CIAIAC

COMISIÓN DE
INVESTIGACIÓN
DE ACCIDENTES
E INCIDENTES DE
AVIACIÓN CIVIL

Report A-015/2010

Accident involving a PIPER PA 25-260 aircraft, registration EC-CVD, operated by Aviación Agrícola J. Carreño, S.L., in the municipality of Aldeanueva de Barbarroya (Toledo), on 29 May 2010

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

Report

A-015/2010

Accident involving an PIPER PA 25-260 aircraft, registration EC-CVD, operated by Aviación Agrícola J. Carreño, S.L., in the municipality of Aldeanueva de Barbarroya (Toledo), on 29 May 2010

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO
SUBSECRETARÍA
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Edita: Centro de Publicaciones
Secretaría General Técnica
Ministerio de Fomento ©

NIPO: 161-12-172-1

Diseño y maquetación: Phoenix comunicación gráfica, S. L.

COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Tel.: +34 91 597 89 63
Fax: +34 91 463 55 35

E-mail: ciaiac@fomento.es
http://www.ciaiac.es

C/ Fruela, 6
28011 Madrid (España)

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.

Table of contents

Abbreviations

00°	Sexagesimal degree(s)
00 °C	Degrees centigrade
AESA	Spanish Aviation Safety Agency
CAMO	Continuing Airworthiness Management Organization
EC	European Commission
FAA	Federal Aviation Administration
h	Hour(s)
HP	Horsepower
km	Kilometer(s)
kg	Kilogram(s)
m	Meter(s)
MTOW	Maximum Takeoff Weight

Synopsis

Owner and operator:	Aviación Agrícola J. Carreño, S.L.
Aircraft:	Piper PA 25-260 "Pawnee", registration EC-CVD
Date and time of accident:	Saturday, 29 May 2010; at 11:45 local time
Site of accident:	Aldeanueva de Barbarroya (Toledo)
Persons onboard:	1. Killed
Type of flight:	Aerial work – Commercial – Agricultural
Date of approval:	19th September 2012

Summary of event

The pilot took off from a temporary runway near the municipality of Aldeanueva de Barbarroya (Toledo). The aircraft was loaded with pesticide for spraying.

The pilot had experience with the aircraft and had recently completed the rating course for agricultural operations, but he had no experience in that type of operation prior to the event.

The flight took place at a low altitude above ground level. After flying over a hill, the airplane descended down its side in a left-bank attitude at a significant pitch angle en route to the field that was to be sprayed with pesticide. As the airplane approached the property, it crashed to the ground.

The pilot died during the rescue despite the efforts of the emergency medical personnel at the scene.

The investigation concluded that the most likely cause of the accident was a loss of control of the aircraft as the pilot was maneuvering close to the ground. Contributing to the accident was the pilot's lack of experience, in particular with agricultural operations.

This report includes two (2) Safety Recommendations, one for the Continuous Airworthiness Management Organization (CAMO) to have it improve its quality procedures and another for Spanish Aviation Safety Agency (AESA) to ensure that the maintenance center's procedures are consistent with the level of maintenance they are authorized to perform.

1. FACTUAL INFORMATION

1.1. History of the flight

On 29 May 2010, at 11:45 local time, a Piper PA 25-260 aircraft, registration EC-CVD, crashed into the ground in the municipality of Aldeanueva de Barbarroya (Toledo). The aircraft had taken off minutes earlier from a nearby temporary runway and was carrying pesticide. The pilot perished as a result of the injuries sustained during the impact.

The day before, 28 May, the pilot had flown a ninety-minute positioning flight from a temporary runway in Cordoba to the temporary runway used as a supply base for the spraying of pesticide. That same day, 28 May, another pilot started the fumigation work on a flight that lasted approximately three hours.

The following day, 29 May, this second pilot continued the activity with a flight lasting two and a half hours. Then, with the aircraft once more in working condition and with half a load, the accident pilot took over for the previous pilot and took off.

The flight path taken is shown in Figure 1.

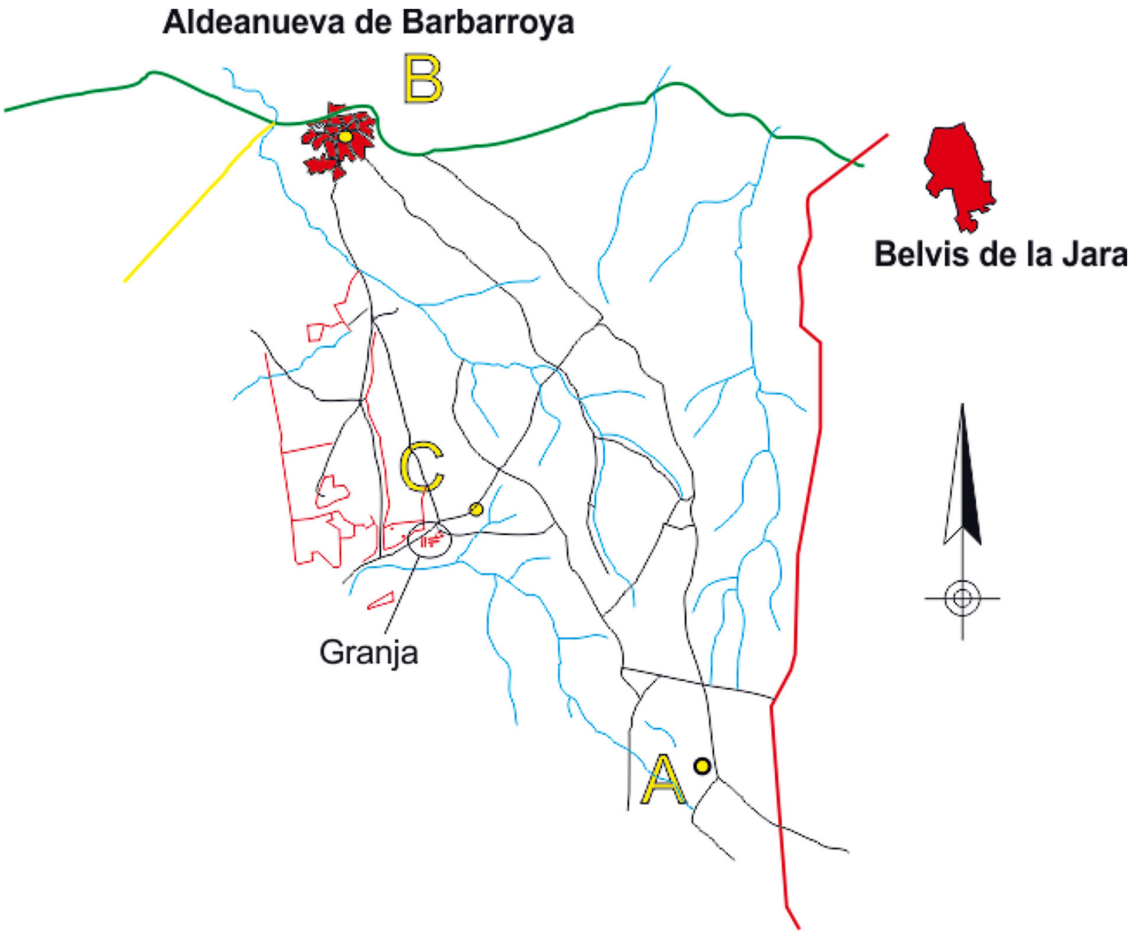

Figure 1.

As the figure shows, the aircraft took off from the temporary runway, point A (elevation 680 m) and headed to the town of Aldeanueva de Barbarroya, point B (elevation 494 m), which was 7.4 km to the northwest. Witnesses in this town reported seeing it fly over the town at a low altitude, noting that they could make out the pilot's head.

Still flying at a low altitude, the pilot headed to point C (elevation 585 m), the field to be sprayed, which was some 4 km south. On the way there, the pilot made two wide turns to the right next to a nearby farm where there were people working. These people confirmed that he was flying low over the ground as he flew away from them to make a new turn in the same direction. Shortly afterwards, with the airplane out of sight, they heard a crashing noise as they stopped hearing the sound from the engine. Assuming that there had been an accident, they telephoned emergency services and headed to the crash site, where they saw the aircraft on the ground.

The wreckage was located at the edge of the terrain being sprayed and exhibited signs of a frontal impact in a left bank and downward pitch attitude.

1.2. Injuries to persons

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

1.3. Damage to aircraft

The impact with the ground affected the front of the frame.

1.4. Other damage

The pesticide in the hopper spilled onto the ground. Some was thrown forward toward a tree that was in front of the wreckage.

1.5. Personnel information

1.5.1. *Pilot*

Age:	25
Nationality:	Spanish

License:	Commercial Pilot License
• Initial issue date:	26/07/2007
• Expiration date:	26/07/2012
Medical certificate renewed on:	08/02/2010
Medical certificate valid until:	08/02/2011

Ratings in effect and expiration dates:

• Single-engine airplane until:	18/01/2011.
• Airplane flight instructor until:	12/03/2011
• Agricultural (unrestricted) until:	31/03/2012

Flight hours:

• Total:	417 h and 30 minutes
• Total hours on the type:	178 h and 30 minutes, of which 165 had been towing banners.

The pilot had no flying experience involving agricultural operations.

1.6. Aircraft information

1.6.1. *Frame*

Manufacturer:	Piper
Model:	PA 25-260
Production number:	25-7405725
Registration:	EC-CVD
Year of manufacture:	1974
MTOW:	1,316 kg
Owner:	Aviación Agrícola J. Carrero, S.L.
Operator:	Same

1.6.2. *Airworthiness certificate*

Number:	1,170
Issue date:	01/02/2005
Expiration date:	07/10/2010

1.6.3. *Maintenance record*

Last inspection	Date	Hours
50-hour	27/05/2010	2,943 h
100-hour	7/09/2009	2,930 h

1.6.4. *Engine*

Manufacturer:	Lycoming
Model:	O-540-G1A5
Rated power:	260 HP
Serial number:	RL-18672-40A

Last inspection	Date	Hours
50-hours	27/05/2010	1,285 h
100-hours	7/09/2009	1,270 h
Installed on aircraft	17/03/1989	0 h

1.6.5. *Propeller*

Manufacturer:	McCauley
Model:	1A200/FA8452
Serial number:	SC001

Installed:	Aircraft hours	Date
	2,628 h	1/03/2003

1.6.6. *Modifications made*

The data sheets of Federal Aviation Administration (FAA) type certificate number 2A8 indicate that, based on the aircraft's serial number (25-7405725), the aircraft originally had two fuel tanks located in the wings. Moreover, and as recorded in the aircraft log book, a Hartzell constant-speed propeller had also been installed, in keeping with the same data sheets.

The inspection of the aircraft revealed two relevant changes to its configuration. The first was an engine modification to install a constant-pitch propeller, the McCauley

1A200/FA that was on the aircraft on the date of the accident. This variant is included in the same data sheets of the type certificate.

The second change affected the arrangement of the fuel tanks, since the accident aircraft had a single tank installed near the firewall, an option that is allowed by the data sheets for aircraft of the same model but with different serial numbers.

1.6.7. *Weight and balance information*

The information obtained allowed investigators to estimate the aircraft's takeoff weight:

- Fuel remaining from previous flight: 58 kg
- Pesticide remaining from previous flight: 25 kg
- Pesticide added before the flight: 183 kg
- Weight of the pilot (estimated): 75 kg

In all, the additional weight on takeoff was estimated at 341 kg, bringing the total takeoff weight to 1,039 kg, which is below the MTOW. The load conditions were also within the aircraft's flight envelope.

1.7. Meteorological information

Since no information specific to the accident area was available, Spain's national weather agency provided weather information based on general conditions in the area, and which matched that reported by eyewitnesses.

In keeping with the above, the most likely weather conditions were weak winds from the west on the ground and at low levels, mostly clear or clear skies and temperatures around 24 °C.

1.8. Aids to navigation

Not applicable. The flight was conducted under visual flight rules.

1.9. Communications

There were no radio communications during the flight.

1.10. Aerodrome information

Not applicable.

1.11. Flight recorders

The aircraft was not equipped with either a flight data recorder or with a voice recorder for the pilot's seat. Applicable aviation regulations did not require the aircraft to carry any type of recorder onboard.

1.12. Wreckage and impact information

Shortly before the accident, the aircraft was flying in wide circles at a low altitude over the area being sprayed. In the final seconds, it flew over the crest of a hill, located 180 m before the impact point, as it started to descend down the side of this hill toward the boundary of the property that was being sprayed.

The wreckage, which was confined to one location and showed no signs of having moved along the ground, was found near a labor road. The areas of the aircraft most affected by the impact were the left wing, the engine compartment and the right wing.

The damage to these components was as follows: on the left wing, the wingtip was bent upward, the frame area, where the braces are anchored, had collapsed and the same braces arched downward. See Figure 2.

Figure 2. Aircraft wreckage

The area housing the engine and the hopper was collapsed. The engine and propeller were shifted left from the centerline of the fuselage and the right wing exhibited significant creasing along its leading edge and upper surface.

The pesticide contained within the hopper was ejected forward onto the vegetation and ground ahead of the aircraft as a result of the impact.

1.13. Medical and pathological information

The forensic analysis revealed that the injuries were mainly confined to the pilot's right side, head and extremities. Specifically, the chest injuries indicated that the safety harness was fastened.

The remaining biological and toxicological studies did not reveal any information of interest to the investigation.

1.14. Fire

There was no fire of either the aircraft or the surrounding terrain.

1.15. Survival aspects

The injuries sustained by the pilot as a result of the impact with the ground were such that emergency personnel were unable to save his life.

The right anchor wire on the harness's inertia reel was severed by the pulling force to which it was subjected. Likewise, the safety helmet exhibited a lengthwise gash along its lower right part, possibly made by the breaking wire.

1.16. Tests and research

1.16.1. *Inspection of the wreckage*

A detailed inspection of the wreckage showed that the flight controls retained continuity after impact. The flaps were deployed halfway, consistent with the position selected on the control in the cockpit.

The emergency load release lever had not been actuated. The throttle and mix levers were at the forward limit of their travel.

There was damage to the lower right side of the power-plant. The propeller hub was crushed and one of the blades was twisted forward and its tip missing. Some of the bolts attaching the plate to the engine were sheared.

1.16.2. *Analysis of the powerplant*

The engine was inspected in a workshop and found to exhibit signs of prolonged use and poor maintenance.

There were holes in the exhaust pipes that had been repaired by soldering. The air baffles in the engine compartment were worn. There was rust on the spark plug threads and the electrodes were of different types. One of the disassembled cylinders had a crack going from a valve to the thread on one of the spark plugs. There was rust in the cylinder base housing in the crankcase.

Despite this, there was no evidence that the engine malfunctioned.

1.16.3. *Flight preparation*

The aircraft's operator, who was also its usual pilot, was the person who had been flying the airplane before the accident flight and one of the people who was in contact with the accident pilot. He stated that the aircraft was loaded with three liters of pesticide and 180 liters of water. It was not refueled.

As regards the operation, he stated that he showed the pilot the location of the fields being sprayed on a map. He also stated that the purpose of the flight was for the pilot to familiarize himself with the operation.

1.17. Organizational and management information

1.17.1. *Information regarding the modifications made to the aircraft*

As for the modifications noted in Section 1.6.6, investigators delved into the history of these changes.

The investigation could find nothing in the maintenance records documenting the change to the location of the fuel tanks. There was also no effort made to renew the airworthiness certificate as a result of this change. Thus, this major modification, as defined in point 21 A.91 of Section A, Subpart D of Commission (EC) Regulation 1702/2003 of 24 September 2003, was not documented anywhere.

1.17.2. *Maintenance information*

On 24 March 2010, the AESA (Spanish Aviation Safety Agency) approved the aircraft's maintenance program, AD-PM-PA25-CVD. In this approval, the Continuing Airworthiness Management Organization (CAMO) was listed as Aeronáutica Delgado, S.L., which was also authorized to maintain the aircraft.

The following maintenance inspections were logged in the engine log book:

- On 7 September 2009, with 1,270 hours on the engine, the 100-hour/annual inspections were performed. FAA directive 2008-19-05 (on cracks in the cylinder heads of O-540 engines) was also implemented.
- On 27 May 2010, with 1,282 hours on the engine, a 50-hour inspection was performed.

The manufacturer's maintenance manual includes the cleaning and adjustment of the gap in the spark plug electrodes as part of the 100-hour/annual inspection requirements.

1.18. Additional information

Not applicable.

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

2.1. Aspects prior to the accident

The pilot had been rated for the performance of crop spraying flights two months before the date of the accident. His previous experience consisted of 165 flight hours towing banners in a Piper PA 25-260, the same model as the accident aircraft.

In the days before the accident he had flown the operator's aircraft for 3 hours and 45 minutes over the course of three flights. The first had been a training/familiarization flight, and the last one a ferry flight to the temporary runway near the town of Aldeanueva de Barbarroya (Toledo), where the operator was going to apply pesticide to a crop field.

As reported by the operator, the purpose of the accident flight was for the pilot to familiarize himself with the operation. The margin between the estimated load being carried on the aircraft and its MTOW was sufficiently large that it would not jeopardize the aircraft's performance. A map was also used to orient the pilot as to the location of the plot of land being treated.

The evidence suggests that after taking off, the pilot flew to the town of Aldeanueva de Barbarroya, which he overflew at a low altitude before proceeding to the field to be sprayed. Upon reaching his destination, he flew over the area twice, tracing out two wide circles as he turned to the right. It was while turning for the third circle that the aircraft crashed to the ground.

2.2. Estimate of the flight path taken by the aircraft

As Figure 3 shows, the aircraft was turning to the right. The pilot flew over the crest of a hill and started to descend on the course indicated by line A in an effort to line up with the direction of the field, line B. The maneuver required losing altitude in a nose-down and left bank attitude. At that time the aircraft's flaps were extended one notch and its engine was at near maximum power.

The indication from the wreckage was that the aircraft touched the ground with its left wingtip, causing it to pivot about this wingtip and to strike the ground with the front engine section at a high nose-down attitude. The structure then collapsed, resulting in the leading edge of the right wing impacting the ground.

As for the arrangement of the wreckage on the ground, the offset between the frame's longitudinal axis and that of the engine compartment, as well as the lateral impacts to the cockpit, indicate the direction in which the aircraft was flying.

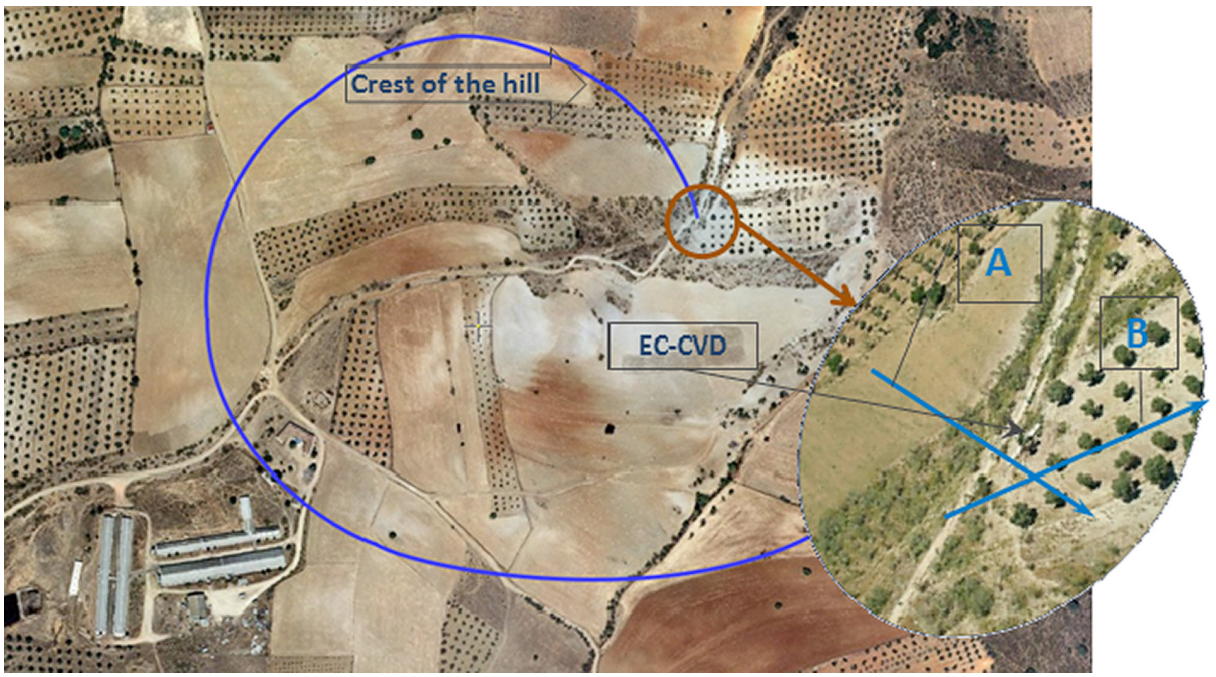

Figure 3. Estimated trajectory

In keeping with the above, it is believed that the pilot attempted to simulate a spraying run over the field and that he crashed to the ground as he tried to correct his course to align the aircraft with the field. The pilot may also have overestimated the distance that separated him from the ground, a task further hampered by the increased difficulty of making an approach over sloping terrain.

2.3. Operational aspects

The data show that the pilot was making his initial flights to familiarize himself with the technique of crop spraying. His previous experience was limited to banner towing flights. There are significant differences between these operations.

One notable difference is that fumigation involves flying at low altitudes, and therefore provides little clearance above the ground as the pilot attempts to adapt constantly to the changing profile of the ground.

The profile flown shows that after taking off, the pilot relied on direct visual contact with the ground to orient himself. Since the elevation of the temporary runway (680 m) was above that of the remaining points, the pilot had to descend, first to the town of Aldeanueva de Barbarroya (494 m), which the pilot overflew at a low altitude above the houses, and then climb to the elevation of the field (585 m) to be sprayed.

Finally, the load was below the maximum weight, which should have allowed the pilot to maneuver the aircraft with certain ease.

2.4. Aspects involving the aircraft

The inspection of the engine after the accident and the analysis of the wreckage indicate that the engine was under power at the time of the accident; however, the presence of rust on the spark plug threads, the combination of different types of spark plugs and the holes in the exhaust pipe, among other defects noted, highlight potential deficiencies in the maintenance of the engine.

As a result, it is believed that the inspection carried out by the maintenance center on 7 September 2009 and 27 May 2010 did not adhere to the practices included in the manufacturer's maintenance manual and that the proper corrective actions were not taken. Moreover, the CAMO could not guarantee the aircraft's continuing airworthiness.

As a result, this report includes the following safety recommendations:

- One directed at Aeronáutica Delgado, S.L. as the CAMO to review its quality procedures so as to ensure the proper maintenance of the aircraft that it manages.
- And another to the Spanish Aviation Safety Agency (AESA) to ensure that the maintenance procedures of the Aeronáutica Delgado, S.L. maintenance center are adequate for the level of maintenance they are authorized to perform.

3. CONCLUSION

3.1. Findings

- The aircraft had a valid Airworthiness Certificate
- The pilot was qualified for the flight and no evidence was found that he was incapacitated during the flight.
- The pilot had no experience with agricultural operations.
- The aircraft's weight at takeoff was below its MTOW.
- The pilot's mission was not properly defined.
- The hopper was loaded with pesticide.
- The entire flight took place at a low altitude above the ground.
- The engine was under power at the time of impact.
- The aircraft impacted the ground at a left bank and significant downward pitch attitude.
- The debris field was compact.
- The wreckage was found at the boundary of the terrain being fumigated.
- An inspection of the engine revealed possible maintenance deficiencies.

3.2. Causes

The most likely cause of the accident was a loss of control of the aircraft as the pilot maneuvered close to the ground.

Contributing to the accident was the pilot's lack of experience, specifically with agricultural operations.

4. SAFETY RECOMMENDATIONS

REC 44/12. It is recommended that the Aeronáutica Delgado, S.L. maintenance management organization review its quality procedures so as to ensure the proper maintenance of the aircraft that it manages.

REC 45/12. It is recommended that the Spanish Aviation Safety Agency (AESA) ensure that the maintenance procedures of the Aeronáutica Delgado, S.L. maintenance center are adequate for the level of maintenance they are authorized to perform.