German Federal Bureau of
Aircraft Accident Investigation

Investigation Report

The Investigation Report was written in accordance with para 18 Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft stating facts only.

Identification

Type of Occurrence:	Serious incident
Date:	17 May 2011
Location:	near Egelsbach
Aircraft:	Helicopter
Manufacturer / Model:	Hélicoptères Guimbal / Cabri G2
Injuries to Persons:	None
Damage:	Aircraft not damaged
Other Damage:	None
Information Source:	Investigation by BFU
State File Number:	BFU 7X008-11

Factual Information

History of the Flight

According to the pilot, he started at about 1155 hrs[1] with a passenger from Frankfurt Egelsbach Airfield with a helicopter Cabri G2 for a pleasure flight. Once mandatory reporting point TANGO was overflown at an altitude of about 1,500 ft AMSL the engine failed after a so called push over manoeuvre. The pilot immediately initiated an autorotation and was able to restart the engine in about 500 ft GND. He decided to return to Egelsbach.

No further engine failures or other technical problems were encountered during the remainder of the flight and the subsequent landing.

Personnel Information

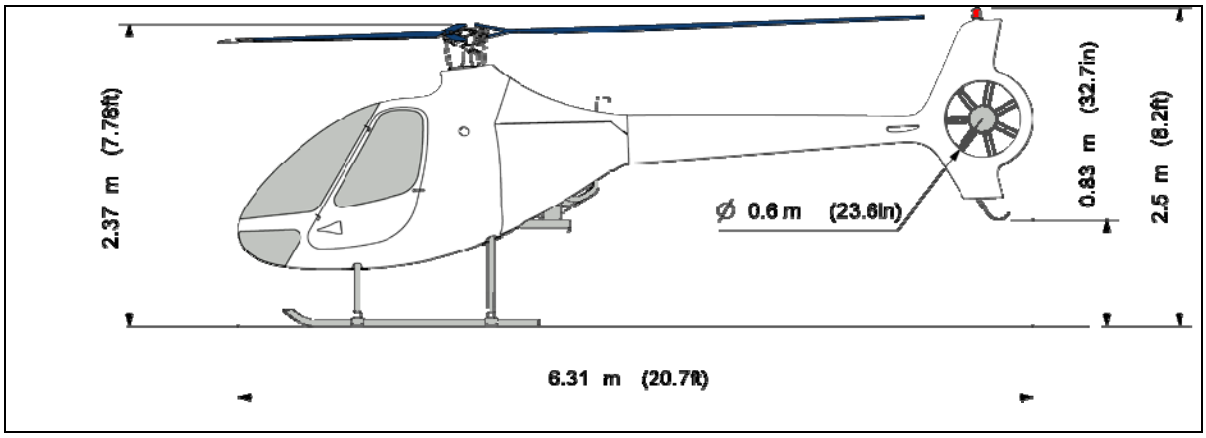
The 35-year old pilot held a Commercial Helicopter Pilot's License (CPL(H)) issued according to JAR-FCL 2 and valid until 18 May 2015. His license included the ratings as Pilot in Command (PIC) and type rating instructor for AS350/350B3, EC120, R22, R44 and G2. In addition, he held the flight instructor ratings for trainings of private and commercial pilots and flight instructor candidates. He held a class 1 medical certificate without restrictions issued according to JAR-FCL 3; it was valid until 28 July 2011.

His total flight experience was 1,587 hours, of which 118 hours were on the type in question.

Aircraft Information

Hélicoptères Guimbal is the manufacturer of the Cabri G2 two-seated helicopter. It has skids, a three-blade main rotor and a Fenestron for anti-torque. Maximum take-off weight is 700 kg. The helicopter is equipped with a Lycoming O-360-J2A piston engine and an Avstar MA-4SPA carburettor. In 2007 EASA approved the helicopter type according to certification specifications CS-27.

[1] All times local, unless otherwise stated



Side-face Cabri G2 Source: Hélicoptères Guimbal

The helicopter Cabri G2 was built in 2010 and had the manufacturer's serial number 1016. According to the weighing report, empty weight was about 424 kg. Total operating hours were about 170 hours.

The helicopter was operated by a commercial air operator and Flight Training School (FTO) which was certified by the Luftfahrt-Bundesamt (LBA).

Meteorological Information

According to METAR of Frankfurt Rhein-Main Airport, the conditions at the time of the occurrence were as follows:

Wind from 240°, with13 knots. Ground visibility was more than 10 km; in 2,500 ft a few clouds (FEW) prevailed. Temperature was 16 °C and and the dewpoint was 11 °C. QNH was 1,012 hPa.

According to the pilot, at Frankfurt-Egelsbach Airfield the wind came from an easterly direction; ground visibility was more than 10 km with few clouds above 5,000 ft (CAVOK).

Aerodrome Information

Frankfurt-Egelsbach Airfield (EDFE) is located west of the city of Egelsbach und about 8 NM south of Frankfurt. The 1,400 m long runway has the direction 090°/270°. Aerodrome elevation is 385 ft AMSL.

Flight Recorders

The helicopter was not equipped with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR). There were no legal requirements for such equipment to be fitted.

Wreckage and Impact Information

The BFU was informed of the Serious Incident during flight operations on 07 June 2011.

The following gives a listing of all the actions undertaken by the operator after the occurrence:

17 May 2011
The helicopter was grounded and the manufacturer informed

18/05/2011
Trouble-shooting in accordance with the instructions given by the manufacturer, fuel supply system was checked; test flight resulted in another engine failure.

19/05/2011
Another trouble-shooting, carburettor No 1 (S/N AV1127488) was disassembled and checked, pressure loss during compression test was determined, carburettor was disassembled and showed pressure traces on the needle valve which was then exchanged along with the valve seat.

20/05/2011
Wiring of the entire engine was checked; the test flight resulted in another engine failure during a flight manoeuvre with decreased load factor

24/05/2011
Carburettor No 1 was substituted with the new carburettor No 2 ((S/N AV11274416), test flight resulted in another engine failure

25/26 May 2011
Trouble-shooting was conducted according to the manufacturer's requirements; electrical fuel pump and Gascolator were disassembled and checked.

27/05/2011
The manufacturer came to Egelsbach, trouble-shooting was conducted, the Governor Control Unit was exchanged, the test flight without the Governor resulted in another engine failure during push over
28/05/2011
Trouble-shooting together with the manufacturer, carburettor No 2 was exchanged with carburettor No 4 Precision Airmotive (S/N VN089302), which was disassembled from helicopter S/N 1008; the test flight resulted in another engine failure

30/05/2011
Helicopter was transported to the manufacturer by road

10/06/2011

The manufacturer returned the helicopter to service

The test flights were partially recorded with an on-board video camera

Fire

There was no fire.

Tests and Research

Due to the engine failures, the manufacturer conducted further test flights with helicopters S/N 1016 (the helicopter in question) and S/N 1008 (an identical helicopter). Therefore, the helicopter S/N 1016 was equipped with a new carburettor No 3 AV 11274432. The original carburettor No 4 (S/N VN089302) was re-installed into helicopter S/N 1008.

During the test flights the performance of the engine decreased whenever load factors were less than 0.2 g; the engine continued to run with normal performance as soon as positive load factors were present. Smoke was observed during the push over manoeuvres.

The original carburettor No 1 (S/N AV1127488) was then re-installed into helicopter (S/N 1016). This time it was determined before engine start-up that the carburettor leaked whenever the additional fuel pump was activated. After engine start-up the carburettor did not leak any more. Again a push over manoeuvre was flown and the engine failed.

As a result the carburettors No 1 and No 2 were sent to the carburettor manufacturer. It was determined that repeatedly carburettor No 1 overflowed at higher pressures. Malfunctions in the area of the carburettor needle, the needle seat and the float bracket were identified as causes which caused higher friction and impairment of the float movement.

Carburettor No 2 showed the same overflowing at higher pressures. The cause was a malfunction in the area of the carburettor needle and the needle seat which resulted in leakages.

Additional Information

Prompted by the engine failures and the determined carburettor problems during low load factors the helicopter manufacturer incorporated push over manoeuvres into his standard test flight program.

In general the manufacturer advises that the flown manoeuvres were outside the flight envelope described in the Flight Manual as safe, normal and permitted. The helicopter manufacturer furthermore advises that push over manoeuvres are dangerous and for a lot of helicopters strictly forbidden.

Investigator in charge: Axel Rokohl

Braunschweig: 5 October 2011

This investigation is 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 - FlUUG) 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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