

AI2021-6

**AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT**

**TOHO AIR SERVICE CO., LTD.
J A 5 0 4 D**

July 29, 2021

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 prevent future accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

TAKEDA Nobuo
Chairperson
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 SERIOUS INCIDENT INVESTIGATION REPORT



July 2, 2021

Adopted by the Japan Transport Safety Board

Chairperson: TAKEDA Nobuo

Member: MIYASHITA Toru

Member: KAKISHIMA Yoshiko

Member: MARUI Yuichi

Member: NAKANISHI Miwa

Member: TSUDA Hiroka

Company	Toho Air Service Co., Ltd.
Type, Registration Mark	Airbus Helicopters AS350B3 (Rotorcraft) JA504D
Incident Class	Dropping of Object during External Cargo Sling Operation Item 16, Article 166-4 of the Ordinance for Enforcement of Civil Aeronautics Act of Japan
Date and Time of the Occurrence	At about 10:55 JST (JST: UTC+9 hours, unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock), December 4, 2020
Site of the Serious Incident	Higashi-Matsushima City, Miyagi Prefecture (38° 20'18" N, 141° 08'04" E)

1. PROCESS AND PROGRESS OF THE INVESTIGATION

Summary of the Serious Incident	On Friday, December 4, 2020 at around 10:55, the helicopter while transporting withered pine weevils trees by cargo sling dropped some of the dead trees on a fallow field in Miyato Island, Higashi-Matsushima City, Miyagi Prefecture. There was no damage to the helicopter, or injury to persons on board or on the ground.
Outline of the Serious Incident Investigation	An investigator-in-charge and an investigator were designated on December 4, 2020. Comments were invited from parties relevant to the cause of the serious incident and the Relevant State.

2. FACTUAL INFORMATION

Aircraft Information	
Aircraft type:	Airbus Helicopters AS350B3
Serial number: 7882	Date of manufacturer: June 3, 2014
Airworthiness certificate: TO-2019-554	Validity: March 3, 2021
Personnel Information	
Captain:	Age: 49
Commercial pilot certificate (Rotorcraft)	July 7, 1992
Specific pilot competence certificate	Expiry of practicable period for flight: May 11, 2022

Type rating for Single-engine turbine (Land)
Class 1 aviation medical certificate

July 7, 1992
Validity: September 22, 2021

Meteorological Information

The Aviation Routine Weather Report (METAR) for Matsushima Airfield
11:00 Wind direction 290°; Wind velocity 13 kt; Prevailing visibility 10 km or over; Cloud FEW;
BKN 4,500 ft BKN 6,000 ft; Temperature 7°C; Dew temperature -5°C; Altimeter setting
(QHN) 1,022 hPa

Weight and Balance

At the time of the serious incident: Weight of the helicopter 2,075 kg; Weight of external sling load about 350 kg; Weight and Balance within an allowable range

Permission by the Civil Aeronautics Act

Proviso to Article 81 (Minimum Safety Altitude) yes

Event Occurred and Relevant Information

(1) History of the Flight

On the day of the serious incident, the helicopter planned to transport the dead trees, which were withered by pine weevils, with a 23 m long sling from four places in Miyato Island. The helicopter took off from Naruse No. 2 helipad (hereinafter referred to as “the Naruse Helipad”) at around 09:01 and repeated transporting the dead trees from the four lifting places as indicated by (1) through (4) in Figure 1 to the Naruse Helipad until around 10:50. At around 10:52, the helicopter slowly made a round approach from the north toward the lifting place (4) for a 24th transport avoiding vessels at work in the bay. When the helicopter was lifting the dead pine trees, which had some of branches cut (about 350 kg), the captain was notified by a signal person by radio, “There is something unstable.” The captain, however, slowly continued the maneuver watching the load motion on the mirror and was heading for the Naruse Helipad via an eastern route at the ground speed of about 25 kt so felt the captain. At around 10:55, the captain was notified by a mechanic in charge, who was watching the slung trees in the left rear seat, that some of the dead trees dropped on the fallow field. The captain was unable to confirm the dropped object on the mirror, continued flying to the Naruse Helipad as the captain did not see any abnormality in the sling equipment or the slung dead trees, and unloaded the trees at the Naruse Helipad. Then, the captain flew back to the area where the dead trees dropped and landed at the Naruse Helipad after having confirmed that there existed no abnormality around the area. At around 11:00, the captain reported of the dropped object (dead branches weighing about 40 kg) to a person in charge of the flight operations of the company.

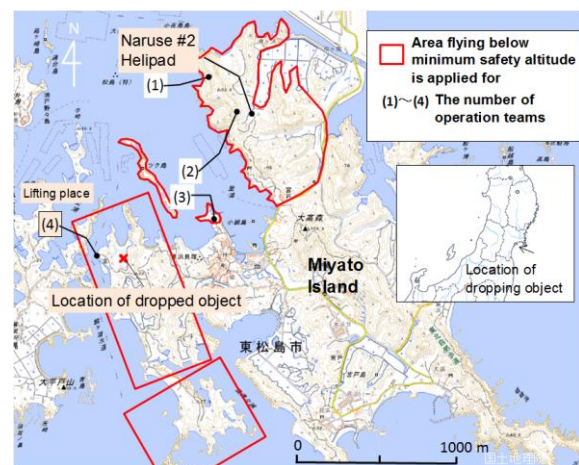


Figure 1 Area applied for flying below Minimum Safety Altitude and work locations

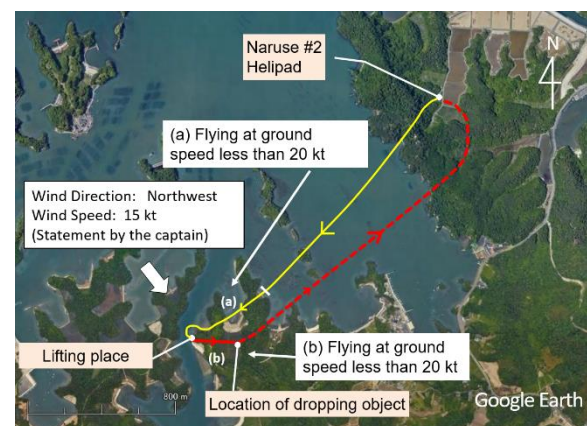


Figure 2 Estimated flight route of the 24th transport

(2) Reporting from the Signal Person

According to the statements of the signal person, he cut off wisteria vines, which got entangled with the dead pine trees, as much as he could with a chain saw before carrying out the dead pine trees and judged that the lifting was practicable. When the dead trees were lifted with the sling, the signal person visually recognized that the mass of the dead branches of the pine trees was entangled with the vines, and reported to the captain by radio saying, "There is something unstable."



Figure 3 Dropped dead branches

(3) Watching by the Mechanic in Charge

According to the statements of the mechanic in charge, the dead trees were entangled with the vines in the 24th lifting, however, they appeared stable without rotating at the times of hovering and commencing the forward flight. At around 10:55, the mechanic in charge did not see the moment of dropping of the dead trees, but confirmed that the trees were dropping, and reported to the captain to that effect.

(4) Company Procedure for Packaging Methods

The procedure of the company provides for the packaging methods for transport of general goods but did not provide for the same for transport of dead or damaged trees.

(5) Engine Status Recording Function and Cockpit Recorder (Vision 1000)

TURBOMECA type Arriel 2D engine installed in the helicopter is equipped with ECU (Engine Control Unit) that properly recorded the time, atmospheric pressure, outside temperature, and operating status of the engine including engine parameters. The cockpit recorder is installed on the cockpit helicopter (Vision 1000), which has a function to record the images and voices in the cockpit and the flight data but did not properly record them due to the malfunction.

3. ANALYSIS

(1) Influence by Airframe and Sling System

As there was no sign showing abnormality in the airframe, and from the fact that some of the dead trees dropped with the hook at the tip of the sling closed, the airframe and sling system are more likely to have been free from abnormality.

(2) Transition Status from Lifting to Dropping of the Dead Trees

From the event occurred and the relevant information, transition from lifting the dead trees to dropping of some of the dead trees in the forward flight is as shown in Figure 4.

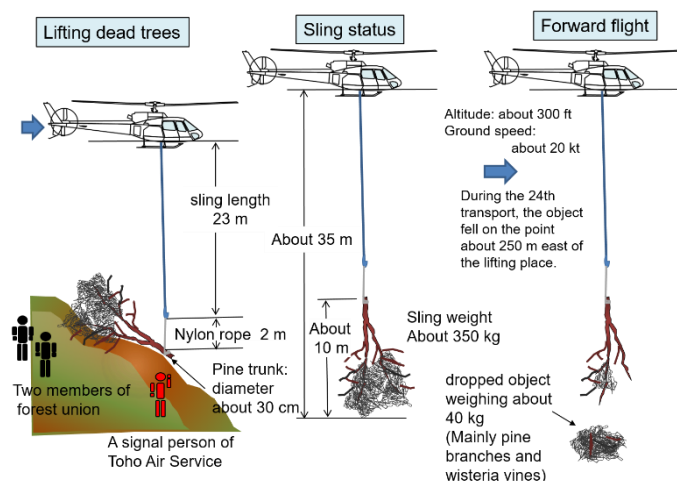


Figure 4 Transition status from lifting to dropping of some of dead trees in forward flight

(3) Comparison between ECU Record and Confirmation Record of the Goods Transport

From the ECU record and confirmation record of the goods transport, the changing tendency of the downwash*¹ was estimated from the varying values of the outside temperature, torque and collective pitch lever.

When the downwash is passing through near the fuselage, the outside temperature sensor attached to a lower part of the fuselage is influenced by heat emissions from the engine, and thereby the outside temperature rises higher than the actual value.

From the fact that the outside temperature rose at around 10:55 when the helicopter was flying at a low speed after the 24th lifting, it is probable that the downwash moved just under the airframe.

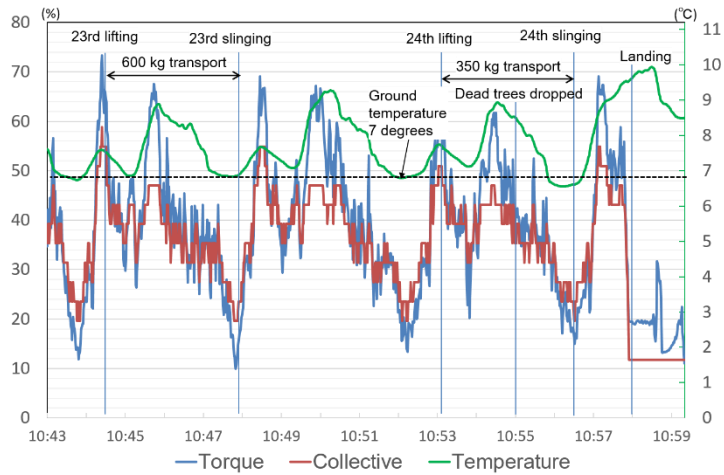


Figure 5 Changes of outside temperatures and engine outputs

(4) Influence by the Wind and Downwash

The weight of the helicopter lifting the dead trees indicates that the induction current generated from the main rotor is more likely to have been about 9.5 m/s. When the helicopter was slowly approaching from the northwest, it is more likely that the downwash was blowing in the vicinity of the sling place before the helicopter arrived just over the sling place influenced by the northwest wind at about 15 kt.

When the dead trees were completely slung, it is likely that the signal person judged that the influence of the downwash was limited as the center of the downwash was on the leeward of about 30 m ahead.

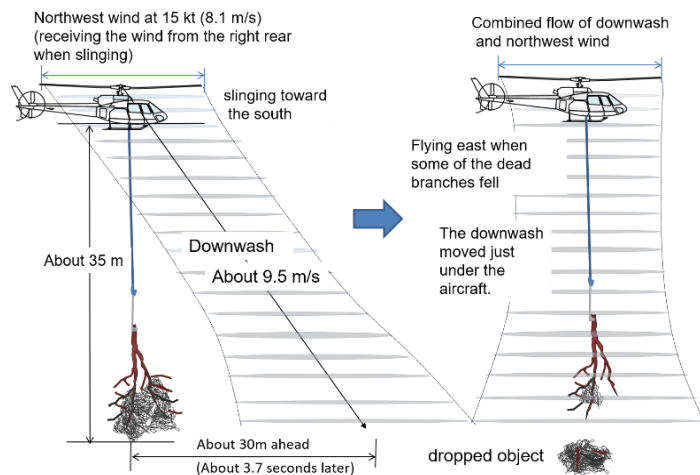


Figure 6 Influence by downwash

From the outside temperature rise as shown in Figure 5, it is probable that the wind combining the downwash and northwest wind increased the wind pressure on the dead trees while the helicopter was flying at a low speed toward the east after lifting since the center position of the downwash moved just under the airframe. (Refer to figure 6)

(5) Clarification and Operation of Dropout Prevention Measures

Packaging methods for carrying out dead or damaged trees were taking place customarily without being clarified in the company. In this serious incident, part of the slung goods, which were not bound tight enough, is most likely to have dropped due to the influence of the downwash. Similarly, when measures to prevent slung goods from dropping are not taken

*1 "Downwash" means air flow generated by the main rotors of a helicopter.

sufficiently, there exists a chance that the goods fall by wind pressure received in flight or load in operation, not limited to the downwash. Besides, in this serious incident, although the signal person pointed out, “There is something unstable,” this could not lead to the prevention of the occurrence. In case of a fear of dropping some of goods, it is required to place the goods on the ground for repackaging and take dropout prevention measures, without relying on the maneuvering of the captain for the preventive measures.

4. PROBABLE CAUSES

In this serious incident, during the flight at low speed, it is highly probable that some of the dead trees dropped on the fallow field due to the wind pressure including downwash because the measures to prevent the slung dead trees from dropping were not sufficient.

5. SAFETY ACTIONS

On December 9, 2020, the company additionally stipulated in the Toho Standard Operating Procedure the methods for packaging and the procedures to suspend the slinging work to prevent dropping, made it public within the company and implemented the safety education.



Wind the rope at around 1/3 or around 1 m of carried out tree with the root side (thicker side) above basically.



Use a blue sheet to prevent branches or trees from coming out of the net.



Bind at the four corners of the net in the same way as packaging for general goods.

Figure 7 Packaging methods for dead or damaged trees (extracted from Toho Standard Operating Procedure)