



**AVIATION INVESTIGATION REPORT
A06W0106**



DYNAMIC ROLLOVER

**REMOTE HELICOPTERS (NWT) LTD.
BELL 206B (HELICOPTER) C-GRHM
WABASCA, ALBERTA, 23 nm NE
04 JULY 2006**

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.

Aviation Investigation Report

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Summary

The pilot of the Remote Helicopters (NWT) Ltd. Bell 206B helicopter (registration C-GRHM, serial number 600) was conducting water-bucketing operations in support of forest-fire suppression activities approximately 23 nautical miles northeast of Wabasca, Alberta. At approximately 1600 mountain daylight time, the helicopter contacted trees adjacent to a shoreline, broke up, and came to rest in an inverted position. The pilot, the sole occupant, was fatally injured.

Ce rapport est également disponible en français.

Other Factual Information

History of Flight

Records indicated that the helicopter was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The aircraft had no known deficiencies before the accident flight. At the time of the occurrence, the aircraft weight was estimated to be under the maximum gross weight limit, and the centre of gravity was within limits. There was sufficient fuel on board to complete the flight.

On the day of the accident, weather observations were taken at the Pelican airstrip, three nautical miles (nm) south of the accident site. At 1430 mountain daylight time,¹ the temperature was 32°C, the wind was from the south-southwest at 5 gusting to 15 mph. At 1730, the temperature was 32°C, with winds from the south-southwest at 8 gusting to 14 mph.

The pilot departed Wabasca at approximately 1030 and arrived 20 minutes later at the Pelican aerodrome, Alberta. He then began forestry crew and equipment movements and accumulated a total flight time of 3.5 hours for the day.

The pilot was observed to be suffering from allergy-like symptoms. At about 1400, the pilot approached the camp medic to get something for his allergy symptoms, and was provided with a bottle of Reactine® (10 mg pills). He took two pills with him and returned the bottle. The label on the bottle contained a warning advising caution when operating vehicles as the medication may cause drowsiness. Another bottle (Reactine® 10 mg) was found at the accident site with one pill remaining in it.

At approximately 1519, while C-GRHM was on the ground at Pelican, a request was made for C-GRHM to provide water-bucket support for Fire 127. The pilot and two forestry officials prepared the aircraft and external load equipment for the intended flight. Completing the connection of the longline/water bucket and the removal of the right-hand pilot door took 30 minutes. By industry standards, 10 to 15 minutes is considered ample time to complete this task. Door removal is a common practice in preparation for longlining operations, as it facilitates monitoring of the external load.

The pilot departed Pelican at 1550 and proceeded to Fire 127. Once at the fire, the pilot's water drops were being directed by the fire operations officer who was in C-FALP, a second Bell 206. The pilot had difficulty picking up the first water load. After the first load of water was dropped on the fire, C-FALP escorted C-GRHM about halfway back to the lake that was being used for water pickup.

At about 1608, the pilot of C-FALP was unable to contact C-GRHM on any of the three radio frequencies in use. The C-FALP crew located the accident helicopter on the ground along the western shore of the lake used for water pickup. The pilot of C-FALP transmitted a MAYDAY

¹ All times are mountain daylight time (Coordinated Universal Time minus six hours).

call and proceeded to land near the accident site, where the fire operations officer attended the scene and observed that the pilot was deceased.

Wreckage and Impact Information

The aircraft wreckage was found at latitude 56°13'61" N, longitude 113°18'191" W, along the western shore of the lake that had been used for water pickup. It was lying inverted and on its left-hand side roof, in the middle of a cutline. The aircraft was approximately 54 feet from the edge of the lake and orientated parallel to the shore (160°M).

A 50-foot longline that had been attached to the bucket was loosely strung in a fairly straight direction from the water-bucket clevis to the belly hook of the aircraft. The bucket clevis was detached from the longline hook; however, no explanation was found for this. This hook was tested on site and later by the manufacturer. It functioned normally in both tests.

The water bucket was found at the shoreline, and its dump valve was in the open position. The bucket is 14 feet long when suspended. The dump valve normally closes automatically by way of a tensioned wire cable when suspended and will only stay open when not suspended. The bucket was tested after the accident and functioned normally.

There was damage to trees between the cutline and shoreline, and there were landing skid marks in the bark of trees bordering the cutline where the helicopter came to rest. These marks were on the lake side of the trees. One tree-top was broken from a bending load. There were indications that, during the break-up sequence, the tail rotor blades struck some trees and bushes between the lake and the cutline.

There were ground scar and component indications that the engine was developing high power at the time of impact, and that the engine continued to run for a brief period after the impact.

Several main rotor blade strike marks were found. One was on the helicopter tail boom just aft of the horizontal stabilizer, where the tail boom was severed. The second strike mark was on the right side of the cabin at the pilot door post. The last strike mark was in the ground immediately to the front of the fuselage. This latter point held most of one blade horizontal and parallel to ground level, buried approximately eight inches. This blade was intact and attached to the main head and trunnion. The other blade was severely damaged, with indications of strike(s) at high power. The mast had been sheared off just below the trunnion, with indications of severe mast bumping by both sides of the trunnion droop stops.

Pilot

The pilot held a valid commercial helicopter licence with five different aircraft type endorsements, and his last medical examination had been conducted on 26 March 2006. Records indicate that he had accumulated 2000 total flight hours, 800 of which were on the Bell 206. His last pilot proficiency check on the Bell 206 type was on 31 March 2006 with his previous employer. An initial visual flight rules (VFR) flight check was completed with Remote Helicopters (NWT) Ltd. on 27 June 2006, and an external load exam was written.

According to his logbook, the pilot had approximately 100 hours of longline experience and 40 hours of sling load experience. The pilot had neither been trained nor authorized to conduct water-bucketing operations by his previous employer or by Remote Helicopters (NWT) Ltd. There was no indication that he had any water-bucketing experience.

Toxicology reports from the medical examiner indicated the presence of an anabolic steroid, but its possible effect could not be determined. The medical examiner's office and Transport Canada have stated that the antihistamine drug Reactine® was a newer type that rarely causes drowsiness.

Transport Canada's *Handbook for Civil Aviation Medical Examiners* does not contain guidelines for specific types of antihistamines that may or may not be acceptable for use by aircrew. However, the Defence Research and Development Canada *Guidelines for Flight Surgeons: Medications and Aircrew*² indicates that Reactine® may produce drowsiness and central nervous system side-effects and is not recommended for aircrew.

Nicholson and Turner (1998)³ conducted a study to examine the effects of cetirizine (generic name for Reactine®) on performance. The study examined measures, which included performance on a tracking task, performance on a vigilance task, sleep latency, and subjective assessments of sleepiness. It was found that cetirizine was not free from central nervous system effects, in that subjects taking the drug reported greater sleepiness, demonstrated shorter sleep latency, and performed more poorly on the tracking task at specific times of the day. The study concluded that cetirizine should not be used by air personnel.

Section 404.06(1) of the *Canadian Aviation Regulations* states in part that

no holder of a permit, licence or rating shall exercise the privileges of the permit, licence or rating if

- (a) one of the following circumstances exists and could impair the holder's ability to exercise those privileges safely:
 - (i) the holder suffers from an illness, injury or disability;
 - (ii) the holder is taking a drug; or,
 - (iii) the holder is receiving medical treatment.

Operation

A contract was in place between the Alberta Ministry of Sustainable Resource Development and Remote Helicopters (NWT) Ltd. for helicopter services. The services included, but were not limited to, flights for the monitoring of forests and various forest firefighting activities such as personnel transportation, water bucketing, drip torching, and moving external loads.

² http://www.toronto.drdc-rddc.gc.ca/medical/meds_e.html, accessed 10 July 2007.

³ A.N. Nicholson and C. Turner, *Central Effects of the H₁-Antihistamine, Cetirizine*, Aviation, Space, and Environmental Medicine, vol. 69, No. 2, 1998, pp. 166-171.

Helicopter operations in a forest-fire environment are complex and in a constant state of changing conditions and priorities. This is a stressful environment.

Water bucketing on forest fires is normally done with the bucket clevis attached directly to the belly hook of the helicopter. The bucket is rigged for use with a lateral cargo hook, which was the case for C-GRHM. The correct attachment of the hook is when the name plate on the bucket control head is facing forward. This aligns the ballast pouch of the bucket in a forward direction of flight. However, for this flight, the pilot had attached a longline to the bucket. This allows the bucket to swivel in any direction, requiring a higher skill level when filling the bucket from hovering flight. This method is usually carried out in operations such as when there is a requirement to deposit water into a portable reservoir used by forest firefighting crews on the ground, and the bucket is lowered straight down through trees to the reservoir.

This particular helicopter and pilot had been hired to transport the fire boss to the various fires for assessment purposes, and the pilot had received all the necessary training for this mission. He had already flown in this capacity 6.1 hours on July 2, 7.5 hours on July 3, and 3.5 hours on the day of the accident. At the time of hire, there was no mention by the Alberta Ministry of Sustainable Resource Development that this helicopter and pilot would be required to carry out external load operations. The casual contract with the Alberta Ministry of Sustainable Resource Development (ASRD) indicates, on a minimum mandatory equipment list for rotor wing on fire operations, the many external load equipment pieces that may be required. ASRD expects that both the helicopter and pilot-in-command be equipped and qualified to use the tools at their disposal or advise the on-site supervisor that they cannot carry out the assigned mission.

Section 5.6.31 of the Remote Helicopters (NWT) Ltd. operations manual addresses specialized training. It specifies that "initial/recurrent flight and ground training are required before a pilot is assigned to duties involving specialized techniques, i.e. longline, water bucketing, hover exit, etc." The pilot had not completed this specialized training, nor were all the required forms and/or exams completed. The operator did not have a system in place to ensure that flight crews did not attempt to complete missions or use equipment for which they were not trained.

Analysis

Investigation of the aircraft wreckage and components found no indication of any mechanical malfunction that may have initiated or contributed to the accident sequence. Weather was also not considered to be a factor.

Although the initiating event in the accident sequence could not be determined, it is most likely that the pilot was filling the water bucket near the edge of the lake and drifted toward the shoreline, where the left skid tubes contacted the trees. This then resulted in the loss of control of the aircraft, ending up in a dynamic rollover condition. The damage patterns are consistent with erratic blade movement that resulted in main rotor strikes of the tail boom and torsion shearing of the main rotor mast.

Given the pilot's interaction with the medic and the presence of a Reactine® bottle at the accident site, it is probable that the pilot took some of the medication. It is also probable that allergy symptoms and/or antihistamine effects distracted the pilot from the surrounding

obstacles and the complexity of the task. Although there are differing opinions regarding the effects of Reactine®, most of the studies found some central nervous system effects from its use. Those effects could have affected the pilot's ability to stay alert and be aware of all surrounding mission factors. It is up to pilots to evaluate if they are in a safe medical condition to exercise the privileges of their licence.

The extended amount of time taken to set up the water bucket before the occurrence flight could have been caused by a lack of familiarity and/or experience with the equipment. The unusual use of the longline for an operation that did not require it also indicated unfamiliarity with this type of operation. The pilot also had difficulties carrying out the first water pickup just before the accident. Combined, these events indicate that the pilot was likely operating beyond his comfort level. Previous experience and training did not provide sufficient skills and awareness to conduct water bucketing in a very active forest-fire environment.

Findings as to Causes and Contributing Factors

1. The pilot undertook a water-bucketing mission for which he did not have the required training and experience.
2. The pilot engaged in flight operations with pronounced allergy symptoms, which probably contributed to reducing his ability to perform complex multi-task missions.
3. It is probable that the pilot took a quantity of an allergy medication that could have affected the pilot's ability to stay alert and be aware of all surrounding mission factors.
4. The operator had no system in place to ensure that flight crews did not undertake missions or use equipment for which they were not trained.

Safety Action Taken

The operator put in place several internal and external audit processes to ensure that pilot training meets all requirements on an ongoing basis. The operator developed a competency card listing all aircraft types and other operations that the individual has been trained on and authorized to perform.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 11 July 2007.