

AI2016-1

**AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT**

NAKANIHON AIR SERVICE CO., LTD.

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DIAMOND AIR SERVICE, INC.

J A 3 0 D A

January 28, 2016

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

Norihiro Goto
Chairman,
Japan Transport Safety Board

Note:

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

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

- 1. NAKANIHON AIR SERVICE CO., LTD., BELL 206B
(ROTORCRAFT), JA9745**
- 2. DIAMOND AIR SERVICE, INC. MITSUBUSHI MU-300, JA30DA
AIRCRAFT PROXIMITY
OVER NAGOYA CITY AICHI PREFECTURE
JAPAN AT AROUND 11:22 JST, OCTOBER 10, 2012**

January 8, 2016

Adopted by the Japan Transport Safety Board

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

SYNOPSIS

< Summary of the Accident >

A serious incident investigation was conducted in response to the submission of a Near Collision report on October 10, 2012 in accordance with the provisions of Article 76-2 of the Civil Aeronautics Law, and Article 166-5 of the Ordinance for Enforcement of the Civil Aeronautics Regulation by the Pilot-in-command of BELL 206B, registered JA9745, owned by the Nakanihon Air Service Co., Ltd., to the Minister of Land, Infrastructure, Transport and Tourism.

JA9745 took off the Nagoya Airfield at 10:13 on October 10, 2012 and was flying west-southwest at an altitude 2,000 ft under VFR bound for the civil training/testing area CK1-3 setup east side over the Suzuka Mountains.

Meanwhile, Mitsubishi MU-300, registered JA30DA, owned by the Diamond Air Service, Inc., took off from the Nagoya Airfield at 09:39 and was flying at an altitude 2,000 ft under VFR on its way back to the Nagoya Airfield on completing the training in the JASDF training/testing area K setup over the ocean south of Atsumi Peninsula.

JA30DA was instructed by an air traffic controller in the Nagoya airdrome control tower to hold over Mamba Bridge 7.3 nm southwest of the airfield at about 11:22, then counter-clockwise turning above the Bridge, approached from the left rear JA9745 and overtook it on the left side.

There were three persons on board JA9745, consisting of a Pilot-in-command and two trainees, and seven persons on board JA30DA, consisting of a Pilot-in-command, First officer and five other crewmembers. There were no injuries to any of those on board either aircraft, and neither aircraft sustained damage.

< Probable Causes >

It is highly probable that even though information on the azimuth and flight altitude of JA9745 was provided, JA30DA could not recognize it and continued the flight; accordingly, both aircraft approached into close proximity.

The abbreviations used in this report are as follows.

CVR:	Cockpit Voice Recorder
FDR:	Flight Data Recorder
ICAO:	International Civil Aviation Organization
IFR:	Instrument Flight Rules
JASDF:	Japan Air Self-Defence Force
PCA:	Positive Control Area
TCA:	Terminal Control Area
TAS:	Traffic Advisory System
TCAS:	Traffic Alert and Collision Avoidance System
VFR:	Visual Flight Rules
VMC:	Visual Meteorological Condition
VORTAC:	VHF Omni-directional Radio Range and Tactical Air Navigation

Unit conversion

1 ft:	0.3048 m	
1 kt:	1.852 km/h (0.5144 m/s)	
1 nm:	1,852 m	
1 atm:	29.92 inHg	:1,013.25 hPa

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Serious Incident

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There were three persons on board JA9745, consisting of a Pilot-in-command and two trainees, and seven persons on board JA30DA, consisting of a Pilot-in-command, First officer and five other crewmembers. There were no injuries to any of those on board either aircraft, and neither aircraft sustained damage.

*1 "VFR" are defined as any flight not predicated on the instrument flight rules. While operating in VFR, a pilot is responsible for the clearance from the terrain and obstacles in addition to the separation from other aircraft and clouds at all time.



JA9745 (Bell 206B)
Over-all length 11.92 m Width 2.07 m
Height 3.26 m
Main/tail rotor diameters 10.15 m/1.65 m



JA30DA (Mitsubishi MU-300)
Over-all length 14.75 m Wing span 13.29 m
Height 4.24 m

1.2 Outline of the Serious Incident Investigation

1.2.1 Investigation Organization

On October 11, 2012, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and another investigator to investigate this serious incident.

1.2.2 Representatives of the Relevant State

An accredited representative of the United States of America, as the state of Designed and Manufactured of the aircraft, involved in this serious incident participated in the investigation.

1.2.3 Implementation of the Investigation

October 11 and 12, 2012	Interviews and aircraft examination
April 16 and 17, 2013	Interviews and aircraft examination

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

Comments were invited from parties relevant to the cause of the Serious Incident.

1.2.5 Comments from the Relevant State

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

2 FACTUAL INFORMATION

2.1 History of the Flight

2.1.1 Summary of the Near Collision report

The following is an outline of the Near Collision report submitted by the pilot-in-command (hereinafter referred to as "PIC") of Bell 206B JA9745 owned by the Nakanihon Air Service Co., Ltd. (hereinafter referred to as "Aircraft A").

Nationality, Registration and Type: JA9745, B06 (Bell 206B)

Call sign: JA9745

Flight Plan: VFR Departure from Nagoya Airfield

Route: Kuwana, CK1-3

First arrival location: Nagoya Airfield

Date and time of occurrence: October 10, 2012, 11:22

Location of occurrence: 8.5 nm south west of Nagoya VORTAC

Phase of flight: During level flight, Altitude 2,000 ft, Magnetic heading 240°

Weather Conditions: Visual Meteorological Conditions (VMC), Flight Visibility 15 nm

Cloud proximity: Below cloud

Position of the sun when witnessing other aircraft: Backlight

Air traffic control authority in communication and frequency upon the incident occurrence:

Centrair TCA, Chubu Terminal Radar Control Facility, Chubu Centrair International Airport
frequency: 119.25 MHz

Description of other aircraft:

Nationality, Registration, Type and Call Sign: Unknown

Aircraft Color: White

Type of Aircraft: Fixed wing aircraft

Type of Propulsion device: Jet

Number of Propulsion devices: Twin engine

Position of other aircraft and distance to the aircraft at first sighting:

The left and the direction of 9 o'clock horizontal distance less than 0.1 nm Downward,
altitude difference 50ft

Position of other aircraft and distance between aircraft at closest proximity:

The left and the direction of 9 o'clock horizontal distance less than 0.1 nm Downward,
altitude difference 50ft

Proximity situation: Overtaking

Transponder: Installed (in use)

Altimeter setting (QNH): 29.98 inHg

Avoidance maneuver:

Aircraft making report: None

Other aircraft: None

The PIC of Mitsubishi MU-300 JA30DA owned by the Diamond Air Service, Inc. (hereinafter referred to as “Aircraft B”) did not submit a Near Collision report.

2.1.2 History of The Flight based on Radar Tracking Records and ATC Communications Records

History of the flight both Aircraft A and Aircraft B (hereinafter referred to as “Both Aircraft”) before and after the incident occurred is as follows: (See Figure 1 – Estimated Flight Routes.)

- | | |
|----------|--|
| 09:39 | Aircraft B took off from Nagoya Airfield and headed toward the training/testing area K (hereinafter referred to as “Area K”) over the ocean south of Atsumi Peninsula. |
| 10:13 | Aircraft A took off from Nagoya Airfield and conducted simulated instrument approaches twice. |
| 11:06:35 | On completing the training at Area K, Aircraft B requested a TCA advisory service (See 2.10.3 (1)) from the Centrair sector of the Centrair TCA in the Chubu Terminal Radar Control Facility in Chubu Centrair International Airport (hereinafter referred to as “Chubu TCA”) for return to Nagoya Airfield. Thereafter, radar identification was made for providing the TCA advisory service, and then the Aircraft B was provided with it. |
| 11:14:46 | Aircraft B was instructed by the Chubu TCA to communicate with the Nagoya sector of the Centrair TCA in the Chubu Terminal Radar Control Facility in the Chubu Centrair International Airport (hereinafter referred to as “Nagoya TCA”) and she read back it. |
| 11:14:47 | Aircraft A the clearance for takeoff got from the airdrome control tower of the Nagoya Airfield (hereinafter referred to as “Tower”) and she read back it. |
| 11:15 | Aircraft A took off from Nagoya Airfield and headed toward the |

civil training/testing area CK1-3 (hereinafter referred to as “CK1-3”) in charge of Chubu TCA.

11:15:21 Aircraft B reported maintain an altitude 3,500 ft to Nagoya TCA.

11:16:45 Aircraft B reported descend to 2,000 ft to Nagoya TCA.

11:20:04 Aircraft A reported an exiting the Nagoya control zone (see 2.10.3 (1)) to Tower and it approved she to change the frequency.

11:20:19 Aircraft A reported proceed to CK1-3 and requested the TCA advisory service to Chubu TCA.

11:20:22 Aircraft B was provided by Nagoya TCA the radar traffic information (see 2.10.3 (2)) of the traffic at an altitude of 2,100 ft and 7 nm north of her and responded that it was looking for the traffic.

11:20:58 Aircraft B reported Nagoya TCA that it is approaching Mamba Bridge.

11:21:03 Aircraft B was provided and warned the radar traffic information of the traffic at the 4 nm north and at an altitude of 2,000 ft from Nagoya TCA at finishing the TCA advisory service, and received the instruction to changing the radar identification code to the VFR code and communicating with the Tower, and read back it.

11:21:24 Aircraft B reported the Tower that it was approaching Mamba Bridge.

11:21:37 Aircraft B was instructed by the Tower to hold over Mamba Bridge for the flyby (a low-level pass for an exhibition flight) mission and read back it.

11:21:40 Aircraft A was notified by the Chubu TCA that it was radar identified 7 nm southwest of the Nagoya Airfield at altitude 2,100 ft.

11:21:49 Aircraft B received and warned from the Tower the traffic information (see 2.10.3 (2)) of the aircraft at an altitude of 2,000 ft and 2 nm north of her, and responded that it is negative contact.

About 11:21:50 Aircraft B started counter-clockwise turning over Mamba

Bridge.

11:22:21 During the turning, Aircraft B approached approximate 390 m left of Aircraft A and overtook her. Both Aircraft did not perform the avoidance operation.

2.1.3 Statements of Both Aircraft Flight crewmembers about the History of the Flight

The history of the flight on statement of Both Aircraft flight crewmembers are as follows:

(1) PIC of Aircraft A

Aircraft A took off with the PIC seated on the left and the pilot Trainee A (hereinafter referred to as “Trainee A”) on the right for flying. As a single-engine turbine aircraft, Aircraft A made a flight along Shinkawa and Shonaigawa for preparation of emergency landing area toward CK1-3. After exiting the Nagoya control zone from the west side, the aircraft communicated with the Chubu TCA requesting the TCA advisory service and it was radar identified at 8 nm southwest of the Nagoya Airfield.

The PIC paid attention to Trainee A on the right seat, while the trainee said “It’s close” pointing his finger and when the PIC turned his head around that direction, something came into his sight in the direction at 9 o’clock. The PIC recognized that it is another aircraft when it flew past into the forward direction. The other aircraft overtook Aircraft A in parallel and turned left and went southward in the direction of the Port of Nagoya. The PIC could see slightly the undersurface and the engine in the rear side of the other aircraft; therefore he thought it to be a twin engine jet.

The PIC felt the distance with the other aircraft was a little less than 200 m and slightly below than the horizontal line; accordingly, he thought it was about 50 ft lower than Aircraft A.

The PIC knew that operating control section of his company had the information made available by a person in charge of JASDF that there was information on the day’s flyby rehearsal schedule and he also knew that there could be a restriction to the entry into the Nagoya control zone during the time of flyby rehearsal.

(2) Trainee A of Aircraft A

The trainee A seated on the right, and then he made Aircraft A take-off. The Trainee A thought that flow southwest and leave the Nagoya control zone, and then

he request the radar vectoring for simulated instrument approach; however, he heard the communication from the Tower notifying the other aircraft that they shall be held for about ten minutes out of the Nagoya control zone because the flyby mission would start. Accordingly, he abandoned the simulated instrument approach and decided to proceed to CK1-3.

Climbing up to 2,000 ft along the river, and then after leaving the Nagoya control zone, he made contact with the Chubu TCA. Operation and ATC communication had been done by the Trainee A.

After being radar identified, when the Trainee A viewed transverse to try look around the route to CK1-3, he noticed that something suddenly emerged from the left rear. When it proceeds on the side toward the front left, he could witness the low-wing aircraft turned south and flew away. About ten seconds passed since the first recognition until no longer visible.

The horizontal distance between other aircraft and the Aircraft A was 100–150 m. The horizontal line was not so clear; therefore, it could not be a reference for the altitude; however, the Trainee A could see the undersurface of the other aircraft and he felt other aircraft was no less than 100 ft higher than the Aircraft A. The distance between the aircraft was close, but he did not feel the danger of collision.

Aircraft A was flying along the river at the time of close encounter and later changed the route along the Higashi Meihan Expressway to enter under the positive control area of the Chubu Centrair International Airport (hereinafter referred to as “Chubu PCA*2).

The PIC requested Chubu TCA to check whether the approaching aircraft was displayed on radar.

Since another aircraft had approached at a height of 2,000 ft and the flight ranges of 2,000 ft and 1,500 ft are most commonly used altitude band for many VFR aircraft, the Trainee A proceed to CK-13 at 1,800 ft bay 200 ft descent.

(3) PIC of Aircraft B

The PIC was seated on the left side as a pilot mainly in charge of flying and the first officer (hereinafter referred to as “FO”) on the right as a mainly in charge of monitoring. ATC communications was made by the FO.

*2 “PCA” is one of airspace under special control in which all aircraft are prohibited from operating under VFR unless otherwise authorized of air traffic control authority.

On its way land back, the radar traffic information given by the TCA advisory to Aircraft B referred to the aircraft which flew northward at an altitude of 3,500 ft to the east of the Chubu Centrair International Airport and along the route of northwest in the direction at 2 o'clock to converge with a helicopter at 3,000 ft and later changed the route to the north. However, Aircraft B could not visually identify the aircraft. There was also information that an aircraft about 3 nm north of Aircraft B at a height of 2,000 ft before Mamba Bridge, but neither PIC nor FO could identify it.

Aircraft B already flew at 2,000 ft, approximately 190 kt before Mamba Bridge, but there was no direction from the Nagoya TCA for the communication with the Tower; therefore the PIC instructed the FO to have communication with the Nagoya TCA, and then with the Tower over Mamba Bridge. Aircraft B was instructed by the Tower to hold over Mamba Bridge due to the flyby mission. There was no further traffic information from the Tower until the hold was over. Aircraft B made three turnings over Mamba Bridge, but the PIC or the FO did not visually recognize another aircraft.

Generally, during the turning, a pilot is watching in the direction of turning. The PIC claimed that he looked in the direction of 45 degrees leftward from the heading when turnings left, looking 3 nm or 5 nm ahead in the direction of flight. On the other hand the FO in the right seat said that he watched in the direction of 80 degrees leftward from the heading.

The PIC also held that when turning leftward, he would oversee the leftward to check and when starting to turn, he would move the eye direction further leftward. Later he recalled that even the FO did not look up on the right side during this time.

(4) FO of Aircraft B

When the Nagoya Station building was in sight in the front, Aircraft B proceeded to Mamba Bridge with the Port of Nagoya seen on the left side and began to descend to 2,000 ft. When the FO reported the Nagoya TCA that it is approaching Mamba Bridge, the Nagoya TCA instructed FO to make contact with the Tower. Later, the FO made contact the Tower when the Aircraft B was immediately before the Mamba Bridge. Instructed by the Tower to hold over Mamba Bridge, Aircraft B started leftward turning at an altitude of 2,000 ft. The FO remembered that there was no traffic information from the Tower when holding at Mamba Bridge.

During the turn, the FO, while confirming Mamba Bridge on the left side, watched in the direction from 10 o'clock to 11 o'clock within 5 nm range from the heading. The right hand side was watched when the bank was slackened.

The FO, about one and a half years since his employment, has never experienced hold over Mamba Bridge.

2.1.4 Statements of Air Traffic Controllers about History of the Flight

The history of the flight on the statements of air traffic controllers whom communicated with Both Aircraft as follows;

(1) The Nagoya TCA

Aircraft B was going to move toward the north on the eastern edge of the Chubu control zone. There was a target of radar approaching as close as about 2.5 nm; accordingly, the radar traffic information was provided to Aircraft B two times, but there was no response that it was visually identified.

Later, there was another target of radar 7 nm ahead of Aircraft B, on the boundary on the west side of the Nagoya control zone at an altitude of 2,000 ft. At this time, Aircraft B was descending to 2,000 ft; accordingly, the Nagoya TCA provided her the radar traffic information as another aircraft. The air traffic controller did not know that the air traffic had departed from the Nagoya Airfield and she had already made contact with the Chubu TCA.

Afterward, Aircraft B reported us that she approached Mamba Bridge, then the Nagoya TCA provided her the radar traffic information of the previous traffic 4 nm in the north at 2,000 ft for attention, and transferred the communication to the Tower.

The controller knew that the flyby rehearsal would be held on that day, but did not know the entry into the Nagoya control zone would be restricted in connection with it.

(2) The Tower

Aircraft A took off for southwest.

After Aircraft A took off, The Tower cleared to perform the flyby mission to the related aircraft. On receiving the report from Aircraft A that it left the Nagoya control zone, the Tower cleared to perform the next mission (flight of trace out a figure-of-eight) to other related aircraft (JASDF aircraft).

Aircraft B made contact to The Tower for landing instruction to the Nagoya Airfield, the Tower instructed Aircraft B to hold over Mamba Bridge. Immediately

after that, a senior controller saying “this traffic is dangerous;” consequently the Tower provided the traffic information of an aircraft 2 nm of north at 2,000 ft to Aircraft B. Aircraft B replied that she was unable to visually identify it. When Aircraft B began to turn, this traffic information was provided.

When the controller later looked at the radar display, the target flew away from Aircraft B and he thought it to be safe.

At that time, the Tower never realized that the target which approached Aircraft B was Aircraft A.

The Tower could not visually identify Aircraft B holding at Mamba Bridge.

There was no report from Aircraft B that it had close proximity with another aircraft.

(3) The Chubu TCA

Aircraft A reported the Chubu TCA just outside the Nagoya control zone that it is proceeding to CK1-3. The altitude was 2,000 ft. When Aircraft A was radar identified, no aircraft target was seen ahead of Aircraft A.

Later, Aircraft A flying east of the PCA inquired of the Chubu TCA about the possibility of any aircraft being displayed flying at the same altitude. A radar unidentified aircraft target was displayed 3–4 nm south of Aircraft A at an altitude of 2,100 ft; therefore, the Chubu TCA informed Aircraft A that it is an aircraft not communicating with the Chubu TCA.

Since the airspace between the Chubu Centrair International Airport and the Nagoya Airfield is congested with aircraft flying under VFR, there are some cases where targets emerge abruptly and the controller thought that this time is also the case. (He did not realize that this is Aircraft B which had received TCA advisory from the Nagoya TCA until a few minutes ago).

2.2 Injuries to Persons

NO one was injured.

2.3 Damage to the Aircraft

There was no damage to Both Aircrafts.

2.4 Meteorological Information

2.4.1 General Weather Outlook

Observation data announced by Japan Meteorological Agency (JMA) (from JMA

website) at a date of this serious incident at 11:20 for Nagoya (35 degrees, 10.0 minutes north latitude, 136 degrees, 57.9 minutes east longitude) was as follows:

Wind direction/ Wind velocity; Southwest/ 2.6 m/s (Maximum momentary Southwest/ 4.6 m/s), Sunshine duration: 0 min.,

Temperature; 22.3°C, Humidity; 59%, Atmosphere (sea level); 1015.2 hPa

Observation data at 12:00 on the day was as follows.

Wind direction/ Wind velocity; West-northwest/ 2.7 m/s, Visibility; 15 km, Sunshine duration; 0.2 hours, Weather; Fine,

Cloud amount; 6, Temperature; 24.2°C, Humidity 56%,

Atmosphere (sea level); 1014.5 hPa

2.4.2 Aeronautical Weather Observation Data for Airfield

The aviation routine weather report (METAR) at 11:00 JST of the Nagoya Airfield, which is located approximately 15 km northeast the incident site is are as follows:

Wind direction/ Wind speed: 310°/ 4 kt (variation width 270°–350°),

Prevailing visibility; 20 km,

Cloud amount/height/form; 1/8–2/8 / 3,000 ft / Cumulus

3/8–4/8 / 5,000 ft / Stratocumulus

5/8–7/8 / 7,000 ft / Altocumulus

Temperature; 22°C, Dew point; 15°C, Atmosphere; 1014 hPa,

Altimeter setting (QNH); 29.96 inHg

2.4.3 Observation by Flight Crewmembers, and others

Aircraft A PIC stated as follows;

It was on the verge of being able to see the Chubu Centrair International Airport just outside the Nagoya control zone and the visibility range was as much as 15 nm. The cloud ceiling over the Nagoya control zone was approximately 2,500 ft.

Aircraft A Trainee A stated as follows;

The horizon was not so clear on that day and the visibility was a bit bad and there was no cloud layer below 2,000 ft.

Aircraft B PIC stated as follows;

Cloud was seen sporadically the base height of 3,000 ft over the Port of Nagoya; besides, flight around Mamba Bridge was at an altitude of 2,000 ft with no cloud in the periphery including the above area.

Aircraft B FO stated as follows;

Visibility range was not so clear enough to view the long distance away, but in fact, it was haze. There was a bit of gas when turning over Mamba Bridge and the visibility was about 8 nm. The cloud ceiling over Mamba Bridge was 3,000 ft or more.

Tower controller stated as follows;

The visibility at the western side of the airfield became worse at about 10:30 and it was hazy over the mountains; besides, the Nagoya station buildings 6 nm south-southwest looked misty.

2.5 Aeronautical Navigation Facilities

At the time of the serious incident, aircraft control radars and air traffic control communication systems for the navigation of Both Aircraft were both in normal operation.

2.6 Information on Communication

According to the statements of the flight crewmembers and the ATC communication records before and after the serious incident, Aircraft A communicated with the Tower first, and then with Chubu TCA, while Aircraft B with the Nagoya TCA first, and then with the Tower. With the close proximity, Aircraft A communicated with Chubu TCA and Aircraft B with the Tower.

2.7 Information on Flight Recorder

No flight recorder (FDR and CVR) was installed on Both Aircraft.

2.8 Information regarding the Serious Incident Site

2.8.1 Situation of the Serious Incident Site

Aircraft A visually recognized Aircraft B on the left side but did not perform an avoidance maneuver while Aircraft B did not visually identify Aircraft A and both aircraft approached each other closest at about 11:22 over the Nagoya city about 8 nm southwest of the Nagoya Airfield.

2.8.2 Airspace at Closest Proximity for Both Aircraft

As Attached Figure 1 shows, as to the airspace of the close proximity, TCA advisory service was conducted by the Nagoya TCA for the east side of the TCA boundary and by the Chubu TCA for the west side.

Moreover, the Nagoya control zone is specified in the vicinity and since the flyby was planned in JASDF Komaki Air Base Aviation Festival on October 14, four days after the

serious incident, low-altitude flying, trace out a figure-of-eight flying and formation flight and others by JASDF aircraft were to be held at around the time of the serious incident within the zone.

2.9 Information on Test and Research

2.9.1 Flight Analysis Based on the Aircraft Control Radar Records and others

Approaching situations of Both Aircraft are shown in Attached Figures 1,2 and 3, based on aircraft control radar records and ATC communication records. The flight routes for each aircraft for each figure has been color-coded with the other party of the communication.

2.9.2 ATC Communication Records Analysis

The ATC communication for Both Aircraft is shown in Annex 1 ATC Communication Records. The records are color-coded with the parties for exchanged communication. Before and after the occurrence of the serious incident, there was no time band where both aircraft communicated with the same controller.

2.10 Information on Organization and Management

2.10.1 Nagoya Airfield

With the opening of the Chubu Centrair International Airport on February 17, 2005, ownership of the Nagoya Airfield changed from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) to Aichi Prefecture for establishment and management. On the same day, the airdrome control services and grand controlled approach service were transferred from the MLIT (former Nagoya Airport Office) to the Ministry of Defense (Komaki ATC Squadron ,JASDF), and the terminal radar control service was transferred to the Chubu Centrair International Airport (Terminal radar control service, Chubu Airport Office, Osaka Regional Civil Aviation Bureau, MLIT).

The Nagoya Airfield runway is adjacent to the JASDF Komaki Air Base and it is shared by the civilian and JASDF aircraft. Head office of Nakanihon Air Service Co., Ltd. is in the Nagoya Airfield. Besides, Diamond Air Service, Inc. uses the facilities adjacent to the airfield.

2.10.2 Air Traffic Control Facilities in Nagoya Airfield

Airport surveillance radar is installed in the Nagoya Airfield used for grand controlled approach service and its display units are provided in the Nagoya airdrome control tower, accordingly, the Tower controllers are able to monitor the traffic around the airfield.

However, the airport surveillance radar system is independent with each other for Nagoya Airfield and Chubu Centrair International Airport; consequently, it is not provided with the functions which automatically share the necessary information for radar identification. Therefore, Aircraft B was radar identified by the Nagoya TCA until it was instructed for communication with the Tower at 11:21:24. Meanwhile, the target of Aircraft B was displayed with the radar display unit of the Tower, nevertheless it is not radar identified at the start of communication with the Tower.

2.10.3 Information Regarding the Air Control Operation

(1) TCA Advisory

Minister of Land, Infrastructure, Transport and Tourism designates the airspace over the airport or neighboring area as a control zone with a notification, provides the separation for IFR*³ aircraft and provides the traffic information appropriately for the VFR aircraft. The air traffic control zone related to the serious incident belongs to the Nagoya control zone, and the aircraft perform landing or take-off at the Nagoya Airfield or pass through the relevant control zone, it is necessary the Tower instruction (including clearance).

Moreover, in a busy airport congested with IFR departure and arrival aircraft, is published as the approach control area outside the control zone, and the separation is provided between an IFR aircraft and all other IFR aircraft, and the traffic information is provided to VFR aircraft to the extent practicable.

Furthermore, among the approach control area, the areas congested with VFR are published as the terminal control area (TCA) wherein TCA advisory service is provided for VFR aircraft. The following service is provided for radar identified VFR aircraft.

- (a) Radar traffic information
- (b) Vectoring on request basis
- (c) Providing of radar position
- (d) Advisory of approach sequence and holding (sequence into the control zone)

TCA related to this serious incident is Centrair TCA, Chubu Terminal Radar Control Facility in the Chubu Centrair International Airport.

*3 “IFR” govern the procedures for conducting flights under the ATC clearances or instructions at all time. Also IFR operations are conducted with assurances of the separation with other IFR aircraft by ATC, but separation from VFR aircraft is not assured other than for PCA; therefore, a pilot shall watch the outsides a means of collision avoidance other VFR aircraft when meteorological condition permit.

(2) Radar Traffic Information

Radar traffic information provision in the TCA advisory is stipulated as follows in the (IV) Radar Usage Reference (Revised on August 31, 2012) in III. Control Method Reference, 5th Control Operation Processing Regulation of the Air Navigation Operation Processing Regulation.

(Excerpt)

15 Additional services

[Applications]

(1) Additional services shall be run within the possible scope of operation in consideration of the running state of the equipment, air traffic capacity, operation capacity and communication capacity.

(Omitted)

[Radar traffic information]

(2) a. Radar traffic information shall include the following items when it is considered advisable to report to an aircraft that an adjacent target to the aircraft under control is confirmed on the scope or a target is confirmed to close on the flight track of the aircraft.

(a) Radar traffic information on the aircraft under radar identification

(i) The azimuth from the aircraft given by a direction of each hour on a clock

(ii) Range from the aircraft

(iii) Heading or maneuvering state

Note: The aircraft being given maneuvering state information is (snipped) closing, converging, (omitted)

(iv) The altitude and type of aircraft if known (snipped)

(b) Radar traffic information on the aircraft under non radar identification

(i) Range from a fix or aerodrome

(ii) Heading or maneuvering state

(iii) The altitude and type of aircraft information if known

Description of the item *15 (2) a (b)* in the above also applies to the traffic information provision (operation differently categorized from the radar traffic information) using the radar display unit in the airdrome control tower. This is the same in with the Ministry of Defense (Komaki ATC Squadron, JASDF).

(3) Role of Controller Position

Role of controller position in the Chubu Terminal Radar Control Facility in the Chubu Centrair International Airport is stipulated in the Control Operation Processing Procedure (Revised by Chubu Airport Office on October 1, 2012) as follows.

(Excerpts)

Work processing procedure 15-3 (Jan 24, 2010, Chief air traffic controller)

Subject: responsibilities of respective control positions

1. Terminal control facility

(8) TCA coordinator position

(i) To perform liaison and coordination with other controller positions or related facilities regarding an aircraft requesting TCA advisory.

There was not specific operation stipulation for liaison and reconciliation between the Nagoya TCA and the Tower for the aircraft which requested TCA advisory service; the information related to the event as described in 2.8.2 was made known in advance to the Chubu Terminal Radar Control Facility.

In this case, liaison and reconciliation was not carried out by the Nagoya TCA to the Tower for Aircraft B about to arrive soon at Nagoya Airfield; usually, this liaison and reconciliation is not carried out. Also for Aircraft A, liaison and reconciliation was not carried out by the Chubu TCA in communication to the Nagoya TCA.

In addition, there are, in Japan, nine airports under the jurisdiction of MLIT which carry out the TCA advisory service. Among them, two airports specifically define the operation of liaison and reconciliation to be carried out from the TCA in the terminal control tower to the airdrome control tower for the aircraft to which TCA advisory was given. Of the two airports, Tokyo Airport Office under Tokyo Regional Civil Aviation Bureau, MLIT, defines detailed stipulation for the liaison and reconciliation of the required information from TCA to the airport control tower in the relevant airport prior to the aircraft having received the TCA advisory entry into the control zone when it lands to the airport or another airfield under the jurisdiction.

2.11 Additional Information

2.11.1 Information on TCAS

Both aircraft did not have the Traffic alert and Collision Avoidance System (TCAS) installed because it was not mandatory for installation. Besides, they did not carry simplified version Traffic Avoidance System (TAS), either.

2.11.2 Information about Front Visual Field of Aircraft B

According to the document from Diamond Air Service Inc., the portion 10 degrees below the horizontal is out of its line of vision for the front visual field of Aircraft B.

3 ANALYSIS

3.1 General

3.1.1 Airman Competence Certificates and Others

The PICs of Both Aircraft held valid airman competence certificates and valid aviation medical certificates.

3.1.2 Meteorological Conditions

The meteorological conditions at a time of proximity of Both Aircraft were that of visual meteorological conditions. As described in 2.4, although the area where the proximity took place was hazy from the observation values and the statements, it is estimated that the visibility was relatively good with 8 nm to 15 nm. Furthermore, both aircraft were flying below the clouds, uninterrupted by clouds, no factors seem to be present to interfere the sight of the other aircraft including the position of the sun.

3.2 Analysis

3.2.1 The Probability of a Mid-Air Collision

According to the approaching conditions in 2.1.1, Figures 2 and 3 as well as 2.1.3 (1) and (2), Aircraft B overtook Aircraft A almost at the same altitude, and it is highly probable that Aircraft A did not find Aircraft B until it came closest and Aircraft B did not find Aircraft A during the flight. From these, it is highly probable that Aircraft A did not have time allowed for avoidance maneuver and Aircraft B did not perform the avoidance maneuver.

As indicated in Figures 2 and 3, according to the analysis of the air traffic control radar records, it is highly probable that the time of the closest proximity of both aircraft was approximately 11:22:21, the distance approximately 390 m (approx. 0.2 nm), altitude at 2,000 ft (record unit in 100 ft) for both.

From the viewpoint of flight path, the continuing of flight of both Aircraft A and Aircraft B did not lead to the highly potential near collision path; besides as described in 2.1.3 (2), the Trainee A witnessing Aircraft B from the right seat in Aircraft A did not feel the

danger of collision.

These facts show that the proximity of both aircraft in this serious incident was a situation where there was no ample time to perform the avoidance maneuver but it can be assumed that near collision is not applicable to this incident because it was not so close to cause the danger of collision or contact.

3.2.2 Proximity of Both Aircraft and Avoidance Actions

(1) Aircraft A

As shown in 2.1.4 (2), (3) and Annex 1 ATC Communications Records, Aircraft A was not provided with the traffic information about Aircraft B by the Tower and the Chubu TCA with which Aircraft A was then communicating. Besides, as described in 2.9.2, it was not in the situation both Aircraft A and Aircraft B shared the same controller. Therefore, it is probable that Aircraft A was flying by monitoring the view around it in a situation where it was not able to recognize the presence of Aircraft B from the communication monitor.

According to the descriptions in 2.1.3 (1), (2) and Figure 2, Aircraft B approached Aircraft A from the left rear side outside the view of Aircraft A, then overtook Aircraft A on the left side. When the Trainee A on Aircraft A was aware, Aircraft B already overtook Aircraft A on the side ahead of Aircraft A and turned away from the path of Aircraft A. Therefore, it is probable that the proximity condition was resolved irrespective of the avoidance maneuver by Aircraft A.

From these, it is highly probable that steering action by Aircraft A, communication and surveillance did not contribute to the proximity of both aircraft.

(2) Aircraft B

As described in 2.1.4 (1), (2), Figures 1 and 2 and Annex 1 ATC Communications Records, Aircraft B was given the information of Aircraft A first by the Nagoya TCA, then by the Tower. The information was that an aircraft was flying in 7 nm north at 11:20:22, 4 nm north at 11:21:03 and 2 nm north at 11:21:49 at the same altitude of 2,000 ft as Aircraft B. In any of these instances, Aircraft B did not visually identify Aircraft A and kept flying maintaining the altitude, resulting in close proximity.

In this case, as descriptions in 2.4.2 and 2.4.3 as well as Figures 1 and 2 show, both aircraft were flying at low altitude below the cloud and it is highly probable that Aircraft B was in a position to visually recognize Aircraft A after the Nagoya TCA provided Aircraft B the information of an aircraft 7 nm north at 11:20:22.

Moreover, from the descriptions of 2.4, 2.1.3 (3) and 2.1.4 (1) and Annex 1 ATC Communications Records, the peripheral meteorological conditions on that day were visual meteorological conditions and the visibility was estimated to be around 8 nm to 15 nm in spite of the haziness. It is somewhat likely that PIC and FO of Aircraft B could not visually recognize Aircraft A under these circumstances, consequently approached Aircraft A due to the lack of surveillance or watch around the surround view; however, the investigation was unable to determine it.

From these, where Aircraft B which were given the traffic information of Aircraft A could not visually recognize Aircraft A for potential of proximity or collision, that is, without being able to keep the safe separation from Aircraft A, it is highly probable that keeping flight without taking any measures of avoiding the close proximity, such as changing the route or altitude, or inquiry into a controller in communication about the proceeding direction or moving conditions, resulted in close proximity of Both Aircraft.

It is desirable that a pilot flying under VFR take some measures at a certain time to avoid the close proximity when unable to visually recognize an aircraft as provided the radar traffic information by the TCA advisory.

From the descriptions of 2.1.3 (3) and 2.1.3 (4) and Figure 2, it is somewhat likely that the followings may have caused for PIC and FO of Aircraft B unable to visually recognize Aircraft A when Aircraft B approached Aircraft A and overtook Aircraft A 390 m in the left side.

- (a) Likelihood that the FO of Aircraft B was also concerned over the communication with the Tower from about 11:21:03.
- (b) Likelihood that the attention of the PIC and FO of Aircraft B was directed to the Mamba Bridge a bit leftward of the nose after being instructed by the Tower to hold over Mamba Bridge.
- (c) Both PIC and the FO of Aircraft B had no memory of the traffic information provided by the Tower at 11:21:49, and then in the course of turning from west to further south, it is likely that they did not pay attention to the north of Aircraft B.
- (d) Since the Aircraft B went into turning, both PIC and the FO paid attention to its direction and due to the turning posture, it is somewhat likely that Aircraft A was temporarily out of line of sight below Aircraft B on the front.

3.2.3 Traffic Information and others provided by Air Traffic Control Authority to Both Aircraft

(1) Traffic information and others from Nagoya TCA and Tower

As described in the rules in 2.10.3 (2), the air traffic control operation related to the traffic information with the use of the Nagoya TCA radar and control tower radar display unit should contain information such as the azimuth, altitude and heading or maneuvering state within the practical range.

However, as shown in the Annex 1 ATC Communications Records, the Nagoya TCA and the Tower told Aircraft B that an aircraft was present 7 nm north at 11:20:22, 4 nm north at 11:21:03, 2 nm north at 11:21:49 at the same altitude of 2,000 ft as Aircraft B, with no information concerning the heading or maneuvering state of the relevant aircraft included.

Information concerning the heading or maneuvering state is considered very useful for an aircraft on determining whether the relevant aircraft could approach or converge with respect to its own aircraft and on taking measures if the avoidance maneuver is needed. Air traffic controllers are expected to include the heading or maneuvering state information as much as possible on providing the radar traffic information.

(2) Coordination between Nagoya TCA and Tower

As described in 2.10.3 (3), there is a provision for liaison and coordination with the related authorities concerning the aircraft which requested the TCA advisory service for the TCA coordinator position in the Nagoya TCA, but there was no operation agreement with the Nagoya Tower for the transaction. And in this case, the Aircraft B information was not made known from the Nagoya TCA to the Tower and never carried out in the ordinary cases, too.

It is likely that the necessary measures could be taken as Aircraft A would fly in advance at an altitude to have sufficient distance from the approach altitude (2,000 ft) of Aircraft B based on the information from the Tower if the Aircraft B information liaison and coordination were made from the Nagoya TCA to the Tower by the time of 11:20:09 when Aircraft A reported that it exited the Nagoya control zone as illustrated in Figure 1.

Besides, as described in 2.8.2, at a time of occurrence of this serious incident, the flyby rehearsal was being performed and this was made known in advance to the Chubu Terminal Radar Control Facility in Chubu Centrair International Airport. However, as described in 2.1.4 (1) and 2.10.3 (3), the Nagoya TCA

controller knew the event to be held, but did not know the probability of restricted entry into the Nagoya control zone. Given the above, it is probable that the Nagoya TCA did not make liaison and coordination for Aircraft B to the Tower.

It is desired that the Chubu Airport Office in the Osaka Regional Civil Aviation Bureau, MLIT, would consider the establishment of the operation agreement for the further work stipulation between the control authorities just as Tokyo Airport Office makes it rules to perform liaison and coordination with the related authorities in the relevant airfield before entry into the relevant air control zone if an aircraft which requested the TCA advisory was going to land at the airfield within the jurisdiction airspace.

(3) Coordination between Chubu TCA and Nagoya TCA

In this serious incident, as shown in the Figure 1 and Annex 1 ATC Communications Records, Aircraft A started communication with the Chubu TCA at 11:20:19 after exiting the Nagoya control zone. It is probable that the flight objective of Aircraft A is the training flight in CK1-3 and it was necessary to proceed under PCA, which is within the airspace of the Chubu TCA.

If Chubu TCA applied the stipulation described in 2.10.3 (3) and made liaison and coordination with the Nagoya TCA (in charge of jurisdiction of the airspace of notification) when Chubu TCA received the notification from Aircraft A that it was in 6 nm southeast (outside of jurisdiction of Chubu TCA) of the Nagoya Airfield, the traffic information would have been shared and it is likely that Aircraft A and Aircraft B could have behaved differently.

3.3 Classification of the Degree of Risk

According to the Guidelines for Degree of Risk, Doc 4444, International Civil Aviation Organization (ICAO), the case in this incident applies to “Safety not assured”. (See Annex 2.)

4 PROBABLE CAUSES

It is highly probable that even though information on the azimuth and flight altitude of Aircraft A was provided, Aircraft B could not recognize it and continued the flight; accordingly, both aircraft approached into close proximity.

5 SAFETY ACTIONS

5.1 Safety Actions Taken by Diamond Air Service

5.1.1 Watch Enhancement

By referring to the relevant literature published by Japan Aircraft Pilot Association and others or investigating or reviewing the behavior of other companies in the same industry, a manual related to the flight entitled as “For Prevention of Collision in Midair (Watching Procedure)” was created for the enhancement of surveillance (watch) around the surround view during flight, and the education was carried out for the pilots and other personnel expected to be on board (completed in May, 2013). Later, re-education was conducted for entire pilots (completed in December, 2013). Copies of the manual were distributed to the companies which cooperated in the survey for reference.

5.1.2 Approach or Landing Method Change

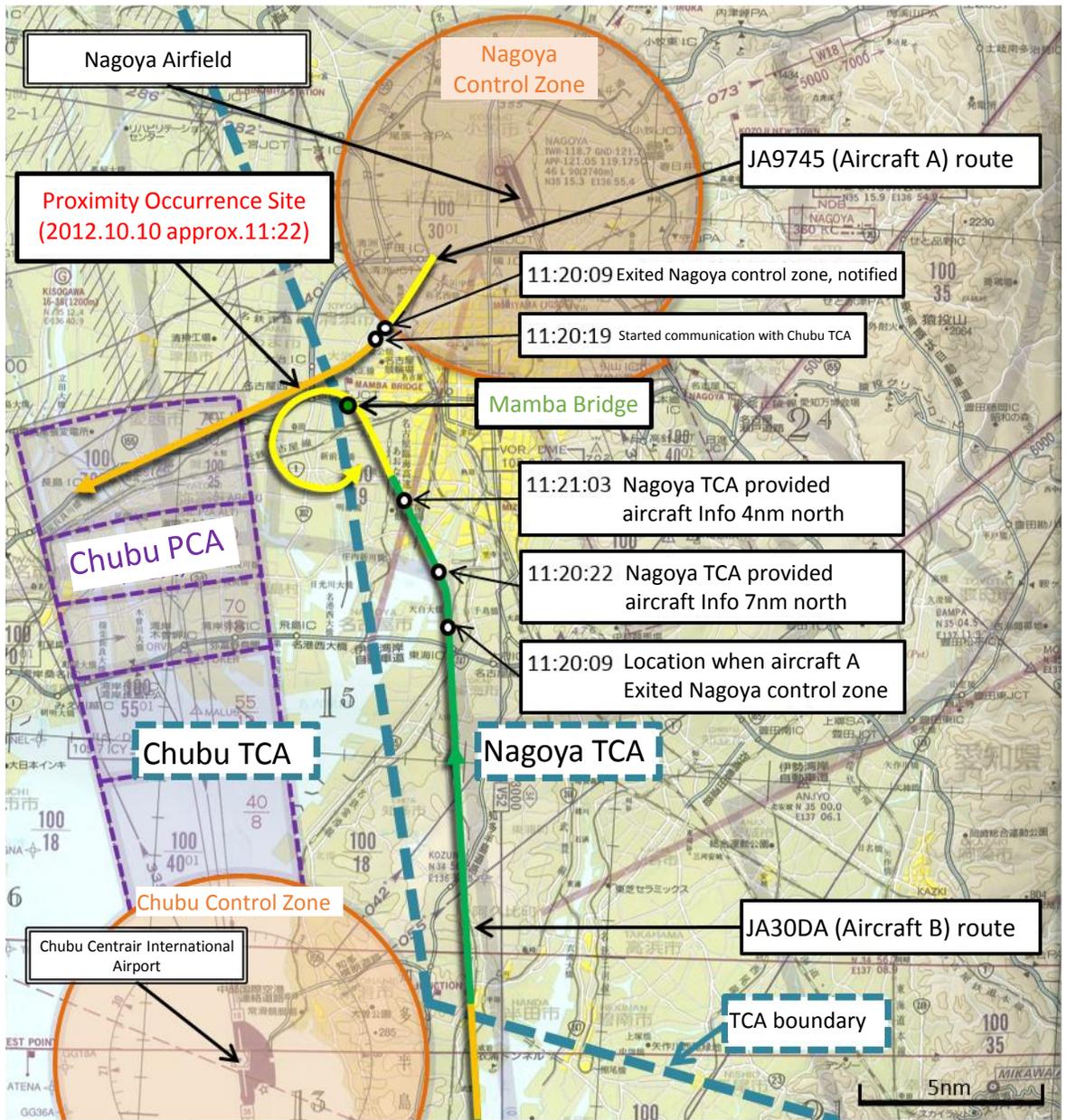
As a provisional measure before TCAS (referred to later) is installed, on approaching or landing at the Nagoya Airfield, control with radar vectoring and simulated instrument flight or instrument flight rules was used (completed on October 12, 2012). These measures are to be basic for approaching and landing even after TCAS is introduced.

Moreover, frequently used routes based on the survey of relevant companies using the Nagoya Airfield are compiled as maps for the awareness to the entire pilots (completed in April, 2013). These copies were distributed to the companies which cooperated in the survey as a reference for sharing information.

5.1.3 Installing TCAS

Of three aircraft owned by Diamond Air Service Inc., TCAS was installed into two aircraft including Aircraft B (completed in December 2013 for Aircraft B and in July 2013 for the other) and TAS was installed into other one aircraft (completed in April 2014).

Figure 1. Estimated Flight Route



Courtesy of TCA Chart published by Japan Aircraft Pilot Association

- Legend
- Tower communication interval
 - Chubu TCA communication interval
 - Nagoya TCA communication interval

Figure 2. Proximity Status Chart

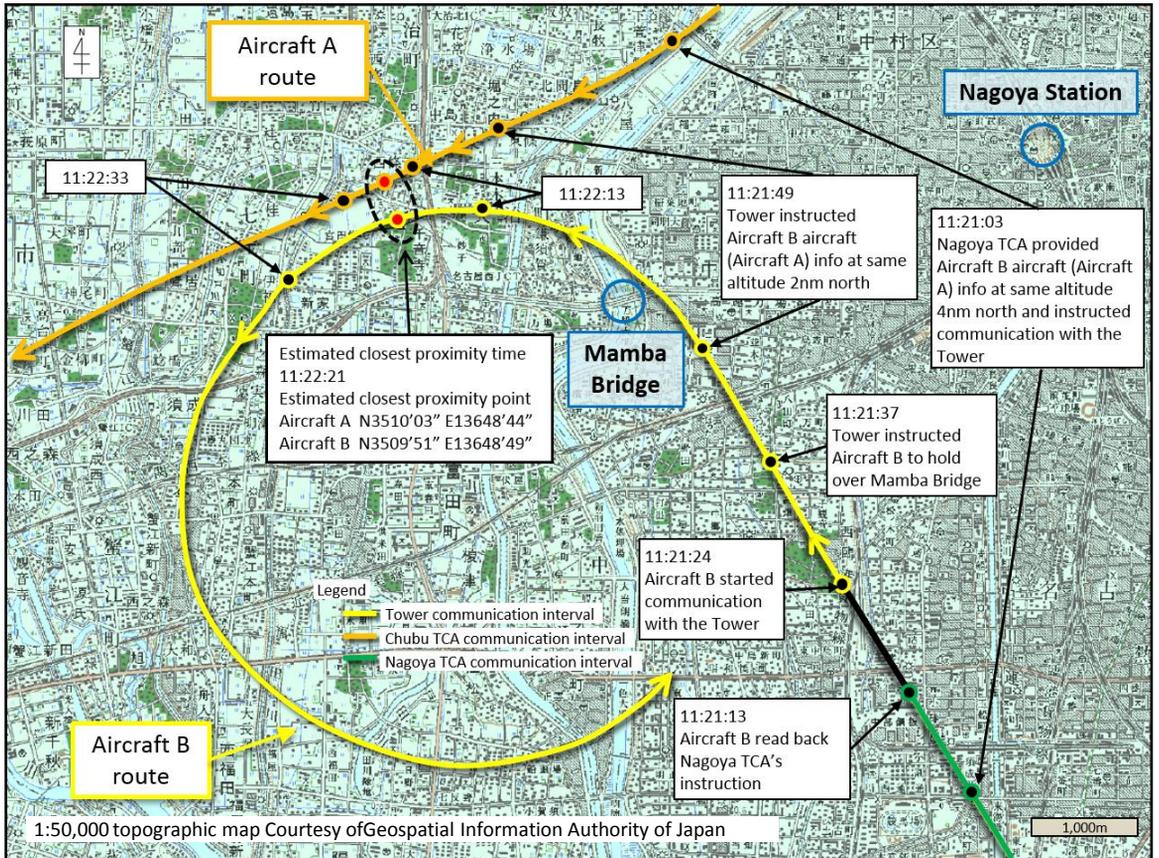
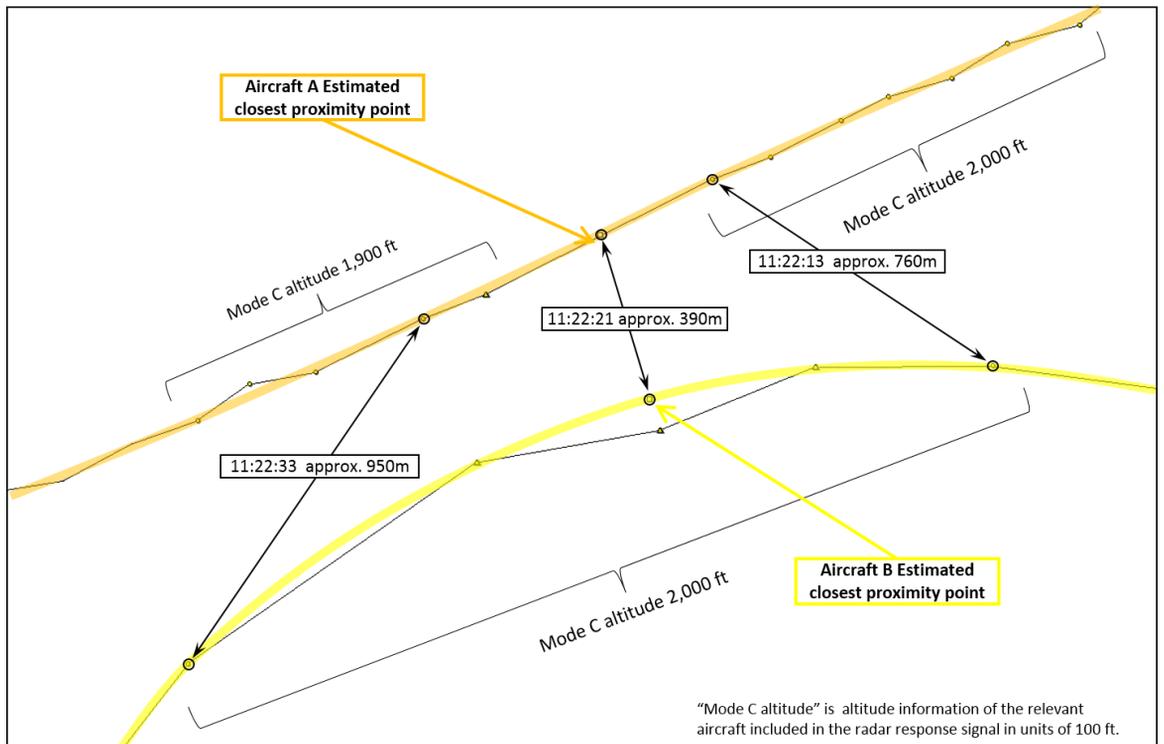


Figure 3. Proximity Status Detailed Chart



Annex 1 ATC Communications Records

Communication with Aircraft A		
Time	Transmitter	Description of communication
11:14:39	Aircraft A	Nagoya Tower, Juliet Alfa Nine Seven Four Five, ready.
11:14:41	Tower	Juliet Alfa Nine Seven Four Five, left turn approved, wind two five zero at three, cleared for take-off Whiskey helipad.
11:14:47	Aircraft A	Nine Seven Four Five, cleared for take-off, Whiskey helipad.
11:15:45	Tower	Juliet Alfa Nine Seven Four Five, report leaving control zone.
11:15:48	Aircraft A	Nine Seven Four Five, report leaving.
11:20:04	Aircraft A	Nagoya Tower, Juliet Alfa Nine Seven Four Five, five mile southwest, two thousand, leaving control zone.
11:20:09	Tower	Juliet Alfa Nine Seven Four Five, frequency change approved.
11:20:12	Aircraft A	Nine Seven Four Five.
11:20:19	Aircraft A	Centrair TCA, Juliet Alfa Nine Seven Four Five, information Zulu.
11:20:24	Chubu TCA	Juliet Alfa Nine Seven Four Five, TCA, ah, go ahead.
11:20:30	Aircraft A	Nine Seven Four Five Six mile southwest of Nagoya. Two thousand. Proceed to Charlie Kilo One dash Three and training. Request TCA advisory.
11:20:39	Chubu TCA	Nine Seven Four Five, squawk one three seven two.
11:20:44	Aircraft A	Squawk one three seven two. Nine Seven Four Five.
11:21:40	Chubu TCA	Juliet Alfa Nine Seven Four Five, radar contact, seven miles southwest of Nagoya. Altitude readout two thousand one hundred.
11:21:47	Aircraft A	Nine Seven Four Five.
11:21:49	Chubu TCA	Juliet Alfa Nine Seven Four Five, er, let me know when you enter the area of Charlie Kilo one dash three. Note that Chuo airport operating runway one eight. Pay attention. Do not enter PCA.
11:21:58	Aircraft A	Nine Seven Four Five, Roger. Char, Report entering Charlie Kilo one dash three.
11:22:03	Chubu TCA	Roger.
11:23:08	Aircraft A	Centrair TCA, Juliet Alfa Nine Seven Four Five, descend one thousand eight hundred. Break. Er, an aircraft which seems to be citation, er, at the same altitude as our aircraft, er, approached and flew away. Squawk displayed?
12:23:23	Chubu TCA	Nine Seven Four Five, Roger. Er, VFR with no contact here.
12:23:30	Aircraft A	Roger. __ Seven Four Five.

Communication with Aircraft B		
Time j	Transmitter	Description of communication
11:15:21	Aircraft B	Centrair TCA, Juliet Alfa Three Zero Delta Alfa, maintain three thousand five hundred.
11:15:26	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, Centrair TCA, continue TCA service.
11:16:45	Aircraft B	Centrair TCA, Juliet Alfa Three Zero Delta Alfa, descend to two thousand.
11:16:50	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, roger. Copy.
11:19:07	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, traffic six miles north of you, squawking VFR, altitude readout one thousand two hundred, southbound.
11:19:17	Aircraft B	Looking for traffic. Three Zero Delta Alfa.
11:19:56	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, previous traffic two point five mile northwest of you, altitude readout one thousand.
11:20:05	Aircraft B	Negative contact, Three Zero Delta Alfa.
11:20:08	Nagoya TCA	Roger.
11:20:22	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, clear of traffic and another traffic seven mile north of you, altitude readout two thousand one hundred, VFR.
11:20:35	Aircraft B	Looking for traffic. Three Zero Delta Alfa.
11:20:58	Aircraft B	Centrair TCA, Juliet Alfa Three Zero Delta Alfa, approaching Manba bridge.
11:21:03	Nagoya TCA	Juliet Alfa Three Zero Delta Alfa, roger. Previous traffic four mile north of you, two thousand. Use caution. Contact Nagoya tower, squawk VFR. Good day.
11:21:13	Aircraft B	Roger, contact Nagoya tower, squawk VFR. Good day, Juliet Alfa Delta Alfa.
11:21:24	Aircraft B	Nagoya Tower, Juliet Alfa Three Zero Delta Alfa, approaching Manba bridge.
11:21:29	Tower	Juliet Alfa Three Zero Delta Alfa, Nagoya Tower, go ahead.
11:21:33	Aircraft B	Three Zero Delta Alfa, approaching Manba bridge, landing instruction.
11:21:37	Tower	Juliet Alfa Three Zero Delta Alfa, hold over Manba bridge due to fly-by mission.
11:21:43	Aircraft B	Roger. Hold over Manba bridge, Three Zero Delta Alfa.
11:21:49	Tower	Juliet Alfa Three Zero Delta Alfa, traffic, two mile north of you, two thousand. Use caution.
11:21:56	Aircraft B	Negative contact, Three Zero Delta Alfa.
11:26:03	Tower	Juliet Alfa Three Zero Delta Alfa, request type of landing.
11:26:07	Aircraft B	Full stop, Three Zero Delta Alfa.
11:26:08	Tower	Roger.
11:27:49	Tower	Juliet Alfa Three Zero Delta Alfa, commence approach. Report entering control zone.
11:27:54	Aircraft B	Roger. Commence approach. Report entering control zone, Three Zero Delta Alfa.

Annex 2 Decision Guidelines for Degree of Risk

I C A O PANS-ATM CHAPTER1. DEFINITIONS Aircraft proximity	
Category	Explanation
Risk of collision	The risk classification of an aircraft proximity in which serious risk of collision has existed.
Safety not assured	The risk classification of an aircraft proximity in which the safety of the aircraft may have been compromised.
No risk of collision	The risk classification of an aircraft proximity in which no risk of collision has existed.
Risk not determined	The risk classification of an aircraft proximity in which insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.

Note: PANS-ATM 16.3.2 dictates the determination and classification of the risks according to the above in the incident report for the aircraft proximity.