

AA2012-5

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

PRIVATELY OWNED

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June 29, 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

**PRIVATELY OWNED
ROBINSON R22 BETA (ROTORCRAFT), JA007J
ROLL-OVER UPON LANDING
SABAEKOIZUMI TEMPORARY HELIPAD, KOIZUMI,
SABAE CITY, FUKUI PREFECTURE, JAPAN
AROUND 18 : 15 JST, JULY 14, 2011**

May 25, 2012

Adopted by the Japan Transport Safety Board

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

SYNOPSIS

<Summary of the Accident>

On July 14 (Thursday), 2011, a privately owned Robinson R22 Beta, registered JA007J, made a roll-over and sustained damage upon landing at a Sabaekoizumi temporary helipad around 18:15 local time after finishing a familiarization flight.

A pilot in command (PIC) and a passenger were on board the aircraft and the PIC sustained major injuries while the passenger minor injuries.

The aircraft sustained substantial damage, but no fire broke out.

<Probable Causes>

It is probable that the accident occurred because the aircraft lost its balance after touchdown and rolled over and landed on the south slope of the helipad injuring the persons on board and damaging the fuselage.

With regard to the events that the aircraft lost its balance after touchdown and rolled over and landed on the south slope of the helipad, it is probable that these were caused by the PIC's unintentional pull-up of the collective pitch and insufficient left pedal input for direction control, which lead to the aircraft's right spinning.

With regard to the PIC's unintentional pull-up of the collective pitch and insufficient left pedal input for direction control, it is possible that this situation resulted from the PIC's insufficient skill maintenance.

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

On July 14 (Thursday), 2011, a privately owned Robinson R22 Beta, registered JA007J, made a roll-over and sustained damage upon landing at a Sabaekoizumi temporary helipad around 18:15 local time after finishing a familiarization flight.

A pilot in command (PIC) and a passenger were on board the aircraft and the PIC sustained major injuries while the passenger minor injuries.

The aircraft sustained substantial damage, but no fire broke out.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On July 14, 2011, the Japan Transport Safety Board designated an investigator-in-charge and another investigator to investigate this accident.

1.2.2 Representatives of the Relevant State

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

July 15 to 17, 2011	On-site investigation, airframe examination and interviews
July 19, 2011	Interviews

1.2.4 Comments from Parties Relevant to the Cause of the Accident

Comments were invited from parties relevant to the cause of the 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

Around 18:00 on July 14, 2011, a privately owned Robinson R22 Beta, registered JA007J (hereinafter referred to as "the Aircraft"), took off from Sabaekoizumi temporary helipad (hereinafter referred to as "Sabae Helipad") for a familiarization flight.

The flight history of the aircraft up to the time of the accident is summarized below, according to the statements by the PIC, the passenger and a witness.

(1) PIC

The PIC showed up at Sabae Helipad around 17:30, met the passenger and other people, and took the aircraft out of its hangar to the takeoff position. He did a pre-flight check to make sure that there were no abnormalities with the aircraft.

It was cloudy with high cloud ceiling and good visibility. The windsock at the helipad indicated north winds and he felt the wind speed at about 5 to 6 kt.

The PIC occupied the right seat and the passenger the left. After an engine run-up, the aircraft took off to the north-northeast around 18:00 and flew toward Echizen City

located about 7 km to the south.

After flying over Echizen City for about five minutes it headed north toward the helipad and started a final approach descent at about 500 ft from a place about 600 m south of Sabae Helipad . The airspeed then was 60 kt.

The PIC took a deeper approach angle than normal in order to clear electric wires stretched south of Sabae Helipad . The approach was done in a controlled manner until terminating to a 2 m hovering.

Because the PIC felt uneasiness when the hovering became unstable in the wind, he struggled to land the aircraft.

The aircraft started to spin to the right after leaning to the right upon touchdown. He didn't remember how he controlled at that time. He found himself in the lying aircraft on the slope south side of the helipad.

The PIC's seat belt was cut by a person who rushed to the site and he got out of the aircraft. Then he was taken to a hospital by ambulance that arrived a little later.

He found no abnormalities with the aircraft and flight control system up until the time of the occurrence. He flew little in recent years and logged only a few hours each year.

(2) Passenger

The Passenger observed the whole process of the landing: the Aircraft approach slowly ended into a hovering above the helipad center and it landed touching its left skid forward portion on the ground with a leaning forward attitude.

The Aircraft then drifted to the right scratching the ground with the front part of the skid just when he expected a full touchdown of the skids.

Immediately afterward, the aircraft hovered up by 1 to 2 m, spinning to the right. The landscape outside looked spinning, and the next moment he realized that the aircraft was lying on its left side on the south slope of the helipad.

The Passenger unbuckled his seat belt and got out following the PIC, and was taken to the hospital by ambulance that arrived a little later.

(3) Witness

The Witness was checking a vehicle in a parking lot located about 120 m south of the accident site. He saw the aircraft flying from the south.

It appeared to have made a stable approach as usual from the south and touched down onto the helipad once, but then, it popped up again. The witness recognized it as an accident when it went out of sight after making one or two spins to the right. It was about 18:15.

The accident occurred around 18:15 on Sabae Helipad (Latitude 35°58'09"N, Longitude 136°09'50" E)

(See Figure 1 Estimated Flight Route, Figure 2 Accident Site , Photo 1 Accident Site)

2.2 Injuries to Persons

The PIC sustained severe injuries such as fractured ribs and others; the passenger minor injuries such as a bruise on his left shoulder.

2.3 Information of Damage to the Aircraft

2.3.1 Extent of Damage

Substantial

2.3.2. Damage to the Aircraft Components

- (1) Fuselage : the left side canopy and left door were broken
- (2) Landing Gears : the left skid was fractured, the right skid was cracked, and the cross tube was deformed
- (3) Rotors : the main rotor was deformed and damaged, the main rotor mast was deformed, and the tail rotor was fractured

The flight control system was connected in a normal manner, but operation of the swash plate was partly restricted due to the deformed mast.

(See Photo 2 Accident Aircraft)

2.4 Personnel Information

PIC	Male, Age 67	
Private pilot certificate (Rotorcraft)		March 13, 1989
Rating for Single-piston engine (Land)		March 13, 1989
Class 2 aviation medical certificate		
Validity		June 12, 2012
Total flight time		317 hrs 01 min
Flight time in the last 30 days		1 h 36 min
Total flight time on the type of aircraft		288 h 56 min
Recent flight experience on the type of aircraft		
Flight time in the last one year		3 h 54 min
Landing numbers in the last one year		9
Flight time in the last 30 days		1 h 36 min
Landing times in the last 30 days		2

The PIC had landed once each flight made on February 16 and June 22, in the period of 180 days between January 2 and June 30, 2011, meaning he had not flown for 125 days between February 17 and June 21.

Flight with an instructor on board:

The PIC had landed with an instructor on board once each flight made on February 16, June 22 and July 1 (the last occasion before the accident) on the occasions of ferry flight for airworthiness inspections.

2.5 Aircraft Information

2.5.1 Aircraft

Type	Robinson R22 Beta
Serial number	2636
Date of manufacture	November 1, 1996
Certificate of airworthiness	DAF2010-652
Validity	March 1, 2012
Category of airworthiness	Rotorcraft, Normal N
Total flight time	1,752 h 02 min
Flight time since last periodical check (100h Check on February 23, 2011)	5 h 00 min

(See Figure 3 Three Angle View of Robinson R22 Beta)

2.5.2 Weight and Balance

When the accident occurred, the aircraft's weight is estimated to have been 1,293 lb and the center of gravity (CG) is estimated to have been longitudinally 97.0 in aft of the datum and laterally 0.3 in to the left of the airframe symmetry plane, both of which are estimated to have been within the allowable range (i.e. maximum gross weight of 1,370 lb, minimum gross weight of 920 lb, and CG range for the weight at the time of the accident: longitudinally 95.7 to 100.7 in aft of the datum and laterally within 2.2 in to the left and 1.9 in to the right of the airframe symmetry plane).

2.6 Meteorological Information

The wind direction and velocity observed at Sabae Nyu Fire Department, located about 2 km southeast of Sabae Helipad, around the time of the accident were as follows (original wind velocity values are converted from m/s to kt):

Time	18:00	19:00
Wind direction	North-northeast	North-northeast
Average wind velocity	6 kt	4 kt
Maximum momentary wind velocity	15 kt	13 kt

2.7 Accident Site Information

2.7.1 Sabae Helipad

Sabae Helipad is located in the southern part of Fukui Plain surrounded by paddy fields. The helipad is an elevated concrete with an elevation of 48 ft. It is a nearly square lot measuring 11m by 11m and its surface is about 3 m higher than the surrounding terrain features. Its north side is a nearly vertical concrete wall.

The takeoff direction is north-northeast, and the landing direction is north and south-southwest.

A windsock was installed on the helipad; however, it had become hardened lacking flexibility. It drooped and it was not fit to indicate accurate wind velocities.

2.7.2 Accident Site

The aircraft was lying on its left side on the south slope of the helipad with its nose orienting to the east.

On the surface of the helipad were scratch marks, about 2.3 m long to the east-west direction, and three dents (almost parallel to the rotor blades). On the roof of the garage, which is about 30 cm lower than the helipad, had also traces of the accident including a fracture, depression and distortion.

(See Figure 2 Accident Site, Photo 1 Accident Site, and Photo 2 Accident Aircraft)

2.8 Information about Search and Rescue

The accident was reported to a fire department at 18:17. Several persons rushed to the site and assisted the PIC's evacuation from the aircraft by cutting his seat belt. The PIC and the passenger were taken into two different ambulances at 18:27 and 18:31, respectively.

2.9 Additional Information

2.9.1 Maintenance of Private Pilots' Skills

As a safety precaution to prevent accidents, the Civil Aviation Bureau (CAB) of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) issued a "Guideline on Measures to Maintain Skills of Private Pilots (*koku-ku-jyo* No. 2077, dated March 28, 2003)", (hereinafter referred to as "Skills Maintenance Guideline"), to encourage private pilots to maintain their aeronautical skills.

The CAB presented specific measures to achieve this goal: periodical safety workshops and accompanied flight training to help them increase safety knowledge and raise safety awareness as well as to prevent their flying skills from eroding. If a pilot's recent landing experience doesn't reach three times in the last 180 days, which were logged by flying the same category/class of aircraft as his/her license dictates, the bureau maintains that he/she should receive a practical training with an instructor on board on techniques which are presented as examples in Skills Maintenance Guideline: takeoff and landing, basic flight, basic instrument flight, and emergency procedures (forced landing, autorotation, and procedures in case of the tail rotor failure).

The CAB has also posted the Guideline on the MLIT website to boost private pilots' safety awareness.

2.9.2 Review System on Specific Pilot Competence

The CAB has established a periodical reviewing system*¹ for their competency after designating pilot's knowledge and ability required for aircraft operation, which require confirmation of its currency as "Specific Pilot Competence".

3. ANALYSIS

3.1 Qualification of Personnel

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

3.2 Airworthiness Certificate of the Aircraft

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

3.3 Relation to Meteorological Phenomena

According to the PIC's statements in 2.1(1) and the observations by the fire department in 2.6, it is probable that it was cloudy with high cloud base with good visibilities and the winds were blowing from the north-northeast at about 6 kt with the maximum momentary wind velocity of more than twice as much, reaching 15 kt at Sabae Helipad around the time of the accident.

It is possible that the north-northeast winds with a changeable wind velocity hit the 3 m high nearly vertical slope of the helipad described in 2.7.1 and generated turbulence to leeward above

*¹ "The Act for Partial Revision of the Civil Aeronautics Act (Act No.50 of 2011)," associated with establishing review system on Specific Pilot Competence for Pilots, was promulgated in May 25, 2011. "The Cabinet Order to Determine the Effective Date of the Act for Partial Revision of the Civil Aeronautics Act," published on December 2, 2011, stipulated that the above Act should come into effect on April 1, 2012, and that the revised provision in the Act which would prohibit flight operations by a pilot not reviewed as per Specific Pilot Competence should come into effect on April 1, 2014.

the heli pad.

As described in 2.7.1, the windsock installed at the helipad had become hardened and was in inadequate condition to indicate an accurate wind velocity. Therefore, it is highly probable that it was difficult to know the accurate state of the airflow at the helipad.

3.4 Damage to the Aircraft

The Aircraft damage described in 2.3.2, it is highly probable that all of the damage was caused by the external force in the accident. Additionally, it is highly probable that there had been no abnormalities with the aircraft prior to the Accident judging from the PIC's statements as described in 2.1(1).

3.5 Final Approach to Rollover

3.5.1 Final Approach

According to the statements in 2.1(1) and (2), its final approach had been stable until the final phase, therefore, it is probable that the Aircraft made a slow stable approach up to the hovering altitude.

3.5.2 Hovering to Rollover

- (1) According to the statements in 2.1(1), (2) and (3), as well as the scratch marks and dents at the accident site described 2.7.2, it is probable that the Aircraft continued to lower itself for the touchdown under unstable hovering condition, drifted to the right with its front skid in contact with the ground under incomplete touchdown and became airborne again. Thereafter it is probable that the Aircraft, while spinning to the right, rolled over and landed with its left fuselage on the south slope of the helipad.
- (2) It is probable that the turbulent airflow described in 3.3 may have contributed to the aircraft's unstable hovering.
- (3) According to the statement in 2.1(1), the PIC felt uneasiness when the hovering became unstable in the wind, he struggled to land the aircraft. Therefore, it is probable that he continued to lower the Aircraft for the touchdown under the unsteady aircraft movement because he felt uneasy about continued hovering in the turbulent air and hurriedly tried to land against the normal practice: wait until he can gain steady control of the Aircraft.
- (4) For a helicopter whose main rotor turns counterclockwise when viewed from above, its main rotor disc needs to be tilted a little to the left to counter the rightward drift generated by the tail rotor thrust.

According to the statement in 2.1(1), the Aircraft leaned to the right after touchdown. It is probable that Aircraft's drift to the right was caused by the PIC's unintentional tilt of the cyclic control to the right during the incomplete touchdown process. In other words right cyclic control movement lead to the reduction of left tilt of the main rotor disc, which is necessary to prevent right drift.

Additionally, it is possible that the wiggling nose movement was caused by the weathercock effect associated with the changeable crosswind components from the right as described in 3.3 and this triggered the PIC's unintentional cyclic control movement to the right causing the main rotor disc to tilt to the right.

- (5) According to the statements in 2.1(1) and (3), the PIC did not remember how he controlled after the touchdown, while the witness said that the Aircraft appeared to have touched

down and then popped up again, disappeared from the helipad after spinning to the right. It is therefore probable that the Aircraft became airborne again after the touchdown and rolled over and landed on the south slope of the helipad while spinning to the right because the PIC unintentionally pulled up the collective pitch when the Aircraft drifted to the right. And his left rudder input was insufficient to counter the collective pitch movement so that the Aircraft began to spin rapidly to the right as it hovered again followed by the loss of balance.

3.6 Pilot's Recent Flight Experience and Skill Maintenance

- (1) As described in 2.9.1, the Skills Maintenance Guideline was issued to present safety measure to prevent accidents, stressing that private pilots should try to maintain their skills and to keep them from eroding by participating in safety workshops as well as fulfilling their flight experience as stipulated in the Guideline.
- (2) As described in 2.4, the PIC had no flight experience in 125 days between February 17 and June 21, which marked third and second flights before the accident, respectively.

Also, his takeoff/landing experience was twice in the past 180 days as of June 30, one day before July 1 when he made the last flight prior to the accident. Therefore, he had not had takeoff/landing experience of three times or more in 180 days at the time, and his flight experience corresponds to the level stipulated in the Guideline, where it is desirable to have a practical training with an instructor on board.

- (3) As described in 2.4, it is probable that the PIC took the opportunity to ferry the aircraft to maintain and recover his skills, which was the last flight before the accident (on July 1), with an instructor on board, when his flight experience was at the level where it is desirable for him to have a practical training as stipulated in the Guideline. However, it is highly probable that this flight centered on navigation associated with an aircraft ferrying accompanied with one-time takeoff/landing, and not on the takeoff/landing and emergency procedures that are deemed essential for ensuring pilot's safety.
- (4) The PIC met the requirements of three takeoffs/landings in the last 180 days as stipulated in the Guideline on the day of the accident (once each day on February 16, June 22 and July 1). However, it is highly probable that the contents of his last flight (on July 1), just before the accident, did not correspond to the category where practical training was required. It is possible that his proficiency was not fully maintained at the day of the accident.
- (5) As described in 3.5.2(3), it is probable that the PIC felt uneasiness about continuing to hover in the turbulent air, and tried to land quickly. Additionally, as described in 3.5.2(5), it is probable that the PIC unintentionally pulled up the collective pitch, but his left rudder input was insufficient, therefore, the Aircraft quickly hovered again and spun rapidly to the right, and it lost balance. His poor handling of the situation is possible that his skill maintenance was insufficient.

3.7 Preventive Measures for Similar Accidents

- (1) In order to prevent occupant's injuries and aircraft damages from its overturn at touchdown, a pilot should control an aircraft to establish a stable hovering above touchdown point and gradually lower the collective pitch until the aircraft touches the ground. A pilot must stop landing process immediately if the aircraft becomes unstable along the way, and resume landing after regaining stability.

If he/she feels uneasiness on final, he/she should not hesitate to initiate a go-around.

- (2) It is imperative to know the accurate state of winds before making an approach when flying a small helicopter, which is easily affected by winds while landing. Therefore, a pilot should fly over once to check the wind condition by looking at a windsock before making a final approach to a helipad, where wind information is unavailable with radio. If the windsock, which is important for this purpose, becomes unfunctional as described in 2.7.1, it must be repaired/replaced for accurate wind indication.
- (3) If a pilot does not meet the requirements for takeoff/landing experience as stipulated in the Skills Maintenance Guideline as described in 2.9.1, he/she must try to recover his/her skills through a practical training with an instructor on board as stipulated in the Guideline. For those who meet the requirements for takeoff/landing experience but has not flown for a long period of time, it is advisable to be fully cautious: he/she should carefully hover and land the helicopter several times on a helipad to regain knack for control, then make a takeoff procedure.

It is desirable that the CAB will not give the false impression that a private pilot reviewed does not need to train himself/herself for maintaining their skills until the next occasion upon reviewing his/her specific pilot competence, but instruct him/her to attend safety workshops and maintain his/her flying skills by training himself/herself as stipulated in the Guideline.

4. PROBABLE CAUSE

It is probable that the accident occurred because the aircraft lost its balance after touchdown and rolled over and landed on the south slope of the helipad injuring the persons on board and damaging the fuselage.

With regard to the events that the aircraft lost its balance after touchdown and rolled over and landed on the south slope of the helipad, it is probable that these were caused by the PIC's unintentional pull-up of the collective pitch and insufficient left pedal input for direction control, which lead to the aircraft's right spinning.

With regard to the PIC's unintentional pull-up of the collective pitch and insufficient left pedal input for direction control, it is possible that this situation resulted from the PIC's insufficient skill maintenance.

Figure 1 Estimated Flight Path

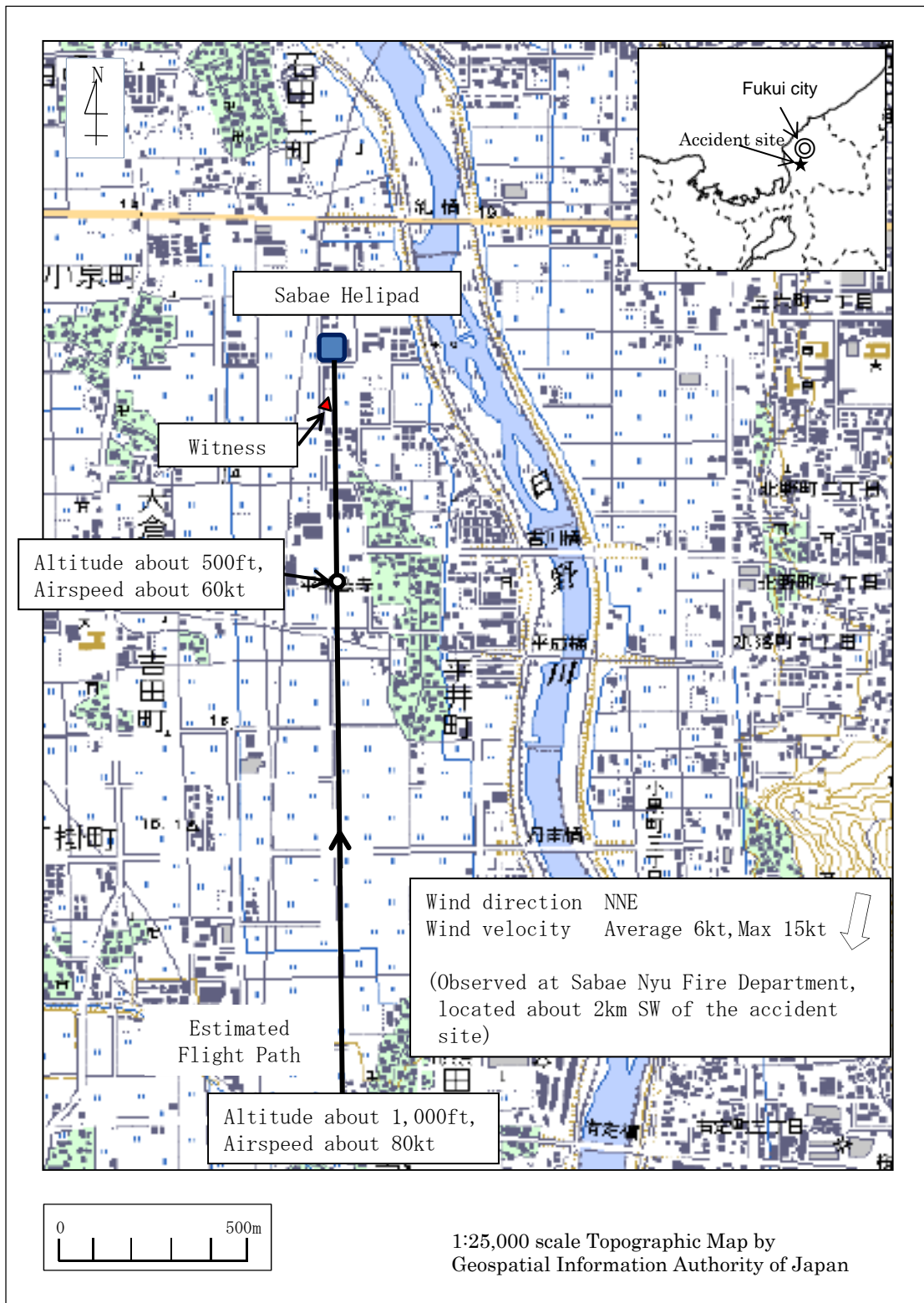


Figure 2 Accident Site

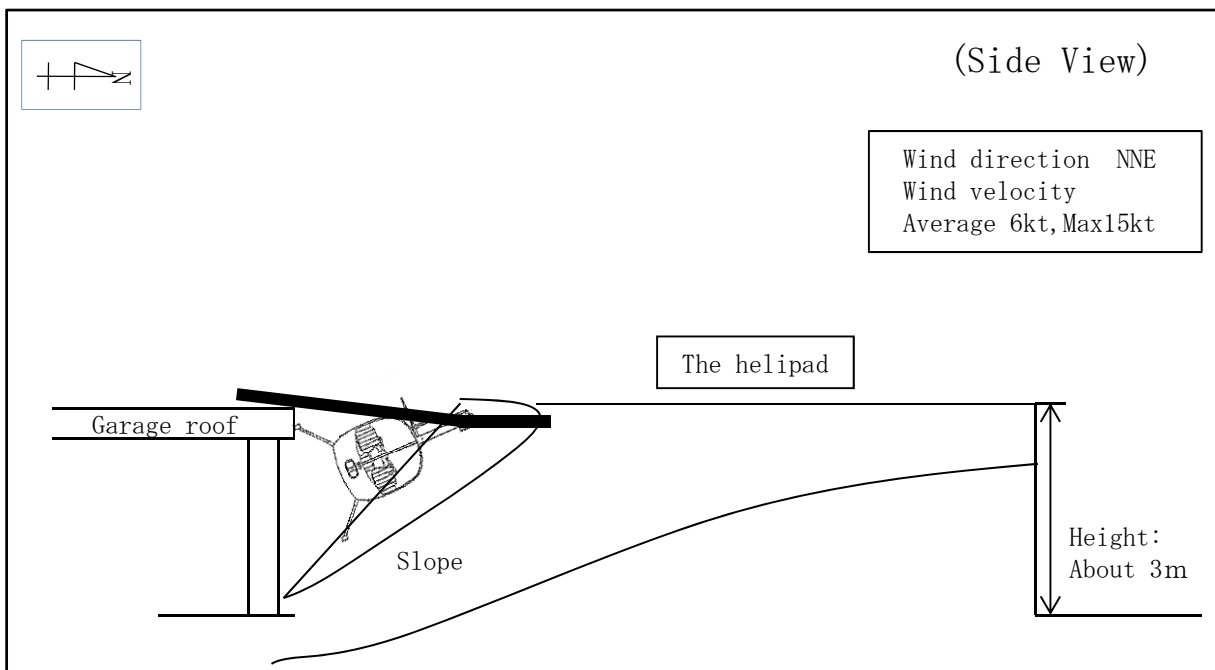
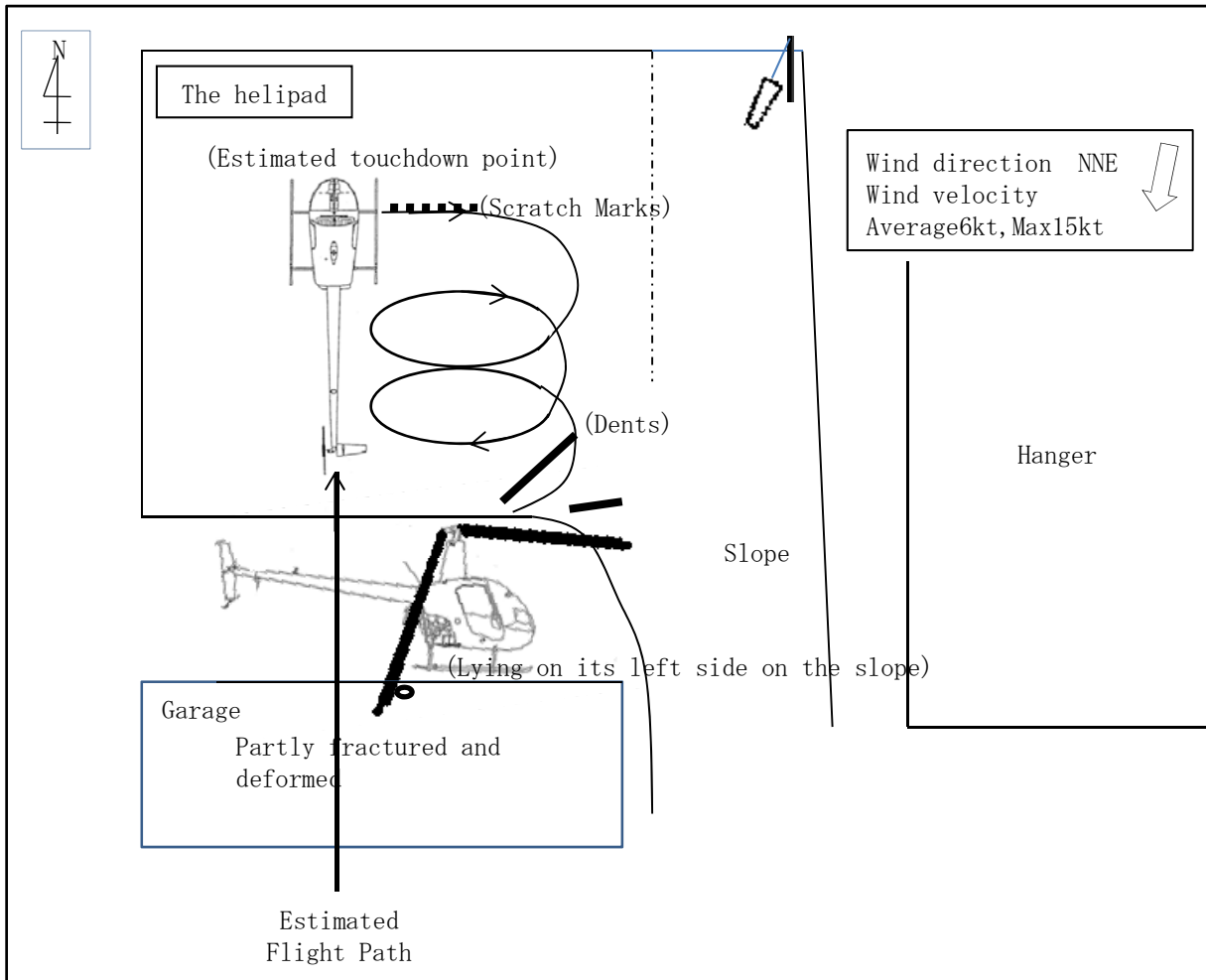


Figure 3 Three Angle View of Robinson R22 Beta

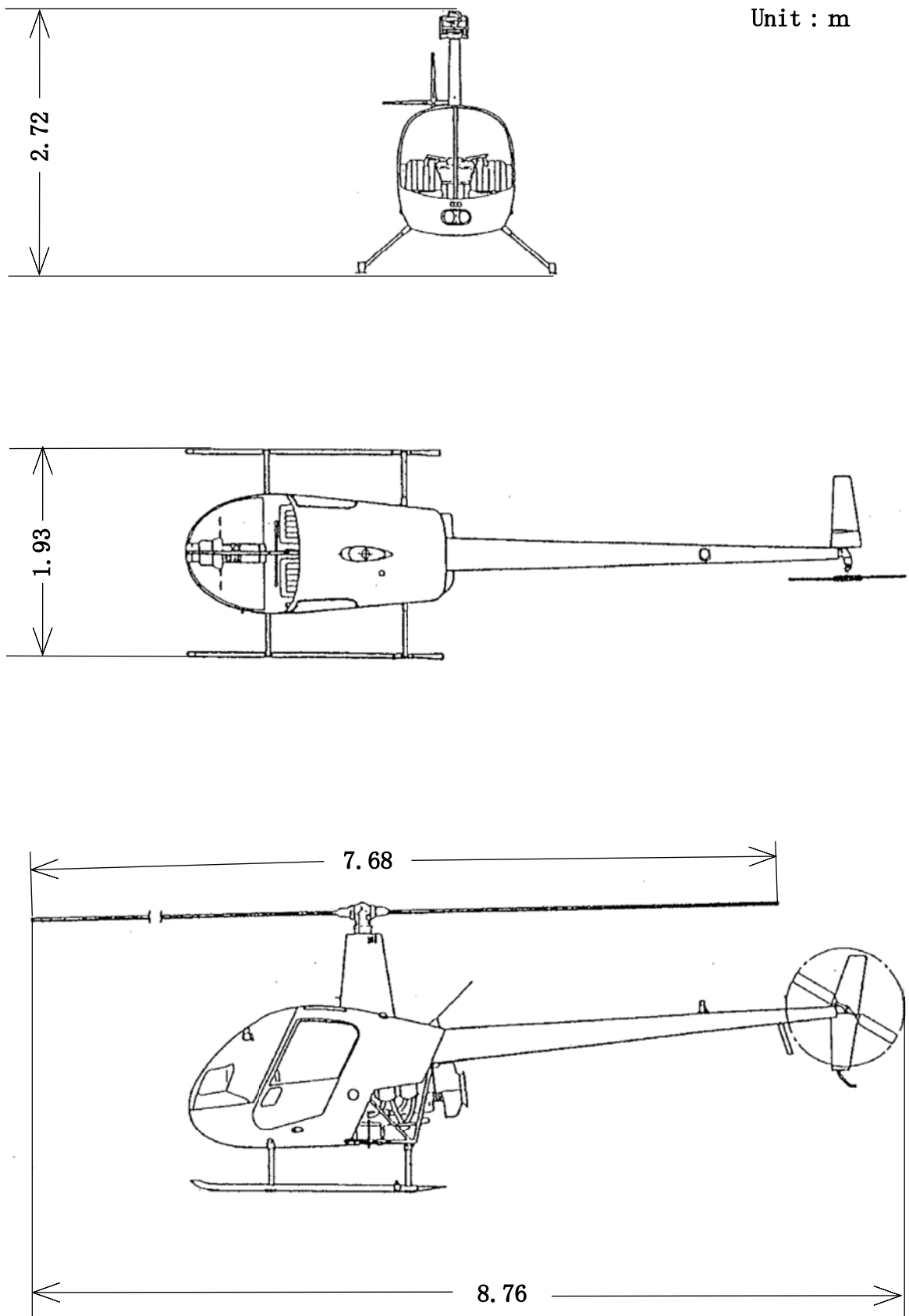
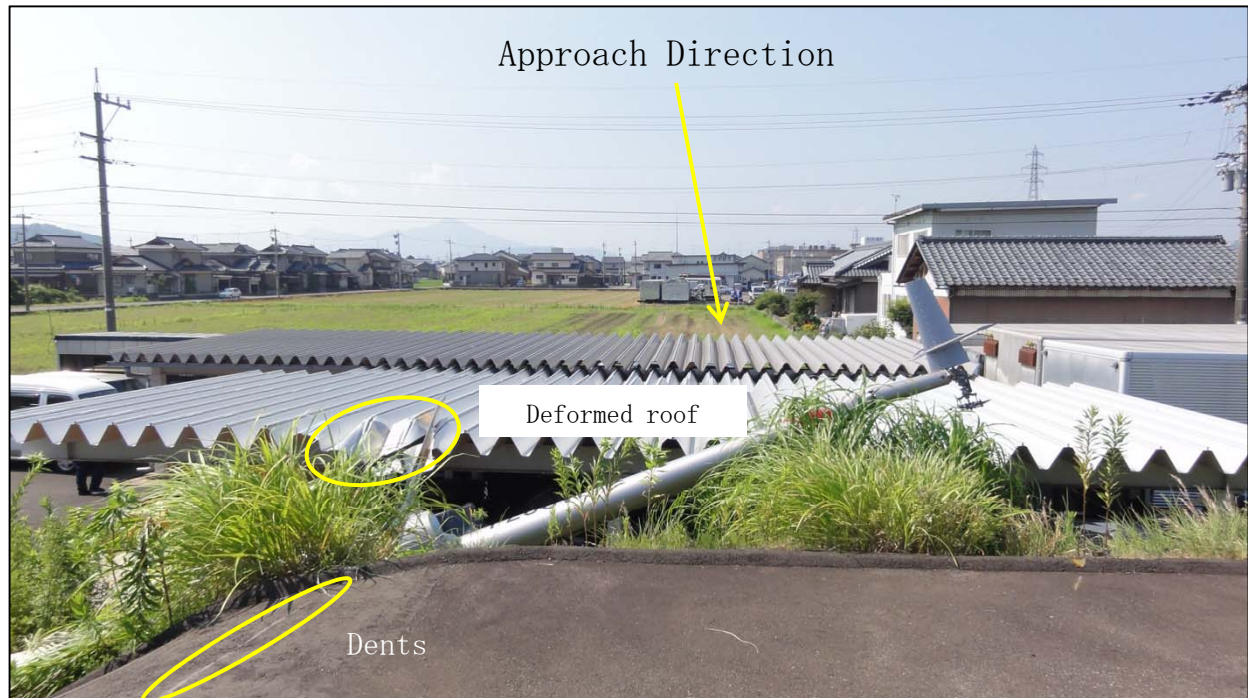


Photo 1 Accident site



(The helipad (Northward))

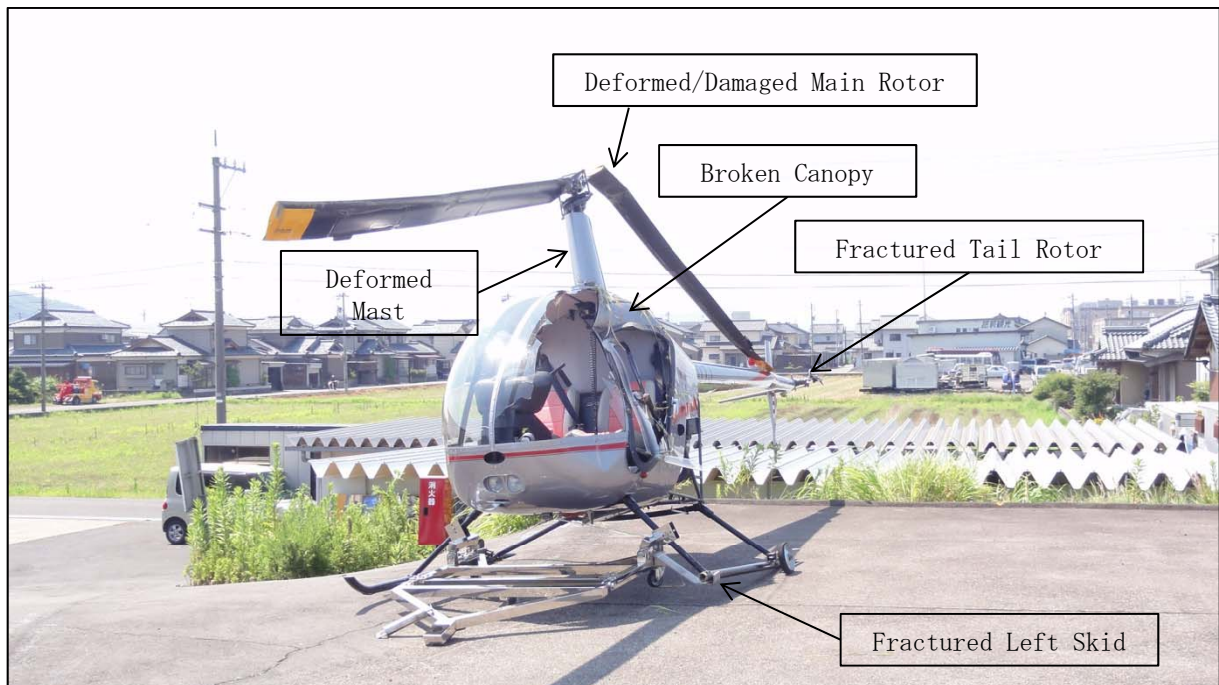


(The helipad (Southward))

Photo 2 Accident Aircraft



(The Aircraft on the slope)



(The Aircraft placed upright on the helipad)