Technical report

A-003/2021

Accident involving an AEROSPOOL WT9 DYNAMIC LSA CLUB aircraft, registration EC-MVK, on runway 08 at Casarrubios del Monte Aerodrome (Toledo) on 20 February 2021

Please note that this report is not presented in its final layout and therefore it could include minor errors or need type corrections, but not related to its content. The final layout with its NIPO included (Identification Number for Official Publications) will substitute the present report when available.

GOBIERNO DE ESPAÑA
MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA
SUBSECRETARÍA
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

NOTICE

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 and its 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 5.6 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 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
°C	Degrees Celsius
%	Per cent
AEMET	Spain’s State Meteorological Agency
AESA	Spain’s National Aviation Safety Agency
am	Morning, before midday
ASDA	Acceleration-stop distance available
CAVOK	Clouds and visibility OK (visibility 10 km or more, no cloud below 5,000 feet, absence of cumulonimbus and towering cumulus and no significant meteorological phenomena)
CIAIAC	Civil Aviation Accident and Incident Investigation Commission
CR (A)	Aircraft class rating
DME	Distance measuring equipment
ft	Feet
GPS	Global positioning system
h	Hours
hPa	Hectopascals
IAS	Indicated air speed
ILS	Instrument landing system
kg	Kilogrammes
km	Kilometres
km/h	Kilometres/hour
kts	Knots (nautical miles per hour)
LDA	Landing distance available
LECU	ICAO code for Madrid-Cuatro Vientos Airport
LEMT	ICAO code for Casarrubios del Monte Airport
LT	Local time
m	Metres
mbar	Millibars
METAR	Aviation routine weather report (in aeronautical meteorological code)
MHz	Megahertz
min	Minute
POH	Pilot Operating Handbook
PPL	Private pilot license
QNH	Altimeter setting to obtain elevation above sea level when on the ground
RT/C	Spanish-speaking radio telephonist
RWY	Runway
s	Second
S	South
SEP	Single-engine piston rating
SP	Single pilot
SW	Southwest
TODA	Take-off distance available

TORA	Take-off range available
UTC	Universal time coordinated
VFR	Visual flight rules
VOR	Very high frequency omnidirectional radio range

SYNOPSIS

Owner	Private
Operator:	Private
Aircraft:	AEROSPOOL WT9
Registration:	EC-MVK
Persons on board:	1 crew member and a passenger, unharmed
Type of operation:	General Aviation – Non-commercial – Recreational flight
Phase of operation:	Approach - final approach
Flight rules:	VFR
Date and time of incident:	20 February 2021; 13:10 LT
Site of incident:	Casarrubios del Monte Aerodrome, Toledo
Date of approval:	15/12/2021

Summary of incident:

At approximately 13:10 LT on Saturday 20 February 2021, the AEROSPOOL WT9 DYNAMIC LSA CLUB aircraft, registration EC-MVK and serial number 18001, was landing on runway 08 at Casarrubios del Monte Aerodrome (LEMT).

After executing the landing flare, the aircraft impacted the ground and bounced back into the air before bouncing again more forcefully a few moments later. The increased force of the second impact buckled the nose leg and ruptured the wheel. After the second bounce, the pilot increased the power to the engine. Unfortunately, the action was ineffective, and after falling onto the asphalt again, the aircraft slid off the right side of the runway and came to stop.

Neither occupant was injured, and both were able to exit the aircraft without assistance.

The aircraft sustained damage to its nose leg, propeller blades (which were destroyed) and lower fairing.

The investigation has concluded that the accident's was probably caused by a poorly executed landing manoeuvre.

No contributing factors have been identified.

No operational safety recommendations are issued.

1. THE FACTS OF THE INCIDENT

1.1. Overview of the accident

On Saturday, 20 February 2021, the AEROSPOOL WT9 DYNAMIC LSA CLUB aircraft, registration EC-MVK and serial number 18001, was carrying out a recreational flight, departing from and returning to its base at Casarrubios del Monte Aerodrome (Toledo).

As the Casarrubios del Monte Aerodrome does not have a weather station, the pilot used the data from the Cuatro Vientos METAR, which indicated a wind direction of 130° according to the pilot (150° according to the official information), and a speed of 15km/h with CAVOK visibility. According to the weather report provided by AEMET, the wind around the aerodrome was light, and there was no precipitation.

At around 12:15 hours, after checking and confirming that the aircraft's weight and balance and fuel, engine oil, and coolant levels, the pilot took off and made a 50-minute local flight to the area of Illescas (Toledo). The pilot then headed back to the departure aerodrome without delay because increased wind speeds were forecast for the afternoon. On the way back, he joined the first third of the left tailwind leg for runway 08 from the area between Navalcarnero and El Álamo. On the tailwind leg, he adjusted the aircraft's speed to between 120 and 130 km/h and once below 130 km/h (white arc), he selected flaps 1. On the last third of the tailwind leg, he reduced speed to 120 km/h, selected flaps 2, and turned onto the base leg. He then turned onto final, selected flaps 3, and adjusted speed to between 100 and 110 km/h.

On landing, the aircraft bounced twice. The second bounce, which was harder than the first, caused the nose leg to collapse and ruptured the nose wheel; subsequently, the aircraft veered off the edge of the runway.

1.2. Injuries to persons

Injuries	**Crew**	**Passengers**	**Total in the aircraft**	**Others**
Fatal				
Serious				
Minor/None	1	1	2	
TOTAL	1	1	2	

1.3. Damage to the aircraft

The aircraft sustained damage to the nose gear and nose wheel when it hit the runway on the second bounce.

Its propeller blades were destroyed when they impacted the ground with the engine at full power.

The front lower fairing also sustained minor damage.

Images showing the extent of the damage can be seen in section 1.12 Aircraft wreckage and impact information

1.4. Other damage

There was no further damage.

1.5. Information about the personnel

The 40-year-old Spanish pilot had a private pilot license (PPL) issued by Spain's National Aviation Safety Agency (AESA) on 24 June 2015 with the following ratings:

- R/TC
- CR(A) SEP (land)/SP, valid until 31 October 2022

His Class 2 medical certificate was valid and in force until 04 October 2022, and he had approximately 110 flight hours, 20 of which were in the accident aircraft itself during the 90 days prior to the incident.

1.6. Information about the aircraft

The EC-MVK Aerospool WT9 aircraft with serial number 18001 was registered in Spain on 02 August 2018 and had a valid restricted certificate of airworthiness issued on 19 November 2018 by AESA. It also had an airworthiness review certificate issued on 31 July 2020 and valid until 30 July 2021. The owner uses the aircraft for recreational purposes.

Both aircraft and engine had been overhauled during scheduled maintenance by approved maintenance centre ES.145.227 on 30 October 2020, when they had 591 flight hours.

At the time of the accident, both aircraft and engine had a total of 611 flight hours.

The Aerospool WT9 is a single-engine, low-wing aircraft with a wingspan of 9 metres and a length of 6.5 metres. It can seat two people, pilot and passenger. The maximum take-off weight of this model is 600 kg. It's powered by a Rotax 912 ULS2 4-cylinder engine that can deliver 100 hp, as well as a Dynon SkyView SV-D1000 integrated avionics system which incorporates most of the flight instruments as well as various sensors and systems, including a GPS device, a warning system capable of issuing alerts (e.g. angle of attack), radio and transponder devices and a stall warning system. It also has an emergency ballistic parachute.

In terms of performance, according to the aircraft operating manual, it has a cruise speed of between 78 and 218 km/h (42-118 kts) with flaps retracted (position 0), a maximum speed (never exceed speed) of 275 km/h (148 kts), a stall speed of 61 km/h (33 kts) with fully deployed flaps (35°, position 3), and its stall speed during landing is 64 km/h (35 kts), with flaps in position 2 (24°).

The aircraft operating manual indicates that landing should be made at 120-130 km/h (IAS) with flaps 2 on a standard airfield, or at 110-115 km/h with flaps 3 on a short airfield,

executing the flare at 2 or 3 metres above the ground and touching down with the main gear so that the nose gear descends as the speed decreases.

1.7. Meteorological information

According to the information provided by the State Meteorological Agency (AEMET), at the time of the event, the stations located around the aerodrome[1] recorded moderate wind speeds and no precipitation.

The METAR for Madrid-Cuatro Vientos Airport (about 26 km NE of Casarrubios Aerodrome) at the time of the event was as follows:

METAR LEVS 201200Z 15008KT 100V200 CAVOK 16/04 Q1015=

The forecast for Cuatro Vientos was for a wind direction of 150° with a speed of 8 knots (15 km/h), with the wind direction varying between 100° and 200° and clear skies. The temperature was 16°C, and the dew point was 4°C. The QNH was 1,015 hPa.

At the time of the event, the sun was approximately 60° to the right of the approach path (i.e. at 2 o'clock) and about 30° above the horizon.

1.8. Aids to navigation

The flight was carried out under visual flight rules, so radio aids were unnecessary.

Radio aids such as ILS, VOR or DME are not used for this type of flight - in fact, this airfield does not have any of these facilities.

1.9. Communications

The communications frequency in use was 123.500MHz, but no communications were recorded.

1.10. Information about the aerodrome

The accident occurred as the aircraft with registration EC-MVK was landing on runway 08 at Casarrubios del Monte Aerodrome, in Toledo province.

With one asphalt runway strip, this civilian aerodrome sits on the border between the provinces of Toledo and Madrid, approximately 34 km SW of the centre of Madrid, at an altitude of 625 metres (2,050 ft). The runway orientation is 08/26, and, according to the Enaire VFR guide, it measures 950 metres long and 26 metres wide.

[1] Stations at Robledo de Chavela, Aranjuez and Toledo as AEMET does not have a meteorological station at Casarrubios del Monte Aerodrome.

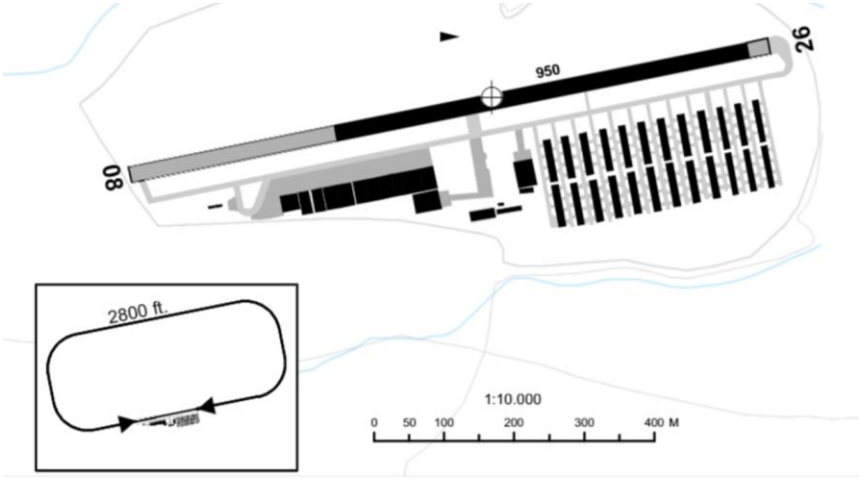

Figure 1: Plan of Casarrubios del Monte Aerodrome

According to the classifications set out in Royal Decree 1070/2015, it's a restricted use aerodrome with refuelling services, aircraft repair facilities and hangars.

In addition, the airfield has the following markings and aids:

- Windsock.
- RWY markings: Designators, threshold, displaced threshold on runway 08, touchdown area and centreline.

There are no lights to mark the touchdown zone, runway centreline or stop zone.

1.11. Flight recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, as the aeronautical regulations do not require them on these types of aircraft.

As previously explained in Section 1.6 Information about the aircraft, the aircraft was equipped with an avionics system that has various sensors and systems, including a GPS device and a warning system that alerts the crew to different situations, such as an excessively high angle of attack, electrical system failures, magnetos failures, low engine oil pressure, etc. This integrated avionics system also has a memory that can record data relating to position, attitude, heading, speed, acceleration, air data, systems status, and the alerts generated by the aircraft's warning system at any given moment. The data is recorded in a file system which can be downloaded as 5 spreadsheets, two of which are particularly relevant to this report.

The files of interest to the investigation are the so-called *Black box log data* and *Alert data*. The first provides information on the flight conditions at all times, indicating, among other details that are less relevant to the investigation, time, position, altitude (GPS and barometric), distance and heading to destination, aircraft attitude (pitch and roll), IAS, TAS and vertical speeds, accelerations, turn rate, angle of attack and altimeter setting. The second stores information on any alerts generated, including the time, date and type of alert, and the position and speed of the aircraft when it was generated.

During the interview with the pilot (on 25 February 2021), the CIAIAC offered to download this data, but the pilot indicated that he would do it himself and send the information to

the CIAIAC. Support to perform the download was also offered but not accepted. Over the course of several months, the CIAIAC repeated its request for the data - 09 March, 03 June, 11 June and 20 August; on 27 July, the pilot contacted the CIAIAC himself to confirm that he intended to perform the download. During these months, the pilot proceeded to repair the aircraft once authorised to do so and flew it before he had downloaded the requested information. In an email exchange on 03 June, the pilot informed the CIAIAC that he had just had the aircraft repaired and had made a flight. Finally, on 23 August, several months after the accident had occurred and the aircraft had been repaired, the pilot downloaded the data and sent it to the CIAIAC.

The data was decoded and analysed. While the Alert data file contained events for flights from 13 September 2020 to 19 August 2021, the Black box log data file only contained data from 27 July. The analysis of the Alert data shows that no flights were made on 19 August but that the avionics system was switched on. The fact that the black box only contains data from the last flight indicates that the system memory for the log data file only stores information for about 25 minutes of flight. This means the data on the accident flight would probably have been deleted during the first flight made after the incident, which, according to the pilot, was around 03 June, the same day he informed the CIAIAC that the aircraft had been repaired and that he had flown it to check its performance.

However, the alert log (which also records position and altitude) recorded the aircraft's movements on previous days; specifically, it made a flight lasting just over an hour in the vicinity of the Casarrubios Aerodrome on 18 May, and another on 26 May to the Algodor Aerodrome. Subsequently, it made further flights over the south of the peninsula: on 06 June to Villamartín Aerodrome (Cádiz), another three (local flights over Villamartín) on 09 June, 22 June and 20 July, and a return flight to Casarrubios on 27 July. Therefore, from the time the aircraft was repaired until the data was downloaded, a total of 7 flights totalling just over 9 hours were made.

The Alert data file contains no data on the final moments of the accident flight. Specifically, no alerts were issued between 12:59:02, when the aircraft entered the final approach leg at approximately 150 feet above the ground on a heading of 100° and at 59.9 kt (point labelled Final Approach in the image below, figure 2), and 12:59:57, when the aircraft had already landed and was moving at 54.6 kt on a heading of 78.5° (point labelled On Ground in the image below, figure 2). The distance between those two points is about 1,840 m. Therefore, based on the aircraft's altitude when it entered final and the distance travelled, we have calculated that its final approach had a glide slope of 10.75%.

Previously, during the turn from base to final approach, several angle-of-attack warnings were issued.

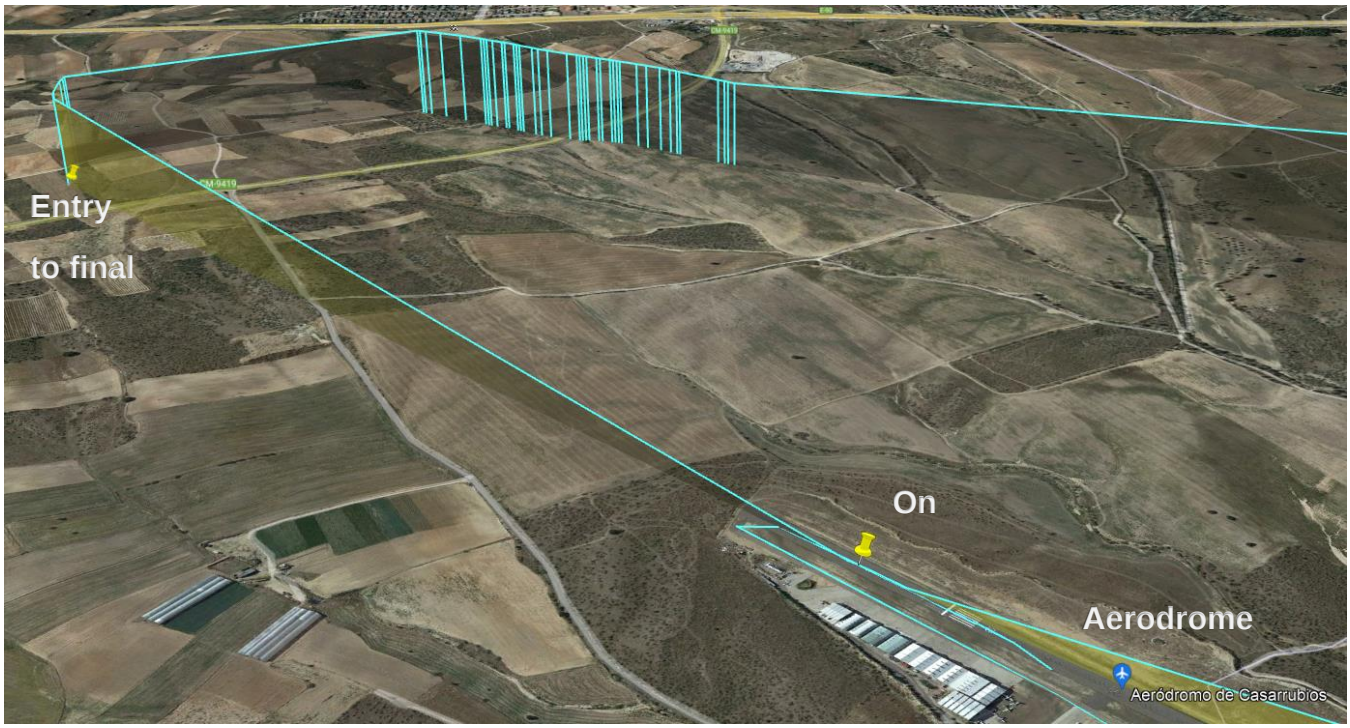

Figure 2: Illustration of the final approach leg

1.12. Aircraft wreckage and impact information

According to the pilot's testimony, when the aircraft "ballooned[2]", he tried to correct the movement by increasing power slightly. However, the correction was insufficient and the aircraft bounced, momentarily returning to the air and then falling onto the runway for a second time. This second contact with the ground involved more force than the first as the pilot had not attempted to correct it. At this point, he increased power to initiate a go-around, but the aircraft fell sharply onto the runway again, making contact with its nose leg, which collapsed.

The aircraft travelled approximately 80 metres from the first point of impact before finally coming to a stop on the right-hand side of the airstrip with its propeller cone off the runway; at this point, the pilot cut all power and switched off the entire electrical system. The stopping point was about 130 metres from the runway threshold (see figure). After shutting down the engine and electrical system, both pilot and passenger exited the aircraft uninjured and without assistance.

[2] In aviation jargon, the term "ballooning" refers to when an aircraft gains altitude without applying power during the flare manoeuvre initiated when parallel to the runway on landing.

Figure 3: Approximate path followed by the aircraft as it dragged along the runway after the second bounce.

The airfield inspection found a piece of the aircraft's nose leg fairing next to the runway designator numbers

Figure 4: Piece of the nose leg fairing

A 60-metre-long mark left by the aircraft as it slid along the runway started approximately 15 metres in front of the fairing piece. In addition, there was a 5-metre-long mark on the grass side strip, which had been made by the propeller cone:

Figures 5 (left): mark on the asphalt; and 6 (right): mark on the edge of the runway and the mud and grass side strip

The aircraft sustained the following damage:

Figure 7: damage to the propeller blades

Figures 8 (previous page, bottom), 9 (this page, top) and 10 (this page, bottom): damage to the nose leg

Figure 11: damage to the underside of the engine fairing:

There was no damage to the interior of the cabin. At the time of the inspection, all the systems were switched off:

Figure 12: Cabin

1.13. Medical and pathological information

There is no evidence of any physiological factors or disabilities that may have affected the pilot's actions.

1.14. Fire

There was no fire.

1.15. Survival aspects

The cabin maintained its structural integrity, and the harnesses functioned adequately.

1.16. Tests and research

N/A.

1.17. Organisational and management information

N/A.

1.18. Additional information

N/A.

1.19. Special investigation techniques

N/A

2. ANALYSIS

According to the pilot's statements and our analysis of the maintenance records, the aircraft was in good working order, and the flight had been smooth and without incident.

The engine functioned as expected, and the engine maintenance log indicates that preventive maintenance had been carried out 20 hours before the accident.

Given the absence of cloud cover, reduced visibility or significant wind, it's unlikely that the weather contributed to the accident or was limiting for the flight. Therefore, the possibility that any meteorological phenomena influenced the incident has been ruled out. Similarly, the possibility that the sun affected the pilot has been ruled out because the aircraft was in a horizontal position.

The damage to the nose leg was studied during a visit to the airfield. It had partially come away from its mount and had bent backwards and slightly to the right, presumably when it hit the runway. It had also lost some of its material due to being dragged along the runway. This material made the marks on the asphalt. The wheel had burst and the fairing had broken into several pieces.

In addition, there were scratches on the underside of the engine fairing, again as a result of the aircraft dragging along the runway.

The damage to the propeller blades, which had been severed close to the hub, suggests the engine was delivering power at the time of impact.

Therefore, in the absence of any engine or control failure, as well as any adverse weather conditions that could have affected the aircraft's stability, and taking into account the pilot's statement regarding the aircraft's behaviour on landing ("ballooning"), the most likely cause of the accident is deemed to be a poorly executed landing manoeuvre.

As previously mentioned, the landing procedure described in the POH stipulates a speed of between 110 and 115 km/h for a short field procedure (which seems to be the case in this incident because the pilot landed with flaps 3, the setting used for a short field). Furthermore, it states that the engine power should be lowered to IDLE when crossing the runway threshold to commence the flare at 2-3 metres above the ground, touching down with the main gear and then, as the speed decreases, the nose landing gear.

The pilot stated that he made the final approach at 100-110 km/h with flaps at 3, although he also said it felt like he was travelling faster than that. Therefore, the poor execution was most likely rooted in the aircraft's rapid descent and flare at excessive speed. The manual is clear on how the landing should be conducted:

> *"Landing approach is conducted at a small glide slope angle due to the long distance of the float before touchdown."*

Given that when an aircraft "balloons", it's normally because the landing flare is carried out at excessive speed, it seems logical that, in the absence of any other previously detailed factors (meteorological influences or unsuitable speed), this is what caused the loss of control and subsequent nose gear landing. Furthermore, the fact that the pilot could not correct the oscillation with the control lever meant that the aircraft bounced even harder the second time and then hit the runway again with its nose wheel.

Information about the data provided

The Black box log data does not provide any useful information for the investigation, as the data on the accident flight was probably deleted during the flight made after the aircraft was repaired in May.

While the data stored in the Alert data file *does* contain data on the system alerts issued during the flight and the aircraft's position at the time (plus other parameters), it is not of particular use to the investigation because it only contains data on the alerts issued before the aircraft joined the final approach leg and after it had touched down, not for the last few moments of the flight. In any case, even if alerts had been issued on the final approach leg and, therefore, it contained data on the aircraft's position and speed, the information would still be insufficient as it does not provide the altitude, ascent speed, angle of attack, or any of the other parameters that would be needed to make a satisfactory analysis of the approach.

Therefore, the files provided do not contain any data of use to the investigation.

With regard to this lack of data, it seems the pilot and owner obstructed the investigation by not initially providing the requested information and then deliberately making a series of flights lasting a total of 9 hours, which, due to the storage capacity of the Black box log data file (about 25 minutes), erased the existing data before it could be downloaded.

3. CONCLUSIONS

3.1. Findings

- The aircraft was maintained according to a scheduled maintenance programme.
- The flight data download was performed too late, due to an apparent lack of cooperation from the pilot.

3.2. Causes/contributing factors

The probable cause of the accident was a poorly executed landing manoeuvre.

No contributing factors have been identified.

4. OPERATIONAL SAFETY RECOMMENDATIONS

No operational safety recommendations are issued.