Report

Accident on **2 January 2009**
at **Molesmes (89)**
to the **Eurocopter EC135**
registered **F-HBMA**
operated by **Regourd Aviation**

BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
Ministère de l'Écologie, du Développement durable, des Transports et du Logement

Foreword

This report expresses the conclusions of the BEA on the circumstances and causes of this accident.

In accordance with Annex 13 to the Convention on International Civil Aviation, with EC directive 94/56 and with the French Civil Aviation Code (Book VII), the investigation was not conducted so as to apportion blame, nor to assess individual or collective responsibility. The sole objective is to draw lessons from this occurrence which may help to prevent future accidents.

Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous interpretations.

SPECIAL FOREWORD TO ENGLISH EDITION

This report has been translated and published by the BEA to make its reading easier for English-speaking people. As accurate as the translation may be, the original text in French is the work of reference.

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Glossary

BKN	Broken cloud (5 to 7 octas)
MGB	Main Gear Box
CPL(H)	Commercial Pilot's Licence (Helicopter)
FEW	Few clouds (1 to 2 octas)
GPS	Global Positioning System
hPa	Hectopascal
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IR	Instrument Rating
kt	Knot
METAR	Aviation meteorological message
NSC	No Significant Clouds
OVC	Overcast (8 octas)
QNH	Altimeter setting to obtain aerodrome elevation when on the ground
SCT	Scattered clouds (3 to 4 octas)
SN	Snow
TAF	Terminal Area Forecast
TEMSI	Chart of significant meteorological conditions
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VOR	Visual Omni Range

Synopsis

Date
Friday 2 January 2009 at 12 h 59(1)

Place
Molesmes (89) France

Type of flight
Positioning flight

Aircraft
Eurocopter EC135 helicopter

Owner
Private

Operator
Regourd Aviation

Persons on board
1 pilot

(1)All times in this report are UTC, except where otherwise specified. One hour should be added to express official time in metropolitan France on the day of the accident.

1 - FACTUAL INFORMATION

1.1 History of Flight

At the request of the owner of the helicopter, the pilot was to position at Lyon-Bron (69) aerodrome for a flight to Annecy on Saturday, 3 January at the beginning of the afternoon.

The pilot, who was worried about the weather conditions forecast for Saturday in the Ile-de-France region, planned to leave on Friday when the conditions were suitable for the flight. He consulted the weather forecasts regularly and decided to take off at around 12 h 00.

On Friday, 2 January 2009, the pilot took off at 11 h 49 from Issy-les-Moulineaux (92) heliport for Lyon-Bron airport under VFR without a flight plan. He performed the flight at an altitude of 3,800 feet. He maintained radio contact with Seine Information in order to be informed about the weather conditions at the destination aerodrome.

At 12 h 37, after an hour's flight above the continuous cloud layer, because of the weather conditions at the destination, he decided to turn back in order to find weather conditions allowing him to continue the flight below the clouds.

At 12 h 49, flying at a low height, the pilot left the Seine Information frequency.

At 12 h 59, near the town of Molesmes (89), the pilot lost control of the helicopter and struck the ground in a field beside a road and a wooded area.

1.2 Injuries to Persons

The pilot was killed.

1.3 Damage to Aircraft

The helicopter was destroyed.

1.4 Other Damage

None.

1.5 Pilot Information

Male, aged 38

- Valid helicopter pilot's licence CPL (H) issued in 1996. IR and night flying rated on multi-engine helicopters.
- Type ratings:
  - AS355 SP
  - EC135 SP obtained in June 2008
- Experience:
  - total: 3,140 flying hours
  - on type: 86 flying hours, including 51 as captain
  - in the last six months: 51 flying hours, all on type
  - in the last three months: 8 flying hours, all on type
  - in the last thirty days: 24 minutes, all on type

1.6 Aircraft information

1.6.1 Airframe

Manufacturer	Eurocopter Deutschland GmBh
Type	EC 135 T2
Serial number	0432
Registration	F-HBMA
Entry into service	19/12/2006
Certificate of Airworthiness	Valid until 08/06/2009
Utilisation as of January 2 2009	310 hours

1.6.2 Engines

	Engine No.1	Engine No.2
Manufacturer	Turbomeca	Turbomeca
Type	Arrius 2B2	Arrius 2B2
Serial number	32217	32218
Installation date	2006	2006
Total operating time	310 hours	310 hours
Operating time since installation	310 hours	310 hours

The helicopter had the equipment required for flight under IFR.

1.7 Meteorological Conditions

1.7.1 General situation

The weather conditions were influenced by an anticyclone centred over Scotland. Below 1,000 metres, the air mass was very humid. There were a lot of stratus clouds over Burgundy.

1.7.2 Estimated weather conditions at the site of the accident between 11 h 00 and 14 h 00 (source: Météo France)

The following weather conditions were estimated by Météo France in the area of the accident:

- Cloud cover:
  - From 4 to 5/8ths of Stratus with a base at 600 to 900 ft / above ground level
  - From 7 to 8/8ths of Stratus or Stratocumulus at 1,500 ft
- QNH: 1024 hPa
- Conditions for each height:
  - From ground level to 600 ft: visibility 4 to 9 km, temperature 0°C to - 1°C, humidity 85 to 100%, wind from North-East at 5 to 10 kt. There was a high risk of icing
  - Above 4,000 ft: CAVOK, temperature + 1°C (4,500 ft), 50% humidity, wind from North at 10 kt

1.7.3 Meteorological messages en route

Avord (18)
LFOA 021100Z AUTO 08007KT //// // OVC005/// M01/M02 Q1024=
LFOA 021400Z AUTO 08006KT //// // FEW009/// OVC014/// M00/M02 Q1023=

Nevers (58)
LFQG 021100Z 07004KT 020V130 9999 BKN006 M00/M02 Q1023=
LFQG 021400Z 07006KT 9999 BKN007 00/M02 Q1023=

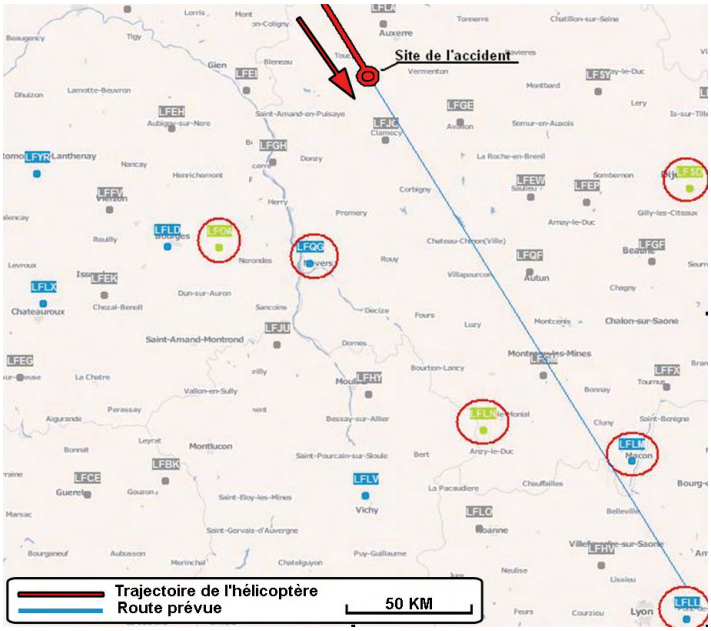
Dijon (21)
LFSD 021100Z AUTO 03005KT 360V060 9999NDV OVC013 01/M02 Q1023=
LFSD 021400Z AUTO 01009KT 9999NDV OVC016 01/M03 Q1022=

Saint Yan (71)
METAR LFLN 021100Z AUTO 05003KT 350V160 9000NDV OVC011 00/M01 Q1023=
TAF LFLN 020640Z 0207/0215 04005KT 9999 OVC010=

Macon Charnay (71)
METAR LFLM 021100Z 35005KT 320V020 8000 OVC006 M00/M01 Q1023=

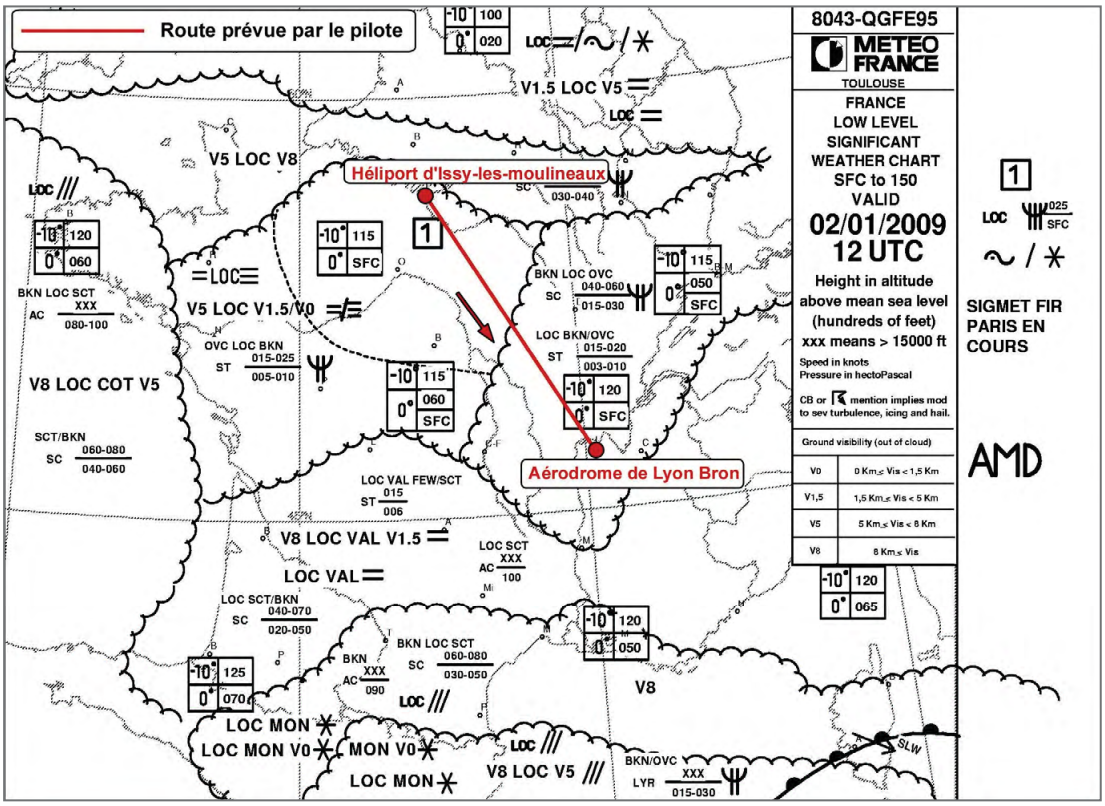
Lyon Bron (69)
METAR LFLY 021100Z 34005KT 9999 OVC009 01/M02 Q1022 NOSIG=

Lyon Saint Exupéry (69)
METAR LFLL 021100Z 03007KT 4500 BR OVC003 M00/M01 Q1022 NOSIG=



Positions of weather stations

1.7.4 TEMSI chart France 12 UTC



Note: The pilot had a weather briefing including:

- the METARs for the departure and destination airfields as well as for certain airfields on the route
- the TAFs for certain airfields on the route but not the destination airfield,
- the TEMSI chart for France at 12 h 00, and wind and temperature charts for 12 h 00.

The TEMSI chart showed a generally continuous stratus cloud layer associated with a moderate to strong risk of icing on the planned route. The cloud base was between 500 and 1,000 feet on the first part of the flight and locally between 300 and 1,000 feet on the second part. The pilot could not have complied with the minimum overflight height of 500 feet.

The METAR for 11 h 00 and the TAF for the Saint-Yan airfield for the period from 7 h 00 to 15 h 00 indicated a continuous cloud layer to about 1,000 feet with no significant evolution.

1.8 Aids to Navigation

The pilot had all the charts required to undertake the flight. A full set of up-to-date VFR and IFR charts covering Western Europe was found on-board the helicopter.

The navigation plotted on the chart (1 / 500 000th) shows that the pilot had plotted a direct route from over Orly airport (91) to Lyon via the VOR beacon at Autun (71).

The helicopter had an autopilot (AP), VOR navigation instruments, and an onboard GPS. The flight path (see paragraph 1.14.2) suggests that the pilot used the navigation mode of the AP, at least until the turnback.

1.9 Telecommunications

The transcript of the radio communications with the information sector of Seine Information is in Appendix 1.

The transcript shows that during the flight the pilot obtained information about the weather conditions at the destination airfield. A discussion ensued on the different flight strategies eventually leading to the decision by the pilot to turn back and descend through the cloud and continue the flight with the ground in sight. The pilot reported he would divert if the weather conditions deteriorated, and left the frequency to continue the flight at a low height.

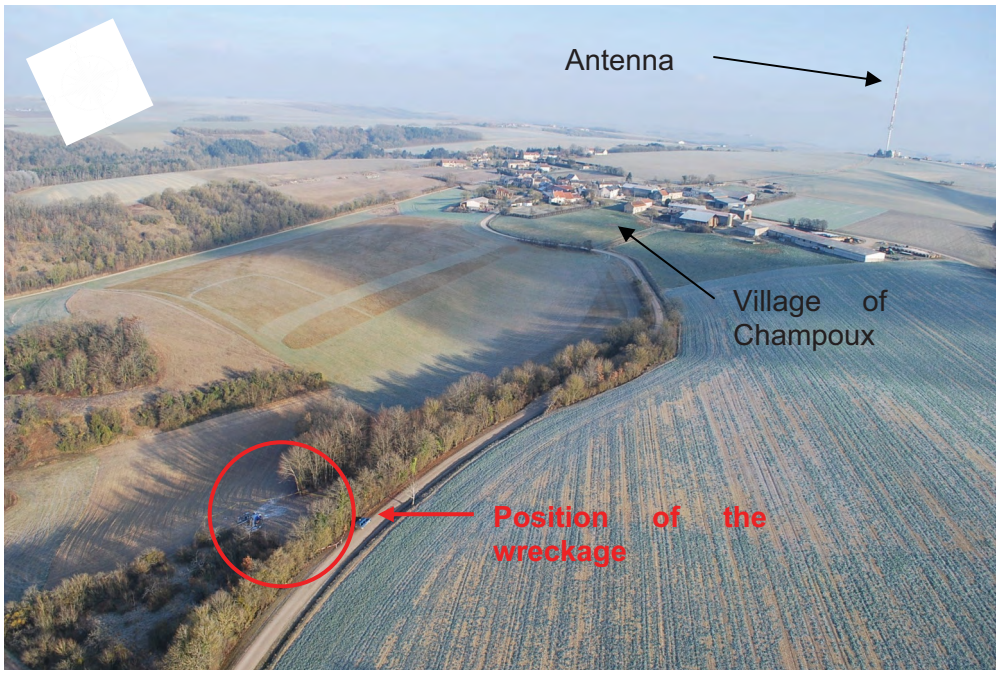
1.10 Flight Recorders

The regulations in force do not require installation of a flight recorder. The helicopter was not equipped with one.

1.11 Wreckage and Impact Information

1.11.1 Examination of the site

The wreckage of the helicopter was located on the edge of the road, 500 metres south of the village of Champoux (89). The area of the accident is very hilly, and includes alternating woodlands and fields. The area in which the wreckage was found was on a slope down from the road. The trees around the accident area were covered with ice but showed no marks from a collision with the helicopter.



A tethered antenna 656 feet high is located near the accident site, at the summit of a hill at 1,864 feet. A thorough inspection of the high and medium voltage cables around the antenna and its tether did not indicate any contact with the helicopter.

1.11.2 Examination of the wreckage

The wreckage was found lying on its left side and oriented approximately north. All the debris was concentrated around the wreckage within a radius of 10 metres except for the right skid, which was found beside the road about 30 metres from the point of impact, and blade tip fairings which had been projected up to fifty metres away.

Cockpit and airframe

The front of the cockpit was destroyed, and contained many marks of compression indicating an impact with the ground at an extreme nose-down attitude. The entire airframe was broken up. The left front seat was separated. The cockpit windshield was completely destroyed. The tail boom was no longer attached to the fuselage, but showed little damage. The horizontal empennage was broken on both sides of the tail boom. The vertical empennage was hardly damaged. The fenestron showed little damage, but the tail rotor blades were severely distorted.

Engines

Examination of the engines showed that they had suffered very severe stress on impact. The air intakes and equipment located at the front had been severely damaged. The left engine also had numerous lateral distortions.

The two shafts (Bendix) linking the engine with the main gearbox (MGB) showed twisting failures, indicating that the engines were running at the time of impact.

Main rotor

The main rotor blades had been destroyed about one third of their length from the fairing tips, then delaminated along the remaining length and broken at the blade root. One blade was folded under the fuselage; the other three were grouped together towards the front of the airframe. The disposition of and damage to the blades indicated that the rotor was turning just before impact with the ground, but that the rotor stopped rotating when the helicopter tipped over onto its left side.

All of these observations indicate that at the time of impact the rotor was turning, and that the engines were running but were probably not operating at maximum power.

Flight controls, main gearbox

All the failures and distortions resulted from the impact. The rear driveshaft was blocked at the level of the rotor brake disk and the mounting bolts on the disk were embedded in the casing of the MGB. The marks made by the nuts show that the rotation of the shaft was stopped abruptly, causing the blockage of the MGB and the main rotor.

Controls and control console

The engine power control on the collective pitch control was set to “Normal” for both engines.

The engine mode selection switches were in the “NORM” position.

The fuel pump switches were set to “ON”.

The “AIR COND” air conditioning switch and the “VENT” rheostat were set to “OFF”.

The “BLD HTG” hot gas bleed switch and the associated temperature control rheostat were set to “MAX”.

It was not possible to determine the position of the “DEFROST” control switch behind the central console.

Note: The position of the switches was that observed during examination of the wreckage, therefore it can not be excluded that these positions were altered by the impact with the ground and were therefore not representative of the configuration during flight.

1.12 Medical and Pathological Information

The autopsy that was performed did not bring to light any specific problems that may have contributed to the accident.

1.13 Survival Aspects

The violence of the impact with the ground left little chance of survival.

The pilot was found outside the seat next to the wreckage of the helicopter. His harness was taken for examination to the BEA laboratory. The harness was open and showed no signs of failure or tearing.

1.14 Tests and Research

1.14.1 Examination of avionics systems

Various avionics systems were extracted from the wreckage of the helicopter in order to retrieve any data that may have been stored:

- VEMD (Vehicle and Engine Multifunctional Display)
- CAD (Caution and Advisory Display)
- DECU (Digital Engine Control Unit)
- WU (Warning Unit)
- FCDM (Flight Control and Display System)

Each of these computers records dedicated fault messages for maintenance of the aircraft. The VEMD also records overruns of certain flight parameters. The WU records all the warnings (audible and visual) that it generates in chronological order, without dating them.

These computers were analysed in the BEA avionics laboratory. All the recorded data were recovered.

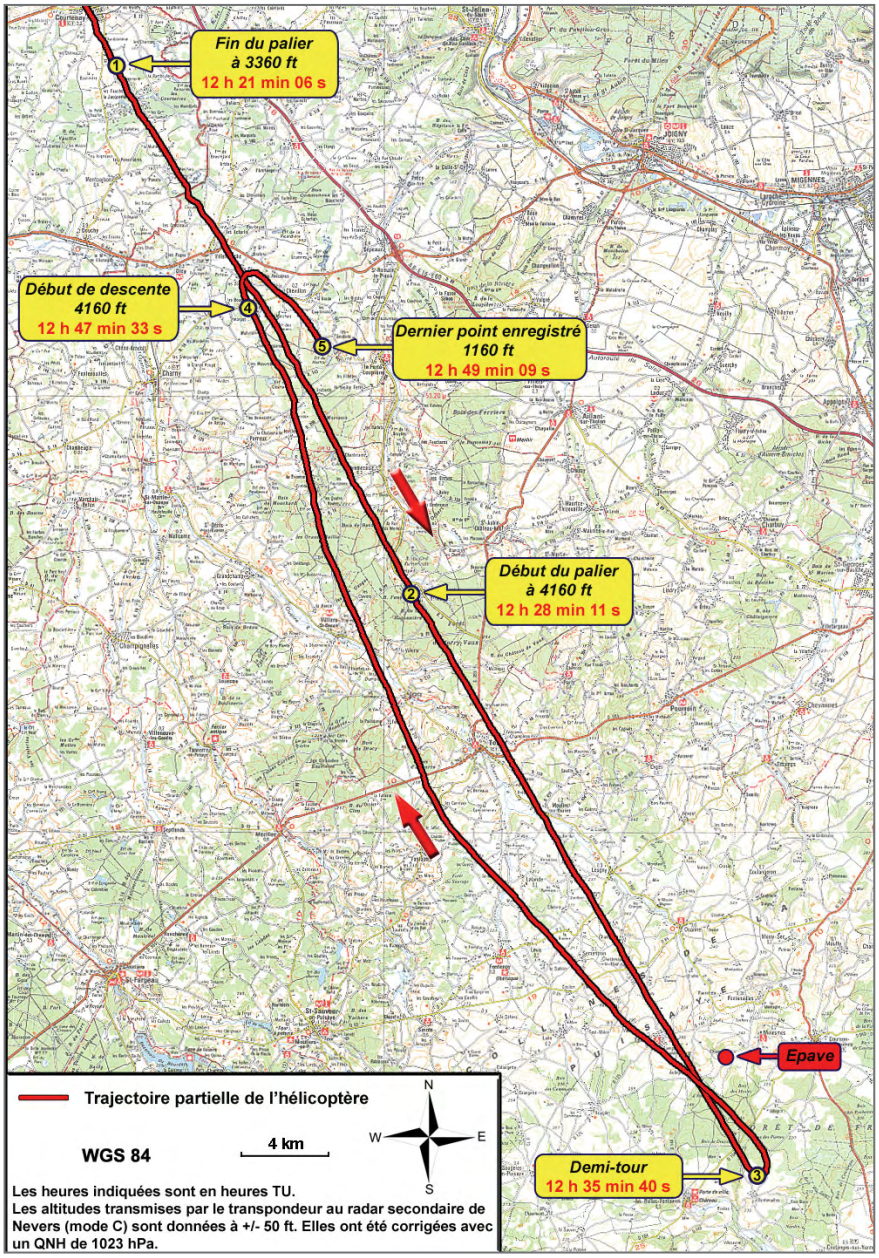
No failure was detected by the DECU during the flight prior to the accident.

No information liable to be associated with a technical problem during the accident flight was recorded by the FCDM, VEMD or CAD. The only failures recorded by these computers at the end of the flight were probably due to the impact.

Analysis of the data recorded by the WU shows a single audible alarm was generated without any warning light indication. This alarm was generated due to exceeding the inertia moment of the rotor mast. Generation of such an alarm in flight is highly unlikely and was undoubtedly due to the impact. The absence of any time scale for these failures makes it difficult to evaluate them.

1.14.2 Examination of radar data

Data from the secondary radars at Palaiseau (91) and Nevers (58) was recovered. Only the partial trajectory from the Nevers radar, which was the most complete, was used and overlaid on an IGN map.



1.15 Information on Organisation and Management

The helicopter was privately owned. The Regourd Aviation company was in charge of the maintenance, management and organisation set up in response to requests from the owner of the helicopter and for providing the pilot. The pilot was hired in July 2008 and had completed EC 135 type rating in England in June 2008.

The pilot was the sole pilot on the helicopter, and was responsible for maintaining updated navigation documentation, as well as the planning, preparation and execution of flights.

1.16 Additional information

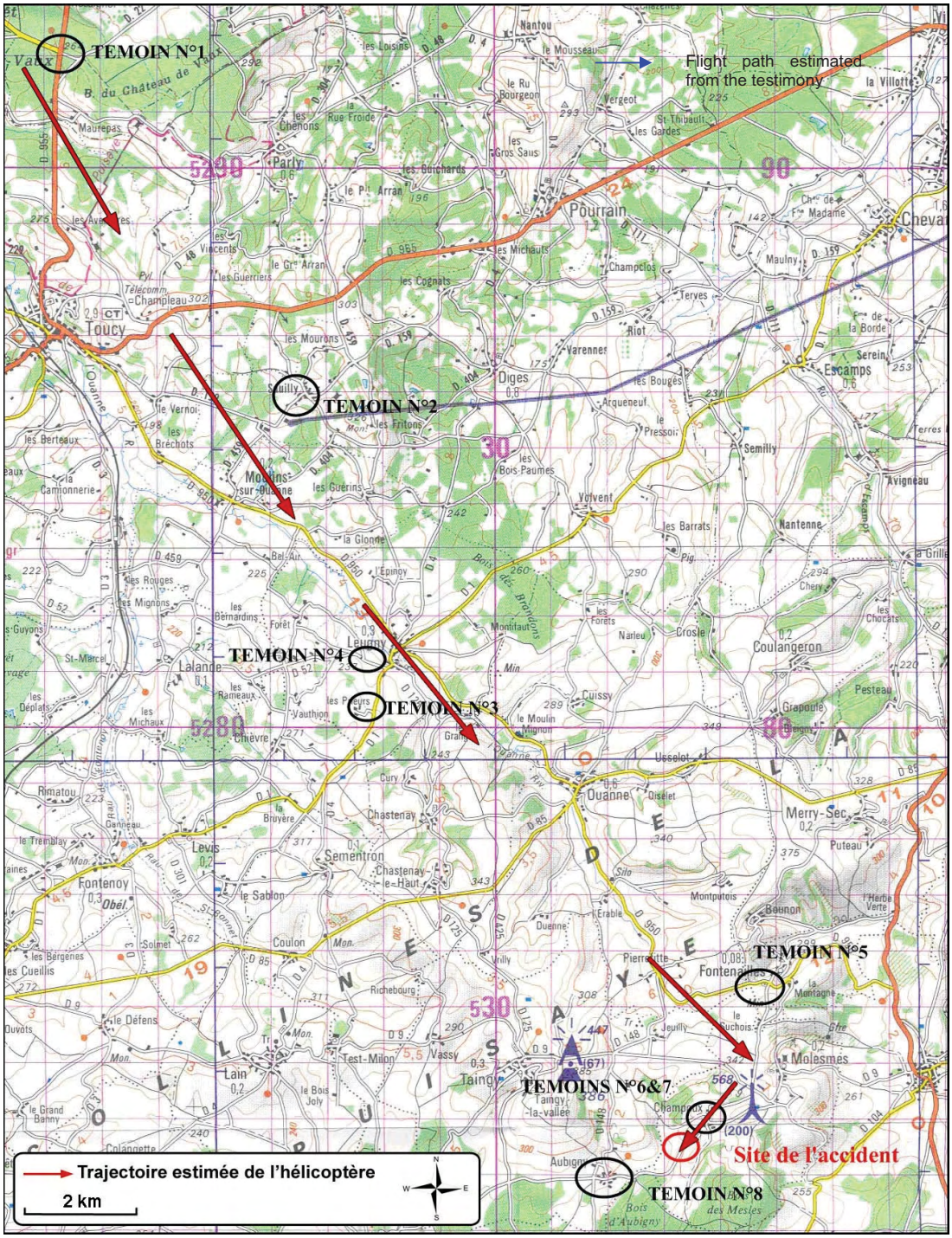
1.16.1 Witness Testimony

During the investigation, testimony from several people was taken.

An official from the Regourd Aviation company indicated that the owner of the helicopter had requested that it be present on the aerodrome of Lyon on Saturday, 3 January from 12 h 00 onwards to perform flights in the Alps. The pilot had originally elected to carry out the positioning flight the day before, because of the adverse weather conditions forecast between Paris and Lyon for the Saturday. On Friday morning, the pilot decided to delay his departure due to inclement weather conditions in Lyon. He had said he would wait for an improvement and felt able to take off early in the afternoon.

A maintenance technician said that he had a discussion with the pilot on the Friday morning, on the specific protection of the helicopter for cold weather conditions, especially when the helicopter was to be parked outside.

Eight eyewitnesses of the last ten minutes of flight before the accident were interviewed. The position of the witnesses is plotted on the chart below, which also shows the direction of flight of the helicopter and the estimated overflight position.



Witness no. 1

The witness said the helicopter was flying at a low height, on a north-west to south-east route, and he noted nothing unusual. The weather was gray, cloudy and a bit foggy.

Witness no. 2

The witness said the helicopter was flying at "high speed", at a low height towards the relay antenna on a north-west to south-east route. He could see the pilot sitting in the right-hand seat.

Witness no. 3

The witness, a passenger in a car, saw the helicopter arriving from the left at a very low altitude and flying "crabwise". He estimated the height to be about 40 metres. The sound "of the engine" was not regular and was "misfiring".

Witness no. 4

The witness, who had some experience in aviation, only heard the helicopter. According to the sound, he thought the helicopter was flying at a low height and detected nothing unusual about the sound. He said that the cloud ceiling was relatively low.

Witness no. 5

The witness, who was driving a vehicle, saw the helicopter arrive from his right and go straight towards the relay antenna. Then he saw the helicopter "in trouble", before he saw it "cartwheel" and crash downhill from the relay station. He noted that the accident took place at "13 h 59 min" (local time). He indicated that the weather was "freezing".

Witness nos. 6 and 7

The witnesses were in a farmyard situated 400 metres from the site of the accident. They hear the very loud noise of the helicopter when it flew over them a very low height. They noted that the helicopter was "moving violently in all directions". They heard the noise of the impact with the ground.

Witness no. 8

The witness saw and heard the helicopter arriving. He heard the engine operating normally, then accelerating.

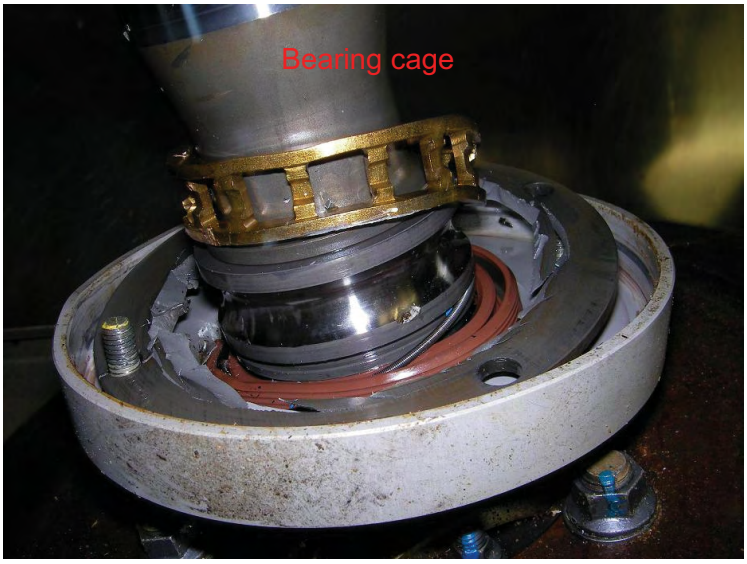
1.16.2 Technical Examinations

Main Gearbox (MGB)

The MGB was stripped down and examined on the premises of the "ZFL" company (a Eurocopter subsidiary) in the presence of the BEA.

The inspection did not bring to light any abnormality that might have caused a malfunction in the MGB.

Only the bearing corresponding to the transmission of the tail rotor was found to be damaged. The bearing cage was somewhat distorted but not fractured, which suggests low rotation energy of the MGB at the time of impact (a bearing cage is completely destroyed when rotation is blocked at normal operating speed).



Bearing located on the MGB, where the drive shaft exits from the tail rotor

Fenestron, tail rotor

The distortions of the tail rotor blades and the damage observed on the stator resulted from the impact with the ground when the helicopter tilted laterally after the impact. The flexball control cable, the pitch actuator and the servo were in normal operating condition.

Engines

Both engines were examined at the premises of the manufacturer Turbomeca, in the presence of the BEA. The gas generator and free turbine rotated freely.

A borescope examination showed good internal condition of both engines, indicating only slight marks of contact at the front of the centrifugal compressor. These marks were due to the impact and demonstrate the rotation of the compressor. The borescope examination showed that both engines were operating at the time of impact.

Harness

The pilot harness, which was found open, was examined (see Appendix 2).

The analysis of the harness buckle did not make it possible to determine whether the pilot was completely attached, partially attached or not attached at all at the time of impact.

1.16.3 Certification and protection against icing

The helicopter was not certified for flight in icing conditions, only the Pitot probes are defrosted. The helicopter has air-conditioning and windshield defogging functions. An 'all weather' window located on the doors can be opened during flight enabling the pilot to get external visibility. However, the small size of this window causes a significant decrease in the visual field and forces the pilot to fly with a sideslip angle to maintain visibility in the direction of flight.

In October 2003 Eurocopter carried out a series of flight tests to verify the ability of the EC 135 to fly in light icing conditions. The series of flight tests demonstrated that the helicopter could fly safely in light icing conditions, although this is not required by JAR-27, JAR-29 or JAR-OPS 3 regulations.

2 - ANALYSIS

2.1 Flight Preparation and Decision to Undertake the Flight

The pilot had the weather forecasts for Friday and Saturday in order to undertake his positioning flight to the Lyon-Bron airfield. The forecasts led him to opt for Friday. The postponement of the takeoff time shows that the pilot waited for the flight conditions to improve.

The pilot chose to fly VFR without a flight plan, at an altitude of about 4,000 feet above the cloud layer in the direction of the Autun (ATN) radio-beacon and then to follow a road to Lyon-Bron.

When the pilot took off, the risk of icing was known and the weather conditions at the destination airfield did not allow him to descend through the cloud and maintain visual flight conditions.

2.2 Flight Sequence

2.2.1 Change of strategy during flight

The radio communications indicate that the pilot began the flight with the intention of adapting his flight strategy according to the changes in weather conditions en route and at the destination. He intended to switch to IFR and use an instrument approach on arrival at the destination, subject to being guided by the air traffic control and to merging with the traffic.

After 50 minutes of flight, the weather information obtained and the uncertainty about being provided with radar guidance by the Lyon control tower led the pilot to make the decision to turn back in order to descend through the cloud and then resume his route to Lyon-Bron.

2.2.2 Flight at a low height below the cloud layer

The pilot found himself below the cloud layer, in an area where the temperatures were negative, with high humidity and local mist.

Witness testimonies indicate that the helicopter was flying “crabwise”. The testimonies and the absence of any anomaly in the tail rotor indicate that the pilot probably used the “all weather” side window, employed in case of the loss of or reduction in external visibility.

The use of the side window significantly reduces the field of vision.

Flight at a low height in a cold and damp atmosphere might have led to the appearance of condensation inside the cabin or ice on the outside, on the cockpit windshield, significantly reducing visibility.

The pilot flew in this configuration to the relay antenna, which formed an obstacle on the flight path.

The abrupt change in trajectory described by witness No. 5, the absence of traces of collision with the antenna or its tethers, and the absence of any malfunction on the flight controls indicate that the pilot probably detected the antenna too late and took sudden evasive action.

2.3 Loss of Control

The last witnesses indicated that just before impact, the helicopter's movements were uncoordinated.

The analysis of the site and the wreckage showed the helicopter hit the ground almost vertically, that there was power in the rotor and the engines were functioning normally. It was not possible to accurately determine the sequence of events between the manoeuvre to avoid the relay antenna and the impact with the ground.

Abrupt evasive action carried out with a reduced field of vision using the "all weather" side window may have deprived the pilot of the visual cues required to control the flight path.

The pilot was found out of the seat next to the wreckage of the helicopter. It is possible that he attempted to remove the moisture inside the cockpit, and this operation cannot be performed with the harness attached. It is possible that during the evasive action, the pilot, who was no longer attached to the seat, was unable to act on the flight controls.

3 - CONCLUSIONS

3.1 Findings

- The accident occurred during a positioning flight to Lyon-Bron airfield.
- The helicopter possessed a valid certificate of airworthiness.
- The pilot had the requisite licenses and qualifications.
- The EC 135 is not certified for flight in icing conditions.
- The pilot had a weather briefing indicating a continuous cloud layer and icing conditions along the planned route and at the destination.
- The pilot started flying above the clouds under VFR without a flight plan. He intended to switch to IFR and use an instrument approach on arrival at the destination.
- The pilot changed strategy during the flight and decided to continue the flight through the cloud.
- The weather conditions on the day did not make it possible to undertake the flight, regardless of the flight regime chosen.
- The helicopter was flying at very low height in an icing atmosphere below the clouds.
- At the end of the flight, the helicopter was seen flying “crabwise”.
- The tethered relay antenna constituted a major obstacle in the path of flight.
- The helicopter was seen to be in trouble just after the evasive action taken to avoid the antenna.
- The wreckage was found a few hundred metres from the antenna.
- Examination of the wreckage and additional inspections showed no evidence of a malfunction that may have contributed to the accident.
- The pilot was found near the wreckage, out of his seat.

3.2 Causes of the Accident

The accident was due to a loss of control at a low height, probably during sudden evasive action taken to avoid an obstacle that was detected too late. The late detection of the obstacle was due to reduced external visibility and a visual field limited by the use of the “all weather” side window.

The loss of outside visual references during the evasive action, or the inability of the pilot to control the flight path, or a combination of both, was the probable cause of the loss of control.

Factors contributing to the accident were:

- The decision to initiate and continue the flight despite known adverse weather conditions.
- The decision to fly at a height that made it impossible to ensure adequate vertical separation with the terrain and any obstacles.
- The choice of a flight path that did not guarantee sufficient horizontal separation with obstacles on the route.

LIST OF APPENDICES

Appendix 1
Transcript of radio communications

Transcript of the Seine sector SJ 120.325Mhz frequency				
From	**To**	**UTC**	**COMMUNICATIONS**	**Observations**
FHBMA	Seine SI	12.29.36	Seine Info, Seine Info from FHBMA good day.	
Seine SI	FHBMA	12.29.47	HBMA, Seine Info good day.	
FHBMA	Seine SI		Seine, good day, an EC-135 from Moulineaux, I'm passing Toussus at present VFR on top, direction Lu… Lyon Bron. I have 70 0 0 on the transponder. Could you contact Lyon Bron for the latest please?	
Seine SI	FHBMA		MA, squawk 70 30 and I will call you back.	
FHBMA	SI		…10 30.	
Seine SI	FHBMA	12.31.22	F-MA, identified radar, call back ready to copy the latest from Lyon Bron at 12 zulu time.	
FHBMA	Seine SI		Ready to copy.	
Seine SI	FHBMA		MA so wind calm, visibility 8 kilometres, cloud cover 500 feet, temperature zero, dew point minus one, and the QNH one zero two two.	
FHBMA	Seine SI		Ok, 8 kilometres, 500 feet and zero, minus one, one thousand twenty two, thank you.	
FHBMA	Seine SI		You can maybe call back Auxerre to get the latest?	
Seine SI	FHBMA		MA, I will call you back.	
FHBMA	Seine SI		*(sound of switch)*	
FHBMA	Seine SI	12.32.18	Correction, err, Seine, from MA, I'd prefer to have the meteo from err…Mâcon please.	
Seine SI	FHBMA		MA, do you confirm, the meteo from Mâcon ?..... do you have the ICAO code?	
FHBMA	Seine SI		LFLM	
Seine SI	FHBMA		MA thanks. I will call you back.	
FHBMA	Seine SI	12.33.26	Seine from MA, for Lyon Bron, can you confirm the runway in service please ?	
Seine SI	FHBMA		err MA,… I will have to call you back err, I will call you back.	
FHBMA	Seine SI		Thanks.	
Seine SI	FHBMA	12.34.59	F-MA, for info at Lyon Bron runway 34 in service.	
FHBMA	Seine SI		Roger 34. Confirm that they have BROKEN at 500 feet or OVERCAST ?	
Seine SI	FHBMA		I think it's OVERCAST at err 500 feet.	
FHBMA	Seine SI		Roger.	
Seine SI	FHBMA		…MA, for info I have no info on the meteo at Mâcon.	
FHBMA	Seine SI		(sound of switch)	
Seine SI	FHBMA	12.35.41	BMA, leaving Seine, transponder 7000. Leave the frequency. If you want it, Paris Info 126 one. Goodbye.	
FHBMA	Seine SI		…(Lyon?) Two solutions, either Lyon Bron takes me for an ILS, radar vectoring and an ILS on their installations or I turn back…err to go below the cloud layer. Can you contact them about that?	
FHBMA	Seine SI	12.36.10	Paris? Seine?	
Seine SI	FHBMA		F-MA, I will call you back.	
Seine SI	FHBMA	12.36.21	MA?	
FHBMA	Seine SI		Receiving you 5.	
Seine SI	FHBMA		Yes, MA, so we can call Bron but for in one hour they won't be able to say if they can take you on ILS	

			especially as that will certainly be done with avec Lyon Saint Ex. and…so… to be safe I advise you to go below the cloud layer, especially as you are in VFR and you have no IFR at the present time.
FHBMA	Seine SI		No, I didn't file an IFR flight plan for err Lyon Bron but hey listen err I'll follow your advice. I'll head back to get sight of the ground and then I'll pass above it.
Seine SI	FHBMA		Roger. If you want another meteo on the other hand we can give you the meteo of a diversion field.
FHBMA	Seine SI		What I need is above the ground. By going a bit north err, it was possible to go below the layer. There at the level of Clamec…(incomprehensible)…Clamecy, its particularly scattered.
Seine SI	FHBMA		Roger so err… call back when you're under the cloud layer.
FHBMA	Seine SI		(sound of switch)
FHBMA	Seine SI	12.46.54	From F-HBMA.
Seine SI	FHBMA		MA, go ahead.
FHBMA	Seine SI		I'm coming…err…I see the ground now.. err well I'll get off, descending. I wish you all a good day.
Seine SI	FHBMA		Roger. Will you tell us the destination anyway?
FHBMA	Seine SI		Affirm. It's still Lyon Bron.
Seine SI	FHBMA		Lyon Bron, roger. Err… aren't you staying with us for the flight info in the lower layers ?
FHBMA	Seine SI		Yeah in any case I can't…if they can take me on ILS there, well listen, I'll do it in VFR above. And if it's no good I'll divert.
Seine SI	FHBMA		Roger so err… But if you turn back, you can stay with us as far as Paris info. Err… and then if you happen to run into any problems don't hesitate to request IFR anyway.
FHBMA	Seine SI		Yes. Affirmative. No problems. I'll ask them if necessary. Roger. I'm maintaining (broken) radar… if you don't get me it's because I'm too low. Have a good day and a happy new year.
Seine SI	FHBMA		Roger so transponder 7000 err and then monitor frequency as you wish and don't hesitate to call us back for another meteo update.
FHBMA	Seine SI		Roger. 7000.

Appendix 2
Examination of the pilot's harness buckle

The pilot's harness buckle was examined.

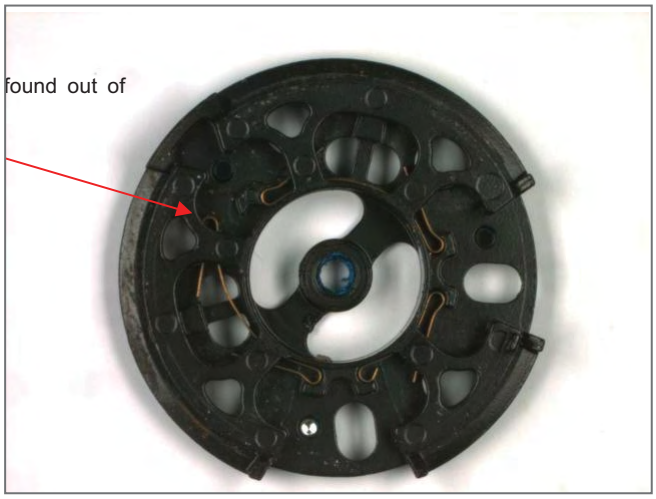
The harness had four attachment points: two lap straps (attachment points left and right) and two shoulder straps (one attachment point).

An initial examination showed that one of the fasteners (right shoulder strap) did not lock in the buckle.

No locking of the fastener of the right shoulder strap

X-ray examination, then the opening of the buckle, showed why it did not lock.

Each fastener is locked by a slug. When it is unlocked, each fastener is released by the expansion of a pin, which is compressed in the locked position. The buckle consists of three pins, two double pins (to release the two fasteners) and a single pin. One of the double pins was found outside its seat on the locking side of the fastener of the right shoulder strap.



Pins used to release the fasteners

In this position, the pin prevents the fastener from being positioned and locking.

No marks on the buckle or the pin made it possible to determine whether the pin on the right shoulder strap was in position at the time of the event, or whether the different fasteners of the harness were locked at the time of the impact.

The analysis of the harness buckle did not make it possible to determine whether the pilot was completely attached, partially attached, or not attached at all at the time of impact.

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