

AA2009-9

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**TOHO AIR SERVICE CO., LTD
J A 6 1 1 7**

October 30, 2009

Japan Transport Safety Board

The investigation for this report was conducted by the Japan Transport Safety Board, JTSB, about the aircraft accident of Toho Air Service Co., Ltd, Aerospatiale SA315B Alouette III registration JA6117 in accordance with the act for the Establishment of the Japan Transport Safety Board and Annex 13 to the Convention on the International Civil Aviation for the purpose of determining causes of the aircraft accident and contributing to the prevention of accidents/incidents and not for the purpose of blaming responsibility of the accident.

This English version of this report has been published and translated by the JTSB to make its reading easier for English speaking people who are not familiar with Japanese. Although efforts are made to translate as accurately as possible, only the Japanese version is authentic. If there is any difference in the meaning of the texts between the Japanese and English versions, the text in the Japanese version prevails.

Norihiro Goto,
Chairman,
Japan Transport Safety Board

AIRCRAFT ACCIDENT INVESTIGATION REPORT

**TOHO AIR SERVICE CO., LTD.
AEROSPATIALE SA315B ALOUETTE III (ROTORCRAFT)
JA6117
TAZAWAKO OBONAI TEMPORARY HELIBASE
SEMBOKU CITY, AKITA PREFECUTURE
AT ABOUT 12:15, OCTOBER 23, 2008**

October 2, 2009

Adopted by the Japan Transport Safety Board
(Aircraft sub-committee)

Chairman	Norihiro Goto
Member	Yukio Kusuki
Member	Shinsuke Endo
Member	Noboru Toyooka
Member	Yuki Shuto
Member	Akiko Matsuo

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1. 1 Summary of the Accident

An Aerospatiale SA315B Alouette III, registered JA6117, operated by Toho Air Service Co., Ltd. for cargo transport, damaged its fuselage around 12:15 JST (Japan Standard Time, unless otherwise stated all times are JST, UTC+9h), upon touching down to a helipad in Tazawako-Ononai temporary helibase, with a polyester tarpaulin sheet being blown up in the air and sucked into its main rotor disc.

On board the Aircraft were a pilot in command, a mechanic and a passenger. Nobody was injured.

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

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

Japan Transport Safety Board designated an investigator-in-charge and an investigator for the accident on October 23, 2008.

1.2.2 Representatives from Foreign Authorities

An accredited representative from France, the state of design and manufacture of the aircraft involved in this accident, participated in the investigation.

1.2.3 Implementation of the Investigation

October 24-25, 2008	On-sight investigation and interview
October 31, 2008	Detailed examination of the aircraft

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

Comments were invited from the parties relevant to the cause of the accident.

1.2.5 Comments from the Participating State

Comments were invited from the participating state.

2 FACTUAL INFORMATION

2.1 History of the Flight

On October 23, 2008, an Aerospatiale SA315B Alouette III, registered JA6117 (hereinafter referred to as “the Aircraft”), operated by Toho Air Service Co., Ltd. (hereinafter referred to as “the Company”) took off from Naruko 1 temporary helibase at about 11:26 with the pilot in command (PIC) and two persons on board and flew to Tazawako-Ononai temporary helibase (hereinafter referred to as “Ononai helibase”) for cargo transport to construct TV broadcasting relay antenna.

The flight plan submitted to the Sendai Airport Office, Tokyo Regional Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism was outlined below:

Flight rules: Visual flight rule, Departure aerodrome: Naruko 1 temporary helibase, Estimated off-block time: 11:30, Cruising speed: 90kt, Route: Yuda, Kakunodate, Destination aerodrome: Akita Ononai temporary helibase, Purpose: Cargo transport, Total estimated elapsed time: 1 hour 30 minutes, Fuel load expressed in endurance: 1 hour and 45 minutes, Persons on board: 3

The PIC occupied the right front seat, a mechanic in the left front seat, and a passenger in the left rear seat. Before commencing descent to Ononai helibase, the PIC made a quick recon flight for wind situation over a mountain top which would be his afternoon work place. At about 12:15, upon touching down to the helipad, blue polyester tarpaulin sheets (hereinafter referred to as “Blue Sheets”), placed near the helipad were flown in the air and one of them was sucked into its rotor disc and caused the aircraft damage.

Development up until the accident occurrence was stated by the PIC, the mechanic, the passenger and eyewitnesses as follows.

(1) PIC

I started a north-east bound descent for landing to Ononai helibase. I confirmed the landing area to be clear from 40 or 50 m of the helipad in this side and I recognized folded Blue Sheets placed near the fuel storage area. I reduced airspeed and confirmed that something was put on the Blue Sheets as weight from 10 or 15 m of the helipad in this side. I continued my approach to the helipad as close to as the nose section of the Aircraft reached over the helipad, but the Blue Sheets stayed there, so my recognition was OK and I continued approaching and

stopped the Aircraft over the helipad as 2 m high hovering. I slowly lowered the collective to touch down, just before that, sudden vibrations at short cycle I had never experienced during my ordinary flights and a sudden yaw hit the Aircraft for a very short period of time. After the touch-down on the helipad which is comprised of steel plates, the landing skids trembled on the steel pads and the Aircraft yawed to the left while it swayed like precession. Vibration after the touchdown was bigger than that of before. I ran the engine shutdown procedure and stopped the main rotor turning with the rotor brake. The right ladder pedal position was full forward at the time of disembarkation.

I didn't know what happened. After the disembarkation an eyewitness told me that a Blue Sheet was blown in the air by the downwash and was sucked into the rotor disc when the Aircraft touched down.

(2) Mechanic

We started descent to Obonai helibase via designated work place from which we were to airlift cargos out. After the transition to a hovering, about 1 m above the ground, the Aircraft yawed to the left and touched down with severely trembling. I suspected the tail rotor of striking something upon touchdown; in fact, after the disembarkation I discovered that the left aft shock strut was snapped and tailboom was bent downward. Tail rotors were not damaged and I had no idea of what happened.

I spotted some Blue Sheets near the fuel storage area during our descent to Obonai helibase. I'm sure the Blue Sheets were folded and weights like timber were put on them.

(3) Passenger

I occupied the left rear seat. During the descent I was monitoring the aft safety clearance to the left. I was counting the distance to the ground via intercom for the PIC. I felt something was wrong when we reached about 50 cm above the ground. The aircraft jolted and at the same time it landed. The vibration was severe with rattling sound and I couldn't figure out what happened. When I saw aft from my seat, the tailboom was bent downward. I couldn't see the Blue Sheets from my position during our touchdown on the ground.

(4) Eyewitness A

The assigned work was to airlift construction materials for broadcasting relay antenna from the mountain top drop zone to Obonai helibase.

I arrived at the Oboni helibase around 10:20 and met the site manager of

the Company to confirm the schedule of the day and the work progress at Obonai helibase. In the past airlifted construction materials were piled up in Obonai helibase; my recognition at that time was that they were all moved away and there should be no flyable objects in and around the helipad, and that recognition lead me not to check Blue Sheets placed near the fuel storage area. The site manager of the Company left the helipad for the top of the mountain to marshal the Aircraft with which the airlift would start around 11 o'clock.

Sometime past 12 o'clock I heard the sound of a helicopter. I visually surveyed the helipad standing at the entrance of Obonai helibase and thought everything was OK.

The Aircraft came in, hovered over the center of the helipad and slowly started descent. Just before the complete touchdown, a Blue Sheet blown in the air by the downwash, was sucked in the main rotor disc and fell to the ground.

I was watching all the sequence in front of the Aircraft, at the timing of the skid touchdown, the Blue Sheet was blown up in the air from the left side of the Aircraft and it was sucked into the main rotor disc. With trembling the Aircraft yawed to the left and came to a stop.

(5) Eyewitness B

I was at the entrance to Obonai helibase being distance myself from the Aircraft. The Aircraft came in straight to the helipad. In order to take cover from downwash I hid behind trees. Soon I heard fluttering sound. I felt strange and got out of the trees and saw the Aircraft turning to the left with oscillation.

I didn't see the blown up Blue Sheet sucked into the main rotor disc because I was behind the trees.

The accident occurred in Obonai helibase (39° 43' N, 140° 44' E) which is located about 3.4 km east of Lake Tazawako in Semboku city, Akita Prefecture, at about 12:15, October 23, 2008.

(See Figure 1 Estimated Flight Route, Figure 2 Accident Site Layout, Photo 1 The Aircraft and Reconstructed Blue Sheet)

2.2 Deceased and Missing Persons

There were no injured persons.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

The Aircraft sustained substantial damage.

2.3.2 Damage to the Aircraft Components

Tailboom and tail rotor drive shaft: bent and some support tubes were destroyed

Left shock strut: broken and snapped

Main rotor blades: one of three blades was damaged

Spacing cables: Two of three cables were detached

2.4 Other Damage

None

2.5 Personnel Information

PIC Male, Age 40

Commercial pilot certificate (Rotorcraft)

Issued on June 6, 1991

Rating: Land Single-Turbine

Issued on June 6, 1991

Instrument (Rotorcraft)

Issued on April 11, 2001

Class 1 aviation medical certificate

Validity

May 26, 2009

Total flight time

4,472 hours 55 minutes

Flight time in the last 30 days

30 hours 55 minutes

Total flight time on the type of aircraft

424 hours 34 minutes

Flight time in the last 30 days

30 hours 55 minutes

2.6 Aircraft Information

2.6.1 Aircraft

Type

Aerospatiale SA315B

Alouette III

Serial number

2020-13

Date of manufacture

1968 (Date unknown)

Certificate of airworthiness

No. Toh-20-255

Validity

August 19, 2009

Category of airworthiness

Rotorcraft, Normal
category N/Special

	category X
Total time in service	3,808 hours 03 minutes
Time in service since last periodical check (October 4, 2008)	33 hours 04 minutes

(See Figure 3 Three-angle-view of Aerospatiale SA315B Alouette III)

2.6.2 Weight and Balance

The weight of the Aircraft at the time of the accident was estimated to be approximately 1,565.06 kg, with the position of center of gravity at 290.6 cm aft of the reference point and 1.3 cm left of the centerline. It is estimated that both of them were within the allowable limits. (Maximum certified weight is 2,300 kg. Allowable center of gravity range corresponding to this weight is between 276 cm - 309 cm in longitudinal axis and 13.5 cm left - 4.3 cm right in lateral axis.)

2.7 Meteorological Information

According to the PIC's statement the weather conditions at the time of the occurrence was as follows.

Weather: cloudy, Wind: direction ESE - SE, 5-7 m/s, Visibility: more than 10 km, Cloud: no cloud cover over Obonai helibase

2.8 Information on Accident Site and Wreckage

2.8.1 Accident Site

The accident site, Obonai helibase was set up in a clearing within woods. The helipad was reinforced with steel plates to prevent sinking. The south-west and north-east sides of the helipad are used for landing and takeoff. A row of trees, about 10 m away from the helipad, runs parallel to the direction of landing and takeoff.

The Aircraft sat on the steel plates orienting to the north, shifted away from the direction of the north-east approach. On the surface of the steel plates remained a series of scratch marks made by the skids and the tail rotor guard.

A scatter of Blue Sheet fragments as a result of being sucked into the main rotor disc was found within 10 m radius of the landing pad.

(See Figure 2 Accident Site Layout)

2.8.2 Detailed Information on Damages

(1) Some of the tubes forming the truss structured tailboom were damaged and snapped. The tail rotor drive shaft and the tailboom itself were bent downwards. Due to the bent tailboom, tail rotor control cable sagged. (See Photo 2 Damaged Tailboom)

(2) The forward shock strut on the left side of the fuselage was damaged and the aft shock strut was snapped. (See Photo 3 Damaged Left Shock Struts)

(3) Among three main rotor blades, one blade had scratch marks solely on its leading edge. Among three spacing cables which maintain inter-blade distance, two spacing cables attached to the damaged main rotor blade were freed as a result of the damaged links to the blade. (See Photo 4 Damaged Main Rotor Blade)

2.9 Information on the Blue Sheet

Each of the Blue Sheets measures 3 m by 3 m. According to the statements by the PIC and the mechanic, they were folded and placed about 4 m away from the landing pad (1.8 m away from the fuel storage area), with some square cut timbers as weights. Although many square cut timbers (10 cm by 10 cm, 1 m long) were found in the accident site, timbers used as weights were not identified.

2.10 Aircraft Hovering Attitude and Main Rotor Blade Movement

The main rotor turns clockwise when seen from above, so the tail rotor thrust pushes the tailboom to the left in order to neutralize anti-torque. In order to counter the drift to the left by the tail rotor thrust, main rotor disc is tilted to the right. This makes the right landing skid touch the ground first in the touch down sequence from hovering.

Rotating blades flap up. When a rotor disc is tilted, each rotating blade experiences lead/lag movement in the plane of rotation. In the case of the Aircraft, drag dampers and spacing cables are installed to restrain blade movements within certain range.

2.11 The Company's Regulation for Cargo Transport Safety

The Company stipulates "Standards for Operating Procedures for Flight Operations" as in-house regulation in order to secure safety and smooth operations.

Below the above mentioned standards, the Company has the “Operating Procedures for Cargo Transport” for the Operations Division, Maintenance Division and Customer Divisions in order to secure safe transport of cargo. For the ground safety it has the “Safety Operating Guidance” These regulations stipulate the safety assurance as follows.

2.11.1 Operations Procedures for Cargo Transport (for Customer Division) (excerpt)

2. Work procedures (preparations)

2-10 Package preparations (with nets and wires)

(7) When packing cargo with a Blue Sheet, use larger sheet and cover the cargo completely. Tie up the upper end of the sheet to prevent flapping. At the loading/off-loading site, make sure that the sheets should be controlled with care not to make them flyable hazards.

3. Safety management (on site)

3-1 Total management

(2) A customer division personnel explains the peculiarities of helicopter operations with “Safety Operations Guidance” to secure flight safety. He has to be alert to the changing situations of the site and make proper decisions with calm mind.

He has to establish a clear responsibility allocation and manage/coordinate to attain continued safe operations.

3-2 Last confirmation prior to the commencement of the work

(6) Clear all flyable hazards.

2.11.2 Safety Operations Guidance (excerpt)

4. Maintenance and putting in order of loading/off-loading sites

Maintaining temporary helibase, cargo assembly areas and drop zones in good order increase the safety level and work efficiency. Pay special attention to plastic sheets, mold plates, plywood, used cement sacks, plastic bags and other light material because they are flyable when blown. Flyable objects may

1) inflict injury on workers and

2) damage helicopters.

3) Make sure to secure them by tying them down or putting weights on them.

3. ANALYSIS

3.1 The PIC held both valid airman competence certificates and valid aviation medical certificates.

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

3.3 It is considered highly probable that the weather condition at the time of the accident had no bearing on the occurrence of the accident.

3.4 Flyable Objects Sucked into the Main Rotor Disc

It is considered highly probable that the Aircraft made a north-east bound descent to land at Obonai helibase, transitioned to a hover, and just before the touch-down on the helipad the Blue Sheets were blown up.

The Blue Sheets, as shown in Figure 2, were placed between the helipad and the 10 m away trees lining along the road. It is considered probable that the Blue Sheets were blown up in the air by downwash, with the added factors that the lateral dispersion of the air was blocked by the trees and the direction of the flow was channeled upwards, and it is considered highly probable that, consequently, one of the Blue Sheets was sucked into the rotating main rotor disc.

With regard to the Blue Sheets being blown up in the air, it is considered highly probable that they were placed under the effective downwash, while the square timbers, as the occupants of the Aircraft confirmed, were used as weights to secure the Blue Sheets, were not heavy enough to serve their purpose.

3.5 Vibrations Experienced by the Aircraft

It is considered highly probable that the main rotor blade which caught the Blue Sheet experienced increased drag and the lateral relationship with other blades became deteriorated causing the spacing cable connection links to snap. Freed spacing cables hit one of the main rotor blades and damaged it.

As described in 2.10, with the main rotor disc being inclined to the right and with the snapped links letting the spacing cables go, it is therefore considered highly probable that the dynamic/aerodynamic balances of the rotating blades were put out of the equilibrium, this led to the precession-like sways of the main rotor

hub to generate vibrations, and caused damage to the Aircraft upon touching down on the ground.

The Aircraft landed on the ground with the right skid first and the vibration increased after the touch-down. It is therefore considered possible that touch-down force of the left skid was augmented by the downward phase of vibration, causing the shock struts to damage themselves. Also it is considered possible that at the same time, weight of tail rotor gearbox and other parts placed near the end of the tailboom acted upon it with excessive downward force --the tailboom was unable to withstand and it collapsed bending itself downward.

With regard to the counterclockwise directional change of the Aircraft on the ground, it is considered highly probable that the tail rotor control cable sagged as the result of the failed tailboom and tail rotor pitch was reduced to almost zero generating reduced amount of thrust.

3.6 Safety Measures at Temporary Helibase

At the time of the accident, the site manager of the Company was at the top of the mountain in order to marshal the Aircraft, not being in Obonai helibase. Before he left for the mountain, he, with the customer, made a quick survey in and around the helipad; however, it is considered highly probable that sufficient counter measures against the flyable objects were not taken.

The Company's regulation described in 2.11 was not specifically stipulated on flyable objects and corresponding countermeasures. It is considered probable that this fact attributed to the failed countermeasure taken at the site. Corresponding countermeasures vary depending on the situation in and around a temporary helibase, it is considered that flyable objects within the influence of downwash should be cleared and if the situation does not allow taking them away they should be tied down.

4. PROBABLE CAUSE

In this accident, it is considered highly probable that with the Blue Sheets left around the landing area without sufficient counter measures against flyable object were taken, the following events took place in succession and the Aircraft was damaged upon touching down on the ground: the Blue Sheet was blown up in the air; sucked into the main rotor disc and blades' lateral relationship went out of the limit; spacing cables escaped after the destruction of the attachment links; main rotor system was put out of the equilibrium and this caused vibrations.

With regard to the failed sufficient counter measures against flyable objects, it is considered probable that the Company's regulations on handling flyable objects not being stipulated specifically acted as a contributing factor.

5. REFERENTIAL MATTERS

After the occurrence of the accident, the Company has revised the Standards for Operating Procedures for Flight Operations as follows (as of January 31, 2009).

(1) "Helibase Safety Checklist" was newly formulated to enforce safety against flyable objects in and around a helipad and this checklist applies to the case where a transfer of on-site tasks to none member of the Company takes place.

(2) Revision was made to take away light materials such as Blue Sheets, plywood, mold boards and suchlike in and around a helipad, and if it is impossible, they should be tied down or be properly handled with counter-flyable measures.

(3) Addition was made for a PIC, onboard observer and other crew to act as a team, sharing the information and evade danger when flyable or dangerous objects were found.

(4) Addition was made that such additional safety measures should be taken upon approaching to a helipad as; cautious approach with effects of downwash in mind; an aerial recon before descent; danger related information shared among crew; in case of unsafe factors remaining on the ground, asking ground crew to remove them; and with the ground safety not being assured, suspension of landing.

Figure 1 Estimated Flight Route

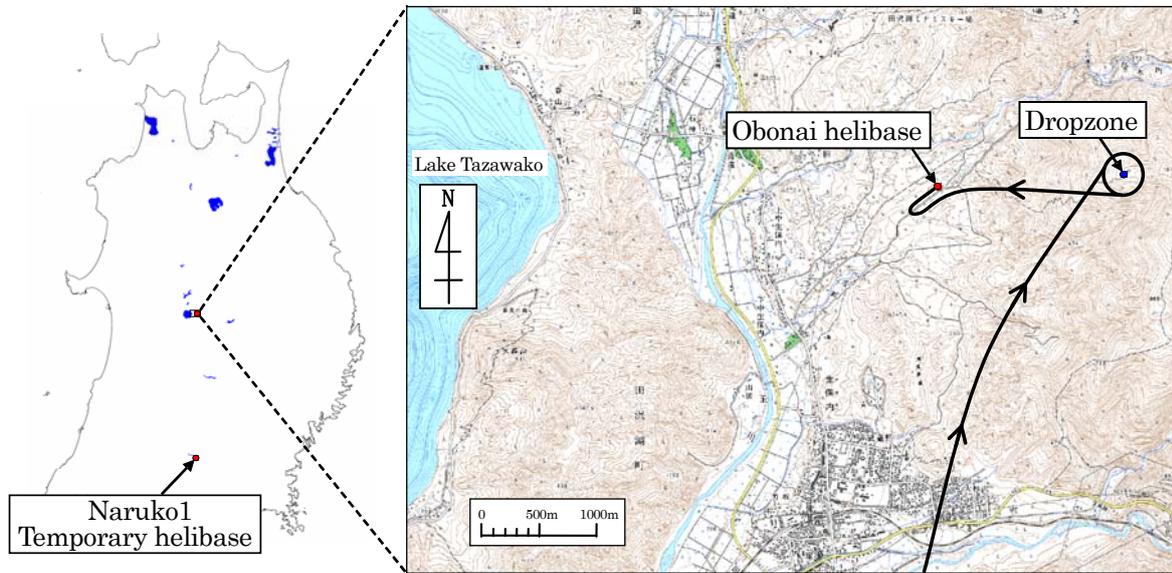


Figure 2 Accident Site Layout

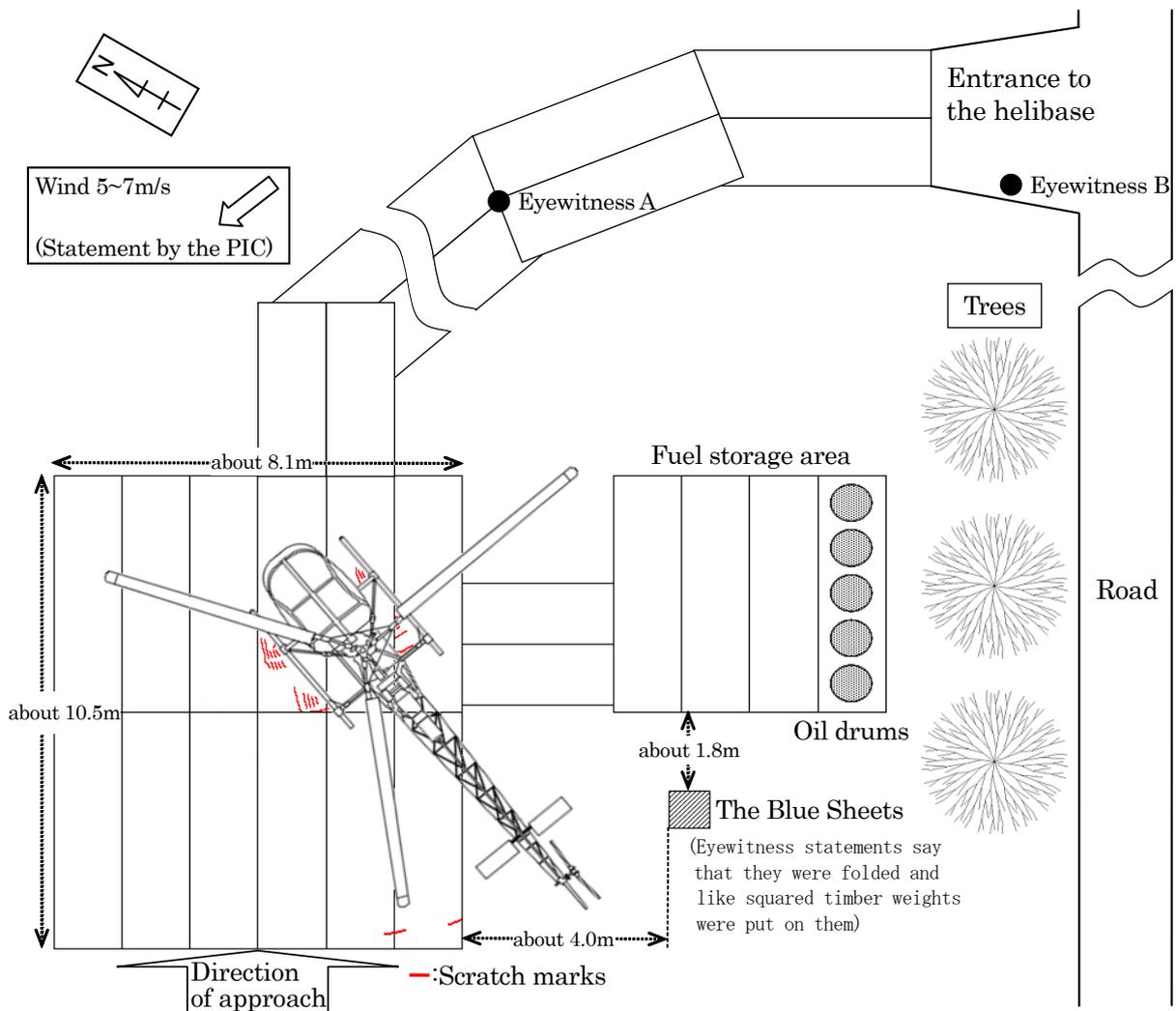


Figure 3 Three-angle-view of Aerospatiale SA315B Alouette III

unit:m

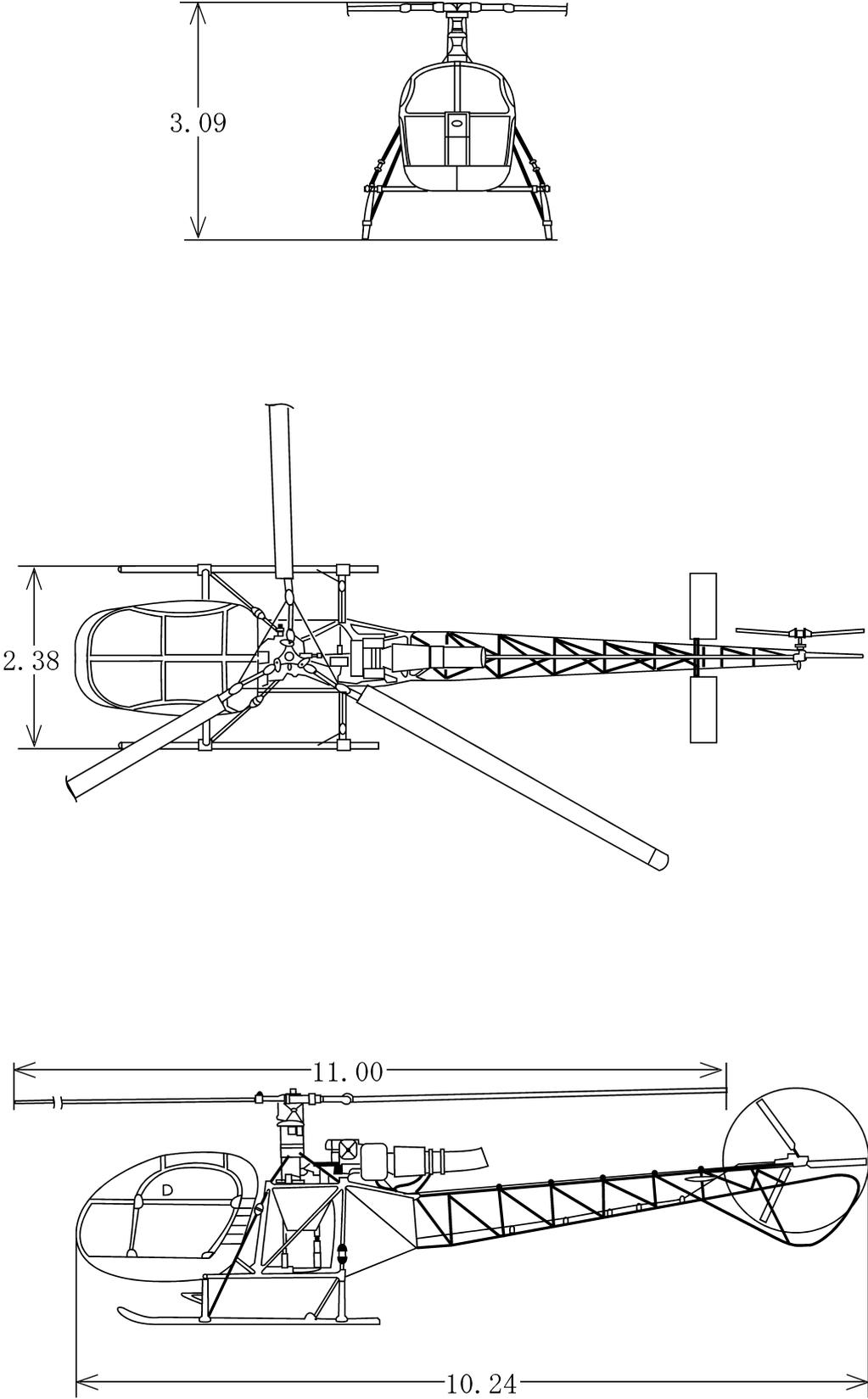


Photo 1 The Aircraft and Reconstructed Blue Sheet



Photo 2 Damaged Tailboom

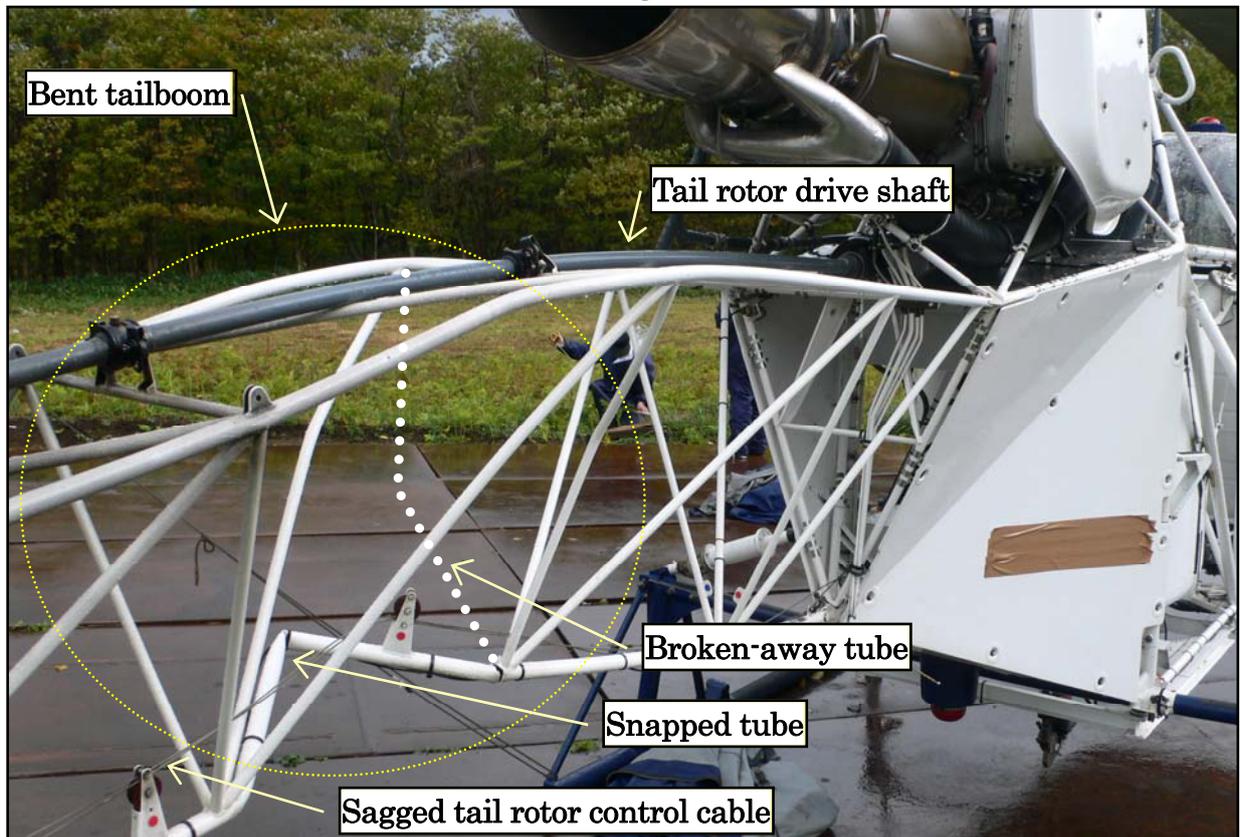


Photo 3 Damaged Left Shock Struts



Photo 4 Damaged Main Rotor Blade

