

AI2009-1

**AIRCRAFT SERIOUS INCIDENT  
INVESTIGATION REPORT**

**JAPAN AIRLINES INTERNATIONAL CO., LTD.  
J A 8 9 0 4**

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J A 8 0 2 0**

**January 23, 2009**

**Japan Transport Safety Board**

The investigation for this report was conducted by Japan Transport Safety Board, JTSB, about the aircraft serious incident of JAPAN AIRLINES INTERNATIONAL , B747-400D registration JA8904 and JAPAN AIRLINES INTERNATIONAL, MD-90-30 registration JA8020 in accordance with Japan Transport Safety Board Establishment Law and Annex 13 to the Convention on International Civil Aviation for the purpose of determining causes of the aircraft serious incident and contributing to the prevention of accidents/incidents and not for the purpose of blaming responsibility of the serious incident.

This English version of this report has been published and translated by JTSB to make its reading easier for English speaking people who are not familiar with Japanese. Although efforts are made to translate as accurately as possible, only the Japanese version is authentic. If there is any difference in the meaning of the texts between the Japanese and English versions, the text in the Japanese version prevails.

Norihiro Goto,  
Chairman,  
Japan Transport Safety Board

# AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

1. JAPAN AIRLINES INTERNATIONAL CO., LTD.  
BOEING 747-400D  
JA8904

2. JAPAN AIRLINES INTERNATIONAL CO., LTD.  
DOUGLAS MD-90-30  
JA8020

AT ABOUT 10:33 JST FEBRUARY 16, 2008

ON THE RUNWAY 01R OF NEW CHITOSE AIRPORT

December 10, 2008

Adopted by the Japan Transport Safety Board  
(Aircraft Sub-committee)

Chairman	Norihiro Goto
Member	Yukio Kusuki
Member	Shinsuke Endo
Member	Noboru Toyooka
Member	Yuki Shuto
Member	Akiko Matsuo

# 1 PROCESS AND PROGRESS OF AIRCRAFT SERIOUS INCIDENT INVESTIGATION

## 1.1 Summary of the Serious Incident

The event covered by this report falls under the category of “an aborted take-off on an engaged runway” as stipulated in Clause 1, Article 166-4 of the Civil Aeronautics Regulations of Japan, and is classified as an Aircraft Serious Incident.

The Boeing 747-400D registered JA8904, operated as Japan Airlines International Co., LTD. scheduled Flight 502, was waiting on a taxiway of New Chitose Airport on February 16, 2008 (Saturday), for takeoff bound for Tokyo International Airport.

On the other hand, Douglas MD-90-30 registered JA8020, operated as Japan Airlines International Co., LTD. scheduled Flight 2503, took off Kansai International Airport and landed at New Chitose Airport runway 01R (B runway) at around 10:29.

While JA8020 landed and was taxiing on the runway 01R, JA8904 taxied into the runway 01R and was waiting under the instructions from the controller, at around 10:33, the aircraft began to start its takeoff rolling without takeoff clearance from the controller, the aircraft was instructed to stop from the controller, the aircraft rejected its takeoff run.

JA8904 of the total 446 persons on board, consisting of a captain and 17 crew members, 428 passengers, JA8020 of the total 126 persons on board, consisting a captain and 4 crew members, 121 passengers, no one was injured.

## 1.2 Outline of the Serious Incident Investigation

### 1.2.1 Investigation Organization

On February 16, 2008, the Aircraft and Railway Accident Investigation Commission appointed an Investigator-In-Charge and two Investigators for this Serious Incident investigation.

### 1.2.2 Representative of Foreign State

A representative of the United States of America (NTSB) as the state of the design and manufacturer of the aircraft involved in this serious incident, participated in the investigation.

### 1.2.3 Implementation of Investigation

February 16 and 17, 2008	Site Survey and Interviews
February 18 to 31, 2008	Analysis of Flight Data Recorder and Cockpit Voice Recorder
February 19 and 21, 2008	Interviews

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

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

### 1.2.5 Comments from the Participating State

Comments were taken from the participating state.

## 2 FACTUAL INFORMATION

### 2.1 History of the Flight

On February 16, 2008, at around 09:54(unless, otherwise indicated, all the times are JST, UTC+9h) the Boeing 747-400D JA8904 (hereafter called “the aircraft A”) operated by Japan Airlines International Co., LTD.(hereafter called “the company”) as scheduled Flight 502, began its taxi bound for Tokyo International Airport from spot 14 of New Chitose Airport (hereafter called “the airport”). A total of 3 pilots were on board in the cockpit of the aircraft A, a captain was at the left pilot seat as PF<sup>1</sup>, a trainee pilot for first officer promotion training(hereafter called “the trainee”) was at right pilot seat as PM<sup>2</sup>, and a first officer seated at observer seat.

The flight plan of the aircraft A sent to Fukuoka Area Control Center of the Ministry of land, Infrastructure, Transport and Tourism was outlined below.

Flight rule: Instrument flight rules (IFR), Departure aerodrome: New Chitose Airport, Off-block time: 09:05, Cruising speed: 507kt, Cruising altitude: FL380, Route: TOBBY (Position Reporting Point) → Y10 (airway) → TLE (Ami VORDME): Destination aerodrome: Tokyo International Airport; Estimated flight time: 1h and 10 min; Fuel on board 3h; Persons on board: 425

On the other hand, Douglas MD-90-30 registered JA8020 (hereafter called “the aircraft B”), operated by the company, as scheduled Flight 2503 was cleared to land by the local controller of the Chitose Aerodrome Control Tower (hereafter called “the tower”) at around 10:27 on the same day.

The flight plan of the aircraft B sent to Fukuoka Area Control Center of the Ministry of land, Infrastructure, Transport and Tourism was outlined below.

Flight rule : Instrument flight rules (IFR), Departure aerodrome: Kansai International Airport, Off-block time: 08:40, Cruising speed: 446kt, Cruising altitude: FL310, Route: OGURO(Position Reporting Point) → KYOTO(Position Reporting Point) → SIGAK(Position Reporting Point) → Y132 (airway) → GUJYO(Position Reporting Point) → Y13 (airway) → CHE (Chitose VORDME) : Destination aerodrome: New Chitose Airport; Estimated flight time: 1h and 26min; Fuel on board 4h 54min : Persons on board: 127

The flight history of the aircraft A, B, and an aircraft on a final approach to the airport which operated by the company as scheduled flight 513, a Boeing 747-400D JA8907 (hereafter called “the aircraft C”), based on the ATC communication records, flight data recorders(hereafter called “DFDR”), ATC radar tracking records, statements of the flight crew and an air traffic controller of the Tower(hereafter called “the controller”), to the occurrence of the serious incident are summarized below.

#### 2.1.1 Flight History based on the ATC Communication Records, DFDR Records and ATC Radar Tracking Records.

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<sup>1</sup> It stands for the pilot flying who is primarily responsible for aircraft maneuvering duty.

<sup>2</sup> It stands for the pilot monitoring who is primarily responsible for non-maneuvering duty.

09:27 Ground de-ice and anti-ice work of the aircraft A started. (the start time of the hold over time<sup>3</sup>, estimated expired time of anti-ice, in the shortest case is at 10:12 and the longest is at 10:47.)

Around 09:54,

The aircraft A off-blocked from spot 14.

10:09:49 The tower instructed the aircraft A, “CROSS RUNWAY01L (A runway), HOLD SHORT OF RUNWAY01R, YOU ARE NUMBER 3”

10:09:56 The aircraft A replied to the tower “CROSS RUNWAY01L, HOLD SHORT OF RUNWAY01R NUMBER 3”

10:28:40 The tower instructed the aircraft A, “RUNWAY01R LINE UP AND WAIT, AND RVR<sup>4</sup> TOUCHDOWN 750M”

10:28:45 The aircraft B’s main landing gears touched down on B runway.

10:28:48 The aircraft A replied to the tower, “RUNWAY01R LINE UP AND WAIT”.

10:28:52 The aircraft A began to taxi from waiting point of taxiway B10.

10:29:18 The tower instructed aircraft B “TURN LEFT TO B2 END OF RUNWAY, CROSS RUNWAY 01L”.

10:29:25 The aircraft B replied to the tower, “B2 CROSS RUNWAY01L”

10:29:26 Ground speed of the aircraft B became zero.

10:29:42 Ground speed of aircraft B began to increase, then after it began to taxi with 2 to 11kt on B runway.

10:30:11 The aircraft A lined up to the center line of B runway.

10:30:19 Number of aircraft controlled by the controller which were waiting for takeoff became 5

10:32:09 N1 of 2nd and 3rd engines<sup>5</sup> of the aircraft A increased, and 4 seconds later they stabilized with 37%

10:32:30 The tower informed the aircraft A, “JAPAN AIR 502, EXPECT IMMEDIATE TAKE-OFF, TRAFFIC LANDING ROLL AND INBOUND TRAFFIC 6 MILES” (This message lasted until 10:32:36 for about 6 seconds.)

10:32:32 N1 of 1st and 4th engines of the aircraft A began to increase.

10:32:37 The aircraft A replied to the tower, “ROGER, JAPAN AIR 502”.

10:32:38 N1 of all engines of the aircraft A reached 50% and began to increase at a time.

10:32:43 Ground speed of the aircraft A gradually began to increase.

10:32:54 N1 of all engines of the aircraft A increased rapidly from about 72% to takeoff thrust

10:32:59 The tower instructed to the aircraft A, “STOP IMMEDIATELY” twice and said, “TRAFFIC

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<sup>3</sup> Rough time of effect continuation for anti-ice liquid which prevent an aircraft to accumulate snow and ice to an aircraft surface when the aircraft on the ground. It starts from beginning of anti-ice work, though time will be depended on weather condition, in this serious incident, time from 45 minutes to 1hour and 20 minutes will be applied. Finally a flight crew watches the snow condition on a main wing by their eyes, and to judge for departure or taxiing back.

<sup>4</sup> RVR stands for Runway Visual Range, a longest distance which can see the marking on the runway, runway edge lights or center line lights on surface on a runway. The value was observed by the distance observation device. According to the operation manual of the company for the aircraft A, RVR valued 500m or more is applied to the weather minimum on its takeoff.

<sup>5</sup> The aircraft A has 4 engines, from aft to forward looking, we called the very left side engine as to the 1st engine, then the 2nd, the 3rd, and very right side is the 4th engine, and also we called the 1st and 4th engines as to outboard engines and 2nd and 3rd engines as to inboard engines.

## LANDING ROLL”

- 10:33:05 The aircraft A replied to the tower, “JAPAN AIR 502”. And the engine thrust of the aircraft A began to decrease.
- 10:33:07 The ground speed of the aircraft A reached about 84kt at the maximum, and thereafter decreased.
- 10:33:12 The tower instructed aircraft C at about 5nm south of the B runway threshold, which was making final approach for landing, to make go around.
- 10:33:13 The speed brake handle stood and engines of the aircraft A applied reverse.
- 10:33:24 The aircraft C replied to the tower, “GO AROUND, FOLLOW MISSED APPROACH PROCEDURE”
- 10:33:25 The Aircraft B began to face in the direction of taxiway B2 from the runway. (The aircraft A and B were at the nearest distance at about 1,800m)
- 10:33:42 The tower instructed the aircraft B to contact ground.
- 10:33:46 The aircraft B replied to the tower, “ROGER, CONTACT GROUND”.
- (See figure 1, 2 and attachment 1)

### 2.1.2 Statements of Flight Crew

#### (1) The captain of the aircraft A

I taxied from pushback toward A runway for 15 minutes, and we waited short of the runway for 20 minutes, shared each work and prepared with talking long time than usual.

After a preceding aircraft (the aircraft B) passed foresight, we extended flaps, checked flight controls and implemented the checklist. We could see the aircraft B when it passed our foresight, then it could not be seen. We were instructed, “LINE UP AND WAIT” and entered into the runway and waiting with stepping on brakes. Concerning our hold over time, we confirmed wing has no snow to accumulate according to the procedures. We knew that there was one traffic on final approach course.

At some minutes later, I think that I have heard “IMMEDIATE TAKE-OFF”, “TRAFFIC 5 or 6 DME”, then the trainee replied “ROGER”. I think this is because that I told some words correspondent to ATC clearance and I said “ROGER”, so the trainee might reply “ROGER” as well. Though the trainee did not read back the clearance, I convinced that takeoff clearance had been received. I thought that “IMMEDIATE” meant an urgent situation, so I judged that the priority of the takeoff procedure was higher than the education to the trainee who had made a simple reply of “ROGER”, but I had a doubt what for. The word of “IMMEDIATE” resulted in neglecting other confirmation. I think that it was wrong not to make the trainee to read back correctly. We were aware that the aircraft C(as for the time that was 5~6nm away)was approaching, with the feeling that I was pushed to my back, I had recognized the information. Although I saw in speculating that the trainee operated switches around landing light<sup>6</sup> switches, I do not remember the switch was surely turned on or not. The preceding aircraft’s “CLEAR OF ACTIVE” was not heard. I heard that “TAXI TO B2” to the aircraft B which had landed. There was no noise in the radio communication. I do not figure why

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<sup>6</sup> As described in 2.7.5(1), according to AOM of the aircraft A, PM turns on the landing lights after receiving the takeoff clearance. Lightened landing lights made other aircraft easy to find the existence of an aircraft and also that is in general a reminder of that they received the takeoff clearance.

“EXPECT” was not heard. It was a judgment in the situation that we could not see the preceding aircraft.

I made a call “TAKE-OFF” and there was no response from the trainee. Though the engine check procedure under bad weather is to increase the engine N1 to 60% and hold for 30 seconds<sup>7</sup>, I gave priority for takeoff procedure impetuously after about 20 seconds, in consideration of the approaching aircraft.

At around 60kt, we received an instruction from the tower “STOP IMMEDIATELY” and we made an engines reverse, applied brakes. Before stopping completely, the tower instructed us, “TAXI TO END OF RUNWAY B2”.

I heard that the tower instructed the aircraft C which was behind us to make “GO AROUND”. I wondered why. Chitose got in a mess due to accumulation of snow and was getting strong snowfall. Though I had an inquiry to the tower, if we made a confirmation, it would be interrupted other aircraft communication, so I thought I would confirm it later. Weather was getting worse and company radio was getting congested. Because I was thinking that I wanted to depart once again if possible, I forgot the confirmation the reason of RTO<sup>8</sup> due to correspondences to our passengers etc. I had no consciousness of violating ATC instructions.

Although ATC controllers at Chitose or Komatsu of Japan Self Defense Force provide various information, I do not want excessive words before or/and after clearances. If the word “DEPARTURE” was used instead of “TAKE-OFF” in this time, we didn’t start to move. In the U.S., even wind direction/velocity information is not provided<sup>9</sup>. These my experiences might have been accepted as ATC clearance at this time. I have no idea of impatience today, but it is fact that I didn’t hear “EXPECT”. I don’t know that I was in hurry unconsciously. I think the atmosphere of effective use of trainee’s ability was established. I do not think I made an atmosphere to hesitate to say to me. While I come to New Chitose 3~4 times in a month, today was the first day to encounter snowfalls this winter.

(2) The first officer of the aircraft A

I saw the aircraft B made an approach and landing. The aircraft B’s touch down to the runway could be seen, after that the aircraft B could not seen. After the aircraft B was seen, I think that the timing of “LINE UP AND WAIT” was slow, we had plenty of time. The captain, the trainee and I had confirmed the clearance to enter the B runway one another then entered. Due to bad runway condition, we lined up to the centerline of the runway with slow speed. Because the check of flaps and flight controls were completed, we were in a settled situation and waiting for the takeoff clearance.

I heard such as “IMMEDIATE TAKE-OFF” “6 MILES or 5 MILES ON SHORT FINAL” and the others were not able to be confirmed. Although the information after I got was that there were “EXPECT” and “AIRCRAFT LANDING ROLL ON RUNWAY” added, I did not

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<sup>7</sup> As described in 2.7.5 (2), according to AOM of the aircraft A, when in bad weather, to confirm that no accumulated ice on engines and engine parameters are normal, to increase the thrust to 60% of N1 and hold for about 30 seconds

<sup>8</sup> RTO stands for Rejected Take Off, to stop a takeoff after takeoff procedure is started.

<sup>9</sup> FAA Order 7110.65S, AIR TRAFFIC CONTROL, according to 3-9-9 Takeoff Clearance, except for an army and navy aircraft, it is not ruled to add the direction and velocity of the wind when issuing takeoff clearance. In addition according to ICAO PANS-ATM, it is not ruled to add wind information on landing or takeoff.



catch them at all. Anyway, the word of “IMMEDIATE” had a large impact and the word of “TAKE-OFF” had remained to my head. I could not catch the trainee said “ROGER”.

Although “IMMEDIATE” means urgent, right away, I have heard it not so many times on a runway. I heard the captain called “TAKE-OFF” and saw him pushed TO/GA<sup>10</sup> switch. At this time, I did not say clearly to the captain “clearance has not come yet”. The reason why I could not say to the captain that “clearance has not come yet” was that because I had been concerned and wondering for words of “IMMEDIATE TAKE-OFF” for some time, while I was thinking and writing the air traffic clearances, etc. in my recording logs during my rumination over the clearance, I think the TO/GA was setting. I think that the captain advanced powers was correspondence to the “IMMEDIATE TAKE-OFF”. When I thought “Ah!” the speed had already been increased. The RTO was made to follow the instructions of “STOP IMMEDIATELY” from the tower.

I wish the ATC information could be provided a little bit earlier. The time like these conditions, we do not want unnecessary information. Especially concerning to the takeoff, we would like to be issued only “CLEARED FOR TAKE-OFF”.

(3) The trainee<sup>11</sup> of the aircraft A

When I contacted with the tower, we were noticed that our takeoff order was the 3rd. Because the runway 01L (A runway) was closed with snow and only runway 01R (B runway) was usable, waiting time for takeoff was longer than usual. While we were waiting on taxiway, due to poor visibility, I remember after a landing aircraft cleared off the runway, it reported to the tower “CLEAR OF ACTIVE”, then the tower issued “CLEARED FOR TAKE-OFF” to a aircraft which was waiting for takeoff.

Because we were instructed from the tower “LINE UP AND WAIT 01R”, we entered the runway and were waiting for takeoff clearance. As I have heard clearly the words of “TAKE-OFF” and “5 MILES or 6 MILES ON FINAL”, but I didn’t hear “EXPECT”. Then, I remember that I said “ROGER, 502”.

Because I did not hear words of “CLEARED FOR”, I did not read back “CLEARED FOR TAKE-OFF”. There were not words of “CALERED FOR”, I was apprehensive about it. The radio communication was clear and there was no overlapping of PA<sup>12</sup> of CP<sup>13</sup>.

After that the captain started takeoff procedure, we received the instruction of “STOP IMMEDIATELY” from the tower at around before 60kt, rejected takeoff and got off by the B2 taxiway at the end.

(4) The captain of the aircraft B

During climbing from the Kansai Airport, I knew that only B2 taxiway was able to use by 9 o’clock ATIS<sup>14</sup> of the airport. We made an ILS approach to the airport, and contact with the

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<sup>10</sup> TO/GA stands for a TAKE-OFF/GO AROUND switch. On takeoff or go around, to push this switch makes an auto throttle to increase the engine revolution for each required power.

<sup>11</sup> A trainee of the company is not a flight crew, but in this report it includes in flight crew.

<sup>12</sup> CP stands for Chief Purser, a person in charge of cabin crew and service.

<sup>13</sup> PA stands for Passenger Address, by a crew of cockpit or cabin to provide necessary information to passengers.

<sup>14</sup> ATIS stands for Automatic Terminal Information Service. At heavy takeoff and landing traffic airport, to broadcast the information of the approach type, using runway, weather information, status of the airport, operation condition of airport facility, and this information is also provided by a data link.

tower at 14nm. I received a landing clearance in normal approach. We could see the runway at DA<sup>15</sup> +100feet and landed at 10:28. The visibility was around 1,000 m with snowfalls, its strength was moderate to heavy.

The runway center line lights and runway edge lights could be seen. As I felt that braking action<sup>16</sup> was MEDIUM TO POOR, there was a possibility of getting worse at the end of the runway, so I made braking slowly, and taxiing slowly and carefully due to poor visibility. I do not have a recognition that we stopped on the runway though I think there was a possibility to slow down much more temporarily. When we were approaching B2 taxiway, we could see runway edge lights. At 10:42, we got in the spot. Flight schedule was from Kansai Airport to Chitose, after that a round trip to Hanamaki Airport, became cancelled due to bad weather of Chitose and Hanamaki

(5) The first officer of the aircraft B

Before approach, we heard through radio that there were some aircraft could not move due to snow on the ground and they were requesting towing cars. During approach, I think that we were not instructed to “REPORT CLEAR OF ACTIVE” from the tower. I thought that it was unavoidable for the situation of snow that the taxiing speed of the captain after landing was slow.

### 2.1.3 Statement of the Controller

On that day, due to the invisible condition such as neither runways nor ramp area, arrival aircraft were vectoring at 15 nm intervals. Since I confirmed that aircraft B landed with ASDE<sup>17</sup> display and I instructed the aircraft A to enter and wait on the runway. The aircraft B considerably slowed down in the middle of the runway, and was taxiing slowly. At that time when the aircraft A aligned in runway center line of 01R, the position of the next approaching aircraft (aircraft C) was about 18 nm away. In comparison to the aircraft which landed before, I felt that getting off the runway of aircraft B was very slow.

I transmitted a message with “EXPECT IMMEDIATE TAKE-OFF” to the aircraft A. And I added the information that an aircraft B was still on the runway and an aircraft C which was 6 nm. I applied “CLEARED FOR IMMEDIATE TAKE-OFF” of Air Traffic Control Procedures<sup>18</sup> to the phraseology.

While the aircraft B needed a time for getting off the runway, and I watched to see the aircraft B was whether getting off the runway or not by ASDE, since the aircraft A began to move, I stopped it promptly. When I said “EXPECT” to the aircraft A, the position of the aircraft B was on the runway between B2 and B3 taxiways.

Usually aircraft starts take-off run within 1 or 2 minutes after issuing take-off clearance, on the day I felt it needed for 3 or 4 minutes, so I let the aircraft A to expect its starting take-off without

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<sup>15</sup> DA stands for Decision Altitude. It is the lowest descending altitude during a precision approach, at which whether a pilot makes a decision to continue approach or of a missed approach.

<sup>16</sup> It is an effect of braking, in the case that a surface of runway etc. becomes slippery with ice or snow, as a result of measuring a friction coefficient etc., expressed in qualitative 6 levels, as GOOD, MEDIUM TO GOOD, MEDIUM, MEDIUM TO POOR, POOR, VERY POOR.

<sup>17</sup> ASDE stands for Airport Surface Detection Equipment. It is primary radar to detect a moving aircraft or a vehicle etc. of the runway and taxiway at an airport. It was implemented in 1988. Refer to 2.5 (2) for ASDE display.

<sup>18</sup> As described in 2.7.2, this is the "Air Traffic Control Regulations" issued by Air Support Command.

delay. In the past, in a similar weather, I experienced that take-offs needed some more minutes.

While I had requested all arrivals before the aircraft B “REPORT CLEAR OF ACTIVE”, as I compared with the report of the arrival aircraft with the ASDE display, there were some differences in each timing or position of getting off the runway, so the aircraft B and after that, I judged it from the ASDE display only.

When making a communication I use my headset, and I can hear my voice from my ear as I transmitted. I keep it in mind, after pressing a button with my finger then begin to speak, not to break off a head of communication carefully.

In the Chitose ATC Squadron, based on the past experience, we were taught to add not only minimum instructions but also its reason and information to an aircraft. I do not know about the Tenerife accident. I recognize that concise and plain information is really important. I have been working here about 5 years since I was transferred, and I have all qualifications of this control facility.

This serious incident occurred on February 16, 2008, at approximately 10:33, on runway 01R of the airport (Ref. point: Lat. 42°46'31"N, Long. 141°41'33"E).

(See Figure 1, 2, 3, 4 Photo 1, 2, 3, 4 and Attachment 1)

## 2.2 Crew Information

(1) Captain of the aircraft A	Male, Age 58 years	
Airline Transport Pilot License (airplane)		October 14, 1987
Type rating for Boeing747-400		February 7, 1994
1 <sup>st</sup> class Aviation Medical Examination Certificate		
Validity		May 26, 2008
Total flight time		14,391 hours 34 minutes
Flight time for previous 30 days		44 h and 15 min.
Flight time on the aircraft type		6,577 h and 54 min.
Flight time for previous 30 days		44 h and 15 min.
(2) First officer of the aircraft A	Male, Age 32 years	
Commercial Pilot License (airplane)		May 2, 2001
Type rating for Boeing747-400		November 11, 2002
Instrument rating		December 20, 2001
1 <sup>st</sup> class Aviation Medical Examination Certificate		
Validity		May 1, 2008
Total flight time		2,676 hours 45 minutes
Flight time for previous 30 days		52 h and 42 min.
Flight time on the aircraft type		2,260 h and 53 min.
Flight time for previous 30 days		52 h and 42 min.
(3) Trainee of the aircraft A	Male, Age 27 years	
Commercial Pilot License (airplane)		February 1, 2006
Type rating for Boeing747-400		October 25, 2007
Instrument rating		October 2, 2006
1 <sup>st</sup> class Aviation Medical Examination Certificate		

Validity	April 19, 2008
Total flight time	352hours 18 minutes
Flight time for previous 30 days	38 h and 55 min.
Flight time on the aircraft type	75h and 16 min.
Flight time for previous 30 days	38 h and 55 min.
OJT starting	October, 2007
OJT Flight times	24 times

(4) Captain of the aircraft B	Male, Age 44 years
Airline Transport Pilot License (airplane)	February 6, 1996
Type rating for Douglas DC-9 <sup>19</sup>	August 11, 1989
1 <sup>st</sup> class Aviation Medical Examination Certificate	
Validity	March 15, 2008
Total flight time	11,104 hours 05 minutes
Flight time for previous 30 days	25 h and 43 min.
Flight time on the aircraft type	9,249 h and 59 min.
Flight time for previous 30 days	25 h and 43 min.

(5) First officer of the aircraft A	Male, Age 35 years
Commercial Pilot License (airplane)	August 31, 1998
Type rating for Douglas DC-9	May 25, 2004
Instrument rating	October 31, 1998
1 <sup>st</sup> class Aviation Medical Examination Certificate	
Validity	September 5, 2008
Total flight time	2,051hours 41 minutes
Flight time for previous 30 days	55 h and 49 min.
Flight time on the aircraft type	1,805h and 25 min.
Flight time for previous 30 days	55 h and 49 min.

### 2.2.2 The controller information

The controller	Male, Age 25years
Certificate of ATC Controller	
Tower control	September 27, 2004
Chitose tower	September 27, 2004
Approach control	March 9, 2007
Chitose approach	March 9, 2007
Terminal radar control	March 9, 2007
Chitose terminal	March 9, 2007
GCA control	July 2, 2007
Chitose GCA	July 2, 2007
Aviation medical examination certificate	

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<sup>19</sup> Douglas DC-9 and Douglas MD-90-30 are in the same type rating.

## 2.3 Meteorological Information

(1) Aviation weather report at the airport was as follows,

- 10:27 Direction of wind... 300°, Velocity of wind... 13 kt, Prevailing visibility... 400 m, RVR RWY01R...800 to 1,400m upward, Present weather snow shower, vertical visibility 200ft, Temperature...-4°C, Dew point...-6°C, Altimeter setting (QNH)... 29.81 inHg
- 10:30 Direction of wind... 300°, Velocity of wind... 13 kt, Prevailing visibility... 500 m, RVR RWY01R...700 to 1,400m downward, Present weather snow shower, vertical visibility 200ft, Temperature...-4°C, Dew point...-6°C, Altimeter setting (QNH)... 29.81 inHg
- 10:31 Direction of wind... 300°, Velocity of wind... 13 kt, Prevailing visibility... 500 m, RVR RWY01R...650 to 1,400m downward, Present weather snow shower, vertical visibility 200ft, Temperature...-4°C, Dew point...-6°C, Altimeter setting (QNH)... 29.81 inHg
- 10:39 Direction of wind... 310°, Velocity of wind... 11 kt, Prevailing visibility... 600 m, RVR RWY01R...650 to 1,200m upward, Present weather snow shower, vertical visibility 300ft, Temperature...-4°C, Dew point...-5°C, Altimeter setting (QNH)... 29.81 inHg

(2) Snow and Ice condition of the airport

Snow and Ice condition information on B Runway at the time of serious incident occurrence were as follows. (A part)

<i>Items Position</i>	<i>Average Snow Depth Actual Depth</i>	<i>Type of Snow</i>	<i>Braking Action (<math>\mu</math>)</i>	<i>Percentage of Coverage</i>	<i>RWY Light</i>
<i>A area (RWY 1/3 South side)</i>	<i>Under 80mm 10mm</i>	<i>Dry Compacted</i>	<i>MEDIUM TO POOR (0.26~0.29)</i>	<i>Above 80%</i>	<i>Unburied</i>
<i>B area (RWY 1/3 Center)</i>	<i>Under 80mm 10mm</i>	<i>Dry Compacted</i>	<i>MEDIUM TO POOR (0.26~0.29)</i>	<i>Above 80%</i>	
<i>C area (RWY 1/3 North side)</i>	<i>Under 80mm 15mm</i>	<i>Dry Compacted</i>	<i>MEDIUM TO POOR (0.26~0.29)</i>	<i>Above 80%</i>	

## 2.4 Communication Information

At the time of serious incident occurrence, communications between the aircraft and the tower were normal.

## 2.5 Serious Incident Site Information

(1) Runway and taxiway

The airport has 2 parallel runways both of which is length 3,000 m, width 60 m, north-south direction. At the time of serious incident occurrence, high speed taxiway B3~B9 and A runway were closed with the accumulation of snow and poor braking action.

Only the B runway, A2, B2, A10, B10 and D taxiways, and those of connected with the apron area were usable. Because of these, runway operation of the both taking off and landing was carried out by using B runway only. All the airport lights, by setting in the daytime intensity

fitted weather situation, set for needed application of the airport, were lighted.

The site of the serious incident was on B runway.

## (2) ATC

The air traffic control of the airport and Chitose Airfield were conducted by Japan Air Self-Defense Force Air Support Command Air Traffic Service Group Chitose ATC Squadron (hereafter called “Chitose ATC Squadron”) using the tower and RACON<sup>20</sup> which are located between the airport and the airfield. The tower has a tower bright display (hereafter called “Bright<sup>21</sup>”) and an ASDE display device. At tower controller seat, picture displayed tentatively on the airport vehicle position indicator as ASDE display device by which is monitored by small camera of the ground controller seat’s ASDE system display.

At the time of serious incident occurrence, the tower was operated by 6 controllers. At that time, as visibility was poor due to snowfall, the aircraft A and B on the runway could not be seen completely from the tower, and the tower controllers controlled traffics by using these radar devices.

## (3) The traffic volume in the serious incident occurrence day

The traffic volume in the airport is about 360 flights per day. At that day 64 flights were cancelled due to snow accumulation etc. From 9 to 12 o’clock, in 54 flights, 5 were cancelled and 27 flights were delayed more than half an hour.

## 2.6 Information on DFDR and CVR

The aircraft A was equipped with a DFDR(part number: 980-4700-003) and a cockpit voice recorder (hereafter called “CVR”, part number: 980-6022-001) both manufactured by Allied Signal Co. of the USA, and the aircraft B was equipped with a DFDR (part number: 980-4700-003) manufactured by Allied Signal Co. of the USA, and a CVR (part number: 980-6020-001) manufactured by Honeywell Co. of the USA.

The both aircraft’s DFDR which is capable more than 25 hours recording are retained at the time of this serious incident occurrence. The CVR of the aircraft A is capable of 2 hours recording and the CVR of the aircraft B is capable of 30 minutes recording were both overwritten records of the time of serious incident occurred and not retained. About the aircraft A, conversation awaiting weather recovery for re-flight, about the aircraft B, conversation after its arrival were retained.

## 2.7 Other Necessary Information

### 2.7.1 The usage of 「TAKE-OFF」 Terminology

- (1) AIP (Aeronautical Information Publication)<sup>22</sup> ENR 1.5.10, 1.7.3 Note, issued by Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism described as follows.

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<sup>20</sup> RAPCON stands for Radar Approach Control. It is an organization or facility where conducts the terminal radar control, approach control and ground controlled approach. It is the acronym used in the ministry of defense or the U. S. armed forces

<sup>21</sup> The display in a control tower which can monitor the radar screen using in RAPCON.

<sup>22</sup> The Aeronautical Information Publication is released to aircraft operators by the Civil Aviation Bureau of Japan predicated on Article 99 of the Civil Aviation Law and Article 209-2 of the Civil Aeronautics Regulations. It covers essential information for aircraft operations.

*ATC will not use the word "TAKE-OFF" except take-off clearance and its withdrawal.*

- (2) FAA Order 7110. 65S, Air Traffic Control, 4-3-1. DEPARTURE TERMINOLOGY issued by Federal Aviation Administration of the United States of America described as follows.

*Avoid using the term "takeoff" except to actually clear an aircraft for takeoff or to cancel a takeoff clearance. Use such terms as "depart," "departure," or "fly" in clearances when necessary.*

- (3) The ATS HANDBOOK distributed to flight crews of the company and about the communication with the ATC facility in 3-2 takeoff clearance described as follows. (Extract)

*"Take off" as terminology does not be used except when "Cleared for take off" and "Cancel take off clearance".*

## 2.7.2 Usage of 「TAKE-OFF Clearance」 Terminology

In Air Traffic Control Regulations III, Air Traffic Control Procedures (hereafter called "Air Traffic Control Procedures") issued by Japan Civil Aviation Bureau and Air Traffic Services Regulations III, Air Traffic Control Procedures (III), (hereafter called "Air Traffic Control Regulations") issued by Air Support Command based on Air Traffic Control Procedures, airport control procedure 2, clearances for using "take-off" described as follows. (Extract)

Beside, there are no description in the Air Traffic Control Regulations and Air Traffic Control Procedures, as described in 2.7.1(1), *"ATC will not use the word "TAKE-OFF" except take-off clearance and its withdrawal."*

### [Airport Control Procedure]

- (1) *Take off clearances should be issued as follows.*

★ *WIND [wind direction] (DEGEES) AT [wind velocity] (KNOT/S), RUNWAY [number] CLEARED FOR TAKE-OFF.*

- (12) *When it needed to make a separation, a controller can issue the following clearance to make an aircraft immediate takeoff which is taxiing or at takeoff position.*

★ *CLEARED FOR IMMEDIATE TAKE-OFF<sup>23</sup>*

- (13) *With traffic situation or other reasons, a controller can cancel the takeoff clearance which has already been issued. In this case, a controller shall instruct a departure aircraft on alternate instructions and the reason when needed.*

★ *[alternate instruction] CANCEL TAKE-OFF CLEARANCE [reason].*

## 2.7.3 ATC communication

### 2.7.3.1 ATC communication and transmitting procedure

The transmitting speed in ATC communication, on the Air Traffic Control Regulations, General rules, 5 Telecommunication, transmitting procedure is described as follows. (Extract)

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<sup>23</sup> In the Air Traffic Control Regulations and the Air Traffic Control Procedures, until March, 2001, it was prohibited to issue the jumbo jet plane at the time of a takeoff or ground maneuvering that required a prompt action than the ordinary such as "CLEARED FOR IMMEDIATE TAKE-OFF".

*(10) b when starting a transmission, pay attention to the next point.*

*(b) Transmitting speed should be adjusted by communication situation, in a radio telephone maintain even rate of speaking, by not more than 100 words per minute.*

In addition, the transmission which described in 2.1.1 that the tower reported to the aircraft A at 10:32:30 was at a speed of 155 words in a minute ('JAPAN AIR 502' are 5 words).

#### 2.7.3.2 Monitoring and confirmation ATC communication

The company's Operations Manual (hereafter called as "OM") The 2<sup>nd</sup> Chapter operation policy, Supplement, "flight operation points" described as follows. (Extract)

##### (1) Cockpit Management and Crew Coordination

*(1) Each flight crew member shall express his/her intention clearly and verify it each other. It is very important for each pilot to have the same understanding about their intention as well as aircraft conditions. The PIC<sup>24</sup> shall make a good atmosphere in the cockpit so that crew members may advise each other easily. When the PIC is going to make decisions on operations, flight crew members should give positive and effective advice as necessary.*

*(6) Each flight crew member shall acknowledge an order given by the PF. In case of receiving the ATC clearances, the PF shall inform other flight crew members that PF understands them. The PF shall order PM to confirm the ATC clearances if there are any doubts or uncertainties.*

##### (2) Clearance Acceptance

*(1) Flight crew members should confirm the contents of ATC clearance carefully each other. When a flight crew member doubts about it, or deems it is necessary to be amended in order to maintain the operational safety, he/she shall confirm its contents or request ATC to amend it without delay.*

*(2) Flight crew members should read back after receiving clearance, attaching a call sign.*

##### (3) Starting of Takeoff Roll

*(2) Flight crew members shall read back takeoff clearance received from ATC.*

*(4) Each flight crew member shall not commence takeoff procedure unless he confirms its receiving of the takeoff clearance.*

In addition, the company's OM the 8th Chapter ATC Communication, Supplement, ATC Communication Procedures described as follows. (Extract)

*1. PF/PM should try to understand exactly an issued ATC clearance/instruction, and unless each understanding concur do not conduct it except ensuring safety.*

*3. As for clearance of takeoff or landing, follow the below procedures.*

*(1) To the issued clearance for the aircraft, PF notifies PM of his acknowledgement.*

*(2) PM reads back of clearance.*

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<sup>24</sup> The PIC (PILOT IN COMMAND) is qualified as the captain who has whole responsibility for the safety of the operation of an aircraft on duty. In this serious incident, the PIC is the captain of the aircraft.



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

*When it doesn't or its concurrence is not confirmed, make PM to confirm to ATC facility.*

(4) *PM says PF when PF's call concurs with his understanding, otherwise, confirm to ATC facility.*

#### 2.7.3.3 ATC clearances etc. that should be read back (Reference)

In AIM-J<sup>25</sup>, the read back which flight crews should make to an ATC facility in an ATC communication, described as follows.(Extract)

*When controllers require confirmation about numbers etc. which are correctly received, by adding 'terminology of READ BACK' after clearances, request pilots to read back. In other case Read back is not compulsory as procedure unless it is requested by ATC. However, a pilot should read back the following items of the clearance or instruction voluntarily as a means of mutual verifications.*

*a) ATC clearance at the time of departure*

*b) Change of altitude and route*

*c) Instructions related to heading*

*d) Instructions related to speed adjustment*

*e) Approach clearance*

*f) Holding clearance*

*g) transponder code*

*h) Altimeter setting*

*i) Clearance of a takeoff or landing (a runway number is included.)*

*j) Taxi (A runway number is included), entering runway, holding short of runway and crossing runway, etc. clearances.*

*k) Frequency change instructions*

#### 2.7.4 Rules for Crew Members Duties and Responsibilities

On the company's OM chapter 5, "Duties and Responsibilities of flight crew members" described as follows. (Extract)

(1) *Responsibilities and duties*

① *Flight crew members*

*2. Each flight crew member shall perceive the purpose and the importance of Crew Resource Management (CRM) and perform the jobs with application of it. CRM refers to the effective use of all available resources : human resources (Flight crew members, Cabin attendants, Dispatcher, Maintenance personnel, Air traffic controllers, etc.) , hardware and information, in order to accomplish safe and high quality operations.*

*3. The PIC shall recognize the close relationship among the jobs to be performed by each flight crew member and shall make every effort to properly allocate the jobs to*

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<sup>25</sup> It stands for Aeronautical Information Manual of Japan, it is the manual of necessary fundamental information in Japanese airspace, general flight procedure, ATC procedure etc., edited by Japan Pilot Association under supervision of JCAB and Japan Meteorological Agency, publishing twice a year.

*be conducted among flight crew members. On operation of flight, each flight crew member shall conduct a function of the mutual supplement among flight crew members, by doing necessary confirmation and reporting.*

4. *When the PIC is going to make decisions on operations, flight crew members should give positive and effective advice as necessary.*

② *The PIC*

1. *The PIC is directly responsible for the judgments over the execution of the flight, and for command and supervision during flight operations.*
3. *The PIC is responsible for execution of the flight based on flight Plan.*
4. *The PIC shall supervise crews and their duties which they carry out, and command them precisely. In addition, He/she keeps it in mind for guidance and upbringing of other crew members.*

④ *The First Officer*

*The first officer assists the PIC during whole flight operation and shall assume the PIC's duties, if the PIC become incapacitated for any reason.*

(2) *Requirement for the Line Training/Check of the First Officer's duty*

*Responsibilities and Duties of other flight crew members*

(1) *The PIC*

*In addition to the responsibility described in 5-3-2, the PIC shall judge and direct to sit Captain or the Flight Crew Member qualified as First Officer on cockpit seat, or direct to sit qualified Flight Engineer on Flight Engineer seat.*

(2) *Captain other than the PIC and the Flight Crew Member qualified as First Officer*

*In the case Candidates for First Officer face difficult situation, Captain other than the PIC and the Flight Crew Member qualified as First Officer assists Candidates at the station and get over with the PIC as much as possible.*

(3) *The First Officer's Responsibilities (Supplement)*

*3. The First Officer shall confirm his responsibility clearly and also make necessary confirmation and effective advice to the PIC through monitoring the PIC's tasks.*

2.7.5 *Flight Operations of the Aircraft A*

- (1) *The company's Aircraft Operation Manual (hereafter called "AOM"), NORMAL PROCEDURE, Takeoff Procedure, described as follows.*

<i>Pilot Flying</i>	<i>Pilot Monitoring</i>
	<i>Notify cabin crew or supernumerary for takeoff.</i>
	<i>When entering the departure runway, set the STROBE light switch to ON.</i>
	<i>Set the transponder mode selector to TA/RA.</i>
<i>Align the aircraft with the runway. Verify alignment with the desired runway on ND.</i>	<i>When received takeoff clearance, set the all LANDING light switches to ON.</i>

<i>Call "TAKEOFF".</i> <i>Advance thrust levers to about 70% N1</i> <i>Stabilize engines</i>	
<i>Push TO/GA switch.</i>	
<i>Verify that desired takeoff thrust is set.</i>	
	<i>During takeoff run, monitor engine instruments, call out any abnormal indications.</i> <i>Adjust takeoff thrust before 80 kt as needed.</i> (omitted)
(hereafter omitted)	

(2) The company's AOM, SUPPLEMENTARY PROCEDURES, Slippery Runway Operation, cold weather operation described as follows. (Partially omitted)

*• If there are no presence of snow, slush, ice or standing water on the taxiway connected to runway, flaps may be set to takeoff position. Whenever even if any of them is present, or if snow or rain with temperature below 0 °C falls, in principal, Set flaps, check flight control system, and complete the Before Takeoff Checklist before entering the runway. However, those actions may be accomplished after entering the runway, if it is concerned that flaps might be freeze after those extensions due to weather condition.*

*Note: It takes about 40 seconds to operate the crossfeed valves for takeoff configuration after setting flaps to takeoff position.*

- The flight control system should be checked sufficiently in extreme cold condition before takeoff roll since congealed oil in the bearings and binding cable seals may occur.*
- After performing above accomplish before takeoff checklist.*
- Verify engine oil temperatures are in normal range.*
- When nacelle anti-ice is required and the OAT is 3°C or below, conduct a static run-up to as high a thrust setting as practical (60% N1 recommended) for approximately 30 seconds and check stable engine operation prior to start of the takeoff run.*

#### 2.7.6 The Company's Trainings etc. related to CRM

Trainings and Checks, etc. related to CRM in the company, described in QUALIFICATIONS MANUAL which prescribes qualifications of Flight Crew Members, Trainees, and the Standards for Trainings and Checks, are summarized as follows.

##### (1) Recurrent Trainings, Checks and CRM

In recurrent trainings, Ground School Trainings are conducted to a captain and a first officer every 1 year and included subjects of CRM improvement.

In recurrent checks, a captain receives twice a year, 1 time can alternate with LOFT<sup>26</sup> and

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<sup>26</sup> It stands for Line Oriented Flight Training, prescribed in paragraph 1, Article 164-2 of the Civil Aeronautics Regulations, consists usual flight crew, by using Full Flight Simulator, an training under a line operation of the normal and possible abnormal and emergency condition, which is designated by Minister of Land Infrastructure Transport and Tourism, the training for the improvement of the ability to practice CRM.

practiced on Intermediate Base Month<sup>27</sup>. A first officer receives LOFT as to a captain.

(2) First officer Promotion Training and CRM

In First officer Promotion Trainings consist of Ground School Trainings, FBS<sup>28</sup> Training or CPT<sup>29</sup> Training, FFS<sup>30</sup> Training, Local flight Training and Line Trainings. Regarding to CRM, after engaging a Line Operation (Line Training<sup>31</sup>), a trainee is to receive CRM Introduction Training within 1 year.

(Note 1) The trainee of the aircraft A was scheduled to receive CRM Introduction Training during First Officer Promotion Training.

(Note 2) When in a Line Training, a trainee is received an evaluation about operation etc. after flight from the Captain who is designated as an instructor.

(3) CRM Training standards

1. CRM introduction

*All flight crew members who start the first flight operation shall receive by Chart 9-2-1*

2. CRM seminar

*Flight crew members who have already received CRM introduction shall receive by Chart 9-2-1*

3. Recurrent training

*Flight crew members who have already received CRM introduction shall receive once a year by Chart 9-2-1*

*Chart 9-2-1 Training for flight crew*

1. CRM introduction

<i>Contents</i>	<i>Duration or times</i>	<i>RMKS</i>
<i>GS<sup>32</sup></i>	<i>12 + 00</i>	

*(Note) In principal, receive before starting flight operation. But, do within 1 year after starting flight operation in case it must be forced.*

2. CRM seminar

<i>Contents</i>	<i>Duration or times</i>	<i>RMKS</i>
<i>GS</i>	<i>30 + 00</i>	

<sup>27</sup> Intermediate Base Month is the month which is 6 month after from the Base Month. Base Month is a month belongs to the day when a pilot passed flying skill check.

<sup>28</sup> It is training by Fixed Base Simulator, main purpose of the training is to give an operation skill. Depending on the object of training, CPT or FTD (Flight Training Device) is used.

<sup>29</sup> It is training by Cockpit Procedure Trainer, a training device in which instruments and controlling devices arranged as same as a real cockpit, and to acquires foundation of operating procedures for transferring to simulator training.

<sup>30</sup> It is training by Full Flight Simulator, main purpose of the training is to give operation skill and control skill.

<sup>31</sup> It is applied to the flight crew trainee who completed the training/examination of the type rating of a practical aircraft, and the experience of minimum at 50~maximum at 100 Legs and at least 1Leg examination will be conducted in line operations.

<sup>32</sup> It stands for Ground School Training.

(Note) In principal, receive within 1 year after starting flight operation.

3. Recurrent training

<i>Contents</i>	<i>Duration or times</i>	<i>RMKS</i>
<i>GS</i>	<i>1 + 00</i>	
<i>FFS</i>	<i>1 + 00 or more</i>	

(Note) In principal, receive FFS on LOFT.

Note) CAB Directive specifies that the minimum time for CRM introduction, CRM seminar and recurrent training is 6 hours or more, none and 30 minutes or more, respectively.

2.7.7 ATC Separation on Slippery Runway Operation

According to the Chitose ATC Squadron, though there is no definition of ATC separation between a landing aircraft and succeeding one on same slippery runway by snow and ice, based on the arrival aircraft's occupancy time of a runway, it is roughly carried out as follows.

<i>Runway condition or Braking action</i>	<i>Separation</i>
<i>DRY or WET</i>	<i>Approximately 6nm</i>
<i>Poor visibility</i>	<i>Approximately 8nm</i>
<i>Medium to Poor</i>	<i>12~15nm</i>
<i>Poor</i>	<i>Approximately 20nm</i>
<i>Very Poor or almost same condition</i>	<i>Approximately 30nm</i>

2.7.8 Referential Cases in the past

(1) The accident at Tenerife airport (Summary of ICAO Circular 153-AN/56)

*On March 27, 1977, two Boeing 747s of KLM in takeoff run and of American Airlines, collide on a runway in the Tenerife airport Spain territory and 583<sup>33</sup> were dead. The airport was covered with thick fog and visibility became deterioration. The accident was thought that a cause of the accident was a controller had used a terminology of "O.K. . . STAND BY FOR TAKE-OFF" which might invite misunderstanding, a captain of KLM mistook as he received a takeoff clearance without hearing of "STAND BY FOR TAKE-OFF" by two transmissions simultaneously, and the captain of KLM made takeoff run without a clearance. And in reply to the Flight Engineer's query as of whether the PANAM had already left the runway, he replied emphatically in the affirmative.*

*Avoidance of usage the word of "TAKE OFF" in the ATC clearance and adequate time separation needed between the ATC clearance and the TAKE-OFF clearance, etc. were recommended in the report.*

(2) The accident in which NTSB recommended the usefulness of CRM at first time.

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<sup>33</sup> Passengers who got injuries in the accident and deceased afterwards, are included.

(The report on research of aviation human factors, the aviation safety promotion foundation, March, 1994, extract)

*The McDonnell Douglas DC-8-61, United Airlines Inc., crashed at 6nm from the Portland International Airport due to fuel exhaustion, while the gear trouble occurred during an approach and flight crew coped with landing gear extension on December 28, 1978.*

*NTSB pointed out in the report as follows.*

*"The flight crew members' scan of the instruments probably narrowed as their thinking fixed on the gear. This accident exemplifies a recurring problem—a breakdown in cockpit management and teamwork during a situation involving malfunctions of aircraft systems in the flight. To combat this problem, responsibilities must be divided among the members of the flight crew while a malfunction is being resolved. In this case apparently no one was specifically delegated the responsibility of monitoring fuel state. Admittedly, the stature of a captain and his management style may exert subtle pressure on his crew to conform to his way of thinking. In training of all airline cockpit and cabin crew members, assertiveness training should be a part of the standard curricula, including the need for individual initiative and effective expression of concern. The probable cause was the failure of the captain to monitor properly the aircraft's fuel state and to properly respond to the low fuel state and the crew member's advisories regarding fuel state. His inattention resulted from preoccupation with a landing gear malfunction and preparations for possible landing emergency. Contributing to the accident was the failure of the other two flight crew members either to fully comprehend the criticality of the fuel state or to successfully communicate their concern to the captain."*

(3) The accident of an aircraft takeoff in the snowfall and plunged into the ice-covered river in Washington D.C., USA (Extract from NTSB AAR-82/08 report)

*On January 13, 1982, a Boeing 737 took off from the Washington National Airport, stalled immediately after the takeoff and plunged into the Potomac River, where is about 1.2 km from the runway. In this accident, 74 of the crew and passengers and 4 people on the ground, total of 78 were killed.*

*The probable cause of this accident was the flight crew's failure to use of engine anti-ice during ground operation, their decision to takeoff with snow/ice on the wing surface of the aircraft and the captain's failure to reject takeoff because at the early stage his attention was called to anomalous engine instrument readings. As a part of the contributing factor was the prolonged ground delay before receipt of ATC takeoff clearance while the aircraft was exposed to continual snowfalls and their limited experience of the flight crew in winter operation, etc.*

(4) JAL1036's ATC Clearance violation in New Chitose Airport. (The summary from the report of the company)

*On January 22, 2005, on the A runway of New Chitose Airport, the Boeing 777-200 bound for Tokyo International Airport, started takeoff run without receiving a takeoff clearance. The factors of this case were that a prevention procedure of the chain of the human error related to an ATC communication (the captain and the first officer did not notice an error) was not established, and also the temporary decline of the monitoring ability by the increase of the work load just before departure.*

(5) Serious Incident occurred in Nagoya airfield (The summary of an Aircraft Serious Incident report AI07-2-2, extract)

*On November 10, 2006, a departing small airplane (total flight time of the captain was 9,200hours) was instructed to hold on a taxiway. When the tower informed the airplane "EXPECT DEPARTURE AFTER ARRIVAL MU300 APPROACHING LEFT BASE FOR FULL STOP", due to the airplane mishear EXPECT as EXPEDITE, the small airplane answered to the tower "ROGER". At once the airplane entered the runway through a runway holding position marking, a scheduled airliner which had been on approach and received landing clearance was made to go around.*

### 2.7.9 The "Mental Set"

According to "the Psychological Dictionary", (Heibonsha Limited, Publishers, November 30, 1995, page 107~108) described as follows. (Extract, tentative translation)

*Set, Mental Set (English). It is a prepared condition to a special recognition or a special reaction.*

*Mental Set is an attention to particular stimulation, or a preparation for peculiar reaction of human attitude such as a calling "ready!" and waiting a "go" sign or an orientation of thinking passage etc., (Omission) these structures are not always the same.*

*(The effect of the Mental Set) The Mental Set promotes, hinders, or changes an achievement of a subject, through promoting an appearance of the recognition or reaction that was Mental Set. (Omission)*

#### *2). Effects of Mental Set to perception judgment*

*According to Bruner, J. S. and others, when a diagram which could see letter B or figure 13, showed in a short time, the most persons who were presented a series of letters in previously identify the diagram as letter B, and requested to draw the reproduction of the diagram, wrote a letter B without think.*

*Persons who were given a series of the numbers just before that, identified the same diagram with 13 and wrote a separated 1 and 3.*

*Just like these, precedence experience, instruction or motivation changes perception setting and then a perception judgment will be changed.*

### 2.7.10 The SRK model

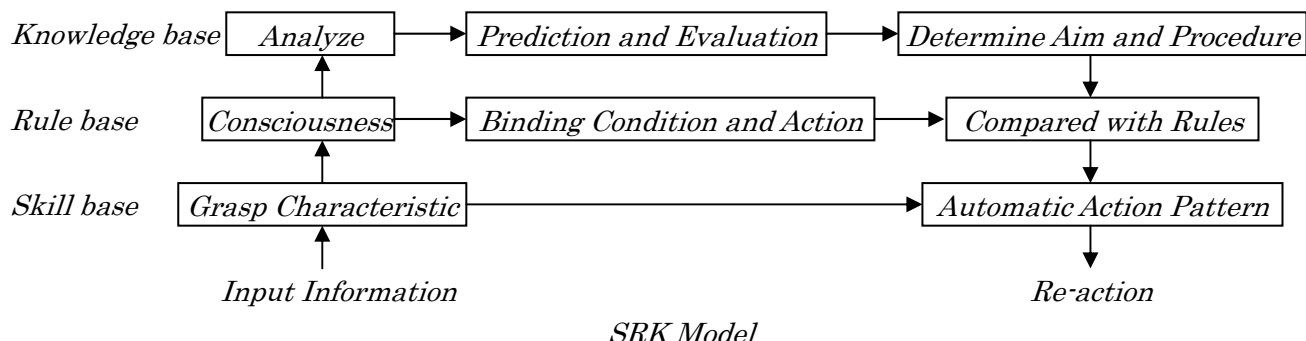
According to "The Encyclopedia of Ergonomics" (Maruzen Co., Ltd., March 30, 2005, page 334~335), the SRK model described is as follows. (A part)

*It is the classification of human behavior which was advocated by J. Rasmussen. It consists of three following categories and it is useful to analyze the thinking/judgment level of a human being.*

*Skill based: It is an action which is implemented without consciousness. For instance, a chasing something that is changing by eyes or hand movement which used an easy assembling process etc. are related to it. Workers has no thinking process which needs awareness of an attention or a control, etc. It is also to say a skilled work.*

*Rule based: The action that is implemented on the basis of the rule (such as the work procedure) that fostered through education and training, etc. Although a point is forming an intention based on the rule is differs from the skill based, and these boundaries are hard to distinguish.*

*Knowledge based: A person has no or almost no experiences in a past or unfamiliar situation etc., implemented action based on a trial and error, understanding situations, or prediction of effect, etc. Simply speaking, it is called an action with thinking/judgment that on the basis of the information which are given and thinking about, gropes for an answer, and decides.*



### 2.7.11 Opinions of the Flight Crews regarding Line Training

After occurrence of this serious incident and the incident in which an aircraft crossed a hold line to enter runway without clearance in the line training in Komatsu Airport (on March 4, 2008), in the company questionnaires regarding the operations with line trainings to all flight crews including trainees and meetings carried out with trainees and instructors of flight crew, main effects gathered from the flight crews were, to evaluate leads difficult to make an assertion<sup>34</sup>, there is atmosphere of difficulty in communication, there is a case of one man operation and CRM is not conducted at that time, too much concentration on an education may influence to ATC communication, the duty of SAFETY FO<sup>35</sup> is not clearly defined, etc.

### 2.7.12 Delays around the Time of the Serious Incident Occurrence

At around the time of the serious incident occurrence (about 10:33), the situation of delayed aircraft more than 30 minutes from scheduled time was as below table. (A part)

ARRIVALS				DEPARTURES			
Flt ID.	Dep.	Schedule	ATA	Flt ID	Dest.	Schedule	ATD
ADO13	RJTT	09:15	10:01	ANA54	RJTT	09:30	14:51
JAL2001	RJOO	10:45	11:15	ANA704	RJGG	09:50	10:27
JAL2903	RJSS	10:45	11:24	SKY708	RJTT	10:00	10:42
SKY707	RJTT	10:50	11:48	JAL506	RJTT	10:00	10:47
ANA57	RJTT	11:05	11:39	ADO16	RJTT	10:10	12:46
JAL515	RJTT	11:20	12:29	ANA722	RJSS	10:15	10:54
ANA867	RJEC	11:40	14:40	ANA766	RJSN	10:25	11:00

<sup>34</sup> It stands for an 'Assertion', express his/her opinion clearly.

<sup>35</sup> As described the company's OM, it stands for qualified co-pilot on board at line training, who is responsible that in the case candidates for first officer face difficult situation, he/she assists them to get over with PIC.



ADO15	RJTT	11:45	12:41	ANA1712	RJBB	10:25	14:22
JAL517	RJTT	11:50	12:20	ANA56	RJTT	10:30	15:30
CSN651	RJSS	11:50	15:02	JAL508	RJTT	10:45	15:06
ANA721	RJSS	11:55	15:47	JAL510	RJTT	11:05	15:37

### 2.7.13 Measures concerning Prevention of Mis-entering into Runway and Mis-departure by Civil Aviation Bureau

The Civil Aviation Bureau of Ministry of Land Infrastructure Transport and Tourism, to prevent the mis-entering into runway and mis-departure, by issuing directives to operators or giving notice to a party concerned etc., has tried to prevent recurrence of similar incident.

Outlines of directives and task forces, etc. by Civil Aviation Bureau to the similar cases occurred recently are as follows.

(1) "Regarding steady implementation of ATC communication etc." (Directive issued March 9, 2005)

Japanese airline operators are requested to drive home their flight crew that communication with ATC facility and mutual confirmation of what they listened should be carried out steadily regarding the matter occurred at the New Chitose Airport on January 22, 2005, described in 2.7.8(4), that an aircraft was instructed to stop from the ATC facility because the takeoff run was begun without receiving a takeoff clearance.

(2) "Investigation and examination task force concerning ATC troubles in Osaka International Airport" (Investigation during October 10~12, 2007)

On occurrence of ATC troubles at Osaka International Airport on September 6 (Crossing runway without a clearance) and on October 5, 2007(Landing on A runway with a landing clearance on B runway), as investigated at the Osaka Airport Office of Osaka Regional Civil Aviation Bureau, the interim report of "The fact relevance that had been gathered", "Matters to be noted as a background of these troubles", and "Matters to be improved" was made public on October 19, 1998.

(3) "Regarding confirmation of ATC instruction to ATC facility" (Directive issued October 22, 2007)

Japanese airline operators are requested to drive home their flight crew that confirmation with ATC facility should be carried out without hesitation when they are dubious about the ATC instruction or there may be any gap in recognition among the flight crew, following the ATC troubles occurred at Osaka International Airport on September 6 and on October 5, 2007 and also that confirmation with ATC facility should be carried out when there are any question about the ATC communication, following the runway incursion occurred at Kansai International Airport on October 20, 2007, that an entering into runway of an aircraft without receiving ATC instruction caused going around of approaching aircraft which had landing clearance.

(4) "Regarding steady implementation of read back to ATC facility etc." (Directive issued October 31, 2007)

Regarding the runway incursion by an aircraft without receiving ATC instruction occurred at the Kansai International Airport on October 20, 2007, Japanese airline operators are requested as follows.

1. *To read back by pilots using the term differ from that the air traffic controller used may cause the discrepancy of the intended communication between the pilot and the air traffic controller, therefore, when responding to the instruction issued by the air traffic controller, the pilot should read back using the same term of the instruction.*

2. *If ATC instruction is dubious or there may be any gap in recognition among the flight crew, it is important to realize ATC instruction clearly by confirming with ATC facility without hesitation. On implementing the confirmation, it should be stated with reason of seeking confirmation as much as possible, to help air traffic controller to recognize.*

(5) “Runway mis-entering prevention measures and examination conference” (December 18, 2007, the 1st meeting, and March 28, 2008, gathering and public.)

*From September to November in 2007, runway incursions were occurred at Osaka International Airport, Kansai International Airport and Chubu Centrair International Airport one after another. Since these occurrence have a commonality that caused by human error intervention by air traffic controller or pilot which occurred in the airport where the air traffic were congested and operations for takeoff and landing were required immediate response, it is required to take necessary measures to prevent a recurrence of such events. Therefore, Civil Aviation Bureau and operators concerned have jointly recognized various issues on runway incursions based on comments from air traffic controllers and pilots, then considered both software and hardware measures such as devising operational idea on ATC communication, implementing the system which helps air traffic controller to grasp situation and so on, As a result, “Runway incursion prevention measures promotion team (tentative name)” has been set up to make efforts against runway incursions.*

## 3 ANALYSIS

### 3.1 Qualifications of the Flight Crew

The captain, the first officer and the trainee of the aircraft A held proper airman competence certificates and valid aviation medical examination certificates. And between the captain and the first officer, the trainee, as described in 2.2.1, there are big differences of their flight experiences and ages.

### 3.2 Qualifications of the Controller

The Controller held a necessary air traffic controller certificate and a valid aviation medical examination certificate.

### 3.3 Contribution of Weather

According to the statements of the flight crew and the controller as described in 2.1 and the meteorological information as described in 2.3, the weather condition at the time of the serious incident was as follows: Even though the RVR value exceeded the weather minima for takeoff of aircraft A, the visibility was temporarily too poor to see apron area from the tower because of flurry snow, the temperature was four degrees Celsius below zero, the braking action of all area was MEDIUM TO POOR with snow. Therefore, it is estimated that the captains of aircraft A and B, did their best to ensure safety of their aircraft, being careful not to go off runway by whiteout<sup>36</sup> or braking operation, and taking into consideration for snow cover and icing.

Regarding the ground speed of the aircraft B became zero as described in 2.1.1, and the captain of the aircraft B stated, "I do not have a recognition that we stopped on the runway" as described 2.1.2 (4), it is considered possible that the captain of aircraft B felt as if the aircraft had been moving due to the snowstorm, even though the aircraft had stopped in fact.

It is estimated that at the time of the aircraft A started its takeoff roll, the visibility was poor due to snowfalls, the aircraft A could not see the aircraft B which was still on the runway

### 3.4 Factors regarding the Flight Crew Members of the aircraft A

#### (1) Burden to the Captain (before receiving the ATC information)

As describes below, during waiting on the runway, it is estimated that there was the environment that could be heavier burden than usual to the captain.

- ① as described in 2.7.5 (2), it was needed to conduct the cold weather operation, the operation which requires many additional procedures than usual.
- ② it was an operation on slippery runway with snow etc. where the braking action was MEDIUM TO POOR.
- ③ It was the operation with the trainee and was needed to educate and evaluate.

Further, it is considered possible that there were another burdens of the time management to the captain as follows:

- ① The off block time of the aircraft was delayed about 50 minutes from the time by flight

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<sup>36</sup> It means the status that looks like in only white by snow, mist, or cloud, and results in to be impossible to recognize attitude, position, or direction.

plan due to the snow removal etc.

- ② It took about 35 minutes to enter the runway from the off block time, it was longer than usual.
- ③ Estimated maximum hold over time to be exceeded at the latest of 10:47, recognizing the risk that snow was covering the wing surfaces like the case described in 2.7.8 (3), and waiting for take-off clearance.
- ④ Even if the takeoff clearance was issued, it needs about 30 seconds to confirm the parameters of the engines as described in 2.7.5 (2), to be afraid that separation would be shortened with the aircraft C on final approach.
- ⑤ After the aircraft B landed, and the aircraft A lined up on the runway center line and stopped, the considerable time (about 2 minutes and 20 seconds) had passed.

From these above, it is considered that the captain was under the situation that it was impossible to conduct visual check on clearing of the runway which is the most important thing for takeoff, and that as described in 2.7.9, the captain was psychologically in the set of waiting for take-off clearance.

Regarding the operation with the trainee in bad weather condition, based on the description of (1) of 2.7.4 (2), to reduce the load to the captain, it is considered that there is an option of quit the training and change to the first officer.

(2) The factors why the Captain fell into an error (at the time of ATC information receiving)

As described in 2.4, at the time of this serious incident occurred, the communication between the aircraft and the controller was normal.

The captain expected clearly the next communication from the controller will be takeoff clearance and just on his mental setting, at 10:32:30, the controller advised “JAPAN AIR 502, EXPECT IMMEDIATE TAKE-OFF, TRAFFIC LANDING ROLL AND INBOUND TRAFFIC 6 MILES” to the aircraft A.

It is considered that the captain mistook the meaning of this information by the air traffic controller as the "takeoff clearance". Regarding this error, while the captain was psychologically setting for waiting take-off clearance as described in previous, the controller used the terminology "TAKE-OFF", the captain had the recognition that the terminology of "TAKE-OFF" is used normally in "takeoff clearance" as described in 2.7.1, and he convinced this word is not used for other purpose, therefore the attention of the captain did not reach to the other part of the communication, judging from the word of “takeoff” he turned to believe that the takeoff clearance was issued, without having any consciousness to confirm the term of “cleared for” was issued or not, then he made an error that the take off clearance was received. Besides, as the captain couldn’t hear “TRAFFIC LANDONG ROLL”, it is considered that it was more difficult for the captain to have doubt toward “takeoff clearance”.

Moreover, regarding the term of "IMMEDIATE TAKE-OFF", it is estimated, “*A controller can issue the clearance to make an aircraft immediate takeoff*” as described in (12) of 2.7.2, the captain judged that it was demanded "immediate take off" because of the safety of the aircraft A and C, and needed to follow this instruction promptly, although he did not read back, as described in 2.7.3.2(3), “flight crew members shall read back takeoff clearance received from ATC”, he had priority for takeoff procedure.

It is considered possible that as the captain was “set” psychologically he corresponded to

the characteristic of the terminology that he wanted to hear, it was the reflective correspondence (the error) of extremely near to a skilled based action in the ruled based action on the SRK model as described in 2.7.10.

The captain began to increase the thrust of the 1st and the 4th engines(at 10:32:32), in addition to the 2nd and the 3rd engines that have been increased for engine parameters confirmation as described in 2.7.5 (2), before the end of whole ATC information received. It is considered that the attention of the captain directed to the engine instruments temporarily by this increasing thrust operation, is one of contributing factor for the captain not to be able to hear ATC information completely.

Also, though the parameter confirmation should be maintained for about 30 seconds after the increased thrust, according to the captain's statement as described in 2.1.2 (1), he told that he had priority for takeoff procedure soon before the enough time, it is estimated that he decided in consideration for the separation with the aircraft C on final approach would be shortened. As described in 2.1.1, at 22 seconds (10:32:54) after the thrust increasing, the N1 of all engines increased rapidly to take-off thrust, it is considered that the captain pushed TO/GA switch at that time.

(3) The factors why the flight crews except the captain failed to catch the ATC information (at the time of ATC information receiving)

According to the statement of the flight crew of the aircraft A as described in 2.1.2, all other operation crew except the captain did not get ATC information accurately either. This is considered possible that the following factors were contributed.

- ① After the aircraft B landed, and the aircraft A lined up on the runway center line and stopped, as the considerable time had passed, they expected that the controller's next communication will be the takeoff clearance.
- ② The controller used the term of "TAKE-OFF"
- ③ Because the captain increased the thrust of the no.1 and no.4 engines before the end of whole ATC information received, the attention of the other flight crews was paid to the engine instruments temporarily
- ④ As for ATC information that issued by the air traffic controller, three aircraft's information regarding the aircraft A, B and C was continuously included, and the transmitting speed was fast as described in 2.7.3.1.

However, since the recording in a cockpit at that time did not remain because CVR was over written as described in 2.6, the factor that this ATC information is not accurately caught, was not able to be specified.

(4) The factors why the captain could not recover from his error (after receiving ATC information)

It is considered possible that factors why the captain could not recover from his error are as follows:

- ① Regarding the description of OM, "In case of receiving the ATC clearances, the PF shall inform other flight crew members that PF understands them. The PF shall order PM to confirm the ATC clearances if there are any doubts or uncertainties." as described in 2.7.3.2(1), the captain made a call "ROGER" as to acknowledge, without being doubts or uncertainties to the contents of the clearance which he convinced, he did not order PM the confirmation to the ATC facility, so there was no resend of instructions or corrections,

etc. from the ATC facility.

- ② Regarding that the captain was certain of being issued “immediate takeoff clearance”, he did not warn the trainee of not carrying out the description of OM, while being aware of that “*Flight crew members should read back after receiving clearance, attaching a call sign.*” as described in 2.7.3.2(2).
- ③ Regarding the points of concern about ATC clearance acceptance, “*Flight crew members should confirm the contents of ATC clearance carefully each other.*” as described in 2.7.3.2(2), because “IMMEDIATE” had been included, the captain gave priority to a prompt beginning of the take off operation, and the flight crews did not confirm “CLEARED FOR IMMEDIATE TAKE-OFF” that the captain had convinced to receive carefully and mutually. Specifically, the captain called "TAKE-OFF" and began the take off operation, without confirming between crews the ATC instruction of "CLEARED FOR IMMEDIATE TAKE-OFF" that he had convinced to receive before the beginning of the take off operation.
- ④ As described in following of (5)~(7), there was not any advice to the captain from the first officer and trainee, and also there was not any advice to trainee from the first officer.

(5) The factors why the trainee could not advise to the captain (after receiving ATC information)

According to the statement of 2.1.2 (3), the trainee stated that he didn't hear the term of “CLEARED FOR”, it is considered that he did not make a “read back” as described in 2.7.3.2 (2), because he thought that he did not receive the takeoff clearance. Therefore, it is considered that the trainee had not mistook received report of takeoff clearance.

However, the fact that the captain made a call as “TAKE-OFF” shows that the captain had been misunderstood that he had received takeoff clearance, when the trainee heard his call, he should point out to the captain without hesitation that they did not receive the takeoff clearance, but couldn't.

It is considered that the factors that the trainee was not able to point it out to the captain were as follows:

- ① The trainee has not took CRM introduction training described in 2.7.6(2) yet.
- ② The trainee's confidence that the receiving information was not the takeoff clearance was shaken due to the captain's takeoff operation
- ③ The trainee depended on the captain recognizing that his operation experience is extremely less in comparison with the captain's.
- ④ Because he was in the position receiving the evaluation of flight from the captain, he tried to accomplish the PM duty for the takeoff operation that the captain had started.
- ⑤ That takeoff operation of the captain was rapid and there was no enough time
- ⑥ Although he replied "ROGER" to ATC, there was no instruction from the captain and the first officer.
- ⑦ After the aircraft had started the takeoff run, making a request to stop was huge psychological resistance.

(6) The factors why the first officer could not advise to the captain(after receiving ATC information)

According to the statement of 2.1.2 (2), although the first officer had the doubt about the term of "IMMEDIATE TAKE-OFF" included in the communication issued by the air traffic controller, and was not able to catch the trainee's reply of "ROGER" as well, because the captain had started takeoff operation promptly by his own judgment, it is considered that the first officer was not able to advise to the captain that reconfirmation is necessary ruminating the doubt in recognizing the succeeding aircraft was approaching to them, losing time to spare while he was trying to avoid disturbing captain and the trainee in the operation.

However, the receipt of the takeoff clearance should be confirmed as a matter of highest priority item and as the description of 2.7.4 (1) 4, "The First Officer assists the PIC during whole flight operation", therefore the first officer should make an advice quickly to the captain that the receipt of takeoff clearance was in doubt.

(7) The factors why the first officer could not advise to the trainee (after receiving ATC information)

As the description in 2.7.4(2), duties and responsibilities of the qualified first officer is described, "*In the case Candidates for First Officer faces difficult situation, Captain other than the PIC and the Flight Crew Member qualified as First Officer assists Candidates at the station and get over with the PIC as much as possible.*". Therefore, the first officer should instruct the trainee to reconfirm the takeoff clearance or if there is not enough time, he should take overrides the radio communication of the trainee and reconfirmed voluntarily.

However, the first officer was failed to catch the trainee's reply of "ROGER", and while he was thinking about the ATC information that included "IMMEDIATE" and "TAKE-OFF", the captain called "TAKE-OFF", and as described in (6) , the first officer also understood the separation to the succeeding aircraft had been shortened, regarding "*The First Officer shall make necessary confirmation and effective advice to the PIC through monitoring the PIC's tasks*" as described in 2.7.4 (3), it is considered that he gave priority not to disturb the workflow of the takeoff operation by the captain and the trainee.

(8) CRM system

In the OM of the company, as described in 2.7.4 and 2.7.6, there shows a policy on pursuing of safe and high quality operation by CRM, its operation policy, and the standards of training etc. moreover, as described in 2.7.3.2, to make an advice positively to the judgment of a captain and to confirm and read back, etc. such as the case when there is a doubt in the ATC communication. However, neither an advice nor a confirmation about the receipt of takeoff clearance was done to the captain at this serious incident, and the communication including assertion (CRM) among the flight crews were not conducted appropriately referential to the case with 2.7.8 (2).

From this and the description of OM, "*(1) Each flight crew member shall express his/her intention clearly and verify it each other. It is very important for each pilot to have the same understanding about their intention as well as aircraft conditions. The PIC shall make a good atmosphere in the cockpit so that crew members may advise each other easily. When the PIC is going to make decisions on operations, flight crew members should give positive and effective advice as necessary.*" as described in 2.7.3.2 (1), it is estimated that the line

training in the company may not be an atmosphere suited for CRM despite, CRM training had been conducted.

In the company, in addition to this serious incident, as described in 2.7.11, there were opinions that there is atmosphere at difficulty in communications with the captain on the line training, it is considered that the CRM system of crew member that shall advise positively against wrong judgment and action of captain who falls into state of mistake, had not been established sufficiently.

Moreover, aforementioned (4)~(7) shows the situation that it may not be surely conducted the regulation of OM, "*(4) Each flight crew member shall not commence takeoff procedure unless he confirms its receiving of the takeoff clearance*" as described in 2.7.3.2 (3).

### 3.5 Factors relating to the Controller

#### (1) The usage of the term of "TAKE-OFF"

As described in 2.7.1 (1), because the term of "TAKE-OFF" is considered that it does not usually used except the issuing of takeoff clearance and its cancellation, it is considered that there was a possibility that the ATC information issued by the controller at 10:32:30 was mistook by flight crew members for takeoff clearance.

However, as described in 2.7.2, Air Traffic Control Procedures and Air Traffic Control Regulations has no description that ATC will not use the term "TAKE-OFF" except take-off clearance and its cancellation, and the controller did not know the accident in Tenerife as described in 2.7.8 (1), it is considered that the controller had not been educated that the use of "TAKE-OFF" would lead an error, therefore it is estimated that the controller used the term "TAKE-OFF" at the time of issuing the ATC information to the aircraft A having no special recognition. From this, it is estimated that the recognition regarding "TAKE-OFF" usage was different between the flight crew members and the controller.

#### (2) The factors regarding the controller for providing the information to the aircraft A

Based on the statement of the controller described in 2.1.3, a proper separation described in 2.7.7 was applied, between the aircraft B landed at 10:28:45 and the aircraft C on final approach. But, when the aircraft A entered B runway at 10:30:11, the landed aircraft B needed more time to get off the runway, further on that day a takeoff aircraft needed time until starting takeoff roll, it is estimated the controller received a psychological oppression that the separation between the aircraft A and the aircraft C would not be ensured, and he wanted to have the aircraft A recognize understand the situation that if the controller issue a takeoff clearance, it is required to make immediate response to the clearance, and have informed such an information.

Also, the information provided by the controller is considered possible that he was expecting the effect that urges tacitly early runway exit to the aircraft B that was required time to exit runway.

#### (3) The necessity of the ATC information issuing

It is estimated the reason of the ATC information issued by the controller to the aircraft A, as described in 2.1.3, was that the controller wanted the aircraft A to expect "immediate



takeoff", it should use the word of "DEPARTURE" not of "TAKE-OFF".

Also, as described in 2.1.2. (1)~(3), it was in the situation that the flight crew of the aircraft A was waiting for takeoff clearance, though it was important to provide ATC information, it is considered that it was necessary to consider sufficiently to use the phraseology and the transmitting speed, etc.

In addition, according to the statement of the controller described in 2.1.3, just before this serious incident occurred, the controller did not request the approaching and landing aircraft after the aircraft B to make "REPORT CLEAR OF ACTIVE" (Report when the runway is vacated) that had been done till then. Therefore, even though this was because the runway vacating report from the landing aircraft till then was different from the information on the ASDE indicator, it is considered that even if the flight crew of the aircraft A monitored the ATC communication in the snowfall, they were not able to grasp the movement of the aircraft B. It is considered that it is necessary to consider that because there will be an useful information to the other aircraft in the bad weather like this serious incident, even in the case that the controller himself does not need information.

Furthermore, according to the DFDR record as described in 2.1.1, as the aircraft B required time from landing to get off the runway, it is considered that if the controller made a ATC communication with the aircraft B such as "Did you need more time to clear the runway due to the weather?", the flight crew of the aircraft A may grasp that the aircraft B was still on the runway.

#### (4) Load to the controller

As described in 2.1.1, just before this serious incident occurred, the aircraft waiting for departures managed by the tower were 5. Also, as described in 2.5 (1), at that time, the operational condition was severe by being limited available runway and taxiway, and as described in 2.7.12, delays of aircraft had been occurred.

Furthermore, as described in 2.5 (2), the meteorological conditions were that the waiting aircraft on the ground and the approaching aircraft could not be seen from the air traffic controller by their eyes, so the air traffic controller is controlling by mainly comparing the ASDE indicator and the bright, it was different operation from usual situation by visual watching.

From these, it is estimated that the load to the controller was heavy.

### 3.6 RTO

As described in 2.1.1, at 10:32:43, the aircraft A started to takeoff run, while the aircraft B landed already was still taxiing between B3 and B2 on the runway.

At 10:32:59, as the controller confirmed the aircraft A began to move with the ASDE indicator, he issued a stop instruction immediately to the aircraft A, the trainee of the aircraft A transmitted an acknowledgement of the stop instruction to the tower promptly, just after that the speed brakes were activated, and engine reversers were deployed, it is estimated that an appropriate stopping instruction by the controller and flight crew members' accurate RTO procedures resulted in avoiding the abnormal closer of the aircraft A to the aircraft B.

Also as described in 2.1.2 (1), due to the captain had not consciousness of serious incident occurrence, so it is estimated that the aircraft A returned to a stand started preparation to depart once again and the CVR had not been stopped.

### 3.7 Severity of this Serious Incident

It is estimated that the straight line distance between the aircraft A and B was, as described in 2.1.1, about 1,800m when two aircrafts became to the closest. The severity of risk of this serious incident based on the ICAO “CLASSIFICATION OF THE SEVERITY OF RUNWAY INCURSIONS” was classified as the “C”, “An incident characterized by ample time and/or distance to avoid a collision”

(See the Attachment 2)

### 3.8 Recurrence Preventive Measures

#### (1) Prevention of discrepancy in ATC communication

As described in 2.7.13, the Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism has been engaging to prevent the mis-entering into runway and mis-departure, by issuing a directive, holding a conference with operators, etc., engaging continuously to prevent recurrence. And as described in 2.7.3.2, the company defined the notices which prevent misunderstanding in ATC communication.

However, this serious incident was occurred.

As for this serious incident, if the captain ordered the flight crew who took charge of the communication to read back, "the instruction of the immediate takeoff" which the captain has convinced to receive, it is considered possible that the flight crews except the captain or the controller may correspond such as taking a reconfirmation, etc.

Though everyone may be happened to fall into the mistake as a human factor, but the flight crews must have consciousness of not beginning the take off operation which is extremely important to safety by mistake, from falling into the mistake by adhering regulations of OM for ATC clearance read back, etc. strictly, and, even if it falls into the state of mistake, to prevent serious situation by other flight crews' pointing out and advice is necessary.

Therefore, it is important to recognize again that steady implementation ATC Communication Procedure described in 2.7.3.2 is necessary. Items to be read back described in 2.7.3.3 for reference, the ATC clearance etc. are important for ensuring the safety of the operation, so it is necessary to read back of these ATC clearance etc. and to prevent the discrepancy in the ATC communication, and when the content of the communication can not be understood or there is a doubt like this serious incident, request to the air traffic controller for sending again, and finally, it is necessary to do mutual confirmation of the content surely among the flight crews.

#### (2) Establishment of the system to advise positively to a captain (CRM)

In the company, as described in 2.7.4, as it defines the importance of CRM among the flight crews and the mutual supplementary function, etc., and in addition, as the recurrence preventive measure of the incident occurred in the airport in January, 2005 described in 2.7.8 (4), the mutual confirmation procedure when ATC instruction is received and the confirmation procedure when there is a doubt in the content of the instruction, were newly set, however, the similar serious incident was reoccurred.

In this serious incident, the captain judged and operated while he was falling into a human error, the trainee and the first officer did not give any advice to the captain. Also, as described in 2.7.11, there is an opinion such as taking communications about operation is not

easy, in the line training of the company.

From these, to the aircraft operators, so that the policy concerning CRM as described in 2.7.4(1)①, may function enough on the scene of line training especially, that is, when the captain and other flight crews conduct their duties, it shall be established that the relation to make an opinion easily, and it is necessary to execute specific measures on the establishment of an effective system which is possible to positively point out and advise for the captain.

By these measures, it is necessary to create an environment that trainees under training can be easily advised for experienced captains.

### (3) The accomplishment of the ATC controller's tasks

It is necessary to describe on Air Traffic Control Procedures and Air Traffic Control Regulations that ATC does not use the term "TAKE-OFF" except take-off clearance and its cancellation. It is important to inform the air traffic controller that the use of "TAKE-OFF" could be misinterpreted by flight crews as takeoff clearance in some circumstances including historical details etc.

Also, it is considered that it needs to establish the usage standards of the terminology which may mislead flight crews.

Recently, air traffic volume increases every year, the load of air traffic controllers at airport traffic control towers are increasing, such as this serious incident, the operation environment where the breaking action was severe etc., in bad weather that controllers can not have direct visual contact on the aircraft easily because of snowfall etc, a lot of delays are occurred as described in 2.7.12, and the load to the air traffic controller increases further as described in 3.5(4). From these, it is necessary for ATC facility, to study on load reduction plan to air traffic controllers at a time of bad weather.

Also, on operation of aircraft in severe meteorological conditions as described in 3.4(1), understanding that loads to flight crews are bigger than usual, it is important for air traffic controllers who can know aircraft's movements, to understand the flight crew's needs for ATC communications and to conduct the control such as considering use of the term and the transmitting speed, etc.

### (4) Implementation of RWSL etc.

To prevent the aircraft mis-entering into the runway and mis-departing, as implementing of hardware like CPDLC<sup>37</sup>, or RWSL<sup>38</sup> in operational evaluation in the United States, it should speed up the research and the development on such devices that flight crew can utilize as a backup of acknowledgement of ATC clearance etc., and it is necessary to put to practical use and to implement without delay.

Also, as air traffic controller's load reduction plan, it is necessary to promote the further development and implementation of ATC service supporting system like the radar system that can confirm the aircraft flying around the airport and the aircraft on the ground one screen by displaying digital information of the flight number etc. to facilitate the identification of the

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<sup>37</sup> It stands for Controller and Pilot Data Link Communications, a control facility and a flight crew exchange various kinds of information etc. by the data link communication.

<sup>38</sup> It stands for Runway Status Lights, when an aircraft enters into or crosses runway, to light up the lights which are installed on runway and taxiway, advice visually for flight crew to prevent runway incursion in an error.

aircraft movements on the ground that it has already been operated in a Japanese major airport, furthermore, like multi-lateration<sup>39</sup>, etc. operated in Tokyo International Airport.

### 3.9 Summary of the analysis

As described above, the analysis concerning this serious incident occurrence is summarized below,

- (1) When the aircraft A was waiting for the takeoff clearance on the runway, the aircraft B on the same runway was not visible from the aircraft A, under low visibility due to snowfalls.
- (2) As the controller did not request "REPORT CLEAR OF ACTIVE" to the aircraft B going ahead, there was no means for the flight crews of the aircraft A to know the time when the runway cleared off by the aircraft B.
- (3) Because the runway occupation of the aircraft B was prolonged, and the controller had psychological oppression about the separation between the aircraft A and the approaching aircraft C, the controller issued ATC information that contained "IMMEDIATE TAKE-OFF".
- (4) It is not described in Air Traffic Control Procedures and Air Traffic Control Regulations that "TAKE-OFF" is used at the takeoff clearance and its cancellation, besides, not using it in principal, and the controller did not have such recognition.
- (5) The captain of the aircraft A, having severe meteorological condition, and being aware of the separation with the approaching aircraft C, was psychologically in the state of "set" that it comes next to be the takeoff clearance, moreover, because the operation of thrusts increase had been started immediately after beginning of the information, and the attention directed to engine instruments, so the controller's information was not caught accurately. From these, the captain of the aircraft A mistook the ATC information for a takeoff clearance.
- (6) As other flight crews of the aircraft A could not also catch the information by the controller accurately, and regarding the receipt of the takeoff clearance, there was a possibility that the system allowing advice to the captain had not been established sufficiently, therefore an advice to reconfirm was not done.
- (7) When the aircraft B was still on the runway, the controller who confirmed the aircraft A began the takeoff run with the ASDE indicator, issued to the aircraft A the stop instruction and had the takeoff run aborted.

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<sup>39</sup> By receipt at 3 or more stations, of transpondering signal from an aircraft, it can measure the position of that aircraft by a difference in reception time. It can add a tag (flight number etc.) to an aircraft symbol automatically.

## 4. PROBABLE CAUSE

It is estimated that this serious incident occurred under the situation in which the aircraft B existed on the runway after landing, the aircraft A not receiving the takeoff clearance started the takeoff run, therefore the controller issued to the aircraft A the stop instruction and had the aircraft A aborted that takeoff run.

Regarding the aircraft A without receiving the takeoff clearance and having started the takeoff run, it is estimated that the controller issued the ATC information that contained "IMMEDIATE TAKE-OFF" which is not used usually, it made the captain of the aircraft A mistook as receiving "instruction of immediate take off", in addition, there was no advice by other flight crews.

To the occurrence of this serious incident, in addition to the above-mentioned factors, it is considered that the following factors mainly contributed.

- (1) When the aircraft A was waiting for the takeoff clearance in snowfalls, under low visibility, the aircraft B on the runway was not visible from the aircraft A.
- (2) It is not described in Air Traffic Control Procedures and Air Traffic Control Regulations that "TAKE-OFF" should not be used except the takeoff clearance and its cancellation, and the controller did not have such recognition.
- (3) The captain of the aircraft A, in the environment that the meteorological condition was severe, so the load in the operation was large, was psychologically in the state of "set".
- (4) As flight crews of the aircraft A could not advise to reconfirm regarding the receiving of the takeoff clearance to the captain, the system allowing advice to the captain had not been established sufficiently.

## 5. SAFETY OPINIONS

The Japan Transport Safety Board, in view of the result of this serious incident investigation, to ensure the safe of air transport, based on Article 28 of Act for Establishment of the Japan Transport Safety Board, expresses safety opinions to the Minister of Land, Infrastructure, Transport and Tourism, Japan as follows,

### 5.1 Review of CRM training program

To supervise the company to perform reviews in contents and timing of the CRM training program, to improve the environment that is easy for other flight crews including the trainee to advise to the captain positively in a case with the doubt for judgment / operation of the captain in line training..

### 5.2 Reconsideration of ATC terminology etc.

To prevent the mis-entering into the runway or the mis-departure, etc, to conduct the following items. When conducting these items, because the air traffic services of the commercial aircraft that uses the New Chitose Airport etc. has been entrusted to the Minister of Defense by providing for Article 137 of the Civil Aviation Law in management of the Minister of Land, Infrastructure, Transport and Tourism, the Minister of Land, Infrastructure, Transport and Tourism should make necessary coordination with the Minister of Defense.

- (1) To stipulate the usage restriction of “take-off” which has a possibility that the flight crew may misunderstand, and to consider necessity of usage restriction for other terms, and executed the education concerning it thoroughly to air traffic controllers, and to decrease the possibility of the misunderstanding in the ATC communications.
- (2) To study reducing load to air traffic controllers from manpower and facility standpoint, in the airport where the air traffic volume is large, with the severe operation condition of the aircraft, and marginal weather conditions not to be seen the aircraft easily from the air traffic controller.
- (3) To study measures considering that air traffic controllers should understand the flight crew's situation and needs enough, and for doing their tasks.

## 6. SUPPLEMENT

### 6.1 Response of the Chitose ATC Squadron

After this serious incident, the Chitose ATC Squadron, as it is not described on Air Traffic Control Regulations that the term of "TAKE-OFF" should not be used except take-off clearance and its cancellation, to prevent reoccurrence, made all controllers informed about the usage of this term adequately.

### 6.2 Response of Civil Aviation Bureau

The Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, just after this serious incident occurred, cautioned the company to supervise thorough procedures to confirm ATC instructions mutually between the captain and the first officer.

### 6.3 Response of the company

#### (1) Thorough read backs

After the occurrence of this serious incident, the company issued a notice dated February 18, 2008, to all flight crews. The contents are, thorough read back of ATC instructions, reconfirmation of ATC instruction between a captain and a first officer and if there is a doubt in instruction content, suggestion should be made without hesitation.

#### (2) The suspension and resumption of line training

Due to this serious incident and runway incursion occurred in Komatsu Airport during line training, the company, suspended the line training on March 6, 2008.

According to the company, in line training, it became clear that there are items should be improved for further safety improvement, as compared to the usual operation there is an environment where is difficult to exchange intension between flight crews, for instance, there is difficulty to advise to an instructor even if a trainee noticed something. Therefore, while in urgent measures are taken, as discussing regard to the middle/long span subject that should tackle in, then the line trainings were resumed on April 4, 2008.

#### (3) The addition of the rule regarding the responsibility of a first officer

After the occurrence of this serious incident, the company issued additional Operations Order dated April 3, 2008. The contents are that a first officer gets on line training, should monitor the trainee's situation in a cockpit seat, especially on ATC communications, should be in readiness to take over at any time, and carry out that as necessary.

#### (4) The limitation of the ATC terminology that is related to a takeoff

From the troubles that are related to departures such as the runway incursion like this serious incident were frequently occurred, the company implemented the measures on April 4, 2008 that limited the communication terminology with an air traffic controller at entering runway. If an air traffic controller uses the term other than limited terminology, execute confirmation to the air traffic controller from a flight crew.

#### (5) Setting for preventive measures for incursions

In response to the Civil Aviation Bureau's caution just after this serious incident, on April 9, 2008, the company gathered the information for passage of this serious incident occurrence, factors, urgent prevention means, improvement of CRM in line training, improvement of manual contents, protection of runway incursion, the first officer's duty and responsibility when gets on line training for trainee of FO promotion training and organizational measures to a thread are organized, and the items mid-long span theme.

(6) Timing of implementation of CRM introduction for a trainee

The company revised its LINE TRAINING GUID on July 22, 2008 that specifies trainees must receive CRM introduction training before starting their line training.



Figure 1 Taxied Routes

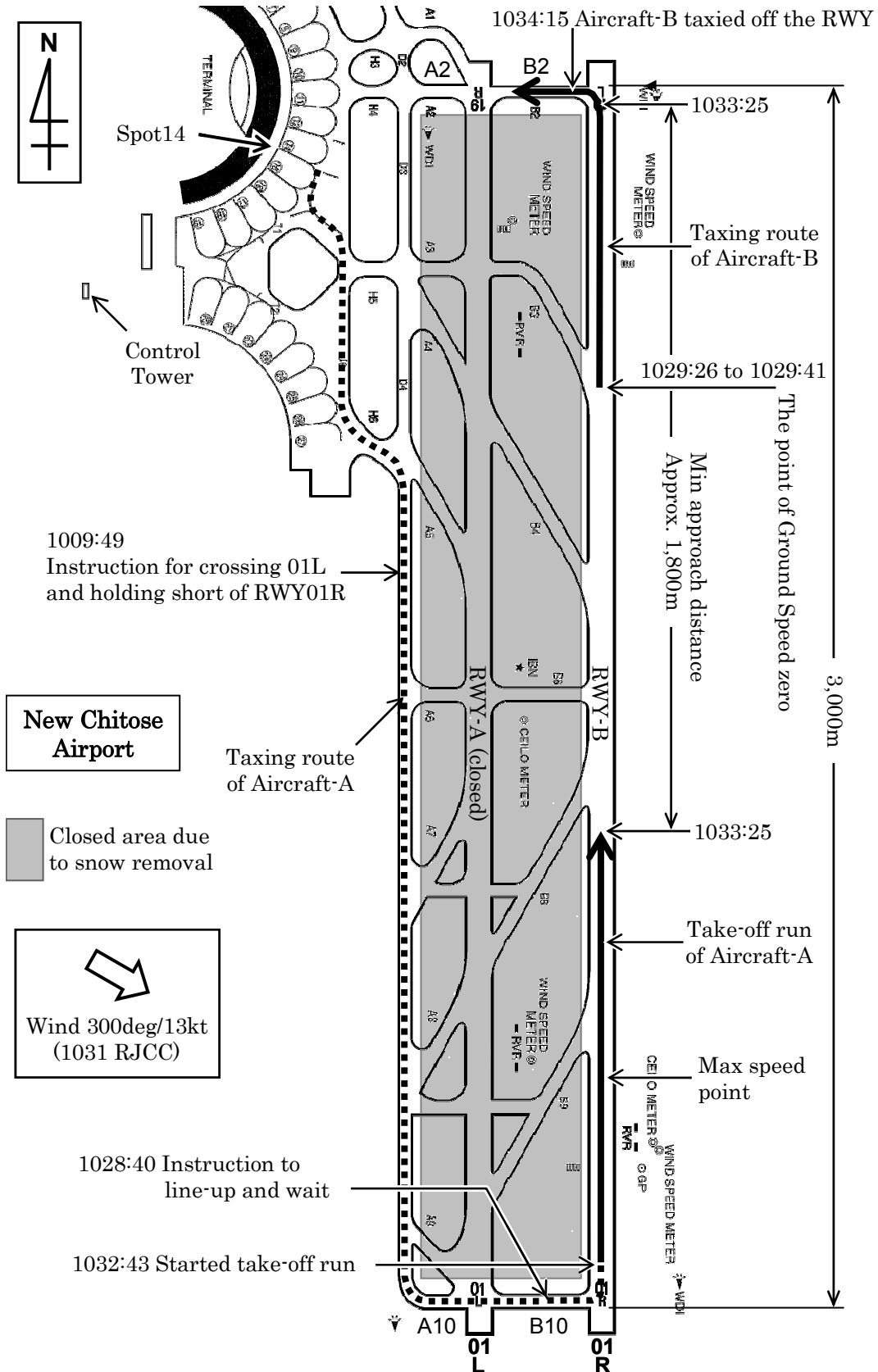


Figure 2 DFDR data of the Aircraft A

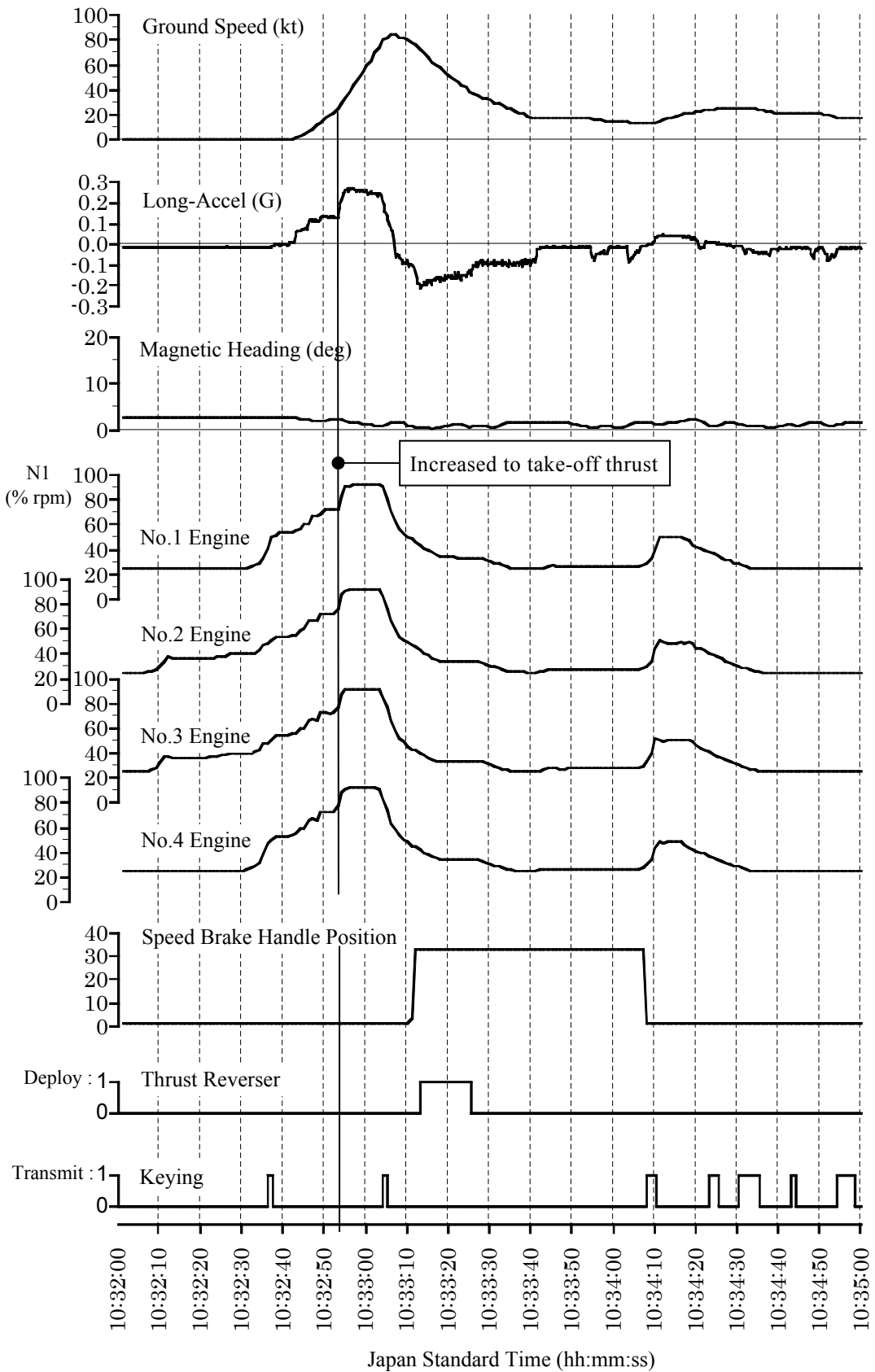


Figure 3 Three views of Boeing747-400D(the Aircraft A)

unit : m

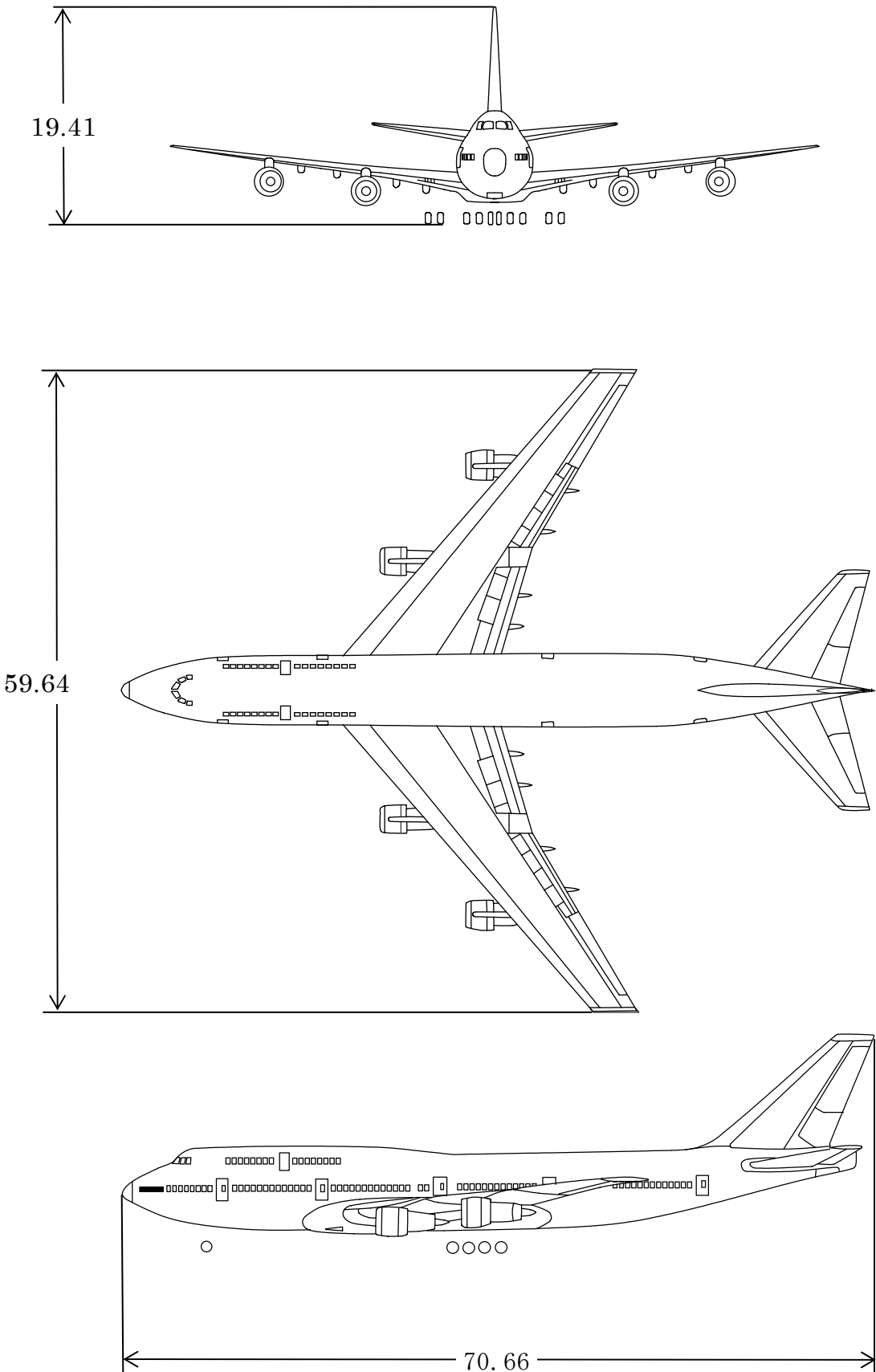


Figure 4 Three views of Douglas MD-90-30(the Aircraft B)

unit : m

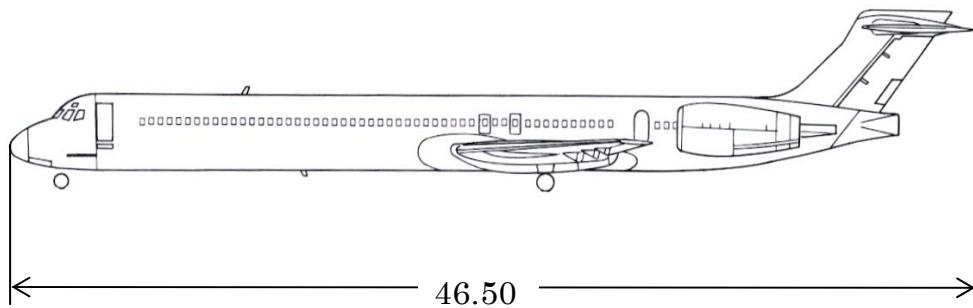
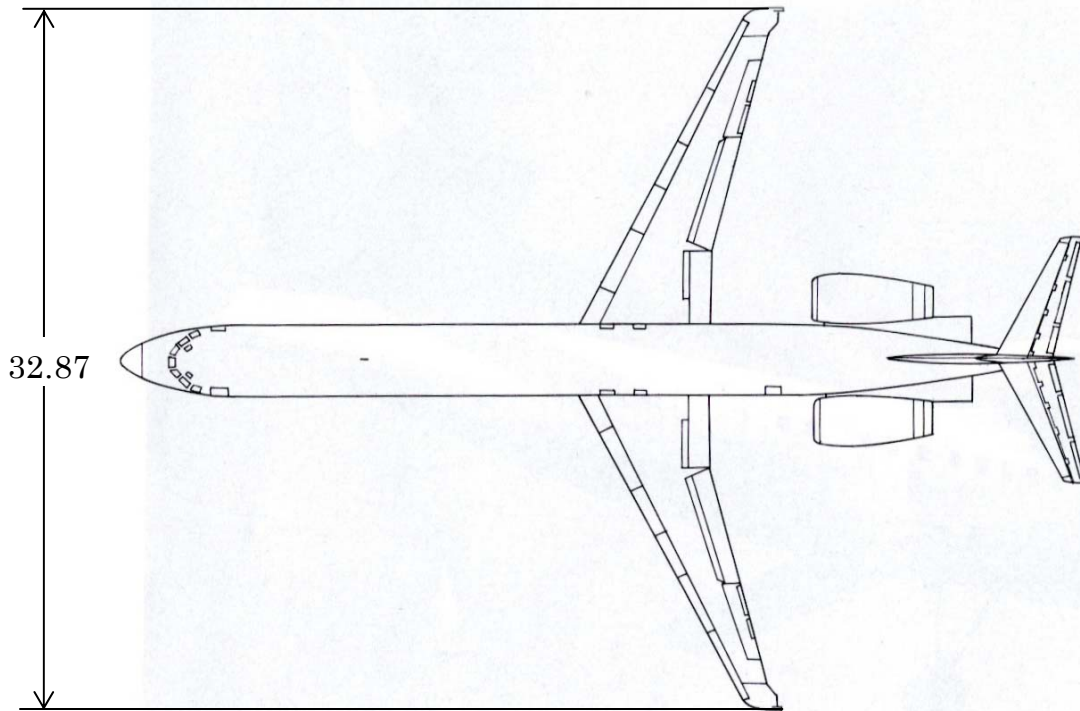
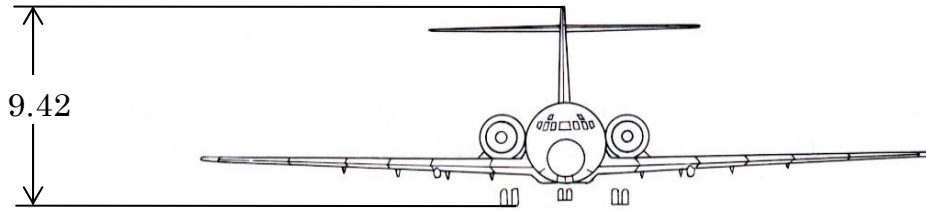


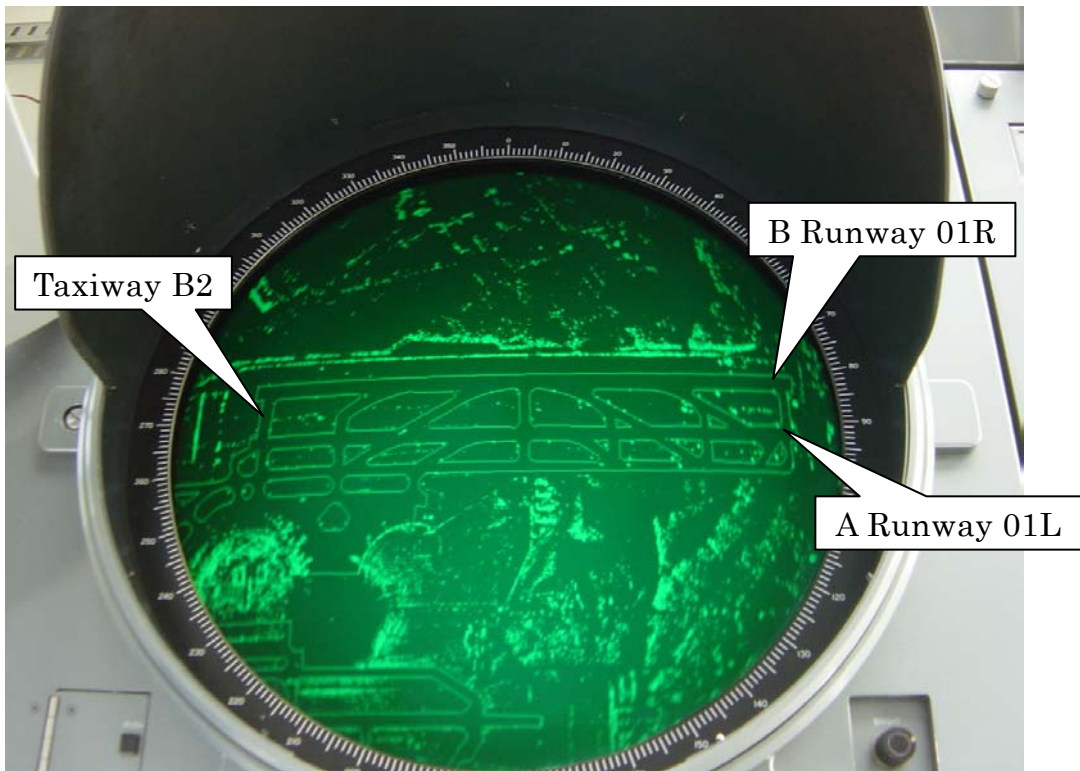
Photo 1 Same Type of the Aircraft A  
(Serious incident aircraft)



Photo 2 Same Type of the Aircraft B

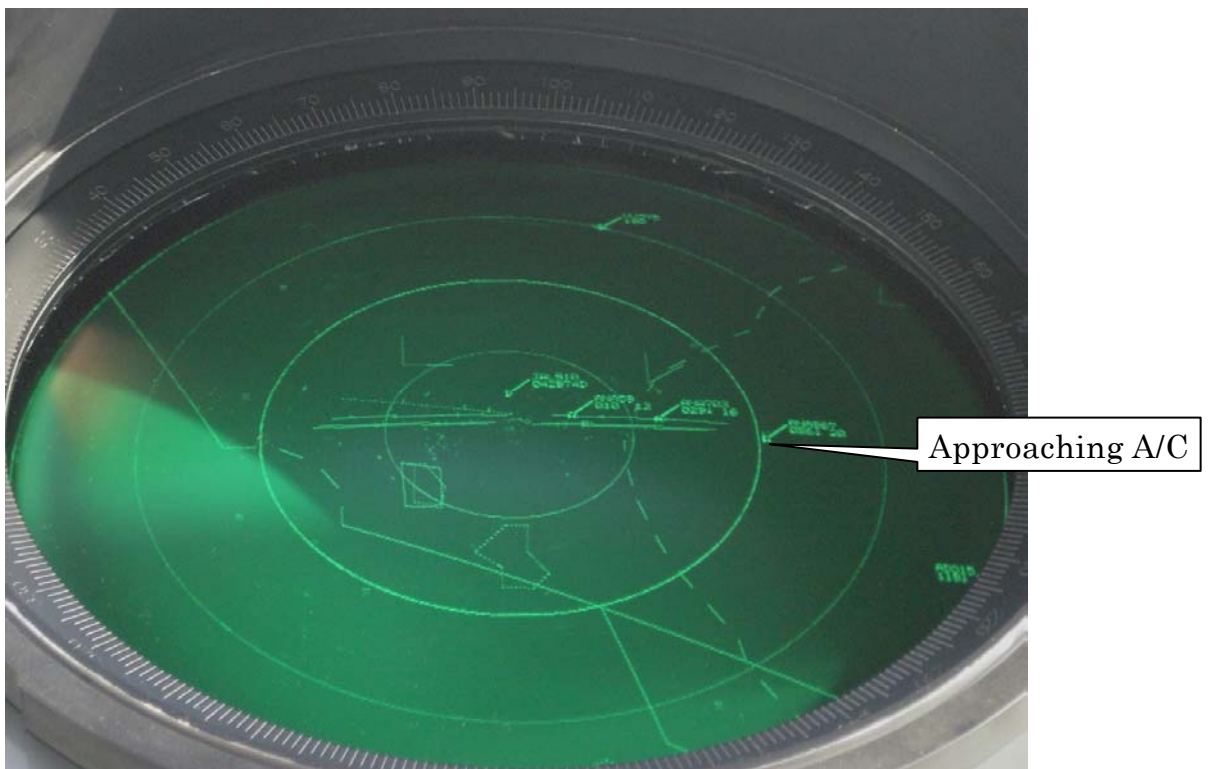


Photo 3 Indicator of ASDE



Note: Refer to 2.5(2) for ASDE Display

Photo 4 Tower Bright Display



# Attachment 1

## ATC COMMUNICATION RECORDS

COMMUNICATIONS between the reference aircraft and the tower.

**Bold letters indicate communications between the aircraft A and the Tower.**

Other communications are omitted.

Legend TWR : The tower controller

JAL502 : The Serious Incident aircraft (the aircraft A)

JAL2503 : The Preceding aircraft (the aircraft B)

JAL513 : The Following aircraft (the aircraft C)

10:09:00	<b>JAL502</b>	<b>CHITOSE TOWER, JAPAN AIR 502, ON YOUR FREQUENCY.</b>
10:09:49	<b>TWR</b>	<b>JAPAN AIR 502, CHITOSE TWR, CROSS RUNWAY 01L, HOLD SHORT OF RUNWAY 01R. YOU ARE NR3.</b>
10:09:56 (omission)	<b>JAL502</b>	<b>CROSS RUNWAY 01L, HOLD SHORT OF RUNWAY 01R NR3, JAPAN AIR 502.</b>
10:21:48	JAL2503	CHITOSE TOWER, JAPAN AIR 2503, 16 DME.
10:21:52	TWR	JAPAN AIR 2503, TWR, RUNWAY 01R CONTINUE APPROACH, WIND 320 AT 8 AND RVR TOUCH DOWN 800M.
10:22:02	JAL2503	JAPAN AIR 2503, CONTINUE APPROACH RUNWAY 01R.
10:23:41	<b>TWR</b>	<b>JAPAN AIR 502, EXPECT DEPARTURE AFTER ARRIVAL TRAFFIC, 11 MILES ON FINAL 01R.</b>
10:23:48	<b>JAL502</b>	<b>JAPAN AIR 502, ROGER.</b>
10:26:46	TWR	JAPAN AIR 2503, RUNWAY 01R CLEARED TO LAND, WIND 330 AT 9, AIRBUS 320 AIRBORNE AND RVR 1,400.
10:26:57 (omission)	JAL2503	JAPAN AIR 2503, CLEARED TO LAND RUNWAY 01R.
10:28:18	JAL513	CHITOSE TOWER, JAPAN AIR 513 ON FINAL RUNWAY 01R 18 DME.
10:28:25	TWR	JAPAN AIR 513, TOWER, RUNWAY 01R CONTINUE APPROACH, WIND 340 AT 9, RVR TOUCH DOWN 750M.
10:28:34	JAL513	JAPAN AIR 513, CONTINUE APPROACH RUNWAY 01R.
10:28:40	<b>TWR</b>	<b>JAPAN AIR 502, RUNWAY 01R LINE UP AND WAIT, AND RVR TOUCH DOWN 750M.</b>
10:28:48	<b>JAL502</b>	<b>RUNWAY 01R LINE UP AND WAIT, JAPAN AIR 502.</b>
10:29:18	TWR	JAPAN AIR 2503, TURN LEFT B2 END OF RUNWAY. CROSS RUNWAY 01L.

( omission )		
10:29:25	JAL2503	JAPAN AIR 2503, B2 CROSS RUNWAY 01L.
(omission)		
10:32:30	<b>TWR</b>	<b>JAPAN AIR 502, EXPECT IMMEDIATE TAKE-OFF, TRAFFIC LANDING ROLL AND INBOUND TRAFFIC 6 MILES.</b>
10:32:37	<b>JAL502</b>	<b>ROGER, JAPAN AIR 502.</b>
10:32:59	<b>TWR</b>	<b>JAPAN AIR 502, STOP IMMEDIATELY, JAPAN AIR 502, STOP IMMEDIATELY TRAFFIC LANDING ROLL.</b>
10:33:05	<b>JAL502</b>	<b>JAPAN AIR 502.</b>
10:33:12	TWR	JAPAN AIR 513, THIS TIME GO AROUND.
10:33:18	TWR	JAPAN AIR 513, I SAY AGAIN GO AROUND, Ah~ TRAFFIC LANDING ROLL AND DEPARTURE TRAFFIC ON THE RUNWAY.
10:33:24	JAL513	JAPAN AIR 513, GO AROUND, FOLLOW MISSED APPROACH PROCEDURE.
10:33:30	TWR	JAPAN AIR 513, THIS TIME TURN RIGHT HEADING 090, CLIMB AND MAINTAIN 4,000.
10:33:34	JAL513	JAPAN AIR 513, HEADING 090, 4,000.
10:33:42	TWR	JAPAN AIR 2503, THIS TIME CONTACT GROUND 1216.
10:33:46	JAL2503	JAPAN AIR 2503, GROUND 1216.
10:33:52	TWR	JAPAN AIR 513, THIS TIME CONTACT RADAR 120.1.
10:33:56	JAL513	JAPAN AIR 513, 120.1.
10:34:02	<b>TWR</b>	<b>JAPAN AIR 5~~ CORRECTION, JAPAN AIR 502, TAXI TO END OF RUNWAY B2.</b>
10:34:09	<b>JAL502</b>	<b>TAXI TO END OF RUNWAY B2, JAPAN AIR 502.</b>
(omission)		
10:36:11	<b>TWR</b>	<b>JAPAN AIR 502, CROSS RUNWAY 01L ON B2.</b>
10:36:16	<b>JAL502</b>	<b>CROSS RUNWAY 01L, JAPAN AIR 502. AND ENTERING B2, JAPAN AIR 502.</b>
(omission)		
10:36:46	<b>TWR</b>	<b>JAPAN AIR 502, CONTACT GROUND 121.6.</b>
10:36:50	<b>JAL502</b>	<b>121.6, JAPAN AIR 502.</b>
(omission)		



## “CLASSIFICATION OF THE SEVERITY OF RUNWAY INCURSIONS”

The classification of the severity of runway incursions based on the ICAO Doc 9870 AN/463 「Manual on the Prevention of Runway Incursions」 are as follows.

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 aircraft but with no immediate safety consequences.
E	Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.