



# SOUTH AFRICAN CIVIL AVIATION AUTHORITY

## ACCIDENT REPORT – EXECUTIVE SUMMARY

Date of Accident	28 April 2000	Time of Accident		0410Z	
Aircraft Registration	ZS-RHV	Type of Aircraft		Bell 407	
Pilot-in-command Licence Type		Commercial		Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	1914,3	Total Hours on Type	Unknown
Type of Operation		Private			
Last point of departure		Private farm, 20km North of Beaufort West			
Next point of intended landing		Oudtshoorn			
Location of the accident site with reference to easily defined geographical points (plus GPS readings if possible)					
Private farm, 20km North of Beaufort West					
Meteorological Information		Fine weather conditions prevailed at the time of the accident.			
Number of people on board	1+1	No. of people injured	0	No. of people killed	1+1
Synopsis					

On 27 April 2000, the pilot, accompanied by the owner, flew the helicopter from FAGC to the farm of the owner, situated approximately 10 NM North of Beaufort West.

On 28 April 2000 at approximately 0410Z, the pilot and the owner left the farm, while it was still dark, on a private flight to Oudtshoorn.

Within a few minutes after take-off the helicopter was destroyed by impact forces as it crashed, fatally injuring both occupants. Although fine weather conditions prevailed there was a possibility of fog patches in the vicinity at the time of the accident.

A farm worker located the wreckage at approximately 08:30Z, later the day.

The pilot was correctly licensed to conduct the flight and according to CAA records the aircraft type was endorsed onto his license.

It was not possible to locate the pilot's logbook. However, his flying experience reflected in this report was as on 1 September 1999, at the time that he renewed his license.

According to available records, the helicopter was correctly maintained and it was operated within its weight- and CG (Centre of Gravity) limitations.

The helicopter impacted the ground, which rises slightly to the south and to the east, in a southerly direction with the lateral axis level, but with a nose down attitude of approximately 45°.

The length of the wreckage path, together with the severe break-up of the wreckage, is indicative of high forward speed during impact.

### Probable Cause

Although it was not possible to conclusively determine the cause of this accident, it would appear that the accident resulted from Spatial disorientation, Vertigo and Loss of visual reference with the ground.

It would also appear that the pilot deviated from Standard Operating Procedures by not climbing to the minimum prescribed heights.

14RC  
28/11/2001



# AIRCRAFT ACCIDENT REPORT

**Name of Owner/Operator** : Dr M.S. Kritzinger  
**Manufacturer** : Bell Helicopters Textron  
**Model** : 407  
**Nationality** : South African  
**Registration Marks** : ZS-RHV  
**Place** : Private farm, 20km North of Beaufort West  
**Date** : 28 April 2000  
**Time** : 0410Z

*All times given in this report are Co-ordinated Universal Time (UTC). South African Standard Time is UTC plus 2 hours.*

## **Purpose of the Investigation :**

*In terms of Regulation 12.03.1 of the Civil Aviation Regulation, 1997, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accident 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 27 April 2000, the pilot, accompanied by the owner, flew the helicopter from FAGC to the farm of the owner, situated approximately 10 NM North of Beaufort West.

1.1.2 On 28 April 2000 at approximately 0410Z, the pilot and the owner left the farm, while it was still dark, on a private flight to Oudtshoorn.



1.1.3 Within a few minutes after take-off the helicopter crashed, fatally injuring both occupants.

1.1.4 A farm worker located the wreckage later the day, at approximately 0830Z, behind a hill, some 400m from the place where the helicopter took off.

## 1.2 Injuries to persons.

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

## 1.3 Damage to aircraft.

1.3.1 The impact forces during the accident destroyed the helicopter.



## 1.4 Other damage.

1.4.1 There was no other damage.

## 1.5 Personnel information.

Nationality		British			
Licence No	CR 28621	Gender	Male	Age	33
Licence valid		Yes	Type Endorsed	Yes	
Ratings		Instructor GrII, Night			
Medical Expiry Date		31 August 2000			
Restrictions		None			
Previous Accidents		Nil			

### **Flying Experience : (At last Licence renewal)**

It was not possible to locate the pilot's logbook. CAA records at the last time of renewal of the license, was used to obtain the pilot's flying experience.

Total Hours (As on 1 September 1999)	1914.3
Total Past 12 Months (As on 1 September 1999)	730 (PIC) 1.4 (Dual)
Total on Type Past 90 Days	Unknown
Total on Type	Unknown

## **1.6 Aircraft information.**

### **Airframe :**

Type	Bell 407	
Manufacturer	Bell	
Date of Manufacture	July 1996	
Total Airframe Hours (At time of Accident)	Unknown (Instruments destroyed)	
Last MPI (Date & Hours)	12 Feb 2000	587.5
Hours since Last MPI	Unknown	
C of A (Issue Date)	4 December 1996	
C of R (Issue Date) (Present owner)	14 August 1998	
Operating Categories	a, c, d, e and f	

### **Total Hrs and Cycles since new:**

Engine	Allison 250 C47 B	587.5 Hrs	1030 Cycles
Gearbox(es)		587.5 Hrs	1030 Cycles
Compressor(s)		587.5 Hrs	1030 Cycles
Turbine		587.5 Hrs	1030 Cycles

### **Weight and Balance:**

The pilot and his passenger were the only occupants on board and did not have any significant cargo with them, therefore it can be accepted that the aircraft's CG (Centre of Gravity) and the weight of the helicopter was well within limits.

## **1.6 Meteorological information.**

*A witness stated that the fog only became visible at approximately 04:45Z. This was noticed a mere 35 minutes after the estimated time of the accident.*

*The observations at Beaufort West (Station 68727) come from an Automatic Weather Station (AWS). Details at 04:00Z are given below.*

Wind direction	030°T	Wind speed	2 Kts	Visibility	Good
Temperature	+3°C	Cloud cover	3 – 4 Octas & Fog present	Cloud base	5000' + AMSL
Dew point	+3°C	QNH	1024		

## **1.8 Aids to navigation.**

1.8.1 N/A

## **1.9 Communications.**

1.9.1 N/A

## **1.10 Aerodrome information.**

1.10.1 N/A

## **1.11 Flight recorders.**

1.11.1 The aircraft was not equipped with FDR's (Flight Data Recorders), nor was it a requirement to be fitted with FDR's.

## **1.12 Wreckage and impact information.**

1.12.1 It would appear that the helicopter impacted the ground in a southerly direction with the lateral axis level, but with a nose down attitude of approximately 45°.

1.12.2 From the initial impact point, the terrain rises slightly towards the south and to the east.

1.12.3 The wreckage was spread out over a distance of approximately 60m from the initial impact point to the last piece of debris on the wreckage trail.

1.12.4 The length of the wreckage path, together with the severe break-up of the wreckage, is indicative of high forward speed during impact.





### **1.13 Medical and pathological information.**

1.13.1 No evidence of pre-existing disease could be found on post mortem examination. No specimens were retained for microscopic examination. Routine toxicology screen was negative and routine alcohol level 0,00g/100ml. CO level was 3%. No medical factor could be identified to be contributory to the cause of the accident.

### **1.14 Fire.**

1.14.1 There was no fire.

### **1.15 Survival aspects.**

1.15.1 This accident was not survivable. The cause of death was multiple injuries.

### **1.16 Tests and research.**

1.16.1 The ECU maintenance terminal and incident recorder was removed and sent to the manufacturer for further investigation.

1.16.2 The manufacturer reviewed the information on the ECU maintenance terminal and incident recorder, but reported that no faults or exceeding of limits were shown.

## 1.17 Organizational and management information.

### 1.17.1 Private flight.

## 1.18 Additional information.

### 1.18.1 Spatial Disorientation (SD)

#### Introduction:

"SD is an incorrect perception of one's linear and angular position and motion relative to the plane of the earth's surface. Specifically, in the flight environment, SD is an erroneous perception of any of the parameters displayed by aircraft control and performance flight instruments."

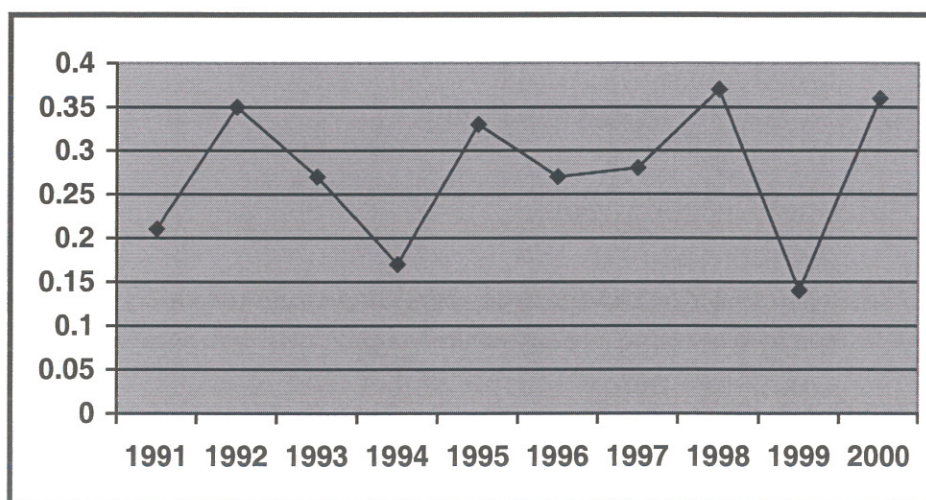
The following overview of SD in USAF Class A mishaps covers basic numbers, how much SD mishaps cost the Air Force in lives and some of the underlying factors causing SD.

Before presenting the data, some assumptions need identification:

1. The mishaps used, from the Air Force Safety Center (AFSC) database, do not include mid-air collisions.
2. The definition used to collect the data and identify SD mishaps comes from AFMAN 11-217 V1, *Instrument Procedures*

#### SD mishaps compared to G-Induced Loss of Consciousness (GLOC)

The rate of SD mishaps is not decreasing. The graph shows the number of SD-related mishaps per 100,000 flight hours compared to the G-Induced Loss of Consciousness (GLOC) Class "A" mishap rate.



1999 was an excellent year and slowed the upward trend when figuring in the first two quarters of 2000. Looking at mishaps from 1991 through the second

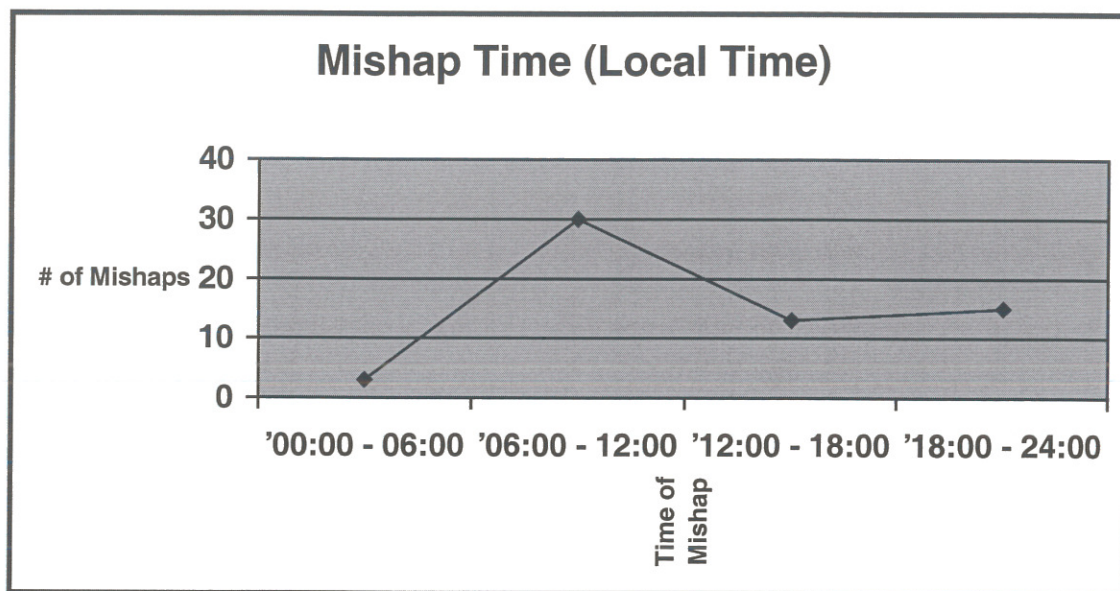
quarter of 2000, 19% of Class "A" mishaps involved SD. Many lives were lost as a result of unplanned impact with the ground.

Category	Total 1991 to 2000	#SD / % of Class "A"	#GLOC / % of Class "A"
Class "A" mishaps	309	60 / 19,4%	11 / 3,5%
Fatal Incidents	89	34 / 38,2%	7 / 7,8%
Fatalities	292	57 / 19,5%	8 / 2,7%

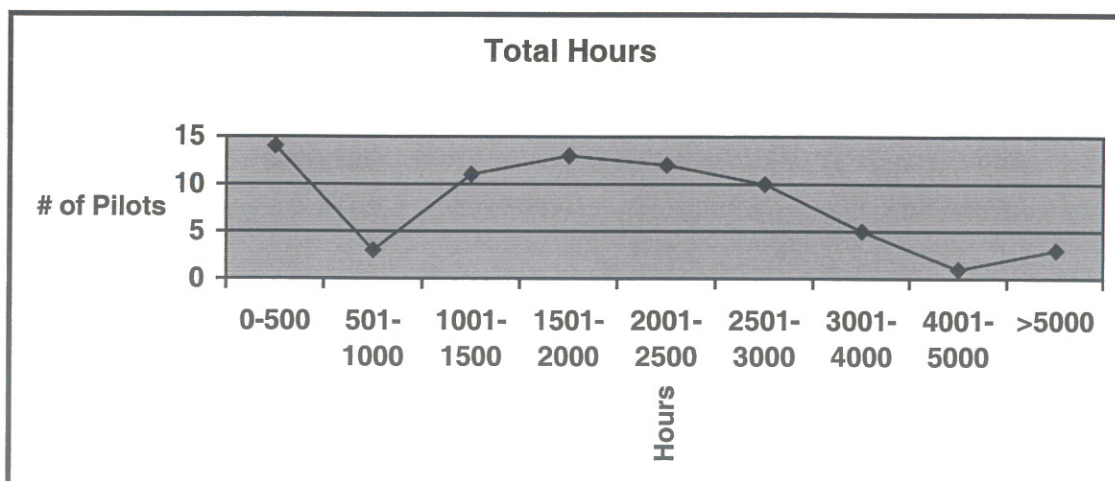
#### SD mishaps compared to the local time of the day

SD occurs commonly in the absence of good visual cues. It was found that most of the mishaps occurred during the hours of 06:00 and 18:00 Local time. (Unfortunately, the database does not accurately describe the actual meteorological conditions, only that it was day/night/dusk.)

It would appear that most of the mishaps occur during daylight hours.

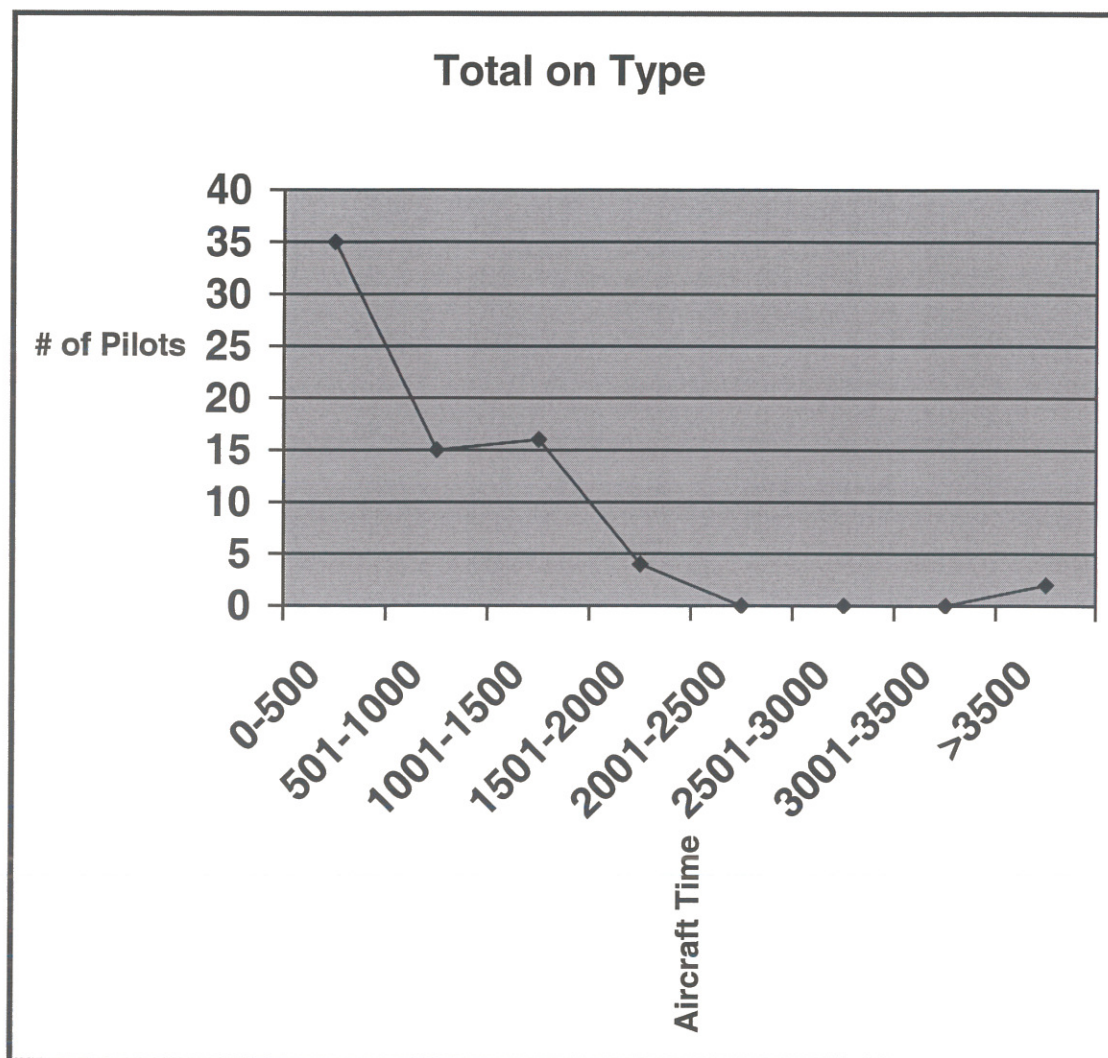


#### Total Flight Hours of Pilots in SD-related Mishaps



### **SD Mishaps vs Total Time on Type**

The following graph shows the hours pilots had in total on a aircraft type when they had their mishap. The majority of pilots involved in SD mishaps have between 0-500 hours on type. Here, it appears, the total time on the aircraft type may influence susceptibility to SD.



### **SD Contributors**

Spatial disorientation is complex and influenced by many variables. A look at what human factors contributed to SD mishaps reveals SD is a result of a breakdown in your crosscheck.

For example, trying to find a target channelizes your attention outside of the aircraft, and you don't notice a slight descent. Or searching for a target on radar, reading an approach plate, and handling a task inside the cockpit which distracts you long enough for the aircraft to change flight parameters. And then there's "expectancy": What do you expect to see and when do you expect to see it? Expectancy is a player in visual illusions where you must interpret the physical scene presented to your eyeballs.

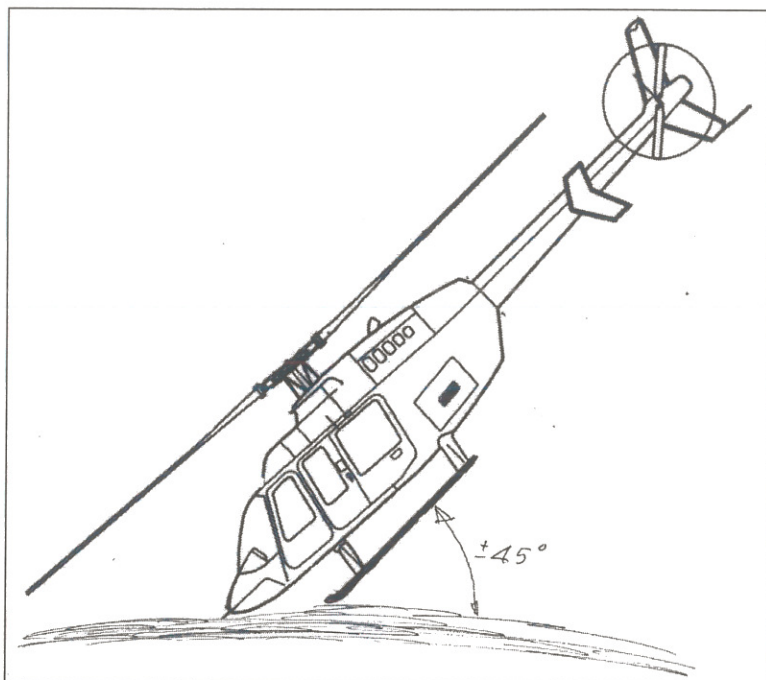
Do the SD contributors correlate with the pilots' hours in their aircraft, i.e., their experience in the aircraft type? How does the pilots' recency of experience, their "proficiency" performing their mission or particular tasks in the mission, mitigate or increase the threat of SD? For instance, how did you recognize you weren't pointed in the same direction you thought you were? What clued you in? How'd you recover?

*The information used above originates from an article that was printed in the Flying Safety Magazine, September 2000.*

- 1.18.2 It would also appear that the pilot deviated from Standard Operating Procedures by not climbing to the minimum prescribed heights (500ft before turning out).

### 1.19 Useful or effective investigation techniques.

- 1.19.1 The helicopter impacted the ground, with the lateral axis level, but with a nose down attitude of approximately  $45^\circ$ , and at high speed in a southerly direction.
- 1.19.2 The above was concluded from the fact that the forward skid ends and the bottom wire cutter, simultaneously made contact in a straight line. This is only possible if the lateral axis are level and the nose are tilted downwards by an angle of  $45^\circ$ .



## 2. ANALYSIS :

- 2.1 The pilot took-off in a easterly direction, turning out in a westerly direction, while it was still dark, but shortly before sunrise. Within a few minutes after take-off the helicopter crashed. This would imply that the pilot took-off towards the light, but turned into the dark.

- 2.2 The impact with the ground was with the lateral axis level, but with a nose down attitude of approximately 45°, at high speed in a southerly direction.
- 2.3 SD is an incorrect perception of one's linear and angular position and motion relative to the plane of the earth's surface. It was considered highly possible that the pilot has lost visual reference to the ground or perhaps encountered an erroneous perception of some of the parameters displayed by the aircraft's instruments.

### **3. CONCLUSION :**

#### **3.1 Findings :**

- 3.1.1 On 27 April 2000, the pilot, accompanied by the owner, flew the helicopter to the farm of the owner, situated approximately 10 NM North of Beaufort West.
- 3.1.2 On 28 April 2000 at approximately 0410Z, the pilot and the owner left the farm, while it was still dark, on a private flight to Oudtshoorn.
- 3.1.3 Within a few minutes after take-off the helicopter crashed, fatally injuring both occupants.
- 3.1.4 A farm worker located the wreckage at approximately 08:30Z, later the day.
- 3.1.5 The impact forces during the accident destroyed the helicopter.
- 3.1.6 The pilot was correctly licensed to conduct the flight and according to CAA records the aircraft type was endorsed onto his license.
- 3.1.7 It was not possible to locate the pilot's logbook. However, his flying experience reflected in this report was as on 1 September 1999, at the time that he renewed his license.
- 3.1.8 According to available records, the helicopter was correctly maintained.
- 3.1.9 The helicopter was operated within its weight- and CG (Centre of Gravity) limitations.
- 3.1.10 Fine weather conditions prevailed at the time of the accident, but there was a possibility of fog patches in the vicinity.
- 3.1.11 The helicopter impacted the ground, which rises slightly to the south and to the east, in a southerly direction with the lateral axis level, but with a nose down attitude of approximately 45°.
- 3.1.12 The length of the wreckage path, together with the severe break-up of the wreckage, is indicative of high forward speed during impact.

### **3.2 Probable Cause/s :**

- 3.2.1 Although it is not possible to conclusively determine the cause of this accident, it would appear that the accident resulted from Spatial disorientation, Vertigo and Loss of visual reference with the ground.
- 3.2.2 It would also appear that the pilot deviated from Standard Operating Procedures by not climbing to the minimum prescribed heights.

## **4. SAFETY RECOMMENDATIONS :**

- 4.1 It is recommended that an article should be published in the Safety Link dealing with spatial disorientation. See Additional Information in this report.

## **5. APPENDICES :**

- 5.1 None

Compiled by: