

AI2019-5

**AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT**

**JAPAN AIR SELF-DEFENSE FORCE
52-8850 & 32-8818**

**RYUKYU AIR COMMUTER CO., LTD.
JA84RC**

July 25, 2019

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board (and with Annex 13 to the Convention on International Civil Aviation) is to prevent future accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

Nobuo Takeda
Chairman,
Japan Transport Safety Board

Note:

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

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

RUNWAY INCURSION JAPAN AIR SELF-DEFENSE FORCE AIRCRAFT F-15J, 52-8850 & 32-8818, ON RUNWAY 36 ENGAGED BY BOMBARDIER DHC-8-402, JA84RC AT NAHA AIRPORT AT AROUND 20:26 JST, JUNE 14, 2018

June 14, 2019

Adopted by the Japan Transport Safety Board

Chairman Nobuo Takeda
Member Toru Miyashita
Member Yoshiko Kakishima
Member Yuichi Marui
Member Yoshikazu Miyazawa
Member Miwa Nakanishi

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Serious Incident	<p>On Thursday, June 14, 2018, F-15J, registered 52-8850 and 32-8818, both operated by Japan Air Self-Defense Force (JASDF), made incursions on runway 36 at Naha Airport without obtaining ATC clearance when Bombardier DHC-8-402 operated by Ryukyu Air Commuter Co., Ltd., registered JA84RC, was on the final approach to the runway after obtaining landing clearance.</p>
1.2 Outline of the Serious Incident Investigation	<p>The occurrence covered by this serious incident report falls under the category of “Attempt of landing on a runway being used by other aircraft” as stipulated in Item 2, Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act (Ordinance of Ministry of Transport No. 56 of 1952), and is classified as a serious incident.</p> <p>On June 15, 2018, the Japan Transport Safety Board (JTSB), upon receipt of the information of the serious incident, designated an investigator-in-charge and three investigators to investigate the serious incident.</p> <p>The occurrence of the serious incident was notified to Canada, as the State of Design and Manufacture of the aircraft involved in the serious incident, however, Canada did not designate an accredited representative. Comments were invited from the parties relevant to the cause of the serious incident. Comments were invited from the Relevant State.</p>

2 FACTUAL INFORMATION

2.1 History of the Serious Incident

According to the statements of the Pilot in Command (PIC) (hereinafter referred to as “the Formation Leader”) of the F-15J, registered 52-8850 (hereinafter referred to as “the Lead Aircraft”), the PIC (hereinafter referred to as “the Wingman”) of the F-15J, registered 32-8818 (hereinafter referred to as “the No. 2 Aircraft”), and the PIC and the first officer of Bombardier DHC-8-402, registered JA84RC (hereinafter referred to as “the Aircraft A”), operated by Ryukyu Air Commuter Co., Ltd., the air traffic controller at aerodrome control position of Naha airport traffic control tower (hereinafter referred to as “the Naha Tower”) and the air traffic controller at ground control position of Naha airport traffic control tower (hereinafter referred to as “the Naha Ground”), the air traffic control (ATC) communication records, the radar track records and the runway occupation records, the history of the serious incident is summarized as follows.

On June 14, 2018 at around 7:30 Japan Standard Time (JST: UTC+9 hours, unless otherwise stated, all times are indicated in JST in this report on a 24-hour clock), the Formation Leader and the Wingman were on duty in the alert-standby room at Naha Air Base of JASDF to stand ready to scramble against intrusions into territorial airspace (hereinafter referred to as “the scramble-ready duty”). Both the Lead Aircraft and the No. 2 Aircraft were deployed at the scramble-ready hangar (hereinafter referred to as “the Alert Hangar”). The Formation Leader and the Wingman were carrying out their duties taking a rest as needed in accordance with the internal rules.

On the day of the serious incident, it was raining intermittently from the morning repeating instrument meteorological conditions (IMC) and visual meteorological conditions (VMC) at Naha airport with rain front accompanying low pressure in the vicinity of main island of Okinawa. Therefore, both the Lead Aircraft and the No. 2 Aircraft were scramble-ready equipped with three external tanks fully filled with fuel considering the possibility of being forced to return to an air base located far away.

On that day at around 20:20, a scramble alarm blared in the alert-standby room. The Formation Leader and the Wingman hopped into their aircraft and taxied out from the Alert Hangar to the apron after having confirmed that there existed no functional anomaly in mutual communications using the radio frequency for use among the formation aircraft (hereinafter referred to as “the UHF-2”).



Figure 1: Lead Aircraft

The Formation Leader presumed, through the visual recognition of the civil aircraft taking off and the light of the Aircraft A, which was visually measured about 10 nm from touchdown on the final approach course, that “*smooth take-off was feasible to conduct between those two aircraft*”.



Figure 2: No. 2 Aircraft

At around 20:23, the Formation Leader established radiocommunication with the Naha Ground on the frequency for ATC use (hereinafter referred to as “the UHF-1”). The Naha Ground instructed the formation aircraft to taxi to E7 taxiway, and simultaneously gave them the flight direction, the frequency to be contacted, and other post-take-off instructions. The Wingman confirmed the communications between the Naha Ground and the Formation Leader.

The Lead Aircraft commenced taxiing to E7 taxiway followed by the No. 2 Aircraft. The Formation Leader was perplexed by the taxiway centerline lights which were not installed along his taxi route from A7 to E7, because, in addition to the night time operation, this was his first time to taxi from the the Alert Hangar of the Naha Air Base. Besides, the Wingman could not timely adapted to the darkness immediately after getting out of the well-lighted Alert Hangar; therefore he was taxiing attentively confirming the position of the Lead Aircraft and the taxiway edge lights, which slightly delayed the move of the No. 2 Aircraft after the Lead Aircraft.

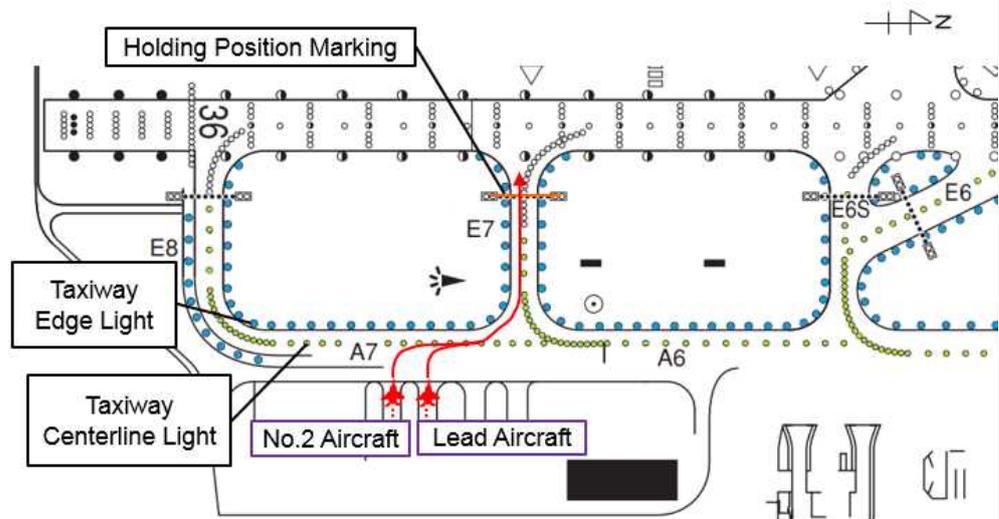


Figure 3: Taxi Route of Lead Aircraft and No. 2 Aircraft

The Formation Leader notified the Naha Tower of “READY FOR DEPARTURE” with the UHF-1 when it entered near the taxiway E7.

The Naha Tower decided to have the Aircraft A land first based on the judgement that it would be difficult to maintain the ATC separation if the scramble aircraft took off between the departing civil aircraft and the Aircraft A because the scramble aircraft would shortly catch up with the civil departure aircraft. Accordingly, the Naha Tower issued the instruction of “HOLD SHORT OF RUNWAY 36, TRAFFIC ON FINAL” to the scramble aircraft by using the frequencies of both UHF band and VHF one at the same time. The ATC communication records stored the read back of “HOLD SHORT, 36” by the Formation Leader; however, he stated that he did not concretely remember the communication but recognized that he received the clearance to enter runway for take-off from the Naha Tower.

After receipt of the read back from the Formation Leader to hold short of runway, the Naha Tower issued the landing clearance to the Aircraft A with VHF at 20:25:14.

The Formation Leader was in the middle of trying to find a way to hasten the No. 2 Aircraft, which was slightly delaying, in parallel with paying attention to the steering of the aircraft on wet taxiways, which became heavier due to three external tanks fully filled with fuel. The ATC communication records stored the Formation Leader’s message sent two seconds after the read back of “HOLD SHORT, 36” to the Wingman saying “Let’s hurry up a little”.

The Formation Leader recognized that the landing light of the Aircraft A he saw just before he had entered the runway was as close as 3 nm by eye measurement. The Lead Aircraft entered the runway around 20:26 without halting short of the holding position marking on the taxiway. The radiocommunication procedure for aircraft in formation (detailed in 2.7(6)) set up in the Naha Air Base stipulates that the lead aircraft shall enter a runway after confirming the read back of ATC instructions by the last aircraft; however, the Formation Leader was not aware that he had entered the runway without confirming the read back by the Wingman until he looked back the history of the serious incident on the next day of the occurrence. The Wingman wondered why the Lead Aircraft did not hold short of runway, but thought that he must have missed the “line up and wait” clearance from the controller; thereafter, he entered the runway following the Lead Aircraft.

	<p>By watching the move of anti-collision lights of the scramble aircraft, the Naha Tower became aware that they entered the runway without obtaining the clearance; accordingly, immediately thereafter he instructed both aircraft to vacate the runway, and simultaneously he cancelled the landing clearance given to the Aircraft A and instructed it to continue its approach as it was doing so.</p>  <p>Figure 4: Aircraft A</p> <p>The PIC and the first officer of the Aircraft A considered the possibility of go-around, but they did not feel the danger because they were flying as instructed by the controller as ever. On the other hand, the cancellation of the scramble order was notified to the Lead Aircraft and the No. 2 Aircraft from the alert-standby room around the time when both aircraft entered the runway.</p> <p>The Naha Tower confirmed that the Lead Aircraft and the No. 2 Aircraft vacated the runway and entered the taxiway E6S, and then, he re-issued landing clearance to the Aircraft A at 20:26:42. The Aircraft A landed on the runway at 20:27:21.</p> <p>This serious incident occurred on Runway 36 at Naha airport (26° 11' 06" N, 127° 38' 49" E) at around 20:26 on June 14, 2018.</p>
2.2 Damage to Persons	None
2.3 Damage to the Aircraft	None
2.4 Personnel Information	Both the Formation Leader and the Wingman held Pilot Competence Certificates and valid Aviation Medical Certificates issued by Ministry of Defense (MOD).
2.5 Aircraft Information	Both the Lead Aircraft and the No.2 Aircraft underwent aviation technical inspections and required maintenances by MOD.
2.6 Meteorological Information	<p>The aerodrome routine meteorological report at Naha airport around the time of the serious incident were as follows:</p> <p>20:00 Wind: 310° at 12kt, Visibility: 8,000m, Prevailing weather: Light rain shower, Cloud: 1/8 stratus 700ft, 4/8 cumulus 2,300ft, 6/8 altocumulus 7,000ft, Temperature: 25°C, Dew point: 24°C, Altimeter setting (QNH): 29.52inHg</p> <p>20:30 Wind: 010° at 16kt, Visibility: 8,000m, Prevailing weather: Vicinity shower, Cloud: 1/8 stratus 700ft, 3/8 cumulus 2,000ft, 5/8 cumulus 3,000ft, Temperature: 24°C, Dew point: 22°C, Altimeter setting (QNH): 29.54inHg</p>

2.7 Additional Information

(1) Position and Distance of Aircraft Concerned

Radar track records indicate that the position and distance of aircraft concerned at the time of occurrence of the runway incursion were as shown in Figure 5, and the distance between the Lead Aircraft and the Aircraft A was about 3.36 nm (about 6,230 m). The distance between the No. 2 Aircraft and the Aircraft A at the time when scramble aircraft vacated the runway was about 1.33 nm (about 2,450 m) as shown in Figure 6.

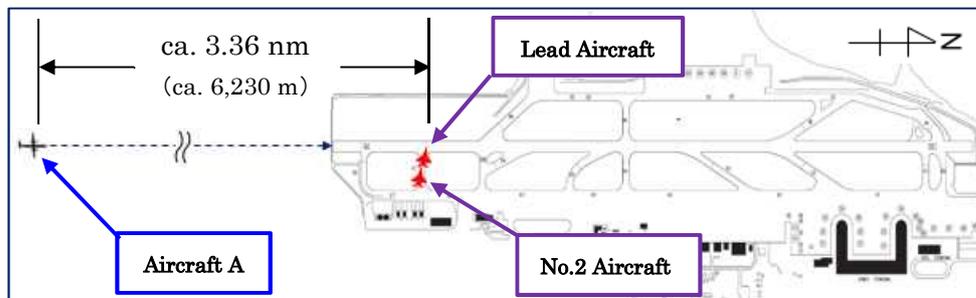


Figure 5: Position of Aircraft A when Lead Aircraft entered runway

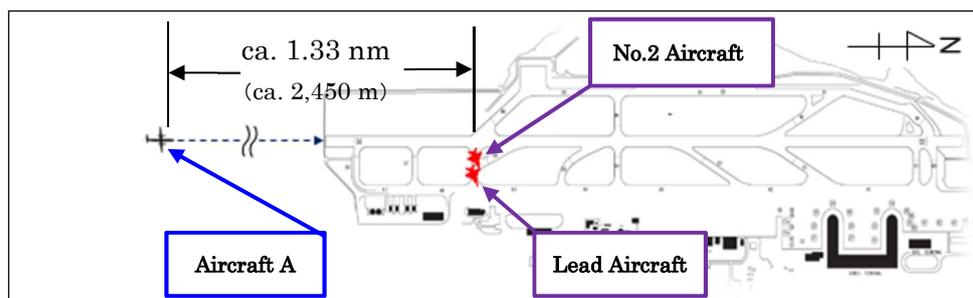


Figure 6: Position of Aircraft A when No. 2 Aircraft vacated runway

(2) Utilization Situation of Naha Airport

According to “The Report on the Status of the Airport 2017” made publicly available by Japan Civil Aviation Bureau, Naha airport is the fifth busiest airport in Japan in terms of the number of annual landings after Tokyo international airport, Narita international airport, Kansai international airport and Fukuoka airport; besides, it is the second busiest airport after Fukuoka operating with a sole runway.

On the other hand, according to the scramble implementation situation made publicly available by MOD, Southwestern Air Defense Force that departs from the Naha Air Base has the highest number of scrambles among the four Air Defense Forces in Japan during the last five years.

The Naha Air Base is established together with Naha airport and the sole runway is shared by civil aircraft (accounting for about 80% of the total annual landings and take-offs) and the Self-Defense Force aircraft (accounting for about 20%).

(3) Job Assignments to the Formation Leader and the Wingman

Both the Formation Leader and the Wingman were temporarily working at the Naha Air Base after having been transferred from an air base that has runways for an exclusive use by the Self-Defense Force. The Formation Leader has abundant experiences of duties at air bases that have runways for an exclusive use by the Self-Defense Force aircraft; and besides, the scramble-ready duty at the Naha Air Base was his first time to take and the second time for the Wingman.

After moving to the Naha Air Base, the opportunity of ground school and familiarization flight by the training staff was given to the Formation Leader and the Wingman, and on the day of the serious incident, the Formation Leader was on the scramble-ready duty at the Naha Air Base for the first time. Besides, it was the first time for the Formation Leader to get out of the Alert Hangar of the Naha Air Base at the time of the occurrence of the serious incident because the familiarization flight did not include the departure from the Alert Hangar. Meanwhile, the ground school included explanations on the feature of Naha airport, operational procedures on the ground such as the radiocommunication procedure for aircraft in formation, and previous cases such as serious incidents and violations of ATC instructions occurred at Naha airport.

(4) Operations of Scramble Aircraft

Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and MOD have established the ways to handle scramble aircraft and have agreed to accommodate it with respect to ATC instructions as far as the safety of other aircraft is not compromised. Besides, at the air base which has exclusive runways for the Self-Defense Force aircraft, where the Formation Leader and the Wingman originally belong to, the priority of scramble aircraft at landings and take-offs has been notified to each squadron. According to the statement of the Formation Leader, the said air base has an environment that scramble aircraft is prioritized to fly over other aircraft.

(5) Radiocommunication Procedures

In general, VHF band is used for ATC radiocommunications with civil aircraft, and UHF band for military aircraft including the Self-Defense Force aircraft, respectively. Air traffic controllers change VHF to UHF or vice versa depending on the type of aircraft; moreover, they use VHF and UHF simultaneously for efficient transmissions, if required.

On the other hand, in the formation flight, the leader normally communicates with air traffic controllers. JASDF F-15J type aircraft operates with setting two UHF band frequencies (UHF-1 and UHF-2) and a pilot uses either UHF-1 or UHF-2 by changing the switch. At the Naha Air Base, UHF-1 was used for communications with ATC and UHF-2 was used among formation aircraft or with Command Post.

	<p>(6) Preventive Measure for Runway Incursion</p> <p>The Naha Air Base implemented the following radiocommunication procedures to prevent runway incursions that could occur in the case of formation flight by fighters and so on.</p> <p><i>After the lead aircraft reads back the ATC instructions, which associate with entering a runway, the last aircraft shall read back or respond it verbatim through the squadron frequency. The lead aircraft shall enter a runway after confirming the read back by the last aircraft of ATC instructions, which associate with entering a runway. (omitted) The ATC instructions to be read back are as follows:</i></p> <p><i>(1) LINE UP & WAIT</i></p> <p><i>(2) CLEARED FOR TAKE OFF (in the case of lack of LINE UP & WAIT and being instructed directly)</i></p> <p><i>(3) CROSS RWY 36/18</i></p> <p><i>(4) TAKE ACTIVE RWY 36/18 (in the case of crossing runway due to a trouble or the like, or entering runway for some other reason)</i></p> <p><i>(omitted)</i></p> <p><i>The lead aircraft is not allowed to enter a runway unless the read back by the last aircraft of ATC instructions, which associate with entering a runway, is confirmed. (omitted)</i></p> <p>(7) Similar Case of Runway Incursion</p> <p>A similar runway incursion case occurred in spite of the read back of HOLD SHORT OF RUNWAY is reported as the serious incident “AI2015-6” by Bell 430, JA06NR, on September 10, 2013, at Kansai International Airport.</p>
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3 ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilots	Yes
3.3 Involvement of Equipment	None
3.4 Analysis of Findings	<p>(1) Situation of ATC Communications</p> <p>It is highly probable that the Naha Tower instructed the scramble aircraft to hold short of runway until the Aircraft A had landed based on the judgement that it would be difficult to maintain the ATC separation if the scramble aircraft took off between the departing civil aircraft and the Aircraft A, because the scramble aircraft would catch up with the civil departure aircraft. It is certain that the Formation Leader correctly read back the instruction to hold short of runway in words. It is highly probable that the Naha Tower and the Wingman judged that the instruction to hold</p>

short of runway was notified to the scramble aircraft without fail after hearing the Formation Leader's read back. On the other hand, it is probable that the Formation Leader recognized that he had received "the clearance to enter runway for take-off", not "the instruction to hold short of runway".

(2) Formation Leader in Taxiing

It is highly probable that the Formation Leader abundantly experienced at the air bases, which have exclusive runways for the Self-Defense Force aircraft, expected to take off prior to landing of the Aircraft A bearing the nature of scramble in mind, which is required to take off immediately. Besides, it is highly probable that the Formation Leader was concerned about a little delay of the No.2 Aircraft when he notified to the Naha Tower that he had been ready for departure, and at the same time he was paying attention to the steering of the aircraft that became heavier due to three external tanks fully filled with fuel, on wet taxiways of the unfamiliar airport at a rainy night. Moreover, since the Formation Leader sent his message to the No. 2 Aircraft saying "Let's hurry up a little" immediately after reading back "HOLD SHORT, 36" to the Naha Tower, it is highly probable that he was strongly conscious of hastening the departure even during the time of the read back. It is probable that the Formation Leader misinterpreted "the instruction to hold short of runway" as "the clearance to enter runway for take-off", which he had anticipated, because he was paying a great deal of attention to the taxiing of his aircraft and the No. 2 Aircraft under the pressure of performing his duty within a limited time. It is highly probable that, with respect to the runway incursion by the Lead Aircraft, the Formation Leader had not completely acquired the radiocommunication procedure implemented at the Naha Air Base, which required the lead aircraft to enter a runway after confirming the read back by the last aircraft.

(3) Wingman in Taxiing

It is highly probable that the Wingman recognized that he had been instructed to hold short of runway by listening to the communications between the Formation Leader and the air traffic controller. Besides, it is highly probable that the Wingman wondered if they had been given clearance to enter runway when he noticed that the Lead Aircraft had been about to enter the runway, while he was trying to recover the delay in lining up in formation concentrating on the steering of his aircraft deliberately and promptly in the midst of struggling to get adapted to the darkness outside. It is probable that the reason the Wingman did not prevent the Lead Aircraft from entering the runway was that he thought he had missed the ATC communication. Moreover, it is probable that the fact that the Wingman did not read back the ATC instruction was explained by the radiocommunication procedures implemented at the

Naha Air Base, which was stipulating that the No. 2 Aircraft (the last aircraft) was not required to read back “HOLD SHORT OF RUNWAY”.

(4) Naha Tower

Naha airport is the second busiest airport operating by a sole runway in Japan, and at the same time the highest number of JASDF scrambles are conducted at the airport; moreover, the sole runway is shared by civil aircraft and the Self-Defense Force one. Unlike air bases that have runways for an exclusive use by the Self-Defense Force aircraft, Naha airport is operated in accordance with adjustments and rules made as appropriate by MLIT and MOD, under the situation that civil aircraft accounts for about 80 % of total runway use. It is highly probable that the Naha Tower was providing ATC service to let the scramble aircraft depart promptly with securing ATC separation from other aircraft.

(5) Educational Training on Aerodrome Facilities and Operational Procedures at Naha Airport

At the time of the occurrence of this serious incident, the Formation Leader was perplexed by the taxiway centerline lights which were not installed along his taxi route. Besides, the Formation Leader entered the runway without confirming the read back of the ATC instruction by the Wingman that is obligatory in accordance with the radiocommunication procedure for aircraft in formation set up in the Naha Air Base. It is probable that the Formation Leader, who was on the scramble-ready duty for the first time at the Naha Air Base, was not familiarized with the environment of Naha airport such as lighting facilities, and so on.; moreover, he had not completely acquired the operations implemented at the Naha Air Base such as radiocommunications, and so on.

It is desirable that JASDF reviews, for verification, the educational trainings for the personnel transferred to the Naha Air Base from air bases, which have an exclusive runway for the Self-Defense Force, enriches the contents of the trainings as needed and promotes sharing of safety-related information such as serious incidents and minor incidents in the past.

(6) Severity Classification

It is highly probable that the distance between the Lead Aircraft and the Aircraft A was about 3.36 nm (about 6,230 m) when the former aircraft entered the runway. It is highly probable that the distance between the No. 2 Aircraft and the Aircraft A was about 1.33 nm (about 2,450 m) when the former aircraft vacated the runway.

According to ICAO “Manual on the Prevention of Runway Incursions” and the judgement tools provided by the said organization, it is certain that the severity classification of this serious incident is equal to severity C (An incident characterized by ample time and/or distance to avoid a collision). (see Attachment “Severity Classification of Runway Incursions”)

4 PROBABLE CAUSES

In this serious incident, it is highly probable that two scramble aircraft in formation misinterpreted the instruction of the air traffic controller; thus, they entered the runway where the Aircraft A was approaching for landing after obtaining landing clearance.

It is probable that the misinterpretation of the instruction of the air traffic controller by the scramble aircraft was contributed by the fact that the Formation Leader and the Wingman, who were temporarily working at the Naha Air Base, were paying a great deal of attention to their taxiing under time pressure, that they were not familiarized with the environment at Naha airport such as lighting facilities, and so on., and that they had not completely acquired the operations implemented at the Naha Air Base such as radiocommunications, and so on.

5 SAFETY ACTIONS

(1) In the wake of this serious incident, 9th Air Wing, Southwestern Air Defense Force has implemented the following safety actions:

- To ensure listening to and reading back of ATC instructions, clearances and approvals without fail.
- To conduct re-education relating to Human Factors.
- To put the radiocommunication procedures in thorough practice and to add reading back of “HOLD SHORT OF RUNWAY” that was not previously stipulated.
- To introduce on-site trainings in the vicinity of the Alert Hangar at night, and to strengthen the educational training associated with ground operations.
- To raise safety awareness through repetitive learning of similar cases and strengthening educations to the newly transferred personnel, which consisting of i) education of previous cases relating to violations of ATC instructions, ii) education of various cases of errors prone to be made taking the characteristics of Naha airport into consideration and iii) education from the aspect of Human Factors.

(2) In addition to (1) above, JASDF notified properly to all the squadrons of the outline of this serious incident and each squadron has conducted safety-related education utilizing the notified materials.

Severity Classification of Runway Incursions

Severity classification described in ICAO “Manual on the Prevention of Runway Incursions” (Doc 9870) is as follows.

Table 6-1 Severity classification scheme

<i>Severity classification</i>	<i>Description**1</i>
<i>A</i>	<i>A serious incident in which a collision is narrowly avoided.</i>
<i>B</i>	<i>An incident in which separation decreases and there is significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.</i>
<i>C**2</i>	<i>An incident characterized by ample time and/or distance to avoid a collision.</i>
<i>D</i>	<i>An incident that meets the definition of runway incursion such as the incorrect presence of a single vehicle, person or aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.</i>
<i>E</i>	<i>Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.</i>

**1 Refer to the definition of “incident” of Annex 13.

**2 The row is shaded to show the applicable severity classification of this serious incident.