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Accident to an ultralight aircraft VL-3 Evolution, national and registration markings LY-VLA, that occurred on 19 April 2014 in Quarter No. 396 of Madžiūnai forest, Madžiūnai village, Paluknys neighbourhood, Trakai region, Vilnius district, the Republic of Lithuania

FINAL REPORT

Transport
Accident and
Incident
Investigation Division

This is a courtesy translation by the Transport Accident and Incident Investigation Division of the Factual Report on the Safety Investigation. As accurate as the translation may be, the original text in Lithuania is the authentic version and the work of reference.

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Code 188604955

FOREWORD

The safety investigation is conducted in accordance with Annex 13 to the Convention on International Civil Aviation and 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 repealing Directive 94/56/EC.

The purpose of the safety investigation is to prevent the occurrence of accidents and incidents in the future, rather than establish blame or liability. The safety investigation is conducted independently of any judicial or administrative proceedings, to apportion blame or liability, are not related to them, and have no impact thereupon.

Each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident or serious incident. The report shall contain, where appropriate, safety recommendations, which shall in no case create a presumption of blame or liability for an accident or serious incident.

In accordance with the provisions, the safety investigation report cannot be used as evidence in a judicial or administrative process seeking to apportion blame or liability, because this was not established in the course of the safety investigation and it is not compatible with the objective of the safety investigation.

The information is published to inform the aviation industry and the public of the general circumstances of the accident or serious incident. Extracts may be published without specific permission providing that the source is duly acknowledged, the material is reproduced accurately and it is not used in a derogatory manner or in a misleading context.

CONTENTS

INTRODUCTION

Owner and operator	JSC JMB Aircraft Baltics
Manufacturer	JMB Aircraft s.r.o. (Czech Republic)
Aircraft type	VL-3 Evolution
Registration	LY-VLA
Place of Accident	Quarter No. 396 of Madžiūnai forest, Madžiūnai village, Paluknys neighbourhood, Trakai region municipality, Vilnius District, the Republic of Lithuania. 54° 27' 01" north latitude, 024° 57' 05" east longitude.
Date and time of Accident	19 April 2014 20:05 local time or 17:05 UTC[1]

Synopsis

At 20:05 on 19 April 2014, an ultralight aircraft VL-3 Evolution piloted by a citizen of the Republic of Lithuania, took off for a pleasure flight from Paluknys aerodrome. Shortly after the take off the ultralight aircraft entered a flat spin and hit the ground in Madžiūnai forest, Vilnius district, the Republic of Lithuania. The aircraft was destroyed due to the impact with trees and the ground. The pilot and the passenger died on the spot. The wreckage of the ultralight aircraft was found the next morning.

[1] *Times in this report are the local time.*

Safety investigation

The safety investigation authority was informed about the missing ultralight aircraft VL-3 Evolution at 23:13. The aircraft was reported found at 6:20 of 20 April 2014.

According to Annex II to Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, and Order No. 4R-25 of 4 February 2008 of the Director of the Civil Aviation Administration of the Republic of Lithuania 'On the approval of categories of civil aircrafts', the aircraft VL-3 Evolution is qualified as an experimental ultralight aircraft.

According to Article 5(1) of 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 repealing Directive 94/56/EC (hereinafter – Regulation (EU) No 996/2010), accidents and incidents of experimental and ultralight aircrafts are carried out only if the safety investigation authority acting in accordance with Article 5(4) of Regulation (EU) No 996/2010 decides to investigate such accidents or incidents when they expect to draw safety lessons from them.

Based on Article 5(3) of Regulation (EU) No 996/2010, the extent of safety investigations of experimental ultralight aircraft and the procedure to be followed in conducting such safety investigations shall be determined by the safety investigation authority, taking into account the lessons it expects to draw from such investigations for the improvement of aviation safety.

After the ultralight aircraft VL-3 Evolution was found on 20 April 2014, acting in accordance with Article 5(4) of Regulation (EU) No 996/2010 and regarding fatal injuries to two citizens of the Republic of Lithuania the safety investigation authority started the safety investigation of the accident.

The aircraft was examined on the accident site on the same day and delivered to the storage location for further expert examination. Also representatives of the ultralight aircraft VL-3 Evolution's manufacturer arrived at the examination site.

According to Article 6(1) of Regulation (EU) No 996/2010 that a safety investigation authority from one Member State may request the assistance of safety investigation authorities from other member States, the German Federal Bureau of Aircraft Accident Investigation (*Bundesstelle für Flugunfalluntersuchung)* appointed an Accredited Representative. Also this final report was reviewed by the French Air Accident Investigation Body for Civil Aviation Safety *(Le Bureau d'Enquêtes et d'Analyses (BEA) pour la Sécurité de l'Aviation civile)*.

1

FACTUAL INFORMATION

1.1. History of the flight

At about 18:00 on 19 April 2014, the pilot with his family arrived at Paluknys aerodrome, located in the Paluknys neighbourhood, Trakai region municipality, Vilnius district, the Republic of Lithuania. In the aerodrome, the pilot took over an ultralight aircraft VL-3 Evolution from its co-owner and intended to take his family members for a pleasure flight in the area of the aerodrome.

The co-owner reported that before the flight the pilot inspected the ultralight aircraft and checked the remaining amount of fuel. Also the co-owner stated that on the same morning he fully filled the fuel tanks of the ultralight aircraft. Then the co-owner with another pilot from the Aeroclub of Vilnius left the Paluknys aerodrome at about 9:00 for the Klaipėda aerodrome. Afterward at about 17:00, he returned to the Paluknys aerodrome. The co-owner stated that no technical difficulties arose in the course of the flight. The weather conditions in the area of the aerodrome were suitable for flights of this aircraft type.

The family members of the pilot and the witnesses reported that after inspection of the ultralight aircraft the pilot took off for his first pleasure flight. The ultralight aircraft flew a circle in the area of the aerodrome and then landed. The pleasure flight was short. Afterwards, the pilot took off for a second pleasure flight on the same route. Then the pilot took off for a third pleasure flight, which was also intended to be a short pleasure flight. Therefore the family members of the pilot expected that the ultralight aircraft would soon return to the aerodrome.

When at sunset the aircraft had not yet returned, a search operation was launched. It was only the next morning that the wreckage of the ultralight aircraft was found not far from the Paluknys aerodrome in Madžiūnai forest.

1.2. Injuries to persons

The pilot and the passenger were citizens of the Republic of Lithuania (Table 1).

Table 1. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal	1	1	2	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
None	-	-	-	Not applicable
TOTAL	1	1	2	-

1.3. Damage to aircraft

The ultralight aircraft was destroyed.

1.4. Other damage

Bark had been stripped from the trunks of some pines and a forest field was destroyed.

1.5. Personnel information

1.5.1. The pilot of the aircraft

The pilot was a 44 years old citizen of the Republic of Lithuania, holding a pilot's licence for ultralight aircraft issued 30 May 2006 by the Lithuanian Federation of Ultralight Aircrafts Pilots and valid until 20 April 2016.

The pilot also had a Private Pilot's licence PPL(A), issued 5 November 2008 by the Civil Aviation Administration of the Republic of Lithuania and valid until 30 November 2014. It listed the single engine piston land SEP(land) rating.

The licence issued by the Lithuanian Federation of Ultralight Aircrafts Pilots indicated that the health certificate issued 30 May 2010 and valid until 25 November 2014.

The pilot also had a medical certificate for a Class 2 and Light aircraft pilot's licence (LAPL) issued 22 May 2013 by the Civil Aviation Administration and valid until 22 May 2015. The medical certificate indicated 'VDL – correction of impaired distance vision'. On 15 March 2011, a prescription for glasses was issued to the pilot. According to the prescription the pilot's right eye required a +1.5 D lens, no vision correction required for the left eye.

At the accident site the pilot was found wearing no glasses.

The pilot started gliding with a training sailplane for children at the age of 14 year. The first license held by the pilot was Commercial Pilot's licence issued 28 June 1993 and valid until 22 April 1995. It listed JAK-18T and gliders ratings.

Later the pilot made a break of several years before he began flying again in 2004. After the break he obtained a Student Pilot's licence issued 23 May 2007. Based on the data in the pilot's flight logbook, last time he performed a glider flight was on 31 July 2005. The pilot's flying history is summarised in Table 2.

Table 2. Pilot's flying experience

Total all types	788 h 00 min.
With an VL-3 type aircraft	17 h 36 min.
Before 2004	445 hours
In 2004	1 h 10 min.
In 2005	2 h 44 min.
In 2006	13 h 47 min.
In 2007	14 h 1 min.
In 2008	13 h 53 min.
In 2009	56 h 53 min.
In 2010	60 h 57 min.
In 2011	59 h 9 min.
In 2012	67 h 30 min.
In 2013	38 h 28 min.
In 2014	4 h 18 min.
Last 90 days	3 h 48 min.
Last 7 days	1 h 36 min.
Last 24 hours	0 h 30 min.

The pilot was familiar with the aerodrome and its surroundings. The Paluknys aerodrome was his home base.

1.5.2. The passenger of the aircraft

The passenger was an 11 year old citizen of the Republic of Lithuania. The passenger was learning to glide with a training sailplane for children. The people who were personally familiar with the passenger claimed that the passenger did not like manoeuvres in the air.

1.6. Aircraft information

1.6.1. General information of the aircraft

The ultralight aircraft VL-3 Evolution (Fig. 1) was designed by the engineering company Vanessa Air. s.r.o. and initially produced by Aveko s.r.o. Later JMB Aircraft s.r.o. took over the production that continued in the same facility in the Czech Republic.

Fig. 1. The ultralight aircraft VL-3 Evolution

The ultralight aircraft VL-3 Evolution has been certified according to regulation UL-2 of Light Aircraft Association of the Czech Republic for maximum take-off weight of 450 kg for the version without and 472.5 kg with a rescue system.

The ultralight aircraft VL-3 Evolution is an aerodynamically directed, single-engine, low-wing airplane of classic design with fore-type retractable or fixed landing gear and with two pilot seats next to each other. The length of the aircraft is 6.20 m, height - 2.05 m, wing span - 8.44 m, wing area - 9.80 m^2.

The aircraft VL-3 Evolution was provided with a specific Pilot Operating Handbook for aeroplane VL-3E-1 dated 07 February 2014 (hereinafter – Pilot Operating Handbook). It indicates:

> *1.13.1 Aeroplane description*
>
> *The fuselage is a carbon shell with carbon/kevlar seats integrated.*
>
> *The wing is a monospar construction with a sandwich skin composed of two layers of carbon and special foam. Control surfaces and empennage is of the same construction.*
>
> *The aircraft is controlled by a dual push-pull control system, only rudder drive is controlled by cable. The ailerons and elevator are controlled by the control stick located between the pilot's legs (co-pilot's). The rudder is controlled by the rudder pedals. Flaps are manually operated by control lever located between the pilots on the fuselage main spar.*

1.6.2. Characteristics of the aircraft

Characteristics of the ultralight aircraft VL-3 Evolution are presents in Tables 3–5.

Table 3. Airframe

Owner and operator	UAB JMB Aircraft Baltics
Manufacturer	JMB Aircraft s.r.o. (Czech Republic)
Aircraft type	VL-3E-1 Evolution
Serial No.	VL-3-120
Year of manufacture	2014
National and registration marks	LY-VLA
Aircraft Certificate of Registration No.	01813
Aircraft Certificate of Registration issue date	27 February 2014
Special Certificate of Airworthiness issue date	27 February 2014
Special Certificate of Airworthiness expiry date	26 February 2015
Total flight hours	32 h 54 min.

Table 4. Engine

Manufacturer	„Bombardier Rotax GmbH“ (Austria)
Engine model	Rotax 912 ULS 2
Engine serial No.	6781897
Manufacturing date	2013

Table 5. Propeller

Manufacturer	Woodcomp (Czech Republic)
Propeller model	SR 3000 / 2WN
Propeller serial No.	SR3000/2N/1730/R/T/CS/W-20093
Manufacturing date	2013

The ultralight aircraft VL-3 Evolution was never registered in the UL register of the Czech Republic. The aircraft had a Certification of non-registration issued by the Light Aircraft Association of the Czech Republic on 12 February 2014. On 19 February 2014 the manufacturer declared to the Civil Aviation Administration that the aircraft was assembled, tested and compliant with airworthiness requirements for ultralight aircraft MTOW 472.5 kg.

The ultralight aircraft VL-3 Evolution was registered in the Register of Civil Aircraft of the Republic of Lithuania on 27 February 2014. The Aircraft did not have an identification plate.

Also the ultralight aircraft VL-3 Evolution did not have limitation placards as indicated in the Annex to the Special Certificate of Airworthiness:

14. The following placard shall be displayed in the cockpit in full view of all occupants 'PASSENGER WARNING: this aircraft is experimental and does not comply with safety regulations of the Republic of Lithuania for standard aircraft'.

15. The word 'EXPERIMENTAL' must be displayed in full view on the aircraft near each entrance.

1.6.3. Flight documents of the aircraft

The ultralight aircraft VL-3 Evolution did not have a permit to use the aircraft radio station and an aircraft logbook, but a sheet of paper with notes on the flight hours and the number of flights was found in the aircraft after the accident.

1.6.4. Maintenance of the aircraft

The ultralight aircraft VL-3 Evolution was provided with a specific Service manual for aeroplane VL-3E-1 dated 07 February 2014. It indicates:

1.2 Periodical service

The producer recommends to make the periodical inspection in the following intervals:

a) after first 25±2 hrs of running

On the sheet of paper, which was found in the aircraft after the accident, with the notes of flight hours and the number of flights was an unsigned entry '25 hours inspection'. As testified by the witnesses, after the first 25 flight hours, the technical maintenance inspection was performed by the pilot himself, however, the unsigned entry '25 hours inspection' was made not by the pilot, but by another person.

1.6.5. Occupants of the aircraft

The manufacturer of the ultralight aircraft VL-3 Evolution indicated:

Pilot in command must seat in left place in generally however in ultralight rules in some countries it is free to choose.

It was found that during the flight the pilot had been sitting on the right side of the aircraft. The people who were personally familiar with the aircraft pilot claimed that the pilot often sat on the right side of the aircraft, because he found it more convenient to control the control stick with his right hand and the throttle control with his left hand.

The Annex to the Special Certificate of Airworthiness of the ultralight aircraft VL-3 Evolution indicates:

11. No passenger may be carried in this aircraft.

1.6.6. Mass and centre of gravity of the aircraft

Impossible to determine exact mass at the time of the accident, because was not possible to establish the exact quantity of fuel in the tank (Section 1.12.6).

The mass and the centre of gravity of the ultralight aircraft VL-3 Evolution at the time of the accident was calculated according to the methodology presented in Chapter 6 of the Pilot Operating Handbook. The aircraft mass and the centre of gravity data are presented in Table 6.

Table 6. Aircraft mass

	Maximum take-off mass	472.5 kg
m_{pr}	Empty aircraft mass	335 kg
m_{p1}	Pilot mass	85 kg
m_{p2}	Passenger mass	45 kg
vp	Fuel quantity	30 l
m_z	Baggage mass	0 kg
x_{bsat}	Centre of gravity of empty weight	18,5 percent
b_{sat}	Medium aerodynamic chord	1236 mm

The ultralight aircraft mass is calculated according to the formula:

$$m = m_{pr} + m_{p1} + m_{p2} + vp \times 0.75 + m_z \quad (1)$$

The ultralight aircraft mass after the accident:

$$m = 335 + 85 + 45 + 30 \times 0.75 + 0 = 486.7 \text{ kg}$$

The ultralight aircraft centre of gravity is calculated according to the formulas:

$$x = \frac{m_{pr} \times \left(\frac{x_{bsat} \times b_{sat}}{100}\right) + m_{p1} \times 682 + m_{p2} \times 682 + vp \times 0.725 \times 215 + m_z \times 1467}{m} \quad (2)$$

$$xt = \frac{x}{b_{sat}} \times 100 \quad (3)$$

The ultralight aircraft centre of gravity:

$$x = \frac{335 \times \left(\frac{18.5 \times 1236}{100}\right) + 85 \times 682 + 45 \times 682 + 30 \times 0.725 \times 215 + 0 \times 1467}{486.7} = 349.16$$

$$xt = \frac{349.16}{1236} \times 100 = 28.25\ \%$$

The ultralight aircraft did not have a maximum take-off weight label as indicated in Chapter 2.15 of the Pilot Operating Handbook.

Chapter 2.15 of the Pilot Operating Handbook contains a caution note:

> *2.15 Limitation placards*
>
> *Caution*
>
> *The owner (aeroplane operating agency) of this aeroplane is responsible for placards readability during aeroplane service life.*

Chapter 6.2.2 of the Pilot Operating Handbook contains a warning note:

> *6.2.2 C.G calculation*
>
> *Warning*
>
> *If C.G. position and take-off weight are not in operating range do not fly!*

Chapter 2.11 of the Pilot Operating Handbook contains a warning note:

> *2.11 Crew*
>
> *Warning*
>
> *Never exceed Maximum Take-off Weight.*

Chapter 2.8 of the Pilot Operating Handbook indicates:

> *2.8 Centre of gravity*
>
> *Operating C.G range 21–34 % SAT.*

1.6.7. Approved manoeuvres of the aircraft

Chapter 1.3.1 of the Pilot Operating Handbook indicates:

> *1.3.1 Aeroplane description*
>
> *VL-3 Evolution aeroplane is intended for recreational and cross-country flying. It is not approved for aerobatic operation.*

Chapter 2.9 of the Pilot Operating Handbook indicates:

> *2.9 Approved manoeuvres*
>
> *Aeroplane category: NORMAL.*
>
> *The aeroplane is approved for Normal and manoeuvres listed below:*
>
> *- Steep turn not exceeding 60 bank.*
>
> *Warning*
>
> *Aerobatics, intentional spins and stalls are prohibited!*

Chapter 3.7 of the Pilot Operating Handbook indicates:

3.7 Recovery from unintentional spin

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

Warning

Intentional spins are prohibited!

The Annex to the Special Certificate of Airworthiness of the ultralight aircraft VL-3 Evolution indicates:

10. This aircraft is prohibited from aerobatic flights.

1.6.8. Stall speed of the aircraft

The stall speeds for different flaps position are described in Chapter 5.2.2 of the Pilot Operating Handbook:

5.2.2. Stall speeds

Stall	*Flaps position*	*Engine power*	*Stalling speed*	
			IAS [km/h]	*CAS [km/h]*
Wing level stall	*RETRACTED*	*idling*	*75*	*82*
	TAKE-OFF	*idling*	*65*	*73*
	LANDING	*idling*	*55*	*65*

1.6.9. Recovery from unintentional spin of the aircraft

Chapter 3.7 of the Pilot Operating Handbook indicates:

3.7 Recovery from unintentional spin

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

1.6.10. Rescue system of the aircraft

The ultralight aircraft VL-3 Evolution was equipped with a whole-plane ballistic parachute rescue system (Table 7). The activation of the system with a special handle opens up a large parachute, and the aircraft together with the crew descend to the ground.

Table 7. Data of the ballistic parachute rescue system in the aircraft

Manufacturer	GALAXY Holding s.r.o. (Czech Republic)
Model	6/600 SD S-LSA SOFT B4
Series No.	5702-14-2715-6757
Manufacturing date	2014 m.
Maximum aircraft mass	600 kg

Supplement B of the Pilot Operating Handbook indicates:

Section 3 – Emergency procedures

In case you decide to use emergency system to solve forced situation, pull the handle of activating system in direction to your body. In this way the pulling rocket will be activated and the parachute pulled out and deployed.

Section 4 – Normal procedures

Rescue system activation

Activation of the rescue system is done always before flight as a part of "Preflight operations".

Activation of the rescue system is done by removing the safety pin from activating handle that is installed in the cabin. It is necessary to place the pin on a safe inside the cabin so as it could no be cause of interference or blocking of controls but that it could be at hand for putting back after landing.

1.6.11. Emergency locator transmitter

The ultralight aircraft VL-3 Evolution did not have an Emergency locator transmitter. The use of such devices in ultralight aircraft is not obligatory.

1.7. Meteorological information

19 April 2014 sunrise was at 6:07 and sunset was at 20:29. Civil twilight was at 21:09.

The Vilnius meteorological station of the Lithuanian Hydrometeorology Service under the Ministry of Environment of the Republic of Lithuania located in Trakų Vokė recorded the weather conditions that are presented in Table 8. The station is located in 22 km to the north-east from the accident site.

Table 8. Meteorological information

Local time	Wind direction, in degrees	Wind speed, m/s	Wind speed in gusts, m/s	Meteorological visibility distance, m	Air temperature, °C	Pressure at the sea level, hPa
18:00	73	3,5	6,9	20000	20,5	1020,8
19:00	63	3,1	5,3	20000	19,9	1020,6
20:00	66	2,7	5,0	20000	18,9	1021,0
21:00	61	2,9	5,5	20000	17,3	1021,5

Similar meteorological conditions at the same time were recorded by the Meteorological Centre of the International Vilnius Airport, located in several kilometres further. The Centre also records the lower cloud base that was in the altitude of 1,500 m (5,000 feet).

1.8. Aids to navigation

Not applicable.

1.9. Communications

The radio communications of the pilot were recorded by the radio station of the aerodrome.

1.10. Aerodrome information

Paluknys aerodrome flight instructions approved by Director of Vilnius aeroclub and in line with Director of the Civil Aviation Administration of 26 April 2011 indicates:

Chapter II. Aerodrome data

<...>

8. Aerodrome is located in about 2.5 km to the south from Paluknys neighbourhood.

<...>

11. Geographical coordinates of the Aerodrome Control Point (ACP) in the WGS-84 system:

11.1. 54° 28' 59" north latitude;

11.2. 024° 59' 32" east longitude.

12. ACP altitude above the average sea level H_{aer} = +466 feet's (+142 m).

13. The magnetic deviation of + 7 ° (2010).

14. Runway magnetic courses (MC), dimensions and characteristics:

14.1. MC 360°-180°, length x wide (in meters): 650 x 50; grass;

14.2. MC 040°-220°, length x wide (in meters): 600 x 100; grass.

<...>

Chapter VI. Airspace and air traffic services

<...>

51. Paluknys aerodrome call sign is „PALUKNYS RADIJO", radio frequency: 125,000 MHz – main, 122,000 MHz – backup.

From 11:00 to 21:00 on the accident date the special gliding zone at the Paluknys aerodrome was activated, therefore a flight coordinator was appointed in the aerodrome. After the flights, at 19:00 p.m. the flight coordinator completed her work, and she was not present at the aerodrome at the accident time.

1.11. Flight recorders

The ultralight aircraft VL-3 Evolution did not have a flight data recorder, or a cockpit voice recorder. The use of such devices in ultralight aircraft is not obligatory.

1.11.1. Recorders of the ultralight aircraft

The ultralight aircraft V-3 Evolution was equipped with a navigation device Garmin GPS MAP 695, that records the position of the aircraft, altitude and airspeed parameters in the course of the flight. The device is not certified.

The ultralight aircraft VL-3 Evolution was equipped with two devices Dynon SkyView SV-D700 (Table 9, Fig. 2) recording the flight and engine operation parameter data. The devices are independent, analogous and installed on the right and left sides of the control panel. The devices are not certified and are designed for experimental class aircrafts. The flight data of the fatal flight of the ultralight aircraft VL-3 Evolution was recovered from one of the devices mounted on the right side, as the one on the left side was not activated during the flight time.

Table 9. Dynon SkyView SV-D700 data

Manufacturer	Dynon Avionics (United States of America)
Model	SV-D700
Right device serial No.	4112
Left device serial No.	4073

Fig. 2. Devices Dynon SkyView SV-D700

1.11.2. Data of flights

The flights trajectories recovered based on the data of the Dynon SkyView SV-D700 are shown in Fig. 3. According to the data, the ultralight aircraft took off for its first pleasure flight (yellow band, Fig. 3) at 19:34 at a 360° magnetic course from the aerodrome runway No. 36 and after a circle in the aerodrome area landed on 19:40. The ultralight aircraft took off for a second flight (green band, Fig. 3) at 19:45 for the same route and landed in the aerodrome on 19:55. It was established that Dynon SkyView SV-D700 started recording the data of third flight (red band, Fig. 3) at 20:01:10 and finished at 20:05:10. Data recording duration – 4 min. or 240 seconds.

Fig. 4 shows the flight and engine operation parameters of second flight from point 1 to point 2 and Fig. 5 shows data of third flight.

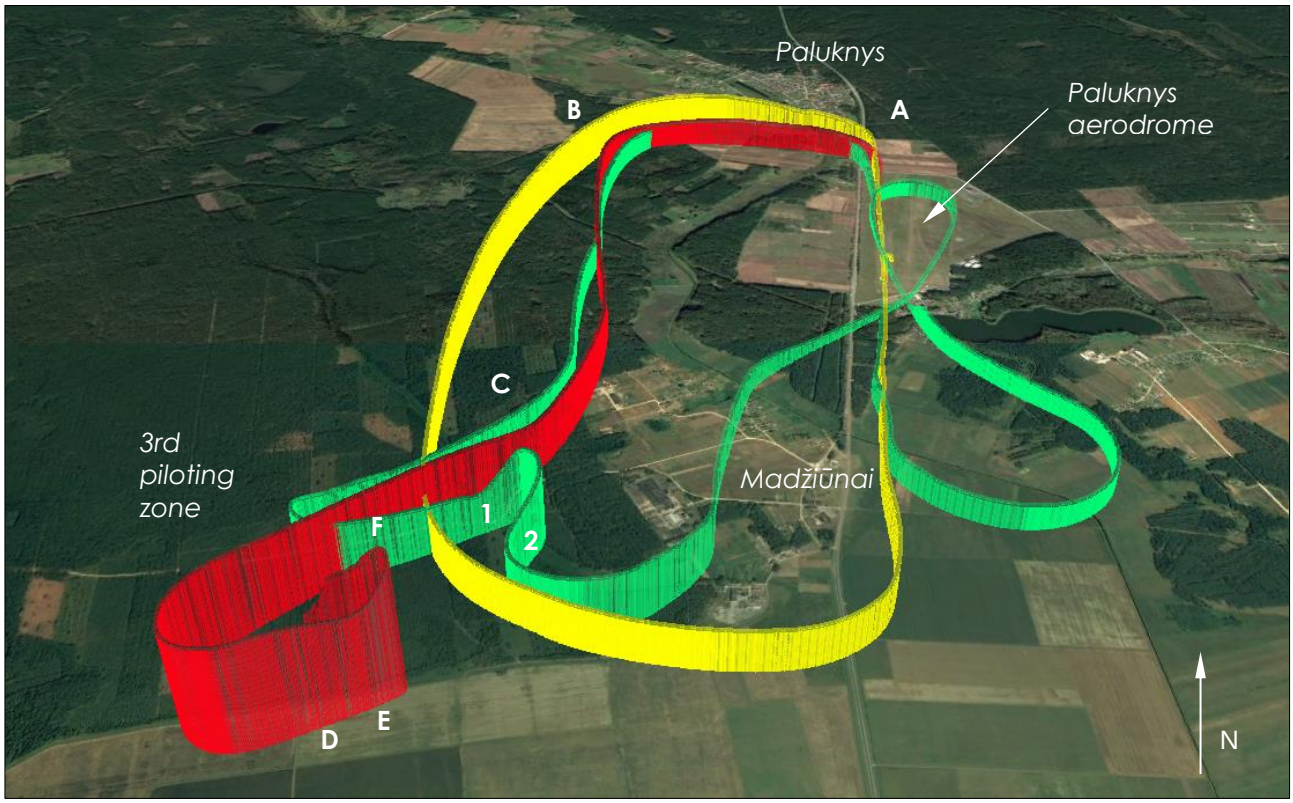

Fig. 3. First flight (yellow band), second flight (green band) and the third flight (red band) that ended in an accident of ultralight aircraft VL-3 Evolution

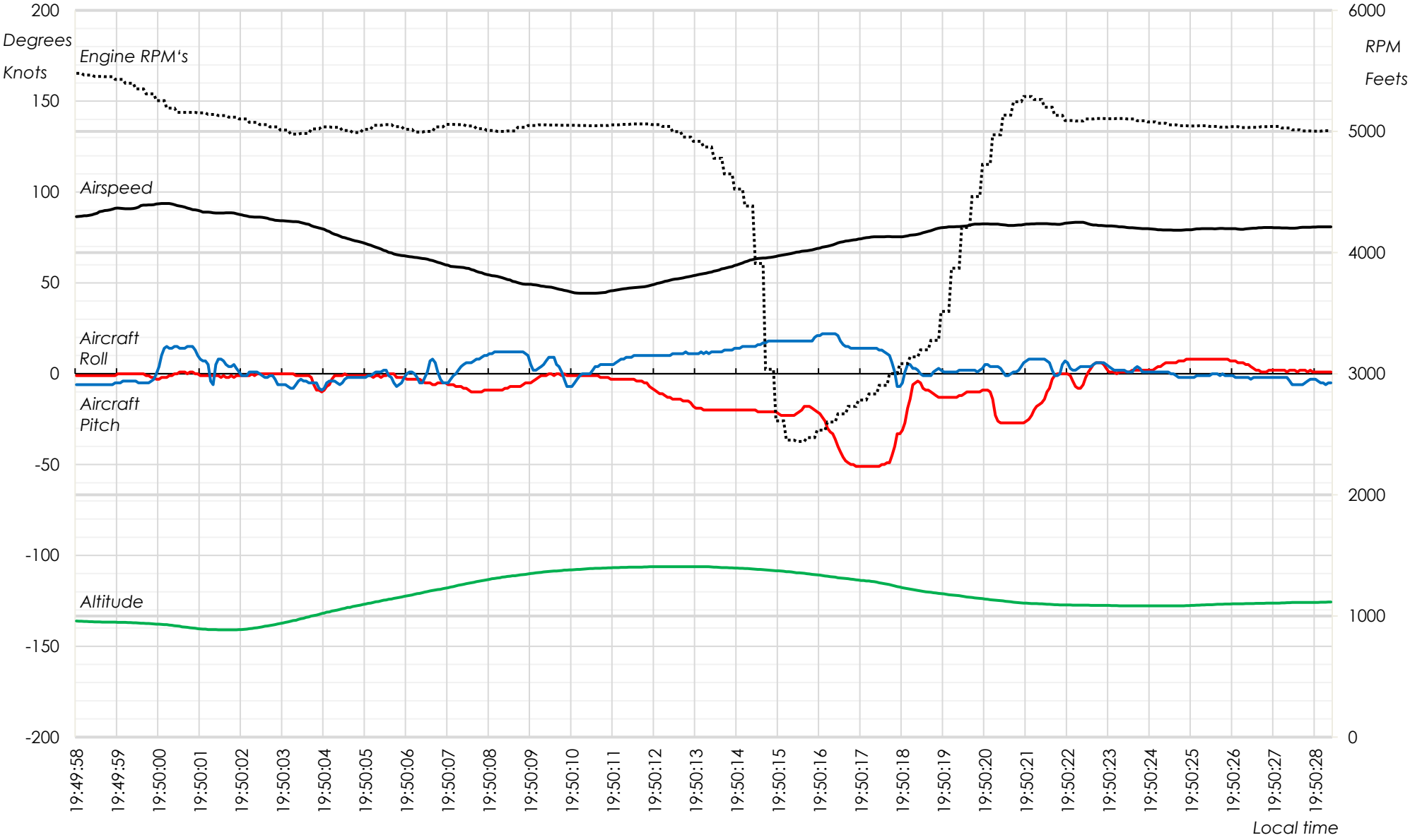

Fig. 4. Flight and engine operation parameter data of the second flight

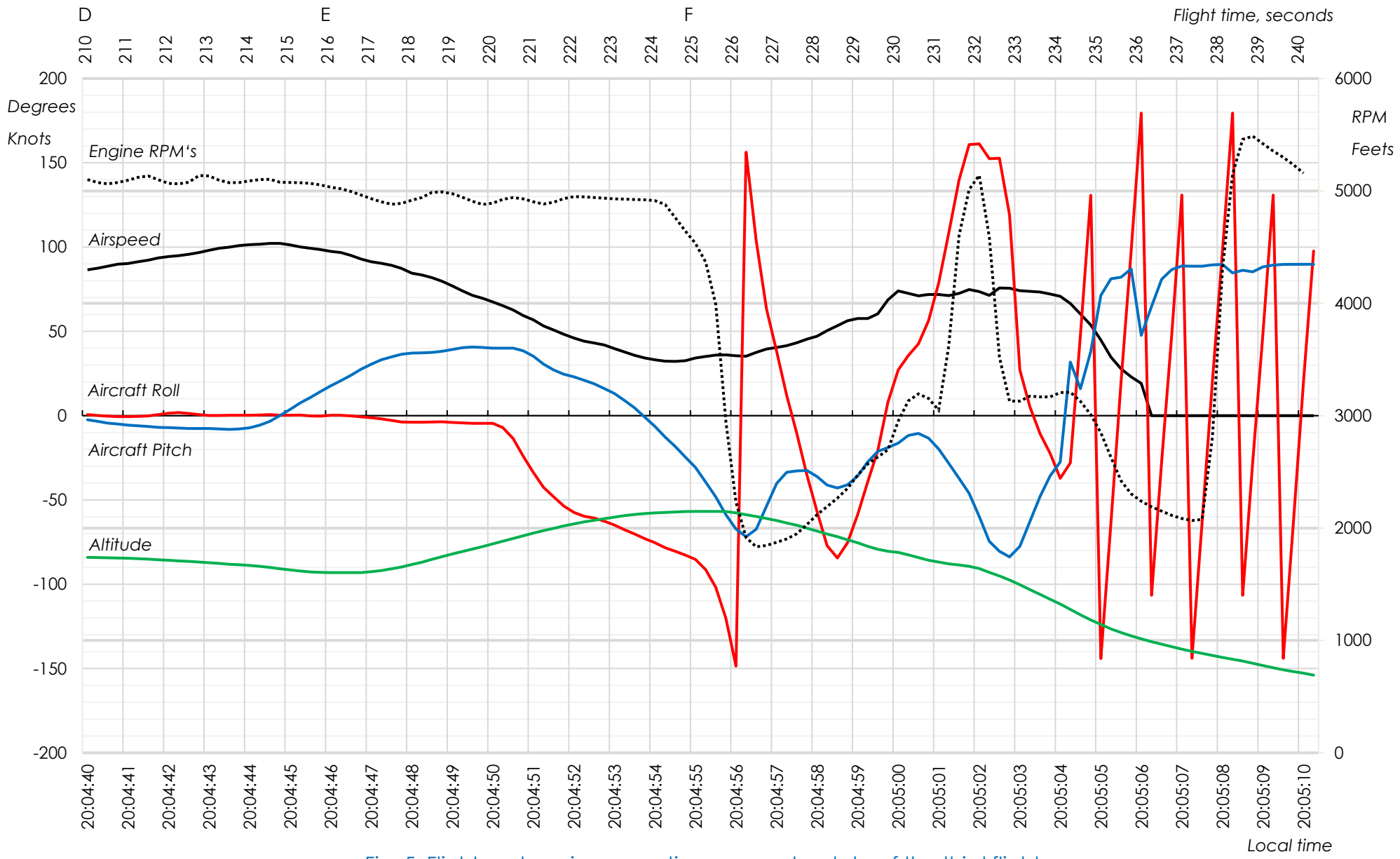

Fig. 5. Flight and engine operation parameter data of the third flight

In the graphs of Fig. 4–5 the black dotted line shows the engine revolutions per minute (RPM); the black continuous line shows the airspeed in knots; the red continuous line shows lateral stability with respect to the longitudinal axis (roll angle); the blue continuous line shows the longitudinal stability with respect to the transverse axis (pitch angle); the green continuous line shows the altitude in feet from the land surface. The bottom horizontal axis of the graph indicates the local time. The right axis shows RPM's and the altitude in feet. The left axis of the graph indicates the airspeed in knots and the longitudinal and lateral stability in degrees.

In Fig. 5. the upper horizontal axis shows the flight time starting at 210 seconds, i.e. 30 seconds (from point D, Fig. 3) to the end of the data record.

1.12. Wreckage and impact information

1.12.1. Site of the accident and impact

Scheme of the accident site is shown in Fig. 6. Trees numbered from 1 to 6 in the scheme of the aircraft accident site. All the distances are expressed in meters.

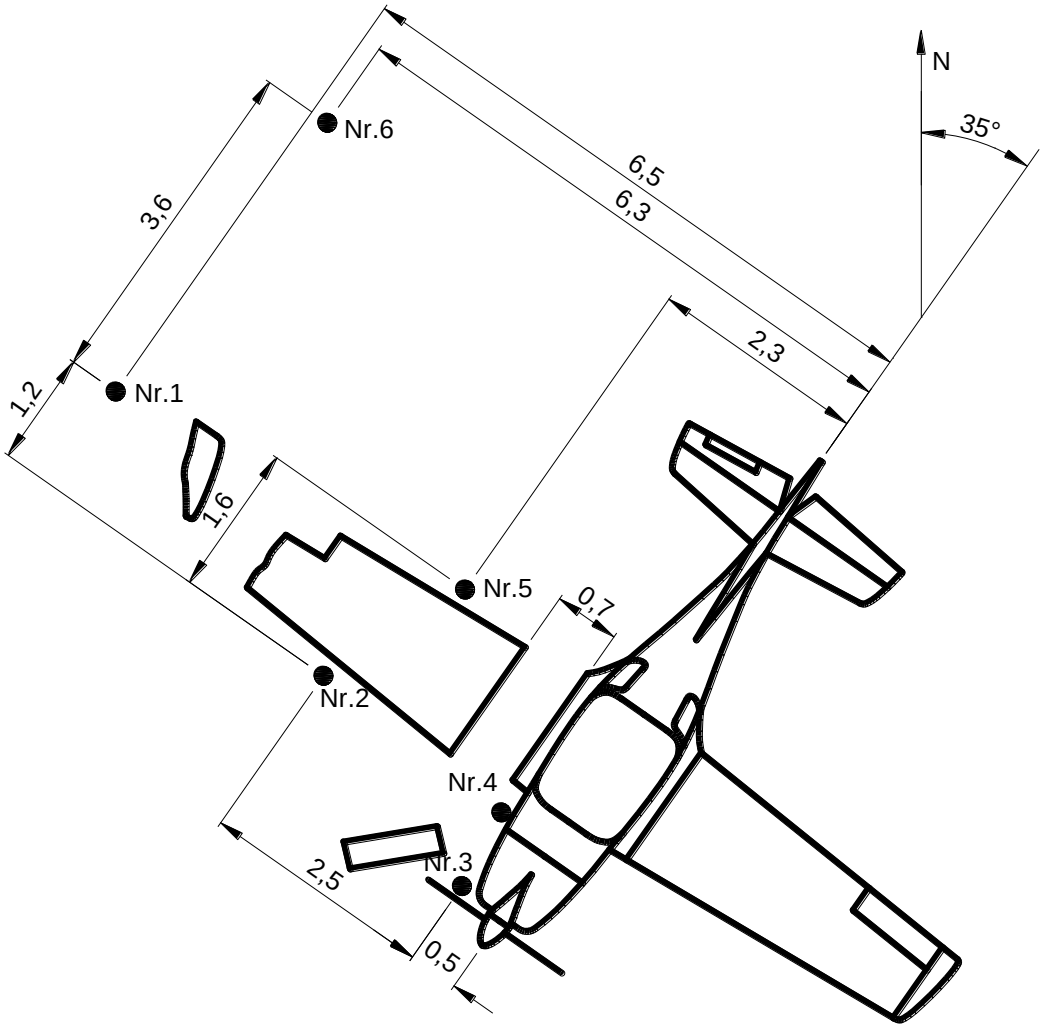

Fig. 6. Scheme of the accident site of the ultralight aircraft VL-3 Evolution

The ultralight aircraft VL-3 Evolution was found in Quarter No. 396 of Madžiūnai forest, Madžiūnai village, Paluknys neighbourhood, Trakai region municipality, Vilnius district (Fig. 7). It was 4410 m from the aerodrome, about 160 m from the field, and about 8 m from the forest quarter line. The ultralight aircraft was on the ground with the bottom part of the fuselage.

At the ultralight aircraft accident site it was observed that the bark was stripped from the trunk of the pine No. 1 at a height of 8-10 m (Fig. 8a). Also the bark was stripped from the trunk of the pine No. 4 at a height of 1.8 m (Fig. 8b) and the trunk of pine No. 2 from a height of 0.7 right down to the ground. Pine No. 3 had branches cut down from a height of 1.7 m right down to the ground and the bark was stripped from a height of 0.3 m to the very ground (Fig. 8b).

Fig. 7. The ultralight aircraft VL-3 Evolution at the accident site

Fig. 8a–8b. Stripped bark from the pines' trunks

1.12.2. Examination of the wreckage

The front part of fuselage of the ultralight aircraft was near the adjacent pines No. 3 and No. 4 (Fig. 8b-9). Between the pines there was the trunk of the tree that had fallen previously and was found under the engine. The entire upper section of the fuselage was cracked behind the firewall. The left part of the fuselage was cracked at the wing spar. Numerous cracks were visible in the front part of the fuselage, which aircraft was laying leaning on the front part of the fuselage. The rear part of the fuselage cracked at its centre, between the cabin and tail section and the start of the tail section. Cracks were visible from both sides of the fuselage.

Fig. 9. The ultralight aircraft VL-3 Evolution at the accident site

The engine frame was bent down and to the right. Deformed parts: air intake box of the engine, carburettor fastening brackets, gas exhaust system pipes and the silencers, upper and lower cowlings of the engine, the firewall. At the part that was not damaged, the engine cowlings were held on their attachment lugs. Slightly damaged propeller fairing. One blade of the propeller was broken close to its root, the other blade suffered minor damage at the front edge (Fig. 9).

The cabin canopy was open and was not damaged (Fig. 9). The canopy attachment was torn out from the frame of the fuselage. The left pneumatic jack kept the canopy open and the right jack was dislocated from its fastening location.

There was no visual damage on the stabiliser (Fig. 9). The operating systems of the elevators and rudder operated correctly. The elevator trim tab was slightly bent upwards. There was not visual damage on the vertical stabilizer, but the rudder had slipped from the suspension hook and remained hanging on the lower unit.

The left wing remained connected to the fuselage, though it had moved several centimetres forward and upward and broke the fairing between the wing and the fuselage (Fig. 9-10). The skin of the left wing had cracked in several places. The steering jack of the left aileron had broken between the left wing and the fuselage.

Fig. 10. Displaced left wing

The right wing had separated from the aircraft (Fig. 11). The spar of the right wing had broken off at the root rib. The spar was partly pulled out from the fuselage, however, by moving it slightly it could not be pulled out completely. The pin connecting the ends of the left and right spars was torn out with all bushings and was partly pulled out.

Fig. 11. Separated right wing between pines

The tip of the right wing at the aileron location was crushed and was hanging supported only by the wires and the pressure sensor tubes (Fig. 12). Pieces of the tip of the right wing were scattered within a radius of several metres.

Fig. 12. Crashed tip of the right wing

1.12.3. Cabin switches and control handles

Positions of the cabin switches and control handles after the accident:

- ignition switch key in the active position of both magnets (left and right);
- the "Master Switch' in the 'ON' position;
- the 'Avionics Switch' in the 'ON' position;
- all fuses located on the right side of the control board in the 'ON' position;
- strobes switch on the left side of the control board in the "ON' position,
- other switches (navigation light, landing light, fuel pump) in the 'OFF' position;
- fuel tank selector was on the right fuel tank position;
- canopy close handle was in the 'Closed' position;
- landing gear control in the 'DRAWN IN' position;
- radio station handle in the position 'Off'
- the engine operation meter shows 32.9 h.;
- altimeter and airspeed indicator shows 0;
- propeller control unit handle in the position 'CONSTANT PITCH';
- flaps lever control handle in the 'LANDING' position;
- choke control handle pushed in;
- airbox control handle pushed in;

- cabin ventilation control handle slightly pulled out;

- cabin heating control handle pushed in.

1.12.4. Examination of the aircraft control system

The ultralight aircraft control system was operational. No evidence that the control system had stuck or broken before the accident. The damage to the control system was caused by the ultralight aircraft's impact with the trees and the ground.

The right aileron was torn off together with the suspension hooks and the jack was broken at the connection between the jack and the controlled tip. The right aileron was thrown away to the front part of the fuselage. The steering jack of the aileron directed to the right part of the wing had broken at the connection of the part of the wing and the fuselage.

The left aileron was bent, but the movement did not transmit to the control stick. After the wing was removed it was found that the jack of the left aileron was broken at the root rib of the wing.

The control systems of the elevator and rudder were operational. The rudder had slipped from the upper suspension hook, and remained hanging on the lower unit.

1.12.5. Examination of the aircraft engine

The examination of the engine at the accident site established that the engine could not rotate, therefore the engine was completely taken apart and examined. The examination did not show any trace of a hydro impact, the crankshaft was not deformed, the bushings of the crankshaft were not damaged, no damage was found on the reducer, and no impurities were found in the lubrication system. It was established that the engine could not be rotated, because of the deformation of ignition system magnets as a result of the impact of the aircraft with the ground.

1.12.6. Examination of the fuel system and the quality of the fuel

The petrol was leaking from the damaged right wing at the accident site, because of the damaged fuel intake tube. Assuming that the petrol was leaking all night, it was not possible to establish the exact quantity of fuel in the tank. When the aircraft was taken to the storage site, more than 30 litres of fuel were extracted from the fuel tanks. The mass of the aircraft was computed assuming that at the time of the accident there were 30 litres of petrol in the tanks (Section 1.6.3.).

Fuel samples were collected for the fuel quality test. The test done by Testing Laboratory of Oil Products in Šiauliai of the State Non-Food Products Inspectorate under the Ministry of the Economy of the Republic of Lithuania concluded that the sample contained 95-petrol, compliant with the requirements defined by LST EN 228:2013, as well as requirements for mandatory indicators applied to petrol products, biofuels and liquid fuel used in the Republic of Lithuania.

The examination of the aircraft fuel system found traces of petrol in the chambers of both carburettor floats. Only a small amount of petrol was found in the chamber of the left carburettor. However the portion of the petrol spilled when the float chamber was removed from deformed suspension bracket of the deformed carburettor. A larger amount of fuel was found in the float chamber of the right carburettor. A visual examination of the petrol in both chambers showed that the petrol was clean, with no traces of deposits or humidity.

A small amount of fuel tank sealing material was found in the fuel filter, however, that did not have any effect upon the performance of the engine. A test of the fuel pump showed that the operation of the pump was normal.

1.13. Medical and pathological information

1.13.1. Examination of the pilot

The pilot died from a head injury. Due to the entirety of such bodily injuries, the pilot died instantaneously.

No traces of ethyl alcohol, toxic substances, drugs or other highly active substances were found in the blood, urine or the internal organs of the pilot. The pilot had not been intoxicated with carbon monoxide.

1.13.2. Examination of the passenger

The passenger died from a head and neck injuries. Death occurred shortly after the individual suffered the injuries.

No traces of ethyl alcohol, toxic substances, drugs or other highly active substances were found in the blood, urine or the internal organs of the passenger. The passenger had not been intoxicated with carbon monoxide.

1.14. Fire

There was no evidence of fire in flight or after the impact.

1.15. Survival aspects

1.15.1. Search for the aircraft

When at sunset the ultralight aircraft VL-3 Evolution had not yet returned, a search was launched by the friends of the pilot's family. They stated that first an attempt was made to contact the pilot by mobile telephone, inquiries were made to other aerodromes in the hope that the missing plane had landed over there.

At 21:25, i.e. 1 h 24 min. after the take-off of the ultralight aircraft VL-3 Evolution, the missing aircraft was reported to the Aeronautics Rescue Coordination Centre of the State Enterprise Oro navigacija. Having collected the initial information, and having assessed the situation, at 21:40 the Aeronautics Rescue Coordination Centre notified the missing aircraft to the Fire and Rescue Department, the Police Department, the Aviation Unit of the State Border Guard Service (hereinafter - Aviation Unit), and the Air Force of the Lithuanian Armed Forces.

The Aeronautics Rescue Coordination Centre decided to engage for the purpose of the search the Aviation Unit, because it has a base at the same Paluknys aerodrome. Also, account was taken of the fact that the search was going to be carried out at night time, and the Aviation Unit is best familiar with the aerodrome and its surroundings, besides, the Aviation Unit specialists had all the equipment required for the operation: searchlights and the thermovisor system equipment.

The first helicopter of the Aviation Unit took off for the search of the ultralight aircraft at 22:30, i.e. 50 min. after the receipt of the notification. There are no crew permanently on duty in the Aviation Unit base and a search and rescue helicopter has to take off within 1 hour 30 minutes of the receipt of a notification. The second rescue helicopter took off at midnight. The search (with breaks for fuel refill, crew change and rest for the pilots) continued through the night. During the search night, the helicopters flew over the accident site several times (Fig. 13).

Fig. 13. The accident site through the thermovisor system equipment (Image of the Aviation Unit)

The wreckage of the ultralight aircraft was found only next morning at 5:58 not far from Paluknys aerodrome in Quarter No. 396 of Madžiūnai forest. At 6:20 concluded that both persons flying the ultralight aircraft were fatally injured. The accident was non-survivable for the persons due to the high impact forces in to the ground.

Both persons were found in the seats of the aircraft with the safety belts buckled up. The safety belts were not broken, only the pilot's safety belt had slipped from his right shoulder onto his arm to elbow level.

1.15.2. Rescue system of the aircraft

The examination of the ultralight aircraft at the accident site established that the activation handle of the ballistic parachute rescue system was blocked by a safety pin (Fig. 14). The flag of the safety pin was found on the cabin floor next to the activation handle. The ring connecting the safety pin with the flag was straightened. The examination of the safety pin showed that it was bent (Fig. 15).

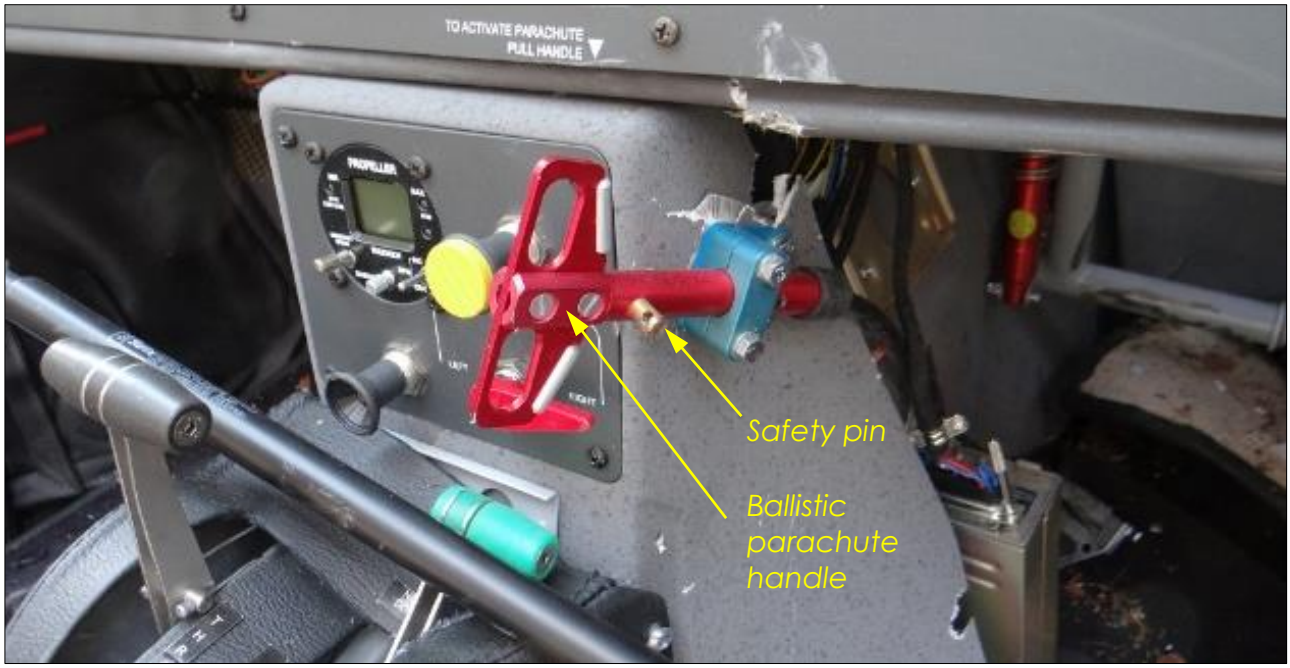

Fig. 14. The ballistic parachute activation handle blocked by a safety pin

Fig. 15. The ballistic parachute activation handle and a bent safety pin

1.16. Tests and research

Not applicable.

1.17. Organizational and management information

1.17.1. Registration of the aircraft

Aviation Law of the Republic of Lithuania indicates:

> *Article 20. The administrator of the Register of Civil Aircraft of the Republic of Lithuania*
>
> *The administrator of the Register of Civil Aircraft of the Republic of Lithuania is CAA.*
>
> *Article 21. Conditions of civil aircrafts registration*
>
> *1. An aircraft shall be registered in Register of Civil Aircraft of the Republic of Lithuania if:*
>
> *<…>*
>
> *2) the aircraft has a Certificate of Airworthiness.*

The Rules on the Issue of Special Certificates of Airworthiness to Civil Aircraft approved by Order No. 4R-13 of 11 February 2003 of the Director of the Civil Aviation Administration 'On the approval of the Rules on the Issue of Special Certificates of Airworthiness to Civil Aircraft' indicates:

> *Chapter V. Identification of aircraft*
>
> *9. The Special Certificates of Airworthiness are issued only to aircrafts that have identification plate.*

1.17.2. Flight documents of the aircraft

Aviation Law of the Republic of Lithuania indicates:

> *Article 51. Duties of pilot in command*
>
> *Pilot in command must:*
>
> *1) Ascertain prior to the flight that the aircraft is prepared for flight, the entire flight crew is assembled and ready and all the necessary documents are on board;*
>
> *<…>*
>
> *Article 64. Aircraft flight documents*
>
> *The following documents must be aboard the aircraft during flight:*
>
> *1) Certificate of Registration of aircraft;*
>
> *2) Certificate of Airworthiness of aircraft;*

3) Licence to use radio station of aircraft;

4) Logbook of technical condition of aircraft;

5) Flight operational instructions guide;

6) Civil responsibility insurance certificate (policy);

7) Documents about passengers, goods, baggage and mail (if there are such aboard the aircraft);

8) Noise certificate (if such is required);

9) Carrier certificate (for carriers only).

Order No. 4R-11 of 10 February 2003 of the Director of the Civil Aviation Administration 'Regarding the Aircraft Logbook' indicates:

1. I a p p r o v e an aircraft logbook and filling instruction.

2. I o r d e r to all the owners and the operators of aircrafts, sailplanes and helicopters, except the carriers of civil aviation whose aircraft logbook are approved in the flight operation manuals to fill in an approved aircraft logbook.

The Rules on the Operation of Stations on Vessels and Aircrafts approved by Order No. 1V-17 of 8 January 2007 of the Director of the Communications Regulatory Authority of the Republic of Lithuania (hereinafter – CRA) 'On the Approval of the Rules on the Operation of Stations on Vessels and Aircrafts' (hereinafter – Rules) indicates:

Chapter II. Issue and withdraw the permit to use the Station on vessels and aircrafts

4. The stations of vessels and aircrafts may be used only having obtained a permit of CRA to operate the station, or an authorisation issued by a competent authority of a foreign state and meeting the requirements of the Radio Communication Regulation, and only under the conditions specified in the license and the Rules and in other legislation.

5. CRA issue the permits for:

5.2. Usage of aircraft stations:

5.2.1. The aircrafts registered in the Register of Civil Aircraft of the Republic of Lithuania.

1.17.3. Maintenance of the aircraft

Aviation Law of the Republic of Lithuania indicates:

Article 31. The supervision of the airworthiness

1. The supervision of the airworthiness of an aircraft registered in Register of Civil Aircraft of the Republic of Lithuania is performed by CAA.

Article 32. The responsibility for the airworthiness of an aircraft

1. The responsibility for the airworthiness of an aircraft lies with its owner or the operator.

The Rules on the Technical Maintenance of Ultralight Aircrafts that are in line with Director of the Civil Aviation Administration on 18 May 2007 'Regarding the Rules on the Technical Maintenance of Ultralight Aircrafts' indicates:

5. Technical maintenance of ultralight aircraft

5.1. Technical maintenance of a serial production ultralight aircraft is performed according to the Technical Maintenance Manual or the Instruction of the manufacturer. <…>

5.2. The technical maintenance of the ultralight aircraft is a sole responsibility of its owner or the operator. In case the owner or the operator of the ultralight aircraft delegates the technical maintenance to another specialist having the appropriate qualification, the owner or the operator remains responsible for the technical maintenance of the aircraft and the quality of its performance. All the operations and actions related to the technical maintenance of the aircraft are in a mandatory manner recorded in the aircraft logbook.

5.3. In case an ultralight aircraft is owned by more than one owner (or an organisation), it is required to appoint (elect) one person responsible for the technical maintenance of the ultralight aircraft. Such person or another specialist having the required qualification and to whom the task to perform the technical maintenance was assigned, shall perform all the works and operations indicated in the technical maintenance manual and make the necessary entries in the aircraft logbook.

1.17.4. Flight logbooks of aircraft pilots

Annex I to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (hereinafter – Regulation (EC) No 1178/2011) indicates:

FCL.050 Recording of flight time

The pilot shall keep a reliable record of the details of all flights flown in a form and manner established by the competent authority

The Regulations on Licensing of Pilots of Ultralight Aircrafts approved by Order No. 4R-97 of 6 May 2009 of the Director of the Civil Aviation Administration 'On the Accreditation of Ultralight Aircraft Pilot Licensing and Training Institutions' indicates:

III. Exams and examinators

24. Pilots-trainees and pilots are required to have properly fill in their flight logbooks.

The safety investigation indicated that the information on a sheet of paper with the notes on the flight hours and the number of flights, was corrected, and did not match the data in the flight logbooks of the pilots flying the aircraft. One of the pilots flying the aircraft did not produce any flight logbook to the safety investigation claiming he did not have any at all.

Also in the ultralight aircraft VL-3 Evolution (registration LY-VLA) involved in the accident was found sheets with entries on the flight hours and the number of flights of another ultralight aircraft VL-3 Evolution (registration LY-VLT) owned by the same owner and the operator. The safety investigation established that the ultralight aircraft VL-3 Evolution (registration LY-VLT) also did not have an aircraft logbook, and the information on the time and number of the flights had been also corrected, and did not match the data entered in the flight logbooks of the pilots flying the aircraft.

This created some difficulties in computing the number of flights actually carried out by the accident pilot. The comparison of the entries in the flight logbook of the accident pilot with the data in the flight logbooks of other pilots did not make it possible to identify the pilot flying the aircraft (registration LY-VLT). Therefore the number of flights completed by the accident pilot was computed on the basis of the entries in his flight logbook.

1.17.5. Retraining of the pilot

The pilot was retrained on 22 August 2013, when he was flying with the VL-3 Evolution for 3 hours and completed 10 landings. Following the retraining no appropriate entries were made in the programme sheets.

It was established that the pilot was retrained to operate an ultralight aircraft VL-3 Evolution by a person who did not have an instructor qualification and the entry 'Complies with the flight commander qualification for flights according to the visual flight regulations' in the pilot's flight logbook was signed by person with instructor qualification.

1.17.6. Training of pilots of ultralight aircrafts

European Regulation do not regulate requirements for ultralight aircraft licence.

An Acceptable Means of Compliance and Guidance Material to Commission Regulations (EU) No 1178/2011 of European Aviation Safety Agency indicates:

SUBPART B - LIGHT AIRCRAFT PILOT LICENCE — LAPL

AMC1 FCL.125 LAPL — Skill test

Contents of the skill test for the issue of a LAPL(A)

SECTION 2 GENERAL AIRWORK

Stalling:

i. clean stall and recover with power;

ii. approach to stall descending turn with bank angle 20°, approach configuration;

iii. approach to stall in landing configuration

SUBPART C - PRIVATE PILOT LICENCE (PPL), SAILPLANE PILOT LICENCE (SPL) AND BALLOON PILOT LICENCE (BPL)

AMC1 FCL.235 Skill test

Contents of the skill test for the issue of a PPL(A)

SECTION 2 GENERAL AIRWORK

Stalling:

i. clean stall and recover with power;

ii. approach to stall descending turn with bank angle 20°, approach configuration;

iii. approach to stall in landing configuration.

The Regulations on Licensing of Pilots of Ultralight Aircrafts approved by Order No. 4R-97 of 6 May 2009 of the Director of the Civil Aviation Administration 'On the Accreditation of Ultralight Aircraft Pilot Licensing and Training Institutions' indicates:

II. Training of pilots of ultralight aircrafts

6. Pilots of ultralight aircraft are trained at training institutions holding a valid accreditation certificate issued by the Lithuanian Federation of Ultralight Aircrafts in the manner set forth by the Director of Civil Aviation Administration (hereinafter – CAA) following the training programmes approved by the Director of CAA.

A practical training programme of ultralight aircraft pilots approved of 6 May 2009 by the Director of the Civil Aviation Administration indicates:

Chapter 1. Programme of ultralight aircraft pilot training

Exercise No.	*Exercise name*	*With the pilot-instructor*		*Solo*	
		Total flights	*Time*	*Total flights*	*Time*
6.	*Sliding, stall, true airspeed*	*3*	*1 h*		
17.	*Stall mode, sliding*			*2*	*30 min*
	Total:	*118*	*19.35*	*44*	*6.25*
				162 flights and 26 hour in total.	

Chapter 2. General requirements

2.10. The number of exercises and the time indicated in the programme are minimal. The decision regarding the actual number of the flights must be taken by the pilot-instructor having assessed whether or not the applicant has acquired the required skills and the experience of a required level.

1.17.7. Retraining of pilots of ultralight aircrafts

A practical training programme of ultralight aircraft pilots approved of 6 May 2009 by the Director of the Civil Aviation Administration indicates:

Chapter 7. Retraining to other type of ultralight aircraft

The pilots holding a valid licence of an ultralight aircraft pilot, and no less than 50 hours' experience in flights as an aircraft commander can be enrolled to a retraining programme. Having completed a retraining programme the pilots holding other licences (private pilot licence, commercial pilot licence, powered glider pilot licence, military pilot licence) are required to take the ultralight aircraft pilot examination according to the full programme. Instructors of ultralight aircraft pilots, pilots-examiners, and pilots performing tests may requalify for a different type of an aircraft independently (solo).

7.1 Prior to starting a practical part for retraining for another ultralight aircraft, the applicant is required to be familiar with new ultralight aircraft:

- the flight operating manual;

- services and technical maintenance instruction;

- pre-flight examination;

- ground preparation in the cabin;

- special cases;

- emergency actions;

- piloting technique and its peculiarities.

The responsibility for checking the pilot's knowledge lies with the pilot-instructor.

7.2 The retraining for flying by a different type of an ultralight aircraft may be performed by the pilot-instructor who has an experience of flying the type of the aircraft for which the applicant is being retrained, for no less than 20 hours. The pilot-instructor conducting retraining is responsible for the duration of the theoretical and practical training section. The scope of the training programme must ensure that all the conditions of a safe operation of an ultralight aircraft are fulfilled.

- For the purpose of retraining for flying a two-seater ultralight aircraft the applicant perform all the exercised under the programme.

<…>

7.3 The programme for retraining for other type of ultralight aircraft provides for a minimum number of exercises and the time. The actual retraining time shall be determined by the pilot-instructor.

Exercise No.	*Exercise name*	*With the pilot-instructor*		*Solo*	
		Total flights	*Time*	*Total flights*	*Time*
1.	*Control flight*	*1*	*20 min*		
2.	*Training circuit flights (300 m)*	*2*	*15 min*		
3.	*Training circuit flights (150 m)*	*2*	*10 min*		
4.	*Extreme cases, emergency cases, where in last two flights the landing to be performed with the engine switched off.*	*4*	*20 min*		
5.	*Solo flight, stall mode, sliding, max. and min. speed, turns at 15°- 45° tilt*			*1*	*30 min*
6.	*Solo circuit flights (300 m)*			*2*	*10 min*
7.	*Solo circuit flights (150 m)*			*2*	*10 min*
8.	*Training for landing calculations*			*2*	*10 min*
	Total:	*9*	*75 min*	*7*	*60 min*

Chapter 15. Reliefs of an ultralight aircraft pilot training programme

15.6 Having completed an ultralight aircraft pilot training or retraining programmes, the pilot-instructor must fill in the flight logbook and the training programme sheets with the relevant scores.

1.18. Additional information

There have been several accidents with an ultralight aircraft VL-3. Such events caused by a loss of control ending in a spin are summarised below.

1.18.1. VL-3, D-MHJM, Germany, 13 April 2008

The accident was investigated by the German Federal Bureau of Aircraft Accident Investigation. The aircraft was destroyed. Both persons fatally injured. The final report was released on September 2009. It indicates that the accident occurred due to flying below the stall speed which caused the spin. 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.

One Safety Recommendation (06/2008) was released. It states that the civil aviation authority should check their certification criteria for rescue systems.

1.18.2. VL-3, N801GB, United States of America, 30 May 2010

The accident was investigated by the National Transportation Safety Board of the United States of America. The aircraft was substantially damaged. Both persons seriously injured. The final report was released on 29 March 2013. It indicates:

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilots' failure to avoid and recover from the prohibited maneuver of aerodynamic spin during a training flight, for undetermined reasons. Contributing to the severity of the accident was the failure of the ballistic parachute rocket as a result of the manufacturer's use of an inadequate thread sealant glue on the end caps of the rocket. Contributing to the severity of the occupants' injuries was the separation of their shoulder belt attachment brackets at impact.

1.18.3. VL-3, OK-LUU 05, Czech Republic, 15 August 2014

The accident was investigated by the Air Accidents Investigation Institute of Czech Republic. The aircraft was destroyed. Both persons fatally injured. The final report was released on December 2014. It indicates that the accident occurred during a flight at low height to its collapse and impact to the ground. The cause of the accident was not clear.

1.18.4. VL-3, OO-H43, Belgium, 8 September 2015

The accident was investigated by the Air Accident Investigation Unit of Belgium. The aircraft was destroyed. Both persons fatally injured. The final report was released on 21 September 2016. It indicates:

3.2 Causes

The cause of the accident is a loss of control during an intentional manoeuvre, ending in a spin. The exact manoeuvre could not be determined with certainty, however it is likely that the pilot was conducting a 'power on' stall exercise or an aerobatic manoeuvre such as a 'zero-G' manoeuvre, a wingover or a lazy eight.

Contributing safety factors:

The decision by an inexperienced pilot to perform non-basic flight manoeuvres without the support of an instructor.

Other safety factors identified during the investigation:

- Prohibition of stalls and lack of guidance in the Flight manual.

- Although the failure of the shoulder harness attachment likely did not make a difference to the pilot's chances of survival, the possibility exists that the same failure reduces the chances of survival in other circumstances. This could be for

example the impact with an obstacle on the ground when performing a forced landing, at a comparable (rather limited) horizontal speed.

- The presence of a marking on the dashboard which can lead the pilot to mistakenly believe that the aeroplane is equipped with an emergency parachute. In case of emergency, this can cause unnecessary distraction and waste of valuable time if the pilot tries to find the lacking emergency parachute handle instead of trying to recover control.

- The lack of stall warning system, in the vast majority of ultralight aeroplanes, can prevent the pilot from realise an approaching stall situation early on.

The following Safety Recommendations were made:

Recommendation BE-2016-0007:

It is recommended that 'JMB Aviation sprl', the Belgian type authorization holder, in collaboration with 'JMB Aircraft s.r.o', the current production company and with the engineering company 'Vanessa Air s.r.o.' revises the flight manual by removing the prohibition of stalls and at the same time incorporates guidance on how to safely perform stall exercises. This safety information should cover amongst others:

- the conditions (minimum safe altitude, power setting, flap setting, etc)

- the risks (stall with power, inadvertent spin entry,)

- the recovery actions

Recommendation: BE-2016-0008:

It is recommended that 'JMB Aircraft s.r.o', the current production company publishes an information bulletin to recommend all VL3 owners and operator to remove the marking about the emergency parachute on the dashboard when no emergency parachute is installed.

Recommendation: BE-2016-0009:

It is recommended that 'JMB Aircraft s.r.o', the current production company publishes an information bulletin to inform the owners of the earlier production of VL3 (up to SN: 100) about the possibility of reinforcing the shoulder harness attachment structure. The information bulletin should include instructions on how to install the reinforcement

Recommendation: BE-2016-0010:

It is recommended that the Belgian CAA, in collaboration with the BULMF, conducts research to assess the usefulness of a stall warning system in some categories of ultralight aeroplanes. Thereafter, if the study concludes that a stall warning will help reducing the risk of loss of control, it is recommended that the BCAA requires the installation of such an equipment in the type of ultralight where it had been deemed worthwhile.

1.18.5. VL-3, D-MVLX, Germany, 8 May 2016

The accident was investigated by the German Federal Bureau of Aircraft Accident Investigation (BFU). The aircraft was destroyed. Both persons fatally injured. The final report was released on 21 September 2017. It indicates:

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.

Also the final report indicates that previously issued Safety Recommendation (06/2008) to the civil aviation authority was not implemented accordingly.

1.18.6. VL-3, 57-AVB, France, 8 April 2017

A witness saw that after take-off the aircraft pitch nose down and hit the ground. The aircraft was destroyed by post impact fire. Both persons fatally injured. The accident is being investigated by the French air accident investigation body for civil aviation safety (BEA).

1.18.7. VL-3, 83-ANS, France, 30 April 2017

The pilot was flying at about 1700 ft. A witness saw the microlight turn, go into a spin, pitch nose down and hit the ground. Both persons fatally injured. The accident is being investigated by the French air accident investigation body for civil aviation safety (BEA).

1.19. Useful or effective investigation techniques

Not applicable.

2

ANALYSIS

2.1. General

Since there were no witnesses for the accident to the ultralight aircraft VL-3 Evolution, the pilot and the passenger being fatally injured, and the aircraft did not have a flight data recorder (FDR) or a cockpit voice recorder (CVR), the analysis of the accident was carried out on the basis of the data from the Dynon SkyView SV-D700, the examination of the accident site and the wreckage of the aircraft.

The safety investigation did not find any evidence to show that the accident of the ultralight aircraft V-3 Evolution occurred because of the failure of aircraft systems or its engine. Before the accident, the systems of the aircraft and engine were functioning correctly. The aircraft, its systems and the engine were damaged by impact forces in to the trees and the ground.

The analysis performed for the purpose of the safety investigation covered the loss of control in flight, survival aspects, training and retraining of the pilot.

2.2. Loss of control in third flight

2.2.1. Actions before the spin

The ultralight aircraft VL-3 Evolution took off for its third pleasure flight in the area of the Paluknys aerodrome at 360° magnetic course from the aerodrome runway No. 36 (Fig. 3). The ultralight aircraft reached the Northern end of the aerodrome, performed a standard left flight circle (points A-B-C, Fig. 3), which the aircraft left at the third turn (point C, Fig. 3). Afterward the ultralight aircraft performed a left turn between points C and E.

Until the 210th second of the flight (point D, Fig. 4) the aircraft flight was progressing in a regular mode. After the aircraft reached third zone of the aerodrome, in the period between the 210th and the 214th seconds of the flight, the speed of the aircraft increased up to 102 knots (189 km/h) and the aircraft turned at a descending angle of 8° (Fig. 5). During that manoeuvre the height of the aircraft decreased to 1,650 feet (503 metres).

At the 214th second of the flight, the aircraft was at a 40° climbing angle, or at above the critical angle of attack. During this manoeuvre the altitude started increasing, while the airspeed slowed down. The RPM's of the engine remained unchanged – about 4,900 rpm. In that position the aircraft remained until 220th second of the flight. Then an acrobatic figure – a vertical turn, or a 180° turn around the vertical axis of the aircraft was performed. When the aircraft turned 180° (nose down), at the 224th second of the flight, the airspeed decreased to 32 knots (59 km/h) and was lower than the aircraft stall speed (40 knots or 75 km/h). During that manoeuvre the altitude increased to 2,140 feet (652 metres).

At the 224th second of the flight, the RPM's of the engine suddenly decreased from 4,880 rpm to 1,830 rpm and because of the rotation moment produced by the engine, the aircraft started turning to the right. With the aircraft rotating, the engine RPM's started increasing on the 226th second of the flight. Then the aircraft pitch indicates that the control stick was pulled and turned to the left. Because of these actions and the resulting change in the rotating moment of the engine, while increased and decreased the RPM's, the aircraft started performing an unstable left spin. At the 229th second of the flight, having performed a single spin, it stopped spinning. In the spin, the airspeed increased from 32 knots (59 km/h) to 61 knots (113 km/h) and the altitude decreased from 2,140 feet (652 m) to 1,810 feet (552 m).

2.2.2. Actions during the spin

The principal reason for a spin is the above critical angle of attack. Also, the sliding angle increases the possibility of a spin developing. When separation of the airflow from one wing is increases, the lift decreases, and therefore accordingly increases the drag, and the wing starts falling. This causes auto-rotation – spontaneous rotation of a falling and uncontrolled aircraft around its longitudinal axis.

A spin consists of three stages – beginning, stabilised spin and its end. The Pilot Operating Handbook defines the general principles for the recovery of unintentional spin. If an aircraft enters a spin, the first action to take is to decrease the thrust of the engine by placing the throttle in the idle position. This reduces the probability of adverse moments in the engine and of gyroscopic effects in a single-engine aircraft. Then by means of the control stick, the ailerons have to be placed in a neutral position. Applying of ailerons may be one of the reasons for the aircraft entering a flat spin, or may cause a larger angular speed with a normal spin. In this case the rudder needs to be apply in the opposite direction to the spin direction, and the control stick pushed hard forward.

Those first four actions are performed simultaneously, though in some airplanes, a short break needs to be made between applying the rudder and the elevator. After the first four actions, the control surfaces must be kept in the recommended position until the aircraft stops rotating, then the rudder needs to be returned to the neutral position. Then the aircraft needs to be pulled out from the fall by gradually pulling the control stick. If the direction rudder is not returned to the neutral position, the aircraft may enter a spin in the opposite direction of rotation.

From the 229th second, the engine RPM's continued increasing from 2,630 rpm to 5,140 rpm. The aircraft pitch indicates that the control stick was pulled. Then, after one single unstable left spin, the aircraft immediately started a right spin. Then aircraft roll indicates that the control stick was turned to the right, and at the 232nd second after three quarters of the single spin the aircraft stopped spinning. During the manoeuvre the altitude decreased from 1,810 feet (552 m) to 1,600 feet (487 m).

Starting from the 232nd second of the flight the engine RPM's has been decreased to 3,130 rpm, and the aircraft returned to a left spin. After half of a single spin starting at the 234th second of the flight the aircraft nose remained above the horizon, and its horizontal speed was rapidly approaching zero. The aircraft entered to a left flat spin.

If an aircraft enters a flat spin, efforts must be made to turn it into a regular spin. In most cases while maintaining the rudder in a neutral position, and having reduced the engine thrust, it is sufficient to turn the control stick (ailerons) to the direction of rotation.

Due to the subsequent manoeuvres when performing the flat spin the readings of the Dynon SkyView SV-D700 not suited for pilotage become unreliable, and therefore could not be referred to in the safety investigation. The end of the recording time was 20:05:10 at an altitude of 691 feet (210m). The ultralight aircraft entered into the spin with 14 seconds left until the end of the recording and at an altitude of 2,140 feet (652 m). There was insufficient time and height available to effect a recovery from the flat spin.

The fact that the ultralight aircraft VL-3 Evolution entered a flat spin is also supported by the observation that the horizontal speed of the aircraft was rapidly approaching zero. In an ultralight aircraft VL-3 Evolution, the pitot tube is installed under the left side of the wing. When the ultralight aircraft was rotating in a flat spin counter-clockwise, the pitot tube entered a negative air flow. The Dynon Skyview SV-D700 interpreted the rapidly decreased air flow to the pitot tube as a stoppage of the aircraft (the aircraft speed with respect to the air flow (pitot tube) became close to a zero) and stopped recording the data (Fig. 5).

The wreckage of the ultralight aircraft VL-3 Evolution found at the accident site, and the signs on the trees showed that the aircraft had entered a flat spin and the trajectory of the aircraft fall was nearly vertical. The aircraft hit the ground with the underside of its fuselage.

The ultralight aircraft spinning in a flat left counter-clockwise spin was vertically descending at high speed, until its right wing hit the trunk of the pine (No. 1) and stripped the bark at the height of 8-10 m (Fig. 8a). Because of the impact to the trunk of the pine, the tip of the right wing of the aircraft was damaged and was cut at about the centre of the right aileron (Fig. 12). Due to this impact the aircraft stopped spinning. As it continued falling, the right part of the aircraft stripped the bark of the trunk of pine No. 4 at a height of 1.8 m right down to the ground (Fig. 8b), and the right side of the wing stripped the bark of the trunk of pine No. 2 from the height of 0.7 m right down to the ground. At the same time the propeller blade cut down the branches from pine No. 3 from the height of 1.7 m right down to the ground, and the engine cowling stripped the bark of the trunk of pine from the height of 0.3 m right down to the ground (Fig. 8b), the ultralight aircraft hit the ground with the underside of the fuselage.

Due to the impact with the ground and the trunk of the tree that had fallen previously, the engine frame was deformed, the body cracked in several places, the left wing with respect to the body moved forward and up, and the right wing with a shortened end remained somewhat further back among pines No. 5, No. 4 and No. 2 (Fig. 11). The aileron of the right wing was thrown away to pine No. 3, close to the aircraft nose (Fig. 7 and 11).

2.2.3. Actions during the second flight

The second flight data shows (point 1, Fig. 3) that a similar manoeuvre was made when the ultralight aircraft reached the third zone of the aerodrome, but the ultralight aircraft did not enter to the spin.

During the second flight (Fig. 4), the engine RPM's were reduced evenly over 3 seconds from 5,056 rpm up to 2,441 rpm with the altitude decreased from 1,407 feet (429 m) to 1352 feet (412 m) and the speed of the aircraft increased from 50 knots (93 km/h) to 67 knots (124 km/h) (Fig. 5).

In the third flight (Fig. 5), the engine RPM's were decreased faster than 3 seconds with the altitude increasing and at speed below the aircraft's stall speed. Because of the lower speed of the aircraft and the resulting change in the higher rotating moment of the engine, instantly decreased the engine RPM's, the aircraft started performing an unstable left spin.

2.3. Qualification of the pilot

2.3.1. Flight experience of the pilot

The pilot of the aircraft has accumulated sufficient experience as a pilot with a private pilot's licence, and had been within recent years flying a sufficient number of hours, 60 h on average.

2.3.2. Retraining of the pilot

The pilot had a valid licence to operate an aircraft of this type. However, in the course of the safety investigation it was established that the pilot was retrained to operate an ultralight aircraft VL-3 Evolution by a person who did not have the instructor's qualification and not according to the retraining programme of ultralight aircraft pilots approved by the Director of the Civil Aviation Administration.

The entries in the logbooks of the pilot and his re-trainer showed that the pilot did not fulfil the requirement regarding solo flights and the minimum number of exercises, because throughout the retraining period the pilot flew for 3 hours and completed 10 landings together with a re-trainer. The programme for retraining provides for a minimum number of exercises – 9 flights with a pilot-instructor (1 h 15 min.) and 7 solo flights (1 hour).

After the retraining sessions, the training programme sheets with the assessment were not filled in, thus it was not possible to determine whether or not the pilot had read the Pilot Operating Handbook or was familiar with exclusive actions, emergency actions, piloting technique and its specificities.

In view of the above, and evidence that the pilot was sitting on the right side, there was a passenger, the ballistic rescue parachute activation handle was blocked by a safety pin, and that having entered the spin the pilot could not follow the basic principles for recovery from spins as defined in the Pilot Operating Handbook, the scope of retraining of the pilot was insufficient to ensure compliance with the conditions of safe operation of a new type of an ultralight aircraft.

2.3.3. Stall training of the pilot

According to International Civil Aviation Organization definitions, a stall is not defined as aerobatics, especially if it is conducted for the purpose of flight training. Stall training can help to recognize a stall and avoid unintentionally stalling and its consequences.

European Aviation Safety Agency Part FCL specifies the contents of the skill test for the issue of a LAPL(A) and PPL(A) and indicates the performance of a clean stall and recovery with power. But European Aviation Safety Agency do not regulate the contents of the skill test for the issuing of ultralight aircraft pilots licences. Therefore stall exercises are performed following the practical training or retraining programmes of ultralight aircraft pilots approved by the Director of the Civil Aviation Administration.

The Pilot Operating Handbook states that the ultralight aircraft VL-3 Evolution is not designed for acrobatic flights and stalls are prohibited. Nevertheless, there are stall speeds in various flap configurations and recovery procedures if an unintentionally spin occurs.

This creates a situation with two contradicting requirements. To fulfil the requirements

of practical retraining programme it is necessary to conduct a stall exercises and at the same time the Pilot Operating Handbook prohibits stalls.

Throughout the retraining period the pilot was not flying in solo and in the retraining programme during solo flight there are stall mode exercise.

2.3.4. Spin training of the pilot

According to the ultralight aircraft pilot practical training programme approved by the Director of the Civil Aviation Administration, pilots are not trained to recover from spins, because a spin is an aerobatic manoeuvre and ultralight aircrafts are not allowed to perform acrobatic flights.

Thus, the pilot had not received any training to recover from a spin with a powered aircraft. This is further evident from the inappropriate actions – increase and decrease of the engine RPM's when the ultralight aircraft entered a spin.

It should be noted that in the past the pilot glided with a sailplane. When being trained to acquire this glider licence, the pilot was trained to perform a spin, and recover from it with an unpowered glider. However, according to the entries in the logbook, the last time the pilot glided was nine years ago.

Nevertheless, in training sessions pilots of ultralight aircrafts should be introduced to spins and other acrobatic figures and the principles of recovery from it. In addition, with a view to providing additional training to ultralight aircraft pilots or renewing their skills, the Lithuanian Federation of Ultralight Aircrafts Pilots and the Lithuanian Federation of Acrobatic Flying could arrange annual training for aircraft pilots. Such training could be voluntary and for a charge.

2.3.5. Actions of the accident pilot during the spin

It should be noted that when the ultralight aircraft entered a spin, the change of unexpected and unusual attitude led to the spatial disorientation of the pilot. It also contributed to the cause for the incorrect reactions and inappropriate actions. Due insufficient time and height available, there was no chance to recover from the flat spin.

2.3.6. Health restriction of the accident pilot

The health certificate for Class 2 and a light aircraft pilot's licence (LAPL) issued by the Civil Aviation Administration indicated a restriction 'VDL – correction of impaired distance vision'. Therefore, the pilot was required to wear glasses. Based on the analysis of the flight operations and considering that the vision correction was minimum (+1.5 D), it may be concluded that the pilot's vision did not have any effect on the accident.

2.4. Aircraft

Given that the ultralight aircraft VL-3 Evolution is not designed for acrobatic flights, it was not possible to assess whether the aircraft had any effect upon the spin and the accident.

2.4.1. Registration of the aircraft

Before registration in the Register of Civil Aircraft of the Republic of Lithuania, it had to have an identification plate and limitation placards on the restrictions upon flights. Therefore, the requirement to have an identification plate and limitation placards was not complied with. The purpose of the restrictions upon flights requirement was to visibly inform the occupant of an ultralight aircraft that the aircraft is experimental and does not comply with the safety regulations of the Republic of Lithuania for standard aircraft.

Also the Special Certificate of Airworthiness of the ultralight aircraft VL-3 Evolution creates a situation with two contradicting requirements – one restriction warns a passenger that the aircraft is experimental while the other restriction indicates that no passenger may be carried in this aircraft.

2.4.2. Flight documents of the aircraft

The owner and the operator of the aircraft did not have a flight logbook and a license to use the aircraft radio station. Therefore, the requirement to have these flight documents was not complied with.

The aircraft had a sheet that contained entered and corrected information on the flight hours and the number of flights, which did not match the data in the flight logbooks of the pilots of the flight concerned. One of the pilots claimed that he did not have any flight logbook at all.

2.4.3. Maintenance of the aircraft

The unsigned entry '25 hours inspections' on the sheet with the flight hours and the number of flights found in the aircraft 'VL-3 Evolution' did not make it possible to determine whether or not the aircraft had been subject to the technical maintenance work, whether all technical maintenance had been completed, who and when such inspections were performed.

2.4.4. Aircraft mass and centre of gravity

The specific characteristics of an aircraft are specifically important in the recovery stages from a spin. Very significant in this respect is the centre of gravity position. For an aircraft with a forward centre of gravity position it is more difficult to start, but easier to recover from a spin. An aircraft with an aft centre of gravity position enters

a spin more easily, which even develop into a flat spin with a very large angle of attack, which is more difficult to recover.

Although at the time of the accident the ultralight aircraft mass exceeded the maximum take-off mass by 14.2 kg, or by 3.02 percent of the maximum permitted aircraft take-off mass – such an increase in the mass did not have any impact upon the stall of the aircraft or the accident.

The co-owner on the same morning fully filled the fuel tanks and flew together with another pilot, thus the pilots should have been aware that they were flying an overloaded ultralight aircraft.

The aircraft did not have a limitation placard with the maximum allowable payload and maximum take-off weight. Therefore, the requirement to have such a limitation placard, which purpose was to visibly inform the occupant of an ultralight aircraft about possible overloading, was not complied with.

2.5. Survivability

2.5.1. Search and rescue services response

Given that the search started within 2 h 02 min. from sunset, and 2 h 29 min. from the take-off of the ultralight aircraft VL-3 Evolution, that the persons were fatally injured instantaneously, that the aircraft engine had cooled down, and that the aircraft was manufactured of composite materials, the use of thermovisors at the disposal of the Aviation Unit of the State Border Guard Service did not make it possible to locate the crashed aircraft and the persons in the night, although it appeared that during the search night the helicopters flew over the accident site several times.

Considering the ultralight aircraft's take-off time, the time of the report on the missing aircraft, the beginning of the search, the direction of the aircraft was not known, and the aircraft did not have an Emergency locator transmitter as it is not obligatory to have one, the actions of the aircraft search and rescue coordination services were appropriate, and the search was started on time.

2.5.2. Aircraft rescue system

The ultralight aircraft VL-3 Evolution was equipped with he ballistic parachute rescue system, but activation handle was blocked by a safety pin with a control flag. This shows that contrary to the manufacturer's instructions the safety pin was not removed before flight. After the retraining sessions, the training programme sheets with the assessment were not filled in, thus it is not possible to determine whether or not the pilot was properly familiar with the Pilot Operating Handbook, or the specificities of emergency actions. Also, this shows that there was not mental pre-flight preparation including emergency briefing related with actions during emergency situation and activation of ballistic rescue parachute.

It was established that the control flag of the safety pin was torn away and the element (ring) connecting the flag with the safety pin was straightened out, and the safety pin was deformed. It shows that after the aircraft entered the spin, the pilot attempted to use the ballistic parachute rescue system. The pilot tried to pull out the safety pin by the control flag, but he only tore off (straightened) the connecting element (ring). Then in an attempt to activate the ballistic parachute rescue system, the pilot bent the safety pin - either when trying to pull it out, or when strongly pulling out the activation handle with the safety pin.

The manufacturer of the aircraft suggested that the safety pin of the ballistic parachute rescue system activation handle is manufactured from a material that would break when pulling out the activation handle with certain force; alternatively, the element (ring) connecting its control flag can be replaced by a carabiner that would not break or disintegrate when pulling out the safety pin by the control flag.

Although the ultralight aircraft is controlled by a dual push-pull control system, the pilot in command seat is on the left side. Where the pilot was sitting on the right side, the ballistic parachute rescue system activation handle and the blocking safety pin were on the left, rather than the right side. The passenger was sitting on the left side of the ultralight aircraft - actually in the place of the pilot in command. Nevertheless, it was not possible to assess whether the side of the pilot's position had any effect upon the accident of the aircraft.

3

CONCLUSIONS

3.1. Findings

Ultralight aircraft

The ultralight aircraft had a valid Certificate of Airworthiness.

The ultralight aircraft did not have identification plate and limitation placards on the restrictions upon flights and the maximum allowable payload and maximum take-off weight.

The ultralight aircraft did not have an aircraft logbook and permit to operate the aircraft radio station.

A sheet of paper found in the aircraft after the accident contained information on the flight hours and the number of flights, but the data were corrected, and did not match the data in the flight logbooks of the pilots flying the aircraft.

The unsigned entry '25 hours inspections' on the sheet with the flight hours and the number of flights found in the aircraft did not make it possible to determine whether or not the aircraft had been subject to the technical maintenance work, whether all technical maintenance had been completed, who and when such inspections were performed.

At the time of the accident the ultralight aircraft mass exceeded the maximum take-off mass by 14.2 kg, or by 3.02 percent of the maximum permitted aircraft take-off mass - such an increase in the mass did not have any impact upon the stall of the aircraft or the accident.

The systems of the aircraft and engine were properly operational. The aircraft, its systems and the engine were damaged by impact forces with the ground.

Pilot

The pilot held a valid licences of a pilot's license for ultralight aircraft and a private pilot's license PPL(A).

The pilot has accumulated sufficient experience as pilot with a private pilot's licence PPL(A).

The pilot was retrained to operate an ultralight aircraft by a person who did not have the instructor qualification and not according to the practical training programme of ultralight aircraft pilots approved by the Director of the Civil Aviation Administration.

The scope of the retraining programme did not ensure that all the conditions for safe operation of an ultralight aircraft were fulfilled.

To fulfil the requirements of a practical retraining programme it is necessary to conduct a stall exercises and at the same time the Pilot Operating Handbook prohibits stalls.

Throughout the retraining period the pilot was not flying in solo and in the retraining programme during solo flight there are stall mode exercise.

The pilot had not received any training on how to recover from spins with powered aircraft, because spin is an aerobatic manoeuvre and ultralight aircrafts are not allowed to perform acrobatic flights.

When being trained to acquire the glider licence, the pilot was trained to perform a spin, and recover from it. However according to the entries in the logbook, the last time the pilot glided was nine years ago.

Flight operations

The pilot was sitting on the right side of the aircraft. Although the ultralight aircraft is controlled by a dual push-pull control system, the pilot in command seat is on the left side.

The passenger of the aircraft was sitting on the left side of the aircraft, i.e. in the pilot in command seat.

No passenger may be carried in this ultralight aircraft.

The ballistic parachute rescue system activation handle was blocked by a safety pin with a control flag.

The ballistic rescue parachute system activation handle and the blocking safety pin was on the left, rather than the right side of the pilot.

Recovery from unintentional spin procedures were not in accordance with Pilot Operating Handbook.

There were insufficient time and height available to effect a recovery from the flat spin.

Survivability

The accident was non-survivable for the persons due to the high impact forces.

3.2. Cause factors

Causal factor

The accident to the ultralight aircraft VL-3 Evolution occurred due to performance of a vertical turn which is an aerobatic manoeuvre. For that reason, the ultralight aircraft was directed towards above critical angle of attack and then stalled. Therefore, the ultralight aircraft started a left spin which because of the inappropriate actions related to the completion of the spin, developed into a flat left spin. There were insufficient time and height available to effect a recovery from the spin.

Contributory factors

According to the ultralight aircrafts pilot practical training programme approved by the Director of the Civil Aviation Administration of the Republic of Lithuania, pilots are not trained to recover from spins, because a spin is an aerobatic manoeuvre and ultralight aircrafts are not allowed to perform acrobatic flights. Thus, the pilot had not received any training to recover from the spin with a powered aircraft.

When the ultralight aircraft entered a spin, the change of unexpected and unusual attitude led to the spatial disorientation of the pilot. It also contributed to the cause for the incorrect reactions and inappropriate actions.

During the flight the ballistic parachute rescue system activation handle was blocked by a safety pin with a control flag. For that reason, when the aircraft entered a spin, the pilot could not use the ultralight aircraft rescue system.

4

SAFETY RECOMENDATIONS

Safety recommendation: with a view to avoiding accidents and incidents in the future, the safety investigation authority drew up a proposal based on the information collected on the basis of the safety investigation, and other sources, for instance, other safety studies.

Safety recommendations shall in no case create a presumption of blame or liability for an accident or serious incident.

This Investigation does not sustain any Safety Recommendations.

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