

AA2015-4

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 3 8 5 3**

April 23, 2015



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

COLLISION WITH A TOWER FOR HIGH VOLTAGE POWER LINES
A PRIVATELY OWNED CESSNA 172M RAM, JA3853
SASAHARA-CHO, TOYOTA CITY, AICHI PREFECTURE, JAPAN
AROUND 11:47 JST, MARCH 5, 2014

April 10, 2015

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 privately owned Cessna 172M Ram, registered JA3853, took off from Nagoya Airfield at around 11:39 Japan Standard Time (JST: UTC+9hr: unless otherwise stated all times are indicated in JST) to take aerial photographs on Wednesday, March 5, 2014. During the flight towards the Omaezaki area, the aircraft collided with a tower for high voltage power transmission lines set up on the ridge of the hilly area of Sasahara-cho, Toyota City, Aichi Prefecture at around 11:47. The aircraft was destroyed and scattered; accordingly, post-crash fire broke out.

A captain and a passenger were on board the aircraft and both of them suffered fatal injuries.

<Probable Causes>

It is highly probable that the Aircraft collided with the Tower for high voltage power transmission lines set up on the ridge of the hilly area because it flew below the minimum safety altitude while it flew from the Nagoya Airfield towards the Omaezaki area under the visual flight rules.

It is somewhat likely that the Aircraft tried to have visual contact with the ground surface by flying below the minimum safety altitude because the visibility was very poor, and cloud was in a low state due to the weather conditions that day.

It is highly probable that the captain forced the flight because the schedule was tight, even though the captain was aware of the difficulty to make the flight while maintaining the visual meteorological conditions.

Abbreviations

GND:	Ground Control Position of Air Traffic Controller
GPS:	Global Positioning System
TWR:	Tower Control Position of Air Traffic Controller
VFR:	Visual Flight Rules

Units

1 inHg:	33.86 hPa
1 ft:	30.48 cm
1 in:	2.540 cm
1 lb:	0.4536 kg
1 kt:	1.852 km/h

1. PROCESS AND PROGRESS OF INVESTIGATION

1.1 Summary of the Accident

A privately owned Cessna 172M Ram, registered JA3853, took off from Nagoya Airfield at around 11:39 Japan Standard Time (JST: UTC+9hr: unless otherwise stated all times are indicated in JST) to take aerial photographs on Wednesday, March 5, 2014. During the flight towards the Omaezaki area, the aircraft collided with a tower for high voltage power transmission lines set up on the ridge of the hilly area of Sasahara-cho, Toyota City, Aichi Prefecture at around 11:47. The aircraft was destroyed and scattered; accordingly, post-crash fire broke out.

A captain and a passenger were on board the aircraft and both of them suffered fatal injuries.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On March 5, 2014, the Japan Transport Safety Board (JTSB) designated the investigator-in-charge and two investigators to investigate this accident.

1.2.2 Representatives and Advisers from Relevant States

An accredited representative of the United States of America, as the State of Design and Manufacture of the aircraft involved in this accident, participated in the investigation.

1.2.3 Implementation of the Investigation

March 5 through 8, 2014:	Aircraft examination, on-site investigation, interviews and information gathering
March 11, 2014:	Interviews
March 17 through 19, 2014:	Interviews
March 17 through 20, 2014:	Analysis of GPS device
March 26, 2014:	Interviews
May 14 and 15, 2014:	Temporary assembly and examination of wreckage
June 12, 2014:	Examination of damaged parts from the tower and collation with damaged aircraft parts

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

As the two persons on board were fatality injured in the accident, their comments could not be obtained.

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 March 5, 2014, a privately owned Cessna 172M Ram, registered JA3853, (hereinafter referred to as “the Aircraft”) took off from Nagoya Airfield to take aerial photographs with two persons on board, the captain and the passenger at around 11:39. During the flight towards the Omaezaki area, the Aircraft collided with the tower for high voltage power lines owned by an electric power company and set up on the ridge of the hilly area of Sasahara-cho, Toyota City, Aichi Prefecture (hereinafter referred to as “the Tower”) at around 11:47.

The flight plan for the aircraft is outlined below:

Flight rules: VFR

Departure aerodrome: Nagoya Airfield

Estimated off-block time: 11:40

Cruising speed: 90 kt

Cruising altitude: VFR

Route: Okazaki-Toyohashi-Hamamatsu-Omaezaki

Destination aerodrome: Nagoya Airfield

Total estimated elapsed time: 3 hr

Fuel load expressed in endurance: 4 hr 30 min

Persons on board: Two

When the captain filed the flight plan to the air traffic services flight information officer (hereinafter referred to as “the Officer”) with telephone, the Officer who received the plan advised the captain that the Nagoya Airfield was in the instrument meteorological conditions and the weather on the flight route was quite bad. In response to this advice, the captain answered that he would depart the Nagoya Airfield with the special VFR*¹ but did not answer specifically on the flight principles on the route. The flight plan was received at 11:26.

The Aircraft took off under standard VFR because the visual meteorological conditions of the Nagoya Airfield was announced by the weather observation at 11:25.

According to the data retained by handhelds GPS navigation device (hereinafter referred to as “the GPS”), the Aircraft flew in the direction of the hilly area on the inland side instead of making the flight according on the route of the flight plan.

(See Estimated Flight Route Based on the cf. Figure 1: Data of the GPS, Figure 3: Flight Plan Route and Flight Direction.)

2.1.1 History of the Flight based on Records of Air Traffic Control Communications of Nagoya Airfield, GPS Data and Comments from Witnesses (Excerpt)

Around 11:32 The Aircraft started taxiing from the parking spot.

11:33:24 The Aircraft was advised by GND (Ground Control Position of Air Traffic

*1 “Special visual flight rules” means that pilots make a flight with visual flight rules in the control zone (except for the specially controlled airspace) or in the information zone under the instrument meteorological condition after having approval from an air traffic control organization. The flight is made according to the following standards in compliance with Ordinance for Enforcement of Aviation Law: (1) Aircraft shall stay away from the cloud; (2) Aircraft shall maintain visibility of 1,500 m or more; and (3) Aircraft shall maintain visual recognition of ground or the water surface.

Controller) to aware that the cloud is low.

11:35:47 TWR (Tower Control Position of Air Traffic Controller) instructed the Aircraft, "Hold short of runway."

11:38:04 The Aircraft received clearance from TWR, "Cleared for take-off."

Around 11:39 The Aircraft took off from the runway 34.

11:43:29 The Aircraft reported TWR that it would leave the air traffic control zone.*2

11:43:35 The Aircraft transmitted its final message to TWR.

Around 11:47 A number of witnesses in the vicinity of the accident site heard the noise of collision.

2.1.2 Statements of Persons Concerned

(1) Family of the captain

The captain frequently went out with the passenger to take aerial photographs. The passenger called him at around 9:00 on the day of accident. Family of the captain advised the captain not to make the flight on account of the bad weather, but he went out in a hurry.

(2) Family of the passenger

The passenger often took aerial photographs and spoke with the family on the day that he would take the photographs of a ship in Suruga Bay. The passenger consulted with a person possessing expertise in photography because the weather was bad on that day.

(3) Witness A

The accident site is in the vicinity of a golf course. Witness A was in the clubhouse in the center of the course which is 860 m away from the Tower in the north north-west direction when he heard the sound of somewhat small aircraft flying, saw something gleam for a second, and then heard the sound of collision. The sound of the somewhat small aircraft flying did not seem to indicate engine abnormality. Witness A thought the sound of the collision was thunder at first but felt it was abnormal for thunder and also felt the sound was more similar to an explosion. When he heard the sound, he could not see the Aircraft itself as it was covered by black clouds. The time was between 11:47 and 11:48. Although it rained a lot in the morning of the day, only light rain was observed at the time of the noise. The visibility was such that beyond 250 yards (about 230 m) was not visible.

(4) Witness B

Witness B was playing golf approximately 1,350 m away from the Tower in the north direction when he saw the Aircraft on level flight flying from north to south at a low altitude. Witness B saw the wing and the side part of the fuselage of the Aircraft, and heard the sound of the collision immediately after the Aircraft entered the cloud. With regard to the weather on that day, the fog was so thick that he could not see the ball he hit. He felt that the altitude of the Aircraft was about 60 m as it flew just above the trees of the golf course.

*2 "Air traffic control zone" is the air area provided to secure safety of aircrafts that depart from the airport or fly subsequently or aircrafts that land on the airports or fly to make landing. It is the midair of the zone surrounded by a circle with a radius of 9km or less (except for special cases) from the airport reference point. It refers to the air area at an altitude less than that specified by the announcement of Minister of Land, Infrastructure and Transportation.

(5) Witness C

Witness C was playing golf with Witness B when he saw the Aircraft flying from north to south at a low altitude. The height of the Aircraft was such that it nearly touched the trees of the golf course, although it did not make the tree leaves fall by touching them. He felt it was 20 m to 30 m from the ground. The sound was loud because the Aircraft was flying at quite a low altitude, but the engine sound was a normal feeling. It was foggy with extremely low cloud cover; therefore, he could not see where the ball fell after hitting it.

(6) Witness D

Witness D was playing golf approximately 870 m away from the Tower in the northeast direction when he saw the Aircraft flying above the hill through the cloud in a southwest direction. Witness D heard the sound of the collision after he saw a gray aircraft with its left main wing facing slightly downward fly slowly and disappear behind the left side tree. The altitude of the flight was slightly above the hill. With regard to the weather on that day, it was rainy and cloudy.

(7) Witness E

Witness E was in a quarry about 130 m away from the Tower to the southeast when he heard twice a sound louder than any he had heard before. He was waiting to sit on the operation seat of an excavator because the weather was bad and it was raining. Time at that Time was a little before 11:50. When Witness E opened the door to see outside, it seemed that fire burned off something above the hill but he could not see the Tower itself. Witness E could not understand what had happened at that time but he saw something white turned into a cluster of fire and fly towards the forest to the west, about 100 m away from where he was. Watching the fire for approximately 10 minutes, Witness E was worried that it may develop into a wildfire as it was not extinguished. As he did not have a mobile phone, he went to another workplace with car to inform the fire department. The fire was extinguished when he returned 20 minutes later.

This aircraft accident occurred on the hilly area of Sasahara-cho, Toyota City, Aichi Prefecture (latitude 35°9'33" north and longitude 137°8'18" east) at around 11:47, on March 5, 2014.

(See Figure 2: Estimated Flight Route (Immediately Before Collision), Figure 6: Narrow Regional Significant Weather Observation Chart (11:00 March 5), Figure 7: Narrow Regional Significant Weather Observation Chart (12:00 March 5) and Photo 4: Accident Site.)

2.2 Injuries to Persons

The captain and the passenger suffered fatal injuries.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to the Aircraft Components

Falling off of the aft fuselage

Falling off of the right main wing and fracture from vicinity of the right main wing

Falling off of the left main wing and burned mark on its fuel tank part
Falling off of the engine and the propeller

2.4 Damage to Objects Other Than the Aircraft

On the upper part of the Tower have crossbeams projecting from east to west. The uppermost part crossbeam is for the ground wire (earth line) and the second level crossbeam is for the power transmission line. There were collision marks in the components including two columns located between the west side of the uppermost part crossbeam and the east side of the second level crossbeam. According to the matching of the actual parts of the Tower with the airframe wreckage, the column located in the east had a collision mark by the engine whose altitude was 259.7 m, 5.3 m below the Tower top. Moreover, there was a scratch mark in the guard of the upper part of the insulator of the power line connected from the north side of the second level east side crossbeam. There was soot from the east column with the collision mark to the east side crossbeam.

In addition, according to the electric power company, it was recorded a momentary power reduction in the vicinity of the accident site at 11:47:46.

(See Figure 4: Range of Collision Marks of the Tower, Photo 2: The Tower struck by the Aircraft (Immediately after Repair) and Photo 3: Collision Marks and Actual Parts Matching.)

2.5 Personnel Information

Captain: Male, age 76

Private pilot certificate (Airplane)

Rating for single engine (land)

October 14, 1988

Class 2 aviation medical certificate

Valid until

December 20, 2014

Total flight time

1,074 hours 55 minutes

Flight time in the last 30 days

5 hours 10 minutes

Total flight time on the type of aircraft

74 hours 55 minutes

Flight time in the last 30 days

5 hours 10 minutes

2.6 Aircraft Information

2.6.1 Aircraft

Type

Cessna 172M RAM

Serial number

17263710

Date of manufacture

July 8, 1974

Certificate of airworthiness

No. DAI-2012-678

Valid until

March 13, 2014

Category of airworthiness

Aircraft Normal N, Utility U or Special Airplane X

Total flight time

6,462 hours 37 minutes

Flight time since last periodical check (100-hr check on November 12, 2013)

57 hours 46 minutes

2.6.2 Engines

Type

Lycoming O-320-D2G

Serial number

L-7783-39A

Date of manufacture	Unknown
Total time in service	3,061 hours 28 minutes
Date of installation to the aircraft	November 9, 2005
Time in service since last overhauling (performed on October 13, 2005)	952 hours 58 minutes

2.6.3 Fuel and Lubricating Oil

Onboard fuel was AVGAS100 and lubricating oil was PHILLIPS66 XC20W-50.

2.6.4 Weight and Balance

When the accident occurred, the weight of the Aircraft was estimated to have been 2,000 lbs and its center of gravity (CG) was estimated to have been 42.8 in aft of the reference datum line. Both of them were estimated to have been within the allowable ranges (maximum takeoff and landing weight of 2,300 lbs and CG range of 35.5-47.3 in corresponding to the weight of the Aircraft at the time of the accident).

2.6.5 Condition of the Aircraft

With regard to the altimeter, the periodic inspection had expired on January 31, 2014, even though inspection must be conducted every 24 months by the circular of the Director of the Civil Aviation Bureau, MLIT, "Standards and Inspections of Altimeters and Static Pressure System."

As for the engine fell off from the Aircraft, the condition of the front first and second cylinders could not be confirmed since the lower spark plugs were fractured and missing while evidence indicating normal burning condition of other six spark plugs were confirmed. The damage was severe; therefore, the in-flight condition of the Aircraft could not be confirmed from the wreckage.

2.7 Meteorological Information

On the day of the accident, the rain cloud covered the sky in the Tokai district and the radar echo was widely observed on the flight plan route from the Nagoya Airfield to the Okazaki area. Although the instrument meteorological conditions were confirmed according to the routine weather observation report of the Nagoya Airfield at 11:00, the visual meteorological conditions were confirmed according to the special weather observation report at 11:25 because the prevailing visibility became 4,500 m to 5,000 m and the ceiling^{*3} became 800 ft (about 250 m) to 1,000 ft (about 300 m).

The aviation routine weather report and the aviation special weather report of the Nagoya Airfield before the takeoff of the Aircraft were as follows:

11:00	Wind direction 320°; Wind velocity 5 kt; Prevailing visibility 4,500 m
	Weather Light shower rain, mist
	Cloud: Amount 3/8; Type Stratus; Cloud base 500 ft
	Amount 5/8; Type Stratus; Cloud base 800 ft
	Amount 6/8; Type Stratocumulus; Cloud base 1,500 ft

*3 "Ceiling" refers to cloud layers which cover 5/8 of the whole sky. It refers to the height of the bottom of the lowest cloud layer from the ground surface or the water surface among cloud layers with a height of less than 6,000 m (20,000 ft) from the ground surface or the water surface.

Temperature 9°C, Dew point 7°C
Altimeter setting (QNH) 29.83 inHg
11:25 Wind direction 320°; Wind velocity 5 kt; Prevailing visibility 5,000 m
Weather Light shower rain, mist
Cloud: Amount 3/8; Type Stratus; Cloud base 500 ft
Amount 5/8; Type Stratus; Cloud base 1,000 ft
Amount 8/8; Type Stratocumulus; Cloud base 1,500 ft
Temperature 9°C, Dew point 7°C
Altimeter setting (QNH) 29.81 inHg

(See Figure 6: Narrow Regional Significant Weather Observation Chart (11:00 March 5), Figure 7: Narrow Regional Significant Weather Observation Chart (12:00 March 5) and Figure 8: Weather Chart.)

2.8 Information on the Tower

Name: Supporting structure of Kitatoyota-Seto line No. 18
Location: Sasahara-cho, Toyota city, Aichi Prefecture
Transmission voltage: 275 kV
Height of the Tower: 63 m (Elevation of the Tower base location site: 202 m above sea level)
Elevation of the Tower: 265 m above sea level

With regard to obstacle markings^{*4} of the Tower, location exemption has been approved because there are mountains higher than the elevation of the Tower and there is no fear of endangering safety of flight of aircraft. In addition, with regard to the neighboring towers connected to the Tower, the same location exemption has been approved and there is no tower with obstruction markings.

2.9 Flight Purpose and Maintenance Plan of the Aircraft

2.9.1 Flight Purpose of the Aircraft

With regard to the flight purpose on the day of the accident, the captain was requested by the passenger to take aerial photographs of a newly-built ship in Suruga Bay.

A person in charge of the shipbuilding company (hereinafter referred to as “the Company”) who requested to take the photographs of the newly-built ship made the following comment:

The Company had requested the passenger to take photographs of about 90 ships in a frequency of about seven ships per year from 13 years ago. The Company left the arrangement of the aircraft to take those photographs with him and the Company was not involved it. The trial trip of the newly-built ship is usually scheduled to conduct in three days, and full-speed navigation called “time trial” is usually conducted on the second day. It is most ideal to take photographs of a newly-built ship during this full-speed navigation as white caps are observed.

^{*4} “Obstacle markings” refer to the facilities to acknowledge existence of objects that endanger flight of aircrafts during daytime using colors or shapes. According to the provision of Article 51 - 2 and Article 132 - 2 Civil Aeronautics Act, installation of obstacle markings are required in the case of objects such as chimneys, flies and steel towers with a height of 60 m or more from the surface of the ground or water (except those deemed unnecessary to be installed with obstacle markings by the Minister of Land, Infrastructure, Transport and Tourism and those to be installed with high intensity obstacle lights and medium intensity white obstacle lights). Obstruction markings are installed with paint colors of red and white and with flags and markers.

For this reason, photographs are taken usually during this time. Although it is better to take photographs of ships on clear days, it is usually regarded as preferable to take photographs of ships with white caps even if the weather is comparatively bad. This time, the trial trip was planned on the three days of March 4-6 and the Company requested that the passenger take photographs on March 5. The planned shooting time was 11:00. The photographs taken are presented to ship owners as a commemorative gift from the Company. Particularly when a ship is ordered from overseas, the last shooting opportunity is when the ship departs the harbor to be delivered to the ship owner in the case where shooting cannot be conducted during the trial trip. In this case, the ship was ordered from overseas and the planned delivery date was March 19, 2014.

2.9.2 Inspection Plan for Airworthiness Certificate of the Aircraft

The expiration date of the current certificate of airworthiness of the Aircraft was March 13, 2014. The preparation of the inspection for certificate of airworthiness was planned to be conducted at a maintenance company from March 7. The application was made so that the inspection for certificate of airworthiness could be conducted on March 19.

2.10 Additional Information

2.10.1 Visual Meteorological Condition

With regard to the visual meteorological conditions, Article 5 of Ordinance for Enforcement of the Civil Aeronautics Act has the following description (Excerpt):

- (ii) Aircraft that flies at an altitude less than 3,000 meters (Omitted) Each listed weather condition according to the classification of aircraft listed in the following items*
 - (a) Aircraft that flies in air traffic control area (hereinafter referred to as "control area"), air traffic control zone (hereinafter referred to as "control zone") or air traffic information zone (hereinafter referred to as "information zone"): Weather conditions that meet requirements;*
 - 1. that flight visibility is over 5,000 meters.*
 - 2. that no cloud is within the vertical distance of 150 meters above and 300 meters below the aircraft.*
 - 3. that no cloud is within the horizontal distance of 600 meters from the aircraft.*
 - (b) Aircraft that flies in the airspace other than control area, control zone and the information zone: Weather conditions that meet the following requirements:*
 - 1. that flight visibility is over 1,500 meters.*
 - 2. that no cloud is within the vertical distance of 150 meters above and 300 meters below the aircraft.*
 - 3. that no cloud is within the horizontal distance of 600 meters from the aircraft.*
- (iii) Aircraft that flies at an altitude less than 300 meters from the ground surface or the water surface in the airspace other than the control area, the control zone and the information zone (Omitted): Weather conditions that meet requirements; (Regarding helicopter that flies at the speed of which collision with other object is avoidable, excludes the item listed in (a)):*
 - (a) that flight visibility is over 1,500 meters.*

(b) that aircraft may fly away from clouds and that pilot may visibly recognize the ground surface or the water surface.

(Omitted)

2.10.2 Minimum Safety Altitude of Aircraft that Fly with Visual Flight Rules

With regard to the minimum safety altitude of aircraft that fly with VFR, Article 174 of Ordinance for Enforcement of the Civil Aeronautics Act has the following description (Excerpt):

(i) In the case of aircraft navigating on a visual flight rules shall take any of the highest of the altitude at which landing is feasible, when power system only has stopped during a flight, without causing danger to human beings or objects on the ground or on water and the following altitudes:

(a) In the case of a space over a densely populated area with human beings or houses, an altitude higher by 300 meters than the top edge of the highest object located within an area with a horizontal distance of 600 meters with the aircraft at its center.

(b) In the case of above an area without human beings or houses, an altitude at which an aircraft can continue flight while maintaining a distance of 150 meters or more from human beings or objects on the ground or on water.

(c) In the case of a space over an area other than that prescribed under (a) and (b), an altitude of 150 meters from the ground or water surface.

(Omitted)

2.10.3 GPS Data

When the Aircraft collided with the Tower, the airframe was broken into pieces; accordingly, many parts were scattered in the vicinity of the accident site. Among those, there was the GPS which is presumed to have been brought onto the Aircraft. The GPS retained the data until 11:47:41 on the day of the accident.

According to the data retained by the GPS, the Aircraft ascended to an altitude of about 390 m after takeoff, and then descended gradually until it flew at an altitude of about 300 m. The Aircraft flew from north to south through the airspace over the neighboring golf course immediately before the collision, and it maintained an altitude of about 300 m when it flew over the golf course according to the data retained by the GPS. Moreover, altitude above the ground level of the flight route over the golf course according to the GPS data was about 220 m to 140 m from north to south in reference to the height per the GSI (Geographical Information Authority of Japan) map*5.

The average altitude data of the GPS retained at 10 locations when the Aircraft was taxiing the ground surface from the parking spot to the runway at Nagoya Aircraft was 13.8 m whereas the average altitude value of the GSI map at the same latitude and the same longitude was 14.5 m.

*5 “Height per the GSI (Geographical Information Authority of Japan) map” refers to the altitude of the ground surface measured by aeronautical laser surveying which uses the system of the GSI map. The accuracy of the altitude (standard deviation) is 0.3 m or less.

(See Figure 1: Estimated Flight Route Based on Data of the GPS, Figure 2: Estimated Flight Route (Immediately before Collision) and Figure 5: Accident Site Layout.)

2.11 Recommendation in the Past Similar Accidents

In the investigation report of the aircraft accident occurred in Kumamoto in January 2011, when an aircraft collided with a mountain slope because it ascended through cloud despite the fact it was flying with the visual flight rules, with a comment on four other accidents involving small aircraft (including rotorcraft) that occurred because the aircraft flew through cloud though they were flying with the visual flight rules in the past five years before publishing the report, the JTSB made a recommendation to advising the Minister of Land, Infrastructure, Transportation and Tourism in September 2012 to publicize the following contents to the pilot associations and also make them known to a pilot individual using the opportunities of the newly introduced system “Review System on Specific Pilot Competence”

- (1) Commence flying only when VMC is maintained all across the enroute based on the latest weather information.
- (2) Prepare alternative plan in case of deteriorating weather while collecting weather information on enroute.
- (3) Decide well in advance on returning to the departed aerodrome or landing at a proper place.

In response to this recommendation, Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism created a brochure to reaffirm the danger of making flights in the cloud with visual flight rules among individual pilots in addition to the warning that had been made thus far and also distribute the brochure at opportunities such as specific pilot competence review in order that the information is known to respective pilots.

The captain received this brochure when he had a specific pilot competence review on February 24, 2014.

3. ANALYSIS

3.1 Airman Competence Certificates

The captain held both valid airman competence certificate and valid aviation medical certificate.

3.2 Airworthiness Certificate

The Aircraft had a valid airworthiness certificate. Though the altimeter had passed the expiration of the inspection period as described in 2.6.5, whether the required accuracy was kept or not could not be confirmed because the altimeter was destroyed in the accident.

The condition of the Aircraft during the flight is unclear because all parties relevant to the cause of the accident suffered fatal injuries and the aircraft was severely damaged as described in 2.6.5. However, it is probable that the conditions of the aircraft were not contributed to the accident because there were no ATC communication records that implied abnormal occurrence in the aircraft, and the engine sound of the Aircraft was normal according to the comments by the

witnesses as described 2.1.2.

3.3 Relations to the Meteorological Conditions

As described in 2.7, the weather conditions at the Nagoya Airfield were just turned into the visual meteorological conditions at 11:25 immediately before the takeoff.

It is highly probable that it was difficult to keep the visual meteorological conditions throughout the route during the flight because, as described in 2.1, the Officer advised that the weather on the route was quite bad, and multiple witnesses commented that it was poor visibility at the time of the accident occurred as described in 2.1.2, and additionally, the rain cloud covered the sky in Tokai district and the radar echo was observed from the Nagoya Airfield to the Okazaki area as described in 2.7.

3.4 Flight Plan Route and Flight Direction

Although the planned shooting time of the newly-built ship was 11:00 as described in 2.9.1, the Aircraft departed later than the time originally planned due to the bad weather. It is somewhat likely that the Aircraft flew towards the inland side to shorten the distance by flying above the hilly area instead of flying over comparatively flat land according to the original plan via Okazaki, Toyohashi, Hamamatsu and Omaezaki. It is also somewhat likely that the Aircraft flew at a low altitude to have a visual contact of the ground surface trying to avoid the cloud which resulted in flying over the hilly area.

3.5 Meteorological Conditions Immediately before the Collision

According to the statements by the multiple witnesses described in 2.1.2, it is probable that the Aircraft had difficulty in maintaining the visibility of 1,500 m or more which is the requirement of the visual meteorological conditions described in 2.10.1. Moreover, the Aircraft needed to achieve an altitude of 150 m or more from the ground surface according to the requirement described in 2.10.2 as it flew over from the city area to the hilly area. According to the GPS data and the ground surface elevation as described in 2.10.3, it is probable that the Aircraft did not comply with the requirement of the minimum safety altitude.

3.6 Conditions at the Time of the Collision

As the airspace above Tokai district was widely covered with rain clouds as described in 2.7, it is probable that the Aircraft could not ascend to a higher altitude on account of low rain cloud cover after the takeoff and flew at an altitude just under the clouds to have visual contact with the ground surface. Because of this as described in 2.10.3, it is probable that the Aircraft ascended to an altitude of about 390 m after the takeoff, then gradually descended to a lower altitude as if pushed down by the rain cloud until it flew at an altitude of about 300 m.

As described in 2.10.3, it is probable that the Aircraft flew almost horizontally at an altitude of about 300 m when it flew above the neighboring golf course immediately before the collision according to the data retained in GPS until five seconds before the collision. However, it is highly probable that the altitude was about 260 m at the time of the collision according to the collision marks of the Tower as described in 2.4. It is probable that the captain descended the Aircraft to a lower altitude to have visual contact with the ground surface as the Aircraft moved into the cloud immediately after it flew over the golf course as described in the statements in 2.1.2 (4) and (5). It

is highly probable that the left main wing of the Aircraft was lowered at the time of collision with the Tower, according to the collision marks described in 2.4. It is somewhat likely that the captain lowered the left main wing on the side of the captain seat to have visual contact with the ground surface by lowering the altitude, or that the captain who had visual contact with the Tower tried to avoid the collision by suddenly lowering the left main wing and turning the Aircraft immediately before the collision.

Moreover, according to the scratch mark in the guard of the upper part of the insulator of the power line connected from the north side of the second level east side crossbeam from the Tower top and according to the matching of the actual parts of the impact scar of the Tower with the airframe wreckage as described in 2.4, it is probable that the leading edge of the left main wing touched and shunted the power lines to generate a momentary power reduction as described in 2.4. It is probable that the Aircraft collided with the Tower at 11:47:46 as there was a momentary power reduction in the vicinity of the accident site around that time as described in 2.4. This took place between 11:47 and 11:48 when the sound of collision was heard as described in 2.1.2 (3). Furthermore, because fire was witnessed as described in 2.1.2 (7), there was soot from the east column with the collision mark to the east side crossbeam as described in 2.4 and there was a burned mark on the fuel tank part of the left main wing as described in 2.3.2, it is probable that a fire broke out generated at the fuel tank of the left main wing when it shunted the power line was short-circuited by the wing.

3.7 Abandon of the Flight or Determination to Return

As described in 3.5, it is probable that it was difficult to make the flight maintaining the visual meteorological conditions under the meteorological conditions that day. Despite the conditions of this weather, the captain did not answer specifically on the flight principles against the weather on the route although he was advised by the Officer as described in 2.1. It is probable that the schedule was tight as the photographing of the newly-built ship was scheduled on March 5, the maintenance of the Aircraft was planned to be started on March 7, and the planned delivery date of the ship which was the last shooting chance was the day of the airworthiness certificate inspection for the airworthiness certification as described in 2.9.1 and 2.9.2. Considering these facts, it is probable that the captain forced the flight knowing that it would be difficult to make a flight maintaining the visual meteorological conditions.

As described in 2.11, the captain had an examination equivalent to the specific pilot competence review nine days before the accident, where he had an explanation on the checkpoints to evaluate the danger of flight in the cloud, and the status of the weather with the visual flight rules. It is probable that the captain should have postponed or abandoned the departure making the use of the knowledge acquired through the review.

4. PROBABLE CAUSES

It is highly probable that the Aircraft collided with the Tower for high voltage power transmission lines set up on the ridge of the hilly area because it flew below the minimum safety altitude while it flew from the Nagoya Airfield towards the Omaezaki area under the visual flight rules.

It is somewhat likely that the Aircraft tried to have visual contact with the ground surface by flying below the minimum safety altitude because the visibility was very poor, and cloud was in a low state due to the weather conditions that day.

It is highly probable that the captain forced the flight because the schedule was tight, even though the captain was aware of the difficulty to make the flight while maintaining the visual meteorological conditions.

5. SAFETY ACTIONS

5.1 Safety Actions Taken

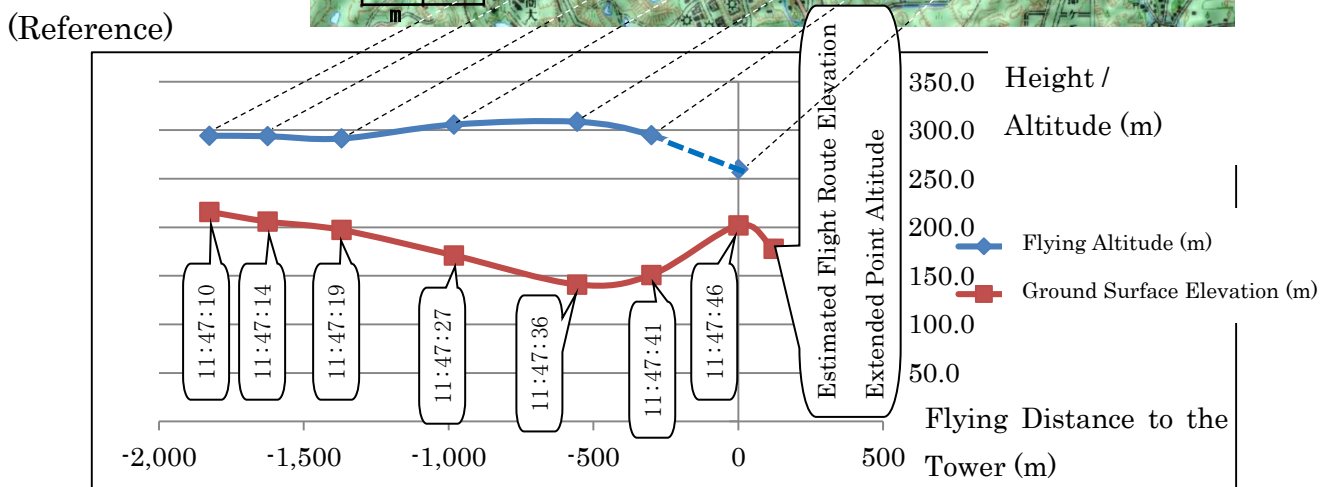
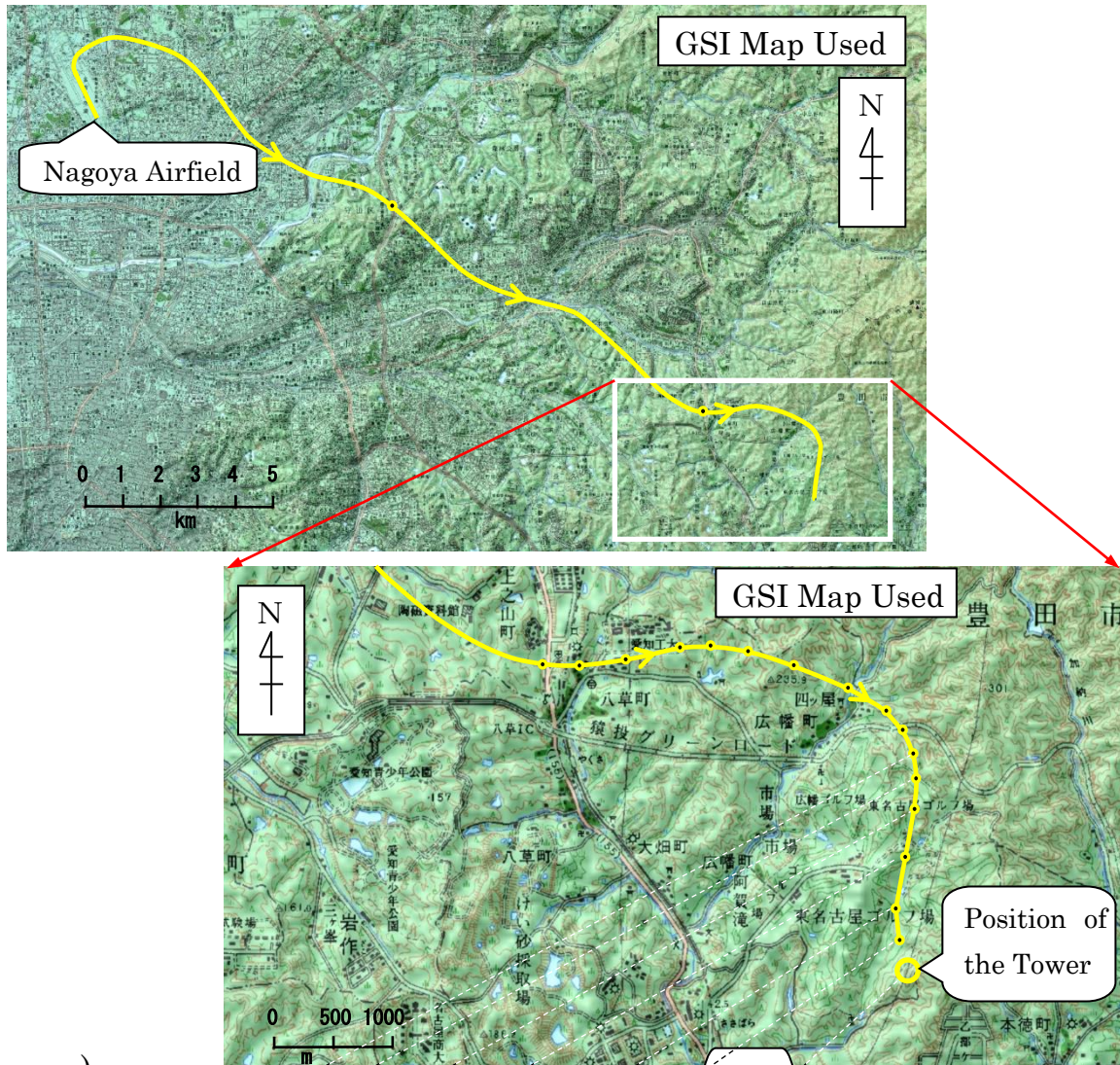
5.1.1 Safety Actions Taken by Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism

Upon the occurrence of the accident, on March 7, 2014, the Civil Aviation Bureau issued a document entitled “Ensuring Safety for Flights with Visual Flight Rules” to the president of the Japan Aircraft Pilot Association and All Japan Air Transport and Service Association, to request that they once again to give guidance on ensuring the safety of flights under the visual flight rules to the members of their organizations. The document requests that the pilots pay extra attention to the following points in flights. (Excerpt)

In the evaluation of the weather conditions to make a flight under the visual flight rules, the following points should be confirmed to determine whether the flight should be made or suspended:

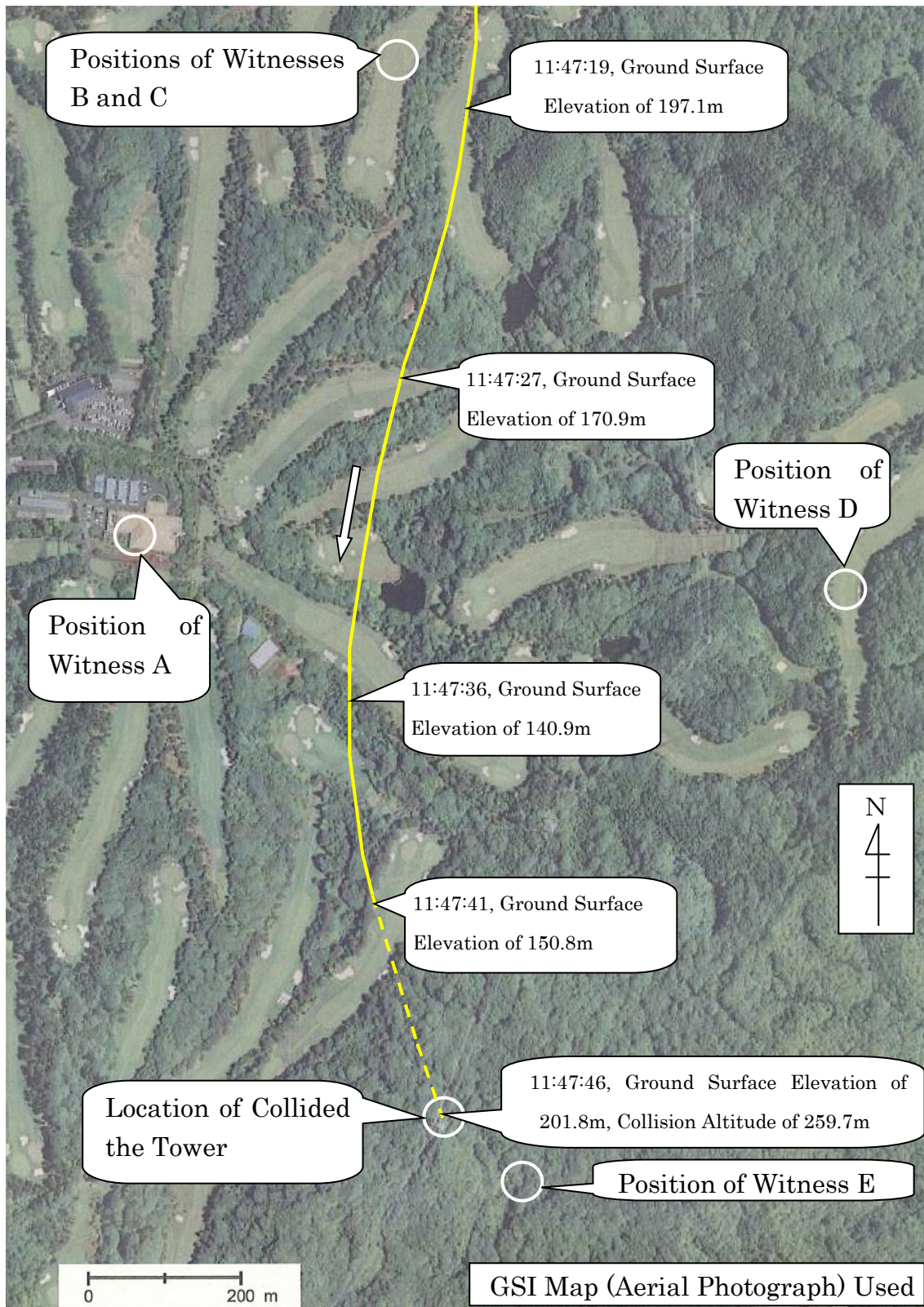
- (1) The pilot should collect the latest weather information, and analyze not only the current status of the weather conditions at departure and destination aerodromes but also analyze the weather conditions on the flight route and the arrival aerodrome at the planned arrival time, and forecast the weather conditions in which the aircraft makes the flight. The pilot should only depart when the visual meteorological conditions can be maintained and the safety of the flight is ensured.
With regard to the analysis of the weather conditions where no weather information on the flight route and the destination aerodrome can be acquired, an appropriate judgment should be made by making use of weather information provided by meteorological organizations in the nearest airfields, and other sources of such information of the flight route or the destination aerodrome.*
- (2) When a change in the weather is expected, an alternative plan in the case of encountering bad weather conditions where it is difficult to keep the visual meteorological conditions should be considered before departure. During the flight, the pilot should also endeavor to collect intermittent weather information and understand changes in weather.*
- (3) In the case of observing the indications for the unexpected weather deterioration, judgment should be made whether the flight should be continued or abandoned promptly so that it can return to the departure aerodrome or make a landing at an appropriate airfield in the vicinity of the flight route.*

Figure 1: Estimated Flight Route Based on the Data of the GPS



※ Height of the Tower: 63m / Elevation of Top of the Tower: 265m / Altitude of Collision: 259.7m

Figure 2: Estimated Flight Route (Immediately before Collision)



※ Time and Positions: GPS Records / Ground Surface Elevations: Altitude Values of GSI Map

Figure 3: Flight Plan Route and Flight Direction

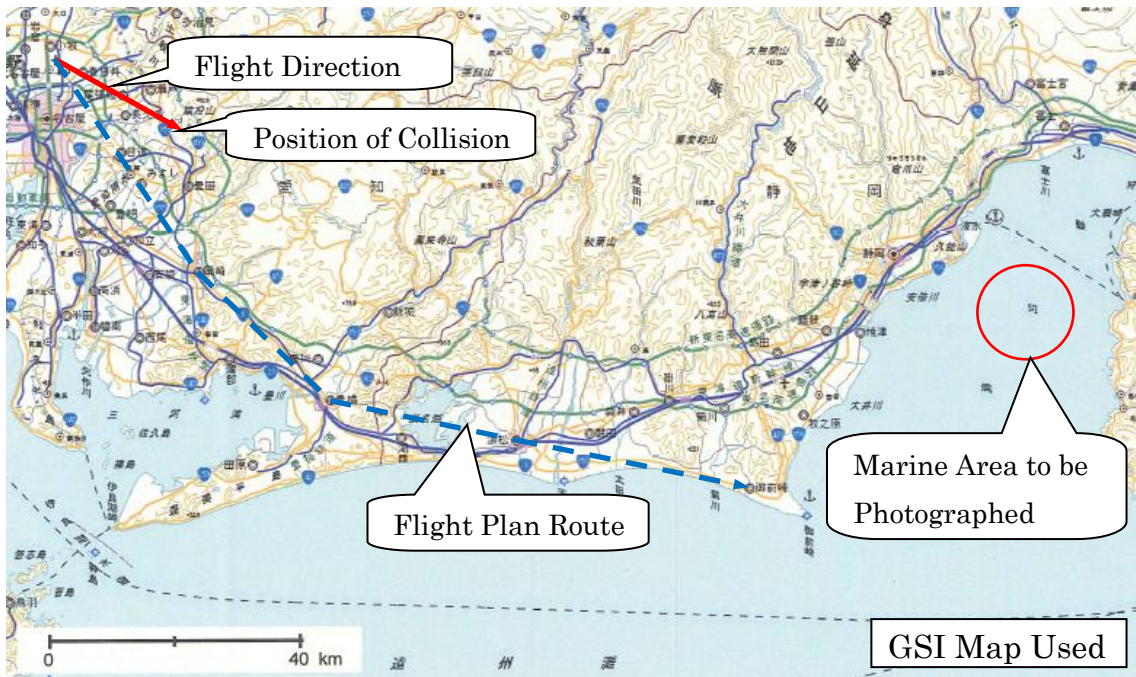


Figure 4: Range of Collision Marks of the Tower

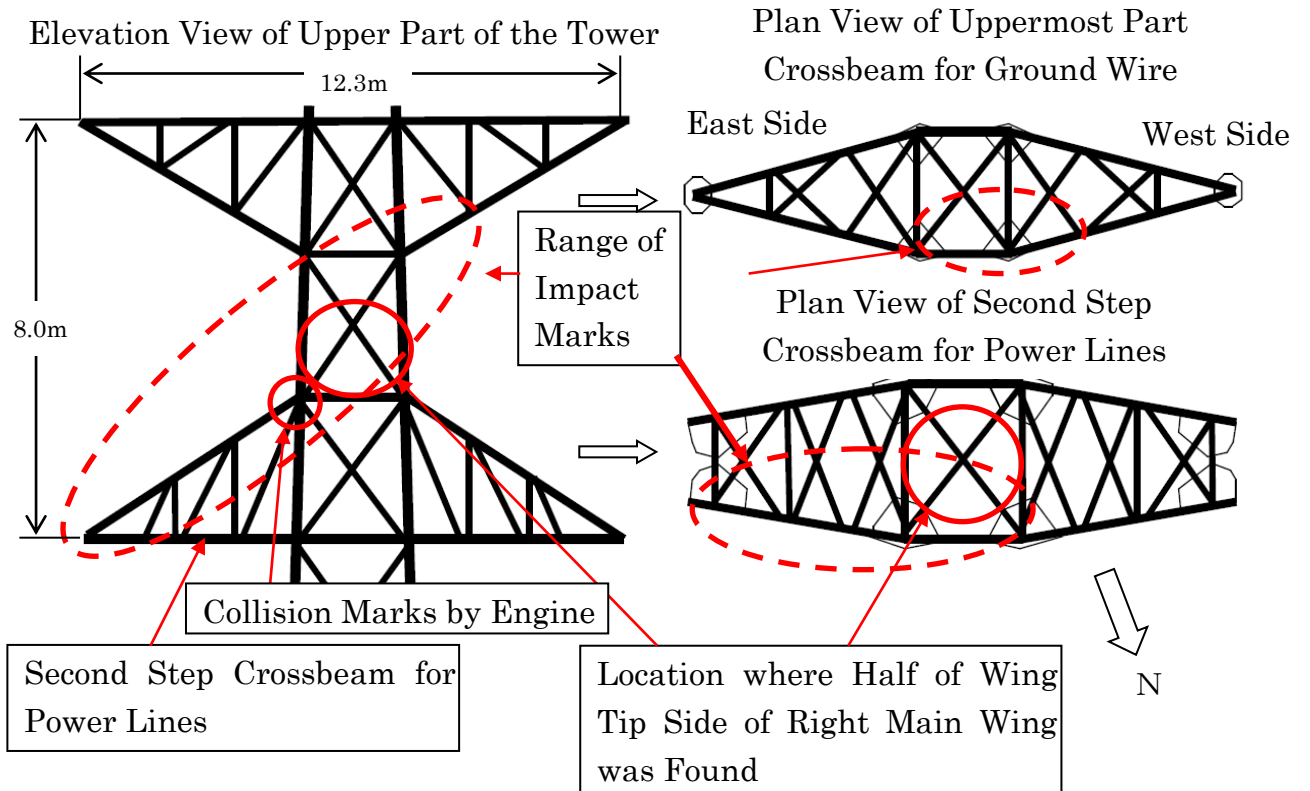


Figure 5: Accident Site Layout

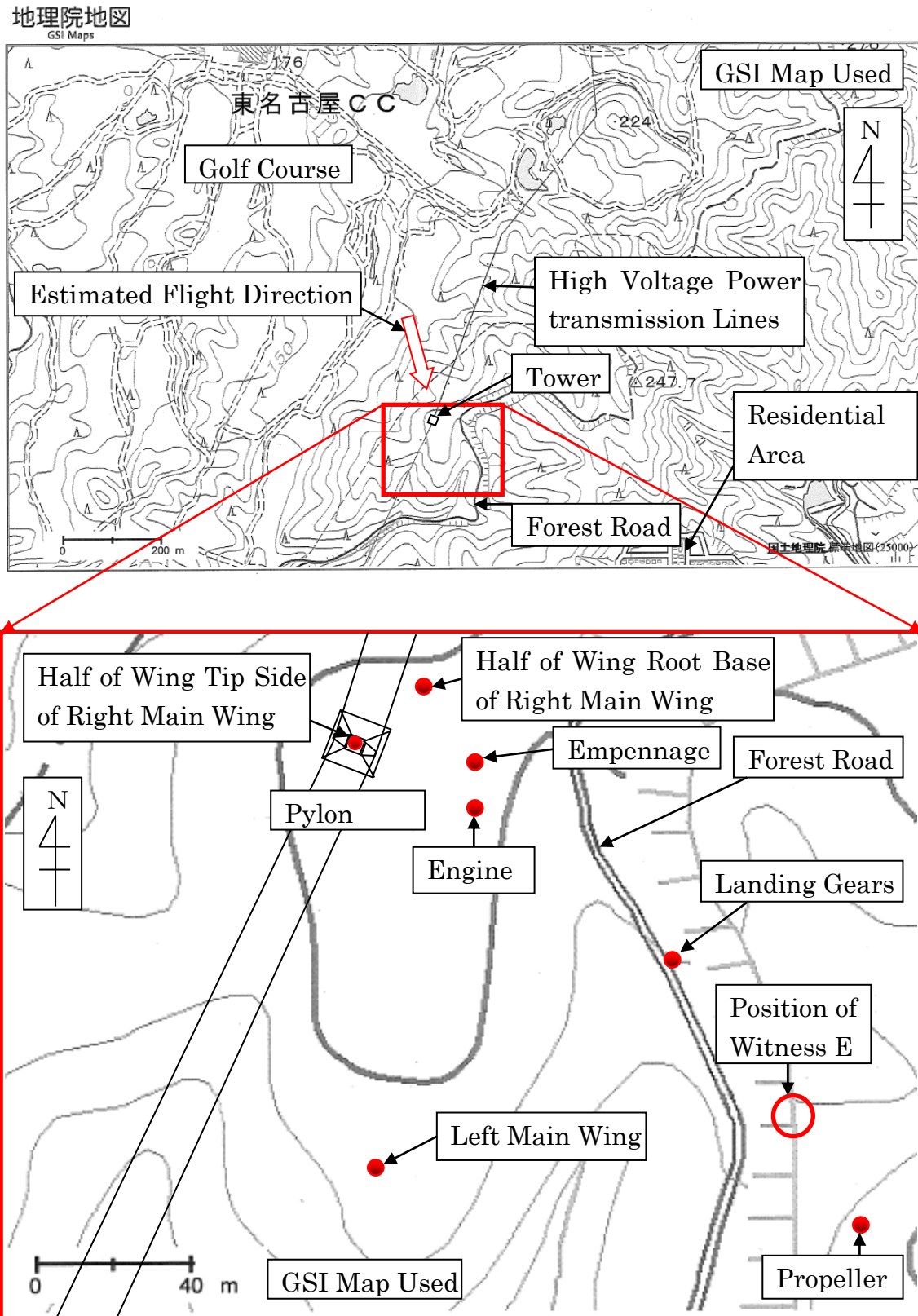


Figure 6: Narrow Regional Significant Weather Observation Chart
(11:00 March 5)

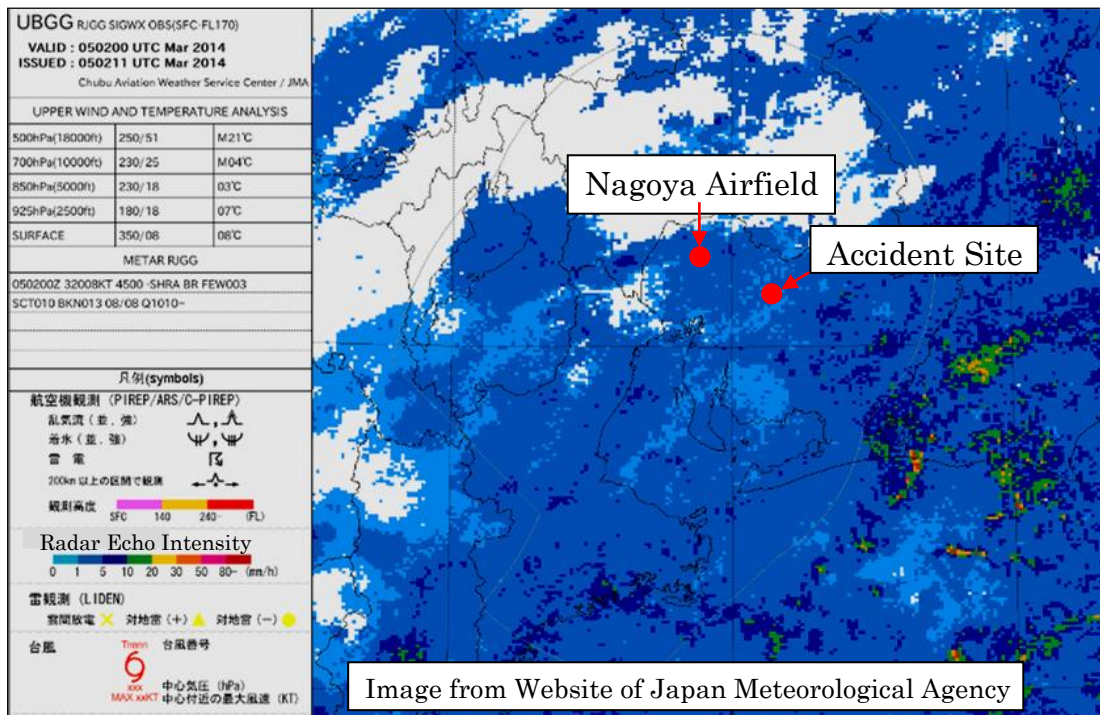


Figure 7: Narrow Regional Significant Weather Observation Chart
(12:00 March 5)

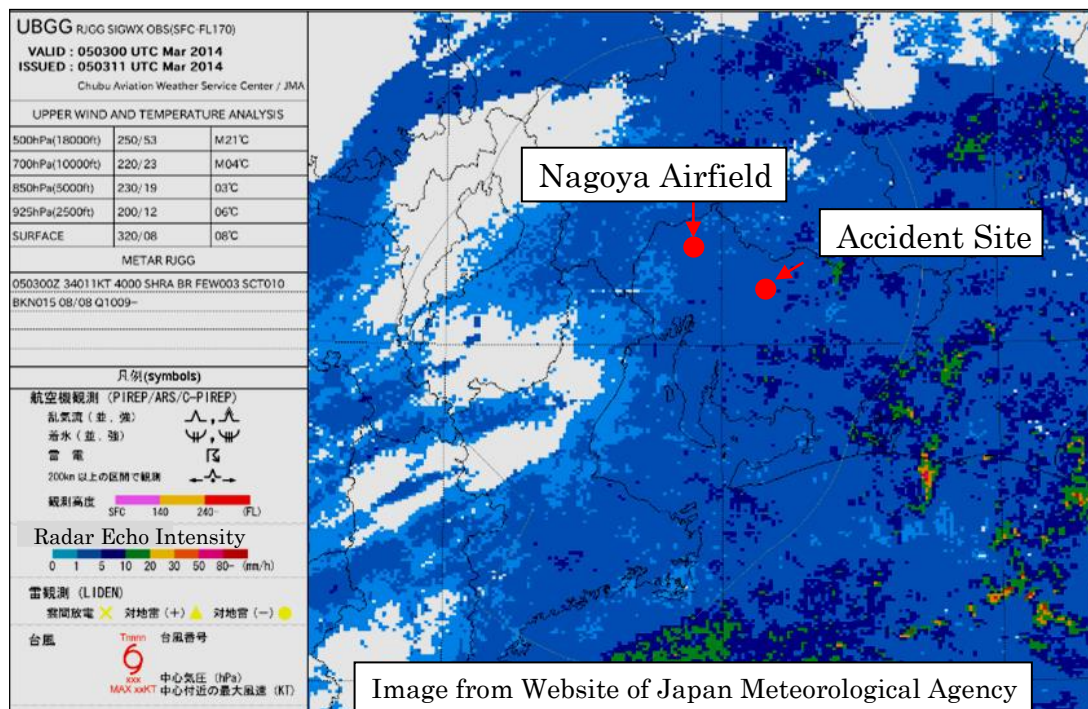
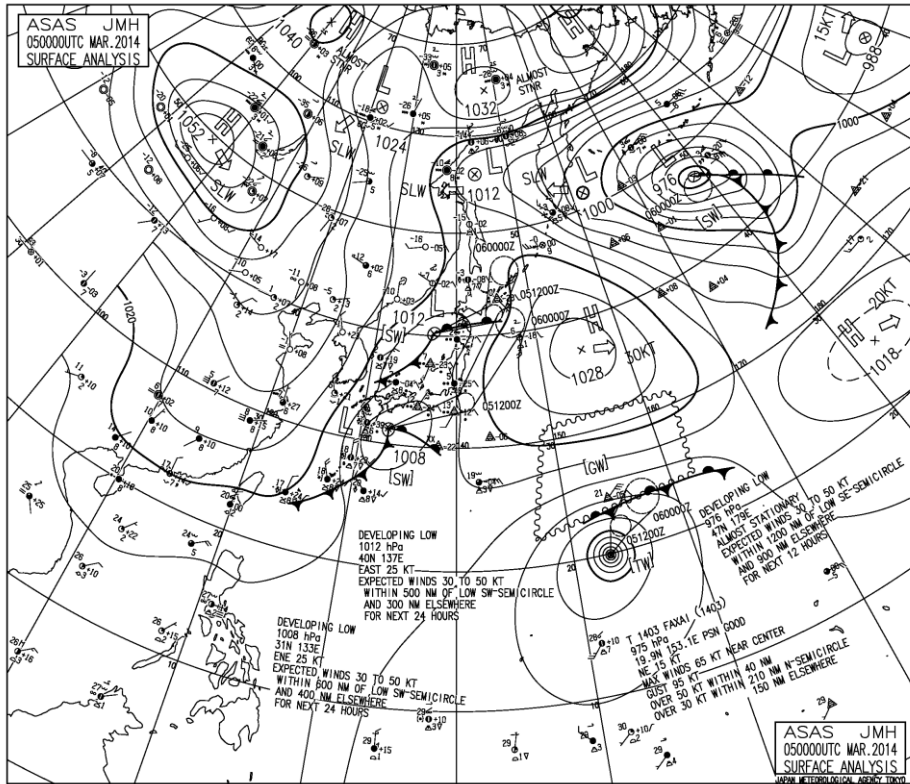
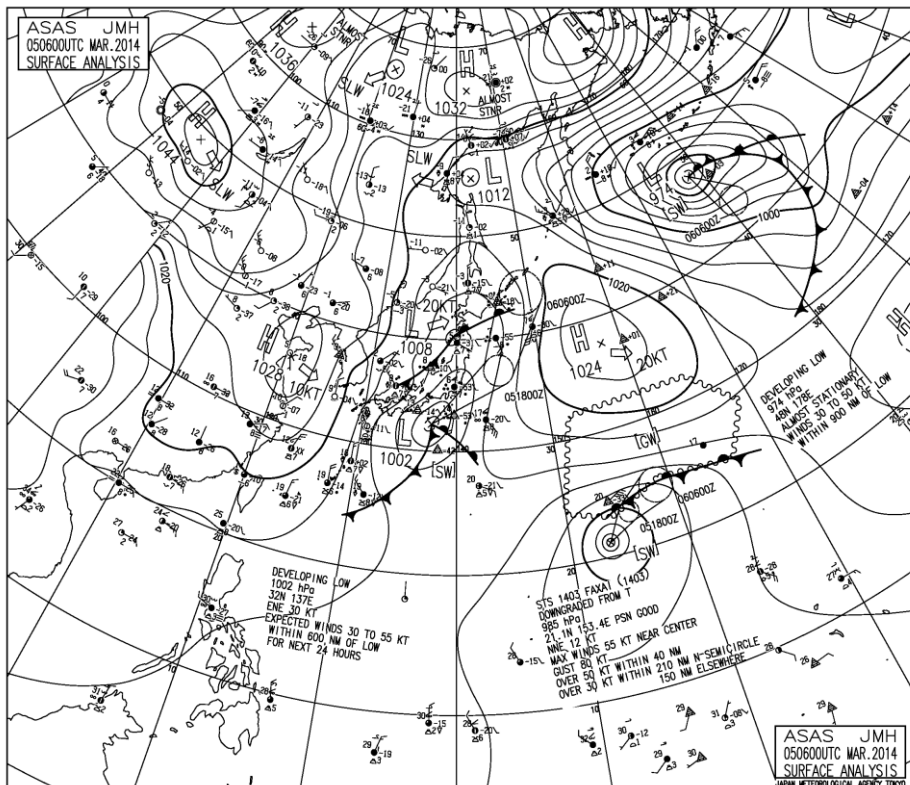


Figure 8: Weather Charts



09:00
March 5



15:00
March 5

Figure 9: Three Angle View of Cessna 172M RAM

Unit: m

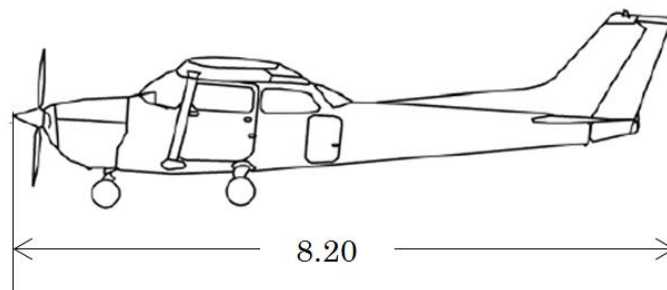
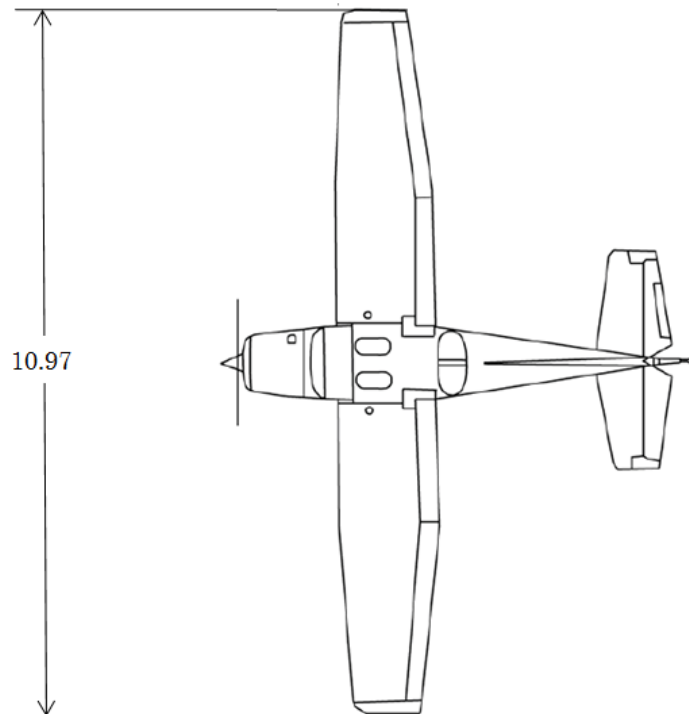
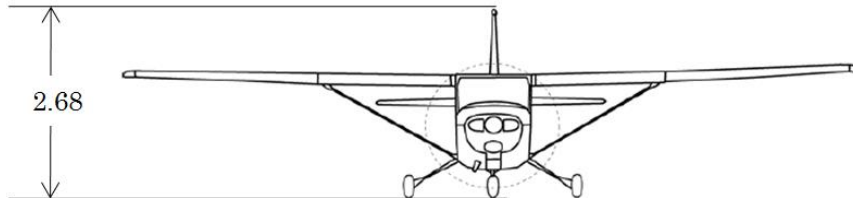


Photo 1: Accident Aircraft



Photo 2: The Tower Struck by the Aircraft
(Immediately after Repair)

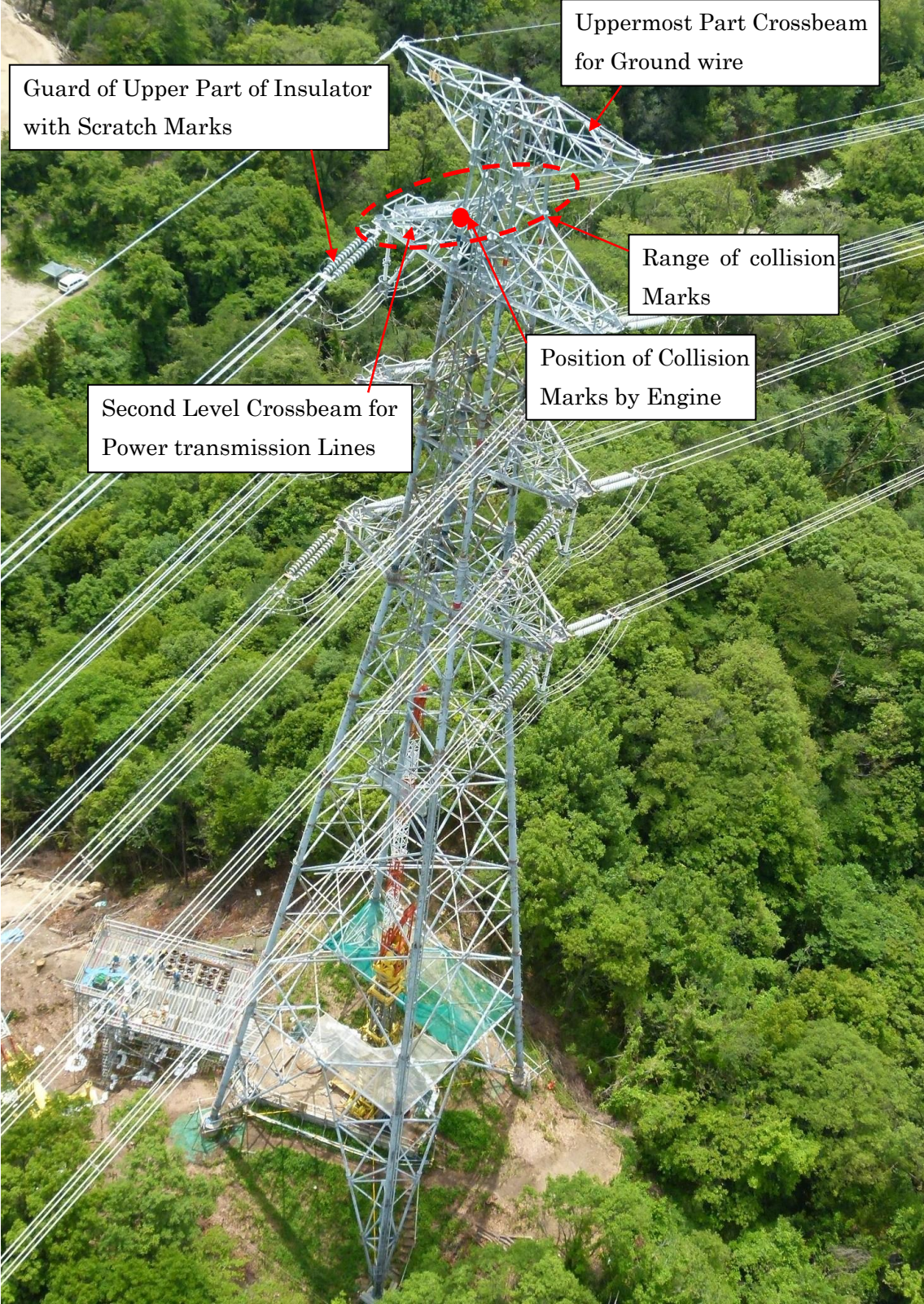


Photo 3: Collision Marks and Actual Parts Matching

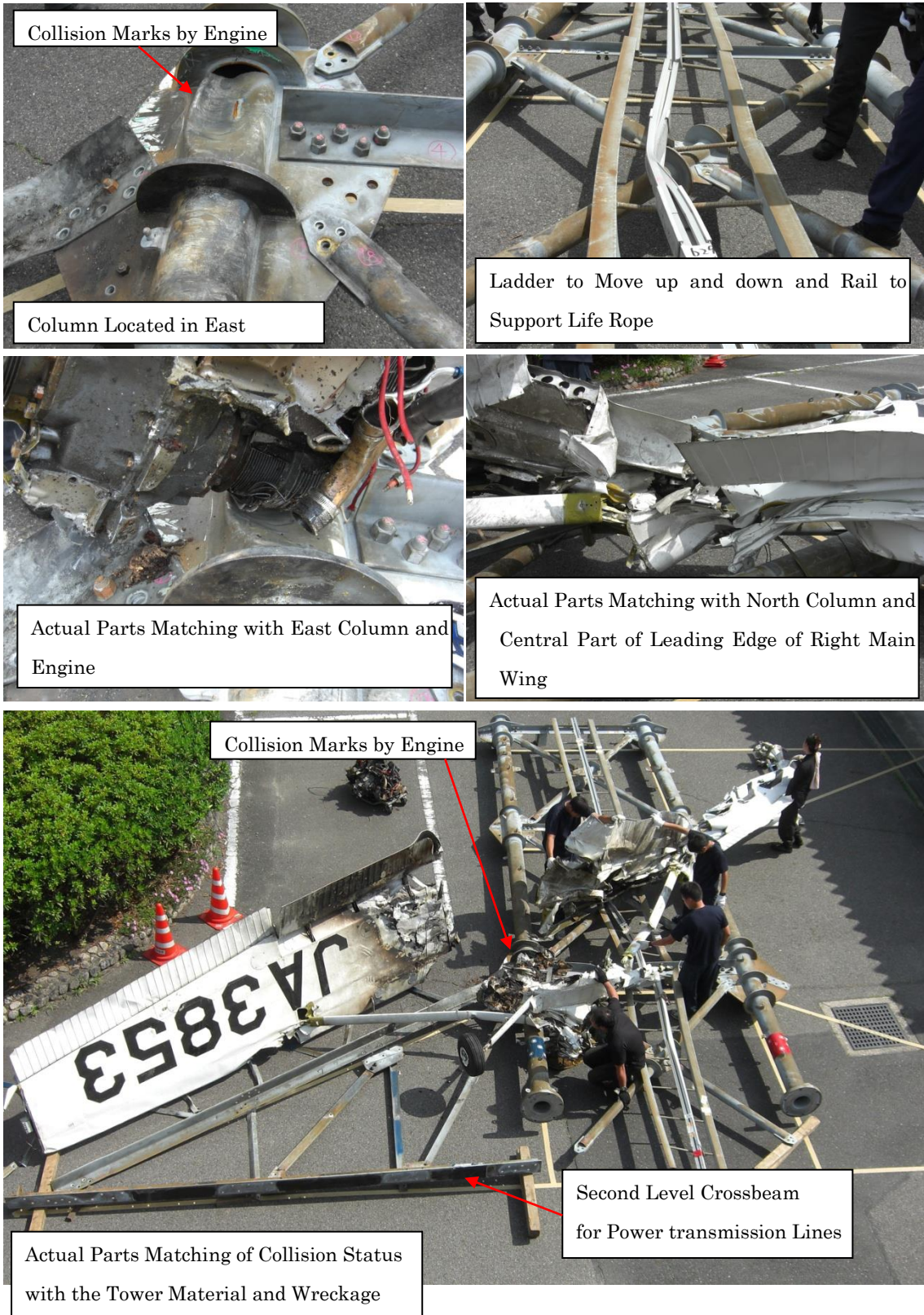
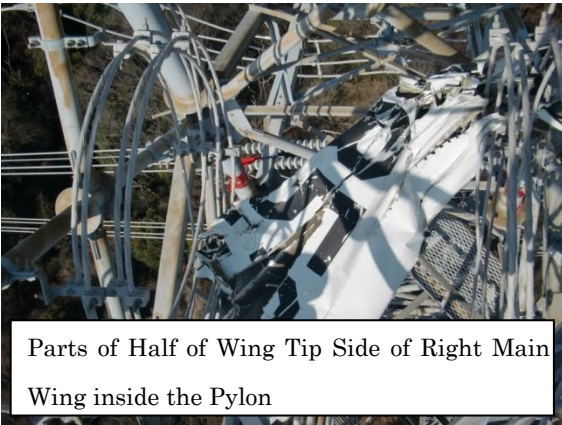
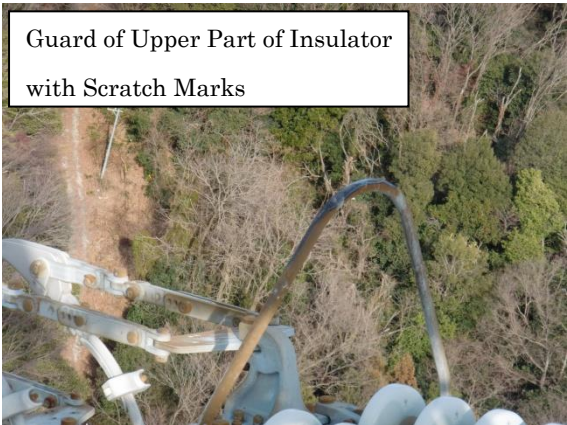


Photo 4: Accident Site



Parts of Half of Wing Tip Side of Right Main Wing inside the Pylon



Guard of Upper Part of Insulator with Scratch Marks



Left Main Wing



Empennage



Engine



Underbelly of Cabin and Left Landing Gear