

AI2021-1

**AIRCRAFT SERIOUS INCIDENT  
INVESTIGATION REPORT**

**JAPAN AIR SELF-DEFENSE FORCE  
93-8550**

**J-AIR CORPORATION  
JA216J**

**January 21, 2021**

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.

TAKEDA Nobuo  
Chairperson  
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

### 1. JAPAN AIR SELF-DEFENSE FORCE

F-2A, 93-8550

### 2. J-AIR CORPORATION

EMBRAER ERJ 170-100STD, JA216J

ON THE FINAL APPROACH COURSE FOR RUNWAY 10 OF  
MISAWA AIRBASE

AT 12:47:16 JST, OCTOBER 3, 2019

December 4, 2020

Adopted by the Japan Transport Safety Board

Chairperson TAKEDA Nobuo

Member MIYASHITA Toru

Member KAKISHIMA Yoshiko

Member MARUI Yuichi

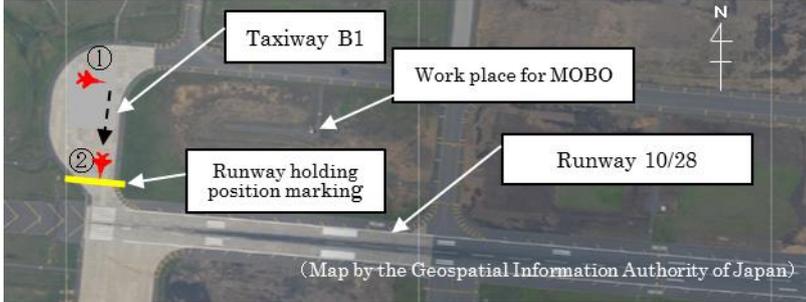
Member NAKANISHI Miwa

Member TSUDA Hiroka

## 1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Serious Incident	<p>On Thursday, October 3, 2019, a F-2A of Japan Air Self-Defense Force, registered 93-8550, made incursion into Runway 10 at Misawa Airbase without obtaining ATC clearance when Embraer ERJ 170-100STD operated by J-AIR Corporation, registered JA216J, 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 investigation report falls under the category of “Attempt of landing on a runway being used by other aircraft” as stipulated in Article 166-4, item (ii) of the Ordinance for Enforcement of the Civil Aeronautics Act (Ordinance of Ministry of Transport No. 56 of 1952) prior to revision by the Ministerial Ordinance on Partial Revision of the Ordinance for Enforcement of Civil Aeronautics Act (Ordinance of Ministry of Land, Infrastructure, Transport and Tourism No. 88 of 2020) , and is classified as a serious incident.</p> <p>On October 3, 2019, the Japan Transport Safety Board (JTSB), upon receipt of the information of the serious incident, designated an investigator-in-charge and an investigator to investigate the serious incident.</p> <p>Although this serious incident was notified to the Federative Republic of Brazil, as the State of Design and Manufacture of the aircraft involved in the serious incident, the State did not designate its accredited representative.</p> <p>Comments on the draft final report were invited from parties relevant to the cause of the serious incident and the Relevant State.</p>

## 2. FACTUAL INFORMATION

<p>2.1 History of the Flight</p>	<p>According to the statements of the Pilot in Command (PIC) of the F-2A of Japan Air Self-Defense Force (JASDF), registered 93-8550 (hereinafter referred to as “Aircraft A”), the PIC and the First Officer (FO) of Embraer ERJ 170-100STD, registered JA216J (hereinafter referred to as “Aircraft B”), operated by J-AIR Corporation, the air traffic controller at tower control position*1 of Misawa Airbase traffic control tower (hereinafter referred to as “Misawa Tower”), the air traffic controller at ground controlled approach position*2 of Misawa Terminal Radar Control (hereinafter referred to as “Final Controller”), the pilot who was working beside the runway to support training management (hereinafter referred to as “MOBO”) belonging to the Third Tactical Fighter Squadron (hereinafter referred to as “the 3rd TFS”) of JASDF and other pilots of the F-2 formation (three aircraft in total) which were going to take off following Aircraft A, the air traffic control (ATC) communication records, the radar track records and the VTR records, the history of the serious incident is summarized as follows.</p> <p>On October 3, 2019 at around 12:33 Japan Standard Time (JST: UTC+9 hours, unless otherwise stated, all times are indicated in JST in this report on a 24-hour clock), Aircraft A started moving from the apron to Runway 10 at Misawa Airbase in order to make instrument flight and navigation training (herein referred to as “the Training”) by solo flight.</p> <p>Around 12:40, Aircraft A switched the radio frequency to the UHF band (315.8 MHz) for Misawa Tower, halted on taxiway B1 (the position shown in Figure 1 ①) before the runway, for take-off preparation.</p>  <p>Figure 1: Moving route of Aircraft A</p> <p>Around 12:43, though the PIC of Aircraft A reported the completion of departure preparation to Misawa Tower for expecting take-off clearance just after arrival of the two F-15 formation aircraft that were entering the traffic pattern to land, he was instructed by Misawa Tower to hold short of</p>
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\*1 The main service of the “Tower control position” is to provide aircraft flying within the aerodrome control zone (within a radius of 5 nm from the center of the aerodrome) with control service such as issuing take-off clearance to the departure aircraft and landing clearance to the arrival aircraft, and others.

\*2 The main service of the “Ground controlled approach position” is vectoring of final or traffic pattern (vectoring the course for up/down, left/right) at the Ground Controlled Approach (a method to guide aircraft in its final approach step by ground radar vectoring). In this serious incident, using radar, the controller at this position was monitoring Aircraft B that was making an ILS approach on the final approach.

the runway 10. At this time, trying not to interrupt the ATC communications related to the landing of the F-15 formation aircraft, the PIC of Aircraft A was intending to report the completion of pre-flight procedures\*<sup>3</sup> for MOBO as was ruled in the 3rd TFS after receiving the next ATC instruction.

The PIC of Aircraft A moved his aircraft closer to the runway holding position marking\*<sup>4</sup> (shown in Figure 1 ②) before the runway and stopped the aircraft in accordance with the holding instruction from Misawa Tower. At this point, it became obvious that the take-off of Aircraft A would be behind scheduled time (12:45) and therefore the training plan should be revised.

At 12:44:04, Misawa Tower instructed the F-15 formation approaching toward Runway 10 to promptly vacate the runway if possible, because there were next inbound and departure aircraft by saying “After Landing, if able, expedite vacating runway due to next inbound and departure.” Although the PIC of Aircraft A heard this instruction, he paid no attention to listen the last half of the instruction about the information on the arrival and departure aircraft.

As there were no communications on the UHF frequency (315.8 MHz) during the time between 12:44:11 and 12:47:06, the PIC of Aircraft A made a change in the training plan for the delay after checking no radio equipment trouble.

On the other hand, as shown in Figure 2\*<sup>5</sup>, around 12:44, after Aircraft B got a clearance for ILS approach to Runway 10 from Misawa Terminal Radar (121.15 MHz), the control of Aircraft B was transferred to Final Controller at the same frequency in order to continue radar monitoring.

At 12:46:58, Misawa Tower issued a landing clearance to Aircraft B on the final approach via Final Controller; however, this landing clearance was transmitted via different frequency (121.15 MHz) from the one (315.8 MHz) to which the PIC of Aircraft A was listening. Therefore, the PIC of Aircraft A had no information about the existence of Aircraft B that was cleared for landing.

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<sup>3</sup> “Reporting the results of pre-flight procedures” refers to the reporting to mutually confirm with other aircraft’s pilots the results of confirming the lock status of wind shield and the connection status of equipment before take-off.

\*<sup>4</sup> “Runway holding position marking” refers to a position where aircraft should make a temporary stop before entering a runway according to the ATC instruction.

\*<sup>5</sup> The “Hotline” in Figure 2 refers to a direct telephone line connecting Misawa Tower controller and Final Controller to talk over the information such as ATC clearances etc.

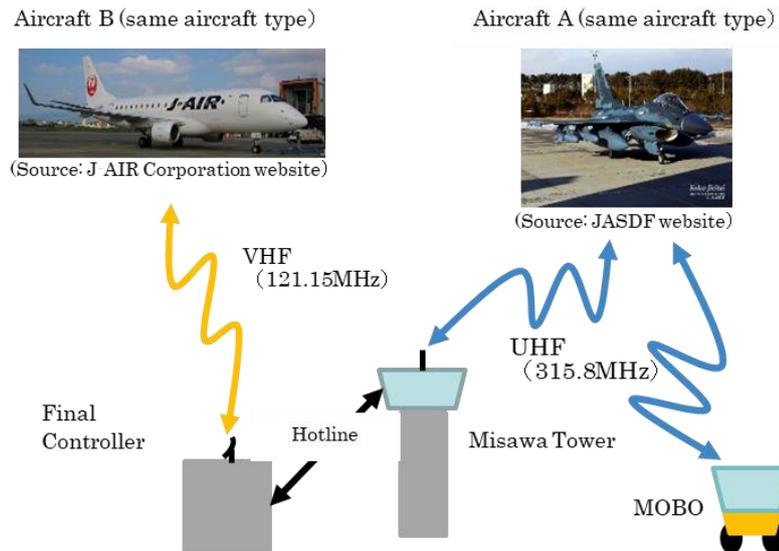


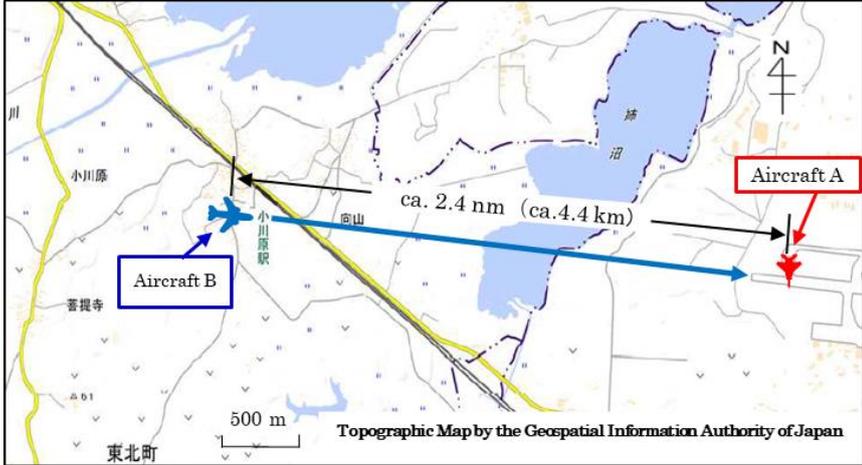
Figure 2: Circumstances of communications among Aircraft A, Aircraft B and air traffic facilities

At 12:47:06, Misawa Tower gave a departure delay information to Aircraft A holding short of Runway 10 by saying “Expect departure after arrival of E-170 3 miles on final, full stop.” Upon receiving this information, the PIC of Aircraft A misunderstood that he was instructed to quickly take off, increased power for starting toward the runway before hearing the whole ATC information from Misawa Tower until the end, and then, the PIC of Aircraft A did not visually check the final approach course on Runway 10. In response to this information from Misawa Tower, the PIC of Aircraft read back to inform that he acknowledged that Aircraft A should take off quickly by saying “Rodger, XX (call sign of Aircraft A) expedite take-off”, and without interrupting the transmission, successively reported the completion of pre-flight procedures to MOBO who was deployed beside the runway by using the UHF tower frequency.

Misawa Tower noticed the error of the read-back from the PIC of Aircraft A, immediately instructed him to hold short of the runway, and watched the behavior of Aircraft A. When this holding instruction was being transmitted, the PIC of Aircraft A was reporting to MOBO, therefore, he could not listen to this holding instruction. Visually confirming that Aircraft A did not stop, continued on going forward, and entered Runway 10, Misawa Tower judged that the PIC of Aircraft A must have not listened this instruction, and instructed Aircraft B, which was approaching around 2.4 nm (about 4.4 km) from the runway, to execute a go-around via Final Controller.

At 12:47:25 just before the Aircraft A to line up in the direction of take-off after entering the runway, the PIC of Aircraft A sent the message to Misawa Tower to confirm whether a take-off clearance was issued to Aircraft A. In response to the confirmation from the PIC of Aircraft A, Misawa Tower instructed the PIC of Aircraft A to hold right there again informing him that Aircraft A was not cleared for entering the runway.

After that, Aircraft A vacated the runway, suspended the training,

	<p>and returned to the apron. On the other hand, Aircraft B, which had been instructed to execute a go-around, landed at Misawa Airbase at around 13:01.</p> <p>This serious incident occurred on Runway 10 at Misawa Airbase (40°42' 16" N, 141°21' 03" E) at 12:47:16 on October 3, 2019.</p>
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	None
2.4 Personnel Information	The PIC of Aircraft A held Pilot Competence Certificates and valid Aviation Medical Certificates issued by Ministry of Defense (MOD).
2.5 Aircraft Information	The maintenance and inspections were performed on the Aircraft A as required by MOD.
2.6 Meteorological Information	<p>The regular aerodrome meteorological report at Misawa Airbase around the time of the serious incident was as follows:</p> <p>13:00 Wind direction 130°, Wind velocity 6 kt,  Directional fluctuation 110° to 170°, Prevailing visibility 15 km  Cloud: Amount 1/8; Type Altocumulus; Cloud base 10,000 ft  Amount 2/8; Type Altocumulus; Cloud base 15,000 ft  Amount 6/8; Type Altocumulus; Cloud base 18,000 ft  Amount 7/8; Type Cirrus; Cloud base 23,000 ft  Temperature 23°C, Dew point 18°C  Altimeter setting (QNH) 1013 hPa</p>
2.7 Additional Information	<p>(1) Position and distance of aircraft concerned</p> <p>According to Records of Aircraft B's Flight Data Recorder, the position of Aircraft B at the time of occurrence of the runway incursion by Aircraft A is shown in Figure 3, and the distance between Aircraft A and Aircraft B was approximately 2.4 nm (about 4.4 km).</p>  <p>Figure 3: The position of Aircraft B when Aircraft A enter the runway (Blue arrow indicates the flight route of Aircraft B after the occurrence of the serious incident)</p> <p>(2) Aerodrome control at Misawa Airbase</p> <p>The control operations for the aerodrome and approach control area</p>

at Misawa Airbase are provided by Misawa ATC Squadron, JADSF. They mainly communicate via UHF with JASDF aircraft and US aircraft, and communicate via VHF with civil aircraft, however, they do not transmit on VHF and UHF frequency at the same time.

Besides, in this serious incident, Aircraft B communicated with Final Controller and received a landing clearance from Misawa Tower via Final Controller (see Figure 2). At Misawa Airbase, controllers routinely perform this kind of control operations for those aircraft making an ILS approach in order to reduce the workload of tower controllers.

(3) Reporting the completion of pre-flight procedures

In order to ensure safety confirmation, the 3rd TFS makes it a rule to report that the pilots confirm the check items directly related to flight safety, such as confirmation of the windshield lock and equipment connection status before take-off, and report the confirmed results one another within the formation. When a training is conducted by only one aircraft, it shall be reported to MOBO.

Besides, MOBO uses UHF radio that is able to transmit and receive communications at Misawa Tower frequency.

(4) Notification from ATC to departure aircraft

The ATC Standard Procedure\*<sup>6</sup> stipulates that traffic information shall be provided to the aircraft holding short of the runway, if required. In addition, in the case where a delay is expected for departure, the information on the expected time of departure shall be notified, if necessary.

(5) Radio communications at Misawa Tower just before the serious incident

According to the VTR records, the ATC communication records, and the statements of relevant persons, the radio communications at Misawa Tower just before the serious incident are as follows.

12:44:04 Misawa Tower instructed the two F-15 formation aircraft on the final approach to promptly vacate the runway, if possible.

12:44:10 The leader of the F-15 formation responded to the instruction.

(After this, there had been no communications via UHF until the delay departure information was notified to Aircraft A.)

Around 12:44:40 The leader of the F-15 formation landed.

Around 12:45:20 The second of the F-15 formation landed.

Around 12:46 The second of the F-15 formation vacated the runway.

12:46:56 Misawa Tower told Final Controller to issue a landing clearance to Aircraft B through the hotline.

12:46:58 Final Controller issued the landing clearance to Aircraft B over the radio.

\*<sup>6</sup> "ATC Standard Procedure" of the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism refers to the standards and other items to be conformed when the air traffic controllers or air traffic management officers carry out operations relating to the air traffic control service.

	12:47:06	Misawa Tower notified Aircraft A of the delay departure information.
	12:47:16	Aircraft A entered Runway 10 (the serious incident occurred).
	12:47:16	Misawa Tower transmitted the holding instruction.
	(6) Implementation status of safety actions against runway incursions	
	① The 3rd Air Wing, JASDF	
	Regarding the runway incursion by F-15 aircraft that occurred at Naha Airport on June 14, 2018, the overview, causes, implemented safety actions, etc. were thoroughly made known to all pilots.	
	② Japan Civil Aviation Bureau of the Ministry of Land, Infrastructures, Transport and Tourism (CAB, MLIT)	
	In response to the runway incursions that consecutively occurred from September to November in 2007*7, “Runway Incursion Prevention Measures and Examination Conference” was held (from December 18, 2007 to March 28, 2008) in order to discuss the issue on ATC miscommunications between controllers and pilots. As a result of this discussion, the CAB, MLIT analyzed the ATC communications in the runway incursions that occurred from September in 2007 to July in 2009, brought out (in March 2011) the “ATC Communication Handbook” that summarizes safety actions and others that were obtained based on the results of the analysis, and created safety actions to implement thoroughly.	
	In this Handbook, the concept of “Communication Loop”* 8 is advocated, and it is shown that air traffic controllers should confirm the read-back from pilots (hereinafter referred to as “Hearing Back”) and pilots should confirm the response taken by the air traffic controllers after Hearing Back (such as the reconfirmation of read-back when the read-back was incorrect).	

### 3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilots	Yes
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	(1) The misunderstanding ATC information made by the PIC of Aircraft A Not knowing the reason why there were no ATC instructions to the

\*7 These runway incursions refer to the incident where without permission an aircraft crossed a runway at Osaka International Airport on September 6 in 2007, the one where a departure aircraft misheard the instruction from the air traffic and entered the runway at Kansai International Airport on October 20, 2007, and the other where an aircraft misinterpreted the instruction to hold short of runway and entered the runway at Chubu Centrair International Airport on November 11, 2007.

\*8 See Page 4 in the “ATC Communication Handbook.”

Aircraft A for about three minutes after he reported its completion of take-off preparation to Misawa Tower and was instructed to hold, the PIC of Aircraft A felt that something was wrong and started thinking how to revise the training plan, such as changes in the training content after take-off, because it was sure that his take-off time should be behind schedule, and it is probable that these factors might have psychological effects on the PIC of Aircraft A who could no longer have room in his mind.

In addition, it is probable that, not recognizing Aircraft B on final approach, the PIC of Aircraft A believed that Aircraft A would be able to take off after the F-15 formation aircraft landed and was expecting the next instruction from Misawa Tower would be Take-off or Hold at the starting position for take-off on the runway.

Therefore, the PIC of Aircraft A did not accurately hear the communication from Misawa Tower and mistook the meaning of the departure delay information that his departure was to be after the Aircraft B's landing as the take-off clearance to Aircraft A that he had been expecting.

(2) Timing of reporting the completion of pre-flight procedures

The PIC of Aircraft A notified Misawa Tower at the ready before reporting the completion of pre-flight procedures to be able to obtain the take-off clearance promptly. And then, as the PIC of Aircraft A was going to report the completion of pre-flight procedures after he received communication from Misawa Tower, it is highly probable that he reported the completion of pre-flight procedures immediately after reading back in response to the departure delay information from Misawa Tower.

(3) Importance of confirming the response after the Hearing Back from controller

In this serious incident, it is highly probable that the PIC of Aircraft A was moving his aircraft forward while receiving the departure delay information from Misawa Tower. Thus, it is also highly probable that the PIC of Aircraft A was not conscious about confirming the hearing back from the controller, in response to his read-back. As the basic manner to ensure safety, it is required for pilots to surely listen to the ATC communications right until the end, understand its content, and then start taking actions.

(4) Aircraft A's PIC's failure to listen to the corrective response from Misawa Tower (holding instruction)

It is highly probable that Misawa Tower noticed the error in the read-back from the PIC of Aircraft A, and immediately instructed him to hold short of the runway, however, as the PIC of Aircraft A was reporting the completion of pre-flight procedures to MOBO, he could not listen to the controller's corrective response (holding instruction) to his read-back.

(5) Aircraft A's PIC's failure to visually confirm the final approach course

In the situation immediately before the occurrence of the serious incident, it is highly probable that the PIC was in the situation where it would be possible to visually check the existence of Aircraft B.

It is probable that because the PIC of Aircraft A was preoccupied with

finishing to report the completion of pre-flight procedures as soon as possible and taking off promptly, he neglected visual check for the final approach course before entering the runway.

Upon entering the runway, it is quite important for pilots to visually confirm the situation on the runway and the approach course, which pilots are required to learn as basic actions so as to diligently conduct these actions.

(6) Classification of Severity

It is highly probable that the distance between Aircraft A and B, when Aircraft A entered runway, was approximately 2.4 nm (4.4 km).

The serious incident comes under the severity classification of Category C (An incident characterized by ample time and/or distance to avoid a collision) of “the Manual on the Prevention of Runway Incursions” of ICAO with classification tools provided by ICAO. (See Attachment)

#### 4. PROBABLE CAUSES

In this serious incident, it is probable that Aircraft A made an incursion on the runway which Aircraft B with landing clearance was approaching on the final course, because the PIC of Aircraft A who was waiting on the taxiway in front of the runway misunderstood the departure delay information provided by the air traffic controller as the take-off clearance, failed to listen to the controller’s corrective response by reporting the completion of pre-flight procedures immediately after making incorrect read-back, and failed to visually confirm the final approach course.

#### 5. SAFETY ACTIONS

(1) Upon occurrence of the serious incident, the 3rd Wing of JASDF took the following major safety actions.

- ① Ensured to listen to ATC instructions and clearance, etc.
- ② Ensured to perform basic procedures and actions.
- ③ Revised the reporting procedures in the case of solo flight.
- ④ Ensured to establish the mutual supplementary system.
- ⑤ Reconfirmed the status in which deviations from ATC communications are likely to occur

(2) JASDF notified all the Flight Squadrons of safety information concerning the serious incident, and each Flight Squadron provided safety training according to this information.

## Severity Classifications of Runway Incursions

Severity classifications described in ICAO “the Manual on the Prevention of Runway Incursions” (Doc 9870) are as described in the table below.

*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 See the definition of “incident” of Annex 13.

\*\*2 Shaded to show the pertinent classification of the serious incident.