

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23LA309

AIRWORTHINESS FACTUAL REPORT

October 9, 2024

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. AIRWORTHINESS FACTUAL REPORT.....	3
C. SUMMARY.....	3
D. DETAILS OF THE INVESTIGATION	4
E. WRECKAGE AND IMPACT INFORMATION.....	5
F. AIRCRAFT INFORMATION.....	5
G. AIRFRAME EXAMINATION.....	6
H. ROTOR BLADE EXAMINATION.....	8
I. ENGINE EXAMINATION.....	9
J. MAINTENANCE RECORDS.....	11
K. PHOTOGRAPHS AND FIGURES	12

A. ACCIDENT

Location: Caldwell, Ohio
Date: July 23, 2023
Time: 1420 Eastern Daylight Time (EDT)
1920 Coordinated Universal Time (UTC)
Aircraft: Bell Helicopter 206-L4, N482TJ

B. AIRWORTHINESS FACTUAL REPORT

NTSB IIC Adam Gerhardt
National Transportation Safety Board
Washington, D.C, USA

Group Member Gary Howe
Bell
Forth Worth, Texas, USA

Group Member Jon-Adam Michael
Rolls-Royce
Indianapolis, Indiana, USA

Group Member Chris Gatley
Van Horn Aviation
Tempe, Arizona, USA

C. SUMMARY

On July 23, 2023, about 1420 eastern daylight time, a Bell 206-L4 helicopter, N482TJ, was involved in an accident near Caldwell, Ohio. The commercial pilot sustained serious injuries. The helicopter was operated by Sky Aviation Corp. under the provisions of Title 14 *Code of Federal Regulations* Part 133 external load operations.

The pilot had completed several external load cargo drop operations in the morning and had refueled multiple times from a trailer based fuel tank at an off-airport landing zone (LZ2). The ground crew assisting the pilot reported that there were no anomalies observed during the morning flying. The helicopter departed for another flight; flight track data showed that the pilot maneuvered over eight drop zones, which was the total number of possible bags to drop from the external carousel hook system. The pilot returned to the landing zone and shut down the helicopter. During the stop, the ground crew added 335 lbs of fuel, and fluid levels were checked, however, no fluids other than fuel were added to the helicopter.

After departing the landing zone, the flight track data indicated that the pilot maneuvered southeast towards one drop zone and then proceeded to maneuver to drop another bag. The flight track showed the helicopter circled the area over the accident site before the helicopter descended through the trees in near vertical path (straight-down) and impacted terrain.

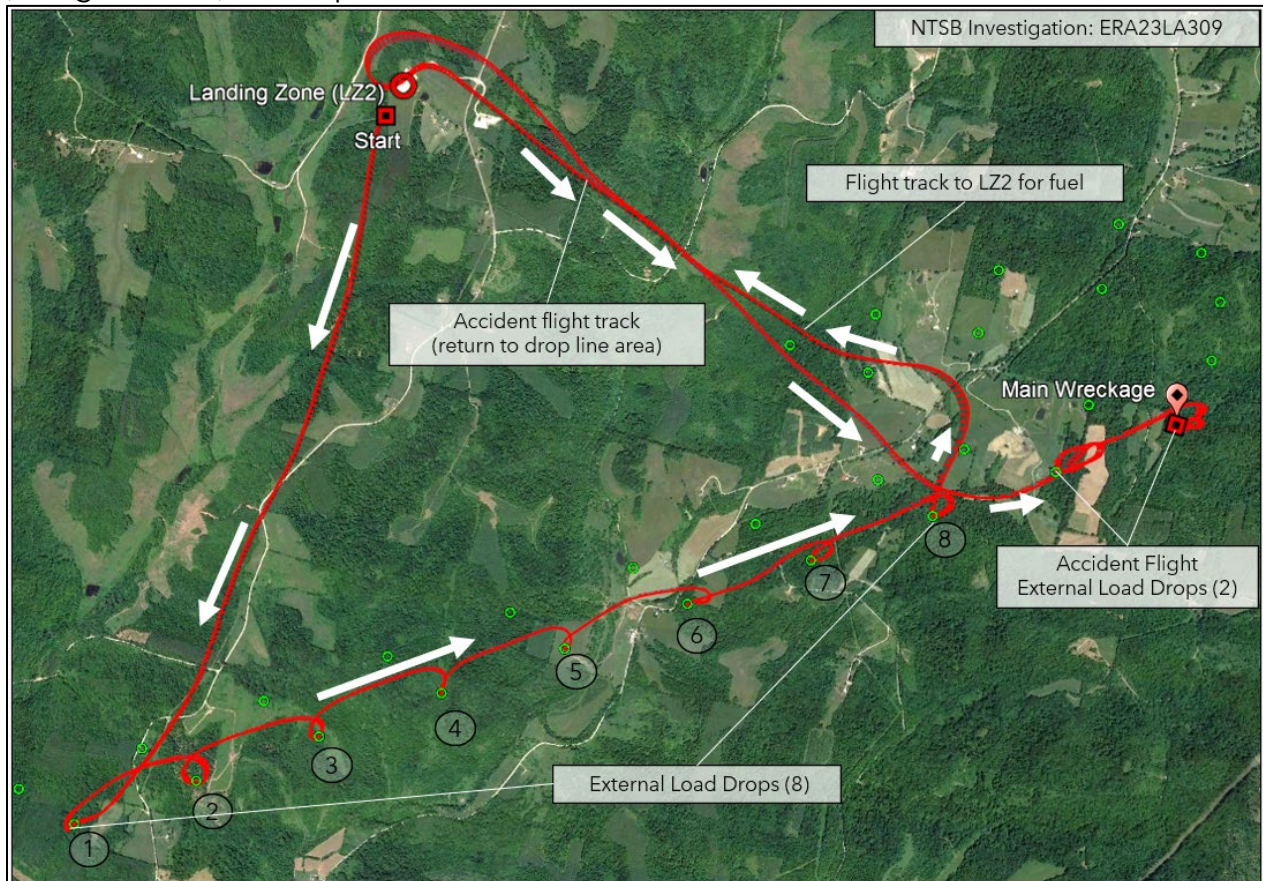


Figure 1: Overview of the Foreflight Sentry flight track (red line) with drop zones (green dots) and accident site denoted.

D. DETAILS OF THE INVESTIGATION

The NTSB did not travel to the accident site. The accident helicopter was recovered to AMF Aviation, Springfield, TN. The NTSB and party members examined the helicopter on August 30 and 31, 2023. This report contains the findings pertaining to the helicopter's airworthiness.

E. WRECKAGE AND IMPACT INFORMATION

Photographs of the accident site provided by Federal Aviation Administration inspectors depicted that the helicopter sustained substantial damage. The tail boom had separated from the fuselage and was found a few feet from the fuselage. Both main rotor blades had fractured from the main rotor mast. The long line was found partially wound around the main rotor mast and the cargo hook remained closed.

The long line was found entangled with the trees surrounding the main wreckage. The external load was found about 20-30 ft from the main wreckage. The below figure outlining the wreckage orientation was provided by the Ohio State Highway Patrol.

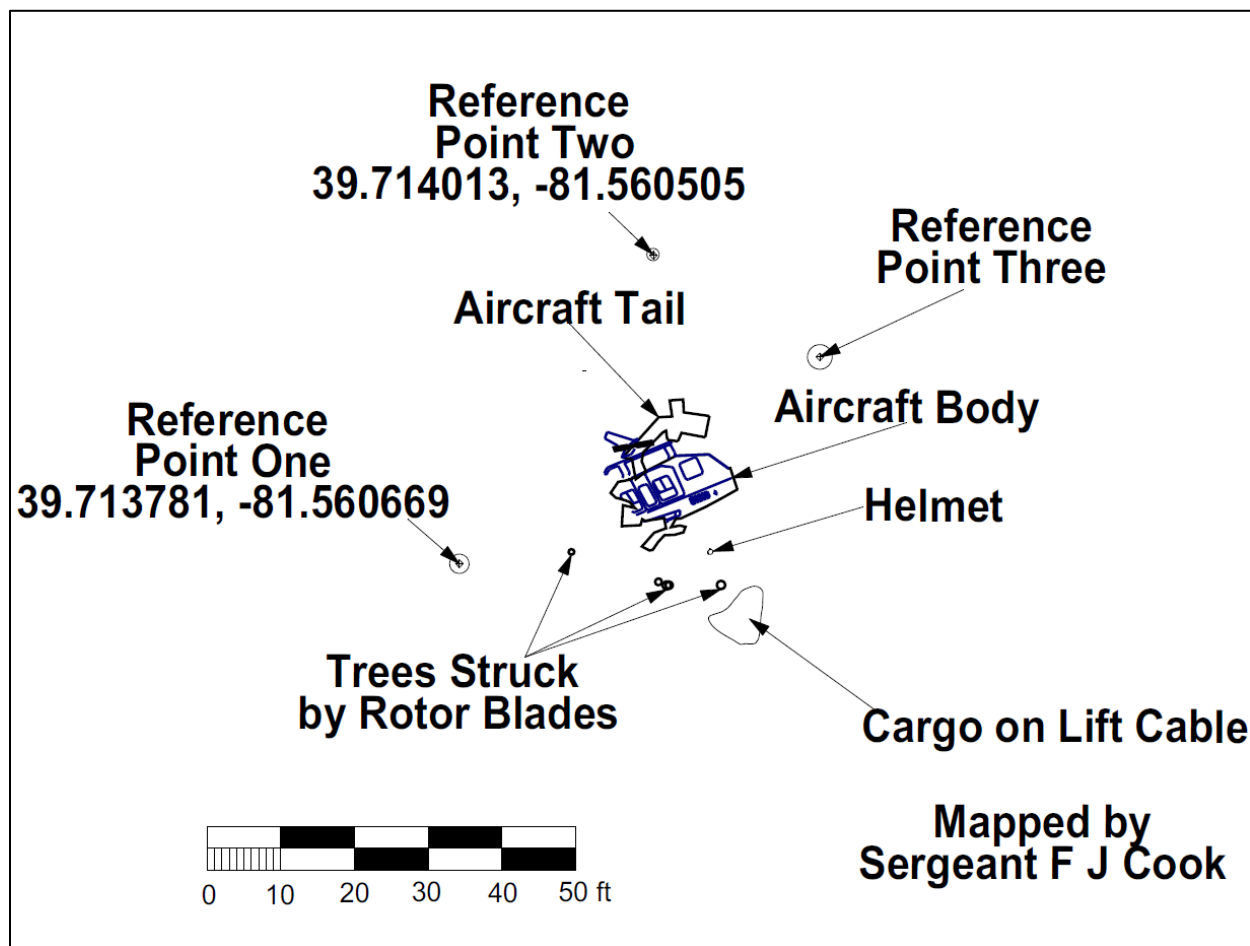


Figure 2: Wreckage diagram provided by the Ohio State Highway Patrol.

F. AIRCRAFT INFORMATION

The accident helicopter was a Bell 206 LongRanger IV (206L4), serial number 52174, equipped with a Rolls-Royce 250-C30P, reverse flow turboshaft engine, serial number CAE-895856. The accident aircraft was manufactured in July 1996. Prior to

the accident flight, the recorded total time on the airframe was 7,211.9 hours. The engine had accumulated 6,827.7 hours.

According to a cargo loading document provided by the operator, a total of 1,070 lbs of external load was hooked to the cargo hook system via 8 separate bags.

During the accident flight, following the refueling and reloading, the first bag was dropped, which weighed 130 lbs, resulting in 940 lbs remaining attached to the helicopter at the time of the accident.

Bell Technical Advisors were requested to provide Out of Ground Effect Hover performance information for the assumed conditions and weight experienced at the time of the accident. The performance calculations found that the accident helicopter would have had sufficient performance for an out of ground effect hover. In addition, the helicopter experienced no issues with the repeated drops and maneuvering with a similar load configuration earlier in the day and during the accident flight.

G. AIRFRAME EXAMINATION

Airframe: The components of the forward airframe (cockpit area) was substantially damaged by impact forces. The tail boom separated just aft of the intercoastal support. Both horizontal stabilizers remained attached to the tailboom. The right finlet had separated but the left finlet remained attached.

Flight controls: The cyclic and collective had been removed from the left side of the cockpit prior to the flight. The pilot cyclic was fractured at the base, however, when the base of the cyclic was moved, there was corresponding movement of the control tubes to the right servo actuator. Lateral movement of the cyclic controls was not possible due to damage caused by impact. Control tube continuity was observed to all three servo actuators. The left seat collective was fractured at the base but moving the collective base on the right side showed corresponding movement to the center servo actuator. Additionally, there was a fracture of the cyclic yoke underneath the seats. The left side anti-torque pedals were recovered. Directional control continuity was observed from the fractured control tube in the tailboom to the fractured control tube under the cockpit. Additional continuity was observed from the fracture control tube (in the separated tail boom) to the tail rotor blades. All three main rotor servos remained attached to the support and hardware was present.

Main Rotor / Main Rotor Drive System: There was no evidence of main rotor drive discontinuity prior to the accident sequence. The main transmission remained attached to the airframe. Main rotor continuity was confirmed by rotating the KAFLEX drive shaft by hand. Movement was confirmed from the drive shaft through the transmission to the mast. Additionally, the 4th stage turbine wheel was rotated by

hand and showed movement of the KAFLEX driveshaft and when rotating in the opposite direction demonstrated that the freewheel unit operation. The mast was bent during the accident sequence. The bump stop showed contact signatures. The transmission was visually inspected, and no pre-impact anomalies observed. The chip detector was removed and visually inspected with no particulate matter observed. No abnormal sounds were heard when the transmission was rotated by hand.

Tail Rotor Drive System: No pre-impact anomalies were observed with the tail rotor drive system. The aluminum tail rotor drive shafts were continuous from the #1 drive shaft segment which had been pulled from the tail rotor gearbox to the fractured # 5 drive shaft segment which appeared to be fractured in overload. The tail rotor gearbox and tail rotor remained installed. Rotation of the tail rotor resulted in a corresponding rotation of the tail rotor gearbox to the input quill; the rotation was smooth and exhibited no evidence of binding or restrictions. Oil was present within the tail rotor gearbox. The oil was of normal color with no abnormal smell. The tail rotor gearbox chip detector was removed and contained no magnetic particles.

Tail Rotor: The two tail rotor blades remained installed and did not exhibit significant deformation or fragmentation. The tail rotor flap stops exhibited evidence of contact with the yoke. The tail rotor pitch change links remained installed and did not exhibit fractures or deformation. The pitch of the tail rotor blades was manipulated by hand with appropriate control movement forward to the aft end of the fractured control tube.

Fuel and Hydraulics: No fuel or hydraulics issues were suspected or reported. The airframe fuel filter was opened and revealed a presence of fuel that was normal color and smell. No sediment was observed in the bowl and no debris observed in the filter element. No pre-existing fuel leaks were observed. There was a trace amount of hydraulic fluid in the reservoir and no debris observed in the screen filter. No pre-existing hydraulic leaks were observed.

Instrument System, Electrical System and Avionics: A complete examination was not conducted; no issues were suspected or reported.

External Cargo System: The cargo hook attached to the underside of the fuselage was found closed with the long line hook still attached. There was no evidence of pulling damage or deformation to the hook system. The emergency hook release was found closed. When actuated, the cargo hook opened, and the long line hook separated from the helicopter. The long line was found twisted around the main rotor mast. Extending downward from the long line hook, about 14 ft in length, the line exhibited evidence of tearing and abrasions where it had wrapped around the main rotor mast. The total length of long line was measured to be 122 ft.

A carousel cargo hook device was located in the debris. It contained a total of 8 hooks, which were found closed.

H. ROTOR BLADE EXAMINATION

The main rotor blades were Van Horn Aviation blades (PN20633000-101, SN A024, SN A025). Both blades exhibited significant fragmentation. The root ends remained attached to the hub with fractures immediately outboard of the main rotor grip plates.

Both blades exhibited multiple indications of leading edge impact related damage. The trailing edge was split open down the entire length of the recovered blades. Respective to blade A024, about 150 inches of blade fragments were pieced together, and of A025, about 180 inches were pieced together. The total length should be about 208 inches. Multiple fragments from the outboard portion of the blades including one tip closeout (PN 20633313-1) piece were located, however which blade they came from could not be determined. In addition, all four trim tabs were located in the debris. The figures below provide an overview of fragments located for both main rotor blades.

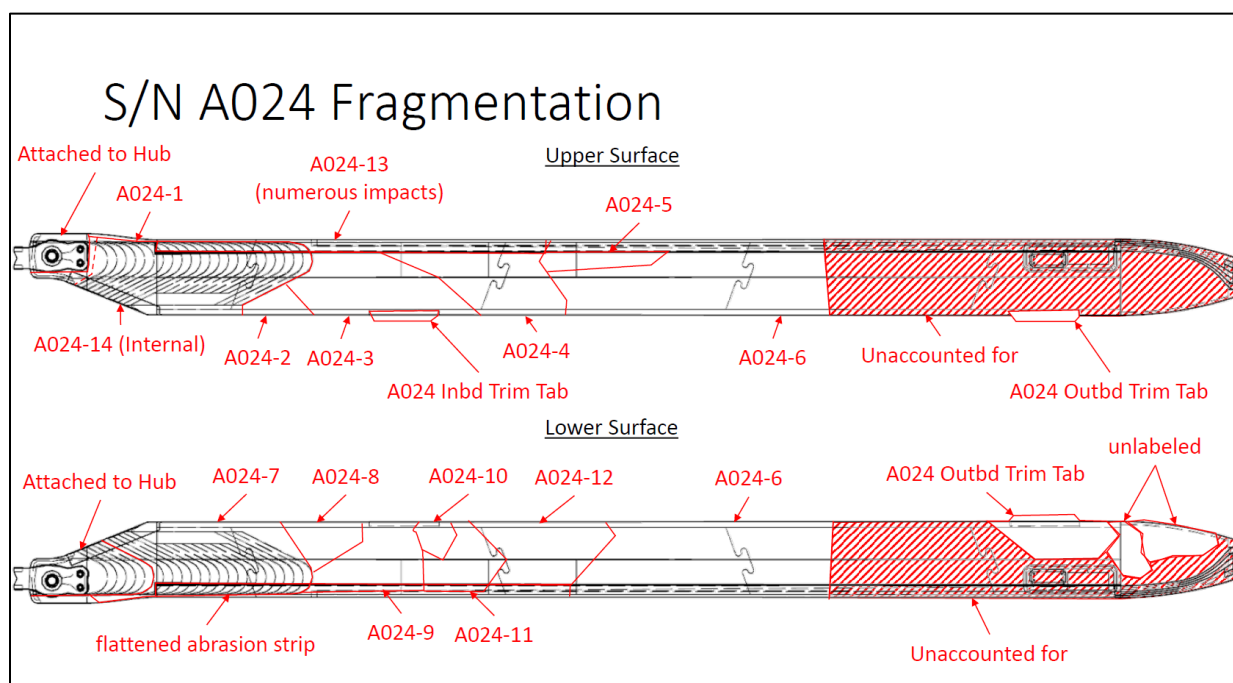


Figure 3: Main rotor blade A024 fragments.

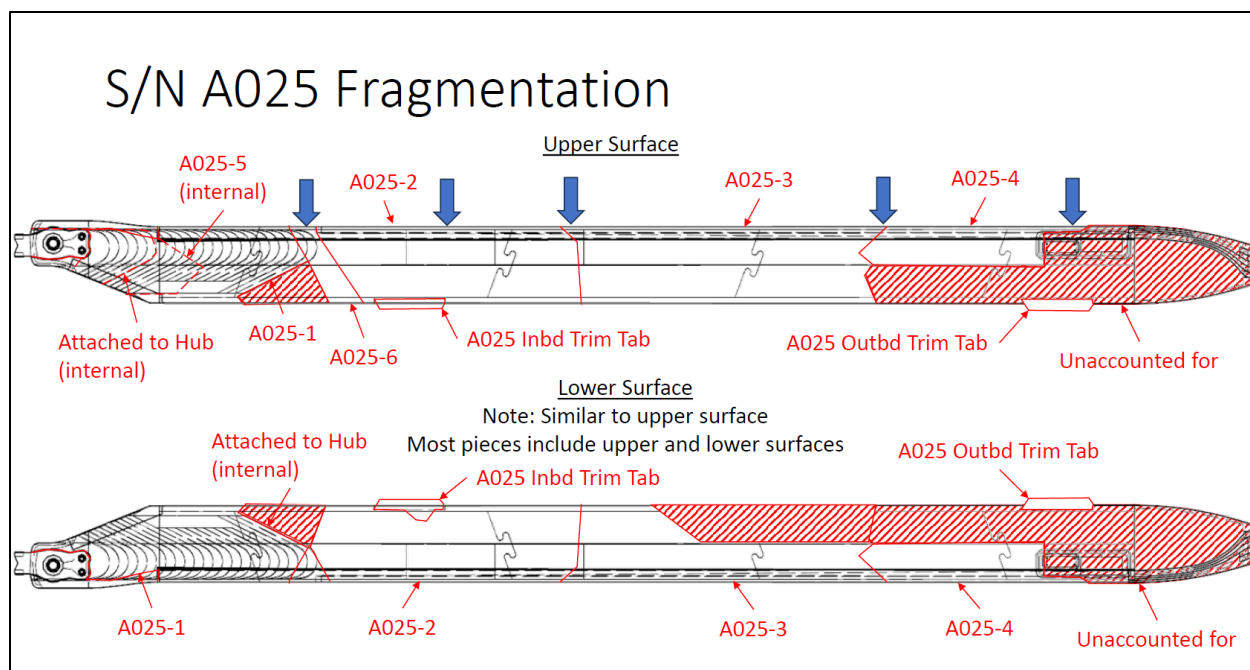


Figure 4: Main rotor blade A025 fragments.

The leading edge abrasion strip was fractured at multiple locations including large sections that had entirely separated and were deformed and flattened. The foam core was found heavily fragmented, and the majority of the foam core had evacuated from the interior of the blades. There were multiple foam core remnants internal to the blade fragments.

The balance weight receptacles (PN 20633311-1) were not located in the recovered wreckage, nor did they remain installed. On blade A025 a portion of the weight pocket cut out was located where the weight normally would have been installed. Leading edge impact damage was observed immediately forward of that location.

Multiple segments of the tungsten noise weight (PN20633921-1) were missing from the interior of the blade. There was evidence of impact related damage in their respective installation areas.

I. ENGINE EXAMINATION

Engine Information:

Engine Model	250-C30P
Rating	650 Shaft Horsepower
Serial Number	CAE 895856

The engine was secure and in place. The left front mount leg was bent and the left rear was broken. The left discharge tube displayed two dents. Otherwise the engine was undamaged.

All of the engine external lines were secure. A pneumatic leak check was performed with no leaks detected. The airframe mounted fuel filter bowl contained residual fuel, which appeared and smelled normal. The filter element was clean.

The engine N1 system turned freely and was continuous from the impeller to the starter generator and first stage turbine wheel. The N2 system turned and was connected to the aircraft power train. No Foreign Object Damage (FOD) was noted on the compressor impeller blades. The fourth stage turbine wheel was normal in appearance when viewed from the exhaust collector.

Linkages from the collective to the Power Turbine Governor (PTG) and from the throttle twist grip to the Fuel Control Unit (FCU) were secure. The FCU throttle input lever moved smoothly.

The engine oil filter was clean and full of oil which was normal in appearance and smell. The upper and lower engine magnetic chip detector plugs were removed and inspected. The upper detector retained a small amount of metallic paste while the lower detector was free of ferrous debris.

The Outer Combustion Case (OCC) was removed, and the combustion liner and air inlet passages of the OCC were normal in appearance with no abnormal burn patterns. The fuel nozzle air shroud face displayed carbon deposits and the primary and secondary fuel orifices were clean. The first stage turbine nozzle shield, first stage turbine nozzle, and first stage turbine wheel blades were intact and normal in appearance.

The compressor was removed and disassembled. Rub indications were observed between the impeller and impeller shroud consistent with engine operation during the impact sequence.

Component	Serial Number	Part Number
Engine 250-C30P	CAE 895856	23062065
Gearbox	CAG 95864	23035178
Compressor	CAC 91955	23051643
Turbine	CAT 95086	23035128
PTG	HR48027	M250-10836
FCU	331576	23087146

Fuel Nozzle	AG83713	M250-10604
Bleed Valve	FF36546	23073353
Fuel Pump	T201272	6896822

J. MAINTENANCE RECORDS

According to the maintenance records provided by the operator, the most recent annual inspection was completed on March 7, 2023. More recent to the accident, on July 10, 2023, 100-HR inspections were noted as complete for maintenance events 1 through 4, with no defects noted. The hobbs meter read 5874.5 hours. At the time of the accident, the engine total time was 6827.7 and the aircraft total time was 7211.9.

K. PHOTOGRAPHS AND FIGURES



Figure 5: View of the helicopter and accident site area.



Figure 6: View of the helicopter and accident site area. Note the long line found wrapped around the main rotor drive shaft.



Figure 7: View of the external load as found next to the helicopter.



Figure 8: View of the helicopter and accident site area. Note the cargo hook remained closed/secured.



Figure 9: Additional view of the long line wrapped around the main rotor drive shaft.



Figure 10: View of a main rotor blade with impact related dirt and debris affixed to its fracture area.



Figure 11: View of the long line tangled with trees.



Figure 12: View of the long line tangled with trees.



Figure 13: View of the helicopter at the recovery facility.



Figure 14: View of the tail rotor and tail boom.



Figure 15: View of the helicopter at the recovery facility.



Figure 16: View of the helicopter at the recovery facility.



Figure 17: View of the servo actuators.



Figure 18: View of the tail rotor.



Figure 19: View of the tail rotor.



Figure 20: View of the main rotor blade recovered fragments.



Figure 21: View of the main rotor blade recovered fragments.



Figure 22: View of leading edge damage to A025 main rotor blade.



Figure 23: View of leading edge damage to A025 main rotor blade.



Figure 24: View of the long line.



Figure 25: View of the cargo hook.



Figure 26: View of the control stick cyclic denoting the "Cargo Release." Right Side: Red handle, emergency cargo release (found closed - not released).



Figure 27: Additional view of "Cargo Release" on the cyclic.



Figure 28: External load carrier with 8 separate release hooks.

Submitted by:

Adam Gerhardt
Senior Air Safety Investigator