Air Accident Investigation Unit
(Belgium)
Federal Public Service Mobility and Transport
info.aaiu@mobilit.fgov.be
www.aaiu.belgium.be

Safety Investigation Report

Ref. AAIU-2021-09-22-01
Issue date: 22 September 2025
Status: Final

Scope: Limited

As per ICAO Annex 13 and EU regulation EU 996/2010, decisions regarding whether to conduct a civil aviation safety investigation, and the extent of an investigation, are based on many factors, including the level of safety benefit expected to be drawn from such an investigation.
For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.

SYNOPSYS

Occurrence class	Accident
Occurrence category	Loss of control - inflight (LOC-I)
Date and time[1]	Wednesday 22 September 2021 14:25 UTC
Location	In a field next to the aerodrome of Kiewit-Hasselt 50° 58’ 17,73”N - 005° 22’ 56,388” E
Aircraft	Brügger MB-2 Colibri
Aircraft category	Fixed wing - Small aeroplane - Amateur-built
Location of departure	Aerodrome of Hasselt/Kiewit (EBZH)
Planned destination	Idem
Type of operation	Non-commercial - Local
Phase of flight	Initial climb
Injuries	1 fatal
Aircraft damage	Destroyed

What happened

A home-based Brügger MB-2 Colibri took off from Runway 09 at EBZH, returned for a full stop but announced a go-around, and the aircraft made a sharp descending turn to the left, crashing and resulting in the pilot's fatal injury.

[1] All time data in this report are indicated in UTC, unless otherwise specified

1. THE OCCURRENCE

This narrative is based on the witness declarations of the accident and video images.

After a period of inactivity – the last flight with this aircraft dated back from 30 March - the pilot wanted to make a flight again with his Brügger MB-2 Colibri, that was based at the aerodrome of Hasselt-Kiewit (EBZH).
The day before the accident, he went to his aircraft, most probably to prep it up. Members of the aerodrome reported that when checking the fuel indication system, the float got stuck. The cork float was removed using a skewer. The pilot then reportedly said he did not want to repair the system and rely on the fuel consumption instead (checking the quantity before the flight and determine the maximum flight time accordingly).
The pilot put some fuel in the tank and performed an engine run and taxied the airplane to the runway and back. He did not fly that day.

On Wednesday 22 September in the afternoon, he took the aircraft out of the hangar again and taxied to the threshold of Runway 09 for a local flight south of the airfield, direction of Hasselt city.

The aircraft was seen coming back around 14:25, re-joining the circuit in the downwind leg, north of the aerodrome. The pilot called in for a full stop (as heard on the aerodrome radio frequency by another pilot). According to witnesses the approach was normal. Just before touchdown, the pilot reported 'going around' on the frequency. The initial climb was again not unusual according to the various witnesses, also no abnormal noises from the engine reported.

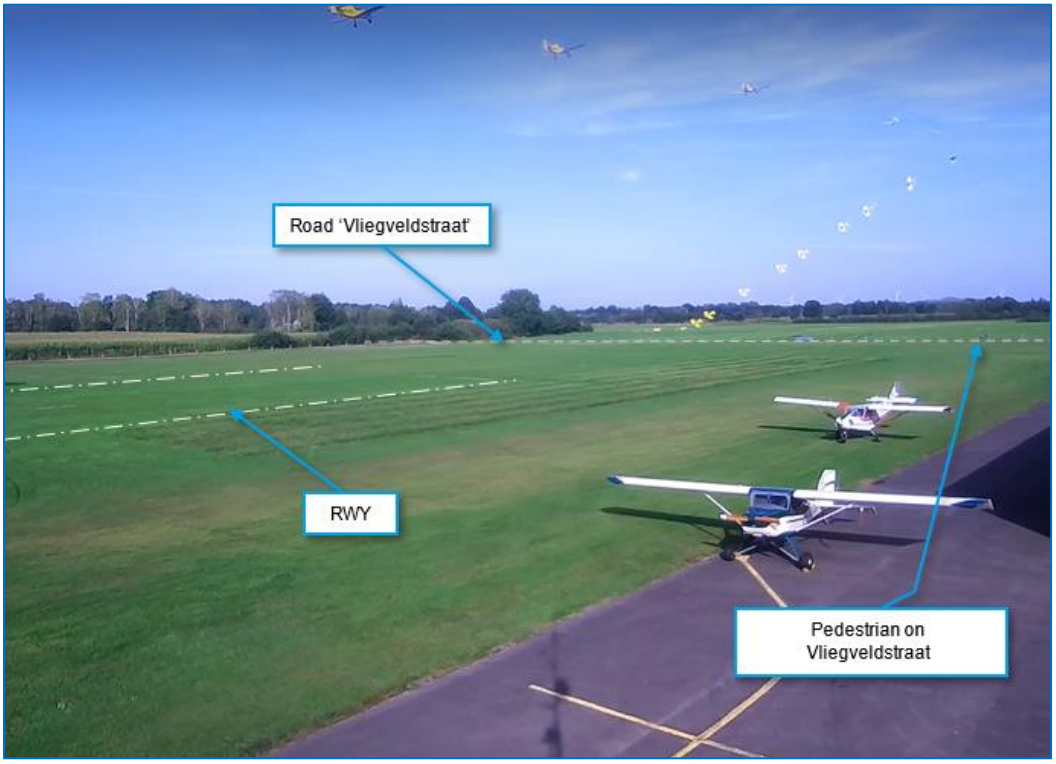

Figure 1 : composite image of the last portion of the flight

Suddenly the aircraft was seen making a sharp descending turn to the left. The aircraft descended very rapidly and rather steep, and impacted the ground of a neighbouring field at the other side of the bordering road “Vliegveldstraat”.

Beside those witnesses present at the airfield, there was also a pedestrian standing and spotting the aircraft in the “Vliegveldstraat”. This witness declared that she saw a first aircraft doing a go-around before she saw the Colibri. The approach was described as normally and also followed by a go-around but this time much higher above the runway than the previous aircraft, definitely no touchdown.

The climb afterwards seemed also nothing unusual until the aircraft suddenly made a sharp turn and descended rapidly giving her the impression that it wanted to land again.

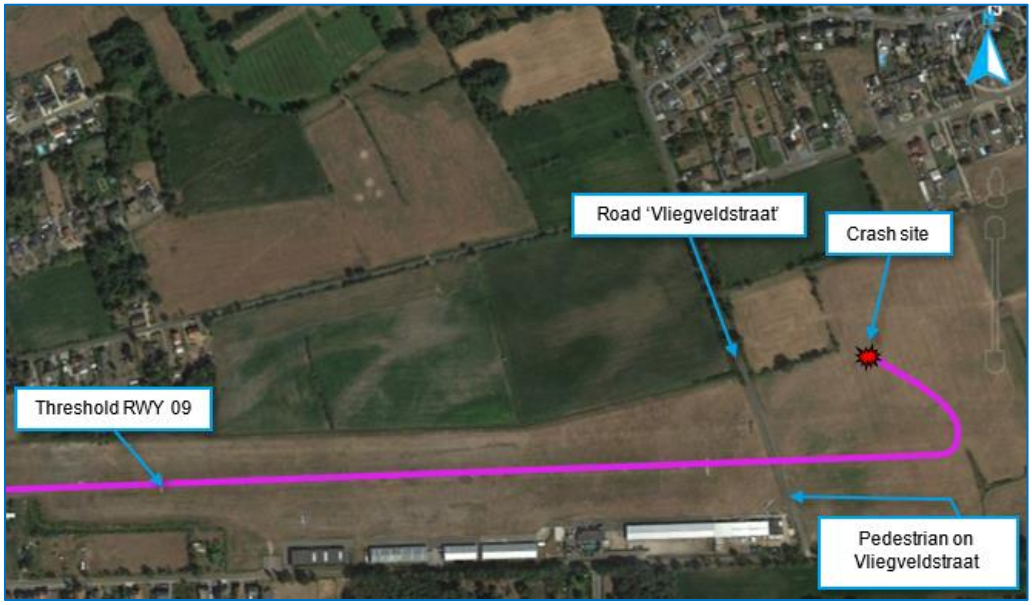

Figure 2 : reconstruction of the approximate horizontal flight path

She confirmed that she didn't see any smoke nor hear any bang. However, she couldn't recall if the engine was still running (making noise) before the impact. However, she often hears (presumably) stunt planes flying over there, and already noticed that the engine noise suddenly cuts out, which always makes her hold her breath. However, as she did not have that feeling this time, she believes the engine kept running.

Upon the crash she started running towards the crash site and was overtaken halfway across the field by a person in a car, followed by a second car. Reportedly, she arrived less than a minute later. The pilot was found lying about 2 meters right in front of the main wreckage. The first man notified the emergency services, she, being a professional nurse, started with the first observations (consciousness, circulation, breathing) and assistance. However, the pilot was found fatally injured.

2. CONTEXTUAL INFORMATION

2.1 Personnel information

Table 1 : General pilot data

Age:	59
Medical certificate:	Class 2/LAPL, Issued in Dec 2020, valid until January 2022
Licenses, ratings and qualifications:	1. Private Pilot Licence First issued (national) in September 1998 by the Belgian CAA Ratings: SEP(land), valid until 30 September 2022 2. ULM Pilot Authorization First issued in June 2012 by the Belgian CAA, valid until January 2022 Qualifications; Monitor (ULM) First issued in June 2016 valid until March 2022 3. Sailplane Pilot Licence First issued in May 2002 by the Belgian CAA Qualifications: Flight Instructor Flight Examiner: Expired in 2017
Overall experience:	In his (second) pilot logbook (2011-2021) linked to his Private Pilot License (PPL), he accumulated a total time of 837 FH (with total of first logbook included). Last flight recorded in the logbook however was on 07/05/2021 with a Cessna C152.

<table>
<tr><td rowspan="4"></td><td>He recorded a total of 391:24 FH on the MB-2 Colibri.

<table><tr><td>2021</td><td>6:43</td></tr><tr><td>2020</td><td>8:59</td></tr><tr><td>2019</td><td>11:59</td></tr><tr><td>2018</td><td>11:12</td></tr><tr><td>2017</td><td>0:00</td></tr><tr><td>2016</td><td>10:51</td></tr><tr><td>2015</td><td>45:30</td></tr><tr><td>2014</td><td>45:30</td></tr><tr><td>2013</td><td>59:21</td></tr><tr><td>2012</td><td>43:42</td></tr><tr><td>2011</td><td>64:29</td></tr><tr><td>09/2009 -2010</td><td>83:07</td></tr><tr><td>Total:</td><td>391:24</td></tr></table></td></tr>
<tr><td>Other type flown: Fisher Celebrity (biplane) since 2015</td></tr>
<tr><td>Total hours ULM: 501:10 FH</td></tr>
<tr><td>Total hours sailplane: 1121 FH</td></tr>
<tr><td>Recent (recorded) experience:</td><td>Last 7 days:
PPL: 0 FH
ULM: 6:42 FH – 15 Landings

Last 30 days:
PPL: 0 FH
ULM: 9:11 FH – 25 Landings

Last 90 days:
PPL: 0 FH
ULM: 20:53 FH – 68 Landings</td></tr>
<tr><td></td><td>Last flight on type – MB-2 before accident flight: 30/3/2021</td></tr>
</table>

2.2 Aircraft information

The MB-2 Colibri is a single seat, amateur-built aircraft with a non-retractable tailwheel landing gear. It has an all wooden framework with plywood fuselage and fabric covered wings. The wing section is a NACA 23012 profile. The pilot's seat is enclosed by an expansive bubble canopy.

The empennage features a horizontal stabilizer with trimmable elevator and an all-movable vertical tail surface acting as the rudder, so no fixed vertical fin.

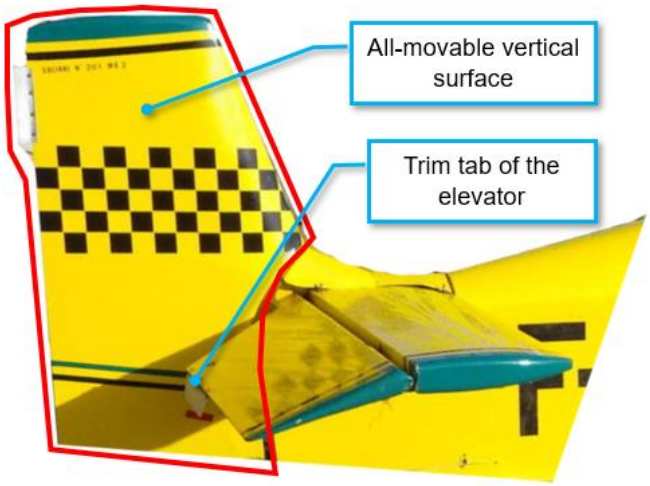

Figure 3 : empennage of the involved MB-2

Table 2 : General aircraft data

General	
Design:	Max Brügger - Switzerland
Model:	MB-2 Colibri
Manufacturer:	Private
History	
Year of built:	1996
Registration:	Registered by DGAC France
Serial:	261
Total hours:	669 flight hours
Engine	
Engine type:	air-cooled, gasoline-fuelled, with four horizontally opposed cylinders
Engine manufacturer and model:	Volkswagen VW 1600 CC - 30 kW (40 hp)
Propeller	
Propeller type:	wooden 2-bladed fixed-pitch propeller
Propeller manufacturer and model:	Helice Leger AL 1883 – diameter 132 cm / pitch 106 cm
Year of built:	2017

Declared data from the initial CNRA-file in 1996:

- Max speed: 210 km/h
- Stall 90 km/h (48 knots)
- Demonstrated cross wind component: 20 knots
- Take-off distance (to a height of 50 ft): 350 meter
- Landing distance (from 50 ft screen height): 300 meter

Performance at max T-O weight (From *Jane's All the World's Aircraft* 1991-92):

- Max rate of climb at S/L: 180 m (590 ft)/min
- Service ceiling: 4,500 m (14,760 ft)

Other data obtained from the flight manual from another MB-2 bearing serial 288:

- Glide ratio 1 : 12

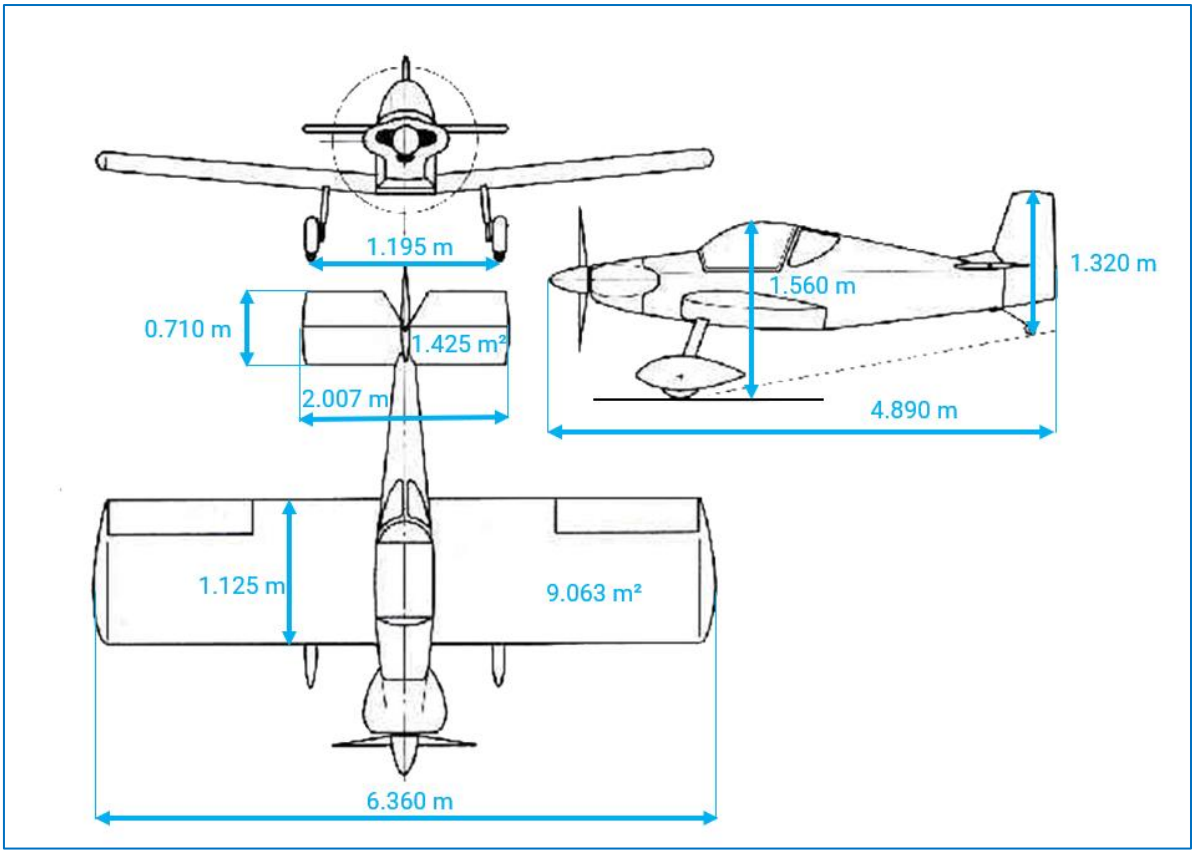

Figure 4 : aircraft dimensions

History of this aircraft

The aircraft was amateur-built from plans provided by Brügger and first flown in August 1996. In 2009, it was purchased by the pilot involved in the accident. By that time, it had accumulated 258 flight hours.

The owner held a certificate of "recognized maintenance structure," U-CNRA-811, issued by OSAC[2] on 15 October 2014. This certificate allowed him to perform maintenance on the aircraft and benefit from a three-year renewal of his Airworthiness Certificate instead of the usual one-year renewal. See also chapter 2.8 of this report.

The maintenance program established by the owner, included an inspection every 100 hours or 12 months, whichever comes first. There were no components with a limited service life. The engine, propeller, and magneto were considered 'On-condition' components, meaning they can stay in use as long as they meet the required standards, without needing a thorough inspection.

The last 100-hour inspection was performed by the owner in January 2021, followed by a check flight. The most recent CNRA renewal was completed on 30 March 2021, by OSAC in Merville, France, and was valid until 10 April 2024.

Engine

The installed engine is a Volkswagen VW 1600 CC boxer engine with four horizontally opposed cast-iron cylinders. The propeller is rotating counter-clockwise.
A carburetor, model Weber, is installed at the bottom of the engine. There is no fuel pump, so it is gravity-fed.
A single magneto, model Slick, provides the ignition for the spark plugs with firing order 1-2-3-4.

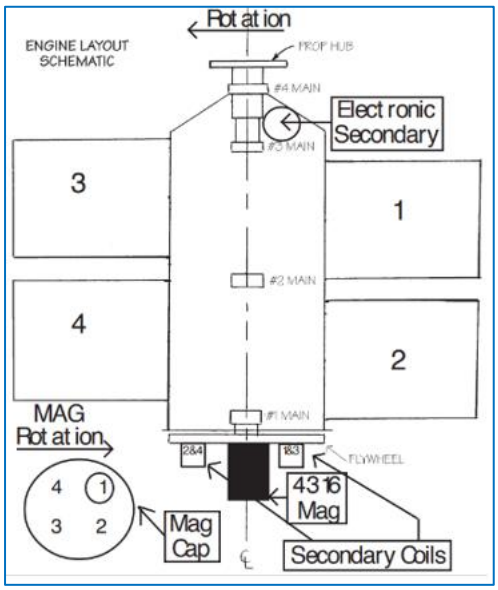

Figure 5 : engine layout schematic

[2] OSAC: l'Organisme pour la sécurité de l'aviation civile (English: Organization for Civil Aviation Safety), which has the exclusive purpose of carrying out technical control missions in certain areas of civil aviation safety on behalf of the Directorate of Civil Aviation Safety (DSAC)

Fuel system

The fuel system consists of 1 metal fuel tank of 33 litres located in front of the cockpit bulkhead and behind the engine.

A pointer rod on a cork float in the pilot's field of vision normally serves as an indication for the fuel quantity.

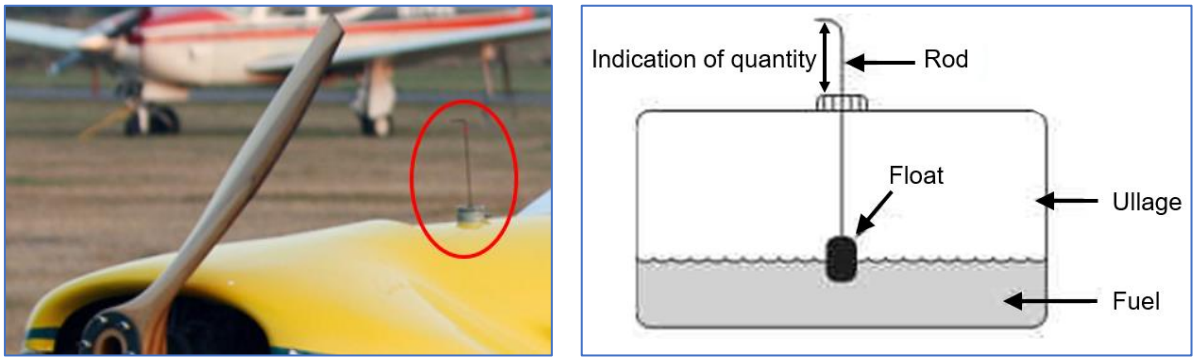

Figure 6: fuel gage on the nose in front of the cockpit

Weight and balance

Empty weight:	226 kg (report from February 2015)
Max take-off weight:	337 kg
Forward limit centre of gravity (CG):	0,28 m aft of datum
Aft limit CG:	0,4 m aft of datum

Datum line is 0,08 meter in front of nose gear axis.
Allowed baggage: 10 kg

2.3 Meteorological information

The synoptic situation gave an anticyclone (Azores' high) (1031 hPa), moving from North of the Azores over the Channel to Germany, stabilizing the air mass over Belgium in a weak gradient.

The aerodrome doesn't have a weather station but the available METARs of nearby aerodromes read as follows at the time of the accident:

METAR Airport of Maastricht-Aachen – The Netherlands (EHBK) (28 km east):

221425Z AUTO 24003KT 170V330 9999 NSC 19/09 Q1027 NOSIG=

METAR Airport of Liège (EBLG) (37 km south):

221420Z 13003KT 050V190 CAVOK 20/08 Q1027 NOSIG=

METAR Airport of Eindhoven (EHEH) (52 km north):

221425Z AUTO 20006KT 190V290 9999 BKN400 20/09 Q1027 BLU NOSIG=

Summarized: a variable light wind of 3 kt with a temperature of 20°C and a QNH of 1027 hPa.

The wind sock on the CCTV recordings confirms the variable wind direction and a wind strength lower than 3 kt on site. Cirrus clouds were visible.

Figure 7 : windsock and clouds at time of the accident (14:25)

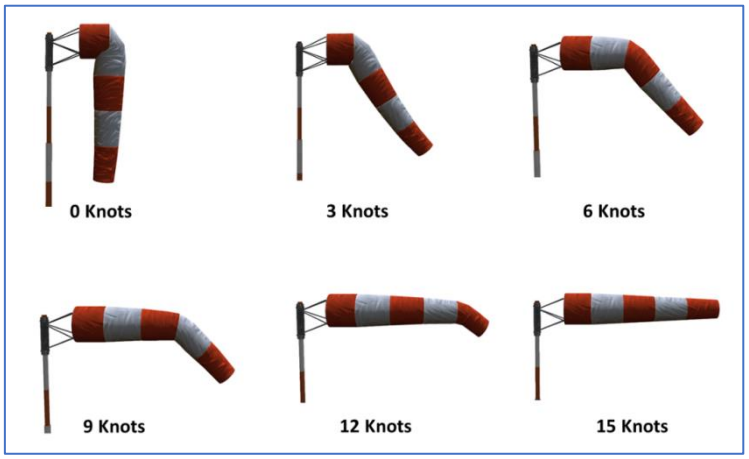

Figure 8 : Windsock windspeed chart for reference

2.4 Aerodrome information

Aerodrome general information

The aerodrome with ICAO code EBZH is an uncontrolled aerodrome with a bidirectional grass runway 09/27 respectively orientated to a true bearing of 90° and 270° and is considered as an airfield with code 1 as per BCAA Circular GDF-04. Both runways are 600 m long and 18 m wide. The elevation of the runway is 133 ft/40 m AMSL.

The runway is located in a runway strip of 660 x 60 meters. Type of runway strip surface: grass.

The coordinates of the Aerodrome Reference Point (ARP) are N50°58'15" – E005°22'30".

The aerodrome of EBZH has a radio service with call-sign 'Hasselt Radio' and provides only basic information.

Traffic patterns around the aerodrome

The aerodrome manual, displays the traffic patterns to be flown around the aerodrome.

In order not to overfly the 'Provinciaal Domein Bokrijk' in the South of the aerodrome, all traffic patterns are to be flown to the North. When taking off from RWY 27 motorized aeroplanes should fly a right hand (RH) circuit pattern at 1200 ft AMSL (1000 ft AGL). The pattern for RWY 09 is left hand.

Figure 9 : published traffic pattern (white) in the aerodrome manual

Safety areas

The length of the safety area located at the ends of the runway strip and intended primarily to reduce risks of material damage in the event that an aircraft should land before the threshold or cross the runway end is:
- in the eastern direction (RWY 09): 30 m
- In the westerly direction (RWY 27): 200 m

This is in accordance with the circular GDF-04, which mandates safety areas with a minimum width of twice the runway width (36 meters) and a minimum length of 30 meters for airfields with code 1.
Additional safety zones outside the aerodrome are located both on the east side, over a distance of 300 meters, and on the west side of the airfield over a distance of 90 meters.

Figure 10 : indication of runway strip, safety areas and extra safety zone east of the aerodrome

2.5 Recorded data

The aircraft was not equipped with any flight recorder, nor was it required. Also, no transponder was installed, which was also not mandatory.

A primary radar track was retrieved from ATS-provider Skeyes, but unfortunately, some data was missing and, after evaluation some blips seemed to come from another, ultralight, aircraft in the aerodrome circuit. In other words, it was not accurate enough to be used for analysis or to draw relevant conclusions.

Two web cameras are installed at the aerodrome office (see also Figure 10). One is orientated to threshold of RWY 09 and another one to RWY 27. The cameras recorded both the approach, the go-around, and the crash at a frame rate of 15 frames per second (fps). No sound was recorded.

2.6 Wreckage and impact information

The main wreckage was lying on a field on the other side of the road bordering EBZH, indicated as a safety zone in the aerodrome manual (See also Figure 10 of this report). The wreckage was lying approx. 215 meters in birds eye view from the threshold of runway 27.

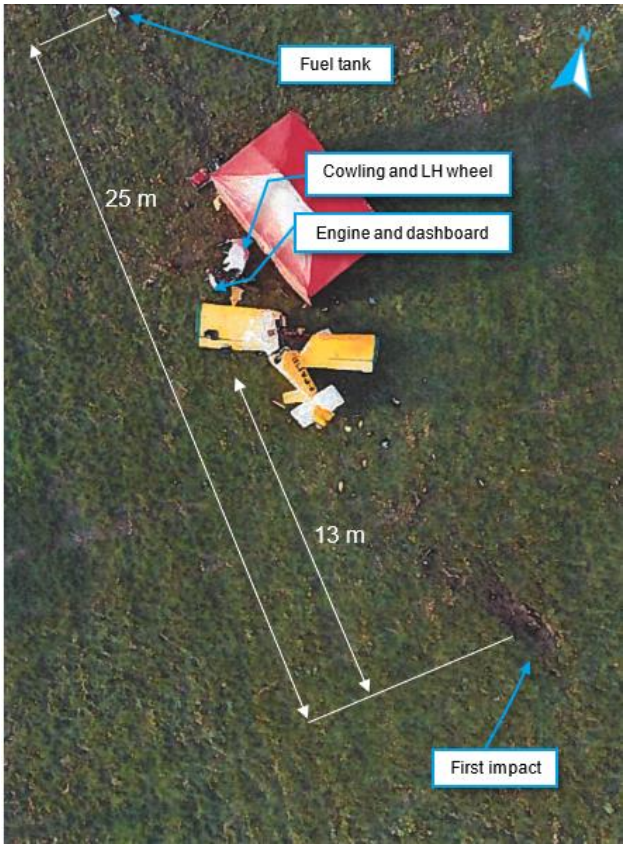

Figure 11: aerial view of the crash zone (picture taken with RPAS of local police department)

Coordinates: 50° 58’ 17,73”N - 5° 22’ 56,388” E

The field itself has an elevation of 134 ft, was covered with grass and the underground was relative hard.

The first impact mark had a heading of +- 305°, the fuselage was 13 meter in front of it and the fuel tank 25 m. The engine and dashboard was found separated in front of the main wreckage.

In the hole left by the impact, one propeller tip was found, along with yellow paint chips. Other small debris was lying in and in front of this. The distribution of it was rather limited to the direction of the impact.

Probably the aircraft touched ground with nose and LH gear first, causing a rebound to the right on the RH wing. Hence the traces of earth on its upper side and the deformation to the aft.

No traces of oil were found on the main wreckage.

Inspection of the flight controls

The connection of the rudder hinge, inside the rudder, was found loose at one side.

Figure 12 : loose hinge inside the rudder (after fabric was cut to have access)

Cables and bell crank were still connected at both sides of the rudder surface. The cables were also still connected on the pedal side. When pulling at the cables at pedal location, rudder surface could still be moved in both directions despite the loose hinge.

Figure 13: View on the right hand side of the rudder.

Figure 14: rudder pedals with connection to cables still in place

The elevator could still be moved up and down when pulling on the cables aft of the cockpit. The connection with the bell crank was still in place. Also when pushing on the stick, of which the attaching rod was heavily deformed, the elevator could be moved.

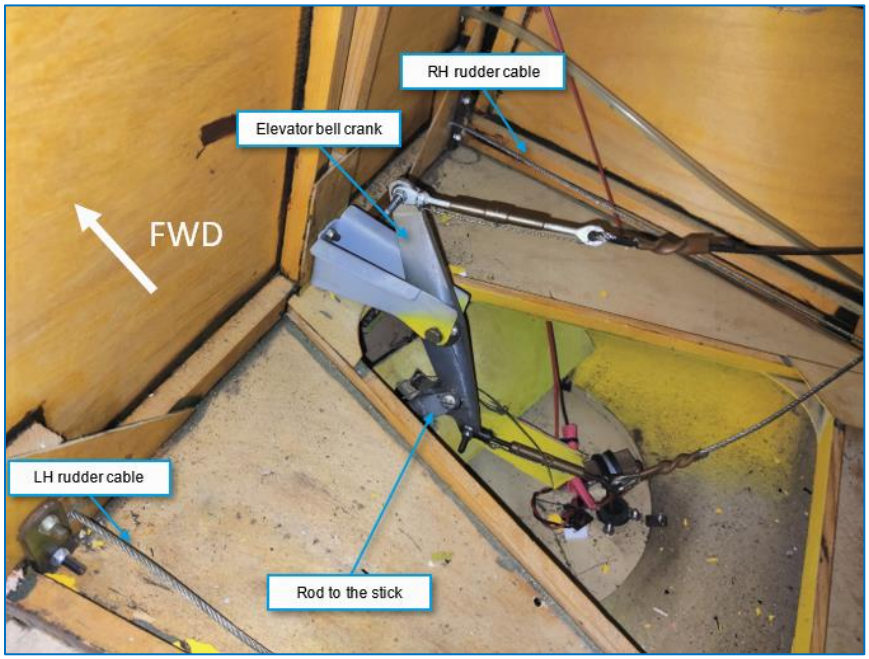

Figure 15 : configuration of the flight controls behind the cockpit

Connections of the ailerons were still in place. By pulling on the cables, both ailerons could be moved, also slightly by moving the deformed stick.

The elevator trim control was found detached from the airframe. The lever was in a mid-position between up and down.

Figure 16 : elevator trim lever as found

The elevator trim tab is located on the inner end of the RH elevator. It was found fully deflected down (which would mean elevator up, aircraft nose-up).

Figure 17 : elevator trim tab full down

Cockpit

The airspeed indicator was frozen on +- 93 mph (+- 80 kt).

Figure 18 : airspeed indicator as found on the crash site

Canopy

The remaining of the canopy were found still locked with the slot system on the fuselage. However the spring of this slot system was slightly worn/not long enough.

Figure 19 : Canopy and lock as it was found (picture taken after the wreckage was removed to a secured site)

Propeller, fuel system and engine

One propeller blade was still intact, the other was broken upon impact. The retrieved tip showed chordwise mud traces, indicative for rotation before impact.

Figure 20 : broken propeller blade showing chordwise traces on the white paint

A quantity of ca 1 liter was still retrieved from the fuel tank. The tank itself did not show sign of deformation, but the outlet making a connection to the engine, located at the bottom, was ripped off. There were traces and an odor of a fuel leak on the crash site, but quantity undetermined. No float was found.

There is slight contamination found in the fuel tank as well in the fuel bowl. Traces of cork were found in the fuel bowl.
The in-line fuel filter was lightly contaminated but still in good condition. Fuel was present.
The float bowl of the carburetor was filled with fuel, the float pin in working condition. All jets of the carburetor were free of contamination.
No signs of dirt in the inlet manifold. The inner wall was slightly damp from the fuel.

The colour of the spark plugs indicated a good fuel mixture, slightly on the rich side (or too cold spark plugs), or due to the use of fuel with too low an octane rating. All spark plugs were spark-tested and working.

The ignition lead of Cylinder No. 3 appeared not to be working. Turning the propeller by hand and checking if the spark plugs gave a spark did not work on cylinder No. 3, even after swapping the spark plugs.
It was observed that the ignition harness of Cylinder No. 3 at the back of the magneto was almost worn through.
The other cables were also damaged, they were already extra protected by electric insulation tape. This could be a sign that the problem was known on this aircraft.
The magneto apparently pressed against the cover of the recess in the fire plate, causing the ignition leads to be pinched at the place of the damage.

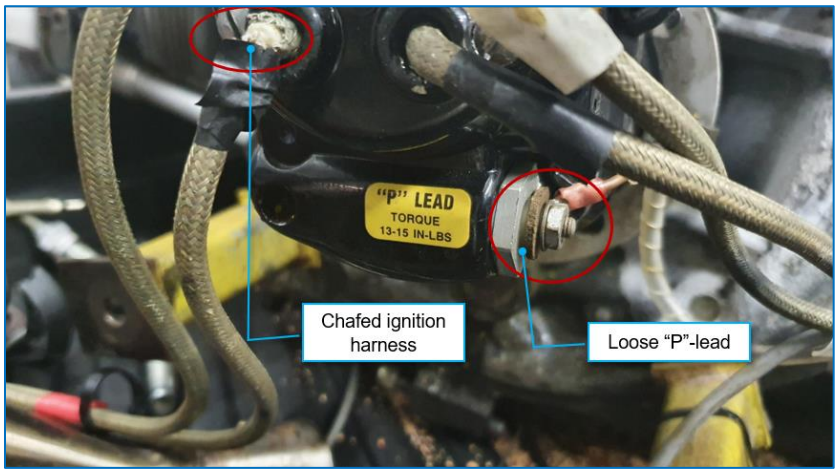

Figure 21 : back side of the magneto showing the damaged harness and loose "P"-lead

The "P"-lead on this magneto was almost loose, it could be easily manually unscrewed, while it should have tightening torque of 13 to 15 inch lbs. The magneto itself was not opened for further investigation as the spark plugs delivered a spark.

Oil was still present in the engine carter.

The cylinder heads and cylinders were not removed for inspection. Compression was measured by turning the propeller by hand. The compression for all cylinders was equal, except for cylinder No. 2, for which the value was about half. In the documentation of the last maintenance, it can also be seen that this cylinder had a slightly lower value during a "differential pressure test," which was still acceptable.

2.7 Survival aspects

The pilot was found lying unconscious on the ground in front and right of the main wreckage by the first witnesses that arrived on site.

The restraint was a 4-point upper restraint of Autoflug, consisting of a multi-point buckle with a pull strap release. The buckle was still secured to one lap belt portion via its fixed lug connection. All other 3 straps were found loose, disconnected from the buckle. The lever of the buckle was in the intermediate “DON” position.
Both belly straps were still attached to the seat, the upper torso straps failed at the anchor point itself (they share one anchor point to the airframe).

Figure 22: restraints as they were found. Left picture is indicating the failed anchor point of the shoulder straps, the right picture shows the buckle with the lever in the intermediate “DON” position.

Operation of the restraint

To don the restraint, the remaining lap belt is inserted together with both upper torso straps into the buckle in the “DON” position. After donning, the lever has to be moved to the “LOCKED” position. The lever is then flush with the buckle cover.
To release the harness, the lever must set to position “RELEASE”. This is done by grasping the loose portion of the strap handle and pulling it using the right hand until the operating lever butts against a stop when it has reached a position approximately perpendicular to the buckle cover. All loose lugs will now fall clear of the buckle. The lever automatically returns to the “DON” position.

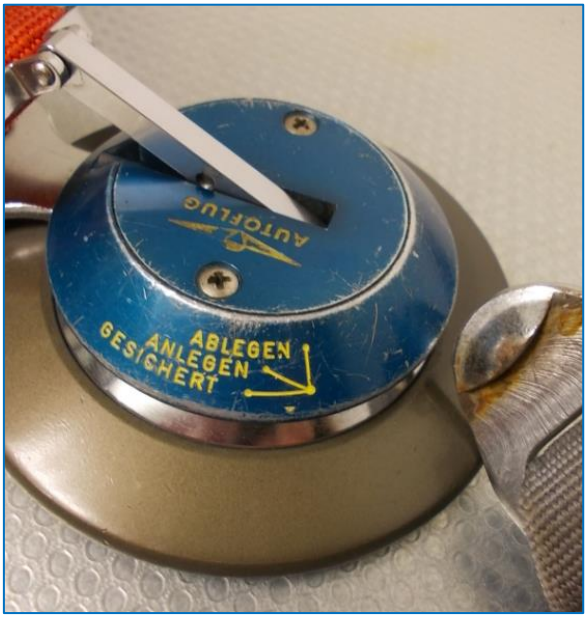

Figure 23 : Example of the installed multi-point buckle with an indication of the 3 positions of the lever: ABLEGEN (RELEASE), ANLEGEN (DON) and GESICHTER (LOCKED).

2.8 French regulation amateur-built aircraft

The aircraft was French registered. In France, aircraft built by amateurs can benefit from a Restricted Aircraft Airworthiness Certificate (or in French: Certificat de Navigabilité Restreint d'Aéronef - CNRA) which provides a regulatory framework adapted to these aircraft built and used without any commercial objective.
Aircraft under CNRA are registered F-Pxxx
A CNRA can be issued to an aircraft built by an amateur, a group of amateurs or an association
This could be:

- Of a prototype;
- of a replica constructed from a bundle of plans or a "material batch";
- of the reconstruction/restoration of an old aircraft whose original definition is no longer known.

CNRA aircraft are not subject to a certification process; it is the manufacturer's responsibility to ensure that the design chosen offers an acceptable level of safety and to ensure the quality of construction, particularly compliance with industry standards and the quality of the materials used.

A CNRA is valid:

- 1 year (default), or
- 3 years, if the maintenance is carried out by the manufacturer, an approved workshop or a "recognized maintenance structure" (U-CNRA).

U-CNRA: Owners of aircraft with a restricted airworthiness certificate, who have appropriate facilities and can justify at least five years of maintenance experience (or three years, subject to training), can benefit from a limited maintenance unit approval for that aircraft only.

The renewal of a CNRA requires the completion of an airworthiness examination carried out by OSAC or an authorized body.

Under his responsibility, the owner of a CNRA:

- defines a maintenance program adapted to its aircraft;
- accepts spare parts;
- decides on the application of airworthiness directives, except those made mandatory for CNRA aircraft.

Under the CNRA regime, the maintenance program is not approved by OSAC: it is developed under the entire responsibility of the owner who has no obligation to determine potentials (engine, propeller, magnetos etc ...).

Since the CNRA is not issued under the conditions of Annex 8 of the ICAO Convention, it basically only allows overflight of French territory or countries with which France has signed specific agreements. In Belgium, the overflight is regulated by the Royal Decree of March 16, 2009, and its amendment by the Royal Decree of June 8, 2017, establishing the conditions for the admission to air traffic of certain aircraft that do not have a certificate of airworthiness. Article 9 states that amateur-built aircraft registered in a member state of the European Civil Aviation Conference (ECAC) and that have a certificate of airworthiness or a flight permit issued by that state are exempt from obtaining a flight permit over Belgian territory. Since France is a member state of the ECAC, French-registered aircraft are therefore permanently allowed and it is not necessary to go through an administrative procedure to obtain a temporary flight permit.

2.9 Additional information

For home-built aircraft registered in Belgium, owners are required to apply the BCAA Technical Note TN 92-01R2 to their aircraft. This technical note describes, in the case of a single magneto, an inspection every 250 hours or 60 months, whichever comes first. This inspection has to be carried out by a duly authorized maintenance organization (Part M-Subpart F, Part 145 or VA[3]) and according to a program based on the instructions of the manual or other publications issued by the manufacturer of the magneto.

[3] national authorization for performing maintenance work on aircraft as described in Annex I of Regulation (EU) 2018/1139

2.10 Other accidents with Brugger MB-2 Colibri

2.10.1 2017 in the UK

On 28 August 2017 an accident occurred with a Colibri MB-2 near Abbots Bromley Airfield, Staffordshire, United Kingdom. The final report with reference *EW/G2017/08/25* of the UK's Safety Investigation Authority (SIA), named the Air Accident Investigation Branch (AAIB), mentions the following:

"*The pilot reported that the acceleration for take-off, the lift-off and initial climb were all satisfactory. At a height of approximately 150 ft, the engine lost power, ran erratically for a few seconds and then stopped. The pilot initially turned right but, after considering the nature of the terrain ahead, reversed the turn to the left to attempt a forced landing. The area beyond the airfield boundary is constrained by a reservoir. The pilot, therefore, had few options and attempted a landing into a field of standing maize, hitting the crop in a left-banked attitude*."

A video of the accident, recorded by a bystander, was available and requested by AAIU Belgium in order to compare the CCTV recordings of the accident under investigation in this report with the flight dynamics of the accident in the UK. The loss of power is clearly audible, and it can be seen that the nose of the aircraft initially pitches down and briefly continues its heading before turning to the right. Subsequently, the engine stops completely, which is followed by the turn to the left as described in the narrative above. The flight path is consistent with what would be expected as a power-off glide with such glide characteristics. The glide phase after the RH turn – at which the aircraft had already lost some altitude with respect to the 150 ft AGL that is stated in the AAIB report – lasted about 15 seconds.

2.10.2 2004 in Finland

On Tuesday 24 August 2004 an accident occurred near Mäntsälä, where a privately built Colibri MB 2 crashed. The aircraft was destroyed and the pilot was fatally injured.
The final report with reference *B 3/2004 L* of the Finnish SIA, mentions the following:

"*The probable cause of the accident is considered to be the unintentional opening of the canopy locking lever during flight. The canopy had immediately opened fully and hit the wing of the aircraft. The strong secondary aerodynamic drag of the large canopy had swung the nose of the aircraft to the right, causing the aircraft to roll around its longitudinal axis to the right and enter a dive. The event had been so rapid that the pilot had not had time to correct the steep dive.*
Contributing factors were the possible absence of a canopy locking lever tension spring, the absence of a safety latch to prevent unintended opening, the pilot's limited recent flying experience and a rough piloting style."

Further in the report the following statement of a test pilot is included: "*the Colibri is comfortable to fly, with adequate control forces and good control efficiency. The aircraft is manoeuvrably*

sensitive. Due to the lack of lateral stabilizer, maintaining directional stability in flight requires keeping the feet on the pedals
at all times. Before the wingtip modification[4], this machine stalled on the left wing in a stall. After the modification, the aircraft stalled in a straight line and the stall speed was reduced minimum of 65 km/h (35 knots).”

2.10.3 2017 in Ireland

On 9 June 2017, a Colibri MB-2 aircraft took off from ILAS Airfield, Taghmon, Co. Wexford for a local flight. Shortly after take-off the canopy of the aircraft opened unexpectedly. The pilot, managed to close the canopy but was unable to lock it shut. Whilst holding the canopy closed with one hand, the pilot completed a circuit and approach back to ILAS Airfield. During the final approach the aircraft flared slightly too high, followed by a hard landing. The aircraft sustained damage to both main wheels, the propeller and the left wing.
The pilot reported no injuries.
A factual report (with reference AAIU Report No: 2017-008) was made and published by the Irish SIA.

[4] The aircraft involved in the Hasselt accident, as considered in this AAIU safety investigation report, did not have the wingtip modification. The wings were in their original design configuration.

3. ANALYSIS

3.1 The go-around

Although it apparently wasn't the pilot's initially intention – reportedly he had previously declared a full stop landing via the radio – no immediate reason for the go-around could be identified. The CCTV footage shows the final moments of the approach as stable. Based on both testimonies and the footage, it appears that the go-around occurred at the beginning of the runway just a few meters above the ground. So it wasn't due to a bad bounce or anything like that. Besides that, the runway was completely clear. Even in the case of an approach that was too fast, there was still enough length available to safely land the aircraft, which can be considered as a lightweight, further down the runway.
Apart from operational reasons, no technical reason could be immediately thought of as to why the pilot would abort the landing instead of continuing. The landing gear is fixed, and if there was a problem with the engine at that moment, it would be strange to take the risk of climbing out (although there is sufficient obstacle clearance in the extension of runway 09).

Given that it was the first flight in a long time (almost six months) with the MB-2, the pilot might have wanted to double-check something. Maybe he wanted to fly another circuit to better determine the fuel consumption, since there was no longer a float gauge. But this remains speculation. The investigation was not able to provide enough information to draw a definitive conclusion on the reason for the go-around.

3.2 Performance of the climb-out

3.2.1 Airspeed

By extrapolating the heading at impact and drawing a curve tangent to this and the initial heading, we obtain more or less the flight path in the horizontal plane (see Figure 24). This is, of course, assuming a constant rate of turn, which was likely not the case here, but this can be neglected for the rough estimations. We also determine the location where the abrupt heading change would have occurred.

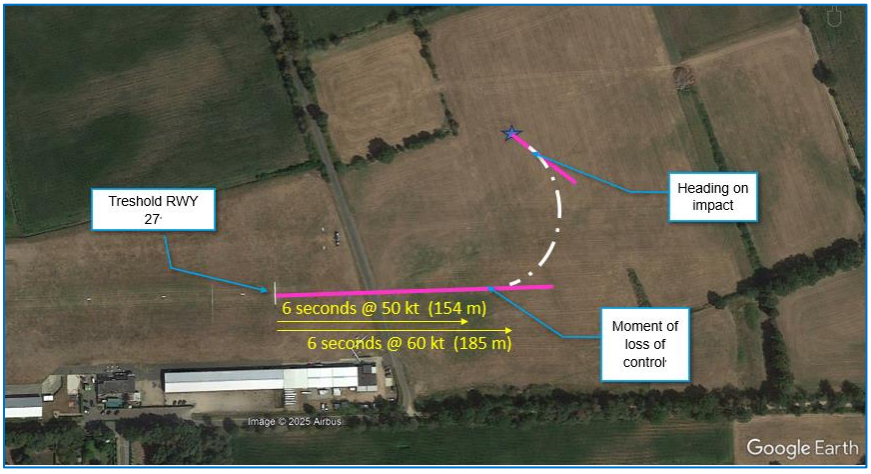

Figure 24 : drawing of a curve (white) tangent to the initial heading and the heading at impact to determine the position/moment of loss of control and the airspeed

Alternatively, we can try to determine this location by calculating the distance from the threshold with an assumed take-off ground speed between 50 to 60 knots. Given the light wind and the slight climb angle, it is acceptable to take the ground speed equal to the airspeed.

We see that these two methods give a fairly narrow area of the location of the loss of control, which, together with the observed climb pitch attitude, cautiously leads us to conclude that full power was available, at least until the moment of the loss of control. Because power + pitch gives the desired airspeed.

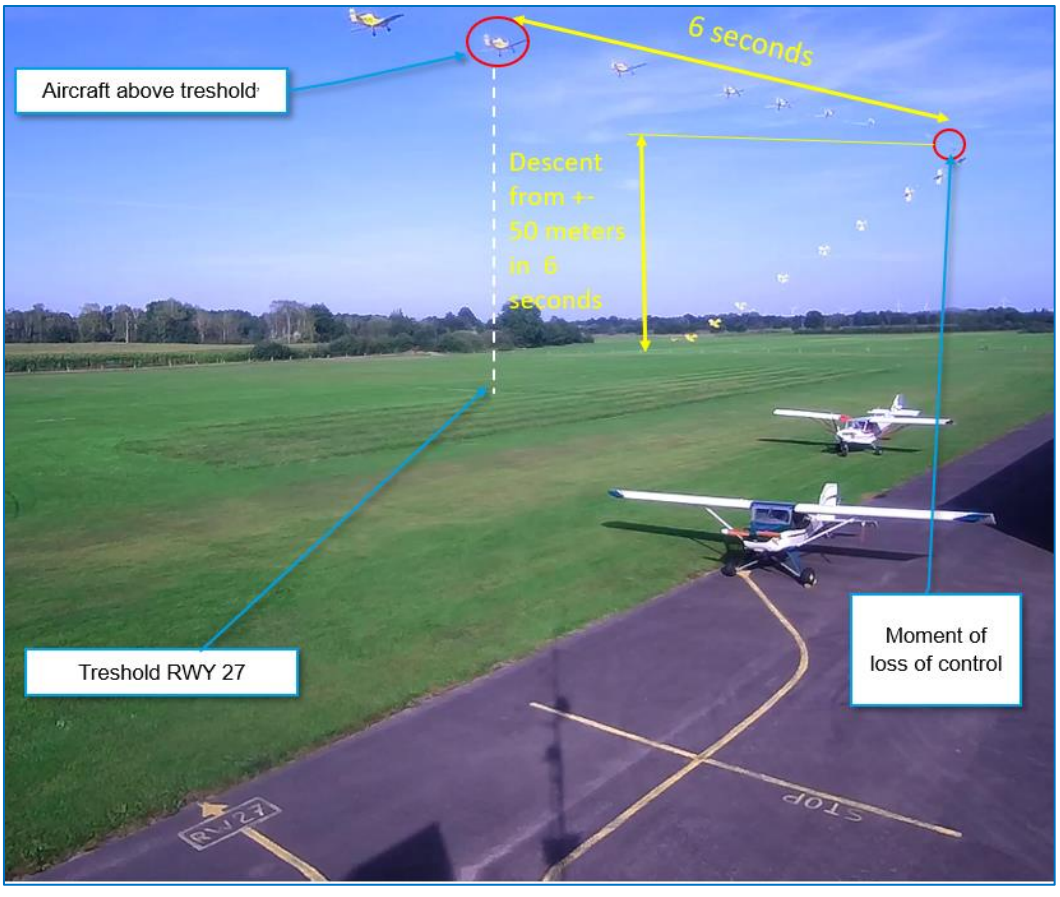

Figure 25 : relevant time and height indications on the composite image of the last portion of the flight

3.2.2 Rate of climb

If we measure the maximum height relative to the ground, reached by the aircraft, we arrive at approximately 35 times the height of the aircraft, or a good 50 meters (172 ft) above ground. This is also a number that was uttered by witnesses and also what would be estimated by sight from the footage.

The time from the go-around at approximately 5 m above ground level to the moment of the loss of control, was rounded to 18 seconds (it was determined that it makes no sense to calculate it to frame resolution since the exact positioning on the CCTV footage is difficult anyway), giving a calculated rate of climb of 524 ft/min.
This is very close to the published rate of climb of 590 ft/min, leading us to conclude that the engine power during the climb was adequate.

3.3 Undesirable event: loss of control - abrupt turn to the left, followed by steep descent

By "undesirable event" is meant the moment where there's a deviation from (suspected) normal operation, and which can be seen as the start of the accident sequence. The go-around could also be considered as the start, but since we concluded in the previous paragraph that the following climb was normal, we take the abrupt left turn to as the undesirable, or also called adverse, event.

A possible explanation for an early turn during the take-off phase could be an engine failure, with the pilot then attempting to glide back for a forced landing. However, the recorded footage was compared with that of the accident in the UK (see Chapter 2.10.1). The gliding characteristics of the aircraft involved are significantly better than the steep descent angle observed in the Hasselt accident. In the case discussed in this report, the aircraft reached the ground from an estimated height of 170–180 ft in just 6 seconds, whereas the aircraft involved in the UK accident was able to glide for 15 seconds after already descending below 150 ft AGL.

Moreover, there was ample space ahead of the aircraft for a forced landing, as shown in Figure 10 of this report. In other words, there was no need to deliberately initiate such an abrupt left-hand manoeuvre.

We therefore conclude that the abrupt turn was the result of a loss of control, which is defined as an unintended departure of an aircraft from controlled flight. The aircraft entered—at least momentarily—a flight regime outside its normal flight envelope, most likely due to a stall of the left wing.

Various factors that may have contributed to the loss of control and thus to the accident, either individually or in combination, are discussed below. The factors listed below are not exhaustive, but are typical factors that contribute to accidents involving small and experimental aircraft.

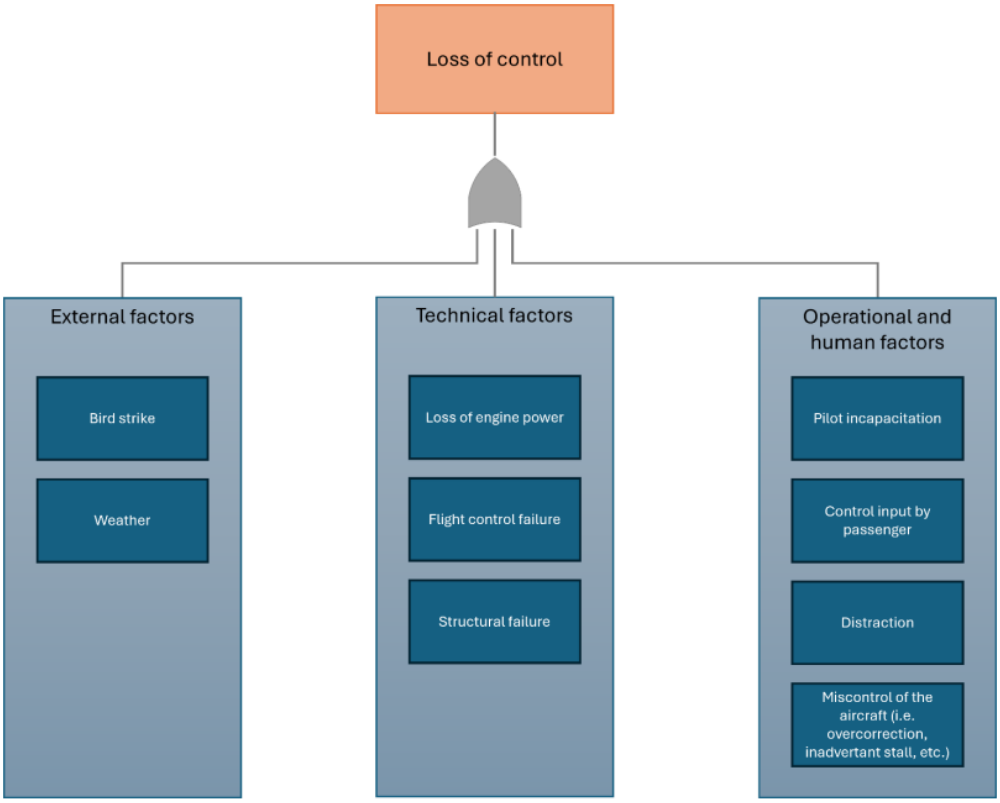

Figure 26 : Simplified fault tree analysis. Possible scenarios that can lead to a loss of control. Illustration by the Norwegian Safety Investigation Authority (NSIA)

3.3.1 External

The wind was calm and the general meteorological conditions were stable. Other pilots flying at EBZH that day, also didn't report any significant issue.

Consequently, loss of control due to turbulence or wind shear is ruled out.

Also, neither remains nor traces were found on the wreckage that could indicate a bird strike.

3.3.2 Technical

Engine

As stated in the introduction of this chapter, a controlled glide back to the airfield was ruled out. However, the question remains whether a loss of power could have caused the initial loss of control (stall of the left wing).
Traces on the broken propeller indicate that the engine was still running at the moment of ground impact. The nearest witness also reported no variation in engine noise. The carburettor float bowl of the separated engine was found full of fuel. The technical investigation also found no engine damage that could explain a complete loss of power.

This leaves the possibility of a partial power loss. As discussed, a damaged ignition harness of cylinder No. 3 was found during the post-accident inspection. The corresponding spark plug produced no spark, even after being replaced. The investigation cannot determine whether this failure was caused by the impact or if the damage was already present. In any case, the issue appeared to predate the accident, as evidenced by the insulation tape applied to the various harnesses.

Even if the engine was running on only three spark plugs—which would indeed result in reduced power—this cannot be identified as the direct single cause of the stall.
In more powerful engines with a counterclockwise rotating propeller, a complete power loss could cause a yaw to the left, as the pilot typically applies significant left rudder to counteract the so-called “right-turn tendencies” during climb. These tendencies would suddenly disappear when the engine loses power. However, for the Colibri with a 40 hp engine, these tendencies are relatively minor. Any (partial) loss of such tendencies should therefore be manageable.

The video of the accident in the UK also demonstrates that the MB-2 remains perfectly controllable during a power loss in the initial climb.

Flight controls

All flight controls were confirmed to be continuous. Only the rudder hinge connection was found loose at its RH side. But full rudder travel in both ways was still established.

The configuration of the elevator trim makes that the tab is deflected down when pulling at the cable. Due to tension forces during impact, the cable might have been pulled, leading to the full-nose-up pitch configuration of the elevator trim tab as found on site. The trim lever was in a neutral position however.

Canopy

In the past, there have been several incidents with other MB-2 aircraft where the canopy opened in flight. The lock on the left part of the broken canopy was found in a – albeit slightly deteriorated but – still locked state.

Additionally, the canopy swings open to the right. If this happened in flight, it would cause asymmetric drag increase on the right side and thus a turn to the right, as opposed to a turn to the left. This also happened in the accident in Finland in 2017.

The scenario of a canopy that had opened in flight is therefore excluded.

3.3.3 Operational and human

For the above explained reasons, we come to a preliminary conclusion that it was caused by a pilot-induced loss of control as opposed to an environmental (turbulence or wind shear) or technical (failure in the flight controls, canopy, or sudden engine stoppage).

Like already explained is the very sudden change in heading and attitude an indication of a stall (= sudden loss of lift). In the subsequent descent path, however, the aircraft does not appear to be in a typical stall condition but rather back in controlled flight. Signs of this are the consistent flight path and gradual change of roll and pitch attitude, where in a stalled condition one would observe more wobbling (shaking) of the fuselage and/or rocking of the wings. More as if the aircraft was in free fall, like a leaf 'swirling' down.
The needle of the retrieved airspeed gauge indicated about 80 knots, which is also way above the 1G-stall speed of 48 knots.

The question remains whether the initial loss of control was due to incorrect manipulation or incapacitation. It was certainly not yet the moment to turn left in the circuit into the so-called crosswind leg. This only happens after the roundabout (see also Figure 9 and Figure 10 of this report).
If we analyse the images further, it seems that the bank angle of the aircraft gradually decreases towards the end, indicating that the pilot probably was still trying to correct at that moment and was therefore fully conscious.

Figure 27 : A zoom-in of the composite image of the descent. The RH wing is clearly at a lower bank angle near the impact (left of the image) compared to the highest position (right).

All the above considerations lead us to conclude that it was highly probably a loss of control by a conscious pilot. A possible explanation could be that he was briefly distracted by something. Due to the very low altitude, he was then unable to regain full control of the aircraft in time.

The Finnish investigation report also mentions comments from a test pilot stating that the aircraft is manoeuvrable sensitive. Due to the lack of lateral stabilizer, maintaining directional stability in flight requires keeping the feet on the pedals at all times. Also, the statement that the "machine stalled on the left wing in a stall" is consistent with what happened here.

However, we cannot entirely dismiss the possibility of pilot incapacitation (partial or full), but unfortunately, no autopsy was conducted that could have clarified these uncertainties. However, as said here above, the CCTV footage shows gradually changes in pitch and roll attitude moments before impact, suggesting that some control of the aircraft was regained, albeit too late.

3.4 Other technical aspects

Float

As described in the narrative, several people at the airfield testified that the pilot had issues with a stuck float during the week and that the cork float was removed using a skewer. Contamination that could indicate cork residue was found in the fuel bowl. However, the fuel filter was still in good condition, and clean fuel was found in the carburetor float bowl with the

jets free of any contamination. Therefore, it can be stated that although there may have been some carelessness, this did not play a role in the accident.

Magneto

As discussed, there were some findings on the connections to the magneto (loose "P"-lead and damaged ignition harness). Since a spark test of the spark plugs was positive, the magneto was not further inspected. According to the maintenance program, the magneto is "On condition," so it appears the magneto was never disassembled for inspection. Neither the expected condition nor the actual condition was described or recorded.

As mentioned in Table 2, this aircraft was registered in France. For Belgian-registered aircraft, TN 92-01R2 requires an inspection every 250 hours or 60 months in the case of a single-magneto system.

During this inspection, the magneto is removed, opened, and elements such as the capacitor, ignition points, grounding, etc., are inspected. If values fall outside tolerances, certain sub-components are replaced.
The ignition harnesses are also fully inspected. In the manuals of Slick (model of the installed magneto), inspections are described at 100h, 500h, 1000h.
In any case, maintenance of the ignition system is a crucial element for the operation of the engine because it consists of several wear parts and especially because in this case no backup system is installed (Second ignition on an extra magneto or an extra electronic ignition).

But is has to be said that for this aircraft, the magneto is virtually inaccessible for inspection, as it is located in a cavity of the firewall. To inspect the magneto, the engine should be removed from the engine stand.

3.5 Survival aspects

The lap belt and both shoulder straps were found loose, disconnected from the buckle. The lever of the buckle was in the “DON” position. Both belly straps were still attached to the seat, the upper torso straps failed at the anchor point itself (they share one anchor point to the airframe), suggesting force was exerted during impact. This is consistent with the pilot that had both upper straps around his shoulders but not adequate connected in the buckle.
This could have been the case if the pilot didn’t move the lever of the buckle further to the “LOCKED” position” prior to take-off. Anyway, various photos on the internet of the pilot in the airplane on different occasions clearly show that the pilot consistently had the shoulder straps on.

Survivability is closely related to the crashworthiness of an aircraft. The latter is defined as the ability of an aircraft and its internal systems and components to protect occupants from injury in the event of a crash. The basic principles of crashworthiness design are generally summarized by the acronym “CREEP" as follows:

- C - Container
- R - Restraint
- E - Energy absorption
- E - Environment (local)
- P - Post crash factors

So next to the restraints, there are 4 other factors that influence the outcome of a crash.

With container, the strength of the cockpit structure is meant. To be fully crashworthy it should withstand the crash impact and maintain as a protective shell around the occupants. Energy absorption is about the control on how energy is transferred during a collision. The primary goal should be for the structure to absorb the impact, rather than the occupants.

Seen the impact and the damage to the fuselage, it is clear that the aircraft has little scores poorly in terms of containment and energy absorption. This is due to its concept and design. There are also no certification specifications for this since it is amateur-built. It's thus considered as an accepted risk.

Even if the restraint had fully functioned, it is therefore unlikely that it would have made any change in the outcome for the pilot.

4. FINDINGS

4.1 Findings as to causes and contributing factors

- The reason for the go-around could not be identified.
- The abrupt turn to the left is considered a momentary loss of control, most likely due to a stall of the left wing.
- Meteorological conditions were stable and did not play a role.
- A partial power loss could not be ruled out. However, based on video footage of a similar incident in the UK, it appears that the aircraft remains controllable under such conditions. It cannot be the sole explanation for the loss of control.
- It is therefore concluded that the cause was an operational (human-induced) loss of control.
- Pilot incapacitation could not be completely ruled out, although CCTV footage suggests that some control of the aircraft may have been regained—albeit too late.

4.2 Findings as to risks

- The anchor point of the restraint failed upon impact, but in this case it is unlikely that it would have made any change in the outcome for the pilot with this impact.
- No requirements for the inspection and overhaul for the single magneto, being a critical system, in the approved maintenance program.

4.3 Other findings

- The available video footage only allowed rough calculations to be made, but nonetheless, it can be concluded that the climb performance during the go-around was adequate.
- The aircraft held a valid Airworthiness Certificate.
- The pilot-owner personally conducted the maintenance on this aircraft, which was permitted due to his valid U-CNRA certificate.
- The aircraft is apparently known for his sensitive characteristics and stall tendency to the left, but the pilot was well experienced on this aircraft.
- The weight and balance was assumed to be within limits as no baggage was on board.

5. SAFETY ACTIONS AND RECOMMENDATIONS

*A **safety issue** is 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 organization or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.*

*A **safety action:** the steps taken or proposed to be taken by an organization or agency on its own initiative in response to a safety issue.*

*A **safety recommendation** is a proposal by the safety investigation authority in response to a safety issue and based on information derived from an investigation and/or study. It's aimed to improve the safety of an organisation and/or system and therefor always addressed to an organisation and/or agency, never to a specific individual. The sole purpose of a safety recommendation is the prevention of accidents or incidents and the reduction of the consequences of such occurrences. It, in no case has the purpose of creating a presumption of blame or liability for an accident or incident. Neither does it reflect the level of contribution to a specific accident or incident.*

*A **safety message:** An awareness which brings to attention the existence of a safety factor and the lessons learned. AAIU can distribute a safety message to a community (of pilots, instructors, examiners, ATC officers), 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.*

As no permanent safety issues related to design, an organisation and/or a system were identified during this investigation, no safety recommendations are issued.

ABOUT THIS REPORT

General	
What?	Safety investigation reports are a technical document that reflects the views of the investigation team on the circumstances that led to the accident or serious incident and is conducted in accordance with Annex 13 to the Convention on International Civil Aviation and Regulation (EU) No 996/2010.
Objective	**The sole objective of safety investigations is the determination of the causes, and to define safety recommendations in order to prevent future accidents and incidents. It is not the purpose of this investigation to apportion blame or liability.** In particular, Article 17-3 of Regulation (EU) 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility.
Investigation authority	The Air Accident Investigation Unit of Belgium (AAIU for the rest of this publication). It is the Belgian permanent national civil aviation safety investigation authority as defined in Article 4 of Regulation (EU) No 996/2010 and established in accordance with the Royal Decree of 26 December 2022. This unit is part of the Federal Public Service Mobility and Transport and is functionally independent from the Belgian Civil Aviation Authority and other interested parties.
This investigation	
Investigation initiation	The accident occurred at 14:25 UTC. The AAIU was notified by the vice-president of the local aeroclub at 14:36 UTC. An investigation team arrived at 17:20 UTC to conduct the on-site examination.
Scope	**Limited** As per Annex 13 and EU regulation EU 996/2010, each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident and serious incident. For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.
Other parties involved	• Bureau d'enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) France • Swiss Transportation Safety Investigation Board (STSB) • The Belgian Civil Aviation Authority (BCAA) • Air Accidents Investigation Branch (AAIB) UK
	AAIU would like to thank the mentioned parties above and all other entities and individuals that have contributed to this safety investigation.