AI2017-1

AIRCRAFT SERIOUS INCIDENT

INVESTIGATION REPORT

JAPAN AIR SELF-DEFENSE FORCE
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ALL NIPPON AIRWAYS CO., LTD.
J A 8 0 A N
JAPAN TRANSOCEAN AIR CO., LTD.
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April 27, 2017

JTSB 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.

Kazuhiro Nakahashi
Chairman
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

JAPAN AIR SELF-DEFENSE FORCE
ROTORCRAFT, CH - 47J, 57-4493
ALL NIPPON AIRWAYS CO., LTD.
BOEING 737-800, JA80AN
JAPAN TRANSOCEAN AIR CO., LTD.
BOEING 737-400, JA8938
LANDING ON THE RUNWAY BEFORE VACATING OF THE AIRCRAFT THAT REJECTED TAKE-OFF
NAHA AIRPORT
AT 13:24 JST, JUNE 3, 2015

April 7, 2017
Adopted by the Japan Transport Safety Board
Chairman Kazuhiro Nakahashi
Member Toru Miyashita
Member Toshiyuki Ishikawa
Member Yuichi Marui
Member Keiji Tanaka
Member Miwa Nakanishi

SYNOPSIS

<Summary of the Serious Incident>

On Wednesday, June 3, 2015, a Boeing 737-400, registered JA8938 (the JTA Aircraft) operated by Japan Transocean Air Co., Ltd. as its scheduled flight 610 was approaching the runway 18 of Naha Airport for landing.

A Boeing 737-800, registered JA80AN (the ANA Aircraft) operated by All Nippon Airways Co., Ltd. as its scheduled flight 1694 bound for New Chitose Airport commenced a take-off roll on the runway with the take-off clearance from the aerodrome control tower of the aerodrome control facility however, it rejected a take-off due to the fact a CH-47J of Japan Air Self-Defense Force, registered 57-4493 (the SDF Aircraft) was approaching the runway after taking off from the taxiway A-5.

After that, although aerodrome control tower of the aerodrome control facility instructed the JTA Aircraft which approaching the runway to execute a go-around, it landed on the runway before

the vacating of the ANA Aircraft at 13:24 JST.

There were 44 persons on board the JTA Aircraft, consisting of the Pilot in Command (PIC), four crew members, and 39 passengers; 83 persons on board the ANA Aircraft, consisting of the PIC, five crew members and 77 passengers; seven persons on board the SDF Aircraft, consisting of the Pilot, four crew members, and two passengers. There were no injuries to these persons.

<Probable Causes>

It is certain that this serious incident occurred as follows: when the ANA Aircraft rejected a take-off on the runway 18 due to the SDF Aircraft crossed over in its front, and the JTA Aircraft landed on the runway 18 before its vacating.

It is probable that the JTA Aircraft landed on the runway was because the PIC, recognizing the existence of the ANA Aircraft on the runway when it started flare, as it had been issued the landing clearance by the aerodrome control tower, although he could not confirm the trend of the ANA Aircraft, based on his experience at the airport and on the same type of aircraft and the landing performance, it was judged by the PIC that it could land safely. It is also somewhat likely that the judgment is related to the fact the PIC could not confirm the trend of the SDF Aircraft which had crossed over the runway.

Regarding the JTA Aircraft landed on the runway although the aerodrome control tower of the aerodrome control facility instructed it to execute a go-around, it is probable that it had already landed on the runway and the reverse thrust operation was started when the PIC and the FO were recognizing the instruction. In addition, it is probable that it was involved that the instruction of executing a go-around had missed the timing.

It is highly probable that the reason why the ANA Aircraft rejected take-off is that, while the PIC was in the situation that he was not able to determine the flight direction of the SDF Aircraft approaching its departure course after the take-off of the SDF Aircraft and because the PIC of the ANA Aircraft felt a serious danger in the continued take-off; therefore, he decided to reject the take-off.

Besides, it is highly probable that, regarding the take-off of the SDF Aircraft, its pilots misunderstood the take-off clearance for the ANA Aircraft as the clearance for their aircraft, as well as the Pilot and the Load-master carried out external visual checks; however, it was due to delay in noticing the ANA Aircraft that commenced a take-off roll.

Moreover, regarding the fact that the pilots of the SDF Aircraft misunderstood the take-off clearance for the ANA Aircraft as their take-off clearance, although they could not accurately hear what was transmitted to them by the aerodrome control tower, it is probable that they did not make mutual confirmation of the contents of the transmission. Besides, it is probable that the pilots of the SDF Aircraft did not notice misunderstanding the take-off clearance, as there was nothing pointed

out from the aerodrome control tower of the aerodrome control facility to the wrong read-back of the SDF Aircraft.

It is probable that because the SDF aircraft was not pointed out from the aerodrome control tower of the aerodrome control facility to the wrong read-back, as the aerodrome control tower was not able to hear its read-back. About this matter, it is probable that because the characteristics of the VHF receiver used for air traffic control communication was involved.

The main abbreviations used in this report are as follows:

AIM	: Aeronautical Information Manual
AOM	: Airplane Operating Manual
AOR	: Airplane Operations Reference
ATC	: Air Traffic Control
CG	: Center of Gravity
CRM	: Crew Resource Management
CVR	: Cockpit Voice Recorder
FAA	: Federal Aviation Administration
FAR	: Federal Aviation Regulations
FDR	: Flight Data Recorder
FL	: Flight Level
ICAO	: International Civil Aviation Organization
IFR	: Instrument Flight Rules
MAC	: Mean Aerodynamic Chord
MLAT	: Multilateration
OM	: Operations Manual
PF	: Pilot Flying
PFTG	: Pilot Flight Training Guide
PM	: Pilot Monitoring
RTO	: Rejected Take-Off
SOP	: Standard Operating Procedure
TEM	: Threat and Error Management
VFR	: Visual Flight Rules
Vref	: Reference Landing Speed

Unit Conversion Table

1 ft: 0.3048 m

1 nm: 1,852 m

1 lb: 0.4536 kg

1 kt: 1.852 km/h (0.5144 m/s)

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1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Serious Incident

On Wednesday, June 3, 2015, a Boeing 737-400, registered JA8938 operated by Japan Transocean Air Co., Ltd. as its scheduled flight 610 was approaching the runway 18 of Naha Airport for landing.

A Boeing 737-800, registered JA80AN operated by All Nippon Airways Co., Ltd. as its scheduled flight 1694 bound for New Chitose Airport as scheduled flight 1694 commenced a take-off roll on the runway with the take-off clearance from the aerodrome control tower of the aerodrome control facility however, it rejected a take-off due to the fact a CH-47J of Japan Air Self-Defense Force, registered 57-4493 was approaching the runway after taking off from the taxiway A-5.

After that, although aerodrome control tower of the aerodrome control facility instructed JA8938 which approaching the runway to execute a go-around, it landed on the runway before the vacating of JA80AN at 13:24 JST.

There were 44 persons on board JA8938, consisting of the Pilot in Command (PIC), four crew members, and 39 passengers; 83 persons on board JA80AN, consisting of the PIC, five crew members and 77 passengers; seven persons on board 57-4493, consisting of the Pilot, four crew members, and two passengers. There were no injuries to these persons.

1.2 Outline of the Serious Incident Investigation

The occurrence covered by this report falls under the category of "Landing on a runway being used by other aircraft" as stipulated in Clause 2, Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act of Japan and is classified as an aircraft serious incident.

1.2.1 Investigation Organization

On June 3, 2015, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two investigators to investigate this serious incident.

1.2.2 Representatives from the Relevant State

JTSB notified the occurrence of the serious incident to the United States of America as the State of Design of 57-4493 and the State of Design and Manufacture of JA80AN and JA8938; however, no accredited representatives were appointed.

1.2.3 Implementation of the Investigation

June 4, 2015 Interviews and on site investigation

June 5, 2015 Interviews

1.2.4 Comments from Parties Relevant to the Cause of the Serious Incident

Comments were invited from parties relevant to the cause of this serious incident.

1.2.5 Comments from the Relevant State

Comments were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

Photo 1: Aircraft-A

CH-47J, 57-4493 of Japan Air Self-Defense Force (hereinafter referred to as "the Aircraft A"), in order to transport personnel and cargoes, at around 13:22 Japan Standard Time (JST, UTC + 9 hrs, unless otherwise stated all times are indicated in JST), June 3, 2015, prior to carrying out items to be performed during hovering before take-off, requested the aerodrome control tower of the aerodrome control facility of Naha Airport (hereinafter referred to as "the Tower") for a clearance to take off from the Taxiway A-5. The outline of the flight plan for the Aircraft A was as follows:

Flight rules: Visual flight rules (VFR)

Departure Aerodrome: Naha Airport

Estimated off-block time: 11:20

Cruising speed: 130 kt

Cruising altitude: VFR

Route: Kerama - Kumejima – Miyakojima

Destination Aerodrome: Naha Airport

Total estimated elapsed time: 3 hours 45 minutes

Fuel load expressed in endurance: 4 hours

Remarks: Loading and unloading of personnel and cargoes at Kumejima Sub-Base and Miyakojima Sub-Base

In the cockpit of the Aircraft A, the Pilot sat in the right seat and the Co-pilot in left.


Photo 2: Aircraft B

In the meantime, the Boeing 737-800, registered JA80AN (hereinafter referred to as "the Aircraft B"), operated by All Nippon Airways Co., Ltd., as its scheduled flight 1694, having finished preparation for flight to New Chitose Airport, was holding at the Taxiway E-0 for take-off from the runway 18. The outline of the flight plan for the Aircraft B was as follows:

Flight rules: Instrument flight rules (IFR)

Departure Aerodrome: Naha Airport

Estimated off-block time: 12:15

Cruising speed: 458 kt

Cruising altitude: FL *1 390

Route: ALC (Amami VORTAC) - (midway abbreviated) - CHE (Chitose VOR/DME)

Destination Aerodrome: New Chitose Airport

Total estimated elapsed time: 2 hours 41 minutes

Fuel load expressed in endurance time: 4 hours 36 minutes

In the cockpit of the Aircraft B, the pilot in command (hereinafter referred to as PIC) sat in the left seat as PF *2 and the first officer (hereinafter referred to as “FO”) in the right seat as PM. *2


Photo 3: Aircraft C

The Boeing 737-400, registered JA8938 (hereinafter referred to as "the Aircraft C"), operated by Japan Transocean Air Co., Ltd., as its scheduled flight 610 was approaching the runway 18 for landing after taking off from New Ishigaki Airport. The outline of the flight plan for the Aircraft C was as follows:

Flight rules: IFR

Departure Aerodrome: New Ishigaki Airport

Estimated off-block time: 12:30

Cruising speed: 393 kt

Cruising altitude: FL 270; Route: GAHRA (Waypoint) - IKEMA (Waypoint) - Y57 (Airway) - CRUXS (Waypoint)

Destination Aerodrome: Naha Airport

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*1 "FL" is the altitude expressed as a numerical value obtained by dividing the altimeter instruction (unit: ft) when the altimeter setting value is set to 29.92 inHg at the pressure altitude of the standard atmosphere by 100. Flight levels are usually used in flight altitudes above 14,000 ft in Japan. As an example FL 390 represents altitude 39,000 ft.

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

Total estimated elapsed time; 0 hours 39 minutes

Fuel load expressed in endurance: 2 hours 29 minutes

In the cockpit of the Aircraft C, the PIC sat in the left seat as PM and the FO in the right seat as PF.

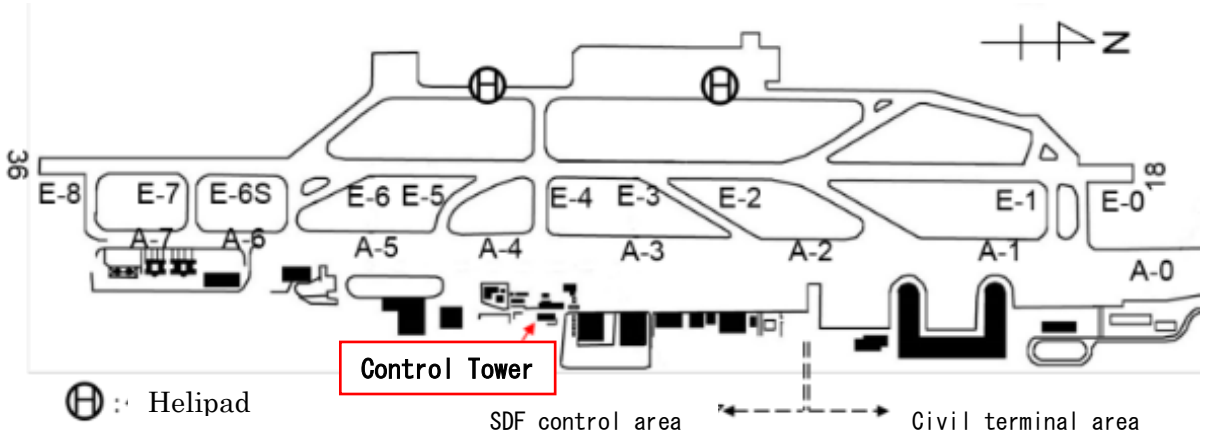

Figure 1: Airport plan view

The history of the flight of the Aircraft A, the Aircraft B and the Aircraft C up to the time of the serious incident was summarized below based on the Air Traffic Control (hereinafter referred to as “ATC”) communications records, the records of the flight data recorder (hereinafter referred to as “the FDR”) of the Aircraft B and the Aircraft C, IC recorder owned by a crew member of the Aircraft A, the records of cockpit voice recorders (hereinafter referred to as "CVR") of the Aircraft B and the Aircraft C and the records of QAR *3 of the Aircraft B, and statements of the Pilot, the Co-pilot and the Load-master of Aircraft A; the PICs and the FOs of the Aircraft B and the Aircraft C; and the training supervisor (hereinafter referred to as "the Tower supervisor A) and the trainee (hereinafter referred to as "the Tower trainee") of the Tower Air Traffic Controllers.

2.1.1 History of the Flights Based on Records of the ATC Communication, IC Recorder, FDR, CVR, and QAR

13:21:23 The PIC of the Aircraft C called "In sight" meaning that he recognized the runway, and the FO responded "Landing" expressing his intention.

13:21:51 The Tower supervisor A asked the Aircraft B if they would accept an immediate take-off, the FO of the Aircraft B responded that they would accept it.

13:21:57 The Tower supervisor A instructed the Aircraft B to enter the runway and hold there, and the FO of the Aircraft B read back it.

(See Appended Figure 1: Estimated Position Relations ①)

13:22:03 A Japan Air Self-Defense Force fighter F15 (hereinafter referred to as "F15")

*3 "Quick access recorder (QAR)" refers to the recording methods that airline companies voluntarily mount to the airframe aiming for higher quality control and safety management which can record various flight data. Since data is mostly recorded on a removable medium, such as optical disc, semiconductor memory, it can be removed from the Aircraft after a series of flight operations.

informed that it would vacate the runway from the Taxiway E-6.

13:22:07 The Tower trainee instructed F15 to expedite vacate the runway from the Taxiway E-6 and to contact with the ground control of the aerodrome control facility of Naha Airport (hereinafter referred to as "the Ground"), and F15 read back it.

13:22:15 The Tower supervisor A notified the Aircraft C to continue its approach and advised that the timing of the issuance of the landing clearance would be late because it would be done after the take-off of the Aircraft B.

13:22:23 The PIC of the Aircraft C responded that it would continue its approach.

13:22:32 The Co-pilot of the Aircraft A requested a clearance for take-off.
(The data was not recorded in the CVR of the Aircraft B.)

13:22:35 The PIC and the FO of the Aircraft C conversed about the possibility of the go-around and confirmed the altitude that should be maintained at the time of go-around. At this time the pressure altitude was 749 ft.

13:22:37 The Tower trainee instructed the Aircraft A to wait using the word "STAND BY".

13:22:40 The Co-pilot of the Aircraft A read back the "STAND BY" and requested a clearance for hovering as well. (The data was not recorded in the CVR of the Aircraft B.)

13:22:43 The Tower trainee issued a clearance for hovering to the Aircraft A and the Co-pilot of the Aircraft A read back it.

13:22:47 The Pilot of the Aircraft A exclaimed "Hovering."

13:22:50 The Tower trainee cleared for take-off immediately to the Aircraft B.
(See Appended Figure 1: Estimated Position Relations ②)

13:22:55 The FO of the Aircraft B read back the clearance for take-off. (In the ATC communications records, the last part (ny four one) of the call sign of the Aircraft A was recorded following to the read back of the Aircraft B.)
The Co-pilot of the Aircraft A read back it. (Although it was not recorded in the ATC communications records, it was recorded in the IC recorder.)

13:22:59 The Aircraft A started a pre take-off inspection including an inspection of AFCS.*4
(Until 13:23:08)

13:23:05 The Aircraft B started its take-off roll.

13:23:06 The automatic voice call-out*5 (hereinafter referred to as "Automatic Call") at the radio altitude of 500 ft of the Aircraft C was activated.

13:23:09 The Tower trainee issued a landing clearance to the Aircraft C with adding a traffic information that the Aircraft B was on a take-off roll.

*4 "AFCS" means an abbreviation for Advanced Flight Control System, it is a system that reduces the pilot's workload and stabilizes the movements of the aircraft.

*5 "Automatic Call" means that the ground altitude (ft) measured by radio waves is uttered in English and it helps grasp a flare start timing and descent rate, and the like.

(See Appended Figure 1: Estimated Position Relations ③)

13:23:10 The Pilot of the Aircraft A exclaimed "Immediate take-off."

13:23:16 The PIC of the Aircraft C read back the landing clearance. At this time the pressure altitude was 369 ft.

13:23:22 The FO of the Aircraft B read the airspeed as "Eighty".

13:23:23 The Pilot of the Aircraft A exclaimed "Final Check" to the Load-master instructing a visual check of the departing and arriving aircraft.

13:23:24 The Load-master of the Aircraft A reported to the Pilot as "Final 1 nm".

13:23:27 The Aircraft A started a right turn.

(See Appended Figure 1: Estimated Position Relations ④)

13:23:30 The Load-master of the Aircraft A reported to the Pilot that the Aircraft B started a take-off roll.

13:23:32 The PIC of the Aircraft B exclaimed that "A helicopter is".

13:23:35 The FO of the Aircraft B started to read the speed of "V_1". *6

13:23:37 The PIC of the Aircraft B exclaimed: "Is not it dangerous?"

13:23:39 The PIC of the Aircraft B exclaimed "Reject" to declare a rejected take-off. At this time the airspeed was 142 kt.

13:23:40 The braking pressure of the Aircraft B reached the maximum (Until 13:23:53).

13:23:41 The 100 ft Automatic Call of the Aircraft C was activated.

13:23:42 The FO of the Aircraft B reported that it rejected the take-off to the Tower.

(See Appended Figure 1: Estimated Position Relations ⑤ and ⑥)

13:23:43 The PIC of the Aircraft C exclaimed "A helicopter" and the FO responded with "Yes". At this time the radio altitude was 71 ft.

13:23:44 The 50 ft Automatic Call of the Aircraft C was activated.

13:23:46 The 30 ft Automatic Call of the Aircraft C was activated and the control column was moved in the direction toward the nose up.

13:23:47 The Tower supervisor A sent the acknowledgement to the Aircraft B.

13:23:47 The 20 ft Automatic Call of the Aircraft C was activated.

13:23:49 The 10 ft Automatic Call of the Aircraft C was activated.

13:23:49 The PIC of the Aircraft C declared "I have control" meaning the change of the maneuvering, and the FO exclaimed "You have control" and took over the maneuvering. Radio altitude at this time was 6 ft, and both thrust levers were moved to idle.

13:23:50 The Tower supervisor A instructed the Aircraft C to execute a go-around.

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*6 "V_1" means the maximum speed during the take-off roll at which the pilot can start rejecting a take-off when an event that affects safe flight continuation occurs to the engine or other equipment of a take-off roll.

13:23:51 The main landing gears of the Aircraft C touched down.

13:23:52 The nose gear of the Aircraft C touched down.

13:23:53 The reverse thrust levers of the Aircraft C was raised up.

13:23:57 The Tower supervisor A instructed the Aircraft C to vacate the runway from the Taxiway E-4.

(See Figure1: Estimated Position Relations; Figure 2: FDR Records (the Aircraft B); Figure 3: FDR Records (the Aircraft C); Attachment 2: ATC Communication Record and Situation of the Aircraft)

2.1.2 Statements of the Crew Members of the Aircraft A

(1) Pilot

On the day of the serious incident, it was a mission to transport personnel and cargoes to Miyakojima via Kumejima. At the time when the Pilot requested taxiing to the Ground, an arriving aircraft on the final approach was visible; therefore, the Pilot notified the crew of that. The taxiing was executed by the Co-pilot and the Pilot was in charge of communication with the Ground. At the Taxiway A-5, the Co-pilot replaced the maneuvering with the Pilot and executed communication with the Tower. Therefore the Co-pilot requested the take-off clearance to the tower, but there was a response of "STAND BY DEPARTURE" meaning waiting for the take-off. After that, when the Co-pilot requested a hovering, it was permitted by "HOVERING APPROVED"; accordingly we started the operation for hovering.

In the meantime, the Co-pilot read back to the Tower. The Pilot had the doubt about the terms of "IMMEDIATE TAKE-OFF" issued by the Tower and was not able to hear the contents of the communication from the Tower; however, as the Co-pilot read back the terms, the Pilot judged that the take-off clearance for his aircraft was issued. At this point, the Pilot did not notice the existence of a departing aircraft other than its own.

When the Pilot conducted an inspection related to the autopilot and declared take-off, the Pilot received a report from the Load-master in the backward as "Final 1.5 nm." Since the Pilot visually recognized an F15 at the Taxiway E-6, he declared that he would make a right turn after avoiding the F15 and then instructed the Load-master "Final check" to confirm the status of the departing and arriving aircraft. He received reports from the Load-master of "Final 1 nm," along with that "There is an aircraft on take-off roll on the runway." The Pilot received a report "our clearance is RIGHT TURN, IMMEDIATE TAKE OFF" when confirming with the Co-pilot concerning the turning direction after take-off. As they were already in the air over the runway, the Pilot judged it safer for the aircraft to keep flying to the west as it was.

(2) Co-Pilot

The Co-pilot carried out taxiing and replaced the maneuvering to the Pilot at the time when the aircraft faced the departure direction at the Taxiway A-5. He noticed that the airport was crowded because there was an interference at the time when the Pilot contacted the Ground. Before approaching the Taxiway, the Pilot operated the radio telephone receiver in order that the Tower frequency could be monitored. Afterwards being instructed to request a take-off clearance to the Tower by the Pilot, the Co-pilot requested it by calling "REQUEST RIGHT TURN CROSS RUNWAY KERAMA": in the direction to Kerama after crossing the runway with a right turn from the Tower; however the Tower instructed him to wait for the word of "STAND BY." After that, when the Co-pilot requested a hovering clearance, it was issued; accordingly the Pilot started the operation for hovering.

When the Aircraft A was leaving the ground or not for hovering, there was a permission from the Tower with "IMMEDIATE TAKE-OFF" as a take-off clearance. The Co-pilot did not recognize the existence of other departing aircraft and he was aware that at that point the take-off clearance was issued to his own aircraft; accordingly, he read back it and executed the pre take-off check, and then the Aircraft A took off.

When it crossed the runway or did not exceed it, he heard the Aircraft B was informing that "We reject because a helicopter crossed in front of us"; accordingly, he grasped the situation.

Thereafter, there were communications concerning the take-off clearance between the Aircraft A and the Tower, and finally, the Tower said "Roger"; therefore, he continued the normal duties. For inquiries from the commander of the Self-Defense Force, the Pilot replied that he had obtained the take-off clearance.

After the arrival of Kumejima, when the Pilot listened the contents of the IC recorder that a crew member was recording, it turned out that the take-off clearance was not meant for their own aircraft.

When receiving the take-off clearance, the Co-pilot felt that the beginning part of the transmission from the Tower was unclear. There was no specific response from the Tower when read back the take-off clearance and there was a recognition that an arriving aircraft was existing on the final approach course; therefore, there was no recognition that it was strange in particular.

(3) Load-master

When taxiing toward Taxiway A-5, the Load-master recognized that there was an aircraft on the final approach course from the communication contents with the Tower. When the Load-master checked the status of the aircraft on the final approach course for

the first time from the bubble window[*7] on the aft right side of the airframe, it was about 3 nm. On the starting of the hovering, the Load-master reported to the Pilot about the situation of the aircraft on the final approach course that it was about 2 nm.

After that, he heard a take-off clearance issued by the Tower. The Load-master could not hear that the voice was meant a take-off clearance for his own aircraft, but when hearing the read back of the Co-pilot, he recognized that it was a take-off clearance for the Aircraft A. At the take-off, when he confirmed the backward according to the direction of the Pilot and reported it to the Pilot that he found an aircraft on the final approach course but he did not see the aircraft on the runway.

In the process of the aircraft taking off and crossing over the runway to westbound, the Load-master confirmed the status of the aircraft that was on the final approach course and reported it to the Pilot. He just found an aircraft under take-off roll at that time and he also reported it to the Pilot. He confirmed that the Aircraft B reported rejecting its take-off at about the same time when his aircraft finished crossing over the runway. After that, the Aircraft B was stopping without vacating from the runway. Since there was an aircraft behind the Aircraft B, when he moved his eyes to the final approach course, it was around the time when the Aircraft C was to land soon. When the Tower instructed the Aircraft B to execute a go-around, it seemed that the Aircraft C had already landed. He felt it very dangerous, but he felt there was no collision because the Aircraft C in the rear reduced speed relatively quickly. He told the Pilot about this situation when it crossed the runway and went to the sea.

2.1.3 Statements of the Crew members of the Aircraft B

(1) PIC

The PIC was instructed from the Ground for taxiing to the Taxiway E-0. The PIC was kept holding for a while as an aircraft was holding on the Taxiway E-1 and several fighter aircraft were also landing; however, there was no traffic information. After several numbers of F15 had landed, when we were asked whether to accept "IMMEDIATE TAKE-OFF" from the Tower, we accepted it because all preparations had been completed. There was an F15 approaching the runway and there was the Aircraft C behind it; therefore the PIC had a recognition that his aircraft would probably to take off between them. The Aircraft B was instructed to enter and hold on the runway as “LINE UP AND WAIT" soon after an F15 crossed the runway threshold. Since the Aircraft B was cleared for take-off at the time or soon after the F15 vacated from the runway, it started take-off roll after

*7 The "bubble window" means a hemispherical window installed one each on the left and right behind the aircraft for the external monitoring. Under command of the Pilot, a crew member in charge conducts external surveillance through this window and reports the situation to the Pilot. See Photo 1.

confirming that the F15 vacated from the runway. After the 80 kt call of the standard call, it was around 100 kt, the PIC visually recognized the Aircraft A hovering in the front left. It is a common thing at other airports that a helicopter is stopping, hovering, or taking off in a different direction on the taxiway; therefore, the PIC thought it would be such a condition. However, the PIC was taking off roll while taking note of the movement of the Aircraft A.

Then there was a sign that Aircraft A was likely to turn to the right toward the runway; accordingly, the PIC said to the FO "Isn't the helicopter dangerous." At that time, as there was no response from the FO, the PIC did not know how the FO thought. When the Aircraft A further approached the runway, it was exceeding 100 kt and was in the area of High Speed RTO *8; accordingly, there was also a risk of RTO execution. While the PIC could not judge the flight direction of the helicopter, when they rotated at normal Vr *9, he made the judgment that it would definitely collide with the helicopter and decided to reject the take-off. At that point of time the V1 call of the FO was not made, and when the PIC confirmed the airspeed indicator, it had just shown V1. Using the autobrakes and thrust reversers, the Aircraft B stopped at a position where it could vacate the runway from the Taxiway E-6.

(2) FO

The PIC commenced a rolling take-off *10 after a take-off clearance had been issued. At the time of commencement of a take-off roll, the FO recognized the Aircraft A on the left front Taxiway A. After that, as the PIC said something at around 100 kt, the FO thought that the PIC had a feeling of diffidence in something, and when he moved his eyes to the front, he had a feeling that the Aircraft A was just crossing the front of their aircraft. The FO recognized that the PIC said something about it.

As it was approaching to V1, in order to make standard callouts the FO returned his gaze to the airspeed indicator and started to call "V" of V1, the PIC called "Reject". During deceleration, the FO reported to the Tower "REJECTED TAKE-OFF HELICOPTER AHEAD OF US."

2.1.4 Statements of the Crew members of the Aircraft C

(1) PIC

There was no problem with weather conditions. It was crowded as usual and the separation with the preceding aircraft was narrow. Aircraft form a line in Naha Airport at

*8 "High speed RTO" is to reject take-off from high speed. There is a danger that there is a possibility of a tire bursting and because the distance to stop is long, there is a high possibility of departing from the runway.
*9 "Vr" means the rotation speed.
*10 "Rolling take-off" means a method of approaching the runway at a taxing speed and starting a take-off roll without stopping on the runway.

every 7 to 7.5 nm and it was the same on the day of the serious incident. When it commenced descending from 1,000 ft, it was not given the landing clearance yet, but at approximately 500 ft it was issued "CLEARED TO LAND." The PIC confirmed that the distance to the landing point displayed on the instrument was 1 nm or more, and the PIC read back as "CLEARED TO LAND 1 NM ON FINAL." Usually, it is only called "CLEARED TO LAND RUNWAY 18," but as 1 nm is too close, in order to tell that to the Tower, he told that "CLEARED TO LAND 1 NM ON FINAL."

Although obtaining the landing clearance, the Aircraft B on the runway did not initiate the take-off roll. After a while, as the Aircraft B initiated to move, the Aircraft C continued to approach the runway thinking that the Aircraft B initiated the take-off roll. The PIC had continued monitoring thinking that there was a possibility of a go-around until the Aircraft B initiated movement, but the PIC felt the likelihood of their own go-around became low.

Afterwards, when the PIC saw that the Aircraft A crossed over the ahead of the Aircraft B which was under the take-off roll, he exchanged words with the FO that "I wonder if such a clearance can be possibly issued." For a moment the PIC thought that the Aircraft B might reject the take-off, he focused on the trend of the Aircraft B; however, as it did not look that its speed of it fell sharply but continued the take-off rolling, the PIC continued approaching into the runway.

Thereafter, a flare operation was initiated by the FO. It is probable that the PIC could have noticed the existence of the Aircraft B if it was there on the runway because the PIC shifted the visual line to the runway end at the stage of the flare; however, it was not possible for him to notice it, and he noticed its presence when the Aircraft C landed. As the PIC did not know exactly the situation of the Aircraft B, and he recognized that the Aircraft A crossed over the runway ahead of the Aircraft B and flew to the west, he took over almost at the same time as the landing without thinking of go-around, he conducted landing operations as usual.

After the landing when the PIC raised the reverse levers up and aft to the interlock position [*11], the Tower instructed them to execute a go-around. As it is so prescribed that “after reverse thrust is initiated, a full stop landing must be made,” and the PIC was confident that the Aircraft B was far enough away and could be stopped behind it, he continued the landing operation and stopped the aircraft. Normally, the PIC vacated the runway from the Taxiway E-4; however, when the weight of the aircraft was light, or when the wind was found strong, the PIC sometimes vacated from the Taxiway E-3. On the day,

*11 "Interlock position" means a position where the reverse thrust lever cannot be moved until the conditions for actuating the reverse thrust device are established at the time of landing.

as the weight was light, the brake operation was carried out in a sense that it could be stopped, he stopped the aircraft near the Taxiway E-3.

The PIC didn't remember clearly whether the Aircraft B had reported the rejected take-off to the Tower.

(2) FO

The FO was flying on RNAV (GNSS) RUNWAY 18 approach *12 following to the radar vectoring. Although there was a deceleration instruction from the Naha terminal control facility, the distance to the preceding aircraft was about 7 nm, the Aircraft C was approaching the runway without no especial discomfort.

The Aircraft C visually recognized that at about 5 nm point of the final approach course as well as an F15 made a landing, the Aircraft B was entering the runway following the instruction of "LINE UP AND WAIT" from the Tower. As the Naha Airport is a crowded airport, it is liable that the separation with the preceding aircraft was to be shortened; therefore, the FO did not think that it would be a tough situation at that time.

The FO visually recognized the runway and had declared to continue the approach for landing, as usual, descent from 1,000 ft had been started, at that time; however, the Aircraft C was not cleared to land.

When it was about 3 nm from the runway threshold, while looking at the situation of the Aircraft B, the FO mentioned about the possibility of a go-around. When the landing clearance was issued at the altitude of around 500 ft, the Aircraft B was beginning to move. Because there had been cases where landing clearance had come at the altitude of around 500 ft or 600 ft at crowded airports such as Naha and Tokyo, although the separation with the preceding aircraft was tight, they were not in a sense that it was quite severe.

At around before and after being cleared to land, the FO saw the Aircraft A was crossing the runway from the east side to the west side, and then he had a talk that it was dangerous with the PIC. However, as the Aircraft A moved away from the runway to the west side, the FO thought without sense of incongruity that the Aircraft B would take off. When the FO was looking at the aiming point*13 he was able to see that the Aircraft B was executing a take-off roll. As the FO was looking the Aircraft B to the front obliquely downward, he could not confirm whether it was lifting off, but it did not seem to be stopped, he recognized that it would take off normally.

The FO started flaring in response to an Automatic Call. Although his attention was being mostly concentrated on the flare, approximately at the same time when the landing was executed the PIC took over operation from him. The PIC, immediately after the

*12 "RNAV (GNSS) Approach" means, based on the data of signals received from GPS, a runway approaching method using navigation (RNAV) that allows you to fly at any point straight.
*13 "Aiming point" is the target landing point on the runway.

landing, touched down the nose gear and started the early reverse operation, then the FO recognized that the Aircraft B was not lifting off. At almost the same time, there was an instruction of a go-around from the Tower. As the reverse operation had already been started, and because there is a regulation of AOM that after a reverse operation is initiated, a full stop landing must be made; accordingly, the stop operation was continued as usual.

The FO didn't remember clearly about the communication of the Aircraft B on rejected take-off to the Tower.

2.1.5 Statements of the Air Traffic Controllers

(1) The Tower trainee

At the Tower initially another trainee had been trained; however, it was changed over to the Tower trainee for ATC training of the fighter aircraft return from around 12:45 the training started under the supervisor of Tower supervisor B. After that, it was time to change the Tower, because the Tower trainee had not completed for ATC training of the fighter aircraft return training, only the Tower supervisor B replaced to the Tower supervisor A, the training was continued.

The Tower trainee was thinking to receive the debriefing (review and discussion after training) from the Tower supervisor B after finishing the landing of the last F15 that returned.

The Tower trainee did not intend to let the Aircraft B take off before the landing of the Aircraft C after the landing of the F15; however, the Tower supervisor A cut in at that moment by asking the Aircraft B "DO YOU ACCEPT IMMEDIATE DEPARTURE?" When listening "ACCEPT" of the Aircraft B acknowledging the take-off, the Tower trainee thought that the Tower supervisor A was planning to let the Aircraft B take off before the landing of the Aircraft C. When the Tower supervisor A instructed the Aircraft B to line up the runway and wait, since the Aircraft C had passed 5 nm, the Tower trainee wanted to let the Aircraft B take off immediately.

After a training supervisor cuts in, the timing at which a trainee resumes ATC communications varies depending on a training supervisor. The Tower trainee, after the execution of cut in by the Tower supervisor A, although there is no memory as to whether or not a specific procedure for resuming radio communication was instructed, issued an instruction to the F15 by "EXPEDITE VACATING RUNWAY" in order that it vacated from the runway quickly. About that time, the Aircraft A requested a take-off clearance. At that time, the Tower trainee judged that it was not a situation to let the Aircraft A take-off, and he had no time to respond to the Aircraft A; therefore, he just instructed "STAND BY" to wait a while. Against it the Aircraft A requested "REQUEST HOVERING" to hover, the Tower trainee issued “HOVERING APPROVED” for a hovering clearance.

After that, the Tower trainee, first, confirmed that the Aircraft B started lining up to the runway, and then he was tracking how F15 vacated the runway from the Taxiway E-6. At that time he was aware that the Aircraft A was on the A-5 Taxiway. The Tower trainee, thinking that the separation between the Aircraft B and the Aircraft C would become strict unless letting the Aircraft B take off immediately after the F15 passed the runway holding position marking, he confirmed that F15 had vacated from the runway and after looking at the runway, issued a clearance of immediate take-off saying "CLEARED FOR IMMEDIATE TAKE-OFF." Until the Aircraft B starts a take-off roll, the landing clearance could not be issued to subsequent the Aircraft C. As there was a possibility that the separation between the Aircraft B and the Aircraft C could not be set on the runway, if the start of the take-off roll of the Aircraft B was delayed, the Tower trainee was mainly watching the movement of the Aircraft B.

As the Aircraft B started a take-off roll, the Tower trainee issued a clearance to the Aircraft C by "B737 ROLLING CLEARED TO LAND" to execute a landing. Since the separation was narrow, he was watching the situation to the very last moment while thinking to let the Aircraft C execute go-around when it became a necessity, an Air Traffic Controller behind the Tower trainee exclaimed: "A helicopter took off and made a right turn and is now flying toward the runway." When the Tower trainee shifted the line of sight, surely the helicopter was taking off. All subsequent communications were done by the Tower Supervisor A.

(2) Tower supervisor A

Before 13:00 the Tower trainee began the training of the Tower. Since it was the final stage of training, the fighter aircraft recovery was the main training task. On the day, the visibility was very good and the weather was fine. Since all the returning fighter aircraft carried out the 360 ° overhead approaches [*14], the Tower was given a role to control them mainly. Since the separation between the last F15 and the subsequent Aircraft C was 6 nm, the Tower supervisor A thought it was possible to let the Aircraft B depart, but the Tower trainee did not act at all.

The Tower supervisor A, thinking that let the Tower trainee experience the control of tense strained separation establishment, cut in the radio communication that the Tower trainee had been doing, after giving information to the Aircraft B about the Aircraft C, when being asked whether to accept "IMMEDIATE DEPARTURE," the Aircraft B responded that would accept it. As it was informed to the pilot of the Aircraft B that the arriving aircraft was at 4 nm on the final approach course, the Tower supervisor A

*14 "360°Overhead Approach" means a method to land by processing the altitude and speed while turning after flying over a runway at an altitude and speed higher than a normal traffic pattern.

instructed the Aircraft B when the Aircraft C was at final 4.7 nm on the final approach course, to line up the runway and wait. From that point the Tower trainee again carried out radio communication.

In that situation, the Aircraft A called in by "READY REQUEST RIGHT TURN TO KERAMA." The Tower trainee instructed the Aircraft A to wait, and then the Aircraft A read back it and requested a hovering clearance; accordingly,the Tower trainee issued it. The Tower supervisor A confirmed that the Aircraft A started the operation for hovering.

The Tower trainee issued the immediate take-off clearance to the Aircraft B. As the start of the take-off roll was a bit late, the separation with the Aircraft C was getting narrower. Since the Tower supervisor A was thinking to decide whether to let the Aircraft C execute a go-around or not, he turned consciousness on the Aircraft C.

At about the same time when the Tower Supervisor A watched the Aircraft A while thinking when to let the Aircraft A take-off, he heard the voice of the Air Traffic Controller in the back saying that "The helicopter took off and made a right turn." Although the Aircraft A did not read back the take-off clearance to the Tower, the Aircraft A was actually turning to the right.

When the Tower supervisor A tried to instruct the Aircraft B to stop its take-off, its thrust reverser started to operate. Because the Aircraft B reported immediately that "REJECTED TAKE-OFF HELICOPTER AHEAD OF US," the Tower supervisor A replied "ROGER".

At that time, the Aircraft C was still in the air near the overrun area, the Tower supervisor A had instructed the Aircraft C to execute a go-around for two times, but the Aircraft C landed. The Tower supervisor A, who was thinking that it was dangerous to let the Aircraft C execute a go-around there because there was the Aircraft B on the runway, instructed the Aircraft C to vacate the runway by "TURN LEFT E-4" immediately. At that time, the Aircraft B was at a position passed the Taxiway E-5. When the Tower supervisor A transmitted to the Aircraft A that took off that "the Tower had not issued a take-off clearance," the Aircraft A responded "Yes, you had." Since it made no meaning if discussed on it, the Tower supervisor A responded with “Roger”.

The Tower supervisor A changed the Tower with an Air Traffic Controller who was waiting behind to repost this case immediately.

Normally, a clearance for take-off accompanied by crossing a runway for VFR helicopter is issued saying "RIGHT TURN APPROVED CROSS OVER RUNWAY 18 WIND SO AT SO CLEARED FOR TAKE-OFF FROM A-5." Since it was different from the take-off clearance to the Aircraft B, the Tower supervisor A never thought that Aircraft A would take off.

This serious incident occurred at Naha Airport (26°11' 45" N, 127°38' 45" E) and at 13:24, on June 03, 2015.

2.2 Injuries to Persons

No one was injured.

2.3 Damage to the Aircraft

No damage was sustained to the aircraft.

2.4 Personnel Information

2.4.1 Crew-Members of the Aircraft A

(1) Pilot: Male, Age 31

Pilot competence certificate (Rotorcraft) Ministry of Defense	April 27, 2010
Type rating for CH-47J	July 05, 2010
Aviation medical examination certificate of Ministry of Defense	
Validity:	October 05, 2015
Class B Aeronautical radio operator	October 02, 2009
Total flight time:	1,861 h 05 min
Flight time in the last 30 days:	19 h 25 min
Total flight time on the type of aircraft:	1,449 h 10 min
Flight time in the last 30 days:	19 h 25 min

(2) Co-Pilot: Male, Age 31

Pilot competence certificate (Rotorcraft) Ministry of Defense	December 22, 2009
Type rating for CH-47J:	March 29, 2010
Aviation medical examination certificate of Ministry of Defense	
Validity:	August 06, 2015
Class B Aeronautical radio operator	June 08, 2009
Total flight time:	1,700 h 54 min
Flight time in the last 30 days:	16 h 18 min
Total flight time on the type of aircraft:	1,289 h 36 min
Flight time in the last 30 days:	16 h 18 min

2.4.2 Crew-Members of the Aircraft B

(1) PIC: Male, Age 37

Airline Transport Pilot Certificate (Airplane):	August 13, 2009
Type rating for Boeing 737:	January 29, 2003

Aeronautical radio operator: May 18, 1998

Class 1 Aviation Medical Certificate

Validity: October 13, 2015

Total flight time: 4,588 h 56 min

Flight time in the last 30 days: 59 h 40 min

Total Flight time on the type of aircraft: 1,941 h 58 min

Flight time in the last 30 days: 59 h 40 min

(2) FO: Male, Age 48

Airline Transport Pilot Certificate (Airplane): March 05, 2004

Type rating for Boeing 737: March 31, 1997

Aeronautical radio operator: November 26, 1992

Class 1 Aviation Medical Certificate

Validity: June 22, 2015

Total flight time: 11,693 h 20 min

Flight time in the last 30 days: 40 h 08 min

Total flight time on the type of aircraft: 5,164 h 40 min

Flight time in the last 30 days: 40 h 08 min

2.4.3 Crew-Members of the Aircraft C

(1) PIC: Male, Age 49

Airline Transport Pilot Certificate (Airplane): May 25, 2006

Type rating for Boeing 737: April 20, 1998

Aeronautical radio operator: June 06, 1991

Class 1 Aviation Medical Certificate

Validity: May 21, 2016

Total flight time: 12,180 h 40 min

Flight time in the last 30 days: 38 h 31 min

Total flight time on the type of aircraft: 10,496 h 38 min

Flight time in the last 30 days: 38 h 31 min

(2) FO: Male, Age 33

Commercial Pilot Certificate (Airplane): February 07, 2008

Type rating for Boeing 737: May 11, 2009

Instrument Flight Certificate: February 08, 2008

Aeronautical radio operator: July 08, 2005

Class 1 Aviation Medical Certificate

Validity: November 07, 2015

Total flight time: 4,347 h 25 min

Flight time in the last 30 days: 53 h 02 min

Total flight time on the type of aircraft: 4,120 h 05 min

Flight time in the last 30 days: 53 h 02 min

2.4.4 Air Traffic Controllers

(1) Tower supervisor A: Male, Age 50

Air Traffic Controller Qualification Certificate

Aerodrome Control Services: April 1, 1991

Training supervisor: December 01, 2013

Validity: March 31, 2016

Medical examination certificate

Validity: June 30, 2016

(2) Tower trainee: Male, Age 26

Air Traffic Controller Qualification Certificate

Aerodrome Control Services (Flight Data only): February 1, 2015

Medical examination certificate

Validity: June 30, 2016

2.5 Aircraft Information

2.5.1 Aircraft

(1) Aircraft A

Type: CH-47J

Serial number: 57-4493

Date of manufacture: June 30, 2005

Total flight time: 3,392 h 24 min

Flight time since last periodical examination (PE was conducted on November 04, 2014) 291 h 30 min

(2) Aircraft B

Type: Boeing 737-800

Serial number: 44558

Date of manufacture: December 07, 2014

Certificate of airworthiness: No. 2014-049

Validity: Period starting from December 19, 2014 during which the Maintenance Management Manuals (All Nippon Airways Co., Ltd.) are applied

Total flight time: 1,134 h 25 min

Flight time since last periodical inspection (A02C inspection: May 07, 2015):

119 h 37 min

(3) Aircraft C

Type: Boeing 737-400

Serial number: 29485

Date of manufacture: November 11, 1998

Certificate of airworthiness: No. 98-079

Validity: Period during which the Maintenance Management Manuals (Japan Transocean Air Co., Ltd. or any other air transport company using this aircraft as a shared commercial aircraft with Japan Transocean Air Co., Ltd.) are applied starting from November 25, 1998

Total flight time: 40,413 h 03 min

Flight time since last periodical inspection (11C maintenance: April 13, 2015):

410 h 02 min

2.5.2 Weight and Balance

(1) Aircraft A

At the time of the occurrence of this serious incident, the weight of the Aircraft A was estimated to have been 40,202 lb and the position of the center of gravity (CG) was estimated to have been 324.3 in aft of the datum line, both of them are estimated to have been located within the allowable range (maximum take-off weight of 50,000 lbs and CG range of 315.5 to 338.7 in) corresponding to the weight at the time of the incident.

(2) Aircraft B

At the time of the occurrence of this serious incident, the weight of the Aircraft B was estimated to have been 130,600 lb and the position of its CG was estimated to have been 19.6% MAC *15, both of them are estimated to have been located within the allowable range (maximum landing weight of 156,500 lb and CG range of 6.0 to 26.1% MAC) corresponding to the weight at the time of the incident.

(3) Aircraft C

At the time of the occurrence of this serious incident, the weight of the Aircraft C was estimated to have been 101,464 lb and its CG was estimated to have been 14.0% MAC, both of them are estimated to have been located within the allowable range (maximum landing

*15 "MAC" stands for Mean Aerodynamic Chord and refers to aerodynamic average chord. It is a chord that represents the aerodynamic characteristics of the wing, and when the chords such as the sweptwing are not constant, they represent the typical chord length. 19.6% MAC indicates a position 19.6% behind the front of this mean aerodynamic chord.

weight of 121,000 lb and CG range of 5.0 to 29.8% MAC) corresponding to the weight at the time of the incident.

2.6 Meteorological Information

Aviation Routine Weather Reports (METAR) data at the time of this serious incident at Naha Airport were as follows:

13:00 Wind direction 200°, Wind velocity 13kt, Prevailing visibility 10km or more.
Cloud: Amount 1/8 - 2/8, Cloud base 1,400 ft cumulus
Amount 5/8 - 7/8, Cloud base Unknown
Temperature 29℃; Dew point 26℃,
Altimeter setting (QNH) 29.83inHg.

13:30 Wind direction 200°, Wind velocity 12kt, Prevailing visibility 10km or more.
Cloud: Amount 1/8 - 2/8, Cloud base 1,400 ft cumulus
Amount 5/8 -7/8, Cloud base Unknown
Temperature 29℃, Dew point 26℃
Altimeter setting (QNH) 29.83inHg.

2.7 Information on Air Navigation Facilities

At the time of this serious incident, Aeronautical radio navigation facilities, the ATC facilities (radar, automated radar terminal system and air-ground communication facilities) and ATC communication facility related to the flight of the Aircraft A, B and C were all operated normally.

Also, among the air-ground communication facilities, the antenna of the VHF radio telephone reception facility (hereinafter referred to as "ground reception facility"), which was then used for ATC communications at that time, located from the airport reference point *16 of Naha Airport at a magnetic bearing of 106° and a distance of about 680 m, the elevation was 46.4 m (about 152 ft), the prospects were good and there were no positional problems for the communication with the Tower and the Aircraft A, B and C, respectively.

*16 "Airport reference point" is a point of place representative of the airfield, in many cases it is set near the point that becomes the geographical center of the airport.

2.8 Information on ATC

2.8.1 Characteristics of the VHF Receivers

Automatic gain control functions (AGC, see Fig2) are installed in the radio telephone receiver used for ground reception facilities for ATC communications in order that the receiver audio output becomes constant even if the antenna input strength changes. With this AGC, even if there is a difference in antenna input strength from each aircraft, Air Traffic Controllers and others can hear at a certain sound level (the purpose of the AGC).

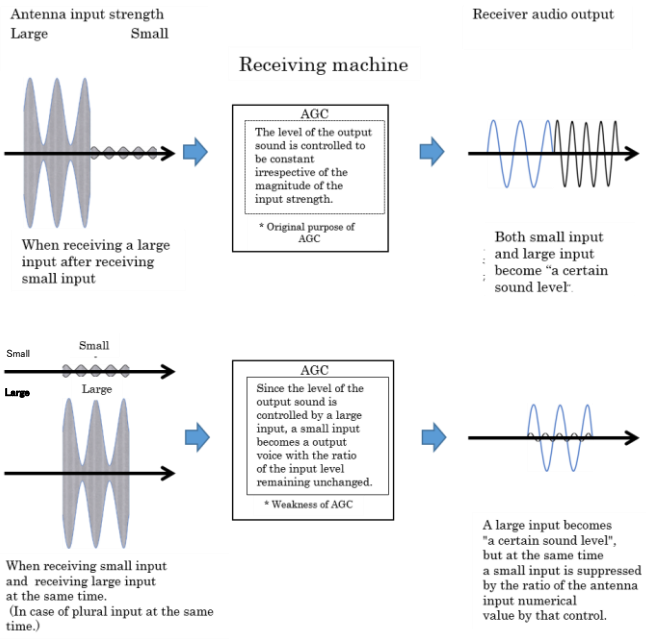


Figure 2: Objectives and weakness of AGC

On the other hand, because a function of this AGC controls the receiver output by large antenna input when plural aircraft transmit a message at the same time, the receiver output by small antenna input remains small (a weakness of the AGC). As the antenna input difference becomes larger, the receiver audio output with small antenna input becomes smaller, it may be suppressed to a level that cannot be heard at all. If the difference in antenna input strength is small, in many cases, transmission contents cannot be heard due to deterioration of voice quality or generation of noise due to the beat phenomenon, the received air traffic controller and others can be recognized that there was the simultaneous transmission.

In the report of the manufacturer of the receiver, if the difference in antenna input strength is 20 dB to 25 dB or less, small signal receiver output sound (1 kHz tone signal in the report) can be heard, but it is said that it will be inaudible at all when it becomes a difference beyond that.

2.8.2 The Reception Condition of the Tower

As described in the Attachment 2 ATC communication records and the situation of the aircraft, the transmission related to the read back of the Aircraft A at 13:22:55 overlapped with the transmission related to the read back of the Aircraft B. At this time, with the received voice at the Tower, the read back as a result of the Aircraft A misunderstanding the take-off clearance for the Aircraft A with the Aircraft B was small to the extent that it could not be recognized, and noticeable background noise was not generated in the reception of the Tower.

Also, the reception of the Aircraft A at the Tower when it did not overlap with the read back

of the Aircraft B was sufficiently large and normal.

2.9 Information about the Airport

Naha Airport is located in the southern part of the main island of Okinawa, the elevation is 11 ft, the runway is 18/36 (magnetic bearing 182°/ 002°), its length is 3,000 m, width is 45 m and with asphalt concrete pavement, also the control Tower is located on the eastern side about the middle of the runway.

The control tower, the passenger terminal buildings, Ground, Maritime and Air Self-Defense Force (SDF)s facilities are located on the eastern side of the runway. Also, helipads *17 are installed on the west side of the runway, but there is no helipad installed on the east side of the runway; therefore, the take-offs and landings of rotorcrafts from the east side of the runway in the visual meteorological conditions are use of the parallel taxiway.

Naha Airport is used by aircraft of the SDFs and others as well as civilian aircraft, the total number of control handling aircraft as of June 17, 2015, was 550 (387 civilian aircraft, and 163 SDF's aircraft) *18 and the number of handling aircraft in 2014 was 261,918 *19. In airports which are operated using one runway, the Airport is the second busiest airport in Japan when converting the latter number in one hour considering the time during which airports are in operation effectively (substantially).

Currently, a new runway is under construction offing of the runway 18/36 and it is scheduled to inaugurate operation at the end of March 2020.

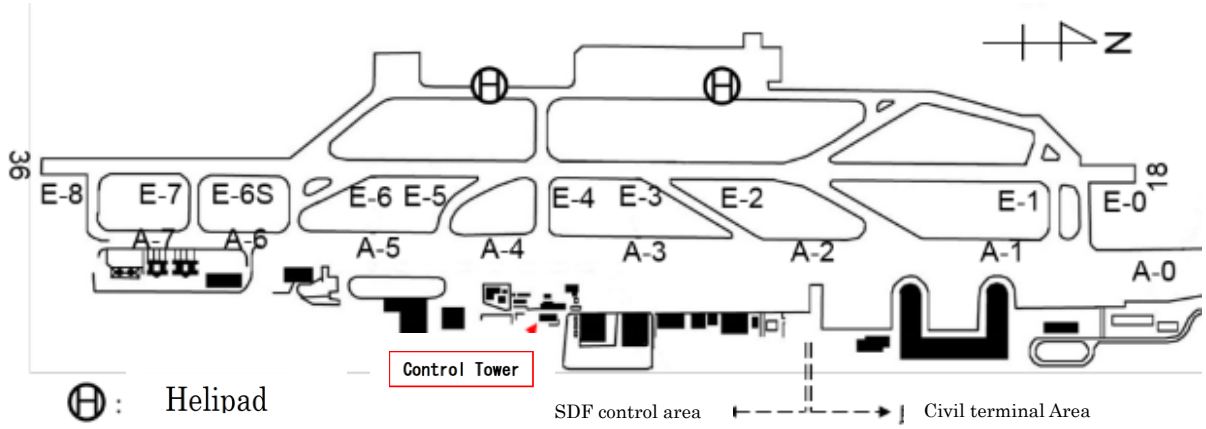


Figure 1: Airport plan view (reproduced)

*17 "Helipad" means a place or platform where a helicopters are taking-off and landing, and a clear mark is drawn in a place away from an obstacle in order for the helicopter to take-off and land safely.

*18 Based on the record of a peak day (June 17, 2015) of Air Traffic Control monthly traffic volume report provided by the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism.

*19 According to 'Aviation from a perspective of numbers' (issued by the Japan Civil Aviation Promotion Foundation.

2.10 Information on Flight Recorders and IC Recorder

(1) The Aircraft A was not equipped with FDR and CVR; the IC recorder that was possessed by the crew-member for self-study had been connected to the intercommunication system to be described later, and when the serious incident occurred ATC communications and intercommunications were recorded.

(2) The Aircraft B was equipped with an FDR capable of recording for a duration of about 25 hours and a CVR capable of recording for a duration of about two hours, manufactured by L3 Communications Holdings, Inc. of the United States of America. The records retained by the FDR and the CVR cover the events that took place at the time of occurrence of the serious incident.

(3) The Aircraft C was equipped with a FDR capable of recording for a duration of about 25 hours and a CVR capable of recording for a duration of about two hours, manufactured by Honeywell International Inc. of the United State of America, The records retained by the FDR and the CVR cover the events that took place at the time of occurrence of the serious incident. The time calibration of FDRs, CVRs and IC recorder was conducted by comparing the time signals recorded in the ATC communication record, the VHF radio transmission signal recorded in the FDR, and the Air Traffic Control communication recorded respectively.

2.11 Information on the Aircraft A

2.11.1 Roles of the Crew Members

According to the descriptions of the instructions of technical orders which is the regulation of Japan Air Self-Defense Force, which are describing the normal operation for safe and effective operation of the Aircraft A, handling method of the aircraft and on-board equipment, during the flight, it is assumed to be responsible for the Pilot to take command and shall be assumed to be responsible for flight operations and crew actions.

A load-master was required to follow the instructions of the pilot, and to monitor and watch the occupants and cargoes during the flight, including outside watching.

While load-masters can hear ATC communications, they are not educated about ATC communications and are not regarded as its mission.

2.11.2 Normal Operation

Pilots of Japan Air Self-Defense Force are carrying out their roles on the basis of the technical manual stipulating the piloting method for each model, technique of crew coordination and the piloting orders of the technical orders.

The piloting orders of the technical orders of the CH-47J stipulates that pilot must perform the function check of the AFCS during hovering if it is the first flight on the flight implementation

day, and the flight of the Aircraft A at the time of serious incident occurrence was the first flight of the day.

At Naha Helicopter Airlift squadron to which the Aircraft A belongs, in addition to pilot's outside watch based on the contents stated in the instructions set forth in the technical manual and piloting order, the other crew members were positively utilized to strengthen the outside watch, but there were no stipulated rules.

In addition, the Naha Local Handbook which prescribes the operation standards regulating the procedure of the flight implementation and others and the procedure which takes into consideration the ATC characteristics of the Airport has been established by this squadron and used by the pilot.

Although there are descriptions of ATC communication examples in this operation standard regulation and the Local Handbook, there is no description about the procedure for pilots to surely understand the ATC communication contents.

Describe the provisions of companies to which the Aircraft B and the Aircraft C belong as a reference below. (Excerpts)

(1) Regulations of the company to which the Aircraft B belongs (OM SUPPLEMENT)

S-2-8 Compliance with control instructions

Supplementary explanation on compliance with ATC *instructions is shown below.*

2. Mutual confirmation of ATC instructions

In order to prevent misunderstanding, a runway incursion due to misunderstanding, the PIC, and the FO, regarding the contents of the control instruction, make sure of mutual confirmation. When there is doubt about the contents of the control instruction or when the recognition between the PIC and the FO is different, confirm with the ATC facilities promptly.

(2) Regulations of the company to which the Aircraft C belongs (OM Supplement)

S-8-4 Procedure for ATC communication

1. PF/PM should try to understand exactly the issued ATC instruction / ATC approval (hereinafter referred to as "ATC instructions"), and if both recognition do not match unless it is unavoidable for safety reasons, do not put it into action. If the PF or the PM is not certain of the given ATC instruction, make sure to reconfirm to the ATC facilities.

Upon confirmation, instead of simple read back, with the term "SAY AGAIN" or "CONFIRM" to ensure implementation.

2. As for the ATC instructions concerning the take-off or landing, approach (refers to approach clearance) and entry into a runway, it will be implemented as

follows.

(1) To the issued ATC instruction for the aircraft, the PF notifies the PM of his/her acknowledgment, what he/she has recognized.

(2) The PM read back of the ATC instruction.

(3) The PF calls its understanding only when the PM's read back concurs with the PF's acknowledgement.

When it doesn't or its concurrence is not confirmed, make the PM to CONFIRM to the ATC facilities.

(4) The PM tells the PF when the PF's call concurs with his/her acknowledgment. If it doesn't concur with his/her acknowledgment, confirm to the ATC facilities.

2.11.3 Information on Radio Telephone and Intercommunication

The Aircraft A is equipped with a device for transmission and receipt outside the aircraft by connecting radio device, as well as for intercommunication among crew members (hereinafter referred to as "intercommunication system").

There are six ICS (Inter Communication System) control panels in total in the intercommunication system, for each pilot, a flight-engineer, and three in rear cabins. There is a switch called monitor switch on the control panel, it is possible to listen to the received sounds of the multiple radios selected by this switch and the aviation navigation facilities at the same time as the intercommunications. The volume can be adjusted with the volume control knob on the same panel. Also, with the microphone select switch on the same panel, it is possible to select a transmission system according to the purpose of use.

2.12 Information Related to Rejected Take-off of the Aircraft B

In the AOR (Supplementary or commentary on the airplane operations manual) of the company to which the Aircraft B belongs, it is described as below concerning the rejected take-off.

(Excerpt)

(2) RTO Policy

1. *RTO Policy Go-Mindedness*

To prevent unnecessary High Speed RTO by making it a company policy that it is generally safer to continue taking-off (Go-Mindedness) rather that rejecting take-off near the V1, "Unless a serious trouble has occurred in continuing take-off."

Whether to reject take-off or continue during a take-off roll, if some trouble occurs, it cannot be uniformly defined, but it is left to the judgment of the PIC, based on various

conditions such as runway length, the weight of the aircraft, and the weather.

2. Procedure

In actual operation, the occurrence of malfunction requiring RTO is extremely rare, so judgment and operation of Go / No Go may be delayed. Therefore, it is important to always review the attitude toward RTO in daily operation.

(4) RTO Procedure

Use Reverse Thrust to the maximum extent possible for direction control. In order to establish the maximum deceleration posture as soon as possible, even with Engine Fire Warning, then use all Reversers.

- *Do the following at the same time*

  Thrust Levers .....Idle

  Brakes.....Verify Operation of Autobrakes or Apply Maximum Braking (When Autobrakes are inoperative or disengaged)
- *Reverse Thrust ..... Maximum Allowable*
- *Continue to apply Maximum Brake until the aircraft has decelerated sufficiently.*
- *Spoiler increases the Brakes effect, so confirm its operation.*

Regarding the use of Brakes, it is important to continue to use until sufficient deceleration, and in some cases use the Maximum Brakes until Full Stop, because there are not few examples of accidents, when released Brakes before decelerated sufficiently.

Also, for re-take-off after RTO, it is required to pay enough attention to Cooling of Brakes.

*(5) **Timing of reading V1***

Regarding the timing of reading V1, as it affects Go / No Go Decision, so it is desirable to read out as follows.

- *PM starts calling of V (vi :) well before V1 reaches about 5 kt, and make sure that the good end of One (wΛn) becomes the V1 Speed.*
- *Start calling of VR and V2 good after becoming their Speeds.*

(Note) On the performance standards, it is assumed that the stop operation has started at the time of reaching V1. Therefore, when recognizing Engine Failure at the time of V1, it conforms to the concept of performance standards to continue the take-off.

2.13 Regulations of the Company to which the Aircraft C Belongs

2.13.1 Regulations Regarding Authority and Responsibility Related to Flight Operations.

The Operations Manual (hereinafter referred to as "OM"), Chapter 2 "Operation policy"

regarding the authority and responsibility related to flight operations (Excerpt)

4. The ultimate responsibility for the safety of flight is in the PIC and its judgment must be respected.

5. If the PIC determines that it is necessary to protect flight safety in emergency situations, it is possible to take the prompt and flexible measures, notwithstanding the provisions of these regulations, including this manual.

2.13.2 Coordination of Pilots

Descriptions regarding coordination between pilots in operation included in the AOM are as follows: (Excerpt)

Normal Procedures-Introduction

Crew Coordination & Scan Policy

Crew Coordination

Take-off and Approach & Landing are the most critical Flight Phases where a close Crew Coordination is required.

Smooth communication between flight crew-members and proper and timely Call-outs are essential for Crew Coordination; however, unnecessary and unrelated conversation shall be avoided as they are an obstacle to the concentration of attention.

Each flight crew-member must have a common understanding of Departure and Approach Plan through take-off briefing and landing briefing.

2.13.3 Operation Implementation Standards for Qualified FO

Regarding implementation criteria when a FO controls, in the OM of the company, Chapter 5 "Crew" and OPERATIONS GUIDE (OG)*20 "FO Right Seat Operation Guide" described as follows: (Excerpt)

(1) OM

5-5-4 Operation Implementation Standard for the Qualified FO

1. *Compliance matter*

When a PIC lets an FO control, it must be followed as stipulated below, in addition to the task allocation as stipulated in the Aircraft Operating Manual.

The PIC, concerning the flight safety, must be aware that a PIC has ultimate responsibility.

(1) PIC must determine a range letting an FO control appropriately, considering the skill, career history, qualification requirements, and situations of the aircraft, weather,

*20 "OPERATIONS GUIDE" means, in accordance with regulations, criteria, of OM and AOM, It is intended to provide to flight crew-members with the information necessary for safely and smoothly carrying out flight operations.

airport and ATC. In addition, when he or she evaluates the situation unfavorable, he or she shall not let an FO control.

(4) The PIC shall call out "You Have" when letting an FO control. To cancel it, change "I Have" to call out and order an FO to return to normal work.

(5) A PIC must strictly monitor the operations of an FO and the condition of the aircraft and must be ready to take over an FO at all times. If he or she judges that an FO's control is unacceptable or the changed circumstance does not allow an FO to continue flying, he or she takes over the controls without delay.

(2) FO Right-Seat Operation Guide

2. Attitude as an Instructor

(2) Responsibilities of a PIC concerning securing safety

It goes without saying that all responsibility for providing safety is in a PIC. In the right-seat flying, the roles as the original PIC and PM Duty plus the instructor role are required. However, we must pay sufficient attention that if the PM duty is neglected it will immediately affect safety, and complete safe flight operations by paying due regards the fact that human ability has a limit.

3. Securing of safety and maintaining operation quality

(1) Restrictions on the instruction enforcement

There are four stages of crew training in the line, nurturing the first officer, steering the right-seat pilot flying, the left-seat pilot flying, the captain training, there are different purposes and qualifications depending on the stage. Of these, right-seat pilot flying, which covers the initial part of a FO's experience, must be carried out in a better operating environment, unlike the later stages.

In a severe operating environment, there are already some rings of Chain of Event, inevitably there are few safety margins, even small mistakes, confusion or even miscalculation is not allowed. The condition for admitting the right-seat pilot flying must be "When there is little fear of occurrence of the abnormal condition and there is sufficient safety margin."

(3) Considerations when letting carry-out flying

① The decline in total performance

The fact that Risk is large for flight by a FO's PF is not necessarily due to the lack of ability for the FO to control the aircraft, there is also a problem in the place where the PIC does not become a good Assistant Pilot (it does not fulfill the role of the FO as much as the FO plays).

If the PIC is in the PM and the Operation of the FO is not satisfied due to deterioration of circumstances, the role of assistance against PF is easy to neglect because the PIC is likely to get caught up in the situation.

In such a case, it is easy for the PIC to make mistakes such as:

- *To be apart from SOP (Forget standard call and instrument monitor, and others);*
- *To get annoyed by forgetting about the necessary instructions, or by issuing an unclear instruction;*
- *To become unclear of the PM duties in Outside Watch / ATC Communication, and others; to Miss the timing of Take-Over*

In order not to fall into such a situation, it is important to have sufficient prior arrangements and a mental attitude that does not hesitate to take over in the daily operations.

Also, the PIC who is too enthusiastic about education is likely to fall into a similar situation, there are examples of resulting in missing of ATC, forgetting to operate the equipment, deviation of the taxiway.

(4) The Operation handover and Take-Over

② *Take-Over*

(a) *Take-Over means to change the control by interrupting the FO's control. This is an important act to secure safety based on the judgment and responsibility of the PIC and at the same time to avoid loss of quality of LINE operation. Also, in a Take-Over at the time of approach landing, neither the PIC nor the FO should hesitate to make a Go-Around without sticking to the subsequent landings, as described in the Operations Manual.*

(b) Take-Over should not be done after encountering a Critical situation, rather it should be done in order not to become Critical.

(5) Precautions when implementing right-seat pilot flying

(b) Determine appropriate scope of the FO's right-seat flying from various operating environments and the FO's qualifications and experience and others. It goes without saying that it is not safe if the criteria for implementation is met, and it is the PIC itself that ultimately guarantees the safety and the quality of Line operation.

(c) A PIC should, in addition to the original duties as the PIC, it should simultaneously fulfill one of three roles as a PM and an instructor's role, it is necessary for each crew to recognize well and to operate so that the Total Performance in the cockpit does not degrade.

2.13.4 Regulations Concerning Go-Around

(1) Regarding Go-Around, it is described in the OM Supplement as follows: (Excerpt)

Ⅳ－３６ Go-Around Mindedness

1. Go-Around is the best and the last measure to interrupt an unstable approach or to avoid a dangerous landing, the decision being left to the flight crew.

The PIC and other flight crews always make a top priority on ensuring flight safety and shall not hesitate to Go-Around. Also, the company does not call the judgment in question.

2. Go-Around must be implemented immediately in the following cases:

(2) When there is a doubt if a safe landing could be carried out or not even if weather conditions are within the stipulated limits.

(5) When instructed from ATC.

3. When either PF or PM judged that Go-Around is necessary, immediately call to that effect and the PF has to perform a pilot operation of Go-Around. In addition, flight crews in the formation inside the cockpit must positively advise, as necessary. In addition, if the FO is in the right-seat and the PF Duty, control should be performed by the PIC, but the initial control can be performed by the FO.

(2) Notes on Go-Around are described in AOM and PFTG as follows: (Excerpt)

① AOM

Normal Procedures-Amplified Procedures

Landing Roll Procedure

WARNING: After operating of Reverse Thrust Levers, Full Stop Landing must be conducted. When engines are in Reverse, an aircraft cannot fly safely.

② PFTG

Go-Around after Touchdown

For the following reason when Thrust Reversers is initiated after landing, Full Stop must be done.

- *It takes 5 seconds for the movement from Reversers to the Forward Thrust Position.*
- *There is a possibility that Reversers may not return to Forward Thrust Position.*

2.13.5 Training of Crew Members

(1) Training by Simulator

In flight crew promotion training for the PIC and the FO of the simulator training of the company to which the Aircraft C belongs, a state is simulated where a take-off airplane makes an incursion into the runway at the judgment of the instructor, the go-around training is carried. In periodic training, the training subjects for weather deficiency and restoration by instructions from the ATC had been defined and the PIC and the FO had carried-out the same subject; however, the training subjects for go-around due to unexpected events that require the own judgment of pilot were not prescribed.

(2) Education and information provision on Anticipating Separation [*21]

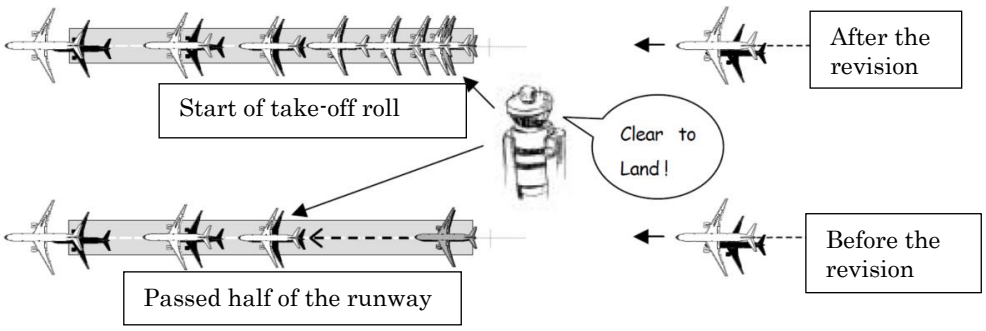
At the time of revision of the ATC Operational Procedure in August 2008, the company to which the Aircraft C belongs issued the "Operation News" (introducing knowledge, case examples, and articles that should preferably be known by each flight crew member and the relevant organizations). Among them, the landing clearance applying the Anticipating Separation is described as follows: (Excerpt)

Operations News (issued on August 22, 2008)

<<Revision concerning clearance to take-off and landing>>

3. Concerning the landing clearance applying the Anticipating Separation

In the case of landing following the take-off airplane, it has been the condition for the landing clearance issuance ***that the take-off airplane has passed through half of the runway*** *until now, since this distance depends on the runway length and it is not uniform in reference to the FAA standard,* ***if the departure airplane has started a take-off roll, a landing clearance will be issued*** *from now on.*



Currently, as an educational material on ATC at the time of the FO promotion training in the company, the Operations News are also used as additional Air Traffic Control Operational Procedure.

2.13.6 Landing Performance

The company to which the Aircraft C belongs is loading a leaflet called Performance Quick Reference in the cockpit so that the flight crew-members can obtain reference performance information on take-off and landing during flight. When estimated from the leaflet of the required landing runway length[*22] for an estimated landing weight 101, 464 lb at the occurrence of this serious incident on the sea level as of the standard atmospheric condition and the landing distance when using the autobrakes are as follows:

(1) Required landing runway length: Approximately 4,270 ft (about 1,300 m)

(Runway threshold passing height altitude 50 ft, flap position: 30, reference landing

*21 See 2.14.5 for "Anticipating separation".

*22 "Required landing runway length" is the landing distance multiplied by the safety factor.

speed Vref [*23]: 128 kt, touchdown point: 1,000 ft from the runway threshold, brake: maximum manual braking forces)

(2) Landing distance when autobrakes are maximum: Approximately 4,140ft (about 1,260m) (Runway threshold passing height altitude 50 ft, flap position: 30, target approach speed over runway threshold Vapp[*24]: 137 kt, touchdown point: 1,500 ft from the runway threshold)

2.14 Air Traffic Control (ATC) Operational Procedure

ATC Operational Procedure in Japan is defined by Civil Aviation Bureau (CAB) of Ministry of land, Infrastructure, Transport and Tourism (MLIT) in III ATC Procedure, Fifth ATC Service Regulations of Air Traffic Service Procedure Handbook (hereinafter referred to as "ATC Operational Procedure") and it stipulates regarding the separation and the like as follows:

2.14.1 General Provisions, Applicability

In carrying out the service, the controllers shall handle the service using their best discretion in case they encounter situations that are not provided for in these standards.

2.14.2 General Applicability, Workload

A controller shall take care that, in carrying out the services, the operational condition of the ATC equipment, communications traffic, proficiency of controllers, and others is taken into consideration and does not exceed the limit of workload in order that the work may be processed safely.

2.14.3 Control Separation between Departing and Arriving Aircraft

(Ⅲ) 3 (2) [separation on same runway]

(1) The separation between aircraft executing take-off/landing shall be set according to the following standards, and specified by visual observation.

(2) The separation between aircraft using the same runway shall be according to the following standards:

c. The succeeding arriving aircraft shall not pass the runway threshold until the leading aircraft is in any one of the following states:

(a) The preceding departing aircraft has passed the runway end or turned above the runway, thereby eliminating danger of collision. (Figure (2) - 6)

*23 "Vref" means the reference speed at landing.

*24 "Vapp" means the speed added at the judgment of the PIC at arbitrary speed (5 to 20 kt) to landing reference speed (Vref) in order to cope with external factors such as wind during entry.

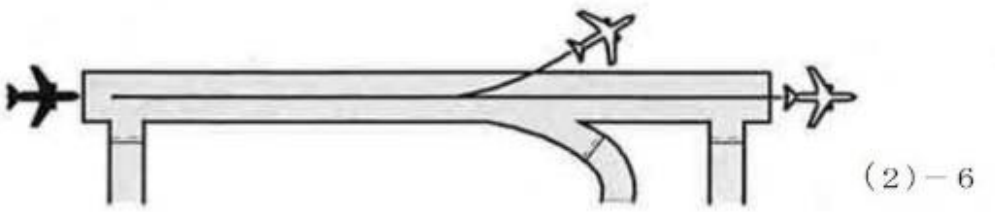


Figure 3: Separation between take-off and landing aircraft

2.14.4 Landing Clearance with Reduced Separation

(Ⅲ) 3 (6) Reduced separation

Notwithstanding the provisions of (1) and (2) a and c in the case where a Controller can confirm a separation on a runway by means of ground marker and other things, a following reduced separation can be applied to the aircraft that take-off and landing using the same runway.

Note: The airport control tower shall not reduce the separation pertaining to wake turbulence control rules.

c. Between departing and arriving aircraft:

In the case where the preceding departing aircraft has taken off to pass a following distance from the runway threshold, the successive arriving aircraft may pass the runway threshold.

*(c) Between category Ⅲ aircraft [*25], or between a category Ⅲ aircraft and a category Ⅰ aircraft, or a category Ⅱ aircraft: 1,800 meters (6,000 feet) (Figure (6)-4)*

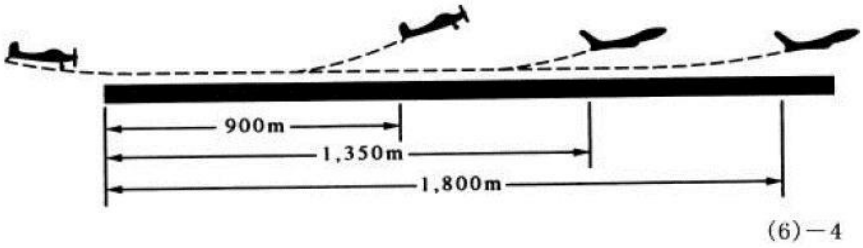


Figure 4: Shortened separation

Both the Aircraft B and the Aircraft C are the Category Ⅲ aircraft, the distance when applying the reduction of the separation between the two aircraft, is 1,800m, as is described in c(c) above.

*25 "Category Ⅲ aircraft" means aircraft belonging to Ⅲ of the aircraft categories divided into 3 stages (Ⅰ, Ⅱ and Ⅲ). Category I aircraft refers to a single propeller aircraft and all helicopters, Category Ⅱ aircraft refers to a twin propeller aircraft with maximum take-off weight of 12,500 pounds (5.7 tons) or less, Category Ⅲ aircraft refers to all aircraft other than Category I aircraft and Category Ⅱ aircraft.

2.14.5 Regulations on Landing Clearance

(Ⅲ) 2(8) [Landing clearance]

(8) a. Landing clearance (including a low approach-clearance, a touch-and-go clearance, stop- and-go clearance and an optional approach clearance, the same shall apply hereinafter) shall be issued according to the following procedure without delay, after the relevant aircraft arrives at the position specified in 3(2), (4), (5) and (6), or when it is determined that a separation specified in 3(2) (except for a(c) and c(c)), (4), (5) and (6) can be established. In the case where the landing clearance is issued before the leaving aircraft is in prescribed states, traffic information pertaining to the relevant aircraft shall be provided. The preceding departing aircraft from the same runway or intersecting runway must have commenced the take-off roll.

(The underlined part is called the Anticipating Separation. The underline was given by JTSB.)

b. In the case where a landing clearance cannot be issued even when the arriving aircraft arrives at a point two nautical miles from the runway threshold (the final approach in the case of an arriving aircraft by way of a traffic circuit pattern), information pertaining to the leading aircraft shall be issued as far as possible.

d. Irrespective of timing of issuing take-off/landing clearances, in the case where it is determined that a separation on the runway cannot be established when the arriving aircraft passes the runway threshold, a go-around shall be instructed.

The landing clearance based on this Anticipating Separation was introduced in the revision applied on August 28, 2008, and regarding the Anticipating Separation before it, according to the ATC Operational Procedure, except for the cases where the preceding departing aircraft is applied with a distance less than one half of the runway length as an interval, it had to pass through the middle part of the runway length being used.

As a reason for this revision, Air Traffic Control Division of CAB stated that in the case of landing following the take-off aircraft, it has been the condition for the landing clearance issuance when applying the Anticipating Separation was that ***the take-off aircraft has passed through half of the runway conventionally,*** since this distance depends on the runway length and it is not uniform, with reference to the FAA standard[*26], ***A landing clearance will be issued after the departing aircraft has commenced take-off roll.***

Prior to the revision of this ATC Operational Procedure, at the 29th ATS Symposium (With the cooperation of Air Traffic Control Division) held by Japan Pilot Association in October 2007,

*26 "FAA standard" is the definition of "FAA standard" as described in FAA ORDER 7110-65 R: "Landing clearance to succeeding aircraft in a landing sequence need not be withheld if you observe the positions of the aircraft and determine that prescribed runway separation will exist when the aircraft cross the landing threshold." <tentative translation>

a research presentation was made about the merits of pilot (arriving aircraft) and controllers of the revision plan related to the Anticipating Separation. At the time, the distributed materials included the description as follows. (Excerpt)

The 29th ATS Symposium Material

(1) Benefits of pilot

·A Landing Clearance by Anticipating Separation reduces the amount of communication during the final approach, also, since the pilot is released from psychological pressure to continue entering a runway without a landing clearance, it can be devoted to control and is very effective in practicing a Stabilized Approach.

·By implementing a Stabilized Approach, the control of the aircraft becomes easy in the final approach, the pilot has a margin for operation, external environmental changes such as wind shear and external situation monitors of traffic and the like can be done sufficiently; accordingly, comprehensive safety improvement can be expected.

(2) Benefits to air traffic controller

·If Anticipating Separation is not applied, the controller should always continue to strain their nerves on the relationship between the arriving aircraft and the departing aircraft in order to measure the timing for issuance of the landing clearance; however, by applying this, when the arriving aircraft approaches the runway threshold it is only necessary to confirm "Is the runway really clear?"

·By reducing communication volume, it is possible to relocate the workload to other tasks necessary for safety, such as external situation monitor and proactive dissemination of traffic information, procedures necessary for ATC.

·By issuing a landing clearance with affording, undesirable circumstances can be avoided, including Landing Clearance cannot be issued due to transmission from another aircraft, and as a result of this, "Landing without Landing Clearance" or "Although the runway is vacant it will execute a go-around as no clearance cannot be issued."

·That is, the Anticipating Separation is a method that can cope with busy situations where the separation is tight and the communication load is high.

2.14.6 ATC Operational Procedure for Helicopter at Naha Airport

The ATC operational procedure for the helicopter at the Airport is set as follows for the second Aerodrome Control Operational Procedure of Work Processing Procedure and it was well-known to helicopter operators. (Excerpt)

The Control Procedure for Helicopter Flight

The helicopter control procedure except when taking off and landing using the runway shall be as follows:

(1) Take-off and landing

a. Take-off and landing can be made to use the taxiway except for those caused by the instrument flight rule. However, a helipad shall be used on the taxiway B.

b. The take-off clearance shall be issued in the order of (1) wind direction and wind velocity (2) take-off clearance (3) take-off place.

d. The take-off and landing at the Taxiway A and the helipad, when all of the following conditions are satisfied, can be done simultaneously. At that time, as necessary, caution information such as a wake turbulence to related aircraft shall be provided.

(A) The meteorological condition of the airport is in visual meteorological conditions.

(B) Appropriate traffic information can be provided.

(C) The visual separation can be established.

(D) It must be the same direction as the direction of use of the runway.

e. When letting to cross the runway use the following terms.

Terms: (Runway in service) CROSS OVER RUNWAY [number].

(For closed runway) CROSS OVER RUNWAY.

2.14.7 ATC Term "STAND BY"

As to the control term "STAND BY" used by the Tower trainee, is specified in the ATC Operational Procedure (I) General 5. For radio communication as follows;

[Guidelines for transmission] (Excerpt)

e. The following terms are used for communication.

English	*Japanese*	*Meaning*
STAND BY	*スタンバイ*	*Wait and I will call you.*

<Reference>

ＳＴＡＮＤＢＹ *"Wait and I will call you."*

(ICAO Annex 10 Vol.Ⅱ[*27] excerpt) *Note. - The caller would normally re-establish contact if the delay is lengthy. STANDBY is not approval or denial.*

Ｓｔａｎｄ ｂｙ－ *Means the controller or pilot must pause for a few seconds, usually to attend other duties of a higher priority. Also, means to wait as in "stand by for clearance."*

(FAR AIM[*28] excerpt)

*27 "ICAO Annex 10" means the 10th Annex to the International Civil Aviation Convention, which describes international standards and recommendations on aeronautical communications.

*28 "FAR AIM" describes basic information of FAR, which stands for the Federal Aviation Regulations is a collection of rules prescribed by the Federal Aviation Administration (FAA), for flying in the United States and procedures concerning ATC and others.

The caller should reestablish contact if a delay is lengthy. "Stand by"
Is not an approval or denial.

2.15 Training of Controllers

2.15.1 Training Situation at the Occurrence of the Serious Incident

At the Tower, as an air traffic controller at Naha aerodrome control facility, during training to acquire qualification for aerodrome control service, the Tower trainee, who was at the final stage of the training related to the Tower, was carrying out on-the-job training (OJT) under the Tower Supervisor A, accompanied by fighter aircraft return. Because the Tower trainee began training during the time when Tower supervisor B was in charge of the Tower, at the end of the charge time of the Tower supervisor B, the Tower supervisor B was replaced to the Tower supervisor A, the Tower trainee kept training regarding ATC of fighter aircraft.

Under such circumstances, the Tower supervisor A judged that it was possible to let the Aircraft C make the landing after the take-off of the Aircraft B by applying the reduced separation and the Anticipating Separation, cut in the radio communication that the Tower trainee was doing and gave the Aircraft B the instruction to line up the runway and wait.

2.15.2 Training by Simulator

The Aerodrome simulator is in place at the Naha aerodrome control facility, a training syllabus using this simulator assuming a reduced separation and the Anticipating Separation and others were not prepared.

2.16 Operation of Naha Airport Traffic Control Tower

2.16.1 Aerodrome Control Service

The aerodrome control service of the Naha aerodrome control facility provided to the aircraft taking-off and landing at Naha Airport, the aircraft flying in an airspace of less than 2,000 ft in a circle with a radius of 5 nm from the Airport reference point, and to the aircraft taxiing on the ground at the Airport. Also, at the Aerodrome control services are provided not only to the regular flights, to small aircraft and rotorcraft of private and government agencies, and to various models of aircraft of the SDF and others, and especially in the control of fighter aircraft, skills corresponding to their specialty are required.

2.16.2 Status of the Control Room of Naha Aerodrome Control Facility

At the control room of Naha Aerodrome Control Facility, the layout of the Controllers is as shown in Fig. 5, and when this serious incident occurred, the Tower trainee and Tower supervisor A were performing the Tower work.

The active runway when this serious incident occurred was the Runway 18, the position at which the Aircraft B commenced take-off roll and the position at which the Aircraft C landed was on the right side as seen from the control Tower, and the taxiway where the Aircraft A took off was on the left side as seen from the control Tower. (See Photo 4)

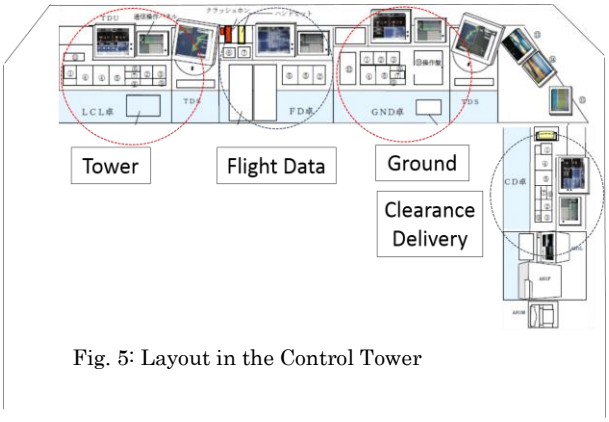


Fig. 5: Layout in the Control Tower

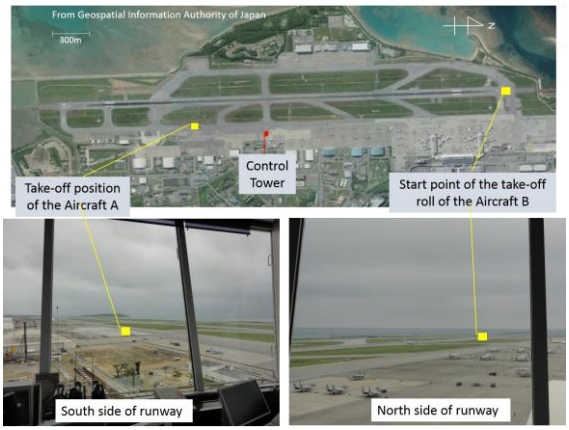


Photo 4: Position relationship of the Control Tower, Aircraft-A and Aircraft-B

3. ANALYSIS

3.1 Qualification of Pilot and Controller

The Pilots of the Aircraft A had a valid Pilot competence certificate and an Aviation medical examination certificate issued by the Ministry of Defense. The crew members of the Aircraft B and the Aircraft C had valid airman competence certificate and valid aviation medical certificate. The air traffic controller had valid air traffic controller qualification certificate and valid aviation medical examination certificate.

3.2 Airworthiness Certificate of the Aircraft

The Aircraft A underwent an aviation technical inspection which is equivalent to airworthiness certificate conducted by the Ministry of Defense, and the Aircraft B and the Aircraft C had a valid airworthiness certificate and all of them had been maintained and inspected as prescribed, no data and statement of indicating the abnormality.

3.3 Relations to the Meteorological Conditions

It is considered highly probable that the meteorological conditions on the day of the serious incident had no relation to the occurrence of the serious incident, as described in 2.1.4 (1) and 2.6.

3.4 Relations to ATC communications

As described in 2.7, the air-ground communication facilities were operated normally, and there were no obstacles to radio waves and equipment that would interfere with communication between the Tower and the Aircraft A, B and C, respectively

However, as described in 2.8.2, the read back of Aircraft A, which made a mistake to take-off clearance for its own, was overlapped with the read back of the Aircraft B and was so small that could not be recognized by the receiving voice of the Tower at that time, no noticeable background noise was occurred.

As a result, the Tower controllers could not be aware that the Aircraft A made a mistake with the take-off clearance to the Aircraft B for their own aircraft.

This is probable that it is due to the involvement of the characteristics of the VHF radio telephone receiver described in 2.8.1, and it is the limit of ATC communication using VHF radio telephone.

It is somewhat likely that in the current state of the VHF radio telephone receiver of the present ATC facilities, when two or more aircraft simultaneously transmit signals to the ATC facilities at the same frequency, the weaker signal transmission form an aircraft is suppressed when received by the receiver of the ATC facilities and there is a possibility that a phenomenon that the control agency cannot perceive the received signal perceive at all in the future.

When aircraft transmit on the same frequency at the same time, it is desirable that CAB inform the persons involved ATC communications that the air traffic controllers might be unable to recognize the situation.

3.5 Take-Off of the Aircraft A

3.5.1 Visual Confirmation at Take-Off

As described in 2.1.2 (2), the Aircraft A took off from the Taxiway A-5 parallel to the Runway 18 while hovering the nose toward the take-off direction. In this case, it is probable that the Pilot who was seated in the right-seat could not sufficiently visibly recognize the condition of the take-off and landing aircraft on the runway.

For this reason, the Pilot pronounced "Final check" at 13:23:23 as described in the Attachment 2 (ATC communication record and situation of the Aircraft) and as described in 2.1.2 (1) he instructed the Load-master for the visual check to confirm the status of the take-off and landing aircraft. It is probable that this is considered to be carried out to strengthen the watch as described in 2.11.2 against it at 13:23:24 the Load-master called by calling that "Final one nm" to convey the information only about the aircraft on the final approach course, and about six seconds later he reported to the PIC again that the Aircraft B was making a take-off roll. It is somewhat likely that the Load-master was intensively looking at solely on the final approach course from the voice of the

Pilot's "Final", as a result of it, there is a possibility that he may have been delayed to notice the Aircraft B on the runway that had commenced take-off roll. As the Pilot had let the Load-master carry out the visual confirmation of the range that he could not perform by himself, it is considered necessary to give a concrete instruction with the intention of the Pilot requiring the visual confirmation of the take-off and landing aircraft could be correctly conveyed to the Load-master.

Also, as described in 2.11.1, no education for the Load-master concerning ATC communication, including outside watch which was given as one of the duties, had been implemented. When letting the Load-master conduct outside watch to ensure air traffic safety in cooperation with the Pilot, it is considered also necessary to implement education on knowledge such as ATC communication.

3.5.2 Misunderstanding of the Take-Off Clearance

As described in 2.1.2 (1), it is highly probable that the Pilot understood to prepare for departure as "STAND BY DEPARTURE" with the instruction of "STAND BY" issued by the Tower trainee. Also, because the Pilot did not recognize the existence of departing aircraft other than their own aircraft, it is somewhat likely that he did not feel it strange when he heard only the word "IMMEDIATE TAKE-OFF" which he was able to hear in the take-off clearance to the Aircraft B given by the Tower. In addition, it is probable that when hearing the read back of the Co-Pilot, who misunderstood the take-off clearance to the Aircraft B as the one to their own Aircraft, the Pilot recognized that their Aircraft was cleared for take-off, and did not confirm the content, misunderstood that clearance as the one to their own clearance.

Meanwhile, the reason for the Co-pilot misunderstood the clearance for take-off to the Aircraft B for their own was, as described in 2.1.2 (2) was that while the Co-pilot recognized the congestion at the airport, when requesting a take-off clearance to their own, following to the "STAND BY" instruction from the Tower, the hovering clearance was given against their request to the Tower, and immediately after the Pilot commenced operation for hovering, although there were some unclear parts, the take-off clearance to the Aircraft B could be heard including "IMMEDIATE TAKE-OFF," and the Co-pilot also did not recognize the existence of a departing aircraft other than their own, it is probable that they misunderstood that a take-off clearance was given and read back. In addition, the Co-pilot, because there was nothing to point out from the Tower, from where he could not hear the read back of the Tower in response to the read back made by himself against the clearance for take-off given by the Tower, it is highly probable that the he was not aware that he misunderstood the take-off clearance given to the Aircraft B for their own.

In the case where the Pilot could not hear contents of ATC communication even partly or uncertain of it, it is considered necessary to make basic correspondence to request for confirmation from the ATC facilities. In addition, as described in 2.1.2(1) and (2), it is considered to be an effective means for the ATC communication that does not occur misunderstanding to determine a procedure

in order to securely understand the contents of the ATC communication.

As described in 2.1.2 (2), the Co-pilot, when being instructed to stand-by with the call "STAND BY" from the Tower in response to the take-off request made by himself, read back the instruction and requested for a clearance of hovering, it was required to understand the meaning of the "STAND BY" specified in the standards for ATC Operational Procedure described in 2.14.7.

3.5.3 Intercommunication System

As described in 2.11.3, the Aircraft A is equipped with a device for intercommunication system with which communication among crew members and the receiving sound, multiple radio telephones and the radio air navigation facilities can be heard at the same time.

As described in the Attachment 2 (ATC Communication Record and Situation in the Aircraft) when this serious incident occurred, an intercommunication call for air traffic information provided by the Load-master to the Pilot started from 13:22:49 was overlapped with the call sign for the take-off clearance provided the Tower to the Aircraft B started from 13:22:50. As a result of this, it is somewhat likely that the Pilot and the Co-pilot could not hear the call sign part of the take-off clearance transmitted by the Tower to the Aircraft B.

On the structure of the aircraft, although it is necessary to use the intercommunication system for in-flight communication, it is probable that it is necessary to devise in operational aspects such as setting priority according to importance and timing of in-flight communication.

3.6 Rejected Take-Off of the Aircraft B

Because the request for take-off made by the Aircraft A at 13:22:32 and the transmission concerning a request of hovering made at 13:22:40 as described in 2.1.1 were not recorded in the CVR of the Aircraft B, the crew members of the Aircraft B were in the situation that they could not hear the transmissions, it is highly probable recognizing that the Aircraft A was staying on the taxiway A-5, paid attention to its trend, as described in 2.1.3(1). It is highly probable that the PIC was sufficiently aware of the danger of high-speed RTO as the speed of the Aircraft B was reaching to V1, as he being in the situation that he was not able to determine the flight direction of the Aircraft A taking departure course of his Aircraft, and because he felt a serious danger in the continued take-off; therefore, it is highly probable that he made a decision to reject the take-off and commenced rejected take-off operation at the same time when he exclaimed "Reject."

As described in 2.1.3 (2), the FO, when hearing the exclamation of "Reject" by the PIC, and after confirming that all rejected take-off operations were properly performed, it is highly probable that he promptly reported the rejected take-off to the Tower.

3.7 Landing of the Aircraft C

3.7.1 Situation to Landing

(1) Trends of the Aircraft B and Possibility of the Go-around

As described in 2.1.4 (1) and (2), it is highly probable that the separation from the preceding IFR aircraft was 7-7.5 nm when the Aircraft C was approaching Naha Airport. Although this separation caused recognition of congestion to the PIC and the FO of the Aircraft C, it is probable that it did not make them feel a sense of incongruity in particular.

As described in 2.1.1 and the Attachment 2 (ATC Communication Record and Situation of the Aircraft) the PIC and the FO of the Aircraft C talked about the possibility of the go-around caused by the separation with the Aircraft B, and mentioned, among them, about the altitude to maintain when executing the go-around. This act is probable that making confirmation of the important part for the go-around procedure, and as described in 2.13.2, to have been done to have common recognition with the PIC.

(2) Landing Clearance and Commence of Take-off of the Aircraft B

At the timing when the landing clearance was issued and it was confirmed that the Aircraft B commenced a take-off roll, it seems that the PIC of the Aircraft C judged, as described in 2.1.4 (1), that the possibility of executing a go-around responding to the trend of the Aircraft B was low risk, and it was not in a severe situation where the go-around is required even if the approach was continued.

The PIC of the Aircraft C, when visually recognized that the Aircraft A crossed over the runway ahead of Aircraft B, focused on the trend of the Aircraft B for a moment, it did not seem that its speed slowed down rapidly. Meanwhile, the FO, because the Aircraft A flew to the west, thought that the Aircraft B would continue the take-off. From these facts, it is probable that the PIC and the FO judged that it did not fall under the circumstances where it was necessary to execute the go-around; accordingly, they continued the approach.

(3) Rejected Take-off of the Aircraft B

As described in 2.1.1 and the Attachment 2 (ATC Communication Record and Situation of the Aircraft) at from 13:23:42 to 13:23:47 the Aircraft B reported the rejected take-off to the Tower. However, because the PIC and the FO of the Aircraft C were unable to hear such report, judging that it does not fall under the circumstances of the executing go-around as described in 2.13.4(1), it is probable that they continued the approach.

As a reason for the PIC and the FO of the Aircraft C were unable to hear the report of the rejected take-off by the Aircraft B was, that from 13:23:37 to 13:23:41, five seconds before such report, they were engaged in a conversation concerning the Aircraft A and the Aircraft B, that the 100 ft automatic call was activated at 13:23:41, and that they were engaged in a conversation concerning the Aircraft A at from 13:23:43, while the timing for touch-down of

the Aircraft, it is somewhat likely that their attention was oriented to the situation that could not be imagined normally that the Aircraft A crossed-over in front of the Aircraft B.

(4) Decision of Landing

As described in 2.1.4 (1) and Attachment 2 (ATC Communication Record and Situation of the Aircraft), it is probable that, at the time when the FO of the Aircraft C started flare, PIC recognized the existence of the Aircraft B on the runway, by taking over control from the FO just before touch-down and continued the landing. Regarding the continuation of the landing, while being cleared to land, although he could not confirm the trend of the Aircraft B, from the PIC's experience on the same type of aircraft and at Naha airport as described in 2.1.4 (1), and the landing performance of the Aircraft C as described in 2.13.6, even when they continued the landing, the PIC judged that it could land safely; therefore, the PIC acted according to circumstances in order to ensure the safety of the aircraft as was described in 2.13.1. Also it is somewhat likely that the judgment is related to the fact the PIC could not confirm the trend of the Aircraft A which had crossed over the runway.

Regarding the landing, although the Aircraft C was instructed to execute a go-around from the Tower, it is probable that since the reverse thrust operation had been already started at the time when the PIC recognized the instruction to execute a go-around, they did not execute it according to the rules described in 2.13.4 (2).

3.7.2 Operating Environment During Right Seat Operation by the FO

At the time of the serious incident, as described in 2.1, the FO was in charge of the PF, and the PIC was in charge of the PM. As described in 2.13.3 (2) on the "Responsibilities of the PIC concerning securing safety" in the FO Right-Seat Operation Guide (OG), it is probable that the PIC is required to play a primary role as the PIC and the role of instructor, in addition to be in charge of the PM work. Also, in "the Restrictions on the instruction enforcement," it is so described that in the right-seat operation, which widely covers the initial part of the FO's experience, must be carried out in a better operating environment, unlike the later stages. Additionally, in the "Considerations when letting carry-out flying, the decline in total performance was referred to and in the "Operation handover and Take-over" it is so described that Take-over should not be done after encountering a critical situation, but rather it should be done in order not to become critical.

It is probable that the PIC might take over at an early stage, when the occurrence of this serious incident, the PIC took over, however, from the above description, in order to prevent falling into a critical situation.

3.7.3 Training of Crew Members

As described in 2.13.5 (1) in the periodic training of simulator of the Company C, the training

subjects for go-around due to unexpected events that require the own judgment of the crew members were not executed. Although there are limits to the events that can be experienced by the simulators, it is required to enhance the training contents in accordance with more actual operations by such as simulating the situations where crew members' judgment is required.

As described in 2.13.5 (2), the company to which the Aircraft C belongs provided education and provision of information concerning the Anticipating Separation; however, the specific contents which the crew members should take note were not included in them. It is desired for the company to verify and clarify the points to be noticed by the crew members and notify those points to them.

3.8 Response of Air Traffic Controllers

3.8.1 Recognition Concerning Take-Off of the Aircraft A

As described in 2.1.5 (1) and (2), when this serious incident occurred, the Tower trainee was carrying out control on-the-job training (OJT) under the Tower supervisor A of the Tower mainly on fighter aircraft recovery. Just before the landing of the last F15, the Tower supervisor A cut in to the radio, and asked the Aircraft B as to whether it was possible to execute an immediate take-off, and as the Aircraft B acknowledged it, he instructed the Aircraft B to line up into the runway and wait.

Around this time the Aircraft A requested a take-off clearance from the Tower. As described in 2.1.5.(1), at that time, the Tower trainee judged that it was not a situation to approve a take-off to the Aircraft A, and could not afford to respond to it to instruct for wait a while by using the word "STAND BY" as described in 2.14.7. However, immediately after that, he issued a clearance for hovering request which was rendered by the Aircraft A at the same time with the read back. As described in 2.1.1 and the Attachment 2 (ATC Communication Record and Situation of the Aircraft), a take-off clearance was issued to the Aircraft B, approximately three seconds after the completion of the read back of the hovering clearance to the Aircraft A.

Because the read back of the Aircraft A to the Tower by misunderstanding the take-off clearance to the Aircraft B for their own was overlapped with the read back by the Aircraft B as described in 3.4, the Tower was unable to hear it. For this reason, it is probable that the Tower did not assume that the Aircraft A would take off.

In addition, it is somewhat likely that even after issuing the take-off clearance to the Aircraft B, the Tower trainee and the Tower supervisor A, as described in 2.1.5(1), (2) and 2.16.2, were paying much attention in the direction of the runway 18 threshold and its final approach course, both were located on the right side as seen from the control tower and, is possibly having been involved in being further delayed to be aware of the Aircraft A that took off from the taxiway A-5 which was located on the left side as seen from the control tower.

3.8.2 Application of the Anticipating Separation

As described in 2.14.3 and 2.14.4, it is probable that the take-off clearance to the Aircraft C was issued after having applied the Anticipating Separation of the distance that was prescribed by standards for ATC Operational Procedure at the same time as the Aircraft B commenced take-off roll. As described in 2.1.1 and the Attachment 2 (ATC Communication Record and Situation of the Aircraft), the issuance timing of the landing clearance to the Aircraft C was immediately after the time when the Aircraft B started take-off roll, at this time, the separation between the Aircraft B and the Aircraft C was about 2,470m, as described in Figure 1: Estimated Position Relations③; therefore, it is probable at this point the Tower trainee and the Tower supervisor A judged that 1,800m as prescribed in standards for ATC Operational Procedure could be satisfied, as described in 2.14.4.

The landing clearance by applying the Anticipating Separation, as described in 2.14.5, can help a pilot during the final approach continue the stabilized approach, and the controller can create to afford such monitoring other related aircraft; therefore, it is probable to be thought that improvement of safety can be expected. Besides regardless of the timing for issuing a landing clearance, if it is judged that an enough separation cannot be established on the runway by the time when the arriving aircraft flies over the runway threshold, it is so specified that the controller shall instruct a go-around.

However, when this serious incident occurred, after issuing the landing clearance to the Aircraft C by applying the Anticipating Separation, as described in 2.1.5 (1) and (2), the Tower trainee and the Tower supervisor A recognized that the separation between the Aircraft B and the Aircraft C was not enough compared to the regulation; therefore, it is probable that it was not enough for them to monitor other related aircraft as they were concentrated too much on the separation between the aircraft in order to instruct the Aircraft C to execute a go-around if the separation on the runway was not established. From this, it is probable that they were delayed in the response to the unexpected take-off of the Aircraft A, and to the correspondence after the report of a rejected take-off performed by the Aircraft B, they lost an opportunity what was prescribed in standards for ATC Operational Procedure for the timing of the instruction of executing a go-around to the Aircraft C.

It is considered highly probable that in conducting operations, as described in 2.14.2 on the standards for ATC Operational Procedure, care must be taken by taking into account of the communication volume and the skill level of the controllers, in order that the limit of work volume that can be handled safely.

Recognizing again that the landing clearance applying the Anticipating Separation is a means to create a margin for improving safety, it is important in cases where it is hesitated about the providing of the separation by a question and a judgment, or when the situation of the relevant

aircraft has been changed, to cancel the landing clearance or to instruct to execute a go-around without hesitation. In addition to that time, it is probable that it is necessary to give instructions with a margin while considering the necessary time for communication.

When this serious incident occurred, as described in 2.1.5 (2), it is probable that there was a possibility that the prescribed separation between the aircraft could not be provided in the landing clearance for the Aircraft C by applying the Anticipating Separation, at the time when the Tower supervisor A felt the delay to start of a take-off roll of the Aircraft B. The Tower controller should have prioritizing safety, given instruction of executing a go-around to the Aircraft C at an early opportunity or providing of a safe separation between the two aircraft.

Also as described in 2.14.5, the landing clearance by applying the Anticipating Separation, it is effective for the air traffic controllers when it is in the busy situation, such as the separation is tight and communication load is high. However it is probable that in the occurrence of this serious incident, by applying the Anticipating Separation together with reducing of the separation, the Tower controller could not take his eyes off the separation between the Aircraft B and the Aircraft C, even after issuing the take-off clearance for the Aircraft C. It is somewhat likely that the landing clearance by applying the Anticipating Separation in a situation where the separation is close to the specified minimum separation would be a burden for the air traffic controllers.

In addition, in the standard for ATC Operational Procedure there is no provision stipulating concrete guidelines how the air traffic controller should correspond in the situation of the rejected take-off when this serious incident occurred. This is why the generation pattern of the incident of rejected take-off is not uniform, as described in 2.14.1, in the event that the air traffic controller encounters a situation not specified in the standard for ATC Operational Procedure should be conducted based on the best judgment. It is desirable for CAB, in order that it could be flexibly responded to the situation depending upon the change in the circumstances, to analyze cases like this serious incident and share the results.

3.9 Training of Air Traffic Controllers

The Tower supervisor A cut in the radio communication and instructed the Aircraft B to line up the runway as described in 2.1.5 (2), was because he gave new task besides the training subject of the day to the Tower trainee thinking that he would like the Tower trainee to experience control of tight separation. This is because, as described in 2.9 and 2.16.1, Naha Airport is a crowded airport, and from the fact that the ATC is being carried out for various aircraft of different flight performances, consisting of private aircraft and SDF units including fighter aircraft, it is probable that the Tower supervisor A judged that it is a good training opportunity to acquire skills corresponding to such actual conditions.

This new task is thought to have caused a change in the flow of traffic intended by the Tower

trainee; however, when the Tower supervisor A asked the Aircraft B whether it was possible to take off immediately, it is probable that the Tower trainee understood the intention of the Tower supervisor A to let the Aircraft B take off before the landing of the Aircraft C and carried out the correspondence after that.

The Tower supervisor A, as described in 2.1.5 (2), was planning to make the decision whether or not to let the Aircraft C execute a go-around; however, it is probable that, because it was a new task given by himself, he intended to hold the instruction for the go-around while ascertaining the correspondence of the Tower trainee until the limit of the time, and tried to instruct the Tower trainee to execute the go-around.

However, both the Tower trainee and the Tower supervisor A, despite the providing of the separation between the Aircraft B and the Aircraft C became strict, without positively instructing to execute a go-around and upon reaching an extreme timing where it must be instructed finally, by taking off of the Aircraft A and reported of rejected take-off of the Aircraft B, as a result, it is probable that at the point of instructing the go-around to the Aircraft C, they missed the opportunity to give instruction for the go-around.

It is desirable for the ATC facilities to review the methods of the practical control training of traffic control considering enough of safety after evaluating on-the-job training and the training effect.

In order to carry out the on-the-job training safely and effectively, review on the necessity of training considering the unexpected events such as the aircraft take-off without a take-off clearance as in this serious incident and an occurrence of high-speed RTO; consequently, in addition to considering the necessity of training for the situation not anticipated in the past training, it is desirable to fully utilize the simulator and other things in order to carry out such training at opportunities other than the ATC on the job trainings.

3.10 Risk in this Serious Incident

The estimated separation between the Aircraft B and the Aircraft C was about 570m, at the stage where the Aircraft C vacated from the runway at the taxiway E-3. According to ICAO "Manual on the Prevention of Runway Incursions," it is certain that the severity of risk for this serious incident falls in the "Category C (An incident characterized by time and/or distance to avoid collision). (See Attachment 1: Classification of the Severity of Runway Incursions)

4. CONCLUSIONS

4.1 Summary of the Analysis

4.1.1 General Information

(1) Certificates

The pilots of the Aircraft A had a valid pilot competence certificate and an aviation medical examination certificate issued by the Ministry of Defense. The crew members of the Aircraft B and Aircraft C had valid an airman competence certificates and valid an aviation medical certificates. The air traffic controllers had valid air traffic controller qualification certificate and valid medical certificate. (3.1)*29

(2) Status of the Aircraft

As the Aircraft A underwent an aviation technical inspection which is equivalent to airworthiness certificate conducted by the Ministry of Defense, and the Aircraft B and the Aircraft C had airworthiness certificate and they had been maintained and inspected in accordance with the specified program; moreover, because there was no data and statement of indicating abnormality, it is highly probable that the status of the Aircraft A, B and C are not involved in the occurrence of this serious incident. (3.2)

(3) Involvement of Weather

It is highly probable that the condition of the weather is not involved in this serious incident. (3.3)

(4) Relation to ATC Communications

The read back of the Aircraft A was overlapped with the read back of the Aircraft B and was so small that could not be recognized by the receiving voice of the Tower and even the noticeable background noise did not occur. Consequently, it is probable that it is due to the involvement of the characteristics of the VHF radio telephone receiver, and it is the limit of ATC communication using VHF radio telephone that has such characteristics.

It is desirable CAB that the controllers and others inform the people involved ATC communication duties that the controllers are sometimes unable to recognize the situation when multiple aircraft make radio communication at the same frequency. (3.4)

4.1.2 Correspondence of the Aircraft A

(1) It is probable that the Pilot could not sufficiently visibly recognize the condition of the taking-off and landing aircraft, he instructed the Load-master to carry out the external visual checks. However, it is probable that the Load-master was intensively looking at solely on the

*29 The numbers described at the end of each sentence in this section represent the major item number related to the description in "3. Analysis".

final approach course from the sound of the PIC's "Final," as a result, it is probable that he may have been delayed to notice the Aircraft B on the runway that had commenced a take-off roll. It is considered necessary to give a concrete instruction with the intention of the PIC could be correctly conveyed to the Load-master. (3.5.1)

(2) When letting the Load-master conduct the outside watch to ensure air traffic safety in cooperation with the Pilot, it is considered also necessary to implement education on knowledge such as ATC communication. (3.5.1)

(3) It is highly probable that, the Co-pilot misunderstood the take-off clearance for their aircraft, because there was nothing to point out from the Tower, when the Co-pilot read back in response. (3.5.2)

(4) It is somewhat likely that the intercommunication system was involved with the fact the Pilot and the Co-pilot could not hear the call sign part of the take-off clearance transmitted by the Tower for the Aircraft B. It is probable that it is necessary to device in operational aspects such as setting priority according to importance and timing for intercommunication. (3.5.3)

4.1.3 Correspondence of the Aircraft B

It is highly probable that the PIC was sufficiently aware of the danger of high-speed RTO, being in the situation that he was not able to determine the flight direction of the Aircraft A taking the departure course of his Aircraft, and because he felt a serious danger in the continued take-off; therefore, it is highly probable that making a decision to reject the take-off and commenced the rejected take-off operation. (3.6)

4.1.4 Correspondence of the Aircraft C

(1) Although the separation between the Aircraft C and the preceding IFR aircraft caused recognition of congestion to the PIC and the FO, it did not make them feel a sense of incongruity in particular. (3.7.1(1))

(2) At the timing when the landing clearance was issued and it was confirmed that the Aircraft B commenced a take-off roll, it seems that the PIC judged that the possibility of executing the go-around responding to the trend of the Aircraft B was low risk, and it was not in a severe situation where the go-around is required even if the approach was continued. (3.7.1(2))

(3) Because the PIC and the FO were unable to hear the report of rejected take-off by the Aircraft B to the Tower, it is probable that they continued the approach with thinking of the Aircraft B was continuing the take-off. (3.7.1(3))

(4) It is probable that, at the time when the FO started flare, the PIC recognized the

existence of the Aircraft B on the runway, by taking over control from the FO just before touch-down and continued the landing. Regarding with this, while being cleared to land, although he could not confirm the trend of Aircraft B, from the PIC's experience on the same type of aircraft and at the airport and the landing performance of the Aircraft, even when they continued the landing, the PIC judged that it could land safely; therefore, the PIC acted according to circumstances in order to ensure the safety of the aircraft. Also it is somewhat likely that the judgment is related to the fact the PIC could not confirm the trend of the Aircraft A which had crossed over the runway. (3.7.1(4))

(5) Regarding the landing, although the Aircraft was instructed to execute a go-around from the Tower, it is probable that since the reverse thrust operation had been already started at the time when the PIC recognized the instruction to execute a go-around, they did not execute it according to the rules of their own. (3.7.1(4))

(6) It is probable for the PIC might take over, in order to prevent falling into a critical situation at an early stage. (3.7.2)

(7) It is required to enhance the training contents in accordance with more actual operations by such as simulating the situations where crew members' judgment is required. (3.7.3)

(8) It is desired for the company to which the Aircraft C belongs to verify and clarify the points of concerning the Anticipating Separation to be noticed to the crew members. (3.7.3)

4.1.5 Correspondence of ATC

(1) Because the read back of the Aircraft A against the take-off clearance to the Aircraft B could not be heard by the Tower, it is probable that the take-off of the Aircraft A was not expected.

In addition, that the Tower trainee and the Tower supervisor A were looking the right side as seen from the control tower, is possibly having been involved in being further delayed to be aware of the Aircraft A that took off from the taxiway A-5 which was located on the left side as seen from the control Tower. (3.8.1)

(2) From this, it is probable that they lost an opportunity what was prescribed by the standards for ATC Operational Procedure for the timing of the instruction of executing a go-around to the Aircraft C.

Also, at the time when they felt that the start of executing a take-off roll of the Aircraft B was late, it is probable that they should have given instruction of executing a go-around to the Aircraft C or to give an instruction that a safe separation could be provided between the two aircraft.

It is desirable CAB, in order that it could be flexibly responded to the situation depending upon the change in the circumstances, to analyze cases like this serious incident and share

the results. (3.8.2)

(3) Because Naha Airport is a crowded airport, and the ATC is being carried out for various aircraft, it is probable that the Tower supervisor A gave new task in addition to the training of the day to make it an opportunity to acquire skills. It is desirable for the ATC facilities to review the methods of the practical control training of traffic control considering enough of safety after evaluating the on-the-job training and the training effect. In addition to considering the necessity of training for the situation not anticipated in the past training, it is desirable to fully utilize the simulator and other things in order to carry out such training at opportunities other than the ATC on the job training. (3.9)

4.2 Probable Causes

It is certain that this serious incident occurred as follows: when the Aircraft B rejected a take-off on the runway 18 due to the Aircraft A crossed over in its front, and the Aircraft C landed on the runway 18 before its vacating.

It is probable that the Aircraft C landed on the runway was because the PIC, recognizing the existence of the Aircraft B on the runway when the FO started flare, as it had been issued the landing clearance by the aerodrome control tower, although he could not confirm the trend of the Aircraft B, based on his experience at the airport and on the same type of aircraft and the landing performance, it was judged by the PIC that it could land safely. It is also somewhat likely that the judgment is related to the fact the PIC could not confirm the trend of the Aircraft A which had crossed over the runway.

Regarding the Aircraft C landed on the runway although the aerodrome control tower of the aerodrome control facility instructed it to execute a go-around, it is probable that it had already landed on the runway and the reverse thrust operation was started when the PIC and the FO were recognizing the instruction. In addition, it is probable that it was involved that the instruction of executing a go-around had missed the timing.

It is highly probable that the reason why the Aircraft B rejected take-off is that, while the PIC was in the situation that he was not able to determine the flight direction of the Aircraft A approaching its departure course after the take-off of the Aircraft A and because the PIC of the Aircraft B felt a serious danger in the continued take-off; therefore, he decided to reject the take-off.

Besides, it is highly probable that, regarding the take-off of the Aircraft A, its pilots misunderstood the take-off clearance for the Aircraft B as the clearance for their aircraft, as well as the Pilot and the Load-master carried out external visual checks; however, it was due to delay in noticing the Aircraft B that commenced a take-off roll.

Moreover, regarding the fact that the pilots of the Aircraft A misunderstood the take-off clearance for the Aircraft B as their take-off clearance, although they could not accurately hear what

was transmitted to them by the Tower, it is probable that they did not make confirmation of the contents of the transmission. Besides, it is probable that the pilots of the Aircraft A did not notice misunderstanding the take-off clearance, as there was nothing pointed out from the Tower to the wrong read-back of the Aircraft A.

It is probable that because the Aircraft A was not pointed out from the Tower to the wrong read-back, as the Tower was not able to hear its read-back. About this matter, it is probable that because the characteristics of the VHF receiver used for air traffic control communication was involved.

5. SAFETY ACTIONS

5.1 Safety Actions Taken after the Serious Incident

5.1.1 Safety Actions Taken by Japan Air Self-Defense Force

The measures to prevent recurrence as Japan Air Self-Defense Force summarize by the Bureau of Operation Planning, the Ministry of Defense on June 10, 2015 was as follows:

(1) Ensuring listening of Instruction/Clearance of the Control Tower and confirmation by The PIC and the Co-pilot

① Mutual confirmation of the communication contents between the Pilot and the Co-Pilot (Request retransmission to the control Tower when it is inconsistent)

② Accurate read back of the Instruction/Clearance of the Control Tower

(2) Ensure thorough crew collaboration

① Reliable situation grasp and command conduct over the crew member by the Pilot

② Proper prioritization among Equipment operation, In-flight instructions, and Conversation (Communication) with the control agency that took place at the simultaneous timing

(3) Review and thorough communications of operation/procedure responding to the characteristics of Naha Airport with high traffic volume

① Fix the procedure in the Naha Helicopter Airlift Squadron to extremely limit the situation where In-flight communication and control communication are done at the same time

② Completely carry confirmation of the traffic control situation of other aircraft and backward visual confirmation, considering the characteristics of Naha Airport

In response to the above, as of July 7, 2015, the following items were newly established in the NORMAL PROCEDURE of the Naha Helicopter Airlift Squadron. (Excerpt)

(6) Safety confirmation procedure from entering a taxiway for a take-off

When taking-off, after entering a taxiway, stop at right angles to a runway, then transit to hovering. After that, by implementing clearing-turn, the pilot shall securely perform visual confirmation of the taking-off and landing aircraft

(7) Monitoring of the Control radio frequencies

Those who are in charge of flight such as crew members shall, when boarding the aircraft, monitor about the frequencies of the radio used for the ATC

Furthermore, added the contents of what is instructed by the Naha Airport Office, West Japan Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism to the Naha Local Book in a form that follows the actual flight.

As of October 9, 2015 the above item (6) was revised as follows:

(6) Safety confirmation procedure from entering a taxiway for a take-off

(a) When taking-off, after entering a taxiway, stop at right angles to the runway, then transit to hovering. After that, by implementing clearing-turn, the pilot shall securely perform visual confirmation of the taking-off and landing aircraft and transmit verbally the presence or absence of other aircraft.

(b) Both the PIC and the Co-pilot monitor to the instructions, approval, and clearance by the Control Tower and surely read it back. If both the PIC and the Co-pilot did not make the same understanding of the contents of the communication from the Tower that they heard, confirm it with the ATC facilities.

5.1.2 Safety Actions Taken by Japan Transocean Air Co., Ltd.

(1) To the relevant crew members, education, training and examination were conducted.

① Re-education on PIC's responsibility and knowledge and ability

② Confirmation of accident, serious incident, and the Civil Aeronautics Act

③ Re-confirmation of Similar Cases and the Right-Seat Maneuvering Implementation Guide for the FO

④ Re-confirmation of CRM (Human Factors/CRM Skill/TEM)

⑤ Training with simulator and examination

- Training:
  Continuation of entrance and appropriate judgment and operation of go-around
- Examination (the PIC only)
  Extraordinary examination

(2) Measures to prevent recurrence for all flight crew members

The "Operating crew department INFORMATION" was issued, in order to attract attention on the necessity of monitoring including the ATC at take-off and landing, as of June 19, 2015. Also, at each JAL Group company to which the relevant company belongs to

published the public information magazine in the company "Corporate Safety and Corporate Safety Information" using this serious incident as a subject to warn extensively.

Also the following contents were implemented during the summer safety campaign of 2015:

① Crew members at managerial position cautioned attention on this serious incident.

a. Attention point for landing clearance based on Anticipating Separation

b. The proper Take-Over timing of the PIC at the time when implementing right-seat flying

c. Roles and precautions of the PIC at the time of being in charge of the PM Duty

d. Runway monitoring (Obstacles/take-off and landing aircraft), Wariness, etc.

The case was confirmed at the 2015 second half SRM (Safety Review Meeting: Meeting to be held in about 5 to 10 people taken twice a year aiming at improving safety awareness aimed for the all flight crew members)

② Simulator training

It is planned to execute practice training of go-around just before touch-down in the periodic training (ADVT) for 2016.

5.1.3 Safety Actions Taken by the Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism

(1) Supplement to standard for ATC procedure

In response to this serious incident, it was notified by the Notification Koku-Ku-Sei No. 105 "On the correspondence for the time being at the time of issuance of take-off and landing clearance," in order to supplement the standard for ATC procedure as of June 8, 2015.

1. When "stand by" is accompanied by take-off and landing, it must be thoroughly observed to provide the traffic information on the related aircraft. In this case "stand by" includes instruction of continued approach.

2. In order to avoid confusion with take-off and landing clearance from/to the runway, in the case of take-off and landing clearance from/to other than the runway, terminology that is different from take-off and landing from/to the runway shall be used.

[Terminology example] JA119F Take off approved from ・・・.

JA121F Landing approved to ・・・.

** Cleared for/to shall not be used.*

3. Regarding the correspondence in 1. and 2. above, it must be confirmed in the future periodical training by using a simulator.

Regarding 1., it was implemented on the same day, and regarding 2., it was notified to the operator by the ATC facilities, which was implemented within Fiscal Year 2015. In addition,

regarding 3., the air traffic controllers of the Naha Airport office, West Japan Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism, it was already implemented to everyone by March 2, 2016 and it is scheduled to be implemented as soon as the simulators are made ready in other ATC facilities.

(2) Compiling Regulation of OJT-I (On the Job Training Instruction)

In order to conduct safe and efficient training supervision work, Koku-Ku-Sei No. 200 was compiled as a Regulation titled "OJT-I Handbook."

5.1.4 Safety Actions Taken by the Naha Airport Office, West Japan Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism

The Naha Airport Office, West Japan Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism, concerning the application of the item 2. in the above Notification, notified the air traffic controllers of the Naha Airport office on June 16, 2015 and started applying on June 22, 2015.

[Example of a take-off clearance]

MAKE RIGHT TURN, (CROSS OVER THE RUNWAY) WIND (DIRECTION) AT (SPEED) DEPARTURE APPROVED FROM (TAKE-OFF PLACE).

Note 1: When clearing as requested by an aircraft, use a wording of "MAKE---".

Note 2: Add "TAXIWAY" for a clearance from/to a taxiway (except for a helipad)

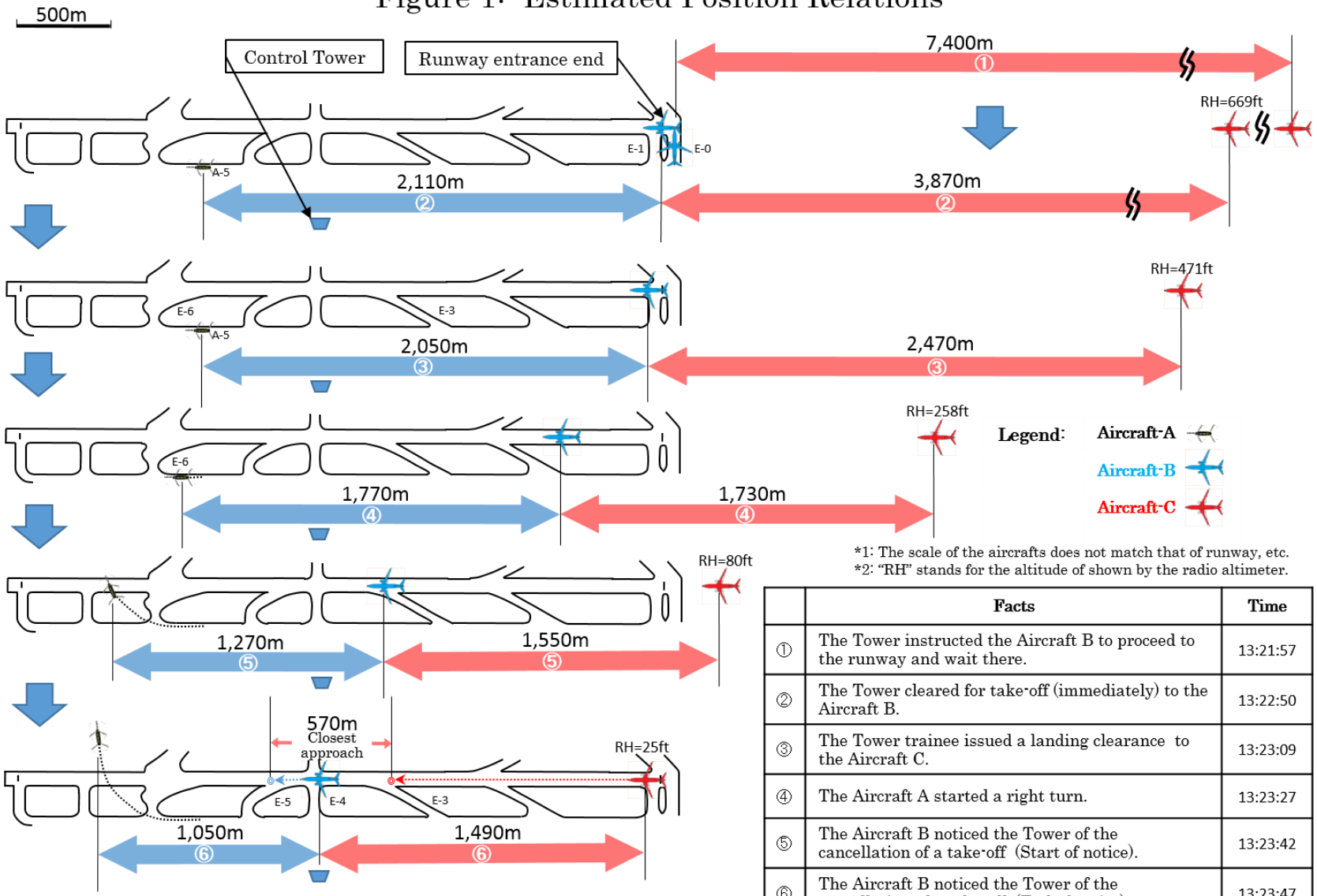
[Example] A4 TAXIWAY

[Example of a landing clearance]

LANDING APPROVED TO (LANDING POSITION) WIND (DIRECTION) AT (SPEED)

In addition, as of June 30, 2015, it was noticed by the business contact "With regard to control operation on taking-off/landing rotorcraft from/to outside of the runway in Naha Airport (Notification)", that the controller shall not issue a control instruction/clearance allowing crossing-over the runway, immediately after a take-off and other new operations and its operation started on July 7, 2015.

Figure 1: Estimated Position Relations



*1: The scale of the aircrafts does not match that of runway, etc.
*2: "RH" stands for the altitude of shown by the radio altimeter.

	Facts	Time
①	The Tower instructed the Aircraft B to proceed to the runway and wait there.	13:21:57
②	The Tower cleared for take-off (immediately) to the Aircraft B.	13:22:50
③	The Tower trainee issued a landing clearance to the Aircraft C.	13:23:09
④	The Aircraft A started a right turn.	13:23:27
⑤	The Aircraft B noticed the Tower of the cancellation of a take-off (Start of notice).	13:23:42
⑥	The Aircraft B noticed the Tower of the cancellation of a take-off (End of notice).	13:23:47

Figure 2: FDR Records (the Aircraft B)

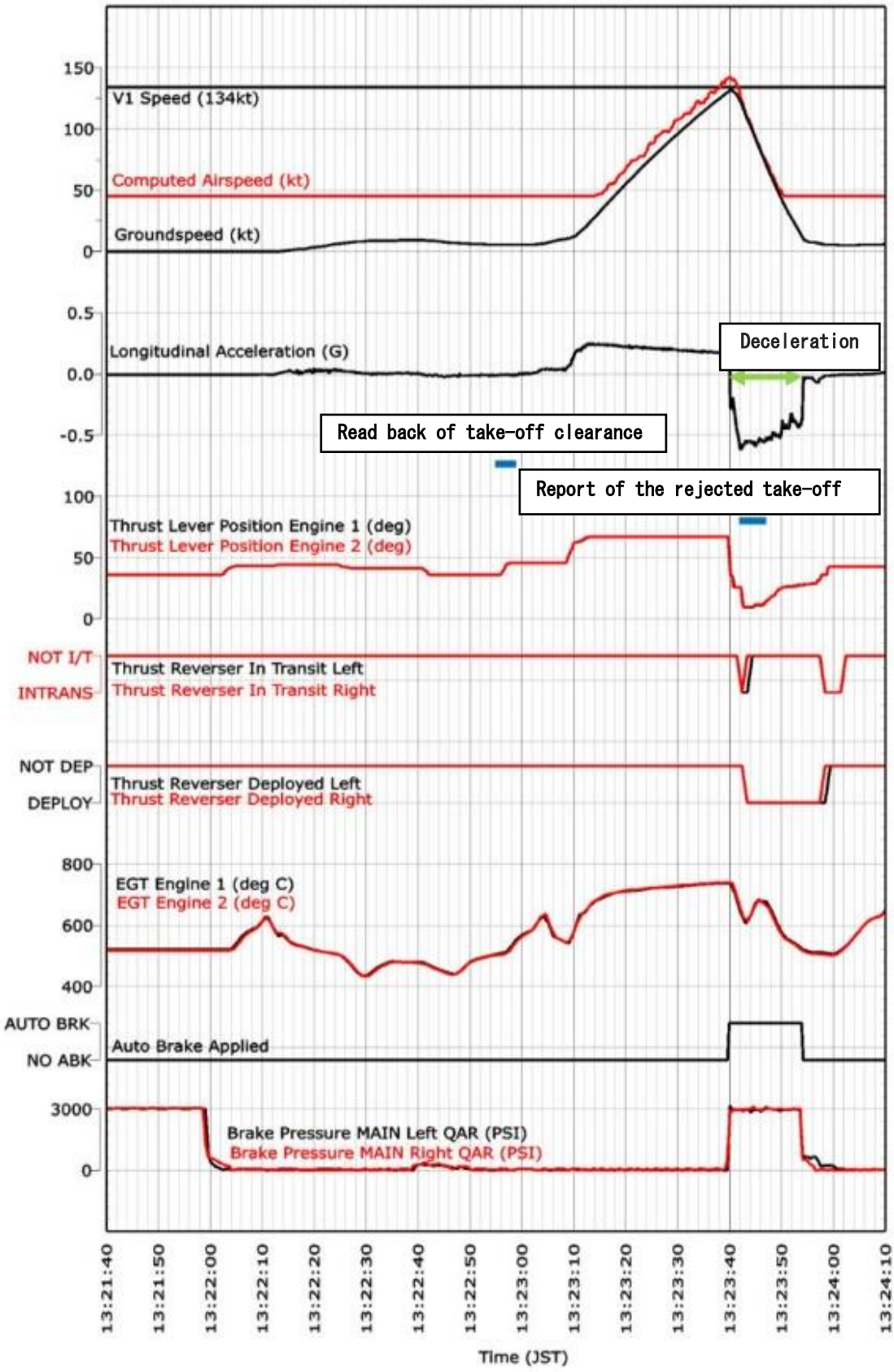
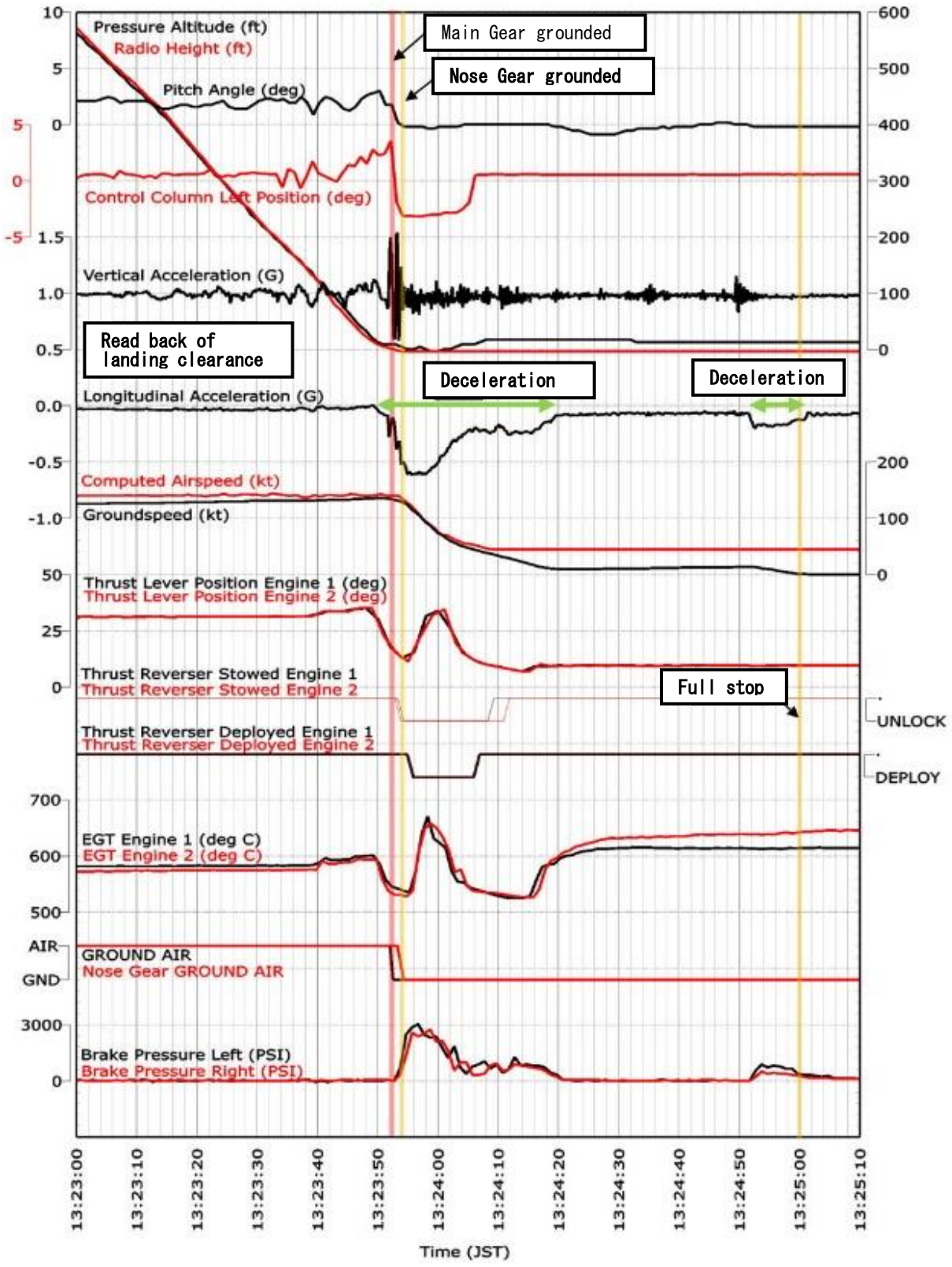


Figure 3: FDR Records (the Aircraft C)



Attachment 1: Classification of the Severity of Runway Incursions

The classification related to the risk measurement described in the Manual on the Prevention of Runway Incursions (Doc 9870) published by ICAO are as shown 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 takeoff of aircraft but with no immediate safety consequences.*
E	*Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.*

* 1. Refer to Annex 13 for the definition of "incident"

* 2. Shading is added to indicate the applicable category in order to show the applicable category of this serious incident.

Attachment 2: ATC Communication Record and Situation of the Aircraft

1. The part surrounded by the thick frame represents the ATC communication.
2. Bold letters represent the voice recorded in the ATC communication record.
3. White letters represent voices transmitted but were not recorded in the ATC communication record.
4. The red letters represent the words overlapped.

	was a transmission from the Tower to the Aircraft-A (Pony 41)
	was a transmission from the Tower to the Aircraft-B (All Nippon 1694)
	was a transmission from the Tower to the Aircraft-C (Jai ocean 610)
	was conversation and voice recorded in CVR and IC recorder that were overlapped with ATC
	was conversation and voice recorded in CVR and IC recorder other than the above
	was the record of FDR and radar track

Aircraft-A (Pony 41)				Tower		Time	Aircraft-B (All Nippon 1694)			Aircraft-C (Jai Ocean 610)		
Pilot	Co-pilot	Load-master	Situation of the Aircraft	Tower trainee	Tower supervisor A		PIC	FO	Situation of the Aircraft	PIC	FO	Situation of the aircraft
						13:21:50						
					All Nippon one six nine four, do you accept immediate departure next inbound four miles.	13:21:51						
						13:21:52						
						13:21:53						
						13:21:54						
						13:21:55		**Affirm All Nippon one six nine four accept.**				
						13:21:56						
					All Nippon one six nine four runway one eight at echo zero line up and wait stand by for immediate departure.	13:21:57						
						13:21:58						
						13:21:59						
						13:22:00						
						13:22:01		**Roger All Nippon one six nine four line up and wait runway one eight.**				
						13:22:02						
						13:22:03						
						13:22:04						
						13:22:05	Notify cabin.					
						13:22:06						
				Jest zero three turn left echo six expedite vacating runway contact ground.		13:22:07			Pong, Pong Pong, Pong. (Chime sound × 4)			
						13:22:08						
						13:22:09						
						13:22:10						
						13:22:11						
						13:22:12						
						13:22:13						
						13:22:14	Checklist					
					Jai ocean six one zero continue approach we have departure Boeing seven three seven wind two one zero at one three expect landing clearance on short final.	13:22:15		Executed checklist.				
						13:22:16						
						13:22:17						
						13:22:18						
						13:22:19						
						13:22:20						
						13:22:21						
						13:22:22						
						13:22:23				**Continue approach Jai ocean six one zero.**		
						13:22:24						
						13:22:25					Continue approach.	
						13:22:26				Continue approach.		
						13:22:27						
						13:22:28						
						13:22:29						
						13:22:30						
						13:22:31						
	Naha Tower Pony four one good afternoon alpha five ready after airborne right turn cross runway KERAMA.					13:22:32						
						13:22:33						
						13:22:34						
						13:22:35				We have only 2.5 miles separation. I wonder wether it is possible.		
						13:22:36						
				Pony four one stand by.		13:22:37						
						13:22:38						
						13:22:39						
	Stand by Pony four one request hovering operation.					13:22:40						
						13:22:41						
						13:22:42					Looks hard.	
				Pony four one hovering approved.		13:22:43						
						13:22:44				Go around, is it.		
	Hovering approved Pony four one.					13:22:45						
						13:22:46						
Hovering.						13:22:47					We maintain one thousand after a go-around.	
						13:22:48						
		Yes, final is two miles.				13:22:49						
		All right. (Speaker unclear)		**All Nippon one six nine four wind two one zero at one two runway one eight cleared for immediate take off.**		13:22:50				Affirmative		
						13:22:51						
						13:22:52						
						13:22:53						
						13:22:54	Roger.					

(The data was not recorded in the CVR of the Aircraft-B.)

Attachment 2: ATC Communication Record and Situation of the Aircraft

Aircraft-A (Pony 41)				Tower		Time	Aircraft-B (All Nippon 1694)			Aircraft-C (Jai Ocean 610)		
Pilot	Co-pilot	Load-master	Situation of the Aircraft	Tower trainee	Tower supervisor A		PIC	FO	Situation of the Aircraft	PIC	FO	Situation of the aircraft
	Right turn approve immediately take off alpha five Pony four one (Record by IC recorder)	"ny four one" was also recorded in the control communication record.				13:22:55		Runway one eight cleared for immediate take off All Nippon one six nine four.				
						13:22:56						
						13:22:57						
						13:22:58						
Before take-off check	Before take-off check					13:22:59	Is the fighter already out of the runway?					
						13:23:00						
						13:23:01		Roger, OK				
						13:23:02						
						13:23:03				It's shorter than one mile.		
						13:23:04	Set heading one eight three.				Roger.	
						13:23:05		One eight three.				
						13:23:06				Five hundred.		500 [Automatic call]
						13:23:07		Roger, N1, Heading select, TOGA.			Stabilized.	
Power check 58.						13:23:08			Thrust Lever started moving			
	Completed.			Jai Ocean six one zero seven three seven rolling runway one eight cleared to land wind two zero zero at one two.		13:23:09						
Immediate Takeoff.						13:23:10						
		Final 1. 5 miles.				13:23:11						
						13:23:12						
Roger, right turn.						13:23:13						
		Roger. Right is clear.				13:23:14		Thrust set.			Roger.	
						13:23:15						
After clear 15, commence right turn.						13:23:16				Cleared to land Jai Ocean six one zero one mile on final.		
						13:23:17						
						13:23:18						
				Roger.		13:23:19						
						13:23:20					Cleared to land.	
						13:23:21				Cleared to land.		
						13:23:22		Eighty.				
Final check.						13:23:23	Check.					
		Final one mile.				13:23:24						
						13:23:25		Throttle hold.				
Right turn. Roger.		Roger, clear.				13:23:26						
			Start right turn			13:23:27						
						13:23:28						
						13:23:29						
		Now starting take-off roll.				13:23:30						
						13:23:31						
						13:23:32	A helicopter is.					
						13:23:33						
						13:23:34						
						13:23:35		V ……one,Vr				
						13:23:36						
Have Co-pilot confirm the turning direction.						13:23:37	Isn't it dangerous?			I wonder if such clearance can be possibly issued		
						13:23:38						
						13:23:39	Reject.		Operation sound		Last minutes, isn't it? Not taken off yet.	
	Immediately. Right turn.					13:23:40			Raised brakes pressure			
Roger.						13:23:41						100 [Automatic call]
			Runway crossing			13:23:42		All Nippon one six nine four reject take off helicopter ahead of us.	Activated thrust reverser			
						13:23:43				A helicopter.		
						13:23:44					Roger.	50 [Automatic call]
						13:23:45						
						13:23:46						30 [Automatic call]
					All Nippon six five six five eight four? Roger.	13:23:47						20 [Automatic call]
						13:23:48						
						13:23:49				I have control.		10 [Automatic call]
					Go around, Jai Ocean anku five one six one zero go around.	13:23:50					You have control.	
						13:23:51						Impact sound (Main gear)
						13:23:52						Impact sound (Nose gear)
						13:23:53						Activated thrust reverser
						13:23:54						
						13:23:55			Operation sound			
						13:23:56						
					Jai Ocean six one zero turn left echo four.	13:23:57						
						13:23:58						
						13:23:59						
						13:24:00		Turn Left echo four All Nippon one six nine four.		Roger, turn left echo three	Turn left echo four Jai** turn left echo three Jai Ocean six one zero	
						13:24:01						
						13:24:02						
						13:24:03						
						13:24:04						