

AA2018-6

**AIRCRAFT ACCIDENT  
INVESTIGATION REPORT**

**PRIVATELY OWNED  
JA7907**

**August 30, 2018**

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

AIRFRAME DAMAGED BY ROLL-OVER UPON LANDING  
ODAIRA, ITOIGAWA CITY, NIIGATA PREFECTURE, JAPAN  
AT AROUND 15:13 JST, MARCH 18, 2017

PRIVATELY OWNED  
ROBINSON R44 (ROTORCRAFT), JA7907,

July 27, 2018

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

## 1. PROCESS AND PROGRESS OF INVESTIGATION

1.1 Summary of the Accident	On Saturday, March 18, 2017, a privately owned Robinson R44, registered JA7907, contacted with a snowy slope upon landing at The Temporary Airfield, in Odaira, Itoigawa City, Niigata Prefecture and rolled over. Its airframe was damaged.
1.2 Outline of the Accident Investigation	<p>On March 31, 2017, the Japan Transport Safety Board (JSTB) ,upon receiving the report of the accident occurrence and designated an investigator-in-charge and two investigators to investigate this accident.</p> <p>Although this accident was notified to the United States of America, as the State of Design and Manufacture of the Rotorcraft involved in this accident, the State did not designate its accredited representative.</p> <p>Comments were invited from parties relevant to the cause of the accident and the relevant state.</p>

## 2. FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statements of the PIC and the passengers, the video taken by a passenger during the flight, and the pictures of the Rotorcraft taken after the accident, the history of the flight is summarized as follows:</p> <p>On March 18, 2017, a privately owned Robinson R44, whose hub for flight services was Temporary Airfield in Odaira, Itoigawa City, Niigata Prefecture (hereinafter referred to as “the Temporary Airfield”), was enjoying a leisure flight with the PIC and the three passengers on board, four people in</p>
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total.

Although the boundary line was not defined at the Helipad in the Temporary Airfield when the accident occurred, the PIC judged that there was no problem in takeoff and landing at the Helipad, assuming the snow on the runway surface would be compacted. In addition, deeming himself to be in good physical condition, the PIC thought that no abnormality was found in the Rotorcraft conditions and determined that there would also be no problem in the weather conditions.

With the PIC on the right pilot's seat, at around 15:10 (JST: UTC + 9hrs, unless otherwise stated all times are indicated in JST on a 24-hour clock) the Rotorcraft took off from Eboshidakeshita Temporary Airfield for the Temporary Airfield.

After taking off, in repeating changing its course, the Rotorcraft flew at a low AGL along the downhill slope of the valley in the mountains. At around 15:12, climbing a little from around Akebidaira and checking visually the Temporary Airfield, the Rotorcraft approached it from the south-southeast. (See Figure 1: the left one and ①) Afterward, passing over the Helipad, with its nose down, the Rotorcraft made a steep left turn and nosedived. However, as trees were looming in front of the Rotorcraft, in order to avoid those trees, the Rotorcraft further took a deeper bank angle, and therefore, it rapidly decreased its altitude. (See Figure 1: ② ③)). At this time, the rotor sound changed and the low rotor rpm(revolutions per minute) warning horn(hereinafter referred to as "the Warning horn", described later in 2.8(3)①) sound. (See Figure 1: ④ ⑤) Subsequently, immediately after turning its nose to the northeast with a shallow bank angle, the Rotorcraft touched the snowy slope on the southwest of the Helipad with its left side. As its main rotor touched the snowy slope on the left side and got stuck in the snow, with its rebound, the Rotorcraft rolled over and its engine stopped. (See Figure: ⑥ ⑦ ⑧ ⑨)

The bubble window (fuselage front wind shield) was broken, the tip of one of the two rotor blades was broken and protruded from the snowy surface, but the other was buried in the snow with its head and mast. The Rotorcraft halted lying on its right with its nose facing the south. (See Figure 2) The ski rack, which was equipped on the left side of its fuselage, was detached and fell off about three meter southwest upward along the snowy slope from there.

The PIC and three passengers evacuated from the broken bubble window.

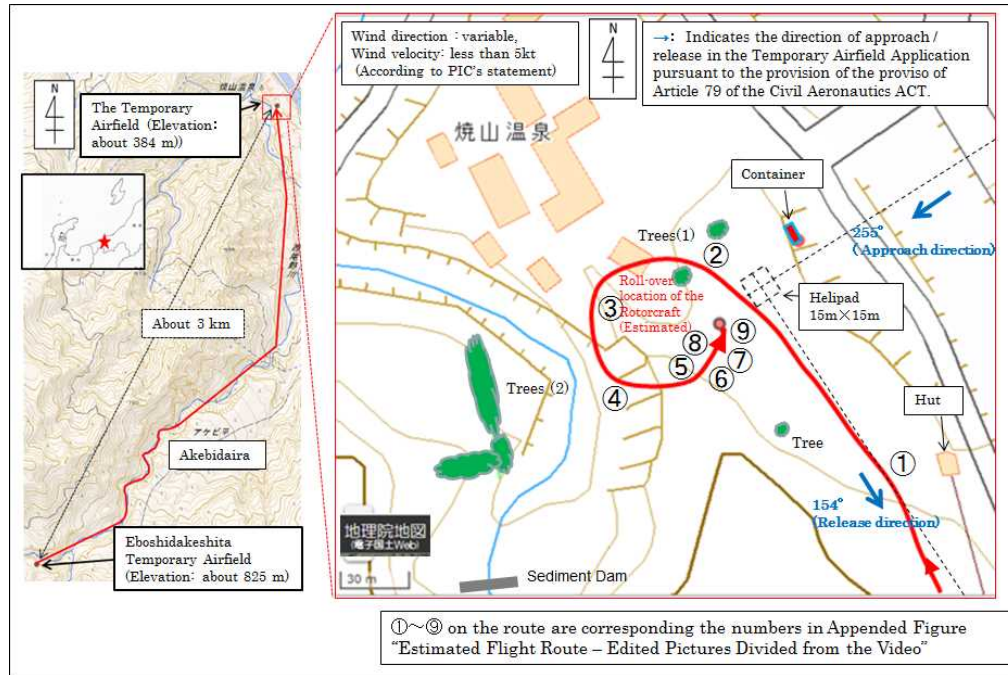


Figure 1: Estimated Flight Route  
(According to the video , pictures and statements)

According to the PIC, he used to gradually descend to a low altitude as fixing his aiming point to the trees near the Helipad in his sight and make a direct approach to land at the Helipad. However, as he had a passenger shooting a video on that day, he decided to consciously attempt to approach from a little higher altitude, descend and land by turning. He remembered lowering the collective lever when the Warning horn rang, however, he did not understand why the Warning horn rang. As the altitude was deemed enough, the PIC descended but only to find that the Rotorcraft has touched down on the snowy surface.

The accident site is in the Temporary Airfield, in Odaira, Itoigawa City, Niigata Prefecture (36°59' 33" N, 138°00' 43" E) and this accident occurred at around 15:13 on March 18, 2017

2.2 Injuries to Persons

None

2.3 Damage to the Aircraft

After the accident, when the Rotorcraft was roped and hauled by snow compaction vehicle on the snowy surface, its damage was expanded. The Rotorcraft was disassembled at the accident site, transported and stored. Therefore, the extent of the damage incurred by the accident could not be determined by the spot investigation on the accident Rotorcraft, but it was estimated from the video and pictures taken at the time when the accident occurred.

- (1) Extent of Damage to the Rotorcraft: Destroyed
- (2) Damage to parts of the Rotorcraft
- ① Bubble window and door frame were broken.
- ② Main rotor blades were broken.

- ③ Main rotor head and mast were broken.
- ④ Ski rack was dropped.

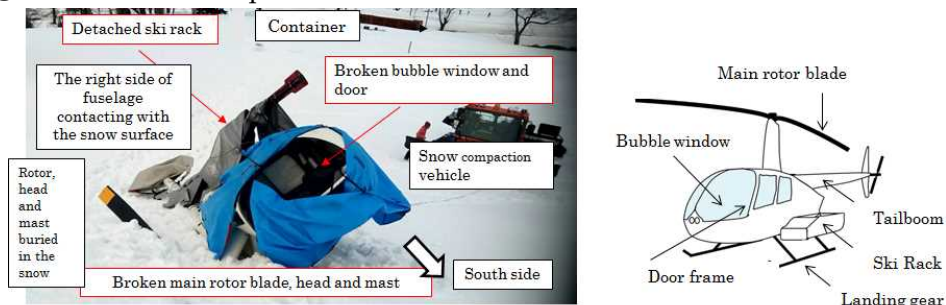


Figure 2: The Rotorcraft right after the Accident  
(The picture taken by a passenger right after the accident before the fuselage was moved)

2.4 Personnel Information

(1) Captain Male, Age 40  
 Commercial pilot certificate (Rotorcraft) November 25, 2003  
 Specific pilot competence Expiry of practicable period for flight  
May 19, 2018  
 Type of rating for single-reciprocating engine (land) May 22, 2003  
 Class 1 aviation medical certificate Validity date: April 24, 2017  
 Total flight time 1,779 hours and 48 minutes  
 Flight time in the last 30 days 1 hour and 18 minutes  
 Flight time on the same type of aircraft 222 hours and 42 minutes

2.5 Aircraft Information

Type: Robinson R44  
 Serial number: 0050; Date of manufacture: February 24, 1994  
 Certificate of Airworthiness No. DAI-2016-458  
 Validity date: November 19, 2017

2.6 Meteorological Information

(1) According to the statement by the PIC, meteorological observations in the Temporary Airfield on the day of the accident were as follows:  
 Weather: Fine; Wind direction: Northwest( with variable) ;  
 Wind velocity: less than 5kt  
 (2) According to the Meteorological Agency “ Local Meteorological Observatory (Itoigawa)”, meteorological observations on the day of the accident were as follows:  
 (Observations at about 14 km northwest of the accident site, the wind velocity was calculated by converting m/s into kt.)

Time	Average		Maximum instantaneous wind velocity	
	Wind velocity (kt)	Wind direction	Wind velocity (kt)	Wind direction
14:50	1.6	West	3.0	West
15:00	1.8	West	3.5	West-northwest
15:10	2.2	West	3.8	West

2.7 Accident Site

It is highly probable that the roll-over location of the Rotorcraft was on the snowy slope about 20 m southeast of the Helipad and the height was about

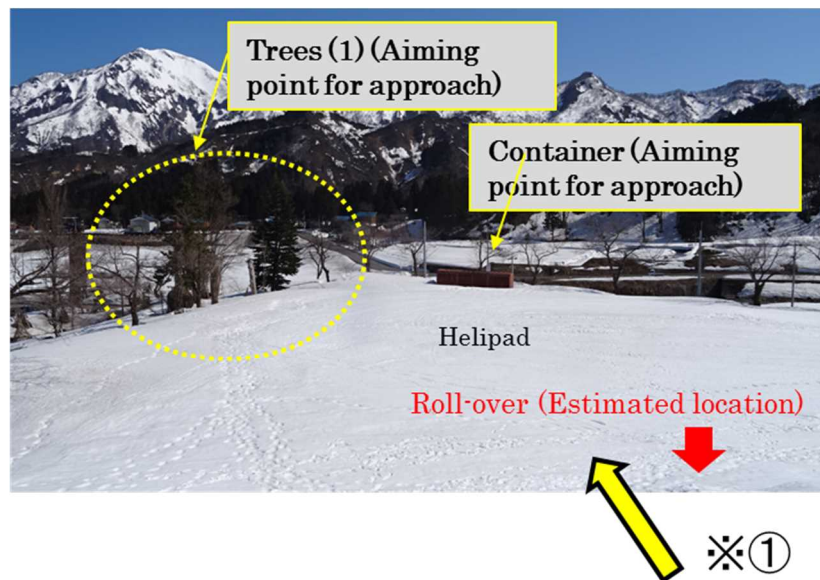
two meters from the Helipad.

It is also probable that the ski rack was dropped out from the fuselage about three meters southwest of the roll-over location along the snowy slope and the height was about seven meters from the Helipad.

Seen from the roll-over location on the snowy slope, the Helipad (Container side in the northeast) and the slope come together in the snow and looked all flat. (See Figure 3)



※ Image (Scale, estimated flight route and the Helipad are indicated as reference)



※①: Seen from the roll-over location on the snowy slope, the Helipad (Container side in the northeast) and the slope come together in the snow and looked all flat.

Figure 3: Situation in the Accident Site

2.8 Additional Information

(1) Featureless terrain illusion

The Federal Aviation Administration stipulates the featureless terrain illusion in Chapter 16, page 16-9, FAA-H-8083-25A, “Pilot’s Handbook of Aeronautical Knowledge” as follows:

*Featureless Terrain illusion*

*An absence of surrounding ground features, as in an overwater approach, over darkened areas, or terrain made featureless by snow, can create an illusion the rotorcraft is at a higher altitude than it actually is. This illusion,*

	<p><i>sometimes referred to as the “black hole approach,” causes pilots to fly a lower approach than is desired.</i></p> <p>(2) Low rotor rotation Warning horn of the Main Rotor</p> <p>① The Rotorcraft is designed to issue the Warning horn sound and caution light on when the number of revolutions of the Main Rotor (hereinafter referred to as “NR”) becomes from 96% to 97% or less of the specified values. In a normal flight maneuver, the rotor governor functions to maintain the specified values from 101% to 102 % and prevents from diminishing the lifting power caused by the low NR. However, with the radical operation of the collective lever and the rudder, the rotor governor would not fully function and the specified values would become lower that triggers the Warning horn.</p> <p>② The Safety Notice SN-10, “Fatal Accidents Caused By Low RPM Rotor Stall” issued by the Manufacturer of the Rotorcraft includes the following descriptions (excerpts):</p> <p style="padding-left: 40px;"><i>Every pilot must have his reflexes conditioned so he will instantly add throttle and lower collective to maintain rotor RPM in any emergency. (omitted) No matter what causes the low rotor RPM, the pilot must first roll on throttle and lower the collective simultaneously to recover RPM before investigating the problem. (omitted) In forward flight, applying aft cyclic to bleed off airspeed will also help recover lost RPM.</i></p> <p>(3) Approval pursuant to the provision of the proviso of Article 79 of the Civil Aeronautics ACT</p> <p>The Rotorcraft got permission in its application for approval (hereinafter referred to as “the Temporary Airfield Application”) pursuant to the provision of the proviso of Article 79 of the Civil Aeronautics ACT, in which the direction of the Helipad and other referential matters are stipulated as follows:</p> <p>① Direction at the Helipad: Approach 255° Release 154° (See Figure 1)</p> <p>② The boundary line shall be defined.</p> <p>(4) PIC’s Obligation to Report stipulated in paragraph 1 of Article 76 of the Civil Aeronautics ACT (excerpts)</p> <p style="padding-left: 40px;"><i>The pilot in command shall, in the event of any of the accidents such as crash, collision, or fire of aircraft, report to the Minister of Land, Infrastructure, Transport and Tourism in accordance with Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.</i></p> <p>It was not until 13 days passed after the accident that the PIC submitted his report.</p>
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### 3. ANALYSIS

3.1 Involvement of Weather	No
3.2 Involvement of Pilot	Yes
3.3 Involvement of Aircraft	None



<p>3.4 Analysis of known items</p>	<p>(1) Situation from its approach up until the airframe was damaged</p> <p>It is highly probable that the Rotorcraft did not approach from 255° direction (northeast) as described in the Temporary Airfield Application, but instead tried to land by taking a steep left turn and nose-diving right above the Helipad. As touching the snowy slope, the Rotorcraft rolled over and the airframe was damaged.</p> <p>(2) Judgment and actions taken by the PIC</p> <p>It is probable that it was thoughtless behavior and a safety neglecting action deviating from the contents in the Temporary Airfield Application that the PIC approached right above the Helipad from the south-southeast while maintaining the altitude and tried to land by taking a steep left turn and nose-diving.</p> <p>It is also probable that as the PIC approached right above the Helipad, took a steep left turn, and nosedived, the Rotorcraft got close to surrounding obstacles.</p> <p>It is highly probable that the PIC descended while avoiding surrounding obstacles by taking a deep bank angle, however, as there was a risk of hitting the ground, in order to avoid it he pulled up the collective lever suddenly, and that triggered the alarm of the Warning horn.</p> <p>It is probable that afterward, as the PIC lowered the collective lever, the NR was recovered and the Warning horn stopped, however, the Rotorcraft had been close to the snowy slope since the PIC continued descending.</p> <p>It is highly probable that the PIC took a shallow left bank and had its nose face to the northeast while further descending along the snowy slope, but the left side of the Rotorcraft contacted with the snowy slope about 20 m southwest of the Helipad.</p> <p>It is somewhat likely that the reason the PIC continued descending in spite of the Warning horn is because he considered its altitude higher than the actual one, since the boundary line was not defined in the Helipad where was covered with snow and no topographic features.</p> <p>(3) Legal compliance</p> <p>The approval pursuant to the provision of the proviso of Article 79 of the Civil Aeronautics ACT is given to the application regarded as no safety problem. Therefore, it is important that aircraft should take the approach course as described in the Temporary Airfield Application during takeoff and landing at the Temporary Airfield Helipad as well as the flight should be run placing priority on safety by defining the boundary line at the Helipad and such.</p> <p>It is probable that the damage to the Rotorcraft was enlarged as moved from the accident site after the accident occurred. The relevant material such as the Aircraft and equipment are necessary to identify the cause of the accident. It is important the relevant material should be preserved the same as in the condition when the accident occurred unless the investigation organization allows it.</p> <p>It is also important that the PIC should understand the Civil Aeronautics</p>
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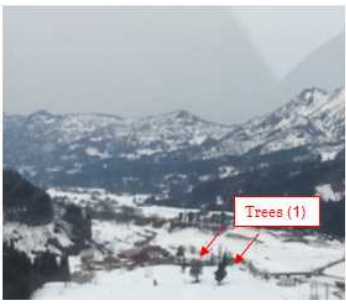
	<p>Act correctly, and in case that an accident has likely happened, he should inform the Civil Aviation Bureau of that as soon as possible.</p> <p>(4) Preventive measures for similar accidents</p> <p>Pilots should pilot the aircraft in compliance with laws and regulations by placing priority on ensuring safety.</p> <p>In order to prevent pilots from making a misjudgment on the altitude due to featureless terrain illusion at the time of flying over a snow-covered area, it should fully take safety measures like defining the boundary line at the Helipad so that it can be a terrain feature on the ground.</p>
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#### 4. PROBABLE CAUSES

In this accident, it is highly probable that upon landing, the Rotorcraft touched the snowy slope short of the Helipad, rolled over and its airframe was damaged. It is probable that the reason the Rotorcraft touched the snowy slope is because the PIC tried to land by taking a steep left turn and nose-diving, neglecting the safety of flight.

Appended Figure: Estimated Flight Route – Edited Pictures Divided from the Video  
 (The number of each picture corresponds to ① to ⑨ put in Figure 1: “Estimated Flight Route”)

① Aiming the trees (1), the Rotorcraft approached from a little high altitude. (at about 15:12:40, 28 seconds before the accident occurred)



② After passing over the Helipad, the Rotorcraft commenced taking a steep turn and nosediving. (at about 15:12:53, 15 seconds before the accident occurred.)



③ While taking a steep left turn with a deep bank angle and nosediving, the Rotorcraft avoided the trees (2). (at about 15:12:59, nine seconds before the accident occurred)



④ The Rotorcraft rapidly decreased its altitude and the Warning sound. (at about 15:13:03 to 04, five to four seconds before the accident occurred)



⑤ The Rotorcraft continued to take a left turn and nosedive. (at about 15:13:04, four seconds before the accident occurred)



⑥ Turning its nose to the northwest, the Rotorcraft descended along the slope. (at about 15:13:06, two seconds before the accident occurred)



⑦ With a shallow bank angle, the Rotorcraft got close to the snowy slope. (at about 15:13:07, one second before the accident occurred)



⑧ The Rotorcraft touched the snowy slope with its left side. Its main rotor touched the snowy slope. (at about 15:13:08, when the accident occurred)



⑨ The Rotorcraft touched down and rolled over. As its bubble window was broken, snow entered into the cockpit. (at about 15:13:08)



As one main rotor blade buried and the other got stuck in the snowy slope, the Rotorcraft rolled over, and its engine stopped. (at about 15:13:09)

