AVIATION OCCURRENCE REPORT

COLLISION WITH TERRAIN/ICE

CANADIAN HELICOPTERS LIMITED WESTERN DIVISION
BELL 206B JETRANGER (HELICOPTER) C-FZSI
MOULD BAY, NORTHWEST TERRITORIES 9 SM S(T)
26 APRIL 1996

REPORT NUMBER A96W0072

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

The Bell 206B helicopter, serial number 647, departed the Mould Bay Airport, Northwest Territories, at 0729 mountain standard time (MST) on a visual flight rules (VFR) flight to Sachs Harbour and Inuvik. The pilot was expected to meet a Twin Otter aircraft at an en route fuel cache located 140 statute miles south of Mould Bay, near Mercy Bay, at about 0900. The helicopter did not arrive at Mercy Bay, and, at approximately 1000, the Twin Otter flight crew began an air search along the direct track to Mould Bay. They located burned and scattered helicopter wreckage on sea ice approximately nine miles south of the Mould Bay weather station. A ground party was quickly dispatched from the weather station in a tracked snow vehicle. They reached the accident site at approximately 1500 and determined that the wreckage was that of the missing helicopter. The pilot had sustained fatal injuries.

Ce rapport est également disponible en français.

[1] All times are MST (Coordinated Universal Time minus seven hours) unless otherwise noted.

Other Factual Information

Mould Bay is an Arctic sea bay on the east coast of Prince Patrick Island. It is oriented north-south, and is surrounded on three sides by barren hills which are up to 900 feet high. The bay is approximately 20 miles long and about 8 miles wide at the south end, where it opens into Crozier Channel. The accident site was located near the south end on the direct track between the Mould Bay Airport and the Mercy Bay fuel cache. The Mould Bay weather station is a remote high Arctic weather station located on the north shore of Mould Bay.

The helicopter had been chartered by a polar research company to retrieve sea buoys and move an ice camp approximately 300 miles northwest of Mould Bay. The pilot had flown the helicopter from Inuvik to Mould Bay on 18 April and had reached the ice camp on 19 April. He operated out of the ice camp for four days and returned to Mould Bay on 23 April. The helicopter was released by the client for the return flight to Inuvik on the morning of 26 April.

The area forecast for Mould region, issued at 0430 MST on 26 April, indicated that VFR conditions would generally prevail during the planned flight period. Sky conditions were forecast to be scattered cloud at 2,000 to 3,000 feet above sea level (asl), with tops at 5,000 feet. Visibilities were forecast to be greater than six statute miles, with occasional visibilities four to six miles in light snow. Local stratus ceilings of 300 to 800 feet above ground level (agl) and visibilities of ½ to 4 miles in fog and light snow were anticipated in areas of on-shore upslope flow. The pilot had telephoned the Sachs Harbour Community Aerodrome Radio Station (CARS) prior to departure, and determined that good VFR weather conditions existed in Sachs Harbour.

The Mould Bay 1400 UTC (0700 MST) AUTO[2] SA reported the sky condition as clear below 10,000 feet; visibility greater than 9 statute miles; temperature -18 degrees Celsius; dew point -21 degrees Celsius; and winds 360 degrees true at 4 knots. Similar conditions were reported one hour later. Weather station personnel estimated the sky condition to be 500 to 1,000 feet overcast and the visibility to be 1 to 4 miles when the helicopter left Mould Bay. The Twin Otter had departed Mould Bay for Mercy Bay at 0900 MST; the flight crew reported that on departure the sky condition was 500 feet overcast and the visibility was 1 to 4 miles. Because of the obvious differences between the weather information provided by eyewitnesses and that provided by the AWOS, it is considered that the AWOS at Mould Bay was not accurately recording actual weather conditions at the time of the accident.

The pilot obtained his commercial helicopter licence in 1993, and had accumulated approximately 1,500 hours of flight experience. He was raised in Sachs Harbour and reportedly was very familiar with Arctic terrain and climate. He had frequently hunted and snowmobiled

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[2] Reported by an automated weather observation system (AWOS).

in Arctic whiteout conditions. He had been employed seasonally for several years to herd reindeer near Tuktoyaktuk, Northwest Territories, with a Robinson R-22 helicopter. Private and commercial training records indicate that the pilot had received a total of 10.6 hours of dual instrument training prior to acquiring his commercial helicopter licence. The pilot was not endorsed for night or instrument flight, and there was no evidence that he had acquired additional instrument training following the issue of his commercial helicopter licence.

Post-mortem examination and a review of medical records yielded no evidence of incapacitation or physiological or psychological factors which could have adversely affected the pilot's performance. Tests for the presence of common drugs were negative.

Records indicate that the helicopter was certified, equipped, and maintained in accordance with existing regulations and approved procedures. It was equipped with the basic flight instrumentation necessary for instrument flight. The flight instruments were mounted in the centre of the instrument panel, to the left of the pilot's position and above the radio console.
The wreckage trail indicated that the helicopter was travelling in a southerly direction when it struck the ice, in an approximately 40-degree nose-down and 45-degree left-bank attitude. The airframe disintegration was extensive. The airframe fuel cell and three 10-gallon kegs of jet fuel, which are presumed to have been located in the cabin of the helicopter, ruptured during the accident. The ice surface was scorched and sooted for most of the length of the wreckage trail. Because of the almost complete destruction of the helicopter by the crash and fire, it could not be determined whether any pre-impact failure or system malfunction contributed to this accident; however, none was identified.

The Transport Canada *Aeronautical Information Publication* (AIP) describes whiteout as an atmospheric optical phenomenon of the polar regions in which the observer appears to be engulfed in a uniformly white glow. Neither shadows, horizon, nor clouds are discernible, and the sense of depth and orientation is lost. Whiteout occurs over an unbroken snow cover and beneath a uniformly overcast sky. Whiteout may be encountered when flying over large frozen bodies of water at some distance from shore. The AIP recommends that pilots avoid such conditions, unless they have suitable aircraft instruments and they are sufficiently experienced.

Entry into a whiteout condition, which can occur in weather conditions which are considerably better than the minimum required for VFR flight, requires an immediate shift to instrument flight. A subtle absence of visual reference may be the first clue to a whiteout, and any delay in recognition may precipitate disorientation. Knowledge and experience, understanding the cause and effect of whiteout, and maintaining sufficient instrument skills to avoid disorientation may be the best defences against whiteout accidents.

The Canadian Helicopters *Flight Operations Manual* cautions against attempting to fly VFR in whiteout conditions, and advises pilots to be alert at all times to the danger of inadvertently entering

these conditions. The Canadian Helicopters recurrent VFR training curriculum did not provide for basic instrument training, nor was there any regulatory requirement for the company to conduct this type of recurrent training.

Spatial disorientation is the false perception and/or interpretation of aircraft attitude with regard to horizontal and gravitational references. Pilots with little instrument time are particularly susceptible to spatial disorientation when they encounter conditions where there are no external visual attitude references.

There are two philosophies with regard to training to prevent helicopter accidents which occur because of inadvertent loss of outside visual reference. One philosophy is to equip helicopters with the basic instrumentation necessary for instrument flight, and to provide recurrent basic instrument training to VFR pilots. This would enable the pilot to maintain control of the helicopter long enough to return to visual flight should whiteout or other instrument meteorological conditions (IMC) be encountered. Some operators believe this may impart a false confidence to VFR pilots and encourage deliberate entry into instrument conditions because of improved instrument skills. Obstacle clearance may be as great a hazard as loss of control during transient VFR/IFR/VFR flight at low altitude. A second philosophy is to provide training which emphasizes early recognition and complete avoidance of potential IMC, without providing recurrent instrument training. This would encourage the pilot to avoid using meagre instrument skills to cope with whiteout and other IMC. Proponents of this philosophy stress diverting, turning back, or landing before loss of visual reference occurs.

The helicopter was fitted with a global positioning system (GPS) receiver. GPS is an inexpensive and accurate navigation system, which is especially helpful for VFR flight in featureless terrain and in areas of compass unreliability. GPS permits direct line navigation for optimal fuel efficiency and nearly eliminates the risk of getting lost. The benefits provided by GPS may be mitigated by the tendency to increase risk taking in other areas, such as attempting VFR flight in poor weather. This tendency is known as risk compensation. Data recovered from the GPS indicated that it was operating at impact.

The helicopter was equipped with a high frequency (HF) radio. The vernier HF antenna tuner was mounted on the left wall of the instrument centre console. The position of the vernier control and the indicator needle required that the pilot look and reach left and downward to tune the HF antenna. The research company routinely provided flight following on 5680 KHz, and the pilot had advised a Mould Bay operator that he would contact him on 5680 about five minutes after take-off. Approximately five minutes after take-off, an HF carrier-only transmission was heard for three to five seconds, indicating that the pilot may have been tuning the HF antenna. There was no subsequent communication with the pilot. The accident site was located approximately five minutes (air time) from the Mould Bay Airport.

The helicopter was equipped with a Pointer Sentry C-4000 emergency locator transmitter (ELT) which was mounted on the right side of

the vertical control tube tunnel that is located in the centre of the cabin. The ELT was torn from the mount and the antenna lead at impact. The case was penetrated and the switch circuitry sustained damage which prevented signal transmission.

Analysis

At the time the pilot departed the Mould Bay Airport, marginal VFR weather conditions prevailed, with the ceiling and visibility estimated to be 500 to 1,000 feet overcast and 1 to 4 miles in fog and light snow. In these conditions, a whiteout probably would have existed over the eight-mile-wide expanse of sea ice on Mould Bay. Wreckage examination indicated that the helicopter was banked left and descending when it struck the ice, indicating that it was out of control. The severe breakup of the helicopter and the scattered wreckage trail are typical of numerous whiteout accidents. It is probable that the pilot lost visual reference because of the whiteout conditions, became disoriented, and lost control of the helicopter. It is possible that the pilot was tuning the radio at the time of the occurrence, which would have contributed to his disorientation.

Because of its ease of use and accuracy, GPS encourages straight-line tracking. The data retrieved from the GPS following the crash and the location of the accident site on a direct line between the departure airport and destination indicate that the GPS was functioning and that the pilot was using GPS as his primary method of navigation. His decision to initiate and continue flight into weather conditions which were conducive to whiteout might have been influenced by the availability of GPS, by the favourable area forecast, and by the fact that he knew the weather was good in Sachs Harbour.

The AWOS at Mould Bay was not accurately recording actual weather conditions at the time of the accident; however, this was not considered to be a factor in the occurrence.

The following Engineering Branch reports were completed:

LP 59/96 - Instrument Examination; and
LP 58/96 - Servo Actuators Examination.

Findings

1. The pilot was certified and qualified for flight in accordance with existing regulations.

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

3. It is probable that the pilot lost visual reference and became disoriented over sea ice during whiteout conditions.

4. The pilot had limited instrument flying experience.

5. Because of impact damage, the ELT did not transmit.

6. The AWOS at Mould Bay was not accurately recording actual weather conditions at the time of the occurrence; however, this was not considered to be a factor in the occurrence.

Causes and Contributing Factors

The pilot lost control of the helicopter after continuing flight into whiteout weather conditions, probably because he became disoriented.

Safety Action

As a result of this accident, Canadian Helicopters Western Division has reviewed its training policy and has incorporated emergency procedure training into the VFR recurrent training curriculum. This training will stress the hazards of "pushing" weather and stress avoidance of weather conditions which may result in whiteout. This training will also prepare the pilot to maintain straight and level flight, climb and descend, and complete a 180-degree turn with reference to the instruments should visual cues be lost.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail and W.A. Tadros, authorized the release of this report on 11 December 1996.