Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A10Q0133

COLLISION WITH SEA

UNIVERSAL HELICOPTERS NEWFOUNDLAND LIMITED
BELL 206L (HELICOPTER), C-GVYM
CLYDE RIVER, NUNAVUT, 40 nm NW
16 AUGUST 2010

Canada

Aviation Investigation Report

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Synopsis

The Bell 206L (registration C-GVYM, serial number 45143), operated by Universal Helicopters Newfoundland Limited, departed Clyde River at 1609 Eastern Daylight Time on a visual flight rules flight to Pond Inlet, Nunavut. Reduced visibility and low ceilings were forecast along the eastern coast of Baffin Island. The aircraft was equipped with a flight following device and was reported overdue at 1819. A search was initiated in the area of the last known position and wreckage was recovered from the surface of the sea on 17 August 2010, approximately 40 nautical miles northwest of Clyde River. The helicopter was destroyed by impact forces; there was no fire. The pilot, the sole occupant of the helicopter, was not found. The accident occurred during daylight hours. No emergency locator transmitter signal was detected by the Search and Rescue system.

Ce rapport est également disponible en français.

Other Factual Information

History of the Flight

The helicopter was being ferried from Broughton Island to Resolute Bay, Nunavut. The pilot selected a routing along the eastern coast of Baffin Island that would require fuel stops in Clyde River, Pond Inlet and Cape York (see Appendix A – Route Map). A visual flight rules (VFR) flight plan was filed with an estimated time en route of 11 hours (9.5 hours flying with 3 stops of 30 minutes each). It was estimated that the pilot started his duty day at 0700 [1]. The filed departure time was 1000 which would have put the aircraft in Resolute Bay by 2100. This was within the allowed 14-hour crew day and prior to sunset. Official sunset in Resolute Bay was after midnight. The search and rescue (SAR) response time on the flight plan was for one hour after the estimated time of arrival in Resolute Bay.

The terrain along the eastern coast of Baffin Island rises dramatically from the sea and has many steep fjords. There are few locations to conduct a precautionary landing. Low cloud conditions would necessitate a routing along the coast line due to the steep terrain.

The pilot departed Broughton Island at 1123 and arrived in Clyde River at 1516 following two en route landings due to weather. The pilot departed for Pond Inlet at 1609. The last known position (LKP) emitted from the flight following device was at 1639.

The entire routing was in uncontrolled airspace.

Weather

The pilot phoned Universal Helicopters Newfoundland Limited (UHNL) dispatch, from Broughton Island, at 0700 to discuss the weather. Due to the weather, the planned departure was delayed. The pilot phoned Arctic Radio at 0804 and received another weather briefing. At the time of this briefing the actual weather in Clyde River at 0700 was easterly winds at 7 knots, visibility 3/8 statute mile (sm) and a ceiling at zero feet above ground level (agl). The forecast for Clyde River valid through to 1500 was calling for visibility of 3 sm in light drizzle and mist with an overcast ceiling of 300 feet agl, temporarily the overcast ceiling was to go up to 1200 feet agl. The Pond Inlet forecast at the time of the briefing was calling for vertical ceilings of 100 feet agl until 1200 but improving after that with a broken ceiling of 3000 feet agl.

The pilot contacted the customer in Resolute Bay at approximately 0900 and discussed satellite and infra-red imagery for the Clyde River area as well the actual weather in Clyde River and Pond Inlet. The 0800 weather was available at that time and for Clyde River the reported visibility was 1 and 1/8 sm with a ceiling at zero feet agl. The 0800 weather for Pond Inlet was reported as visibility 9 sm with a ceiling at 7600 feet agl.

There is no record that the pilot made further inquiries concerning the weather.

The Surface Analysis for 1400 on 16 August 2010 showed a large low pressure system centered over southern Hudson Bay. A weak surface trough extending northwards from this low into

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1 All times Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

central Baffin Island resulted in a light easterly flow off Davis Strait and Baffin Bay onto the northeast coast of Baffin Island.

Satellite imagery indicated an extensive area of low cloud moving onshore in the light easterly flow all along the northeast coast of Baffin Island. Due to the topography of Baffin Island it is reasonable to conclude that the higher terrain to the west of Clyde River would have been obscured in the moist, onshore/upslope flow.

The Aviation routine weather reports (METAR) in Clyde River were as follows:

- At 1600 - wind 050° True (T) at 4 knots, visibility 3 ½ sm, overcast ceiling at 200 feet agl, with overcast layers to 7600 feet agl, temperature 7°C, dewpoint 7°C, and altimeter setting 29.91 inches of mercury (in. Hg).

- At 1635 - wind 040° T at 4 knots, visibility 2 ½ sm, overcast ceiling at 200 feet agl, with overcast layers to 5700 feet agl, temperature 7°C, dewpoint 7°C, and altimeter setting 29.92 in. Hg.

The METARs in Pond Inlet were as follows:

- At 1600 - wind 250° T at 2 knots, visibility 15 sm with fog in the vicinity, few clouds at 500 feet agl, few clouds at 2000 feet agl, broken ceiling at 6800 feet agl, temperature 7°C, dewpoint 6°C, and altimeter setting 29.93 in. Hg.

- At 1700 - wind 240° T at 5 knots, visibility 15 sm with fog in the vicinity, few clouds at 500 feet agl, few clouds at 2000 feet agl, broken ceiling at 6600 feet agl, temperature 7°C, dewpoint 6°C, and altimeter setting 29.93 in. Hg.

The following terminal aerodrome forecasts were valid at the time of the crash (1500 on 16 August until 0300 on 17 August):

Clyde River:

Wind 110° T at 3 knots, visibility 1 sm in light drizzle and mist, overcast ceiling at 200 feet agl, temporarily for the period visibility 6 sm in mist, overcast ceiling 800 feet agl. Remarks – forecast based on automatic observations.

Pond Inlet:

Wind variable at 3 knots, visibility greater then 6 sm, few clouds at 300 feet agl, scattered clouds at 2000 feet agl, broken ceiling at 6000 feet agl, temporarily for the period visibility greater then 6 sm in light rain, scattered cloud at 300 feet agl, broken ceiling at 2000 feet agl, overcast cloud at 5000 feet agl.

The Graphical Area Forecast valid for the period closest to the time of the crash depicted an extensive area of low cloud over Clyde River with local visibility 1 sm in light drizzle and mist and ceilings of 300 feet agl in coastal sections. No icing or turbulence hazards were forecast in the Clyde River area.

There are no weather reporting stations between Clyde River and Pond Inlet. Additionally, there were no pilot reports (PIREP) [2] transmitted in the timeframe surrounding the crash.

The Pilot

Records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations. The pilot had approximately 5000 hours total flight time of which 3665 were on type. This was the pilot's third season working with the company in the Arctic. The pilot was not instrument rated.

The UHNL Crew Position Reports for the occurrence pilot indicate the pilot was off duty the first two weeks of July, flew 14 July to 03 August, was off duty 04 to 07 August and had been flying 08 to 16 August. The average duty day in August was 10 hours. At the time of the occurrence he had been on duty 9.5 hours. The pilot had been operating within the flight and duty time requirements.

The Operator

UHNL is based in Newfoundland and Labrador with corporate headquarters and maintenance centre located in Goose Bay. It operates a mixed fleet of helicopters, under *Canadian Aviation Regulations* (CARs) Subpart 702 [3] and 703 [4], out of bases in Goose Bay, St. John's, Pasadena and Gander. Each location has permanent base personnel and hangar support facilities for year-round operations and maintenance. UHNL conducts only day, VFR operations.

The company is authorised to conduct overwater flights in the Bell 206L in accordance with Commercial Air Service Standards (CASS) 723.23. The Company Operations Manual, Section 4.24, outlines the requirements that must be met for over water operations. These conditions are congruent with the regulatory requirements.

Flight Following

The company operates a pilot self-dispatch system [5] due to the remote operating locations. The company aircraft are equipped with automated flight following devices that provide position information.

The flight following device obtains position data from the Global Positioning System (GPS) satellite constellation and automatically transmits this information to the ground stations (operator and device manufacturer). Position reports are sent at intervals that can be configured by the operator (15 minutes for UHNL). A warning is provided to the monitoring station whenever the aircraft fails to send a position report for more than 30 minutes. The transmission of these reports happens without the need for input by the crew. Software tools provided by the device manufacturer turn the raw data of position reports into useful information (tracking,

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[2] A pilot weather report pertaining to current weather conditions encountered in flight.

[3] Commercial Air Services - Aerial Work

[4] Commercial Air Services - Air Taxi Operations

[5] CASS 723.16. Operational control is delegated to the pilot in-command of a flight by the operations manager, who retains responsibility for the day-to-day conduct of flight operations.

mapping and reporting). UHNL has several pre-set reporting messages that the pilot can select such as:

• OPERATIONS NORMAL	• LANDING FOR FUEL
• DEPARTING ENROUTE	• LANDING DUE TO WEATHER
• PLS EXTEND FLT. PLAN BY 2 HOURS	• LANDING AT DESTINATION
• DOWN AND CLEAR FOR THE NIGHT	• LANDING DUE TO MAINTENANCE

Pilots are directed to utilize the company radio frequencies, satellite phone or data downlink for direct contact with the company and check in every 2 hours during flight operations. The pilot had sent 2 "LANDING DUE TO WEATHER" messages on the Broughton Island – Clyde River leg.

SAR Activity

When the helicopter failed to transmit a position report for more than 30 minutes (1711), the operator called the manufacturer of the flight following device to see if it had the same data. It also had not received any position data for more than 30 minutes. Following several unsuccessful attempts to contact the helicopter, the operator called the Joint Rescue Coordination Centre (JRCC) in Halifax, Nova Scotia at 1819 and requested Search and Rescue (SAR) assistance. No emergency locator transmitter (ELT) signal was detected by the SAR system.

A Canadian Forces C-130 Hercules was tasked on 16 August at 1904 and was over the LKP at 0152 (17 August). The weather over the site was reported as 200 foot ceilings and 1 sm visibility. They were unable to conduct VFR operations near the LKP. A Canadian Forces Cormorant helicopter was tasked at 2051 with an estimated time of arrival on site of 0200 (17 August). This helicopter was delayed due to poor weather.

At 0200 (17 August), the JRCC Trenton took over as SAR Mission Coordinator as the LKP was in its region of responsibility. Multiple other assets were tasked on 17 August. Weather delayed further search operations until later in the morning of 17 August. At 1740, some wreckage was found floating near the south shore of the fjord close to the LKP (see Photo 1). The fjord is approximately 15 nm wide at the mouth; the LKP was approximately 5 nm from the south shore of the fjord. Crews continued searching throughout the remainder of 17 August and all of 18 August without finding any further wreckage or the pilot. The wreckage was subsequently recovered by a Canadian Coast Guard ship and later transported to Clyde River.

There were 3 icebergs in the fjord on 17 August 2010. One was reported to be 50 feet high, one 40 feet high and one smaller. Each was searched for signs of impact marks and debris; none were found.

The search was stood down and handed over to the Royal Canadian Mounted Police as a missing person case on 19 August following extensive operations in the area of the debris field, surrounding fjord and associated shoreline.

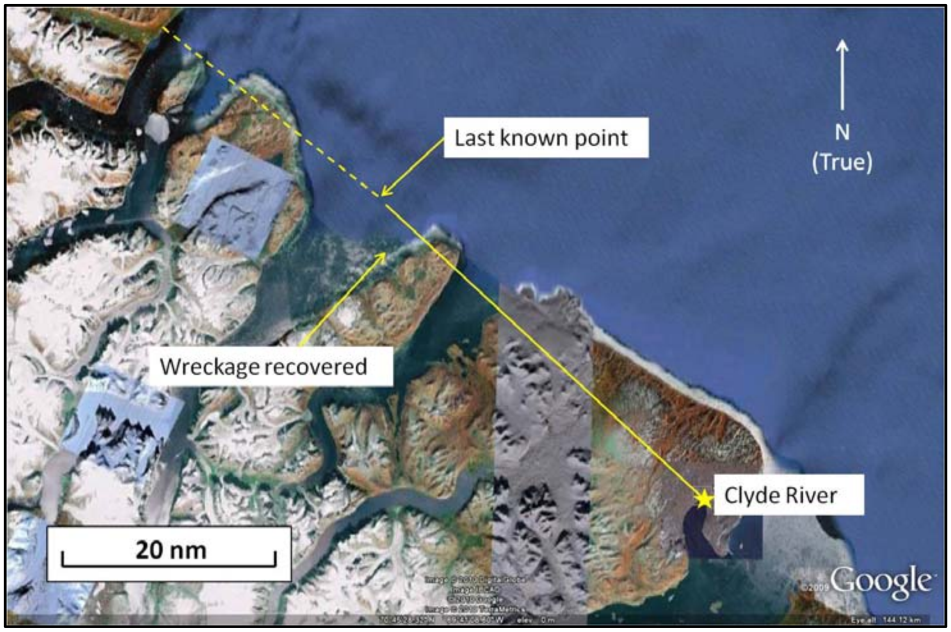

Photo 1. Last route segment

The Aircraft

The aircraft was certified and equipped in accordance with existing regulations.

Canadian Aviation Regulations (CARs) 605.93(3), states the following: ''The owner of an aircraft shall ensure that all of the necessary measures are taken to protect the technical records for the aircraft from damage and loss.'' Paragaph 8 of the instructions included in the operator's approved Journey Log specified the following actions to meet this requirement: detachable sheets are to be removed and forwarded to technical records if full or upon completion of a maintenance release (such as for a 100-hour inspection). The last log sheet forwarded to the operator technical records section was dated 26 July.

The operator also has a Maintenance Tracking Report which was last updated on 08 August 2010. It showed that the next 100-hour inspection was due in 7.9 hours. The recent log sheets along with the one including the certification of the 100-hour inspection were left with the Journey Log so that they could be forwarded to technical records when the helicopter was at a more suitable location for mailing. The documentation was lost as a result of the accident. It was subsequently determined that the 100-hour inspection had been carried out on 15 August 2010. If an extension to the inspection is required, such a request must be made by the aircraft maintenance engineer to the Director of Maintenance or Quality Assurance Manager. If granted, such a request should prompt an update of the Maintenance Tracking Report, which was not the case.

The helicopter was not equipped with a radar altimeter nor was it required to be. An immersion suit was onboard but not worn by the pilot as it was recovered with the wreckage. A life jacket and life raft were part of the helicopter equipment on this flight, but neither were recovered. The life jacket was required to be manually activated after egress. It is not known if it was worn. The pilot's helmet was recovered.

Pop-out floats

The helicopter landing gear was equipped with pop-out floats. The purpose of these floats is to provide emergency water landing capabilities. Each float (left/right) consists of three inflatable bags. The bags are held tightly stowed under a canvas cover designed to release the bags as inflation is initiated. An inflation nitrogen bottle is mounted under the fuselage just behind the front crosstube. Pressure is released via an electically activated squib and distributed to the bags via T-fittings.

The nitrogen bottle can store up to 2500 pounds per square inch (psi) and the normal inflation pressure is 2.5 psi. Excess pressure is vented via a relief valve and a minimum of 1.5 psi is recommended to assure expected buoyancy. A non-return valve is included in the inflating lines to each bag to prevent any backflow of nitrogen. It takes approximately 5 seconds to fully inflate the floats.

Arming of the system is done via a guarded switch located on the upper left instrument panel and confirmed by a light. A test switch and test light is also provided to check the system. Float inflation is done via a trigger switch on the under side of the collective.

The flight manual supplement for these floats states that inflation above 52 knots (60 miles per hour) is prohibited as this will result in undesirable pitching. Additionally, it states that during flight over ground or at altitudes greater than 500 feet above the water, the system should be de-armed. It is not recommended to inflate the floats more than 2000 feet above the intended landing area.

Being electrically triggered, the inflation system circuit can be affected by salt water immersion. The possibility of sea water causing a short is affected by:

- the salinity;
- the water temperature;
- contaminants present in the water;
- the physical distance between the two sections of the circuit (the distance the electrical current must cross); and
- the available current and initial voltage difference.

In general, salt water is assumed to be a fairly good electrical conductor for circuits in close proximity to each other such as in the switches used for arming and triggering the system. The time to create a short would be dependent on the time required for the sea water to penetrate the circuitry.

The maximum airspeed with floats inflated is 69 knots. The maximum airspeed in an autorotation with floats inflated is 60 knots

Wreckage Information

Figure 1 shows the recovered sections of the helicopter. The engine, most of the cockpit, and most of the tail section were not recovered (see Photo 2). The fracture surfaces observed on the recovered sections were attributed to overstress as a result of water impact. The degree of helicopter break-up and damage to the recovered sections indicate an impact at a speed in excess of that associated with an emergency landing.

The fracture surfaces exhibited characteristics that indicate the helicopter hit the water in forward flight with a left bank. The degree of bank could not be determined. No indications of pre-existing fractures were observed on the recovered wreckage.

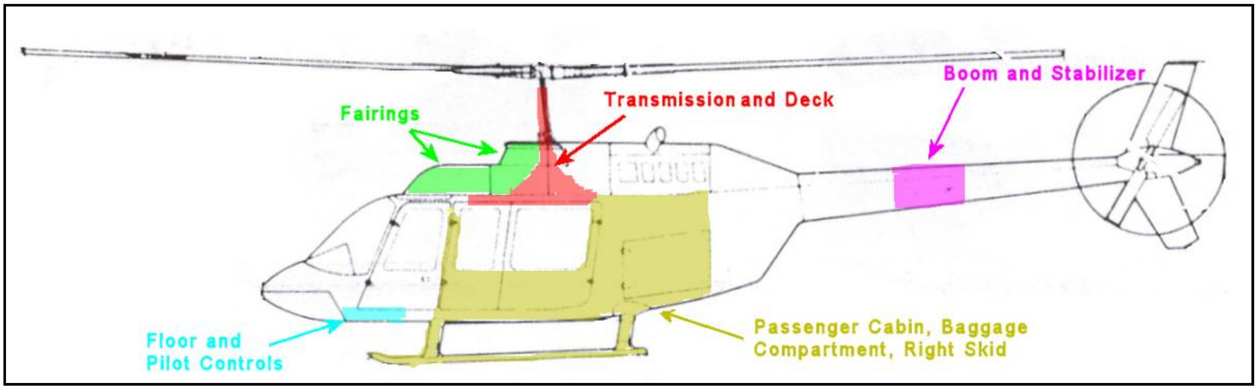

Figure 1. Salvaged helicopter parts

Photo 2. Recovered fuselage

The left landing gear had separated along with its pop-out floats. The direction of the torsional deformation of the left, front crosstube is consistent with the bottom end of the cross tube having been forced aft. The right landing gear was still solidly attached to the fuselage. The pop-out floats on the right skid were found deployed when the wreckage was recovered, and were keeping the wreckage afloat. They were partly torn from the right skid tube. The front bag was torn off the skid and held by its inflating line, the front half portion of the center bag was also torn and the rear bag was not damaged. When the wreckage was recovered by the Coast Guard all bags of the right skid appeared to be normally inflated.

The pilot's harness was found unbuckled. The lift lever on the buckle was tested and still worked smoothly with no indications of damage. The webbing and metal fittings were intact with no separations. The metal fittings were solidly fixed to the airframe. The manner in which the pilot's left shoulder belt and left lap belt metal fittings were jammed together, and the appearance of the left lap belt webbing, suggest that the harness was fastened at the time of impact. The lift lever style of buckle can be opened simply by pulling up on it with minimal force, so it is likely that it opened during the break-up sequence.

The main rotor transmission and the cabin roof had separated as a single unit. All the structural separations were examined visually, and were found to exhibit features consistent with failure by overstress. Grease was found splattered on the adjacent main transmission support link. The grease came from the coupling that joins the engine to the transmission. This coupling came apart during the break-up, separating the engine from the transmission. The grease was spattered on every component and bulkhead in the vicinity of that coupling, indicating that this coupling was turning at the time of break-up. Examination of the oil filter did not show any sign of metal contamination. One of the chip detectors had not been exposed to sea water and was unremarkable. The other one showed signs of heavy corrosion and did not offer any useful information.

The tail boom was found fractured just aft of the stabilizer. Both vertical finlets mounted at the tips of the stabilizer were also found fractured. No paint transfer was present to confirm main blade contact; however, the fracture angle of the finlets and the boom corresponded to an angle of rotor blade passage.

The main rotor mast had fractured 22 inches above the collar located just above the boot. The main rotor mast was bent from vertical. The fracture surface exhibited features consistent with failure by torsional overstress and not due to any pre-existing damage. Although the main rotor system was rotating at the time of impact, it could not be determined at what speed the system was turning.

There was insufficient wreckage recovered to rule out the possibility of a mechanical anomaly which could have triggered a caution light and an emergency landing.

The fuel tank was recovered intact and was partially full. A fuel sample was sent for laboratory analysis. No anomalies were detected.

Emergency Locator Transmitter

The helicopter was equipped with a fixed ELT, model 406AF-H manufactured by Kannad. This model is fixed to the airframe and specially designed for horizontal installation aboard helicopters. It is triggered by impact forces; however, for the signal to be detected, the ELT antenna must still be serviceable and not underwater. The ELT was recovered from the wreckage by the Coast Guard ship and a weak tone could be heard from the unit, but no very high frequency (VHF) signal could be detected.The switch was in the arm position but the coax cable to the antenna had been torn off at the ELT connector. The antenna was not recovered. Without the antenna being attached the signal could not be transmited.

Regulations for Visibility in Uncontrolled Airspace

For a helicopter being operated under day, visual flight rules (VFR) in uncontrolled airspace below 1000 feet agl, visibility must not be less than 1 mile (CARs 602.115). The company had an Operations Specification (Ops Spec) for flight operations in reduced visibility provided they adhere to the CASS which in part requires pilots to have specialised training. The company does not utilise this Ops Spec and does not train its pilots for reduced visibility operations as it does not want its pilots planning or conducting flights in visibilities below 1 mile in uncontrolled airspace.

Regulations for Flight Over Water

A single-engined helicopter cannot be operated over water more than 25 nautical miles (nm), or the distance that can be covered in 15 minutes of flight at the cruising speed filed in the flight plan, whichever distance is less, from a suitable emergency landing site unless life rafts sufficient to carry all occupants are carried on board. The pilot filed a cruising speed of 110 knots; in 15 minutes the helicopter would travel approximately 27 nm.

If a helicopter is required to carry life rafts, then a helicopter passenger transportation suit system (immersion suit) must be worn if the helicopter is travelling over water having a temperature of less than 10°C (CARs 602.63). The sea temperature for that area of the Arctic was approximately 3°C. [6]

No person shall operate an aircraft over water, beyond a point where the aircraft could reach shore in the event of an engine failure, unless a life preserver, individual flotation device or personal flotation device is carried for each person on board (CARs 602.62).

The accident occurred on a flight plan leg that required a life jacket be available. The final leg required a life raft, immersion suit and life jacket.

Spatial Disorientation

On the ground, spatial orientation [7] is sensed by the combination of vision, muscle sense, and specialized organs in the inner ear, which sense linear and angular accelerations. Vision is the strongest of the orienting senses, and in visual flight, the pilot relies on regular visual references with the ground and horizon to control the aircraft attitude and altitude. If a pilot is in cloud, the visual reference to the ground and horizon is lost. As a result, the available cues (solely from the external forces on the body) often produce spatial disorientation in flight, because the pilot has a false impression of aircraft attitude and motion. Under these conditions, the pilot is completely dependent on the flight instruments and learned flying skills for control of the aircraft. Pilots that are not experienced with flying the aircraft solely with reference to instruments are particularly susceptible to spatial disorientation when they are confronted with no external visual attitude references. Flying over low contrast surfaces such as snow or water during overcast cloud conditions poses similar orientation challenges.

The following TSB Laboratory reports were completed:

LP 126/2010 – Structural Examination of Helicopter C-GVYM
LP 172/2010 – Fuel Analysis

Analysis

The helicopter was serviced and maintained in accordance with existing requirements. The required 100-hour inspection had been carried out. However leaving the documention on the aircraft resulted in its loss and was not in keeping with the intent of the CAR or the operator's instructions. Carrying maintenance documentation onboard an aircraft may impede an investigation in the event of an accident. No indications of pre-existing fractures were observed on the recovered wreckage. The damage to the main rotor mast and transmission indicates the rotor drive train was rotating at the time of impact; the rate of rotation could not be determined. Fuel exhaustion and fuel quality were not considered contributing factors.

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6 Data received from Canadian Coast Guard ship operating in the area.

7 Adapted from the Federal Aviation Administration, Medical Facts for Pilots - Spatial Disorientation (AM-400-03/1) and Transport Canada, *Instrument Procedures Manual* (Fourth Edition, 1997), Section 1.4.

Had the helicopter not been equipped with a flight following device that sends a warning whenever the aircraft fails to send a position report, the SAR response would have been delayed as no signal was received from the ELT.

The helicopter would have been flying below 200 feet above sea level (asl) given the overcast cloud layer and therefore the float inflation system should have been armed. The airframe damage suggests the helicopter was travelling above 52 knots and therefore it is unlikely that the floats were manually triggered. Given the speed at impact, it is unlikely that the pilot was faced with an in-flight mechanical anomaly which would have prompted an emergency landing.

The forces of the initial impact on the left landing gear were sufficient to tear the left skid and its flotation bags from the airframe. The flotation system could have been shortcircuited as a result of salt water immersion and likely triggered inflation some time after the left skid was torn from the helicopter. Even though the separation of the left landing gear caused the break of the left inflating lines and the venting of a large amount of nitrogen, sufficient volume was delivered to the right flotation bags to permit buoyancy of the remaining aircraft wreckage.

The pilot was qualified and current to conduct the flight. The pilot had been operating within the flight and duty time requirements.

Although the ceiling was quite low on departure from Clyde River, the flight visibility was within the limitations for uncontrolled airspace. Based on the forecasts and actual weather, the pilot likely had an expectation that the weather would improve as he flew towards Pond Inlet. It is possible that the pilot departed with the intention to test the weather along the coast and return to Clyde River if the weather prevented safe transit to Pond Inlet.

The helicopter was crossing the mouth of a 15 nm-wide fjord when it went missing. The LKP was approximately one-third of the way across. It is unlikely the pilot would attempt the crossing if the far side was not visible. This would imply the visibility must have improved in the area of the fjord, at least when the crossing was initiated.

The following scenarios were considered in an attempt to explain why the helicopter struck the sea surface:

- There was insufficient wreckage to rule out the possibility of an in-flight mechanical anomaly (caution light). Due to the cloud ceiling the pilot would have been flying low level over water. A minor distraction inside the cockpit could result in an inadvertent descent into the sea if the pilot was to lean forward and displace the cyclic while investigating a caution light or gauge display. This would result in a relatively high speed impact which the wreckage also suggests.

- If the weather worsened during the crossing, due to the low ceiling and low visibility described in the area forecast, then the pilot would be faced with a low level flight over water with no visible land to assist spatial awareness. Flying over water under overcast clouds in rain and mist may have compromised the pilot’s spatial orientation. The pilot was not instrument rated and would have been challenged to maintain helicopter control under these conditions. This may have resulted in one of the following:

- o Without a close crosscheck of altitude, an inadvertant descent could develop. Due to reduced visual cues in the deteriorating weather it may have gone unnoticed until it was too late to prevent impact with the sea surface. This would result in a relatively high speed impact which the wreckage also suggests; or
- o Faced with deteriorating weather the pilot may have initiated a turn to the left to return to the closest shoreline. Without a strong background in instrument flying, it is possible that the pilot lost altitude and struck the sea while turning. This would result in a relatively high speed impact which the wreckage also suggests.

There was insufficient factual information to conclusively state why the helicopter struck the sea surface.

Finding as to Causes and Contributing Factors

1. It could not be determined why the helicopter struck the sea surface.

Findings as to Risk

1. Carrying maintenance documentation onboard an aircraft may impede an investigation in the event of an accident.

2. The emergency locator transmitter (ELT) was armed but the antenna had been torn off. Without the antenna, an emergency signal cannot be transmitted to initiate search and rescue (SAR).

Other Finding

1. The SAR response was triggered by the lack of position reporting from the onboard flight following device.

Safety Action Taken

Universal Helicopters Newfoundland Limited (UHNL) conducted an internal safety investigation as part of its safety management system. This report is being used as training material for flight crews and will be discussed during annual base safety meetings. Risk Assessment workshops for staff and clients planned prior to the accident will be expanded to include human factor issues.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 27 September 2011.

Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.

Appendix A – Route Map