AA2013-8

AIRCRAFT ACCIDENT
INVESTIGATION REPORT

PRIVATELY OWNED

J A 2 2 D B

October 25, 2013

Japan Transport Safety Board

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 determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. 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 ACCIDENT INVESTIGATION REPORT

PRIVATELY OWNED
EXTRA EA300/200, JA22DB, CRASH INTO THE SEA
SURUGA BAY (THE WATERS OFF BETWEEN THE ESTUARIES OF OKITSU RIVER AND FUJI RIVER)
SOMETIME BETWEEN09:15 (LAST RADAR ACQUISITION) AND 10:17 (EXPECTED TIME OF FUEL EXHAUTION)
JULY 26, 2011

September 27, 2013

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>

On Tuesday July 26, 2011, a privately owned Extra EA300/200 took off from Fujigawa glider strip for flight test to prepare for the airworthiness inspection boarded by a pilot. The airplane did not return to the glider strip even after the expected time of arrival, 09:57 and went missing. At around 15:00 the same day, the search operation recovered airplane debris from the sea stretching between the estuaries of Okitsu River and Fuji River, northern part of Suruga Bay. It was unable to find the pilot.

<Probable Causes>

This accident possibly occurred as follows: the airplane not equipped with an attitude indicator encountered bad weather; the pilot lost visual cue in the clouds was falling into a spatial disorientation; and resulted in the crash into the sea.

The JTSB doesn't deny the possibilities of mechanical anomalies which lead to the unusual attitude, or the lightning strike which inhibited the normal flight. With the missing pilot and small fraction of recovered debris, the JTSB was unable to identify the probable cause of the crash.

The following abbreviations and unit conversion are used in this report.

Abbreviations

ELT: Emergency locator transmitter

GPS: Global positioning system

RCC: Rescue coordination center

VFR: Visual flight rules

VHF: Very high frequency

Unit conversion

1ft: 0.305 meters

1lb: 0.45 kilograms

1in.: 25.4 millimeters

1. PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Tuesday July 26, 2011, a privately owned Extra EA300/200 took off from Fujigawa glider strip for flight test to prepare for the airworthiness inspection boarded by a pilot. The airplane did not return to the glider strip even after the expected time of arrival, 09:57 and went missing. At around 15:00 the same day, the search operation recovered airplane debris from the sea stretching between the estuaries of Okitsu River and Fuji River, northern part of Suruga Bay. It was unable to find the pilot.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On July 27, 2011, the Japan Transport Safety Board designated an investigator-in-charge and one investigator for the accident investigation.

1.2.2 Representatives from Relevant State

An accredited representative of Germany, as the State of Design and Manufacture of the airplane involved in this accident, participated in this investigation.

1.2.3 Implementation of the Investigation

July 27 and 28, 2011: Interview, on-site investigation and examination of the recovered debris

August 23, 2011: Examination of the recovered debris

1.2.4 Comments From the Parties Relevant to the Cause of the Accident

No comments were taken from the pilot due to his status of missing.

1.2.5 Comments From the Relevant State

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

2. FACTUAL INFORMATION

2.1 History of the Flight

On July 26, a privately owned Extra EA300/200 took off from the runway 18, Fujigawa glider strip at 08:57 for flight test to prepare for the airworthiness inspection with a pilot boarding in the rear seat, which is located in Kanbaramukojima, Shimizu-ku, Shizuoka City, Sizuoka Prefecture.

The outline of the flight plan filed was as follows:

Flight rules:	VFR
Departure aerodrome:	Fujigawa glider strip
Estimated off-block time:	09:00
Cruising speed:	130 kts
Route:	Miho
Destination aerodrome:	Fujigawa glider strip
Total estimated elapsed time (EET):	1 hr 00 min
Purpose of flight:	Flight test
Fuel load expressed in endurance:	1 hr and 20 min
Persons on board:	1

2.1.1 Development of the Flight Based on the Radar Trajectory Recorded at Hamamatsu Base, Japan Air Self-Defense Force (JASDF)

The radar of the Hamamatsu Base, JASDF recorded the airplane's intermittent trajectories from 09:14:33 to 09:15:14 and from 09:15:33 to 09:15:53. These trajectories showed its left turn over the estuary of Okitsu River at 4,200 feet and roll-out to the general direction of the glider strip. Its altitude diminished from 5,000 feet to 4,600 feet within eight seconds (the rate of descent equals to as much as 3,000 fpm). The airplane was out of the radar detection from 09:15:14 to 09:15:33 and on and after 09:15:53.

(See Figure 1: Estimated Flight Route, Figure 2: Radar Controller)

2.1.2 Radio Transmission Record Between the Pilot and a Radar Controller

The transmission between the pilot and the controller is as follows. The nuance in the manner and voice of the pilot was normal. The symbol "…" in the following texts denotes the intermittent and inaudible portion of the radio transmission.

09:15:18	Pilot	HAMAMATSU RADAR, JULIET ALPHA TWO TWO DELTA BRAVO (with static noise).
09:15:24	Controller	STATION CALLING, HAMAMATSU RADAR, SAY

		AGAIN CALL SIGN.
09:15:27	Pilot	YES, JULIET ALPHA … DELTA BRAVO. AROUND MIHO. REQUEST TRANSPONDER CHECK (with static noise).
09:15:36	Controller	(With rattling noise) STATION CALLING, HAMAMATSU RADAR, YOUR VOICE CUTTING. SAY AGAIN.
09:15:38	Pilot	YES, JULIET ALPHA TWO TWO DEL … (with static noise).
09:15:51	Controller	(With rattling noise) JULIET ALPHA TWO TWO DELTA PAPA, GO AHEAD.
09:16:00	Controller	…
09:16:20	Controller	STATION CALLING, HAMAMATSU RADAR, SAY AGAIN. YOUR VOICE CUTTING.
09:17:10	Controller	(Noise)

2.1.3 Statement of the Relevant Person

A mechanic who had been in charge of the airplane maintenance stated the development up to one hour and 20 minutes into the situation as follows:

The mechanic's maintenance work for the airworthiness inspection ended on July 25 with an engine run. He confirmed that it had no anomalies. When the mechanic showed up on the day of the accident, he found the pilot had already parked the airplane in front of the hanger ready to tow it with a tow tractor. The pilot towed it to the runway. He filed the flight plan to start the flight at 09:00. The purpose of flight was transponder check.

The pilot did the engine run while the mechanic did the exterior check. The radio transmission check revealed no anomalies. The pilot said "It's going to rain. I doubt the weather hold in the morning. I will be back in about 20 minutes against the flight plan with 1-hour EET." His manner was as normal as before.

The airplane took off from runway 18, climbed straight followed by a left turn over the Fuji River and flew west after flying over the glider strip. The mechanic called the pilot over the radio with no reply from him. The mechanic thought that the pilot had changed the frequencies and saw it off until it went out of sight.

The mechanic called the airplane at about 10:10 as it didn't come back even after one hour into the flight. He had no response. He became uneasy when it became one hour 20 minutes into the flight and dialed the pilot's cell-phone number. The response was an automated out-of-reception message. He tried again a little

while later, this time he had also no response.

At about 10:30 he made a phone call to an air traffic services flight information officer at Tokyo Airport Office to get information about the airplane, but no information was available.

Judging from the dispersed debris the very likely accident site is the sea stretching off between the estuaries of Okitsu River and that of Fuji River, northern part of Suruga Bay—the air space above this area is referred to as "the accident airspace" in this report. The exact time of occurrence was not determined although it is short time after the loss of airplane's radar detection at 09:15:53, July 26, 2011.

(See Figure 1: Estimated Flight Route, Picture 1: Accident Airplane)

2.2 Injuries to Persons

The pilot became missing.

2.3 Damage to the Airplane

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to Airplane Components

a. Fuselage: Damaged

b. Wings: Damaged

c. The engine, propeller, instrument and other parts were not recovered.

(See Picture 2: Recovered Debris)

2.4 Personnel Information

2.4.1 Certificates

Pilot Male Age 56

Commercial pilot certificate (Airplane, single engine, land):	October 9, 1981
Type rating for Multi-Engine Land	November 27, 1995
Instrument flight certificate (Airplane):	June 24, 1997
Class 1 aviation medical certificate	
Validity:	Until September 5, 2011
Total flight time:	4,053 hr and 38 min
Flight time in the last 30 days:	1 hr and 55 min
Total flight time on type of aircraft:	83 hr and 57 min
Flight time in the last 30 days:	1 hr and 55 min

2.4.2 Pilot's Flight Experience on The Airplane

The pilot's flights from January to July 2011 were logged in the aircraft flight logbook with average monthly flight time of two hours and 30 minutes.

2.5 Aircraft Information

2.5.1 Airplane

Type:	Extra EA300/200
Serial number:	020
Date of manufacture:	October 7, 1997
Certificate of airworthiness:	No. TO-22-257
Validity:	August 19, 2011
Category of airworthiness:	Airplane Normal N or Acrobat A
Total flight time:	1,314 hr and 02 min
Flight time since last periodical check (100 hr check, July 25, 2011):	0 hrs 00 min

(See Figure 3: Three-Angle View of Extra EA200)

2.5.2 Engine

Type:	Lycoming AEIO-360-A1E
Serial number:	L-33886-51E
Date of manufacture:	October 19, 2007
Total flight hour:	122 hr and 18 min

2.5.3 Onboard Navigational Instruments

The front cockpit housed an altimeter and a speedometer while rear cockpit housed an altimeter, turn/bank indicator, magnetic compass, engine revolution indicator, manifold pressure gauge, exhaust gas temperature indicator, oil temperature/pressure indicator, fuel quantity indicator, and GPS, except attitude indicator. An attitude indicator is indispensable for instrument flight; it is not a mandatory requirement for VFR flight. The Aircraft Flight Manual warns solo flights to be done in the aft seat in Paragraph 14 "Limitations, " Chapter 2.

2.5.4 Antenna Locations of VHF Radio and Transponder

The VHF radio antenna was installed inside the vertical fin, while that of the transponder on the forward under fuselage.

2.5.5 Weight and Balance

When the accident occurred, the weight of the airplane is estimated to have been about 690 kilograms, and the center of gravity is estimated to have been about 82 centimeters aft of the reference line, both within the allowable ranges (the maximum takeoff weight of 840 kilograms and the CG range of 73.2 to 89.1 centimeters corresponding to the weight at the time of the accident).

2.5.6 Fuel and Lubricating Oil

The fuel was AVGAS100 and lubricating oil was AEROSHELL W100

2.5.7 Documents to be boarded

The flight logbook was found in the hanger, which is supposed to have been on board the airplane.

2.6 Meteorological Information

2.6.1 General Weather Outlook

The excerpt of the general weather outlook for Shizuoka Prefecture released on the day of the accident by Shizuoka Local Meteorological Observatory at 04:48 was as follows:

> A trough with cold air mass over the Sea of Japan is slowly moving to the east. Warm southerly wet air mass is flowing into it.
>
> Shizuoka Prefecture's prevailing weather will be cloudy due to this atmospheric pattern.
>
> With the influence of cold air mass and southerly wet air, the atmosphere will be unstable today. It will be cloudy with occasional rain in Shizuoka Prefecture and some places will have heavy thunderstorms.
>
> Cold air mass and warm southerly wet air will make atmosphere unstable tomorrow as well and it will be cloudy with occasional rain or thunderstorms.

2.6.2 Aeronautical Weather Observation at Shizuoka Airport

Aerodrome routine meteorological report (hereinafter referred to as METAR) for Shizuoka Airport located 49 kilometers southwest of the accident airspace during the time frame relevant to the take off time of the airplane as follows:

09:00

> Wind direction 350°; Wind velocity 4 kts; Wind direction variations 310°-010°

Prevailing visibility 4 km, Mild thunderstorm, Haze

Cloud: Amount 1/8, Type Stratus, Cloud base 300 ft

Amount 4/8, Type Stratus, Cloud base 700 ft

Amount 1/8, Type Cumulonimbus, Cloud base 2,000 ft

Amount 7/8, Type Cumulus, Cloud base 2,500 ft

Temperature 22°C, Dew point 22°C

Altimeter setting (QNH) 30.06 inHg

Thunderstorm 10 km north of the airport moved to northeast.

2.6.3 Terminal Aerodrome Forecast for Shizuoka Airport

06:00

Wind direction 040°; Wind velocity 4 kts

Prevailing visibility 8 km

Cloud: Amount 1/8, Type Stratus, Cloud base 800 ft

Amount 6/8, Type Stratus, Cloud base 1,200 ft

Prevailing visibility 1,200 m, thunderstorm, haze expected temporally from 07:00 to 12:00

Cloud: Amount 6/8, Type Stratus, Cloud base 300 ft

Amount 7/8, Type Cumulus, Cloud base 500 ft

Amount 1/8, Type Cumulonimbus, Cloud base 2,000 ft

Wind speed and wind direction to shift to 210°/10 kts at 12:00 starting at 10:00.

2.6.4 Automated Meteorological Data Acquisition System (AMeDAS) Information Near the Glider Strip

a. Shimizu observation station (12 kilometers south west of the glider strip)

09:00 Wind direction 157.5°, wind speed 1.2 m/s, Temperature 25.8°C

09:30 Wind direction 247.5°, wind speed 1.5 m/s, Temperature 23.5°C, Precipitation 3.0 mm/h

b. Fuji observation station (8 kilometers north-northeast of the glider strip)

09:00 Wind direction 180.0°, wind speed 1.3 m/s, Temperature 25.9°C

09:30 Wind direction 180.0°, wind speed 2.0 m/s, Temperature 26.0°C

2.6.5 Asia Pacific Surface Analysis Chart

The Asia Pacific Surface Analysis Chart as of 09:00 July 26, 2011 depicted that the high pressure of 1,024 hPa was in the far east of Japan, and it is overhanging west.

In addition, 850 hPa and 700 hPa Asia Analysis Charts as of 09:00 read southwesterly winds of 10-15 knots over Tokyo at altitudes of 1,560-3,180 meters.

(See Figure 4: Surface Analysis Chart)

2.6.6 Radar Echo Composite Chart

According to the Radar Echo Composite Chart (Precipitation) generated by Japan Meteorological Agency, northeastern part of Shizuoka Prefecture had precipitation of 6 mm/h when the airplane took off at 08:57. The chart also showed that the cloud of 8,000-meters cloud top height was over the estimated flight route at 09:20.

(See Figure 5: Echo Altitude (Cloud Top) Composite Chart and Figure 6: Echo Intensity (Precipitation) Composite Chart)

2.6.7 Weather Conditions Stated by the Mechanic

According to the mechanic, the weather conditions at the glider strip were as follows:

> It was VFR condition, but the visibility was diminishing and dark clouds were observed to the west. When the airplane took off, the western mountains were not visible; factory chimneys on the other side (to the east) of the Fuji River were clearly visible. About 20 minutes after the airplane's takeoff, it downpoured for 5-10 minutes deteriorating the visibility not being able to see the other side of the river, then visibility was recovered. At about 09:30 he heard rambling of the thunder from the southwest.

2.7 Accident Airspace and Debris Information

2.7.1 Accident Airspace

Suruga Bay covers northern part of an imaginary line (length about 55 kilometers) between Omaezaki Point and Irōzaki Point at the tip of Izu Peninsula. The bay is deep and its tidal current is complicated.

The accident airspace is 80-90 kilometers northeast of Hamamatsu Base. A mountain range which stretches southward with ridge elevation of 600-800 meters (1,800-2,400 feet) is located between the Base and the airspace. The mountain range generates non-detectable areas to the east of the range and this overlaps the accident airspace.

(See Figure 1: Estimated Flight Route)

2.7.2 Detailed Damage Description

Recovered debris included such as parts of wings, elevators, engine cowling, both main landing gear tires and wheels. The wheels were deformed and tires were punctured. The remaining major parts such as fuselage, vertical fin, engine and propellers were not recovered.

Burned and charred wing main spar was recovered on the beach about 16 kilometers east of the strip on March 3, 2011; other recovered right wing parts exhibited no fire damage.

(See Picture 2: Recovered Debris)

2.7.3 Search and Rescue Operation

According to Japan Coast Guard (JCG) and Tokyo Rescue Coordination Center (RCC[1]), the overview of search and rescue (SAR) operation went as follows:

July 26

09:57	The SAR operation was initiated due to the absence of arrival confirmation.
10:28	As it passed the expected fuel starvation time (10:17), the SAR phase shifted into the distress phase.
10:45	Shimizu Coast Guard Office issued an order to Kano and Fujikaze to search the waters from the estuary of Fuji River to the waters off Miho, along the airplane's estimated flight route.
11:55	The RCC requested the Central Air Defense Force Headquarters, JASDF in Iruma City to dispatch units as part of disaster relief operation.
14:47	JASDF aircraft found a piece of probable body part on the sea. (Later examination confirmed that the DNA of this body part matched that of the pilot).
14:58-15:35	Kano recovered debris of upper surface of the fuselage.
16:05	Mihokaze (patrol vessel) shipped them to the Coast Guard Office. The mechanic identified them as parts of the airplane.
16:12	Kano recovered debris of the upper left wing surface.
18:00	Suruga (Police patrol vessel) recovered debris of cockpit.

July 27

17:50	A helicopter dispatched from Central Air Defense Force

[1] RCC is an on-demand organization set up at Tokyo Airport Office to have a direct control of SAR operations from the broader point of view.

recovered debris of nacelle.

July 28

08:40 Mihokaze recovered debris part of the seat.

09:40 A Coast Guard airplane (stationed at Haneda Air Base) was mobilized for the search.

12:45 Kano recovered debris of the right wing and other things.

19:00 Each participating organization was relieved from the search and shifted to normal patrol status.

August 8

17:15 SAR operation was terminated.

The locations and date/time of recovered debris are as follows:

Pieces of recovered Objects originating from	Locations (Δ in Fig.1)		Date/Time of discovery
	Latitude	Longitude	
Upper surface, fuselage	35° 0.30'	138° 38.90'	14:58~15:35, Jul. 26
Upper surface, L wing	35° 1.80'	138° 39.90'	16:30~17:00, Jul. 26
Cockpit	35° 0.02'	138° 37.98'	18:00, Jul. 26
Nacelle	35° 5.90'	138° 41.30'	17:50, Jul. 27
Seat	35° 5.60'	138° 40.00'	08:40, Jul. 28
Right wing, etc	35° 3.00'	138° 35.80'	12:45~14:04, Jul. 28

Total number of mobilized aircraft, ships and personnel for the SAR and recovery are as follows:

JCG: 4 ships, 1 airplane, 1 helicopter, 67 personnel

Shizuoka Air Rescue: 1 helicopter, 5 personnel

Shizuoka Prefectural Police: 1 ship, 1 helicopter, 8 personnel

Ministry of Defense: 2 helicopters, 4 personnel

(See Figure 1: Estimated Flight Route)

2.8 Medical Information

2.8.1 Pilot's Medication

According to the pilot's doctor the pilot saw him in January 2007; however, symptoms improved by medication then. His symptoms had been improving in July 2011: never the less, he had received continue to medication.

The names of remedial drugs, dosage, types, target symptoms and side effects are listed below and use of each drug is declarable upon aviation medical examination.

Name	Dosage	Type	Efficacy	Side effect
Prednisolone	1 tablet after breakfast	Steroid	Chronic rheumatoid arthritis, Juvenile rheumatoid arthritis Rheumatic fever *	Nausea, Stomachache, Heartburn, Dry mouth Loss of appetite, Insomnia, Arthralgia, Fever, Dullness, Weight increase *
Methotrexate	5 tablets/week	Immuno-suppressive drug	Chronic rheumatoid arthritis *	Bone marrow suppression, Gastrointestinal disorder, Hepatornphric disorder, Interstitial pneumonia, Leukocytopenia *
Leucovorin	1 tablet/week	Antifolate	Alleviation of side-effects by Methotrexate *	Diarrhea, Loss of appetite, Dullness *

* Excerpts from Encyclopedia of Medicines, 21st edition (Authored by Toshiya Tachibana, Published by Socym Co. Ltd. in 2011), Encyclopedia of Medicines, 2009 edition (Authored by Miyazaki Toshio, Published by Asakurasyotenn Co. Ltd.)

2.8.2 Aviation Medical Certificate

The application form for aviation medical certificate requires current medication (medicine for external use and sleeping pills, both inclusive) to be filled. The last three application forms (submitted in 2008, 2009 and 2010) carried no description on the used drug. The organization designated to perform the medical certification had, as per the document storage period (five years), destroyed the pilot's application form for the year 2007, which was the first application submitted after his rheumatism diagnose. For this reason the contents of the application remain unknown.

2.9 Other Information

2.9.1 Flight and Visual Sensation

"Aeronautical Medicine" (co-authored by Kenichi Higashi and Masaoki Tsuchiya, published by HOBUN SHORIN CO. LTD. in 1997) carries the description on spatial disorientation derived from visual illusion as one of the sensational illusions under poor visibility.

> *Our brain processes the information derived from vision, somatic sensation[2], and the sense of equilibrium to form spatial orientation. Erroneous interpretation of this information results in spatial disorientation. Lack of sensation information leads to a poor judgment. Conflicts between the vision and sense of equilibrium may lead to spatial disorientation. (Some portions omitted) During a night flight or a flight under adverse weather conditions a pilot has difficulty to establish cues for attitude judgment and tends to lose spatial orientation. Obscured horizon or distant view may affects pilots to unknowingly deviate from proper flight attitude.*

2.9.2 Emergency Locator Transmitter

The onboard emergency locator transmitter (ELT) was removed from the airplane for the periodical check and the airplane flew without it.

The mechanic stated why it was removed as follows:

He asked the pilot to have it checked by certified organization. He believed the returned ELT was installed by the pilot; however he found it in the hanger.

The maintenance log showed that the ELT had been installed and the mechanic had completed the inspection on damage, airplane installation (done on July 23, 2011) as well as the completion of the aircraft 100-hour check.

The ELT was capable of sending signal to airplanes or ships on 121.5 MHz while sending location signal to search and rescue satellites on 406 MHz.

Either type 1 (automatic activation) or type 2 ELT is mandatory to be installed regardless of over-water flight, depending on an airplane's use and number of passenger seats. It was mandatory for the airplane to install it on and after July 1, 2011.

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[2] Somatic sensation means the sensation generated from skin sensation, tension of muscles or tendons.

3. ANALYSIS

3.1 Qualification of Flight Crew

The pilot held valid airman competence certificate and valid aviation medical certificate.

3.2 Airworthiness Certificate

The airplane had a valid airworthiness certificate and had been maintained and inspected as prescribed. But the limited amount of recovered debris made it impossible to judge whether the airplane had anomalies or not.

The accident flight without installing the ELT, as described in the section 2.9.2, violated the article 62, Civil Aeronautics Act (CAA) and article 150, Ordinance for Enforcement of the Civil Aeronautics Act (OECAA), both stipulate the installment of emergency equipment (ELT inclusive). Had it been installed, the SAR operation could have been done more effectively.

The flight logbook, as described in 2.5.7, was found in the hanger not boarded on the airplane. This was the violation of the article 59, CAA, and article 144, OECAA.

3.3 Meteorological Conditions

According to the METAR information as of 09:00 at Shizuoka Airport, the airport observed a mild thunderstorm, visibility of four kilometers with haze, nearly overcast with cumulus with its cloud base at 2,500 feet (762 meters). Figure 5 Echo Altitude (Cloud Top) Composite Chart showed 11,000-feet-high cumulonimbus at 10 kilometers north of the airport was traveling east.

Along the airplane's estimated route which connects the estuary of Fuji River and Miho airstrip between 09:00 and 09:20, Figure 6 Echo Intensity (Precipitation) Composite Chart shows the precipitation of six millimeter per hour, while AMeDAS recorded precipitation of three millimeter per hour at Shimizu at 09:30. These facts suggest southerly wet warm air flowed into Shizuoka Prefecture generating unstable air conditions. The mechanic stated that he had heard rumbling of thunderstorm to the southwest of the glider strip at about 09:30.

With these things considered, it is somewhat likely that the airplane was flying in-cloud or in the precipitation.

3.4 Airplane's Flight Route and the Pilot's Decision

3.4.1 Flight Route After the Takeoff

According to the statement in 2.1.3, it is somewhat likely that the airplane took

off from runway 18 and headed west, and Hamamatsu Radar captured it over the estuary of Okitsu River, its possible flight route was along the coast line heading west over Suruga Bay.

Its radar return was lost for 19 seconds after 09:15:14. It was recaptured after a left turn for 20 seconds after 09:15:33, the pilot possibly had an intention of returning to the glider strip.

3.4.2 Flight Between 09:15:33 and 09:15:53

The pilot was communicating with the radar controller to have his transponder return checked. As the transmission was broken, he possibly climbed to 5,000 feet. The airplane was radar-captured during this period while his transmission terminated abruptly at 09:15:38. Characteristics of radio wave propagation, radio malfunction, or an urgent situation for the pilot to discontinue radio transmission is a possible cause for disrupted transmission.

There is also a possibility of lightening strike, as this occurred when the rumbling of thunder was heard from southwest at the glider strip and recorded radio transmission included static noise.

As described in 2.1.1, the airplane, after leveling off at 5,000 feet, descended about 3,000 fpm during the period from 09:15:45 to 09:15:53 and its radar capture was lost. It is probable that its flight was probably normal until the sudden dive.

3.4.3 Reason of Sudden Dive

The following are possible reasons for the sudden dive which took place at 09:15:45.

a. Voluntary dive

Under the suddenly deteriorated weather conditions, the pilot dived toward the visible sea surface to escape the bad weather conditions.

b. Involuntary dive

(1) Loss of attitude reference cue due to low visibility

As the glider strip observed precipitation which reduced the visibility to two kilometers at around 09:20, in the vicinity of the estuary of Okitsu River the visibility was reduced well before 09:20. In the airspace over the estuary where the airplane made a left turn to 60° it is possible that the weather conditions were as bad as it was difficult to maintain proper flight attitude.

(2) Onboard equipment

The airplane, as described in 2.5.3, was not equipped with an

attitude indicator—no onboard attitude reference, it was impossible to judge airplane attitude in the airspace where outside reference cue is unobtainable.

Considering the above mentioned (1) and (2), the pilot fell into the spatial disorientation as he flew in the airspace where no outside reference cue is available. Once a pilot loses spatial orientation, it is impossible to get out of it without visually confirming clear outside attitude reference cue, such as the horizon.

It cannot deny the possible attitude loss due to control malfunction and loss of normal flight due to lightning strike. However, the fact that small portion of airplane debris and body tissue of the pilot are recovered made it impossible to identify the cause of sudden dive.

The airplane's attitude (with its antenna on its belly) during the dive with its transponder antenna facing away from the radar probably affected the loss of radar return after 09:15:53 in addition to the possible geographical effects on radar wave caused by the mountain range.

3.4.4 Determination of the crash location

As described in 2.7.1, the airplane's last radar track was lost due to the lost radar return and the exact location of the crash was not determined as the ELT was not installed as described in 2.9.2.

As described in 2.7.3, the vastly dispersed debris suggests possible midair disintegration; however, floating debris might travel by the complicated currents of suruga Bay transported them. For these reasons it was unable to determine the occurrence of midair disintegration and the exact location of the crash.

3.5 Airplane Part Damaged by Fire

As stated in the section 2.7.2, the portion of the right wing main spar was the only part that was damaged by fire. In-flight fire originated from the fuel tank should have damaged wider area; recovered peripheral parts exhibited no sign of fire. This fact suggests that the fire damage was caused upon the impact with the surface or sometime later, not in-flight.

3.6 Aviation Medical Certificate

As described in 2.8.1, from January 2007 to the time of occurrence of the accident, the pilot was receiving medications that, if taken, may have affected his piloting abilities.

However, as s described in 2.4.2, records indicated that he logged the average

monthly flight time of two hours and 30 minutes, even under the medication. His absence made it impossible to get his statement for detailed medication. Consequently, it was impossible to investigate matters such as whether or not his piloting abilities were affected by the side effects of the medication. Upon applying for the aviation medical certificates, he should have state the medication taking at the time, while seeking diagnosis from a doctor.

4 PROBABLE CAUSE

This accident possibly occurred as follows: the airplane not equipped with an attitude indicator encountered bad weather; the pilot lost visual cue in the clouds was falling into a spatial disorientation; and resulted in the crash into the sea.

The JTSB doesn't deny the possibilities of mechanical anomalies which lead to the unusual attitude, or the lightning strike which prevented the normal flight. With the missing pilot and small fraction of recovered debris, the JTSB was unable to identify the probable cause of the crash.

Figure1 Estimated Flight Route and Discovery position, the date and time

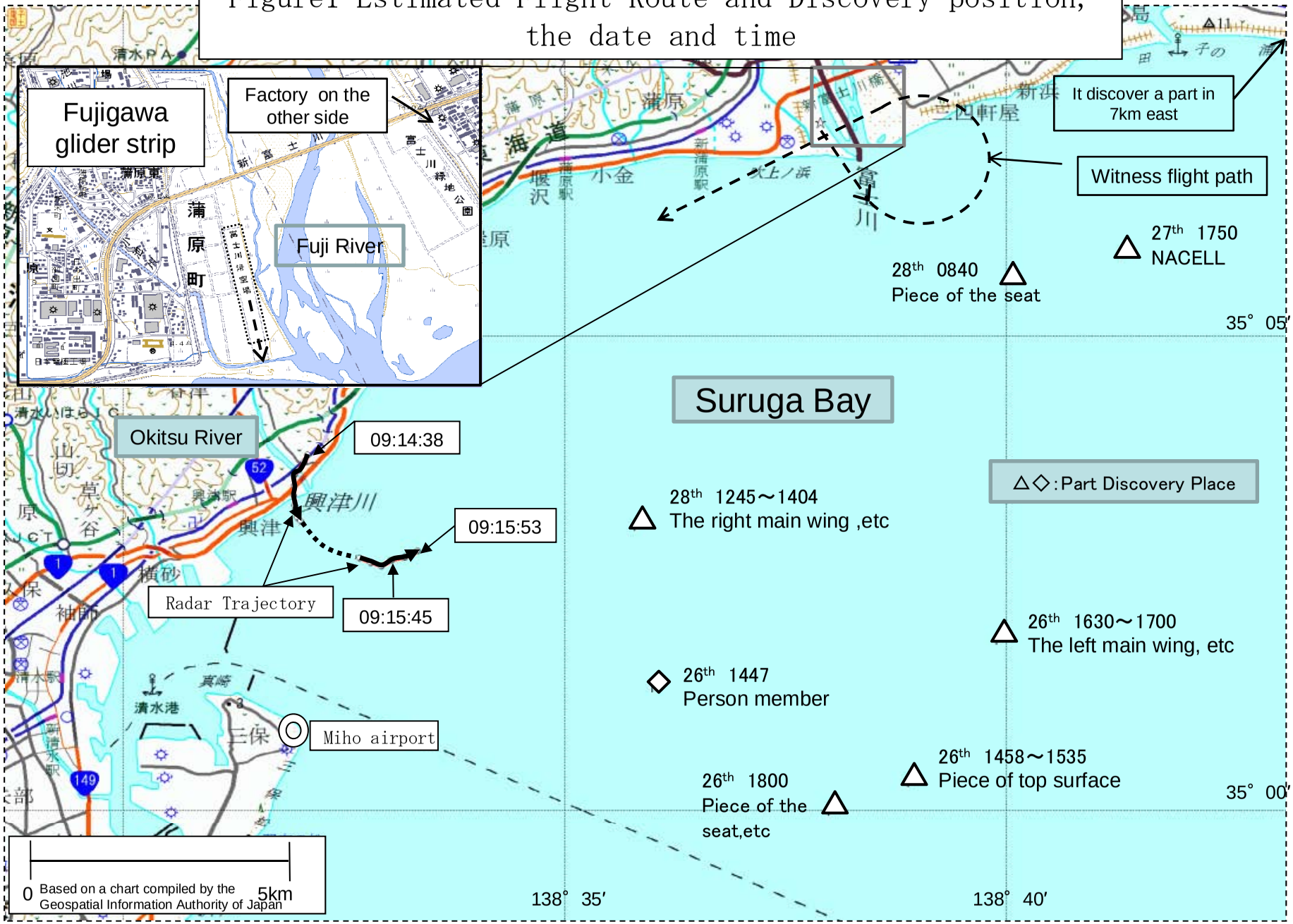
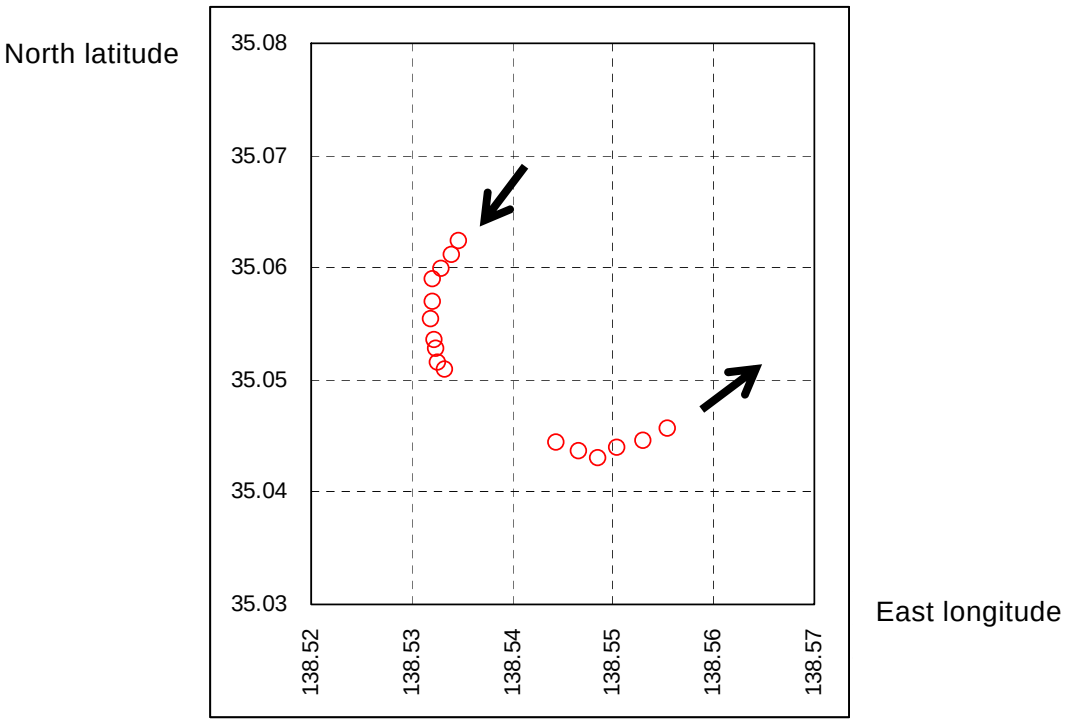
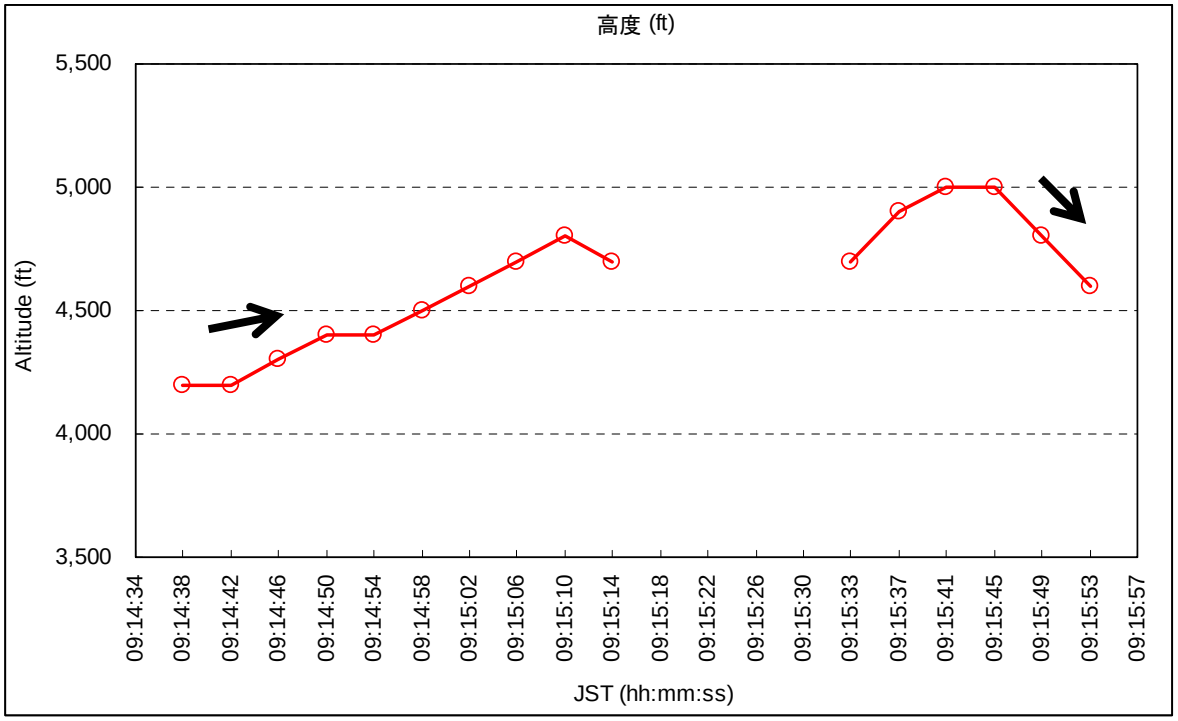


Figure 2 Rader Controller



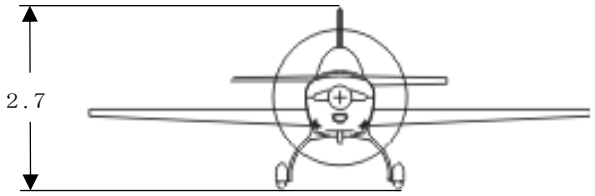
Flight Path

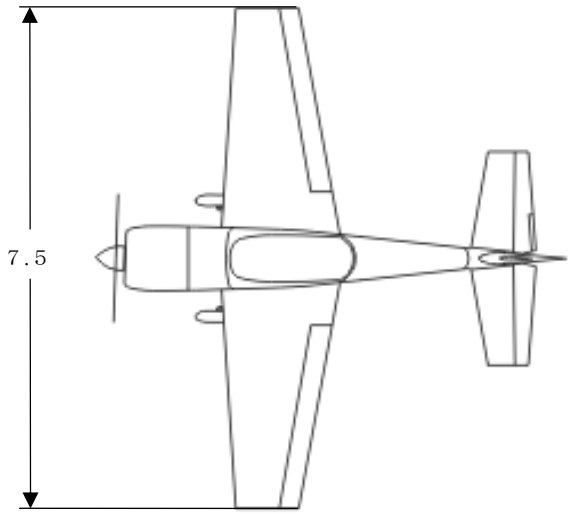


Flight Path

Figure 3 Three Angle View of Extra EA200

unit：m





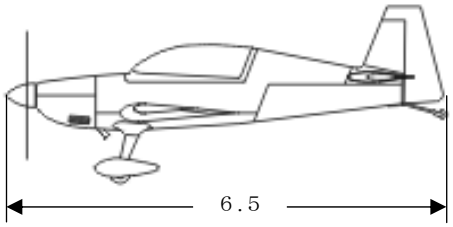


Figure 4 Surface Analysis Chart

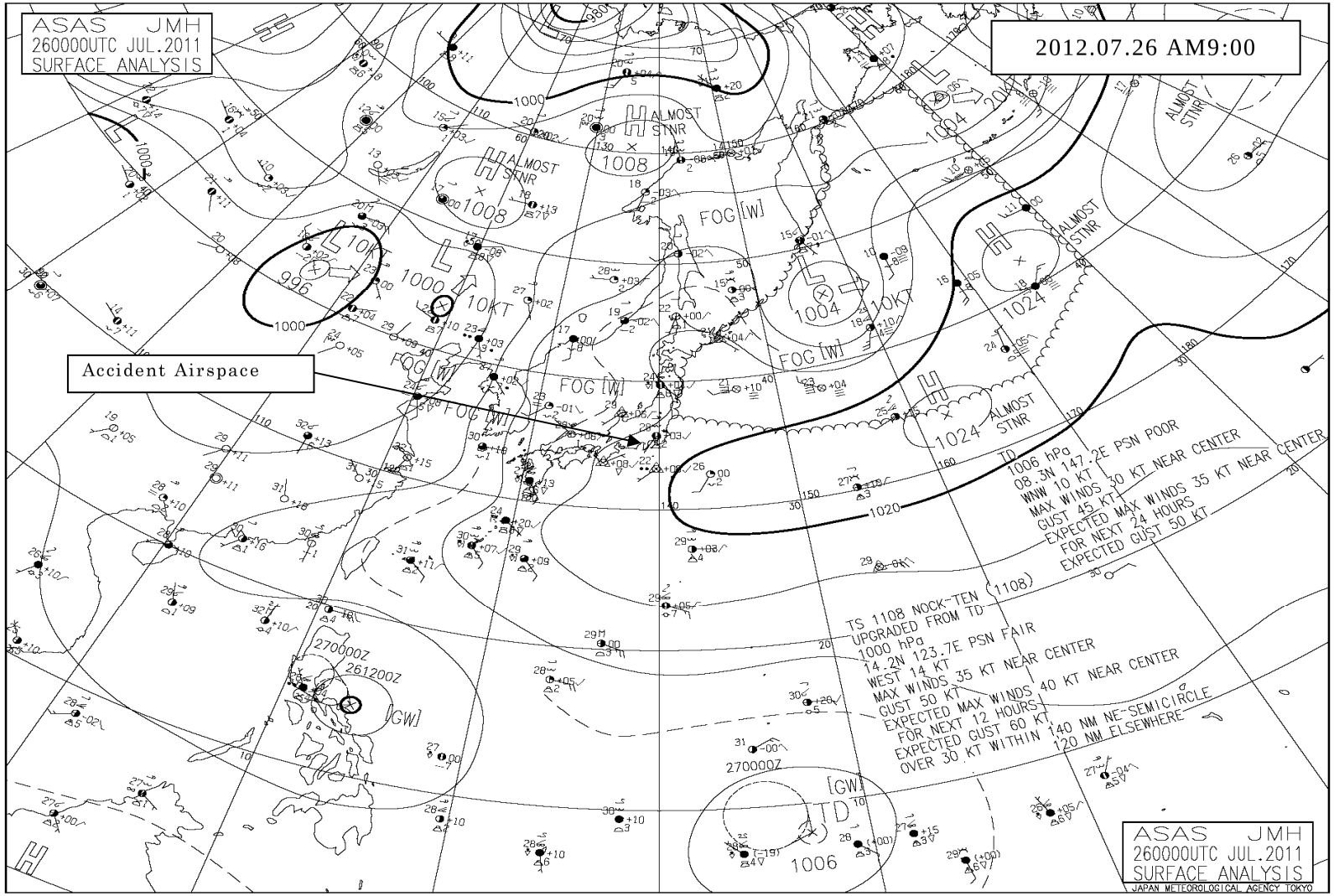
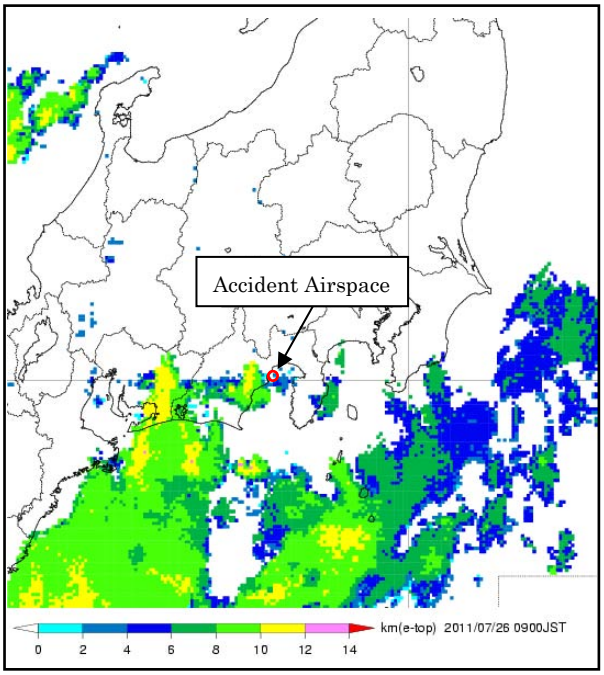


Figure 5 Echo Altitude (Cloud Top) Composite Chart



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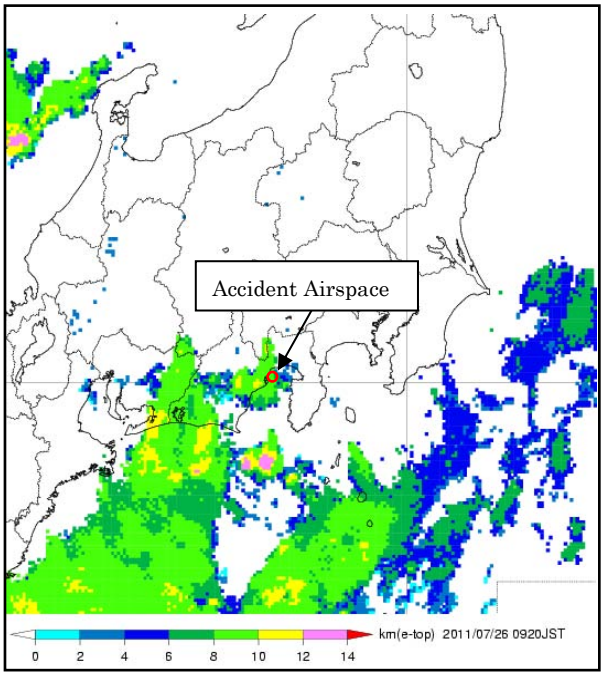

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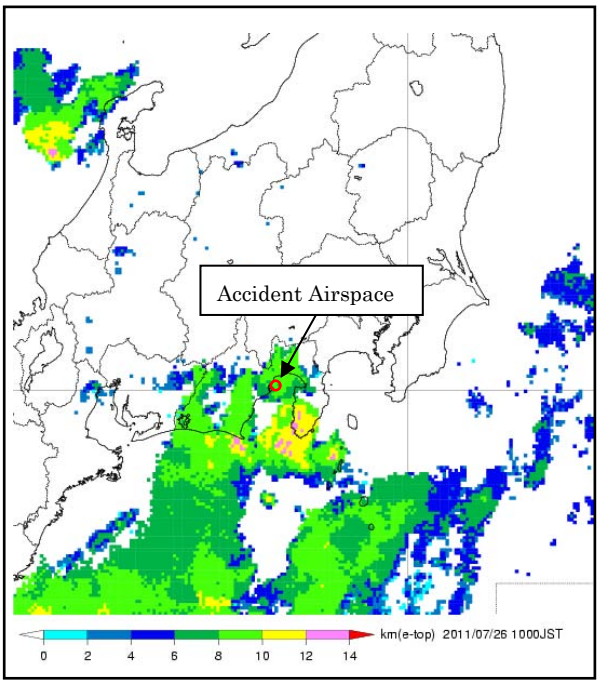

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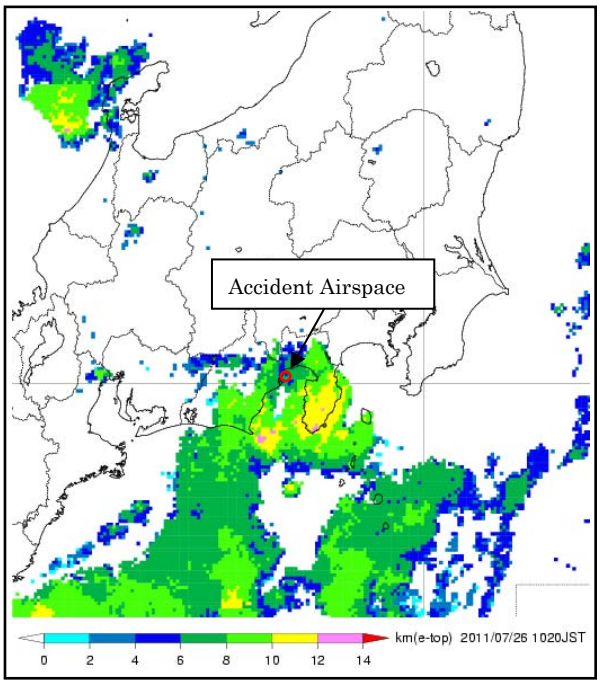

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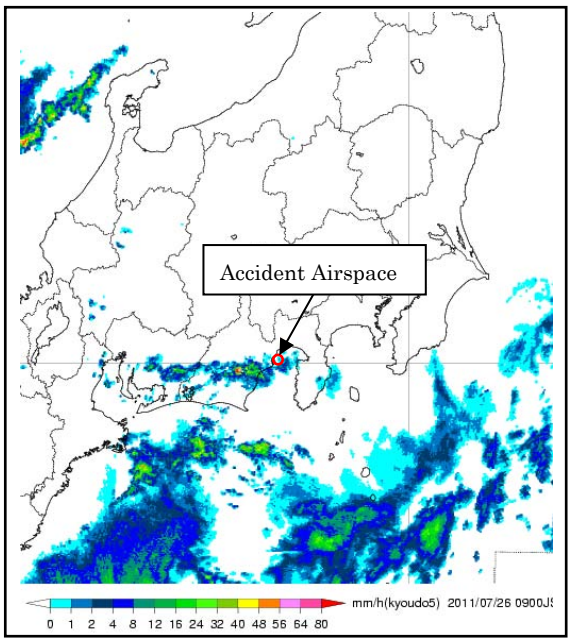
Figure 6 Echo Intensity (Precipitation) Composite Chart



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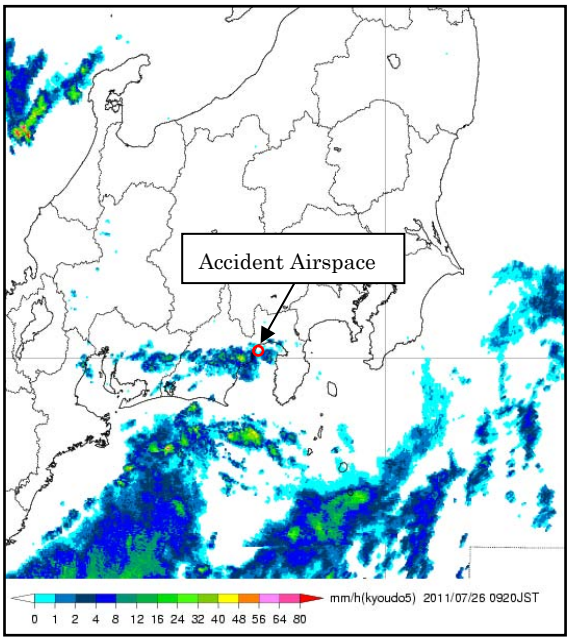

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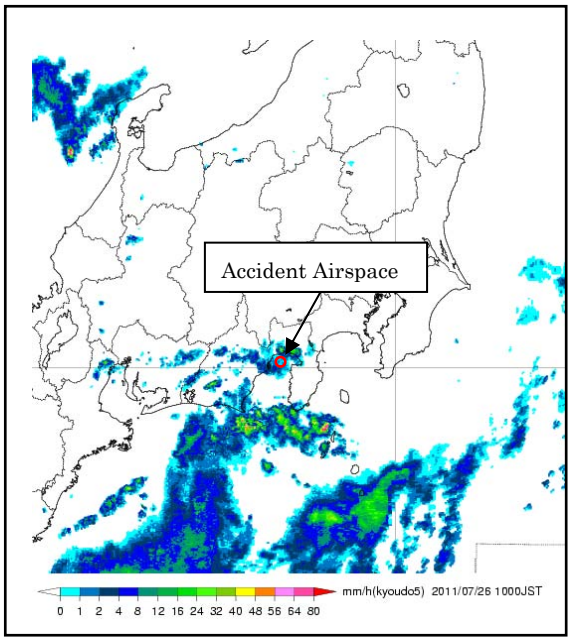

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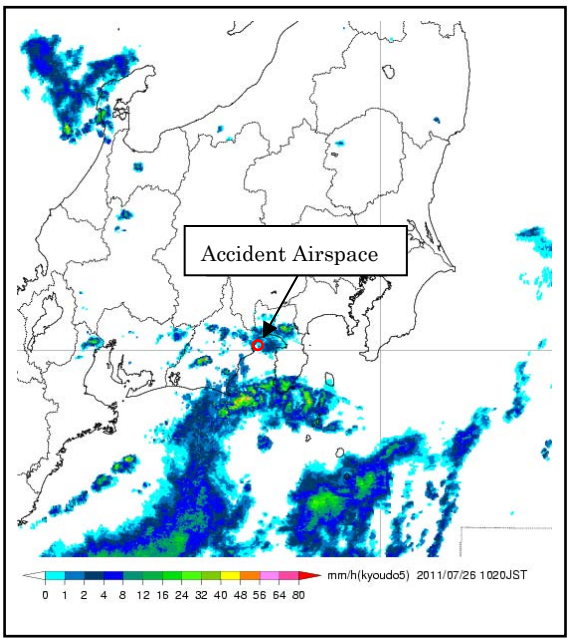

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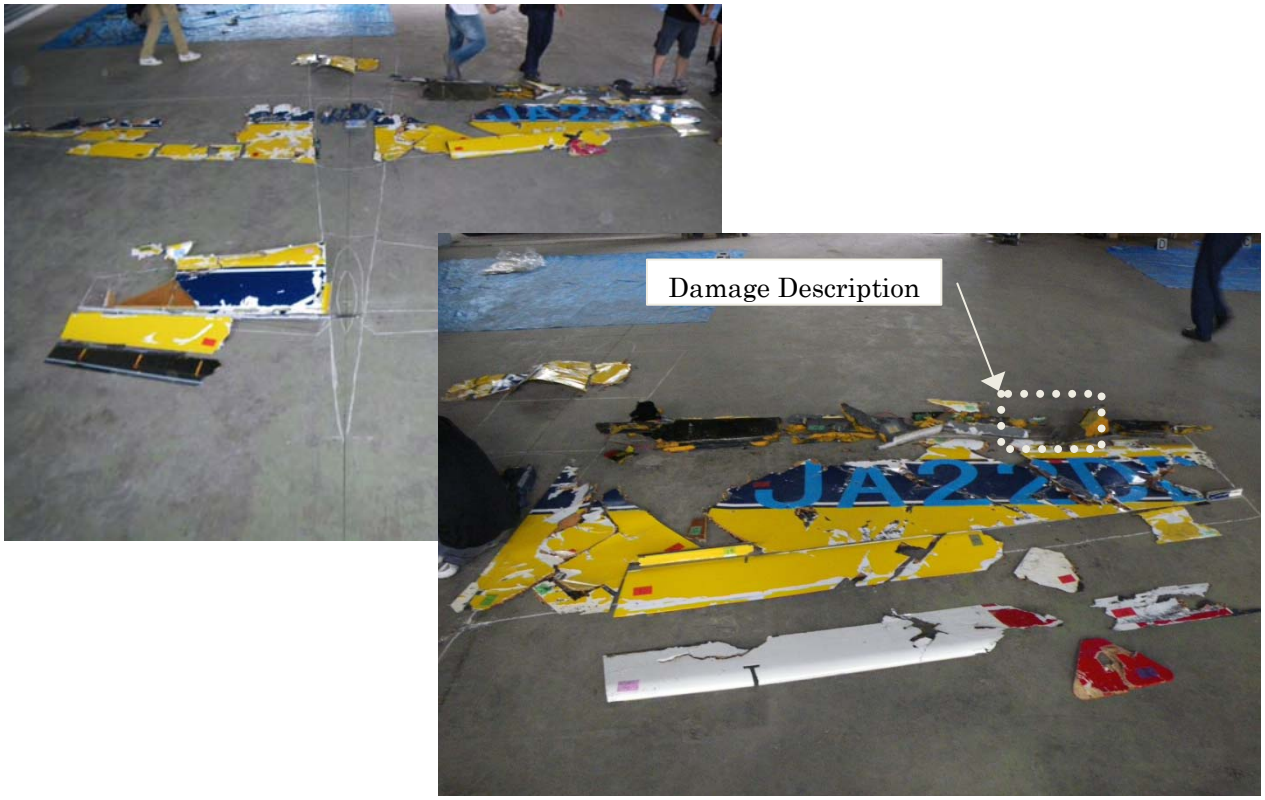
Picture 1 Accident Airplane

Picture 2　Recovered Debris



Closeup picture of left main wing