

Technical report

A-059/1999

**Accident involving Hispano Aviación HA-1112 M1L
«Buchón» aircraft, registration G-BOML, near
Sabadell airport on 25 Sep 1999**



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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 in which happened the event being investigated, with its causes and its consequences.

In accordance with the provisions of Law 21/2003 and Annex 13 to the Convention on International Civil Aviation, the investigation has exclusively a technical nature, without having been targeted at the declaration or assignment of blame or liability. The investigation has been carried out without having necessarily used legal evidence procedures and with no other basic aim than preventing future accidents.

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

This report has originally been issued in Spanish language. The English translation is provided for information purposes only.

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Abbreviations

00 °C	Degrees Celsius
00° 00' 00"	Degrees, minutes and seconds
Ac	Altostratus
ACC	Area Control Centre
ADF	Automatic Direction Finder
AIP	Aeronautical Information Publication
APP	Approach Control
ATC	Air Traffic Control
CAT I	Category I ICAO
Ci	Cirrus
CRM	Crew Resource Management
CTE	Commander
CTR	Control Zone
Cu	Cumulus
CVFR	Controlled Visual Flight Rules
CVR	Cockpit Voice Recorder
DH	Decision Height
DME	Distance Measuring Equipment
E	East
EPR	Engine Pressure Ratio
EM	Emitter
ETA	Estimated Time of Arrival
FAP	Final Approach Point
FDR	Flight Data Recorder
ft	Feet
g	Acceleration due to gravity
GPWS	Ground Proximity Warning System
h. min: seg	Hours, minutes and seconds
HP	Horsepower
hPa	Hecto-pascal
IAS	Indicated Air Speed
IFR	Instrumental Flight Rules
ILS	Instrumental Landing System
IMC	Instrumental Meteorological Conditions
INTA	National Institute of Aerospace Technology
Kms	Kilometres
Kts	Knots
Kw	Kilowatts
lbs	Pounds
m	Metres
MAC	Mean Aerodynamic Chord
mb	Milibars
MDA	Minimum Descent Altitude
MDH	Minimum Descent Height
METAR	Meteorological Actual Report
MHz	Megahertz
MM	Middle Marker
N	North
N/A	Not Applicable
NDB	Non Directional Beacon
MN	Nautical mile
OM	Outer Marker
P/N	Part Number
PF	Pilot Flying
PNF	Pilot Not Flying

Abbreviations

QNH	Air pressure adjustment to make the altimeter mark the altitude of the airport above sea level during landing and take off
RVR	Runway Visual Range
S/N	Serial Number
S	South
Sc	Stratocumulus
Shp	Shaft Horsepower
SVFR	Special Visual Flight Rules
TWR	Control Tower
U T C	Universal Coordinated Time
VIP	Very Important Passenger
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Radio-Range
W	West

1. FACTUAL INFORMATION

1.1. History of the Flight

A Hispano Aviación HA-1112-M1L Buchón aircraft, registration G-BOML, took off from Gerona airport at 9.15 UTC, with the pilot flying solo, accompanied by an Aztec Piper from Sabadell Aeroclub. It flew to Sabadell, where an aerial showl was taking place.

According to a witness testimony, when flying into Sabadell airport, the two aircraft, with the Piper in the lead, began a pass at a low height and in formation along runway 31. Approximately halfway down the runway, the HA-1112-M1L aircraft abandoned the formation to the left and partially repeated the pattern to perform a pass along the runway, at a low height and high speed, finishing with a climb with a barrel roll in the direction of Tarrasa and entered the left approach pattern to runway 31 at the right altitude.

During that maneuver, according to the report from the airport tower controller, the pilot requested authorisation to cross the airfield and land on runway end 13. Once authorisation was granted, he performed a short pattern that ended in a left turn at low height with between 30° or 45° of bank, as if trying to see the runway threshold he left behind, with his landing gear down and in a landing configuration.

At one point during the manoeuvre, the aircraft's left wing began to descend and the aircraft lost height. Despite attempts by the pilot to recover from the departure from controlled flight by increasing power and managing to climb a bit, it was not enough and, finally, the aircraft impacted against terrain and caught on fire.

The aircraft slid across the ground, broke the fence surrounding the airport, crossed the airport ring road, climbed the bank located before the runway threshold 13 and finally stopped in the strip at the threshold height, about 30 meters from the runway end. The aircraft caught on fire and was destroyed.

1.2. Injuries to Persons

Injuries	Fatal	Serious	Minor/none
Crew	1		
Passengers			
Others			

1.3. Damage to Aircraft

The aircraft was destroyed as a result of the impact with terrain and subsequent fire.

1.4. Other Damages

While moving across the ground after the impact, the burning aircraft dragged the perimeter fence of the airport and caused damage to the ring road and area adjacent to it.

1.5. Personnel Information

1.5.1. *Pilot in command*

Age/Sex: 40 years old/Male
Nationality: British
License: Basic Commercial Pilot
Number: BC/229828G/A
Validity of Licence:

— Renewal Date: 22/06/1999
— Expiration Date: 21/06/2000

Ratings. Flying license limited to:

- Flights under VFR meteorological conditions
- Exhibition flights or exhibition practice.
- Flights from the aircraft base to the place of the exhibition and vice versa.
- Flights for airworthiness evaluation of his own aircraft.

Total Flight Hours: 4565 hours.

1.6. Aircraft Information

1.6.1. *Airframe*

Make: Hispano Aviación, S. A.
Model: HA-1112 M1L «Buchón» (originally from the Messerschmitt Me-109 G-2)

Manufacturing Number: 151
Year of Manufacture: Rebuilt 06/05/1988
Registration: G-BOML
M.T.O.W.: 2850 kg (6270 pounds)
Owner: Classic Aviation Ltd. (Tortola, British Virgin Islands-C/O
PO Box 159,Basle Airport, Basle,Switzerland, CH-4030)
Operator: The Old Flying Machine Company

1.6.2. *Certificate of Airworthiness*

Number: PR 031303/004
Type: «Permit to Fly», given by the CAA UK, authorises a specified aircraft to carry out flights without a certificate of airworthiness, under certain conditions, in the United Kingdom as well as in countries that accept it. In this case, the main conditions are:

1. Exhibition flights / public demonstration, preparation for the exhibition, tests and transfer to/from their operation base.
2. Flights are not allowed over assemblies of people or populated areas, except for where necessary for take off and landing.
3. The aircraft will be maintained by an approved organisation and operated according to CAP632¹.
4. A sign will be placed in full view of the occupants indicating that «the aircraft has not been certified according to an international requirement».
5. A «Flight Release Certificate» will be available guaranteeing that the aircraft has been inspected and is equipped for flight.

Issue Date of «Permit to Fly»: 08/07/1999
Expiration Date of «Permit to Fly»: 07/07/2000

¹ CAP 632: Operation of «permit-to-fly» ex-military aircraft on the UK register. Civil Aviation Authority (CAA-UK).

1.6.3. *Maintenance Record*

Total Flight Hours: 364 hours
«Flight Release Certificate»²:
Issued By: The Old Flying Machine Company
(CAA Approval Number AI/9462/94)
Issue Date: 22/09/1999
Valid For: 16 hours or 40 days
Regulation on Application: British Civil Aviation Regulation (BCAR) A3-7 APP.2

1.6.4. *Engine*

Make: Packard Motor Car Co.
Model: Merlin 224MK
Power: 1610 HP (from its similarity with the Rolls Royce Merlin)
Series Number: 189277
Maintenance: Inspection record checked prior to issue of the «Flight Release Certificate».

1.7. **Meteorological Information**

According to witness testimonies, the meteorological conditions when the accident occurred was wind calm (the Control Tower estimates a 250-03 wind) and good visibility (CAVOK conditions: ceiling and visibility OK). Therefore, the meteorological conditions were adequate for carrying out a VFR visual flight.

The temperature at the time was estimated at approximately 27 °C.

1.8. **Aids to Navigation**

Navigation aids were not used. In any case, they are not considered relevant to the investigation of this accident.

1.9. **Communications**

Appendix C includes the communications that took place before the accident between the pilot and the Sabadell airport control tower.

² The «Flight Release Certificate» includes signatures of approval for the structure and engine of the aircraft.

According to the control tower, the best estimate that can be made from these communications is that the accident occurred at 9 hours 42 minutes and 15 seconds with a possible error of only a couple of seconds.

1.10. Aerodrome Information

The reference point of the Sabadell airport is located in the following co-ordinates: 41°31'15.25" N / 02°06'18.10" E with an elevation of 147.91 metres at sea level. The airport has a rough-textured concrete runway that is 900 meters long and has a 13-31 orientation.

The airport control tower communications have a frequency of 120.8 MHz.

1.11. Flight Recorders

The aircraft did not have flight recorders on board. They are not mandatory for this type of aircraft.

1.12. Wreckage and Impact Information

The aircraft made impact with its left wing and slid across the ground, resulting in a fuel explosion and subsequent fire.

The wing assembly remained mounted in position; the left wing was deformed and damaged, while the right wing was almost intact, damaged only by the fire. The right slat could move in and out while the left one was deformed and bent with the wing box during impact. Both slats remained in place.

The fuel tank located under and behind the pilot's seat had exploded outwards, melting the frame due to heat action, while the lower wall and floor of the cockpit were left intact.

The structure of the cockpit area, the windshield and the dome apparently didn't show any sign of distortion, the cockpit dome could open and close/lock, the transparencies were intact and the levers and controls were in normal positions (throttle and propeller pitch levers full forward, etc.). The landing gear was in place, with the gear down and locked.

The tail, engine and propeller had come off from their position. The rudder and elevators were detached and were located at the aircraft point of impact, a propeller blade was broken by the root and was embedded in the bank, the engine was still joined

together to the firewall by the fuel connections and didn't show any signs of other type of failure (valves, bearings, camshaft, etc.).

Appendix B shows a general view of the remains of the aircraft and a detail of the rudder.

1.13. Medical and Pathological Information

The pilot was alive and conscious when rescued, after the fire had been extinguished by airport emergency personnel. He suffered from burns to the head, arms and legs, and died the following day.

1.14. Fire

After impact with the terrain, there was an explosion, followed by a fire breaking out, the damage of which has been previously described. The fire was promptly extinguished by airport emergency personnel.

1.15. Survival Aspects

The violent impact, as well as the explosion and subsequent fire, made the pilot's chances of survival very low, despite the fact that he wore a helmet and used safety belts.

1.16. Tests and Research

1.16.1. *Testing on Aircraft Wreckage*

Due to the nature of the accident, it was not considered necessary to carry out any testing or additional investigations on the aircraft wreckage.

1.16.2. *Witnesses Testimonies*

Even though the accident took place in a public exhibition, the witnesses that gave testimonies were mainly staff or collaborators of the company that operated the aircraft, as well as the airport tower Chief Controller .

These testimonies (especially comments later sent by a first-degree relative of the pilot who also worked for the same company and had detailed knowledge on the manoeu-

vres the pilot usually carried out in exhibition flights) were used to reconstruct the aircraft's flight trajectory over Sabadell airport during the accident (See Appendix A). The comments and testimonies also allowed the previous factual description to be made without including any others worthy of mention. It has therefore not been considered necessary to repeat these testimonies, although their details have been taken into account in the elaboration of the accident analysis.

There is also a videotape belonging to a fan that shows the final part of the trajectory and the moments right after the accident, proving, in spite of the lateral and steep perspective of the camera, that the bank angle in the final turn increased suddenly from an initial 30 or 40° to around 80° and that the emergency personnel came to the rescue immediately after the accident.

All of this is confirmed by the controller who stated that, after communicating to the pilot that the landing gear was down and locked, and authorising runway 13, he «saw him in a very tight base leg but high enough to be able to land easily. But when he proceeded to make the last turn for the very short final, I thought it was at a banking angle of 50-60 degrees and that something was going wrong with the manoeuvre, which led me to sound the fire alarm just in case». This action resulted in the promptness of the arrival of the airport emergency service personnel.

1.16.3. *Remarks about the Aircraft*

The HA 1112-M1L aircraft was built by Hispano Aviación, S. A. after purchasing the licence from Messerschmitt, based on the Me 109G-2 but equipped, around 1954 with a Rolls-Royce Merlin 550/45 engine with 1610 HP and a Dowty Rotol four-blade propeller instead of the original Daimler Benz DB 605A engine with 1474 HP and the three-blade propeller used in the German aircraft.

The HA 1112-M1L aircraft is based on the HA 1109-K1L, with modifications to the engine and armament. It was manufactured in the late 1940's and early 1950's and was taken out of service from the Spanish Air Force in 1960.

The HA 1112-M1L aircraft presents the same marginal compliance of stability and handling qualities requirements as the original type design, inherent to the aircraft design, but enhanced, even more by increased torque (power) and mainly by the effect of the propeller slipstream, as well as some modifications (fin offset and others) introduced in order to install an engine that rotated counter-clockwise, used in some aircraft in the series.

In view of all this, the conditions imposed by the aircraft's «Permit to Fly» (a substitute in certain cases for the Certificate of Airworthiness for this type of exhibition aircraft) included limitations on aerobatics (it only allowed steep turns, flat slips, roll

barrels and ascending half loops) and also included the following warning labelled as a «Warning»:

«This aircraft presents many of the stability deficiencies of the original design type; all manoeuvres that can lead to an inadvertent loss of flight controllability are prohibited.»

The mentioned modifications, changes of propeller, engine and structural elements, made it necessary for the rudder trim to be adjusted to the *certified* value.

2. ANALYSIS

2.1. History of the Flight

The aircraft had travelled to Spain, together with others from The Old Flying Machine Co., to participate in an aeronautical exhibition carrying out aerobatic flights. The accident took place during the flight to Sabadell from Gerona airport, where the aircraft had spent the night.

The flight took off at 9.15 UTC without any incident, flying in a formation led by an Aztec Piper belonging to Sabadell Aeroclub.

According to witnesses testimonies, the statements received later on, and what is deduced from communications with Sabadell airport control tower, once at the airport, and when both aircraft were performing a pass at a low height and speed over runway 31/13, the aircraft abandoned the formation to the left, making part of the left approach pattern and performed a pass at a low altitude (estimated at 10-20 meters) and high speed (estimated at 260-270 knots) that ended approximately 200 meters from the end of the runway, in a climb (estimated at a 5g «pull») with a barrel roll in the direction of Tarrasa, returning to carry out the left approach pattern to enter on runway threshold 31. The figure estimates correspond to the comments sent later on the aforementioned first-degree relative of the pilot, which are considered to match other testimonies and comments received and analysed.

During the pattern, the pilot requested authorisation to land on runway threshold 13. The controller authorised him to use any one of the thresholds, at his choice. In order to proceed with this manoeuvre through runway threshold 13, the aircraft had to cross the field and carry out two steep turns to the left, the last one of which, at least, was carried out at a very low speed and very low height, in landing configuration, with the landing gear down.

All the available data, witnesses testimonies, the times stated by the tower controller and the images on the aforementioned fan videotape, lead to conclude that the final turn of the manoeuvre to face runway end 13 was too tight, possibly because the aircraft had overshoot the runway threshold and the pilot, wanting to be positioned for the landing, had to look back. According to the pilot's relative, the manoeuvre should have been made with 35-40 banking degree, while the controller estimates it to have been between 50-60 degrees.

The result was that the aircraft suffered a left wing-drop during the manoeuvre, losing height quickly. Although the pilot tried to recover it by increasing power and stepping on the right rudder to the maximum, he was able to climb a little, but not enough to avoid the accident.

A witness stated that he saw, from his position, that the aircraft «descended quickly, disappearing under and above the field level». The same witness stated that he heard the roar of the engine and the noise of the impact.

According to comments by the aforementioned relative, «when the pilot realised the stall was occurring, he applied more power and later reduced it, probably because of the increase in bank to the left caused by the propeller torque. Then, he stepped on the right pedal to the maximum and when the aircraft began to recover, it impacted with terrain». This would explain seeing the aircraft under and above the level of field level, as one of the witnesses indicated.

On the other hand, the great effect of the propeller slipstream could be due to the lack of trimming shown by the rudder trim, which would also explain the tendency to use manoeuvres towards the left, since when giving more power the left wing would tend to descend.

Regarding the accident itself, several hypotheses have been considered to explain how an experienced aerobatic pilot, like the one in command, could have entered into a stall condition in the final turn.

- a) Possible momentary distraction when looking back to locate the runway threshold that had been overshot.
- b) An erroneous estimate of the height of the bank or slope located at the runway end and, when attempting to correct it, the increase of power and rudder, causing a bigger banking due to the effect of the propeller slipstream and torque.
- c) The aforementioned relative of the pilot suggests as a probable cause the possible persistence of the vortexes generated in the quick pass and the «pull» previously exerted. In this case, when crossing the vortex, an increase in angle of attack would be induced with the resulting stall condition. This hypothesis cannot be discarded completely. However, it is impossible to know the effect and condition of these vortexes more than two-and-a-half minutes after the pass, as deduced from the times stated in communications with the tower, and, additionally the pilot's experience makes it plausible to presume he would be aware that the airfield is short.

It is therefore concluded that it is not possible to accurately determine the exact cause of the accident. The most probable cause was a conjunction of some of the hypotheses mentioned, combined with the aforementioned stability deficiencies and all of this in a demanding pilot environment such as can be the case of an air exhibition, especially in the final moments.

Appendix A shows the reconstruction of the aircraft' trajectory over Sabadell airport.

3. CONCLUSIONS

3.1. Findings

- The pilot had a valid Basic Commercial Pilot License limited to the type of flight he was carrying out.
- The aircraft had a «Permit to Fly», issued by the CAA-UK that included the «Flight Release Certificate» for the airframe and engine, signed by The Old Flying Machine Co. and approved by the British Aeronautical Authority (CAA-UK).
- The meteorological conditions were adequate for carrying out a visual flight and the wind was practically calm (estimated at 250-03).
- During the turn to the left for the final approach to the runway threshold 13, carried out at a very low speed and height, the aircraft lost control and fell to the ground.

3.2. Causes

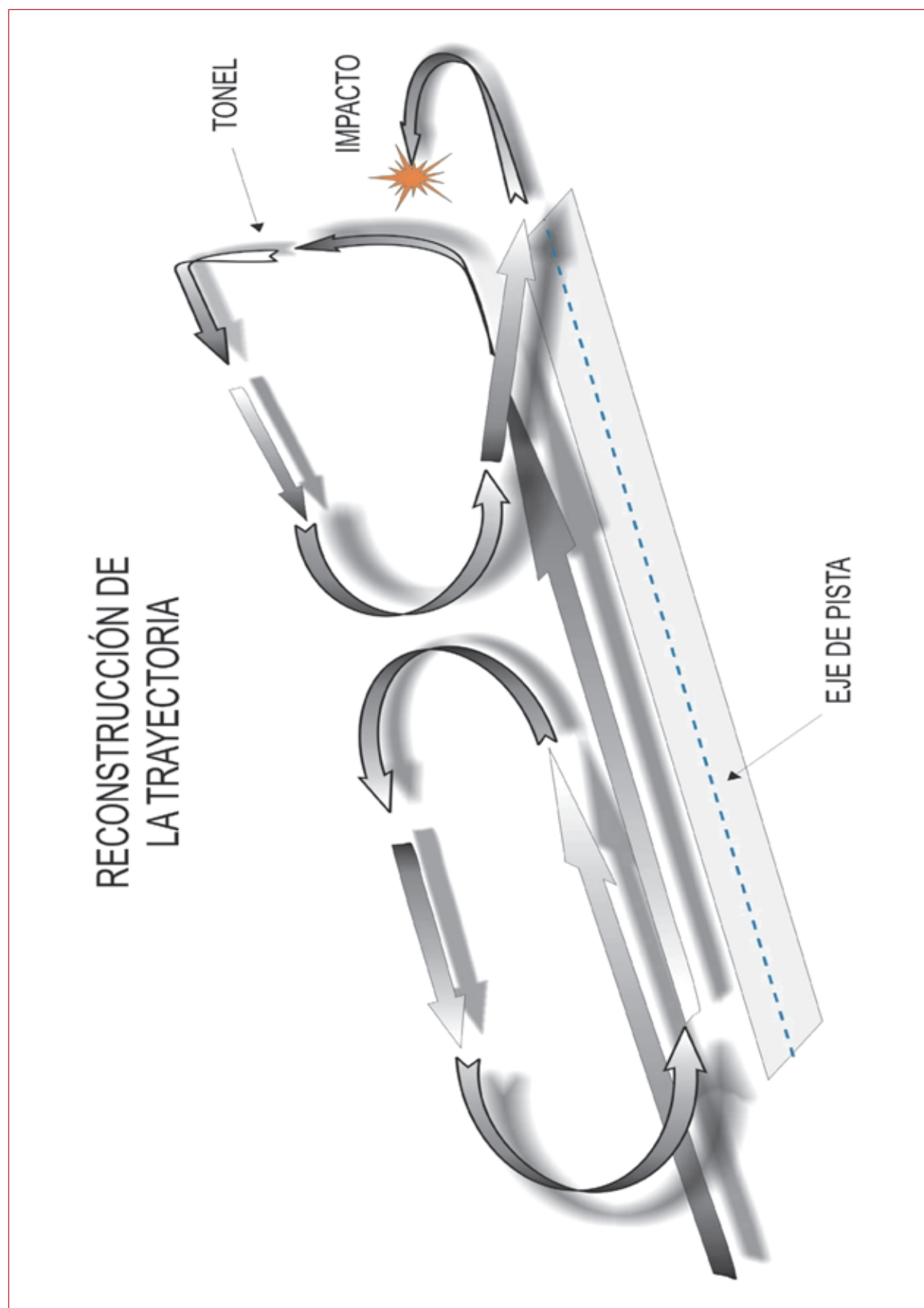
The most probable cause of the accident is considered to be that the aircraft had a left wing-drop departing from controlled flight at very low height during a tight turn to final to the runway threshold, after having performed a series of aerobatic manoeuvres over the airport.

4. SAFETY RECOMMENDATIONS

None.

APPENDICES

APPENDIX A
Reconstruction of the aircraft trajectory
over Sabadell Airport



APPENDIX B

Pictures of aircraft and rudder wreckage



Aircraft wreckage



Rudder wreckage

APPENDIX C
Communications between the pilot
and the Airport Control Tower

**Transcription of the verbal communications
Accident on 25 September, 1999 at Sabadell Airport
Aircraft: G-BOML**

NOTE: The aircraft came from Gerona in flight formation with other aircraft that was handling the communications on behalf of the two of them.
The G-BOML had carried out some acrobatic manoeuvres above the vertical of the airport and, when finished, he called the Tower. The runway in use was 31 with wind 250-03 (almost calm). The previous fly-by and approach were carried out to runway 31.
The communications were originally held in English.

TRANSCRIPTION:

0940z A/c Sabadell Messerschmitt is left hand down wind for 31.

0940'23" TWR Messerschmitt Roger Cleared to land 31.
A/c Cleared to land Messermicht. Thank you.

0940'42" A/c Sabadell Messerschmitt?
TWR Yes Sir?
A/c Could you confirm eh eh I prefer to land 13 is that possible?
TWR If you want runway 13 is OK. Cleared to land 13 or 31 at your discretion.
A/c Thank you very much. Starting for left down wind for 13.
TWR OK Sir. Cleared to land 13.

0941'45" A/c Messerschmitt turning final with wheels down an locked.
TWR OK. Landing Gear seems to be down and locked.

0941'55" TWR Cleared to land 13 Messer

This was the latest communications, and the accident happened at 09:42:15 with a few seconds of error.