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Report

Accident on **9 December 2010**
at **Tourrettes-sur-Loup (06)**
to the **Robinson R22 helicopter**
registered **G-CBVL**

BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
Ministère de l'Ecologie, du Développement durable et de l'Energie

Safety Investigations

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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.

Table of Contents

Glossary

AGL	Above Ground Level
CEPr	DGAC engine test center of Saclay
DGAC	French civil aviation directorate
ft	Feet
GPS	Global Positioning System
kt	Knots
NM	Nautical Mile
QNH	Atmosphéric Pressure at sea level
UTC	Universal Time Coordinated
VHF	Very High Frequency

Synopsis

Date
Thursday 9 December 2010 at about 7 h 55[1]

Place
Tourrettes-sur-Loup (06)

Type of flight
Private flight

Aircraft
Robinson R22 helicopter registered G-CBVL

Owner
Ground Control Ltd

Operator
Private

Persons on board
Pilot + passenger

[1]Unless otherwise indicated, the times in this report are expressed in Universal Time Coordinated (UTC). One hour should be added to obtain the time in metropolitan France on the day of the event.

Summary

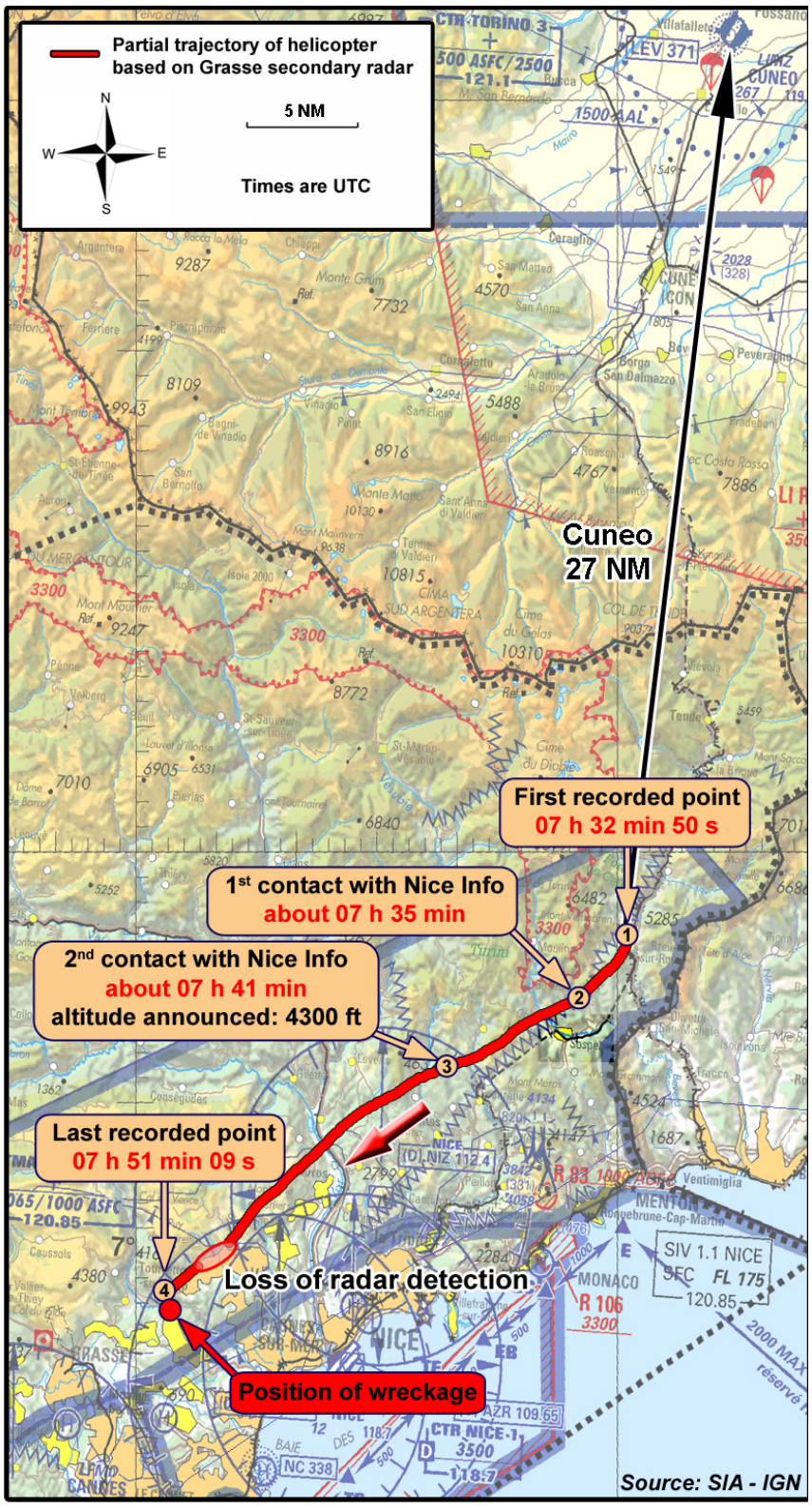
The pilot took off from a private helipad in Cuneo (Italy) for a flight bound for the United Kingdom via the Rhône valley. He transited north of the Nice Côte d'Azur aerodrome CTR, in contact with the Flight Information Service. Twenty minutes later, the controller lost radar and radio contact with the aircraft. The wreckage was found on the side of a wooded hill. The pilot and passenger were killed.

The investigation showed that the accident was likely due to an inappropriate input on the flight controls by the pilot in turbulent conditions. This input caused rotor shaft bumping that resulted in a deviation in main rotor rotation and the failure of the main blades' droop restrainer.

1 – FACTUAL INFORMATION

1.1 History of Flight

The pilot had had the 50-hour overhaul done at an approved maintenance centre in Cuneo (Italy).



On the day of the accident, he took off with a passenger at 6 h 45 and planned to refuel in Aix-en-Provence or Avignon before continuing his flight. No flight plan was filed.

At 7 h 35 min 20, he contacted the Nice-Côte d'Azur FIR (Nice Info).

At 7 h 40 min 14, he informed the controller that he had taken off from a private helipad north of Sospel (06) and that he estimated his position to be 2 NM north of Escarène, at an altitude of 4,300 feet at QNH 1000 hPa. The controller requested a transponder squawk and then indicated that the QNH was 1008 hPa.

From 7 h 51, the controller called the pilot several times but did not get an answer.

A witness located under the helicopter's flight path saw it dive to the ground and informed the rescue services.

The wreckage was found on the side of a wooded hill.

1.2 Killed and Injured

Injured	Crew	Passengers	Other persons
Fatal	1	1	0
Serious	0	0	0
Slight/None	0	0	0

1.3 Damage to the Aircraft

The helicopter was destroyed.

1.4 Other Damage

Not applicable.

1.5 Pilot Information

Male, aged 50

Aviation qualifications:

- ❒ private helicopter pilot licence PPL (H) issued 22 June 1993 by the United Kingdom civil aviation authorities;
- ❒ Robinson R22 type rating valid until 10 July 2011;
- ❒ Robinson R22 safety training course;
- ❒ authorisation to use French helicopter landing pads dated 30 January 2006, issued by the Paris Préfecture de Police, valid until 25 January 2016;
- ❒ second class medical fitness certificate valid until 8 February 2011.

Experience:

- ❒ 2,374 flying hours;
- ❒ 11 flying hours in the previous three months, of which 4 on type;
- ❒ 30 minutes flying time in the previous 24 hours, all on type.;

The pilot regularly took part in helicopter competitions with a Robinson R22. He had won the British National Championship eight times.

1.6 Aircraft Information

1.6.1 Airframe

Manufacturer	Robinson
Type	R22 beta II
Serial number	3353
Entry into service	15 August 2002
Airworthiness certificate	19 May 2010
Utilisation as of 22 November 2010	2,296 hours

1.6.2 Engine

Manufacturer	Lycoming
Type	0-360 J2A
Serial number	L-38632-36A

1.6.3 Fuel

The approved fuels for use on the helicopter were:

- 100 LL aviation gasoline for all engines;
- 100/130 aviation gasoline for 0-320-B2C and 0-360-J2A engines.

The helicopter had a capacity of:

- 75 litres including 72.7 usable litres in the main tank;
- 41.3 litres including 39.7 usable litres in the reserve tank.

The day before the accident, on the return from the first ferrying attempt, the pilot carried out additional fuelling with about thirty litres of automobile 95 lead-free petrol to which he added 250 ml of Wynn's additive. The helicopter then had a full tank.

1.6.4 Weight and Balance

The maximum weight authorised on take-off is 621 kilograms.

The following calculation gives an estimated helicopter weight on leaving Cuneo of 648 kg:

- Empty weight = 400 kg
- Weight of occupants and their baggage = 165 kg
- Weight of 116 litres fuel x 0.72 = 83 kg

Based on an hourly consumption of 35 litres/hour, at the time of the accident the weight of the fuel was about (116 – 40) x 0.72 = 55 kg, giving a total weight of about 620 kg. This was very close to the maximum authorised weight.

The investigation also showed that the helicopter had a forward CG, but remained within the limits defined by the manufacturer. The calculations are in appendix 1.

No weight and balance calculation document relating to the accident flight was found in the wreckage or at Cuneo.

1.7 Meteorological Conditions

On the day of the accident a westerly airflow over the southern Alps generated winds that reached 55 knots between 1,200 and 2,200 metres altitude. At low altitude, meteorological observations indicated winds not exceeding 25 kt (see the METAR for Cuneo, Nice and Cannes in appendix 2). The TEMSI France chart at 9 h 00 showed a cloudy area over the northern Alps.

The temperature and dew point at Tourettes-sur-Loup station showed a Foehn effect warming and drying the air mass, an upsurge in wind on the south-east sides of the high ground was possibly producing strong gusts downwards locally, and very severe turbulence.

The estimated meteorological conditions at the accident site were, for a time, clear with very good visibility. Air pressure was 1007 hPa. Below 3,000 metres there was no noticeable icing and the air mass was dry. Wind conditions were as follows:

- on the ground, variable wind, 4 to 6 knots and strong local gusts to 45 kt;
- 500 metres above ground level (AGL), wind from 280° at 25 knots, maximum 45 kt;
- 1,500 metres AGL, wind from 300° at 59 kt;

No meteorological dossier was found in the wreckage.

1.8 Aids to Navigation

No GPS was found on board the helicopter.

1.9 Telecommunications

The pilot contacted Nice FIR on information frequency 120.850 MHz. The transcript is in appendix 3.

1.10 Aerodrome Information

Not applicable.

1.11 Flight Recorders

The helicopter was not equipped with flight recorders. The regulations in force for this type of aircraft did not require it.

1.12 Wreckage and Impact Information

1.12.1 Examination of the site

The accident occurred in a wooded area about 2 kilometres south-west of the commune of Tourrettes-sur-Loup, between departmental road 2210 and the Colle-sur-Loup road. The site, located at an altitude of 220 metres, was very steep.

1.12.2 Wreckage examination

The helicopter was destroyed. The main section lay at the foot of a tree. A section of blade was found 30 metres before the site while a piece of the landing skids was located about 30 to 40 metres from the site.

Observation of the site and wreckage showed high vertical energy on impact. No component observed showed horizontal energy, or rotation of the main and tail rotors . The wreckage could not be fully examined on site. It was transported to the CEPr for additional examinations.

Part of the main rotor blade was located seven months later about 580 metres from the accident site and recovered in December 2011.

1.13 Medical and Pathological Information

The samples taken showed no anomalies liable to have affected the pilot's ability.

1.14 Fire

There was no fire.

1.15 Survival Aspects

The helicopter's collision with the ground left the occupants no chance of survival.

1.16 Tests and Research

1.16.1 Examinations carried out at the CEPr

The additional examinations and analyses carried out on the wreckage of the helicopter showed that:

- the main blade droop restrainer was broken;
- the engine was in working order before and at the time the accident;
- the flight controls and their continuity showed no defects;
- power transmission between the engine and the rotors was effective;
- the left side door, the opening Plexiglas panel, and the forward end of the left skid were absent.

One of the two blades from the main rotor was reconstituted with a section taken from the wreckage and the segment recovered in December 2011. Both parts of the blade were contiguous. Examination of the impacts present on its leading edge showed that the blade struck the front section of the left skid and the canopy.

Such a contact was only possible after main rotor rotation deviation following the failure of the droop restrainer of the main blades.

Blade reconstitution

All the other damage recorded was the result of the shock on impact.

The report on the wreckage examination is in appendix 4.

1.16.2 Radar Trajectory

Readout of the ATM data from the Grasse secondary radar enabled the aircraft's flight path to be reconstructed from its entry into Nice FIR until the loss of detection. See paragraph 1.1.

1.17 Information on Organisations and Management

The helicopter belonged to Ground Control Limited, based in Essex. It was maintained by TK Helicopter Services Limited.

1.18 Additional Information

1.18.1 Testimony

1st witness

The pilot was staying with a friend in Cuneo. The helicopter was stored in a hangar located in this friend's residence. The latter indicated that the pilot and his passenger arrived in Cuneo by air the day before the accident. The pilot then tried to ferry the R22 to England. Because of poor meteorological conditions, he turned back to Cuneo after 20 minutes flight. The witness indicated that the pilot was used to carrying out flights from Cuneo to England via Chambery and never flew via Nice. He added that the helicopter was being sold and that the pilot had to ferry it quickly to its future owner. He stated that at the time the R22 took off from his residence, on the day of the accident, the meteorological conditions were CAVOK. He did not see the pilot consult a meteorological information site.

2nd witness

On the day of the accident, the pilot of a private helicopter and professional aeroplane instructor carried out a helicopter flight from Cannes aerodrome at about 8 h 15. After 15 minutes of flight, near Saint Vallier de Thiey, located 15 kilometres from Tourrettes-sur-Loup, he decided to abort his trip and return to Cannes. He noticed severe turbulence on approaching high ground.

3rd witness

A witness on the ground stated that he had seen the helicopter fly vertically over his house at a height of about 150 metres. He added that there was a very strong wind, a "south-westerly Mistral". He noticed that the helicopter seemed to be caught in wind flurries and that the tail boom was swinging from right to left. He heard sounds of "backfiring" then there was no sound. The witness saw the helicopter drop.

Other testimony

Two witnesses on the ground saw a metallic part separate from the helicopter and spin slowly to the ground.

1.18.2 Safety instructions

The manufacturer Robinson published a certain number of Safety Notices.

Safety Notice SN-32 states that flight in high winds or turbulent atmosphere should be avoided. It gives the recommended procedures in the event of entry into unexpected turbulence. Part 3 states "Do not over control" and paragraph 5 states *"avoid flying on the downwind side of hills, ridges or tall buildings where turbulence will likely be most severe"* (see appendix 5).

Safety Notice SN-11 states that low load factors per pitch-down input are extremely dangerous. *"Pushing the cyclic forward … even from level flight produces a low-G (weightless) flight condition. If the helicopter is still pitching forward when the pilot applies aft cyclic to reload the rotor, the rotor disc may tilt aft relative to the fuselage before it is reloaded. The main rotor torque reaction will then combine with tail rotor thrust to produce a powerful right rolling moment on the fuselage. With no lift from the rotor, there is no lateral control to stop the rapid right roll and mast bumping can occur. Severe in-flight mast bumping usually results in main rotor shaft separation and/or rotor blade contact with the fuselage."* (see appendix 6).

1.18.3 Previous events

The NTSB database mentions several accidents with rotor shaft failures similar to the accident to G-CBVL.

Registration	Date of accident	Cause
N8457J	26 February 1998	The cause identified by the NTSB for this accident was main rotor rotation deviation during a flight with moderate to severe turbulence.
N4029Q	27 November 2004	The causes identified by the NTSB for these accidents were main rotor rotation deviation. The consequences were mast bumping and main blade contact with the cockpit.
N8313Z	18 August 2000	
N83112	28 September 1994	
N4017J	10 August 1993	
N8069X	30 September 1992	
N83858	29 June 1992	
N191KC	6 May 1992	
N8413Q	4 March 1992	
N2313G	30 January 1992	
N80783	23 November 1990	
N23039	5 July 1991	
N8475	3 November 1987	

A study carried out by the BEA[2] examined Robinson R22 accidents, in particular those involving main rotor bumping in flight in low-G conditions.

[2]See : http://www.bea.aero/etudes/etuder22/etuder22.pdf

2 – ANALYSIS

2.1 Flight Preparation

No flight plan was filed. Furthermore, it was not possible to determine whether the pilot had obtained relevant meteorological information. However, the choice of a route via the Southern Alps tends to indicate that the pilot was aware of meteorological conditions in the Chambery region.

2.2 Get-home-itis

The pilot had to ferry the helicopter to the United Kingdom in order to deliver it to its future owner. The day before the accident, he had made a first attempt to ferry it. He had aborted his flight due to deteriorating meteorological conditions. The second attempt was probably subject to multiple constraints, personal and/or professional.

On the day of the accident, the meteorological conditions on departure from Cuneo were favourable. The wind was light.

Together these conditions likely prompted the pilot to carry out the flight. The BEA has published a study[3] on accidents that occurred when pilots tried to reach their destination at all costs. This study calls this phenomenon “Get-home-itis“.

[3]See BEA safety study: http://www.bea.aero/etudes/gethomeitis/gethomeitis.html

2.3 Piloting

The meteorological information and testimony indicate that the sector to the north of Nice was subject to strong winds. On approach to the mountainous area the aerology became very turbulent. The pilot had never taken this route and he didn't know the characteristics of this region, with its distinctive aerology.

The pilot encountered strong turbulence close to the high ground at Tourrettes-sur-Loup.

The manufacturer recommends avoiding flight in high winds or in a turbulent atmosphere.

The helicopter was subjected to positive and/or negative load factors, conditions in which the risk of main rotor unloading is significant. In this case, the controls act on the rotor without its aerodynamic profile being modified.

It is likely that the pilot, surprised by a strong gust of wind and the deviation of the helicopter's flight path, made an inappropriate input on the flight controls, resulting in mast bumping. This bumping resulted in the failure of the main blades' droop restrainer and a deviation of the main rotor from its path. One blade of the main rotor struck the cockpit, causing the left door to be torn off, and then the front of the left landing skid. This blade then broke, causing the helicopter to lose lift.

3 - CONCLUSIONS

3.1 Findings

- The pilot held the licences and qualifications required to undertake the flight.
- The helicopter had a valid airworthiness certificate.
- The pilot was performing a ferry flight with a passenger.
- The pilot had made a first attempt at ferrying the day before the accident.
- The meteorological situation in the area, characterised by strong turbulence, made it impossible for the flight to be carried out safely.
- The pilot did not know the specific aerological features of the region north of Nice.
- The helicopter was subjected to strong turbulence.
- The pilot's inputs on the flight controls likely led to the failure of the main blades' droop restrainer.
- One of the main rotor blades struck the helicopter cockpit and left skid.
- The blade breakage led to the helicopter's loss of lift.

3.2 Causes of the Accident

The accident was likely due to the pilot's inappropriate input on the flight controls in turbulent conditions. This input caused mast bumping, resulting in a deviation of the main rotor blade path and failure of the main blade droop restrainer.

Contributing to the accident were:

- a "Get-home-itis" phenomenon pushing the pilot to undertake and then continue a flight despite deteriorating aerological conditions;
- lack of knowledge of the aerological conditions in the area north of Nice.

List of Appendices

APPENDIX 1

Weight and balance calculation at the time of the accident

R22 Beta G-CBVL

Longitudinal balance

	Weight KG		Arm Moment		Moment
Empty weight	400.00	x	2.631	=	1 052.40
Pilot + Baggage	80.00	x	1.981	=	158.48
Passenger + Baggage	85.00	x	1.981	=	168.39
Main fuel	55.00	x	2.758	=	151.69
Auxiliary fuel	0.00	x	2.639	=	0.00
TOTALS	620.00		2.469		1 530.96
	A		B		C

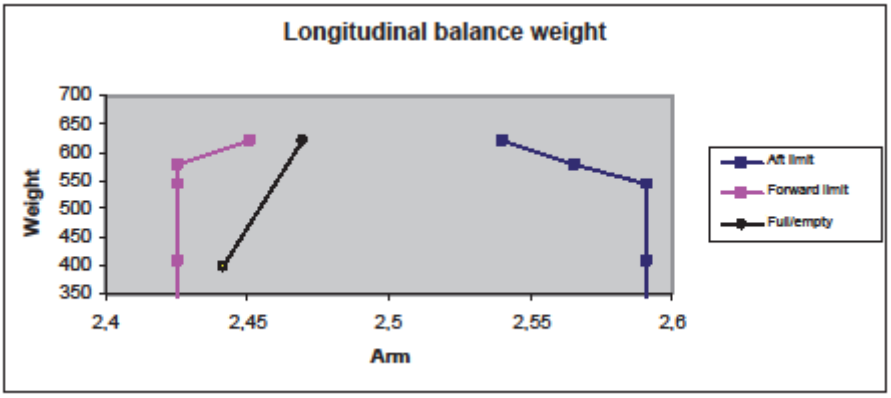
Arm Moment = **C/A=B**

Lateral Balance

	Weight KG		Arm Moment		Moment
Pilot + Baggage	80.00	x	+ 0.27	=	21.60
Passenger + Baggage	85.00	x	- 0.23	=	-19.55
Main fuel	55.00	x	- 0.28	=	-15.40
Auxiliary fuel	0.00	x	+ 0.28	=	0.00
TOTALS	220.00		-0.06		-13.35
	A		B		C

Arm Moment = **C/A=B**

Station				Weight	Arm	Moment
Base				400	2.63	1052.58
Right door removed			-5.2		1.97	0.00
Left door removed			-5.2		1.97	0.00
Extinguisher removed			-1.6		1.02	0.00
Right seat+baggage				80	1.98	158.50
Left seat+baggage				85	1.98	168.40
Empty weight				565	2.44	1379.47
Main 19.2 max	In litres: 75	Fill	75	55	2.76	151.71
Aux 10.5 max	In litres: 41	Fill	41	0	2.64	0.00
Full fuel weight				620	2.47	1531,19



APPENDIX 2

METAR and TAF at Cannes and Nice
TEMSI chart

METAR de l'aéroport de Cannes LFMD du 09/12/10 entre 05 h et 08 h UTC :

LFMD 090500Z AUTO 27013KT 9999NDV NCD 15/07 Q1007=
LFMD 090530Z AUTO 26016KT 9999NDV NCD 15/08 Q1007=
LFMD 090600Z AUTO 26014KT 9999NDV NCD 15/07 Q1007=
LFMD 090630Z AUTO 26017G27KT 220V290 9999NDV NCD 14/08 Q1008=
LFMD 090700Z AUTO 25017KT 9999NDV NCD 14/08 Q1008=
LFMD 090730Z AUTO 25018KT 9999NDV NCD 14/07 Q1008=
LFMD 090800Z AUTO 25018KT 9999NDV NCD 14/08 Q1008=

METAR de l'aéroport de NICE LFMN du 09 /12/10 entre 05h et 08h UTC :

LFMN 090500Z 24012KT CAVOK 14/08 Q1007 NOSIG=
LFMN 090530Z 23014KT CAVOK 14/09 Q1007 NOSIG=
LFMN 090540Z 23015KT CAVOK 14/09 Q1007 NOSIG=
LFMN 090600Z 23016KT CAVOK 15/09 Q1007 NOSIG=
LFMN 090630Z 22020KT CAVOK 15/09 Q1007 NOSIG=
LFMN 090700Z 22021KT CAVOK 14/08 Q1007 NOSIG=
LFMN 090735Z 25013KT 220V310 CAVOK 14/08 Q1008 NOSIG=
LFMN 090800Z 30008KT 260V330 CAVOK 14/08 Q1008 NOSIG=

TAF de l'aéroport de Cannes LFMD du 09/12/10 entre 05 h et 08 h UTC :

LFMD 090500Z 0906/0915 27015KT CAVOK TEMPO 0906/0914 25020G30KT BECMG 0914/0915 09010KT=
LFMD 090800Z 0909/0918 25020KT 9999 FEW030 SCT230 TEMPO 0909/0913 25025G35KT TEMPO 0913/0918 09010KT=

TAF de l'aéroport de NICE LFMN du 09 /12/10 entre 05 h et 08 h UTC :

LFMN 090500Z 0906/1012 24015KT CAVOK BECMG 0912/0914 09010KT FEW040 TEMPO 0918/0923 27010KT BECMG 0923/1001 34010KT CAVOK=

Metar de Cuneo LIMZ entre 5h et 8h utc
LIMZ 090650Z 25004KT 0200 R21/0275 FG OVC001 00/00 Q1006 RMK VIS MIN 0200=
LIMZ 090750Z 21004KT 1600 BR BKN080 00/00 Q1006 RMK VIS MIN 1600=

TAF de Cuneo LIMZ entre 5h et 8h utc
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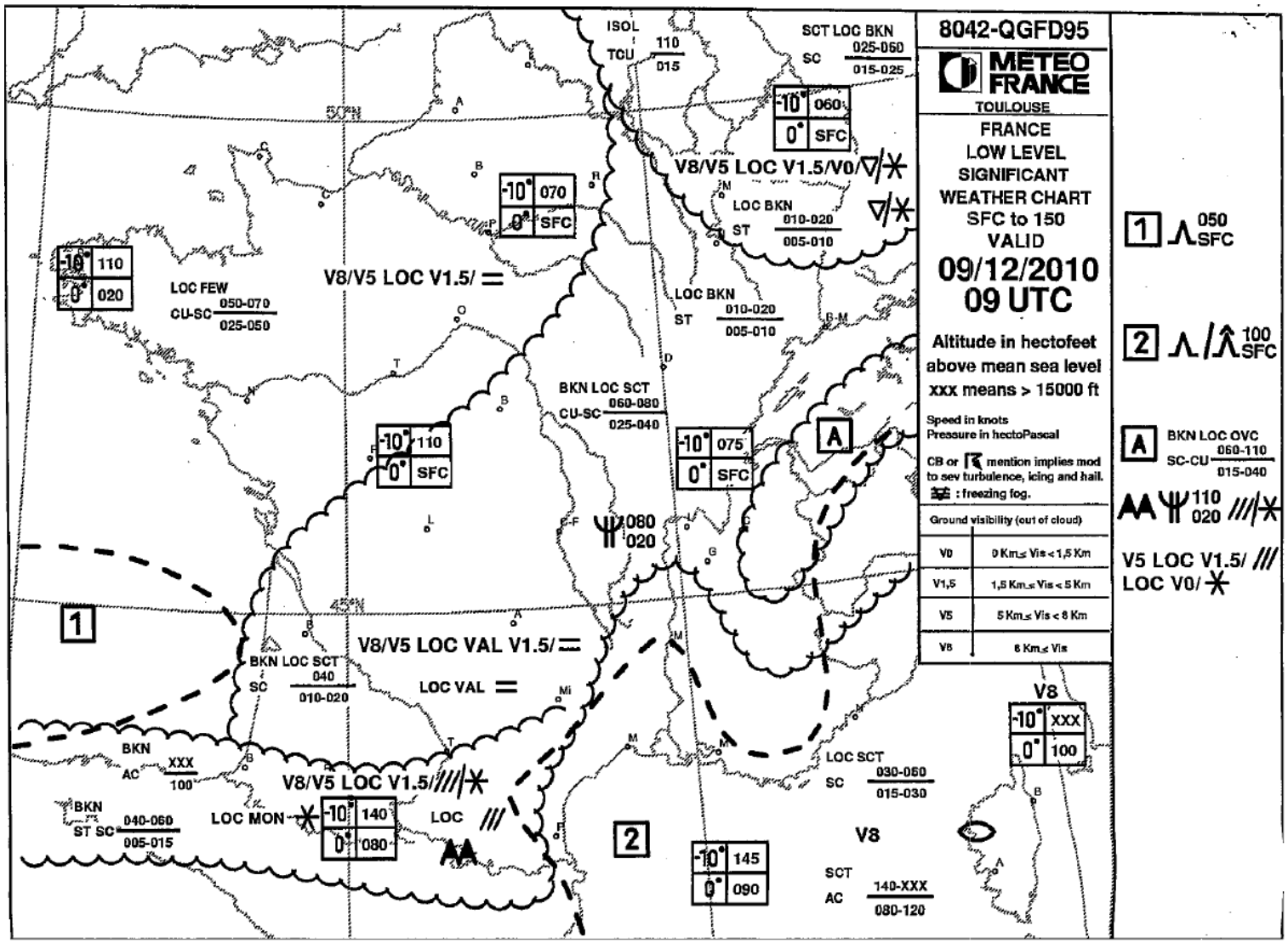
LIMZ 090800Z 0909/0918 VRB05KT 0400 FG BKN003 BECMG 0910/0912 CAVOK=


8042-QGFD95
METEO FRANCE
TOULOUSE
FRANCE
LOW LEVEL
SIGNIFICANT
WEATHER CHART
SFC to 150
VALID
09/12/2010
09 UTC
Altitude in hectofeet
above mean sea level
XXX means > 15000 ft
Speed in knots
Pressure in hectoPascal
CB or TCU mention implies mod to sev turbulence, icing and hail.
: freezing fog.
Ground visibility (out of cloud)
V0 0 Km≤ Vis < 1,5 Km
V1,5 1,5 Km≤ Vis < 5 Km
V5 5 Km≤ Vis < 8 Km
V8 8 Km≤ Vis
ISOL TCU 110 015
SCT LOC BKN SC 025-050 015-025
-10° 060 0° SFC
V8/V5 LOC V1.5/V0
LOC BKN ST 010-020 005-010
-10° 070 0° SFC
-10° 110 0° 020
LOC FEW CU-SC 050-070 025-050
V8/V5 LOC V1.5/
LOC BKN ST 010-020 005-010
BKN LOC SCT CU-SC 060-080 025-040
-10° 110 0° SFC
-10° 075 0° SFC
A
080 020
1
V8/V5 LOC VAL V1.5/
BKN LOC SCT SC 040 010-020
LOC VAL
BKN AC XXX 100
V8/V5 LOC V1.5/
BKN ST SC 040-060 005-015
LOC MON
-10° 140 0° 080
LOC
2
-10° 145 0° 090
LOC SCT SC 030-060 015-030
V8
SCT AC 140-XXX 080-120
V8
-10° XXX 0° 100
1 050 SFC
2 100 SFC
A BKN LOC OVC SC-CU 060-110 015-040
110 020
V5 LOC V1.5/
LOC V0/

APPENDIX 3

Transcript of ATC communications

Col. n°1 Station émettrice	Col. N°3 heure UTC (HHMMSS)	Colonne n°4 Communications	Colonne n°5 Observations
GCBVL	07 :35 :24	Nice bonjour hélicopter GOLF CHARLIE BRAVO VICTOR LIMA	
Nice Info	07 :35 :30	Hélicopter VICTOR LIMA. Say again full call sign	
GCBVL	07:35:34	Helicopter GOLF CHARLIE BRAVO VICTOR LIMA	
Nice Info	07:35:40	Is it GOLF CHARLIE BRAVO VICTOR LIMA?	
GCBVL	07:35:45	GOLF CHARLIE BRAVO VICTOR LIMA	(brouillé)
Nice Info	07:35:48	Call you back, VICTOR LIMA	
GCBVL	07:40:05	Nice, hello. Helicopter GOLF CHARLIE BRAVO VICTOR LIMA	
Nice Info	07:40:12	GOLF VICTOR LIMA	
GCBVL	07:40:14	GOLF VICTOR LIMA, R 2 2, two people on board from private site north of Sospel to Avignon. Our current position is two miles to the north of l'Escarène (?) at 4300, 1 0 0 0, squawking 7000. Requesting flight information service as we transit underneath your zone to the north of Nice.	
Nice Info	07:40:36	GOLF CHARLIE BRAVO VICTOR LIMA. Affirm.You squawk now 5 4 0 1 and confirm your departure field please	
GCBVL	07:40:46	Squawking 5 4 0 1 and it was a private site, not an airfield, a private site, it's Sospel	
Nice Info	07:40:53	VICTOR LIMA, say again departure field	
GCBVL	07:40:56	Not an airfield.....Sospel;	
Nice Info	07:41:03	Roger. Call you back to contact Marseille Information	
GCBVL	07:41:08	GOLF VICTOR LIMA. Merci.Can I have the QNH, please?	
Nice Info	07:41:16	Euh... VICTOR LIMA. QNH is 1 0 0 8	
GCBVL	07:41:20	1 0 0 8 VICTOR LIMA	
Nice Info	07:55:53	GOLF CHARLIE BRAVO VICTOR LIMA on freq?	
Nice Info	07:56:00	GOLF VICTOR LIMA on freq?	
Nice Info	07:56:05	GOLF VICTOR LIMA	
Nice Info	07:57:25	FOX CHARLIE HOTEL sur la fréquence?	
FGBCH	07 :57:26	Oui, CHARLIE HOTEL, on vous reçoit. C'est votre correspondant qui ne vous entend pas, je présume. Vous voulez qu'on essaie le relais ?	
Nice Info	07 :57:31	Voilà, exactement	
FGBCH	07 :57 :34	FOX VICTOR LIMA de CHARLIE HOTEL ?	
Nice Info	07 :57 :37	C'est GOLF VICTOR LIMA, l'indicatif.	
FGBCH	07 :57 :41	GOLF VICTOR LIMA de CHARLIE HOTEL	
FGBCH	07:57:51	GOLF VICTOR LIMA de CHARLIE HOTEL , est-ce-que vous m'entendez?	
FGBCH	07 :58 :04	CHARLIE HOTEL, on n'a pas de réponse de GOLF VICTOR LIMA	
Nice Info	07 :58 :07	Reçu CHARLIE HOTEL	

APPENDIX 4

Summary of DGA/CEPR examination report

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTÈRE DE LA DÉFENSE
ET DES ANCIENS COMBATTANTS

DGA

DIRECTION GENERALE
DE L'ARMEMENT

DGA Essais propulseurs

RAPPORT D'INVESTIGATIONS

01 – DAI – 11
OT n° 5506

Objet : Hélicoptère Robinson R22 immatriculé G-CBVL accidenté le 9 décembre 2010 à Tourrettes-sur-Loup (06)
Examen de l'aéronef

Références : Demande BEA n° 01/2011 du 10/01/2011

Date de réception des pièces : 06/01/2011
Début de l'investigation : 19/01/2011
Fin de l'investigation : 12/01/2012

Résumé :

Les examens et les analyses réalisés à DGA Essais propulseurs sur les éléments de l'épave de l'hélicoptère Robinson R22 immatriculé G-CBVL accidenté le 9 décembre 2010 à Tourrettes-sur-Loup ont permis d'établir les faits suivants :

- Le moteur, les éléments des commandes de vol et de la transmission de puissance étaient dans un état mécanique satisfaisant au moment de l'évènement.

- La porte gauche, la verrière en « plexiglas », l'extrémité avant du patin gauche sont absents.

- Une des deux pales du rotor principal a été reconstituée à partir de deux éléments retrouvés distants de 578 m environ sur le site de l'accident. Des marquages réalisés au droit d'une zone d'impact en bord d'attaque d'un des éléments sont présents sur l'autre et coïncident parfaitement.

- L'emplacement et la largeur des deux zones d'impacts identifiées sur la pale reconstituée correspondent respectivement à un contact avec le patin avant gauche et la verrière.

- Tous les autres endommagements constatés résultent du choc à l'impact.

La cause de l'accident est un contact entre la pale principale avec le cockpit et l'avant du patin d'atterrissage gauche. Ce contact n'est possible qu'après la divergence du plan de rotation du rotor principal nécessitant la rupture de la butée basse des pales principales. Le fort matage des cassures de la butée basse empêche de déterminer son mode d'endommagement.

Des constats similaires ont déjà été réalisés sur des aéronefs de même type, trois rapports du NTSB ont été identifiés.

COMPOSITION

Pages	Planches	Annexes	Références bibliographiques
36	18	5	Documents constructeurs

REPERES D'ARCHIVAGE

Thème d'identification : Robinson – R22 – hélicoptère - bipale

Mots clés : contact rotor-fuselage – Lycoming - reconstitution

Le Responsable Investigations	Le Responsable Prestations Projets	Le chef de la Division Analyses Investigations Correspondant Qualité
P. PEURIERE	P. PEURIERE	R. SABOURIN

DIFFUSION INTERNE : D⇨SDA⇨SDT⇨DAI⇨DAI/St - DAI/I – DAI/M (SD)

DIFFUSION EXTERNE :
BEA (à l'attention de M. MENEZ ou Melle DE ZELICOURT – 2 ex. + 2 supports numériques)
SRGTA de Roissy (à l'attention de l'Adjudant SELLIER – 1 ex.+ 1 support numérique)

Modèle DGA Essais propulseurs n°319021 S-CAT Ed02 associé à la procédure CEPr n°319017 S-CAT

APPENDIX 5

Robinson R22 Safety Notice 32

ROBINSON
HELICOPTER COMPANY

Safety Notice SN-32

Issued: Mar 98

HIGH WINDS OR TURBULENCE

Flying in high winds or turbulence should be avoided but if unexpected turbulence is encountered, the following procedures are recommended:

1) Reduce airspeed to between 60 or 70 KIAS.

2) Tighten seat belt and firmly rest right forearm on right leg to prevent unintentional control inputs.

3) Do not overcontrol. Avoid large or abrupt control movements. Allow aircraft to go with the turbulence, then restore level flight with smooth gentle control inputs.

4) Leave governor on and do not chase RPM or airspeed. Momentary RPM or airspeed excursions are to be expected.

5) Avoid flying on the downwind side of hills, ridges, or tall buildings where the turbulence will likely be most severe.

6) Never fly into a blind or box canyon during high winds.

APPENDIX 6

Robinson R22 Safety Notice 11

ROBINSON
HELICOPTER COMPANY

Safety Notice SN-11

Issued: Oct 82 Rev: Nov 00

LOW-G PUSHOVERS - EXTREMELY DANGEROUS

Pushing the cyclic forward following a pull-up or rapid climb, or even from level flight, produces a low-G (weightless) flight condition. If the helicopter is still pitching forward when the pilot applies aft cyclic to reload the rotor, the rotor disc may tilt aft relative to the fuselage before it is reloaded. The main rotor torque reaction will then combine with tail rotor thrust to produce a powerful right rolling moment on the fuselage. With no lift from the rotor, there is no lateral control to stop the rapid right roll and mast bumping can occur. Severe in-flight mast bumping usually results in main rotor shaft separation and/or rotor blade contact with the fuselage.

The rotor must be reloaded before lateral cyclic can stop the right roll. To reload the rotor, apply an immediate gentle aft cyclic, but avoid any large aft cyclic inputs. (The low-G which occurs during a rapid autorotation entry is not a problem because lowering collective reduces both rotor lift and rotor torque at the same time.)

Never attempt to demonstrate or experiment with low-G maneuvers, regardless of your skill or experience level. Even highly experienced test pilots have been killed investigating the low-G flight condition. Always use great care to avoid any maneuver which could result in a low-G condition. Low-G mast bumping accidents are almost always fatal.

NEVER PERFORM A LOW-G PUSHOVER!!

BEA

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