AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/2/3/8780	
Aircraft Registration	**ZS-ROV**	**Date of Accident**	14 April 2010			**Time of Accident**	0547Z
Type of Aircraft	Robinson R22 (Helicopter)		**Type of Operation**		Private		
Pilot-in-command Licence Type		Private Pilot	**Age**	30	**Licence Valid**		Yes
Pilot-in-command Flying Experience		Total Flying Hours	72,5		Hours on Type		68,7
Last point of departure	Rand Airport (FAGM) Gauteng						
Next point of intended landing	Rand Airport (FAGM) Gauteng						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Open grass field NEAR Panorama Aerodrome (GPS position S 26˚19'45" E028˚03'54")							
Meteorological Information	Wind direction: 330˚TN; Wind speed: 4 knots; Visibility 400 m; Temperature 17 ˚C; Dew point 15 ˚C; Cloud cover: NSC; Cloud base: NSC.						
Number of people on board	1+0	**No. of people injured**	0	**No. of people killed**	1		

Synopsis

On Wednesday morning, 14 April 2010, at approximately 0538Z, a Robinson R22 helicopter, ZS-ROV, with the pilot as the only person on board, took off from Rand Aerodrome (FAGM) on a hire and fly flight to the Rand Helicopter General Flying (GF) area. The intention of this flight was to do some steep approach exercises.

When the helicopter did not return to the Flying School as scheduled, the South African Police Service (SAPS) were informed. The school and the police started a search for the missing helicopter.

At approximately 0840Z the air traffic controller (ATC) at Rand Aerodrome (FAGM) received a call from a person on the ground in the GF area informing them that the helicopter with registration ZS-ROV had crashed.

The helicopter was destroyed during the impact sequence and the pilot was fatally injured.

Probable Cause

The pilot entered instrument meteorological conditions (IMC), where after he collided with terrain because he had no visual reference to the ground.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Gypsey Empire Properties (PTY) LTD
Manufacturer : Robinson Helicopter Company
Model : R22 Beta
Nationality : Nigerian
Registration Marks : ZS-ROV
Place : Alberton
Date : 14 April 2010
Time : 0547Z

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 interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish legal liability****.*

Disclaimer:

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On 14 April 2010 at approximately 0500Z the pilot of ZS-ROV was conducting his pre-flight inspection. As the pilot was a former student of the chief flight instructor (CFI) at the flying school from where ZS-ROV was hired, the CFI discussed his intentions during the hire and fly period with the pilot.

1.1.2 The CFI was told by the pilot that he had experienced some difficulties with steep approaches (accurate distance assessment) when flying alone. Because the helicopter's weight would be less than when he was flying with an instructor, his intention was to practise some steep approaches in the GF.

1.1.3 The CFI then left and took off on a training flight. His route took him past the GF area where he noticed some low-lying fog. He then sent the pilot of ZS-ROV an sms message via cell phone at 0534Z, warning him not to come to the GF area due to the low-lying fog.

1.1.4 At approximately 0538Z the pilot of ZS-ROV took-off from Rand Aerodrome (FAGM) in VFR conditions on a flight to the GF area.

1.1.5 As the CFI did not receive an acknowledgement of his message from the pilot of ZS-ROV, he was listening out on the frequencies 125,6 MHz and 124,4 MHz, which were the frequencies normally used when flying in the GF area, but did not hear any radio transmissions from the pilot of ZS-ROV.

1.1.6 When the CFI returned to the flying school, he noticed that ZS-ROV was not back yet and immediately asked when ZS-ROV had left and how much fuel he had on board, as he was supposed to be back by then.

1.1.7 They were concerned about ZS-ROV not being back and made several radio calls on 125,6 MHz and 124,4 MHz and called the pilot on his cell phone, but to no avail.

1.1.8 After another half an hour, the flying school decided to inform the SAPS and send the CFI to search for the helicopter in the GF area. The police sent a helicopter to join the search after approximately 40 minutes.

1.1.9 The CFI was unable to find ZS-ROV, and with his fuel getting low, he decided to return to FAGM. On his way back to FAGM, at approximately 0840Z, he was informed by the FAGM tower they had received a report of a helicopter accident in the GF area involving ZS-ROV. As he was low on fuel, he could not turn around to see if it was indeed ZS-ROV.

1.1.10 The accident occurred in daylight conditions at a geographical position determined as S 26˚19'45" E E028˚03'54" with an elevation of 4 984 ft.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The helicopter was destroyed. **(See Figure 1.)**

Figure 1: Wreckage of the destroyed helicopter.

1.4 Other Damage

1.4.1 Minor damage was caused to the surrounded vegetation.

1.5 Personnel Information

Nationality	Nigerian	Gender	Male	Age	30
Licence Number	**********	Licence Type	Private (H)		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	30 September 2011				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	72,5
Total Past 90 Days	14,4
Total on Type Past 90 Days	14,4
Total on Type	68,7

1.5.1 The flying experience hours should not be regarded as a true reflection of the pilot's total hours, as his pilot logbook could not be found after the accident. These hours are the last recorded hours received from the flying school where the pilot was a student and from where the helicopter was hired.

1.6 Aircraft Information

Airframe:

Type	Robinson R22 Beta	
Serial Number	3427	
Manufacturer	Robinson Helicopter Company	
Year of Manufacture	2003	
Total Airframe Hours (At time of Accident)	2005,8	
Last MPI (Date & Hours)	30 March 2010	1990,6
Hours since Last MPI	15,2	
C of A (Issue Date)	1 March 2007	
C of R (Issue Date) (Present owner)	22 February 2008	
Operating Categories	Standard	

Engine :

Type	Lycoming L-39052-36
Serial Number	3427
Hours since New	2005,8
Hours since Overhaul	TBO not yet reached

1.6.1 This helicopter had been involved in two previous accidents. The first accident occurred on 7 June 2004 when the helicopter had a hard landing resulting in the tail boom being severed, main rotor blades being destroyed and the landing skid gear being broken off.

1.6.2 The second accident occurred on 14 September 2005 when the helicopter had a hard landing resulting in damage to the airframe, and the landing skid gear was bent.

1.6.3 Weight & Balance Calculation

C of G Calculation			
Item	**Weight (lbs)**	**CG (inches)**	**Moment**
Empty Weight	900.9	101.7	91594
Pilot	207.0	78.0	16146.0
Fuel (main)(39L)	68.6	108.6	7454
Fuel (aux)(19L)	33.4	103.8	3471
Total weight	**1210**	**98.1**	**118665**

The C of G calculations are within limits as per the pilot operating handbook (POH).

1.6.4 At the time of the accident the helicopter was operated at 1210 lbs which was 160lbs below the helicopter's maximum gross weight which was 1370 lb according to the POH, Section 2, Page 2-3.

1.7 Meteorological Information

1.7.1 An official weather report was obtained from the South African Weather Service (SAWS). **See Appendix A for the complete Weather Report.**

Wind direction	330˚TN	Wind speed	4 knots	Visibility	400 m
Temperature	17 ˚C	Cloud cover	NSC	Cloud base	NSC
Dew point	15 ˚C				

1.7.2 According to the official weather report, mist was observed in the Alberton area at the time of the accident.

1.8 Aids to Navigation

1.8.1 The helicopter was equipped with standard navigational equipment as per minimum equipment list approved by the Regulator. There were no recorded defects to navigational equipment prior to the flight.

1.9 Communications

1.9.1 The helicopter was equipped with standard communications equipment as per the minimum equipment list approved by the Regulator. There were no recorded defects to communications equipment prior to the flight.

1.9.2 The pilot did communicate his intentions to fly to the GF area to the Rand

Aerodrome Control Tower after take-off on frequency 118,7 MHz.

1.10 Aerodrome Information

1.10.1 The accident did not occur at or near an aerodrome.

1.11 Flight Recorders

1.11.1 The helicopter was not fitted with a cockpit voice recorder (CVR) or a flight data recorder (FDR) and neither was required by regulations to be fitted to this type of helicopter.

1.12 Wreckage and Impact Information

Figure 2: Area of Impact

1.12.1 Impact damage

The wreckage was located in a straight line in an open grass field. The debris path extended on a course of approximately 195 degrees magnetic and terminated approximately 10 metres beyond the main wreckage. The angle of freshly broken branches from a small tree next to the initial point of impact was measured and indicated that the helicopter had hit the ground at an angle of approximately 45 degrees. All of the helicopter's major components were located at the accident site, with most of the debris within a 50-metre radius from the initial impact point.

The initial point of impact (IPI) was noted by the presence of a depression of approximately 250 mm wide by 1 metre long by 200 mm deep in the firm, grass-covered dirt terrain. A piece of the right-hand skid gear was found outside the depression.

Figure 3: Wreckage of helicopter

1.12.2 Fuselage

The fuselage was destroyed by the impact and was subsequently consumed by the post-impact fire. Evidence on the ground indicated the fuel tank ruptured on impact and caused a fuel spillage of approximately 10 metres in length.

1.12.3 Tail boom

The tail boom structure was found attached to the main fuselage, but severed about midway by the main rotor blades.

1.12.4 Main rotor blades

One of the main rotor blades had separated from the main rotor mast and was found in the vicinity of the initial impact point. The other main rotor blade was still attached to the main rotor head hub assembly.

1.12.5 Engine

The engine was separated from the helicopter during the impact sequence. Evidence indicated that the engine hit the ground on two occasions between the impact point and the point where the engine came to rest, approximately 40 metres from the IPI. Substantial damage was caused to the engine and associated components.

1.12.6 Cockpit seats

Both cushions of the passenger seat were found on the scene but both seat structures were destroyed during the impact.

1.12.7 Safety harness

One of the two bottom attachment points of the pilot safety harness was torn out of the fuselage while the other bottom attachment point was broken off. The shoulder harness was melted by the post-impact fire.

1.13 Medical and Pathological Information

1.12.1 A post-mortem examination was performed on the deceased pilot after the accident. The result of the post mortem and toxicology test were not available at the time the report was compiled. Should any of the results, once received, indicate that medical aspects may have affected the performance of the Pilot, this will be considered as new evidence and the investigation re-opened.

1.14 Fire

1.14.1 The fuselage of the helicopter was consumed by the post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered not survivable due to the high vertical and longitudinal impact loads on the cockpit.

1.16 Tests and Research

1.16.1 A post-accident examination was conducted on the following instruments:

Airspeed indicator
Part number: 8000
Serial number: 182018

Vertical speed indicator
Part number: 7000
Serial number: 302664

Altimeter
Part number: 5934PM-3
Serial number: 428726

All the abovementioned pitot-static instruments were bench-tested and found to be fully operational during the accident flight. The damage to the instruments was caused by the accident sequence. **(See Appendix B for test report.)**

1.17 Organizational and Management Information

1.17.1 The last mandatory periodic inspection that was certified on the helicopter prior to the accident was on 30 March 2010 at 1990,6 hours by a CAA-approved aircraft maintenance organization (AMO) which was in possession of a valid AMO approval certificate.

1.17.2 The helicopter was hired from a SACAA-approved aviation training organisation (ATO), which was in possession of a valid ATO approval certificate.

1.18 Additional Information

1.18.1 Instrument Flying Training

The pilot had received a total of 6,1 hours of instrument flying (IF) training on a flight simulator at another ATO. Evidence obtained from his training file at this organisation indicated that the pilot had become fixated on one instrument and ended up with excessive bank and nose down into a spiral dive to the right during each of his IF training periods.

1.18.2 Controlled Flight into Terrain (CFIT)

CFIT is defined as an accident in which a fully qualified and certificated crew flies a properly working airplane into the ground, water, or obstacles with no apparent awareness by the pilot.

The Instrument Procedure Handbook (FAA-H-8261-1A), Chapter 4, states:

"The basic causes of CFIT accidents involve poor flight crew situational awareness. One definition of situational awareness is an accurate perception by pilots of the factors and conditions currently affecting the safe operation of the aircraft and the crew. The causes of CFIT are the flight crews' lack of vertical position awareness or their lack of horizontal position awareness in relation to the ground, water, or an obstacle. More than two-thirds of all CFIT accidents are the result of an altitude error or lack of vertical situational awareness. CFIT accidents most often occur during reduced visibility associated with instrument meteorological conditions (IMC), darkness, or a combination of both."

1.18.3 Situational awareness

Situational awareness is defined in the Aviation Instructor Handbook (FAA-H-8083-9), Chapter 9, as follows:

"Situational awareness is the accurate perception of the operational and environmental factors that affect the aircraft, pilot, and passengers during a specific period of time. Maintaining situational awareness requires an understanding of the relative significance of these factors and their future impact on the flight. When situationally aware, the pilot has an overview of the total operation and is not fixated on one perceived significant factor. Some of the elements inside the aircraft to be considered are the status of aircraft systems, pilot, and passengers. In addition, an awareness of the environmental conditions of the flight, such as spatial orientation of the aircraft, and its relationship to terrain, traffic, weather, and airspace must be maintained.

"Situational Awareness means the pilot is aware of what is happening around the pilot's aircraft at all times in both the vertical and horizontal plane. This includes the ability to project the near term status and position of the aircraft in relation to other aircraft, terrain, and other potential hazards.

"To maintain situational awareness, all of the skills involved in aeronautical decision making are used."

1.18.4 Wreckage examination

The wreckage examination revealed no indication of mechanical anomalies that would affect the flight characteristics of the helicopter. The post-accident investigation of the main rotor and tail rotor blades indicated the engine was under power at the time of impact.

1.18.5 Icing Probability

During the investigation at the accident site, the investigator-in-charge (IIC) could not find any anomalies that might have contributed to an engine or any other mechanical failure. However, when considering the meteorological conditions of the day – a dew point temperature of 15 ºC and ambient temperature of 17 ºC – there was a chance of moderate icing during cruise power and a chance of serious carburettor icing at descent power, as depicted on the carburettor icing probability chart. **(See Appendix C.)**

1.18.6 Witness statement

According to a witness, the layer of fog was approximately 50 ft above ground level (AGL) and approximately 300 ft thick. He did hear the noise of the helicopter above the clouds but never saw the helicopter until after the accident.

1.19 Useful or Effective Investigation Techniques

1.19.1 None

2. ANALYSIS

2.1 According to the pilot's records, he was the holder of a private pilot licence (helicopter), which was valid at the time of the accident. He was also in possession of a valid medical certificate without any medical restrictions.

2.2 Although the pilot was in the process of obtaining his instrument rating, he had not yet qualified to fly in instrument flight rules (IFR) conditions. Training records revealed the pilot had experienced serious problems in maintaining attitude each time he was subjected to IFR conditions.

2.3 Maintenance records revealed the helicopter was properly maintained by suitably qualified personnel and at an AMO. All required maintenance documents were correctly completed.

2.4 A weight and balance calculation revealed the helicopter was operated within the prescribed weight and balance limitations.

2.5 Severe impact forces and the post-impact fire destroyed the helicopter during the sequence of the accident.

2.6 The area where the accident took place was covered in a dense (approximately 300 ft thick) layer of fog at the time of the accident. The pilot had had previous difficulties in distance judgement; it is therefore most likely that he entered the layer

of fog unexpectedly. The most likely reason forcing the pilot to enter the layer of fog was probably carburettor icing, as no mechanical failure of the helicopter and associated systems could be found after the accident. It is therefore probable the pilot encountered a loss of situational awareness when entering the fog and was unable to accurately judge, through visual reference, his altitude above ground and the attitude of the helicopter.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was the holder of a valid private pilot (helicopter) licence and had the helicopter type endorsed in his logbook.

3.1.2 The weather was suitable for flight under VFR conditions at the time the pilot took off from Rand Airport (FAGM).

3.1.3 The aircraft had a valid certificate of airworthiness and was recorded as being serviceable for the flight.

3.1.4 There was extensive fog cover in the area where the accident took place.

3.1.5 The reason for the pilot's entering the layer of fog could not be determined.

3.1.6 The pilot probably and possibly unknowingly lost visual reference with the ground when entering the layer of fog, resulting in a collision with the ground.

3.1.7 The accident was not survivable due to the magnitude of the deceleration forces and the severity of the post-impact fire.

3.2 Probable Cause/s

3.2.1 The pilot entered IMC, where after he collided with terrain due to the fact that he had no visual reference to the ground.

4. SAFETY RECOMMENDATIONS

4.1 None

5. APPENDICES

5.1	Appendix A	Weather Report
5.2	Appendix B	Dart Aeronautical report
5.3	Appendix C	Carburettor icing-probability chart

Report reviewed and amended by the Advisory Safety Panel on 20 July 2010

-END-

Appendix A

South African Weather Service

AIRCRAFT ACCIDENT REPORT

Document Reference: ZS-ROV-2010-04-14-013
Document Type: Report
Version: 1

Document Control

Version and Amendment Schedule

Version	Version Date	Author	Description of Amendments
1	2010/05/10	L Masimini	Document Created

Scope

The meteorological information provided in this report includes the following:

- Surface analysis of the meteorological conditions at the time or close to the time of accident or incident such as temperature, dew point, surface wind, cloud cover, visibility and weather
- Surface and upper air systems analysis
- A brief analysis of satellite data
- Weather conditions in the vicinity of the incident such as temperature, dew point, surface wind, cloud cover, visibility and weather.
- The following is also included as attachments to the report at the time and as close as possible to the time of accident or accident:
  - Satellite picture
  - Surface Analysis
  - Significant Weather Chart
  - Upper air chart and
  - Upper winds

Purpose

To provide the authorities with meteorological information required for accident/incident investigation at the time or closest to the time of aircraft accident or incident.

Background

An aircraft accident/incident occurred on 14 April 2010 between 0500Z and 0500Z.

The aircraft accident/incident took place near the Alberton/Klipriver area in Gauteng, whose geographical coordinates (Klipriver) are approximately S26° 23' 22.5'' E028° 04' 14.5''. The aircraft registration is ZS-ROV.

1. WEATHER CONDITIONS AT TIME OF INCIDENT

SURFACE ANALYSIS (0600Z 14 APRIL 2010)

A surface high pressure system is situated over the north-eastern parts of the country. The high pressure system is causing a weak onshore flow pushing low clouds over the north-eastern parts (see Attachment A.

UPPER AIR (0600Z 14 April 2010)

A high pressure system dominates the upper levels favouring subsidence over the central and eastern parts (see Attachment B).

SATELLITE IMAGE (0600Z 14 April 2010)

The satellite image indicates mist and/or fog patches around the area of incident (See Attachment D).

2. WEATHER CONDITIONS IN THE VICINITY OF THE INCIDENT

No official observations are available for the place and time of the incident/accident. The most likely weather conditions about the time of incident, is similar to that at Rand Airport given below:

Time: 0600Z	
Temperature:	17°C
Dew Point:	15°C
Surface Wind:	330° TN 03knots
Cloud cover:	NSC
Weather:	BR
Visibility:	400m

Note: For visibility below 1000m fog should be reported and the satellite image (see Attachmet D) does indicate the possibility of fog patches in the area of incident/accident. Thus the BR reported at Rand Airport could possibly be fog.

3. ATTACHMENTS

A: Surface Analysis (0600Z 14 April 2010)

B: Upper Air Chart valid for 0600Z 14 April 2010

C: Significant Weather Chart (low level) valid for 0600Z 14 April 2010

D: Satellite Image valid for 0600Z 14 April 2010

E: Upper Winds (low level) valid for 0600Z 14 April 2010

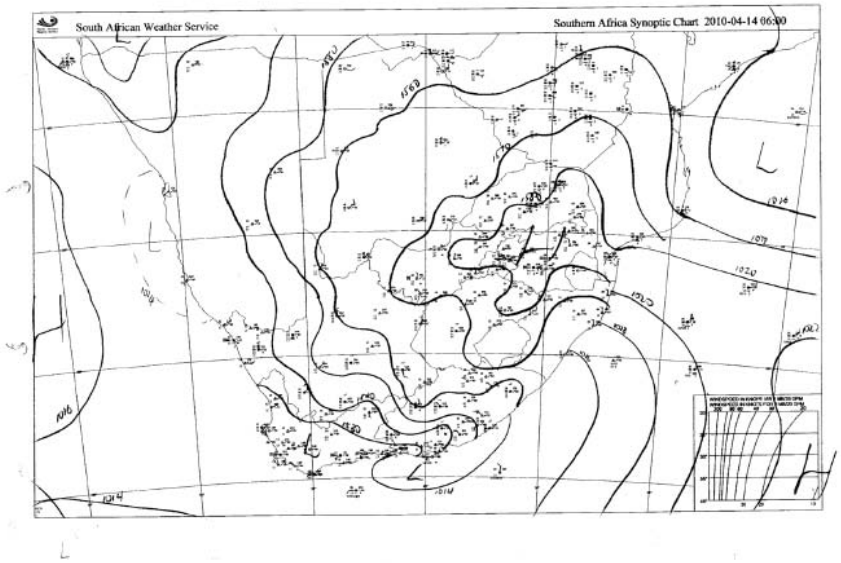
Recommendation

Nil

Conclusion

Nil

Attachment: A



Attachment: B

UNCONTROLLED COPY: WHEN PRINTED OUTSIDE ELECTRONIC QUALITY MANAGEMENT SYSTEM

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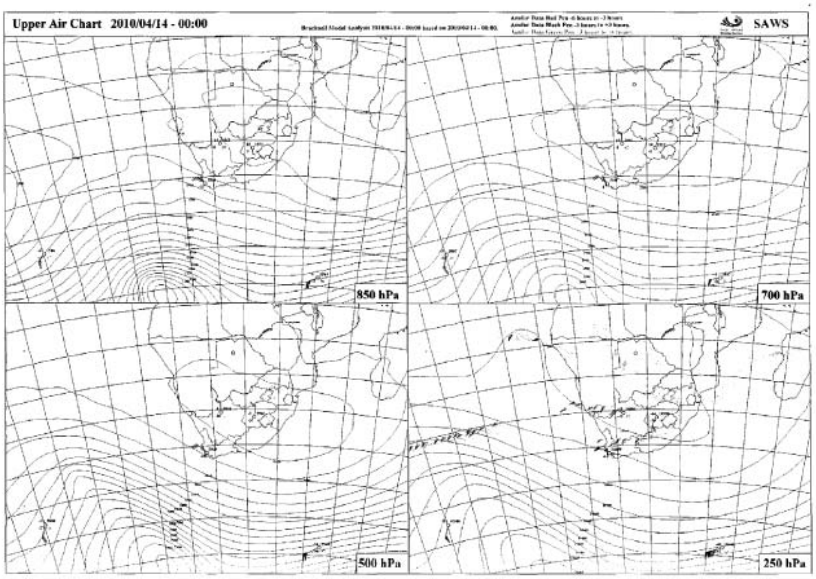

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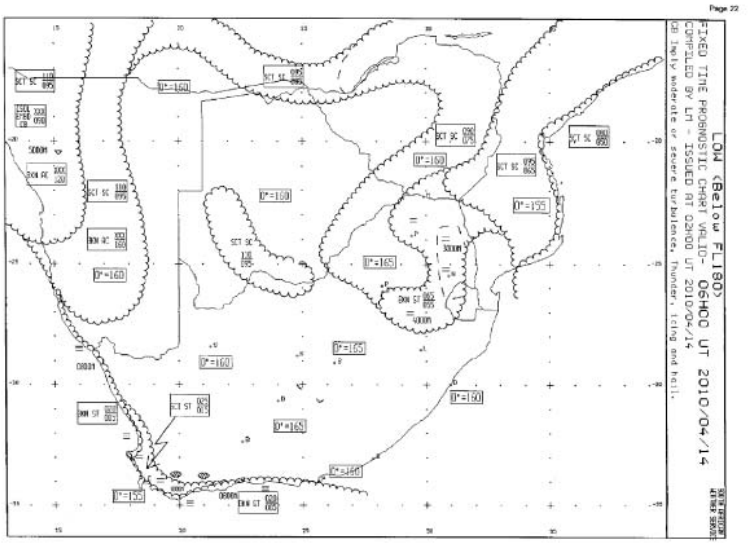

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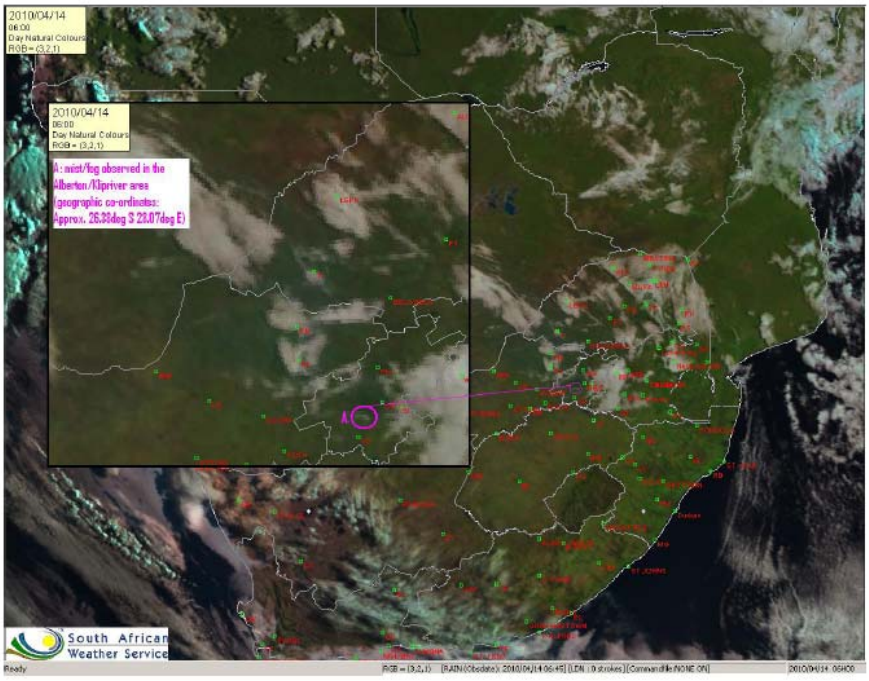

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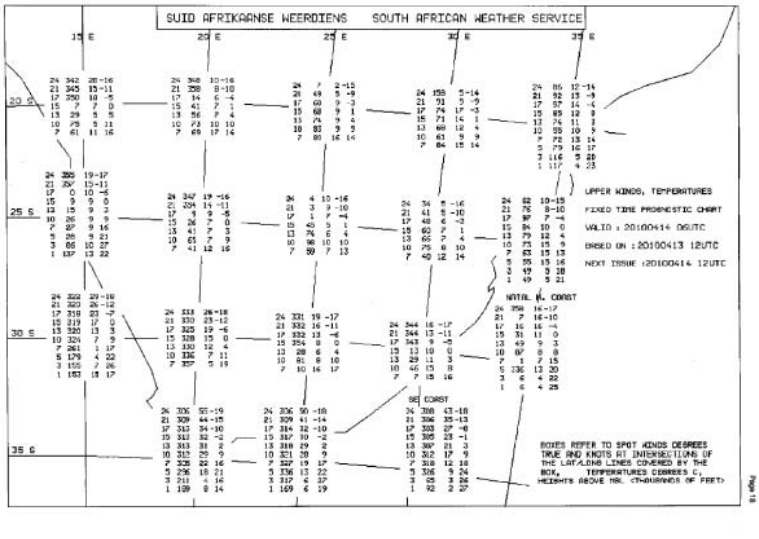

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Dart Aeronautical CC

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Dear Chris

Dart Aeronautical has done bench testing on below listed Pitot Static instrumentation and we have found that the instruments were working correctly with the last flight.

Dart suspects that the units were damaged due to the severe impact of the rotor craft with the ground.

Airspeed Indicator
Part Number: 8000
Serial Number: 182018

Vertical Speed Indicator
Part Number: 7000
Serial Number: 302664

Altimetre
Part Number: 5934PM-3
Serial Number: 428726

PIETER VILJOEN
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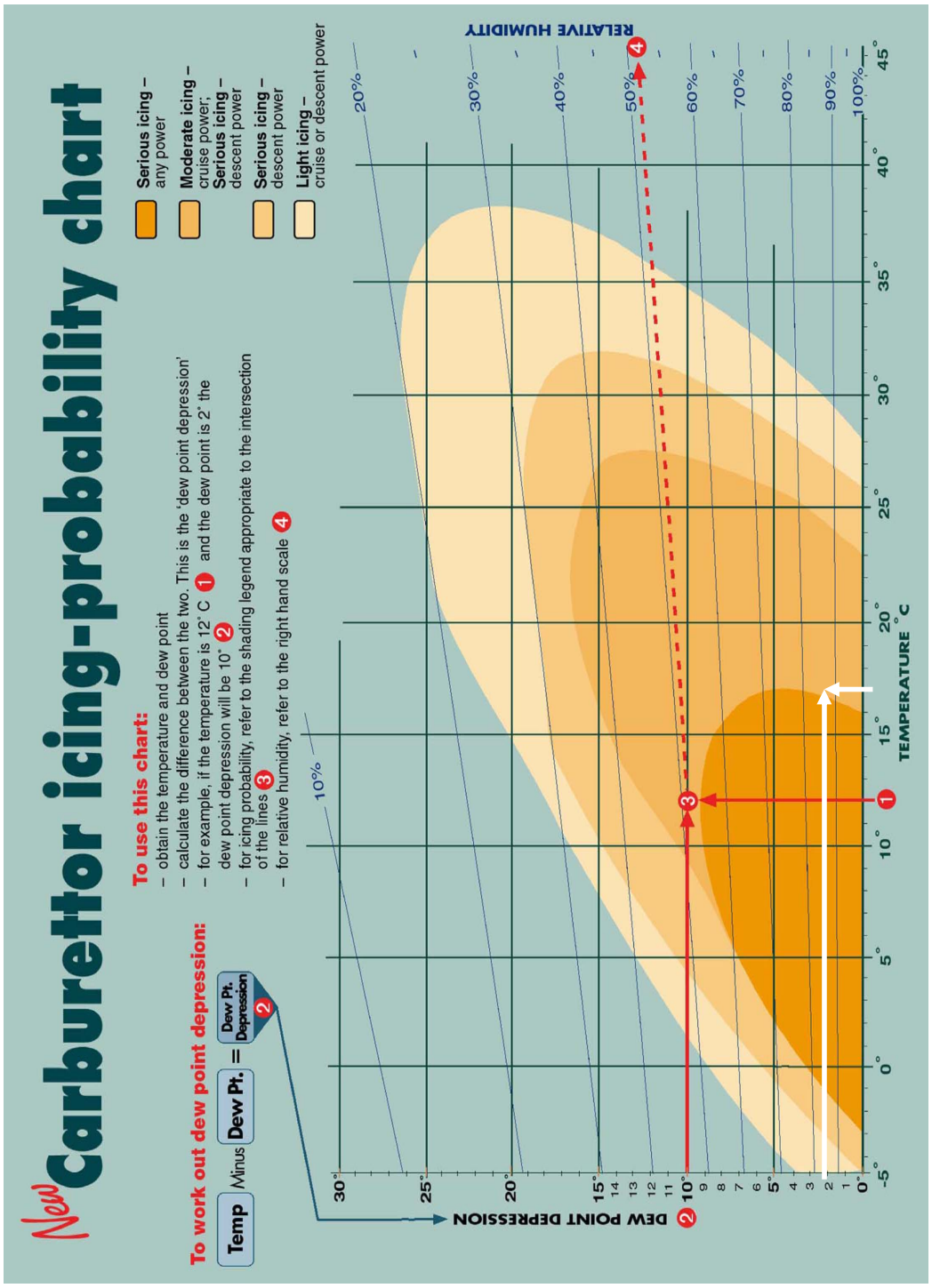

Carburettor icing-probability Chart

With a temperature of 17˚C and a dew point of 15˚C the dew point depression on the day of the accident was 2. The icing-probability falls in the area where the two white arrows met. This area indicate there was a possibility of Moderate icing during cruise power and Serious icing during descent power.