

AA2012-7

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

PRIVately OWNED

J A 7 0 1 M

September 28, 2012



The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board and with Annex 13 to the Convention on International Civil Aviation is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Norihiro Goto
Chairman,
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

COLLISION WITH MOUNTAIN SLOPE
A PRIVATELY OWNED PIPER PA-46-350P, JA701M
SOUTH-SOUTHEAST SLOPE OF MT. YAGO
APPROXIMATELY 14 KM NORHTEAST OF KUMAMOTO AIRPORT
AROUND 17:15 JST, JANUARY 3, 2011

September 7, 2012

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Shinsuke Endoh
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Yuki Shuto
Member	Toshiki Shinagawa

SYNOPSIS

Summary of the Accident

A privately owned Piper PA-46-350P, registered JA701M, took off from Kumamoto Airport at around 17:11 Japan Standard Time (JST: unless otherwise stated all times are indicated in JST) for Kitakyushu Airport and went missing on Monday, January 3, 2011. It was found on the south-southeast slope of Mt. Yago, 14 km northeast of the airport next day.

Two persons on board, a PIC and a passenger, suffered fatal injuries.

The aircraft was destroyed; however, no fire broke out.

Probable Causes

It is highly probable that the aircraft collided with the mountain slope during its in-cloud post-takeoff climb with low climb rate on its VFR flight to Kitakyushu Airport from Kumamoto Airport, resulting in the aircraft destruction and fatal injuries of two persons on board—the PIC and the passenger.

It is somewhat likely that the contributing factor to in-cloud flight toward mountain slope with low climb rate is the PIC's lack of familiarization with terrain features near Kumamoto Airport; however, the JTSB was unable to clarify the reason.

Recommendation

In light of this accident and similar accidents mentioned above, the JTSB, in accordance with the Paragraph 1, Article 26, the Act for Establishment of the Japan Transport Safety Board, recommends the Minister, MLIT as follows:

In order to prevent the accidents in in-cloud flight under Visual Flight Routes, Civil Aviation Bureau publicizes again the following contents to the pilot associations and also make them known to a pilot individual using the opportunities of the newly introduced system “Review System on Specific Pilot Competence” (2012 MLIT Ordinance No. 22):

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

Abbreviations

ARP:	Aircraft Reference Point
ATIS:	Automatic Terminal Information Service
EDI:	Enhanced Digital Indicator
ELT:	Emergency Locator Transmitter
GND:	Ground
GPS:	Global Positioning System
HSI:	Horizontal Situation Indicator
ILS:	Instrument Landing Indicator
KIAS:	Indicated Airspeed expressed in "Knots"
NTSB:	National Transport Safety Board
TCA:	Terminal Control Area
VHF:	Very High Frequency
VOR:	VHF Omni Directional Radio Range

Units

1 lb:	0.4536 kg
1 ft:	0.3048 m
1 kt:	1.852 km/h (0.5144 m/s)
1 in:	25.4 mm
1 nm:	1,852 m

1. PROCESS AND PROGRESS OF INVESTIGATION

1.1 Summary of the Accident

A privately owned Piper PA-46-350P, registered JA701M, took off from Kumamoto Airport at around 17:11 Japan Standard Time (JST: unless otherwise stated all times are indicated in JST) for Kitakyushu Airport and went missing on Monday, January 3, 2011. It was found on the south-southeast slope of Mt. Yago, 14 km northeast of the airport next day.

Two persons on board, a PIC and a passenger, suffered fatal injuries.

The aircraft was destroyed; however, no fire broke out.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On January 4, 2011, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two investigators to investigate this accident.

1.2.2 Representatives From Relevant States

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

1.2.3 Implementation of the Investigation

January 4 to 6, 2011	On-site investigation, aircraft examination and interviews
January 18	Interviews
January 20 to 23	On-site investigation, aircraft examination and interviews
April 11 to July 29	Analysis of the navigation device
May 11 to 13	Examination of aircraft parts
June 10 to November 24	Extraction of Data from the navigation device and engine instruments and their analyses

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

As the two persons on board were fatally injured in the accident, their comments were unable to be obtained.

1.2.6 Comment From the Relevant States

Comment on the draft final report was invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On January 3, 2011, a privately owned Piper PA-46-350P, registered JA701M, took off from Kumamoto Airport at around 17:11 for Kitakyushu Airport, with two persons on board: a PIC in the left seat and a passenger in the right seat.

The flight plan for the aircraft is outlined below:

Flight rules:	Visual flight rules (VFR)
Departure aerodrome:	Kumamoto Airport
Estimated off-block time:	17:12
Cruising speed:	170 kts
Cruising altitude:	VFR
Route:	Kurume
Destination aerodrome:	Kitakyushu Airport
Total estimated elapsed time:	30 min
Fuel load expressed in endurance:	2 hr 10 min
Persons on board:	Two

The history of the flight up to the accident occurrence is summarized below, based on the records of air traffic control communications, radar track records, and statements by the passenger who disembarked at Kumamoto Airport (hereinafter referred to as “the passenger A”), the air traffic controller of Kumamoto Airport (hereinafter referred to as “the Controller”) and the eyewitness.

2.1.1 History of the Flight based on Records of ATC Communication and Radar Track Records

Around 17:11	The aircraft took off from runway 07, Kumamoto Airport.
17:12:11	The radar of the Kumamoto aerodrome station C captured the aircraft.
17:14:11	The PIC made a position report at 6 nm north of the airport at 2,300 ft.
17:14:25	The PIC reported to Kumamoto Tower saying “climbing to 6,500 ft.”
17:14:31	The PIC reported to Kumamoto Tower saying “frequency change, 701M.”
17:14:58	The aircraft vanished from the radar screen.
Around 17:19	An aircraft flying over KAZMA (way point) at 10,000 ft reported to Kumamoto Tower of a reception of emergency locator transmitter (ELT) signal.

2.1.2 Statements of Persons Concerned

a. Passenger A

Four passengers including the passenger A and the PIC flew from Amani Airport to Kumamoto Airport, on January 3. The stopover at Kumamoto Airport was a

scheduled one.

The PIC changed flight rules from VFR to instrument flight rules (IFR) over Kagoshima to land Kumamoto Airport. The onboard weather radar showed no red display equivalent to heavy precipitation en route. The aircraft had no abnormalities for engine and flight control system. The PIC was in good health condition. After the landing at Kumamoto Airport, the PIC did not stop the engine to disembark two passengers, and hurriedly departed for Kitakyushu Airport. The passenger A had no idea why the PIC was in a hurry.

b. The Controller

At the time of the accident, the Kumamoto Airport was under visual meteorological condition (VMC) and the using runway was 07. The sunset was very close and it was dark, also raining. The Controller saw the vague shape of the mountain range in the east quadrant of the airport. The aircraft went into clouds after the post-takeoff left turn and he lost sight of it at about 2 nm from the airport. When he inquired its climbing altitude, he received PIC's calm reply of "climbing to 6,500 ft." Short stopover made him think that the PIC was in a hurry.

c. Eyewitness

The eyewitness saw the aircraft landing and takeoff when he was taking pictures of aircrafts on the north perimeter road of Kumamoto Airport. His experience of watching the same type of aircraft told him that its rate of climb was small. The weather condition was bad and the mountains of the northeast were not visible due to clouds; besides, it was already dark surrounding. He lost sight of the aircraft right after its takeoff.

The accident occurred on a south-southeast slope ($32^{\circ} 55' 49''$ N, $130^{\circ} 57' 12''$ E) of Mt. Yago, about 14 km northeast of Kumamoto Airport at 17:15, January 3, 2011.
(See Figure 1: Estimated Flight Route)

2.2 Injuries to Persons

The PIC and the passenger suffered fatal injuries.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to the Aircraft Components

Fuselage: Destroyed

Main wings: Both wings were fractured from the fuselage.

Empennage: Both horizontal wings were fractured from the fuselage and the vertical fin was fractured.

Engine: Damaged

Propellers: Severed

2.4 Damage to Properties Other Than the Aircraft

Tens of trees were damaged.

2.5 Personnel Information

PIC Male, Age 53

Private Pilot Certificate (Aircraft):	July 15, 1991
Type rating for land-use single engine:	July 15, 1991
Type rating for land-use multiple engines:	June 26, 1997
Instrument Flight Certificate:	October 15, 2002
Class 2 Aviation Medical Certificate:	
Valid until:	April 1, 2011
Total flight time:	1,537 hr 19 min
Flight time in the last 30 days:	2 hr 05 min
Total flight time on the type of aircraft:	119 hr 25 min
Flight time in the last 30 days:	2 hr 05 min

2.6 Aircraft Information

2.6.1 Aircraft

Type:	Piper PA-46-350P
Serial number:	4636188
Date of manufacture:	January 8, 1999
Certificate of airworthiness:	DAI TO-2010-043
Valid until:	April 25, 2011
Category of airworthiness:	Aircraft Normal, N
Total flight time:	1,497 hr 15 min
Flight time since last periodical check (100-hr check on April 6, 2010):	34 hr 00 min
(See Figure 2: Three-Angle-View of Piper PA-46-350P)	

2.6.2 Engines

Type:	Lycoming, TIO-540-AE2A
Serial number:	RL-10452-61A
Date of manufacture:	December 26, 2002
Total time:	731 hr 33 min

2.6.3 Fuel and Lubrication Oil

Onboard fuel was AVGAS100 and lubrication oil was AEROSHELL W80.

2.6.4 Weight and Balance

When the accident occurred, the weight of the aircraft was estimated to have been 3,805 lb and its center of gravity (CG) was estimated to have been 137.9 in. aft of the datum

line, estimated to have been within the allowable range (maximum takeoff weight of 4,100 lb and CG range of 136.1-144.5 in corresponding to the weight of the aircraft at the time of the accident).

2.7 Meteorological Information

2.7.1 Weather Outlook

The weather outlook issued at 16:35, January 3 by Kumamoto Regional Meteorological Observatory was as follows:

Kumamoto prefecture in the night of January 3, due to the influence of pressure trough and cold weather, will be rain or snow; besides, there will be a place with a lightning.

Northern Kyushu district is clouded by the influence of the pressure trough and cold weather, there are raining places centered on the coasts of Tsushima Strait.

(Special attention to: strong winds in Kumamoto and Amakusa-Ashikita area; accretion of snow on power lines in Kumamoto and Aso areas; high waves in Amakusa-Ashikita area; and thunder strikes in Kumamoto area.)

(See Figure3: Asia Surface Weather Chart)

2.7.2 Cloud Type and Cloud Top Height Derived From Satellite Cloud Grid Information Data

General information on cloud types and cloud top heights derived from Satellite Cloud Grid Information Data (SCGID)*¹ as of 17:00, January 3 was as follows:

Cloud cover over the northern Kyushu was mostly cumuli, while the areas east of Mt. Aso – Oita and Tsuiki areas were covered with stratocumuli. In addition, according to the cloud top heights of SCGID, the cloud top height of cumuli over the accident site was about 6,560-9,840 ft, while that of stratocumuli east of Mt. Aso was about 6,560 ft.

2.7.3 Radar Echo Intensity

According to the radar echo chart observed at 17:00 and 18:00 January 3, the accident site was out of precipitation area at 17:00, while it was entering in precipitation area with intensity of 0-1 mm/h at 18:00.

(See Figure 4: Radar Echo Charts)

2.7.4 Aeronautical Weather Observations for Kumamoto Airport

Details of aeronautical weather observations around the time of the accident occurrence were as follows:

16:00 Wind direction 280°; Wind velocity 5 kts

Visibility 20 km

Cloud: Amount 1/8; Type Cumulus; Cloud base 1,500 ft

Amount 3/8; Type Cumulus; Cloud base 2,500 ft

Amount 5/8; Type Cumulus; Cloud base 3,500 ft

*¹ Satellite Cloud Grid Information Data is generated from the observation data collected by the weather satellite Himawari. It provides information on clouds, which consists of total cloud amount, upper level cloud amounts, cloud top heights, convective cloud amounts, and cloud types.

Temperature 6 °C, Dew point 2 °C
Altimeter setting (QNH) 29.98 inHg
17:00 Wind direction 290°; Wind velocity 6 kts
Visibility 10 km
Light shower rain
Cloud: Amount 2/8; Type Cumulus; Cloud base 1,500 ft
Amount 4/8; Type Cumulus; Cloud base 2,500 ft
Amount 6/8; Type Cumulus; Cloud base 3,500 ft
Temperature 5 °C, Dew point 3 °C
Altimeter setting (QNH) 29.99 inHg
Automatic Terminal Information Service (ATIS)*² provided at Kumamoto Airport included above weather information.

2.7.5 Statements on Weather Conditions Around Mt. Yago

a. Passer-by

He was on a roadside of Milk Road— 1.9 km southeast from the accident site and heard aircraft engine sound at 17:15. He stated that it was cloudy and it started to snow at 17 o'clock and it was fairly dark then.

b. Paraglider pilot

A paraglider pilot at the launch point about 500 m southwest of the accident site stated that he cancelled his flight because the mountain slope higher than about 2,300 ft was under incloud condition and it began to snow at around 15 o'clock at an altitude of about 2,600 ft.

2.8 Ice Protection and Ice Detecting System Equipped with the Aircraft

The aircraft was equipped with ice protection and ice detection system. A Pilot Operating Handbook urges a pilot to activate ice protection system when a flight into icing conditions (moisture is visible at or below +5°C outside air temperatures (OAT)) is anticipated, or when he encounters the conditions during climb, cruise or descent.

2.8.1 Ice Protection System

Ice protection system includes: pneumatic wing and empennage boots, surface deice annunciation, wing ice detection light, electrically heated deice pads on propeller blades, electrically heated windshield, windshield heat annunciation, heated lift detector and heated pitot head.

2.8.2 Ice Detecting System

The aircraft was equipped with a sensor in the vertical fin deicer, which notifies a pilot of the icing when the ice thickness reaches 1/4 in. or greater.

2.8.3 Activation Procedure

*² ATIS provides continuous repetitive broadcast of recorded information for aircraft operations such as latest weather, airport conditions and operational condition of navigation aids.

“Section 4 Normal procedures,” Supplement 3, Pilot Operating Handbook carries the following procedures before entering probable icing conditions.

- | | |
|---------------------------------------------------------------------------------------------|----------------------------------------------------|
| · <i>Induction air</i> | <i>ALTERNATE</i> |
| · <i>PITOT HEAT switch</i> | <i>ON</i> |
| · <i>S. WRN HEAT switch</i> | <i>ON</i> |
| · <i>WSHLD LO switch</i> | <i>ON (WSHLD HI in actual ice)</i> |
| · <i>PROP HEAT switch</i> | <i>ON</i> |
| · <i>DEFROST knob</i> | <i>OUT</i> |
| · <i>VENT/DEFOG switch</i> | <i>ON, if additional defrost is desired</i> |
| · <i>SURFACE DEICE switch</i> | <i>activate after 1/4 to 1/2 inch accumulation</i> |
| · <i>Relieve propeller imbalance (if required) by exercising propeller control briefly.</i> | |
| <i>Repeat as required.</i> | |

“Section 5 – Performance,” Supplement 3 Anti-icing system carries the following:

Climb speed should be increased to 130 knots when icing conditions are encountered during climb.

2.8.4 Emergency Procedures in Case of Malfunction of Ice Protection System

Section 3– Emergency procedures, Supplement 3 carries the following:

Warning

The malfunction of any required deice equipment requires immediate action to exit icing conditions. Depending on the severity of the icing encounter, failure to take immediate positive action can lead to performance losses severe enough to make level flight impossible. Therefore, upon verification of a system malfunction or failure, climb or descend out of icing conditions if this provides the shortest route. If exit must be made in level flight, consider the use of maximum power and exit by the most direct route. The effect of the additional fuel burned at higher power settings on aircraft range must be considered and an alternate airport chosen if necessary.

2.9 Accident Site Information

2.9.1 Accident Site

The aircraft was lying on a logging road (elevation about 2,880 ft) heading to the east-northeast (about 070°). The road runs in an east-west direction on a southeast mountain slope of Mt. Yago (top elevation: about 3,090 ft). 85 m (on the side of Kumamoto Airport) from the aircraft to the southwest stands a tree whose top was chopped (hereinafter referred to as the “Tree A”). Trees standing between the first ground impact scar and the Tree A were all damaged: the nearer to the ground scar, the lower the damaged portion on the trees; and tree tops near the Tree A were chopped horizontally. The distance between the Tree A and the ground scar was about 45m and the dip angle from the ground scar to the top of Tree A was about 3°. A tree at the ground contact trace was pushed down uphill (hereinafter referred to as the “Fallen tree A”). There was a large contact trace on the uphill bank on the logging road 25 m from the Fallen tree A. The aircraft was about 20m away from the contact trace to the northeast. Contact traces were found on the road bank leading to the aircraft.

There was no trace of fire.

(See Figure 5: Accident Site Layout)

2.9.2 Detailed Damage Description

a. Fuselage

The fuselage was severely damaged with longitudinal compression buckles.

b. Main Wings

The left wing was broken into three major pieces; the right wing, four major pieces.

Both wing tanks were empty and there was lingering fuel fume. The flap actuator exhibited UP position.

c. Landing Gears

The right landing gear was found on the ground separated from the right wing.

The left landing gear was still attached to the left wing. The nose gear was in its original position.

d. Vertical Fin

Both horizontal wings were fractured at its attaching point to the fuselage. Upper portion of the vertical fin was severed.

e. Engine

Engine support frame was bent downward causing the engine to face aft in an upside-down posture. The forward portion of the engine was damaged severely: out of six cylinders, the No. 2 cylinder head was broken.

f. Propeller

Three propeller blades were all broken at their roots and part of them were found in small pieces.

(See Figure 5: Accident Site Layout and Photo 2: Accident Aircraft (At the Accident Site))

2.10 Radar Track Records

The radar of Kumamoto Tower lost the tracking of the aircraft at the point 8 nm northeast of the airport at 2,800 ft, with the last heading to the northeast and the ground speed (GS) of 150 kts. The rate of climb at 17:13 was 750 fpm.

(See Figure 1: Estimated Flight Route)

2.11 Radio Communication

The Kumamoto Tower-to-aircraft radio transmission was normal.

2.12 Medical Information

According to the autopsy report compiled by the Department of Forensic Medicine, Faculty of Life Science, Kumamoto University Graduate School, the cause of death for the PIC was blows on the whole body. His blood sample tested negative for alcohol and illegal drugs.

The possible cause of death for the passenger was cardio circulatory disorder caused by hemorrhage from the head and other body parts.

2.13 Information on Search and Rescue Operation

The aircraft vanished from the radar screen in Kumamoto Tower at 17:15.

An aircraft flying over KAZMA at 10,000 ft reported to Kumamoto Tower the reception of ELT signal at 17:19. Tsuiki Air Base, Air Self Defense Force, in charge of instrument approach service to Kitakyushu Airport called the aircraft but to no avail. After a coordination with the Rescue Coordination Center (RCC), MLIT, Kitakyushu Airport Office: manage the destination aerodrome issued the INCERFA (uncertain phase) to rescue parties concerned. After the failed attempt to collect information on the missing aircraft, the airport office issued the DETRESFA (distress phase) at 19:22 to launch the search and rescue (SAR) operation.

At 15:03, January 4, Ground Self Defense Force soldiers found the aircraft and two occupants on the slope 1.3 km south-southeast of Mt. Yago. Kumamoto Prefectural Police identified them as the PIC and the passenger.

Total number of personnel and air assets mobilized for the operation were as follows:

- Kumamoto Prefectural Police: one helicopter and 120 policemen
- Oita Prefectural Police: one helicopter and 15 policemen
- Saga Prefectural Police: one helicopter
- Yamaguchi Prefectural Police: one helicopter
- Fire Fighting Organization: one helicopter, 63 firefighters and 19 fire engines
- Defense Ministry: two helicopters, one aircraft and 30 soldiers

2.14 Examination of Navigation Device

2.14.1 Autopilot System

The aircraft was equipped with an autopilot device, Bendix/King KFC225 (manufactured by Bendix/King) which has no data recording capability, while onboard Bendix/King KCM100 was capable of storing KFC225's malfunction data and set altitude information. KCM100 was shipped to the USA for analysis and it was done with the oversight provided by the National Transport Safety Board (NTSB).

The analysis indicated that no malfunction data was stored in the device while it contained set altitude data of 6,500 ft. The analysis did not determine whether the PIC used the device at the time of the accident.

2.14.2 Navigation Device Installed on the Aircraft

The aircraft was equipped with an integrated navigation device GNS530 (manufactured by Garmin Ltd.), navigation device Bendix/King KX155A and horizontal situation indicator (HSI)*³ (manufactured by Bendix/King).

a. GNS530

It is an instrument integrated with the VHF radio, the VOR/ILS receiver and GPS receiver. Its navigation display shows selected flight plan, route, airports and navigation

*³ HSI: HSI is an aircraft instrument which shows an aircraft magnetic heading and a selected VOR/ILS course.

aids along the planned route.

GNS530 retains information on selected and standby frequencies stored for the VHF radio and the VOR/ILS receiver, as well as the last GPS position at the time of shutdown. Upon being powered up, it resumes the last setting at the time of shutdown.

The examination revealed the following:

(1) VHF receiver

- Selected frequency: 118.700 MHz (Kumamoto Tower)
- Standby frequency: 123.850 MHz (Kumamoto TCA)
- No anomalies on the receiver.

(2) VOR/ILS receiver

- Selected frequency: 112.80 MHz (Kumamoto VOR)
- Standby frequency: 113.85 MHz (Suo VOR)
- No anomalies on the receiver.

(3) Last GPS position

32° 55. 77' N, 130° 57.15' E (corresponding to the locations 7.4 nm, 42° from Kumamoto Airport reference point, and 8.0 nm, 51° from Kumamoto VOR)

(4) Navigation map

Map scale can be changed automatically (using auto zoom feature) or manually. When a flight plan is set under auto zoom enabled mode, the device shows all legs of a planned route on the display automatically adjusting from an enroute scale of 200 nm through each lower scale, stopping at 5.0 nm.

The selected zooming method was auto zoom and the shown map range was 200 nm for a straight line distance of about 61 nm from Kumamoto Airport to Kitakyushu Airport.

(5) User waypoints

The GNS530 retained six user waypoints for northern Kyushu as shown here.

Table 1: Stored Waypoints

NAME	Description	Position
		*Grid Lat/Lon hddd° mm.mmm' WGS 84
42	Kyushu	N34 00.960 E131 03.800
43	Kyushu	N34 00.960 E130 59.730
44	Kyushu	N33 55.930 E131 00.800
ASARI	Kyushu	N33 53.600 E131 12.980
FR5NE	Kyushu	N33 55.330 E131 35.480
FR5SE	Kyushu	N33 46.800 E130 58.390

b. KX155A

A KX155A consists of a navigation device and a radio; each device stored the following

frequencies:

- (1) Navigation device
 - Selected frequency: 112.80 MHz (Kumamoto VOR)
 - Standby frequency: 109.30 MHz (Kumamoto ILS)
- (2) Radio
 - Selected frequency: 121.80 MHz (Kumamoto Ground)
 - Standby frequency: 118.85 MHz (Kitakyushu Tower)

c. HSI

The HSI heading indicator pointed to 34°.

2.14.3 Engine Digital Instrument

The aircraft was equipped with an Enhanced Digital Indicator (EDI). It records abnormal peak values and corresponding duration, and an average value of abnormal values when abnormality occurs in the engine.

The EDI was shipped to the USA and examined with oversight provided by the NTSB; however, the internal damage made it impossible to retrieve recorded information.

2.14.4 Ice Protection Switch Panel

An ice protection switch panel is aligned with toggle switches of AIR CON, BLOWER, SURFACE DE-ICE, STALL HEAT, PITOT HEAT, VENT DE-FOG, CABIN HEAT, WINDSHIELD LOW HEAT, WINDSHIELD HIGH HEAT, ICE LIGHT and PROP HEAT. Each switch has two positions: ON and OFF.

The switch panel was free of damage. All switches except WINDSHIELD HIGH HEAT and SURFACE DE-ICE were in ON position.

2.14.5 Barometric Altimeter

The QNH value set to the altitude indicator was 29.99 inHG.

2.15 Other Necessary Information

2.15.1 The Operation and Timing of Navigation Device

According to a pilot who taught the PIC how to use the navigation device stated as follows:

The deceased PIC seldom did data input into KFC225 or GNS530 on the ground. It was when the aircraft became stabilized during a climb or after a level-off that he did data input. Most of the data input into GNS530 was direct course values of destination aerodrome and others.

2.15.2 PIC's Flight Experience in Kyushu Area

The aircraft flight logbook contained his flight records from Kitakyushu Airport to other airports in Kyushu; however, no record was found on his landing at and takeoff from

Kumamoto Airport.

His personal logbook contained records in which he flew from Amakusa Airport to Saga Airport via Kumamoto Airport in 2006 and a flight between Iwami Airport and Kumamoto Airport in 1997 flying another aircraft.

2.15.3 Access to Weather Information

The PIC made a phone call to the weather station at Amami Airport and acquired the enroute weather information to Kumamoto Airport. He took off from Kumamoto Airport for Kitakyushu Airport without visiting the weather station at Kumamoto Airport and without acquiring necessary weather information.

A piece of paper containing possible Kumamoto weather as of 16:00 was found in the cockpit.

2.15.4 Aircraft Readiness for IFR Flight

The aircraft was IFR flyable with necessary equipment installed.

2.15.5 Climb Performance

The best rate-of-climb obtained from a performance chart contained in the Pilot Operating Handbook is about 1,480 fpm under the conditions of 110 KIAS, 0°C outside air temperature (OAT), 2,500 ft, 3,805 lb, maximum continuous power, and both flaps and landing gears retracted. The aircraft can reach about 6,000 ft within 4 min. Its best-angle-of-climb speed (Vx) is 81 KIAS and maximum operating altitude (pressure altitude) is 25,000 ft.

2.15.6 Onboard Weather Radar

Onboard weather radar was Bendix/King RDR2000 and its features were as follows:

- Available ranges: 10, 20, 40, 80, 160 and 240 nm
- Antenna tilt: +15° to -15°
- Scanning angle: 90° or 100°
- Radar returns shown in colors: black, green, yellow, red and purple red (the more the indicated color shifts to purple red, the bigger precipitation it represents.)

2.15.7 Operational Hours at Kumamoto and Kitakyushu Airports

Kumamoto Airport is open from 06:00 to 21:30, while Kitakyushu Airport is open for 24 hours.

2.15.8 IFR Route From Kumamoto Airport to Kitakyushu Airport

While a pilot flies IFR from Kumamoto to Kitakyushu Airport, he receives instructions from Fukuoka approach and other ATC organizations. Its traveling distance is longer than that of VFR flight, leading to a longer flight time. IFR radio transmissions with ATC organizations concerned are generally complicated.

2.15.9 VFR Route From Kumamoto to Kitakyushu Airport

There are two possible VFR routs from Kumamoto Airport to Kitakyushu Airport:

Route 1: Kumamoto Airport to Kurume to Kitakyushu Airport

Route 2: Kumamoto Airport to Western area of Mt. Aso to Southern area of Mt. Kuju to Oita Airport to on the sea to Kitakyushu Airport

2.15.10 Flight Rule From Amami Airport to Kumamoto Airport

The PIC started the flight from Amami Airport under the VFR flight, changed flight rules to IFR over Kagoshima and landed Kumamoto Airport after descending from 11,000 ft.

2.15.11 Safety Measures for VFR Flight

The Civil Aviation Bureau (CAB), MLIT issued the directive of Operations Director on April 30, 2002—"Measures to be taken for safe VFR flights" (Kokukuko No. 86)— to All Japan Air Transport and Service Association Co., Ltd. and Japan Aircraft Pilot Association in order to secure flight safety. The contents are as follows:

1. Pilots shall consider the following upon judging the weather conditions for VFR flights.

(1) Collect latest weather information. Analyze not only the present weather conditions of departing and destination points, but also the weather conditions of enroute and that of destination at the estimated time of arrival (ETA). Anticipate the possible weather conditions to be encountered en route. Depart the aircraft only when thorough VMC and flight safety are considered to be certain.

(2) Under expected deteriorating weather conditions, consider alternative courses of action before takeoff against non-VMC conditions. During flight, continue collecting enroute weather information being abreast with the change of weather.

*(3) Upon noticing an indication of deteriorating weather conditions, make a quick decision and return to the departing point or land at a suitable landing site.
(omitted)*

2.16 ELT

The aircraft's ELT was the type which emits radio signals in frequencies of 121.5 MHz and 243.0 MHz, not being capable of emitting 406 MHz radio signals to locate itself using SAR satellites.

3 ANALYSIS

3.1 Airman Competence Certificates

The PIC held both a valid airman competence certificate and a valid aviation medical certificate.

3.2 Airworthiness Certificate

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

3.3 Meteorological Phenomena at the Accident Site

Statements described in 2.1.2 (2), (3) and 2.7.5 suggest that, weather conditions near the Kumamoto Airport was such that the aircraft flew into clouds right after the takeoff, and that the accident site was in cloud with snow fall under reduced ambient light at the time of the accident occurred. It is highly probable that these conditions prevented the PIC from obtaining visual cues of the terrain under the conditions thereof.

3.4 PIC's Interpretation of Weather Conditions

As described in 2.1.1, the ATC communication records contained no receipt of weather information by the PIC. However, as described in 2.14.5, the QNH value of the Aircraft's barometric altimeter was set to 29.99 in Hg; therefore, as described in 2.7.4, it was consistent with the value observed at 17:00 at Kumamoto Airport. These facts indicate that the PIC collected 17:00 weather information released by listening to ATIS. In addition, as statement in 2.1.2 (1), he resumed the flight without stopping engine after the arrival at Kumamoto Airport; accordingly, it is highly probable that he skipped the visit to the weather station for weather briefing.

As described in 2.15.10, the aircraft changed flight rules to IFR over Kagoshima and landed Kumamoto Airport after descending from 11,000 ft, it is somewhat likely that the PIC observed the cloud top height to the north during the descent to the airport. Moreover, as described in 2.1.1, the PIC informed Kumamoto Tower of its intention to climb to 6,500 ft. Furthermore, as described in 2.7.2, the cloud top height of stratocumuli eastern part of Mt. Aso was 6,560 ft.

It is somewhat likely that the PIC decided to resume the flight to Kitakyushu Airport without receiving the weather briefing at the weather station of Kumamoto Airport, as he had judged during the descent to the Kumamoto Airport that the flight to Kitakyushu Airport would be possible by flying above 6,500 ft with the help of onboard weather radar.

3.5 Aircraft Conditions Up to the Time of the Accident

3.5.1 Flight Controls System and Engine

As described in 2.14, the flight control system and the engine installed on the aircraft had no abnormalities; moreover, as described in 2.1.1, no communication records existed suggesting the onset of aircraft abnormalities. Furthermore, according to the statement in 2.1.2.a, the the aircraft had made a normal flight to Kumamoto Airport, and as described in

2.10, it was flying at G. S. of 150 kts. Therefore, it is probable that the flight control system and the engine had no abnormalities.

3.5.2 Possibility of Flight Under Icing Condition

According to the statement described in 2.7.5, the area near the accident site was in cloud conditions with snow fall at the time of the accident occurred, and as described in 2.7.4, the outside air temperature was 5 °C at Kumamoto Airport (elevation 190 m). It is probable that, as calculated outside temperature at the elevation equal to the accident site (877 m) is 0-0.5 °C with the temperature lapse rate of 0.65 °C/100 m, the accident site was under icing conditions.

As described in 2.14.4, the entire switch positions were in ON positions except SURFACE DE-ICE and WINDSHIELD HIGH HEAT on ice protection switch panel; accordingly, it is probable that the captain anticipated icing conditions.

In addition, as described in 2.8.3, the supplementary Pilot Operating Handbook urges pilots to increase climb speed to 130 kts when icing conditions are encountered.

Therefore, it is somewhat likely that, the PIC was expecting icing conditions, and then he was flying the aircraft keeping the climb rate low in order to gain climb speeds with ice protection system activated.

As described in 2.8.4, the Handbook maintains that the malfunction of any required deice equipment requires immediate action to exit (climb or descend from) icing conditions. However, as the figure 1 illustrates that the aircraft maintained speed and heading after the rollout from a left turn during its takeoff climb, it is possible that its icing protection was functioning.

3.6 PIC's Judgment and Flight Route

3.6.1 Familiarization to Terrain Features Near Kumamoto Airport

The aircraft's flight logbook contained the PIC's flight records from Kitakyushu Airport to other airports in Kyushu; however, his personal logbook contained records for landing at and takeoff from Kumamoto Airport with another aircraft. Therefore, it is somewhat likely that he was not sufficiently familiar with the terrain features near Kumamoto Airport.

3.6.2 Decision on Takeoff From Kumamoto Airport and Flight Route Thereafter

With regard to the hurried takeoff from Kumamoto Airport described in 2.1.2.a and b, it is somewhat likely that the captain pursued the VFR flight under diminishing daylight conditions and departed hurriedly for Kitakyushu Airport due to the sunset nearness and the deteriorating weather around Kumamoto Airport as described in 2.1.2.b and 2.7.1.

As described in 2.15.3, the PIC acquired the enroute weather information to Kumamoto Airport at Amami Airport weather station, and then as described in 2.7.1, it is probable that he abandoned the original waypoint of Kurume considering the deteriorating weather conditions which was moving east from the western Kyushu.

It is highly probable that his possible intention was to take the new course (somewhat differs from the one described in 2.15.9: Kumamoto Airport to western area of Mt. Aso to

southern area of Mt. Kuju to Usa to Kitakyushu Airport) which would enable him to fly over mountains of moderate height at 6,500 ft and reach the destination by turning to the left during its after-takeoff climb and flying directly to FR5NE described in 2.14.2.a.(5) positioned on the extension of the aircraft's flight path.

The cloud conditions in the vicinity of the accident site as the statements described in 2.1.2.b and c, and 2.7.5.a and the reduced aircraft climb rate as the statement described in 2.1.2.c and the show in Figure 1, it is somewhat likely that the PIC expected icing conditions and kept the climb rate low in order to gain climb speed activating the ice protection as described in 3.5.2. However, as described in 3.6.1, he was not familiar with the terrain features north of Kumamoto Airport, he possibly judged the climb rate non-problematic. It is somewhat likely that the following suggest that he stabilized the aircraft after rolling out to the east-northeast, and made a data input during straight ascent into the clouds with a low climb rate:

- KCM100 retained set altitude information of 6,500 ft in its memory chip and the aircraft turned to the left during after-takeoff climb followed by a wing-level ascent as described in 2.14.1.
- The other pilot stated that the PIC had a tendency for data input after the stabilization of an aircraft as described in 2.15.1.

3.6.3 Selection of Flight Rule

As the statement described in 2.1.2.b, the VMC at Kumamoto Airport indicates that the PIC chose to fly VFR at the time of his takeoff. However, according to the statements described in 2.1.2.b and c, the aircraft went into clouds after post-takeoff left turn, and as the statement described in 2.7.5.a, the accident site was in cloud conditions with snow fall. Therefore, it is probable that the aircraft flew under the condition where VFR was unable to maintain. The PIC should have returned to the airport or change flight rules to IFR under the circumstance.

As described in 2.15.8, an IFR flight route is generally longer than that of VFR flight and flight time is longer with complicated radio communications with ATC organizations concerned; accordingly, it is somewhat likely that the PIC chose not to fly IFR upon taking off from Kumamoto Airport. However, the landing at Kumamoto Airport was made after changing from VFR to IFR; therefore, it is somewhat likely that the PIC had an outlook for enroute flight rule change to IFR.

3.6.4 PIC's Decision on Flying in Clouds

The following possibilities are summarized from the comprehensive interpretation of contents in 3.4, 3.5.2, 3.6.1, 3.6.2 and 3.6.3:

- a. The PIC had an outlook for an enroute flight rule change to IFR depending on the weather.
- b. He depended on the onboard weather radar and navigation device.
- c. He reduced climb rate in order to secure climb speed anticipating icing conditions.

- d. He was not familiar with mountain terrain features near Kumamoto Airport; however, he believed that he could climb through the clouds without crashing into terrain even with the reduced climb rate.

It is somewhat likely that these elements affected his decision to fly into clouds under VFR; however, the JTSB could not clarify the reason.

3.6.5 Events From Tree Contact, Collided with the Slope to a Halt

According to the scene of the accident site described in 2.9.1, it is somewhat likely that the progress which the aircraft chopped Tree A, and then collided with trees are as follows:

- a. The aircraft approached the mountain slope flying at 3° climb angle, had tree contacts, chopped tree tops in a straight path and crashed into the ground. During this period its wings and empennage were ripped off.
- b. The aircraft, after crashed into the ground, traveled 30 m with forward momentum tearing down some trees (Fallen tree A inclusive), collided with the uphill bank, changed its direction to the right by about 40°, traveled another 20 m and came to a halt.

Trees chopped horizontally in a straight path up to the point of ground impact suggest no evasive maneuvers; therefore, it is somewhat likely that the PIC's first realization of controlled flight into terrain upon chopping tree tops.

In addition, the PIC had not noticed that the aircraft is approaching the mountain slope, since he may have inputted data into the navigation system as described in 3.6.2; hence, it is somewhat likely as one of the contributing factors to which the captain's situation recognition was reduced.

4 PROBABLE CAUSES

It is highly probable that the aircraft collided with the mountain slope during its in-cloud post-takeoff climb with low climb rate on its VFR flight to Kitakyushu Airport from Kumamoto Airport, resulting in the aircraft destruction and fatal injuries of two persons on board—the PIC and the passenger.

It is somewhat likely that the contributing factor to in-cloud flight toward mountain slope with low climb rate is the PIC's lack of familiarization with terrain features near Kumamoto Airport; however, the JTSB was unable to clarify the reason.

5 SAFETY ACTIONS

A PIC, even with onboard GPS and other navigation devices, should not fly into clouds on its flight path under VFR. Under the situation where continued VFR flight is impossible he should take actions such as returning to the departed airport or changing flight rules to IFR.

6 RECOMMENDATIONS

It is highly probable that the aircraft collided with the mountain slope during its in-cloud post-takeoff climb with low climb rate under VFR. It is probable that the PIC might have acquired the latest weather information over the radio; however, it is highly probable that he took off without acquiring necessary weather briefing from the weather situation at Kumamoto Airport.

In the past five years there were four cases where VFR flights of small aircraft (helicopters inclusive) ended up with accidents. The four cases are as follows:

- A Cessna TU206GU, JA3902, collided with the mountain slope east of Mt. Iwabe, Fukushima-town, Matsumae-gun, Hokkaido prefecture in July 2010.
- A Robinson R44II, JA32CT, crashed about 15 km southeast of Tajima Airport, Hyogo Prefecture in July, 2009.
- An Aerospatiale AS350B, JA9755, off Cape Omasaki, Oma-cho, Shimokita-gun, Aomori Prefecture in July, 2008.
- A Cessna 404, JA5257, crashed into the mountain slope near the top of Mt. Ena, Nakatsugawa city, Gifu Prefecture in November, 2007.

The highly probable causes of these accidents are insufficient collection of weather information and non-execution of returning to departed airport upon encountering devastating weather conditions.

The Civil Aviation Bureau, MLIT issued the directive of Operations Director titled as “Measures to be taken for safe VFR flights (Kokukuko No. 86, dated April 30, 2002)”, to All Japan Air Transport and Service Association and Japan Aircraft Pilot Association. In spite of the directive’s intention, accidents like above continue to occur, in which an aircraft end up with accident after it flew in cloud under VFR.

In light of this accident and similar accidents mentioned above, the JTSB, in accordance with the Paragraph 1, Article 26, the Act for Establishment of the Japan Transport Safety Board, recommends the Minister, MLIT as follows:

In order to prevent the accidents in in-cloud flight under Visual Flight Routes, Civil Aviation Bureau publicizes again the following contents to the pilot associations and also make them known to a pilot individual using the opportunities of the newly introduced system “Review System on Specific Pilot Competence” (2012 MLIT Ordinance No. 22):

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

Figure1: Estimated Flight Route

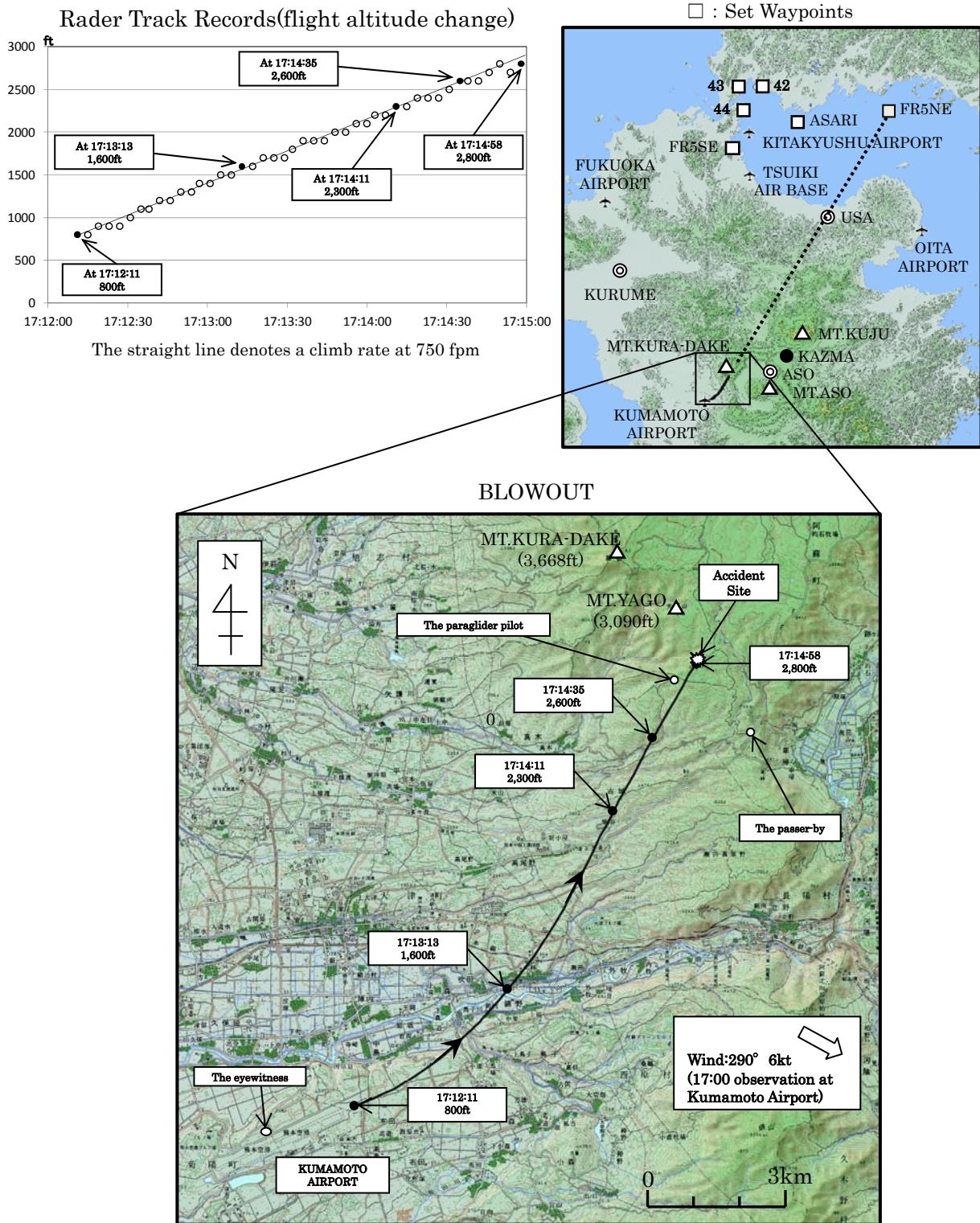


Figure 2: Three-Angle-View of Piper PA-46-350P

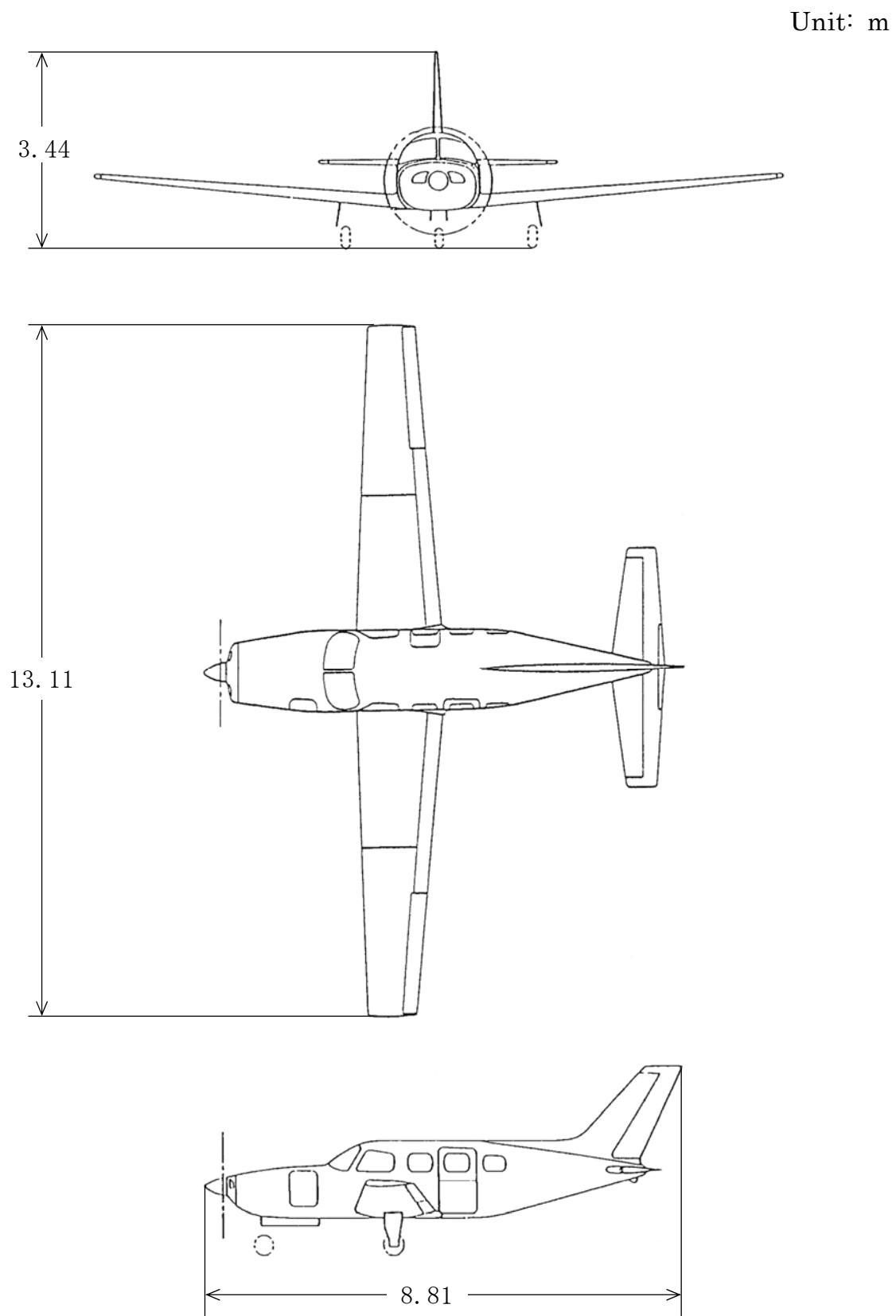


Figure 3: Asia Surface Weather Chart

As of 15:00 January 3, 2011

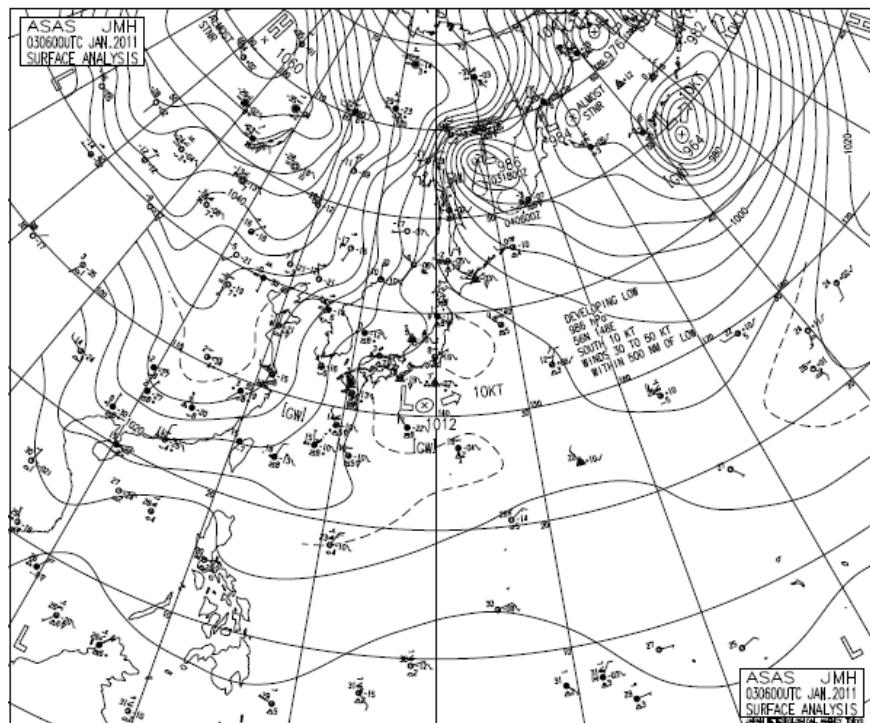
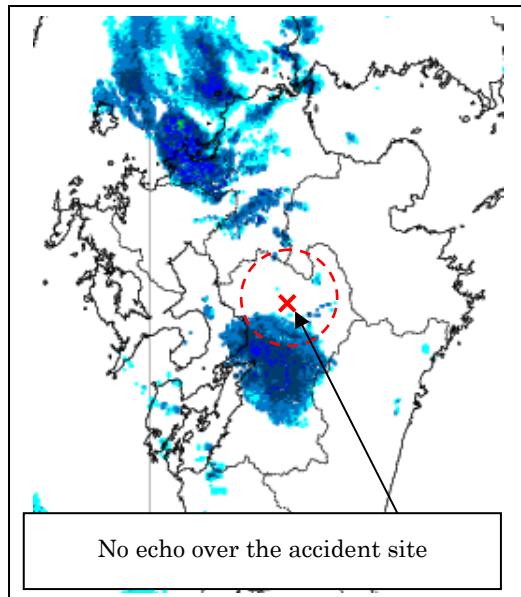
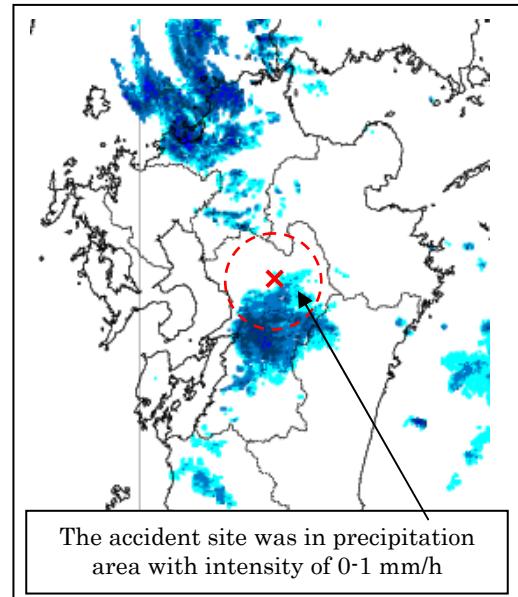


Figure 4: Radar Echo Charts

As of 17:00 January 3, 2011



As of 18:00 January 3, 2011



Accident site

Referenced from the Radar Echo Data (Jan.3)

Issued by the Meteorological Agency

Figure 5: Accident Site Layout

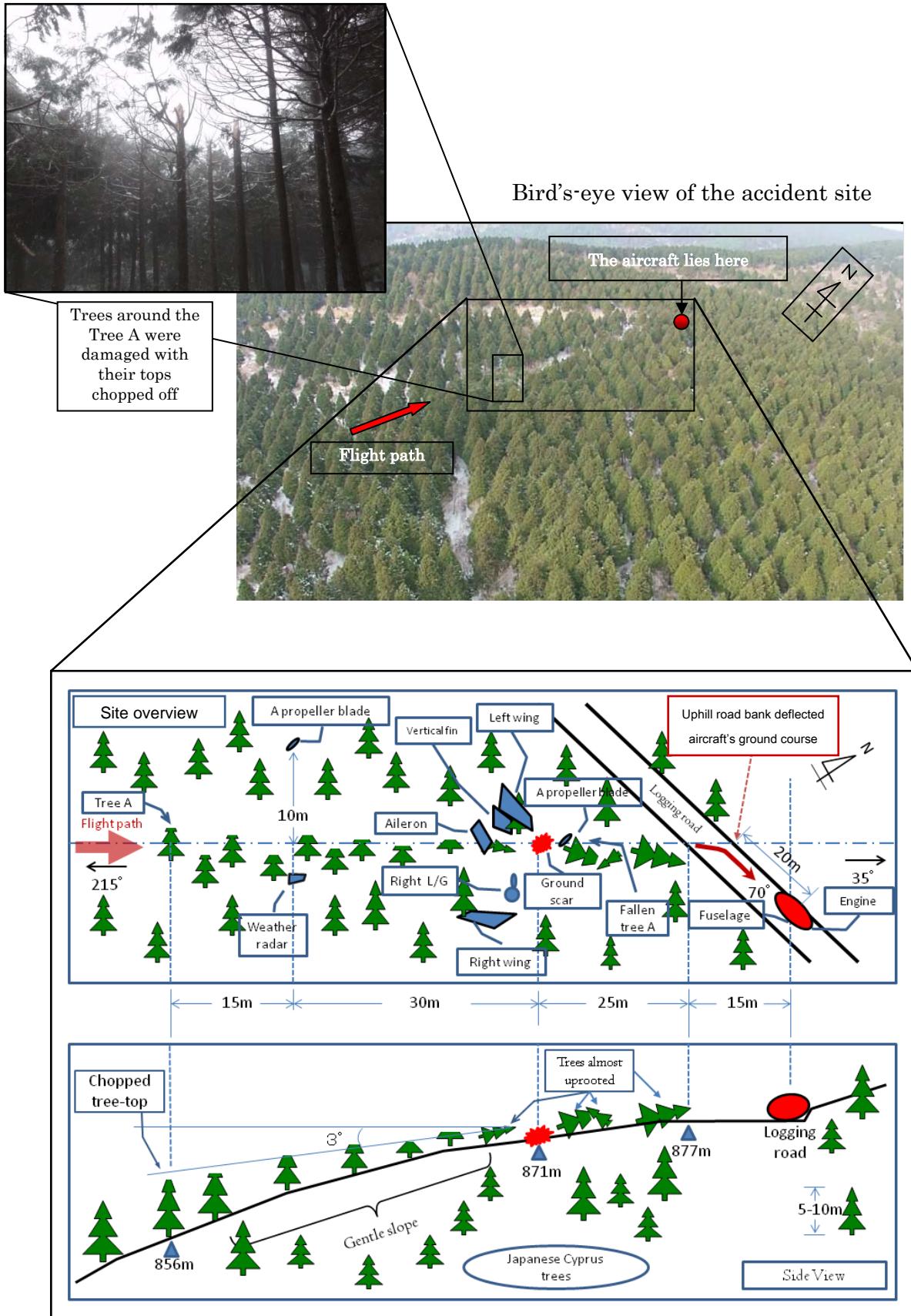


Photo1: Accident Aircraft



Photo2: Accident Aircraft (At the accident site)

