

# CIAIAC

Comisión de Investigación  
de Accidentes e Incidentes  
de Aviación Civil

## **TECHNICAL REPORT**

**A-078/2002**

Accident occurred on 19  
December 2002 involving  
a PIPER PA-46-500TP  
aircraft (Malibu «Meridian»),  
N-53328, in Mount Mola  
of Son Montserrat, in the  
municipality of Bunyola  
(Balears)



MINISTERIO  
DE FOMENTO

# Technical report

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SECRETARÍA GENERAL DE  
TRANSPORTES

COMISIÓN DE INVESTIGACIÓN  
DE ACCIDENTES E INCIDENTES  
DE AVIACIÓN CIVIL

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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 and its causes and 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. This English translation is provided for information purposes only.

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## Abbreviations

00 °C	Degrees Celsius
ACC	Area Control Center
AIP	Aeronautical Information Publication
approx.	Approximately
ARO	Air traffic services reporting office
ATZ	Aerodrome traffic zone
CTR	Control zone
dd-mm-aaaa	Date in day, month and year
EFIS	Electronic Flight Instrument System
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FIR	Flight information region
FL	Flight level in hundred of feet
FP	ATC flight plan
ft	Feet
ft/min	Feet per minute
GNS/GPS	GEOnet Names Server/Global Positioning System
GVN	Call sign of the operator GRAVINA
h	Hour(s)
hh:mm:ss	Hours, minutes, seconds
HJ	Day time
IFR	Instrument flight rules
INM	Spanish National Meteorological Institute
kg	Kilogram(s)
km	Kilometer(s)
kt	Knot(s)
lb	Pound(s)
LCD	Liquid crystal display
LEX	Leading edge extension
m	Meter(s)
METAR	Meteorological report
MHz	Megahertz
MSA	Minimum safe altitude
MTOW	Maximum takeoff weight
N	North
NE	North-east
NM	Nautical miles
NW	North-west
PPL(A)	Private pilot licence (aeroplane)
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
SE	South-east
SSR	Secondary surveillance radar
SHP	Shaft horse power
SW	South-west
TAFOR	Terminal area forecast
TMA	Terminal control area
UK	United Kingdom of Great Britain
USA	United States of America
VFR	Visual flight rules
VMC	Visual meteorological conditions
W	West

## Synopsis

Operator:	Private
Owner:	Private
Aircraft:	Piper PA-46-500TP Malibu «Meridian»
Date and time of the accident:	19-12-2002; approx. 11:53:00 h <sup>1</sup>
Place of the accident:	Mount Mola de Son Montserrat in the municipality of Bunyola (Majorca Island, Balears)
Persons on board:	Three (pilot and two passengers)
Type of flight:	Private flight, returning to its usual base in Sabadell Airport
Date of approval:	28 September 2005

### Summary of the accident

The aircraft took off from the Son Bonet Aerodrome on the island of Majorca at 11:46 h. After takeoff it went off course penetrating CTR Palma de Mallorca. After some six minutes it flew over the mountains to the north of the island where the conditions were below the minimum for VFR flying. In level flight the aircraft crashed headlong into a rocky wall of the mountain at an altitude of some 2,000 ft. The three occupants were fatally injured.

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<sup>1</sup> Times are given in local time. UTC is two hours less than local time.



## 1. FACTUAL INFORMATION

### 1.1. History of the flight

At approximately 11:46 h on 19th December 2002, the aircraft Piper model PA-46-500 PT Malibu, Meridian, registration N-53328, took off from the San Bonet Aerodrome, situated at the northern limit of the CTR (control zone) of Palma (or Son San Juan) airport in Palma de Mallorca. The pilot and two passengers related to the pilot were on board. The pilot had completed a flight plan (FP) with Sabadell aerodrome registered as his destination. It was a private flight. The aircraft had landed at Son Bonet, Majorca, two days previously, 17th December, at around 15:30 h.

The FP indicated that the operation would be carried out under Visual Flight Rules (VFR), with a duration of 1:20 h up to Sabadell. The alternate aerodrome was Gerona. The aircraft's endurance was three hours of flight with 450 liters of fuel on board at takeoff. The call sign for the air traffic control (ATC) services was GVN 051, with the first three letters corresponding to the company Gravina, S. L., located in Sabadell, which was in the process of purchasing the aircraft. The FP also indicated that the aircraft was equipped with a SSR Mode C transponder.

The weather conditions in Son Bonet were within the limits of Visual Meteorological Conditions (VMC), with rainfall, horizontal visibility of some 8,000 m and cloud ceiling at 5,000 ft being recorded. During that time other local VFR traffic was operating normally in Son Bonet.

At 11:45 h, GVN 051 established contact with the control tower (TWR) of Palma to commence takeoff, as is obligatory, because Son Bonet lies within its control zone. After takeoff from Son Bonet, the aircraft penetrated some miles into the takeoff area of runways 06 L and R at Palma de Mallorca and was urgently requested by Control to head north and leave the area because at that moment a commercial passenger flight was taking off.

The aircraft's flight continued five or six minutes in a northerly direction, penetrating a mountainous area on the island which separates the airports of Palma and Son Bonet on the island's NW coast. That day some of the mountain peaks were covered by clouds.

At approximately 11:53 h, the aircraft, in horizontal flight, crashed into a steep SE facing mountain cliff. The point of impact's elevation was 600 m. The aircraft's three occupants died and the aircraft caught fire and was destroyed in the impact and explosion.

The site of the accident is some 13 NM to the north of Son San Juan and some 11 NM from Son Bonet, in an area known as mount Mola de Montserra in the Sierra d'es Puig de Mos mountains, near the locality of Orient in the municipality of Bunyola, Majorca. Its approximate geographical coordinates are 39° 44.763 N/02° 47.123 E.

The control radar track and the statements of several witnesses confirm the northerly direction of its course prior to the crash and its level flying.

The rescue services were notified immediately by witnesses of the accident. The aircraft wreckage was located at 12:53 h in a place accessible almost exclusively by helicopter.

### 1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal	1	2	3	
Serious				
Minor				Not applicable
None				Not applicable
<b>TOTAL</b>	<b>1</b>	<b>2</b>	<b>3</b>	

### 1.3. Damage to aircraft

The aircraft was destroyed in the impact, explosion and fire.

### 1.4. Other damage

The aircraft's fire caused vegetation to catch fire, affecting some bushes at the site of the impact and trees in the place where the wreckage fell and came to rest.

### 1.5. Personnel information

#### 1.5.1. Pilot

Age: 49 years  
Nationality: Spanish  
License: PPL(A) (Private Pilot License-Aeroplane)  
Ratings: — Single-engine landplanes (valid up to 02-05-2003)  
— PA-46 (valid up to 22-06-2003)  
— VFR-HJ (VFR, daytime visual)  
Pilot's license: — Date issued: 21-11-2000  
— Renewal date: 08-03-2002

Medical examinations:	— Initial:	02-05-2000
	— Last:	01-03-2002 (validity: 24 months)
Flight hours:	— Total:	460 h approx.
	— In the type:	106 h approx.
	— In the 30 days prior to the accident:	12 h approx.

The flight hours indicated above were provided by the company Gravina, S. L. The flight hours recorded in the pilot's license were 97:30 h.

Flight instruction in the aircraft type was received by the pilot in a simulator centre in Florida, USA and was certified on 24th May 2002. Type rating for flying the Piper PA-46 Malibu was obtained at the Meridian Aviation Limited center in Bournemouth, UK, on 27th June 2002. The instruction program also covered aircraft EFIS (Electronic Flight Instrument System) operation, with «VFR only» being noted down in the record.

## 1.6. Aircraft information

The aircraft Piper PA-46 Malibu «Meridian» made its first flight in August 1998 and obtained the type certificate number A25SO from the FAA (Federal Aviation Administration), as per FAR-23, Normal category, on 27th September 2000.

The aircraft involved in the accident operated under a USA registration in the name of Globe Aero Ltd., which has stated that it never took possession of the aircraft and that the North American registration was for its export to the PIPER distributor in the UK. Globe Aero Ltd. was only responsible for the ferry flight across the Atlantic Ocean.

In Spain, Type Certificate No. 215-1/1 was granted to this aircraft type on 8th January 2003, subsequent to this accident.

The company GRAVINA took control of the aircraft in the summer of 2002 and started to operate it under the North American registration. Whilst complying with the Spanish registration and air worthiness certificate obtainment procedures, this same aircraft took part in the type certification tests in Spain with a flight carried out on 16th November 2002 in Sabadell under the supervision of the Regional Office No. 2 of the Civil Aviation Authority (DGAC).

The model's main features are:

— Wingspan:	13.11 m
— Length:	8.98 m
— Height:	3.44 m
— Capacity:	6 occupants, including crew

- Usable fuel: 643 liters (170 gallons)
- Type of fuel: Jet-A1
- Endurance: 4.37 h
- Certified ceiling: 30,000 ft
- Maximum operating speed: 188 kt (348 km/h)

The aircraft was equipped with EFIS instrumentation, ATC-transponder, meteorological radar and GNS/GPS navigation systems. It was also fitted with ADAHRS (Air Data, Attitude and Heading Reference System).

### 1.6.1. *Airframe*

- Make: The New Piper Aircraft Inc.
- Model: PA-46-500TP
- Serial number: 4697098
- Year of manufacture: 2001
- Registration: N-53328
- MTOW: 4,850 lb (2,197 kg)
- Owner: Private
- Operator: Private

### 1.6.2. *Engine*

- Make: Pratt & Whitney Canada Corp.
- Model: PT6A-42A
- Power: 500 SHP (limited by certification)
- Serial number: PCE-RMO 114
- Last 100 h inspection: 03-09-2002

### 1.6.3. *Propeller*

- Make: Hartzell
- Model: HC-E4N-3Q
- Serial number: HH1274
- Last general inspection: 03-09-2002

#### 1.6.4. *Airworthiness certificate*

Number: DOA SO-1  
Category: Normal  
Date issued: 24-08-2001  
Issued by: FAA

#### 1.6.5. *Maintenance log*

Total flight hours: 140.8 by 14-10-2002<sup>1</sup>  
Last 100 h inspection: 03-09-2002<sup>2</sup>  
Hours at last 100 h inspection: 124 h

During the maintenance stoppage on 3rd September 2002, the magnetic flow detectors were replaced and path system compensation was carried out. Functional and in-flight operating tests were carried out after these modifications with satisfactory results.

Factory tests, performed the previous year, included altimeter, ATC-transponder, emergency altimeter systems and static tests.

### 1.7. **Meteorological information**

The area forecast for the island of Majorca for low altitude flying (GAMET) valid for the time of the accident predicted very cloudy skies, with the cloud base between 800 and 3,000 ft above sea level, local showers and moderate turbulence between 900 and 1,100 ft.

According to the routine aviation meteorological reports (METAR) of Palma de Mallorca airport, which is very close to the aerodrome of Son Bonet and to which it provides the meteorological service, at 11:30 h the conditions were:

- Variable direction winds with a strength of 3 kt.
- Horizontal visibility of 8,000 m.
- Drizzle in the airport and its vicinity.

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<sup>1</sup> According to the Aircraft Log. More up-to-date information provided by the operator estimates that the aircraft's total hours at the date of the accident were approximately 165.

<sup>2</sup> The report of the last 100 hours inspection carried out by a certified maintenance centre does not indicate any anomalies. Subsequently, the Piper Service Bulletin No. 1121 was incorporated on 14-10-2002.

- Slight cloud with base at 2,000 ft, cloudy skies with base at 5,000 ft.
- Ambient temperature 15 °C.
- Dew point 14 °C.
- QNH of 1,022 millibars.
- Without significant changes forecast for the next two hours.

The information notified by TWR Palma to GVN 051 referred to the wind conditions, with a 060° direction and a strength of 3 kt.

Later, the service controller stated that «the morning of the 19th showed a problematic weather conditions with practically 8/8 dense clouds and a critical cloud ceiling which in many zones reduced visibility».

According to the statements of persons present at the moment of takeoff, at the Son Bonet Aerodrome, although it was raining, the weather conditions were within VFR limits, there was a flow of light aircraft training flights taking off and landing, which was not interrupted, and other VFR flights operated during the morning.

Witnesses in the area where the accident occurred stated that in those places there was thick mist and clouds, which were hiding the tops of the mountains, and local rainfall. This information coincided with the probable weather data for the zone and time of the accident provided by the Spanish National Meteorological Institute (INM) during the investigation.

### **1.8. Aids to navigation**

#### **1.8.1. Radar track**

##### **1.8.1.1. Flight in which the accident occurred**

The flight's radar tracks, recorded in the Area Control Centre of Palma de Mallorca (ACC Palma) are available.

Figure B-2 shows the flight's radar track represented on the Palma de Mallorca airport visual approach chart included in the Aeronautical Information Publication (AIP) documentation, valid in September of 2003. The visual outgoing and incoming routes to the ATZ are the same now as on the date of the accident (see Figure B-1).

#### *Path on the ground*

The ground path shown in Figure B-2 presents two discontinuous legs, showing that there was loss of radar signal coverage.

The first leg commenced with radar signal pickup at 11:46:35 h and continued until 11:50:33 h, the moment at which the radar signals were lost for the first time.

During this leg, the aircraft appeared on the control screens erroneously identified as flight AEA 8401 instead of GVN 051. At that moment the ATC-transponder's response code was 3260. The track confirms the aircraft's deviation to the right after takeoff, which penetrated 3 km inside the airport's control zone (CTR) and more than 1 km inside the final approach area. In the last part of this leg the aircraft adopted a northerly course.

The second leg of the path, now with reference GVN 051 and code 7071, started at 11:51:05 h and terminated at 11:51:51 h, when the radar signal was lost for the second time. At that moment, the indication in the control tower was a speed of 117 kt, flight level FL 20 and rising. As can be seen in Figure B-2, in this leg the aircraft, already in a mountainous area, flew following the valley through which the Alaro-Orient highway runs. In its run, the aircraft passed between Peñal d'es Coros, near the tip of which (822 m) are the ruins of Castillo de Alaro castle and the Soucadena (816 m) and Puig de San Miguel (663 m) mountains, finding itself at the end of the leg opposite the south-east face of mount Mola de Son Montserrat (628 m). The radar track ends one mile before the point of impact.

### *Flight profile*

The flight profile is represented in Figure B-3 and shows the variation in altitude relayed by the aircraft via the ATC-transponder in the two legs defined above.

After takeoff, the aircraft climbed to an altitude of 1,500 ft at a rate of some 950 ft/min. At that moment the aircraft was entering CTR Palma and the takeoff area of runway 06L. Then, whilst turning to the north, the aircraft descended to an altitude of 1,000 ft and then climbed to 1,800 ft (some 1,200 ft above ground level at that moment).

In its northerly course, the aircraft descended to an altitude of 1,100 ft, when the radar signal was lost. This signal was recovered after some 50 seconds, initially recording an altitude of 1,400 ft, with the climb continuing to an altitude of 2,000 ft at 11:51:51 h, at which moment the recording was lost before the impact.

#### **1.8.1.2. Outward flight to Son Bonet**

The path of the aircraft's flight to Son Bonet, made on 17-12-2002, two days before the flight in which the accident occurred, is shown in Figure B-4.

It can be seen that in this flight the pilot followed the more usual route of the VFR corridor to the north of the CTR, flying over Pollensa and Inca in order to access the aerodrome transit zone.

Worth mentioning is the fact that, apart from a possible time synchronization error, the aircraft landed at 17:33 h, a little after sunset (17:26 h, according to official information) and therefore slightly outside the VFR limitations of the aerodrome and of the pilot.

### 1.9. Communications

The communications equipment of both the aircraft and the control offices functioned correctly throughout the whole flight.

The aircraft maintained communications with TWR Palma de Mallorca (118.30 MHz), on the local frequency of Son Bonet (123.5 MHz) and with the Airport traffic services Reporting Office (ARO) of Palma de Mallorca (130.25 MHz). A transcription only of the communications with TWR Palma has been obtained, of which the following statistics have been summarized:

- The recording covers a time period of nine and a half minutes.
- 72 communications between TWR and four aircraft operating at that moment, including GVN 051, were recorded.
- 29 of these communications were made between TWR and the aircraft involved in the accident.

The most relevant of the communications between TWR and GVN 051 are reproduced below:

Time hh:mm:ss	Station	Communication	Comment
11:44:35	GVN	Palma good morning from Gavina 051 in Son Bonet.	First radio communication of GVN 051 with TWR Palma
11:44:49	TWR	... Permission to take off from Son Bonet with the traffic in sight...	Authorization is given for takeoff and wind conditions are indicated. The transponder code is not mentioned in the conversations.
...			
11:47:21	TWR	Goflight nine one five, cleared for take-off zero six left...	TWR authorizes takeoff of other traffic from runway 06L in Palma whilst GVN 051 is taking off from the parallel runway in Son Bonet, four km to the north.
...			
11:48:10	TWR	Station responding three two six zero identify yourself.	



Hora hh:mm:ss	Estación	Comunicación	Comentario
11:48:17	TWR	Station responding three two six zero identify yourself.	
11:48:21	GVN	Er... GAVINA 051 responding in 3260, ELLEH...May I have a transponder?	
11:48:26	TWR	Turn to the left immediately. You are in the line of traffic takeoffs, please.	TWR observes in the surveillance radar screens that a flight has invaded the takeoff area of the runway in use. Several communications from TWR follow, urging the flight to immediately leave the takeoff zone because the aircraft's turn to the left is too gentle and slow.
11:48:53	GVN	I'm turning to the left. Please confirm course.	
11:48:56	TWR	Course north, take course north out of the CTR, please.	
11:49:00	GVN	Maintain course north, Gavina 051.	
...			
11:49:50	TWR	Five One, the altimeter is one thousand twenty-two. Maintain one thousand ft or less above the ground.	The controller updates information on the altimeter's correct draught which is necessary in order to be able to maintain the aircraft below the authorized level and know its height above ground with reference to maps.
11:50:44	TWR	GVN 051, squawk seven zero seven one, please.	Control gives a transponder squawk code in accordance with the air traffic rules
...			
11:50:56	TWR	GVN 051, confirm you will leave by zone Charlye Valdemosa.	Charlye Valdemosa may refer to the Valdemosa Corridor. There is no point Charlye on the VFR chart.
11:51:00	GVN	Affirmative, Gavina 051.	
11:51:02	TWR	Copied, <b>maintain visual contact with the ground at all times</b> and one thousand ft or less. I have no traffic in that zone, altimeter is one thousand twenty-two, <b>in contact with the ground.</b>	Control's insistence as regards visual contact with the ground has been highlighted in bold font. In the following communications Control gives instructions so that GVN 051 can update its FP.
...			
11:52:16			Last broken communication of GVN 051, acknowledging a frequency for change of FP.

## **1.10. Aerodrome information**

### **1.10.1. *General information on the aerodrome of Son Bonet***

The aerodrome of Son Bonet, code LESB, is situated 2 NM to the north of Palma airport, code LEPA, within and outside its aerodrome traffic zone (ATZ) but close to the northern limit of its control zone (CTR).

The aerodrome of Son Bonet has one asphalt runway, 1,000 m long and 22 m wide, with a 06/24 direction, parallel to the two runways in Palma de Mallorca or Son San Juan airport.

Son Bonet aerodrome's transit circuits are carried out to the north of the field, with turns to the left when operating on runway 06 and turns to the right when runway 24 is in service.

The aerodrome of Son Bonet only operates in the daytime (HJ). In general, greater share of its services, in particular those of control, meteorology and operations, are provided by the installations of Palma de Mallorca airport.

The orography to the north of CTR Palma is characterized by mountain chains which run in a NE to SW direction, with heights of up to 4,741 ft.

### **1.10.2. *VFR procedures in the vicinity of Palma***

There is a terminal control area, TMA Palma, in FIR Barcelona, the lateral limits of which include the whole of the Balearic Islands; therefore, uncontrolled VFR flights have to be conducted between the land or sea surface and the TMA's lower level, which varies in the different sectors into which it is divided, whilst respecting other areas of restricted and hazardous spaces and CTRs.

There is a rectangular-shaped control zone (CTR) around Palma airport, with its longest sides being parallel to the runways, within which only controlled flights, i.e. with Control's authorization, are accepted. This CTR covers the instrumental approach areas to the Palma runways.

Figure B-1 includes the visual approach chart to the aerodrome of Son Bonet and Palma airport, in force on the date of the accident, of the AIP (Aeronautical Information Publication). This chart shows that the aerodrome of Son Bonet is outside and close to the northern limit of CTR Palma de Mallorca airport and within its air transit zone (ATZ).

In order to operate in these airspaces, the use of an ATC-transponder, prior notification to ARO Palma de Mallorca and two-way radio communication, with permanent listening in to certain frequencies, are compulsory.

The visual access corridors to ATZ Palma are marked on the chart reproduced in Figure B-1. There is a lane towards the north, towards point N above Valdemosa. A corridor in a NE direction, parallel along its outside to the CTR, leads to the town of Inca and beyond to Pollensa bay. Another VFR corridor goes to the W towards Andratx. To the south of the CTR there are other corridors and lanes and in order to gain access to them, crossing the CTR, permission must first be obtained from control, with holds at certain points. These corridors are ideal routes for navigation because they are based on town and road landmarks, which are easy to distinguish and recognize from the air.

VFR departure procedures contained in the AIP establish that aircraft flying under VFR which wish to leave the CTR must inform TWR Palma, before takeoff, of the VFR notification point (NW, NE, SE or SW) through which they wish to proceed and receive instructions for the departure procedure.

VFR flying outside the corridors is permitted always provided that it is carried out below the TMA's lower level, in this case 300 m above ground or sea level and that VMC conditions exist. In the sector where the accident occurred, the terrain reaches elevations of 4,741 ft, meaning that VFR flying can go up to 5,741 ft. Instrumental charts specify in that sector an MSA (Minimum Safe Altitude) of 7,000 ft, below which IFR flights should not descend.

### **1.11. Flight recorders**

The aircraft was not equipped with flight data or cockpit voice recorders, which are not required for those of its type.

### **1.12. Wreckage and impact information**

#### **1.12.1. Point of impact**

Majorca is not very mountainous in the central and southern parts of the island; however there is a mountainous coastal region along its NW with peaks which reach 4,741 ft in some points. In some places the mountainous escarpments form cliffs with vertical walls.

The site of the accident is some 13 NM to the north of Son San Juan and some 11 NM from Son Bonet, in an area known as mount Mola de Montserrat in the Sierra d'es Puig de Mos mountains, near the locality of Orient in the municipality of Bunyola, Majorca. Its approximate geographical co-ordinates are 39° 44.763 N/02° 47.123 E.

Figure A-1 shows a panoramic view of the area in which a large black mark on the rocky wall, produced by the impact and subsequent fire of the aircraft and the fuel it was carrying, can be seen. The point of impact's elevation is some 600 m (2,000 ft).

At the foot of the cliff, the side of the mountain descends with a 50% gradient and is covered with trees and shrubs. A shrub at the vertical of the point of impact was burned but without signs of possible direct impacts.

#### **1.12.2. *Distribution and inspection of the wreckage***

The main wreckage was found grouped together, very broken up and burned, on the slope, at the foot of the black mark left by the explosion on the cliff. The fire which started with the impact continued in the aircraft wreckage but without spreading to the surrounding vegetation.

Some fragments were found in holes in the cliff (see Figure A-2), including a propeller blade. Other smaller aircraft fragments were scattered over an area several meters in diameter on the mountain slope.

Figure A-3 shows details of the propeller blade picked up on the slope.

From the examination of the wreckage it can be safely deduced that the aircraft was in a flight line with a NW bearing, at cruising speed, and that the propeller was receiving engine power when it crashed into the cliff.

#### **1.13. Medical and pathological information**

The autopsy carried out on the aircraft's occupants could only confirm that the bodies were completely charred after the accident.

#### **1.14. Fire**

The aircraft's direct impact against the rocky wall was extremely powerful, and resulted in an explosion and fire, which continued until all the aircraft's fuel had been consumed. The vegetation in a small area at the foot of the impact point also caught fire.

#### **1.15. Survival aspects**

Given the accident's characteristics, i.e. the aircraft's direct impact against a vertical wall at a cruising speed of 117 kt (216 km/h), followed by explosion and fire, it is concluded that there was no possibility of survival for the aircraft's occupants.

Rescue services reached the site of the accident in one hour.

## 1.16. Tests and research

### 1.16.1. *Statement of witnesses*

Statements were taken from three witnesses. One of them was driving along the road from Orient to Alaro, where it reaches the locality known as Sollerich, and the other two were hunting in the game preserve in that locality.

The three statements coincide and indicate that at the time of the accident there was a thick mist in the area. The first witness saw the aircraft through the mist whereas the other two only heard its engine, which sounded normal. The three of them estimated that the aircraft was flying very low and the three of them heard the crash and saw fire and smoke. One of the hunters warned the emergency services whilst the witness who was driving warned the Municipal Guard on reaching his destination.

### 1.16.2. *Other statements*

Owing to their interest in providing better knowledge of the accident, it has been considered advisable to include in this report the following statements:

- The first was made by a pilot from the company operating the aircraft and indicated that it was the third time that the pilot involved in the accident had flown to the island of Majorca and that it is normal to operate through the area of Pollense, to the north-east of the island, during both entry and departure.
- The second corresponds to other operators' pilots, some of whom were talking to the pilot involved in the accident prior to takeoff, and remembered that, on the day of the accident, they had commented to him that the height of the clouds above Inca, on the Son Bonet to Pollense route, was 1,500 ft at approximately 11:45 h and that visibility was good.
- Lastly, the third came from the aerodrome's local office staff and stated that:
  - He saw the pilot for the first time on the day of the flight because the arrival flight landed in the afternoon, after the aerodrome's office had closed. On being asked, the pilot confirmed that he was the aircraft's owner.
  - The pilot prepared the Flight Plan by computer and sent it, also by computer, to Operations at Palma de Mallorca airport. He also requested and noted down the aerodrome's local control and operating frequencies and those of the Palma de Mallorca airport control tower.
  - The pilot requested METAR and TAFOR information of airports on the Spanish mainland; the pilot seemed to remember that they were Reus, Gerona and Sabadell and that the pilot specifically commented that the conditions were bad in the first of them.

- To the witness's question as to why he hadn't requested meteorological information on the Balearic Islands, the pilot replied that he didn't think it was necessary because he could see what the weather was like because he was there. The witness does not think that he obtained this information beforehand.
- He confirmed that there were several VFR flights, all local, on the morning of the accident and that it started to rain when the aircraft was about to depart. At that moment nearly all the aircraft returned to ground, except one which was carrying out a continuous takeoff and landing training flight.
- Lastly, he indicated that, after takeoff, the aircraft turned to the right, which nobody ever does, as though he were going to Palma de Mallorca airport.

### **1.17. Organizational and management information**

#### **1.17.1. ATC services to VFR flights**

According to AIP Spain, section ENR 1-4-3, in Class D controlled airspace, corresponding to CTR Palma, ATC and VFR/VFR and VFR/IFR transit information and anti-collision advice is provided on request.

### **1.18. Additional information**

#### **1.18.1. Visual Flight Rules**

The flight was planned as VFR and, therefore, the visual flight rules of Annex II of ICAO and ATR (Air Traffic Regulations) were applicable to it.

Within the controlled airspace, visual flight rules require the pilot to keep a distance from clouds of 1.5 km on a horizontal plane and 300 m on a vertical plane and that its visibility is greater than 5,000 m. In uncontrolled airspace, a visibility in excess of 5,000 m is also required, together with absence of clouds and to be within sight of ground.

VFR flights must not take off or land in any aerodrome within a transit control zone:

- a) If the cloud ceiling is below 1,500 ft.
- b) If visibility at ground level is less than 5 km.

#### **1.18.2. Use of the ATC-transponder or SSR transponder**

Radar use and procedures are defined in section 4.6.5.3.8.a. of the Air Traffic Regulations and in AIP Spain, section ENR 1.6.

These regulations establish that pilots must operate their SSR transponders and select modes and codes in compliance with ATC instructions and that they must maintain them until they receive an indication to the contrary.

Both in TMA Barcelona and Palma, and throughout the whole of FIR Barcelona, Madrid and the Canary Islands, above flight level FL200, the aircraft which use these airspaces must be equipped with an SSR transponder with Mode A/3, as a minimum.

If ATC has not already specified a code, on entering these airspaces, aircraft must respond with code 2000 if the flight is controlled or code 7000 if it is not.

### 1.18.3. *Human factors*

Numerous studies on the contribution of human factors in the causes of accidents of all types reveal the importance of the decision-taking process. An important number of accidents have their origin in incorrect decisions taken previously and in the fact that they were not taken at the right moment.

The decision-taking process is not always logical; values, personality, attitudes and behavior and the habits of the people who take them all have an influence:

- Self-sufficient attitudes («Who are you to tell me what I have to do?»)
- Impulsive attitudes («I have to do something right now!»)
- Invulnerability attitudes («This can't be happening to me!»)
- Attitudes of showing off, boasting («I'm better than...»)
- Defeatism attitudes («I give up»)

Positive attitudes contrary to those indicated can include:

- Stick to the procedures that are normally good.
- Think before deciding.
- That can also happen to me.
- It's not worth taking risks for nothing.
- All is not lost, I can still do something.

Consideration must also be given to the fact that the human mind, which makes decisions, is limited and works sequentially. It concentrates on one thing at a time and finds it hard to share conscious attention amongst several tasks at once, reaching a stage of mental blockage under the stress of the workload.

Decisions need to be made when changes are detected which are considered to be important. In order to make decisions, the objectives of the subsequent action must be defined, the different options have to be identified, the best option has to be selected

and the results have to be evaluated. All these steps require time and the use of mental resources.

Decisions which are not urgent, which can be deliberate decisions, can become critical when made in moments of crisis if they are not made before and in time.

It is also well known that the way in which a question is posed can have an influence on the reply.



## 2. ANALYSIS

### 2.1. Flight preparation

Aircraft Piper, model PA-46-500 PT, Meridian, registration N-53328, was in the process of being purchased by a Spanish operator and was pending completion of the registration process in the Spanish Aircraft Register. As preliminary steps, it was in the process of having the type certificate authorized in Spain. All maintenance activities had been carried out within the appropriate time periods and it can be said that the aircraft was ready for its return flight to its operating base in Sabadell as planned.

The weather conditions for departure in Majorca, en route and at the flight's destination were within parameters permitting flight under visual flight rules (VFR). In Son Bonet and Palma de Mallorca, from the METAR information, a relative humidity of almost 100% from very low altitudes, evidenced by the proximity of outdoor and dew point temperatures of 15 and 14 °C, respectively, could be estimated. The gentle breeze from the east could make the clouds in the mountains to the north of the CTR stationary. Sufficient visibility, of 8 km, could be reduced by the onset of rain and more so at a height by the presence of scattered clouds at levels of 2,000 ft.

The general weather conditions, with the existence of a warm front, were propitious for the formation of stationary mist and clouds in the mountainous areas.

However, for people familiar with the area, the conditions could be considered to be sufficient for visual flying and, consequently, the VFR activity continued normally, especially instruction flights in the aerodrome's circuit.

The aircraft's pilot had arrived at Palma two days before and, consequently, could have rested sufficiently during the time he remained on the island. He had carried out the arrival flight from Sabadell on two previous occasions and this last time he entered by the VFR north corridor, on course 234°, from Pollensa. Owing to the fact that he landed more or less at sunset, it can be assumed that he preferred that route for safety reasons rather than the alternative, more direct route of the Valdemosa corridor, which would have allowed him to arrive a few minutes earlier. It is logical to assume that for the return flight, taking off from runway 06 at Son Bonet, he would choose the same route with the opposite course of 054°. The FP does not establish the route selected for leaving Palma.

Before takeoff, the pilot was informed of the weather conditions at his destination and in two alternative aerodromes but the person who attended him was surprised by his self-reliant attitude and the fact that he did not request information on the departure aerodrome because, as he indicated, he was there and could see the weather.

If the previous times he visited Majorca were the only flights he made in the area and if the weather conditions on those other occasions were good, the conditions on that

particular day could have proved to be different and difficult for a pilot with his general flying experience of some 400 h and some 100 h in the type of aircraft, which he had started to fly only a few months earlier and which is equipped with a turbine engine of considerable power (500 HP) and complete instrumentation.

Possibly the flying preparation did not include complete information on VFR procedures, orography and maps of the area, the meteorology in the different TMA departure routes and the ATC-transponder's use and draught.

The pilot completed a flight plan, which he communicated to Palma Operations via the computer terminal in Son Bonet. The FP did not indicate the route he planned to take. The FP indicated that the aircraft was equipped with an SSR Mode C transponder or transponder, capable of transmitting the aircraft's altitude.

### **2.2. Execution of the flight**

As is obligatory, before takeoff the pilot requested authorization from the Palma tower. Once permission had been granted, without establishing the radar transponder code which is necessary for flying in that TMA, the aircraft commenced takeoff at approximately 11:46:00 h. The transponder was energized and response code 3260 probably corresponded to that introduced in the previous flight from Sabadell to Son Bonet, carried out two days previously. It can be assumed that the transponder was not verified during the check prior to takeoff.

No mention was made in the takeoff permissions of departure procedures or the point at which the aircraft wished to leave the ATZ, which are expressly included in the Palma VFR chart.

One minute later, TWR authorized the instrumental takeoff of other traffic in Palma from runway 06L.

When the Gravina aircraft went off its forecast route and entered the CTR without permission, it was taking a possible collision course with the commercial traffic in takeoff. Presumably GVN 051 was not aware of where it was going. It is impossible to know what caused this deviation, whether errors in compasses, ignorance of the departure course, confusion as to visual checkpoints on the ground or a simple momentaneous distraction due to activity inside the cabin.

The incident was successfully addressed by Control, which identified the intruding aircraft, GVN 051, and forced it to abandon the area with a northerly course.

The aircraft's response was slow and imprecise, with a 180° turn to the left and a radius of some 2.5 NM, followed by a tighter 90° turn to the right, taking the northerly course.

Nor did it maintain its height, which oscillated between 1,000 and 1,800 m. These turns may have contributed to an increase in the pilot's disorientation.

During these few minutes radio activity was high, with 72 communications being recorded in 9.5 minutes, 40% of which were direct between TWR and the aircraft in question. The pilot had to attend the radio every eight seconds, without forgetting the flight, navigation and ground observation.

The situation required a great ability to react and a certain desire to receive assistance appears to have existed in the pilot when he requested confirmation of his course from Control. The aircraft had recently undergone changes to its course systems but there does not appear to have been any anomalies in them because on being requested to take a northerly course the aircraft carefully maintained it. Nor are there any data to lead to the suspicion of an altimetric error. The controller's insistence on the altimeter's correct draught must put aside any idea of incorrect use.

Because shortly after takeoff he took the wrong route, when he turned right for the northern course towards the mountains, the pilot may have been completely disoriented. The aircraft probably reached the mountains at about 11:50:00 h; the clouds would have forced him to descend to 1,000 ft and he would be just tens of metres above ground. Radar coverage was lost because of his low altitude (see Figures B-2 and B-3). He would then have flown over the Alaro to Orient highway, which is when he was seen and heard by some of the witnesses a short distance away.

At that moment TWR asked if it was his intention to leave the TMA via Valdemosá. The pilot responded in the affirmative but it is possible that he did not know what he was being asked and replying to.

The rest of the flight, one minute and a half more, was on a northerly course between clouds and clear patches, which according to witnesses existed, and the mountains against which the aircraft finally crashed in level flight. The aircraft's speed in the last radar log was 117 kt.

In the strong head-on collision against the rocky face the aircraft exploded and burst into flames, burning the 400 liters of Jet A-1 kerosene in the wings. In these circumstances the survival of the aircraft's occupants was most improbable.

### **2.3. Services provided by ATC control to the aircraft**

In class D airspace, ATC must provide separation for IFR aircraft from other IFR and VFR aircraft. This was done by the controller on this occasion.

The heavy workload in the aircraft's cabin was reflected in TWR which had to urgently solve the CTR's violation by an aircraft which was not expected.

The controller's first action was to clear the area, but without abandoning his attention to flight GVN 051, to which he gave the ATC-transponder code, which ought to have been provided prior to takeoff, and altimetric data.

He devoted a large part of his attention to the aircraft involved in the accident, which he apparently did not lose sight of since the moment it invaded the CTR, whilst also handling three IFR flights simultaneously in departure and arrival operations. The large number of communications may have complicated the task in the cabin of GVN 051, but it has to be noted that the information being transmitted was completely relevant.

At no time did the pilot indicate his possible disorientation nor did he specify that he required courses to leave the Palma area. The controller initially provided guidance for the aircraft to leave the CTR. Possibly he expected that the aircraft would retake the NE course in the direction of Inca and Pollensa. When it continued with the northerly course he judged it necessary to ascertain its intentions and it was then that he requested confirmation as to whether or not the pilot intended to depart via «Charlye Valdemosa». This question may have confused the pilot because there is no checkpoint denominated Charlie in the VFR approach chart to Palma and, with the Valdemosa checkpoint being N or November, he must have thought that Charlye referred to the initial letter of «corridor».

The pilot replied in the affirmative, possibly without knowing what he was saying. If he had communicated his wish to use the Pollensa exit, Control could have provided radar vectorial guidance.

Be that as it may, the aircraft persisted on its northerly course where there were mountains and clouds. In that area VFR flying was possible but maintaining altitudes below the TMA lower level, at approximately 4,500 ft (1,000 ft above ground), always provided that the conditions were VMC. The height maintained by the aircraft was approximately 2,000 ft, most certainly due to the environmental conditions.

The controller could not observe the weather conditions outside the ATZ, hence his insistence in his communications that the pilot should «maintain visual contact with the ground at all times». According to ATR provisions, separation from the ground is the VFR pilot's responsibility in addition to the obligation of keeping away from clouds, fog and other VFR aircraft with visual references.

### **2.4. Human factor aspects**

The pilot probably had the preconceived idea of returning to Sabadell that day. The decision to return, made previously and regardless of factors affecting the advisability of flying, would probably have been made on the assumption of good weather, as had been experienced on the date of his arrival at Palma.

The weather had worsened considerably on the 19th with the passing of the warm front. The pilot was informed, partly by other pilots, of weather conditions en route above Inca but apparently he was not aware of the difficulties imposed by the weather conditions. His attitude in the operations office at the aerodrome of Son Bonet denotes a certain self-sufficiency self-sufficient attitude on waiving more complete meteorological information for his departure and route. The flight in the company of relatives and in a brand new aircraft may have led to a certain tendency to «showing off».

Previous or implicit decisions not to thoroughly prepare the flight being undertaken turned against him subsequently. The pilot could perhaps have decided to postpone the flight until the conditions improved or until he had prepared the flight more conscientiously.

It is considered that the pilot's workload during the six minutes of flying was heavy for his level of experience. The initial mistake in the course and awareness of a near-miss with the commercial aircraft may have left the pilot rattled. In this state, and in addition to normal flight tasks, the pilot had to observe ground checkpoints with which he was not familiar, with reduced visibility, operate the transponder system with response code changes, attend to constant communications, make a note of the radio frequencies being communicated to him and, above all, make changes in his flight plan.

It would seem that he did not have time to stop and assess the possible lines of action to be taken at each moment. Without making his own decision on the route to be followed, he may have given up, allowing himself to be persuaded by the idea of following course N and a reference such as Valdemosa employing instrumental confirmation in order to navigate. Following this line, the way in which the controller queried the intentions of flight GVN, which was following a northerly course («GVN 051, confirm you will leave by zone Charlie Valdemosa»), may in some manner have stimulated the pilot's affirmative response and the aircraft's continuance on that course. The pilot, in a possibly confused state of mind, may have responded affirmatively to any question put to him. In this situation, it is possible that the pilot could not remember that the safe departure course was towards the NW (054°). Even though the pilot may have been hoping to obtain greater assistance from Control, he was unable to transmit this need in order to achieve that objective.

### 3. CONCLUSION

#### 3.1. Findings

- The pilot held a valid license with ratings for the aircraft type and VFR flying being carried out.
- The pilot's experience in the type was limited to 100 flight hours in the last six months.
- Although the aircraft had not completed its registration in Spain, there is no evidence of possible conditions which could affect its airworthiness on the date of the accident. It was being operated within authorized limits, it was of recent construction (less than two years) and its maintenance inspections had been satisfactorily completed within the specified time periods.
- The corresponding Flight Plan had been submitted and distributed, although without specifying the route and the ATC-transponder's response code.
- The weather conditions in the departure aerodrome were within the limits established for VFR flights. Nevertheless, the risk existed of these limits being exceeded in some parts of the island of Majorca, with a reduction in visibility and low ceilings in the mountainous regions in the north of the island.
- Apparently without realizing it, the aircraft entered CTR Palma de Mallorca, causing a near-miss incident with another aircraft in IFR flight.
- The correction maneuvers may have disorientated the pilot, who maintained the northerly course initially indicated by control for the aircraft to leave the CTR, entering the mountainous region in the NW of the island.
- The aircraft confirmed to control that it would leave the control zone by point N, Valdemosa, to the north of the ATZ.
- After passing through a valley between two mountains, the aircraft crashed head-on against a rocky wall, which the pilot probably did not see because it was covered by clouds and thick fog.
- As a result of the impact, the aircraft exploded and caught fire, burning the fuel on board until completely consumed, with the fire spreading to a small area of mountain. The aircraft was completely destroyed and the three occupants perished.

#### 3.2. Causes

It is believed that the accident occurred as a result of the marginal VMC conditions which existed in the area where the aircraft was flying under VFR rules.

The aircraft entered this area possibly due to the pilot's disorientation and inadequate preparation and execution of the flight.

#### **4. SAFETY RECOMMENDATIONS**

None.

# APPENDICES



**APPENDIX A**  
**Photographs of the wreckage**  
**and their location**



Figure A-1. *Panoramic view of the accident site*



Figure A-2. *Wreckage on the mountain's vertical wall*





Figure A-3. *Wreckage of a propeller blade*

**APPENDIX B**  
**Radar track, flight profile**  
**and flight charts**

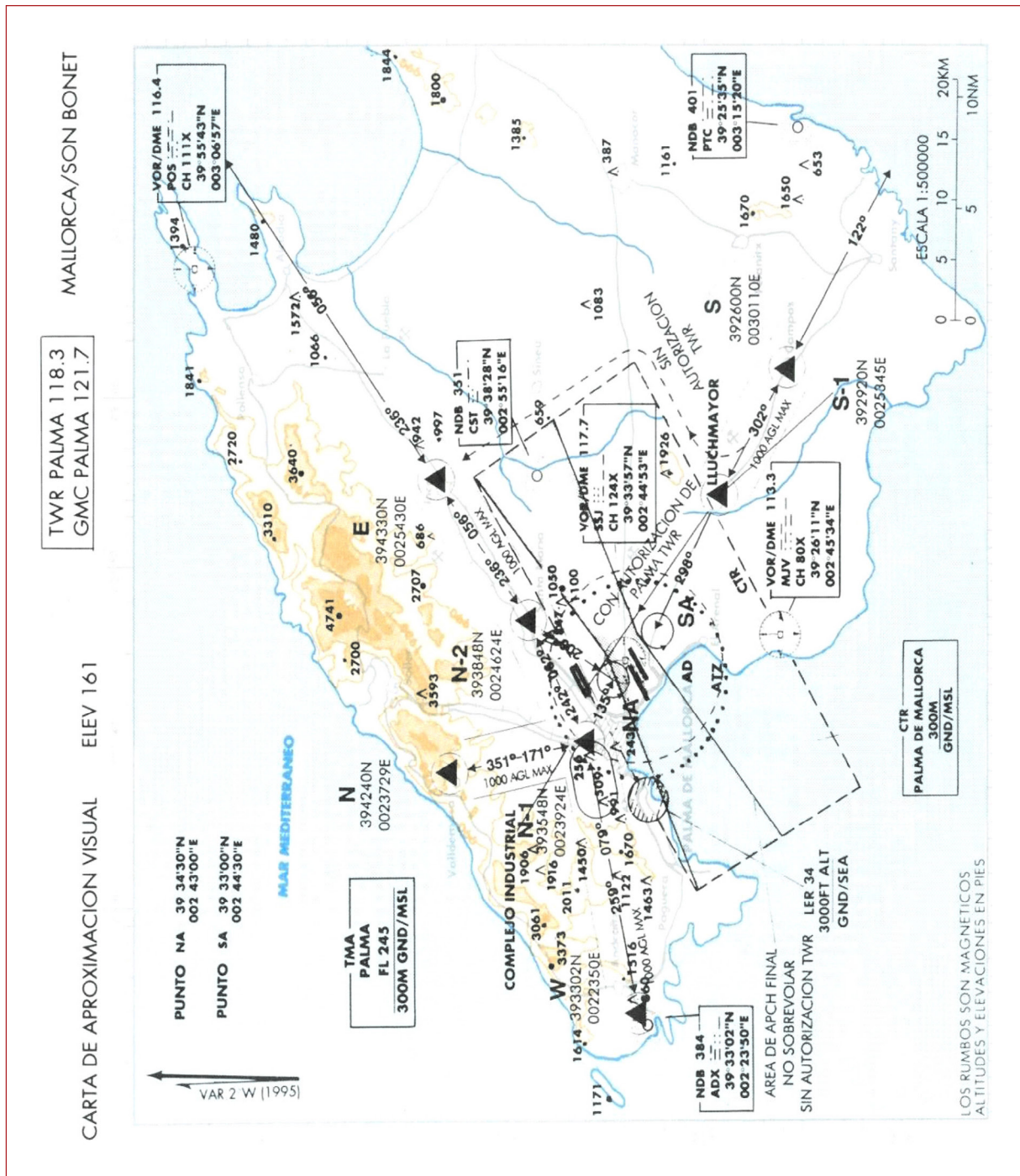


Figure B-1. VFR flight chart, valid on the date of the accident, at Son Bonet Aerodrome



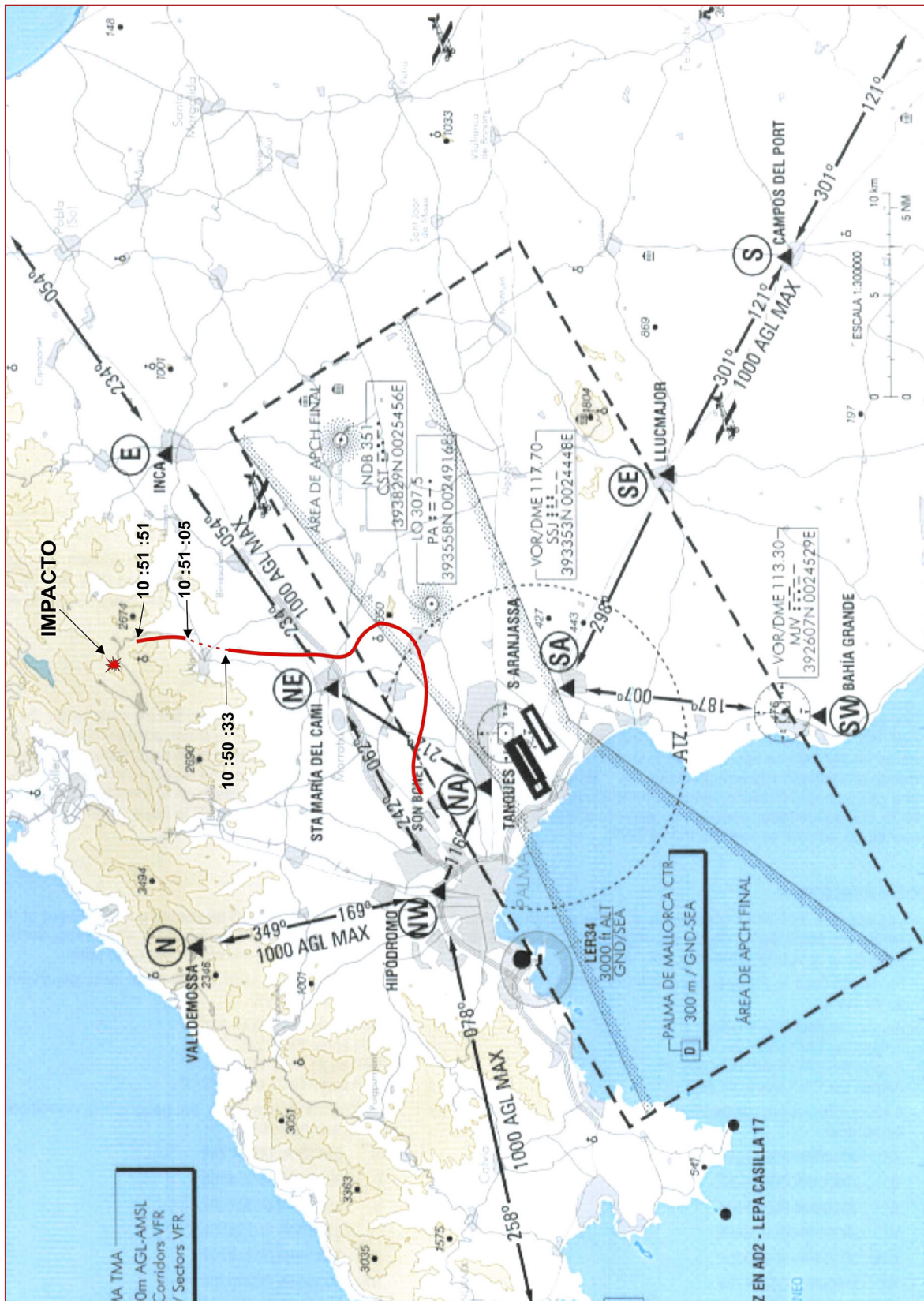


Figure B-2. Radar track of the accident flight

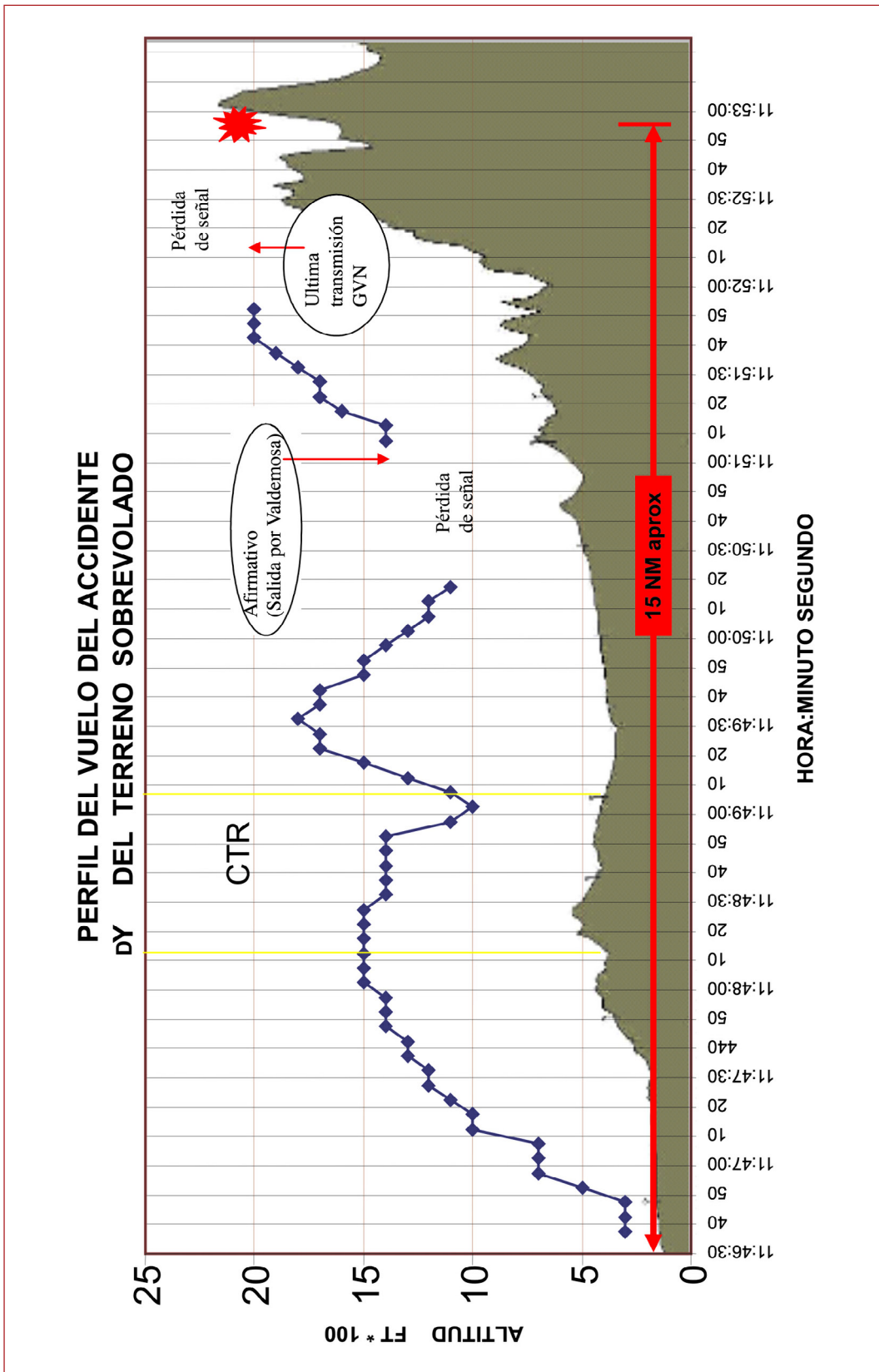


Figure B-3. Profile of the accident flight

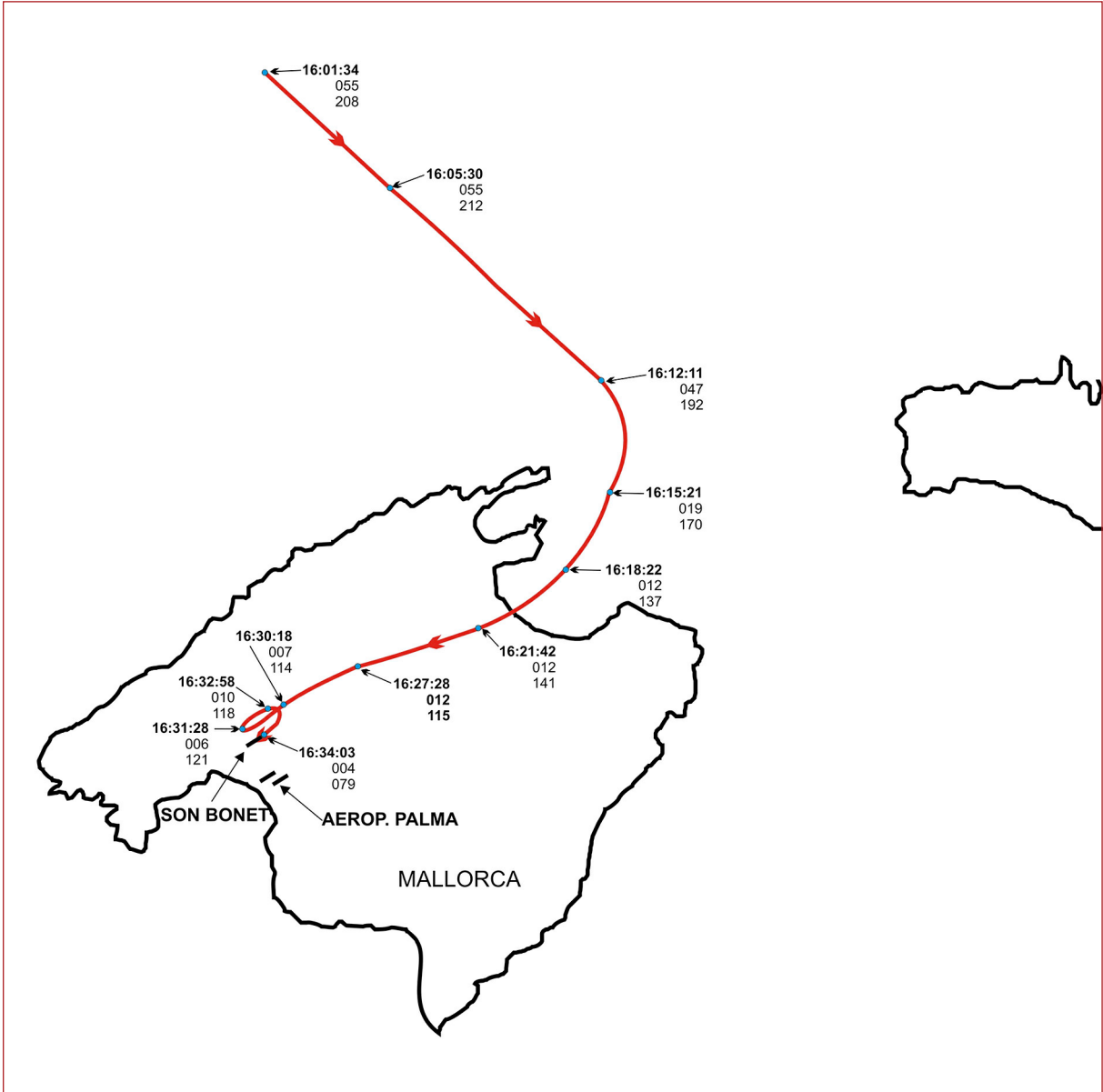


Figure B-4. Radar track of the flight from Sabadell to Son Bonet (on 17-12-2002)



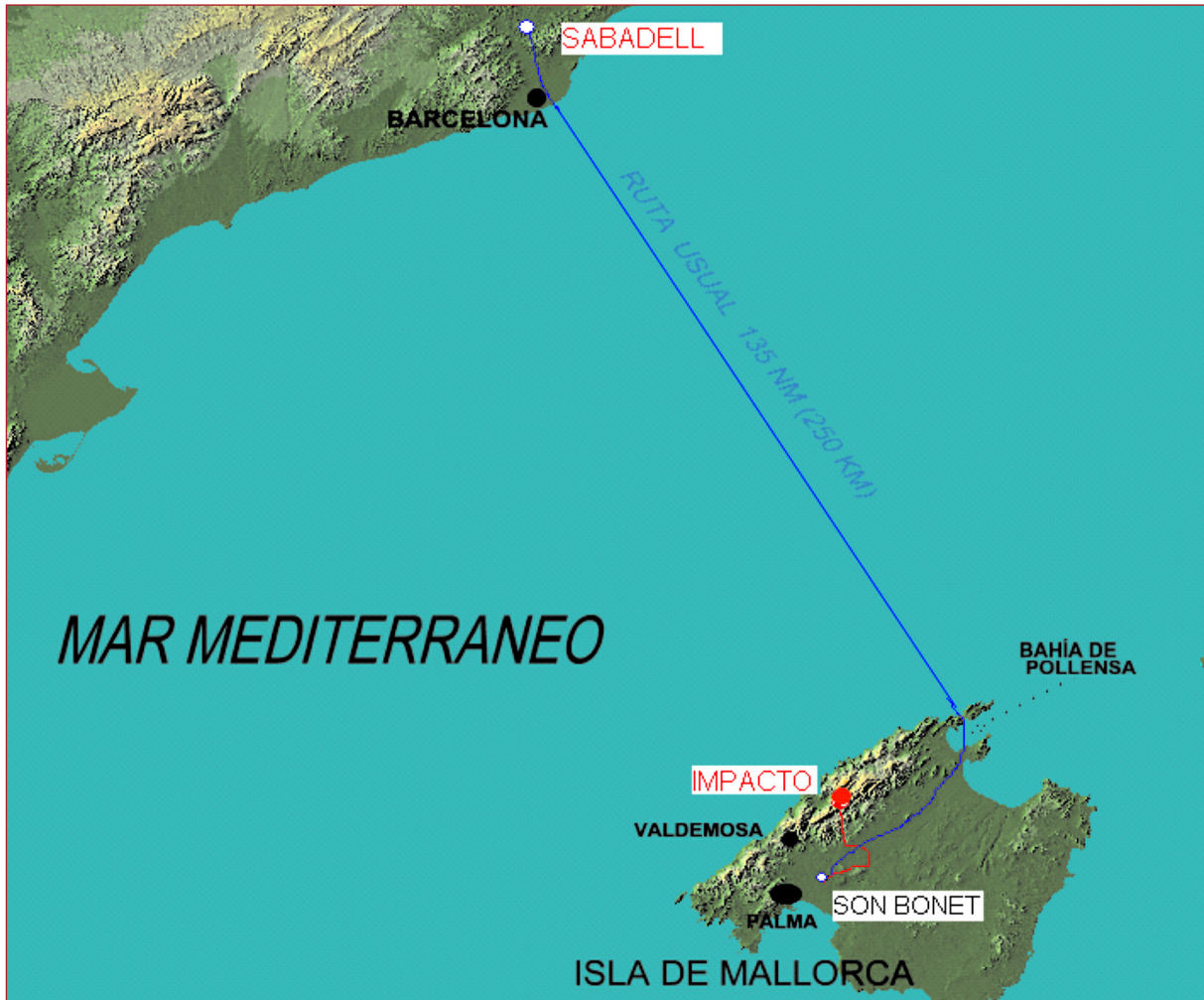


Figure B-5. Probable scheduled route