AVIATION INVESTIGATION REPORT
A02A0098

LOSS OF CONTROL / COLLISION WITH GROUND

CANADIAN HELICOPTERS
BELL HELICOPTER TEXTRON 212 C-GDVG
GOOSE BAY, NEWFOUNDLAND AND LABRADOR
18 AUGUST 2002

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

A Canadian Helicopters Bell 212, serial number 30762, C-GDVG, was departing Goose Bay, Newfoundland and Labrador, with a sling load. The sling load was a military utility trailer, on a 100-foot long line plus 20-foot chokers, being picked up from the tarmac across from the company ramp. About halfway across the 210-foot wide tarmac, the aft end of the trailer struck the tarmac, leaving a gouge 10 feet long. The trailer then struck the top of another sling load, positioned on the opposite side of the tarmac from the departure point. The helicopter then veered left about 45 degrees as it cleared the airport perimeter fence. Approximately 150 feet beyond the fence, the trailer entered a stand of alders, 20 to 25 feet tall, and cut a swath 75 feet long before being lifted clear of the trees. Over the next approximately 300 feet, the trailer and/or trailer tow bar struck or dug into the ground at least three times. At some point after clearing the fence, the helicopter was observed rotating to the left. It was estimated that the helicopter completed two 360-degree rotations before striking the ground in an upright attitude, 120 feet beyond the trailer, with the long line still attached to the cargo hook. (See Appendix A). The helicopter crashed in a wooded area outside the airport perimeter fence, approximately 800 feet from the departure ramp. The pilot, who was the sole occupant, suffered serious but non life-threatening injuries. The helicopter was substantially damaged. There was no post impact fire.

Ce rapport est également disponible en français.

Other Factual Information

The surface weather record for Goose Bay, Newfoundland and Labrador, at the time of the accident was as follows: temperature 15.3° C, dew point 7.5° C, and wind 060 degrees true at 7 knots.

The helicopter maintenance engineer (AME), who had hooked up the load, observed the helicopter in difficulty and followed after it. When he arrived at the crash site, the engines were still running and main rotor blades were still turning. The AME entered the helicopter via the right cockpit door and attempted to shut down the engines, first by rolling off the throttles, then by turning off the fuel valves, and then by pulling the engine fire handles, all to no avail. (The engines stopped about 20 minutes later due to fuel exhaustion.) He then pulled all circuit breakers and turned off all electrical switches to reduce the hazard of fire as the ground was covered in fuel from ruptured fuel cells. The airport fire fighters, who had been alerted to the crash by the airport tower controller, arrived at the crash site shortly after the AME, and evacuated the pilot from the helicopter.

The pilot, who was flying from the left seat, reported that he had pulled about 97 per cent torque to lift the load off the ground. He also reported that he had encountered some pylon rock in the helicopter while slinging other heavy loads. When he encountered pylon rock during this flight, he expected it to abate as soon as he had gained some forward speed. He had not realized that he had dragged the load on the tarmac or that the load had hit the sling load on the ground, as he associated these events with pylon rock. After clearing the perimeter fence, the pilot was in the process of turning back toward the airport on his intended route. While in this turn, the airspeed decreased and the helicopter entered pylon rock again. During his recovery action, the load struck the ground again. The pilot had armed the cargo hook electrical release prior to picking up the load and had tried to release the load at some point during the flight, but could not recall exactly when.

Experienced Bell 212 helicopter pilots stated that this model helicopter is susceptible to pylon rock during sling operations, and that it is necessary to use very smooth control inputs in order to avoid it. Two other company pilots, who had flown this helicopter a few days prior to the accident flight, reported that it was possible to induce some pylon rock, but that it was well within acceptable limits.

Examination of the helicopter at the crash site showed that the landing gear cross tubes were splayed outward and driven up into the belly of the helicopter. As well, the aft cross tube had broken off in the area of the saddle mounts and had punctured the fuel cell. The nose of the helicopter was partially severed and bent downward. The tail boom in the area of the fin was twisted to the right and the tail rotor drive shaft had severed. The tail rotor blades were broken off about mid-span from contact with the alders and ground and the tail rotor gearbox output shaft was broken off. The twisting signature on the tail rotor drive shaft indicated that it was being driven by the engines at the time the tail rotor blades struck the ground.

After the helicopter was recovered from the site, an examination of the area below the transmission—the Hell Hole—revealed that the aft right quadrant and the aft quadrant had received substantial structural damage from the cargo hook being pulled back against these areas. The tail rotor control tube that runs along the right side of the Hell Hole was jammed in a full-left pitch position and the throttle control tubes that run up the aft wall were also jammed.
The electrical cannon plug that supplies power to cargo hook release was broken off. The cannon plug was re-attached and the cargo hook electrical release was tested and found to be functional.

The emergency locator transmitter (ELT), Pointer Sentry, model number C4000, mounted on the door post just aft of the pilot's seat, had detached from its mounting bracket and was found laying on the floor of the helicopter. The ELT had activated during the crash; however, the antenna had pulled out of the ELT when it detached from the bracket and the signal was not being effectively transmitted. The ELT installation was tested in accordance with *Canadian Aviation Regulations* Standard 551-104; it was determined that the installation was capable of withstanding the ultimate inertia force of 22.5g downward, as required by regulation.

The maximum allowable gross weight for the Bell 212 is 11 200 pounds. The helicopter's empty weight was 6920 pounds, including the weight of the pilot, and there was approximately 1300 pounds of fuel on board at the time of the occurrence. The complete external load, including all attaching equipment, was weighed after the occurrence: the weight was 3200 pounds. The gross weight of the helicopter at the time of the occurrence was calculated to be 11 420 pounds, 220 pounds over the allowable gross weight.

The customer had reported that the trailer and its contents weighed about 3000 pounds. The operator did not weigh the load prior to the helicopter attempting to pick it up; however, the cargo hook has a load cell that is used to determine the weight of sling loads. The trailer was to be the first load, but when the helicopter lifted it, it was found to weigh 3500 pounds and was too heavy to sling. The pilot then set it down and departed with another load. While the helicopter was gone on this first trip, a portion of the cargo inside the trailer was removed to reduce the weight of the load; however, the weight reduction was apparently not recorded. It could not be established whether the load was weighed during the second pick-up.

According to the Hover Ceiling Out of Ground Effect chart found in the *Bell 212 Flight Manual*, section 4, pages 4-16, the maximum gross weight limit for out of ground effect hover for the conditions that existed on the day of the accident was 10 900 pounds. The helicopter would be out of ground effect during load pick up on a long-line slinging operation and, consequently, 520 pounds over the maximum gross weight limit for this flight.

Analysis

No pre-impact discrepancies were found on the helicopter that would have contributed to the accident. Although the cannon plug that supplies power to the electrical cargo hook release was found to be broken off, it was determined that electrical release was serviceable when the flight started. The damage inside the Hell Hole to the cannon plug, tail rotor control tube, and throttle control tubes most likely occurred when the trailer tow bar dug into the ground, as this would have created a sudden deceleration of the trailer, creating high rearward forces on the cargo hook. Damage in this area would have prevented the pilot from controlling the helicopter and releasing the load. It would also have prevented operation of the throttles. The downward bending to the nose of the helicopter resulted in discontinuities in the electrical systems.

The gross weight of the helicopter exceeded both the maximum allowable gross weight and the maximum allowable gross weight limit for out-of-ground-effect hover. Because the helicopter was so heavy, it was unable to cleanly lift the load clear of the ground and into forward flight. Consequently, during the transition to forward flight, the helicopter descended and the load struck the tarmac and then the other sling load. The load became unstable and started to oscillate. The pilot mistakenly associated this with pylon rock and continued the flight, believing that this condition would abate as soon as the helicopter gained forward speed. It is probable that the pilot did not attempt to release the load until after the tow bar dug into the ground near the end of the accident sequence. By this time, the damage had occurred to the Hell Hole area and the cargo hook electrical release was rendered unserviceable.

Findings as to Causes and Contributing Factors

1. The gross weight of the helicopter exceeded both the maximum allowable gross weight and the maximum allowable gross weight limit for out-of-ground-effect hover.

2. Because of its heavy gross weight, the helicopter was unable to cleanly lift the load clear of the ground during transition into forward flight. The helicopter descended after entering forward flight, causing the load to drag and become unstable.

3. The pilot's attempt to release the load came too late in the accident sequence.

Findings as to Risk

1. The ELT signal was not effectively transmitted because the antenna had pulled out of the transmitter when it detached from the ELT mounting bracket.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 03 April 2003.

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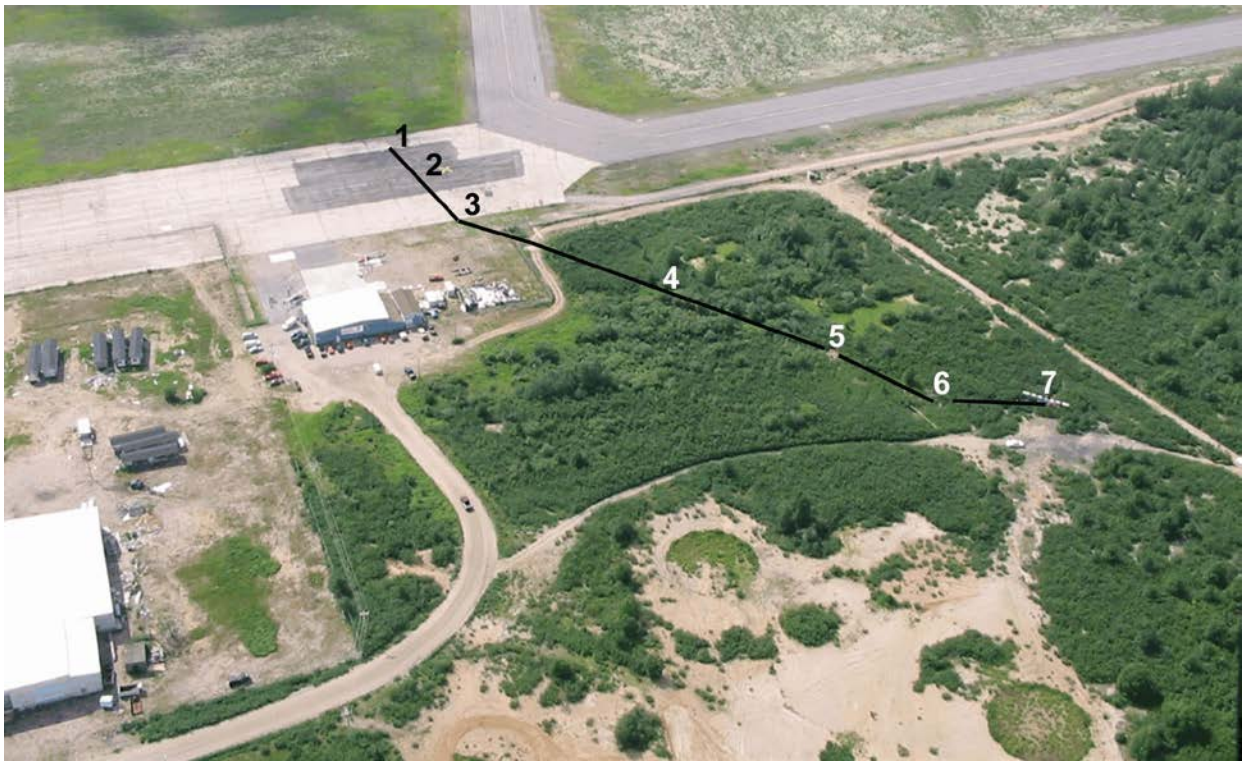
Appendix A – Accident Area



Accident sequence

1. Load pick-up
2. Load strikes ramp
3. Load strikes other sling road
4. Swatch cut digs in
5. Tow bar digs in
6. Trailer comes to rest
7. Helicopter comes to rest