



## Safety Investigation Report

# ACCIDENT B&F TECHNIK FK12 COMET AT EBAV AIRFIELD ON 29 AUGUST 2013

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## **SYMBOLS AND ABBREVIATIONS**

AAIU(Be)	Air Accident Investigation Unit (Belgium)
ACTT	Aircraft Total Time
AFM	Aeroplane Flight manual
AGL	Above Ground Level
ARCA	Autorisation Restreinte de Circulation Aérienne (Permit to fly)
BCAA	Belgian Civil Aviation Authority
BfU	Bauvorschriften für UL (German Technical standard for ultralight aeroplanes)
BULMF	Belgian ULM federation
ICAO	International Civil Aviation Organisation
IMC	Instrument Meteorological Conditions
METAR	Meteorological Aerodrome Report
PIC	Pilot in Command
PPR	Prior Permission Required (airfield)
ULM	Ultra-Léger Motorisé (Ultralight aircraft)
UTC	Universal Time Coordinated
RWY	Runway
EBAV	Avernas airfield

## **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 and EU Regulation 996/2010, 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 to define recommendations in order to prevent future accidents and incidents.

In particular, Article 17-3 of the EU regulation EU 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility in the accident.

The investigation was conducted by Sam Laureys and Henri Metillon

The report was compiled by Henri Metillon and was published under the authority of the Chief Investigator.

## TERMINOLOGY USED IN THIS REPORT

**Safety factor:** an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence.

**Contributing safety factor:** a safety factor that had it not occurred or existed at the time of an occurrence, then either:

- (a) the occurrence would probably not have occurred; or
- (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or
- (c) another contributing safety factor would probably not have occurred or existed.

**Other safety factor:** a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

**Safety issue:** a safety factor that

- (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and
- (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

**Safety action:** the steps taken or proposed to be taken by a person, organisation or agency on its own initiative in response to a safety issue.

**Safety recommendation:** A proposal of the accident investigation authority in response to a safety issue and based on information derived from the investigation, made with the intention of preventing accidents or incidents. When AAIU(Be) issues a safety recommendation to a person, organization, agency or Regulatory Authority, the person, organization, agency or Regulatory Authority concerned must provide a written response within 90 days. That response must indicate whether the recommendation is accepted, or must state any reasons for not accepting part or all of the recommendation, and must detail any proposed safety action to bring the recommendation into effect.

**Safety message:** An awareness which brings under attention the existence of a safety factor and the lessons learned. AAIU(Be) can disseminate a safety message to a community (of pilots, instructors, examiners, ATC controllers), an organization or an industry sector for it to consider a safety factor and take action where it believes it appropriate. There is no requirement for a formal response to a safety message, although AAIU(Be) will publish any response it receives.

## SYNOPSIS

<b>Date and hour of the accident:</b>	29 August 2013 at 14:12 UTC <sup>1</sup>
<b>Aircraft:</b>	Ultralight B&F Technik FK12 Comet SN: 20
<b>Accident location:</b>	EBAV (N 50° 42' 25,86" – E 005° 04' 09,87")
<b>Aircraft owner:</b>	The pilot was the aeroplane's owner
<b>Type of flight:</b>	General Aviation - Local
<b>Phase of flight<sup>2</sup>:</b>	Manoeuvring
<b>Persons on board:</b>	1

### Abstract:

The aeroplane was performing aerobatics at very low altitude over the two aligned runways of a closed airfield, involving a flight at low level ending by wingover<sup>3</sup> manoeuvres beyond each runway end. After the aeroplane repeated the manoeuvre twice, the aeroplane crashed into the ground of the northern runway at high speed.

### Cause(s):

The aircraft crashed upon a sudden descending turn initiated by the pilot when flying level over the airfield, at very low altitude. The probable cause of this descending turn is a pilot action on the controls that could be related to:

- A loss of the ground visual reference due to smoke present above the airfield, or
- The pilot having a sudden medical event possibly caused by the pull-up action exercised a few seconds before the crash.

### Hazards identified during the investigation<sup>4</sup>:

- Flying close to the ground (low altitude operation)
- Flying through the self-produced smoke
- Setting a bad example to other pilots.
- Performing aerobatics with an aeroplane not certified for such flights.
- Uninsufficient or inadequate maintenance/inspection of the fuel system.

### Consequence<sup>5</sup>:

Unintended flight in IMC (UIMC)  
Controlled flight into terrain (CFIT)

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<sup>1</sup> For the purpose of this report, time will be indicated in UTC, unless otherwise specified.

<sup>2</sup> Type of flight: as per ICAO common taxonomy team to classify occurrences.

<sup>3</sup> A wingover is an aerobatic manoeuvre in which an aeroplane makes a steep climb, followed by a vertical flat-turn. The manoeuvre ends with a short dive as the plane gently levels out, flying in the opposite direction from which the manoeuvre began.

<sup>4</sup> Hazard – Condition or object with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

<sup>5</sup> Consequence – Outcome(s) of the hazard

## 1 Factual information.

### 1.1 History of flight.

The pilot pulled his aeroplane out of the hanger, installed his own wind-sock and took off from the airfield of Avernas (EBAV) at around 14:00.

The airfield was closed and the pilot did not inform anyone of the flight. He also did not inquire if there was military activity underway or planned at EBBE.

One witness saw the aeroplane taking off from the closed northern runway 23. After take-off, the aeroplane flew horizontally over the runway and also above the south runway at an estimated height between 10 and 15 meters above ground level (AGL).

The smoke generator system installed in the aeroplane was activated and was continuously producing a light grey/white smoke. The aeroplane was seen making a wingover above the field located beyond the end of the south runway, and thereafter coming back over the runways at a very low altitude. The same manoeuvre was performed a second time beyond the end of the north runway.

During the second or the third repetition of this flight pattern, the aeroplane collided with the ground on the north runway at a considerable speed.

The only witness of the event present on the airfield had his back to the aeroplane when the impact with the ground occurred. However, he stated that he heard the sound of the impact about 3 seconds after he lost eye contact with the aeroplane.

The witness reported the engine noise he heard throughout the flight was consistent with an engine delivering power and the witness did not notice any change in the engine/propeller noise before the impact.

### 1.2 Injuries to persons.

Injuries	Pilot	Passenger	Others	Total
Fatal	1	0	0	1
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	0
Total	1	0	0	1

### 1.3 Damage to aircraft.

The aircraft was totally destroyed but did not catch fire.

#### 1.4 Other damage.

Minor damage was found to the runway grass surface as well as a limited fuel ground contamination.

#### 1.5 Personnel information.

**Pilot:**

Sex: Male  
Age: 62 years old  
Nationality: Belgian

License: Holder of a Ultralight Aircraft Flight Authorization issued in Belgium, first on 27 December 1983, last on 17 January 2013. The Flight Authorization was valid until 30 December 2013. Ultralight instructor rating obtained on 5 September 2002 (no longer valid).

Medical certificate: Class 4 medical certificate valid until 29 December 2013.

Experience: Wide experience flying ultralight aircraft. Total experience was around 2130FH.  
Average flight hours during the last 12 years: 34FH/Year.

The pilot was known to be a skilled, but undisciplined pilot performing aerobatic flights and very low altitude flights with his B&F Technik FK12 Comet<sup>6</sup>. After several warnings, the pilot had been grounded by the EBAV airfield authority for a 90-day period. However this period of flight prohibition at EBAV, expiring in August 2013, had been lifted a couple of days before the planned date. This allowed the pilot to fly his aeroplane during the week-end prior to the accident, for the purpose of a flight demonstration<sup>7</sup>.

Pilot log book: The pilot log book was last filled in on 21 October 2012. A stamp from BCAA showing the last licence renewal can be found in the log book near the last flight. Additionally, a small "Note Book" was found containing a few records of flights, ending on 4 August 2013.

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<sup>6</sup> During a low level flight performed in the course of 2012 one main landing gear leg had been damaged by a collision with a cultivated field.

<sup>7</sup> The ultralight club organized on this day the 30<sup>th</sup> anniversary of the founding of the club.



## 1.6 Aircraft information.

### Airframe:

- Manufacturer: B&F Technik
- Type: FK12 Comet
- Serial number: 20
- Built year: 1999
- Registration: OO-F\*\*
- Certificate of registration: N°6561 issued by BCAA on 22 October 2007.
- Permit to fly: ARCA ref N-1999-561 issued by BCAA on 27 November 2007.
- Type authorization: 2003-85 Issue 1 – 16/06/2003
- Aeroplane total time: Around 837 hours.

### Engine:

- Manufacturer: Rotax
- Type: 912 UL 80 hp
- Total flight hours: Unknown
- Serial number: 440 31 11

### General:

The B&F FK12 Comet is a single-engine ultralight biplane designed in Germany and manufactured by “FK Lightplanes”. The FK12 first flew in 1999 and is approved in Germany as ultralight according BfU 95<sup>8</sup>.

Although the aeroplane is generally considered as a sports aircraft; aerobatic manoeuvres, including spins, bank angles greater than 60°, as well as IFR and VFR night are prohibited (See Aeroplane Manual Nr.: 12-XXX-1E).

The aeroplane manufacturer stated that such an aeroplane had never suffered any inflight structural failure, even in aerobatics.

The aeroplane is equipped with single bay (one interplane strut each side) wings of equal span, significant stagger and swept at about 14°. The two seats are in tandem. It can be flown from either seats, the pilot in command occupies the aft seat. Vertical and horizontal tail surfaces are trapezoidal, with a swept fin. The Comet has a metal tube fuselage structure, using steel at the front and aluminium further aft.

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<sup>8</sup> BfU is the technical standard applicable to ultralight aeroplanes in Germany

A conventional undercarriage with spring cantilever legs is mounted on the lower fuselage longerons. It is covered with a mixture of composites and fibreglass laminates. A ballistic parachute (BRS 5) is an option. The Comet is powered by different versions of Rotax horizontally-opposed four cylinder engines.



Figure 1: picture of a FK12 aeroplane as found in the aeroplane manual.

#### Aircraft log book

The aircraft log book was last filled in on 21 October 2012. No flight is recorded after this date.

#### Aeroplane Manual

The aeroplane Manual Nr 12-XXX-1E applies to the B&F FK 12 Comet SN: 20. This manual was available and was downloaded<sup>9</sup>, for the purpose of the investigation, from the Technik Vertriebs GmbH website <http://www.fk-lightplanes.com/>.

The aeroplane original manual was neither found in the wreckage nor retrieved elsewhere.

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<sup>9</sup> The aeroplane manual was downloaded from the manufacturer website on 5 September 2013. However, it appears to be no longer available at the date of conclusion of the present report.

### 1.7 Meteorological conditions.

A witness present on the airfield stated there was virtually no wind in the airfield vicinity. The lack of wind caused the smoke produced by the aeroplane to float in the air a few meters above the ground.

There are no meteorological observations made at the airfield itself. The meteorological observations around the time of the crash made in EBCI, EBBR and EBLG were:

- Wind direction variable and wind speed between 3kts and 5kts
- Few clouds at 4400ft and 4700ft.
- Visibility: more than 10km
- Temperature: 23°C and dew point: 11°C.
- QNH: 1022hPa.

### 1.8 Aids to navigation.

Not applicable

### 1.9 Communication.

There was no communication

### 1.10 Aerodrome information.

The EBAV Avernois ULM airfield is located 1.5 km north northwest of Avernois-le-Bauduin. The geographical coordinates of the airfield are N 50° 42' 24" – E 5° 04' 05".

The use of the airfield is subject to prior permission from the operator (PPR), the ultralight flying club "Aéro Club de Hesbaye".

The airfield features two bi-directional grass runways arranged in line and separated from each other by a small perpendicular country road. The runways are oriented 50° / 230° (RWY: 05/23). The runway located north of the airfield was temporarily closed and was used as a taxiway to join the southern runway after crossing the country road.

Northern runway (temporarily closed) dimensions: 235 x 30m.

Southern runway dimensions: 260 X 30m.

Elevation: 394 feet.

Take-off and landing pattern: LH when taking-off and landing on the runway 05. A RH circuit is prescribed for take-off and landing on runway 23.

The airfield is geographically located inside two Military Exercises and Training areas extending from the ground (EBD37 "Military light aircraft aerobatics flights" and HTA08 "Helicopter operation at very low altitude").

Consequently, the airfield may only be opened outside the military operational hours (typically during the week-end) or during operational hours, by getting contact with EBBE to ensure that there is no military activity planned or underway.

The airfield supervisor checks that these conditions are satisfied before he opens the airfield.

Additionally each aeroplane or group of aeroplanes must always establish radio contact with EBBE (when open) before taking-off or entering two Military Exercises and Training areas.

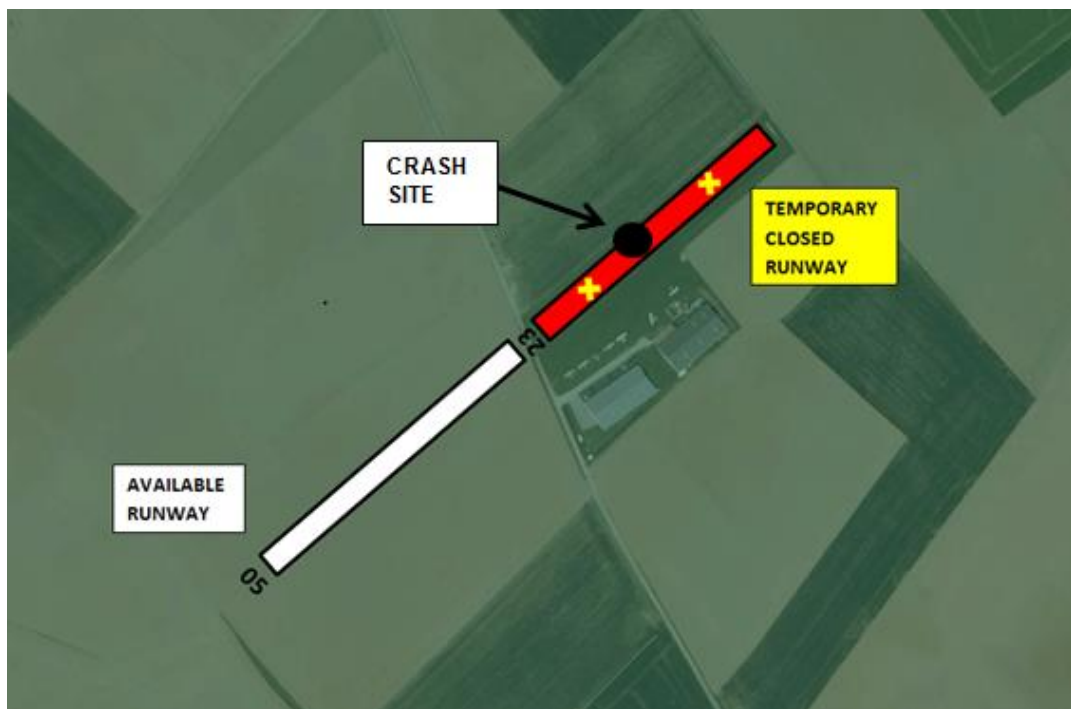


Figure 2: Lay-out of aerodrome

### 1.11 Flight recorders.

No flight recorder was installed, nor was it required. There was an action-camera (type Go Pro) on board, but it was not recording when the accident occurred.

## 1.12 Wreckage and impact information.

### On the crash site examination

The aircraft crashed on the northern (closed) grass runway of EBAV.

The first impact mark is near the border of the runway and the impact path was about 19 meters long and oriented in an easterly direction. The aircraft finally came to a halt in a horizontal attitude with its longitudinal axis pointing to 150°. The first impact mark is consistent with the engine block colliding with the ground, with obvious traces of propeller strikes separated by +/- 45 cm.

The right-hand wingtip, wheel and wheel well were found on the left side of the impact path. The rim of the wheel was heavily crushed due to the impact. Along the path, foam pieces of wing ribs and pieces of the engine cowling were found.

The left-hand wheel was still attached on a broken part of the leaf spring and was located just behind the aircraft wreckage, also left of the impact path.

The engine compartment was substantially crushed and all three propeller blades were broken off, lying in different places along the flight path. The right-hand wings showed obvious traces of compression at the root and a lot of mud on both the upper and lower side.

The connection between the upper and lower wing was broken due to the impact. The leading edges were quite intact. The left-hand wings showed less damage although the connection rods between the upper and lower wing were also broken.

The empennage of the aircraft was still intact and showed no damage, apart from the tail wheel that broke off and was lying right behind the wreckage.

The aeroplane was equipped with an emergency ballistic parachute which was unfired. The extractor rocket was inaccessible, being squeezed between the engine and the firewall. However, its control cable could be localized inside the cabin remains and was, on instruction from the investigator on site, cut by the rescue services as close as possible to the firewall.

The aeroplane was equipped with one rear metal fuel tank and 2 front plastic fuel tanks. All of them had been torn open during the accident. The rear tank was found empty while both front plastic tanks still contained around a height of 5 to 10cm fuel. Fuel spillage occurred through ruptures in the tanks and/or fuel lines. A plastic tank containing the oil for the smoke system was installed on the front seat. The tank had not been punctured and was half full (contained around 5 litres). After examination of the wreckage on the crash site, the remaining structural tubes connecting the cabin and the tail as well as different connecting rods, cables and wirings were also cut in a controlled manner to facilitate the transportation of the wreckage to a secure hangar.

#### Detailed examination of the wreckage

The wreckage was carefully investigated a few days after the accident, beginning with a positive deactivation of the emergency parachute.

Lifting of the wreckage showed the engine and the fuselage undersides suffered extensive damage. The end of the R/H under wing leading edge was crushed and the same wing showed signs of compression at the root in the area of the rear spar attachment. The rear attachment fitting of the lower wing was severed.

The continuity of the flight controls in the tail section was verified showing no anomaly. By contrast, some flight control rods and the associated rod ends located in the underside of the fuselage were found severely damaged and some of them were broken.

The pilot stick was also found broken at the root while the front stick was almost intact. Examination of the damaged parts showed they all suffered static ruptures likely to have been caused by the impact forces of the crash. No sign of a pre-impact mechanical interruption was detected in the flight controls.

The main landing gear remains were also examined. The original one piece leaf spring was broken in 3 almost equivalent lengths meaning 2 legs + the central part normally installed under the fuselage. Additionally, the R/H leg was also broken and separated at its attachment to the R/H wheel hub.

The underside of the engine was severely crushed, including the water cooler and the exhaust tubes. The engine mount was also severely deformed having as a consequence the engine coming into contact with the firewall and the engine oil tank being compressed.

The engine was examined as follow:

- Inspection of the spark plugs: no anomaly.
- Inspection of both carburettors. The bottom side of both carburettors' float bowls were found to be contaminated. The L/H carburettor float bowl was empty which is normal as it was found upside down after the accident while the R/H carburettor contained still a certain quantity of fuel. Particular attention was paid to determine a potential nozzle obstruction. No obstruction was found.



**Figure 3: carburettors' bowl showing the presence of contaminant.**

- Removal of the cylinder head covers to examine the rocker valves. No anomaly was found.
- The crankshaft was turned using a lever to rotate the propeller hub. The crankshaft was hard to rotate, likely due to the deformation of some parts. However the rotation of the crankshaft could show the rockers of front cylinders were moving, demonstrating a normal continuity in the valve train.

**1.13 Medical and pathological information.**

No autopsy or blood sampling was performed.

**1.14 Fire.**

There was no fire.

**1.15 Survival aspects.**

Notwithstanding the pilot wore the safety belts and shoulder harnesses, the impact was not survivable.

**1.16 Tests and research.**

Not applicable.

**1.17 Organizational and management information.**

Not applicable.

**1.18 Additional information.**

Not applicable.

**1.19 Useful or effective investigation techniques.**

Not applicable.

## 2 Analysis.

### 2.1 The wreckage

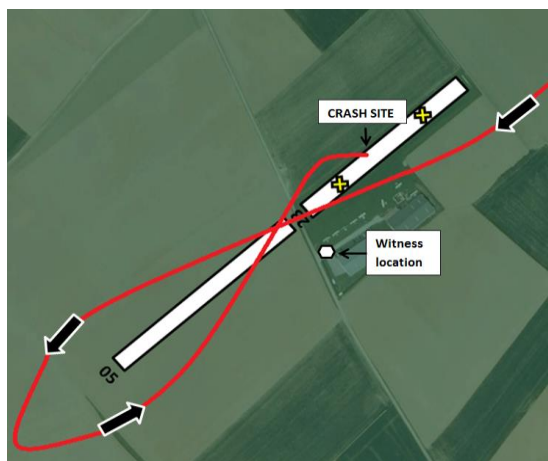
From the evidence found at the crash site and the further inspection of the airframe and the engine it may be concluded that the airframe did not suffer any pre-impact damage that would have adversely influenced the controllability of the aeroplane. In particular, the following was noted:

- Continuity of all flight control cables, control links and bellcranks from the sticks to the attachment fittings. All the control links and bellcranks found separated during the inspection showed evidence of overload and deformation likely originating from the impact with the ground.
- No sign of in-flight break-up of the primary structure and control surfaces could be found.

Both the propeller strike on the ground and the damage to the propeller showed evidence of rotation on impact, demonstrating the engine was delivering power. Additionally a witness reported hearing the sound of an engine delivering power until the impact.

However, the examination of the engine found a contamination in the carburettors demonstrating that the maintenance was not adequately performed. Notwithstanding that anomaly, no indication was found showing that this contamination prevented the effective functioning of the carburettors. This contamination likely wasn't a contributing factor in the accident.

### 2.2 The flight path



**Figure 4: flight path deduced from the witness statement and impact traces.**

The flight path was reconstructed based on the statement of a witness sitting in his car close to the country road. However, it has to be noted that the witness was facing opposite to the flight path when the aeroplane flew approximately above the closed runway and impacted the ground.

The easterly direction of the flight just before the impact was determined by the impact traces left in the ground and the repartition of the lost parts found in the neighborhood of the wreckage.

The direction of impact was estimated to be oriented almost 60° to the right of the last witnessed heading.



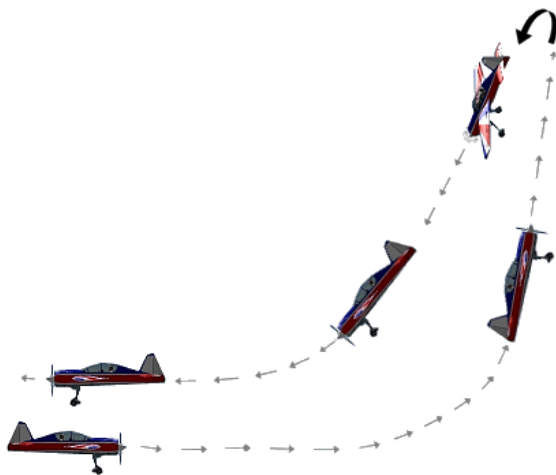


Figure 5: drawing of a wingover manoeuvre.

After each wingover executed at the end of the runways the aeroplane levelled off in an opposite direction and flew horizontally above the runways at high speed and very low altitude (10 to 15 meters above the ground as stated by the witness).

### 2.3 Pilot's non-compliance with the Regulation<sup>10</sup>

During the investigation, evidence showed the pilot made several infringements with respect to the Belgian aviation law:

- Taking-off from a closed airfield. The airfield was closed when the aeroplane took off and crashed. The signal area showed a white cross and no "T" landing direction indicator and there was no wind direction indicator installed and no airfield director was present. (See Law 1937 – Article 14). This was also a violation of the internal rules of the airfield.
- Performing aerobatics with a motorized ultralight aircraft, (Royal Decree 25 May 1999: ultralight aircraft Article 52)
- Flying below the minimum regulatory height. Except for the purpose of taking-off or landing, the regulation prescribes to fly at a minimum height of 500ft (150m) above the lowest obstacle when flying outside cities or built up areas (See Royal Decree dated 15 September 1994, "Rules of the Air" Article 74).
- Performing aerobatic manoeuvres below a minimum regulatory safety height. Except if authorized by the BCAA, no aerobatic flight may be performed below 2,000ft AGL (600 m) (See Royal Decree dated 15 September 1994, "Rules of the Air" Article 14).
- Performing aerobatics with an aircraft not certified for it.
- Not regularly filling in the pilot log book. The Regulation states that the pilot log book must be filled in at the end of every flight (See Royal Decree dated 25 May 1999 "Ultralight aircraft"). Not filling in his log book since the last licence renewal suggests that the pilot did not complete it in a conscientious manner, but only made it (to appear) up-to-date just before he had to renew his licence.

<sup>10</sup> The text of the different legal requirements applicable to ultralight aircraft in Belgium can be downloaded from the BCAA website

[http://www.mobilit.belgium.be/fr/transport\\_aerien/legislation/](http://www.mobilit.belgium.be/fr/transport_aerien/legislation/) and  
<http://www.mobilit.belgium.be/nl/luchtvaart/wetgeving/>

## 2.4 Psychological aspects

The pilot's recurring violations/offences show that the pilot, generally speaking, did not adhere to a system aiming at guaranteeing an adequate level of safety. The pilot's behaviour on the day of the accident and his history of repeated, deliberately unsafe actions demonstrate he was unwilling to respect basic safety rules.

Such a behaviour by an experienced pilot, founding member of the ULM club, with a recognized skill, is an unsafe message for the other members of the ULM club, particularly for the low-time and student pilots.

The fairly recently appointed airfield authority and some instructors were aware of this concern and tried to remedy the situation.

The current airfield authority stated that they first tried to get the pilot back on track through dialogue rather than conflict. The airfield authority first had the impression they had succeeded in positively influencing the pilot who was progressively changing his mind. However new events showed that the pilot didn't actually change his behaviour, and as a consequence the airfield authority decision to ground him for 90 days.

Normally, the successive airfield supervisors witnessing unsafe actions by the pilot should long ago have informed the BCAA of these issues (As per Circular GDF-04U (6)(4)(2)(b)). However, experience shows that almost no airfield supervisor or airfield authority wants to involve the BCAA in such situations, probably because it would be felt as a denunciation that may cause additional unnecessary tensions.

This can sometimes lead to paradoxical situations where one party (mainly the airfield authority) must face difficult unsafe situations and at the same time is not confident to report it to the BCAA. There is obviously a cultural and psychological barrier preventing the airfield authorities from informing and asking for the support of the BCAA in resolving the situation.

## 2.5 Meteorological conditions

The meteorological conditions were, at first sight, adequate to perform aerobatic manoeuvres. Visibility was perfect and, as stated by a witness, there was practically no wind.

However the lack of wind caused the smoke produced by the aeroplane to float in the air as a layer of mist, possibly causing flight visibility to be affected.

Possible visibility restriction due to glare of the sun could be excluded because the sun was behind the pilot (Azimuth was approx. 227° and elevation 40°).

By contrast, adverse visibility caused by the reflection of the sun on the white/light grey smoke could not be excluded.

## 2.6 Hypothesis

The pilot was known to be a skilled pilot, performing regular aerobatic flights at a very low level. An action camera record of another flight demonstrates that the pilot was very comfortable with the handling of his aeroplane including for the avoidance of ground obstacles (i.e. trees). Additionally, the comments made by several members of the aero club appear to confirm that the pilot was sufficiently trained and was able to fly at a very low level above the flat surface of the airfield. However this is obviously not safe and it is forbidden.

Close examination of the wreckage could not identify any technical anomaly that would have adversely affected the controllability of the aeroplane.

The estimated last direction of the flight compared with the direction of the impact suggests that the aeroplane was performing a sudden descending turn to the right on impact. This descending turn is also demonstrated by the repartition of the damage found during the wreckage examination.

Taking into account the absence of technical anomaly and the lack of wind or turbulence, it is likely that this descending turn was initiated by the pilot.

Therefore, the 2 following hypothesis were identified that could explain the crash:

- A sudden loss of visual and spatial references caused by flying in the layer of smoke present above the airfield (Unexpected entry into IMC conditions) or,
- The pilot having a sudden medical event a few seconds after the significant pull-up action (positive G forces) exercised at the end of the wingover manoeuvre. This could have caused a “greyout”<sup>11</sup> which is a reduction of visual capabilities when submitted to significant positive G forces.

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<sup>11</sup> A “greyout” is a transient loss of vision characterized by a perceived dimming of light and colour, sometimes accompanied by a loss of peripheral vision. It is a precursor to fainting or a blackout.

### 3 Conclusions.

#### 3.1 Findings.

- The aeroplane was in an airworthy condition which means properly type accepted, registered and covered by a valid permit to fly.
- Thorough examination of the wreckage did not find any pre-impact failure of the structure or flight controls.
- Indications have been found in the wreckage showing that the maintenance was not adequately performed (carburettor contamination). However, this issue was determined not likely to be a contributing factor in the accident.
- The pilot log book and the aircraft log book were found to be not regularly filled in. No flight performed after 21 October 2012 was recorded, although evidence shows the pilot performed flights after that date.
- The pilot was duly qualified and licensed for piloting ULM (Ultralight Aircraft Flight Authorization). He possessed a valid class 4 medical certificate.
- The pilot had a wide experience flying ULM's. Although not permitted, the pilot regularly performed aerobatic manoeuvres<sup>12</sup> and extremely low level flights with his FK 12 aeroplane.
- The pilot was known to members of the aero club to be an undisciplined person who loved to flirt with danger.
- The performance of aerobatic manoeuvre with a ULM as well as flying lower than 500 ft AGL except for the purpose of taking off or landing is not allowed per Belgian Aviation regulation.
- The pilot had, shortly before the accident, performed unsafe manoeuvres close to the EBAV airfield, having as a consequence that after several calls to order, he was no longer authorized to fly at EBAV for 90 days. However, this grounding had been lifted during the week-end preceding the accident for the 30th anniversary of the founding of the club, to be able to perform a flight demo.
- The airfield was closed and the pilot did not inform anyone of the flight. The pilot did not ask EBBE if there was military activity underway or planned.
- When the accident occurred, the pilot was performing low fly-passes above both runways ending with wingover manoeuvres. The smoke system was delivering smoke during the whole flight.
- The weather conditions were excellent for a standard flight implying a good visibility and practically no wind, however the lack of wind caused the smoke produced by the aeroplane to stagnate just above the airfield.
- The aircraft impacted the north runway after having performed several low fly-passes over both runways.

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<sup>12</sup> "Aerobatics flight" means manoeuvres intentionally performed by an aircraft involving an abrupt change in its attitude, an abnormal attitude, or an abnormal variation in speed, not necessary for normal flight or for instruction for licenses or ratings other than aerobatic rating.

### 3.2 Causes.

The aircraft crashed upon a sudden descending turn when flying level over the airfield, at very low altitude. The probable cause of this descending turn is a pilot action on the controls that could be related to:

- A loss of ground visual reference due to smoke present above the airfield, or
- The pilot having a sudden medical event possibly caused by the pull-up action exercised a few seconds before the crash.

Contributing factor:

The pilot's unsafe behaviour was not reported to the Belgian CAA, as required by the Circular GDF-04U, preventing the BCAA from taking appropriate action.

## 4 Safety recommendations.

### 4.1 Safety factor: pilot's overconfidence.

An extensive flight experience and a recognised high level skill are no guarantee for a satisfactory level of safety, particularly if the pilot does not hesitate to flout the basic rules of safety. Therefore:

**Recommendation BE.2015-0011**

**It is recommended that the Belgian ULM Federation (BULMF) uses this accident report to raise the general awareness amongst their members about the dangers of overconfidence, even for pilots with a lot of experience and demonstrated high skill level, resulting in defying and ignoring the basic safety rules.**

### 4.2 Safety issue: insufficient or inadequate maintenance/inspection of the fuel system.

Indications have been found in the wreckage showing that the maintenance of the fuel system was not adequately performed. Poor maintenance will, sooner or later, lead to engine problems or even failure. Therefore:

**Recommendation BE.2015-0012**

**It is recommended that the Belgian ULM Federation (BULMF) raises the general awareness amongst their members about the danger of insufficient or inadequate maintenance/inspection of the fuel system of their ULM. This is particularly crucial for ULM's not regularly flying during the winter period, back in use after a long period of inactivity.**

Other safety factors found during this investigation:

- Performing extremely low altitude operation.
- Flying through the self-produced smoke.
- Setting a bad example to other pilots, particularly towards low time pilots or student pilots.
- Performing aerobatics with an aeroplane not certified for such flights.
- Operating from closed airfields without checking that there is no military activity underway or planned.





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