

AA2017-5

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 2 1 B B**

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

CRASH DUE TO MID-AIR BREAKUP

PRIVATELY OWNED, GLASFLÜGEL 304CZ-17

(GLIDER, SINGLE-SEATER), JA21BB

MIHARU TOWN, TAMURA-GUN, FUKUSHIMA PREFECTURE

AT AROUND 14:05 JST, MAY 5, 2016

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 Thursday, May 5, 2016, at around 11:56 Japan Standard Time (JST: UTC + 9 hours; all times are indicated in JST on a 24-hour clock), a privately owned Glasflügel 304CZ-17, registered JA21BB (glider, single seater), took off from the Kakuda Glider Field in Kakuda City, Miyagi Prefecture by aero tow for a training flight, but crashed in a mountain forest in Miharu Town, Tamura-Gun, Fukushima Prefecture at around 14:05.

The pilot was the only person on board the aircraft, and he was fatally injured.

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

< Probable Causes >

It is highly probable that this accident occurred when JA21BB crashed in a mountain forest because it broke up in mid-air while flying.

It is somewhat likely that the glider broke up in mid-air because, after it had entered a steep turn and stalled while the pilot had succumbed to a state of hypoxia and was semi-conscious, excessive bending occurred owing to aerodynamic force on the glider and the Glider was subjected to load exceeding the ultimate maneuvering load, influenced by the fact that the glider assumed a significant nose-down attitude including spin and nosedived, and that it passed through an area of turbulence.

It is somewhat likely that the pilot succumbed to a state of hypoxia because he had forgotten to open the oxygen valve before setting off and thus started the flight with no supply of oxygen, and had not noticed that oxygen was not being supplied because he did not check the oxygen supply during flight, and so continued to climb without noticing signs of hypoxia in himself.

Abbreviations and Acronyms used in this report include the following:

ACC: Area Control Center
CAT: Clear Air Turbulence
GPS: Global Positioning System
PSI: Pound-force per Square Inch
VFR: Visual Flight Rules
VWS: Vertical Wind Shear

Unit Conversion Table

1ft: 0.3048m
1nm: 1,852km
1kt: 1.852km/h
1mph: 1.609km/h

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Thursday, May 5, 2016, at around 11:56 Japan Standard Time (JST: UTC + 9 hours; all times are indicated in JST on a 24-hour clock), a privately owned Glasflügel 304CZ-17, registered JA21BB (glider, single seater), took off from the Kakuda Glider Field in Kakuda City, Miyagi Prefecture by aero tow for a training, but crashed in a mountain forest in Miharu Town, Tamura-Gun, Fukushima Prefecture at around 14:05.

The pilot was the only person on board the glider, and he was fatally injured.

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

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

The Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident.

Experts from the Japan Aerospace Exploration Agency cooperated in analyzing the state of damage to the glider.

1.2.2 Representatives from the Relevant State

An accredited representative of Czech Republic, 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

| | |
|------------------|--|
| May 6 to 7, 2016 | Glider examination, on-site investigation and interviews |
| May 26, 2016 | Glider examination |
| June 6, 2016 | Analysis of damage to the glider |
| June 9, 2016 | Investigation on hypoxia, voice communication and others |
| August 4, 2016 | Image analysis of the state of damage to main wings |

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

Comments were not invited from the person relevant to the cause of the accident because the pilot was fatally injured in this accident.

1.2.5 Comments from the Relevant State

Comments were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On May 5, 2016, at around 11:56, a privately owned Glasflügel 304CZ-17 (hereinafter “the Glider”), registered JA21BB, took off from the Kakuda Glider Field in Kakuda City, Miyagi Prefecture (hereinafter “the Glider Field”) by aero tow for a training.

The flight plan for the Glider was outlined below:

| | |
|-------------------------------|---|
| Flight rules: | Visual Flight Rules (VFR) |
| Departure aerodrome: | Kakuda Glider Field |
| Estimated off-block time: | 10:00 |
| Cruising speed: | 70 kt |
| Cruising altitude: | VFR |
| Route: | Kakuda – Nasu (Tochigi Prefecture) – Ichinoseki (Iwate Prefecture) – Kakuda |
| Destination aerodrome: | Kakuda Glider Field |
| Total estimated elapsed time: | 8 h 00 min |
| Persons on board: | 1 |

The flight history up to the time of the accident is outlined below, based on ATC communication records, flight track records recorded on a multifunctional mobile phone (hereinafter “smartphone”), and statements by the witness and others.

2.1.1 History of the Flight until the Crash Based on ATC Communication Records and Smartphone Flight Track Records

| | |
|--------------|---|
| Around 11:56 | The Glider took off from the Glider Field by aero tow. |
| 13:08:06 | The Glider was climbing toward the northwest from an altitude of about 18,700ft about 4.4nm northwest of the Glider Field. The pilot reported to Tokyo Area Control Center (hereinafter “ACC”) that he was climbing beyond an altitude of 18,000ft. |
| 13:49:00 | The Glider was heading south at an altitude of about 17,600ft about 25nm southwest of the Glider Field. The pilot reported to ACC that he was heading south at an altitude of 17,000ft. |
| 13:55:50 | The Glider was climbing toward the south from an altitude of about 22,200ft about 8.0nm north-northwest of the accident site. The pilot reported to ACC that he was heading south at an altitude of 22,000ft. |
| 14:00:10 | The Glider reached an altitude of about 25,000ft about 5.0nm west-northwest of the accident site and was flying toward the southeast. The pilot reported to ACC that he was flying at an altitude of 19,000ft, but the sound reception was weak and unclear, and subsequent communications could not be heard properly. |
| 14:01:20 | The Glider was flying toward the southeast at an altitude of about 25,600ft about 4.0nm west of the accident site. After a sound like a moaning voice was recorded on ATC communication with ACC, silent noise was recorded. |
| 14:04:30 | The Glider arrived at the accident site and stopped moving. |

2.1.2 Statements of the Witness and Others

(1) Witness (resident near the accident site, male)

The witness was working in a field on a slope about 150m west of the accident site when he heard a strange noise like a rush of wind, whereupon he turned around and witnessed the Glider passing over the trees, crossing a valley and flying toward the slope on the eastern side. At this time, the Glider appeared to have no wings.

The witness immediately headed for the site and was climbing up the slope when he saw the crashed aircraft, so he returned to his home nearby, called the police and asked for rescue services.

(2) Club Member A (Glider Field operations manager, male)

Club Member A serves as an instructor in the club that runs the Glider Field, and on the day of the accident, was engaged in work such as coordinating aircraft take-off and landing operations at ground level as the Glider Field operations manager.

He had heard from the pilot that he was planning a long-distance flight of about 300km and had reported a flight plan of eight hours from 10:00, and from the pilot's appearance at this time, thought that there seemed to be no abnormality in his mental or physical state.

He confirmed that, after the pilot had his proficiency confirmed by another instructor in a multi-seater glider, he took off in the Glider at 10:02 by winch towing. After that, he confirmed that the pilot flew near the glider field without engaging in long-distance flight, and landed at around 11:20.

After confirming that the pilot had again took off by aero tow before 12:00, he heard radio communication that the Glider was flying while receiving traffic information by radar from the air traffic authority.

When one hour and 30 minutes had passed since the Glider took off, he heard that the Glider's flight altitude had been reported as 18,000ft, and worried about the oxygen supply.

(3) Club Member B (glider co-owner, male)

On the day of the accident, he had assembled the Glider along with four other members including the pilot. He saw the pilot finally attaching the main pin for fastening the left and right main wings.

(4) Club Member C (Glider co-owner, male)

The pilot had plentiful experience of flying at high altitude while inhaling oxygen.

Two days before the accident occurred, Club Member C confirmed that there were oxygen reserves of about 80% (about 1,600psi) on the oxygen meter inside the system (pressure gauge). After that, the Glider did not fly at high enough altitudes for oxygen to be used.

When using oxygen, the oxygen valve needs to be opened before setting off, as the valve cannot be reached during flight.

This accident occurred in a mountain forest in Miharu Town, Tamura-Gun, Fukushima Prefecture (37°29.32'N, 140°31.48'E) at around 14:05 on May 5, 2016.

(See 2.11.1.1 Diag.3 General map of flight track record, Fig.1 Accident Site, Photo Accident Glider)

2.2 Injuries to Persons

The pilot was fatally injured.

2.3 Damage to the Glider

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to the Glider Components

- (1) Windshield: Destroyed
 - (2) Pilot's seat: Instrument panel damaged
 - (3) Main wing section: Both main wings separated (whereabouts unknown)
 - (4) Fuselage: Outer skin of forward fuselage ruptured, underside of forward fuselage damaged and deformed, after fuselage broken off and separated (whereabouts unknown)
 - (5) Tail: Broken off and separated (whereabouts unknown)
- (See Photo: Accident Glider)

2.4 Other Damage

Some breakage to trees in the mountain forest

2.5 Personnel Information

Pilot Male, Age 43

Private Pilot Certificate (Glider) June 23, 1994

Type rating for High-class glider

Class 2 Aviation Medical Certificate

Validity March 12, 2017

Specific Pilot Competence Expiry of practicable period for flight April 24, 2018

Total flight time 441 h 03 min

Flight time in the last 30 days 2 h 07 min

Total flight time on the type of aircraft 96 h 12 min

Flight time in the last 30 days on the type of aircraft 1 h 18 min

Experience of high altitude flight requiring oxygen supply equipment

According to the pilot's flight records, he had flown the Glider at an altitude of 10,000ft and above on a single occasion one year before the accident. There were records of five other flights at high altitude, all of which were at least 10 years before the accident, and the highest altitude reached was 12,000ft.

2.6 Glider Information

2.6.1 Glider

Type Glasflügel 304CZ-17

Serial number 61-17

Date of manufacture April 4, 2003

Certificate of airworthiness Dai 2015-26-03

Validity December 27, 2016

Category of airworthiness Glider Utility

Total flight time 648 h 18 min

Flight time since last periodical check

(Annual check: Carried out on December 26, 2015) 75 h 33 min

(See Fig. 2 Three Angle View of the Glasflügel 304CZ-17)

2.6.2 Weight and Balance

At the time of the accident, the weight of the Glider is estimated to have been 377.6 kilograms and the position of the center of gravity is estimated to have been 273 millimeters aft of the reference line, both of which are estimated to have been within the allowable range (maximum takeoff weight of 450 kilograms and 200 to 325 millimeters for center of gravity range corresponding to the weight at the time of the accident).

2.7 Meteorological Information

2.7.1 Weather conditions near the accident site

(1) Weather near the accident site

- 1) Values observed by the Funehiki Automated Weather Station of the Japan Meteorological Agency located about 4nm southeast of the accident site and at more or less the same elevation at 14:00 (wind velocity in m/s converted to kt) were as follows.

Weather clear; Temperature 17.3°C; Wind direction west; Wind velocity about 10 kt; Maximum instantaneous speed about 25kt

- 2) Routine aviation weather observations at 14:00 in Fukushima airport located about 16nm south of the accident site were as follows.

Wind direction 300°; Wind velocity 12 kt / Maximum instantaneous speed 22kt;
Prevailing visibility 10 km

Cloud: Amount 1/8, Type Cumulus, Cloud base 3,000 ft

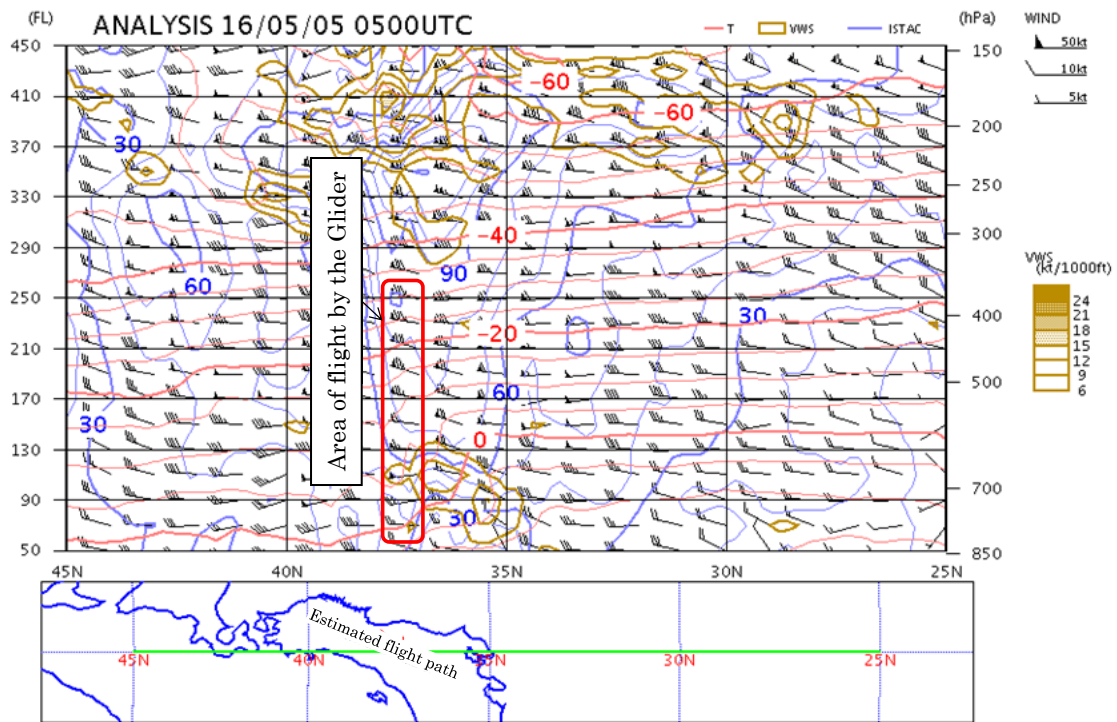
Amount 3/8, Type Altocumulus Cloud base 7,000 ft

Temperature 20°C; Dew point 3°C; Altimeter setting (QNH) 29.83 inHg

(2) Weather conditions in the upper air over the accident site

1) Upper wind conditions

According to observations of upper wind at 14:00 by the Wakamatsu Station Wind Profiler of the Japan Meteorological Agency located about 30nm west of the accident site, wind direction was about 290° while wind velocity was about 25kt at an altitude of 3,000ft and about 40kt at 7,000ft. Diag.1 shows the hourly atmosphere analysis chart at 14:00 on the line of longitude 140°E about 25nm west of the accident site. The wind direction in the vicinity of the estimated flight path of the Glider was about 290°, while wind velocity was about 50kt at 11,000ft, about 75kt at 18,000ft, about 80kt at 21,000ft and about 90kt at 25,000ft. At the altitude of 18,000ft to 25,000ft at which the Glider was flying before it crashed, there was no sign of a pronounced vertical wind shear (VWS) as a vertical discontinuity that would give rise to clear-air turbulence (CAT).



Diag.1 Hourly atmosphere analysis chart at 140°E

2) Cloud conditions

As shown in the model discussed in 2.7.2 below, rotor clouds are usually formed when a mountain wave occurs, with lenticular clouds above them. The visible satellite images at 14:00 on the day of the accident were as shown in Photo A. Rotor clouds arising below the peak of mountain waves generated on the leeward (east) side of the Ou mountain range are linked in strip formation with clouds appearing to be lenticular clouds arising above them, and these waves have reached as far as the Pacific Ocean.

According to the Rapid scan satellite imagery in Photo B, the peak altitude of clouds at the top of the waves was about 10,000-18,000ft. The state of these clouds can also be seen in Photo C (taken at 13:26 at an altitude of about 18,900ft) recorded on the pilot's smartphone.

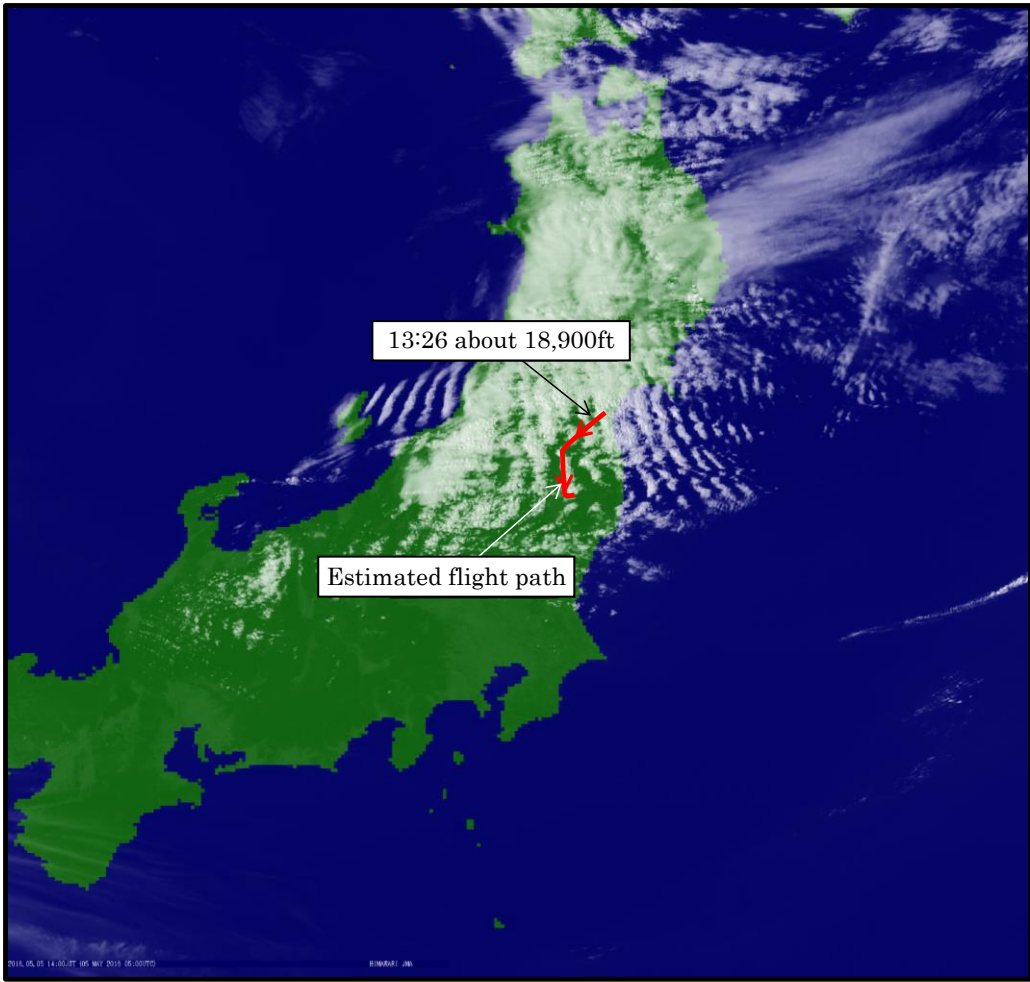


Photo A Weather satellite image (14:00)

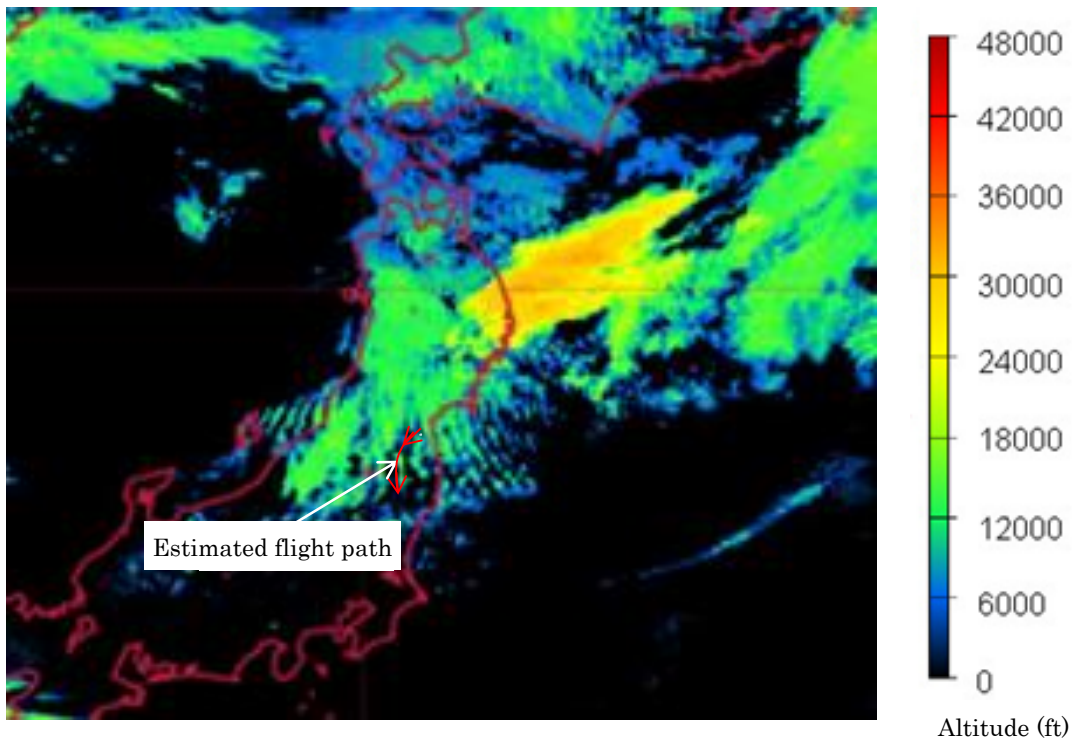


Photo B Rapid scan satellite imagery (14:00)



Photo C View toward the nose during flight (13:26 at an altitude of about 18,900ft)

2.7.2 Mountain Waves

Mountain waves generated in mountainous areas are described as follows in *Atarashii Kōkū Kishō* (“New Aviation Weather”) by Umeji Hashimoto and Yoshio Suzuki (Kuraimu Kishō Tosho Shuppan, 13th Revised Edition, July 30, 2009 (p.265)). (Excerpt)

16-12 Mountain waves

A model of a mountain wave is shown in Fig.16-20. (part omitted) Air flow passing over mountainous terrain descends rapidly, then rises toward the peak of a wave formed at a point several miles on the leeward side. This peak repeatedly rises and falls at the first position of the wave, as does the air flow thereafter, and sometimes as many as ten or more waves can be generated downstream. The wave remains in a more or less constant position as long as a strong wind is sustained, and once generated, can exist for several hours or even several days. A cap cloud shows that a mountain wave exists on the leeward side. Rotor clouds formed below the first peak of the mountain wave and lenticular clouds formed above it reveal the existence of a mountain wave. (part omitted)

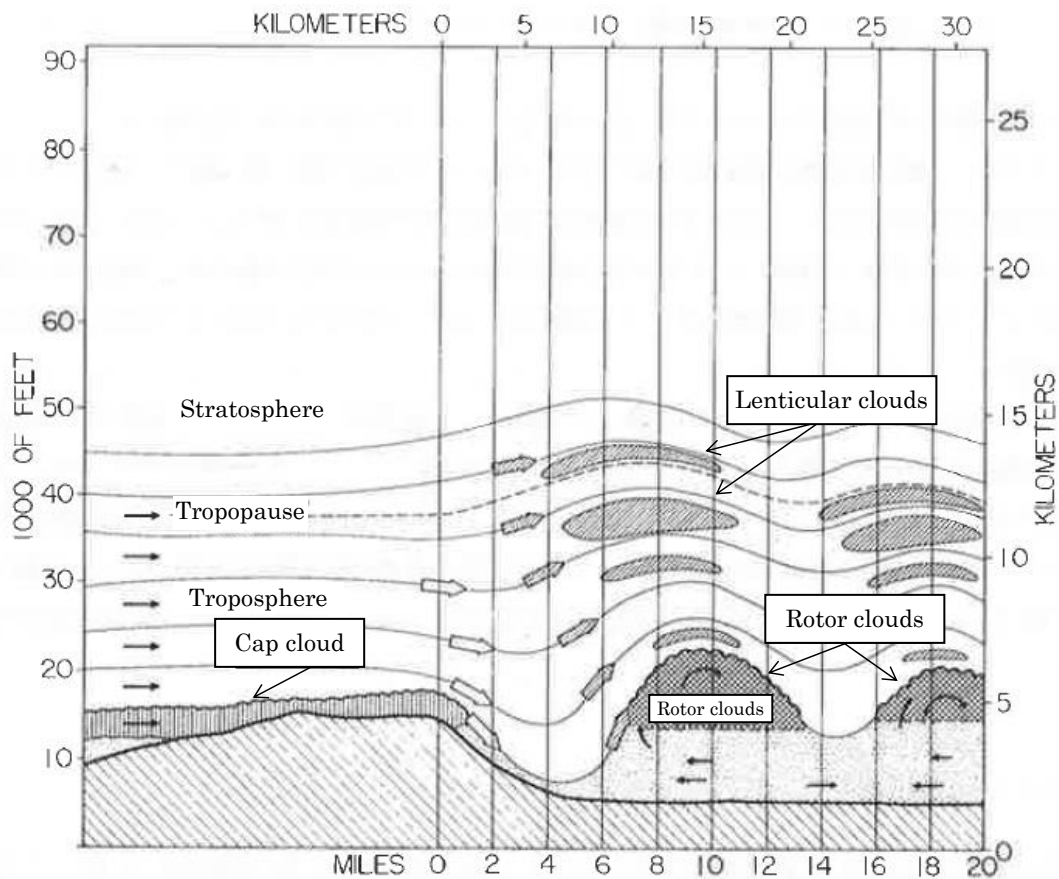


Fig. 16-20 Model of a mountain wave (based on Jenkins)

Fig.16-21 shows a pattern of mountain waves appearing under geographical conditions similar to those of Mount Fuji, from the results of a wind tunnel experiment by the Meteorological Research Institute. Mountain waves are formed at the wind velocity of 20kt shown in the figure, whereupon the general current and vortex current start to flow independently. At wind velocity 40kt, the bottom layer is disturbed, the general current is disturbed by the vortex current, and turbulence is also generated under the general current. This phenomenon is known as "hydraulic jump." At a wind velocity of 60kt, the general current and vortex current disturb each other further still, and the generated turbulence flows toward the leeward side. This phenomenon is known as "separation."

When separation occurs, a countercurrent is formed toward the mountain peak from the leeward side, pronounced wind shear is created between it and the general current blowing over the mountain peak, and vertically rising eddies are

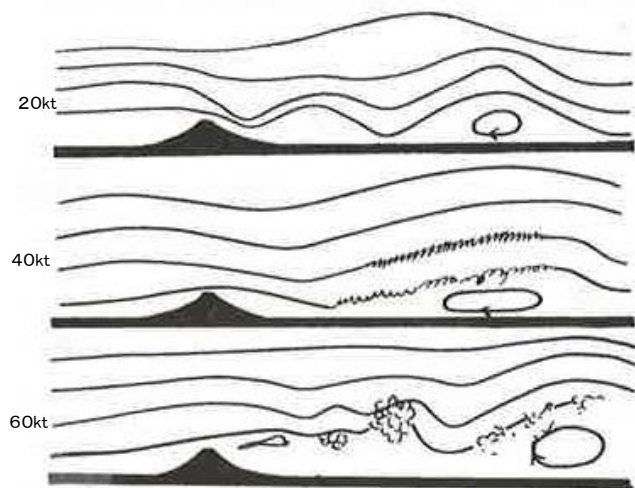


Fig.16-21 Wind tunnel experiment on mountain waves (by S. Soma, MRI)

also formed. Although the strongest turbulence exists in this case, clouds do not appear unless there is water vapor.

2.8 Accident Site and Wreckage Information

2.8.1 Situation of the Accident Site and Surrounding Area

Immediately to the west of the Glider flight path is the Ou mountain range, a string of mountains with an elevation between 6,000 and 6,500ft. The accident site was a mountain forest lying just beyond the southern end of this mountain range. To the west of the accident site lies Lake Inawashiro, and to the west-northwest is Mount Bandai with an elevation of about 6,000ft.

The Glider had come to a halt on the eastern slope of a valley extending from north to south, with the nose pointing toward the east.

Although signs of contact with the Glider can still be seen on trees immediately adjacent to the Glider's final position on the north side, no pronounced contact marks could be confirmed on other surrounding trees.

At the accident site, the forward fuselage including the nose and pilot's seat (about two-thirds of the total length) remained, but the two main wings and the after fuselage including the tail could not be found in the area around the accident site.

(See 2.11.1.1 Diag. 3: Overall chart of flight track records, Photo: Accident Glider)

2.8.2 Glider Damage and others

The result of the Glider examination at the accident site and in the Glider storage location was as follows.

(1) Nose

Nose section: Virtually undamaged

Windshield: Broken, fragments scattered around the accident site



Photo D Nose section and forward fuselage

(2) Pilot's seat

1) Instrument panel

Speed indicator: 0km/h indicated, Altimeter: 4,500m indicated, Variometer: rate of descent 4m/sec indicated, Electric variometer (with altimeter function displaying altitude in ft): No display, Instrument panel: Deformation damage

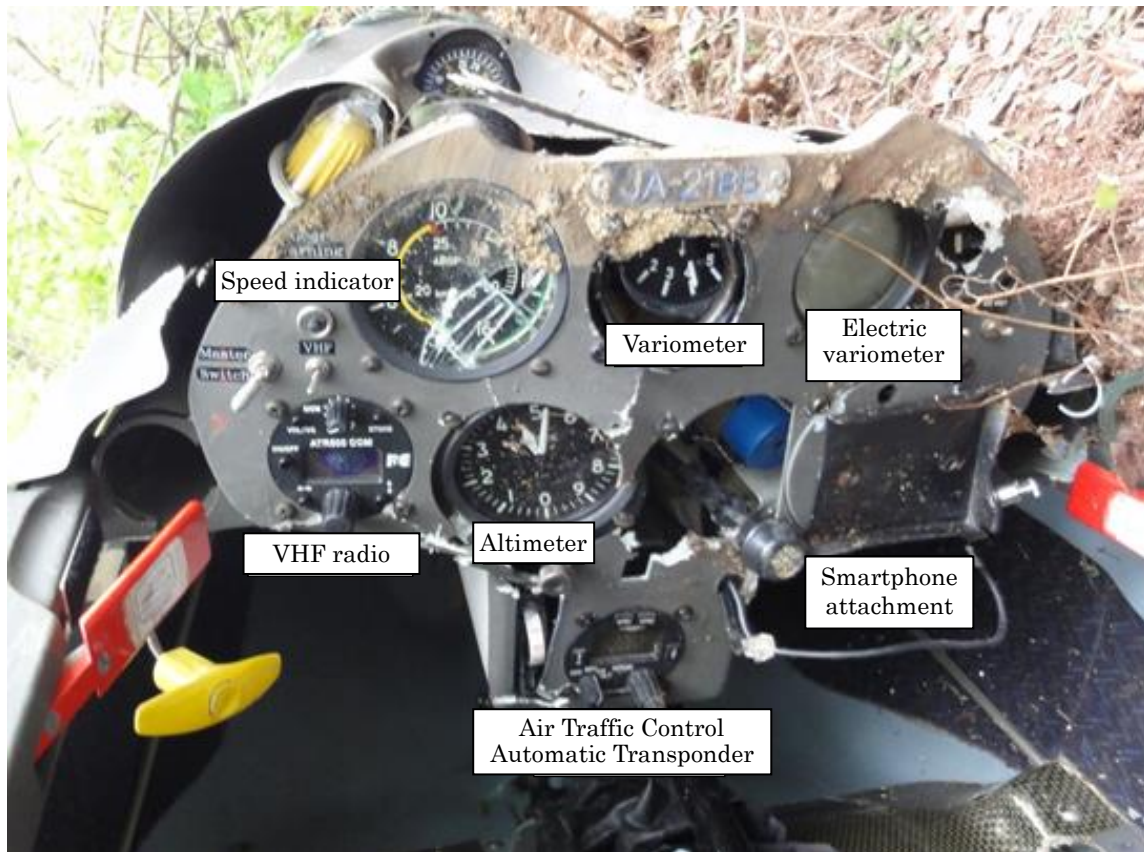


Photo E Instrument panel

2) Operating levers

Flap levers: Fully lowered position, Landing gear lever: Raised position, Canopy emergency ejection lever: Closed position, Elevator trim: Somewhat to after of center position

3) Oxygen supply equipment

Oxygen valve: Closed position, Oxygen cylinder reserve meter: about 80% (a state in which oxygen is ejected when the valve is opened), In-system oxygen meter (pressure gauge): 0% (0 psi), Oxygen regulator: 5th position^{*1}, Oxygen supply pipe: Oxygen supply pipe missing between decompressor and oxygen regulator, intranasal supply pipe worn by the pilot, portable oxygen device: Unused state

^{*1} The “5th position” is used when flying at an altitude of 18,000ft, and supplies oxygen at the rate of 1.8 liters per minute. 6th position is for emergency use, giving a continuous supply of oxygen.

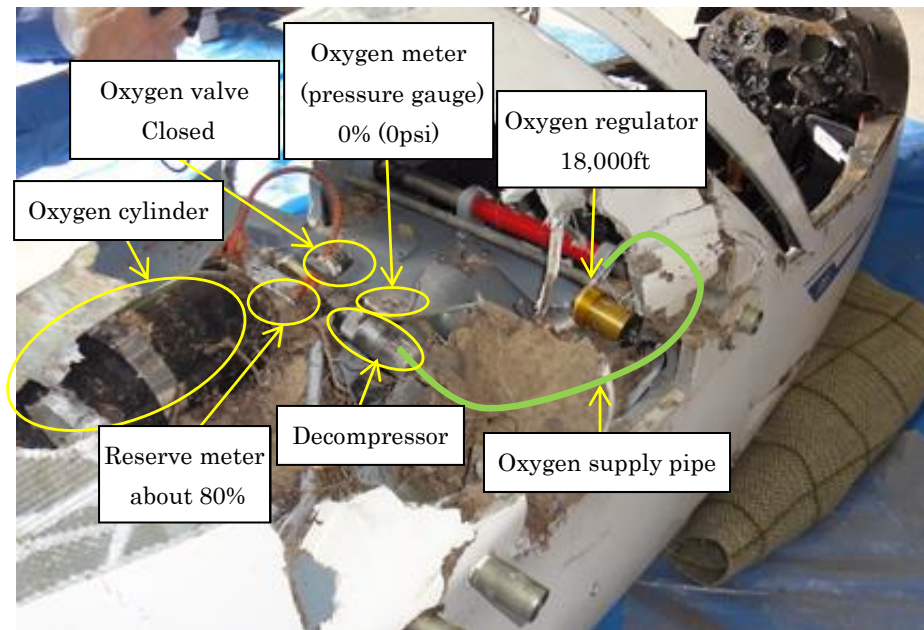


Photo F Oxygen supply equipment

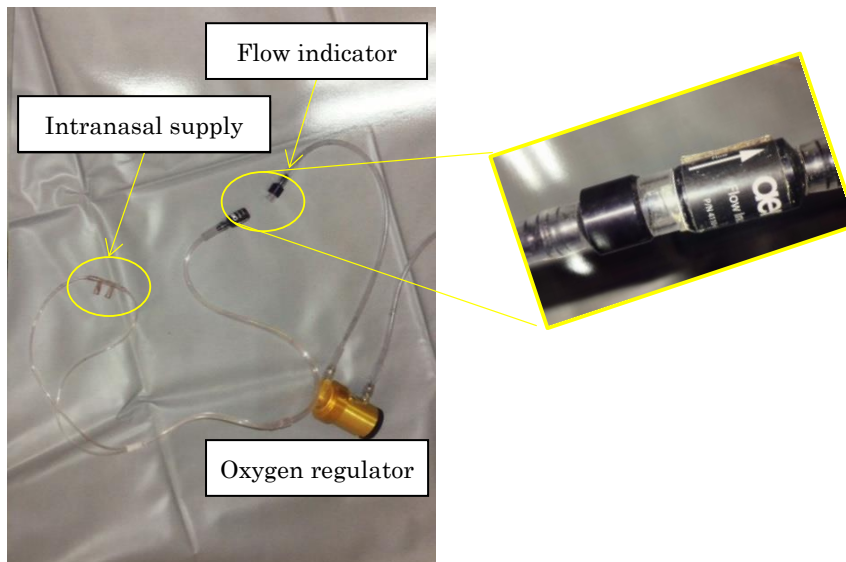


Photo G Oxygen supply pipe

- 4) Parachute
 - Worn but unused by the pilot
- (3) Underside of forward fuselage
 - Outer skin: Cracked, torn, twigs remaining
 - Inside landing gear wells: Pine branch and numerous twigs remaining

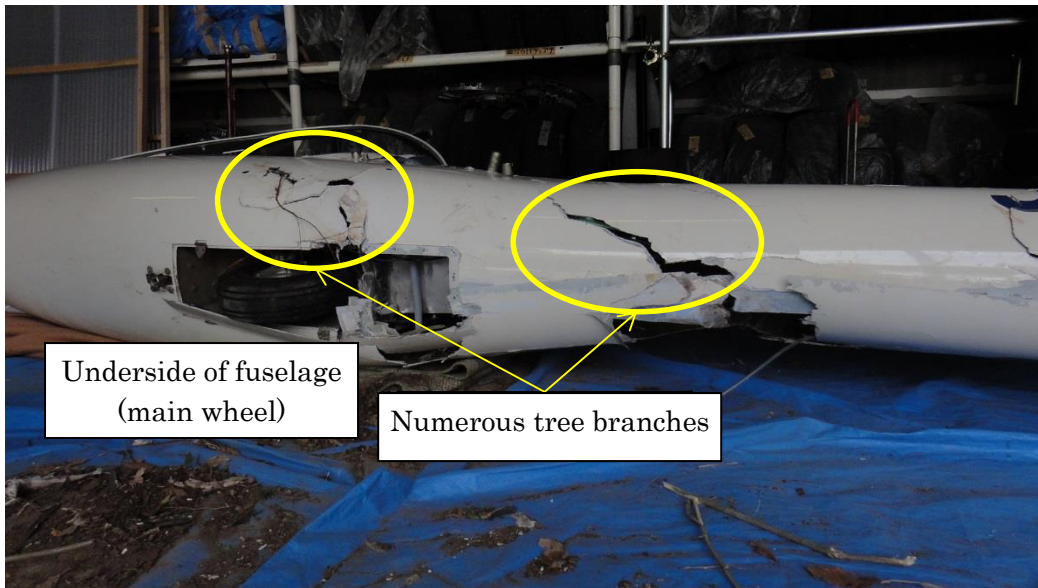


Photo H Underside of forward fuselage

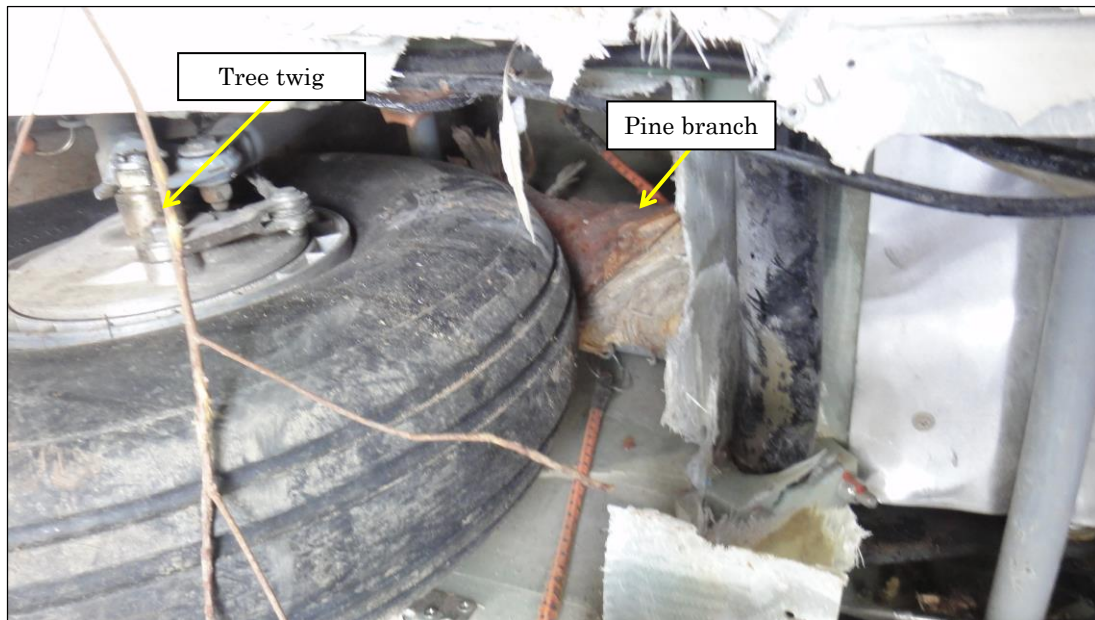


Photo I Inside landing gear well

(4) Forward fuselage

Outer skin on top of forward fuselage at main wing joint torn off, whereabouts unknown; both main wings separated from joints, whereabouts unknown; one main wing connecting tube at rear left bent backwards.

Tail flight control system disconnected at break between forward and after fuselage.

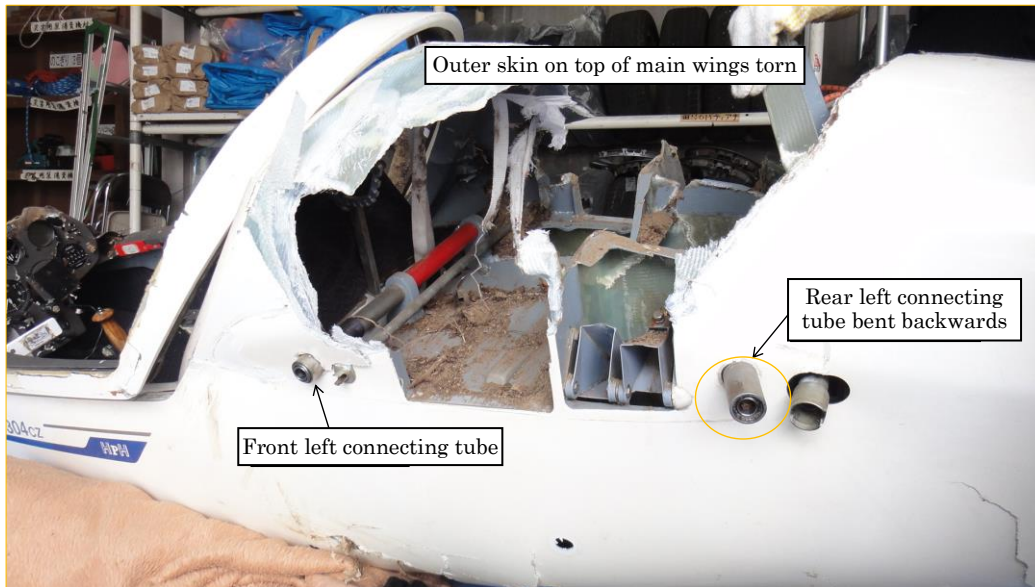


Photo J Joint between forward fuselage and main wings

(5) After fuselage

The after fuselage including the tail was broken from the forward fuselage and separated, whereabouts unknown.



Photo K Separated after fuselage including the tail (state before the accident)

2.9 Medical Information

2.9.1 Cause of Death of the Pilot

According to an autopsy conducted by the Fukushima Prefectural Police Headquarters, the cause of death of the pilot was loss of blood due to cardiac rupture.

A series of injuries caused by impact with a blunt object was also seen from the chest to the upper abdomen.

Alcohol and drugs were not detected.

2.9.2 Hypoxia

The following description of hypoxia is given in “Aeronautical Engineering Course 3: Aircraft Systems” (Japan Aeronautical Engineers’ Association, 2006 (p.89)). (Excerpt)

3-2 Atmosphere and respiration

Pulmonary functions cause oxygen in the air to be absorbed into the blood and carbon dioxide in the blood to be released. To maintain this function, oxygen partial pressure needs to be kept at 80mmHg. A decrease in oxygen partial pressure first impacts nerve tissue, causing impairments to the brain, vision and consciousness. After this, muscle failure occurs, and the functions of the heart and limbs are lost. These symptoms are known as hypoxia or anoxia.

The first sign of hypoxia is a loss of judgment and coordination, weakened vision and a heightened sense of well-being. For pilots and crews, this sense of well-being is a forewarning that an extremely dangerous condition is imminent. Hypoxia normally worsens with altitude; at about 50,000ft (15,240m), a person will completely lose consciousness within 10 seconds followed shortly thereafter by death unless supplemental oxygen is inhaled. Table 3-1 shows signs of hypoxia encountered at each altitude in the absence of supplemental oxygen.

Table 3-1 Signs of hypoxia depending on altitude (Excerpt)

| <i>Altitude (ft)</i> | <i>Signs</i> | <i>Time until signs appear</i> | <i>Remarks</i> |
|----------------------|---|--------------------------------|---|
| 8,000 | <i>Night vision slightly impaired.</i> | | |
| 10,000 | <i>Fatigue, sluggishness</i> | <i>4 hours</i> | <i>Highest altitude without use of oxygen</i> |
| 18,000 | <i>Mistaken sense of well-being, overconfidence, decrease in attentiveness, blurred vision, diminished memory</i> | <i>Within 30 mins.</i> | |
| 20,000 | <i>Loss of muscle control, judgment, deduction, memory and temporal awareness</i> | <i>Within 15 mins.</i> | |
| 22,000 | <i>Convulsions and loss of consciousness</i> | <i>5-10 mins.</i> | <i>With rapid decompression, 1-2 mins.</i> |
| 25,000 | <i>Loss of consciousness</i> | <i>2-5 mins.</i> | <i>With rapid decompression, 1 min.</i> |

2.10 Information on Test and Research

2.10.1 Altimeter Disassembly Inspection

The altimeter installed in the Glider was disassembled, the state of damage confirmed and the functions tested, with the following results.

- (1) The pivot section connecting the aneroids with the indicator needles inside the altimeter was broken.
- (2) It is probable that the breakage of the pivot section has been caused by large acceleration

in a vertical direction.

- (3) Due to the breakage of the pivot section, the needles were in a state of uncontrolled movement.

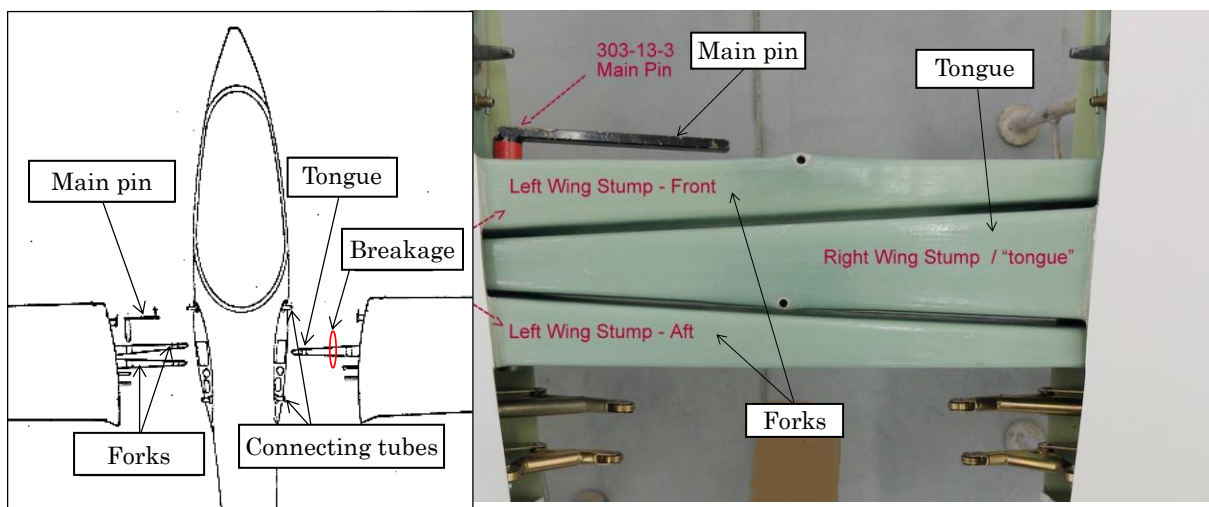
2.10.2 Analysis of State of Damage to the Glider

2.10.2.1 State of damage to the main wings

Findings and other observations on image analysis of the state of damage to the main wings, made by the Glider manufacturer, were as follows.

(1) Structure of the main wing attachment

The structure of the right and left main wings is as shown in Diag. 2 and Photo L, where the two stumps (forks) of the left wing and the single stump (tongue) of the right wing are fastened with a main pin inside the fuselage.



Diag. 2 Sketch of main wing attachment

Photo L Main wing attachment

(2) Strength of the wing stumps

The limit maneuvering load*² factor of the Glider on the plus side is 5.3. Moreover, the result of a static load test for main wing bending moment carried out using a Mosquito glider (the prototype of the Glider) demonstrated that the safety factor is 1.62, thus exceeding the regulation (1.5).

(3) Separation of the main wings

The eventual collapse of the right wing stump (tongue) is currently being reviewed. It is thought that the wings might have slid out of the connecting tubes after the Glider crossed the Glider load envelope.

2.10.2.2 State of damage to the fuselage

Findings on image analysis of the state of damage to the fuselage, made with the cooperation of experts from the Japan Aerospace Exploration Agency, were as follows.

(1) State of damage and breakage to the forward fuselage outer skin

Although there was little damage to the top outer skin where the forward fuselage was broken, traces of damage caused by tensile load can be seen.

*² "Limit maneuvering load" means the maximum load anticipated in a state of normal operation.



Photo M State of the upper forward fuselage

(2) State of damage and breakage inside the forward fuselage

Parts that were whitened and damaged as a result of compression when the fuselage itself was crushed into an elliptical shape can be seen in the center of the reinforcing frame at the sides of the forward fuselage interior.

The surface of the outer skin on the right side of the fuselage is badly damaged clockwise from around 3:00 to around 6:00 on the underside, accompanied by peeling in the surrounding area, and there are traces showing that the damage progressed from the outside to the inside.

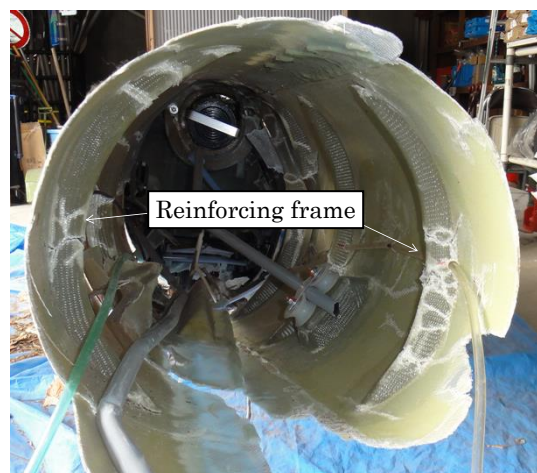


Photo N State of the outer skin at the break in the forward fuselage

2.11 Additional Information

2.11.1 GPS Records

Navigational software for gliders had been installed in a smartphone thought to have been attached to a holder on the instrument panel, and the flight history from the Glider Field to the crash site was recorded on it.

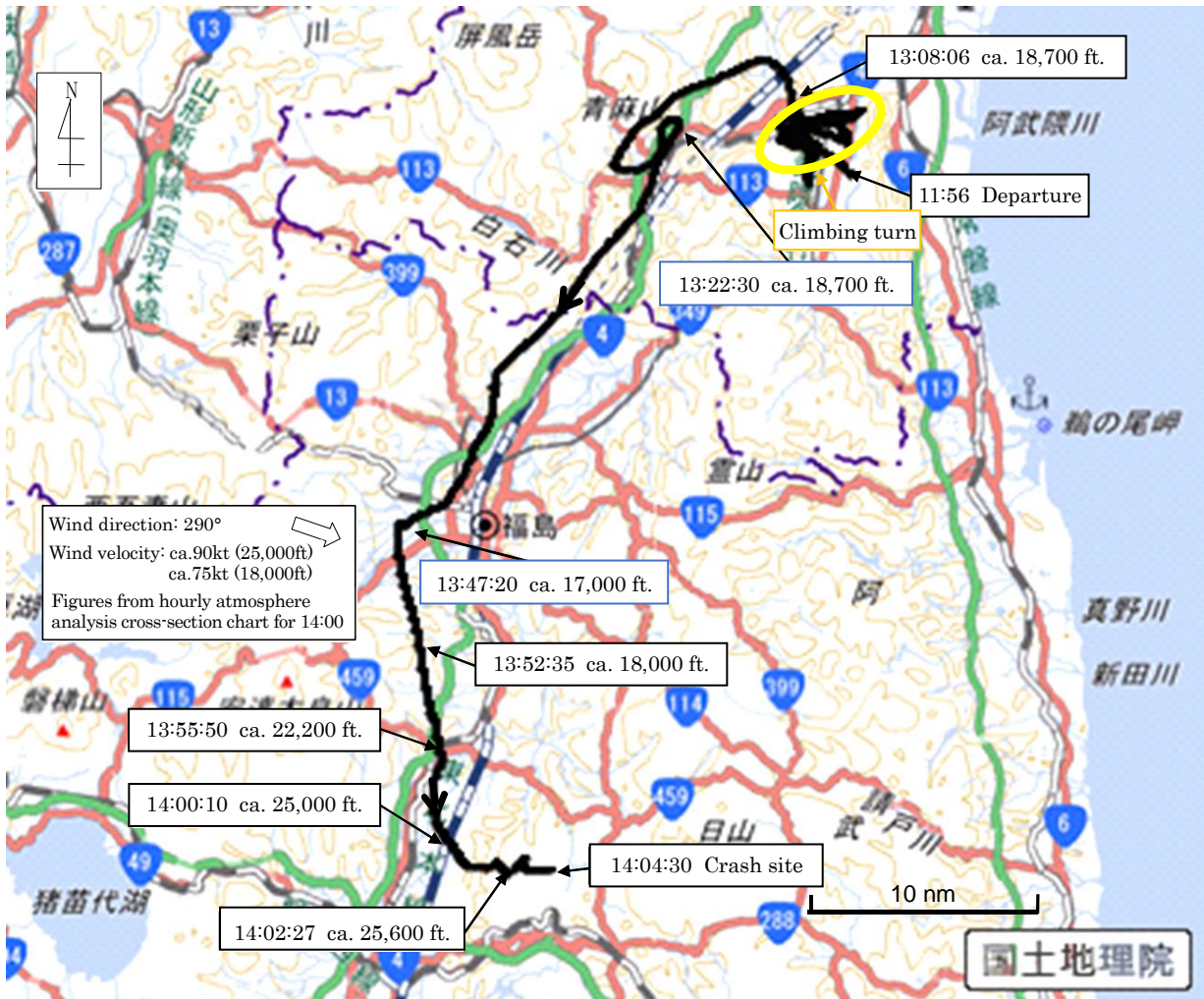
This software worked in cruise and turning modes using GPS, and had the function of providing the pilot with navigational information (such as present position, altitude, ground speed, glide ratio and wind) on an electronic map.

2.11.1.1 Flight track record from departure to the crash site

The flight track record of the Glider from departure to the crash site is shown in Diag. 3.

At around 11:56, the Glider took off from the Glider Field, separating from the tow plane at an altitude of about 2,800ft about 3nm northwest of the Glider Field at around 12:01. It then climbed while turning in the airspace near the Glider Field, reaching an altitude of about 18,700ft at around 13:08. From around 13:23, it traveled south for about 21nm along the Tohoku Expressway on a flight course of about 220°, then at around 13:47 flew to the west of Fukushima City. The average ground speed at this time was about 50kt, and assuming upper wind to be 290° and 75kt based on 2.7.1 (2) Diag. 1, the heading at this time was about 260° (drift angle 40° left) and True Air Speed was about 103kt. If corrected for altitude at the predicted outside air temperature, the Indicated Air Speed (hereinafter “air speed”) was about 75kt.

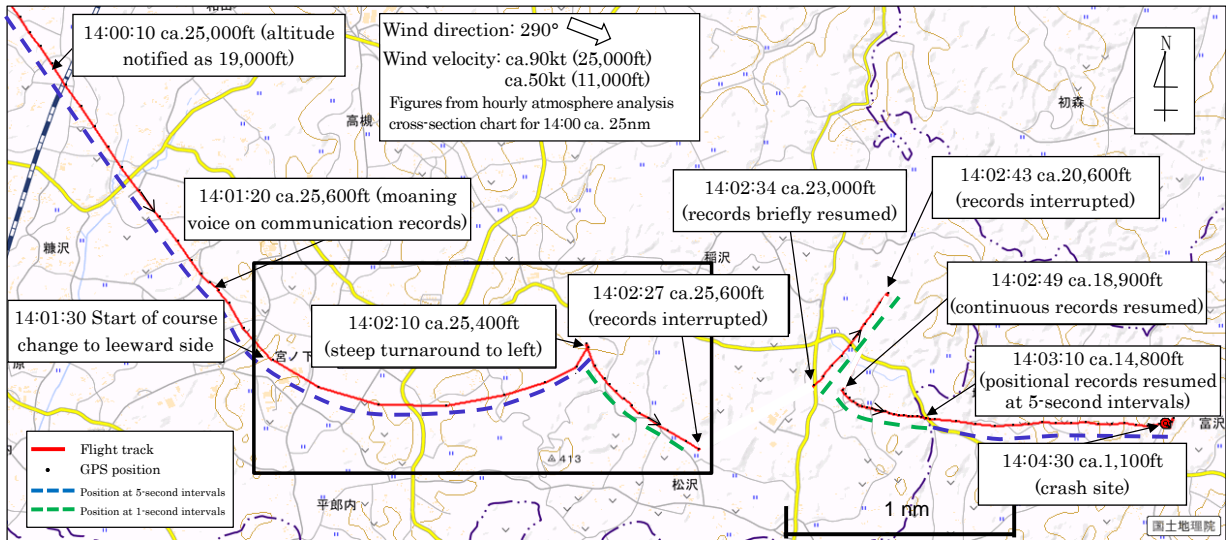
At around 13:53, the Glider started to climb from an altitude of about 18,000ft on a flight course of about 170°, reached an altitude of about 25,000ft at around 14:00, gradually changed course eastward, and reached the crash site at around 14:05. The average rate of climb while climbing was about 920ft/min.



Diag. 3 General map of flight track record

2.11.1.2 Flight track record near the crash site

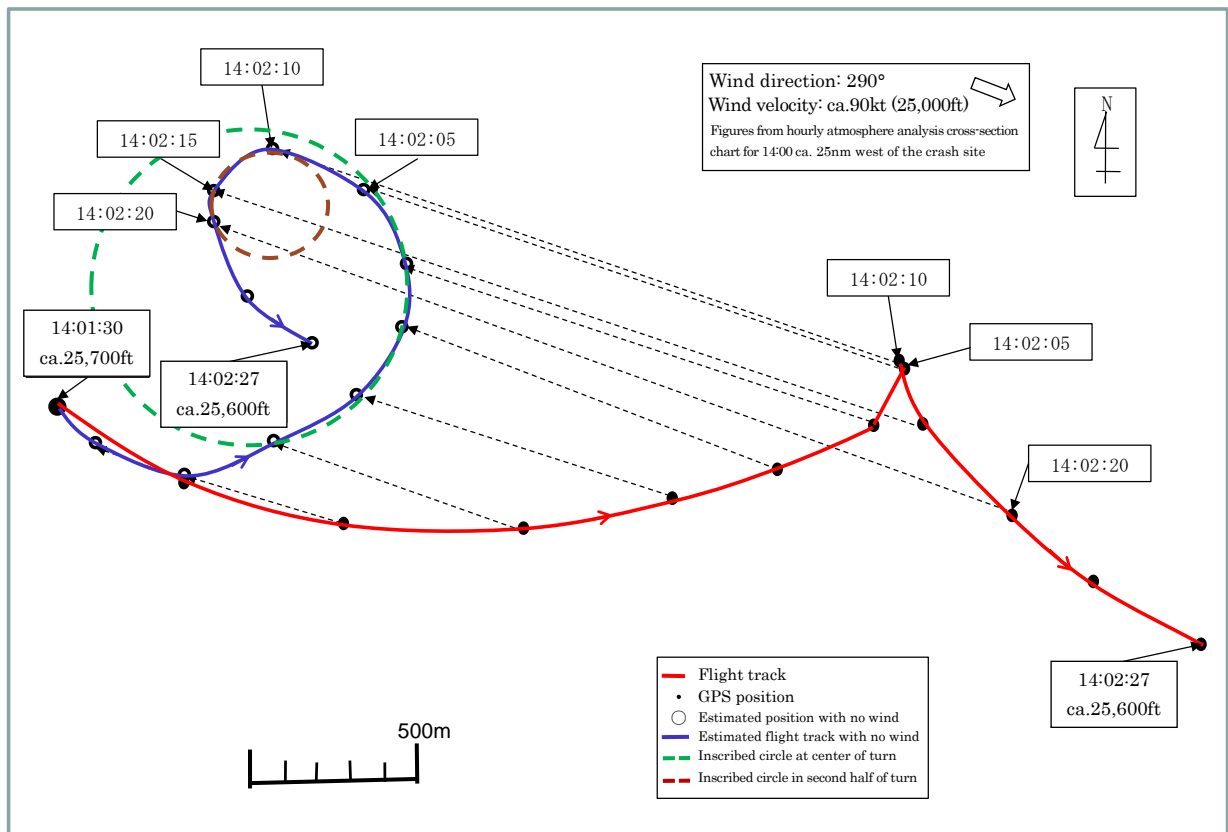
The flight track record of the Glider near the crash site is shown in Diag. 4.



Diag. 4 Map of flight track record near the crash site

At around 14:00, the Glider reached an altitude of about 25,000ft about 5nm west-northwest of the crash site. At this time, as described in 2.1.1 above, the pilot reported an altitude of 19,000ft in communication with the ACC. After this, a sound like a moaning voice and silent noise were recorded at 14:01:20. At this time the Glider was flying at an altitude of about 25,600ft, and after this, from around 14:01:30 it gradually started turning to the left on the leeward side.

Diag. 5 shows a sketch of the estimated flight track with no wind, excluding the impact of wind while making this turn.



Diag. 5 Flight track while turning

In the estimated flight track with no wind, as shown by the blue line, the turning radius gradually decreases after starting the turn. The turning radius would have been about 450m in the middle part of the turn, as shown by the broken green line in Diag. 5, and would finally have become extremely small at about 150m in the second half of the turn from around 14:02:10 to around 14:02:20, as shown by the broken brown line.

Assuming the wind during the turn to have been 290° and 90kt, based on the hourly atmosphere analysis chart shown in 2.7.1 (2) above, the True Air Speed of the Glider is thought to have been about 100kt, slightly larger than the headwind component (90kt). This is in view of the fact that the flight track only advanced minimally under the impact of a strong headwind from 14:02:05 to 14:02:10, when the Glider was facing upwind in the middle of the turn as shown in Diag. 5. If this is corrected for altitude at the predicted outside air temperature, the air speed at this time would have been about 66kt. Meanwhile, if it can be assumed that the Glider was turning steadily with a turning radius of about 450m in the first half of the turn, the equilibrium bank angle would need to have been about 31°, since the altitude while turning had hardly changed at all. Similarly, given a radius of about 150m in the second half of the turn, the equilibrium bank angle would need to have been about 61°.

Thereafter, as shown in Diag. 4, recording of positional information was interrupted after recording an altitude of about 25,600ft at 14:02:27 immediately after the turn was complete, but was resumed from the point when the altitude fell abruptly at 14:02:34, then was again interrupted at 14:02:43. Again, continuous recording of positional information resumed from an altitude of about 18,900ft at 14:02:49, continuing until the Glider reached the crash site. Moreover, the position when recording was resumed for just nine seconds in mid-descent was discontinuous with the positional information before and after it.

(1) Rate of descent

According to the flight track record, the rate of descent while the Glider was descending is summarized as follows.

- 1) 14:02:27-14:02:49: about 18,300ft/min

From the final point where positional information was continuously recorded until the position where continuous recording of positional information was resumed.

- 2) 14:02:49-14:04:30: about 10,600ft/min

From the position where continuous recording of positional information was resumed until the Glider reached the crash site.

(2) Ground speed

Between the position where continuous recording of positional information was resumed and the crash site, the Glider moved about 1.4nm more or less linearly to the east, and the average horizontal ground speed during this time was about 50kt.

2.11.2 Matters Stated in the Flight Manual

The following details were included in the Flight Manual of the Glider. (Summary)

(1) Operating limits

- 1) Air speeds

Never exceed speed: 135kt (250km/h) (up to 13,000ft)

: 122kt (226km/h) (19,500ft)

: 109kt (202km/h) (26,000ft)

Maximum speed with flaps: 97kt (180km/h)

Maximum speed in rough air and maneuvering speed^{*3}: 97kt (180km/h)

2) Limit maneuvering load factor

The following maneuvering load factors^{*4} must not be exceeded.

a Airbrakes closed

97kt (180km/h): +5.3, -2.65

135kt (250km/h): +4.0, -1.5

b Airbrakes extended

+3.5

3) Ultimate maneuvering load factor^{*5}

The safety factor is 1.5.

(2) Stalling speed (weight at time of accident)

Flaps raised: 39kt (72km/h)

Flaps lowered: 37kt (69km/h)

(Although the Flight Manual makes no mention of changes in stalling speed accompanying an increase in flight altitude, according to the Glider manufacturer, it was in a more or less negligible range for the wing profile of the Glider (HQ10-16,42).)

(3) Glide performance (weight at time of accident)

Best glide ratio: 43.5:1

Best glide speed: about 57kt (about 105km/h)

(4) High speed flight

At speeds up to the maneuvering speed = 97kt (180km/h), full control deflection of the ailerons and rudder are allowable. Also, at speeds up to the never exceed speed with flaps = 135kt (250km/h), up to 1/3 of the full control movement is permissible.

The control range permitted for elevator deflections is lower than the above, and care must be taken not to exceed the limit maneuvering load factor.

During extreme turbulence, such as may occur in wave rotors, thunderclouds, visible up-currents, or while crossing mountain ranges, the maximum speed in rough air = 97kt (180km/h) should not be exceeded.

2.11.3 Wave Soaring

The U.S. Department of Transportation Federal Aviation Administration Flight Standard Service "Glider Flying Handbook" 2003, pp.10-15, includes the following statements on wave soaring, in which a Glider gains altitude from upward air currents on a mountain wave and glides. (Excerpt)

FLYING IN THE WAVE

Once the wave has been contacted, the best techniques for utilizing the lift depend on the extent of the lift (especially in the direction along the ridge or mountain range producing

^{*3} "Maneuvering speed" is the speed beyond which full control movement or abrupt control input should be prohibited, in order to avoid excessive load on the aircraft.

^{*4} "Maneuvering load factor" is the ratio between load acting on an aircraft due to motion and the weight of the aircraft.

^{*5} "Ultimate maneuvering load factor" is a load factor corresponding to structural strength, calculated by multiplying the limit maneuvering load factor by a suitable safety factor. The limit maneuvering load factor + 5.3 of the Glider gives an ultimate maneuvering load factor of + 7.95.

the wave) and the strength of the wind. (part omitted)

If the wind is strong enough (40 knots or more), find the strongest portion of the wave and point into the wind, and adjust speed so that the glider remains in the strong lift. (part omitted)

Often the wind is strong, but not quite strong enough for the glider to remain stationary over the ground, so that the glider slowly moves upwind out of the best lift. If this occurs, turn slightly from a direct upwind heading, drift slowly downwind into better lift, and turn back into the wind before drifting too far.

(part omitted)

Searching upwind first allows the pilot to drift downwind back into the up part of the wave if he or she is wrong. Searching downwind first can make it difficult or impossible to contact the lift again if sink on the downside of the wave is encountered. In addition, caution is needed to avoid exceeding the glider's maneuvering speed or rough-air redline, since a penetration from the down side of the wave may put the glider back in the rotor.

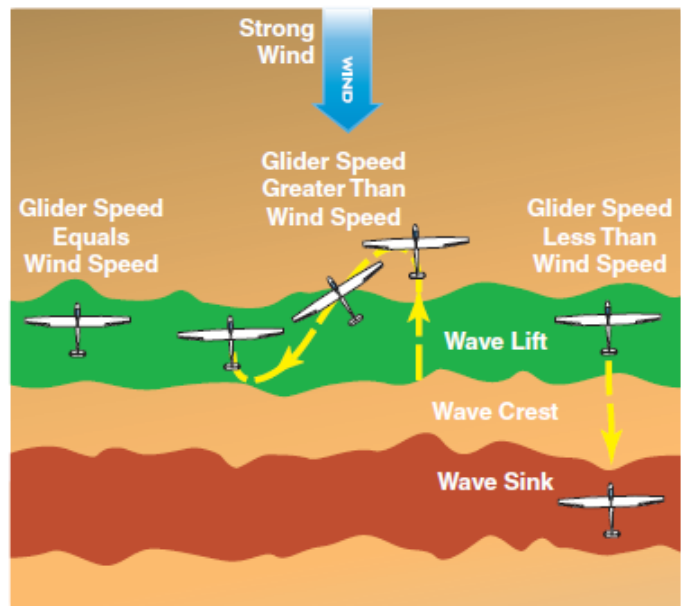


Figure 10-24. Catching a thermal by flying upwind away from the slope lift.

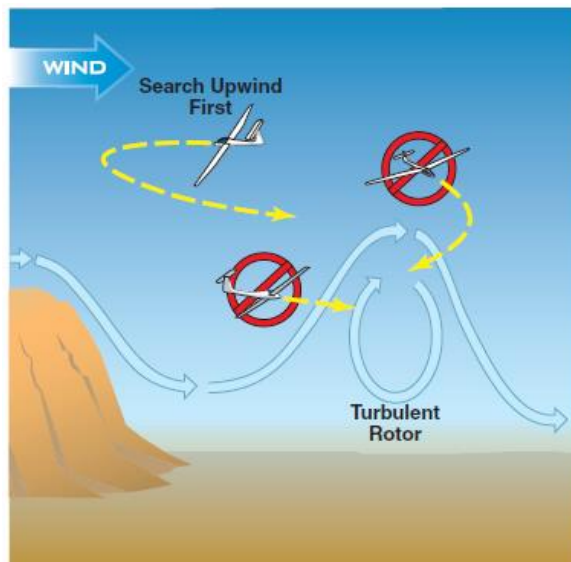


Figure 10-25. Search upwind first to avoid sink behind the wave crest or the rotor.

2.11.4 Terminal Velocity in Free Fall

The United States Parachute Association "Skydiver's Information Manual" 2016-2017, pp.126, includes the following statements on free fall when skydiving.

When the human body free falls in belly-to earth orientation from an altitude of 15,500ft to 3,000ft, the terminal velocity is 120mph (176ft/sec).

This converts to a rate of descent of about 10,560ft per minute.

2.11.5 Air Traffic Control Automatic Transponder

Under the provisions of Article 60 of the Civil Aeronautics Act and Article 146 of the Civil Aeronautics Act Enforcement Regulations, aircraft flying by visual flight rules in air traffic control areas of 3,050m (10,000ft) and above must be installed with Air Traffic Control Automatic Transponder having the functions of transmitting the identification code and altitude of the Glider

(hereinafter “transponder”).

The transponder installed in the Glider did not have the function of transmitting altitude.

2.11.6 Oxygen Supply Equipment

The Flight Manual of the Glider included a statement that oxygen equipment must be installed if flying at high altitudes of 3,000m or more. However, the oxygen supply equipment installed in the Glider was not recognized as Glider equipment, and was not included in the list of equipment.

Since the oxygen valve behind the pilot’s seat cannot be opened or closed while in mid-flight, it has to be opened before departure. As well as this, altitude is set by means of an oxygen regulator inside the cockpit (permissible range: 10,000-18,000ft). The oxygen supply status during flight can be confirmed by means of a flow indicator inside the oxygen supply pipe.

The Glider was not fitted with an inspection chart for confirming said equipment before flying, a check list when using said equipment and others.

(See 2.8.2 (2) Photo F Oxygen supply equipment, Photo G Oxygen supply pipe)

3. ANALYSIS

3.1 Qualifications of Personnel and Others

The Pilot had a valid airman competence certificate and a valid aviation medical certificate.

3.2 Airworthiness Certificate

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

3.3 Relationship with Meteorological Conditions

(1) Weather near the accident site

Judging from the observed values described in 2.7.1 (1) above, it is highly probable that the weather on the ground around the accident site was clear and a westerly wind was blowing with a maximum instantaneous wind velocity of about 25kt.

(2) Weather conditions in the upper air

1) Updraft and downdraft

As described in 2.7.1 (2) above, a westerly wind was blowing at a velocity of around 90kt near the altitude of 25,000ft at which the Glider was flying just before it crashed, but there was no sign of pronounced vertical wind shear that would give rise to clear-air turbulence. Again, as described in 2.7.1 (2) 2), according to satellite images, clouds appearing to be lenticular clouds and rotor clouds generated at the peak of air flow waves coming over the mountain range were linked together in strip formation in the vicinity of 10,000-18,000ft.

Judging from these facts and the rate of climb of the Glider described in 2.11.1.1 above, it is probable that an updraft of around 1,000ft/min had been generated at the forward of the wave and a similar downdraft at the back of the wave.

2) Turbulence

As described in 2.7.2 above, under geographical conditions similar to those of Mount Fuji, the bottom layer is disturbed at a wind velocity of 40kt or more, the general current is disturbed by the vortex current, and turbulence reaching above the elevation of the mountain peak is generated.

As described in 2.7.1 (2) above, it is somewhat likely that, because a westerly wind with a velocity of about 40kt was blowing in the upper air near the accident site and an even stronger westerly wind was blowing in the upper air above that when the accident occurred, strong turbulence had been generated as a result of single-peak mountain waves thought to be geographical conditions similar to those of Mount Fuji near the crash site on the leeward side of Mount Bandai.

3.4 Damage to the Glider

Judging from the statement by Club Member B described in 2.1.2 (3) above, it is highly probable that the Glider was assembled before the flight and that the main pins of the main wings were also attached at this time.

As described in 2.10.2.1 above, in the findings on image analysis of the state of damage to the main wings conducted by the Glider manufacturer, the right wing stump (tongue) is thought to have collapsed and the wings to have eventually slid out of the connecting tubes after the Glider crossed

the Glider load envelope.

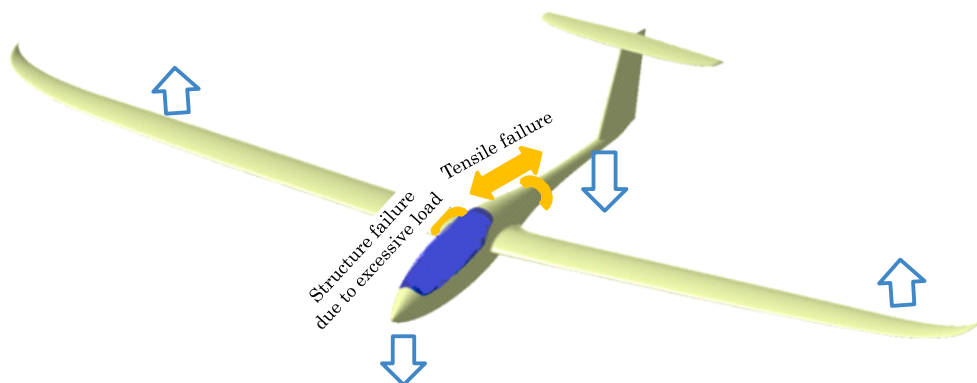
As described in 2.10.2.2 above, the top outer skin of the fuselage appears to have ruptured as a result of tensile load. In addition, parts that were whitened and damaged as a result of compression when the fuselage itself was crushed into an elliptical shape can be seen in the center of the reinforcing frame at the sides of the fuselage interior. The fuselage outer skin is badly damaged in a clockwise direction, accompanied by peeling in the surrounding area, and there are traces showing that the damage progressed from the outside to the inside.

As described in 2.10.1 above, it is probable that the altimeter was damaged as a result of large acceleration in a vertical direction.

As described in 2.8.2 (3) above, there were cracks and breakage on the outer skin of the fuselage underside, and twigs were still remaining there. There was also a pine branch lodged inside the landing gear well.

Judging from this, it is somewhat likely that the damage to the Glider occurred in a process such as the following.

- (1) Excessive upward bending occurred in the main wings due to aerodynamic force, downward bending between the forward fuselage and the after fuselage including the tail (tension above, compression below) then occurred due to the resultant inertial force, a load exceeding the ultimate maneuvering load described in 2.11.2 (1) 3) was applied, the right wing stump (tongue) broke, and the right wing became separated from the Glider. Meanwhile, at the point when a large downward bending occurred in the Glider, the fuselage was subjected to bending compression, the center of the reinforcing frame inside the fuselage broke, and next the outer skin was torn from the top of the mid fuselage.
- (2) The loss of the right wing caused the Glider to roll in a clockwise direction, while the left wing slid out of the connecting tubes on the fuselage and became separated from the fuselage. At more or less the same time, the after fuselage including the tail became severed from the forward fuselage, accompanied by rupturing of the outer skin.



Diag. 6 State of damage

- (3) The forward fuselage fell onto the accident site in a more or less horizontal attitude with the fuselage underside facing down, then collided with trees and the ground, whereupon the forward fuselage underside and windshield were smashed and the instrument panel was damaged.

3.5 Situation until the Crash

3.5.1 Situation from Departure until Nosedive

(1) Departure

Judging from the matters described in 2.1.1, 2.1.2 (1) and 2.8.2 (2) 3), it is highly probable that the Glider took off from the Glider Field by aero tow at around 11:56 with the oxygen valve closed.

(2) Climb

Judging from the flight track records described in 2.11.1.1, it is highly probable that the Glider, after reaching an altitude of about 18,700ft at around 13:08, more or less maintained altitude while heading south to the east of the Ou mountain range, again started to climb from around 13:53, and reached an altitude of about 25,000ft at around 14:00.

(3) Turn to leeward

Judging from the flight track records described in 2.11.1.2, it is highly probable that the Glider, after reaching an altitude of about 25,000ft, gradually turned to the left until it faced east on the leeward side, and then started to turn steeply as if reversing direction for about 10 seconds from around 14:02:10 to 14:02:20.

(4) Nosedive

Judging from the flight track records described in 2.11.1.2 above, it is somewhat likely that, because the positional information of the Glider was interrupted at 14:02:27, seven seconds after the steep turn ended, and significantly lost altitude immediately after that, then resumed in a continuous state 22 seconds later, the Glider nosedived after making the steep turn.

3.5.2 Situation during Nosedive

(1) Nosedive of the Glider

The rate of descent immediately after the start of the nosedive described in 2.11.1.2 (1) 1) above was 18,300ft/min, which would correspond to about 187kt when converted to a vertical True Air Speed. When this is corrected for altitude at the predicted outside air temperature at 22,000ft, the intermediate altitude in 1), the air speed would have been about 130kt. This exceeds the never exceed speed (122kt (19,500ft)) and maximum speed in rough air (97kt) described in 2.11.2 (1).

Judging from the fact that the Glider maintained altitude, it is somewhat likely that, because it descended at a significant speed exceeding the never exceed speed in a short time after the steep turn, it was not in free fall or similar, but nosedived in a pronounced nose-down attitude including spin (a state in which after stalling, an aircraft descends more or less vertically in a spiral formation). It is also somewhat likely that the spinning motion at this time made it difficult for GPS positional calculations to be made, and the positional information was interrupted.

(2) Breakup of the Glider

As described in 2.11.1.2 (1) 2) above, the rate of descent after continuous recording of positional information had been resumed at 14:02:29 was about the same as the rate of descent when the human body free falls in belly-to earth orientation, as described in 2.11.4, and this continued until the crash site. It is therefore probable that only the forward fuselage where the smartphone had been placed fell in a virtually horizontal state after

continuous recording of positional information had been resumed.

Judging from this, it is probable that the Glider broke up under a process such as described in 3.4 above during the time after the Glider started to nosedive until continuous recording of positional information was resumed.

It is somewhat likely that the Glider broke up because excessive bending occurred due to aerodynamic force on the Glider as described in 3.4 above and the Glider was thus subjected to load exceeding the ultimate maneuvering load, influenced by the fact that the Glider nosedived in a pronounced nose-down attitude including spin and that it passed through an area of turbulence as described in 3.3 (2) 2).

3.5.3 Crash Situation

It is probable that, after it had broken up in mid-air, the Glider crashed in the mountain forest in a virtually horizontal attitude with its fuselage underside facing down, while being made to drift by a strong west wind with an average velocity of about 50kt.

Judging from the cause of death described in 2.9.1 above, it is probable that the pilot was killed by the impact of the crash.

3.6 Judgments, Consciousness, Operations and Others by the Pilot

3.6.1 Before Departure

Judging from the flight plan described in 2.1 and the statement by Club Member A described in 2.1.2 (2) above, the pilot was planning a high-altitude long-distance flight lasting eight hours. As described in 2.11.6 above, the oxygen valve behind the pilot's seat cannot be opened or closed while in mid-flight. When flying at high altitude, therefore, the oxygen valve has to be opened and the operational status of oxygen supply equipment confirmed before departure, but the oxygen valve was in a closed state at the accident site. Judging from this, it is probable that the pilot had forgotten to open the oxygen valve before setting off and thus started the flight with no supply of oxygen.

3.6.2 After Departure

- (1) At the start of wave soaring

Judging from the flight track records described in 2.11.1.1 above, it is probable that the pilot, after riding on a thermal updraft (thermal) to make a climbing turn near the Glider Field, reached an altitude of 18,000ft or more by wave soaring.

As described in 2.7.1 (2) above, the wind velocity at altitude 18,000ft was about 75kt. It is highly probable that, as described in 2.11.1.1, the pilot countered this wind by flying at a speed more than 30kt in excess of the cruising speed of 70kt in the flight plan, as described in 2.1 (True Air Speed about 103kt).

It is probable that the pilot judged flight to be possible, even though the upper wind was stronger than expected and the limit speed margin had reduced due to the increase in cruising speed compared to the plan, and thus started to cruise on the scheduled route.

- (2) When communicating with ACC

As described in 2.11.5 above, the Glider was not installed with a transponder having the necessary altitude response function for flying by visual flight rules in air traffic control areas at an altitude of 10,000ft and above.

As described in 2.1.1 above, the ATC communication records show that the pilot reported his altitude each time he changed altitude, but when reporting at 14:00, with the

altitude at 25,000ft, he mistakenly reported an altitude 6,000ft lower than the actual one. Because the transponder of the Glider did not have an altitude response function, however, it is highly probable that ATC was unable to recognize the discrepancy.

(3) When hypoxia associated with high altitude flight set in

1) As described in 2.9.2 above, signs of hypoxia include reduced attentiveness within 30 minutes at an altitude of 18,000ft, and a loss of muscle control, judgment and others within 15 minutes at 20,000ft. Finally, consciousness is thought to be lost after 2-5 minutes at 25,000ft.

As described in 2.11.1.1 and 2.11.1.2 above, the Glider, after reaching an altitude of 18,000ft or more at around 13:08, flew in the same altitude band for about 45 minutes until starting its climb at around 13:53. After that, it passed 20,000ft at 13:54 and reached 25,000ft at around 14:00.

Judging from these facts, it is somewhat likely that, having flown in the vicinity of altitude 18,000ft without an oxygen supply for about 45 minutes, the pilot was showing signs of hypoxia and his attentiveness was decreasing. Given this situation, it is somewhat likely that, because the pilot did not confirm the supply of oxygen during flight using the flow indicator described in 2.11.6 above, he did not realize that oxygen was not being supplied and did not notice signs of hypoxia in himself either, and in this state, moved away from the altitude band near 18,000ft where he had been flying without problem until then, and continued to climb.

Furthermore, it is somewhat likely that, after reaching an altitude of 25,000ft, the pilot succumbed to a state of more severe hypoxia and became semi-conscious, and, as described in 2.11.1.2 above, after he had reported the wrong altitude, made a sound like a moaning voice, and started a turn to the leeward side as mentioned in the precautions against wave soaring, the bank angle suddenly increased.

2) As described in 2.11.6 above, the permissible range of altitude for the oxygen supply equipment mounted in the Glider was 10,000-18,000ft, and it is probable that, even if the oxygen valve had been opened at the position set at the time of the accident (18,000ft), it would have been insufficient as an oxygen supply to cope with the altitude at which the Glider was flying (about 25,000ft).

(4) When the Glider stalled

As described in 2.11.1.2 above, the Glider performed a steep turn at a bank of about 60° from an air speed of about 66kt in the second half of the turn, but because gliders that cannot use engine thrust maintained almost the same altitude, it is somewhat likely that the Glider adopted a large angle of attack during the steep turn and the air speed decreased significantly.

In other words, it is somewhat likely that the Glider entered a steep turn while the pilot was in a state of semi-consciousness due to hypoxia, and that after the air speed had decreased and the Glider stalled, it nosedived in a pronounced nose-down attitude including spin, as described in 3.5.2 (1) above.

Moreover, the flap levers of the Glider were in the fully lowered position, as described in 2.8.2 (2) 2) above, but it was not possible to specify whether this was due to an operation by the pilot, or whether the position moved due to the impact when the Glider broke up, for example.

3.6.3 During Nosedive and Mid-Air Breakup

Because it is somewhat likely that the pilot was in a state of semi-consciousness due to the effects of hypoxia, it is probable that he could not carry out a proper recovery operation, even at the point when the Glider nosedived in a pronounced nose-down attitude including spin. Again, for the same reason, it is probable that he was also unable to make a bailout using the parachute he was wearing.

3.7 Prevention of Accidents during High Altitude Flight

The following measures could generally be considered to prevent accidents during wave soaring or other high altitude flight at 3,000m and above.

3.7.1 Preparations before the Flight

(1) Equipment

As well as preparing the following items of equipment and firmly checking their functions, checklists and similar means should be prepared for checks before departure and during flight.

1) Radio and transponder

Radio equipment for communication with air traffic control and a transponder with an altitude response function

2) Oxygen supply equipment: Equipment approved for use in glider

(2) Confirmation of weather conditions

The state of wind, cloud, temperature, precipitation and other phenomena in the airspace where flight is planned should be well confirmed in advance, and unreasonable flight plans should be avoided.

3.7.2 Matters for Caution during Flight

(1) Preventing near collision with other aircraft

Gliders that have difficulty in maintaining course and altitude should be actively provided with radar traffic information by air traffic control in order to prevent near collision with other aircraft in the same control area. Moreover, aircraft flying by visual flight rules in air traffic control areas at an altitude of 3,050m (10,000ft) and above should be sure to activate transponders capable of transmitting altitude when flying in such airspace, since it is mandatory for these to be installed.

(2) Preventing hypoxia

Bearing in mind that signs of hypoxia appear gradually, the flow of oxygen, changes in reserves, changes in one's own senses and other aspects should be periodically ascertained.

Should any abnormality be felt, the Glider should be taken to a lower altitude until the state of hypoxia is eliminated.

(3) Ascertaining wind and air flow

Westerlies generally increase in velocity as altitude increases. Therefore, an altitude band in which flight can be achieved with ease should be selected in consideration of the difference between the wind velocity at the flight altitude and the limit speed.

Since areas of downdraft occur downstream of updraft due to mountain waves, and rotor areas accompanied by turbulence exist in layers below these, all due caution should be exercised when flying, taking care to avoid passing through areas of turbulence at high speed while descending.

4. PROBABLE CAUSES

It is highly probable that this accident occurred when the Glider crashed in a mountain forest because it broke up in mid-air while flying.

It is somewhat likely that the Glider broke up in mid-air because, after it had entered a steep turn and stalled while the pilot had succumbed to a state of hypoxia and was semi-conscious, excessive bending occurred owing to aerodynamic force on the Glider and the Glider was subjected to load exceeding the ultimate maneuvering load, influenced by the fact that the glider assumed a significant nose-down attitude including spin and nosedived, and that it passed through an area of turbulence.

It is somewhat likely that the pilot succumbed to a state of hypoxia because he had forgotten to open the oxygen valve before setting off and thus started the flight with no supply of oxygen, and had not noticed that oxygen was not being supplied because he did not check the oxygen supply during flight, and so continued to climb without noticing signs of hypoxia in himself.

Fig. 1 Accident Site

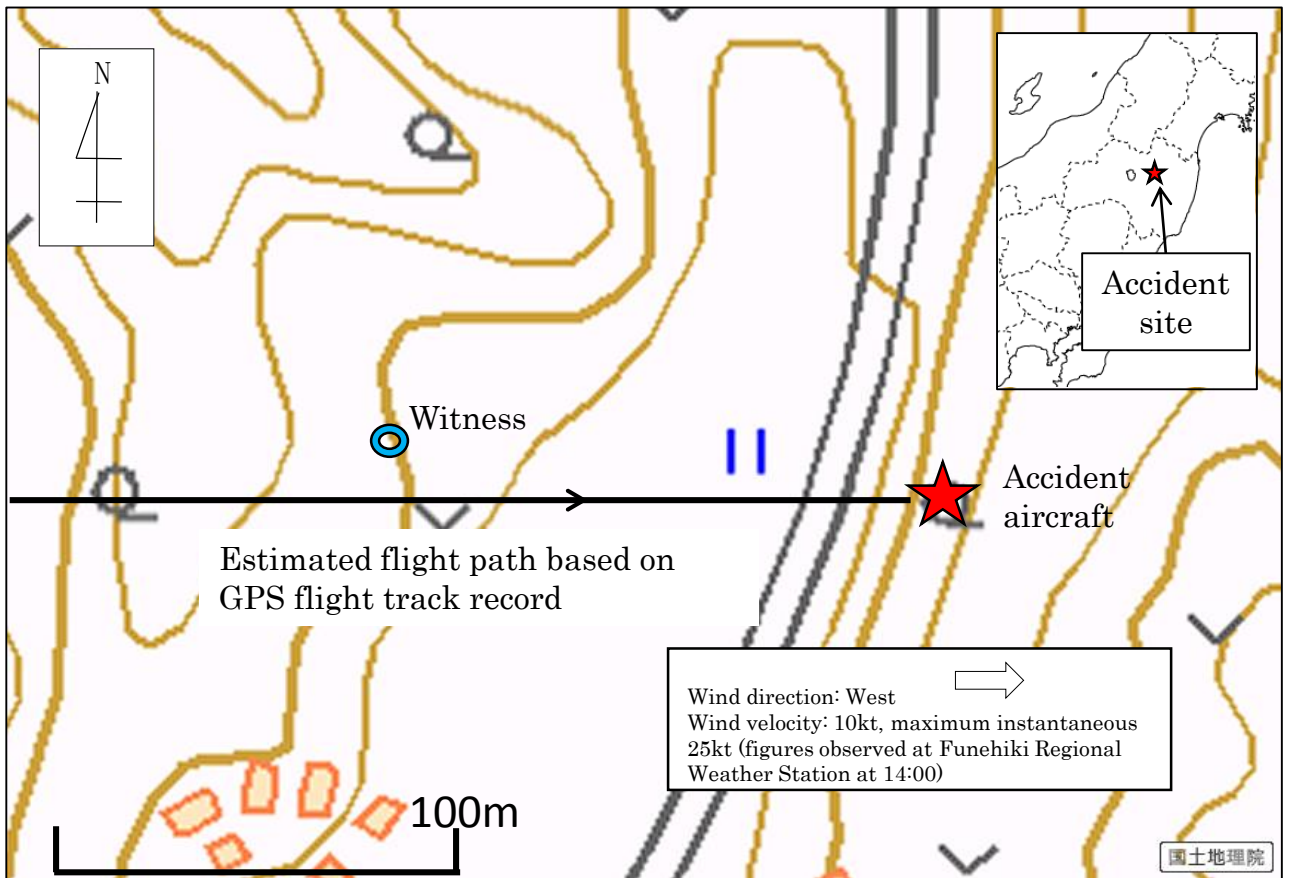


Photo Accident Glider



Fig. 2 Three Angle View of the Glasflügel 304CZ-17

Unit: m

