AI2022-2

AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT

TOHOKU AIR SERVICE, INC.
J A 3 3 2 T

March 24, 2022

Japan Transport Safety Board

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.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

i) In case of being able to determine, the term "certain" or "certainly" is used.
ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.
iii) In case of higher possibility, the term "probable" or "more likely" is used.
iv) In a case that there is a possibility, the term "likely" or "possible" is used.

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

February 25, 2022
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	Tohoku Air Service, Inc.
Type, Registration Mark	Eurocopter AS332L1 (Rotorcraft) JA332T
Incident Class	Dropping of Object during External Cargo Sling Operation Item 15, Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act of Japan prior to revision by the Ministerial Ordinance on Partial Revision of the Ordinance for Enforcement of Civil Aeronautics Act (Ordinance of Ministry of Land, Infrastructure, Transport and Tourism No. 88 of 2020)
Date and Time of the Occurrence	At about 09:50 Japan Standard Time (JST: UTC + 9 hours; unless otherwise stated, all times are indicated in JST in this report on a 24-hour clock), August 28, 2020
Site of the Serious Incident	Nagaoka City, Niigata Prefecture (37'29"04 N, 139'02"19 E)

1. PROCESS AND PROGRESS OF THE INVESTIGATION

Summary of the Serious Incident	On Friday, August 28, 2020, while transporting a cargo (removed materials from a steel tower weighing approximately 790 kg) by cargo sling after take-off from the Chuetsu substation temporary helipad in Nagaoka City, Niigata Prefecture, the helicopter dropped the cargo on a grassy area in the vicinity of the temporary helipad at about 09:50. There was no damage to the helicopter, or no injury to persons onboard or on the ground.
Outline of the Serious Incident Investigation	An investigator-in-charge and two investigators were designated on August 28, 2020. An accredited representative and an advisor of the French Republic participated in the investigation as the State of Design and Manufacture of the helicopter involved in the serious incident. Comments were invited from the party relevant to the cause of the serious incident and from the Relevant State.

2. FACTUAL INFORMATION

Aircraft Information

Aircraft type: Eurocopter AS332L1
Serial number: 9005 Date of manufacture: November 22, 2004
Airworthiness certificate: DAI-2020-105 Validity: June 9, 2021

Personnel Information

Captain: Age: 55

Commercial pilot certificate (Rotorcraft): January 25, 1991

Specific pilot competence certificate

Expiry of practicable period for flight: May 27, 2022

Type rating for multiple-engine turbine (Land)

Aerospatiale SA330 September 1, 2011

Class 1 aviation medical certificate Validity: July 22, 2021

Total flight time: 7,560 hours 50 minutes

Flight time on the type of the aircraft: 939 hours 40 minutes

Meteorological Information

The weather was fine, and the wind was almost calm with no turbulence during the flight (statement of the captain).

Event Occurred and Relevant Information

(1) History of the flight

The helicopter took off from the Chuetsu substation temporary helipad at 09:17 to transport the materials pertaining to the renovation work of the steel tower after the onboard guide holding a mechanic qualification had confirmed in preflight inspection that there was no anomaly with the airframe and the external cargo sling system. In the helicopter, the captain sat in the left pilot seat, the trainee for OJT in the right pilot seat, and the onboard guide on the left rear seat to perform onboard guidance, cargo detach operations, and so on. Two persons each of the ground worker engaged in sling work (the hook person) and the ground worker engaged in ground guidance by hand signal (the signal person) were assigned on the side of each steel tower and in the temporary helipad. The sling length was set to be 16 m from the flight survey result of the previous day.

The helicopter equipped with two hooks in red and yellow, respectively, which were independent from each other, moved to over the cargo to be transported in the next operation under the control of the captain guided by the signal person and the onboard guide after transporting a winch weighing approximately 2.7 t from the helipad to the side of the steel tower No. 3 with the red hook. The hook person who had been on standby for the next transportation grasped the yellow hook that was guided in front of him or her, the load beam of which was in locked condition and the keeper in unlocked condition, and opened the keeper to hook the hanging ring of the wire, which combined two cargo nets containing the materials of the steel tower (weighing approximately 790 kg), on the load beam of the yellow hook. The hook person confirmed in accordance with the procedures that the hanging ring was securely hooked on the load beam, strongly pulled the wire of the sling cargo twice to securely lock the keeper, and confirmed with the signal person that the hook lock indicator and the keeper unlock lever were in lock position. After the captain by the indicator installed in the pilot seat and the onboard guide by the indicator installed in the left rear seat, respectively, confirmed that the load beam and the keeper were in lock condition and they verbally confirmed each other, the helicopter commenced a 10th transportation of the day to transport the sling cargo to the helipad. When the helicopter climbed and the sling cargo left the ground, the load beam and the keeper were locked. When the helicopter turned from the northwesterly direction and was flying at an altitude of approximately 25 m above ground level with the nose facing the helipad, the sling cargo suddenly dropped. The worker assigned as communication personnel in the helipad saw the moment the load beam suddenly opened, and the sling cargo dropped without largely swinging.

According to the onboard guide, when the sling cargo dropped, he or she opened a one-third of the left rear door to prepare for commencing guidance putting his or her hands on the door kept facing the front, and he or she did not touch the cargo hook switch (momentary switch) of the cabin control box that functioned as cargo detach operations.

After the helicopter landed at the helipad, the onboard guide confirmed that there was no anomaly with the system, and the load beam and the keeper were locked. There was no damage to the hanging ring of the collected cargo nets, the load beam, and the keeper.

Take-off and landing at the helipad were performed from the northwesterly side, and the serious incident occurred during a fourth approach of the day to the helipad with the cargo externally slinging.

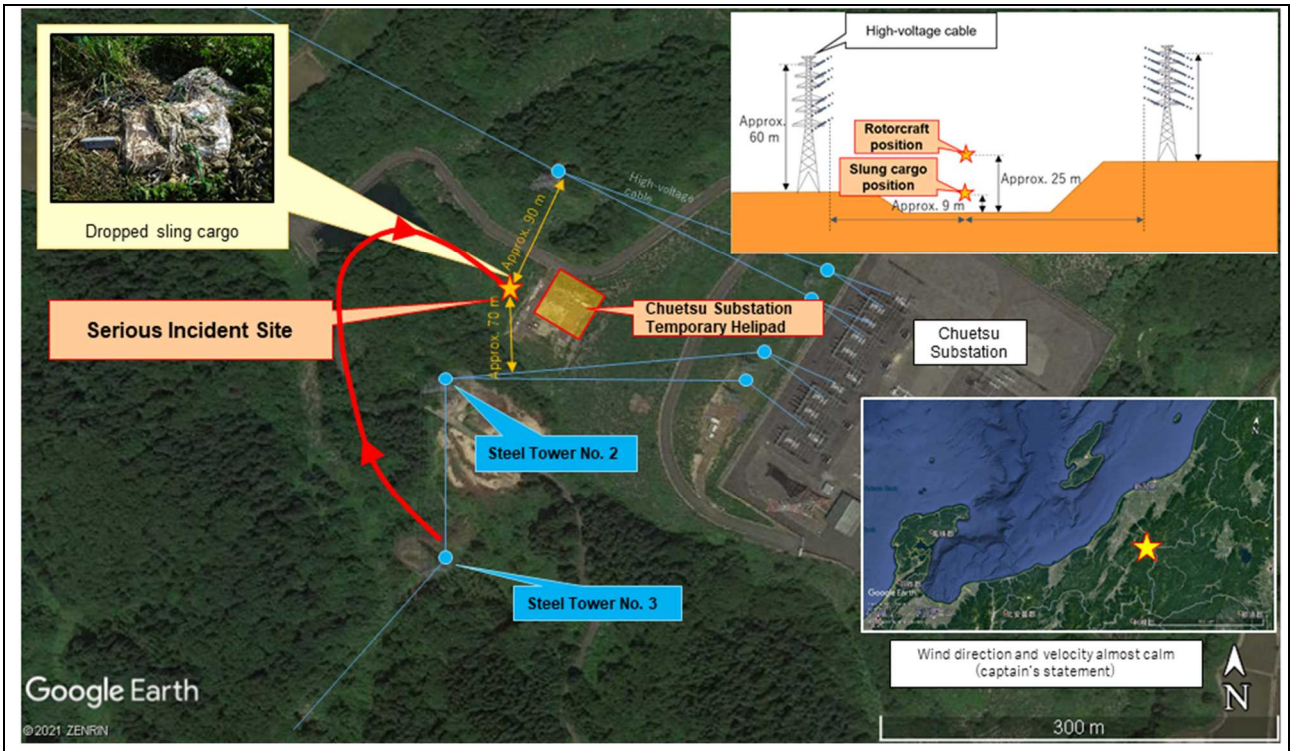

Figure 1　Estimated flight route

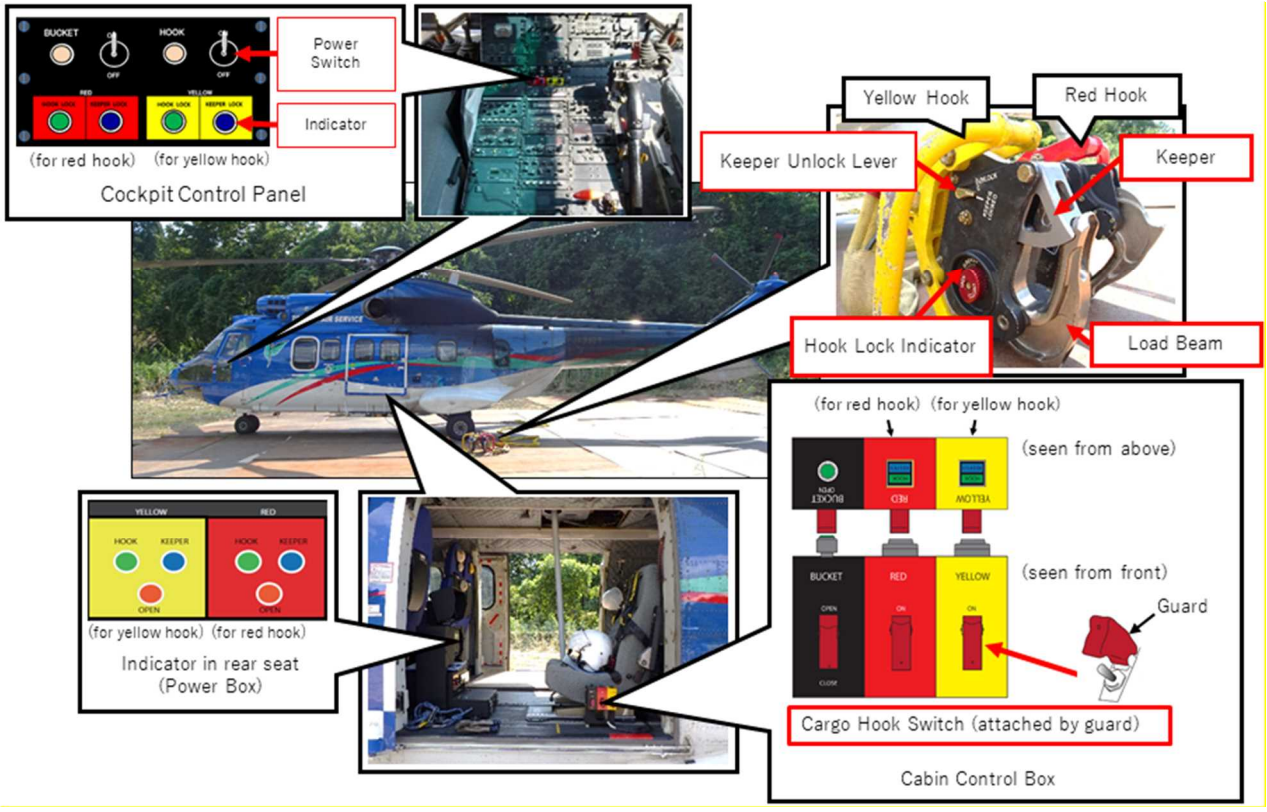

Figure 2　Arrangement of hooks, switches, and indicators

(2) External cargo sling system

The external cargo sling system had specifications that electricity was supplied by switching "ON" the power switch of the cockpit control panel, and switching "ON" the cargo hook switch of the cabin control box installed on the side of the rear seat activated the relay inside the power box and released the lock of the load beam and the keeper. The cargo hook switch was attached by the guard that functioned as a measure to prevent malfunction. The load beam had a mechanism to return to lock position by the inner spring after it opened by the cargo hook switch onboard, or it

manually opened from the hook. Despite that the keeper had specifications to be kept unlocked until it was locked by applying a load on the load beam, it often returned to lock position.

Besides, once the load beam and the keeper were locked, they mechanically kept a locked status until the hook was manually unlocked, or a signal was sent to open the hook by switching "ON" the cargo hook switch. During the series of external cargo sling operations, the power switch was kept "ON" all the time.

(3) Detailed inspection of external cargo sling system, etc.

Cargo sling system of the helicopter comprised the external cargo sling system consisted of the hook and the sling, etc., and the power box, etc. (electricity supply system) that supplied and controlled electricity to the system.

Detailed inspection of each system as described below was performed with the result showing that any of them was normal.

(i) functional and electrical tests in condition of adding impact and vibration

(ii) teardown inspection of the wire bundles and the components

(iii) teardown inspection and load test of the hooks

(4) Electromagnetic interference

At the time of occurrence of the serious incident, a high-voltage cable in the surroundings was in live line condition (condition where voltage was applied to the high-voltage cable), and a computed electromagnetic field strength in the rotorcraft position and hook position at the time of the occurrence was 46V/m/0.467 micron T and 18V/m/0.259 micron T, respectively, that indicated the level of daily life.

3. ANALYSIS

The possibility that a malfunction of the external cargo sling system due to shaking of the airframe, etc. caused the load beam to open was reviewed in the detailed inspection of the system. The JTSB concludes that the possibility is probable to be low from the result that the same phenomenon was not reproduced in the inspection.

The possibility that a malfunction of the external cargo sling system such as a malfunction of the relay due to electromagnetic interference was also reviewed since the system controlled the release of the lock of the hook only by the single relay inside the power box. The possibility is also probable to be low since the helicopter had flown for cargo transportation, prior to the serious incident, in the course that was closer to the high-voltage cable than the serious incident, and the electromagnetic field strength in the vicinity of the serious incident site, 70 m away from the high-voltage cable, was computed to be on the level of daily life.

It is probable that there occurred no problem with the sling work such as improper wire roping *1, etc. since the load beam, the keeper, and the hanging ring did not sustain any damage. Besides, it is probable that the closed load beam and keeper after landing were explained by the keeper that returned to lock position when the hanging ring came off and the load beam returned to lock position since the keeper often returned to lock position.

The possibility that the sling cargo dropped by an operation error of the cargo hook switch is probable to be low since the onboard guide stated that he or she did not touch the cargo hook switch and faced the front putting his or her hands on the door when the sling cargo dropped, and the cargo hook switch was attached by the guard to prevent an operation error.

From analysis of these, the probable cause of the opened load beam and dropping of the sling cargo could not be determined.

However, that it is probable that the possibility that the onboard guide automatically touched the cargo hook switch due to the routine caused by the repeated behavior cannot be denied since the serious incident occurred in a 10th transportation and the same pattern of behavior had been repeated in unloading the cargo during the period.

From the perspective of preventing recurrence, that it is probable that measures to improve fail-safe and fool proof of the external cargo sling system are effective so that the lock of the load beam cannot be released by immediate activation of the relay even in the case of a temporary malfunction of the system or an operation error of the cargo hook switch.

*1 "Improper wire roping" means that a roping should astraddle a load beam, instead it straddles between a load beam and a keeper, which are merely closed in contact by a force of spring.

4. PROBABLE CAUSES

The JTSB concludes that, in the serious incident, it is probable that the sling cargo dropped during the external cargo sling operation since the load beam was suddenly unlocked and open. The probable cause of the unlocked load beam could not be determined.

5. SAFETY ACTIONS

After the serious incident, the company suspended the use of the subject external cargo sling system, and external cargo sling operations were performed by other existing equipment (manual hook) that was allowed to be equipped to the subject helicopter until improvements in fail-safe of the system operation and enhanced information function to flight crew are implemented.