AIRCRAFT ACCIDENT INVESTIGATION REPORT

SERIOUS INJURY TO A GROUND OPERATOR DURING CARGO SLING WORK,

AERO ASAHI CORPORATION

AEROSPATIALE AS332L1 (ROTORCRAFT), JA9678

NANTAN CITY, KYOTO PREFECTURE, JAPAN

AT ABOUT 13:30 JST, JUNE 15, 2023

May 10, 2024
Adopted by the Japan Transport Safety Board
Chairperson TAKEDA Nobuo
Member SHIMAMURA Atsushi
Member MARUI Yuichi
Member SODA Hisako
Member NAKANISHI Miwa
Member TSUDA Hiroka

Company	Aero Asahi Corporation
Type, Registration Mark	Aerospatiale AS332L1 (Rotorcraft), JA9678
Accident Class	Serious Injury to a ground operator during cargo sling work
Date and Time of the Occurrence	At about 13:30 Japan Standard Time (JST: UTC+9 hours), June 15, 2023
Site of the Accident	Nantan City, Kyoto Prefecture (35° 14' 39" N, 135° 31' 04" E)

1. PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION

Summary of the Accident	On Thursday, June 15, 2023, when the helicopter lifted the Cargo covered in cargo net*1 (hereinafter referred to as "Cargo net"), it came into contact with a ground operator in the mountains in Nantan City, Kyoto Prefecture, and the ground operator was seriously injured.
Outline of the Accident	An investigator-in-charge and two other investigators were designated on June 15, 2023.

*1 "Cargo net" refers to a tool used to wrap and suspend loads by attaching suspension straps to the four corners of the rope woven nets.

Investigation	Comments on the draft Final Report were invited from the parties relevant to the cause of the accident. Comments on the draft Final Report were invited from the Relevant State.

2. FACTUAL INFORMATION

Aircraft Information

Aircraft type: Aerospatiale AS332L1
Serial number: 2231 Date of manufacture: February 18, 1988
Airworthiness certificate: No. TO-2022-412 Validity: March 3, 2024

Personnel Information

Captain: Age 42
Commercial pilot certificate (Rotorcraft) March 12, 2004
Specific pilot competence Expiry of practicable period for flight February 3, 2025
Type rating for Aerospatiale SA330 February 5, 2018
Class 1 aviation medical certificate Validity: February 26, 2024
Onboard mechanic: Age 28 Period of experience as an onboard mechanic: 2 months
Ground operator A (the injured): Age52 Cargo transport experience: about 30 years
Ground operator B: Age 55 Cargo transport experience: about 30 years

Meteorological Information

According to the statement of the captain, at the time of the occurrence of the accident, it was no wind in the vicinity of the accident, the cloud base was 3,000 ft and the temperature was 26 to 27℃.

Event Occurred and Relevant Information

(1) History of the Flight

For external cargo sling operation of materials for the power line replacement work, the helicopter took off from an Operation Site in Hatago District, Hiyoshi Town, Nantan City, Kyoto Prefecture, and it was scheduled to sling up Cargo nets from a loading site near a transmission tower and unload it at a cargo unloading site in Hijitani District, Miyama Town, Nantan City. (See Figure 1)

With the captain in the right cockpit seat and the onboard mechanic in the guide's seat in the left aft cabin on board, the helicopter took off from the Operation Site at about 13:15 to start its afternoon work, equipped with the sling wire ropes approximately 20m in length and hooks.

At about 13:24, the captain visually confirmed the position of each Cargo net on the slope in order to lift the three Cargo nets (Figure 1, Cargo net 1 to 3) all together, made the helicopter enter above the loading site at about 40m AGL, descend to about 21m AGL and hover. After that, the onboard mechanic confirmed the position of Cargo nets with the two ground operators in the mountain side, and guided the helicopter so that

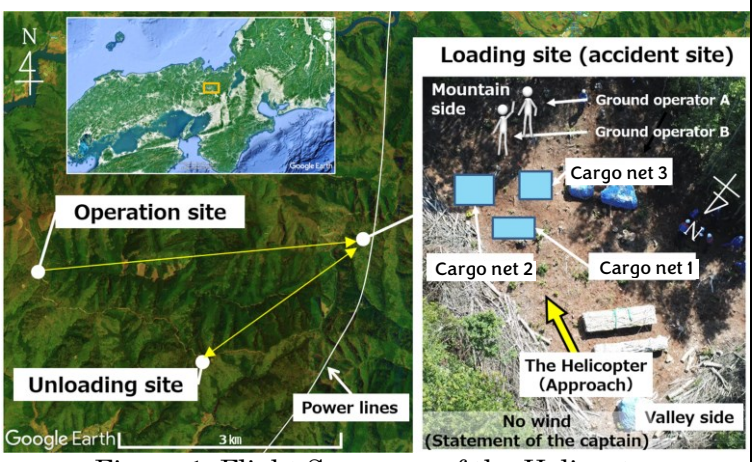

Figure 1: Flight Summary of the Helicopter

the hooks would be positioned between Cargo net 2 and Cargo net 3.

Ground operator A moved to the position where Ground operator A would be able to reach the hooks that had descended and moved to the valley side after hooking the sling wire ropes connected to each of the three Cargo nets onto the cargo hook. After that, Ground operator B in charge of sending a signal to the onboard mechanic made a hand signal, “Climb” to the onboard mechanic.

Guided by the onboard mechanic, the captain started the climb procedure for the helicopter as if to bring Cargo net 1 in the valley side to the two Cargo nets put in the mountain side. As the helicopter climbed, the sling wire ropes connected to Cargo net 1 were taut, which caused Cargo net 1 to start coming close to right under the hook as if to drag on the slope.

As confirming that the rootstock was caught in the stitch of Cargo net 1 which had started to move, in order to remove it, Ground operator A performed the support work from the valley side, pushing up the left side (Cargo net 2 side) of Cargo net 1 to the mountain side.

Monitoring the ground operation while guiding the helicopter, the onboard mechanic found that Ground operator A touched Cargo net 1 and push it up from the valley side. At this time, as there was no sign from Ground operator B particularly, the onboard mechanic judged there would be no danger for Ground operator A, thus continued to guide instructing the helicopter to climb slowly. At about 13:30, the onboard mechanic witnessed the situation where Cargo net 2 started to swing in a counter-clock direction and come into contact with Ground operator A after the sling wire ropes connected to Cargo net 2 began to be taut. After that, as confirming that Ground operator A moved to the mountain side while holding the left arm, the onboard mechanic reported that situation to the captain.

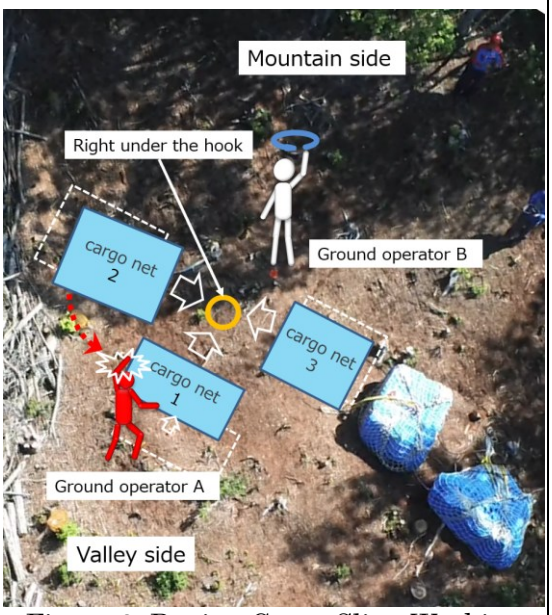

Figure 2: During Cargo Sling Working

As receiving the report from the onboard mechanic, the captain communicated via radio to the company staff in the unloading site that Ground operator A might have been injured. And then the captain then headed towards the unloading site and unloaded the Cargo nets. After that, the captain headed towards the loading site to check the ground operators at the loading site, but could not see any ground operators there, therefore, the captain judged continuing the cargo transport as impossible, the helicopter returned to the Operation Site and landed there at about 13:39.

After descending the mountain with other ground operator, Ground operator A was transported to the hospital in Kyoto City and was diagnosed with extensive skin exfoliation requiring hospitalization.

(2) Cargo nets

All three Cargo nets have tools wrapped in blue sheeting, and their sizes (length, width, height) and weights were approximately as follows:

Cargo net 1: 180 cm, 90 cm, 70 cm, 500 kg
Cargo net 2: 170 cm, 130 cm, 110 cm, 1,000 kg
Cargo net 3: 140 cm, 120 cm, 90 cm, 600 kg

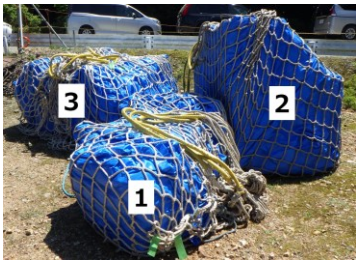

Figure 3: Cargo nets (Taken at the unloading site)

(3) Division of Roles during Sling Load Cargo Transport

The executing company of the power line replacement work made a contract with the company to transport the materials by helicopter. In addition, the ground work related to the cargo transport was handled by the ground operators of another company, which received the contract for the ground work at the loading site from the executing company, who were conducting the ground work such as confirming cargo packing style, sending hand signals for the ground guidance, hooking cargo onto the hook and others.

(4) Ensuring the Safety for Ground Work

The Regulations for the Implementation of Flight Operations (Helicopter) of the company's operations manual stipulates measures required for ensuring safety in each flight phase, and that while the helicopter is hovering, the ground operator shall move away to a safety position after hooking the cargo onto the hook, if support work is unavoidable, the ground operator shall do it with in a short time and the greatest care.

Besides, regarding ensuring the safety related to ground work, the company provided education and training to the ground operators engaged in the ground work for the cargo transportation.

(5) Statements of Ground Operators

According to the statements of Ground operator A, Ground operator A did not inform Ground operator B and the onboard mechanic that Ground operator A would approach Cargo nets or perform the support work. As Cargo net 1 was put in the place where it was easier to get caught on rootstocks, Ground operator A was paying attention to Cargo net 1, however, as Ground operator A feared, the stitch of Cargo net 1 got caught on the rootstock. Despite knowing that ground operators should move away to a safety position after hooking the cargo onto the hook, Ground operator A performed the support work as thinking it would be easy to remove.

During the support work, Ground Operator A did not notice that Cargo net 2 came closer. And when contacting with Cargo net 2, Ground operator A got the arm caught between Cargo net 1 and Cargo net 2 and for a moment was almost going to be dragged by the motion of the Cargo nets, but succeeded in pulling the arm out of between the two Cargo nets, thus moved away from the Cargo nets by climbing up the slope. According to Ground operator B, as Ground operator B confirmed the wire rope condition and was sending a signal to the onboard mechanic, Ground operator B did not notice that Ground operator A moved to the valley side and was performing the support work.

(6) Duties of Onboard Mechanic

According to the company's operations procedures and its subordinate regulations, the duties of the onboard mechanic are to provide aircraft guidance instructions using guidance phraseology while reporting the information about ground operators' on-site situation and others to the captain and to assist the captain to operate aircraft safely with proper judgement, and the onboard

mechanic shall always provide the captain with reliable information. In addition, during the onboard guidance, the captain shall follow the guidance without delay when the captain is told by the onboard mechanic, who is able to directly confirm the on-site situation by visual inspection, to "stop (temporary suspension of action)".

3. ANALYSIS

(1) Ground Work (Support Work)

The JTSB concludes that it is certain that Ground operator A, who had been performing the support work, was injured because when the helicopter was lifting the three Cargo nets, Cargo nets 2 was swinging around and came to contact with Ground operator A' left arm.

As the helicopter climbed, Cargo net 2 was dragged to the mountain side and was most likely swinging around the point where it had touched the ground as a fulcrum to the valley side.

The swinging Cargo net came to contact with Ground operator A was most likely because without moving away to a safety position, Ground operator A was performing the support work in the area where the Cargo net could swing around despite the helicopter that had started to lift the Cargo nets. At this time, Ground operator B in charge of sending signals to the onboard mechanic did not notice that Ground operator A approached the Cargo net.

The company is required to secure the ground work safety in cooperation with the ground work contract company by ensuring thoroughly that when the support work is unavoidable, the ground operator shall fully inform the onboard mechanic of the intention to perform the support work from the ground operation side in advance and the helicopter shall stop climbing.

(2) Monitoring of Ground Work

The JTSB concludes that the onboard mechanic highly probable continued providing guidance instructions for the helicopter to climb while recognizing that Ground operator A was not moving to a safe position.

The onboard mechanic continued providing guidance instructions for the helicopter to climb was because the onboard mechanic judged there would be no danger for Ground operator A since there had been no signal particularly from Ground operator B in charge of sending signals to the onboard mechanic. However, when it is confirmed that the ground operator does not move away to a safe position in monitoring the ground work, it is necessary to reduce the risk due to a swinging Cargo net and others and secure the ground work safety under the guidance of "stop" to the captain without delay.

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of this accident was that it is certain that Ground operator A was injured because while the helicopter was lifting the three Cargo nets, one of them was swinging around and came to contact with Ground operator A who did not move away to a safe position because of the support work.

The Cargo net came to contact with Ground operator A was because most likely because the helicopter continued to climb although Ground operator A had not moved away to a safety position, and probably because communication between the Ground operators and the onboard mechanic was inadequate.

5. SAFETY ACTIONS

(1) Safety Actions Considered Necessary

As described in "ANALYSIS", it is necessary for the external cargo sling operators to ensure thoroughly that the ground operators shall never approach cargoes without sending a sign to the onboard mechanic, and that when finding the ground operator has not moved to a safe position during the monitoring of ground work, the onboard mechanic shall secure the safety for the ground work in cooperation with the captain.

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

a) The company issued a reminder to those involved in the cargo transport in the company regarding ensuring the safety of ground work.

b) In the education and training materials in accordance with the company's operations procedures, the company clearly specified the procedures such as when the support work is unavoidable, the ground operator shall do it after giving a sign to the onboard mechanic care, and the ground operator shall not approach Cargo nets without sending a sign (June 24, 2023)

c) Regarding b) described as above, the company informed the executing company about it and provided reeducation for the ground operators and those involved in the cargo transport in the company. (July 5, 2023)