

AI2015-4

**AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT**

**CHINA EASTERN AIRLINES CO., LTD.
B2332
AIRASIA JAPAN CO., LTD.
JA01AJ**

May 28, 2015

 **JTTSB** *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.

Norihiro Goto
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

1. CHINA EASTERN AIRLINES CO., LTD.
AIRBUS A319-112, B2332
 2. AIRASIA JAPAN CO., LTD.
AIRBUS A320-214, JA01AJ
- RUNWAY INCURSION
ON RUNWAY 18 AT NAHA AIRPORT
AT ABOUT 13:24 JST, JULY 5, 2012

April 24, 2015

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Shinsuke Endoh
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Yuki Shuto
Member	Keiji Tanaka

SYNOPSIS

<Summary of the Serious Incident>

On July 5 (Thursday), 2012, an Airbus A319-112, registered B2332, operated by China Eastern Airlines Co., Ltd., was taxiing toward Runway 18 at Naha Airport in order to depart for Shanghai (Pudong) Airport as the scheduled Flight 2046 of the company. Meanwhile, an Airbus A320-214, registered JA01AJ, operated by AirAsia Japan Co., Ltd., was on the final approach after receiving a landing clearance for Runway 18 at Naha Airport during the flight test required before commencing commercial transport services.

Although an air traffic controller instructed B2332 to hold short of the runway, the aircraft entered the runway; as a result, JA01AJ made a go-around following the instructions from the air traffic controller.

There were 27 people on board B2332, consisting of a Pilot in Command (PIC), nine other crewmembers and 17 passengers, while 38 people on board JA01AJ, consisting of a PIC, five other crewmembers and 32 personnel involved with the flight test. No one was injured and no damage was sustained on either aircraft.

<Probable Causes>

It is highly probable that this serious incident occurred because the departing aircraft (B2332) made an incursion onto the runway despite being instructed to hold short of the runway, causing the arriving aircraft (JA01AJ), which had already been cleared to land, to attempt to land on the same runway.

It is highly probable that B2332 entered the runway because the flight crewmembers of the aircraft misheard and misunderstood the instruction to hold short of the runway as an instruction to hold on the runway and could not find the arriving aircraft, as well as because the air traffic controller did not recognize that the readback from the aircraft was incorrect and consequently did not confirm or correct the readback.

It is somewhat likely that noise occurring in the sound of the hold instruction from the air traffic controller contributed to the mishearing of the instruction by the flight crewmembers, and also that the misunderstanding by the flight crewmembers that they were allowed to enter the runway and the mind that there was no arriving aircraft contributed to the result that the flight crewmembers could not find the arriving aircraft.

It is also somewhat likely that the following contributed to the fact that the air traffic controller did not notice the incorrect readback and failed to confirm or correct the readback.

- (1) The air traffic controller heard the readback from B2332 over a loudspeaker without wearing a headset.
- (2) The readback from B2332 was unclear.
- (3) The air traffic controller assumed that her own instructions were read back correctly.

Abbreviations used in this report are as follows:

CRM:	Cockpit Resource Management
CVR:	Cockpit Voice Recorder
DFDR:	Digital Flight Data Recorder
FL:	Flight Level
FTM:	Flight Training Manual
ICAO:	International Civil Aviation Organization
PF:	Pilot Flying
PM:	Pilot Monitoring
PNF:	Pilot Not Flying
RWSL:	Runway Status Lights
RWY:	Runway
SOP:	Standard Operating Procedure
TACAN:	UHF Tactical Air Navigation Aid
TDS:	Tower Display Subsystem
TO/GA:	Take-off / Go-around
UHF:	Ultra High Frequency
VHF:	Very High Frequency
VOR:	VHF Omnidirectional Radio Range
VORTAC:	VOR and TACAN Combination

Unit Conversion Table

1 ft:	0.3048 m
1 nm:	1.852 km (1,852 m)
1 kt:	1.852 km/h (0.5144 m/s)

1. PROCESS AND PROGRESS OF THE SERIOUS INCIDENT INVESTIGATION

1.1 Summary of the Serious Incident

On July 5 (Thursday), 2012, an Airbus A319-112, registered B2332, operated by China Eastern Airlines Co., Ltd., was taxiing toward Runway 18 at Naha Airport in order to depart for Shanghai (Pudong) Airport as the scheduled Flight 2046 of the company. Meanwhile, an Airbus A320-214, registered JA01AJ, operated by AirAsia Japan Co., Ltd., was on the final approach after receiving a landing clearance for Runway 18 at Naha Airport during the flight test required before commencing commercial transport services.

Although an air traffic controller instructed B2332 to hold short of the runway, the aircraft entered the runway; as a result, JA01AJ made a go-around following the instructions from the air traffic controller.

There were 27 people on board B2332, consisting of a Pilot in Command (PIC), nine other crewmembers and 17 passengers, while 38 people on board JA01AJ, consisting of a PIC, five other crewmembers and 32 personnel involved with the flight test. No one was injured and no damage was sustained on either aircraft.

1.2 Outline of the Serious Incident Investigation

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

1.2.1 Investigation Organization

On July 5, 2012, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two other investigators to investigate this serious incident.

1.2.2 Representatives of the Relevant States

An accredited representative of the People's Republic of China, as the State of Registry and Operator of the aircraft involved in this serious incident, and an accredited representative of France, as the State of Design and Manufacture of the aircraft involved in this serious incident, participated in the investigation.

1.2.3 Implementation of the Investigation

July 6, 2012	On-site investigation and interviews
July 7, 2012	Interviews
August 16 and 17, 2012	Interviews
September 20, 2012	Interviews

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

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

1.2.5 Comments from the Relevant States

Comments on the draft report were invited from the relevant States.

2. FACTUAL INFORMATION

2.1 History of the Flight

On July 5, 2012, at around 13:22 Japan Standard Time (JST: UTC+9 hours, all times are indicated in JST on a 24 hour clock), an Airbus A319-112, registered B2332 (hereinafter referred to as “Aircraft A”), operated by China Eastern Airlines Co., Ltd., began taxiing from Spot 43 at Naha Airport toward Runway 18.

The outline of Aircraft A’s flight plan was as follows:

Flight rules:	Instrument Flight Rules (IFR)
Departure aerodrome:	Naha Airport
Estimated off-block time:	13:30
Cruising speed:	401 kt
Cruising altitude:	FL290
Route:	ONC (Erabu VORTAC) – A586 (airway) – POTET (position reporting point) – A593 (airway) – (remainder omitted)
Destination aerodrome:	Shanghai (Pudong) Airport
Total estimated elapsed time:	1 hour 7 minutes

When the serious incident occurred, in the cockpit of Aircraft A, the PIC sat in the right seat as the PM (pilot monitoring: pilot mainly in charge of duties other than flying) and the FO (First Officer) sat in the left seat as the PF (pilot flying: pilot mainly in charge of flying). In addition, one other pilot (hereinafter referred to as the “Rear Seat Pilot”) sat in an observer seat behind the pilot’s seats.

On the other hand, an Airbus A320-214, registered JA01AJ (hereinafter referred to as “Aircraft B”), operated by AirAsia Japan Co., Ltd., took off from Narita International Airport at 11:00 then flew to Naha Airport, and was on the approach to Naha Airport.

The outline of Aircraft B’s flight plan was as follows:

Flight rules:	Instrument Flight Rules (IFR)
Departure aerodrome:	Narita International Airport
Estimated off-block time:	10:15
Cruising speed:	478 kt
Cruising altitude:	FL280
Route:	(omitted) – SUC (Shimizu VORTAC) – B597 (airway) – ONC (Erabu VORTAC) – OKUMA (position reporting point)
Destination aerodrome:	Naha Airport
Total estimated elapsed time:	2 hours 23 minutes.

When the serious incident occurred, in the cockpit of Aircraft B, the PIC sat in the left seat as the PF and the FO sat in the right seat as the PM.

The flight histories of the Aircraft A and the Aircraft B up to the serious incident are outlined below, based on the records of the digital flight data recorders (hereinafter referred to as “DFDR”), radar tracking records, air traffic control (ATC) communication records, and the records of prototype

multilateration system*¹, as well as statements of the flight crewmembers and the air traffic controllers (hereinafter referred to as the “Controllers”).

2.1.1 History of the Flights Based on ATC Communication Records, Radar Tracking Records, DFDR Records and the Records of Prototype Multilateration System

13:17:10	Aircraft A, which was parked at Spot 43, reported to the ground control (hereinafter referred to as the “Ground”) that it was ready for a pushback.
13:17:14	The Ground approved the pushback to Aircraft A, and Aircraft A read it back.
13:17:30	The Ground affirmed to Aircraft A that the readback was correct, and reported to Aircraft A that the departure runway was Runway 18. Aircraft A read it back.
13:18:30	Aircraft A released its parking brake. Subsequently, Aircraft A was pushed back from Spot 43 to Taxiway A0, and its parking brake was applied on A0.
Around 13:19:50	Aircraft B intercepted the final approach course, on a 186 degree course to the Naha VORTAC (hereinafter referred to as “NHC”).
13:22:11	Aircraft A reported to the Ground that it was ready for taxiing.
Around 13:22:14	Aircraft B passed CHATN* ² .
13:22:16	The Ground instructed Aircraft A to taxi to Taxiway E0 and depart from Runway 18, and Aircraft A read it back.
13:22:24	Aircraft B reported to the Local Control (hereinafter referred to as the “Tower”) that it had passed CHATN.
13:22:27	The parking brake of Aircraft A, which was holding on Taxiway A0, was released. Subsequently, Aircraft A began taxiing, and then it was taxiing at a slow speed generally under 10 kt.
13:22:30	The Tower instructed Aircraft B to continue approach to Runway 18, and then Aircraft B read it back and also reported that its arrival Spot was 61.
13:22:56 – 13:23:01	The Tower cleared Aircraft B to land on Runway 18.
13:22:57	The Ground instructed Aircraft A to confirm taxiing to Taxiway E0 and to contact the Tower.
13:23:01 – 13:23:04	Aircraft A read back Taxiway E0 and the contact with the Tower.
13:23:02 – 13:23:04	Aircraft B read back the landing clearance for Runway 18.
13:23:18	Aircraft A established communication with the Tower and reported the Tower that it was on Taxiway E0. At this moment Aircraft A was turning right from Taxiway A0 to Taxiway E0.
13:23:23	The Tower instructed Aircraft A, “Hold short of Runway One Eight. Report when ready.”

¹ “Multilateration system” refers to a surveillance system to locate aircraft or vehicles by measuring differences in arrival times of signals transmitted from the ATC secondary surveillance radar transponders on board the aircraft or the vehicles at three or more receiver sites at an airport.

² “CHATN” is the Final Approach Fix for the VOR RWY 18 approach and is located at 6 nm north of NHC on the final approach course, which is a 186 degree course to NHC. Aircraft making the VOR RWY 18 approach should cross this fix between an altitude of 1,000 and 700 ft.

13:23:30	Aircraft A read back to the Tower saying “(inarticulate sound) Runway One Eight, report ready.” At this moment, the position of Aircraft B was about 3.5 nm from the threshold of Runway 18 at a radio altitude of about 1,090 ft. Around this moment, Aircraft A applied its brake on Taxiway E0 and then reduced speed to less than 10 kt but did not come to a stop on E0.
Around 13:23:50	Aircraft A crossed the runway holding position marking on Taxiway E0. At this moment, the position of Aircraft B was about 2.7 nm from the threshold of Runway 18 at a radio altitude of about 920 ft.
13:23:58	Aircraft A, which entered Runway 18 from Taxiway E0 and then began to turn left, reported to the Tower that it was ready for departure.
13:24:01	The Tower instructed Aircraft A to stand by and Aircraft B to go around. Aircraft B read it back. The thrust levers of Aircraft B, which was on the final approach, were advanced to the TO/GA position, and Aircraft B began to climb from a radio altitude of about 770 ft. At this moment the position of Aircraft B was about 2.1 nm from the threshold of Runway 18.
13:24:12	The Tower instructed Aircraft A to hold present position, and Aircraft A read it back.
13:24:26	Aircraft A stopped along the center line of Runway 18, and then its parking brake was applied.

2.1.2 Statements of Flight Crewmembers

2.1.2.1 Flight Crewmembers of Aircraft A

(1) PIC

Although the PIC flew to Japan four to five times per month, this was his fifth or sixth time flying to Naha Airport.

There were three pilots on board this flight, and the Rear Seat Pilot was responsible for the ATC radio communication.

After beginning to taxi, since the Rear Seat Pilot received instructions from the Ground to contact the Tower, he called the Tower whereupon he received the instruction saying “Line up and wait. Report when ready,” and read it back. Since there were no corrections from the Tower regarding the readback, Aircraft A entered the runway and he reported that Aircraft A was ready for departure; then, an instruction “Hold position” was issued by the Tower. The initial instruction from the Tower was conveyed as “Line up and wait” to the two pilots in the front seats by the Rear Seat Pilot, and all three of them had the same understanding of it. Moreover, before entering the runway, the PIC looked to the right to check the final approach, but he could not see any arriving aircraft. He does not know how long he was waiting on the runway, but he heard the instruction “Go around” for another aircraft, and after this he saw an aircraft flying above and heading for the right downwind. From this moment until the takeoff clearance was issued, the PIC was not advised anything more; therefore, he did not notice that they had made a mistake of any kind, and believed that it was a normal departure. He first found out about the runway

incursion after arriving at Shanghai Airport, when he was at his company's rest facility.

When three pilots are on board, the PIC decides which of the PM or the pilot seated in the observer seat will be responsible for the radio communication. If the pilot in the observer seat is responsible for the ATC radio communication, that pilot will read back the communication as he understands it, and then if there are no corrections from ATC, he will verbally convey those instructions or clearances once again to the pilots in the front seats. If either of the pilots in the front seats determines that the readback is incorrect, that pilot will immediately notify the pilot in the rear seat.

(2) FO

The FO began to fly to Japan starting from 2008, and came to Japan at least once a week, on an average of seven to eight times per month.

On the day of the serious incident, the FO's duty was only to be present for one round trip between Shanghai and Naha. In order to be promoted to the position of PIC, he required 200 hours of experience serving as a PF in the left seat after PIC promotion training; therefore, he was seated in the left seat as the PF for both the out-bound and return flights.

After the pushback, the engines were started, and then the flight control checks were completed before taxiing. After beginning to taxi, Aircraft A was instructed by the Ground to contact the Tower while in the area before turning from Taxiway A0 to Taxiway E0. When the Rear Seat Pilot called the Tower, there were instructions "Line up and wait. Report ready," and he read them back. Since the Before Takeoff Checklist had not yet been performed, the FO reduced speed slightly and entered the runway after completing the checklist. Before entering the runway, the FO looked to the left to see if there was any other aircraft on the runway. He then also looked to the right, but due to the angle of his view, he was unable to clearly see backwards. As there were no arriving aircraft, the Aircraft A entered the runway, but when the Rear Seat Pilot reported "Ready," he was instructed to "Hold position" and the FO saw another aircraft flying above. A short time after that aircraft turned to the right, Aircraft A was cleared for takeoff.

Although the Rear Seat Pilot was responsible for the ATC radio communication, the other two pilots also monitored the instruction from the Tower; accordingly, "Line up and wait" was not incorrect. Moreover, if the readback had been incorrect, one of the other pilots would have noticed it. Furthermore, since there were no corrections from the Tower regarding the readback either, the FO continued taxiing and entered the runway.

The instruction "Line up and wait" is used in China as well, as an instruction to hold on a runway.

(3) Rear Seat Pilot

The Rear Seat Pilot flew to Japan at least five times per month, but the day of the serious incident was his first time to Naha Airport.

On this flight, the Rear Seat Pilot was responsible for the ATC radio communication. When there are three pilots on board, it is the PIC who decides on the responsible person.

The Rear Seat Pilot was cleared for taxiing from the Ground, and he received an instruction to contact the Tower before turning to Taxiway E0. When he called the Tower, he received the instructions "Line up" and "Report ready" and read them back. He then conveyed the instruction "Line up" to the two pilots in the front seats who had monitored the radio communication together with him, and there were no objections from them. Then, the two front pilots began the Before Takeoff Checklist, which was completed before

crossing the runway holding position marking. He confirmed before entering the runway that there were no other aircraft on the runway or final approach, and there were no corrections from the Tower up until then. After he crossed the runway holding position marking and was about to intercept the center line of the runway, he reported to the Tower that they were ready, whereupon he was instructed to hold present position. Then the two front pilots told that they saw an aircraft go around, but the Rear Seat Pilot was unable to see it.

2.1.2.2 Flight Crewmembers of Aircraft B

(1) PIC

As this flight was a flight test, the only people on board were employees from the PIC's company and personnel from the Civil Aviation Bureau (CAB). In addition to the PIC and FO, a Check Pilot from the PIC's company and an Operations Inspector from the CAB were seated in the cockpit.

Aircraft B was radar vectored by the Naha Terminal Approach Control (hereinafter referred to as the "Approach") to the final approach course, which is a 186 degree course to NHC, and cleared for VOR RWY18 approach. It intercepted the final approach course at a point about 12 nm from NHC, at an altitude of 1,000 ft. Since the radio communication transfer from the Approach to the Tower was late, the FO reported to the Approach that he was passing CHATN, at which time he was instructed to contact the Tower. When communication with the Tower was established, he was cleared to land. The PIC began to descend at a point 3 nm from NHC, but was instructed by the Tower to go around when he was at an altitude of about 600 ft. Subsequently, he received an instruction from the Tower to follow the missed approach procedure, and then instructed to contact the Terminal Departure Control (hereinafter referred to as the "Departure"). The go-around was executed as usual, without a flurry.

The PIC had the runway in sight from about 8 nm north of the airport, but was unable to distinguish other things such as buildings at the airport. Moreover, after the go-around, the PIC had to immediately shift to level flight at an altitude of 1,000 ft, and he was too involved with this to look at the runway. After the go-around, he heard from the FO that there was another aircraft on the runway. There were no reports from ATC regarding the reason for the go-around, and the PIC was informed that there had been a runway incursion via the company radio on the way back to Narita Airport.

During the time from the landing clearance until the go-around instruction, the PIC did not hear any other communications between other aircraft and the Tower, and he also did not remember hearing the instruction issued to the China Eastern Airlines aircraft to hold short of the runway.

The landing lights were illuminated in accordance with the regulations, at an altitude of 10,000 ft.

(2) FO

While the FO was speaking to the PIC about the delay in the radio communication transfer to the Tower, he called out CHATN, which was the Final Approach Fix, and immediately reported to the Approach that he had passed CHATN. He was then instructed to establish communications with the Tower, but he did not clearly remember whether he had received the landing clearance from the Tower immediately or he had been instructed to continue the approach.

From an altitude of 1,000 ft Aircraft B began to descend, and at an altitude of 700 to 600 ft it was instructed by the Tower to go around. Since a go-around at the Naha Airport requires level flight at an altitude of 1,000 ft, he was careful not to exceed the altitude and speed limitation. Subsequently, having received instructions from the Tower to fly in accordance with the missed approach procedure and to contact the Departure, he followed those instructions.

When he was instructed to go around, the FO was busy with the maneuver for the go-around and did not know whether there were any other aircraft on the runway, but upon reaching over the runway, he glimpsed an aircraft entering the runway. Since the go-around was a normal one, he did not feel that there was any particular danger.

While the FO was responsible for the ATC radio communication, there were few communications between other aircraft and the Tower, and he felt that the traffic at the airport was light.

2.1.3 Statements of Controllers

When Aircraft B established communication with the Tower, it reported that it had passed CHATN. At this moment, the Controller responsible for the Tower (hereinafter referred to as the “Tower Controller”) had Aircraft B in sight and saw that the landing lights of Aircraft B were illuminated. After Aircraft B then flew for about 1 nm, the Tower Controller cleared Aircraft B to land.

Subsequently, the Tower Controller established communication with Japan Airlines Flight 2576 (hereinafter referred to as “Aircraft C”), which was taxiing north toward Taxiway E1 for departure, and instructed to “Report when ready.” The Tower Controller was then called by Aircraft A, which was taxiing south toward Taxiway E0 from the international terminal apron, and this was the first time that the Tower Controller became aware of Aircraft A. Since Aircraft A was of a foreign airline, the Tower Controller carefully instructed Aircraft A to “Report when ready” by clearly adding “Hold short of Runway 18.” Although the readback from Aircraft A was not clear, the Tower Controller heard that it sounded like “Hold short of Runway 18, report when ready.”

The Controller at the Assistant Control position had reported the departure sequence to the Radar Approach Control Facility in the order of Aircraft C followed by Aircraft A, and it would be necessary to coordinate the sequence change if Aircraft A were to depart first; therefore, the Tower Controller was concerned about whether Aircraft C or Aircraft A would report “ready” first. The Tower Controller had not provided any traffic information regarding Aircraft B to Aircraft C or Aircraft A.

There was a “ready” report from Aircraft A first, and since Aircraft A appeared beyond Aircraft C on E1, with its nose having passed over the runway holding position marking, the Tower Controller told Aircraft A to “Stand by” and immediately instructed Aircraft B to go around and follow the missed approach procedure. At this moment, the position of Aircraft B, when confirmed visually and on the TDS³, was about 3 nm on the final approach. The Tower Controller continued by instructing Aircraft A to hold present position, but Aircraft A was already facing south on the runway. The Tower Controller did not report the reason for the go-around to Aircraft B.

³ “TDS (Tower Display Subsystem)” refers to a display device equipped in an Airport Traffic Control Tower, whose display is divided into an airspace surveillance screen that monitors aircraft flying in the vicinity of an airport, and an airport surface surveillance screen that monitors aircraft taxiing on the ground. On both surveillance screens, the position of aircraft is displayed together with their radio call signs (flight numbers), aircraft types, speed, arrival spots, etc.

At the Naha Airport Traffic Control Tower, the loudspeakers on the Local Control Console and the Ground Control Console are always on in order that any received voice can be heard. This is in order that the Controller at the Assistant Control position can quickly call other Control Facilities according to traffic conditions and make coordination if necessary, and that the Controllers responsible for the Tower and Ground can understand each other's situations.

When the serious incident occurred, the air traffic volume was not particularly heavy, all radio communications even with Self-Defense Force aircraft were being conducted by VHF, and the Tower Controller was concerned about the headset cord interfering with her ability to move and look behind her; therefore, she was not wearing the headset over her ear and was instead carrying out communications while holding it in her hand. For this reason, she was sending transmissions with the tip of the voice tube of headset pointed toward her mouth.

The serious incident occurred at around 13:24, on July 5, 2012 on Runway 18 (26°12'34"N, 127°38'46"E) at Naha Airport. At this moment, the position of Aircraft B which was on the approach was about 2.7 nm from Aircraft A.

(See Figure 1: Estimated Taxiing Route, Figure 2: Estimated Flight Route, Figure 3: DFDR Records, and Attachment 1: ATC Communication Transcript)

2.2 Personnel Information

2.2.1 Flight Crewmember Information

(1) PIC of Aircraft A	Male, Age 47	
Airline Transport Pilot Certificate (Airplane)		July 12, 2004
Type rating for Airbus A320		March 26, 2004
Class 1 Aviation Medical Certificate		
Validity		March 13, 2013
Aviation English Language Proficiency Certificate (Level 4 Language Proficiency* ⁴)		
Validity		December 27, 2013
Total flight time		11,581 hr
Flight time in the last 30 days		75 hr 28 min
Total flight time on the type of aircraft		10,434 hr
Flight time in the last 30 days		75 hr 28 min
(2) FO of Aircraft A	Male, Age 28	
Commercial Pilot Certificate (Airplane)		August 12, 2006
Type rating for Airbus A320		June 12, 2008
Instrument Flight Certificate		May, 2006
Class 1 Aviation Medical Certificate		
Validity		September 1, 2012
Aviation English Language Proficiency Certificate (Level 4 Language Proficiency)		
Validity		May 24, 2014
Total flight time		4,948 hr
Flight time in the last 30 days		64 hr 39 min
Total flight time on the type of aircraft		4,698 hr

⁴ Annex 1 to the Convention on International Civil Aviation categorizes language proficiency for the use of aviation radiotelephones into levels from 1 (low) to 6 (high), with Level 4 or higher proficiency in English required for pilots flying overseas, Controllers, etc.

Flight time in the last 30 days	64 hr 39 min
(3) Rear Seat Pilot of Aircraft A Male, Age 24	
Commercial Pilot Certificate (Airplane)	September 24, 2009
Type rating for Airbus A320	August 9, 2011
Instrument Flight Certificate	September 24, 2009
Class 1 Aviation Medical Certificate	
Validity	September 1, 2012
Aviation English Language Proficiency Certificate (Level 4 Language Proficiency)	
Validity	May 13, 2013
Total flight time	1,071 hr
Flight time in the last 30 days	32 hr 53 min
Total flight time on the type of aircraft	821 hr
Flight time in the last 30 days	32 hr 53 min
(4) PIC of Aircraft B Male, Age 44	
Airline Transport Pilot Certificate (Airplane)	October 27, 1999
Type rating for Airbus A320	April 13, 2012
Class 1 Aviation Medical Certificate	
Validity	May 11, 2013
Aviation English Language Proficiency Certificate (Level 4 Language Proficiency)	
Validity	December 8, 2012
Total flight time	9,519 hr 52 min
Flight time in the last 30 days	55 hr 40 min
Total flight time on the type of aircraft	127 hr 05 min
Flight time in the last 30 days	55 hr 40 min
(5) FO of Aircraft B Male, Age 47	
Airline Transport Pilot Certificate (Airplane)	March 24, 1998
Type rating for Airbus A320	August 21, 1991
Class 1 Aviation Medical Certificate	June 28, 2013
Validity	
Aviation English Language Proficiency Certificate (Level 4 Language Proficiency)	
Validity	July 9, 2013
Total flight time	11,252 hr 04 min
Flight time in the last 30 days	33 hr 26 min
Total flight time on the type of aircraft	4,760 hr 58 min
Flight time in the last 30 days	33 hr 26 min

2.2.2 Air Traffic Controller Information

Tower Controller Female, Age 39	
Air Traffic Controller Competence Certificate	October 1, 1993
Aerodrome control rating	October 1, 1993
Facility rating: Naha Airport Traffic Control Tower	April 22, 2002
Medical Certificate	
Validity	May 30, 2013

2.3 Meteorological Information

Aeronautical weather observations at Naha Airport were as follows:

13:00 Wind direction 200°, Wind velocity 13 kt, Visibility 35 km
Clouds: Amount FEW, Type Cumulus, Cloud base 2,000 ft
Temperature 32°C, Dew point 26°C
Altimeter setting (QNH) 29.86 inHg

13:30 Wind direction 200°, Wind velocity 14 kt, Visibility: 40 km
Clouds: Amount SCT, Type Cumulus, Cloud base 2,000 ft,
Amount SCT, Type Unknown, Cloud base Unknown,
Temperature 32°C, Dew point 26°C,
Altimeter setting (QNH) 29.86 inHg.

2.4 Aerodrome Information

2.4.1 Runway

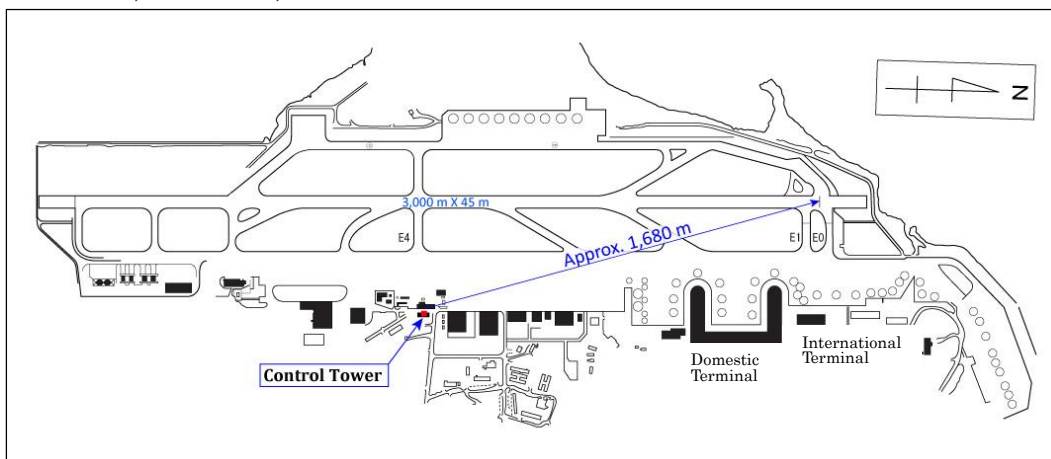
Naha Airport has one runway with a length of 3,000 m, a width of 45 m, and an orientation of 18/36. When the serious incident occurred, the runway was being used in a southward direction (orientation 18).

There are also parallel taxiways located on both sides of the runway, with Taxiway A on the east side and Taxiway B on the west side.

2.4.2 Control Tower

As shown in the figure below, the Airport Traffic Control Tower is located on the east side of the area near the halfway point of the runway. It is about 35.5 m high from the ground level and the floor of the tower cab is 28.7 m high from the ground level.

The distance from the Control Tower to the threshold of Runway 18, where the serious incident occurred, is about 1,680 m.



⁵ The “Air Traffic Control English Language Proficiency Certificate” certifies air traffic controllers and other personnel using aviation radiotelephones as possessing English language proficiency of Level 4 or higher as defined in Annex 1 to the Convention on International Civil Aviation.

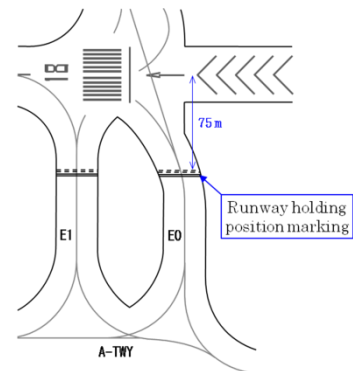


The view in the vicinity of Taxiway E0 and E1 from Airport Traffic Control Tower

2.4.3 Taxiway E0

As shown in the figure at right, Taxiway E0 is located between Parallel Taxiway A and the overrun on the north side of the runway. It is connected to the threshold of Runway 18; therefore, Taxiway E0 is mainly used together with the adjacent Taxiway E1 when departing aircraft are entering Runway 18 for takeoff.

In order to indicate the position at which aircraft should come to a stop short of the runway, a runway holding position marking is placed at a point 75 m away from the extension of the runway's center line.



2.4.4 Passenger Terminal Area

The passenger terminal apron is located along Parallel Taxiway A which is on the east side of the runway, covering an area corresponding to about one-third of the area on the north side of the runway. The international passenger apron is located on the north side of Taxiway E1, and the domestic passenger apron is located on the south side of Taxiway E1. Therefore, when using Runway 18, international departing aircraft taxi southward on Parallel Taxiway A, and domestic departing aircraft taxi northward on Parallel Taxiway A, toward E0 or E1.

2.4.5 Multilateration System

At Naha Airport when the serious incident occurred, a multilateration system was under operational evaluation, and the tracking data of the aircraft was recorded in the prototype installation.

The landing and taxiing conditions of the aircraft involved in the serious incident were confirmed by the playback function of the prototype installation.

2.5 Information on Communications

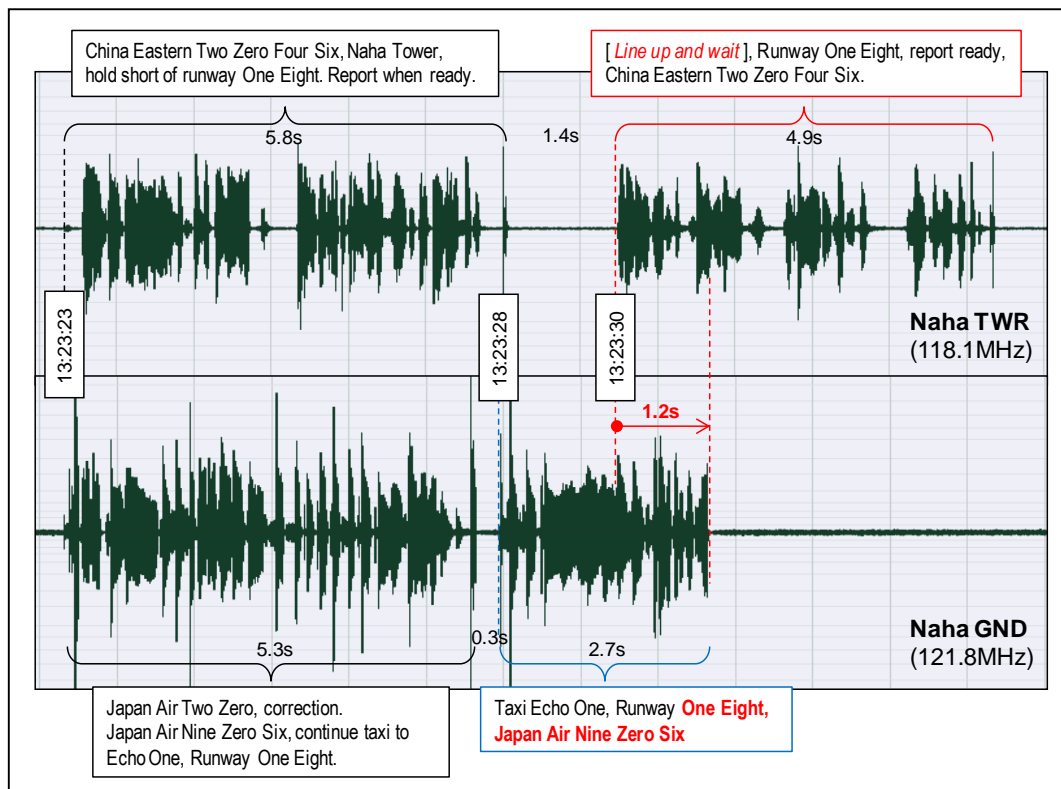
2.5.1 Situation of ATC Radio Communications

When the serious incident occurred, there were no abnormalities identified in the communication facilities for the ATC radiotelephones installed at Naha Airport.

The content of communications between the involved aircraft and the Airport Traffic Control Tower are as shown in Attachment 1: ATC Communication Transcript. Unclear portions caused by

pop noise (noise occurring when sound is cracked by excessive strength of the voice or by blowing into a microphone) are recorded on the voice of the Tower Controller. This noise primarily occurs on consonant sounds, and is particularly prominent in the “Hold short” portion, in the transmission beginning at 13:23:23, which instructed Aircraft A to hold short of the runway.

The readback of this hold instruction from Aircraft A began at 13:23:30. The beginning portion of the readback “Line up and wait” was recorded unclear voice and was very difficult to read. Moreover, as indicated in the figure below, from 13:23:28, immediately after the hold instruction from the Tower was completed, Japan Airlines Flight 906 (hereinafter referred to as “Aircraft D”), which had been instructed on the Ground frequency to taxi to the runway, began to read back the instruction, and the readback from Aircraft A was overlapping the latter half of the readback from Aircraft D for about 1.2 seconds.



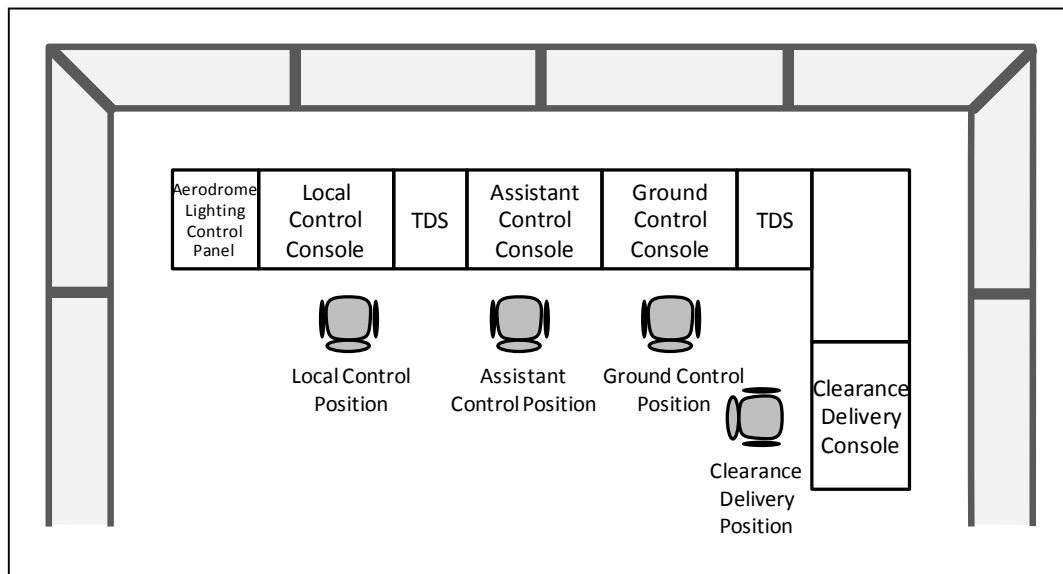
Incidentally, the recorded sound of the Controller’s voice on the recorder was derived from the signal at the stage where it was output from a control console to a transmitter, and was not from the signal which had been transmitted and then received. Therefore, it is not of the same quality as the sound that was heard in the aircraft.

2.5.2 Control Console Arrangement and Voice Output

In the Airport Traffic Control Tower located in the Control Tower, the Local Control Console, Assistant Control Console, and Ground Control Console are arranged from the left in that order on the west side facing the runway, and the Clearance Delivery Console is located facing north. A TDS is located between the Local Control Console and Assistant Control Console, and to the right of the Ground Control Console.

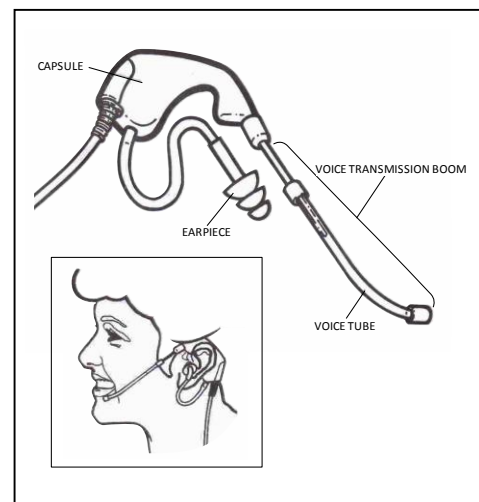
A radio communication unit for selecting the radio frequency used for communications is mounted on each control console except for the Assistant Control Console, and received sound on the selected frequency can be heard by using a headset connected to the control console. The received

sound can also be output from a loudspeaker located on each control console.



2.5.3 Controller Headsets

The headsets used by Controllers for their duties at the Naha Airport Traffic Control Tower are ear-hook type and manufactured in the United States of America. They are composed of a microphone contained in a capsule to be hooked over the ear, and a tube known as a “voice transmission boom” extending from the capsule to a sender’s mouth area, within which the sender’s voice travels to the microphone. When the headset is properly worn, the tip of the voice tube, a part of the voice transmission boom, comes sideways against the lips. The received sound is heard through an earpiece connected to the capsule and inserted into the ear.



There were no regulations at the Naha Airport Traffic Control Tower regarding the use of these headsets, although the manufacturer’s instruction manual, which was distributed to Controllers, includes the following descriptions.

D Adjusting the Voice Transmission Boom

1 Clear voice tube models have the microphone in the capsule. The voice tube is adjusted by sliding in or out, and rotating as needed.

(Omitted)

2 With one hand, hold the capsule securely against your head. With your other hand, adjust the voice transmission boom so the tip is two finger widths away from your face at the corner of your mouth.

2.6 Flight Recorders

Aircraft A was equipped with a DFDR manufactured by AlliedSignal (now Honeywell) of the United States of America and a Cockpit Voice Recorder (CVR) manufactured by Honeywell of the United States of America. The data of the serious incident when it occurred were retained in the DFDR, which has a 25-hour recording capability; on the contrary, the data were already overwritten

in the CVR, which has a 2-hour recording capability, and were not retained in it.

Aircraft B was equipped with a DFDR manufactured by L-3 Communications of the United States of America, and a CVR also manufactured by L-3 Communications of the United States of America. The data of this serious incident when it occurred were retained in the DFDR, which has a 25-hour recording capability; on the contrary, the data were already overwritten in the CVR, which has a 2-hour recording capability, and were not retained in it.

The time calibration for the DFDRs was made by comparing the time signals recorded on the ATC communication records with the VHF transmission keying signals recorded on the DFDRs.

2.7 Information on Auditory Masking

“The Encyclopedia of Ergonomics” (edited by Takao Okubo, published by Maruzen Co., Ltd.) includes descriptions of a phenomenon in which a certain sound becomes inaudible due to the presence of another sound as follows. (Excerpt)

Masking

The process by which the stimulus threshold of a sound is elevated due to the presence of another sound (masking sound). The elevated threshold is known as the “masked threshold in dB.” The phenomenon of masking is frequently encountered in everyday situations, one example of which is becoming unable to hear the sound of a conversation taking place on a platform at a train station due to the noise of a passing train.

2.8 Information on Air Traffic Control

2.8.1 Air Traffic Control Procedure

The air traffic control procedure in Japan is prescribed in III Standards for Air Traffic Control Procedure (hereinafter referred to as the “Standards for ATC Procedure”) in Fifth Air Traffic Service Procedure Handbook of Air Traffic Service Procedure Handbook by the CAB of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

The following descriptions regarding the confirmation of readback from aircraft are provided in 5. Telephone Communications of (I) General Provisions in the Standards for ATC Procedure.

(11) In order to confirm that air traffic control clearances, air traffic control approvals and air traffic control instructions, which had been issued by radio communication, were correctly received, readbacks from aircraft shall be surely heard. If there are no readbacks, if readbacks are unclear, or if readbacks are incorrect, appropriate measures shall be taken immediately.

Moreover, the following descriptions regarding holding on a runway and holding short of a runway are provided in 2. Air Traffic Control Clearances, etc. of (III) Aerodrome Control Procedures, in the Standards for ATC Procedure. (Excerpt)

(3) a. When takeoff clearance cannot be issued immediately but the situation is believed to be safe, a departing aircraft may be instructed to hold on the runway after the number of using runway is stated. In such a case, traffic information shall be provided to the aircraft as necessary.

★ RUNWAY [number] LINE UP AND WAIT. ([traffic information])

[Example] JA004G runway 04 line up and wait. Traffic B767 on final runway 34R.

(6) a. When an aircraft cannot be allowed to enter a runway due to traffic conditions, it shall be instructed to hold short of the runway. In such a case, traffic information shall be provided to the aircraft as necessary.

★ HOLD SHORT OF RUNWAY [number]. ([traffic information])

- b. *If a specific readback, in response to a. above, is not received or if such a readback is unclear, the pilot shall be instructed to read back the hold instruction.*

★ **READ BACK HOLD SHORT INSTRUCTIONS.**

Note: “Specific readback” shall include terms such as “Holding short” or “Holding” that refer to holding, and terms such as “ROGER” or “WILCO” shall be insufficient.

[Example] Controller: ANA2147, hold short of runway16R. Traffic 2 miles on final.

Pilot: Roger.

Controller: ANA2147, read back hold short instructions.

Pilot: Roger, holding short of runway 16R, ANA2147.

2.8.2 China Eastern Airlines Regulations

The following descriptions are provided in Chapter 4. Aircraft Radio Communications in the FTM (Flight Training Manual) for China Eastern Airlines.

1. 无线电通话要求

(Omitted)

— 通话 CRM 操作规范

- ▶ 通讯频道管理和许可接收严格按照《运行手册》10.2.2 和 10.2.4 执行
- ▶ 在滑行、起飞、爬升、下降、着陆及非巡航的 3000 米高度的飞行关键阶段严禁聊天或进行与飞行无关的活动
- ▶ 耳机和内话的使用：从推出飞机到巡航，下降至停机，建议高度 6000 米以下机组在座成员必须带上耳机使用内话机，监听 ATC 指令，巡航阶段不负责通信的人可以将耳机取下
- ▶ 无线电通信分工：如驾驶舱只有两人飞行时，有 PNF 负责通信联络；如三人时，可由中间座负责通信联络
- ▶ 无线电通信：通信频率的调定转换由负责通信者设定并报出所使用发射机和频率，其他成员同时证实并检查；通讯员听到任何指令时，应大胆复述，所有成员必须独立确定，互相证实检查；任何人有任何疑问不可存有侥幸心理猜测指令，及时与管制员证实。当主通信者需联系其它频率或暂不能履行通信职能时，应对主频率合理交接，视情况调高主频率音量，确保主频率通讯正常
- ▶ 中间座负责通信时，必须及时、准确地将 ATC 通报给机组，当发现机组有错忘漏动作或危及飞行安全时，应口头及时提醒，但不得动手

(Provisional translation)

— Operational requirements for Radio Communication in terms of CRM

- ▶ *The management of Radio Communication channels and the permission of receiving the incoming radio call must stick to the provisions 10.2.2 and 10.2.4 in the operational manual.*
- ▶ *Non-essential conversations and activities are not allowed during critical phases of flight such as taxi, take-off, climb, descent, landing and non-cruise phase of flight under 3000 meters.*
- ▶ *Usage of earphones and intercom systems: the flight crewmembers shall wear the earphones and intercom systems to monitor the ATC clearance from the phases of push-back through cruise, and descent through parking. The recommended altitude for wearing the earphones is at and below 6000 meters. Pilot not responsible for the communication don't need to wear the earphone during cruise.*
- ▶ *Radio communication assignment : If there are two pilots in the cockpit, the Pilot-Not-Fly is responsible for the radio communication. If there are three, the observer can make the radio communication.*
- ▶ *Radio Communication: The pilot who makes radio communication is responsible for the*

frequency setting and call out the transmitter used, the frequency selected, other flight crew shall make a double check and confirm. The communicator shall repeat loudly what he/she heard, and other flight crew member shall independently confirm and mutually confirm the result of double check. Timely confirm with the ATC if anyone has a doubt about the clearance. Handover the communication duty to the other or raise the volume of the master frequency for the proper communication on the master frequency if the communicator will use another frequency to communicate or cannot perform the communication duty temporarily.

- ▶ *The observer shall timely and precisely relay the ATC clearance to the flight crew if he/she is responsible for the communication. The observer can only orally alert the flight crewmembers, but never join the control to correct if the observer finds there is any mistake, negligence or omission at operation that might jeopardize the flight safety.*

3. ANALYSIS

3.1 Airman Competence Certificate and Others

The PIC, FO and Rear Seat Pilot of Aircraft A and the PIC and FO of Aircraft B held valid Airman Competence Certificates, valid Aviation Medical Certificates, and valid Aviation English Language Proficiency Certificates.

3.2 Air Traffic Controller Competence Certificate and Others

The Tower Controller held a required Air Traffic Controller Competence Certificate, a valid Medical Certificate, and a valid Air Traffic Control English Language Proficiency Certificate.

3.3 Effects of Meteorological Conditions

It is highly probable that the meteorological conditions at the time of the serious incident had no bearing on the occurrence of the case.

3.4 Situations of the Aircraft Involved

3.4.1 Situation of Aircraft A

3.4.1.1 Recognition of Aircraft B

As described in 2.1.1, Aircraft A was instructed by the Ground on the transmission starting at 13:22:57 to taxi to Taxiway E0 and to contact the Tower, and at 13:23:01 Aircraft A read them back. According to the voice recordings of the ATC communication, this readback ended at 13:23:04. Following this, immediately before 13:23:05, the Ground replied, "Good day," and ended communications with Aircraft A. Meanwhile, the landing clearance to Aircraft B was issued by the Tower on the transmission starting at 13:22:56, and then the readback from Aircraft B started at 13:23:02 and ended at 13:23:04. Therefore, the readbacks from both Aircraft A and Aircraft B ended at nearly the same time, and it is highly probable that when Aircraft A selected the Tower frequency, the communications regarding the landing clearance to Aircraft B had all been completed. After this, there were no communications between the Tower and Aircraft B until the go-around instruction, and the traffic information regarding Aircraft B was not provided to Aircraft A; therefore, it is highly probable that the flight crewmembers of Aircraft A were not capable of knowing the presence of Aircraft B or the landing clearance that had been issued to it through ATC radio communications until Aircraft A entered the runway.

According to the DFDR records, between the times of 13:23:30, when Aircraft A had completed turning to E0, and 13:23:50, when Aircraft A crossed the runway holding position marking, Aircraft B flew from about 3.5 nm to 2.7 nm out of the threshold of the runway. Moreover, according to the statements of the flight crewmembers of Aircraft B in 2.1.2.2 and the statements of the Tower Controller in 2.1.3, it is highly probable that the landing lights of Aircraft B were illuminated at this moment. Furthermore, according to 2.3, at the time of the serious incident at Naha Airport, the prevailing visibility was 35 to 40 km and the cloud ceiling was 2000 ft. Tower Controller also stated that she had had Aircraft B in sight since it was around CHATN. However, according to 2.1.2.1, the flight crewmembers of Aircraft A stated that they entered the runway after confirming that there were no aircraft on the final approach; in particular, the PIC, who was seated in the right seat on the final approach side, mentioned that there were no other arriving aircraft. Thus, the flight crewmembers of Aircraft A could not find Aircraft B, which was on approach 3 nm or thereabouts away from the threshold of the runway with its illuminated landing lights, in the weather conditions

where there were no visibility restrictions; as mentioned below in 3.4.1.2, it is somewhat likely that the flight crewmembers of Aircraft A misunderstood that they were allowed to enter the runway and minded that there was no arriving aircraft.

The presence of arriving aircraft on approach might not be recognized only by monitoring the ATC radio communications; therefore, the flight crewmembers of Aircraft A should have carefully checked the final approach.

3.4.1.2 Recognition of Hold Instruction

According to the statements of the flight crewmembers of Aircraft A in 2.1.2.1, all three of the flight crewmembers recognized the instruction from the Tower as the instruction “Line up and wait” indicating to hold on the runway.

Moreover, according to the DFDR Records in Figure 3, after Aircraft A began taxiing, it gradually increased its taxiing speed and reached 12 kt at 13:23:29, when it had nearly completed turning from Taxiway A0 to Taxiway E0. Starting from immediately before this at 13:23:27, its brakes were applied and at 13:23:41, its speed was reduced to 6 kt. According to the statements of the FO in 2.1.2.1(2), it is probable that this deceleration was to perform the Before Takeoff Checklist before entering the runway. Subsequently, the brakes were not applied, and the speed of Aircraft A was slightly increased to 8 kt as it passed the runway holding position marking; therefore, it is probable that the flight crewmembers of Aircraft A had no doubt about entering the runway.

From these points, it is probable that the flight crewmembers of Aircraft A misheard the instruction to hold short of the runway as an instruction to hold on the runway and misunderstood that they got an approval to enter the runway.

3.4.1.3 Receiving Condition of the Hold Instruction

As described in 2.5.1, pop noise was recorded over the voice recording of the “Hold short” part of the instruction to Aircraft A to hold short of the runway. Although it is somewhat likely that this noise was involved in the mishearing of the instruction by the flight crewmembers of Aircraft A, there were no data retained in the CVR of Aircraft A; therefore, it was not possible to examine the receiving condition for the hold instruction or determine the extent of its involvement.

3.4.2 Situation of Aircraft B

3.4.2.1 Recognition of Aircraft A

According to the statements of the flight crewmembers of Aircraft B in 2.1.2.2, although they had the Naha Airport runway in sight from about 8 nm away, they did not sight Aircraft A, which was entering the runway, and they did not remember hearing any hold instruction issued by the Tower to Aircraft A. Therefore, it is highly probable that while Aircraft B was on the approach to Runway 18, it did not notice the presence of Aircraft A and only executed a go-around by following the instruction from the Tower.

3.4.2.2 Go-around of Aircraft B

Although it is probable that, as described in 3.4.2.1, Aircraft B executed a go-around without noticing the presence of Aircraft A, according to the DFDR records of Aircraft B, the radio altitude of Aircraft B when turning to climb by following the go-around instruction from the Tower was about 770 ft, and its position at the moment was about 2.1 nm from the threshold of the runway; therefore, it is probable that Aircraft B went around without any difficulty.

3.5 Situation of Controllers

3.5.1 Recognition of Takeoff and Landing Sequence

According to the statement in 2.1.3, when the Tower Controller established communication with Aircraft A, this was the first time she became aware of the presence of Aircraft A. It is probable that this was because Aircraft A was relatively small for a passenger airliner and was departing from the international terminal apron, which is located far away from the Control Tower with poor visibility. On the other hand, Aircraft C was a domestic departure and Taxiway A beside the domestic terminal apron was highly visible from the Control Tower; therefore, it is probable that the Tower Controller was aware of its presence before communication was established.

According to the ATC communication records, the Tower issued the landing clearance to Aircraft B before establishing communication with Aircraft A and Aircraft C; therefore, it is highly probable that when the Tower Controller established communication with Aircraft A and Aircraft C, she planned to have both of those aircraft take off after Aircraft B had landed. Moreover, although the departure sequence had been reported in the order of Aircraft C and Aircraft A to the Radar Approach Control Facility, it is highly probable that the Tower Controller requested both aircraft to report when they were ready for departure because it was not determined which aircraft would become ready for departure first.

3.5.2 Occurrence of Pop Noise and Headset Usage Procedures (when Transmitting)

According to 2.1.3, the Tower Controller stated that she conducted communications without wearing a headset but by holding it in her hand, and that the tip of the voice tube was pointed toward her mouth; therefore, it is highly probable that the pop noise described in 2.5.1 occurred because the breath of Tower Controller struck directly the opening in the tip of the voice tube when she uttered words. The controller also stated that she clearly added “Hold short of Runway 18”; therefore, it is probable that prominent noise was caused when the Tower Controller stressed the “Hold short” portion.

It is probable that if the headset had been properly worn, the tip of the voice tube would have been positioned at a right angle to the Tower Controller’s lips, and this pop noise would not have occurred; therefore, in order to transmit a clear voice when a headset is used, it is considered necessary for Controllers to engage in their duties by wearing the headset as described in the manufacturer’s instruction manual mentioned in 2.5.3.

3.5.3 Occurrence of Masking and Headset Usage Procedures (when Receiving)

As described in 2.7, it is believed that a phenomenon known as “masking” may occur where the existence of one sound may affect the hearing of another sound.

According to the statement in 2.1.3 and the condition of ATC communication in 2.5.1, the readback of Aircraft A on the Tower frequency overlapped the readback of Aircraft D on the Ground frequency for 1.2 seconds, and it is highly probable that the readbacks of Aircraft A and Aircraft D were audible from the loudspeakers of the Local Control Console and the Ground Control Console. Therefore, it is somewhat likely that the masking occurred over the auditory sense of the Tower Controller, who did not wear a headset, and influenced her hearing ability on the “Hold short” part in the readback of Aircraft A.

While sound from a loudspeaker on a control console is attenuated in volume and deteriorated in clarity depending on the distance from the loudspeaker, sound from a headset, as described in 2.5.3, can be heard from an earpiece inserted into the ear and is anytime at a constant volume and superior in clarity to sound from a loudspeaker; therefore, it is probable that it could be easily

distinguished from the sound heard by the other ear. It is probable that if the headset had been worn and the readback from Aircraft A had been heard through the earpiece, it would have been possible to recognize the readback from Aircraft A was unclear voice.

From these points, in order to prevent the occurrence of masking and to make sure communications, it is considered necessary for Controllers responsible for Tower or Ground at Airport Traffic Control Towers, where more than one control position conducting ground-to-air communication are allocated, to listen to sounds through the earpieces by wearing headsets, even if those sounds are output from loudspeakers.

3.5.4 Recognition of Unclearness of Readbacks

According to 2.1.3, the Tower Controller stated that although it was not clear, she heard the readback from Aircraft A saying like “Hold short of Runway 18, report when ready.” As described in 2.5.1, the beginning portion of the readback from Aircraft A was recorded unclear voice and the readback from Aircraft A began to overlap with the readback from Aircraft D. Immediately afterwards, the readback from Aircraft D ended, and the rest of the readback after “Runway 18” was heard. Accordingly, it is somewhat likely that the Tower Controller did not recognize that the readback itself was unclear, believing that it became unclear because of the overlap and that the “Hold short of Runway 18,” which the Tower Controller had instructed clearly herself, had been read back properly.

As described in 2.8.1, it is specified in the Standards for ATC Procedure that if the readback of an instruction to hold short of the runway is unclear, an instruction to read back the hold short instruction shall be issued. However, it is probable that because the Tower Controller did not recognize that the readback from Aircraft A was unclear, this procedure was not complied.

Generally, the pilot will continue his/her operation if the Air Traffic Controller doesn't correct his/her readback even though the readback is not the clearance issued by the controller. While engaged in their duties, Controllers should always keep in mind that in ATC radio communications, presumption or conjecture to account for portions of communications that are not heard completely or are not mentioned may lead to misunderstandings. If the Tower Controller was not confident of hearing the readback of “Hold short” instruction, she should have instructed Aircraft A to read back the “Hold short” portion as specified in the Standards for ATC Procedure.

3.5.5 Recognition of the Situation during Aircraft A's Runway Incursion

According to 2.1.3, the Tower Controller stated that when there was a “ready” report from Aircraft A, Aircraft A appeared beyond Aircraft C which was on Taxiway E1, and Aircraft A had crossed the runway holding position marking and that thus she immediately instructed Aircraft B to go around. However, according to the taxiing tracking records of Aircraft A and Aircraft C on the multilateration system, as shown in Figure 1, at around 13:23:50 when Aircraft A crossed the runway holding position marking, Aircraft C had not yet entered Taxiway E1, and it is highly probable that this was immediately before Aircraft C turned from Taxiway A to E1.

It is probable that when Aircraft A turned to Taxiway E0, Aircraft A was obscured by Aircraft C on Taxiway A, and that the “ready” report from Aircraft A prompted the Tower Controller to sight it again and to recognize its runway incursion. However, it is also probable that the Tower Controller mistakenly remembered Aircraft C, which had entered E1 immediately after this, as already having entered E1 at that time.

3.6 Severity of the Serious Incident

When Aircraft B began to climb, its distance from Runway 18 and its altitude were about 2.1 nm and about 770 ft, as described in 2.1.1.

The classification for the severity of the serious incident according to the ICAO's "Manual on the Prevention of Runway Incursions" (Doc 9870), using a computer program provided by the ICAO, corresponds to "C (An incident characterized by ample time and/or distance to avoid a collision)." (Refer to Attachment 2: Classification of Severity of Runway Incursions)

4. PROBABLE CAUSES

It is highly probable that the serious incident occurred because the departing aircraft (Aircraft A) made an incursion onto the runway despite being instructed to hold short of the runway, causing the arriving aircraft (Aircraft B), which had already been cleared to land, to attempt to land on the same runway.

It is highly probable that Aircraft A entered the runway because the flight crewmembers of the aircraft misheard and misunderstood the instruction to hold short of the runway as an instruction to hold on the runway and could not find the arriving aircraft, as well as because the Tower Controller did not recognize that the readback from Aircraft A was incorrect and consequently did not confirm or correct the readback.

It is somewhat likely that noise occurring in the sound of the hold instruction from the Tower Controller contributed to the mishearing of the hold instruction by the flight crewmembers, and also that the misunderstanding by the flight crewmembers that they were allowed to enter the runway and the mind that there was no arriving aircraft contributed to the result that the flight crewmembers could not find the arriving aircraft.

It is also somewhat likely that the following contributed to the fact that the Controller did not notice the incorrect readback and failed to confirm or correct the readback.

- (1) The Tower Controller heard the readback from Aircraft A over a loudspeaker without wearing a headset.
- (2) The readback from Aircraft A was unclear.
- (3) The Tower Controller assumed that her own instructions were read back correctly.

5. SAFETY ACTIONS

5.1 Safety Actions Taken by China Eastern Airlines after the Serious Incident

In addition to circulating information on the serious incident within its flight crewmembers, China Eastern Airlines implemented the following actions.

- (1) Each flight unit shall make good arrangement of the flight crew based on their English language proficiency.
- (2) Each flight unit shall organize some technical discussions on how to use the radio phraseology in English according to different regions in the world.
- (3) Each flight crewmember shall crosscheck each and every ATC instruction and clearance during the flight. Further confirmation shall be made if the instruction or clearance cannot be heard clearly or understood. The flight crewmembers must strictly follow the SOP (Standard Operating Procedures) and can never execute any ATC instruction or clearance if it is not clear or not understood.

5.2 Safety Actions Taken by the MLIT after the Serious Incident

5.2.1 Actions Taken by the CAB of the MLIT

At Naha Airport, Taxiways E0 and E1, connecting to the north end of the runway, are located adjacent to each other, and when aircraft stand on both taxiways, it is difficult for aircraft on E0 to be visually confirmed from the Airport Traffic Control Tower, and for aircraft approaching from the north side of the runway to be visually confirmed from aircraft on E1, creating the potential risk of runway incursion. Therefore, there is a need to develop facilities regarding the prevention of runway incursions as quickly as possible. Moreover, a project is being planned to construct one more runway at the airport, and after the project is completed, it is expected that aircraft will constantly cross the runway. Thus, the MLIT has decided to install RWSL^{*6} at the airport.

Of the components of the RWSL system, it has been decided that runway entrance lights will be placed at E0 and E1, and that the other RWSL components will be arranged in conjunction with the project to construct the additional runway.

5.2.2 Actions Taken by the Naha Airport Office

After the serious incident occurred, the Naha Airport Office of the Osaka Regional Civil Aviation Bureau of the MLIT decided to take following actions and notified all air traffic controllers belonging to the office of the actions.

- (1) When issuing an instruction to hold short of the runway, relevant traffic information should be added to the instruction as much as possible.
- (2) It is preferable to use a headset as much as possible, and when wearing it, note that the voice tube should be positioned so that the user's breath will not strike it directly.
- (3) When issuing instructions to aircraft, ensure, as ever, that you properly hear readbacks.

Moreover, as future initiatives, the Naha Airport Office decided to promote discussions on the establishment of double watch control by assigning additional controller to monitor the Local Control

⁶ "RWSL (Runway Status Lights)" are a runway status display system. If an aircraft or vehicle is occupying a runway, RWSL alerts other vehicle or aircraft intending to enter the runway, or other aircraft intending to take off from the runway by illuminating lights. These lights consist of Takeoff Hold Lights and Runway Entrance Lights, which are automatically activated according to the positions of aircraft, etc. detected by a multilateration system or radar surveillance system.

position according to traffic conditions.

Figure 1: Estimated Taxiing Route

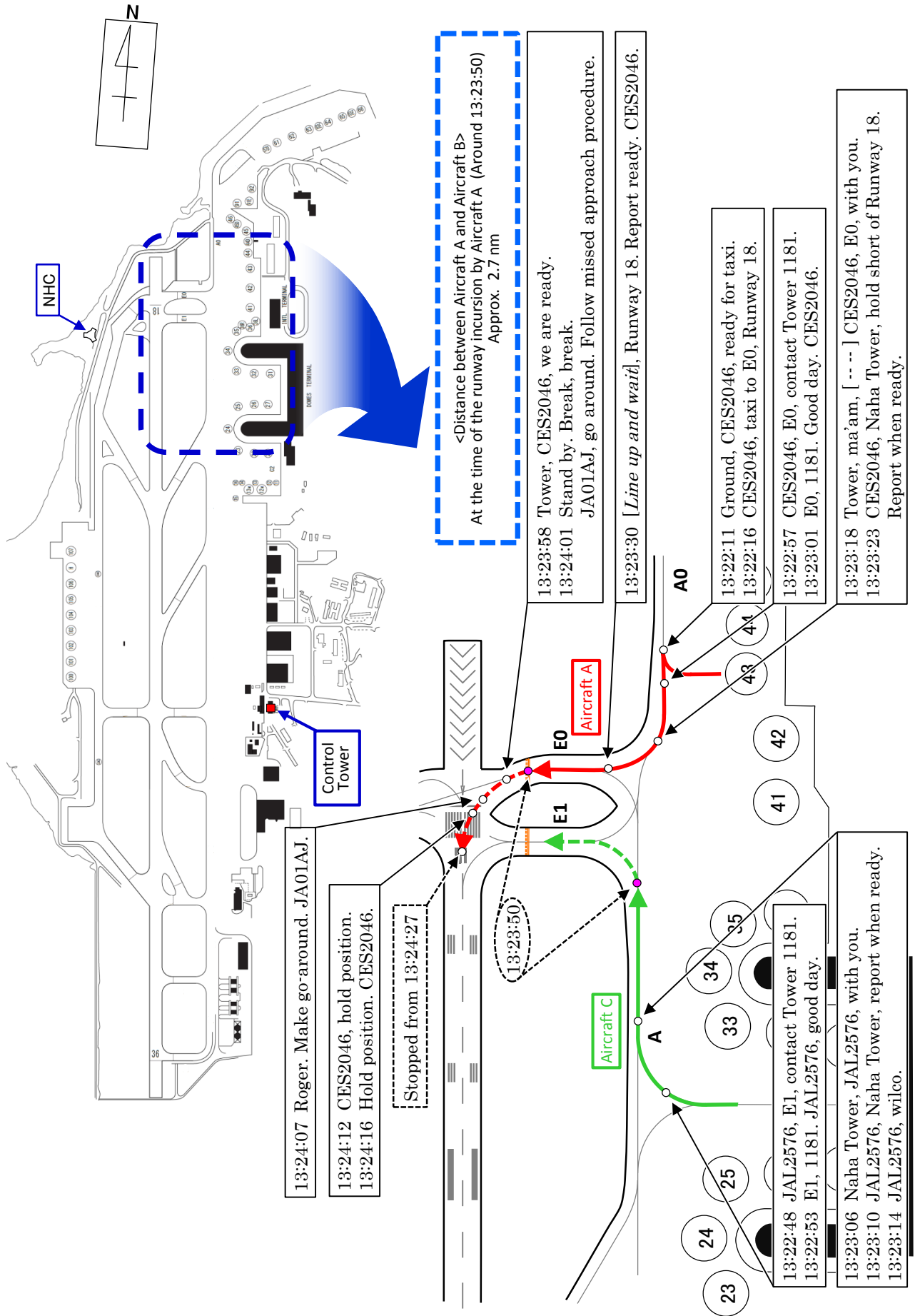
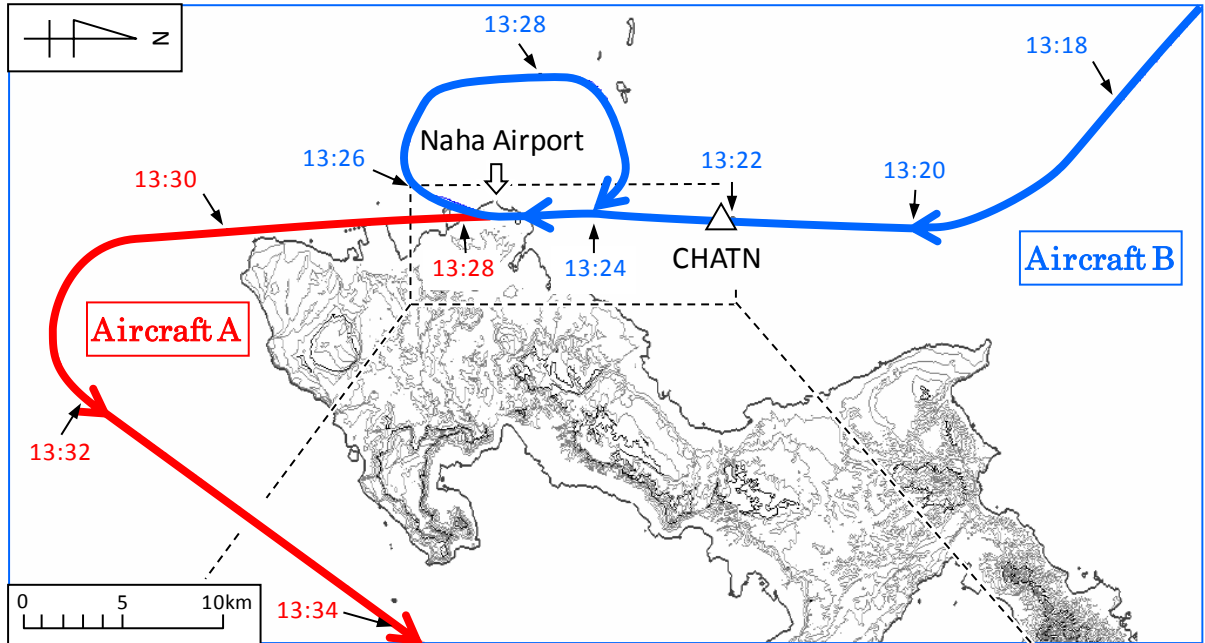


Figure 2: Estimated Flight Route



Enlarged View

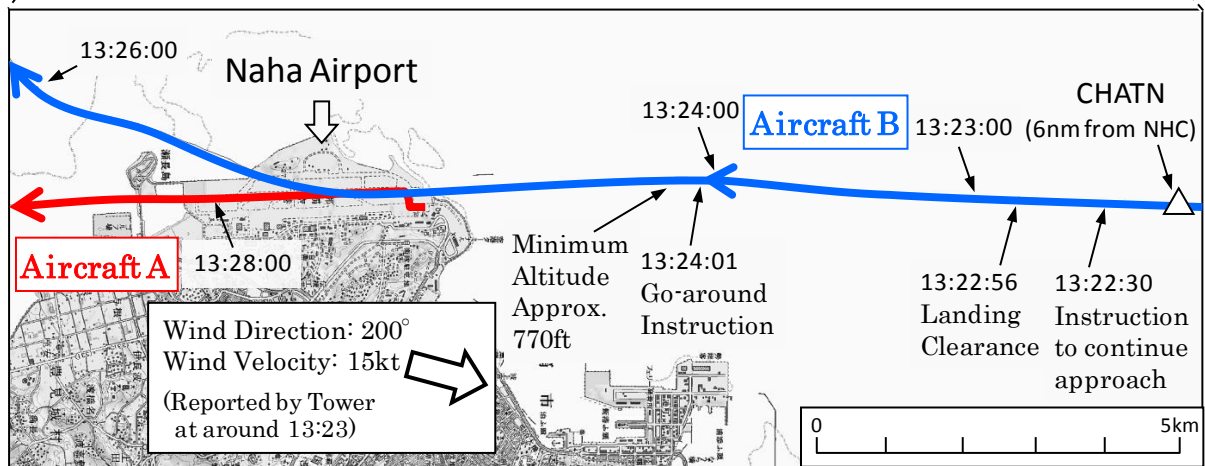
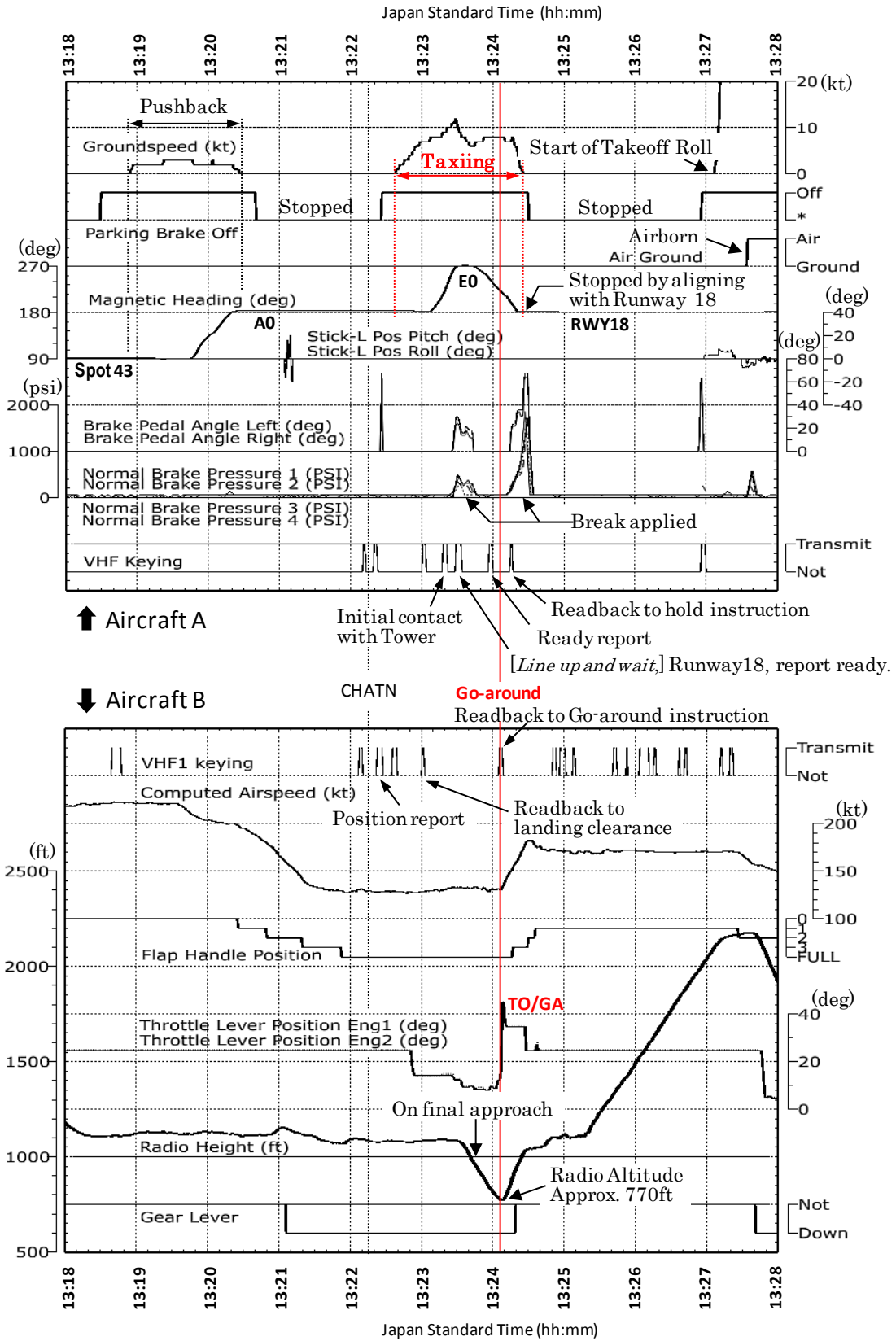


Figure3: DFDR Records



Attachment 1: ATC Communication Transcript

Ground Control Communication (121.8MHz)		Time	Local Control Communication (118.1MHz)	
Message	Sender		Sender	Message
Ground, China Eastern Two Zero Four Six, we're ready for push back, start-up.	CES2046	13:17:10		
China Eastern Two Zero Four Six, push back approved to Alfa taxiway.	GND	13:17:14		
Ah, push back approved, ahh, to Alfa taxiway. China Eastern Two Zero Four Six.	CES2046	13:17:22		
That's affirmative, Runway One Eight.	GND	13:17:30		
Runway One Eight. China Eastern Two Zero Four Six.	CES2046	13:17:32		
Ahh, Ground, Japan Air Nine Zero Six, request push back, Gate Two Two, ah, Foxtrot.	JAL906	13:17:35		
Japan Air Nine Zero Six, stand by please, traffic behind you. Stand by.	GND	13:17:40		
Stand by.	JAL906	13:17:44		(Omitted)
Japan Air Nine Zero Six, this time push back approved to Mike Two for Runway One Eight.	GND	13:17:54		
Mike Two, Runway One Eight. Push back. Japan Air Nine Zero Six.	JAL906	13:17:58		
(Omitted)				
Naha Ground, Japan Air Two Five Seven Six, request taxi.	JAL2576	13:21:47		
Japan Air Two Five Seven Six, taxi to Echo One, Runway One Eight.	GND	13:21:50		
Taxi to Echo One, Runway One Eight. Japan Air Two Five Seven Six.	JAL2576	13:21:52		
(Omitted)				
Ground, China Eastern Two Zero Four Six, ready for taxi.	CES2046	13:22:11		

Ground Control Communication (121.8MHz)		Time	Local Control Communication (118.1MHz)	
Message	Sender		Sender	Message
China Eastern Two Zero Four Six, taxi to Echo Zero, Runway One Eight.	GND	13:22:16		
Taxi to Echo Zero, Runway One Eight. China Eastern Two Zero Four Six.	CES2046	13:22:20		
(Omitted)		13:22:24	JA01AJ	Naha Tower, Juliet Alfa Zero One Alfa Juliet, apprao.. departed CHATN.
(Omitted)		13:22:30	TWR	Juliet Alfa Zero One Alfa Juliet, Naha Tower, Runway One Eight, continue approach, wind two zero zero at one five.
Ground, Japan Air Nine Zero Six, request taxi.	JAL906	13:22:33		
Japan Air Nine Zero Six, hold short of Alfa taxiway.	GND	13:22:37	JA01AJ	Ah, continue approach. Juliet Alfa Zero One Alfa Juliet, Spot Six One.
Hold short of Alfa taxiway. Japan Air Nine Zero Six.	JAL906	13:22:41	TWR	Roger.
		13:22:42	TWR	All Nippon One Seven Six Eight, turn left Echo Five. Contact Ground one two one decimal eight.
		13:22:47	ANA1768	Take Echo Five, contact Ground one two one eight. All Nippon One Seven Six Eight.
Japan Air Two Five Seven Six, Echo One, contact Tower one one eight one.	GND	13:22:48		
		13:22:51	TWR	Good day.
Echo One, one one eight one. Japan Air Two Five Seven Six, good day.	JAL2576	13:22:53		
	GND	13:22:56	TWR	Juliet Alfa Zero One Alfa Juliet, Runway One Eight, cleared to land, wind two zero zero at one five.
China Eastern Two Zero Four Six, Echo Zero, contact Tower one one eight one.	GND	13:22:57		
Echo Zero, one one eight one. Good day. China Eastern Two Zero Four Six.	CES2046	13:23:01		
		13:23:02	JA01AJ	Runway One Eight, cleared to land. Juliet Alfa Zero One Alfa Juliet.
Good day.	GND	13:23:04		
Naha Ground, All Nippon One Seven Six Eight, request taxi, Spot Three Six Left.	ANA1768	13:23:06	JAL2576	Naha Tower, Japan Air Two Five Seven Six, with you.
All Nippon One Seven Six Eight, hold at Number Four Stop-line.	GND	13:23:10	TWR	Japan Air Two Five Seven Six, Naha Tower, report when ready.

Ground Control Communication (121.8MHz)		Time	Local Control Communication (118.1MHz)	
Message	Sender		Sender	Message
Hold at Number Four Stop-line. Nll Nippon One Seven Six Eight.	ANA1768	13:23:13		
		13:23:14	JAL2576	Japan Air Two Five Seven Six, wilco.
		13:23:18	CES2046	Tower, ma'am, [-- --] China Eastern Two Zero Four Six, Echo Zero, with you.
Japan Air Two Zero, correction. Japan Air Nine Zero Six, continue taxi to Echo One, Runway One Eight.	GND	13:23:23	TWR	<u>China Eastern Two Zero Four</u> Six, Naha Tower, hold short of Runway One Eight . <u>Report</u> <u>when ready</u> .
Taxi Echo One, Runway One Eight. Japan Air Nine Zero Six.	JAL906	13:23:28		
		13:23:30	CES2046	[Line up and wait,] Runway One Eight , report ready. China Eastern Two Zero Four Six.
(Omitted)		13:23:58	CES2046	Tower, China Eastern Two Zero Four Six, we are ready.
		13:24:01	TWR	Stand by. Break, break. Juliet Alfa Zero One Alfa Juliet, <u>go</u> around. <u>Follow missed approach</u> <u>procedure</u> .
		13:24:07	JA01AJ	Roger. Make go-around. Juliet Alfa Zero One Alfa Juliet.
		13:24:12	TWR	China Eastern Two Zero <u>Four</u> Six, <u>hold position</u> .
		13:24:16	CES2046	Hold position. China Eastern Two Zero Four Six.
		13:24:45	TWR	Juliet Alfa Zero One Alfa <u>Juliet</u> , <u>follow missed approach</u> <u>procedure</u> and Naha, contact Naha Approach one two six decimal five.

Legend

Time	Japan Standard Time (hh:mm:ss)	GND	Ground Control
[-- --]	Unclear and unreadable part	TWR	Local Control
[<i>Italic</i>]	Unclear and difficult part to read	CES2046	China Eastern Airlines Flight 2046 (Aircraft A)
<u>Underlined</u>	The part of noise on the voice sound	JAL906	Japan Airlines Flight 906 (Aircraft D)
		JAL2576	Japan Airlines Flight 2576 (Aircraft C)
		JA01AJ	JA01AJ (Aircraft B)
		ANA1768	All Nippon Airways Flight 1768 (Arriving aircraft)

Attachment 2: Classification of Severity of Runway Incursions

The classifications of severity described in the ICAO “Manual on the Prevention of Runway Incursions” (Doc 9870) are as follows.

Table 6-1. Severity classification scheme

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

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