

AI2013-2

**AIRCRAFT SERIOUS INCIDENT  
INVESTIGATION REPORT**

**PRIVATELY OWNED  
J A 4 1 7 8  
JAPAN AIR COMMUTER CO., LTD.  
J A 8 4 7 C**

April 26, 2013

 **JTSA** *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. PRIVATE

CESSNA 172RG, JA4178

2. JAPAN AIR COMMUTER CO., LTD.

BOMBARDIER DHC-8-402, JA847C

March 22, 2013

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>

At about 17:24 Japan Standard Time (JST) on July 8 (Sunday), 2012, when a privately owned Cessna 172RG, registered JA4178, was approaching Runway 34 of Fukuoka Airport after it received a landing clearance from an air traffic controller, a Bombardier DHC-8-402, registered JA847C, which was operated by Japan Air Commuter Co., Ltd. as its scheduled flight 3635 and was to depart from the runway, entered there after it received from the controller an instruction to wait on the runway. The controller instructed JA4178 to perform a go-around.

There were three persons on board JA4178, consisting of the pilot in command (PIC) and two passengers, and 75 persons on board JA847C, comprising the PIC, three crew members, and 71 passengers, but there was no injury to these persons and no damage to the two aircraft.

### <Probable Causes>

It is highly probable that this serious incident occurred because, when Aircraft A (arrival aircraft) was approaching Runway 34 of Fukuoka Airport after it received a landing clearance from the Tower, Aircraft B (departure aircraft) entered the runway as the Tower instructed it to wait there.

The Tower instructed Aircraft B to wait on the runway though it had already issued a landing clearance to Aircraft A. It is highly probable that this occurred because the Tower temporarily had forgotten the existence of Aircraft A.

It is probable that the Tower had forgotten the existence of Aircraft A because he wanted to let many waiting News-gathering Helicopters and scheduled departure flights depart soon, and that this distracted the Tower's attention. In addition, the strip for Aircraft A did not serve as a reminder because the Tower removed it from the strip bay, and it is probable that this also affected the occurrence of the incident.

Abbreviations used in this report are as follows:

ASDE: Airport Surface Detection Equipment  
ASR: Airport Surveillance Radar  
CVR: Cockpit Voice Recorder  
DFDR: Digital Flight Data Recorder  
GND: Ground  
ICAO: International Civil Aviation Organization  
IFR: Instrument Flight Rules  
ILS: Instrument Landing System  
MLAT: Multilateration  
PF: Pilot Flying  
PM: Pilot Monitoring  
RA: Resolution Advisory  
REL: Runway Entrance Lights  
RWSL: Runway Status Light  
TCAS: Traffic alert and Collision Avoidance System  
TDS: Tower Display Subsystem  
THL: Takeoff Hold Lights  
TWR: Tower  
VFR: Visual Flight Rules  
VMC: Visual Meteorological Conditions

#### Unit Conversion Table

1 ft: 0.3048 m

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

1 nm: 1,852 m



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

## 2. FACTUAL INFORMATION

### 2.1 History of the Flights

The privately owned Cessna 172RG, registered JA4178 (hereinafter referred to as “Aircraft A”), which took off Tokushima Airport at 15:27 on July 8, 2012, was approaching Fukuoka Airport after it received a landing clearance from an air traffic controller (hereinafter referred to as the “Controller”).

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

Flight rules: Visual flight rules

Departure aerodrome: Tokushima Airport

Estimated off-block time: 15:30

Cruising speed: 130 kt

Cruising altitude: VFR

Route: Kawano - Imabari - Yoejima - Kitakyushu

Destination aerodrome: Fukuoka Airport

Total estimated elapsed time: Two hours

Fuel load expressed in endurance: Four hours and 30 minutes

In the cockpit of Aircraft A, the PIC sat in the left seat.

Meanwhile, the Bombardier DHC-8-402, registered JA847C (hereinafter referred to as “Aircraft B”), which was operated by Japan Air Commuter Co., Ltd., entered Runway 34 after it was instructed by the Controller to wait there.

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

Flight rules: Instrumental flight

Departure aerodrome: Fukuoka Airport

Estimated off-block time: 17:05

Cruising speed: 344 kt

Cruising altitude: FL160

Route: YAMGA (reporting point) - KUE (Kumamoto VOR/DME) - MZE (Miyazaki VOR/DME)

Destination aerodrome: Miyazaki Airport

Total estimated elapsed time: 30 minutes

Fuel load expressed in endurance: Three hours and 13 minutes

In the cockpit of Aircraft B, the PIC sat in the left seat as the PF and the First Officer (FO) in the right seat as the PM.

According to the records of air traffic control communications, radar tracking records, and

statements of Aircraft A's PIC, Aircraft B's PIC, and the Controller, the history of Aircraft A's and Aircraft B's flight up to the time of the serious incident is summarized as follows:

#### 2.1.1 History of the Flights Based on the Records of Air Traffic Control Communications and Radar Tracking

- 17:13:21 Aircraft B requested a taxiing from Spot 18-1 to Runway 34 to the Fukuoka aerodrome's ground controller (hereinafter referred to as the "Ground"). The Ground instructed Aircraft B to taxi to Runway 34.
- 17:14:30 Aircraft A reported to the Fukuoka aerodrome's controller (hereinafter referred to as the "Tower") that it had flown over Dazaifu. The Tower instructed Aircraft A to wait outside its control zone, and Aircraft A read back the instruction.
- 17:15:46 The Ground instructed Aircraft B to monitor the Tower's frequency, and Aircraft B read back the instruction.
- 17:16:00 The Tower instructed Aircraft A to avoid entering the final approach course and head to 1 nm east of the airport, and Aircraft A read back the instruction.
- 17:19:13 The Tower instructed Aircraft A to wait 1 nm east of the airport, and Aircraft A read back the instruction.
- 17:20:05 Aircraft B requested a departure from Taxiway E11 to the Tower. The Tower instructed the aircraft to proceed to Runway 34 via E11 and wait in front of the runway, and Aircraft B read back the instruction.
- 17:20:59 The Tower instructed Aircraft A to proceed to the right base leg after visually confirming the preceding arrival aircraft that was flying halfway through the right downwind leg and follow the visually confirmed aircraft, and Aircraft A read back the instruction.
- 17:22:56 The Tower issued the second landing clearance for Runway 34 to Aircraft A, and the aircraft read back the instruction.
- 17:24:15 The Tower instructed Aircraft B to wait on Runway 34, and Aircraft B read back the instruction.
- 17:24:51 The Tower informed Aircraft A that the wind direction was 330° and that the wind velocity was 11 kt.
- 17:25:16 The Tower instructed Aircraft A to go around, and Aircraft A read back the instruction. At that time, Aircraft A was flying at a point 0.8 nm away from the runway approach end.

#### 2.1.2 Statements of Flight Crewmembers

(1) PIC of Aircraft A

The PIC of Aircraft A decided to approach from the south because it was instructed to use Runway 34 at Fukuoka Airport.

Since Aircraft A was flying at an altitude lower than the lower limit for the air zone controlled by the Fukuoka Terminal Control facility (hereinafter referred to as the “Approach”), the PIC of Aircraft A did not establish radio communications with the Approach but did so directly with the Tower about 10 nm south of the airport.

The Tower instructed Aircraft A not to enter the control zone but to wait while circling around southeast of the airport. Later, Aircraft A received an instruction to report 1 nm east of the airport, and when it was circling counterclockwise around 1 nm east of the airport, the Tower asked the PIC of Aircraft A whether he could see a preceding arrival aircraft flying in the left downwind leg. When the PIC of Aircraft A informed the Tower that he had visually confirmed the preceding arrival aircraft flying in the left downwind leg, the Tower instructed the PIC of Aircraft A to follow the preceding arrival aircraft. Aircraft A entered the right downwind leg and then received the second landing clearance. Following the landing clearance, Aircraft A started its final approach following the preceding arrival aircraft that had flown through the left downwind leg.

After the preceding arrival aircraft landed, the PIC of Aircraft A assumed that the landing clearance for Aircraft A would be cancelled because the Tower instructed another aircraft to wait on the runway. Aircraft A continued to approach in a position that would enable it to go around at any time.

Since it was gradually approaching the airport, the PIC of Aircraft A moved the flight route a little toward the east (to the right of the direction of approach) from the center line of the runway for caution’s sake. At about the time when he intended to go around after confirming with the Controller, the Controller instructed Aircraft A to perform a go-around and evade toward the east, and therefore, the PIC of Aircraft A followed the instruction and went around. The PIC of Aircraft A did not feel any particular danger.

(2) PIC of Aircraft B

At around 17:15 JST, as Aircraft B went out of its spot, the understanding of its PIC was that the aircraft would probably be the third to take off. When the aircraft’s radio communications were transferred to the Tower, the Ground gave the control instruction “monitor tower (switch to the Tower’s frequency and wait for its call),” which was different from the usual one, and therefore, Aircraft B waited. But since there was no call from the Tower at all, the FO requested a departure from E11 to the Tower. Subsequently, Aircraft B continued to wait for about five minutes.

After Aircraft A's preceding arrival aircraft landed, the Tower gave the instruction "line up and wait (wait on the runway)," and the PIC of Aircraft B entered the runway after he confirmed that the runway entrance lights (REL) were off.

The PIC of Aircraft B heard the instruction "...No. 2 cleared to land" but did not understand whom the instruction was given to because there were many helicopters from news media (hereinafter referred to as "News-gathering Helicopters") and departure aircraft waiting for take-off clearances.

The PIC of Aircraft B, who recognized that the traffic was congested, continued to enter the runway while paying attention and closely watching the traffic outside together with the FO, but neither of the two officers did not visually detect the approach of Aircraft A. Small aircraft are difficult to discover if it is 1-2 nm or more away from the end of the runway.

When Aircraft B entered the runway, its PIC heard the Tower's instruction "go around." Later, the Tower issued an take-off clearance, but with a target shown directly above Aircraft B on the TCAS screen, the PIC of Aircraft B, who was concerned about whether Aircraft A had completely evaded to the east, confirmed with the Tower as to whether it was all right to take off. Since the Tower's answer was "no traffic," Aircraft B took off as instructed after confirming the safety of the runway.

### 2.1.3 Statements of Controllers

#### (1) Tower

The Tower started to work at the aerodrome control position at about 17:00 JST.

At Fukuoka Airport, the traffic of aircraft reaches a peak between 16:30 and 18:00. At first, when the Tower took the seat, the traffic was small but increased gradually with the passage of time. In addition to controlling scheduled arrival and departure flights, the Tower was letting News-gathering Helicopters take off as a shooting case had occurred in Kurume when Aircraft A requested a landing clearance from the direction of Dazaifu. Since the traffic was large, the Tower instructed Aircraft A to fly to 1 nm east of the airport, and after letting it wait there for a while, the Tower gave it information on the aircraft that was approaching Runway 34 ahead of Aircraft A while visually confirming the runway.

The Tower instructed Aircraft A to follow the preceding arrival aircraft after visually confirming it, and confirmed that Aircraft A was following the aircraft flying ahead of it.

Since the departure aircraft on Runway 34 started a take-off rolling when the aircraft arriving ahead of Aircraft A was circling around over the left base leg, the Tower issued a landing clearance to the preceding arrival aircraft and at the same time issued the second

landing clearance as an “anticipated landing clearance<sup>\*1</sup>” to Aircraft A. The Tower was worried by the fact that he had to let News-gathering Helicopters take off early, and that three to four scheduled departure flights were kept waiting.

News-gathering Helicopters requested a take-off to the south-southwest, but the Tower could not allow them to fly in the requested direction because they would run head-on<sup>\*2</sup> into aircraft approaching Runway 34 through visual confirmation, if any. The Tower coordinated with the Approach to lower the flight altitude of arrival aircraft, thus letting three helicopters take off to the west after giving instructions on their flight altitude.

Aircraft B called the Tower when it was taxiing halfway between the end of the runway and Spot 18-1 (near Taxiway E7). It requested an intersection departure<sup>\*3</sup> from Taxiway E11.

By the time when the aircraft arriving ahead of Aircraft A passed the approach end of Runway 34, the Tower had forgotten the existence of Aircraft A, and therefore, the Tower instructed Aircraft B, which had already waited at E11, to wait on the runway.

Usually, since arrival aircraft approach Runway 34 using the left traffic pattern, they are visually confirmed when they fly from the turning base leg to the final approach course, but the Tower failed to confirm Aircraft A in the final approach course. Small aircraft can easily be recognized when they are circling around, but are difficult to spot if they are in other positions. Nor could Aircraft A be confirmed on the screen of the Tower Display Subsystem (TDS). Furthermore, the strip bay<sup>\*4</sup> was also confirmed.

When it let Aircraft A wait 1 nm east of the airport, however, the Tower removed the strip for Aircraft A because the strip bay was full, and later, when Aircraft A returned to the final approach course, the Tower failed to confirm Aircraft A in the strip bay because the existence of the aircraft had slipped his mind, which caused the Tower to forget to return the strip to the strip bay though he should have done so.

How to use strips as reminders is left to each controller. The Tower used strips as reminders to prevent him from forgetting the existence of VFR arrival aircraft, but he did not use them as reminders to confirm whether he had issued a landing clearance.

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\*1 “Anticipated landing clearance” refers to a landing clearance issued when, before a required interval on the runway between an airplane and one that arrives or departs ahead of it is actually established, a controller determines that such an interval can be established.

\*2 “Head-on” refers to a situation in which two aircraft facing each other are highly likely to collide with each other.

\*3 “Intersection departure” refers to a method of take-off in which aircraft start a take-off rolling from a point other than the end of a runway where the runway meets a taxiway or another runway rather than using the whole length of a runway that can be used.

\*4 “Strip bay” means a box that contains strips for departing and arriving aircraft, etc.

When the aircraft that had arrived ahead of Aircraft A left the runway for Taxiway E6, the Tower conducted a wind check (reporting wind direction and velocity) for the aircraft arriving next, but as he felt uncomfortable about letting Aircraft B wait on the runway when another aircraft was arriving, the Tower instructed Aircraft A to go around and avoid to the east, after that, gave it an instruction to wait 1 nm east of the airport.

It is unusual for fixed-wing VFR aircraft to establish radio communications with the Tower suddenly and request an instruction for landing as Aircraft A did in this case. If an aircraft establishes radio communications with the Approach first, the Approach would give an individual code and a tag to the aircraft, but usually, the Tower does not give individual codes directly to VFR aircraft.

At Fukuoka Airport, the runway status light (RWSL)<sup>\*5</sup> system is designed so that it turns on runway entrance lights (RELs) when an arriving aircraft comes within about 2 nm of the runway approach end. Since the PIC did not report that there was a discrepancy between the RWSL system and the instruction to wait, the Tower assumed that any of the RELs had not been turned on (see 2.10.4).

## (2) Ground (Deputy Chief Air Traffic Controller)

The Ground took a seat at the ground control position at 17:00 JST. Aircraft B taxied out from Spot 18-1.

As there were several scheduled flights about to depart and furthermore News-gathering Helicopters scheduled to depart, the Ground thought that there would be problems with the issuance of landing clearances if it allowed departure aircraft taxiing on the ground to establish radio communications with the Tower, and determined that it was better not to allow them to do so immediately. For this reason, the Ground continued to control the third and fourth aircraft from Runway 34 without transferring their communications with the Ground to the Tower.

When it gave instructions to change frequency, the Ground also continuously instructed three to four aircraft to monitor the Tower so that the Tower could call departure aircraft at times that were convenient to it.

Many helicopters not only from news media but also from the police, firefighting, and other authorities as well as those for patrolling power transmission lines are permanently stationed at Fukuoka Airport. Since it is difficult to control these helicopters in addition to scheduled flights, the Tower is sometimes supported by other controllers. When this serious

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\*5 Runway Status Lights (RWSL) is a system to display the condition of the runway. This system, which consists of runway entrance lights (RELs) and take-off hold lights (THLs), draws the attention of PICs by turning on necessary lights depending on how the runway is occupied by aircraft. THLs have not been installed at Fukuoka Airport.

incident occurred, however, the Ground did not think that the Tower was so busy that it needed support.

When the News-gathering Helicopters called the Ground, there were several scheduled departure and arrival flights, and the Ground, unable to coordinate with the Tower, stopped the taxiing of the Helicopters. If the Ground passed the helicopters on to the Tower immediately at the helipad, the Tower would need to confirm with them again as to which direction they planned to head for and other details, but if the Ground did not allow them to move until its coordination with the Tower was completed, it would be able to spare the Tower the burden of such confirmation. The Ground thought that it was better to inform the Tower, when it had extra time, which helipad the helicopters were going to use and which direction they planned to head for.

Strips for scheduled departure flights and VFR aircraft (departing and arriving) are placed in the strip bay. Those for helicopters are also placed in the strip bay until they leave the control zone because their take-offs do not mean the immediate end of control, and therefore, the strip bay sometimes become full of strips.

When some of the helicopters called, the Ground needed to consider seeking support from someone else, but at that moment, he did not expect that these helicopters would have effects on arrival aircraft and other airport users.

This serious incident occurred on Runway 34 of Fukuoka Airport at about 17:24 JST on July 8, 2012.

(See Figure 1: Estimated Flight Routes of Aircraft A and Aircraft B; Figure 2: Estimated Traffic Conditions Just Before the Occurrence of the Serious Incident; Figure 3: Layout of the Control Tower and View of the Runway; and Attachment 1: Records of ATC Communications)

## **2.2 Injuries to Persons**

No one was injured.

## **2.3 Damage to the Aircraft**

There was no damage to both aircraft.

## **2.4 Personnel Information**

(1) PIC of the Aircraft A Male, Age 53

Private Pilot Certificate (Airplane)

November 15, 2004

Type rating for airplane single engine land	November 15, 2004
Class 2 aviation medical certificate	
Validity	December 18, 2012
Total flight time	699 h 01 min
Flight time in the last 30 days	4 h 02 min
Total flight time on the type of aircraft	479 h 41 min
Flight time in the last 30 days on the type of aircraft	4 h 02 min
(2) PIC of the Aircraft B Male, Age 35	
Airline Transport Pilot Certificate (Airplane)	June 8, 2010
Type Rating for Bombardier DHC-8	June 8, 2010
Class 1 Aviation Medical Certificate	
Validity	September 18, 2012
Total flight time	5,953 h 44 min
Flight time in the last 30 days	54 h 21 min
Total flight time on the type of aircraft	2,797 h 40 min
Flight time in the last 30 days on the type of aircraft	54 h 21 min
(3) FO of the Aircraft B Male, Age 32	
Commercial Pilot Certificate (Airplane)	September 13, 2006
Type Rating for Bombardier DHC-8	September 13, 2006
Instrument Flight Certificate	September 13, 2007
Class 1 Aviation Medical Certificate	
Validity	March 2, 2013
Total flight time	2,566 h 43 min
Flight time in the last 30 days	47 h 26 min
Total flight time on the type of aircraft	285 h 19 min
Flight time in the last 30 days on the type of aircraft	47 h 43 min

## 2.5 Air Traffic Controllers

(1) The TWR	Male, Age 46
Air Traffic Control Certificate	
Aerodrome control services	October 1, 1992
Approach control services	February 1, 1993
Terminal radar control services	July 1, 1993
En route air traffic control services	June 1, 1995
En route approach control services	June 1, 1995

Radar area control services	June 1, 1996
Medical Certificate	
Validity	June 30, 2013
Aviation English Language Proficiency Certificate	
Validity	March 31, 2015
(2) The GND	Male, Age 53
Air Traffic Control Certificate	
Aerodrome control services	October 1, 1979
Approach control services	May 1, 1980
Terminal radar control services	October 1, 1980
En route air traffic control services	June 1, 1987
En route approach control services	June 1, 1987
Radar area control services	February 1, 1988
Medical Certificate	
Validity	June 30, 2013
Aviation English language Proficiency Certificate	
Validity	March 31, 2013

## 2.6 Meteorological Information

Aerodrome routine meteorological reports for Fukuoka Airport around the time of the serious incident were as follows:

17:30 Wind direction 340°, Wind velocity 10 kt, Visibility 25 km

Cloud: Amount FEW, Type Stratus, Ceiling 3,500ft

Temperature 25°C, Dew point 16°C

Altimeter setting (QNH) 29.67inHg

## 2.7 Information on DFDRs and Cockpit Voice Recorders

Aircraft B was equipped with a DFDR (part number: 980-4700-027) and a cockpit voice recorder (CVR) (part number: 980-6022-011) manufactured by Honeywell of the United States of America. The data of Aircraft B's CVR (with a maximum recording period of two hours) were overwritten as the aircraft continued several legs of flight even after the occurrence of the serious incident---a reason why useful information is not left in the recorder.

## 2.8 Information on Air Traffic Control

### (1) Assignment of Controllers

On the day of the incident, eight controllers were on duty at the Control Tower. Two of them (one of whom was a trainee) took the ATC Clearance Delivery seat with four others each in the Flight Data, Ground, Tower, and DO position. The remaining two were on standby.

(See Figure 3 “Layout of the Control Tower and View of the Runway.”)

### (2) Operation of Air Traffic Control

At Fukuoka Airport, an instrument landing system is installed on Runway 34, too, but due to noise problems under the flight routes, its operation is limited if weather conditions are bad. In principle, aircraft must use a visual approach when using Runway 34.

If an incident, accident, fire, or similar occurs around Fukuoka Airport, police and firefighting helicopters are urgently mobilized to respond to it. In line with this move, News-gathering Helicopters request take-off clearances all at once. In particular, if such an event occurs near the west traffic pattern when aircraft use a visual approach for Runway 34, it is necessary to establish a certain interval in altitude between News-gathering Helicopters and aircraft using a visual approach.

Since June 2011, in order to ensure safe traffic, the airport authorities has prioritized aircraft landing on or taking off from the runway and helicopters landing on or taking off from the helipad.

### (3) Tower Display System (TDS)

TDS, which consists of the airport surface control screen and the airspace surface control screen, is a system to display the location of aircraft based on data from the airport/secondary surveillance radars (ASR/SSR), airport surface detection equipment (ASDE), and the multilateration (MLAT) system.

Furthermore, in addition to the previous function of displaying targets around the airport and on the airport surface, this system provides the functions listed below to draw the attention of arriving and departing aircraft.

- (a) Display a red bar on the entrance to the taxiway connected to the runway on the screen if a landing aircraft reaches a point from which it takes a certain period of time to the runway approach end or if a departure aircraft starts a take-off rolling and exceeds a certain speed
- (b) Display the condition of RWSLs on the airport surface screen

The ATC Operational Procedure in Chapter III of the ATC Service Regulations (hereinafter referred to as “the ATC Operational Procedure”), established by the Civil Aviation Bureau, does not have provisions of TDS, and the provisions of tower bright

displays and airport surface radar displays are applied.

In terms of the functions mentioned in (a) and (b) above, information on VFR arrival aircraft is not automatically put in the system as information on IFR one is, and it is necessary to enter such information manually. The designation of individual codes for VFR arrival aircraft and other procedures had not been established, however.

## **2.9 Measures Taken by the Fukuoka Airport Office**

In the investigative report (AI2012-3) on the serious incident at Fukuoka Airport it published in April 2012, the Japan Transport Safety Board recommended measures to be taken to prevent the recurrence of similar incidents, which consisted of the promotion of installation of RWSLs and use of effective reminders. Following the recommendations, the Fukuoka Airport Office took the following measures:

### **(1) Reminders**

At the Tower, air traffic controllers used strips for VFR arrival aircraft as reminders in order to prevent their existence from slipping their minds. One strip bay was used and contained strips for about seven aircraft.

### **(2) Response to the RWSL and double-watch system<sup>\*6</sup>**

The double-watch system had been implemented on a routine basis since May 2011, but the Airport Office decided to put it in place only during busy periods because the assessment and operation of the RWSL system began in April 2012. The deputy chief operation controller and other officers determined busyness, but the degree of busyness was not defined in qualitative terms.

When this serious incident occurred, the double-watch system was not in place.

## **2.10 Other Necessary Information**

### **2.10.1 Waiting on the Runway and Landing Clearances**

The following is excerpts of descriptions about “waiting on the runway” and “landing clearances,” which are included in “(III) Aerodrome Control Procedure, 2. ATC Clearance and Others” in the ATC Operational Procedure.

*“Waiting on the runway”*

*(3) a. Even if he/she cannot issue a take-off clearance to a departing aircraft immediately, the air traffic controller can permit it to wait on a runway by informing it in advance of the number for the runway it should use if the controller deems it safe to do so. In this case, the*

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<sup>\*6</sup> “Double watch” refers to a system in which qualified controllers monitor other controllers’ duties and give necessary advice to them and take other measures.

*controller shall provide the aircraft with traffic information as necessary.*

*“Landing clearance”*

*(8) a. A landing clearance (including clearances for low approach, touch-and-go, stop-and-go, and optional approach; the same shall apply to the following provisions) shall be issued without delay following the procedures specified below after the preceding aircraft involved (omitted) has reached a designated position or when it is judged that a designated separation can be established between the aircraft involved and the preceding aircraft (omitted). When the controller issues a landing clearance before the preceding aircraft reaches the designated condition, the traffic information about the preceding aircraft involved shall be provided, and the preceding departure aircraft cannot be allowed to start a take-off rolling from the same runway or any intersecting runway.*

*c. After a landing clearance is issued, the controller cannot allow other aircraft which use the same runway to take off, line up and taxi on the runway, and cross the runway ahead of the arrival aircraft involved.*

*d. Regardless of the timing for issuing a landing clearance, if it is judged that an enough separation cannot be established on the runway at the time when the arrival aircraft flies over the runway approach end, the controller shall instruct a go-around.*

*“Instruction for go-around”*

*(10) If it is judged that the arrival aircraft cannot continue an approach safely because of the condition of the runway, air traffic, and other reasons, the controller shall instruct the aircraft involved to perform a go-around. Instructions for the aircraft about its flight rules from then on shall be issued at an appropriate time.*

#### **2.10.2 Tower Bright Display**

The following is excerpts of descriptions about the tower bright display, which are included in Chapter (III) 10 of the ATC Operational Procedure.

##### *Application*

*(1) The tower bright display (hereinafter referred to as the “Bright”) can be used when the whereabouts of aircraft flying in the control zone and surrounding areas must be confirmed and necessary information must be provided to these aircraft and at the same time, when this can be judged to be necessary for performing ATC services.*

*(Note) The confirmation of the whereabouts of an aircraft by the Bright is unrelated to radar identification as stipulated in (IV) the standards for the Use of Radar. The service stipulated in this paragraph is not a radar service.*

### 2.10.3 Airport Surface Radar Display System

The following is excerpts of descriptions about the airport surface radar display system, which are included in “(III) 9. Airport Surface Radar Display System” of the ATC Operational Procedure.

#### *Application*

*(1) The airport surface radar display system can be used when aircraft or vehicles on the runway or taxiway must be relocated or their existence must be confirmed and at the same time, when this can be judged to be necessary for performing ATC services.*

*(Note) The airport surface radar display system consists of the airport surface detection equipment (ASDE) and the multilateration system (hereinafter referred to as MLAT) or either of the two as its sensor(s). In the case of the system consisting of only MLAT, attention must be paid to the fact that some aircraft and vehicles are not displayed.*

### 2.10.4 RWSL

(1) The following is excerpts of descriptions about RWSL, which are included in “(III) 13. Aerodrome Lighting Operation Methods” of the ATC Operational Procedure.

#### *Operation of the RWSL system*

*(3) If a discrepancy arises between a take-off clearance or a control clearance or similar related to waiting on or crossing the runway and the RWSL system, or if it is otherwise deemed necessary, the operation of the RWSL system shall be suspended until such a discrepancy or its cause is eliminated.*

(2) The Aeronautical Information Circular (AIC) on the assessment and operation of RWSLs at Fukuoka Airport (Nr 007/12) states as follows (excerpts):

#### *4. Measures that should be taken by the PIC*

*The PIC shall pay attention to the fact that turning on or off RWSLs does not mean a clearance or instruction by a controller and follow the following rules:*

*1) Aircraft must not enter the runway while RELs are on.*

*2) Even if RELs, which have been on, are turned off, aircraft must not enter the runway without a clearance or instruction by a controller.*

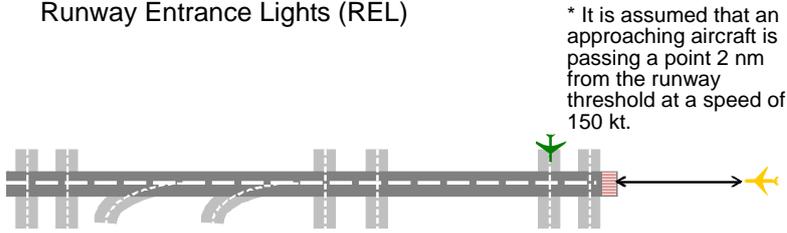
## RWSL System



**REL** Light at the center line of the taxiway

- The color of the light is red.
- Lights using LED as their source are installed.

### Runway Entrance Lights (REL)



- An REL is installed near the center line of a taxiway that intersects a runway. The REL is turned on when there is an aircraft that is going to take off from or land on the runway.
- Lighting requirement  
When an arrival aircraft approaches a point from which it takes a certain period of time (parameter specification) before the aircraft reaches the runway threshold

### 2.10.5 Air Traffic Condition

Before this serious incident occurred, from 17:22 to 17:25 JST, the Tower was controlling eight aircraft.

The status of radio communications at the Tower was as follows:

- 17:22:17 Issued a take-off clearance to a departure aircraft (ANA320)
- 17:22:26 A News-gathering Helicopter (JA427B) reported that it had left the control zone.
- 17:22:47 Issued a landing clearance to the preceding arrival aircraft (ANA4938)
- 17:22:56 Issued the second landing clearance to Aircraft A
- 17:23:08 Instructed a News-gathering Helicopter (JA05CF) to report when it left the control zone
- 17:23:30 Issued a take-off clearance to a News-gathering Helicopter (JA004W)
- 17:23:36 Transferred a departure aircraft (ANA320) to the departure control
- 17:24:15 Instructed Aircraft B to wait on Runway 34
- 17:24:30 A News-gathering Helicopter (JA05CF) reported that it had left the control zone.
- 17:24:41 Transferred the preceding arrival aircraft (ANA4938) to the ground control
- 17:24:51 Provided wind information
- 17:25:02 A News-gathering Helicopter (JA004W) reported that it had left the control zone.
- 17:25:11 A News-gathering Helicopter (JA08CH) requested a take-off clearance.
- 17:25:16 Instructed Aircraft A to go around

From 17:17 to 17:38 JST, four News-gathering Helicopters departed, and three arrived. When the serious incident occurred, three departure aircraft waited in front of Runway 34 in addition to Aircraft B.

(See Figure 2 “Estimated Traffic Conditions Just Before the Occurrence of the Serious Incident.”)

### **3. ANALYSIS**

#### **3.1 Airman Competence Certificates and Others**

The PIC of Aircraft A and the PIC and FO of Aircraft B held both valid airman competence certificates and effective aviation medical certificates.

#### **3.2 Air Traffic Controller Competence Certificates and Others**

The Tower held a required air traffic controller qualification certificate, a valid medical certificate, and a valid aviation English language proficiency certificate.

#### **3.3 Relation to Meteorological Phenomena**

It is highly probable that the weather conditions at that time had nothing to do with the occurrence of this serious incident.

#### **3.4 Situations of the Aircraft Involved**

##### **3.4.1 Aircraft A and Aircraft B’s Close Approach to Each Other**

As described in 2.1.1, it is highly probable that Aircraft A approached Aircraft B as follows:

- 17:14:30 Aircraft A passed Dazaifu, and Aircraft B, which passed E6, was taxiing on the ground to head for Runway 34.
- 17:15:46 Aircraft A was flying about 7 nm away from the approach end of Runway 34, and Aircraft B was taxiing on the ground near E8 to head for Runway 34.
- 17:19:13 Aircraft A started to wait 1 nm east of the airport, and Aircraft B, which passed about halfway between E10 and E11, was taxiing on the ground to head for Runway 34.
- 17:24:15 Aircraft A was flying about 2 nm away from the approach end of Runway 34, and Aircraft B started to enter Runway 34 from the stop line.
- 17:24:51 Aircraft A was flying about 1.3 nm away from the approach end of Runway 34,

and Aircraft B was entering Runway 34.

17:25:16 When the Tower instructed Aircraft A to go around, the aircraft was flying about 0.8 nm away from the approach end of Runway 34 while Aircraft B was waiting on the runway.

#### 3.4.2 Situation of Aircraft A

According to the descriptions in 2.1.1 and the statements in 2.1.2(1), by the time when Aircraft A started its final approach following the preceding arrival aircraft, Aircraft B had been instructed to wait on the runway. The PIC of Aircraft A said that since he expected the landing clearance for his aircraft to be canceled, the aircraft was prepared so that it could go around at any time, but that Aircraft A continued its final approach.

Based on these descriptions and statements, it is probable that while preparing for a possible go-around, the PIC of Aircraft A tried to pick his timing for confirming with the controller as to whether the aircraft should go around, taking into consideration the fact that he still had enough time, that the safety of the aircraft was not affected by such a go-around, and that furthermore, the traffic at the airport was congested.

#### 3.4.3 Situation of Aircraft B

According to the statements in 2.1.2(2), the PIC of Aircraft B thought that the instruction “No.2 cleared to land” was not understand whom the instruction was given to because there were many News-gathering Helicopters and departing aircraft were kept waiting on the taxiway.

Based on these statements, it is probable that the continuous issuance of landing clearances, including the one for Aircraft A, made it difficult for the PIC of Aircraft B to obtain information on related aircraft. In addition, since Aircraft A was small, the likelihood was that it was difficult to visually confirm the aircraft. Therefore, it is probable that Aircraft B entered the runway as instructed by the controller.

If a landing/take-off clearance is issued to one aircraft at a time, it is easy for aircraft to grasp the traffic condition around them. It is considered that if landing clearances had been so issued, it would have been more likely that the PIC of Aircraft B noticed inappropriate control instructions, etc.

### **3.5 Situation of Controllers**

#### 3.5.1 Tower

(1) According to the statements in 2.1.3(1), when the preceding arrival aircraft passed the

runway approach end, the Tower was primarily concerned that he had to let News-gathering Helicopters depart early, and that many departure aircraft were kept waiting.

As described in 2.8(2) and 2.10.5, it is also probable that News-gathering Helicopters' requests for a take-off clearance all concentrated in busy times while many scheduled departure flights were kept waiting.

From this, it is probable that after he issued a landing clearance to Aircraft A, the Tower wanted to let many waiting News-gathering Helicopters and departure aircraft depart early as his workload increased, and that as he was distracted by these duties, he had temporarily forgotten the existence of Aircraft A.

(2) According to the statements in 2.1.3(1), the Tower removed the strip for Aircraft A from the strip bay because the strip bay was full and because he instructed the aircraft to wait 1 nm east of the airport. Later, he should have returned the strip to the strip bay when Aircraft A came back to the final approach course, but he failed to do so because the existence of Aircraft A had slipped the Tower's mind.

According to the same statements, meanwhile, the Tower used strips as reminders not to forget the existence of VFR arrival aircraft, but did not employ them as reminders to confirm whether he had issued landing clearances to approaching aircraft.

Based on these statements, it is probable that the strip for Aircraft A was not placed in the strip bay. It is also probable that the Tower lost his timing for returning the strip for Aircraft A to the strip bay because he was busy responding to News-gathering Helicopters and other aircraft, forgetting the existence of Aircraft A. Furthermore, it is probable that after he issued a landing clearance to Aircraft A, the Tower lost the opportunity of recalling the existence of Aircraft A to which he had already issued a landing clearance because he did not use strips as reminders for landing clearances.

(3) According to the statements in 2.1.3(1), the Tower could not confirm Aircraft A in the final approach course and on the TDS screen. He said that small aircraft can easily be spotted when they are circling around, but that in other cases, it is difficult to spot them.

If Aircraft A had first established radio communications with the Approach, the Approach would have given it an individual code and a tag, but usually, the Tower does not give individual codes directly to VFR aircraft. As described in 2.8(3), it was necessary to enter these codes and tags for VFR aircraft manually, and when the serious incident occurred, there was no established procedure for doing so.

Judging from these circumstances, it is likely that the Tower confirmed whether Aircraft A was in the final approach course, but that he could not spot it easily because it was a small airplane.

In addition, it is probable that since Aircraft A established radio communications directly with the Tower, an individual code was not given to the aircraft, and that therefore, its tag was not displayed on the TDS screen, a reason why on the TDS screen it was difficult to distinguish Aircraft A from other VFR helicopters flying around the airport.

Moreover, it is probable that since he could not find Aircraft A as an arrival one on the TDS screen, the Tower determined that there was no aircraft in the final approach course and then instructed Aircraft B to wait on the runway.

(4) According to the statements in 2.1.3(1), the Tower performed a wind check for arrival aircraft.

Judging from this, it is likely that the reason Tower did so was that he had not completely forgotten Aircraft A as one of the arrival aircraft. It is probable, on the other hand, that if he had completely remembered Aircraft A then, he would have immediately instructed it to go around before the wind check, but in reality, he did not. For this reason, it is probable that the existence of arrival aircraft remained in the Tower's mind, but that at that moment, he did not remember Aircraft A as a specific aircraft to which he had issued a landing clearance. After the wind check, it is probable that he realized that Aircraft B was waiting on the runway while Aircraft A was in the final approach course, and that he immediately instructed the latter to go around.

### 3.5.2 Ground

According to the statements in 2.1.3(2), when he let Aircraft B establish radio communications with the Tower, the Ground instructed the aircraft to monitor the Tower so that the Tower could radio contact Aircraft B when it was convenient to the former. The Ground also said that he also decided not to transfer its control over helicopters to the Tower immediately.

Based on these statements, it is probable that the Ground was paying attention so that the workload at the Tower did not increase too much.

As the workload was growing rapidly, however, it would have been desirable for the Ground, as a deputy chief air traffic controller, to not only pay attention to reduce the workload but also consider supporting by other controllers and taking other measures.

## **3.6 Assessment of the Measures Taken by the Fukuoka Office, Etc.**

### 3.6.1 Reminders

As described in 2.9(1), the strip bay could contain strips for seven aircraft, but during the busy time period, strips overflowed as the traffic grew rapidly due to the handling of

News-gathering Helicopters and other duties, and the Tower removed the strip for Aircraft A from the strip bay. For this reason, it is probable that the strip failed to serve as a reminder for Aircraft A.

Since the number of strips that can be contained in the strip bay is limited, it was necessary to take measures such as getting extra strip bays ready in preparation for a sharp rise in traffic.

Meanwhile, it had been decided that strips should be used as reminders for VFR aircraft, but how to use them was left to the discretion of each controller. It is probable that the Tower lost the opportunity of recalling Aircraft A because he did not use strips for arrival aircraft to confirm whether landing clearances had been issued. The Fukuoka Airport Office needed to stipulate how to use strips as reminders, including confirming whether landing clearances had been issued.

### 3.6.2 RWSL System and TDS

As described in 2.8(3), it is probable that since there was not clearly established procedure for entering data on VFR arrival aircraft in the system, the Tower could not take appropriate actions such as giving an individual code to Aircraft A when it called the Tower directly as in this case. It is also probable that the RWSL system did not work because Aircraft A was not recognized as an arrival aircraft on the radar system, and the attention of the PIC and the controller was not attracted because a tag was not given to Aircraft A on the TDS screen. It was necessary to establish procedures that enabled the Tower to respond even when it was called directly.

Since it is likely that similar incidents occur at other airports, it is desirable to consider establishing procedures for entering data on VFR arrival aircraft in the RWSL system taking the status of system operation at each airport into account.

### 3.6.3 Response to Increased Workload

As described in 2.10.5, News-gathering Helicopters' requests for departure concentrated in the busy time period while many departure aircraft were kept waiting. It is highly probable that this urged the controller to issue take-off clearances soon, and all these factors affected the occurrence of this serious incident. Since there is a limit to the ability and concentration of individual controllers, however, it was necessary for controllers to consider it important to follow basic procedures and take workload into consideration and at the same time strive to prevent the occurrence of human errors while keeping the importance of helping each other through teamwork in mind. In particular, it is necessary to support other controllers when

their workload grows sharply, and in order to determine whether to support other controllers, it was necessary to have specific standards for doing so. Furthermore, it was necessary to confirm on a daily basis through training and other means as to what specific support should be provided and how.

### **3.7 Severity of This Serious Incident**

As described in 2.1.1, when the Tower instructed Aircraft A to go around, the distance between the aircraft and Aircraft B was about 0.8 nm (about 1.5 km).

According to the classification of severity in the ICAO Manual on the Prevention of Runway Incursions (Doc. 9870), as a result of assessments based on the programs provided by ICAO, this serious incident is considered as (C) “An incident characterized by ample time and/or distance to avoid a collision.”

(See Attachment 2 “The Classification of the Severity of Runway Incursions.”)

## **4. PROBABLE CAUSES**

It is highly probable that this serious incident occurred because, when Aircraft A (arrival aircraft) was approaching Runway 34 of Fukuoka Airport after it received a landing clearance from the Tower, Aircraft B (departure aircraft) entered the runway as the Tower instructed it to wait there.

The Tower instructed Aircraft B to wait on the runway though it had already issued a landing clearance to Aircraft A. It is highly probable that this occurred because the Tower temporarily had forgotten the existence of Aircraft A.

It is probable that the Tower had forgotten the existence of Aircraft A because he wanted to let many waiting News-gathering Helicopters and scheduled departure flights depart soon, and that this distracted the Tower’s attention. In addition, the strip for Aircraft A did not serve as a reminder because the Tower removed it from the strip bay, and it is probable that this also affected the occurrence of the incident.

## **5. SAFETY ACTIONS**

### **5.1 Measures Taken after the Serious Incident to Prevent the Recurrence of Similar**

## **Ones**

### **5.1.1 Measures Taken by the Civil Aviation Bureau**

Following this serious incident that involved a runway incursion, the Air Traffic Control Division of the Air Traffic Service Department at the Civil Aviation Bureau of the Ministry of Land, Infrastructure and Transport distributed an office circular entitled “About Performing ATC Services More Steadily and Following the Basic Procedures Strictly” to all air traffic control organizations. In this circular, the Division instructed them to take measures for preventing the recurrence of similar incidents such as using strips as reminders for arrival aircraft (including the confirmation of landing clearances), establishing a backup system during busy times, and ensuring close cooperation and mutual support among team members. It also instructed them to make doubly sure again that all controllers provide ATC services appropriately and follow the basic procedures strictly.

### **5.1.2 Measures Taken by the Fukuoka Airport Office**

After the occurrence of this serious incident, the Fukuoka Airport Office of the Osaka Regional Civil Aviation Bureau took several safety measures. They included analyzing duties that could be shared by other controllers to reduce the overall aerodrome control workload, establishing a backup system that would work if traffic exceeded a certain volume, issuing no landing clearance to the second and later approaching aircraft, installing additional strip bays and establishing a unified method of employing strips as reminders, and giving tags to fixed-wing VFR arrival aircraft.

Figure 1 Estimated Flight Routes of Aircraft A and Aircraft B

Aircraft A

Aircraft B

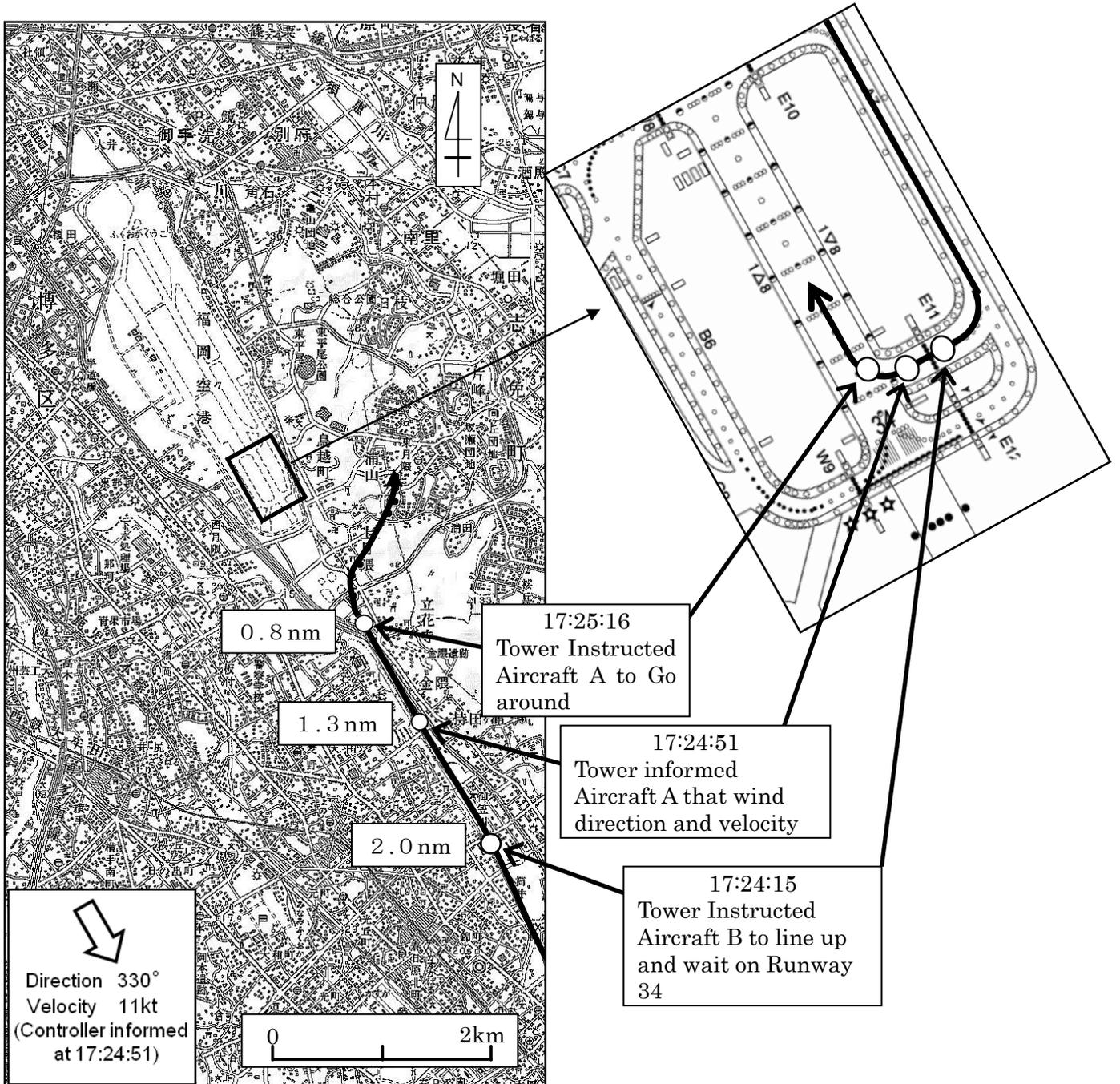


Figure 2 Estimated Traffic Conditions Just Before the Occurrence of Serious Incident

(About 17:24)

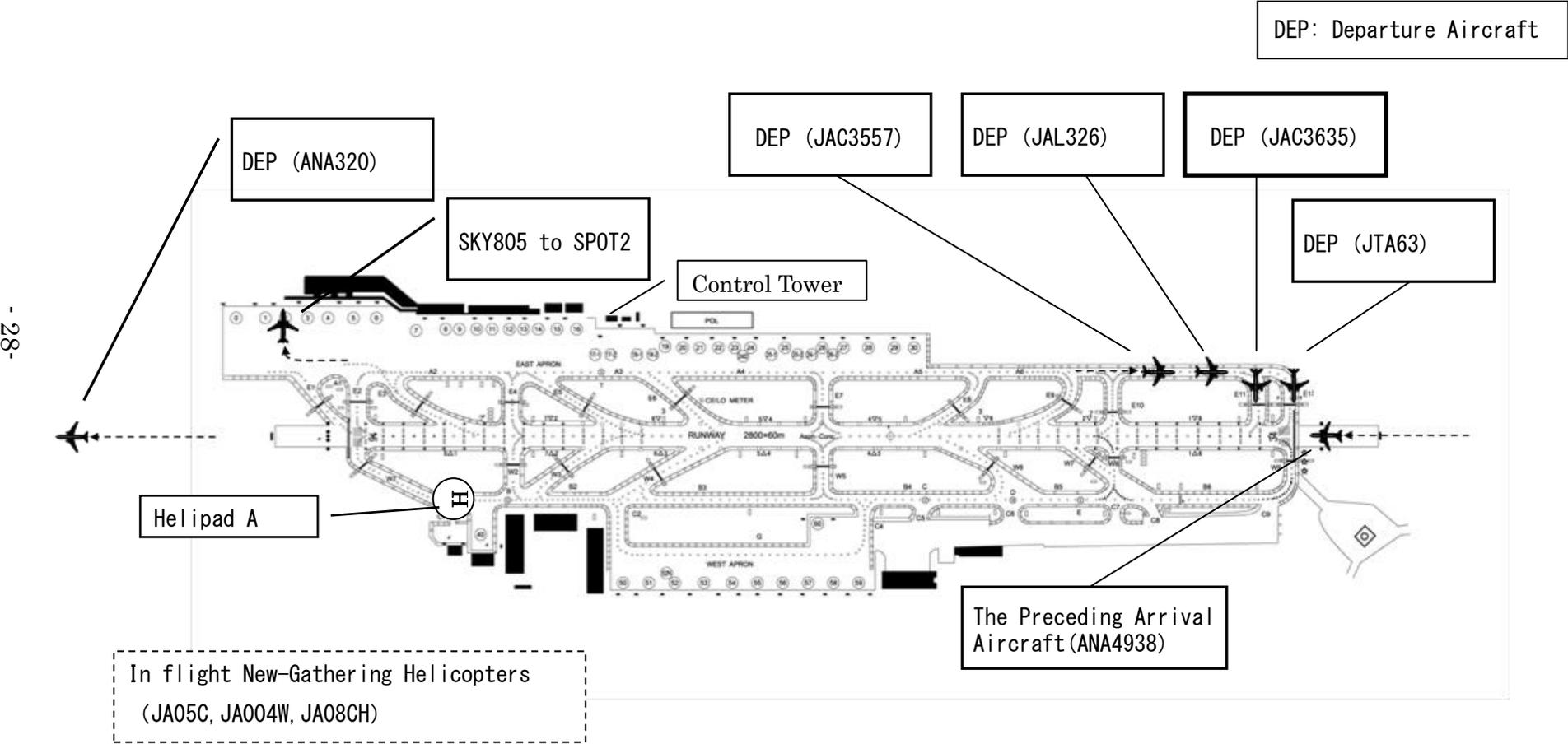
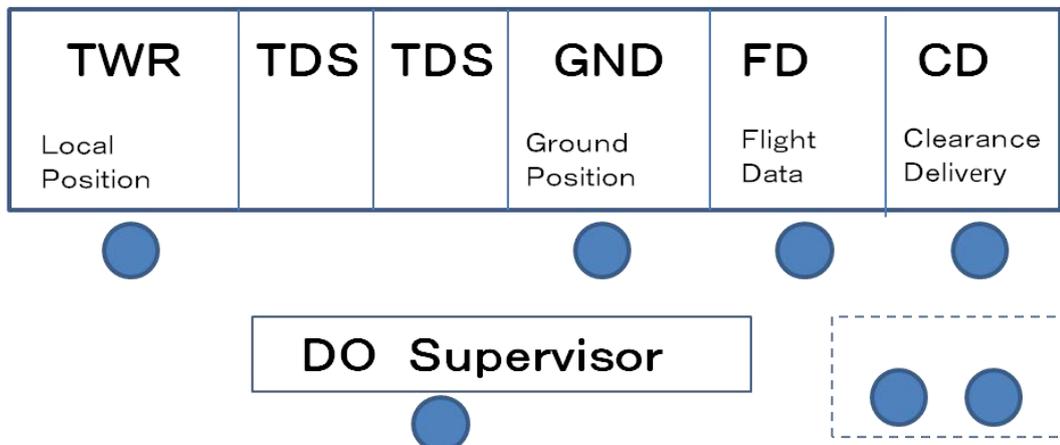
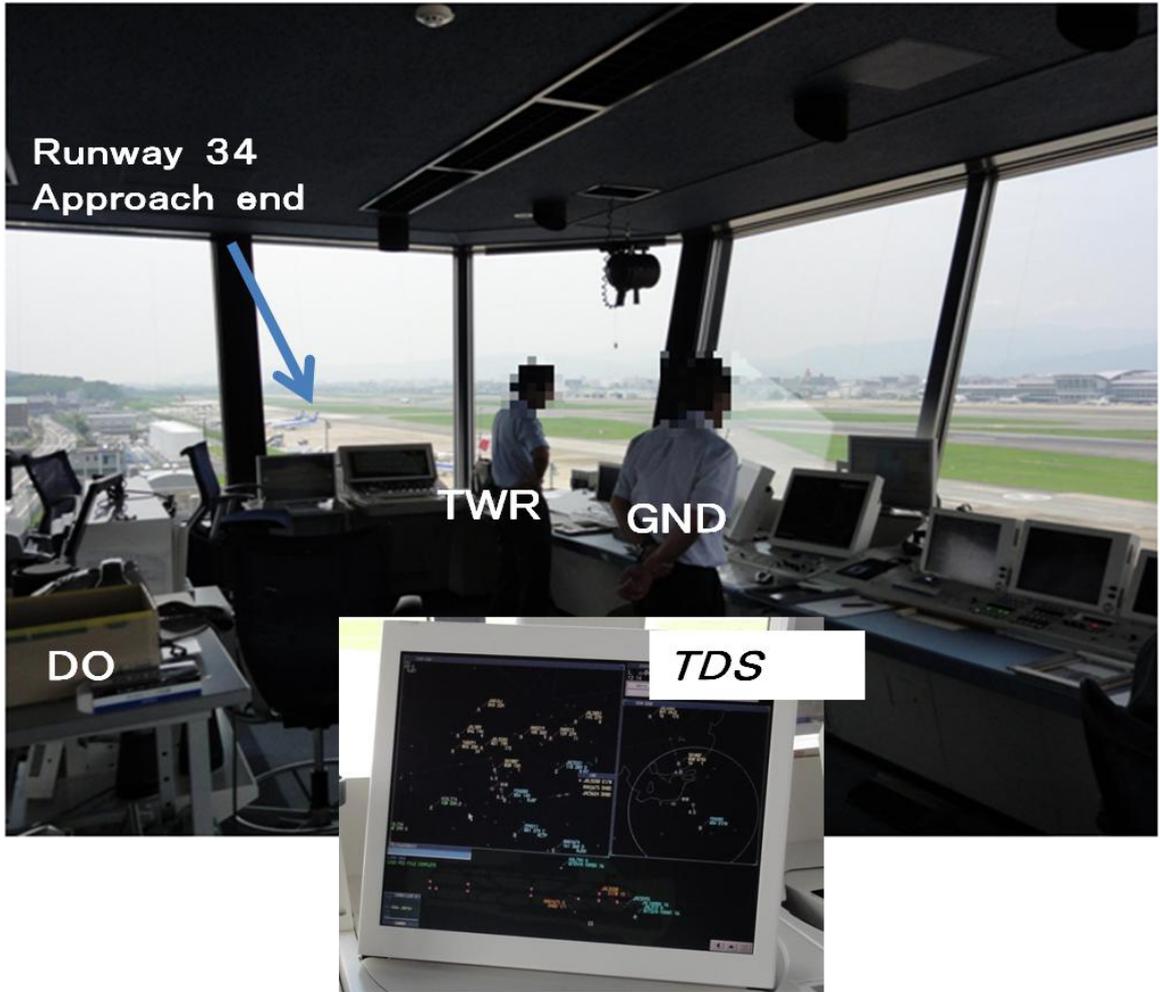


Figure 3 Layout of the Control Tower and View of the Runway



## Attachment 1 Records of ATC Communications

JST (hh:mm:ss)	Fukuoka Tower (118.4MHZ)		Fukuoka Ground (121.7MHZ)	
	Origin	Contents	Origin	Contents
		(Omitted)		(Omitted)
<b>17:13:21</b>			<b>JAC3635</b>	<b>Fukuoka Ground, JAC3635, spot 18-1, with V, request taxi.</b>
17:13:28			GND	JAC3635 Taxi to RWY34.
17:13:30			JAC3635	Taxi to RWY34.
17:14:20	TWR	JA4178 Say again your position.		
17:14:26	JA4178	Over DAZAIFU		
<b>17:14:30</b>	<b>TWR</b>	<b>4178 Roger Keep out of control zone.</b>		
17:14:35	JA4178	4178 Roger Keep out of control zone.		
<b>17:15:46</b>			<b>GND</b>	<b>JAC3635 Monitor TWR 118.4</b>
17:15:49			JAC3635	JAC3635 Monitor TWR 118.4
<b>17:16:00</b>	<b>TWR</b>	<b>JA4178 Proceed to 1nm east, keep out of final course.</b>		
17:16:09	JA4178	4178 Roger proceed to 1nm east, keep out final course.		
<b>17:19:13</b>	<b>TWR</b>	<b>JA4178 Hold 1nm east.</b>		
17:19:16	JA4178	4178, Hold 1nm east.		
<b>17:20:05</b>	<b>JAC3635</b>	<b>Request E11 intersection departure, ready.</b>		
17:20:10	TWR	Roger taxi via E11 hold short of RWY.		
17:20:12	JAC3635	Taxi via E11 hold short of RWY, JAC3635.		
<b>17:20:59</b>	<b>TWR</b>	<b>JA4178, traffic on middle downwind, report insight.</b>		
17:21:01	JA4178	4178, Traffic insight.		
17:21:05	TWR	Roger, proceed to right base, follow the traffic.		
17:21:08	JA4178	4178 Roger proceed to right base, follow the traffic.		
17:22:17	TWR	ANA320 wind 350 at 10, RWY34 cleared for take off.		
17:22:26	JA427B	Fukuoka Tower JA427B 5nm SSE, 1600ft, leaving.		
17:22:33	TWR	JA427B roger good day.		
17:22:38	JA427B	Thank you for information, good day.		
17:22:47	TWR	ANA4938, departure start rolling, RWY34 cleared to land, wind 340 at 10.		
17:22:53	ANA4938	RWY34 Cleared to land , ANA4938		
<b>17:22:56</b>	<b>TWR</b>	<b>JA4178 number 2 RWY34 cleared to land, wind 340 at 10.</b>		
17:23:04	JA4178	JA4178 roger, number 2 cleared to land RWY34.		
17:23:08	TWR	JA05CF Report leaving control zone.		
17:23:12	JA05CF	05CF roger.		

JST (hh:mm:ss)	Fukuoka Tower (118.4MHz)		Fukuoka Ground (121.7MHZ)	
	Origin	Contents	Origin	Contents
17:23:15	JA004W	Fukuoka Tower JA004W helipad A ready for departure, request SSW departure, left turn.		
17:23:25	TWR	004W confirm SSW, left turn?		
17:23:29	JA004W	Affirm.		
17:23:30	TWR	Roger left turn approved, wind 350 at 10 helipad A cleared for take off.		
17:23:34	JA004W	Cleared for take off, 004W.		
17:23:36	TWR	ANA320 contact departure.		
17:23:39	ANA320	ANA320 Contact departure.		
<b>17:24:15</b>	<b>TWR</b>	<b>JAC3635 RWY34 line up and wait.</b>		
17:24:20	JAC3635	JAC3635 RWY34 line up and wait.		
17:24:30	JA05CF	Fukuoka Tower 05CF 5nm SW, 1300ft leaving control zone.		
17:24:37	TWR	Roger good day.		
17:24:39	JA05CF	Roger good day.		
17:24:41	TWR	ANA4938 turn right E6 contact ground 121.7.		
17:24:48	ANA4938	E6 121.7 ANA4938 good day.		
<b>17:24:51</b>	<b>TWR</b>	<b>Wind check 330 at 11.</b>		
17:25:02	TWR	JA004W report leaving control zone.		
17:25:05	JA004W	Roger report leaving control zone 004W.		
17:25:11	JA08CH	Fukuoka Tower 08CH, T helipad ready, left turn to SSW departure.		
<b>17:25:16</b>	<b>TWR</b>	<b>Break, JA4178 Go around.</b>		
17:25:18	JA4178	4178 go around.		
17:25:20	TWR	Go around and break to right.		
17:25:22	JA4178	JA4178 roger break to right, hold 1nm east.		
17:25:25	TWR	Roger, proceed to 1nm east.		
		(Omitted)		

Legend: **TWR** Fukuoka Tower  
**GND** Fukuoka Ground  
**JAC3635** Commuter 3635 (DHC-8-402) Aircraft B  
**JA4178** four-one-seven-eight (Cessna 172RG) Aircraft A  
JA427B four-two-seven bravo (Bell 427)  
ANA4938 All Nippon 4938 The Proceeding Arraival Aircraft  
JA05CF zero-five Charlie Foxtrot (BK117 C2)  
JA004W zero-zero-four Whisky (Bell 412EP)  
JA08CH zero-eight Charlie Hotel (BK117 C2)  
ANA320 All Nippon 320

Note: Time were corrected by the Japan Standard Time (JST) recorded with ATC communications.

# Attachment 2 Classification of Severity of Runway Incursion

## Chapter 6

### CLASSIFICATION OF THE SEVERITY OF RUNWAY INCURSIONS

#### 6.1 SEVERITY CLASSIFICATION

6.1.1 The objective of runway incursion severity classification is to produce and record an assessment of each runway incursion. This is a critical component of risk measurement, where risk is a function of the severity of the outcome and the probability of recurrence. Whatever the severity of the occurrence, however, all runway incursions should be adequately investigated to determine the causal and contributory factors and to ensure risk mitigation measures are implemented to prevent any recurrence.

6.1.2 Severity classification of runway incursions should be assessed as soon as possible after the incident notification with due regard for the information required in 6.2. A reassessment of the final outcome may be applied at the end of the investigation process.

6.1.3 For the purpose of global harmonization and effective data sharing, when classifying the severity of runway incursions, the severity classification scheme in Table 6-1 should be applied. See Figure 6-1 for examples of severity classification.

Table 6-1. Severity classification scheme

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

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