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AVIACIÓN **C**IVIL

Report A-001/2016

Accident involving a SOCATA TB-20
aircraft, registration EC-ESK, operated
by a private operator, in the Serranía
de Cuenca Natural Park (Spain)
on 16 January 2016



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SUBSECRETARÍA

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DE ACCIDENTES E INCIDENTES
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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) n° 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.

Table of contents

Abbreviations vii

Synopsis ix

1. Factual information 1

 1.1. History of the flight 1

 1.2. Injuries to persons 1

 1.3. Damage to aircraft 1

 1.4. Other damage 1

 1.5. Personnel information 2

 1.6. Aircraft information 2

 1.7. Meteorological information 2

 1.8. Aids to navigation 3

 1.9. Communications 5

 1.10. Aerodrome information 5

 1.11. Flight recorders 6

 1.12. Wreckage and impact information 6

 1.13. Medical and pathological information 8

 1.14. Fire 8

 1.15. Survival aspects 9

 1.16. Tests and research 9

 1.16.1. Statement from the dead pilot’s friend and partner 9

 1.16.2. Statement from two eyewitnesses who were hunting 9

 1.16.3. Statement from an eyewitness who was waiting for a tow truck 9

 1.17. Organizational and management information 10

 1.18. Additional information 10

 1.18.1. Bird concentration map 10

 1.18.2. Route taken by the aircraft 10

 1.18.3. Information on the griffon vulture 11

 1.18.4. Certification requirements for the SOCATA TB 20 aircraft 12

 1.19. Useful or effective investigation techniques 12

2. Analysis 13

 2.1. General 13

 2.2. Analysis of the griffon vulture strike 13

 2.3. Analysis of the pilot’s actions 14

3. Conclusions 15

 3.1. Findings 15

 3.2. Causes/Contributing factors 15

4. Safety recommendations 17

5. Appendix 19

 Annex 1. Map of bird concentrations 21

Abbreviations

° ' "	Sexagesimal degrees, minutes and seconds
°C	Degrees centigrade
AEMET	Spain's National Weather Agency
AESA	Spain's National Aviation Safety Agency
AIP	Aeronautical information publication
cm	Centimeters
CR	Class Rating
EASA	European Aviation Safety Agency
FAR	Federal Administration Regulations (United States)
ft	Feet
hPa	Hectopascals
ICAO	International Civil Aviation Organization
Kg	Kilograms
Km	Kilometers
kph	Kilometers per hour
lb	Pounds
LEMU	Mutxamel aerodrome ICAO code
LEOS	Pajares de los Oteros aerodrome ICAO code
m	Meters
N	North
N/A	Not affected
PPL(A)	Private pilot license (airplane)
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
Rpm	Revolutions per minute
s	Seconds
SEP	Single Engine Piston (Land) rating
ULM	Ultralight
UTC	Coordinated Universal Time
VFR-HJ	Visual flight rules – daytime
W	West

Synopsis

Owner:	Private
Operator:	Private
Aircraft:	SOCATA TB-20, registration EC-ESK
Date and time of accident:	16 January 2016 at 16:47 local time
Site of accident:	Serranía de Cuenca Natural Park (Spain)
Persons onboard:	4, killed
Type of flight:	General Aviation - Private
Phase of flight:	En route
Date of approval:	March 29, 2016

Summary of the event

On Saturday 16 January 2016, a SOCATA TB-20 aircraft, registration EC-ESK, struck a griffon vulture in Cerro de los Rabadanés, within the municipal limits of the city of Cuenca (Spain), while flying over the Serranía de Cuenca natural park.

According to the flight plan, the aircraft had taken off that morning at 09:26 on a visual flight from the Pajares de los Oteros aerodrome in León (Spain), to the Mutxamel aerodrome in Alicante (Spain), where it landed at 11:36.

The pilot and his family planned to return to León in the afternoon, taking off from the Mutxamel aerodrome at 15:47, as noted in the flight plan.

As they were flying over the Serranía de Cuenca Natural Park, a griffon vulture struck the leading edge of the left wing. Part of the wing detached, falling to the ground along with the remains of the bird, causing the pilot to lose control of the aircraft, which crashed into a wooded area seconds later.

The impact with the ground and with several trees destroyed the aircraft and killed all of its occupants.

The accident is thought to have occurred at 16:47 local time, since the aircraft's radar track was lost one second later.

¹ All times in this report are local. To obtain UTC, subtract one hour from local time.

The investigation has determined that this accident was caused by the loss of control of the aircraft following the loss of part of the left wing after an impact with a vulture.

1. FACTUAL INFORMATION

1.1. History of the flight

On Saturday 16 January 2016, a SOCATA TB-20 aircraft, registration EC-ESK, took off from the Pajares de los Oteros aerodrome (León) at 09:26 on a visual flight to the Mutxamel aerodrome (Alicante), where it landed at 11:36.

The pilot and his family planned to return to León in the afternoon, taking off from the Mutxamel aerodrome (Alicante) at 15:47, as noted in the flight plan.

As they were flying over the Serranía de Cuenca Natural Park, a vulture struck the leading edge of the left wing. Part of the wing detached, falling to the ground along with the remains of the bird and making the airplane uncontrollable, causing it to crash into a wooded area seconds later.

The impact with the ground and with several trees destroyed the aircraft and killed all of its occupants.

The accident is thought to have occurred at 16:47 local time, since the aircraft's radar track was lost one second later. At the time the aircraft was at an altitude of 6400 ft.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal	1	3	4	
Serious				
Minor				N/A
None				N/A
TOTAL				

1.3. Damage to aircraft

The aircraft was completely destroyed.

1.4. Other damage

There was no additional damage with the exception of a small fire that broke out in the area where the main aircraft wreckage was found.

1.5. Personnel information

The pilot, a 50-year old Spanish national, had a private pilot license (PPL(A)) that had been issued by AESA on 25 June 2010 and was valid until 31 December 2016. He also had a single-engine piston (land) class rating, CR(A) SEP(land), and a daytime visual flight rating, VFR-HJ.

He had a class 2 medical certificate that was valid until 12 February 2016.

On the day of the accident he had 334 total flight hours.

1.6. Aircraft information

The SOCATA TB-20 aircraft, registration EC-ESK and serial number 747, was manufactured in 1987 and registered in Spain's National Aviation Safety Agency's Aircraft Registry on 31 March 2010. It was outfitted with a LYCOMING IO-540-C4D5D engine.

The accident aircraft had a Certificate of Airworthiness that was issued in May 2005 by Spain's Civil Aviation General Directorate. The Airworthiness Review Certificate had been issued by SINMA AVIACION, S.L., as the continuing airworthiness maintenance organization, on 20 June 2015 and it was valid until 19 June 2016.

The last inspection of the aircraft was conducted on 18 December 2015. It was a 50-hour check and it was carried out at the Sinma Aviación, S.L. certified Part-145 center. At the time of the inspection the airplane had 3,605:45 hours and the engine 235:10 hours.

1.7. Meteorological information

The Spanish National Weather Agency (AEMET) does not have weather data for the Serranía de Cuenca, but the data from the station in Cuenca (35 km to the south) and adverse phenomena advisories were used to determine the most likely weather at the accident site:

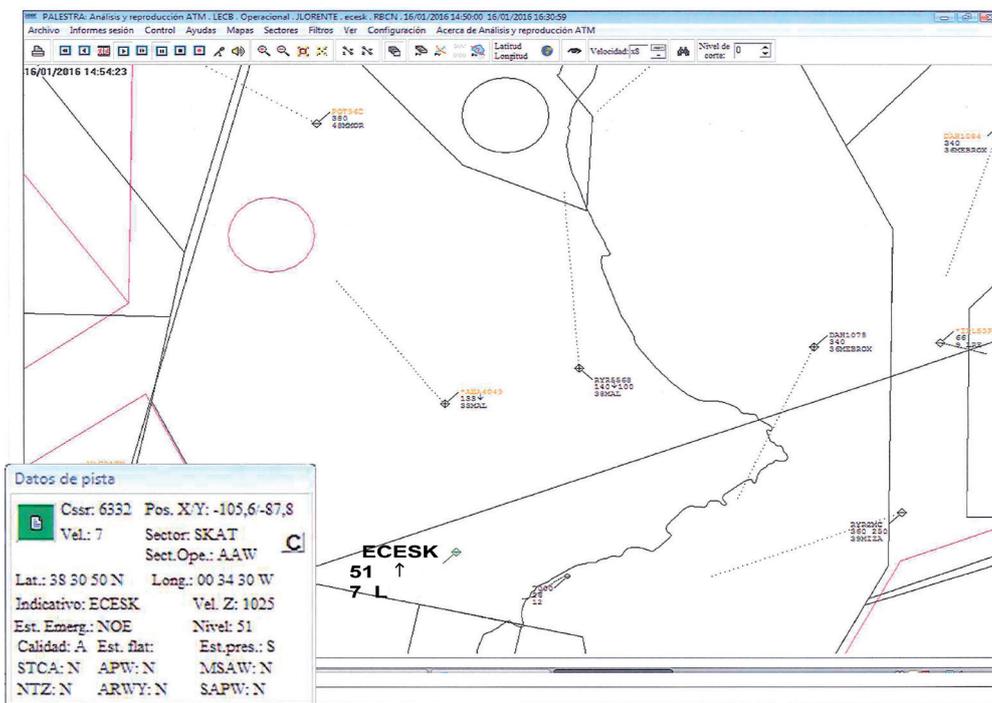
Wind from the north at 0° and 10 kph, gusting to a maximum of 30 kph from the north. Winds aloft were strong (over 100 kph at 9000 meters), meaning that at low flight levels, and considering the mountainous terrain in the area, winds stronger than those recorded at the station in Cuenca cannot be ruled out. For example, given the synoptic conditions, at a level of 850 hPa (about 1500 meters above ground level), the wind could have been as high as 50 kph.

Visibility on the ground was good. The sky was clear, the temperature was 7° C, the relative humidity 40% and the pressure (QNH) was 1,030 hPa. Moreover, no significant weather events were observed.

1.8. Aids to navigation

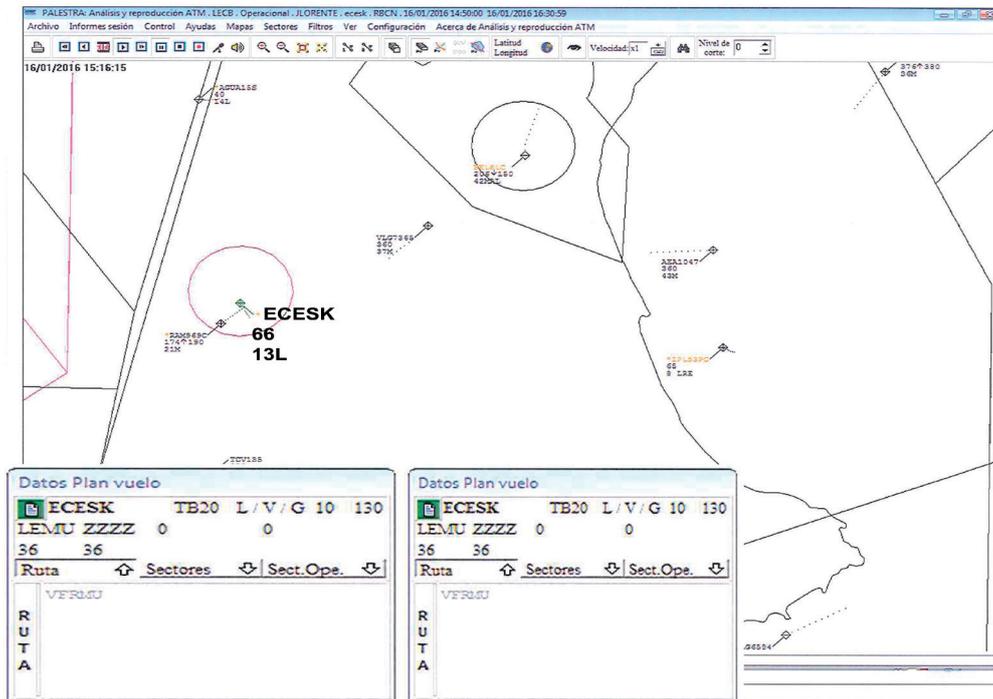
The parts of the radar track of most significance to the analysis of the accident are shown below.

At 15:54:23 the aircraft was in contact with Alicante Approach, flying at 5100 ft and climbing to reach 6500 ft six minutes later.

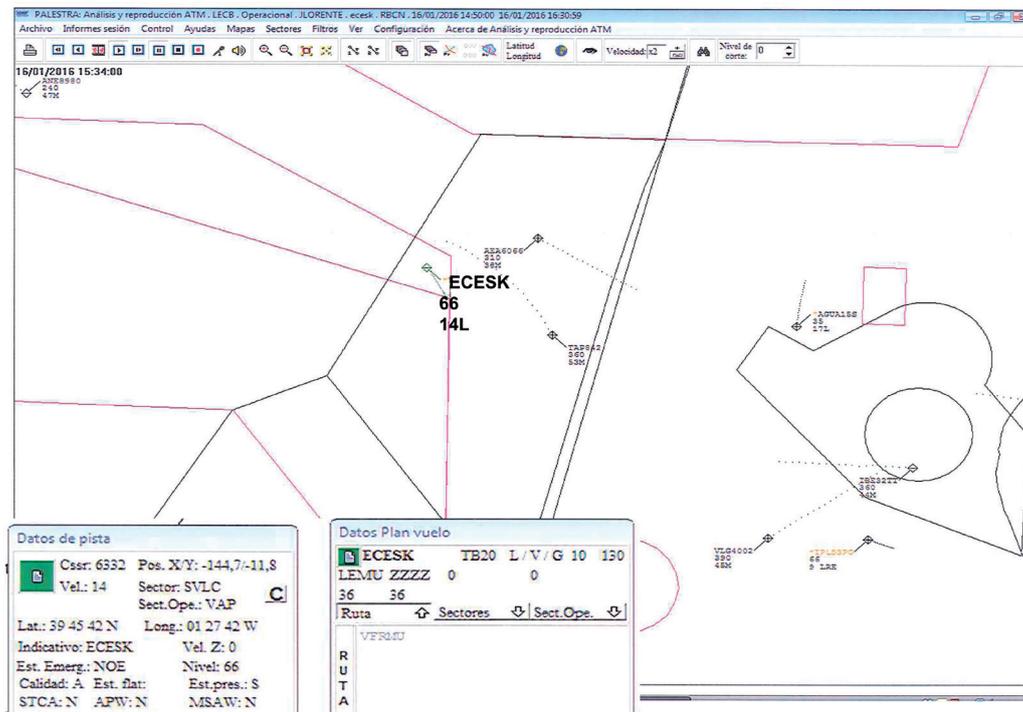


Report A-001/2016

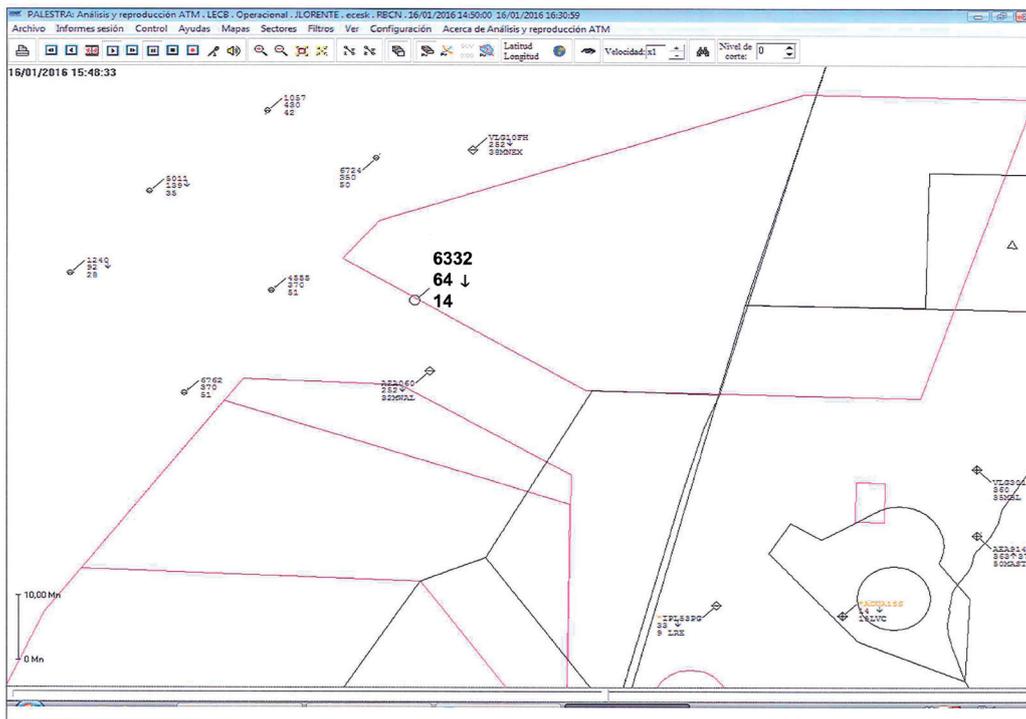
At 16:16:15 the aircraft was in contact with Valencia approach and flying at 6600 ft.



The aircraft's position at 16:34:00 was as follows:



The radar track was lost at 16:48:34. One second earlier, the aircraft's coordinates were 40° 13' 05" N, 1° 53' 12" W and its position was:



1.9. Communications

The communications between the pilot and the various control stations that the aircraft was in contact with that are of most interest to the analysis of the accident are provided below.

At 15:52:08 the pilot contacted Alicante approach to report that he had filed a visual flight plan to fly to León, that he had taken off from Mutxamel and that he was on heading 330 direct to Requena. He requested to fly at 6500 ft.

At 16:16:15 the pilot contacted Valencia approach to report he was flying to León on a visual flight plan.

At 16:33:52 the controller at Valencia approach instructed the pilot to contact Madrid. The pilot correctly acknowledged the instruction, this being his last communication with air traffic control services.

1.10. Aerodrome information

The aircraft had taken off from the Mutxamel aerodrome (Alicante), ICAO code LEMU, en route to the Pajares de los Oteros aerodrome (León), ICAO code LEOS.

1.11. Flight recorders

Not applicable.

1.12. Wreckage and impact information

The aircraft was completely destroyed. Its wreckage was found in two areas that were separated by 1.04 km.

The first area (at coordinates 40.200231 N, -1.872787 W) contained the debris from the left wing along with the body of the vulture. The diagram below shows the relative positions of the various parts of the left wing and of the vulture.

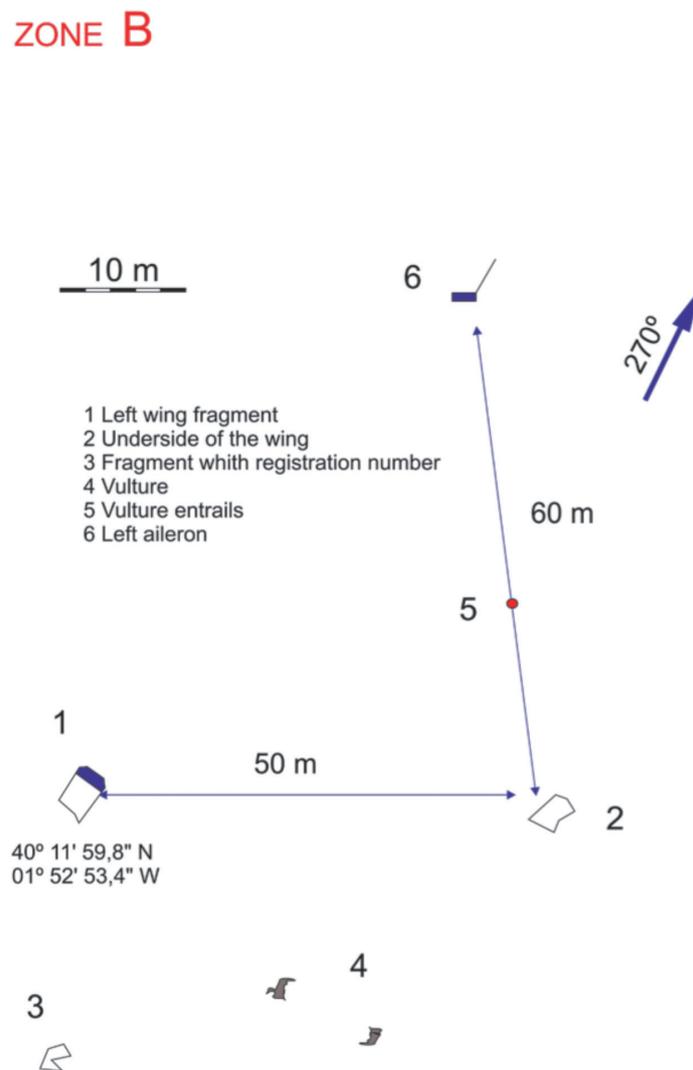


Fig. 1. Positions of the various parts of the left wing and of the vulture

The photographs below show debris from the left aileron, with part of a control linkage still attached to it, part of the skin from the bottom of the left wing, and the left wingtip, which were found in this area.



Fig. 2. Left aileron



Fig. 3. Fragment from underside of left wing



Fig. 4. Left wingtip

1.15. Survival aspects

Due to the nature of the accident, all four occupants of the aircraft were killed from multiple trauma injuries.

1.16. Tests and research

1.16.1. Statement from the dead pilot's friend and partner

He stated that the pilot was familiar with the Mutxamel-León route, as he flew it often. He thought that the pilot may have been flying into the sun and either did not see the vulture or if he did, had no time to avoid it if flying with the autopilot engaged.

He also said that the pilot, in addition to his experience as a Socata TB20 pilot, had a ULM license and used to fly a high-wing TECNAM ultralight.

1.16.2. Statement from two eyewitnesses who were hunting

There were two people hunting in the area near the accident; specifically, in the Picuerdo preserve, located in "Casa de la Sabrina", and in Tierra Muerta.

One of them stated that at about 16:45, he heard the sound of a small plane passing overhead, flying maybe 200 or 300 m above the ground. He then heard a rather loud impact. He saw the airplane continue to fly for a few more seconds, only to then go into a dive. The engine was running at high RPMs. It took the airplane about 8 seconds to fall to the ground, after which he heard as the airplane impacted the ground.

The other eyewitness stated that although he did not see the aircraft, he did hear it fly overhead. He later heard a fairly loud impact, followed by another, louder noise some 10 to 12 seconds later.

1.16.3. Statement from an eyewitness who was waiting for a tow truck

There were two individuals near the crash site who were waiting for a tow truck for their vehicle, which had broken down on kilometer 43 on road CM-2015. At around 16:50, one of them saw a small airplane flying over the mountains at an altitude that while not excessively low, was lower than he was used to seeing. The aircraft was flying normally and he did not notice anything unusual. Seconds later he saw fragments detach from the airplane, though he could not identify them as it was too far away. The aircraft then started pitching up and down, leaving a trail of black smoke, until, during one of the

pitching motions, it fell straight down in a nose spin. It disappeared from view and he heard a loud explosion.

He stated that from the time he saw the fragments detach, it took about 3 or 4 seconds for the airplane to fall to the ground.

The sound of the explosion was very loud. There were no sounds before it. The sound of the explosion was continuous and was accompanied for a few seconds by a cloud of black smoke that rose up from the hill where the airplane had crashed.

He stated that there was a large number of vultures flying in the area.

1.17. Organizational and management information

Not applicable.

1.18. Additional information

1.18.1. Bird concentration map

The chart below, showing bird gathering areas year-round, including the main vulture breeding colonies, was taken from the AIP (Aeronautical Information Publication).

1.18.2. Route taken by the aircraft

Data from the radar track were used to plot, on the bird concentration map published in the AIP, the route taken by the aircraft until the instant when the track was lost. As the figure below shows, the accident occurred in an area identified as having one of the main vulture breeding colonies:

The griffon vulture is a gliding bird more than a flying bird. It can fly between 1,800 and 3,500 meters above sea level, although on some days it can reach as high as 6,000 meters above sea level.

1.18.4. Certification requirements for the SOCATA TB 20 aircraft

The SOCATA TB 20 aircraft has an EASA.A.378 type certificate that specifies that the aircraft has been certified as per the FAR-23 regulations, Amendments 1 to 16, and that its airworthiness category is "Normal FAR-23".

The FAR-23 regulations, Amendments 1 to 16, do not require aircraft in the normal category to be certified against bird strikes. Subsequently, section 23.775 of Amendments 23-49 to FAR 23 required that, for commuter category airplanes, the windshield panes in front of the pilot (s) and supporting structures for these panes be able to withstand a bird strike from a two-pound bird.

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

2.1. General

On Saturday 16 January 2016, a SOCATA TB-20 aircraft, registration EC-ESK, took off at 15:47, as shown on the flight plan, on a visual flight from the Mutxamel aerodrome (Alicante, Spain) to the Pajares de los Oteros (León, Spain), from where it had left that same morning.

The accident occurred when the aircraft was flying over the Serranía de Cuenca Natural Park, which is labeled on the bird concentration map published in the AIP as one of the primary vulture breeding grounds. Flying over this area is permitted.

At the time of the accident, the aircraft was flying at an altitude of 6400 ft. Considering the elevation of the crash site (about 1350 meters), the aircraft was flying some 600 meters above ground level. Even though eyewitnesses reported their surprise at seeing the aircraft fly so low, it must have been an illusion. The applicable regulation, SERA.5005, Visual Flight Rules, letter f, point 2, requires that visual flights be at least 150 m (500 ft) above the highest obstacle within a 150-m (500-ft) radius of the aircraft. This means that the pilot was in compliance with the requirement in this regulation for this type of flight.

2.2. Analysis of the griffon vulture strike

The vulture that impacted the aircraft was an adult specimen weighing 6 to 9 kg. Based on the radar track, at the time of the accident the aircraft was flying at a speed of 140 kts. The kinetic energy delivered by the impact with the vulture, not taking into account the air speed, was between 15,561.60 and 23,342.40 joules, for a bird weight of 6 or 9 kilos, respectively.

To put these kinetic energy figures into perspective, the current EASA certification specifications for normal, utility, acrobatic and commuter category airplanes (CS-23) only require that commuter category airplanes be able to withstand, without penetration, the impact of a 0.91 Kg (2 lb) bird when the velocity of the airplane relative to the bird along the airplane's flight path is equal to the airplane's maximum approach flap speed. That corresponds to deliver a kinetic energy of between a few joules and, in the case of the Fairchild SA-227, 5,566 joules.

Therefore, normal, utility, acrobatic and commuter category airplanes are not certified to withstand impacts with a kinetic energy as high as that delivered by this impact with the vulture.

2.3. Analysis of the pilot's actions

When encountering a vulture, the safest evasive maneuver is to gain altitude; since vultures are heavy birds that are not very agile, they will normally try to avoid a collision by descending.

It is impossible to know whether the pilot saw the vulture and tried to perform some type of evasive maneuver, or whether the collision took place without the pilot noticing the animal. At the time of the accident (16:47 local) the sun would have been near the pilot's line of sight, and if the autopilot had been engaged, the pilot may not have seen the bird due to not paying sufficient attention to his surroundings, or he may have seen it but not early enough to execute an evasive maneuver.

3. CONCLUSIONS

3.1. Findings

- The pilot had a valid license and medical certificate.
- The aircraft's documentation was valid and it was airworthy.
- Weather conditions were not limiting to visual flight.
- In his communications with the various air traffic control stations, the pilot did not report any type of technical failure in the aircraft during the flight.
- The area where the accident took place is labeled on the bird concentration map published in the AIP as one of the main vulture breeding areas year-round.
- According to the certification specifications, the wing of the SOCATA TB20 aircraft does not have to withstand a bird strike.

3.2. Causes/Contributing factors

The investigation has determined that this accident was caused by the loss of control of the aircraft as the result of losing part of the left wing following a bird strike with a vulture.

4. SAFETY RECOMMENDATIONS

None.

5. APPENDIX

ANNEX 1. MAP OF BIRD CONCENTRATIONS

ANNEX 1

MAP OF BIRD CONCENTRATIONS

