

AI2019-7

**AIRCRAFT SERIOUS INCIDENT
INVESTIGATION REPORT**

**NISHI NIPPON AIRLINES CO., LTD.
J A 0 0 3 W**

October 31, 2019



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.

Nobuo Takeda
Chairman
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

October 11, 2019

Adopted by the Japan Transport Safety Board



Chairman Nobuo Takeda
 Member Toru Miyashita
 Member Yoshiko Kakishima
 Member Yuichi Marui
 Member Yoshikazu Miyazawa
 Member Miwa Nakanishi

Company Name	Nishi Nippon Airlines Co., Ltd.
Aircraft Type, Registration Mark	Bell 412 EP (Rotorcraft) JA003W
Incident Class	Dropping of Object during External Cargo Sling Operation Article 166-4 (xv) of Ordinance for Enforcement of the Civil Aeronautics Act of Japan
Date and Time of the Occurrence	At about 13:22 Japan Standard Time (JST: UTC+9 hours, unless otherwise stated all times are indicated in JST on a 24-hour clock), October 20, 2018
Site of the Incident	Otoyo Town, Nagaoka County, Kochi Prefecture (33°45'14" N, 133°45'43" E)

1. PROCESS AND PROGRESS OF THE INVESTIGATION

Summary of the Serious Incident	On Saturday, October 20, 2018, the Aircraft dropped the fresh concrete from the bucket that was slung external to the Aircraft while flying over the mountain forest in Otoyo Town, Nagaoka County, Kochi Prefecture. There was no damage to the ground.
Outline of the Serious Incident Investigation	The Japan Transport Safety Board designated an investigator-in-charge and one investigator on October 20, 2018 to investigate this serious incident. Comments were invited from parties relevant to the cause of the serious incident. Comments were invited from the Relevant States.

2. FACTUAL INFORMATION

Aircraft Information Aircraft type: Bell 412EP Serial number: 36223; Date of manufacture: January 12, 1999 Certificate of airworthiness: No. DAI-2018-118; Validity: May 24, 2019
Personnel Information Captain: Male, Age 63 Commercial pilot certificate (Rotorcraft) February 4, 1983

Specific pilot competence certificate

Expiry of practicable period for flight: March 26, 2020

Type rating for Bell 212

January 23, 1996

Class 1 aviation medical certificate

Validity: December 8, 2018

Meteorological Information

Weather conditions in the vicinity of the Temporary Helipad in Otoyo Town, Nagaoka County, Kochi Prefecture were clear with a north-northeast wind of 15 to 20 kt and there existed rough air condition in the flight route according to the statement of the pilot.

Details of the Incident and Related Information

(1) History of the Flight

The Aircraft took off from the cargo loading site of the Temporary Helipad in Otoyo Town around 12:20 to transport the fresh concrete used for the construction work of an electricity pylon of the power grids to the cargo unloading site located about 1.9 km in the east-southeast. About 10 times of round flights were planned for the transport of the fresh concrete using two buckets, one each alternately.

After the second transport of the fresh concrete by the Aircraft, there occurred the malfunction that the shutter of the opening on the bottom of the bucket did not open by the operation from the cockpit. Due to the malfunction, the ground worker A at the cargo unloading site manually operated the open/close handle to open and close the shutter from the third transport in accordance with the Company's regulation for transport operation.

Around 13:20, the Aircraft departed the cargo loading site for the tenth transport. The Aircraft was severely shaken in a vertical direction several times due to rough air condition over the valley in the flight route. When the Aircraft approached the cargo unloading site, the bucket operator sitting in the left pilot seat noticed that, when he looked at the slung bucket to guide the Aircraft, the shutter was open and the fresh concrete (about 600 kg) was missing.

The Aircraft returned to the Temporary Helipad without doing anything and landed there. After the landing, the ground worker B at the cargo loading site confirmed that the shutter of the bucket was open about 80% and closed the shutter by the open/close handle. The Worker B did not operate the shift lever of the bucket at this time.

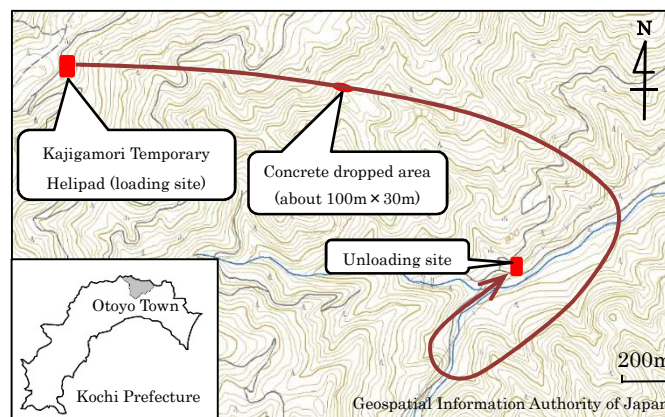


Figure 1: Estimated Flight Route

(2) Open/Close of Shutter and Lock Mechanism

There are two modes of “auto” and “manual” available for opening and closing the shutters. “Auto” is set when opening the shutter by operation from the cockpit and “manual” is set when a ground worker manually opens it by the open/close handle. When the open/close handle is in the completely closed position, the shutter is locked by the over center mechanism and cannot

open by the load of the fresh concrete. Besides, the actuator for opening and closing shutter can fix the position of the shutter by setting the shift lever to “auto” position and connecting it with opening and closing mechanism because it retains the contracted condition of the operating signal input when it is shut down.

The Company was using both the fixing function of the actuator and the locking of the over center mechanism in order to prevent unintended opening of the shutters.

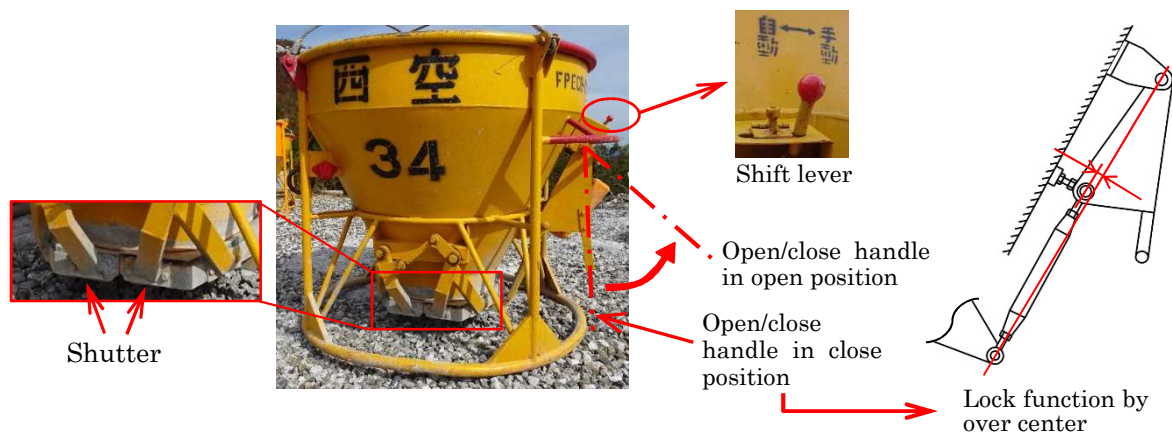


Figure 2: The bucket used at the time of the serious incident

(3) The Company’s Regulation for the Transport Operation

The Company’s regulation for the transport operation provided that the shift lever was to be shifted to “auto” after having discharged the fresh concrete at the cargo unloading site in order to have the shutter securely fixed to the closed position even in the case of opening and closing the bucket by “manual”. Besides, there was no process provided in the regulation to confirm that the open/close handle was to be in the closed position and the shift lever was to be in “auto” position before filling the fresh concrete in the bucket at the cargo loading site.

(4) Confirmation of Locking the Shutter

When the bucket was used in the eighth transport just before used in the tenth transport where the serious accident occurred, the ground worker A at the cargo unloading site did not recall whether he shifted the shift lever from “manual” to “auto” after discharging the fresh concrete. Besides, the ground worker B and C at the cargo loading site recognized that the open/close handle was to be in the closed position and the shift lever was to be in “auto” position, however, did not recall whether they confirmed these prior to the tenth transport.

(5) Cause of the Malfunction That the Shutter did not Open by On-Board Operation

Through the troubleshooting after this serious incident, it was confirmed that the wire that supplied the operating signal of the actuator to the bucket was cut. The functional test performed on the ground by connecting the bucket system and the Aircraft in the same situation as the serious incident after repairing the cut wire, revealed that the shutter normally operated at “auto” mode.

3. ANALYSIS

(1) Locking the Shutter

It is highly probable that the shift lever was in “manual” position and the fixing function of the shutter by actuator did not work at the time of the tenth transport because the ground worker B at the cargo loading site manually closed the shutters without operating the shift lever when the Aircraft returned to the Temporary Helipad after the serious incident. Besides, it is highly probable that the locking by the over center mechanism did not work either at this time

because the fresh concrete dropped in the tenth transport.

It is probable that the ground worker A did not securely close the open/close handle after discharging the fresh concrete in the eighth transport, and furthermore, he forgot to shift the shift lever to “auto” position. Also, it is probable that the ground worker B and C did not confirm that the open/close handle was securely in the closed position and the shift lever was in “auto” position when filling the fresh concrete into the bucket for the tenth transport.

(2) Opened Shutter

It is highly probable that the shutter did not open immediately after the fresh concrete had been loaded into the bucket for the tenth transport under the situations that locking by the over center mechanism of the shutter did not properly work. However, it is probable that the shutter was forced to be opened by the load of the fresh concrete imposed on the shutter which increased by the downward inertia when the Aircraft was vertically shaken due to rough air condition in flight.

(3) Thorough Implementations of the Work

The Company’s regulation for transport operation did not include the procedure to confirm that the locking by the over center mechanism and the shift lever was in “auto” position. It is desirable that the Company provide the procedure for such confirmation and procedure to prevent forgetting, and notify all workers involved in transport operation.

4. PROBABLE CAUSES

In the serious incident, it is highly probable that the fresh concrete dropped on the ground by unintended opening of the shutter while the Aircraft was flying with loading the fresh concrete in the bucket.

It is probable that the unintended opening of the shutter was caused by the increased load imposed on the shutter when the helicopter was shaken due to rough air condition and was flying in the situation that the locking by the over center mechanism of the shutter was not properly working.

5. SAFETY ACTIONS

The Company has established following safety actions after the serious incident.

- (1) “Lock/Unlock” placard has been additionally displayed to the shift lever of every bucket used by the Company.
- (2) The Company’s regulation for transport operations have been revised as described below and performed reeducation for all workers involved in transport operations.
 - (i) To provide the methods for confirmation of locking by the over center mechanism and the shift lever position when operation the bucket by manual opening and closing.
 - (ii) To provide to suspend of work when change in the work has occurred and situations have changed from pre-work meeting, and to hold a separate meeting to confirm the work after the change and the methods to implement such work.
- (3) Aircraft accident case study in the past have been added to the recurrent trainings for workers involved in transport operation
- (4) “Confirmation by pointing and calling” and “confirmation by vocalizing” have been recommended as a basic action to secure safety in the entire of work.