		CA18/2/3/8017			
		SOUTH AFRICAN CIVIL AVIATION AUTHORITY ACCIDENT REPORT – EXECUTIVE SUMMARY			
Aircraft Registration	ZS-RMR	Date of Accident	2 October 2005	Time of Accident	1830Z
Type of Aircraft	Messerschmitt Bolkow Blohm GMBH MBB BO 105-S		Type of Operation	Medivac	
Pilot-in-command Licence Type	Commercial	Age	35	Licence Valid	Yes
Pilot-in-command Flying Experience	Total Flying Hours	1779.42	Hours on Type	4.6	
Last point of departure	GPS position S 33° 43.645' E023° 19.355', near the town of Haarlem				
Next point of intended landing	FAGG				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)					
GPS position S 33° 47.56' E023° 19.97', near the town of Haarlem					
Meteorological Information	According to the official weather report, partly cloudy conditions, with isolated thunderstorms which were most likely at the time and place of the accident.				
Number of people on board	1+2+1	No. of people injured	0	No. of people killed	4
Synopsis					
<p>On 2 October 2005 at approximately 1615Z, the helicopter was despatched from George, with the pilot and two paramedics on board to attend to a serious road accident near Haarlem on the Langkloof road. The helicopter landed on the road at the road accident site at approximately 1640Z. At approximately 1750Z it took off again with one patient (an American citizen) who was seriously injured, for a flight back to a hospital in George.</p> <p>At approximately 1830Z the helicopter crashed in mountainous terrain near Haarlem. All the occupants sustained fatal injuries and the helicopter was destroyed.</p> <p>The pilot held a valid commercial pilot's licence, was instrument-rated, a grade 3 flight instructor and a class 2 test pilot. According to available information, the aircraft was serviceable in all respects.</p> <p>According to SACAA documentation, the operator, AMS Air Ambulance, also known as Red Cross, was fully Part 138 compliant in accordance with the regulations of the SACAA (South African Civil Aviation Authority), but had been granted exemption by the Licensing Council from holding a G-7 licence. However, the operation had not been exempted from complying with the Part 138 regulations. No operations audit report could be located on the operator file at the SACAA. However, a debrief report on operations audit, dated 10 August 2004, was located. There was only a recommendation on this debrief report, stating that it is recommended that Part 138 be endorsed. This document was dated 10 August 2004.</p> <p>The last MPI was certified on 15 March 2005 at 8006.1 airframe hours. The last audit on the AMO was carried out on 15 September 2005. No major findings had been identified.</p>					
Probable Cause					
CFIT (Controlled Flight Into Terrain).					
Contributory factors: Spatial disorientation Poor weather conditions Night-time flight					



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Air Ambulance Service (Red Cross)
Manufacturer : Messerschmitt Bolkow Blohm
Model : GMBH MBB BO 105-S
Nationality : South African
Registration Marks : ZS-RMR
Place : Haarlem
Date : 2 October 2005
Time : 1830Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation :

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997) this report was compiled in the interests of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and **not to establish legal liability**.*

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

- 1.1.1 On 2 October 2005 at approximately 1615Z, the helicopter was despatched from George, with the pilot and two paramedics on board to attend to a serious road accident near Haarlem on the Langkloof road.
- 1.1.2 The helicopter landed on the road at the road accident site at approximately 1640Z. At approximately 1750Z it took off again with one patient (an American citizen) who was seriously injured, for a flight back to a hospital in George.
- 1.1.3 At approximately 1830Z the helicopter crashed in mountainous terrain near Haarlem. All the occupants sustained fatal injuries and the helicopter was destroyed.



The RED arrow indicates the position of the road accident from where the helicopter took off. Position S33° 43.645' E023° 19.355 @ an elevation of 2500 ft AMSL.



The arrow indicates the position of the helicopter accident. Position S33° 47.56' E023° 19.97' @ an elevation of 4600 ft AMSL

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	1	2	1	-
Serious	-	-	-	-
Minor	-	-	-	-
None	-	-	-	-

1.3 Damage to Aircraft

1.3.1 The helicopter was destroyed by the impact forces and the post-impact fire.



The picture above shows the tail-boom of the helicopter and below it can be seen that the helicopter was destroyed by the impact forces and the post-impact fire.



1.4 Other Damage

- 1.4.1 Apart from fire damage to the surrounding vegetation, there was no other damage.



Fire damage caused to the vegetation in the immediate area of the accident.

1.5 Personnel Information

Pilot-in-Command

Nationality		South African			
Licence No	*****95	Gender	Male	Age	35
Licence valid		Yes	Type Endorsed	Yes	
Ratings		Instructor (Gr 3): 24/04/2003 – 23/04/2006 Instrument: 22/04/2005 – 21/04/2006 Test Pilot: Class 2 Night			
Medical Expiry Date		31 October 2005			
Restrictions		Nil			
Previous Accidents		Nil			

Flying Experience:

Total Hours	1779.7
Total Past 90 Days	4.6
Total on Type Past 90 Days	4.6
Total on Type	4.6

1.6 Aircraft Information

Airframe:

Type	MBB-BO 105-S
Serial #	S-603
Manufacturer	Messerschmitt Bolkow Blohm GMBH
Year of Manufacture	1983
Total Airframe Hours & Cycles @ 100 Hrs Inspection (MPI) (15 March 2005)	Hours: 8006.1 Cycles: 39923
Hours since Last MPI	81.2
C of A (Issue date)	4 August 2000
C of R (Issue Date)	21 September 2000
Operating Categories	Standard

Engine 1:

Type	Alison 250-C20B
Ser #	CAE 834767
Hours & Cycles since New (On 8 December 2004) 600 Hrs Inspection	Engine Hours: 8006.1 Engine Cycles: 37603 Gearbox: 3224.6 Compressor: 2762.5 Turbine: 7982.2
Hours & Cycles since Overhaul (On 8 December 2004) 600 Hrs Inspection	Engine Hours: Not overhauled Engine Cycles: Not overhauled Gearbox: Not overhauled Compressor: Not overhauled Turbine: Not overhauled

Engine 2:

Type	Alison 250-C20B
Ser #	CAE 833073
Hours & Cycles since New (On 8 December 2004) 600 Hrs Inspection	Engine Hours: 8115.2 Engine Cycles: 32291 Gearbox: 7144.1 Compressor: 6592.2 Turbine: 8439.5
Hours & Cycles since Overhaul (On 8 December 2004) 600 Hrs Inspection	Engine Hours: Not overhauled Engine Cycles: Not overhauled Gearbox: Not overhauled Compressor: 57.1 Turbine: 57.1

1.7.1 Meteorological Information

There were no witnesses to this accident. No official weather observations were available at the time and place of the accident. According to an official weather report obtained from the SA Weather Services, the following conditions prevailed in the area on the day at 1500Z:

Wind direction	180°	Wind speed	05 Kts	Visibility
Temperature	11.0 °C	Cloud cover	Unknown	Unknown
Dew point	08.0 °C			

1. Surface analysis (1500Z on 18 January 2005)

A cold front was present on the KZN (KwaZulu-Natal) coast with a high pressure system behind it. A trough of low pressure was present over the central interior.

2. Upper Air Analysis

Strong westerly to south-westerly upper-winds were present in the upper air over the coastal areas.

The balloon ascent at 1200Z at Port Elizabeth weather office indicates the following winds:	
7000'	240° 20 kt
8000'	240° 27 kt
10 000'	240° 45 kt
In mountainous areas, these strong upper winds could have caused mountain waves and the dangers associated with them.	

3. Satellite Imagery

The 1500Z visual satellite imagery shows no clouds in the Haarlem area. The 1815Z infrared satellite imagery cannot show any low clouds even if there were clouds because of the small temperature difference between the surface and low clouds.

However, the most likely weather conditions at the place of the accident were partly cloudy conditions with isolated thundershowers.

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment for the aircraft type. At the time of the accident, there was no communication with the Air Traffic Control Centre in FAGG (George Aerodrome), nor was there any transponder squawk given or observed.

1.9 Communications.

- 1.9.1 According to the District Manager Metro EMS EDEN, the pilot made a radio call to the EMS Communication Centre at approximately 1830Z, giving a positional report. The District Manager could not recall the actual position of the helicopter at the time of this radio call. No radio transmissions between the aircraft or any other station were recorded.

1.10 Aerodrome Information

Aerodrome Location	Not applicable
Aerodrome Co-ordinates	Not applicable
Aerodrome Elevation	Not applicable
Runway Designations	Not applicable
Runway Dimensions	Not applicable
Runway Used	Not applicable
Runway Surface	Not applicable

1.11 Flight Recorders

- 1.11.1 The aircraft was not equipped with any data recorders, nor was it a requirement by regulation.

1.12 Wreckage and Impact Information

- 1.12.1 The slope of the terrain where the aircraft impacted the terrain, varies between 30° to 45° and the site elevation averaged at approximately 4600' AMSL.



The picture above shows the terrain gradient which averaged between 30° to 45°



The picture above shows the terrain gradient which averaged between 30° to 45°



The helicopter was destroyed during the initial impact and the post-impact fire.

- 1.12.2 The helicopter impacted the terrain on a heading of 102°M at an altitude of 4600' AMSL.
- 1.12.3 The remains of the main rotor, the landing gear skids, the tail boom, the tail rotor and various pieces of the instrumentation were located at the initial impact point.
- 1.12.4 Some medical equipment, e.g.: oxygen bottle, stretchers etc. and the bodies of the occupants were recovered on an average of 45m further uphill from the initial impact point, spread out in an arc of approximately 30°.
- 1.12.5 Various minor parts of the helicopter were located between the initial impact point to a distance of approximately 75m downhill from the initial impact point.
- 1.12.6 During the impact sequence, the engines separated from the helicopter and rolled a distance of approximately 85m down the mountainside, into a valley from where it was not possible to safely recover these engines.

1.13 Medical and Pathological Information

1.13.1 Pilot:

- 1.13.1.1 The pilot held a valid, unrestricted medical certificate as a commercial pilot, which expired on 12 January 2006.
- 1.13.1.2 According to the medico-legal post-mortem examination, the cause of death of the pilot was multiple injuries.
- 1.13.1.3 According to the Forensic Chemistry Laboratory, a blood sample was examined with the concentration of alcohol found in the sample being 0.00 gram / 100 ml.

1.13.2 Patient:

- 1.13.2.1 According to the medico-legal post-mortem examination, the cause of death was multiple injuries.

1.13.3 Flight Paramedic 1:

- 1.13.3.1 According to the medico-legal post-mortem examination, the cause of death was multiple injuries.

1.13.4 Flight Paramedic 2:

- 1.13.4.1 According to the medico-legal post-mortem examination, the cause of death was multiple injuries.

1.14 Fire

- 1.14.1 The helicopter was destroyed during the accident sequence and the post-impact fire.

1.15 Survival Aspects

- 1.15.1 The severity of the impact, as illustrated by the severe break-up of the aircraft during the impact sequence as well as the post-impact fire, rendered this accident to be not-survivable.
- 1.15.2 Although the accident occurred on 2 October 2005, rescue workers were only able to recover the bodies of the occupants from the mountain, by late afternoon on 3 October 2005.
- 1.15.3 This delay was caused by the search for the wreckage. After the wreckage was located, adverse weather conditions prevented the rescue team from flying to the accident site by helicopter and they had to walk for several hours before reaching the site.

1.16 Tests and Research.

- 1.16.1 The investigation team obtained the services of a helicopter to reach the accident site. During the flight to the accident site, the IIC (Investigator-in-Charge) requested the pilot of this helicopter to fly at the same height as that of the main impact point. It was noted that Plettenberg Bay was clearly visible from the accident site at a distance of 19nm south of the accident site. However, this flight was conducted in daylight and in VMC conditions.

1.17 Organisational and Management Information

- 1.17.1 No operations audit report could be located on the operator file at the CAA. However, a debrief report, dated 10 August 2004, on an operations audit was located. There is a remark on this debrief report stating that it is recommended that Part 138 be endorsed.
- 1.17.2 According to CAA documentation, the operator, AMS Air Ambulance, also known as Red Cross, was fully Part 138 compliant in accordance with the rules of the SACAA (South African Civil Aviation Authority), but was granted an exemption by the Licensing Council of South Africa, National Department of Transport from holding a G-7 licence. However, the operation was not exempted from complying with Part 138 of the CARs regulations.
- 1.17.3 On 30 May 2005, a letter was addressed to Ulawulo Lwephondo (AMS) by the Provincial Administration of the Western Cape (Department of Health and Social Services). In paragraph 2 of this letter it is stated that no flying will be done during the night while flying to the scene. However, no mention was made in the letter regarding a return flight from an accident site.

1.17.4 The intent of medi-vac flights is to render assistance and save lives by the transportation of injured persons to a hospital as quickly as possible. This has an effect on aircrew and paramedics, in that the pressure of assisting victims does affect decisions on whether to proceed with a flight or not, even in adverse weather conditions. This is a worldwide problem, indicated by the number of medi-vac fatal accidents occurring under adverse weather conditions. Where aircrew under normal circumstances may decide not to proceed with a flight, the pressure of knowing that a person's life is at stake, can influence this decision to the extent that they proceed with the flight, often with fatal consequences.

1.18 Additional Information

1.18.1 The wreckage of the helicopter was located early in the morning on 3 October 2005 by an aircraft that took part in an official search for it.

1.18.2 According to information obtained from the website of the SA Weather Service, the sunset and the moonset times were as follows on 3 October 2005:

Sunset	1630Z
Moonset	1740Z

From previous information and the above information the following can be concluded:

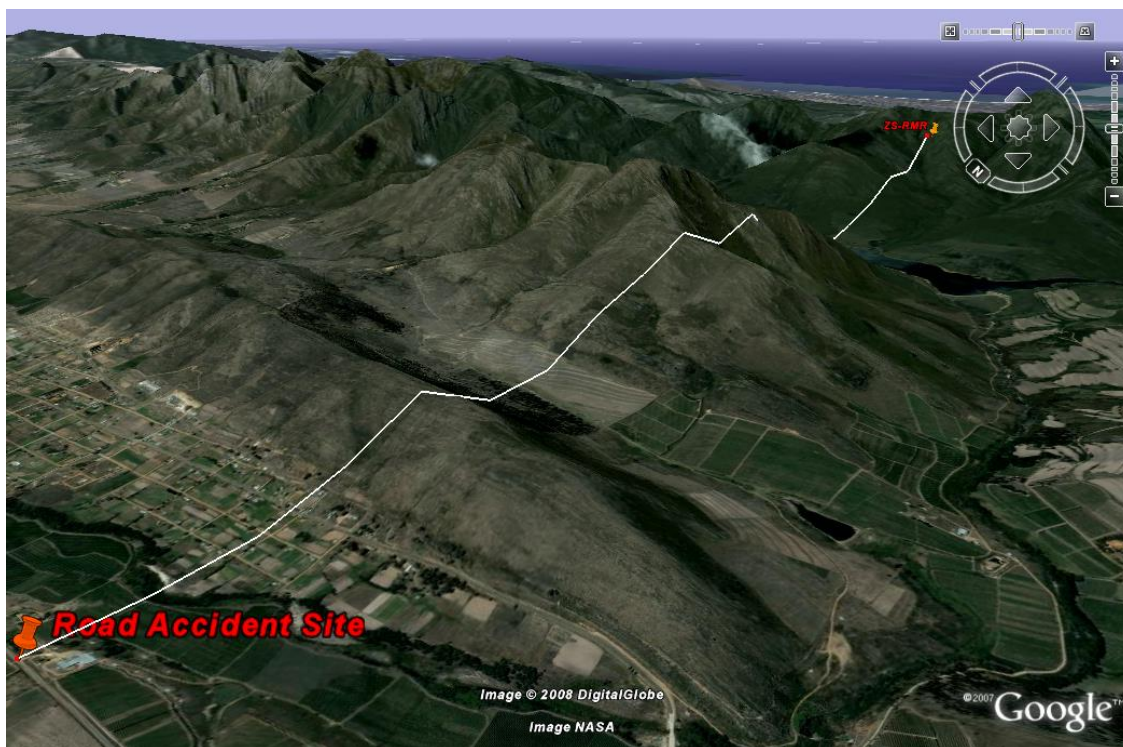
Helicopter landed at road accident site	1640Z	10 Minutes after sunset*	By definition Night starts 15 minutes after official Sunset.
Helicopter took off from road accident site	1750Z	60 Minutes before moonset 80 Minutes after sunset 10 Minutes after moonset	
Helicopter crashed	1830Z	120 Minutes after sunset 50 Minutes after moonset	Eg: Dark moon

1.18.3 Due to adverse weather conditions it was only possible for the investigation team to get to the terrain on 5 October 2005.

Information on take-off position & accident site position

Take-off position	Coordinates	S33° 43,6' E23° 19,5'	Accident site position	Coordinates	S33° 47,5' E23° 19,9'
	Elevation	2500' AMSL		Elevation	4600' AMSL
	GPS bearing to accident site	192° M		GPS bearing to take-off position	12° M
	Type of terrain	Tar road		Type of terrain	Mountains
Distance from road site (take-off point) to the crash site			Approximately 7.7 km (4.15 nm)		

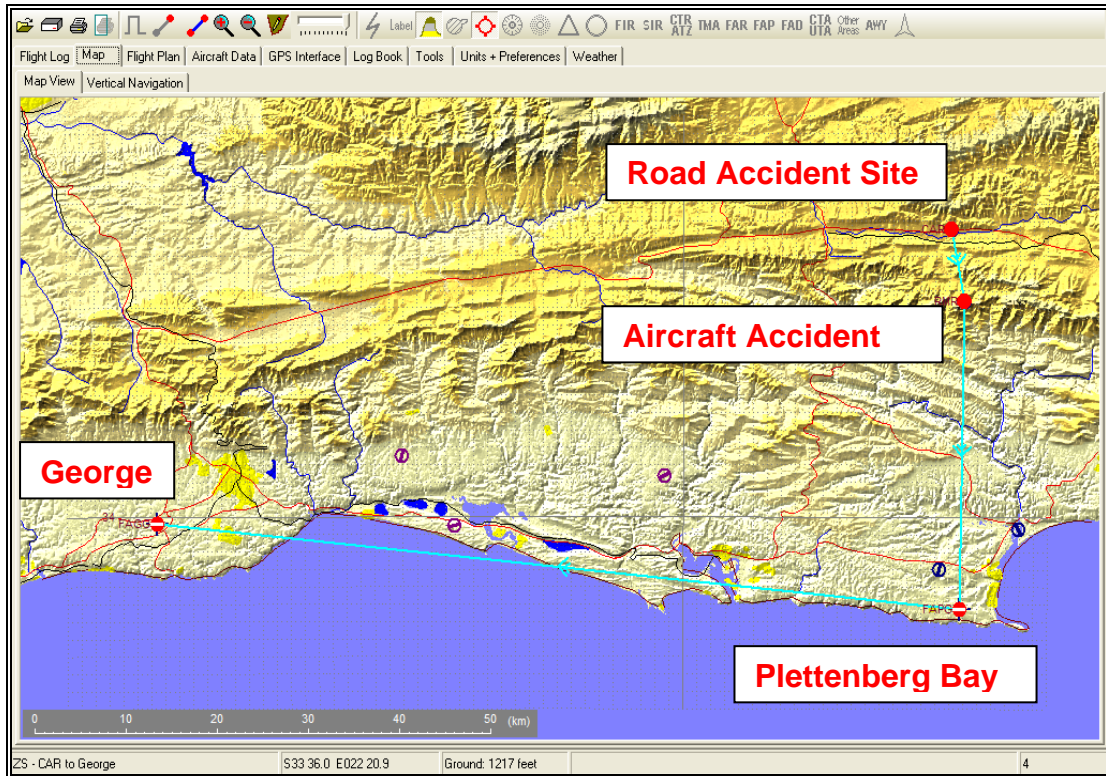
The picture below shows the take-off position at the road accident site and the ground profile (Ground track) to the aircraft accident site. In the background (top right hand corner), Plettenberg Bay can be seen.



1.19 Useful or Effective Investigation Techniques

1.19.1 Map & Vertical Navigation Profile:

- 1.19.1.1 A computer program (*EASYPLAN, Version 3.047*) was used to create the intended flight details from the position where the aircraft took off to the accident site, continuing to George, via Plettenberg Bay as illustrated below.



2. ANALYSIS

- 2.1 The helicopter departed from George at 1615Z and arrived at the road accident scene at 1640Z, ie: 10 minutes after official sunset time with night flying officially starting 15 minutes after sunset time.
- 2.2 A letter addressed to Ulawulo Lwephondo (AMS) by the Provincial Administration of the Western Cape (Department of Health and Social Services), stating that no flying will be done during the night while flying to the scene. The pilot probably expedited the flight in order to get to the road accident scene before official sunset. The return flight only commenced back in darkness after the injured person had been stabilized.
- 2.3 After take-off from the road accident site, the pilot headed South towards Plettenberg Bay instead of Westerly towards George. At the aircraft accident site, the helicopter impacted the terrain in an easterly direction.
- 2.4 No official weather observations were available at the time and place of the accident. However, the most likely weather conditions at the place of the accident were partly cloudy with isolated thundershowers. During the

investigation the IIC (Investigator-in-Charge) requested the pilot of another helicopter to fly at the same height / elevation as that of the accident site. It was noted that Plettenberg Bay was clearly visible from the accident site. It is the opinion of the Investigator-in-Charge that the mountain was probably covered in cloud at the time of the accident.

- 2.5 According to the official meteorological report from the South African Weather Service, the most likely weather conditions at the place of the accident, were partly cloudy conditions with isolated thundershowers. The accident occurred 120 minutes after sunset and 50 minutes after moonset.

3. CONCLUSION

3.1 Findings

- 3.1.1 The helicopter crashed in possibly cloudy night conditions, in mountainous terrain, fatally injuring all the occupants.
- 3.1.2 The pilot held a valid Commercial licence with a Night Rating, an Instrument Rating and a Gr 3 Flight Instructor Rating.
- 3.1.3 The pilot held a valid, unrestricted medical certificate as a Commercial pilot, which was valid until 12 January 2006.
- 3.1.4 The pilot was correctly licensed to conduct the flight, although he had limited experience on the aircraft type.
- 3.1.5 The aircraft was destroyed during the impact and the ensuing fire. Both engines separated from the aircraft and rolled down the mountainside into a valley from where it was not possible to safely recover these engines.
- 3.1.6 The operator, AMS Air Ambulance, also known as Red Cross, was fully Part 138 compliant in accordance with the regulations of the SACAA (South African Civil Aviation Authority), but had been granted exemption by the Licensing Council from holding a G-7 licence. However, the operation had not been exempted from complying with the Part 138 regulations. No operations audit report could be located on the operator file at the CAA. However, a debrief report, dated 10 August 2004, on an operations audit was located. A recommendation on this debrief report stated that Part 138 should be endorsed.
- 3.1.7 The last audit on the AMO showed that no major findings were identified. On 21 September 2004, the AMO approval number was renewed until 30 October 2005.

- 3.1.8 On 30 May 2005, a letter was addressed to Ulawulo Lwephondo (AMS) by the Provincial Administration of the Western Cape (Department of Health and Social Services). In paragraph 2 of this letter it is stated that no flying will be done during the night while flying to the scene. However, no mention was made in the letter regarding a return flight from an accident site.

3.2 Probable Cause/s

CFIT (Controlled Flight Into Terrain).

Contributory factors:

Night time flight
Spatial disorientation
Poor weather conditions.

4. SAFETY RECOMMENDATIONS

- 4.1 It is recommended that the SACAA require operators to impose a requirement of a minimum extent of experience for pilots before allowing them to do mercy flights or medi-vac flights, including that of being familiar with the terrain in their operational sectors.
- 4.2 It is recommended that the SACAA require operators involved in this type of operation to obtain detailed weather reports from the SA Weather Services prior to any flight, especially in coastal areas, and that the safety officer should ensure that pilots are familiar with the interpretation of such reports before commencing any flights.

5. APPENDICES

- 5.1 Annexure A:

Part 138

Air Ambulance Operations

138.06.5 The pilot-in-command of a helicopter used in an air ambulance operation shall not undertake any air ambulance flight operation by night, unless such helicopter is certified for instrument flight and is operated in accordance with its flight manual for instrument flight: Provided that in any other case, an air ambulance flight which is operated under VMC –

- (a) may continue to an illuminated hospital stop or an aerodrome approved for night operations for not more than 45 minutes after sun set; and
- (b) may commence such flight within the 45 minutes before sun rise.

-END-

Report has been reviewed and amended by Advisory Safety Panel

18 November 2008