AIRCRAFT ACCIDENT INVESTIGATION REPORT

October 9, 2025
Adopted by the Japan Transport Safety Board
Chairperson RINOIE Kenichi
Member TAKANO Shigeru
Member MARUI Yuichi
Member SODA Hisako
Member TSUDA Hiroka
Member MATSUI Yuko

Company	Tohoku Air Service, Inc.
Type, Registration Mark	Eurocopter AS332L1 (Rotorcraft), JA332T
Accident Class	Serious injury to a ground operator during cargo sling work
Date and Time of the Occurrence	At about 10:50 Japan Standard Time (JST: UTC+9 hours), March 15, 2025
Site of the Accident	Kawasaki Town, Shibata County, Miyagi Prefecture (38° 14' 16" N, 140° 35' 05" E)

1. PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION

Summary of the Accident	On Saturday, March 15, 2025, while a Eurocopter AS332L1, JA332T, operated by Tohoku Air Service, Inc. (hereinafter referred to as "Company A") was descending to unload externally underslung cargo near the construction site of a transmission tower in Kawasaki Town, Shibata County, Miyagi Prefecture, a ground operator lost the balance due to the downwash[*1] from the helicopter, fell off a cliff and sustained an injury.
Outline of the Accident Investigation	Upon receiving of notice of the accident occurrence, on March 26, 2025, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident. An accredited representative of the French Republic participated in the investigation as the State of Design and Manufacture of the helicopter involved in the accident. Comments on the draft Final Report were invited from parties relevant to the cause of the accident, and the Relevant State.

2. FACTUAL INFORMATION

Aircraft Information

Aircraft type: Eurocopter AS332L1
Serial number: 9005 Date of manufacture: November 22, 2004
Airworthiness certificate: No. DAI-2024-562 Validity: January 20, 2026

＊1 "Downwash" refers to the downward flow of air created by the main rotor of a helicopter.

Personnel Information

Pilot: Age: 41

Commercial pilot certificate (Rotorcraft): June 2, 2005

Ratings Limitations: Aerospatiale SA330 May 19, 2014

Pilot competence assessment Expiration date of piloting capable period: July 22, 2026

Class 1 aviation medical certificate Validity: July 9, 2025

Onboard mechanic: Age 65

Onboard mechanic experience: about 35 years

Ground operator A (signal person): Age 41

Helicopter cargo transport experience: about 2 years

Ground operator B (chief ground operator): Age 32

Helicopter cargo transport experience: about 9 years

Meteorological Information

According to the pilot's statement, the weather around the accident site was clear at the time of the accident, with a westerly wind of 3 to 4 m/s.

Event Occurred and Relevant Information

(1) History of the Flight

Figure 1: The Accident Site and the Operation Site

At about 09:57, the helicopter took off from the operation site in Kawasaki Town, Shibata County, Miyagi Prefecture, with the pilot sitting in the right pilot seat, the fellow passenger in the left pilot seat, and the onboard mechanic in charge of guiding the helicopter in the guide seat on the left side of the cabin.

After conducting cargo sling work at another work site, the helicopter began to approach from the south at about 10:48 in order to carry out the first unloading work at the construction work (hereinafter referred to as "the construction") site of the Tohoku Electric Power Network transmission tower (Miyagi Marumori Main Line No.48 Tower).

The work site was located in a cleared area on the ridge, and measured about 14 m wide from east to west and about 8 m wide from north to south. The surrounding terrain was steeply sloped, resembling a cliff, except on the east side (see Figure 2).

The pilot hovered at about 19 m above ground level (AGL).

The underslung cargo was a cube approximately 3 tons in weight with each side of approximately 2 m, containing materials for a temporary stage. There was no swing of the underslung cargo.

On the ground, the ground operator A in charge of guiding the helicopter (hereinafter referred to as "the signal person") visually confirmed the helicopter and then moved from the west side of the top of slope[*2] to uneven ground about 2 m wide, located about 2 m down the slope, in order to move to a position where the onboard mechanic on the helicopter could be seen.

＊2 "Top of slope" refers to the uppermost edge of an artificially created slope formed from cut earth and embankment.

To reduce the influence of the wind pressure and dust caused by the downwash, the signal person adopted a low posture, and put on the helmet's face guard while facing away from the aircraft. However, when looking back, the signal person lost the balance and fell about 17 m off the cliff.

The onboard mechanic visually confirmed that the signal person had lowered the posture to withstand the downwash and was moving to the left of the helicopter so that the signal person would be easily visible to the onboard mechanic. However, the signal person was not visible when the onboard mechanic looked back at the signal person after moving the gaze to the underslung cargo. The onboard mechanic then recognized that the signal person had fallen off a cliff and reported this to the pilot.

Upon receiving the report from the onboard mechanic, the pilot lowered the underslung cargo to the location initially indicated by the signal person and began to hover in order to ascertain the signal person's status. As confirming the signal person who had fallen, the pilot suspended the cargo sling work and the helicopter landed at the operation site at about 10:54.

Figure 2: The Accident Site and the Slope Viewed from the Sky

In response to a call for assistance, a rescue helicopter and a doctor helicopter transported the signal person to a hospital in Sendai City. The signal person was diagnosed with a fracture of the transverse process of the lumbar vertebrae and multiple rib fractures, requiring hospitalization.

(2) Roll Divisions in the Construction

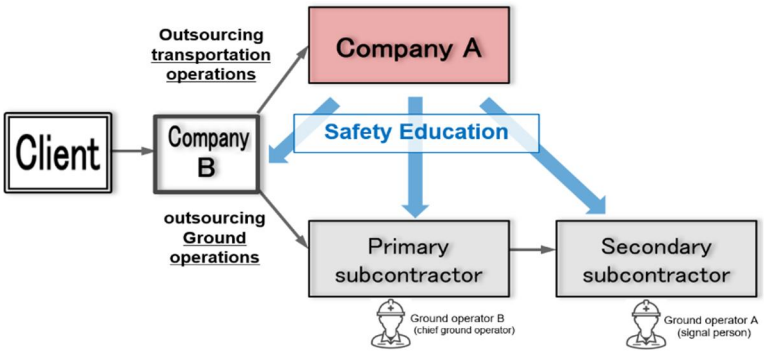

Figure 3: Roll Divisions in the Construction

Company A was contracted by Company B to transport materials by helicopter for the construction.

Company B was a prime contractor of the construction and had subcontracted ground operations related to cargo transport (ground guidance, confirming cargo packing style, cargo packing, hooking and unhooking of the cargo, assembling scaffolding for a temporary stage and others) to the primary subcontractor.

The ground operators were subcontracting company employees, whereas Company B employees were not included. The signal person and the ground operator B (hereinafter referred to as “the chief ground operator”) were employed by a different subcontracting company (see Figure 3).

(3) Education Materials of Company A

In order to ensure safety in ground operations, Company A provided educational training in advance to all those engaged in ground operations (including those from Company B and the subcontract company), based on Company A's standard for the implementation of flight operations, in accordance with the education material "Helicopter Cargo Transport and Safety Operations Guidance" (hereinafter referred to as "the Guidance").

Regarding how the person in charge of ground guidance should send signals, the Guidance stated the following in bold, underlined letters: 'Signals should be given with large movements ***in a place that is easily visible to the onboard mechanic***' (the rest omitted); '***Signals should be given in a position that is easily visible to the onboard mechanic***' (the rest omitted).

In addition, regarding downwash, the Guidance stated at the beginning that 'the wind pressure of the rotor blade (downwash) is significant' and provided information on precautions regarding flyable objects.

(4) Selection of Signaling Location

Regarding the signaling location for ground guidance, it should be visible to the onboard mechanic in accordance with the Guidance and the signal person thought that it would be better to put the underslung cargo in order from the west side of the top of slope, as six cargo sling operations were planned at the work site. Therefore, the signal person selected the uneven ground located down the slope.

(5) About the Accident Site

The accident site located on the west side of the top of slope was a cliff, which made it a place where there was a risk of falling off. And it was an uneven ground that would make it easier to lose one's footing than at the top of slope.

(6) Safety Management at Work Sites

The chief ground operator wrote on the TBM-KYR*3 Implementation Record Sheet (created by Company B), which was used during the meeting held before the cargo sling work began for the day, "There is a risk of slipping on the slope and falling, resulting in injury", identifying this as a risk factor.

In addition, the chief ground operator performed a risk assessment on three risk factors (severity, probability and frequency) in the table, judging that, despite some issues, the work would be acceptable, with the ratings for severity, probability and frequency were 3, 2 and 2, respectively (see Table 1 and 2).

(7) Effects of Downwash

Table 1: Risk Score Weighting Criteria for TBM-KYR Implementation Record

Severity	
Fatal (death, permanent disability)	10
Serious injury (requiring more than 30 days)	6
Minor injury (less than 30 days to recover)	3
no need to rest from injury	1
Probability	
Certain (disaster will occur even with considerable caution)	6
High (disaster can occur even with normal attention)	4
Yes (if you're not careful, disaster may occur)	2
None (disaster does not occur under normal conditions)	1
Frequency	
Frequent	5
Sometimes	3
Occasionally	2
Rarely	1

Table 2: Risk Assessment Criteria

Risk assessment judgment criteria		
Scores	Risk assessment	Criteria to respond
14 or more	There is an issue to be resolved immediately	Require to work suspension or take actions
13 to 9	There is a serious problem	Require to take actions
8 to 5	It is acceptable, even with some problems	Risk confirmation Start work after warning
4 or less	It is acceptable with no problems	

*3 "TBM-KYR" refers to risk prediction activities that confirm information about risks in advance through meetings at the work site before work begins, which is named TBM-KYR because they stand for Tool Box Meeting-Kiken Yochi (risk prediction) Risk, meaning to hold a meeting (M) near the tool box (TB) to predict and assess risks (KYR).

Verification by the Tokyo Fire Department of the effects of downwash[*4] *revealed that, "in a no- natural-wind condition, the range expected to have no effects of downwash on any person or object would require a horizontal distance of at least 50 m from the center of a helicopter's rotors, in case that the helicopter's hovering AGL altitude is less than 150 ft (45.7 m). In a natural wind condition, the downwash would blow towards the leeward side. Therefore, caution should be used even within the range of a horizontal distance of 50 m or more from the center of a helicopter's rotors. Caution should be used for all helicopter models, regardless the AGL altitude used in the verification, since an instantaneous horizontal wind velocity of 10 m/s or more could cause people to fall, objects such as signs and tin sheets to be blown off within a horizontal distance of 40 m from the center of a firefighting helicopter's rotors.*".

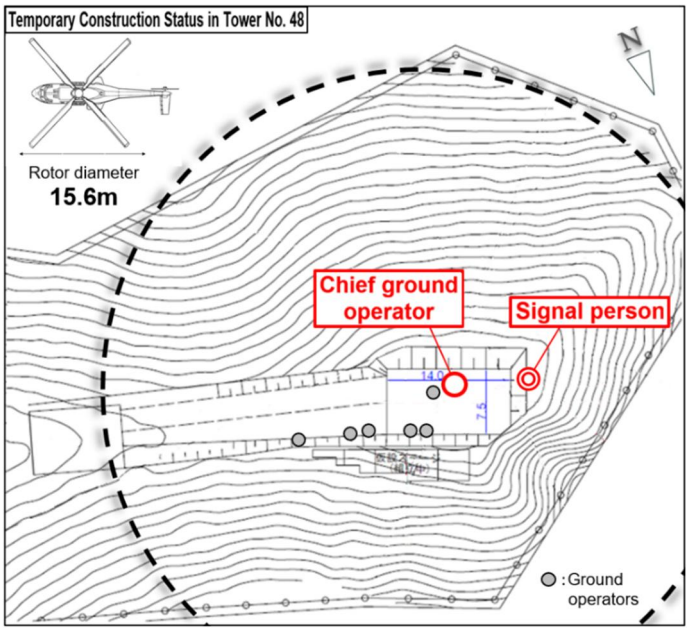

Figure 4: Range Requiring Caution for Downwash
(Black broken line area: Partially added to the construction drawing)

In this accident, the AGL altitude from the work site of the helicopter was about 19 m. The work site measured about 14 m from east to west and 8 m from north to south. Therefore, the entire work site was within the range requiring caution against downwash (see Figure 4).

Several ground operators who were interviewed stated that, about the size of the work site, they felt the work site was narrower than usual.

3.ANALYSIS

(1) The JTSB concludes that it is most likely that, in terms of signaling location for ground guidance, the signal person was so focused on moving into a position that could be easily visible to the onboard mechanic that the signal person selected a place at risk of falling off, which caused the signal person to lose the balance due to the effects of the helicopter's downwash, resulting in the signal person falling off the cliff and sustaining injury.

(2) Education Materials of Company A

The JTSB concludes as follows:

Company A was contracted to transport construction materials by helicopter. In terms of disaster prevention for the construction material transport by helicopter involving several

＊4 Sato Ayumu, Kaneko Kohei, and Otaki Eiichi, "Verification of Wind Velocity Measurement of Downwash Generated by Large Helicopters During Hovering", (Tokyo Fire Department, Fire Technology and Safety Office, 2018) p. 28.
This document states that the firefighting helicopters used in the measurements are four models: Kounotori 'Stork' (EC225LP), Hibari 'Skylark' (AS332L1), Chidori 'Plover' (AW139), and Tsubame 'Swallow' (AS365N3). While the Chidori 'Plover' and Tsubame 'Swallow' are medium-sized helicopter, the measurements were conducted for reference purposes in a comparison with large helicopter.

companies working together, Company A had provided educational training in advance to all those engaged in ground operations, based on its operation manual and standard for the implementation of flight operations.

In the pre-educational training materials (the Guidance) used by Company A, the explanation of the signaling position of the signal person emphasized the need to select a position that was visible to the onboard mechanic. On the other hand, the explanation of downwash only stated at the beginning that 'the wind pressure of the rotor blade (downwash) is significant', as related to the relevant work. However, the explanation for others was limited to precautions regarding flyable obstacles. Therefore, it is possible that, in terms of the educational curriculum, ground operators, including the signal person and the chief ground operator, did not receive adequate educational training about the downwash.

(3) Safety Management at the Work Site

The JTSB concludes as follows:

Company B was contracted to perform ground operations for the construction project and was in charge of the site representative at the work site where several companies worked together. Therefore, risk management at the work site was probably not conducted appropriately.

Regarding how the person in charge of ground guidance should send signals, the Guidance stated the following in bold, underlined letters: '*Signals should be given with large movements in a place that is easily visible to the onboard mechanic*' (the rest omitted); '*Signals should be given in a position that is easily visible to the onboard mechanic*' (the rest omitted).

(4) About the Work Site

The JTSB concludes that, according to the statements of several ground operators who were interviewed, that the work site was most likely narrower than a normal work site. In addition, based on the reference in 2 .(7), the work site as a whole was located within a range strongly affected by downwash, in which it was most likely difficult for ground operators to avoid the effects of the downwash.

4.PROBABLE CAUSES

The JTSB concludes that the probable cause of this accident was that the signal person most likely lost the balance due to the effects of the helicopter's downwash, fell off the cliff and sustained an injury.

It is most likely that the signal person sustained an injury because the signal person was so focused on being in a position that could be easily visible to the onboard mechanic that the signal person selected a place at risk of falling off the cliff.

5. SAFETY ACTIONS

(1) Safety Actions Required

It is desirable that the explanation of the selection of signaling position in the Guidance used by Company A for the pre-educational training should not only describe the need for signal persons to select a position to be visible to the onboard mechanic, but also address the need for signal persons to ensure their own safety, including selecting evacuation routes by themselves.

From the perspective of the disaster prevention for the transport of construction materials by helicopter involving several companies working together, in pre-educational training provided by Company A to ground operators, it is necessary to ensure that they are fully aware of the risks posed

by downwash and to educate them not to underestimate its effect.

As a site representative at the work site, Company B should ensure the safety of ground operators by understanding the contents of the meeting and installing a fall prevention fence, if necessary.

(2) Safety Actions Taken by Company A after the Accident Occurred

a. Company A informed all pilots and onboard mechanics involved in the operation of transporting underslung external cargo by helicopter of the accident, sharing the relevant information. (On March 16 and 31, 2025)

b. Company A instructed all ground operators, including signal persons, to confirm the circumstances of the accident and provided them with face-to-face retraining on the effects of downwash, the selection of safe signaling point, including evacuation site after ground guidance, and work equipment by using the Guidance. (On March 31, 2025)

c. It was decided to review the descriptions in the Guidance in order to explain more specifically the intensity of the wind pressure generated by helicopters, raise awareness of the risks, and ensure that signal persons confirm hazardous areas in advance and select their own evacuation route. Additionally, a visually effective leaflet was created for use during the educational training. (On June 1, 2025)

(3) Safety Actions Taken by Company B after the Accident Occurred

a. All ground operators, including signal persons, with retraining on the precautions for transporting underslung external cargo by helicopter (including the necessity of safety equipment). (On March 31, 2025)

b. It was decided that the chief ground operator and the signal person would select a signaling position where work at height would not be required (a flat area with no risk of falling off) as well as the chief ground operator shall also confirm the selected signaling position with the ground operators and the aviation company during the pre-meeting after which the signal person will be deployed there. (On March 31, 2025)

c. It was decided that, before moving the work site, the chief ground operator should confirm that ground operators are carrying the necessary protective equipment for helicopter transport work, such as goggles and others, given the wind pressure generated by the helicopter and the reduced visibility due to dust being kicked up. (On March 31, 2025)

d. It was decided that a fall prevention fence should be installed at the top of slopes with an inclination angle exceeding 40°. (On April 4, 2025)