

CIAIAC

Comisión de Investigación
de Accidentes e Incidentes
de Aviación Civil

TECHNICAL REPORT

A-022/2002

Accident to aircraft
ROBIN DR 400-180,
registration number
D-ESCM, in Huetor
Santillán (Granada),
on 10 May 2002



MINISTERIO
DE FOMENTO

Technical report

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TRANSPORTES

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DE AVIACIÓN CIVIL

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

NIPO: 161-03-011-0
Depósito legal: M. 23.129-2003
Imprime: Centro de Publicaciones

Diseño cubierta: Carmen G. Ayala

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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
00° 00' 00"	Degrees, minutes and seconds
DETRESFA	Distress phase
E	East
ft	Feet
h	Hours
hh:mm	Time expressed in hours and minutes
HP	Horsepower
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
INCERFA	Uncertainty phase
INTA	Instituto Nacional de Técnica Aeroespacial
km	Kilometres
kt	Knots
METAR	Ordinary Meteorological Report
MTOW	Maximum Take-Off Weight
N	North
NM	Nautical miles
NW	North-West
S	South
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
W	West

Synopsis

At 09:33 h¹ on 10th May 2002, the ROBIN DR 400-180 aircraft, registration number D-ESCM, took off from Perpignan Airport (France), with two pilots, one of whom was acting as the pilot in command, and one passenger on board, in the direction of Granada Airport, where estimated time of arrival was 14:48 h. The aircraft's endurance in this flight was 5:05 h.

At 13:46 h, the aircraft made contact with the control tower at Granada Airport, in what was its last communication, reporting that it was situated at 10 NM to the E of the airport. The control tower's instrumentation (goniometer) indicated that this communication was coming from the NE, as a result of which the service controller tried to communicate with the aircraft on successive occasions, but without success.

At 14:30 h an INCERFA message was issued and, on receiving no news from the aircraft, a DETRESFA message was issued at 14:47 h. As from that moment a search by air and land was commenced. The aircraft wreckage and the dead bodies of its occupants were located at 14:30 h on the following day, 11th May 2002, in the area denominated Sotanilla Haza del Rey, in the municipality of Huetor Santillán (Granada), some 15 km to the NE of the city of Granada.

According to the reports of the autopsies carried out on the dead bodies of the aircraft's occupants, the accident occurred at approximately 14:30 h on 10th May 2002.

The investigation has established that the probable cause of the accident was the execution of an approach descent to Granada Airport, within a space covered with clouds which hampered the performance of a VFR flight, and without real knowledge of the geographical position and height above ground.

No safety recommendation has been issued as a result of this accident.

¹ Times are expressed in local time except where other wise indicated. In is necessary to deduct two hours to get UTC time.

1. FACTUAL INFORMATION

1.1. History of the flight

At 09:33 h on 10th May 2002, the Robin DR 400-180 aircraft, registration number D-ESCM, took off from Perpignan Airport (France), with two pilots, one of whom was acting as the pilot in command, and one passenger on board, in the direction of Granada Airport, where estimated time of arrival was 14:48 h. The aircraft's endurance in this flight was 5:05 h.

According to the communications between the aircraft and the various air traffic control facilities throughout the route, the progress of the flight was normal. At 13:46 h the aircraft made contact with the control tower of Granada Airport, in what was its last communication, informing that it was located at 10 NM to the east of the airport. However, the control tower's instrumentation (goniometer) indicated to the air traffic controller that this communication was coming from the NE. On the assumption that the pilot did not have a clear idea of his real position, attempts were made on successive occasions to communicate with the aircraft, but without success.

After being unable to contact the aircraft, the alert procedure was activated and a search by air and land was commenced. The aircraft wreckage and the dead bodies of its three occupants were found at 14:30 h on the following day in Sotanilla Haza del Rey in the municipality of Huetor Santillán (Granada), some 15 km to the NE of the city of Granada.

In this flight the accident aircraft was being accompanied by another of the same characteristics, which took off from Perpignan one hour later. The occupants of both aircraft had scheduled a route lasting 12 days, visiting different towns in Spain and Morocco, with this flight being the second stage of the forecast flights.

1.2. Injuries to persons

Injuries	Fatal	Serious	Minor/none
Crew	1		
Passengers	2		
Others			

1.3. Damage to the aircraft

The aircraft was completely destroyed as a result of the impact with the ground.

1.4. Other damage

Some slight damage was caused to the vegetation in the site of the accident, particularly to the branches of three small olive trees into which parts of the aircraft structure crashed.

1.5. Personnel information

1.5.1. *Pilot in command*

Age, sex:	50 years, male
Nationality:	German
License:	Private pilot license (aeroplane)
Qualifications:	Single engine piston, up to an MTOW of 2,000 kg. VFR and aerobatics flights
Date of issue:	01-06-1992
Renewal date:	27-12-2001
Expiry date:	29-01-2004
Flying experience:	— Total flight hours: 347:14 (up to 24-04-2002) — Hours on aircraft type: 74:18

1.5.2. *Passenger with pilot's license*

Age, sex:	34 years, male
Nationality:	German
License:	Private pilot license (aeroplane)
Qualifications:	Single engine piston, up to an MTOW of 2,000 kg. Gliders with or without engine. VFR flights
Date of issue:	31-10-2001
Expiry date:	15-02-2003
Flying experience:	In 1992 he obtained a Glider Pilot Licence and in 2000 he qualified as a powered glider pilot — Total flight hours: 165:29 — Hours on single engine piston: 30:12 — Hours on aircraft type: 10:19

1.6. Aircraft information

The Robin DR 400 is a single-engine, four-seater aircraft with low wing and fixed tricycle landing gear, which is made of wood and is built by the company Pierre Robin in France. Its main dimensions are: wingspan 8.72 m, length 6.96 m, height 2.23 m and wing surface 13.6 m². Its economy cruising speed is 245 km/h and it has a maximum endurance of 6 h.

Since 1957, this company has been devoted to the development and manufacture of light aircraft based on the Jodel Aircraft wing design, prototypes of which were flown between the years 1948 and 1950. The company has built more than 600 aircraft in their different versions and in various countries, including Spain (Aero Difusión).

Nearly 1,350 units of the Robin DR 400 type in all its versions have been built, the difference between them being their power, which varies between 112 and 200 HP. The DR 400-180R has been developed for towing gliders.

1.6.1. Aircraft identification

Make:	Robin
Model:	DR 400-180
Serial number:	2365
Year of manufacture:	1997
Registration number:	D-ESCM
MTOW:	1,100 kg
Owner:	Private (Flying Club)

1.6.2. Airworthiness certificate

Number:	L 20973
Type:	Private
Technical performance:	Normal. Flight under visual flight rules
Date of issue:	11-12-1997
Renewal date:	08-02-2002
Expiry date:	02-2003

1.6.3. *Maintenance log*

Total flight hours: Unknown
Last annual inspection: — Date: 08-02-2002
— Flight hours: 897 h

1.6.4. *Engine*

Make: Lycoming
Model: O-360-A3A
Power: 180 HP

1.6.5. *Propeller*

Make: Sensenich
Model: 76EM8S5-O-64

The last inspections of the engine and propeller coincide with that of the airframe.

1.7. **Meteorological information**

The weather conditions in Granada Airport during the period between 13:30 h and 14:30 h were as follows:

Wind: Direction 270° to 280° and intensity 8 to 11 kt
Visibility: Between 8,000 and 9,000 m
Cloudiness: — Few clouds between 1,500 and 2,000 ft
— Scattered between 2,500 and 3,000 ft
— Broken between 4,000 and 5,000 ft
Temperature: Between 15 and 16 °C
Dew point: 10 °C

1.8. **Aids to navigation**

They do not affect this case.

The last radar echo recorded in the Control Centre of Seville situated the aircraft at the co-ordinates 37° 58' 53 N/03° 24' 23 W, which correspond approximately to Puerto del Molinillo on the A-92 highway, the elevation of which is 1,300 m (4,264 ft).

This point is located some 20 km to the NE of the site of the accident and approximately 40 km also to the NE of Granada Airport.

1.9. Communications

At 13:46 h, the aircraft made contact with the control tower in Granada Airport, in what was its last communication, informing that it was situated at 10 NM to the E of the Airport. However, the control tower's instrumentation (goniometer) indicated to the service controller that this communication was coming from the NE; on the assumption that the pilot did not have a clear idea of his real position, attempts were made on successive occasions to communicate with the aircraft, but without success.

1.10. Aerodrome information

Not applicable to this case.

1.11. Flight recorders

The aircraft was not equipped with flight recorders as they are not obligatory for aircraft of its type.

1.12. Wreckage and impact information

The accident occurred at some 15 km to the NE of the city of Granada, at the point of co-ordinates 37° 13' 28" N/03° 32' 13" W, where the elevation of the terrain is 1,140 m (3,655 ft). This point is to the South of and close to the A-92 highway.

The aircraft wreckage was found over a distance of some 200 m on a strip of flat terrain with a gentle slope to the south and a sharp drop to the east, parallel to a path which provides access to a country house.

The major part of the left wing with its aileron was found amongst the branches of the first olive tree, which was completely destroyed.

Then there was an area of terrain that had been turned over and in which horizontal marks with the same distance between them were seen, which may have been caused by the propeller. The main impact occurred at this point in which the aircraft was destroyed, the wreckage of which slid along leaving smashed pieces of the structure along the way.

The rear part of the fuselage came to a halt next to another olive tree, together with the horizontal tail, right elevator, rudder, the propeller joined to the crankshaft flange and separated from the engine by the breaking of the crankshaft, one undercarriage leg and other elements difficult to identify due to the high degree of destruction in which they were found.

Finally, a bit further away, the cabin wreckage appeared.

A large quantity of pieces of the aircraft, which was materially smashed into match-wood, was found all over the surface of the strip of land described above.

1.13. Medical and pathological information

The reports of the autopsies carried out on the dead bodies of the aircraft's occupants indicate that, in the three cases, the cause of death was the destruction of vital organs produced as a result of the multiple traumatism suffered in the accident. They also indicate that death occurred at approximately 14:30 h on 10th May 2002.

1.14. Fire

There was no fire.

1.15. Survival aspects

Due to the impossibility of establishing contact with the aircraft and when it did not arrive at the airport, the control tower issued an INCERFA message at 14:30 h; after receiving no news of the aircraft, it issued a DETRESFA message at 14:47 h, close to the estimated time of arrival (14:48 h). As from that moment a search was commenced by land and air. The aircraft wreckage and the dead bodies of its occupants were located at 14:30 h on the following day, 11th May 2002, in an area denominated Sotanilla Haza del Rey, in the municipality of Huetor Santillán (Granada), some 15 km to the NE of the city of Granada.

1.16. Tests and research

In order to obtain accurate information on the mechanism that separated the propeller from the engine, the propeller was sent to the Structures and Materials Department of the Instituto Nacional de Tecnología Aeroespacial (INTA) for study.

The report issued by the INTA first describes how the propeller shows signs of high plastic deformation and numerous impacts on the leading edge and to a lesser extent on the trailing edge, concentrated in the final third of the span of both blades.

The plastic deformation of one of the blades consists of its twisting in the direction of increasing the angle of attack of the affected sections, with this deformation being concentrated from halfway along the span to the tip. In the other blade, the plastic deformation consists of the bending forwards of the outboard third of its span.

The propeller is joined to the crankshaft flange by means of six bolts. This flange is broken at its connection with the crankshaft, at the end of the radius between the crankshaft axis and the propeller's fixing flange, with this breakage being the one that caused the separation of the engine propeller assembly.

After the performance of the corresponding hardness and macro and micro fractographic tests, the conclusion is reached that the propeller securing flange's material is correct and that the breakage is of a ductile nature, basically produced by tension stresses associated with the assembly's general bending overload, very probably due to an impact. The marks of the terrain left on the blades and their deformation indicate that this overload occurred, very probably from the impact against the ground.

1.17. Organisational and management information

Not applicable.

1.18. Additional information

It should be pointed out that the occupants of the aircraft which was accompanying the one which suffered the accident stated that they had been forced to fly very low due to the intense cloudiness in the area.

1.19. Useful or effective investigation techniques

Not used.

2. ANALYSIS

The flight started in Perpignan (France) at 09:33 h bound for Granada Airport, where the occupants of the aircraft expected to land at 14:48; the forecast duration of the flight, 05.15 h, was within the aircraft's endurance.

The aircraft's last communication with the control tower of Granada Airport was made at 13:46 h, indicating that the aircraft was at 10 NM to the E of the airport, although the TWR's goniometer situated the aircraft to the NE, where it was actually located.

This, combined with no knowledge of any other communication referring to an abnormality, appears to indicate that the flight as far as the vicinity of Granada Airport took place normally and even gaining time with respect to that forecast.

From the point at which the last radar bearing of the aircraft was recorded, at Puerto del Molinillo on the A-92 highway, with an elevation of 4,264 ft, to the site of the accident, with an elevation of 3,655 ft, everything appears to indicate that the flight was carried out following the mentioned highway, between scattered clouds and at a low altitude, due to the fact that the base of the most compact clouds was at a height of between 4,000 and 5,000 ft, with the base of the scattered clouds at a height of between 2,500 and 3,000 ft, which probably affected visibility of the terrain. The statements of the occupants of the other aircraft, in the sense that they had to fly very low due to the intense clouds in the area, confirms this point.

The damage to the propeller, particularly that relating to plastic deformation in both blades, one of them with twisting in the direction of increasing the leading angle of the transverse sections from halfway down its span to the tip and in the other deformation consisting of the bending forwards of the outboard third of the blade, indicates that at the moment of the impact the propeller was turning with power from the engine although this power was probably reduced given the slight deformations observed in the blades.

This gives rise to the assumption that the engine had reduced power which, combined with the reduction in height in the last 20 km and the conviction held by the aircraft's occupants that they were at 10 NM to the E of the Airport, leads to the conclusion that the aircraft was descending for its approach to the Airport, with the assumption that it was in a geographical situation with respect to the Airport which was not its real position and consequently without knowing its real height above ground level.

In these conditions, it is most likely that in the last moments before the accident the aircraft was in a cloud with consequent lack of visibility of the terrain and without having a clear idea of its low height above the ground. Based on these premises, the following hypotheses have been considered:

1. Visibility increased, but so close to the ground, that the pilot only had time to instinctively pull on the control column to raise the aircraft but due to the engine's

low speed and power the aircraft stalled and took a nose dive, with the wreckage being concentrated and without the dispersion presented by the accident, as a result of which this hypothesis is rejected.

2. In the event that the increase in visibility gave time for a forced landing to be attempted, this would have been made on the undercarriage, which would probably have been destroyed, with the aircraft sliding along on its lower side without causing the destruction and dispersion of the wreckage. On the other hand, the propeller's separation from the engine would be through the breakage of the bolts which connect it to the crankshaft flange, by the shearing exerted on them, when the propeller hit the ground with the engine continuing with power and in a plane more or less parallel to the ground. The lack of dispersion of the wreckage and the way in which the propeller was actually torn off from the engine (breakage of the crankshaft instead of the bolts securing it to the flange) mean that this hypothesis also has to be rejected.
3. Lastly, the possibility exists that visibility did not increase at any moment and the aircraft, without the pilot having a chance to react, reached the ground with a small descent angle, with its hub crashing into the ground, which would explain the crankshaft's breakage produced by the tension stress (propeller) associated with a general bending overload of the assembly caused by the impact. This hypothesis is considered to be the most likely.

The first impact is caused by the left wing crashing into a small olive tree, causing it to break off and remain caught up amongst its branches. Immediately afterwards, and with a slight turn to the left, the main impact of the hub takes place, which causes the aircraft's disintegration and the sliding of the wreckage over the surface of the ground, following a slightly curving path to the left, aided by the terrain's slope towards the same side.

3. CONCLUSION

3.1. Conclusions

- The pilot had a valid license and was qualified for the flight.
- The aircraft had been maintained in accordance with its Maintenance Plan and had a valid Airworthiness Certificate.
- The meteorological conditions were at the limits for VFR flying, with patches of cloud between 2,500 and 3,000 ft.
- The last communication with the aircraft was at 13:46 h, without any abnormality being reported.

3.2. Causes

The accident probably occurred during the approach descent to Granada Airport, within a space covered with clouds which made VFR flying difficult, without real knowledge of its geographical position or height above ground.

4. SAFETY RECOMMENDATIONS

None.

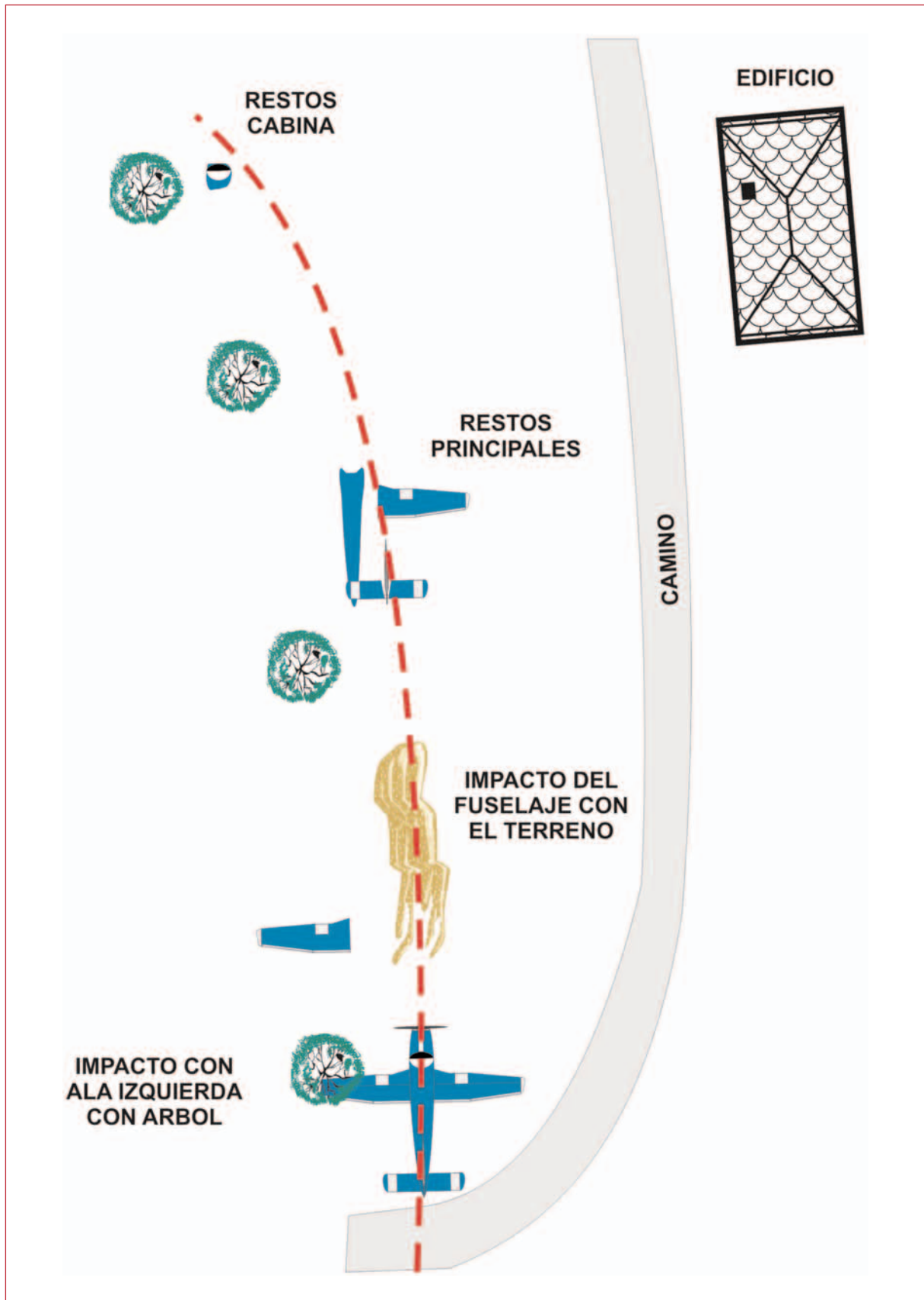
APPENDICES

APPENDIX A
**Map of the aircraft's
situation and path**



APPENDIX B

Wreckage scatter diagram



APPENDIX C

Photographs



Photo 1. *Aircraft similar to the one involved in the accident*



Photo 2. *Start of the aircraft's path along the ground*



Photo 3. *Path along the ground, seen from the place occupied by the main wreckage*