AI2022-7

AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT

PRIVATELY OWNED
J A 3 8 1 5

SPRING AIRLINES CO., LTD.
B – 9 9 4 0

October 27, 2022

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.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

i) In case of being able to determine, the term "certain" or "certainly" is used.
ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.
iii) In case of higher possibility, the term "probable" or "more likely" is used.
iv) In a case that there is a possibility, the term "likely" or "possible" is used.

AIRCRAFT SERIOUS INCIDENT

INVESTIGATION REPORT

A SITUATION WHERE A PILOT IN COMMAND OF AN AIRCRAFT RECOGNIZED A RISK OF COLLISION OR CONTACT WITH ANY OTHER AIRCRAFT

1. PRIVATELY OWNED BEECHCRAFT A36, JA3815

2. SPRING AIRLINES CO., LTD.

AIRBUS A320-214, B-9940

ABOUT 1.1 NM WEST-SOUTHWEST OVER SAGA AIRPORT

ABOUT 11:21, DECEMBER 21, 2019

October 7th, 2022
Adopted by the Japan Transport Safety Board
Chairperson TAKEDA Nobuo
Member SHIMAMURA Atsushi
Member MARUI Yuichi
Member SODA Hisako
Member NAKANISHI Miwa
Member TSUDA Hiroka

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the serious incident	On December 21, 2019, a privately owned Beechcraft A36, registered JA3815, was in level flight toward Fukue Airport from Yao Airport, when an Airbus A320-214, registered B-9940, operated by Spring Airlines Co., Ltd. was descending to Saga Airport after taking off from Shanghai Pudong International Airport on a scheduled Flight 8577 of the company. Then, both aircraft were closely approaching each other about 1.1 nm west-southwest over Saga Airport, and B-9940 took evasive action executing instructions provided by Traffic Alert and Collision Avoidance System. On February 21, 2020, the captain of a privately owned Beechcraft A36, registered JA3815, submitted a Near Collision Report to the Ministry of Land, Infrastructure, Transport and Tourism (A report pursuant to the provision of Article 76-2 of Civil Aeronautics Act and Article 166-5 of

	Ordinance of the Enforcement of the Civil Aeronautics Act). Consequently, it was classified as a serious incident on February 26, 2020.
1.2 Outline of the serious incident investigation	Upon receiving the report of this serious incident, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this serious incident on February 26, 2020. In addition, another investigator was assigned on July 1, 2020. An accredited representative of the People's Republic of China, as the State of Operator of the aircraft involved in this serious incident participated in the investigation. Comments were invited from the parties relevant to the cause of the serious incident. Comments were invited from the Relevant States.

2. FACTUAL INFORMATION

2.1 History of the Flight

(1) Following is an outline of the Near Collision Report submitted by the captain of a privately owned Beechcraft A36, registered JA3815 (hereinafter referred to as "Aircraft A").

Figure 1: Aircraft A

Date and Time of incident:	About 11:20 Japan Standard Time (JST,UTC+9hours), December 21, 2019
Position at time of incident:	Magnetic direction of 256° from Saga VOR/DME (herein referred to as "SGE"), Distance 10 nm
Phase of flight:	During level flight, Altitude 4,500 ft, Ground speed 120 kt
Other aircraft:	Jet (Passenger airplane)
Position of other aircraft and distances to the aircraft at first sighting:	Direction 12 o'clock, Horizontal distance 10 nm, Downward
Position of other aircraft and distances between aircraft at closest proximity:	Upward, Altitude difference between 50 and 100 ft
Proximity situation:	Head-on
Evasive action:	Aircraft making report: None Other aircraft: Yes (climb)

(2) Based on the statements of the captain of Aircraft A and the pilot in command (hereinafter referred to as "the PIC") and the First Officer

(hereinafter referred to as “the FO”), of Airbus A320-214, registered B-9940 (hereinafter referred to as “Aircraft B”), operated by Spring Airlines Co., Ltd., a controller at the departure control position (hereinafter referred to as “Fukuoka Departure”, a controller at the terminal control area position (hereinafter referred to as “Fukuoka TCA”, see 2.5 (1).) in Fukuoka Terminal Facility, an air traffic services flight information officer of Fukuoka Flight Service Center (hereinafter referred to as “Fukuoka FSC”, see 2.5 (2).) and an air traffic services flight information officer of the Saga Aerodrome Information Service Station (hereinafter referred to as “Saga Radio", see 2.5 (3).) as well as records of the quick access recorder (QAR), ATC communications, and radar tracking of Aircraft B, the history of the flight by both aircraft is summarized below.

Aircraft A took off from Yao Airport at about 08:58 on Saturday, December 21, 2019 with a captain and three other passengers. While being on level flight pattern at an altitude of 4,500 ft and flying with manual control on VFR*1 toward Fukue Airport as its destination, at about 11:03:21, Aircraft A contacted Fukuoka FSC and reported its current position was at about 37 nm east of Saga Airport and flying toward Fukue Airport. By the way, Aircraft A was equipped with only one VHF radio. Upon receiving this report, Fukuoka FSC provided Aircraft A with the aerodrome routine meteorological reports (METAR) as of 11:00 at Fukue Airport.

On the same day, Aircraft B took off from Shanghai Pudong International Airport on a scheduled Flight 8577 of the company with 159 people in total, consisting of a PIC, other six crewmembers and 152 passengers and was flying on IFR*2 toward Saga Airport as its destination at an altitude of 6,000 ft on the direct route (see 2.5 (4)) from Nagasaki VOR/DME (hereinafter referred to as “OLE”) to SGE. (See Figure 3)

Figure 2 Aircraft B

About at 11:19:16, when Aircraft B contacted Fukuoka Departure for transfer of communication control, Fukuoka Departure recognized that VFR aircraft was flying westward at an altitude of 4,600 ft, 4 nm east of SGE on the radar screen and provided Aircraft B with this radar traffic information (see 2.5 (5)) on this VFR aircraft.–

*1 “VFR", which stands for Visual Flight Rules 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.
*2 “IFR" which stands for Instrument Flight Rules govern the procedures for conducting flights under the ATC clearances or instructions at all time.

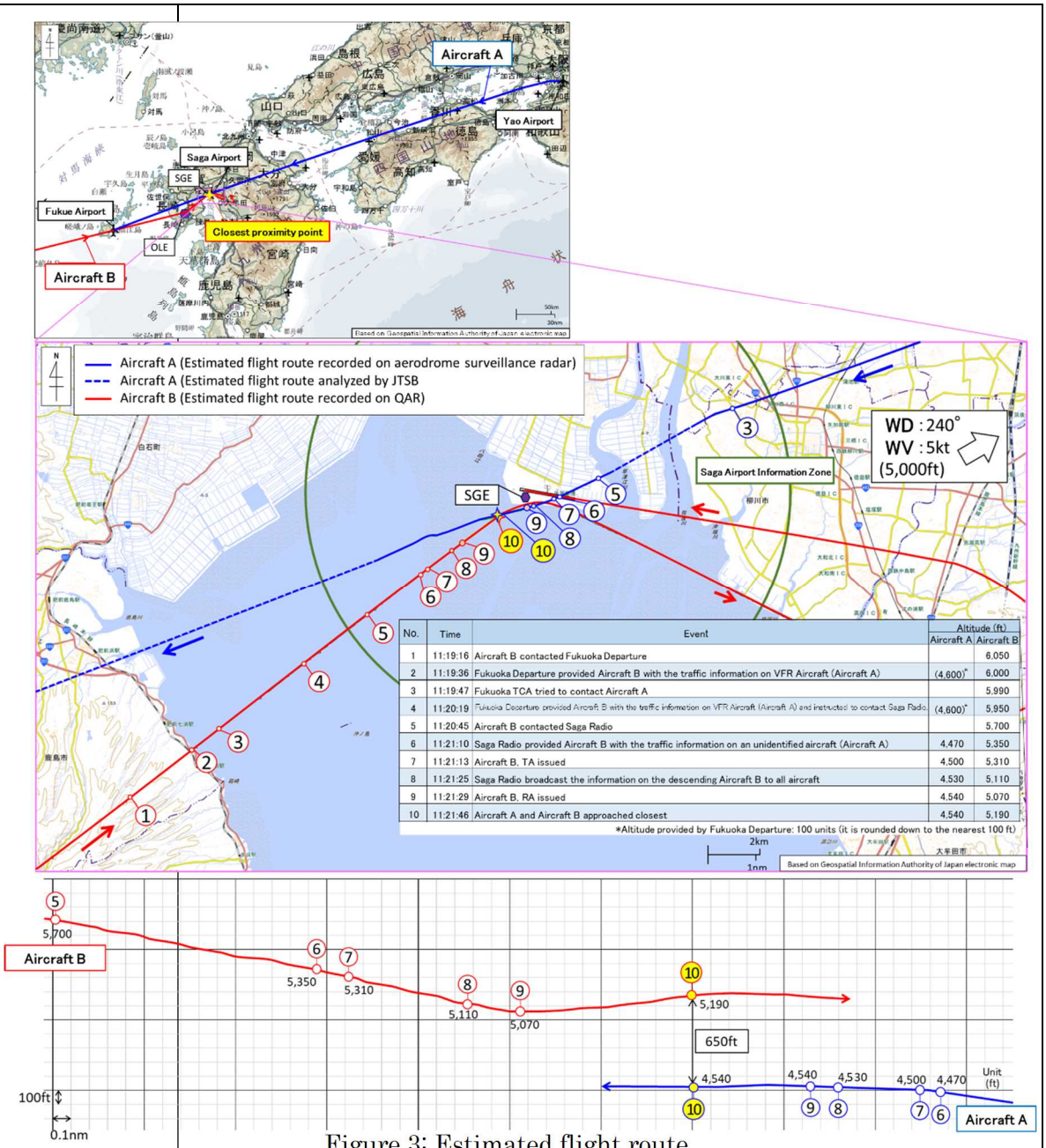

Figure 3: Estimated flight route

At about 11:19:47, judging from the list of VFR aircraft scheduled to fly in the same time and the same area, Fukuoka TCA estimated that the VFR aircraft would be Aircraft A and tried to contact Aircraft A at the Fukuoka TCA frequency in order to provide Aircraft A with the radar traffic information*3 on the Aircraft B. However, there was no reply from Aircraft A. At this time, Aircraft A was tuning to the Fukuoka FSC frequency. Fukuoka TCA asked Saga Radio about the information on this VFR aircraft, but Saga Radio did not have the information on the VFR aircraft.

At about 11:20:04, Fukuoka Departure instructed Aircraft B to

*3 "Radar Traffic Information" refers to traffic information issued when a radar target is recognized on the radar screen approaching an aircraft under control, or when a radar target is recognized that may be in proximity to the flight path of the aircraft, and when it is deemed advisable for the air traffic controller to notify the pilot of the aircraft.

	descend to an altitude of 5,000 ft and cleared for ILS approach to Runway 29 from immediately over SGE. At about 11:20:19, although the radar target of the VFR aircraft disappeared off the radar, Fukuoka Departure instructed Aircraft B to contact Saga Radio after informing that VFR aircraft would probably be flying 3 nm east of SGE. At about 11:20:45, when Aircraft B communicated with Saga Radio, Saga Radio recognized the existence of the VFR aircraft by an APDU*4, and then informed Aircraft B that there was an unidentified aircraft, which was flying at display altitude of 4,600 ft over near SGE. At 11:21:13, a Traffic Advisory (hereinafter referred to as "TA") was issued by the Traffic Collision Avoidance System (hereinafter referred to as TCAS", see 2.5 (5)) of Aircraft B at an altitude of 5,310 ft, 2.5 nm west-southwest of SGE. Aircraft B reported to Saga Radio that it was looking for the unidentified aircraft to visually confirm it. At about 11:21:25, Saga Radio broadcast to all aircraft via the main frequency and gave them the information (Information concerning traffic*5) that an Airbus A320 aircraft (Aircraft B) was descending to an altitude of 5,000 ft, about 2 to 3 nm west of Saga Airport and going to start to make an ILS approach to Runway 29 after this. While Aircraft B came close to an altitude of 5,000 ft, as instructed, with its autopilot system switched to the mode to level off and its descent rate decreased, at 11:21:29, the TCAS of Aircraft B issued a resolution advisory (hereinafter referred to as "RA") instruction to climb at an altitude of 5,070 ft, thus Aircraft B disengaged the autopilot system and took evasive action following the RA instruction. At about 11:21:42, Aircraft B reported to Saga Radio that it took evasive action following the RA instruction, and climbed up to an altitude of 5,200 ft. At about 11:21:46, when both aircraft approached each other closest about 1.1 nm west-southwest over Saga Airport, Aircraft A was at an altitude of 4,540 ft and Aircraft B was at an altitude of 5,190 ft. The horizontal distance difference between these two aircraft was 0 nm. At 11:21:54, Aircraft B began descent again as the RA was cleared, and started to make an ILS approach to Runway 29 from over SGE. After around 11:03, the VHF receiver of Aircraft A had been left tuning to the Fukuoka FSC frequency. After passing over Saga Airport, the captain of Aircraft A found other aircraft flying ahead, looked approaching while gradually climbing and further going to pass at a much

*4 "APDU" stands for Aircraft Position Display Unit, is a device installed at an airport, etc., that receives aircraft position, altitude, etc. transmitted from the ARSR/ORSR or ASR information processing system and displays the aircraft on the display in real time

*5. "Information concerning traffic " shall be information on an aerodrome or aircraft, vehicles, human beings, etc. at or in the vicinity of the aerodrome which are considered to affect navigation of an aircraft to which airport mobile communication service is going to advise and information that a flight information officer visually confirms or one reported by an aircraft, control facility or other reliable source

	closer altitude immediately above the Aircraft A, but he does not took evasive action. At about 11:25:20, Aircraft A reported to Fukuoka FSC that it was flying toward Fukue Airport at an altitude of 4,500 ft about 10 nm west of Saga Airport and asked Fukuoka FSC whether the passenger aircraft, which approached head-on and passed nearby sometime after Aircraft A had passed over Saga Airport, was the aircraft that had climbed from Nagasaki Airport. Not being aware of the aircraft that had approached Aircraft A, Fukuoka FSC told Aircraft A to contact Fukuoka FSC by telephone again after the landing at Fukue Airport. After Aircraft B landed at Saga Airport at 11:30:01, when Saga Radio asked Aircraft B about where the RA was issued, crewmembers of Aircraft B responded by saying that it was not sure about the accurate position, but when Aircraft B was approaching SGE, the altitude of other aircraft was 4,500 ft and Aircraft B maintained between an altitude of 5,300 and 5,200 ft, and although they were not able to visually confirm other aircraft, they did not feel any danger. After that, when flying north of Nagasaki Airport, Aircraft A contacted a controller of Nagasaki Airport Traffic Control Tower (hereinafter referred to as "Nagasaki Tower") in order to avoid the proximity to take-off and landing aircraft of Nagasaki Airport, reported its position and altitude, continued flying, and landed at Fukue Airport at about 12:00. On December 23, 2019, Fukuoka FSC notified the captain of A aircraft that TCAS-RA of an airliner had been activated at Saga Airport and requested to establish communication with Saga Radio or Fukuoka TCA at the time of flying around Saga Airport. On December 26, 2019, the captain of Aircraft A made a phone call to the Fukuoka Terminal Facility, requesting information on the aircraft that had passed nearby Aircraft A. On February 21, 2020, the captain of Aircraft A submitted a Near Collision Report to the Ministry of Land, Infrastructure, Transport and Tourism, and it was accepted on February 25, 2020. On February 26, 2020, the Japan Civil Aviation Bureau (JCAB) reported it to the JTSB, and consequently, it was classified as a serious incident. This serious incident occurred at about 11:21 on December 21, 2019, about 1.1 nm west-southwest of Saga Airport (33'08"32 N, 130'16"54 E).
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	None

2.4 Meteorological information	The aerodrome routine meteorological reports (METAR) for Saga Airport, the closest airport to the serious incident site, around the time of the serious incident were as follows: 11:00 wind direction 340°, wind velocity 6 kt, Prevailing visibility 10 km or more Cloud: Amount 1/8; Type Cumulus; Cloud base 4,000 ft Cloud: Amount 4/8; Type Altocumulus; Cloud base 17,000 ft Temperature 7℃, Dew point 4℃ Altimeter setting (QNH) 30.29 inHg
2.5 Additional information	(1) Terminal Control Area (TCA) Among the approach control areas, the areas particularly congested with VFR aircraft are published as the TCA wherein TCA advisory service is provided for VFR aircraft.– TCA advisory service is conducted in order to support the operations of VFR aircraft, and based on requests from VFR aircraft flying in the TCA, air traffic controllers provide such as vectoring, information on radar position, advisory of approach sequence and holding (sequence into the control zone), and radar traffic information. The JCAB-compiled AIM-J (Aeronautical Information Manual of Japan) (edited by AIM-Japan Editorial Association, published by Japan Aircraft Pilot Association) includes the following description: A pilot should request TCA advisory as much as practicable when operating within TCA in VFR. (290 14 in Chapter 2) In the northern part of Kyushu, the areas published as the TCA are shown in Figure 4.

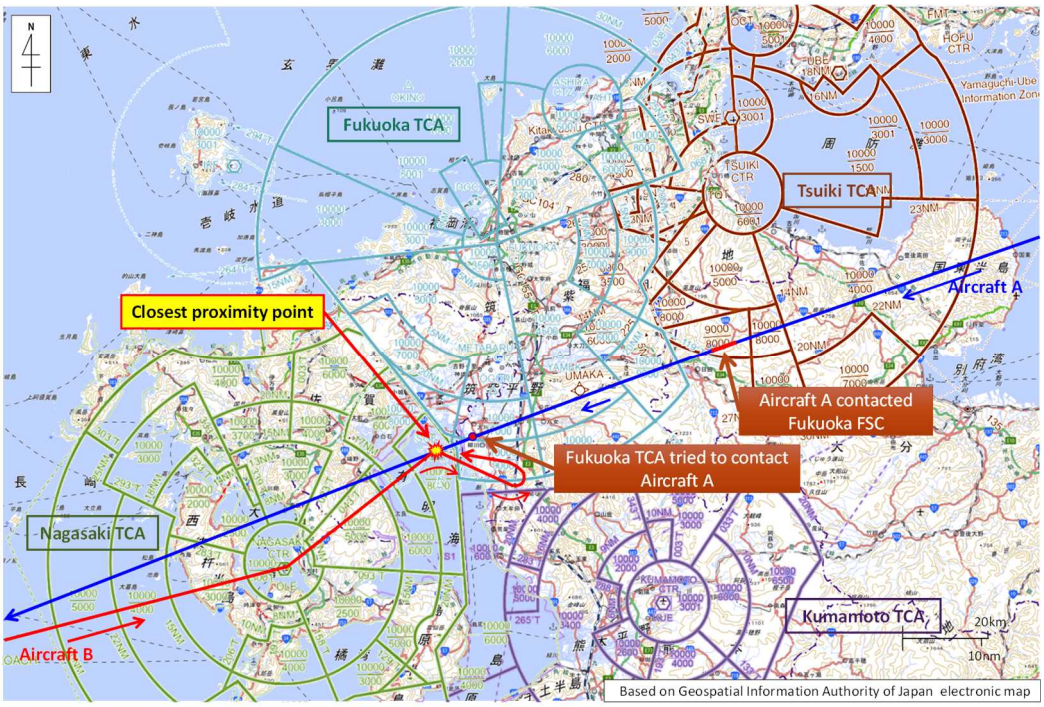

Figure 4: TCA airspace in the northern part of Kyushu

(2) Flight Service Center (FSC)

FSC is an organization that provides, collects and conveys the information necessary for safe operations of aircraft, and relays ATC clearances in order to assist aircraft in flight and on ground. FSCprovide airport remote mobile communication service and area/en-route information service by air traffic services flight information officers at each airport. It was located at each major airport office in New Chitose, Sendai, Tokyo, Chubu, Osaka, Fukuoka, Kagoshima and Naha.

Area/en-route information service units includes reception of position reporting and PIREPs (pilot weather reports) from aircraft in flight and provision of operation supports such as flight plan change and others, weather information and aircraft information based on requests from aircraft, but no information concerning traffic using APDU is provided, except for that pertaining to civil training & testing areas..

(3) Airport mobile communication station (Radio)

Radio refers to air-ground navigation aid services that aid the navigation of aircraft flying in the airport and its surrounding areas and following services shall be provided by air traffic services flight information officers.

a) Provision of information required for aircraft navigation
b) Sharing of ATC information between aircraft and ATC service provider
c) Sharing of other information required for safe aircraft operations

(4) OLE-SGE direct route

The direct route between OLE and SGE at the time of the occurrence of this serious incident was defined as follows:

OLE VOR/DME 059° $\frac{16\text{nm}}{6000}$ SGE 8DME $\frac{8\text{nm}}{5000}$ 239° SGE VOR/DME

This means the MEA*6 from OLE up to 16 nm is 6,000 ft, and subsequently the MEA up to SGA is 5,000 ft.

(5) Outline of Traffic alert and Collision Avoidance System (TCAS)

TCAS is a device that detects an aircraft proximity in which serious risk of collision exists and provides the pilot with a TA that is the radar position of the aircraft and a RA that instructs avoidance maneuver.

a) TA

It shows that an approaching aircraft is within a range where a collision could occur in about 25 to 48 seconds, and provides the radar position of the aircraft.

b) RA

*6 "MEA" stands for Minimum Enroute Altitude that is established between two radio navigation fixes on airways, RNAV routes, direct routes and part of oceanic transition routes, and that is the lowest altitude for safe IFR flight on those routes mentioned above. It is calculated by taking into consideration a radio wave arrival distance from aeronautical radio navigation facilities and safe clearance from the ground or obstacles.

	It informs that an approaching aircraft is within a range where a collision could occur in about 15 to 35 seconds, and provides instructions on avoidance maneuver the pilot needs to take. There are two types of TCAS, one is TCAS I that provides only TA, and the other is TCAS II that can provide TA and vertical RA. For aircraft with more than 19 passenger seats or aircraft equipped with turbine engines with maximum take-off weight exceeding 5,700 kg, TCAS II, version 7.1. is mandatory to be installed. Aircraft A does not have TCAS because it is not mandatory for installation. Aircraft B is equipped with TCAS II, version 7.1. (6) ATC facilities and others which Aircraft A contacted ATC facilities and Airport mobile communication station which Aircraft A contacted from its take-off from Yao Airport to the landing at Fukue Airport are put in order as follows: Controller at Yao Airport Traffic Control Tower, Controller at the terminal control area position of Kansai Terminal Control Facility, Fukuoka FSC, Nagasaki Tower and Fukue Aerodrome Information Service Station.

3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilot	None
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	(1) Identification of both aircraft Based on the statements of the captain of Aircraft A and the PIC of Aircraft B, the FO of Aircraft B, Fukuoka Departure, Fukuoka FSC and Saga Radio as well as records of ATC communications and radar tracking records at the time of the occurrence of the serious incident, the JTSB concludes that VFR aircraft, which was flying westward at an altitude of 4,600 ft, 4 nm east of SGE on the radar screen, was certainly Aircraft A, and that the passenger aircraft, which passed nearby Aircraft A over around Saga Airport, was certainly Aircraft B. (2) Both aircraft flight routes up to closest proximity The JTSB concludes that Aircraft A was certainly flying in level flight on VFR to the west-southwest toward Fukue Airport at an altitude of about 4,500 ft, and that Aircraft B was certainly flying on IFR and descending to an altitude of 5,000 ft toward SGE (to the northeast) on OLE-SGE direct route. Descending to the altitude of 5,000 ft, as instructed by Fukuoka Departure, Aircraft B came close to the instructed altitude of 5,000 ft, and

	its autopilot system was switched to the mode to level off, thus the descent rate was decreasing. When the RA was issued, the altitude was 5,070 ft. Fukuoka Departure instructed Aircraft B to descend to an altitude of 5,000 ft. The MEA on direct route between OLE and SGA was 5,000 ft at this serious incident site. At closest proximity, the time was 11:21:46, when the flight routes of both aircraft crossed each other, and the horizontal distance was 0 nm, and the altitude difference was 650 ft. (3) Evasive action Aircraft A did not take evasive action. Aircraft B took evasive action. The JTSB concludes that this is probably because Aircraft B was aware of the existence of VFR aircraft (Aircraft A) with the traffic information notified by the ATC and the information provided by its installed TCAS, and furthermore, it is probable that Aircraft B did not have to take evasive action so rapidly because its descent rate had been already reduced with its mode switched for a level flight. (4) Communications between VFR aircraft and ATC facilities and others The JTSB concludes that at the time of the occurrence of the serious incident, Aircraft A was flying tuning to the frequency of Fukuoka FSC which did not provide information concerning traffic using APDU, and thus it was not able to reply to the communication which Fukuoka TCA had sent to Aircraft A, and also failed to receive Information concerning traffic that Saga Radio had given to all aircraft, thus highly probably Aircraft A was not able to obtain the traffic information on Aircraft B and was unable to predict the presence of B aircraft. It is important for pilots flying on VFR to pay attention to the differences in operations and services of each ATC facility and Airport mobile communication station, and select appropriate ATC facility and Airport mobile communication station in order to receive services from them. It is also important for ATC facility and Airport mobile communication station to consider how to provide information after understanding difference in services each of them can provide. It is desirable to consider in the future how information should be provided with respect to ATC facility and Airport mobile communication station, taking into account the differences in the services that each can provide. A pilot flying on VFR in the TCA shall request the TCA advisory service as much as possible and receive services for supporting a VFR aircraft operation including radar traffic information. In addition, when flying in the vicinity of departure route / approach course at the airport congested with aircraft traffic, to monitor about the frequencies of the radio used for the ATC facilities and Airport mobile communication station is also more likely useful for accurately understanding traffic information.

	(5) Determination of Risk Classification The JTSB concludes that there was more likely no risk of collision or contact because the altitude difference between two aircraft was about 650 ft at closest proximity. Judging from the above, this serious incident is classified as "No risk of collision" under the International Civil Aviation Organization (ICAO) Document, Risk Classification of Aircraft Proximity. (See Attachment: Risk Classification of Aircraft Proximity)

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of this serious incident was that Aircraft A in level flight on VFR approached Aircraft B without predicting the existence of Aircraft B, because Aircraft A did not obtain the information on Aircraft B, which was flying on IFR and descending toward SGE on the direct route, from ATC facility and others.

In addition, it is probable that there was no risk of collision or contact even at the time of closest proximity.

Attachment: Risk Classification of Aircraft Proximity

I C A O Air Traffic Management (PANS-ATM) CHAPTER1. DEFINITIONS Aircraft proximity	
Risk Classification Explanation	Risk Classification 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: There is a statement of "The degree of risk involved in an aircraft proximity should be determined in the incident investigation and classified as "risk of collision", "safety not assured", "no risk of collision" or "risk not determined"." at 16.3.2 in PANS-ATM.

As a result of the danger assessment, the gray shaded category as above is applicable to this serious incident.