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Report
ULM A-016/2018

Accident involving an ELA-07-R-115 powered ultralight, registration EC-EZ1, in Camarenilla (Toledo, Spain) on 8 August 2018

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

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Foreword

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident object of the investigation, and its probable causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1., 4. and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

Contents

Abbreviations

° ’ ”	Sexagesimal degrees, minutes and seconds
%	Percent
AESA	National Aviation Safety Agency
ft	Feet
h	Hours
Kg	Kilograms
Km	Kilometers
l	Liters
m	Meters
N	North
RPM	Revolutions per minute
TULM	Coordinated universal time
ULM	Ultralight Aircraft
UTC	Universal Time Coordinated
VFR	Visual flight rules
W	West

Synopsis

Owner and Operator:	Private
Aircraft:	ELA-07-R115, registration EC-EZ1
Date and time of accident:	8 August 2018 at 20:15 (local time[1])
Site of accident:	Camarenilla (Toledo, Spain)
Persons on board:	One (killed)
Type of flight:	General Aviation. Private
Phase of flight:	Takeoff
Type of operation:	VFR
Date of approval:	28 November 2018

Summary of event:

On Wednesday, 8 August, aircraft ELA, registration EC-EZ1, took off from runway 23 at the aerodrome of Camarenilla (Toledo) to go on a local flight.

The pilot was the sole occupant.

During the takeoff, at an approximate distance of 1.6 km away from the aerodrome, along the extension of the runway centerline, the aircraft crashed to the ground and caught fire.

The pilot was killed and the aircraft was destroyed.

The investigation was unable to determine the cause of the accident.

[1]. Unless otherwise specified, all times in this report are local. To obtain UTC, subtract two hours from local time.

1. FACTUAL INFORMATION

1.1. History of the flight

On Wednesday, 8 August, autogyro ELA, registration EC-EZ1, took off from runway 23 at the aerodrome of Camarenilla (Toledo) shortly before 20:15 to go on a local flight. The pilot was the sole occupant.

Based on the information provided by individuals who were flying in the area, the aircraft took off normally and reported it was heading south.

According to a flight instructor who saw it take off and who landed just before the accident autogyro took off, it had under 35 l of fuel and it did not rise much when it took off. Once the accident pilot reported his intention to proceed south, he lost the autogyro from view.

The aircraft crashed approximately 1.6 km away from the aerodrome, along the extension of the runway centerline, and caught fire after impacting the terrain.

The instructor and other persons who were at the aerodrome saw a column of smoke and proceeded to the crash site, but were unable to do anything to help the pilot, who had perished in the crash.

Figure 1. Aircraft path

1.2. Injuries to persons

The pilot perished on impact.

1.3. Damage to aircraft

The aircraft was destroyed.

1.4. Other damage

There was no other damage.

1.5. Personnel information

The pilot was 53 years old and had an ultralight pilot license (TULM) issued on 18 August 2017 by Spain's National Aviation Safety Agency (AESA) with an autogyro rating. The license and rating were valid until 31 August 2019.

The pilot had a class-II medical certificate that was valid until 25 July 2019.

The instructor who trained him reported that they had flown on paramotor aircraft before, but that he was not registered when he started to fly autogyros.

He also reported that he did not let him[2] fly solo for a long time because he was not proficient in handling the aircraft and did not know the procedures well. He also commented that he had done fairly well on the exam to obtain his license and that he had 40 h of experience (including training hours), including 6 h on the accident autogyro[3].

1.6. Aircraft information

The aircraft had a special restricted airworthiness review certificate issued by the National Aviation Safety Agency (AESA) on 19 June 2017.

It had 125:16 total flight hours. Its last maintenance check had been on 11 May 2018, with 111:11 h on the engine. It had flown 14:05 h since its last maintenance check.

An autogyro is an aircraft in which the thrust is provided by a propeller, and the lift is provided by a two-bladed rotor that turns freely and that is also used to control the bank (by moving the control stick left or right) and pitch (by moving it forward and back) angles. The yaw movement is controlled with the rudder, which is moved by using the pedals in the cockpit.

The ELA-07-R115 model is a two-seater, three-axis tandem aircraft with dual controls, and a tricycle landing gear with a nose wheel.

[2]. The same person who saw him take off.
[3]. The pilot logbook was on board the aircraft and burned in the fire. The information provided by the instructor in terms of his experience is deemed to be highly reliable.

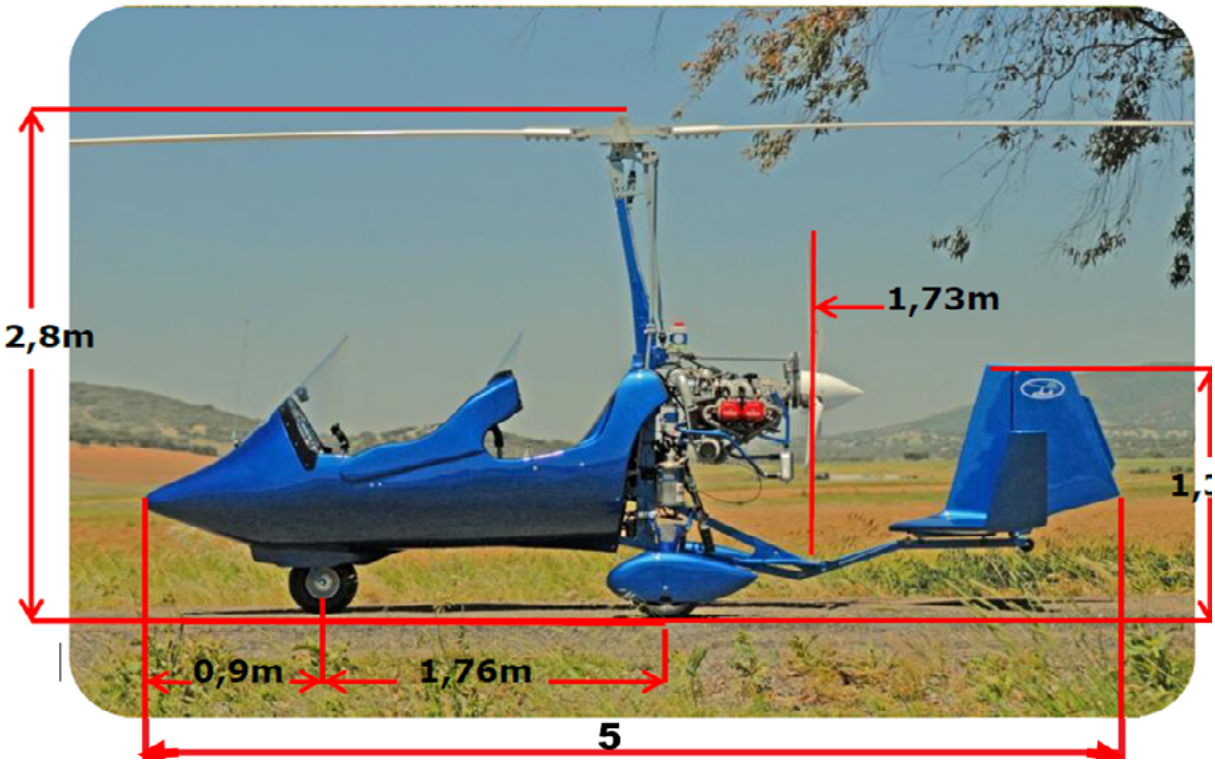

Figure 2. Dimensions of autogyro ELA-07-R115

The main structure is a single piece made of stainless steel. The fairing is made of composite materials and the cockpit, which is open, has a transparent polycarbonate windshield. The rotor blades are made of aluminum and composites. The engine is located behind the cockpit and drives a three-bladed propeller, which is made of composites, as are the tail surfaces, that is, the fixed horizontal stabilizer, with winglets, and the vertical stabilizer, which includes the rudder.

The accident autogyro, registration EC-EZ1, was manufactured in 2007 and had serial number 06071610724. Its empty weight was 250 kg and its maximum takeoff weight was 450 kg. It had a Rotax 914 UL engine, serial number 914UL 4419478.

1– Compass 2– Altimeter 3– Anemometer 4– Variometer (Optional) 5– Rotor tacometer 6– Engine tacometer 7– Oil pressure 8– Flight compensator pressure 9 – Radio (optional). 10- EGT (optional). 11– Inlet position (optional) 12– Fuel pressure 13– Oil temperature 14– CHT 15 – Pneumatic valve 16– Ignition switch

Figure 3. Cockpit of autogyro ELA-07-R115

1.7. Meteorological information

The weather conditions were not limiting for this type of flight.

1.8. Aids to navigation

Not applicable to this event.

1.9. Communications

Not applicable to this event.

1.10. Aerodrome information

The aerodrome of Camarenilla (Toledo) is located 0.5 km north of the town by the same name, separated from it by local road To-2816, which travels northwest in that area. Its reference point is at coordinates 40° 1′ 20.59″ N - 4° 4′ 21.11″ W

and is at an elevation of 531 m (1,742 ft). It is an uncontrolled aerodrome where using the radio is not required.

It has one compacted gravel runway in a 05/23 orientation that is 550 m long.

Figure 4. Aerodrome of Camarenilla

It is located inside the hazardous area called LED55A, whose vertical limits range from an altitude of 1000 ft to 4000 ft.

According to the procedures at the aerodrome, inbound aircraft that have a radio must report their intentions and position 3 minutes before reaching the aerodrome. Approaches are made by flying over the field at 1,000 ft to check the runway in use and then joining the north traffic pattern. The procedures also state to avoid flying over the town of Camarenilla, the buildings marked on the chart or the sensitive wildlife area, and they also warn of the large number of birds of prey in the area.

1.11. Flight recorders

The aircraft was not equipped with flight recorders, which were not required by law.

1.12. Wreckage and impact information

The wreckage was in a crop field divided into two slopes by a strip of land.

The autogyro was on its right side, with its longitudinal axis facing 200º. The main rotor was facing the high part of the field.

Behind the tail of the autogyro was the strip that separated the two slopes of the field.

The main wreckage had been moved down the slope, perpendicular to its longitudinal axis, some 2 m by emergency services in order to recover the pilot's body.

Figure 5. Status of the autogiro at the accident site

The marks left by the propeller indicate that the aircraft also moved simultaneously along its longitudinal axis.

There was continuity between the pedals and the tail, and no breaks were found in either the bars or the cables that control the movement. There were also no breaks in the transmission components, though the pedals could not be moved because they had been jammed and bent by the impact.

The main gear spring was almost flat.

The rotor blades were in their plane of rotation, with practically no signs of having malfunctioned before the impact.

One of them was dented around its midpoint and part of its trailing edge was missing.

The droop stops on the rotor rocker were in good condition.

The tail was detached and located next to the main wreckage. The base of the tail was in its proper place. The vertical stabilizer had also detached, as had the rudder from the vertical stabilizer.

There was continuity in the rotor control bar.

The throttle control rod had detached, but the engine turned and there was continuity to the pre-rotator.

The oil thermostat was melted, as were all the other aluminum components.

As for the condition of the rotor, the pneumatic trim piston was loose, but its condition seemed to indicate that it was attached before the impact, since none of its components was in a bad condition.

The blades were very straight. If the rotor reaches its normal rotating speed, they tend to bend somewhat, meaning they probably did not reach this speed.

The instrument panel showed damage consistent with having been impacted by the pilot's body.

Two of the propeller blades had been consumed by the fire, with only some debris remaining around the hub. The third was broken very close to the hub and exhibited breakage by bending due to the impact with the ground.

1.13. Medical and pathological information

The autopsy revealed that the pilot's death was caused by shock due to polytrauma.

1.14. Fire

A fire broke out after the impact that completely charred the aircraft fairing and the interior of the cockpit, laying bare the structure and all of the control and transmission components.

1.15. Survival aspects

The strong impact and subsequent fire made it impossible for the pilot to survive.

1.16. Tests and research

The engine was first inspected at the aerodrome to check for signs of a malfunction. It was then taken to a hangar, where its condition was thoroughly examined, yielding the following findings:

The servo was in good condition.

There were long fibers hanging from the propeller blades, indicating that the blades did not break in the air or due to the impact, but that they had been consumed in the fire.

To the naked eye, all engine components were in their place; however, signs of possible overheating before the fire were found, and in light of this uncertainty, it was decided to do a more detailed inspection in the workshop.

The nuts on all the engine components were loose due to the intense heat produced by the fire.

The engine cover had been melted by the heat.

The engine was in the rich mixture position and it was properly sealed. The condition of the housing also indicated that the engine had not seized.

There were no particles found in the magnetic plug, which would indicate that the engine had not seized.

The block on the #1 cylinder was extensively burned, though the cylinder itself

looked normal. The #1 piston was in good condition and its color was good.

The O-ring on the #1 cylinder was burned.

The #2 cylinder was drenched in oil (greased), but it was not possible to determine if oil had leaked out the head before or after the impact. On opening the cover, the O-ring was found in its place. It was not burned. When it was removed, its condition was found to be good overall, though there was soot. The electrodes on the spark plugs were gapped, meaning they were in good condition.

The #2 piston was well greased. The tappets on the #2 cylinder were not scratched.

The #3 cylinder was also in good condition. It was not seized. Inside, there were differences in color due to having been subjected to different temperatures. The tappets on the #1 and 3 cylinders were not scratched. They were not removed, but they seemed to be in good condition.

The #4 cylinder was also removed. The exhaust valve did not move. The spring was found to be burned, but less than the spring on the intake valve.

The pistons were disassembled, and while the #4 piston was not seized, it was very dry. In the absence of oil, the first thing to fail are the tappets. The tappets on the #4 cylinders were not scratched. They were burned.

There was unburned oil in the gear box. The oil pump worked correctly. The oil filter was removed to check it for chips.

The electric starter was burned by the fire. The freewheel and the pistons were in good condition.

The crankshaft was not a solid piece, but consisted of various components. In an impact, it tends to bend, but not seize. However, it was seized, but not because of a malfunction, but rather due to the high temperatures to which it had been subjected.

The camshaft was in good condition, meaning it was not seized. The bushings that supported the crankpins had withstood considerable heat. They showed signs of having started to melt, and though there were signs of overheating, there were no signs of seizing.

1.17. Organizational and management information

Not applicable to this event.

1.18. Additional information

The aircraft traveled a distance of 1,590 m along a ground elevation profile that was descending from the aerodrome to the accident site at an average gradient of 3.7%, with the aircraft impacting a point that was 14 m below the elevation of runway 23.

Figure 6. Profile of the terrain throughout the flight

1.19. Useful or effective investigation techniques

No special investigation techniques were required.

2. ANALYSIS

The evidence found at the crash site indicates that the impact with the ground was practically vertical, that is, with a very low component of translational speed.

This is confirmed by the deformation of the main gear spring, which was practically flat, and the condition of the tail supports.

The good condition of the rotor rocker droop stops indicates that there was no mast bumping caused by unloading of the rotor (loss of lift) as a consequence of an instantaneous negative acceleration.

In these aircraft, tilting the rotor backward raises its revolutions, and therefore the lift. This is referred to in aviation jargon as "loading the rotor".

It may be that the rotor was tilted forward somewhat, and therefore "unloaded", meaning it was not generating enough lift.

The fact that the blades were practically intact could also indicate that the RPM were not sufficient to keep the aircraft aloft.

A study of the engine reliably concluded that it did not fail prior to the accident, meaning it was supplying power and that all of the damage found was a result of the impact and the fire that broke out afterwards.

The above notwithstanding, investigators were unable to determine the cause of the accident.

3. CONCLUSIONS

3.1. Findings

- The aircraft took off from runway 23 at the aerodrome of Camarenilla.

- The pilot had a valid license and medical certificate.

- The aircraft had a valid certificate of airworthiness.

- Immediately after taking off, the pilot reported he was flying south.

- The airplane fell to the ground from a low altitude some 1.6 km southwest of the aerodrome.

- The impact with the ground was completely vertical.

- After the impact, the aircraft caught fire.

- An analysis of the engine concluded that it had not malfunctioned before the accident.

3.2. Causes/Contributing factors

The cause of the accident could not be determined.

4. RECOMMENDATIONS

None.