Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A01W0297

LOSS OF ENGINE POWER, HARD LANDING

ARCTIC SUNWEST CHARTERS LTD.
EUROCOPTER EC120B (HELICOPTER) C-GRTA
YELLOWKNIFE, NORTHWEST TERRITORIES 5 nm E
18 DECEMBER 2001

Canada

Aviation Investigation Report

Loss of Engine Power, Hard Landing

Arctic Sunwest Charters Ltd.
Eurocopter EC120B (Helicopter) C-GRTA
Yellowknife, Northwest Territories 5 nm E
18 December 2001

Report Number A01W0297

Summary

At approximately 1335 mountain standard time, a Eurocopter EC120B helicopter, C-GRTA, serial number 1076, with two pilots on board, was on a training flight in the Twin Towers helicopter practice area five nautical miles east of Yellowknife Airport, Northwest Territories. After approximately 25 minutes of flight, during a power-on approach to a large clearing, the rotor speed decayed and the low rotor rpm warning horn sounded at a height of about 150 feet above ground level (agl). The pilot entered an autorotation and in the ensuing hard landing, the helicopter was substantially damaged. The pilots sustained minor injuries.

Ce rapport est également disponible en françois.

Other Factual Information

The helicopter departed Yellowknife Airport at 1330 mountain standard time[1]. The company chief helicopter pilot was the pilot-in-command and flew the aircraft from the right seat. Another company pilot occupied the copilot seat. Dual controls were installed. The intent of the flight was for the chief pilot to practice normal and emergency manoeuvres, including power recovery autorotations.

After take-off, the crew conducted landings on a taxiway before flying to the helicopter practice area. They then conducted air exercises and hovering manoeuvres in a large snow-covered clearing, followed by right-hand power-on circuits back to the clearing. When the pilot-in-command began to increase collective pitch, at about 150 feet agl on final approach for the second circuit, the rotor tachometer indicated rapidly decaying rotor rpm and the low rotor rpm warning horn sounded. The pilot-in-command noticed an illuminated engine oil pressure annunciator light. The second pilot noticed illuminated annunciator lights, but could not positively identify them.

Rather than attempt a low-level steep turn in order to land on a road, the pilot continued on the final approach heading to land straight ahead in the clearing. The glide had to be stretched to clear trees; the helicopter entered the clearing with a high rate of descent, low forward speed and insufficient rotor rpm to cushion the landing. The aircraft touched down heavily; the main rotor blades flexed downward, severed the tail boom, and threw the fenestron[2] 50 feet to the left of the main wreckage. The main rotor blades were damaged and the front skid gear cross tube broke at the right saddle. There was no damage to the forward fuselage or cabin area.

The final approach track was about 160 degrees magnetic (˚M) and the helicopter came to rest on a heading of about 170˚M after skidding about 20 feet. The engine was not running after the landing. Before evacuating the helicopter, the pilots conducted a shut-down procedure and turned off the emergency locator transmitter (ELT), which had activated. The crew contacted an overflying aircraft by radio and they were picked up by a company helicopter about 20 minutes after the accident.

The weather at Yellowknife at the time of the occurrence was as follows: winds 214˚M at four knots, visibility 15 statute miles, a few clouds at 20 000 feet agl, temperature minus 27˚C, dew point minus 31˚C, altimeter setting 29.79, and remarks cirrus one-eighth coverage.

Both pilots held valid commercial helicopter pilot licenses. The pilot-in-command had accumulated about 4000 hours total flying time, with 150 hours on type, while the second pilot had accumulated about 10 000 hours total time and 400 hours on type.

---

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

[2] The EC120B fenestron is an enclosed 8-bladed tail rotor.

The aircraft was certified, maintained, and equipped in accordance with existing regulations and approved procedures. Aircraft weight at the time of the occurrence was calculated to be 3065 pounds, within the maximum gross weight limit of 3780 pounds. The centre of gravity was calculated to be 158.27 inches aft of the datum, which was within the limits from 150.7 to 163.0 inches.

Examination of the helicopter and its systems at the accident site and in the company's maintenance facility did not reveal any anomalies that could cause a loss of power in the Arrius 2F engine. The engine met all specifications when tested after the accident in the manufacturer's facilities. The helicopter was equipped with a computerized vehicle engine monitoring display (VEMD), which recorded various engine performance parameters. Most of the data were lost when power was removed from the aircraft. Data that was retrieved from the VEMD pertained to exceedences of normal engine parameters; these data did not indicate that the engine had been operated beyond normal limitations.

Prior to the flight, the helicopter was refuelled with 130 litres of Jet A-1 fuel, which was sufficient for the flight. The EC120B *Flight Manual* states that fuel anti-ice additive is mandatory for operation at temperatures below 0˚C. In the event of fuel contamination with water in freezing temperatures, the additive combines with free water and prevents the formation of ice crystals, which may clog the fuel system. Premixed anti-ice additive was not available from the fuel distributor and the fuel ticket indicated that it was not dispensed into the helicopter. Company personnel, including the crew of C-GRTA, were unaware that anti-ice additive was not available at Yellowknife. The crew did not request that additive be added to the fuel, nor did they add it themselves during refuelling. During wreckage examination, no contaminants, including water or ice, were found in the helicopter fuel system.

The normal rotor speed in the EC12 B is 406 rpm and the low rotor speed audio warning activates at or below 370 rpm. There is no audio warning of engine power loss. The free turbine engine is mounted about six feet behind the pilot position. Engine noise in the cockpit is minimal.

Analysis

Symptoms displayed by the helicopter indicated a loss of engine power: low rotor rpm, low rotor rpm warning horn, illuminated oil pressure light, engine not running after the landing. Illuminated annunciator lights could not all be identified and it was not possible to determine the exact aircraft systems status during the emergency. Post-crash examination and testing of the aircraft and its systems did not identify a cause for the loss of engine power.

Although it was not determined to be a factor in the accident, the lack of fuel anti-ice additive in the EC120B operating at temperatures below 0˚C could potentially cause a loss of engine power.

An approach to landing in an unprepared, confined area is a high workload exercise that requires the pilot's attention to be concentrated mostly outside the cockpit. In these circumstances, a pilot may not be aware of an engine power loss during the initial stages of deceleration, especially if the engine is mounted some distance from the cockpit. The first compelling indication of an engine power loss may be the low rotor rpm warning horn, indicating a drop in rotor rpm of at least 9%. In the final approach phase of flight, the aircraft energy state is relatively low and lost rotor rpm can be difficult to recover.

In attempting to stretch the autorotative glide into the clearing, the pilot allowed the rotor rpm to drop substantially, which resulted in a hard landing with substantial damage to the helicopter.

Findings as to Causes and Contributing Factors

1. The helicopter sustained an engine power loss for undetermined reasons.

2. Engine power loss was not identified by the pilot until rotor rpm had decayed, and stretching the autorotative glide to the clearing resulted in a further reduction of rotor rpm and a hard landing.

Findings as to Risk

1. Fuel anti-ice additive was not added to the fuel; therefore, there was potential for an ice blockage in the helicopter fuel system in the event of water contamination of the fuel system.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 December 2002.