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Aircraft Accident Investigation Bureau AAIB

Final Report No. 2010 by the Aircraft Accident Investigation Bureau

concerning the accident

to the Robin DR300-180R aircraft, HB-EPG

on 4 July 2006

Saanen aerodrome, municipality of Saanen/BE

approximately 50 km south-west of Bern

Ursachen

Der Unfall ist auf einen Brand nach einer Notlandung, ausgelöst durch eine Störung am Vergasersystem des Motors, zurückzuführen. Diese vorbestandene Störung am Vergasersystem wurde nicht erkannt.

General information on this report

This report contains the AAIB's conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with article 3.1 of the 9th Edition, applicable since 1st November 2001, of the Annex 13 of the Convention on International Civil Aviation of 7 December 1944 and article 24 of the Federal Air Navigation Law, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the accident investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the German language.

Unless otherwise indicated, all times mentioned in this report are indicated in the standard time applicable to the area of Switzerland (local time – LT), corresponding at the time of the accident to Central European Summer Time (CEST). The relationship between LT, CEST and coordinated universal time (UTC) is: $LT = CEST = UTC + 2 \text{ h}$.

Final Report

Aircraft type	Robin DR300-180R	HB-EPG		
Operator	Segelfluggruppe Olten SGO, 4601 Olten			
Owner	Segelfluggruppe Olten SGO, 4601 Olten			
Pilot	Swiss citizen, born 1938			
Licence	Commercial pilot's licence CPL (A), FI(A) Glider			
Flying hours	total flights with motor-aircraft	3435:38 h during the last 90 days	23:29 h	
	on the accident type	206:55 h during the last 90 days	0:45h	
	total glider	1172:18 h during the last 90 days	16:01 h	
Location	Saanen aerodrome/BE (LSGK)			
Coordinates	---	Elevation	997 m AMSL	
Date and time	4 July 2006, 12:46 LT			
Type of operation	VFR private			
Flight phase	Landing			
Accident type	Aircraft was consumed by fire on the runway after a successful emergency landing following an engine trouble			
Injuries to persons				
Injuries	Crew	Passengers	Total number of occupants	Others
Fatal	---	---	---	---
Serious	---	---	---	---
Minor	---	---	---	---
None	1	---	---	---
Total	1	---	---	---
Damage to aircraft	After the emergency landing on runway 26, the aircraft was undamaged. As a result of the ensuing fire, the aircraft was destroyed.			
Other damage	Insignificant damage to 20 m ² of runway due to fire.			

1 Factual information

1.1 Flight preparations and history of the flight

1.1.1 General

The following flight preparations and history of the flight of aircraft HB-EPG is based on statements by the pilot and witnesses and on entries in the aircraft documentation.

1.1.2 Flight preparations

1.1.2.1 Engine troubles prior to the date of the accident

On 27.05.2005, the engine cut out on the ground after landing. Other analogous incidents occurred up to the end of the towing season (5 to 6 cases). As a reaction to the faults which occurred in 2005, the carburettor was dismantled at the end of the 2005 flying season by the gliding group's technician and sent to the company named Cermec Motor SA with a description of the defect for "repair or partial overhaul". This company carried out a repair and issued an airworthiness certificate. Subsequently, on the occasion of a 100-hour engine check, the technician in charge refitted the carburettor on 16.03.2006.

On 24.06.2006, the aircraft was flown to Saanen aerodrome to be used for towing during a gliding camp lasting several weeks, organised by the glider group Segelflugguppe Bern. It was used there from 25 June.

After the flights in the morning of 26.06.2006, the aircraft was refuelled. Afterwards, the engine could no longer be started and gasoline leaked from the air filter housing beneath the engine. The fuel pump was as usual switched on when the start-up was attempted.

The technical trouble was not examined because it was possible to restart the engine by tapping several times on the carburettor housing and no further gasoline leakage was detectable.

On the morning of 27.06.2006, the aircraft was again used for towing operations after telephone clearance from the operator's technician. On the landing approach, when power was increased from idling, the engine cut out. The pilot made a successful emergency landing on runway 26 of Saanen aerodrome. When he vacated the aircraft after the landing roll, the pilot noticed a fairly large quantity of gasoline which had leaked out, underneath the engine cowling.

In view of the incident, the technician came to Saanen, dismantled the carburettor and again sent it to Cermec Motor SA for repair. Once this company had repaired the carburettor and issued an airworthiness certificate, the carburettor was refitted by the technician on 30.06.2006. The operation of the engine was checked the same day, on the ground and in the air, and the aircraft was again released for flight operations.

The subsequent 29 towing flights with three different pilots were without incident.

On 04.07.2006, the pilot of the flight involved in the accident had the task of carrying out towing flights from Saanen aerodrome. On the previous day he had made contact with the pilot who had made the towing flights on that day in order

to obtain information about his impending missions and about the situation at Saanen aerodrome. The latter informed him that everything was in order. According to the pilot's statements, he was not informed about the gasoline trouble noticed on 26.06.2006, the emergency landing on 27.06.2006 or the measures subsequently taken to rectify the fault.

1.1.3 History of the flight

The first two towing flights on 04.07.2006 of aircraft HB-EPG, conducted by the pilot of the flight involved in the accident, took place without incident. After a 30-minute pause, the third towing flight of the day took place. The climb was made at full power and the electric fuel pump in the "ON" position. The release of the glider took place at 2100 m AMSL and was 100 m higher than for the two preceding flights.

On the approach to runway 26 with the throttle position in the idling range, at about 1600 m AMSL the pilot noticed unusual engine running when speed was reduced. With the fuel pump still switched on, he tried to normalise engine running by pulling the carburettor pre-heater and changing the throttle position. It was not possible to increase the engine's reduced power by these measures.

About 1.5 km before the threshold of runway 26, the engine cut out and the propeller continued turning only as a result of windmilling. The pilot made a successful emergency landing on runway 26 of Saanen aerodrome and decelerated along the right side of the runway. After the aircraft had come to a standstill, he tried to start the engine two or three times in order to vacate the runway. During these unsuccessful start attempts, the person in charge of the gliding camp start lists noticed a fire spreading on the ground under the aircraft's fuselage. This person alerted the pilot by radio. He was able to vacate the aircraft to safety before fire reached it. The fire brigade arrived six minutes after the fire broke out. They were unable to prevent the aircraft from being completely consumed by fire.

1.2 Meteorological information

<i>Cloud</i>	<i>1-2/8 cumuli, base approx. 8000 ft AMSL</i>
<i>Visibility</i>	<i>30 km</i>
<i>Wind</i>	<i>West-south-west, approximately 5 - 10 kt</i>
<i>Temperature</i>	<i>26 °C</i>
<i>Dew point</i>	<i>9 °C</i>
<i>Atmospheric pressure</i>	<i>QNH LSZH 1018 hPa</i> <i>QNH LSZA 1018 hPa</i> <i>QNH LSGG 1017 hPa</i>

1.3 Aircraft information

1.3.1 Robin DR300-180R aircraft, HB-EPG

Aircraft type	Robin DR300-180R
Characteristics	Single-engined, four-seater low-wing aircraft, wooden construction with landing flaps and fixed landing gear in controllable nose-wheel configuration
Manufacturer	S.A. Avions Pierre Robin, Dijon, France
Registration	HB-EPG
Year of construction	1972
Serial number	649
Owner	Segelfluggruppe Olten SGO, 4601 Olten, Switzerland
Operator	Segelfluggruppe Olten SGO, 4601 Olten, Switzerland
Airworthiness certificate	Issued by the FOCA on 10 March 1995, valid till revoked.
Registration certificate	Issued by the FOCA on 10 March 1995, valid till removal from the aircraft register.
Unladen weight	530 kg
Mass and centre of gravity	The centre of gravity was within the prescribed limits and the maximum take-off mass was not exceeded.
Certification	VFR by day
Operating hours, airframe	Total hours since manufacture 3065:30 hours
Maintenance	The FOCA issued the aircraft's operator with an authorisation to carry out minor maintenance work (50- and 100-hour checks). One of the operator's technicians, who was in possession of a valid certificate for aircraft maintenance personnel type M, gliders and powered gliders, carried out the maintenance work on behalf of the operator.
Last 100-hour check	Carried out on 16.03.2006 at 3030:58 operating hours, airframe, by SGO
Condition check	The last condition check was carried out by the FOCA on 18.03.2005.
Fuel grade	AVGAS 100 LL
Fuel reserves	The aircraft was equipped with a main tank, capacity 110 litres, and an additional tank, capacity 50 litres. It was not possible to define the fuel remaining after the emergency landing as the two tanks were destroyed by fire. Since the last refuelling on the previous day (80 litres), a total of 64 minutes had been flown.

- 1.3.2 Engine
- | | | |
|------------------------|--|---------------|
| Manufacturer | Textron Lycoming | |
| Type | O-360-A3A | |
| Serial number | L-22559-36A, power 180 HP | |
| Year of construction | Unknown, fitted in aircraft HB-EPG on 16.07.1993 | |
| Engine operating hours | Total hours since manufacture | 3042:46 hours |
| | Total hours since overhaul | 994:46 hours |
| | Total hours since last 100 hour check | 34:23 hours |
- 1.3.3 Carburettor
- | | | |
|---|------------------------------------|--|
| Manufacturer | Precision Airmotive Corporation | |
| Type | MA-4-5 | |
| Serial number | G182565 | |
| Part Number | 10-3878 | |
| Year of construction | Unknown | |
| 1 st carburettor repair | 05.09.2005, 960:23 operating hours | |
| 2 nd carburettor repair | 28.06.2006, 989:29 operating hours | |
| Operating hours at the time of the accident | 994:46 hours | |
- 1.3.4 Propeller
- | | | |
|-----------------|---------------------------|--|
| Characteristics | Two-blade metal propeller | |
| Manufacturer | SENENICH Corporation | |
| Type | 76EM8S5-0-58 | |
| Serial number | 20889K | |

1.4 Technical investigations

Technical investigations were carried out on the carburettor and the engine's muffler.

1.4.1 Carburettor

The examination of the carburettor, and in particular of the combustion residues found inside the float chamber, was intended to provide information about possible contamination of the carburettor system and about the fuel used on the flight.

No indications were found of any contamination of the carburettor by foreign bodies or by the use of aviation fuel not permitted for aircraft HB-EPG.

1.4.2 Carburettor float system

The fitted float was made of metal. The hinge of the float, which was supposed to enable unrestricted up and down movement of the float in the carburettor bowl, was measured.

Although the carburettor was subjected to high temperatures during the fire, among other things it was still possible to examine the clearance ratios of the float hinge mechanism and compare them with those of a new part. The clearance in the hinge on the aircraft involved in the accident, compared to the new part, was greater by a factor of 2.5. The result was that the free upward movement on the outside of the float (rotation) was 10 mm, compared to 4 mm on a new float. The float on the aircraft involved in the accident moved 5 mm laterally compared with 2 mm on a new float.

There are no guidelines in the overhaul instructions for the Precision Airmotive MA-4-5 carburettor for clearance ratios of the float hinge. Neither the bore nor the screws are measured. Only an assessment of the free movement clearance of the float was described in the E-1000 servicing instructions which was available at the time of the accident for making repairs in the area of the float hinge mechanism.



Fig. 1: Float hinge and bowl



Fig. 2: Wear on the float hinge

1.4.3 Engine muffler system

On aircraft HB-EPG, the operator replaced the original Robin muffler with a Piper PA-28-180 muffler with manifolds and a "Balmer" type silencer. Although in the documentation received from the operator on the equipment list dated 12.05.1978 a muffler is newly specified, it is not clear in which form this modification was authorised by the FOCA.

A round hole approximately 2 cm in diameter was found in the muffler housing. No connection could be established between this damage and the engine cut-out before the landing, the ensuing outbreak of fire and the subsequent destruction of the aircraft.



Fig. 3: Muffler housing with hole

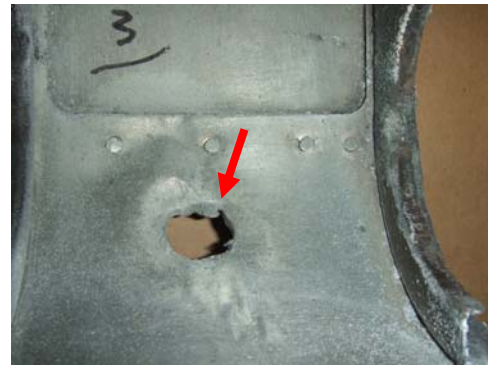


Fig. 4: Damage in the muffler housing

1.5 Aircraft maintenance

1.5.1 Maintenance by the operator of the aircraft

On 21.08.1986, the FOCA issued the operator with an authorisation No. EPG/1 for specific minor maintenance work, namely 50- and 100-hour checks, on aircraft HB-EPG, in accordance with art. 37 of the Ordinance on Approval and Maintenance of Aircraft. For the execution and certification of this work on aircraft HB-EPG, the operator designated as technician a member of the gliding group who was in possession of a valid certificate for aircraft maintenance personnel No. M/2178 for gliders and powered gliders.

1.5.2 Repair work on the Precision Airmotive MA-4-5 carburettor

From the aircraft documents it is apparent that the Precision Airmotive Carburettor MA-4-5, P/N 10-3878, S/N G182565 was twice sent to Cermec Motor SA for repair in 2005 and 2006 because of incidents. The respective dismantling and re-assembly work on the aircraft was carried out by the technician designated by the operator.

According to the maintenance company's repair reports, neither the float nor the float hinge were replaced during the repair work of 2005 and 2006.

2 Analysis

2.1 Technical aspects

2.1.1 Carburettor float system

It can be assumed with a high degree of probability that the large clearance in the float hinge at times seriously impeded the free up-and-down movement of the float, thereby preventing level regulation in the carburettor. When the fault occurred, the float chamber overflowed.

It remains an open question why Cermec Motor SA did not detect and rectify this malfunction on the occasion of two checks and repairs.

2.1.2 Maintenance work on aircraft HB-EPG

The question is raised as to why, over a fairly long period, it was accepted that the engine would cut out on the ground after landing.

It is not clear from the available documentation whether the operator submitted a report on the gasoline loss on 26.06.2006 and the engine cut-out in the air on 27.06.2006 when the carburettor was sent to Cermec Motor SA.

On aircraft HB-EPG, the operator replaced the original installed Robin muffler with one of the Piper PA-28-180 with manifolds and a "Balmer" type silencer. It is not clear from the documentation which was provided by the operator concerning this conversion whether this change was certified by the FOCA.

The type of trouble-shooting and the maintenance in general of this aircraft leave questions open.

3 Conclusions

3.1 Findings

- The pilot was in possession of the appropriate pilot's licences.
- During the descent prior to landing, the engine cut out approximately 1.5 km before the runway. The pilot made a successful emergency landing on runway 26 of Saanen aerodrome.
- During the attempt to re-start the engine on the runway, a fire spread on the ground underneath the fuselage and the aircraft was completely consumed by fire.
- Several serious faults occurred with the engine before the flight involved in the accident. The pilot was not informed of these.
- The engine failure of 04.07.2006 occurred approximately five flying hours after the second carburettor repair on 27.06.2006.
- Excessive clearance between the bore and the bolt of the hinge mechanism was found on the carburettor's float system.
- The EPG/1 authorisation issued to the operator by the FOCA only permitted minor maintenance work on aircraft HB-EPG, but not repair work such as the dismantling and refitting of the carburettor.
- It is not clear from the documentation which was provided by the operator concerning this conversion whether this change was certified by the FOCA
- Both the mass and centre of gravity were within the permitted limits.

3.2 Causes

The accident is attributable to a fire after an emergency landing, triggered by a fault in the engine's carburettor system. This pre-existing fault in the carburettor system was not detected.

Payerne, 26 March 2009

Aircraft Accident Investigation Bureau

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