

AA2017-5

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
JA 7963**

July 27, 2017

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.

Kazuhiro Nakahashi

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 INTO THE FACE OF THE MOUNTAIN SLOPE
PRIVATE OWNED ROBINSON R22 BETA (ROTORCRAFT),
JA7963
MATSUIDA-TOWN, ANNAKA-CITY, GUNMA-PREFECTURE,
JAPAN
AT ABOUT 10:56 JST, NOVEMBER 22, 2015**

June 23, 2017

Adopted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakahashi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
Member	Yuichi Marui
Member	Keiji Tanaka
Member	Miwa Nakanishi

SYNOPSIS

<Summary of the Accident>

On Sunday, November 22, 2015, a privately owned Robinson R22 Beta, registered JA7963, took off from Tokyo Heliport at 09:55 Japan Standard Time for a familiarization flight to Komoro Temporary Helipad at Komoro City, Nagano Prefecture. At about 10:56, the rotorcraft collided into a slope face of a mountain at side of Joshin-etsu Expressway near Matsuida Town, Annaka City, and Gunma Prefecture.

A captain and a passenger were on board the rotorcraft and both of them died in

the collision.

The rotorcraft was destroyed, but there was no outbreak of fire.

<Probable Causes>

In this accident, it is probable that the rotorcraft collided into a slope face of a mountain, because it continued a flight in spite of a deteriorated weather during the flight to a temporary helipad of destination and resulted in flying at low altitude in order to secure a visibility under a condition where VMC could not be maintained.

Regarding the reason for the rotorcraft to continue a flight in spite of the deteriorated weather, it is probable that it was because the pilot was trying to find a route to the destination.

Abbreviation used in this report are as follows:

GPS: Global Positioning System
VFR: Visual Flight Rules
VMC: Visual Meteorological Condition
VRS: Vortex Ring State

Unit Conversion Table:

1 ft: 0.3048 m
1 lb: 0.4536 kg
1 kt: 1.852 km/h (0.5144 m/s)

1. PROCESS AND PROGRESS OF THE ROTORCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Sunday, November 22, 2015, a privately owned Robinson R22 Beta, registered JA7963, took off from Tokyo Heliport at 09:55 Japan Standard Time (JST: UTC + 9 hrs, unless otherwise stated all times are indicated in JST on a 24-hour clock) for familiarization flight to Komoro Temporary Helipad at Komoro City, Nagano Prefecture. At about 10:56, the rotorcraft collided into a slope face^{*1} of a mountain at side of Joshinetsu Expressway near Matsuida town, Annaka city, Gunma Prefecture.

A captain and a passenger were on board the rotorcraft and both of them died in the collision.

The rotorcraft was destroyed, but there was no outbreak of fire.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On November 22, 2015, the Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident.

1.2.2 Representative of the Relevant State

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

1.2.3 Implementation of the Investigation

November 23 and 24, 2015	Interviews, On-site investigation, Information gathering
November 25 and 26, 2015	Interviews
January 7, 2016	Examination of the airframe
July 6, 2016	Investigation of the same type of the rotorcraft

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

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

*1 “A slope face” means an artificial slope face of a mountain made by a cut of the ground, embankment and likes.

1.2.5 Comments from the Relevant State

Comments on the Draft Final Report were invited from the participating State.

2. FACTUAL INFORMATION

2.1 History of the Flight

A privately owned Robinson R22 Beta, registered JA7963 (hereinafter referred to as “the rotorcraft”), was flying from Tokyo Heliport to Komoro Temporary Helipad (hereinafter referred to as “the Komoro Helipad”) at Komoro City of Nagano Prefecture for a familiarization flight on November 22, 2015.

A captain and a passenger were on board the rotorcraft.

The flight plan of the rotorcraft was outlined below:

Flight rules:	Visual Flight Rules (VFR)
Departure aerodrome:	Tokyo Heliport
Estimated off-block time:	09:50
Cruising speed:	80 kt
Cruising altitude:	VFR
Route:	Kawagoe - Takasaki - Karuizawa
Destination aerodrome:	Komoro Helipad
Total estimation elapsed time:	1 hour and 30 minutes
Fuel load expressed in endurance:	3 hours and 20 minutes
Persons on board:	Two

The history of the flight up to the accident is summarized as below, according to records of the portable GPS receiver which the captain had carried into the rotorcraft (hereinafter referred to as “the GPS”), the communication records with a Koto Flight Service (hereinafter referred to as “the Flight Service”) at the Tokyo Heliport, the images saved in a digital camera which the passenger had (hereinafter referred to as “the digital camera”), and the statements of eyewitness.

2.1.1 History of the Flight based on the GPS Records, the Communication Records of the Flight Service and the images saved in the digital camera

09:55	Took off from the Tokyo Heliport
09:57	End of the communication with the Flight Service
Around 10:20	Passing over a vicinity of Higashi-Matsuyama City of Saitama

	Prefecture
10:53:20	Passing over Joshin-etsu Expressway (hereinafter referred to as “the expressway”) in a westerly direction from the point at about 460 m south-southwest of the accident site
10:53:52	Changing from a direction heading toward a mountain at about 700 m west-northwest of the accident site to the accident site direction
Around 10:55	Turning to fly over the expressway near the accident site
10:56:11	End of the GPS records near the accident site after passing from south to north over the expressway.

2.1.2 History of the Flight according to the statements of the eyewitness and others

(1) The Owner of the rotorcraft

An owner of the rotorcraft had regularly rent out the rotorcraft to the captain. Furthermore, he is managing a flight club and the captain and the passenger were the member of the club.

In a morning of the accident day, the captain and the passenger were preparing the rented rotorcraft at a temporary helipad (hereinafter referred to as “Nagareyama Helipad”) of Nagareyama City, Chiba Prefecture to fly to the Komoro Helipad after the stop to refuel at the Tokyo Heliport. The captain and the passenger were checking the meteorological data and the images from the live camera set up near Mt. Asama via internet and had decided to takeoff if the ridgeline of Mt. Asama become visible on live camera. After executing an exterior inspection of the airframe, as the captain sat in the left seat and the passenger sat in the right seat, the rotorcraft took off from the Nagareyama Helipad at around 09:05. Prior to the departure, the captain and the passenger did not show any sign of health problems.

The owner of the rotorcraft had acknowledged that the rotorcraft landed at the Tokyo Heliport because he was listening to communication between the rotorcraft and the Flight Service with a ground radio device. Then, the captain contacted him at his cellphone, “We finished refueling, now. If the ridgeline of Mt. Myougi would be visible, we will go. If not, we will be back.” Since then, he had never listened to radio communication. Additionally, radio communication between the Nagareyama Helipad to the Tokyo Heliport had been performed by the passenger.

Furthermore, the owner of the rotorcraft had been to the Komoro Helipad for several times in the past with the captain on board with him, but he always took

the flight route from the Usui Mountain Pass through north side in order to avoid flying over the mountains near the accident site.

(2) The maintenance engineer

The maintenance engineer contracted to maintain the rotorcraft including an examination of an airworthiness certificate for it. The latest airworthiness examination was on October 28, 2015 and at that time, he adjusted the cyclic stick because its friction was weakened, and also replaced the battery. Furthermore, he did test run of the engine on the ground and detect no anomaly on the airframe including the engine.

(3) The eyewitness A

The eyewitness A had been in a garden of his home since around 10:30 on the day of the accident.

The rotorcraft was flying and turning over the vicinity of the accident site for about 10 minutes after hearing of the sound of rotorcraft flying. After that, the cloud in a sky was hiding the rotorcraft, but I could see the rotorcraft again, because it started to lower the altitude. At around 10:55, the sound changed to the sound like accelerating a vehicle engine. Then, the rotorcraft pitched-down the rotorcraft, after passing over the expressway from south side to the accident site, and I heard the impact sound of “thump”. The impacting state was not visible because the rotorcraft went behind the mountain into hiding. At the time, almost half of the mountain above the accident site on the slope was hidden behind cloud.

(4) The eyewitness B

The eyewitness B was watching ahead from a passenger seat of a running vehicle on the outbound line of the expressway. A red rotorcraft passed over the expressway from south side to north side and after heading to the accident site, collided into the slope face of the mountain. The visible flight height of the rotorcraft was almost same as the height as the collision site.

The location where this accident occurred and where the rotorcraft was stopped was at the slope face (36°20'32"N 138°42'56"E) at an altitude about 530 m of a mountain on the north side of Tokyo Bound Expressway at Matsuida Town, Annaka City, Gunma Prefecture between Usui-Karuizawa Interchange and Matsuida-Myougi Interchange, and the date and time of the accident was at around 10:56 on November 22, 2015. (See Appended Figure 1: Estimated Flight Route, Photo 1: Accident Rotorcraft, and Photo 2: Accident Site Area)

2.2 Injuries to Persons

The captain and the passenger were killed.

2.3 Damage to the Rotorcraft

2.3.1 Extent of Damage

Destroyed.

2.3.2 Damage to the Rotorcraft Components

Fuselage	Broken, Bent, Ruptured
Tail Cone	Broken
Engine	Broken, Damaged
Main Rotor	Broken, Bent
Tail Rotor	Broken, Bent
Landing gear	Broken, Bent
Control system	Partial Ruptured

(See Photo 3: Damage Situation of the Rotorcraft)

2.4 Personnel Information

(1) Captain Male, Age 54

Private Pilot Certificate (Rotorcraft)

Type rating for single-piston engine (land) March 24, 1989

Class 2 aviation medical certificate

Validity June 8, 2016

Specific pilot competence certificate

Expiration date of piloting capable period October 19, 2016

Total flight time 376 hrs 33 min

Flight time in the last 30 days 0 hrs 0 min

Total flight time on the type of rotorcraft Unknown

Flight time in the last 30 days 0 hrs 0 min

(2) Passenger Male, Age 57

Private Pilot Certificate (Rotorcraft)

Type rating for single-piston engine (land) October 2, 2002

Class 2 aviation medical certificate

Validity November 19, 2016

Specific pilot competence certificate

Expiration date of piloting capable period not-yet-tested

Total flight time	Unknown
Flight time in the last 30 days	Unknown
Total flight time on the type of rotorcraft	Unknown
Flight time in the last 30 days	Unknown

2.5 Rotorcraft Information

2.5.1 Rotorcraft

Type	Robinson R22 Beta
Serial number	3204
Date of manufacture	March 30, 2001
Certificate of airworthiness	No. Tou-27-349
Validity	November 14, 2016
Category of airworthiness	Rotorcraft Normal N
Total flight time	2,340 hrs 30 min

(See Appended Figure 2: Three Angle View of Robinson R22 Beta)

2.5.2 Weight and Balance

When the accident occurred, the weight of the rotorcraft is estimated to have been 1,282 lb and the position of the center of gravity (CG) is estimated to have been 249.2 cm aft of the reference line and 2.1 cm right of the centerline, all of which are estimated to have been within the allowable ranges (the maximum gross weight: 1,370 lb, the minimum gross weight: 920 lb; the CG range for the weight at the time of the accident: longitudinally 243 to 259 cm and laterally within 5.6 cm to the right and 6.6 cm to the left of the airframe symmetry plane).

2.5.3 Fuel and Lubricating Oil

The loaded fuel and lubricating oil on the rotorcraft were AVEGAS100LL and MIL-L22851.

2.6 Meteorological Information

2.6.1 General Weather Conditions

(1) General weather conditions of the Gunma Prefecture issued by Maebashi local meteorological observatory at 10:42 on the day of the accident was as follows:

A continental anticyclone was extending from North Japan to East Japan. The weather in the Kanto-Koshin regions was forecasted to be mostly cloudy and to be raining at some area of Izu Islands. On 22, the weather indicated that a high

pressure would extend to cover the area from the north, but it would be under the influence of a pressure trough and a wet air. Due to this, the weather of Gunma Prefecture was forecasted to be mostly cloudy.

(2) General weather conditions of Nagano Prefecture issued by Nagano local meteorological observatory at 10:50 on the day of the accident was as follows:

A high pressure was indicated to cover Honshu, loosely, but an upper pressure trough was approaching from west. The weather in Nagano Prefecture was forecasted to be clear or cloudy. On 22, a high pressure would cover the area, but it would be under the influence of an upper pressure trough and a wet air. Due to this, the weather of Nagano Prefecture was forecasted to be mostly cloudy with some sunshine hours.

2.6.2 Observations according to the regional automated weather station

(1) Observations at Nishinomaki Observatory located approximately 11 km south-southwest of the accident site at an elevation about 377 meters, was as follows:

11:00 Wind Direction South, Wind Velocity 1.8 m/s, Temperature 9 °C
Sunshine Duration 0 hour, Precipitation 0 mm/h

(2) Observations at Karuizawa Observatory located approximately 15 km west of the accident site at an elevation about 1,000 meters, was as follows:

11:00 Wind Direction East-Northeast, Wind Velocity 3.5 m/s,
Visibility 20 km
Weather Cloudy, Temperature 7 °C, Dew Point 5.5 °C
Atmospheric pressure 911.8 hPa, Sunshine Duration 0 hour,
Precipitation 0 mm/h

2.6.3 Other information relating to the weather by Japan Meteorological Agency

The Surface Analysis chart at 09:00 on the day of the accident shows conditions where clouds covered around Kanto Region, altocumulus cloud was generated at middle-level and cumulus cloud and stratocumulus cloud were generated at low-level. Furthermore, low cloud was existed at the visible and infrared color images and the cloud top height information at 10:55.

However, no warning or advisory was issued by Gunma or Nagano Prefectures at the accident relating time zone.

(See Appended Figure 3: Asian Pacific Surface Analysis chart, and Appended Figure 4: Satellite Image)

2.6.4 Observation according to the relevant agencies

(1) East Nippon Expressway Company Limited

The observations based on the weather observation conducted by the company using observation device set up on the expressway right below the accident site because the surrounding area of the accident site is mountainous area and tends to have fog generation, are as follows:

10:55 Ground visibility 586 m, no precipitation

(2) Gunma Prefectural Police Aviation Unit

After deploying a unit to rescue operation, on receiving the accident report, the Unit conducted a weather observation at the site and the observations were as follows:

12:12 Cloud base height about 600 m, Flight visibility about 3,000 m,
Wind direction south, Wind velocity breeze,

(3) Gunma Prefectural Air Rescue

On receiving the accident report, the observations at the time to departure from the Gunma Heliport to rescue were as follows:

11:25 Cloud base height low, Ground visibility 3,000m,
Wind direction south, Wind velocity about 1 m/s

2.6.5 Other weather information

(1) Observation by Eyewitness

Based on the contents of the statement of the eyewitness A as described in 2.1.2 (3), the cloud altitude which a saw at the time of the accident was as follows:

① The height from the road surface of the expressway to the mountain slope was about 109 m including about 15 m of trees height. Therefore, the half of the height from the expressway to the mountain slope including trees are about 55 m.

② The elevation at the expressway road surface is about 490 m.

Based on above mentioned, cloud existed at an altitude about 545 m.

(2) Images taken by digital camera

The images saved in the digital camera owned by the passenger include the image taken during the flight at the point above Higashi-Matsuyama City, Saitama Prefecture at around 10:20. In this image, the sky above the rotorcraft to the heading (toward the accident site) were widely covered with cloud.

(See Photo 4: Digital camera Image)

2.7 Communications

The rotorcraft was communicating with the Flight Service at the time of takeoff from Tokyo Heliport to the Komoro Helipad, however, after that, there was no communication with the Flight Service nor any other organization like the flight support center.

Furthermore, state of the communications with the Flight Service during the flights from the Nagareyama Helipad to the Tokyo Heliport and from the Tokyo Heliport to the Komoro Helipad were good and the passenger was in charge of all these communications.

2.8 Accident Site and Wreckage Information

2.8.1 Condition of the Accident Site

The accident site was on the slope face of the mountain at north-side of the expressway. Kanto Mountains lays from south to north at west-side of the accident site, Mt. Myougi (at an elevation about 1,104 m and the distance from the site is about 5.1 km) is at south-southeast and Usui Mountain Pass (at an elevation about 960 m and the distance from the site is about 5.7 km) is at west-northwest.

The slope face is a land managed by East Nippon Expressway Company Limited, rhombus wire nets were installed on about 45 degrees tilted slope face in order to prevent earth damages like a slope failure or a landslide, and large rocks are dotted under the wire nets. Adding to this, there are concrete paved paths provided for maintenance at every approximately 10 m in perpendicular direction, and the rotorcraft stopped at the path with the nose facing east. Furthermore, there are cliff at about 60 m east from where the rotorcraft stopped, the north and east sides are lower and provide good views.

There were damaged wire nets on three places at about 7.6 m upward, one place at about 4.5 m right-upward and one place at about 4.3 m left-upward from a spot where the rotorcraft stopped at (at an elevation about 530 m), and there was the trace of fuel leakages near the damaged part at about 4.3 m left-upward from the spot.

All parts of the destroyed rotorcraft are scattered around the accident site.

(See Appended Figure 5: Accident Site and Appended Figure: 6 Map near the Accident Site)

2.8.2 Details of the Damages

(1) Fuselage and others

A whole of the fuselage was completely destroyed without any traces of its original shape.

The battery equipped at the left side of engine compartment below the airframe was broken into pieces and the internal pole plates were separating individually.

(2) Tail Cone

Broken at the joint part near the middle.

(3) Engine

Crankcase was broken at the forward section of the airframe.

The intake air-filter was damaged as being crushed.

The lower oil pan was damaged as a strong force pushing upward from the bottom.

(4) Main Rotor

One of two blades was largely bent from near the central part to below (ground).

The other blade was broken from the root.

(5) Tail Rotor and others

One of two blades was broken from the root. Furthermore, the lower vertical stabilizer was bent backward.

(6) Landing gear (Skids and crosstube)

Skids were broken near the mounting of the left front crosstube. The face touching the ground had a contact mark with the rhombus wire nets preventing earth-damage. The right side did not have a big damage.

The crosstube was bent like being pushed to the rear of the airframe and the whole was largely bended.

2.9 Medical Information

Gunma Prefectural Police said that the captain and the passenger died of traumatic shocks due to a multiple injuries. The captain and the passenger tested negative for alcohol and addictive drugs. Furthermore, the captain was confirmed to sit in the left seat based on the seatbelt mark on him.

The passenger was suffering diabetes and regularly taking insulin, but the fact was not included in his report for examination of aviation medical certificate. Furthermore, Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter referred to as "JCAB") stipulates the aviation medical criteria for an aviation medical certificate and the aviation medical examination manual as the criteria describes as follows (excerpts):

1-5 Endocrine and Metabolic disorder

1. Physical examination criteria

A person shall not have endocrine disorder or metabolic disorder, or organ damage or dysfunction due to these disorders that may disrupt flight disorders.

(Omitted)

2. Incompatibility

2-3 Diabetes, requiring regular intake of insulin or oral hypoglycemic agents

(Omitted)

2.10 Information on Fire and Rescue operation

The rotorcraft was destroyed, but there was no outbreak of fire.

Furthermore, the rescue operation relating to the accident were outlined as follows:

10:57 A citizen made an emergency call to the police (110).

11:32 Expressway patrol of Gunma Prefectural Police arrived at the site, confirmed that two passengers were on board and made a call to the fire department (119).

11:39 Unconsciousness of the captain and the passenger were confirmed.

11:55 The disaster-prevention helicopter of Gunma Prefecture hoisted the passenger and transported to a hospital.

13:49 Started to transport the captain by hands.

14:24 The captain was taken aboard an ambulance on the expressway.

2.11 Tests and Researches

2.11.1 GPS records

Portable GPS receiver (nuvi 1480) manufactured by GARMIN Ltd. found in the rotorcraft had records of altitudes, longitudes and latitudes from the takeoff up to the accident on that day and ended at 10:56:11 as its last entry. The information were recorded at every second until 10:55:40, but after that time, at 5 seconds interval or at 21 seconds interval.

It is probable that it is not so precise because the GPS receiver is portable type and the flight route was through mountains, but based on this GPS records the airspeed and descend rate are calculated, and the tables and figures are made as the condition around the accident site, because these records are only records of the altitudes, the longitudes and latitudes of the rotorcraft from the takeoff up to the accident.

(See Appended Figure 7: GPS Records near the Accident Site)

2.11.2 Investigation regarding Vertical Load on Landing Gears

According to the designer and the manufacturer of the rotorcraft a landing gear of

the type of rotorcraft is designed to absorb a specified vertical velocity exceeding the designed strength of the skid and the crosstube of the landing gear is estimate more than 13.4 ft/sec when the gross weight is 1,370 lb.

2.12 Additional Information

2.12.1 Control System of the rotorcraft

The main control system of the rotorcraft was equipped around the right seat, but a cyclic stick, a collective pitch lever and tail rotor pedals are equipped at the left seat to enable a control from left. Furthermore, a radio communication system was operable from both of right and left seats.

2.12.2 VMC

Regarding VMC, Ordinance for Enforcement of the Civil Aeronautics Act has the following description (Excerpts):

(Instrument Meteorological Conditions)

Article 5: Low meteorological visibility as specified by Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism set forth in paragraph (15), of Article 2 of the Act shall be meteorological conditions (hereinafter referred to as "visual meteorological condition") other than those listed in the following items according to the classification of aircrafts listed in the following items:

(Omitted)

*3. 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 (excluding aircrafts listed in the following item):
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 the pilot may visibly recognize the ground surface or the water surface.

2.12.3 Safety securement at VFR

On March 2014, JCAB makes this notice of considerations to determine a flight regarding weather condition known to the related organizations as follows (Excerpts):

(1) In order to secure a safe flight during VFR, collect and study the latest weather information which is not only a current weather conditions on a departure place

and a destination, but also a weather conditions along a flight route and a weather condition of destination at arrival, and predicting what kind of weather condition to fly through, make sure for the rotorcraft to takeoff only when it seems possible to maintain the VFR flight and to secure the safety of the flight. Furthermore, regarding of the analysis of a weather condition at cases not to be able to obtain weather information over a flight route and at a destination, an appropriate decision by utilizing weather information obtained from meteorological agencies on the flight route or near the destination should be made.

(2) When a change of weather is expected, with a study of alternative plans for a case to face a bad weather where it would not be possible to continue the VFR flight, try to collect weather information intermittently even during flight and try to grasp any changes of weather.

(3) When a meteorological indication to deteriorate appears, make an early decision about whether or not to continue a flight, then choose to return to a departure aerodrome or make a landing at an appropriate airfield in the vicinity of the flight route.

2.12.4 Acquisition of information like weather information or others required for flight operation

It was possible to obtain weather information and likes from any agencies like the Flight Support Center at the Tokyo Heliport or during flight, but there were no records of any requests for the weather information by the rotorcraft.

2.12.5 Information about the Komoro Helipad of destination

The Komoro Helipad of destination helipad which obtains permission of provision of Article 79 of Civil Aviation Act was added to a restaurant which is located at about 27 km west-southwest from the accident site. Furthermore, the Komoro Helipad does not have a facility to refuel. And on a direct line from the accident site to the Komoro Helipad, the Kanto Mountains lays from south to north and mountains exceeding 1,000 m elevation stands.

Checking the log book by the captain since 2011 for the flight records to the Komoro Helipad, he had flew to there once on January 2013.

(See Appended Figure 6: Map near the Accident Site)

2.12.6 Vortex Ring State

The flight manual of the rotorcraft stipulates a safety notice issued as a notice

regarding safety for an operator of the type of rotorcraft by designers and manufacturers of the rotorcraft and describes a precaution regarding Vortex Ring State (hereinafter referred to as “VRS”) as follows (Excerpts):

Safety Notice SN-22

Issued: Jul 86 Rev 94, Japanese translated: June 5, 2002

(Omitted)

Reduce rate of descent before reducing speed

During an approach, many helicopter accidents are occurred, because a pilot reduces airspeed to almost zero prior to his/hers reducing a rate of descent. If a pilot raises a collective pitch lever in order to stop the descent, it will result into downwash made by the rotorcraft, and it will require bigger engine output and collective pitch. The rotorcraft will result in a hard-landing because it falls into Vortex Ring State meaning Settling with Power and often result to lie on its side. This type of accident could be generated during a steep approach regardless of power-on or -off.

Reducing descend rate prior to reduction of speed can prevent accidents. Follow the next rule.

Never allow your airspeed to be less than 30 kt until your rate-of-descent is less than 300 ft per minute.

(Underlines are according to original)

Furthermore, a general technique to recover from the VRS is; first, lower a collective pitch lever to increase vertical descent speed, and then if cyclic stick regains its control, increase forward airspeed and raise a collective pitch lever.

3. ANALYSIS

3.1 Qualifications of Personnel

The captain held both a valid airman competence certificate and a valid aviation medical certificate. The passenger held a valid airman competence certificate, but as described in 2.9, because he had a regular injection of insulin, it is highly probable that he could not meet a criteria for an aviation medical certificate.

3.2 Airworthiness Certificate

The rotorcraft had a valid airworthiness certificate and had been maintained and inspected as prescribed.

3.3 Conditions of the Airframe

It is highly probable that the rotorcraft was damaged due to the impact generated by the accident as described in 2.3.2 and 2.8, Furthermore, it is highly probable that the airframe had no anomaly before the accident occurred, based on the statements described in 2.1.2 (1) and 2.1.2 (2).

3.4 Relations to the Meteorological Conditions

3.4.1 Weather conditions at the time of the departure and during the flight

As described in 2.6.1 and 2.6.3, on the day of the accident, the weather conditions in Gunma Prefecture and Nagano Prefecture were covered with cloud and according to the statement described in 2.1.2 (1), it is probable that the captain and the passenger acknowledged the deterioration of weather and were making decisions mainly based on the clouds over Mt. Asama and Mt. Myougi whether or not to continue the flight, as they checked the conditions of these mountains in particular during the time to check the weather condition for the Flight Route up to the destination.

As described in 2.6.5 (2), images were saved in the digital camera which belonged to the passenger and was left in the rotorcraft, and the images were taken from the Higashi-Matsuyama City of Saitama Prefecture to heading direction over the flight route, and there was already clouds like a stratus at the front and over the rotorcraft. The GPS altitude of the rotorcraft at the time was about 780 m, however, it is probable that Mt. Myougi at an elevation about 1,104 m located at about 60 km northwest to the heading, where they considered to be a decision making point to continue the flight or not, was already covered with cloud, and it is probable that the captain and the passenger decided to continue the flight based on the visibility condition of the ground and likes without making any decisions as an original plan to discontinue the flight when the ridge of Mt. Myougi is not visible.

3.4.2 Weather conditions near the accident site

On the accident day, it is probable that the situation^{*2} was apt to generate fog based on the relations between a temperature and a dew point as shown in 2.6.2, Based on the ground visibility about 586 m as described in 2.6.4 (1), and the cloud at a height about 545 m as described in 2.6.5 (1), it is probable that the visibility was not good and low cloud were already existed, and the rotorcraft entered the cloud based on the flight

^{*2} When the condensation nucleus starts to absorb moistures in the air, it may soon form the water drop. When the dew point gets close to the current air temperature, the condensation nucleus grew faster, the moistures in air started to condensate at surfaces of nucleus and fog becomes easy to be generated.

altitude records by the GPS as shown in Appended Figure 7 or was near the cloud and under a condition where VMC could not be maintained. Furthermore, it is probable that Mt. Asama at an elevation 2,568 m which was considered to be the guide to decide to continue the flight or not at the time of takeoff from Nagareyama Helipad could not be seen. Furthermore, it is somewhat likely that the cloud was almost standstill because of a gentle breeze condition in the vicinity as described in 2.6.2.

3.4.3 Flight decision relating to the VFR

As described in 2.12.3, JACB shows and makes notice of considerations to determine the flight relating to weather condition known to operators conducting VFR, but it is probable that the pilot determined the flight only with the weather condition at that time without predicting the weather at the destination helipad or along the flight route. The pilot should properly comply with the considerations of this notice.

3.5 Situation of the pilot

As described in 2.12.1, the rotorcraft had a control device equipped for each of left and right pilot seat, it is possible to control from either left or right pilot seats. Furthermore, a radio communication system could be controlled from either left or right seats, as described in 2.7, it is highly probable that the passenger was performing radio communications.

Normally, the captain would sit in the right seat, but as described in 2.9, based on the mark made by the seatbelt on his body, it is probable that the captain was sitting in the left seat and the passenger was sitting in the right.

As described in 2.4 (1), the captain held valid certificates required. And as described in 2.4 (2), the passenger held valid certificates required, but he did not take the specific pilot competence. And regarding the intake of insulin, it is highly probable that the health condition of the passenger could not meet a criteria for Aviation Medical Certificate.

It was not possible to determine who controlled the rotorcraft, the captain or the passenger, due to the death of both.

3.6 Selection of Flight Route

As described in 2.1.1 and 2.11.1, it is highly probable that the rotorcraft was flying to the Komoro Helipad of destination following the flight plan based on the GPS records and others. However, about the route from Takasaki to Karuizawa included in the flight plan, as the statements described in 2.1.2 (1), when the captain accompanied the flight

of the rotorcraft to the Komoro Helipad in the past, the past flight route stayed clear of the mountain area where the height are high and flew through the Usui Pass at the north side, however, it is probable that the selection of the flight route of this time as described in 2.11.1, would be straight and fly over the high mountains. Furthermore, it is probable that the visibility at direction to the north side route flown in the past flight which the captain had experienced was relatively good because it was same sighting direction as the eyewitness A saw the rotorcraft as the statement described in 2.1.2 (3). Under these condition, why the operator chose the flight crossing the mountains is somewhat likely that there were psychological factor like his wishing to arrive at the destination as fast as possible.

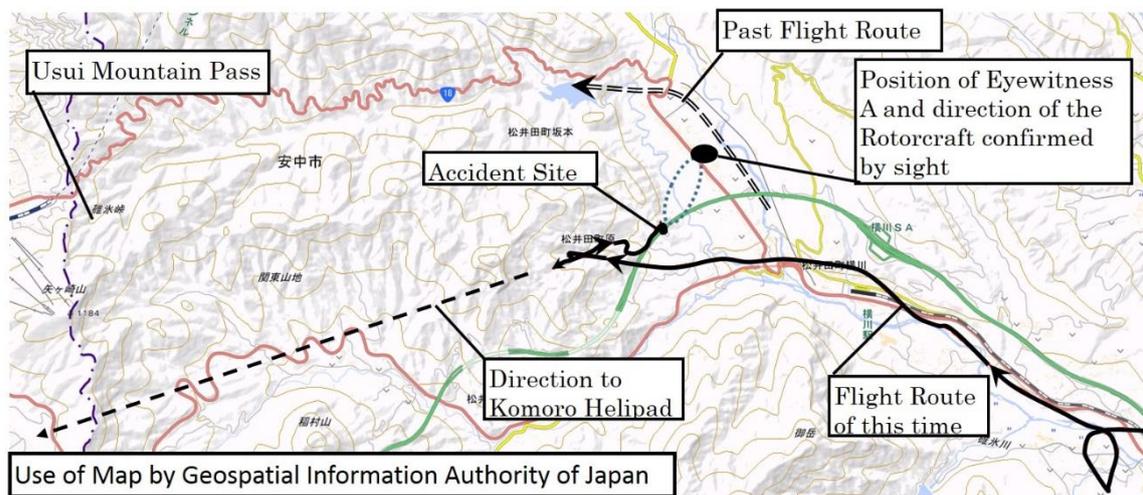


Figure 1: The Past Flight Route

3.7 Situation of the Collision

As described in 2.1.2 (3) and (4), the statement described that the rotorcraft collided with the nose down, flying at the same altitude of the collided site and passing over the expressway at the time of collision. As described in 2.8.2, it is probable that the rotorcraft was flying and collided with a fixed forwarding speed as passing over the expressway because the left skid was broken near the mounting part of the front crosstube and the crosstube was bent like being pushed backward of the airframe. Adding to this, it is probable that receiving a load in diagonal direction, it collided into the slope face of the mountain beside the expressway as described in 2.8.1, the collision from the left front first, and it is somewhat likely that the impact force at the time of collision becomes bigger due to the rocks under the rhombus wire nets set up on the slope face.

At the time of contact, it is probable that because the front of the left skid was broken, the nose contacted at facing east, then, the crosstube bent and the bottom of the

fuselage was broken. Furthermore, based on the contact mark on the ground as described in 2.8.1, it is probable that the rotorcraft contacted the spot which was about 7.6 m upward from the location to stop, then the fuselage moved to the spot about 4.3 m upward and left from the location to stop and slid down to the last location where it parked while receiving repeated damages.

3.8 Relations to VRS

As described in 2.12.6, in order to avoid VRS, the flight manual of the rotorcraft stipulates that never allow the airspeed to be less than 30 kt until the rate of descent is less than 300 ft per minute, however, the calculated groundspeed with records and a calculated rate of descent from the GPS described in Appended Figure 7, because the forward airspeed calculated from observations (wind direction south; wind velocity 1.8 m/s) of winds at Nishinomaki which is the nearest local meteorological observatory from the accident site as described in 2.6.2 (1) was 504 ft/min and 2.4 kt at 10:55:50 and 678 ft/min and 2.2 kt at 10:56:11, therefore during this time zone, it is somewhat likely that the rotorcraft entered VRS. However, it is probable that the rotorcraft recovered from VRS by the time of passing the expressway from south to north based on the collision condition described in 3.7, and the statement described in 2.1.2 (3) and (4), even though it had entered VRS.

3.9 Situation of Maneuvering Operation

Based on the route according to the GPS records as described in 2.11.1, the pilot selected the route crossing the Kanto Mountains as described in 3.6, but as described in 3.4.2, it is probable that the low cloud at an altitude about 545 m already covered the area and it was not possible to maintain VMC described in 2.12.2. it is probable that in order to keep the visual contact with the ground, looking for a flight route to escape apart from the cloud and changing the route to return, it flew to over the expressway and it is probable that at the time it was required to lower the altitude gradually due to the low cloud base condition.

As described in 2.8.1, a cliff locates at about 60 m east from the location where the rotorcraft stopped and low land were spread at further ahead to north and east from the spot, furthermore, it is probable that the visibility was fairly good at north-east direction as described in 2.1.2 (3), because the eyewitness A could see the rotorcraft, and then it is somewhat likely that the pilot was trying to fly to the direction, but it is somewhat likely that he collided into the face slope of the mountain because he did not notice the slope face or he was delayed to notice it.

Furthermore, the rotorcraft after the change of the course, when he lowered the altitude in order to avoid the cloud over the expressway, it is somewhat likely that the rotorcraft fell into VRS because he reduced the speed with descending at large rate of descent as described in 3.8. Based on the flight height of the rotorcraft according to the statement of the eyewitness B as described in 2.1.2 (4), up to the time of passing over the expressway from south to north, it is probable that he planned to increase a vertical descending speed by downing the collective pitch lever in order to recover from VRS, and then it is somewhat likely that he reduced the rate of descend by use of cyclic stick at the time about leaving the VRS territory.

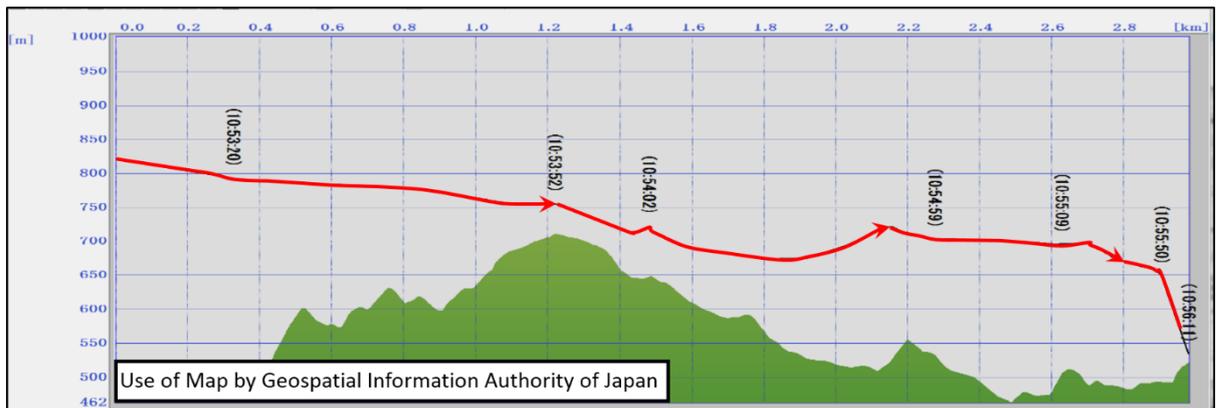
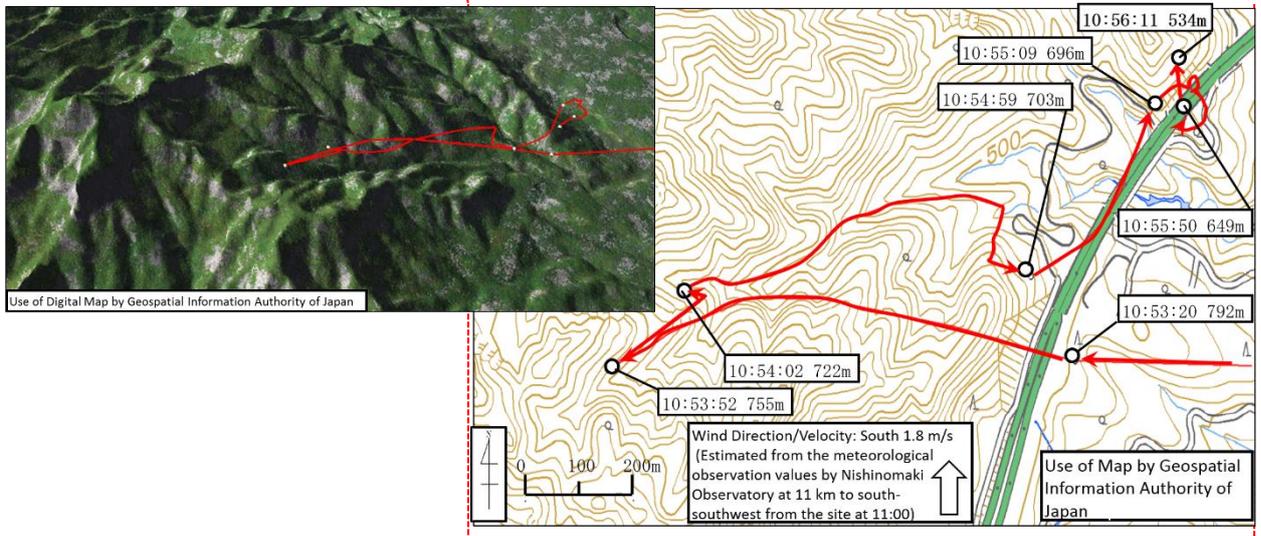
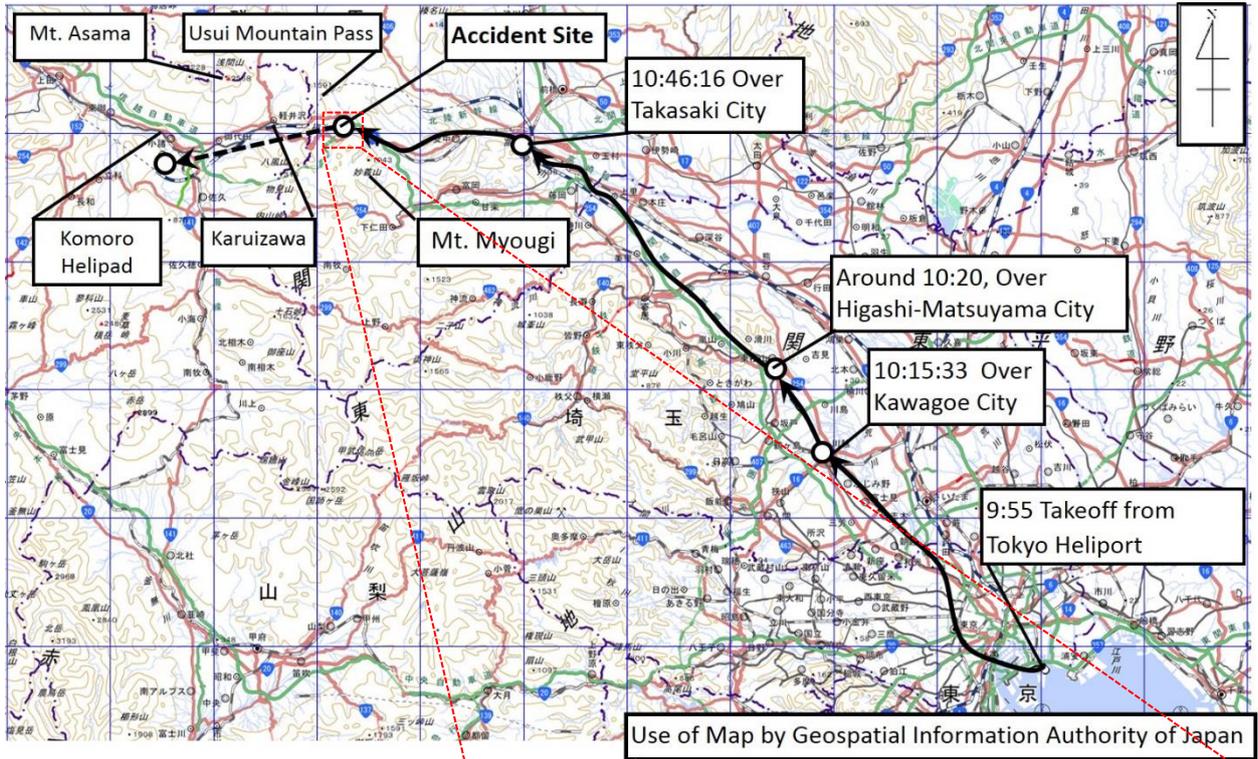
Furthermore, the sound like accelerating a vehicle engine in the statement of the eyewitness A as described in 2.1.2 (3), is probable that it was caused by the operation to raising a collective pitch lever, however, it is somewhat likely that the pilot operated to raise the collective pitch in order to level out from steep descent since there was no sudden climb in the GPS records.

4. PROBABLE CAUSES

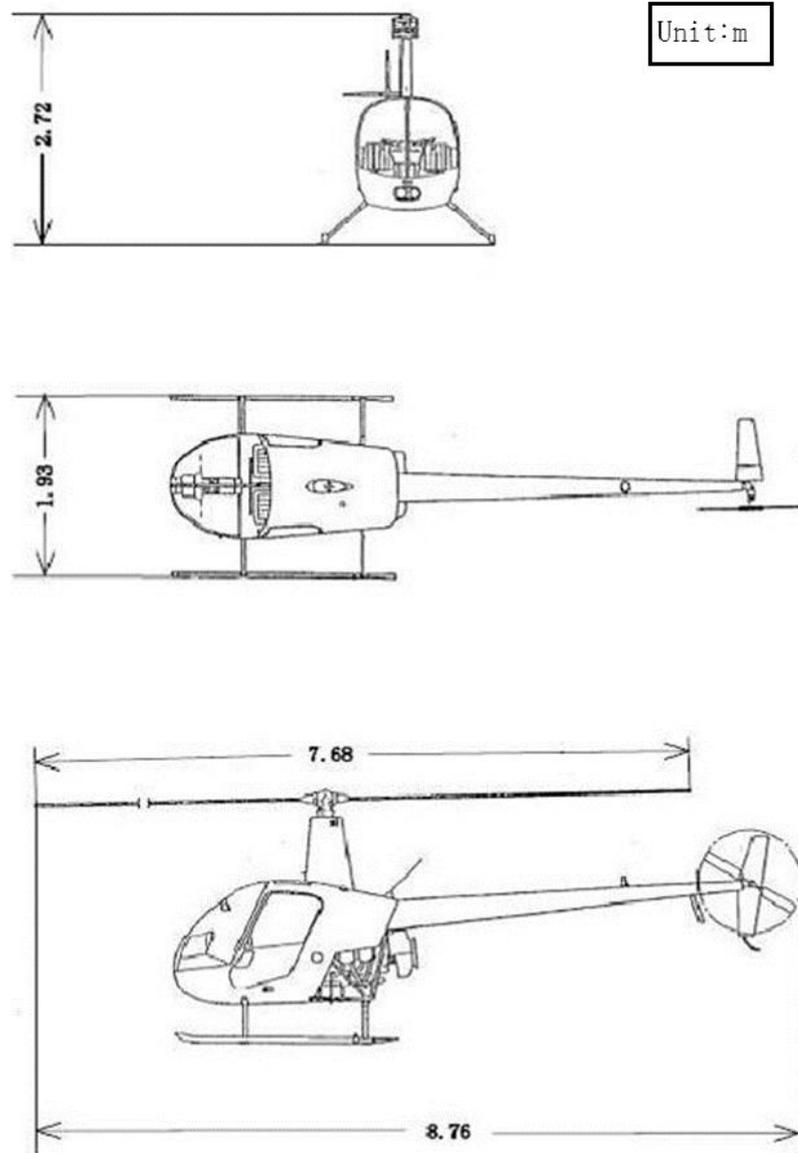
In this accident, it is probable that the rotorcraft collided into a slope face of a mountain, because it continued a flight in spite of a deteriorated weather during the flight to a temporary helipad of destination and resulted in flying at low altitude in order to secure a visibility under a condition where VMC could not be maintained.

Regarding the reason for the rotorcraft to continue a flight in spite of the deteriorated weather, it is probable that it was because the pilot was trying to find a route to the destination.

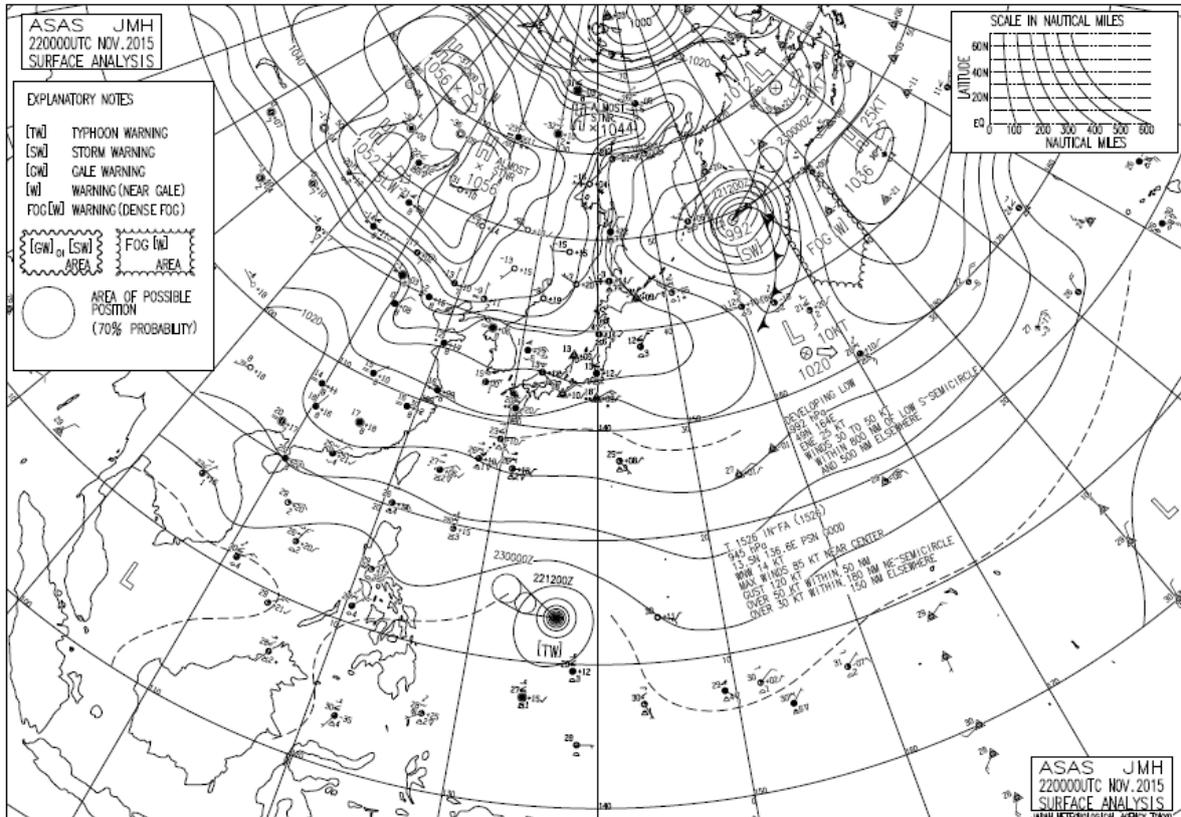
Appended Figure 1: Estimated Flight Route



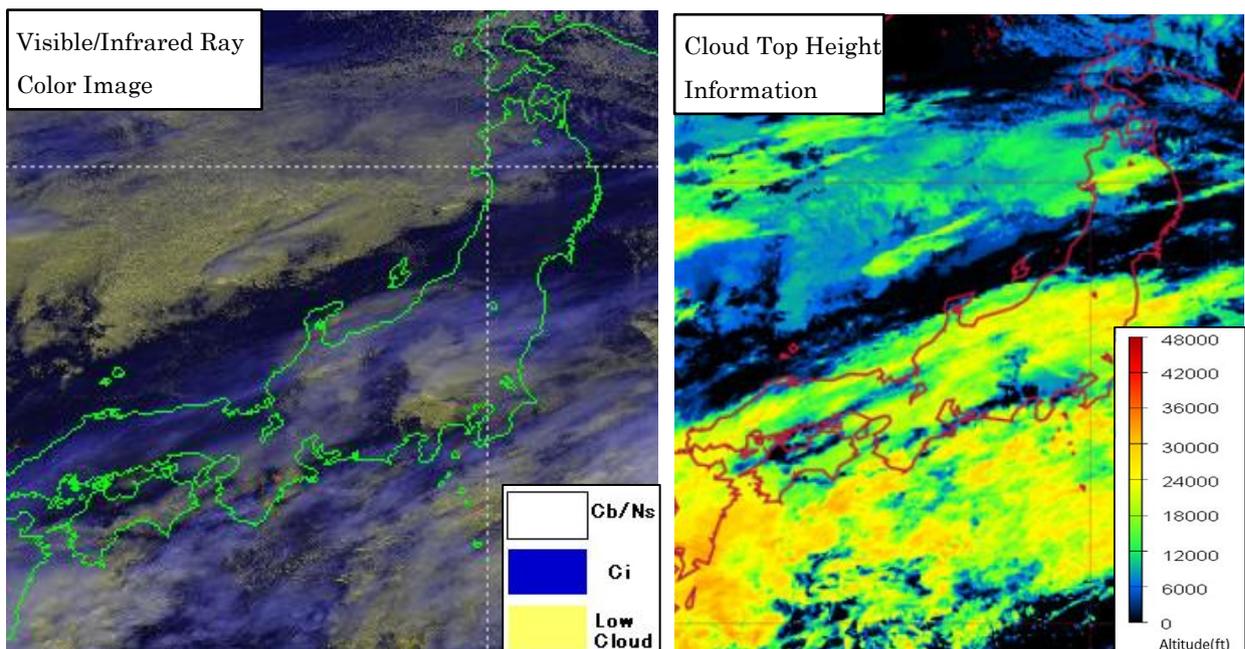
Appended Figure 2:
Three Angle View of Robinson R22 Beta



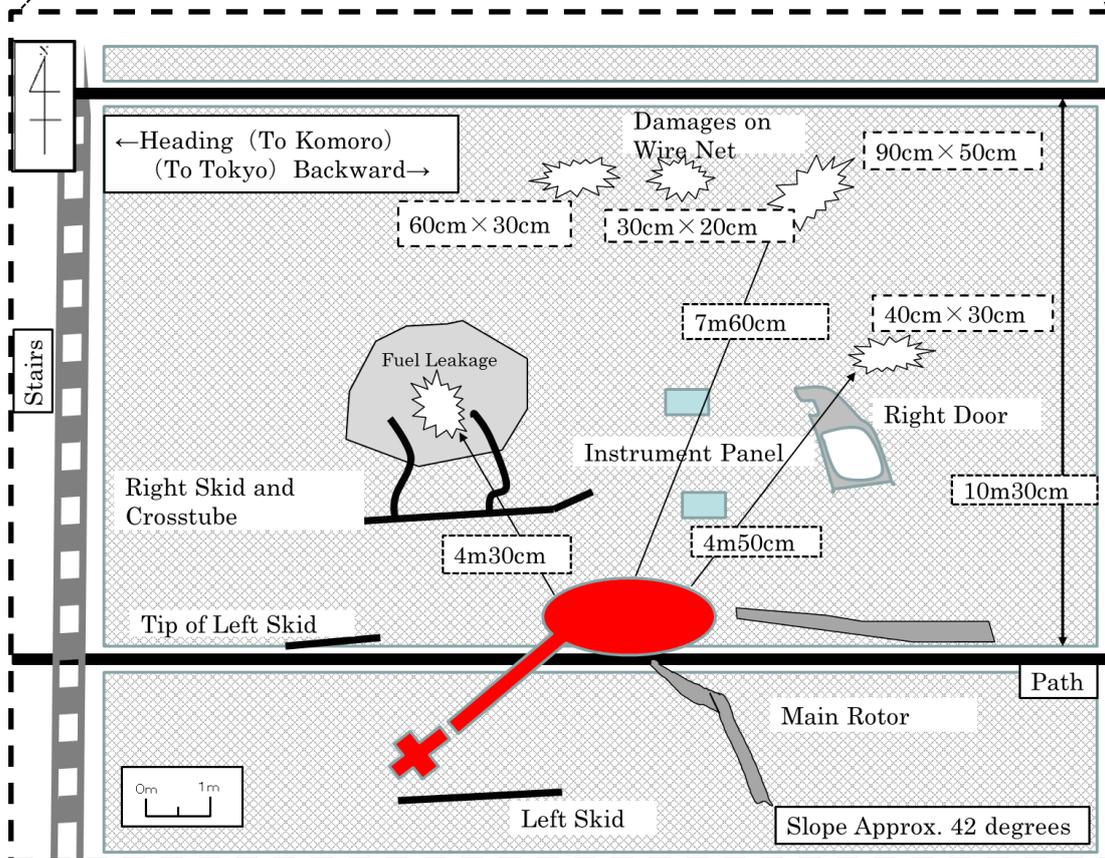
Appended Figure3: Asian Pacific Surface Analysis Chart
(09:00, November 22)



Appended Figure 4: Satellite Image
(10:55, November 22)



Appended Figure 5: Accident Site



Appended Figure 6: Map near the Accident Site



Appended Figure 7: GPS Records near the Accident Site

Time	GPS Altitude (m)	Calculated Ground speed (kt)	Calculated Rate of Descent (ft/min)
1055:08	695	52.3	-140
1055:09	696	41.7	0
1055:10	696	34.3	60
1055:11	696	30.2	0
1055:12	696	25.3	60
1055:13	697	22.5	60
1055:14	697	19	140
1055:15	698	13.1	-12
1055:20	691	9	-12
1055:21	691	9.5	-292
1055:22	688	14.1	-280
1055:23	687	14.5	-370
1055:25	684	13.4	-310
1055:26	682	12.6	-370
1055:27	680	12.3	-340
1055:28	679	8.5	-300
1055:30	676	7.1	-220
1055:31	675	10.4	-280
1055:32	673	18.2	-320
1055:34	669	24.1	-380
1055:35	667	26	-400
1055:36	665	25.9	-380
1055:37	663	24.9	-340
1055:38	662	22.6	-260
1055:39	661	18.4	-200
1055:40	660	11.9	-172
1055:45	656	7.6	-204
1055:50	649	5.9	-504
1056:11	534	5.7	-678

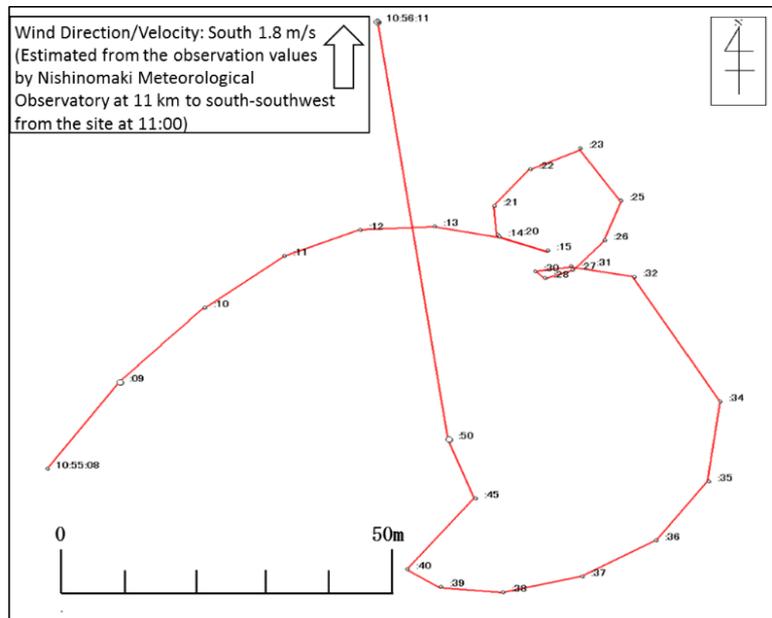


Photo 1: Accident Rotorcraft



Photo 2: Accident Site Area

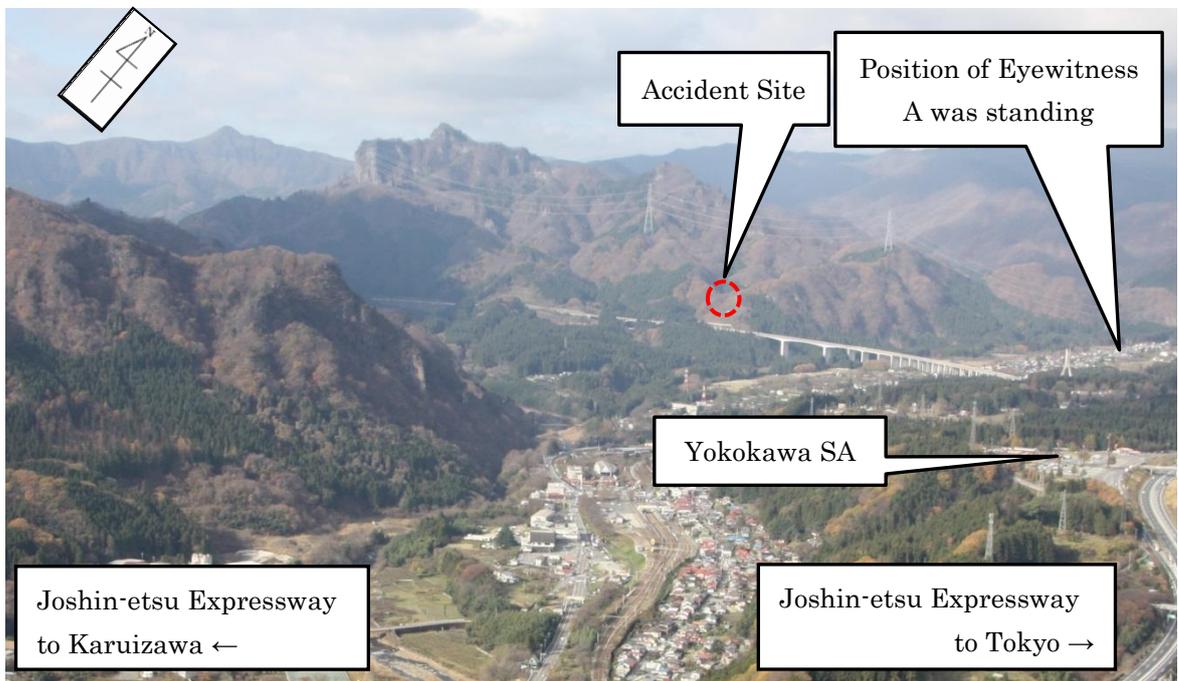


Photo 3: Damage Situation of the Rotorcraft

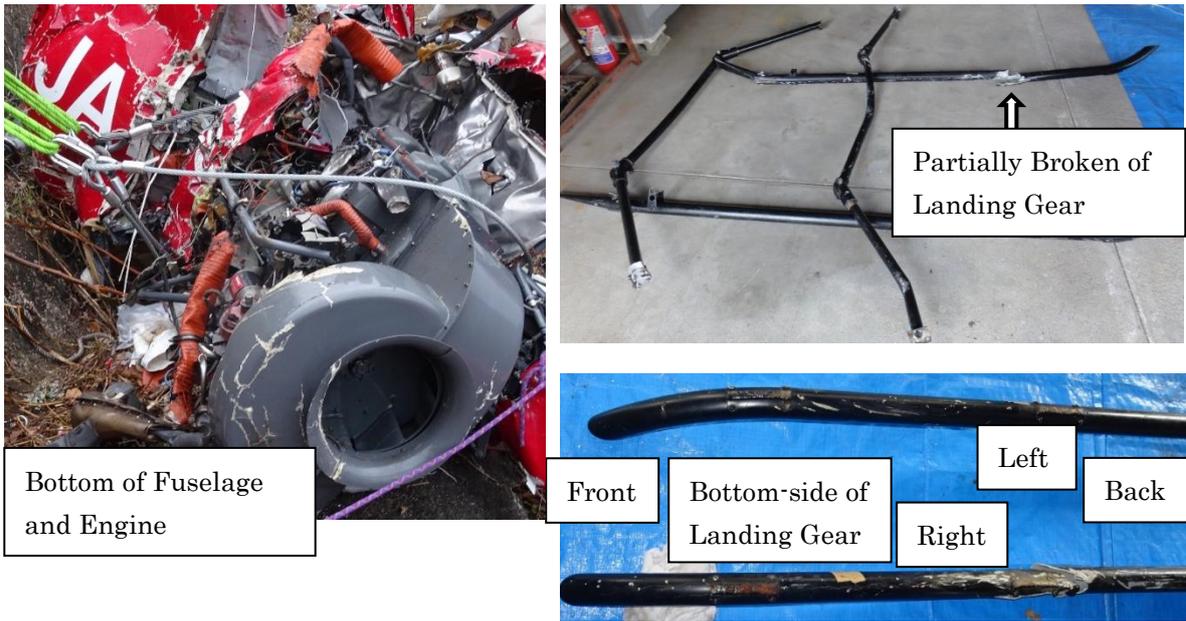


Photo 4: Digital Camera Image

