Bundesstelle für
Flugunfalluntersuchung

German Federal Bureau of
Aircraft Accident Investigation

Investigation Report

Identification

Type of Occurrence:	Accident
Date:	8 May 2016
Location:	Teising
Aircraft:	Ultralight aircraft
Manufacturer / Model:	JMB Aircraft s.r.o. / Aveko VL-3 E
Injuries to Persons:	Two persons fatally injured
Damage:	Aircraft destroyed
Other Damage:	Crop damage
State File Number:	BFU16-0524-3X

Factual Information

History of the Flight

On 6 May 2016 the ultralight aircraft Aveko VL-3 E was flown from Kamenz to Mühldorf am Inn. The aircraft was on a demonstration tour for prospective customers. In the subsequent days a total of 26 flights with prospective customers were conducted.

At the day of the accident 10 flights were conducted. At 1602 hrs[1] another take-off with a prospective customer occurred on runway 08.

1 All times local, unless otherwise stated.

The owner stated that essentially the demonstration flights followed the same routine. After take-off climb with 150-170 km/h up to an altitude of 4,000 ft AMSL, then straight and level flight and turns. At 4,000 ft AGL the slow flight characteristics should be demonstrated with extended landing gear. It had been agreed with the demonstration pilot that no tilting characteristics should be demonstrated. Depending on the estimation of the demonstration pilot, in a safe altitude the prospective customers could control the aircraft themselves and thereby conducting slight climb and descent flights and turns.

A witness stated that at approximately 1607 hrs north of the town Teising the ultralight had had engine misfiring and then crashed to the ground in "korkenzieherartigen Bewegung (corkscrew motion)".

Personnel Information

Since 11 December 2000, the 51-year-old ultralight pilot in the left-hand seat held a Microlight Pilot's Licence for aerodynamically controlled ultralight aircraft with the rating for passenger flights issued by the Luftsportgeräte-Büro des Deutschen Aero Club e.V. (Bureau for Certification of Light Air Sports Devices at German Aeroclub, DAeC); valid until 24 May 2017. He also had the instructor rating for student pilots for aerial sports equipment for aerodynamically controlled ultralight aircraft; valid until 19 May 2017. He had a total flying experience on ultralight aircraft of 693 hours; of which 22:58 hours were on type. His class 2 medical certificate was valid to 16 December 2017.

The pilot in the left-hand seat held a Microlight Pilot's Licence equipment with the rating for passenger flights valid until 15 July 2018 issued on 15 July 2013 by the Luftsportgeräte-Büro des Deutschen Aero Club e.V.

Aircraft Information

The Aveko VL-3 E is a twin-seat aerodynamically controlled ultralight aircraft in fibre composite construction with retractable landing gear.

Certification in Germany was based on the simplified type certificate based on the CZ-type certificate ULL 01/2007 of the Czech Republic.

Manufacturer:	JMB Aircraft s.r.o
Type:	Aveko VL-3 E

Manufacturer's Serial Number (MSN):	VL-3-189
Year of manufacture:	2016
Maximum take-off mass	472.5 kg
Engine:	Rotax 912 ULS
MSN:	6.785.355
Rescue System:	Galaxy GRS 6/473 SD
Total airframe hours:	29 hours

The ultralight had a German certificate of registration and was owned by a German sales organisation of the Czech manufacturer.

According to the weighing report of the German class 5 examiner of 28 April 2016 its empty weight was 347.4 kg. The weighing report of the manufacturer of 28 April 2016 showed a mass of 350 kg. The German equipment list did not contain an autopilot system.

The test documents of the certificate of registration contained a flight report dated 28 April 2016, which was signed by the German examiner. According to the flight report take-off was at 1615 UTC and landing at 1745 UTC at Kamenz Airfield. The flight log book of Kamnez Airfield did not contain any flights with the ultralight for the time period mentioned. Coming from the Czech Republic, the ultralight landed at Kamenz Airfield for the first time on 28 April 2016 at 1747 UTC.

A weight label was located below the instrument panel in the pilot's leg area of the ultralight. Payload was listed with 125.1 kg.

The owner stated that at the time of take-off approximately 20 l fuel were on board. After the flight the aircraft should be refuelled.

According to the post-mortem examination the two occupants weighed together 148 kg plus clothing (1.5 kg each).

The baggage on board had a mass of approximately 4 kg.

BFU calculations for the load condition at the time of take-off

	Mass [kg]
1. Empty mass:	350
2. Crew:	151

3. Baggage:	4
4. Fuel 20l:	14.5
Total Flight Mass	**519**

According to the data sheet and Pilot Operating Handbook (POH) maximum take-off mass is 472.5 kg.

The centre of gravity calculation determined 28.7% MAC (Mean Aerodynamic Chord). According to the POH the allowable centre of gravity is between 21 and 34% MAC.

The POH stated in Chapter 6 *Weight and Balance*:

Warning

If C.G. position and take-off weight are not in operating range (see 6.2.1.) Do not fly !

The Center of the Gravity must be inside operating range (see 6.2.1.) during the whole flight!

Excerpt from the POH

POH, Chapter 6.2.2.C.G. Calculation describes:

6.2.2 C.G. calculation

Empty weight (see 2.7)	m_{pr} [kg]
Pilot weight	m_{p1} [kg]
Copilot weight	m_{p2} [kg]
Fuel quantity	vp [litr]
Baggage weight	m_z [kg]
C.G. of empty airplane (see 2.8)	x_{bsat} [%]
Wing leading edge position	x_{NH} = 540 mm
M.A.C. displacement	x_{SAT} = 68 mm
M.A.C.	b_{SAT} = 1236 mm

Weight $m = m_{pr}+m_{p1}+m_{p2}+vp*0{,}725+m_z$

C.G. position

$$x = \frac{m_{pr} \cdot \left(\frac{x_{bsat} \cdot b_{sat}}{100} \right) + m_{p1} \cdot 682 + m_{p2} \cdot 682 + vp \cdot 0.725 \cdot 215 + m_z \cdot 1467}{m}$$

$$xt = \frac{x}{b_{SAT}} \times 100$$

Excerpt from the POH

POH Chapter 3 Emergency Procedures described the procedure to recover from spinning:

3.7 Recovery from unintentional spin

There is no tendency of spontaneous uncontrollable spin entry if normal pilot techniques are used.

Should an inadvertent spin occur, the following recovery procedure should be used:

1. Throttle - retard to idle
2. Control stick - hold ailerons neutralized
3. Rudder pedals - apply full opposite rudder
4. Control stick - forward elevator control as required to break the spin
5. Rudder pedals - immediately after the stopping of a rotation neutralise the rudder
6. Recover from dive

Excerpt from the POH

Rescue System Galaxy GRS 6/473 SD

The ultralight was equipped with a Galaxy GRS 6/473 SD rescue system. On the homepage the manufacturer indicated the calculated minimum rescue height when the rescue system is activated during spinning. The information is based on an article dated 7 November 2008 and describes the different options of using the rescue system. In addition, the differences of the various certification criteria (DULV, DAeC / Germany and ATSM F-23-16-12 / USA) are compared. The problem that is encountered when calculating rescue height is that the speed during spinning is below the speed the manufacturer uses during certification tests (90 km/h). Thus, the opening time for the rescue system is longer. At an estimated speed during spinning of 63 km/h 1.5 seconds have to be added to the 4.5 seconds determined during testing. Therefore, the calculated rescue height is between 63 and 83 m above ground. Is the rescue system activated in inverted position, an additional 20 m above ground are needed.

Minimum rescue height:

$$Ho = \frac{0{,}5 * 9{,}81 * 6^2}{2} + 13{,}6 = 102\ [m]$$

If the system is used in reverse flight, then to the counted height, +20m is added.
Minimum rescue height is : 102 + 20 =122m over ground. **The difference is then 40 m!**

Calculation of the rescue height — Source: Manufacturer

In the English manual (Galaxy GRS, Instruction Manual for Assembly and Use) the manufacturer gives information about the rescue height:

2.4 Minimum height

You are warned that the minimum firing height of 100 ft (30 m) for canopy without slider (measured in 38mph (60km/h) in horizontal flight) and 200 ft (60 m) for canopy with slider may not always be a safe height from which to fire the system because of rotation or tilt of the plane, when the minimum firing height may be 180-250 ft (60–80 m).

Meteorological Information

According to witness' statements visual meteorological conditions prevailed. Pilots approaching Mühldorf am Inn Airfield described the weather as "bockig (turbulent)".

The BFU charged the Deutsche Wetterdienst (German meteorological service provider, DWD) with an expert opinion regarding the weather conditions on 8 May 2016 in the Mühldorf/Teising area.

The expert opinion came to the following conclusion:

At the time of the accident essentially the gusty surface wind and distinct thermals were aeronautically relevant. It is to be noted that both meteorological phenomena interact: The gusty east wind negatively affects thermal development because a developing thermal hose can be torn off by the wind and the thermal lift is suddenly severed.

If during such weather conditions flight manoeuvres are conducted, which bring the aircraft close to the flight envelope, a sudden change in thermal lift by the turbulences described can become dangerous. In addition, the described formulation of a pilot flying in such an area "Das Wetter sei „bockig“ in der Luft (the weather is turbulent in the air)" is a plausible description.

Radio Communications

There were radio transmissions between the Flugleiter (A person required by German regulation at uncontrolled aerodromes to provide aerodrome information service to pilots) and the ultralight. The radio transmissions were not recorded.

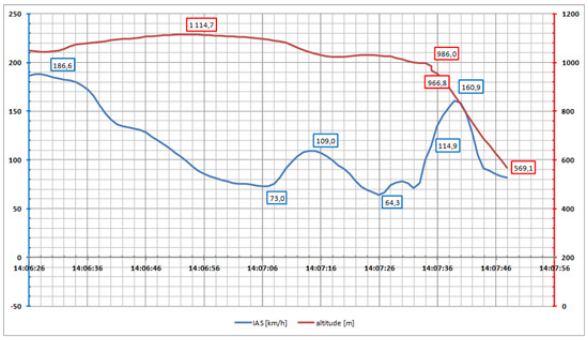
Aerodrome Information

Mühldorf Special Airfield /EDMY) has one asphalt runway, oriented 08/26, which is 805 m long and 20 m wide. Aerodrome elevation is 404 m AMSL.

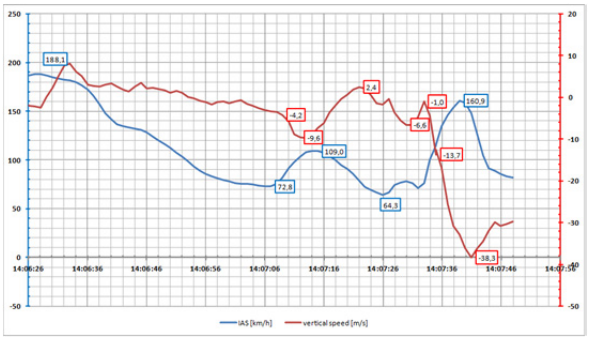
Flight Recorder

The ultralight was equipped with a Garmin Multifunction-Display (GDU 460) and a FLARM. For the recording of the sensor data the Garmin uses UTC for the time and True Airspeed (TAS) and Indicated Airspeed (IAS) in knots (kt) for the speeds. The values are presented in a graph. Local time and speeds in km/h were used for the image.

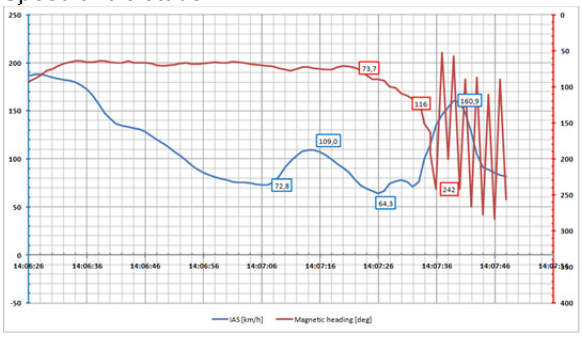
The Garmin data was read-out and analysed at the BFU.



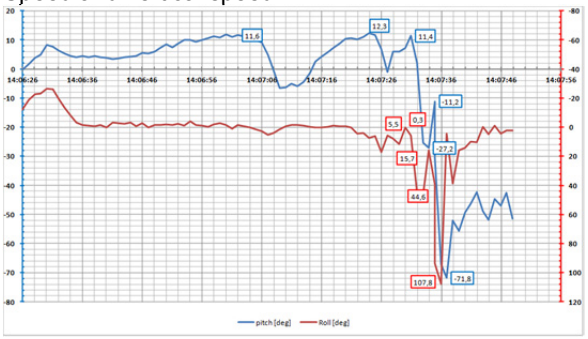
Speed and altitude



Speed and vertical speed



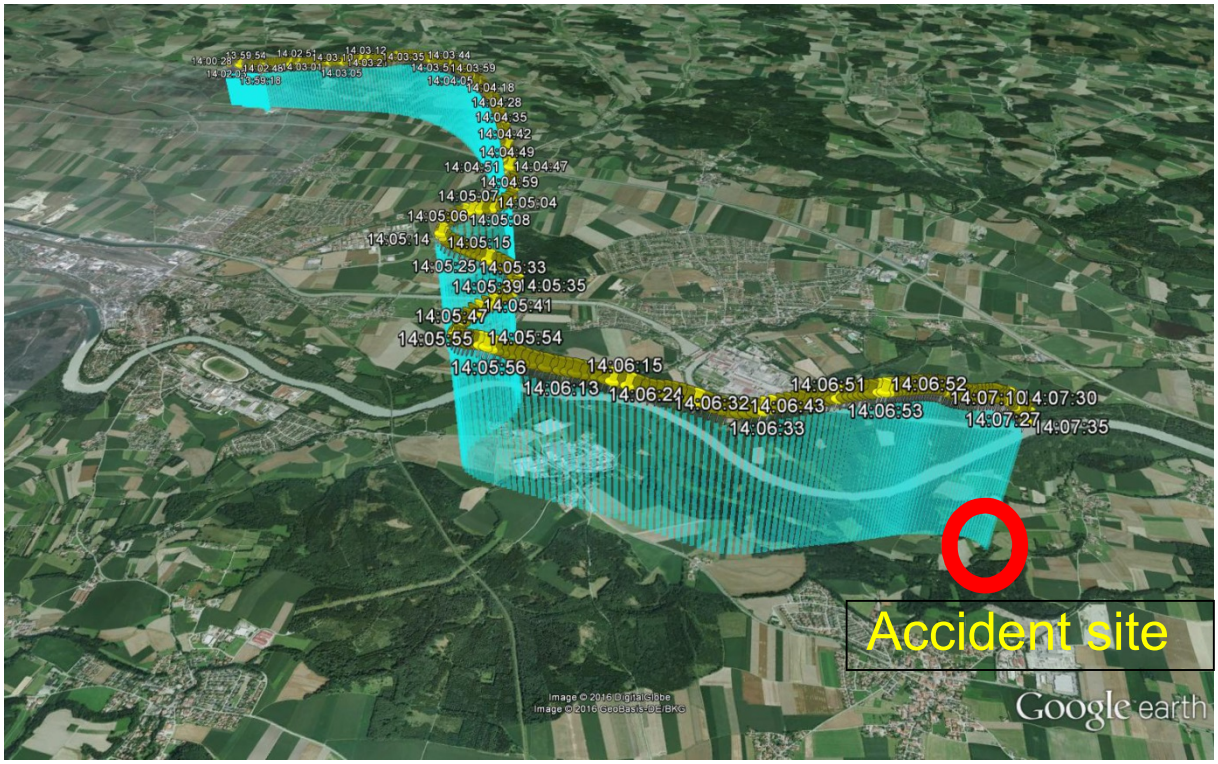
Speed and magnetic heading



Yaw and bank angle

Selected parameters of the analysed Garmin data Source: BF

According to this analysed data take-off occurred at 1602 hrs. The ultralight climbed to 1,080 m AMSL. During cruise flight a maximum ground speed of 200 km/h was reached. At 1606 hrs engine thrust was selected to idle and ground speed reduced to 76 km/h. A pitch of 11.6 degrees and no bank angle were recorded. After a stall warning speed increased to 109 km/h with a rate of descent of -9.6 m/s. Engine thrust was increased to 2,670 revolutions per Minute (RPM). This was followed by climb with a rate of 2.44 m/s and subsequent speed reduction to 79 km/h and engine thrust at idle. The angle of attack was increased and the flight continued with a pitch of 11 to 12 degrees. The rate of descent was -1.7 m/s and the bank angle 5 to 6 degrees. With this configuration the speed was further decreased to 64 to 72 km/h. The rate of descent increased to -6.6 m/s. At 1407 hrs the pitch angle changed within 0.5 seconds from 12° to -1° and the bank angle increased from 5° to 16°. Then the pitch angle was 11.5° and the bank angle 5° to 6°. The speed was between 64 and 72 km/h. The rate of descent was 6.6 m/s. For six seconds this configuration was maintained until stall occurred at 1607:32 hrs. The ultralight entered a right spiral. At 1607:32 for 0.3 seconds engine thrust was increased to 4,040 rpm and then selected to idle. At 1607:48 hrs the recording ended.



Depiction of the accident flight using Garmin data Graph: BFU/GoogleEarth™

Wreckage and Impact Information

The accident site was located on a field approximately 9.5 km south-east of Mühldorf am Inn Special Airfield and about one kilometre north of the town of Teising. Terrain elevation was 405 m AMSL.

The ultralight had impacted the ground with a pitch angle of 30° to 40°. Traces of rotary motion could not be detected. The bottom surface of the engine fairing impacted the ground first ground. The fuselage had fractured in the area of the fire wall. The engine mounting had been deformed. The side panels of the cockpit and the bottom surface of the fuselage had fractured. The control stick on the right side had been deformed.

The landing gear was retracted. The lever for the flaps was in the position retracted. The lever for the engine thrust was in the position idle and the trim in the nose up position above the take-off position.

The wing tanks had burst and fuel had leaked out.

A functioning autopilot was found in the wreckage.

Interior with load label Photo: BFU

The rescue system had been deployed. The parachute of the rescue system was found north abeam of the wreckage.

The BFU weighed the wreckage. Its mass was determined with 361 kg. The weight included the baggage and the documents found in the wreckage.

Examination of the Rescue System

The rescue system was examined together with the manufacturers:

Due to the damages, the position of the slider, and the suspension lines the manufacturer is of the opinion that it must be assumed that the activation of the rescue system occurred at a speed below 120 km/h, approximately three seconds before impact, and in about 50 m above ground. The deployment energy on the suspension lines had been between 800 and 900 kg.

Engine examination

In the presence of the BFU, the engine was disassembled, examined, and assessed at the maintenance organisation of the engine manufacturer:

The pressure loss was within the tolerances of the manufacturer specifications. Due to the impact the propeller flange was beyond the tolerance. The oil pump had fractured. The oil filter insert showed no foreign objects. The spark plugs showed a fawn-brown discolouration and indicated correct combustion of the fuel-air-mixture.

The exterior of the exhaust had been damaged by the impact. The exhaust muffler was cut open and visually inspected. There were no damages on the inner components.

Fuel was found in both float chambers of the carburettor. Neither water nor contamination was found. The float pairs weighed 6 g and 6.9 g, respectively, and were therefore below the maximum allowable total weight of 7 g per float pair.

The engine was subject to functional testing. The damaged components such as engine mounting, cooler, water pipes, and oil tank including heat exchanger were replaced. The electric fuel pump from the wreckage was mounted to the test stand together with the engine and subject to functional testing.

The determined performance data of the engine corresponded with the requirements of the engine manufacturer. Dysfunction of the engine could not be determined.

In summary, the engine examination determined:

The engine test did not reveal any damages, which were not caused by the impact with the ground.

The electric fuel pump showed proper functionality with sufficient fuel pressure.

The engine started right away during the engine test and reached the complete performance data as required by the engine manufacturer.

During the entire examination no dysfunction or damages could be determined, which would have indicated engine malfunction during operation.

Medical and Pathological Information

The Institut für Rechtsmedizin der Ludwig-Maximilians-Universität München examined the bodies of the two occupants.

The pilot in the left-hand seat died during the ground impact. The pilot in the right-hand seat also died at the accident site. According to the coroner the injuries on his right hand had been caused by the control stick.

Fire

There was no impact fire.

Additional Information

Autopilot

The Federal Ministry of Transport and Digital Infrastructure stipulated in 2007 that autopilots were not necessary in ultralights and contradict the fundamental aim of aerial sports equipment. The Test Instruction for Examiners (PAUL) of the DAeC, Edition August 2013, Item 12.2. Special Regulations states:

The fitting of ultralights with autopilots is not permissible. If such a gadget is fitted no airworthiness review certificate shall be issued.

The currently applicable test instruction of the Deutsche Ultraleichtflugverbandes (German Microlight Association, DULV) (1.1/01.03.2007) does not consider the prohibition of autopilots and deviates from common test instructions.

The Luftfahrt-Bundesamt (German civil aviation authority, LBA) instructed the DULV with a letter dated 30 May 2016, that the fitting of an autopilot is not permissible and that the test instructions have to be revised accordingly.

Rescue System

Due to an air accident involving an Aveko VL-3 (BFU 3X017-0/08) in 2008, the BFU issued a safety recommendation (06/2008) to the LBA to examine the certification criteria for the type certificate of rescue systems. The BFU investigation report included additional information regarding the type certificate and the use of the rescue system Galaxy GRS -6/473 SD.

Excerpt investigation report BFU 3X017-0/08:

The manufacturer stated that due to requirements by DULV, for the certification of the rescue system other test procedures were used than required by the airworthiness requirements for rescue systems for ultralight dated 30 September 1999 (LTF 99). The test dropping, required in LTF 99, with a flow rate of 45 km/h were not conducted. Instead a flow rate of 120 km/h was used.

According to the manufacturer at speeds below 120 km/h opening time and rescue height increase. For the rescue system to open entirely more than twice that is needed or even more than the required certification criteria.

The Airworthiness Requirements for Rescue Systems for Ultralight of 30 September 1999 (LTF 99) Chapter 5 Practical Tests for Type Certification stipulates:

5.1 Determination of rescue height and opening time

Definitions: The rescue height is the loss of altitude until the parachute is filled entirely.

The opening time is the time until the parachute is filled entirely.

a) Three droppings with an activation speed Va = 0 km/h are to be conducted. Rescue height shall not be more than 80 m.

b) Verification under a) is provided if opening time is below four seconds.

c) If parachute clusters are used rescue height and opening time are always to be determined with the entire cluster.

d) If a rocket engine is used instead of a) at least three rocket launchings of the integrated rescue system in the installation configuration with a flow rate of 45 km/h are to be conducted.

The opening time of four seconds shall not be exceeded.

On 1 October 2009 DULV issued a safety information (DULV-2009-002, see Appendix) for owners and pilots of ultralights equipped with the rescue systems Junkers Magnum Light Speed Softpack and Galaxy GRS 6/473 SD. It described that the mentioned systems do not meet the certification criteria and the DULV therefore issued their own criteria, which are not part of the current certification regulation.

Analysis

General/Accident Occurrence

The investigation revealed that after take-off in Mühldorf the aircraft initially climbed to 918 m AMSL and then turns with bank angles of 45° to 60° were flown. At 1,080 m AMSL at 1606:33 hrs the engine thrust was selected to idle. Almost with stall speed the ultralight turned right with slight bank angle and large angle of attack. During the manoeuvre the rate of descent was -6.6 m/s. During the time period between the engine thrust “idle” and the manoeuvre with a rate of descent of -6.6 m/s the engine thrust was at least once increased to 2,670 rpm/m and again reduced to idle. This configuration resulted in stall on the right wing. During the attempt to

recover a stabilised flight attitude the pitch and bank angle and the engine performance were changed speedily. This resulted in a significant increase in angle of attack and stall at the wings.

The BFU is of the opinion that the ultralight was subject to unintended spinning during the subsequent flare.

The examination of the rescue system showed that it had been activated only shortly before the impact. Due to the low altitude, below 50 m AGL, the canopy of the rescue parachute could not completely open. The partially open parachute was enough to slow the rotation of the ultralight and reduce the impact speed.

The traces at the accident site and on the wreckage show that the aircraft crashed without yaw movement with an angle of 30° to 40° to the ground. The accident was non-survivable for the occupants due to the severe injuries caused by the high impact forces.

Ultralight aircraft

The aircraft had a German certificate of registration. The manufacturer had weighed the ultralight before it was flown from the Czech Republic to Germany. The empty weight was given as 350 kg. The equipment list of the manufacturer contained the autopilot. According to the statement of the German examiner a complete airworthiness check and weighing was conducted in Kamenz after the landing at 1947 hrs. The empty weight was given as 347.4 kg. The equipment list did not include an autopilot. The data recording of the Garmin system shows that whenever the aircraft electrical system was switched on a functional autopilot was connected. The airworthiness certificate was issued without further notes or comments. The examiner stated that he knew about the autopilot. The flight report mentioned in the certification documentation of 28 April 2016 was not mentioned in the aircraft log book or the airport log book. The BFU disputes whether the data in the flight report is correct.

The loading label with the maximum allowable payload had been mounted in the leg area below the instrument panel. The BFU is of the opinion that the requirement according to the Airworthiness Directive (AD) No: LSG 05-004, which states that the loading label should be mounted in the field of vision of the pilot, was not properly executed. The requirement's purpose was to visibly inform the occupant of an ultralight about the limited payload and a possible overloading of the ultralight.

The investigation revealed that the examination requirements differ in some points between the version of the DAeC LSG-office and the DULV version. The DAeC version does not permit the fitting of an autopilot. An airworthiness certificate shall not be issued any more. The version of the DULV did not mention the specific remark about an autopilot being a criterion for exclusion. The organisations were aware of the stipulations the Federal Ministry of Transport made in 2007. Class 5 examiners for ultralight are accredited by both organisations and may work for both. The BFU is of the opinion that the examiner knew about the prohibition of the autopilot in the ultralight.

The investigation of the ultralight did not reveal any technical cause for the accident. The engine failures described by a witness could not be confirmed by the analysed flight data recordings.

POH, Chapter 6 Weight and Balance provides information on centre of gravity calculation. The BFU is of the opinion that due to the published formula the provided information is not suitable for flight operations. For the average pilot a simple solution, e.g. graphs or loadsheets, is more applicable and common.

Rescue System

The investigation showed that the rescue system was activated with a low flow rate below 50 m above ground.

According to the calculations of the manufacturer 102 m above ground and six seconds would have been necessary. Because there is not much horizontal velocity and therefore a low flow rate during spinning opening time of the parachute increases. The parameters for the opening time of the parachute with 4.5 seconds at 90 km/h were beyond the certification criteria and then there was the additionally needed time during spinning.

On 16 January 2007 DULV type certificated the rescue system in accordance with the Airworthiness Requirements for Rescue Systems for Ultralight (LTF 99). Already during the type certification DULV diverted from the airworthiness requirements and issued a type certificate. Due to a BFU safety recommendation (06/2008) to the LBA, DULV issued a safety information (DULV-2009-002) on 1 October 2009 regarding the rescue systems Junkers Magnum Light Speed Softpack and Galaxy GRS 6/473 SD. The rescue systems mentioned did not meet the certification criteria for rescue systems. Therefore DULV issued their own certification criteria, which did not

correspond with existing certification criteria. The BFU safety recommendation to check the certification criteria for rescue systems was not implemented correctly.

The BFU is of the opinion that type certificate of the rescue system based on the LTF 99 should not have been issued.

Individual Actions

Based on witnesses' statements demonstration of slow flight characteristics of the ultralight was part of the flight program. Compared to the previous flight, the accident flight was a prolonged flight with high angle of attack. The ultralight was flown with a nose-up attitude, drifted off slowly, banked and then started spinning. Spatial disorientation of the pilot as consequence of the unexpected and unusual attitude change has to be taken into account as cause for the incorrect reaction and control reaction, respectively, which would have resulted in an uncontrolled flight attitude and the continuation of the spinning. From the beginning of the spinning until the end of the Garmin system recording 16 seconds elapsed. In order to recover an uncontrolled flight attitude or activate the rescue system the remaining altitude and the time was not sufficient.

Specific Conditions

The pilot held the required licences and ratings to conduct the flight; in addition he also held the instructor rating for ultralights. His total flying experience of 693 hours was sufficient. His training of the last 30 days has to be considered as good. His flying experience on type of 22:58 hours was not very distinct.

Visual Meteorological Conditions (VMC) prevailed at the time of the accident. The weather, which was described as "turbulent" could have marginally influenced the stall.

The maximum take-off mass of the ultralight was exceeded. The BFU is of the opinion that both pilots should have been aware that they were flying an overloaded ultralight. A corresponding label with the maximum allowable payload (125.1 kg) was installed in the cockpit, but not in the in direct visual range of the occupants.

Defences

In the scope of this investigation, the term "defences" or “safety mechanism” means technical systems, actions, procedures and institutions which shall minimise the effects of technical and human errors to protect flight safety.

Relating to in-flight dysfunctions, emergency procedures had been established, which shall allow a pilot to minimise the effects of such a dysfunction and land the aircraft safely. One principle is to remain in or regain control of the aircraft. Then the pilot should focus on processing the dysfunction. For example by trouble shooting, checking ones course of action, and decision making regarding the further course of the flight. According to the POH, in the present case the pilot could have recovered the spinning or activated the rescue system. Based on the Garmin data analysis no recovery attempt to end the spinning can be detected. Activation of the rescue system occurred in low altitude; i.e. the canopy could not open fully. A decision-making process appropriate to the situation would not have been possible in the short time between the probably unexpected spinning and the activation of the rescue system. The activation of the rescue system in low altitude shows that the pilot did not have standard options available to him, such as recovering the spinning or activation of the rescue system. Especially a time-sensitive course of action requires trained procedures. Mental pre-flight preparation including emergency briefing would probably have increased situational awareness and resulted in earlier action (e.g. activation of the rescue system).

The ultralight certification process in Germany does not require spinning tests, but stipulates equipment with a rescue system. If the pilot encounters a situation which is not controllable the rescue system should be activated. Therefore the rescue system is of fundamental importance for the certification of Microlights The BFU is of the opinion that during type certification this safety system should be specifically monitored. It should not be possible for DULV to certify it by defining their own criteria and interpreting tolerances.

Conclusions

The accident was caused by flying below the stall speed, which caused the ultralight to spin. The pilot did not recover the spinning during the time remaining until the impact with the ground. The rescue system was activated in an altitude which was insufficient for the parachute to completely open, which was pivotal to the severity of the accident.

Safety Recommendations

Due to an air accident, in 2008 the BFU issued a safety recommendation (06/2008) to the LBA requiring the LBA to check their certification criteria for rescue systems. The issuance of this safety recommendation was caused by the certification of the rescue system Galaxy GRS 6/473 SD, which did not meet LTF 99 requirements.

As reaction, DULV stated on 1 October 2009 in a safety recommendation DULV-2009-002 that it had certified the rescue system contrary to the stipulations of LTF 99. Instead they had used their own certification criteria, which did not meet the Airworthiness Requirements for Rescue Systems for ultralight aircraft dated 30 September 1999 (NfL II-122/99).

BFU Safety Recommendation (06/2008) to the LBA was not implemented accordingly.

Investigator in charge: Knoll

Field investigation: Rachl

Braunschweig: 21. September 2017

Appendix

Safety report DULV 2009-002

Deutscher
Ultraleichtflugverband e.V.

Sicherheitsmitteilung **DULV-2009-002**	Datum: 1. 10. 2009
An alle Halter und Piloten von Ultraleichtflugzeugen mit Rettungsgeräten: **Junkers Magnum Light Speed Softpack** **und** **Galaxy GRS 6/ 473 SD**	**Rettungsgeräte für UL** Anhängelast Maximalgeschwindigkeit Mindestgeschwindigkeit

Die Lufttüchtigkeitsforderungen für Rettungsgeräte für Ultraleichtflugzeuge bekannt gemacht in den NfL II - 122/99 vom 30.09.1999 basieren auf der Annahme, dass diese Rettungsgeräte sich entweder mit der Ausgangsgeschwindigkeit Va = 0 km/h in einer Höhe von 80 m öffnen müssen, oder die Entfaltungszeit vier Sekunden nicht überschreiten darf. Bei Verwendung eines Raketenmotors ist in Punkt 5.1 d) eine maximale Entfaltungszeit von 4 Sekunden bei einer Ausgangsgeschwindigkeit Va = 45 km/h gefordert.

Diese Forderungen sind für einige der heute existierenden Ultraleichtflugzeuge, die mit einer maximalen Abflugmasse von 472,5 kg und einer Vne von bis zu 340 km/h unterwegs sind, nicht anwendbar.

Um bei diesen Massen und Geschwindigkeiten ein sicher funktionierendes Rettungssystem entwickeln zu können, sind Öffnungsverzögerer (Slider) notwendig. Ansonsten treten bei diesen Massen und Geschwindigkeiten Kräfte auf, die entweder das Rettungsgerät oder aber das Ultraleichtflugzeug zerstören würden.

Der Nachteil, der mit der Verwendung dieser Öffnungsverzögerer verbunden ist, ist eine längere Öffnungszeit des Rettungssystems.

De facto wurden die Parameter Masse und Gebrauchshöchstgeschwindigkeit mehr und mehr nach oben verlagert, ohne dass die Parameter Entfaltungshöhe und Entfaltungszeit für solche Geräte angepasst wurden.

Der DULV hat aus diesen Gründen bei der Musterprüfung der Rettungsgeräte Junkers Magnum Light Speed Softpack, Kennblatt-Nr. R 28/05-8 und Galaxy GRS 6/ 473 SD, Kennblatt-Nr. R 29-07 einen Geschwindigkeits-Massen Parameter eingeführt. Dieser Massenparameter beschränkt, wie auch in den entsprechenden Kennblättern vermerkt, die Verwendung dieser Rettungsgeräte auf Ultraleichtflugzeuge, deren Geschwindigkeits-Massen Parameter (Vne/m) > 0,4 ist. Wobei die Vne des Ultraleichtflugzeuges in dem das Rettungsgerät verwendet werden soll, einzusetzen ist und für m die maximale Abflugmasse des betreffenden Ultraleichtflugzeuges.

Da die Öffnungsverzögerer bisher nicht in den Lufttüchtigkeitsforderungen für Rettungsgeräte Stand 1999 berücksichtigt sind, erarbeiten die beauftragten Verbände eine Ergänzung der Vorschriften und werden künftig die ermittelten Werte zur Entfaltungszeit in den Gerätekennblättern veröffentlichen.

Die beauftragten Verbände weisen dringend darauf hin, dass Rettungsgeräte nicht alle möglichen Gefahrenzustände und –abläufe abdecken können. Die spezifischen Informationen sind in den Betriebshandbüchern zu veröffentlichen und die Piloten und Halter sollten sich ausreichend darüber informieren.

Jo Konrad Vorsitzender	Kersten Ebeling Technik Referat

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FlUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

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