

Investigation Report

Identification

Type of Occurrence:	Accident
Date:	4 April 2009
Location:	Near Hartenholm
Aircraft:	Helicopter
Manufacturer / Model:	Hughes Helicopter / Hughes 369HS
Injuries to Persons:	Two persons severely injured Three minor injuries
Damage:	Aircraft severely damaged
Other Damage:	Minor crop damage
Information Source:	Investigation by BFU
State File Number:	BFU 3X018-09

Factual Information

History of the Flight

At 1337 hrs¹ the helicopter pilot took off from Hartenholm Airfield with four passengers on board for a 30-minute commercial sightseeing flight above Hamburg.

¹ All times local, unless otherwise stated.

The pilot stated the following: After gaining forward speed along runway 23 he climbed toward the South to get to the mandatory reporting point November of the Control Zone Hamburg. In 500-600 ft AMSL and with an airspeed of about 75 kt, all of a sudden he heard the aural warning of the RPM indicator and several warning lights illuminated in the cockpit. He reacted with the immediate initiation of an autorotation and searched for a suitable landing area. In flight direction he saw a fenced-in paddock which he tried to reach. He intended to cross the fence running perpendicular to his flight direction; thereby the airspeed and the main rotor's RPM decreased considerably. At the end of the autorotation, the helicopter plunged and then impacted the ground hard with a nose-up attitude from a height of about 3 m. It flipped over its nose.

Thereby, the tail boom severed. The fuselage came to rest on its right side. The pilot left the helicopter by unaided and assisted the passengers to leave the wreckage.

Personnel Information

The 58-year-old pilot held an Commercial Pilot's License Helicopter (CPL(H)) first issued on 7 March 1996. He held the type rating as Pilot in Command (PIC) for the HU369/MD500N/600, valid until 2 February 2010. He also held a restricted flight instructor rating (FI(H) rp) for non-commercial helicopter pilots. He held a class 1 medical certificate valid until 26 July 2009. His total flying experience on helicopter was about 1,990 hours; about 1,600 hours of which were on the accident type. On 21 January 2009 he passed an Operator Proficiency Check for his HU369 pilot's license. According to the documentation, section 4, autorotation descends, autorotation landings and flares with the help of the engine were trained. His pilot's log book showed that in the last 30 days he had flown one hour and in the last 90 days two and a half hours on the type.

Aircraft Information

The helicopter HU369HS, year of manufacture 1970, manufacturer by Hughes Helicopters had the manufacturer's serial number 700241S. It was equipped with an Allison 250-C18A gas turbine engine. Maximum take-off mass was 1,156 kg. The take-off mass was about 1,094 kg. Total operating hours were 3,390 hours. The last annual inspection took place on 18 April 2008. Since then the helicopter had been operated for 116 hours. On 25 September 2009 the last 100-hour inspection took place and since then the helicopter had been operated for about 20 hours.

The centre of gravity was within limits; the maximum take-off mass was not exceeded. The operator was certified by the Luftfahrt-Bundesamt (German civil aviation authority, LBA).

Meteorological Information

According to the Deutscher Wetterdienst (German meteorological service provider, DWD) at the day of the accident the weather in Hamburg was as follows: Visual Meteorological Conditions (VMC) with a ground visibility of 6 km, no significant cloud, wind from 280 with 8 kt and a barometric air pressure (QNH) of 1.017 hPa. The temperature was 12°C and the dewpoint was 3°C.

Communications

During take-off radio communications with the Flugleiter (a person required by German regulation at uncontrolled aerodromes to provide aerodrome information service to pilots) of Hartholm Airfield took place. It was not recorded. During the occurrence the pilot did not send a radio message.

Airport Information

Hartholm Airfield (EDHM) has one 761 m asphalt runway oriented 05/23. Aerodrome elevation is 108 ft AMSL.

Flight Recorders

The helicopter was not equipped with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR). These recording devices were not mandatory.

Wreckage and Impact Information

The accident site was located about 1,650 m south-west of Hartenholm Airfield and east of Wolfsberg on a paddock. The ground was soft and damp.

The helicopter was on its right fuselage side pointing north; opposite to the direction of flight. The four main rotor blades were attached to the rotor head and showed multiple bends. The rotor head and the control rods between swash-plate and rotor head showed several fractures. The right skid tip was severed in the area of the forward equaliser bar and was found

about 6 m north-west of the wreckage. The tail boom had been severed. Parts of the tail boom and the tail section were found about 20 m west of the main wreckage. Indentation marks of the skids were found about 3 m north of the wreckage. An about 3.5 m long indentation mark of the tail skid was found about 8.60 m North of the wreckage and axial to the extension of the indentation marks of the skids.

After the wreckage was salvaged, the engine and the drive train for the main gear box were examined. The engine oil level was normal; both magnetic chip detectors plugs were clean. There was fuel in all fuel lines from the tank to the combustion chamber and injector, respectively. About 130 litres of fuel were de-fuelled. The engine could be turned manually without any noticeable mechanical sounds. The mechanical fuel pump did not show any anomalies. The N1 controller of the engine fuel control unit was at the open flow position; scale position 80°. The N2 controller was in the position "high revolution speed". The engine fan blades were examined with a borescope but showed no anomalies.

Fire

There was no fire.

Tests and Research

Fuel samples were taken and the engine removed for further analysis. A maintenance organisation conducted the engine inspection. No mechanical damages were found which would have caused a sudden power loss during the flight.

In detail, the examination showed the following results:

1. Compressor Section: The compressor inlet was free of foreign object damage. Traces of corrosion within the compressor scroll were noted upon borescope inspection. The compressor bleed valve was intact and undamaged.
2. Accessory Gearbox Section: The magnetic chip detector plugs were checked immediately after the accident and did not show any contamination. Oil and fuel filters were clean. The fuel pump was not damaged. The N1 and N2 gear trains rotated freely.
3. Turbine Section / Combustion Chamber: The exterior did not show any damages. A borescope inspection was completed on all 4 turbine wheels and the first stage nozzle with no visual indications of turbine damage. Some damages were found in the combustion chamber but cannot be linked to the engine failure.

The engine was installed in a certified test stand and a test run. Minor leaks in the lubrication system occurred. The engine power necessary for take-off was reached although the power was 4.5% below the engine manufacturer's specification power. During the test run the bleed valve open and close points were noted and later determined to be within specification

The fuel samples were examined. It was determined that the specification AFQRJOS Joint Fuelling System Checklist for JET A-1 with the exception of the parameter "Existent Gum" was adhered to. One sample showed 11 mg/100ml and another 12 mg/100ml existent gum; the allowable maximum is 7 mg/100ml.

Additional Information

For each helicopter an altitude-speed-chart is compiled in the scope of type certification and incorporated into the handbook. These depict altitude and speed combinations which have to be avoided during flight because within these ranges a safe autorotation is not possible. According to the pilot's statement the helicopter was not within such an altitude-speed range.

Analysis

The weather was suitable for the planned flight. The pilot held the required helicopter licenses and ratings. The aircraft had a valid certificate of registration. The controls of the helicopter were not impaired technically.

After take-off and during climb the engine failure occurred. In the cockpit this was indicated by acoustic and visual warnings. The investigation did not reveal a cause for the engine failure.

The exceedance of the parameter existent gum cannot have caused the engine failure because the fuel filter and injectors did not show any contamination and during the test run the engine developed sufficient power. The samples had been stored for quite some time and this might have caused the high rate of existent gum.

With single-engined aircraft it is important to take the possibility of an engine failure into consideration when planning and conducting flights. This engine failure occurred in a flight phase disadvantageous for the pilot. Due to the low height there was very little time to initiate and carry out an autorotation once the emergency situation was realised. The option to find an obstacle-free emergency landing area was limited due to the initial situation. The landing on the nearest field was therefore correct. The paddock located in flight direction was suitable

for the emergency landing. The fence around the field hindered the landing but did not make it impossible.

The autorotation landing was controlled in a way that in about 3 m helicopter and engine RPM were decelerated. The plunge could no longer be avoided. Then the helicopter crashed uncontrolled to the ground.

Conclusions

The accident occurred because the autorotation was finished in too great an altitude after the engine failed.

Investigator in charge: Karge

Assistance: Rokohl

Braunschweig, 6 August 2012

Appendices



Indentation marks of the skids and wreckage position from flight direction

Photo: BFU



View from opposite approach direction

Photo: BFU

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (Flugunfall-Untersuchungs-Gesetz - FIUUG) of 26 August 1998. The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise. This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

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