the position of the aircraft as well. As judging that there would be still time for the aircraft to land and Vehicle B was also about to vacate the runway, the Tower thought there was no need to instruct the aircraft to execute a go-around or others. At 05:35:53, the aircraft landed on Runway B. The captain and the co-pilot did not visually recognize Vehicle B on the runway.
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	None
2.4 Personnel Information	(1) Tower: Age 43 Air Traffic Control Certificate October 1, 2008 Aerodrome Control Service October 1, 2008 Medical Examination Certificate Validity: June 30, 2024 (2) Ground: Age 43 Air Traffic Control Certificate October 1, 2002 Aerodrome Control Service October 1, 2002 Medical Examination Certificate Validity: June 30, 2024
2.5 Vehicle Information	(1) The aircraft Aircraft type: Boeing 737-800 Serial number: 30786 Date of manufacture: May 22, 2002 Airworthiness certificate: AC10987 (2) Vehicle B Owner: Kansai Airports Vehicle type: Nissan X-Trail Color: Yellow-green Others: Equipped with blue flashing lights on the roof, and the lights were turned on.
2.6 Meteorological Information	The observation data in the aerodrome routine meteorological report at the Airport at around the time of the serious incident was as follows: 05:30 Wind direction: 040°, Wind velocity: 11 kt Prevailing visibility: 10 km or more Clouds: Amount 1/8 to 2/8, Cloud base 4,400 ft Amount 5/8 to 7/8, Cloud base 4,600 ft
2.7 Additional Information	(1) Runways and Others at the Airport and the Operation Condition The Airport has Runway A (Runway 06R/24L) with a length of 3,500 meters and a width of 60 meters and Runway B (Runway 06L/24R) with a length of 4,000 meters and a width of 60 meters. At the time of the occurrence of the serious incident, Runway A, its parallel taxiway and others were closed

	for maintenance as planned closure. In addition, on the day of the serious incident, one of the two Connecting Taxiways was partly closed as planned closure, therefore, several aircraft or others were unable to taxi between the 1st Airport Island and the 2nd Airport Island at the same time in a two-way traffic, thus they were required to taxi in a one-way alternating traffic, but at 05:30, the closure was lifted. (2) Firefighting and Rescue Exercises On the day of the occurrence of the serious incident, from 04:00 to 07:00, “Response time measurement training" (held at least twice a year) was scheduled to determine the response times that it would take for several fire engines to reach the runway end after their dispatch from the fire stations. Each dispatch takes about 15 minutes, which basically should not be interrupted once it starts. On the day, the fire engines were scheduled to be dispatched twice for each end of Runway B, four times in total. And the two dispatches had been already done until the serious incident occurred (the other remaining two dispatches were decided to be canceled before the serious incident occurred). (3) Personnel Assignment The Airport Traffic Control Tower has two tower control positions (in charge of Runway A and Runway B, respectively) and two ground control positions (in charge of for the 1st Airport Island and the 2nd Airport Island, respectively), and depending on the runway operation conditions, the traffic volume and others, the services of each position are combined appropriately. When the serious incident occurred, at the tower control position, assigned were one controller solely in charge of Runway B, one ground controller in charge of combined services for the two Airport Islands, and one coordinator position who concurrently served as the ATC clearance delivery position, that was three controllers in total (see Figure 3). The coordinator position was set facing Runway A just same as the ground control position in charge of the 1st Airport Island. (4) Confirmation of the Positions of Vehicles and Others At the Airport, introduced are Multilateration system that supports air traffic controllers in confirming the positions of aircraft taxiing. On the other hand, for inspection vehicles, towing vehicles and others, as they do not install the device that transmits the information on their positions, air traffic controllers confirm their positions visually or by a report from those vehicles.

3. ANALYSIS

(1) Issuing of Landing Clearance for the Runway Where There is a Vehicle

The JTSB concludes that it is certain that when Vehicle B was conducting a scheduled inspection on Runway B with the entry permission, the Tower cleared the aircraft to land on the runway.

The reason why the Tower cleared the aircraft to land on Runway B despite the existence of Vehicle B on the runway was most likely because the Tower judged that Vehicle B had vacated the runway, thus there would be no obstacles and others on the runway, as the Tower received the

incorrect information that the runway was clear from the Ground in charge of radio communications with Vehicle A and Vehicle B, and did not visually recognize Vehicle B on the runway.

It is highly probable that the Ground informed the Tower of incorrect information that the runway was clear was because the Ground mistook the report of vacating the runway from Vehicle A for that from Vehicle B. The reason why the Ground misidentified the report about vacating of the runway was probably because the workload temporarily increased due to a series of events such as handling of firefighting and rescue exercises, coordination with the Radar Approach Control Facility about the approach procedure of the aircraft, operations amid restrictions related to taxiway closure and others. Therefore, the Ground more likely responded to the term "Operation" mentioned in the report from Vehicle A, with the sense of urgency to have Vehicle B vacate the runway as quickly as possible. Besides, as the aircraft was approaching Runway B than expected, the Ground more likely reacted strongly to the term "Vacate" mentioned in the subsequent report from Vehicle A, while misidentifying the communication parties. Furthermore, the Ground was a head at the Airport Traffic Control Tower, which possibly increased the stress due to the increased workload.

From the fact that when reporting to the Ground about vacating Runway A, the driver of Vehicle A felt something wrong with the Ground who had only read it back without specifying the runway designator, it is possible that if the Ground had read it back with the acknowledged runway designator and vehicle's current position to Vehicle A, the driver of Vehicle A could have noticed the misidentification of communication parties. When air traffic controllers engaged in ground control position's services receives a report from one of several vehicles especially permitted for entering that it has vacated the runway, it is important that they should read it back to the vehicle concerned, including the information on the specific runway designator and the current position. In addition, it is important to prevent misidentification of communication parties by thoroughly ensuring the basic actions of communication including conveying the specific information to the related control positions and mutually confirming it.

(2) Confirmation of Obstacles and Others on the Runway

As described in (1), the JTSB concludes that the fact that as not visually recognizing Vehicle B on Runway B, the Tower judged that Vehicle B had vacated the runway and there would be no obstacles and others on the runway, also most likely caused the Tower to clear the aircraft to land on the runway. The reason why the Tower did not visually recognize Vehicle B was more likely because the Tower checked the runway based on the incorrect information provided by the Ground that the runway was clear.

In order to more surely confirm that a vehicle entering the runway has vacated the runway, it is effective to visually recognize that the vehicle reached outside of the runway. The Tower, who failed to visually recognize that Vehicle B vacated the runway, should have confirmed with the Ground to ensure which taxiway and others Vehicle B was heading toward when it vacated the runway. It is important that air traffic controllers engaged in tower control position's services ensure that the basic actions should be taken to confirm there would be no vehicle on the runway when issuing the take-off and landing clearance.

(3) TRM*6 for Air Traffic Control Services

The JTSB concludes that on the day of the serious incident, firefighting and rescue exercises schedule and the Ground's responsible position as a head led to the Ground's sense of urgency and

*6 "TRM (Team Resource Management)" refers to strategies for the best use of all available resources - information, equipment and people - to optimize the safety and efficiency of air traffic control services.

stress. It is beneficial for air traffic controllers, as a part of TRM, regardless of their position, to be conscious of creating an atmosphere where they can share and consult with the team on a daily basis about what they feel as a business threat (Element that induces an error).

(4) Support for Vehicle Position Confirmation

The JTSB concludes that in order to check the positions of the inspection vehicles, the air traffic controllers at the Airport cannot confirm their positions with the Multilateration system, therefore they confirm them visually or relying on the reports from those vehicles. It is desirable that the Civil Aviation Bureau should consider measures to support for the vehicle position confirmation by air traffic controllers to ensure that the aerodrome control services shall be provided in a safe and smooth manner regardless of weather conditions and time period.

(5) Classification of Severity

The JTSB concludes that the closest distance between the aircraft and Vehicle B before Vehicle B vacated the runway was most likely approximately 3,480 m (approximately 1.88 nm).

The serious incident certainly falls under the severity classification of Category C (An incident characterized by ample time and/or distance to avoid a collision) of "the Manual on the Prevention of Runway Incursions" of ICAO with classification tools provided by ICAO. (See Attachment "Severity Classifications of Runway Incursions").

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of this serious incident was certainly that when Vehicle B was conducting a scheduled inspection on Runway B with the entry permission, the Tower cleared the aircraft to land on the runway, therefore, the aircraft attempted to land.

The reason why the Tower cleared the aircraft to land on Runway B despite the existence of Vehicle B on the runway was most likely because as the Tower received the incorrect information that the runway was clear from the Ground who was in charge of radio communications with Vehicle A and Vehicle B, and the Tower did not visually recognize Vehicle B on the runway, therefore, judged that Vehicle B had vacated the runway, thus there would be no obstacles and others on the runway.

It is highly probable that the Ground informed the Tower of incorrect information that the runway was clear was because the Ground mistook the report of vacating the runway from Vehicle A for that from Vehicle B.

5. SAFETY ACTIONS

5.1 Safety Actions Required	As described in "3 ANALYSIS", when air traffic controllers engaged in ground control position's services receives a report from one of several vehicles especially permitted for entering that it has vacated the runway, it is important that they should read it back to the vehicle concerned with the information on the specific runway designator and the current position. Besides, it is important to prevent misidentification of communication parties by thoroughly ensuring the basic actions of communication including conveying the specific information to the related control positions and mutually confirming it. Furthermore, it is important that air traffic controllers engaged in the tower control position's services ensure that the basic actions should be taken to confirm there would be no vehicle on the runway when issuing the take-off and landing clearance.

5.2 Safety Actions Taken after the Serious Incident	(1) Upon the occurrence of this serious incident, the Airport Traffic Control Tower has taken the following measures as of July 20, 2023, and conducted familiarization training for the purpose of responding appropriately to the situation where it would be doubtful about the use of the runway by November 10, 2023. ・ Instructions, responses and coordinations with regards to vehicles shall include the runway designator and the taxiway designator. ・ Controllers at tower control position shall confirm the position of the vehicle when it enters or vacates the runway. ・ When there is an arriving aircraft, in principle, the vehicle shall be vacated from the runway before the arriving aircraft passes the point at 10 nm from the runway threshold. (2) In addition to the above, the Air Traffic Control Division, Air Traffic Services Department of the Civil Aviation Bureau instructed all facilities providing aerodrome control services to take the following measures by November 30, 2023. ・ Regarding radio communications when permitting inspection vehicles and others to enter the runway and the helipad, instructing them to vacate from the runway and the helipad and confirming that they have vacated from the runway and the helipad, the communication examples to prevent from misidentification shall be set out and stipulated in the ATC Operational Guidelines, the ATC Operation Processing Procedures and others. In setting those examples out, it shall be noted that pre-coordination with operators of inspection vehicles should be required to have a common understanding.

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.