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Air Accident Investigation Unit

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FINAL REPORT ON THE ACCIDENT TO ULM POLARIS FK14B (OO-F37) IN HASSELT ON JUNE 30,2007

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FOREWORD

This report is a technical document that reflects the views of the investigation team on the circumstances that led to the accident,

In accordance with Annex 13 of the Convention on International Civil Aviation, it is not the purpose of aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the Final Report is the determination of the causes, and define recommendations in order to prevent future accidents and incidents.

Unless otherwise indicated, recommendations in this report are addressed to the Regulatory Authorities of the State having responsibility for the matters with which the recommendation is concerned. It is for those Authorities to decide what action is taken.

NOTE: For the purpose of this report, time will be indicated in UTC, unless otherwise specified.

Synopsis

Date and hour of the accident

Saturday, 30 June 2007, around 14.15 UTC.

Aircraft

Type: B&F FK14B Polaris
Registration: OO-F37

Accident Location:

Wanbeekstraat, 3 Hasselt

Aircraft Owner

Kristoffel BVBA

Type of flight

Local flight

Persons on board

2 Pilots

Abstract.

A B&F FK14B Polaris, registered OO-F37 took-off from Kiewit airfield around 14.10 for a local flight.

After reaching the altitude of 1500ft, the aircraft was seen in a steep climb of 60%, followed by a level flight of 300m.

Then, the aircraft banked hard right, and went into a high speed spin.

The engine flamed out during the descend.

The aircraft recovered from the spin at an altitude of ca 50m, went horizontal without forward speed.

The aircraft crashed nose down in a backyard of a residence located 3 Wanbeekstraat, in Hasselt.

1. Factual Information

1.1. Chronology of the events

On Saturday, 30 June 2007, the first pilot of the aircraft OO-F37 was on the Kiewit airfield. His intention was to fly with his aircraft, a recently-bought ULM Polaris FK14B.

He met another pilot (second pilot), who asked him to accompany him for the flight.

The first pilot sat on the left seat, and the second pilot, on the right seat. The fuel tanks were fully filled in, as usual.

The aircraft took off from Kiewit airfield for a local flight, around 14.10 LT, according to the first pilot.

After take-off, when leveling around 1500 ft, as stated by the first pilot, the second pilot asked to take over the controls. The first pilot accepted, and passed over the controls.

The aircraft then arrived above the crash zone, from the north-east. The aircraft went into steep climb of 60° incidence, with full power, then the aircraft leveled, in a shallow dive for 300m.

Then the pilot in command banked the aircraft for a hard bank turn to the right. The aircraft rolled (180°) to the right, and went into a high speed spin.

The first pilot recalls he reduced the regime of the engine, as it was still in full power. The engine flamed out, and shut down.

A witness showed fumes coming out of the extremities of the wings; it was fuel being ejected from the vent holes. This could ascertain that the wings remained intact during the flight.

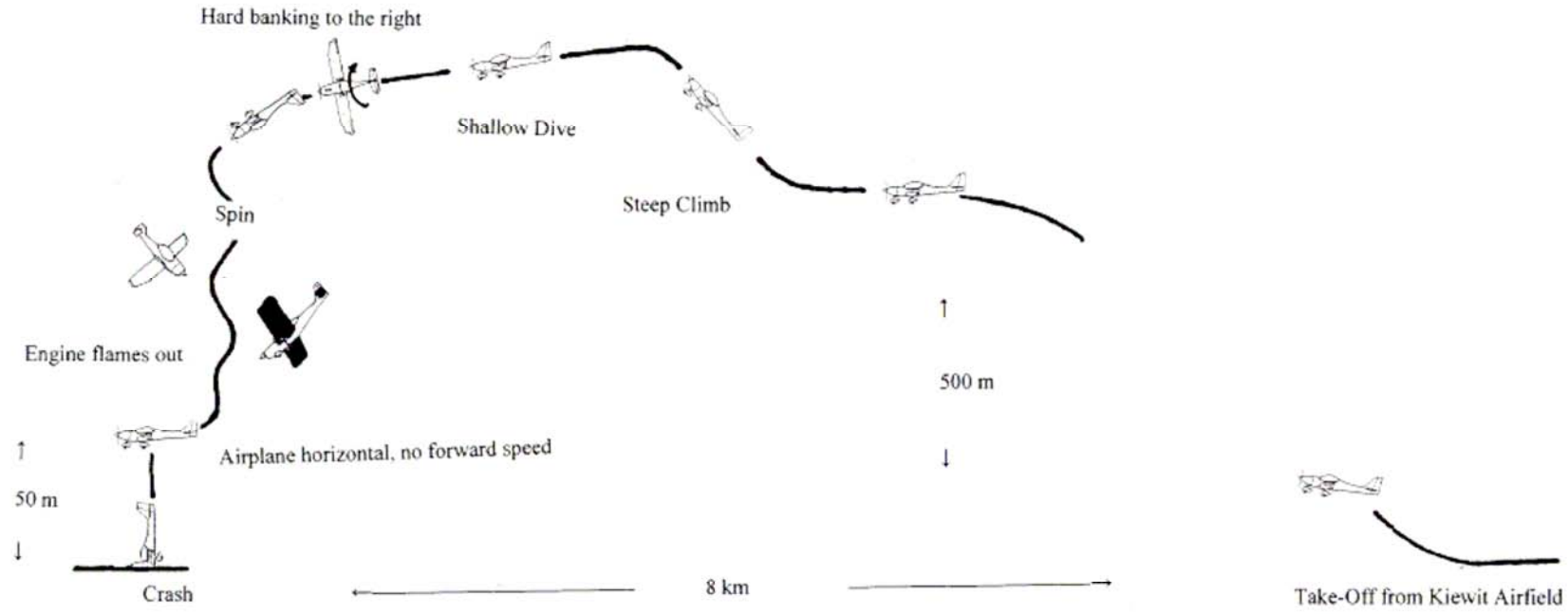
The aircraft recovered from the spin at an altitude of 50m, but seemingly having lost all forward speed.

The aircraft crashed vertically in the backyard of a residence on Wanbeekstraat, 3 Hasselt around 14.15.

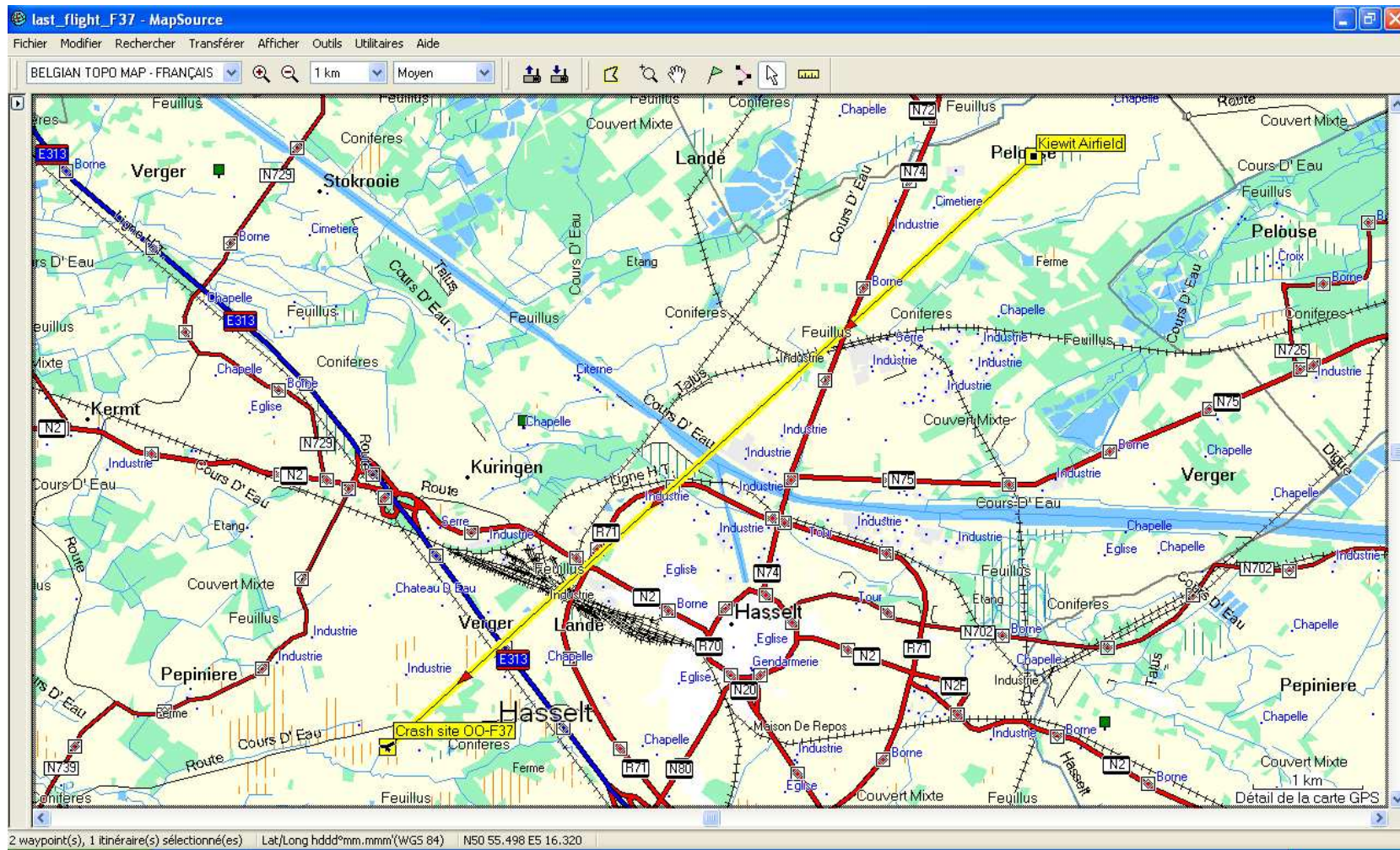
The first pilot succeeded to escape from the aircraft, before it caught fire.

The second pilot died from a heart attack before the aircraft caught fire. The pilot suffered multiple bone fractures, and was transported to the hospital.

The aircraft was totally destroyed, leaving only the metallic structure.



The Accident Flight



1.2. Injuries to persons

Injuries	Pilot	Passenger	Others	Total
Fatal	1	0	0	1
Serious	1	0	0	1
Minor	0	0	0	0
Total	2	0	0	2

1.3. Damage to aircraft

The aircraft was totally destroyed by impact and subsequent fire.

1.4. Other damage

1 tree brought down by impact with aircraft, and slightly burned.
5 other trees showing signs of burning.

1.5. Personnel information

First Pilot.

Sex: Male

Age: 54 years-old

Nationality: Belgian

Licence: First issue 29 April 1998, expiring 11 October 2007.

Class Rating: ULM.

Limitations: Shall wear corrective lenses.

Medical: General: Last 11/10/2006, expiring 11/10/2007.

EC: Last 10/10/2006, expiring 11/10/2007.

RT, issued 17/05/2001, validity unlimited.

The person had a total of more than 500 FH experience, amongst which 50 FH on OO-F37 / Polaris.

Second Pilot.

Sex: Male

Age: 61 years-old

Nationality: Belgian

Licence: First issue 31 May 1999, expiring 1 September 2007.
Class Rating: ULM.

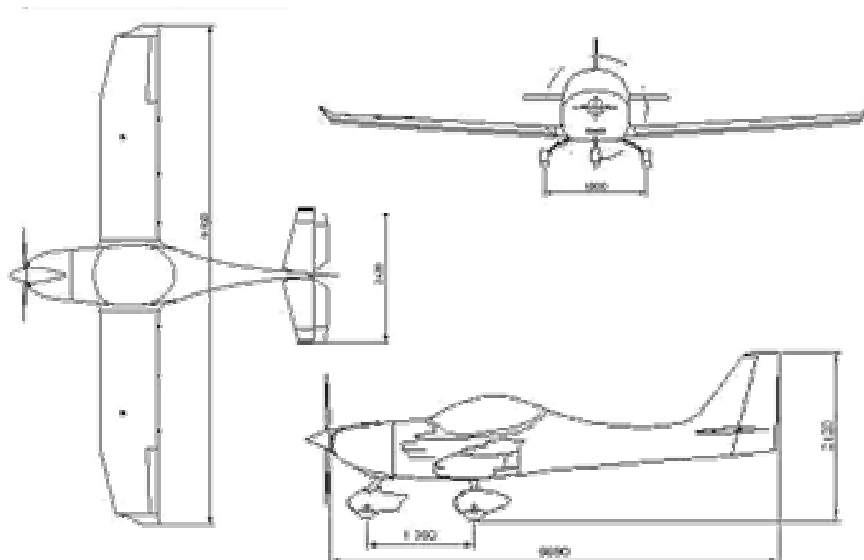
Medical: General: Last 11/08/2006, expiring 1/09/2007.
EC: Last 11/08/2006, expiring 1/09/2007.

RT, issued 3/06/1999, validity unlimited.

The person had a total of more than 1100 FH experience on ULM

1.6. Aircraft information

The B&F FK 14 B is a two-seat ultralight aircraft, with a low wing with upturned wingtips incorporating navigation lights. The structure is mainly composites. The landing gear is a non-retractable tricycle type; composites cantilever main legs and steerable nosewheel.



B&F FK14B 3-side view.

The Polaris is certified as Ultralight according BFU 95 / LTF UL 2003. In Belgium, the aircraft datasheet is ref Nr ARCA 2004-106, issue 1, dated 3-11-2004.

In Belgium, the aircraft is certified with a Maximum Take-Off weight of 450kg, while in Germany, this weight is brought to 472,5kg.

The aircraft comes with a lot of options, increasing the empty weight. The standard empty weight of the FK14B is 261kg. OO-F37 had several options embodied, bringing the MTOW to 296kg.

Amongst other, OO-F37 was equipped with the following options:

- Enlarged Fuel Tank system (78 liters)
- Additional central Fuel Tank system.
- Rescue System BRS 5

The Airplane Manual states:

Acrobatic manoeuvres, including spins, bank angle greater 60°, as well as IFR and VFR night are prohibited.

In strong turbulences the airspeed has to be reduced below 172kph.

All manoeuvres with zero or negative load factors must be avoided under all conditions, these manoeuvres may cause a fire, especially using ROTAX engines with carburettors

Airframe

Manufacturer: B&F Technik Vertriebs gmbh

Type: Polaris FK 14 B 912 S

Serial Number: 64

Built year: 2006

Registration: OO-F37

Certificate of Registration: N°6531, issued 31 January 2007.

Certificate of Airworthiness: Autorisation restreinte de circulation aérienne pour aéronef ultra-léger / Beperkte toelating tot het luchtverkeer voor ultralicht luchtvaartuig N°N-1999-530-, issued 15 Feb 2007.

Empty weight: 296 kg

Total Flight Hours: ca 50 FH

Engine

Manufacturer: Rotax

Type: 912S

Serial Number: 564.62.55

Total Flight Hours: ca 50 FH

Propeller

Manufacturer: Warp - Duc

Type: CS 170/3

Total Flight Hours: ca 50FH.

Owner

Kristoffel BVBA
Renier Sniederpad,1
2970 SCHILDE

1.7. Meteorological information

Observed at Kleine Brogel (36km North of the crash site) – 16.25LT

Wind:

Direction: 220°

Speed: 9kts

Visibility: unlimited

Clouds:

Scattered at 3500ft

Banks of clouds at 6000ft

Pressure: 1015mb

Color State Blue

The meteorological conditions had no influence on the accident.

1.8. Aids to Navigation

The aircraft was equipped with a GPS.

1.9. Communication

There were no recorded information about communication between the airfield and the aircraft during flight.

The aircraft was not equipped with squawk, or transponder.

1.10. Airfield information

The aircraft had taken off from Hasselt (Kiewit - EBZH) airfield.

COORD: 50°58'12"N - 005°22'30"E
ELEV (m / ft): 43 / 141
QFU : 090° / 270°
Dimensions(m) : 600 x 18
Surface : GRASS
Strength: 5 700 kg

1.11. Flight Recorders

Not applicable

1.12. Wreckage and Impact information

All the damage to the aircraft was consistent with the aircraft hitting the ground, and the subsequent fire.

The composite parts of the aircraft were all consumed by the fire, and only the metallic structure of the cabin was left. This structure shows deformations consistent with impact forces.

Continuity of the flight controls was established (up to the fixation bolts), and there was no evidence of a control restriction.

There was no sign of structural failure.

The Right wing showed some remains of composite parts, while the Left wing was totally consumed, indicating the fire started on the LH side.

The engine was not rotating upon impact; although broke into pieces, a part of the propeller tip was found close to the engine.

The rescue system operating handle was found, as well as elements of this system. The system was not used.

All instruments, computers, etc, were destroyed, burned beyond recognition.



1.13. Medical and Pathological information

The post-mortem shows the second pilot died from a heart attack. The report also shows scars from previous heart problems.

Both pilots suffered fractures at the feet, due to the crash; the ankles were clammed within the airframe structure.

1.14. Fire

Aircraft destroyed by fire, fire broke out after impact and after the first pilot escaped the aircraft. The right side of the aircraft is more damaged than the left side; the right wing was probably damaged by impact with the trees, rupturing the fuel tank.

The aircraft structure is mainly made of composite, and was totally consumed by the fire; only the metallic parts remained.

1.15. Survival Aspects

The deceased person was sitting on the right-hand seat and had safety belts on.

The seats and belts were still attached to the structure after impact. The airframe structure took the most of the impact force, at the exception of the deformation of the lower structure, that resulted in trapping the feet of both pilots.

The aircraft is equipped with a rescue system, installed in front of the instrument panel, on the left side. The system is activated by pulling a red handle in front of the pilot . A safety pin, to be removed before flight, avoids inadvertent use during parking.

The rescue system fires a rocket, that opens a parachute, slowing the descend of the aircraft in its entirety. This system is designed to work up to an aircraft weight of 475kg and a speed of 276kph.

The activation handle was not pulled; the first pilot stated he had no time to react. The rocket fused during the fire of the aircraft; the cap was found in a field at a distance of 50m of the aircraft.

1.16. Test and Research

No test or research have been possible on the remains of the aircraft.

2. Analysis.

Weight.

A problem inherent to the ULM is the weight.

The aircraft is certified in Belgium with a MTOW of 450kg, while in some other countries, this weight could be brought to 472,5kg (Germany) when the rescue system is installed (France).

The commercial brochure –with the adequate precautionary warnings – states the maximum weight in flight is 520kg.

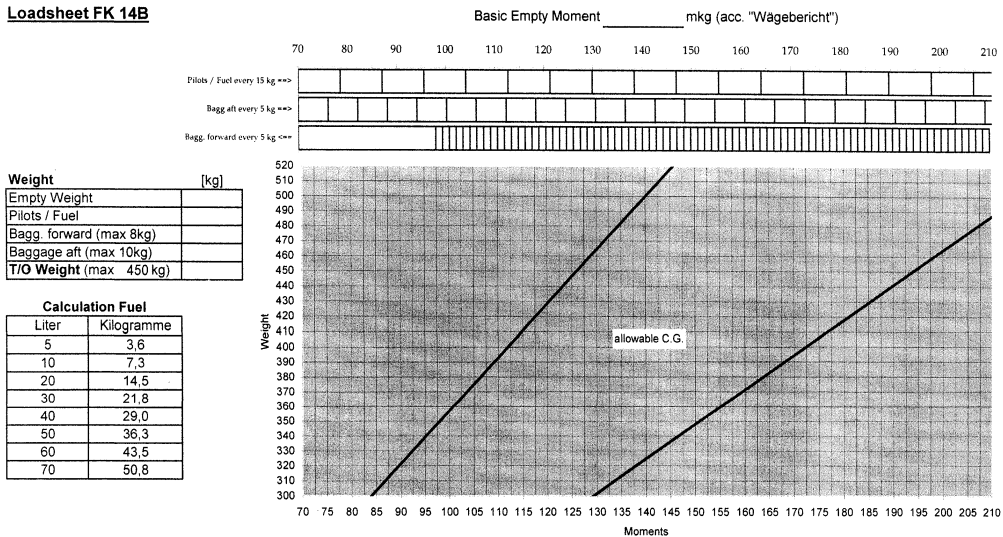
The Load Sheet features a graph, where the scale goes up to 520kg.

The weight of OO-F37, when taking off with the 2 persons on board, and 78 liters of fuel, was well above the certification figure of 450kg.

In normal circumstances, this would not have a negative impact on the position of the CG, as shown on the table; even with a weight of 520 kg, (of course, provided the weight be distributed normally), the CG would always be between limits.

Although the loading of the aircraft was exceeding limits, this would not have dramatically influenced the circumstances of the crash.

Loadsheet FK 14B



Instruction:

For every 15kg of Pilots and fuel weight 1 box to the right. From there go to the row below. For every 5kg of baggage aft 1 box to the right.
From there go 1 row below. For every 5kg of baggage in the forward compartment 1 box to the left (as this compartment is forward of datum).
From the last box draw a vertical line to the lower graph. Draw a horizontal line with the takeoff weight into this graph as well.
The intersection of both lines marks the takeoff C.G. It must be within the thick black lines.

Engine failure.

The Rotax 912S engine flamed out when, when the aircraft was spiraling downwards, the crew reduced the power.

The lay-out of the Rotax carburetor is not designed to operate in all positions. When the aircraft is nosing down, with negative acceleration, fuel may be ejected from the carburetor, hence the risk of flame out, or even fire, as underlined at several locations in the aircraft manual.

Physical condition of the pilot.

This accident outlines the importance of physical checks for pilots, even though the last ECG checks performed did not detect the heart problem of the passenger-pilot.

3. Conclusions.

3.1. Findings

- The pilots had a valid pilot's license and medical certificate.
- The second pilot died from a heart attack before the aircraft caught fire.
- The aircraft had a valid airworthiness certificate and had passed all required inspections.
- The aircraft have had excess weight, with respect to the certification MTOW. The excess weight is estimated to have been more than 30kg.
- The aircraft manual prohibits acrobatic manoeuvres, including spins, bank angle greater 60°, as well as IFR and VFR night.
- There was no sign of in-flight structural failure.
- The engine flamed out and stopped rotating during the spin.

3.2. Causes.

The accident was caused by the maneuver – hard right banking - leading to a high-speed spin that could not have been recovered by the pilot-in-command.

There are actually two possibilities; either the fatal maneuver was conscientiously made by the pilot-in-command, as a follow-on to the steep climb, against all manufacturer's warnings and aviation common sense, or the fatal maneuver was caused by an unforeseeable event.

We favor the second possibility, although no scientific proof exists to confirm it; the maneuver could have been caused by the uncontrolled movements of the pilot-in-command having a heart attack. This situation was not identified by the second person, who could not take over the controls. The engine flamed out when the engine lever was retarded. The aircraft recovered from the spin for an unknown reason, but without forward speed.

A contributing cause was the flame-out of the engine during the spin.

4. Safety recommendations.

There are no safety recommendations directly linked to the causes of the accident.

Loading and weight control

Although not directly connected to the accident, it was felt during the enquiry that a potential danger exists in relation with the loading of the aircraft, and the relation with the certification MTOW limit.

The certification MTOW limit of 450kg is understood by many ULM-pilots as a “paper” limit, and that it is OK to go beyond that limit, or at least not to care about it.

We suggest BCAA to consider an awareness campaign in order to outline the importance of the loading of aircraft and the technical and safety rationale behind the definition of the 450kg MTOW limit.