

Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

**AVIATION INVESTIGATION REPORT  
A13C0073**



**COLLISION WITH WATER**

**CUSTOM HELICOPTERS LTD.  
BELL 206B (HELICOPTER), C-GQQT  
GULL LAKE, MANITOBA  
01 JULY 2013**

**Canada**

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 A13C0073

### Collision with water

Custom Helicopters Ltd.  
Bell 206B (Helicopter), C-GQQT  
Gull Lake, Manitoba  
01 July 2013

### *Summary*

The Custom Helicopters Ltd. Bell 206B (registration C-GQQT, serial number 1657) departed Gillam, Manitoba, at 1600 Central Daylight Time for a flight to Gull Lake, Manitoba, about 22 nautical miles (nm) to the west. The purpose of the flight was to pick up a team of 3 passengers who had been transported to Gull Lake earlier in the day. There was no further contact with the pilot, and the helicopter was declared missing at 2030. The following morning, debris from the helicopter was found on the Gull Lake shoreline, about ½ nm from the pickup point. The pilot's body was recovered from the water 6 days later. Despite several sonar searches, the main wreckage was not found.

*Ce rapport est également disponible en français.*

## *Factual information*

### *History of the flight*

At approximately 0830<sup>1</sup> on the day of the accident, the pilot flew twice from Gillam, Manitoba, to a landing site on the north shoreline of Gull Lake, Manitoba, a wide area of the Nelson River about 22 nautical miles (nm) west of Gillam. The pilot was transporting 2 teams of 3 passengers that were conducting fisheries research. The survey teams used 2 boats to travel from the landing site to their work site, about 8 nm southwest. Forest fires burning on the north side of Gull Lake were not considered a threat to their safety, as the teams were planning to work on the south shore of Gull Lake. The teams were to call the pilot using a satellite telephone when ready to be picked up from the landing site.

The teams finished work at about 1610 and started to travel to the agreed pickup site. By this time, the wind had shifted and become stronger, blowing smoke and fire towards the south shore. The teams decided to travel to the community of Split Lake, Manitoba, about 30 miles southwest, where they planned to spend the night. At approximately 1700, they advised their company representative in Gillam of the change in plan and asked that the pilot be informed. The representative called Custom Helicopters Ltd. (Custom) as requested, but found that the pilot, concerned for the teams' safety, had already departed after learning that thick smoke was moving into the Gull Lake area. The pilot made a phone call to a Government of Manitoba Department of Conservation (Conservation) employee at about 1715, indicating that he was at the pickup site waiting for the crews. Smoke began to encroach on the landing site, and the pilot departed, although the time of departure is not known.

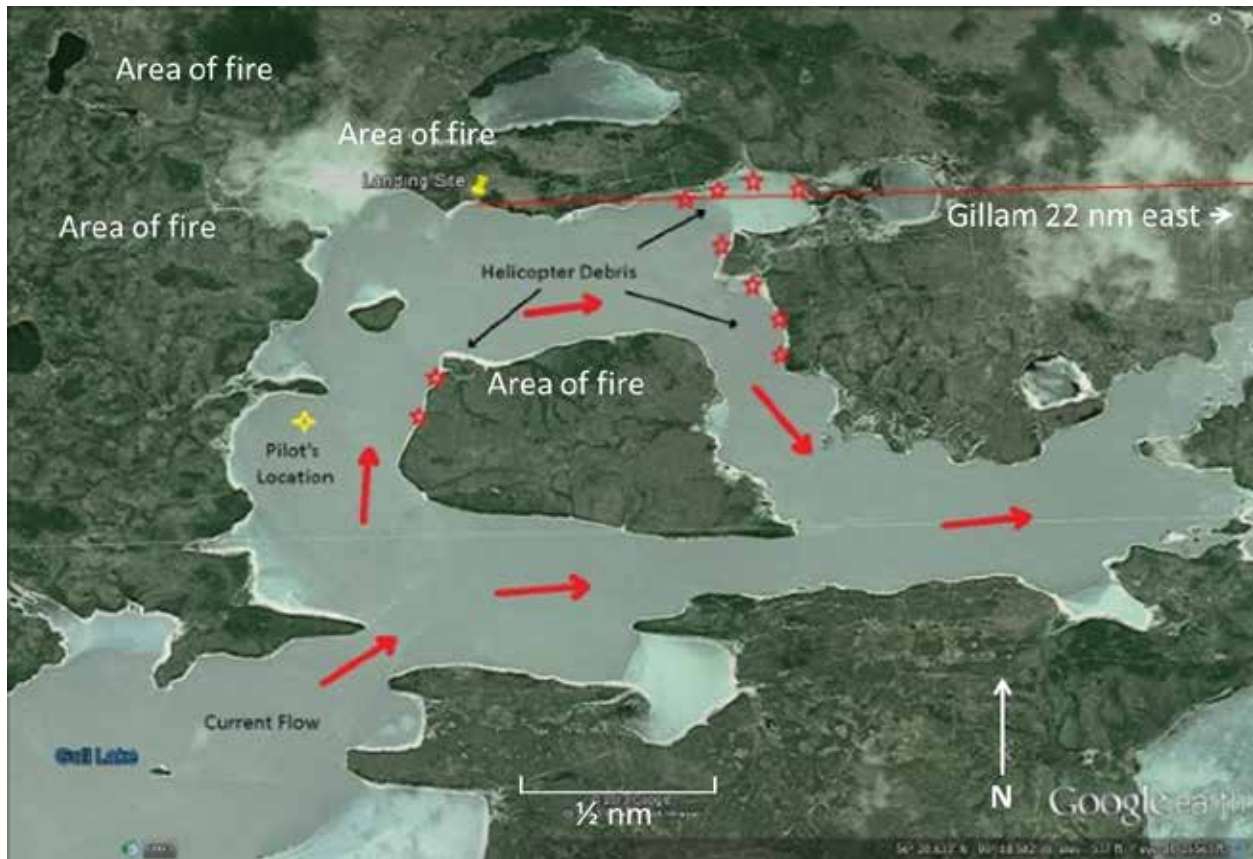
Custom had no further contact with the pilot; it declared the helicopter overdue at 2030, and initiated a search. Custom uses a satellite flight tracking system to track its helicopters. The helicopter was tracked on the outbound flight on the morning of the occurrence, but the tracking system stopped working at 0936 on the return flight. The owners called the service provider and were informed that the satellite system was out of service. Due to the interruption in service, the occurrence flight was not tracked by satellite. However, the occurrence pilot did inform another company pilot based in Gillam of his intentions for the flight.

Debris from the helicopter was found the following day along the shoreline of Gull Lake about ½ nm east, downstream from the pickup site (Figure 1).

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<sup>1</sup> All times are Central Daylight Time (Coordinated Universal Time minus 5 hours).

Figure 1. Map showing debris locations (indicated by red stars)



The Royal Canadian Mounted Police dispatched an underwater recovery team, who conducted a side-scan sonar mapping of the area. Several underwater targets were identified. Concurrent with the sonar mapping, a dragging operation was initiated, and the pilot's body was recovered on 07 July 2013. No underwater wreckage was located or recovered. A commercial underwater salvage team was contracted to continue the wreckage recovery operations. The salvage team began dive operations on 17 July 2013. Several targets were investigated, but no helicopter debris was identified. The salvage team was forced to discontinue the salvage operation due to weather and technical difficulties. The salvage team returned to the site on 19 August 2013 and conducted a thorough examination of all previously identified targets. Again, no helicopter wreckage was found.

### *Weather*

An aerodrome special meteorological report (SPECI) for Gillam, 22 nm east of the accident site, was issued at 1644. Weather was forecast to be wind 270° true (T) at 7 knots, visibility 2 statute miles (sm) in smoke, ceiling overcast at 2500 feet above ground level (agl), remarks: stratocumulus 8 oktas, variable visibility in smoke aloft to the southwest. The weather deteriorated rapidly, and another SPECI was issued at 1718. Weather was forecast to be: wind 270°T at 11 knots, visibility 1/2 sm in light rain showers and smoke, ceiling overcast at 500 feet agl, remarks: smoke 8 oktas, variable visibility in smoke aloft. The weather system was moving from west to east, and similar conditions to those observed at Gillam likely prevailed in the Gull Lake area. Moderate mechanical turbulence was forecast for the route of flight. The pilot was informed by a Conservation official that the thick smoke was also present in the Gull Lake area.

Instrument meteorological conditions (IMC) exist when the visibility and distance from cloud are less than the minimum specified in Division VI of Subpart 2 of *Canadian Aviation Regulations* (CAR), Part VI.<sup>2</sup> CARs subsection 602.115(d) provides that the minimums for helicopters operating in uncontrolled airspace below 1000 feet agl are the following:

- (i) during the day, flight visibility is not less than one mile, except if otherwise authorized in an air operator certificate or a flight training unit operator certificate – helicopter,
- (ii) during the night, flight visibility is not less than three miles, and
- (iii) in either case, the aircraft is operated clear of cloud.<sup>3</sup>

### *Company information and dispatch procedures*

Custom has been conducting helicopter operations since 1977. It has a fleet of 24 helicopters, which includes Bell 206B Jet Rangers, Bell 206 Long Rangers, Bell 205 A1s, and the Astar 350B2. The head office is located at St. Andrews Airport (CYAV), Manitoba. Full-time bases and maintenance facilities are located at Thompson, Gillam, Island Lake, and Churchill, Manitoba, and Rankin Inlet, Northwest Territories.

Custom uses a Type “D” operational control system. The operations manual provides the following information:

#### **3.3 FLIGHT DISPATCH AND FLIGHT WATCH**

- (1) The Company [*Custom*] utilizes the pilot self-dispatch system.
- (2) The PIC [*pilot-in-command*] of any flight is the sole authority to make decisions as to initiation, continuation, delay, diversion or rerouting of the flight when conditions are such that operational decisions are necessary.
- (3) The PIC shall notify the person who authorizes the flight of any change of itinerary or schedule.<sup>4</sup>

##### **3.1.1 Revenue Flights**

- (1) **All revenue flights shall be authorized by the Operations Manager or the Chief Pilot. When operating away from the Company main base this authority is delegated to the Pilot-in-Command<sup>5</sup>**

The accident flight was performed in accordance with these 2 conditions.

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<sup>2</sup> Transport Canada, *Aeronautical Information Manual*, General 5.1, Glossary of Aeronautical Terms.

<sup>3</sup> *Canadian Aviation Regulations*, Part VI, Division VI – Visual Flight Rules, Standard 602.115: Minimum Visual Meteorological Conditions for VFR Flight in Uncontrolled Airspace.

<sup>4</sup> Custom Helicopters Ltd., *Company Operations Manual*, Section 3.3 – Flight Dispatch and Flight Watch.

<sup>5</sup> *Ibid*, Section 3.1.1 – Revenue Flights.

The company is authorized under its air operator certificate to allow pilots to fly in uncontrolled airspace in a visibility of less than 1 mile, but not less than ½ mile of flight visibility. Pilots flying with less than 1 mile visibility must have 500 hours as PIC and have completed the pilot decision-making training, and the helicopter must be flown at a reduced speed in order to provide the PIC with adequate opportunity to see and avoid obstacles.

### *Aircraft information*

The helicopter was a Bell 206B built in 1975. It was equipped with high skid gear and bear paws.<sup>6</sup> The helicopter had accrued 21 585 flight hours at the time of the occurrence and undergone a 100-hour inspection on 05 May 2013, approximately 55 flight hours before the accident. The helicopter was equipped with a Field Tracker 2100, a satellite flight tracking system. The satellite tracking service was not available during the accident flight. There were no other reported defects or unserviceability.

Records indicate that the aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures.

### *Wreckage examination*

The debris that was located along the Gull Lake shoreline during the initial recovery operations was transported to the TSB facility in Winnipeg, Manitoba, for further examination. Less than 10% of the helicopter was recovered. The following pieces were identified:

- portions of the lower forward and aft belly areas
- portions of the crew and passenger door sills and frames
- a section of the pilot door
- crew and passenger seat pans and cushions
- interior panelling; the collective guard panel
- pieces of the main fuel-tank bladder
- upper deck pieces
- the baggage floor and the baggage door
- engine cowling pieces
- the helicopter ration kit
- pieces of the main rotor blade

Partial reconstruction indicated predominant damage to the lower right area of the helicopter, with the fragment size increasing towards the rear of the helicopter. Deformation to the pilot's door and door sill and occupant seats indicates an approximate impact angle of 30° nose-down,

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<sup>6</sup> The term "bear paw" refers to an attachment to the rear of the skid designed to increase the surface area for landings in soft terrain.

with a 40° right bank angle. The damage pattern is consistent with a water impact at high forward speed.

Three pieces of rotor blade were recovered, 2 of which were identified as portions of blade skin aft of the main blade spar. The remaining piece was a laminated portion near the blade root. It could not be determined if the pieces were from both blades. However, the severe damage indicates that they were likely part of the advancing blade. The main spar had been torn out and the blade skin was buckled, curled, and peeled back. The severe blade destruction is indicative of high rotational speed consistent with high engine power.

### *Pilot information*

The pilot held a valid commercial pilot licence – helicopter endorsed for the Bell 206 and restricted to daylight flying. The pilot had no instrument training. On the day of the accident, the pilot's accumulated total flying time was 10 500 hours, with more than 8500 hours on the Bell 206. The pilot had received recurrent ground and flight training on the Bell 206 and had completed a pilot proficiency check (PPC) in June 2013. This included training for flight in reduced visibility under visual flight rules (VFR), and pilot decision-making. The pilot had been employed by Custom for more than 16 years.

In the previous year, the pilot had flown 209 hours, with 37 hours flown in the previous 30 days and 17 hours in the previous 7 days. In the 48-hour period that preceded the day of the accident, the pilot had flown a total of 3.4 hours. The pilot had 13 hours of rest before starting duty on the day of the accident, and met the rest requirements of the CARs.

The pilot was certified and qualified for the flight in accordance with existing regulations, and there was no indication that the pilot's performance was affected by physiological factors.

### *Spatial orientation*

Spatial orientation is critical for pilots to maintain control of an aircraft. Health and Welfare Canada's *The Pilot's Guide to Medical Human Factors* states the following:

Vision is the dominant sense enabling pilot spatial orientation. Peripheral vision is the primary source of spatial orientation, with vestibular organs and kinesthetic sensors also contributing. In the absence of adequate visual cues when peripheral vision is limited, vestibular and kinesthetic illusions or false impressions can occur. This sometimes results in pilot disorientation and loss of situational awareness, which can lead to loss of aircraft control. In instrument meteorological conditions (IMC), the pilot must rely on instruments instead of instinct to overcome illusions or false impressions. In visual meteorological conditions (VMC) the pilot relies on outside references to control the aircraft.<sup>7</sup>

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<sup>7</sup> Health and Welfare Canada, *The Pilot's Guide to Medical Human Factors*, Minister of Supply and Services Canada, 1993, Chapter 7 – Orientation and Disorientation.

## *Inadvertent IMC and loss of control*

Transport Canada has published many articles concerning whiteout and flight into IMC involving pilots with no instrument rating. The available information concerning inadvertent flight into IMC by unqualified pilots and the inevitable outcome is widely distributed.

In 1990, the TSB recommended that:

The Department of Transport require verification of proficiency in basic instrument flying skills for commercially-employed helicopter pilots during annual pilot proficiency flight checks.

TSB Recommendation A90-81

In 2012, the TSB found that the risks associated with VFR flight into adverse weather for these types of operations remained substantial. In addition, the TSB recently investigated helicopter accidents in which loss of visual reference was cited as causal; these included occurrences A12P0079, A11W0152, and A10Q0148. Because Transport Canada had not indicated it planned to take any action to reduce these risks, the TSB rated Transport Canada's response Unsatisfactory.



## *Analysis*

The examination of the small amount of wreckage recovered indicated that the helicopter struck the water at high speed and was destroyed. Major portions of the structure were never recovered, including the engine and drivetrain. Therefore, the possibility that the loss of control was due to a mechanical malfunction could not be ruled out. The fragmentation of the main rotor into small pieces indicates that the engine and rotor systems were producing high power. The high-speed impact and high engine power indicates that the pilot was not attempting an auto-rotational landing.

The impact angle with the water was 30° nose-down, with a 40° right bank angle. The high forward speed is not consistent with Custom's direction regarding flight in low visibility, according to which aircraft should be flown at a reduced speed to provide adequate opportunity to see and avoid obstacles.

The weather system in the area was moving from west to east. It is therefore likely that the deteriorating weather at Gillam, Manitoba, was indicative of similar weather in the Gull Lake, Manitoba, area. As the pilot departed from the landing site because of the progress of the fire, he likely flew into an area of lower visibility, due to either heavy smoke in the area or rain showers, or both. This likely contributed to a loss of situational awareness, and would have reduced the pilot's ability to maintain control of the helicopter. The helicopter descended and struck the water before the pilot was able to regain adequate visual reference.

The TSB has previously identified that some commercial pilots do not have basic instrument flying skills. If commercial helicopter pilots do not have basic instrument flying skills, there is an increased risk of a loss of situational awareness and control in situations where a visual flight rules flight continues into instrument meteorological conditions.

## *Findings*

### *Findings as to causes and contributing factors*

1. The heavy smoke or rain showers, or both in the area likely resulted in instrument meteorological conditions at low level.
2. The pilot likely lost situational awareness and control of the helicopter in instrument meteorological conditions, resulting in impact with the water.

### *Findings as to risk*

1. If commercial helicopter pilots do not have basic instrument flying skills, there is an increased risk of a loss of situational awareness and control in situations where a visual flight rules flight continues into instrument meteorological conditions.

### *Other findings*

1. The retrieval of the wreckage was impeded by the lack of flight tracker data which was non-operational during the accident flight.

## *Safety action*

### *Safety action taken*

#### *Custom Helicopters Ltd.*

Custom Helicopters Ltd. incorporated the *Pilot Competencies for Helicopter Wildfire Operations*<sup>8</sup> guide into its spring training program. The purpose of the guide is to promote effective helicopter operations in wildfire operations, and the competencies it outlines are standards that pilots have to meet before being dispatched to work in wildfire operations. Pilots are to be trained in accordance with a training syllabus for 8 competencies:

1. General wildfire operations knowledge
2. Mountain flying
3. External load – short line (horizontal reference), long line (vertical reference), precision load placement, water bucketing/tanking
4. Class D external loads
5. Aerial ignition device and drip torching
6. Hover exit
7. Confined area operations
8. Low visibility flight

*This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 25 June 2014. It was officially released on 17 July 2014.*

*Visit the Transportation Safety Board's website ([www.bst-tsb.gc.ca](http://www.bst-tsb.gc.ca)) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.*

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<sup>8</sup> Helicopter Association of Canada, *Pilot Competencies for Helicopter Wildfire Operations*, Best Practices Training and Evaluation, Amendment 1, 05/04/2011.