

<b>AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY</b>
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				Reference:	CA18/2/3/9433	
<b>Aircraft Registration</b>	ZU-UHI	<b>Date of Accident</b>	22 April 2015		<b>Time of Accident</b>	1405Z
<b>Type of Aircraft</b>	Bell 205 – UH-1H		<b>Type of Operation</b>	Fire Fighting - Part 137		
<b>Pilot-in-command Licence Type</b>		Commercial	<b>Age</b>	39	<b>Licence Valid</b>	Yes
<b>Pilot-in-command Flying Experience</b>		Total Flying Hours	2 914		Hours on Type	1 567.4
<b>Last point of departure</b>		Tulbagh Forestry Station (Western Cape)				
<b>Next point of intended landing</b>		Bains's Kloof Pass area (Western Cape)				
<b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b>						
Bains's Kloof Pass area (GPS coordinates: S33°36'30.68' E019°6'29.18') and a field elevation of 2026ft						
<b>Meteorological Information</b>		Surface wind: 045 <sup>0</sup> at 12-15 kt, Visibility: CAVOK				
<b>Number of people on board</b>	1 + 1	<b>No. of people injured</b>	0	<b>No. of people killed</b>	2	
<b>Synopsis</b>						
<p>The pilot, accompanied by a helicopter safety lead (HSL) (assisting to secure the bambi bucket), took off from Tulbagh Forestry Station for a fire-fighting operation in the Bain's Kloof Pass area. According to the eye witness the incident commander (IC) there was a truck approaching on the R301 from Wellington, which was successfully stopped at a safe from the temporary landing zone on which the helicopter intended to land. At the time, the helicopter's approach was uneventful and it hovered at a distance of 50 m before the temporary landing zone which was used by ZS-HBU on the R301 regional road. The spotter pilot reported that he saw the helicopter pitching up a few metres and rolled to the left with its tail low. The helicopter's main rotor blades made contact with terrain before it crashed and came to rest on its left-hand side.</p> <p>The helicopter was destroyed by impact forces, post impact fire (which was successful extinguished by the other helicopter and ground fire fighters) and later on by the veld fire.</p> <p>Investigations revealed that after an attempt for an abortive landing, the helicopter's main rotor blades made contact with the terrain on its left side, rolled to the left before it crashed. The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component which resulted on a loss of tail rotor effectiveness.</p>						
<b>Probable Cause</b>						
The helicopter's main rotor blades made contact with the terrain during an attempt to abort the landing resulting in a loss of control and crashed.						
<b>Contributory</b>						
<p>a) A cross wind component of 12-15kt</p> <p>b) Loss of tail rotor effectiveness</p>						
SRP Date	13 February 2018		Release Date	12 March 2018		
CA 12-12a		<b>01 FEBRUARY 2017</b>			Page 1 of 42	



## AIRCRAFT ACCIDENT REPORT

**Name of Owner** : FFA Assets (Pty) Ltd  
**Name of Operator** : FFA Aviation (Pty) Ltd  
**Manufacturer** : Bell Helicopter Textron  
**Model** : UH-1H/B205  
**Nationality** : South African  
**Registration Marks** : ZU-UHI  
**Place** : Bain's Kloof area  
**Date** : 22 April 2015  
**Time** : 1405Z

*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 (2011) 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 blame or liability.***

### **Disclaimer:**

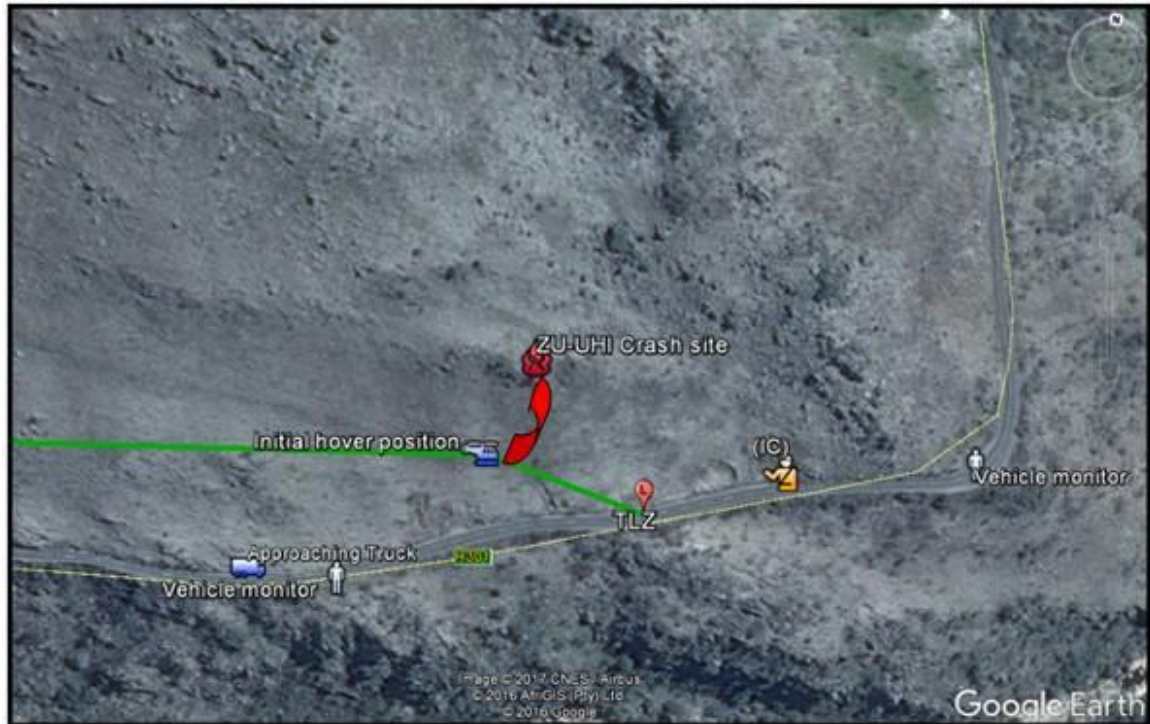
*This report is produced without prejudice to the rights of the CAA, which are reserved.*

## **1. FACTUAL INFORMATION**

### **1.1 History of Flight**

1.1.1 On Wednesday 22 April 2015 at approximately 1335Z, helicopters ZS-HBU and ZU-UHI were dispatched from Tulbagh Forestry Station to assist in a fire-fighting operation in the Bain's Kloof Pass area. This operation consisted of two helicopters and one fixed-wing aircraft, which was a spotter. The first helicopter ZS-HBU took off without any incident and flew to the area where the operations were to be conducted. This helicopter landed on the temporary landing zone on R301 regional road, facing into the north-east (nose facing into the wind). The helicopter safety leader (HSL) disembarked, attached the 'bambi' bucket where after the helicopter proceeded with the fire-fighting operation. This helicopter continued its operation without any incidents.

1.1.2 According to the incident commander (IC), he was busy directing the helicopter (ZU-UHI) where to make a safe landing on the road, by means of hand signals. The IC was assisted by two colleagues who were positioned on both sides of the landing zone to stop any approaching motor vehicles during landing operation. While the helicopter was coming to land, still hovering at approximately 30-40 ft above ground level (AGL) at a distance of approximately 50 m from the landing zone, a vehicle approached from behind the helicopter, and was stopped at a safe distance from the landing zone.



**Figure 1:** Google Earth image of the accident site

The pilot then steered the helicopter away from the road in the direction of the mountain (to the left). The IC witnessed the helicopter initially banking slightly to the right and then to the left, then colliding with terrain. He then ran towards the helicopter; as he got closer he observed fuel was leaking. Although the main rotor was separated from the helicopter, the engine was still running. The fuel ignited and a fire started. He then started using his knife to cut off the safety harness and removed the pilot from the helicopter. The fire became intense and he could not go back to remove the HSL who was seated in the rear seat.

1.1.3 The fire-fighting operations were stopped in order to assist with extinguishing the fire of the burning helicopter and rescue the occupant. The helicopter ZS-HBU was requested to fly to the crash site to drop its load on top of the burning ZU-UHI helicopter. The fire-fighting ground crews also assisted with the extinguishing of the fire and they were successful in suppressing it. Both occupants were fatally injured as a result of the accident. The HSL sustained fatal injuries as a result of impact forces and the post-impact fire. The pilot suffered fatal injuries as a result of impact forces. The helicopter wreckage was further destroyed by overnight veld fire.



**Figure 2:** ZS-HBU helping the ground fire team to extinguish the ZU-UHI post-impact fire

1.1.4 The helicopter accident occurred on mountainous terrain in the area of Bain's Kloof Pass at GPS coordinates S33°36'30.68' E019°6'29.18' and a field elevation of 2 026 ft..

## 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 helicopter was destroyed by impact forces and post impact fire which was extinguished and by the overnight veld fire which father destroyed the helicopter.



**Figure 3:** Damage to the helicopter

## 1.4 Other Damage

1.4.1 None.

## 1.5 Personnel Information

1.5.1 Pilot-in-command:

Nationality	South African	Gender	Male	Age	39
Licence Number	0271077901	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Night, Instructor Grade 2, Test Pilot Class 2, Cull, Undersling/Winch				
Medical Expiry Date	30 November 2015				
Restrictions	None				
Previous Accidents	None				

1.5.2 Pilot-in-command Flying Experience:

The following hours are taken from the pilot's file as submitted to the regulator during his licence renewal in 2013:

Total hours: 2 914

Instruction hours: 1 567.4

Note: The investigators contacted the wife of the pilot requesting the pilot log books and she was unable to assist. The log book of the pilot was never found and it is suspected that it got destroyed in the wreckage.

## 1.6 Aircraft Information



**Figure 4:** The aircraft prior to the accident

- 1.6.1 The Bell 205 is a rotating wing aircraft manufactured by Bell Helicopter Textron. The helicopter was imported from Ethiopia after it was withdrawn from service with the Ethiopian Air Force (ex-military) and the owner complied with the South African National Conventional Arms Control Act 41 of 2002. The helicopter was first registered on the South African register on 2 September 2005 under FFA Assets (Pty) Ltd. The engine with serial number 30172B was purchased as a surplus engine and was also imported from Ethiopia. The engine was in an inhibited state as required for long-term storage prior to installation.
- 1.6.2 According to the aircraft records the helicopter was involved in an accident of a similar operation on 25 January 2007. The helicopter experienced an engine failure whilst attempting to uplift water, and ditched into the dam. The investigation then revealed that the engine had an internal bearing failure.

Airframe:

Type	UH1H/ B205	
Serial Number	13729	
Manufacturer	Bell Helicopter Textron	
Year of Manufacture	1974	
Total Airframe Hours (At time of Accident)	3 460.1	
Last Phase 6 inspection (Date & Hours)	12 January 2015	3 385.9
Hours since Phase	74.2 hrs	
Authority to Fly (Issue Date)	16 February 2015	
C of R (Issue Date) (Present owner)	14 November 2006	
Operating Categories	Commercial Part 137	

\*NOTE: The operating categories and conditions as specified on the Authority to Fly that was issued for this helicopter were indicated as Commercial, which only allows the following operations: Agricultural Operations, Forest and Wildlife Conservation, and External Load Operations.

Engine:

Type	Honeywell-Lycoming T53-L-13B
Serial Number	LE 11457
Hours since New	3676
Hours since Overhaul	662.7

## 1.7 Meteorological Information

1.7.1 Weather information as obtained from the operator:

Wind direction	045°	Wind speed	12-15 kt	Visibility	CAVOK
Temperature	Unknown	Cloud cover	N/A	Cloud base	N/A
Dew point	Unknown				

## 1.8 Aids to Navigation

1.8.1 The helicopter was equipped with standard navigation equipment that meets the requirements of the regulator. There were no reported defects to the navigation equipment at the time of the accident.

## 1.9 Communications

1.9.1 The helicopter was equipped with standard communication equipment that meets the requirements of the regulator. There were no reported defects to the communication equipment at the time of the accident.

## 1.10 Aerodrome Information

1.10.1 The accident did not occur at an aerodrome. The accident occurred at the mountainous Bain's Kloof Pass with GPS coordinates determined to be S33°36'30.68', E019°6'29.18' at a field elevation of 2 026 ft.

## 1.11 Flight Recorders

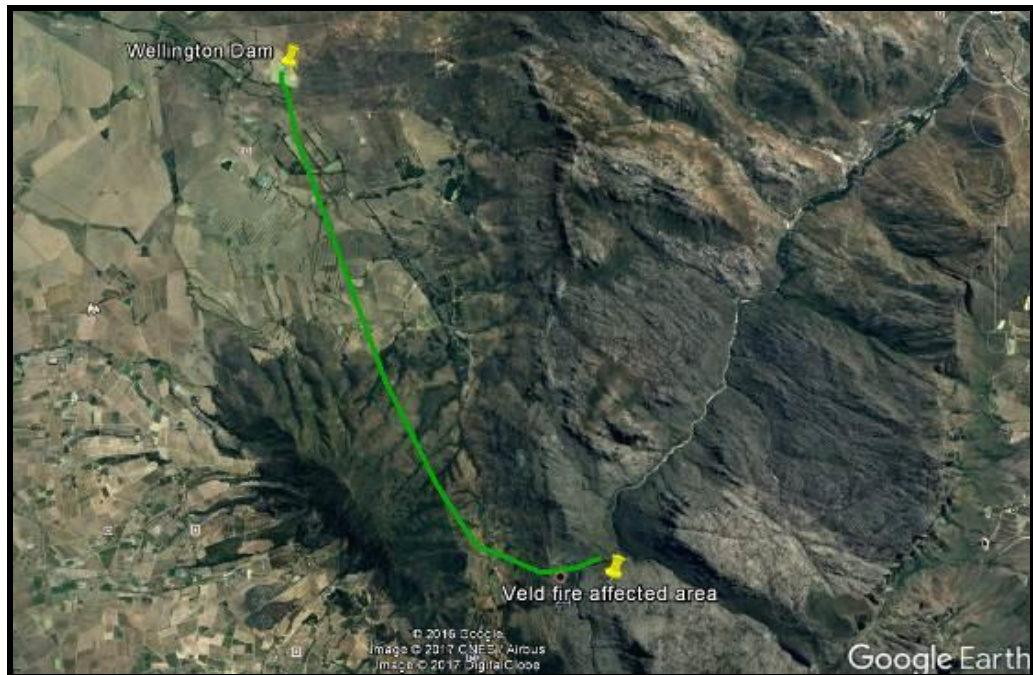
1.11.1 The helicopter was not fitted with a cockpit voice recorder (CVR) or a flight data recorder (FDR) neither was required by regulations to be fitted to this type of helicopter.

## 1.12 Wreckage and Impact Information

1.12.1 The area at which the accident occurred is mountainous terrain. There were fire-fighting operations being conducted at the time of the accident.

1.12.2 The helicopter was to uplift water from a farm dam approximately 10 km north-west of the fire-affected area. At the time of the accident, the helicopter (ZU-UHI) approached the temporary landing zone from the south-west and was facing north-east, hovering for landing to have the bambi bucket attached to the helicopter for

fire-fighting operations. The helicopter was then observed to turn to the right and then to the left as it pitched nose up, before its main rotor blades impacted with high-rising terrain on the left and it crashed. The distance from the temporary landing zone (on the R103 regional road) to the accident site was approximately 91 m at an incline angle of approximately 35° from the road surface. The helicopter impacted the terrain and came to rest on its port side with the tail boom severed.



**Figure 5:** Google Earth view of the operational area

1.12.3 All damage to the helicopter airframe structure, power plant and control surface components was attributed to the high-impact forces and fire damage (post-impact and veld fire).



**Figure 6:** Google Earth view of the area of the veld fire around the accident site



1.12.4 According to the IC, moments after the crash he was able to climb the mountain in an attempt to rescue the occupants, and he reached the helicopter. The engine was still running with fuel leaking from the ruptured fuel tank. The accident helicopter caught fire moments later and the fire became intense. The fire was successfully extinguished by both helicopter ZS-HBU and the ground fire-fighting team who reported to the accident site; however, the overnight veld fire in the area destroyed the rest of the wreckage overnight.

1.12.5 The following was observed of the wreckage on the next day when the investigators arrived on site.

- The accident site was confined to be the point of impact. The main rotors and tail boom had separated, and were located within a 5 m radius from the main wreck.



**Figure 7:** The operational site

- The fuselage was destroyed, and the seats and some of the instrument panel components had been thrown out. The damage was consistent with the helicopter impacting hard with the terrain.



**Figure 8:** The helicopter before it was destroyed by veld fire overnight

- Figure 8 shows the helicopter wreckage lying on its left-hand side following successful post-impact fire suppression. Helicopter debris was scattered around within a radius of 5 m.
- The helicopter wreckage was destroyed by both impact forces and fire (post impact and veld).



**Figure 9:** The damaged tail boom and tail rotor blade respectively.

- The tail-boom was destroyed by both impact forces and fire.
- The tail rotor assembly and the tail rotor blades separated from the helicopter.

### **1.13 Medical and Pathological Information**

1.13.1 According to the post-mortem report, the cause of the death of both occupants was determined to be neck fracture and blunt force trauma to the chest.

### **1.14 Fire**

1.14.1 There was evidence of a post-impact fire which destroyed the aircraft.

### **1.15 Survival Aspects**

1.15.1 Due to the high impact forces associated with the wreckage damage, the accident was not considered survivable. The cockpit structure of the helicopter was destroyed with part of the crew seat thrown out of the helicopter. The helicopter was equipped with a shoulder harness which the pilot made use of during flight. During an attempt at rescue by the IC, the pilot's harness was cut off to remove him from the burning wreckage; due to intensified fire, the HSL could not be removed until the fire was extinguished. The other helicopter (ZS-HBU) was requested to dump water on the burning wreckage to help the ground fire-fighting crew, which was successful.

### **1.16 Tests and Research**

1.16.1 During the investigation the operator together with the investigators tested the following components hydraulic lines and actuators. The tests revealed no anomalies that could have contributed to this accident. All damage to the components were attributed to the impact and post-impact fire and veld fire overnight.

1.16.2 The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component which could have led to the loss of tail rotor effectiveness. The chart below indicates the limits of the cross wind components. Cross wind within the shaded area of the chart could drastically affect the pilot's ability to control the aircraft.

**CONTROL MARGIN  
TRANSITIONAL FLIGHT  
324 ROTOR/6600 ENGINE RPM**

CONDITIONS WHERE THE CONTROL  
MARGIN MAYBE LESS THAN 10%  
ARE SHOWN IN SHADED AREA

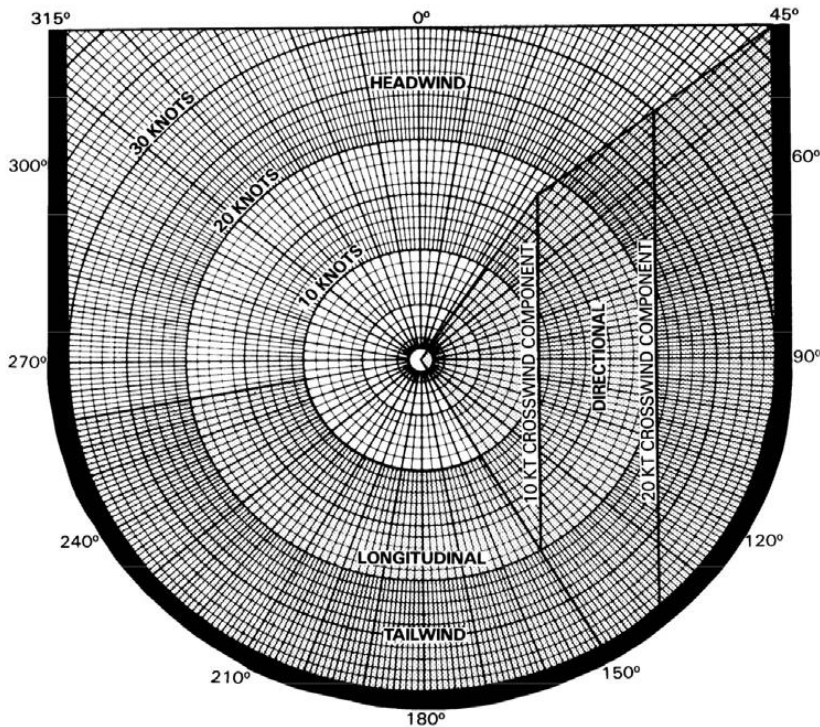


Figure 10: Control Margin Transitional Flight

## 1.17 Organizational and Management Information

1.17.1 The helicopter was authorised for fire-fighting operations as stipulated in the Authority to Fly. The flight was conducted under air operating certificate (AOC) no: CAA/G921D at the time of the accident. The AOC was issued on 17 February 2015 and was valid until 6 February 2016. The helicopter ZU-UHI was authorised to operate under the G8 (fire spotting, control and fighting) and G15 (undersling and winching operations) categories.

1.17.2 According to the maintenance records, the last mandatory periodic inspection (MPI) that was carried out on the helicopter prior to the accident was on the 12 January 2015. The aircraft maintenance organisation (AMO) was in possession of a valid AMO approval certificate that was issued on 2 July 2014, and which was valid until 30 June 2015.

1.17.3 At time of the accident the following components were over flown as stated bellow:

- The swash plate assembly on ZU-UHI was overflown by 540 hours on a 1 200 TBO as per the log card.
- The rotating bolt kit on ZU-UHI was overflown by 103 hours on a 600 hours life limit as per the log card.

- The operator submitted two Aircraft Status Report (See Appendix B(1 & 2) below. These reports indicate the following amongst others:
  - Report of the 03/02/2014 and 27/01/2015 both indicate that the swash plate part number (P/N) 204-011-400-11, serial number (S/N) 3468 was installed on 16/02/2011 at 2757.20hours however no record of this installation was recorded in the airframe log book (See appendix D(2). According to the historical service record (HSR) the last date of installation was 06/10/2006 where after the component was cleaned and reinstalled on 21/03/2007 after the aircraft was submerged in water (See appendix D(1).
  - The status reports submitted by the AMO, both indicate that the TBO for the rotating bolt kit part number (P/N) 204-1629-2, was installed on 28/02/2008 at 2757.20hours however no record of this installation was recorded in the airframe log book (See appendix D(2). The two status reports have two different TBO hours for the rotating bolt kit, the report of 03/02/2014 indicates a TBO of 600hours and the report of 27/01/2015 has an increased TBO of 1000hours. According to the manufactures requirements the TBO is 600hours see appendix C. Investigators could not find any record of an upgrade to Bell Dash 20 kit (see appendix D2).

## 1.18 Additional Information

### 1.18.1 Rules of the air:

The information was extracted from FFA manual of procedure (MOP) Part 137 Manual A Issue 2 (Section 14 Division one guided by CAR 91.06).

Landing on Roads:

No pilot shall use a public road as a place of landing or take-off in an aircraft, except:

- a) in the case of an emergency involving the safety of the aircraft of its occupants
- b) for the purpose of saving human lives
- c) when involved in civil defence or law-enforcement operations and aerial fire-fighting, provided that at all times reasonable care is taken for the safety of others with due regard to the prevailing circumstances.

### 1.18.2 Loss of tail rotor effectiveness (LTE)

LTE is not a maintenance malfunction and may occur in varying degrees in helicopters at air speed less than 30kt. It is a critical low speed aerodynamic flight characteristic which can result in an unwanted rapid yaw that does not subside and if it is not corrected can result in a loss of control. Certain wind directions are more likely to cause tail rotor thrust variations than others. These relative wind directions form an LTE conducive environment.

## 1.19 Useful or Effective Investigation Techniques

### 1.19.1 None.

## 2. ANALYSIS

- 2.1 The pilot was qualified for the flight with a valid medical certificate. He was familiar with the operations of the helicopter type, with over 1 000 flying hours of experience.
- 2.2 According to available records during the investigation, the aircraft was not maintained in accordance with manufacturer's prescribed procedures and requirements. The operator held a valid AOC and AMO certificates with required operational specifications attained in accordance with the regulator's approved procedures and regulations.

The swash plate assembly on ZU-UHI was overflowed by 540 hours on a 1 200 time between overall (TBO) as per the log card. The rotating bolt kit on ZU-UHI was overflowed by 103 hours on a 600-hour life limit as per the log card. Aircraft maintenance is essential to aviation safety. The primary role of aircraft maintenance is to ensure that aircraft comply with all legal requirements (e.g. continuing airworthiness requirement, airworthiness directives, certificate of release to service, type certificate and supplementary type certificate), operational requirements, appropriate equipment for the type of operation being flown (e.g. communication, navigation, surveillance and fire fighting).

- 2.3 According to the reporting of the accident, the helicopter was observed approaching and hovering at a distance of 50 m before the temporary landing zone near the IC. At the same time, a truck approached from the rear of the helicopter and was stopped by a person who was stationed to control road traffic before the landing zone. The IC then observed the helicopter turning slightly to the right and then banked to the left, where after it collided with high-rising terrain. The spotter pilot who was flying above reported that he observed the helicopter pitching up and rolling to the left, followed by impact with the terrain.
- 2.4 The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component and lost tail rotor effectiveness.
- 2.5 The helicopter was deployed for a fire-fighting operation, operating under a restricted Part 137 certificate of airworthiness. The mission for which the helicopter was deployed was not unusual; the pilot was well familiar with the intended operation and well experienced in helicopter flying. The accident occurred whilst the helicopter was attempting to land in order to deploy a bambi bucket. The nature of the operation is high-risk; pilots are typically faced with many obstacles and challenges, at times can find themselves in confined areas.

- 2.6 The pilot was fully aware of the operational conditions and requirements as stipulated on the FFA Part 137 Manual A Issue 2 (Section 14 Division one guided by CAR 91.06 ).
- 2.7 Investigations revealed that after an attempt for an abortive landing, the helicopter's main rotor blades made contact with the terrain on its left side, rolled to the left before it crashed. The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component which resulted on a loss of tail rotor effectiveness.

### **3. CONCLUSION**

#### **3.1 Findings**

- 3.1.1 The pilot had a valid commercial licence and was properly rated on the aircraft type. He held a valid medical certificate, which was to expire on 30 November 2015.
- 3.1.2 According to available records, the aircraft was not properly maintained. The last MPI that was carried out on the aircraft prior to the accident was on 12 January 2015.
- 3.1.3 Prior to the accident, the bambi bucket was stowed inside the helicopter, to be attached at the temporary landing zone to eliminate drag during the flight.
- 3.1.4 The helicopter was in possession of a valid Authority to Fly, which was issued on 16 February 2015 with an expire date of 11 January 2016
- 3.1.5 The helicopter turned to the right and then to the left in a nose up attitude before colliding with terrain.
- 3.1.6 The fuel tank ruptured during impact and the aircraft caught fire. The fire was however extinguished by ZS-HBU. The helicopter was destroyed by impact forces, post-impact fire and veld fire
- 3.1.7 The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component and lost tail rotor effectiveness.
- 3.1.8 All tested components (hydraulic lines and actuators) revealed no anomalies or presence of any fault which could have contributed to the accident. (see Appendix A)
- 3.1.10 The helicopter's main rotor blades impacted terrain and the pilot lost control.
- 3.1.11 Both pilot and HSI were fatally injured as a result of impact forces and post impact fire.
- 3.1.12 The helicopter was operated under Part 137 operation as approved by the regulator.

3.1.13 The operator was in possession of a valid AOC to conduct fire fighting and the helicopter in question was duly authorised to operate under the AOC.

3.1.14 The aircraft maintenance organisation that conducted the last phase inspection on the helicopter prior to the accident flight was in possession of a valid AMO approval certificate at the time.

3.1.15 The main wreckage was consumed by the fire that erupted overnight.

3.1.16 At the time of the accident the following components were over flown:

- The swash plate assembly on ZU-UHI was overflowed by 540 hours on a 1 200 TBO as per the log card.
- The rotating bolt kit on ZU-UHI was overflowed by 103 hours on a 600 hours life limit as per the log card.

3.1.17 Investigations revealed that after an attempt for an abortive landing, the helicopter's main rotor blades made contact with the terrain on its left side, rolled to the left before it crashed. The investigation identified that the aircraft was approaching to land at low speed in to a 12-15kt wind. The aircraft was turned left exposing the tail rotor to a cross wind component which resulted on a loss of tail rotor effectiveness.

### 3.2 Probable Cause/s

3.2.1 The helicopter's main rotor blades made contact with the terrain during an attempt to abort the landing resulting in a loss of control and crashed.

3.2.2 Contributory

- a) A cross wind component of 12-15kt, and
- b) Loss of tail rotor effectiveness.

## 4. SAFETY RECOMMENDATIONS

4.1 **Safety Action by regulator:** The Regulator withdrew the privileges of the operator' operating certificate subject to the operators rectification of the findings stipulated in the Regulator' audit report.

4.2 **Safety Action by Operator:** Following the accident, the operator did engage the services of two international experts in order to assist with the operational review of the operator.



## **5. APPENDICES**

5.1 Appendix A: Crash Lab report

5.2 Appendix B: Aircraft Status Report

5.3 Appendix C: Manufacturers Requirements

5.4 Appendix D: Maintenance Records

5.5 Appendix E: Comments from the operator which the investigating team does not agree with.

Appendix A Crash Lab report





COMPILED BY 		PAGE 1 OF 14		
COMPILED FOR: FFA Assets Pty Ltd	<b>INVESTIGATION REPORT: MAIN ROTOR CONTROL ASSEMBLY &amp; WARNING LIGHT PANEL, BELL UH-1H</b>		DOCUMENT NUMBER MET-006-12-15	
			DATE 2015-12-10	ISSUE 1
<b>ITEM A:</b>	<b>HYDRAULIC SERVO CYLINDER ASSEMBLY, LEFT HAND CYCLIC CONTROL SYSTEM, MAIN ROTOR ASSEMBLY, BELL UH-1H HELICOPTER</b>			
<b>ITEM B:</b>	<b>WARNING LIGHT PANEL, COCKPIT INSTRUMENTS, BELL UH-1H HELICOPTER</b>			
<b>1. INTRODUCTION &amp; BACKGROUND INFORMATION</b>				
1.1. The Left Hand Cyclic Control Hydraulic Servo assembly (Photo 3) originating from a Bell UH-1H "Huey" Helicopter (Photo 1), was submitted to determine the operation status thereof on impact.				
1.2. The Cockpit Warning Light Panel assembly (Photo 4) originating from a Bell UH-1H "Huey" Helicopter (Photo 1), was submitted to determine the status of selected warning indicators on impact.				
1.3. The Bell UH-1H aircraft was involved in a Cat 5 accident. Post impact fire damages were caused by a secondary veld-fire and not by impact (Photo 2).				
				
Photo 1: File Photo: Working On Fire "Huey" <sup>1</sup>				
				
Photo 2: Impact site				



Photo 3: Supplied Hydraulic Servo (digital)



Photo 4: Supplied Warning Light Panel (digital)

1.3. This report is divided into the following sections:

(a)	INTRODUCTION & INFO	Par. 1
(b)	APPLICABLE DOCUMENTS	Par. 2
(c)	DEFINITIONS	Par. 3
(d)	INVESTIGATOR	Par. 4
(e)	APPARATUS AND METHODOLOGY	Par. 5
(f)	INVESTIGATION	Par. 6
(g)	DISCUSSION AND CONCLUSIONS	Par. 7
(h)	RECOMMENDATIONS	Par. 8
(i)	DECLARATION	Par. 9

## 2. APPLICABLE DOCUMENTS

(a) None supplied.

## 3. DEFINITIONS

(a)	OEM	Original Equipment Manufacturer
(b)	SACAA	South African Civil Aviation Authority
(c)	AMO	Aircraft Maintenance Organization
(d)	SEM	Scanning Electron Microscope
(e)	EDS	Energy Dispersive X-ray Spectrometry
(f)	FOD	Foreign Object Damage
(g)	OEM	Original Equipment Manufacturer
(h)	LH	Left Hand
(i)	NDT	Non-Destructive Testing

#### 4. PERSONNEL

- (a) The Investigative member and compiler of this report is Mr C.J.C. Snyman, ID number 6406105057080. Mr Snyman is a qualified Physical Metallurgist (H.N.Dip Metallurgical Engineering, Tech. PTA), Radiation Protection Officer (RPO) registered with the National Nuclear Regulator (NNR) and Aircraft Accident Investigator (SCSI).

#### 5. APPARATUS AND METHODOLOGY

- (a) The apparatus employed for this investigation are Stereo- and Electron Microscopes (EDS), Non-Destructive Testing equipment and Digital Camera.
- (b) The methodology included a visual investigation of supplied parts, x-ray analysis, teardown followed by a Microscope investigation.

#### 6. INVESTIGATION NOTES

##### 6.1. ITEM 1: Hydraulic Servo Assembly.

The visual inspection of the as-received Hydraulic Servo unit (Diagrams 1, 2 and 3: Red dashed squares; Photo 5) revealed a fractured attachment bracket (orange arrow) and extensive post-impact fire damages with a clear indication of the servo jack position after impact (Photo 6, red arrow).

The supplied hydraulic feedlines and connectors revealed extensive external fire damages (Photo 5, yellow arrows) but no clear indications of internal blockages. No seals and/or O-rings survived for inspection.

The Hydraulic Actuator block (Photo 5, blue arrow; Photo 7) was removed from the Hydraulic Control Valve (Diagrams 2 and 3, blue arrows; Photo 8) for inspection. All the inlet and return ports proved to be unobstructed (Photo 9). Teardown of the actuator revealed no clear indication/s of possible blockages (Photo's 10 and 11).

The Hydraulic Servo assembly was exposed to a -x-ray inspection prior to final teardown (Photo's 12, 13, 14 and 15). No clear indications of blockages, fractures or other discrepancies were noted.

The Hydraulic Control Valve (Photo 17) and Control Tube Internal hydraulic feed lines (Photo 18) revealed no clear indication/s of obstruction and passed a low-pressure flow test.

All three hydraulic seals (Photo 19, red arrows) proved to be in good condition with no clear indications of fractures, excessive wear or collapse.

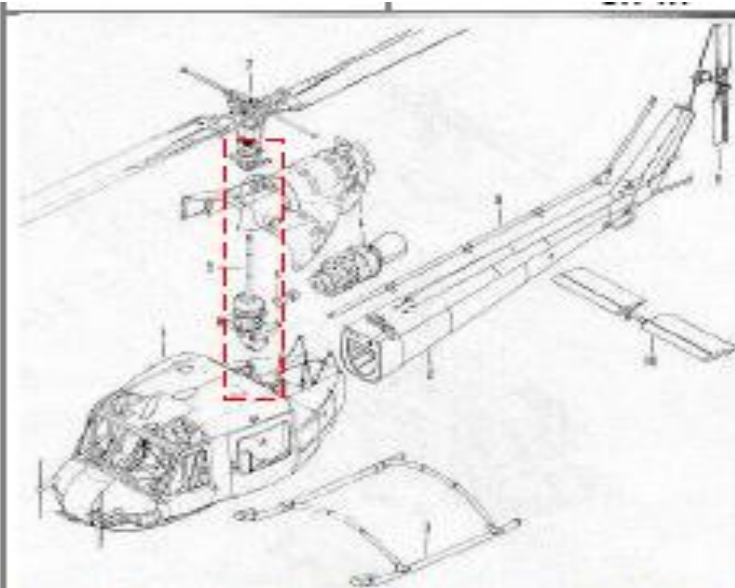


Diagram 1: General layout - Bell UH-1H – relative position of relevant assembly.

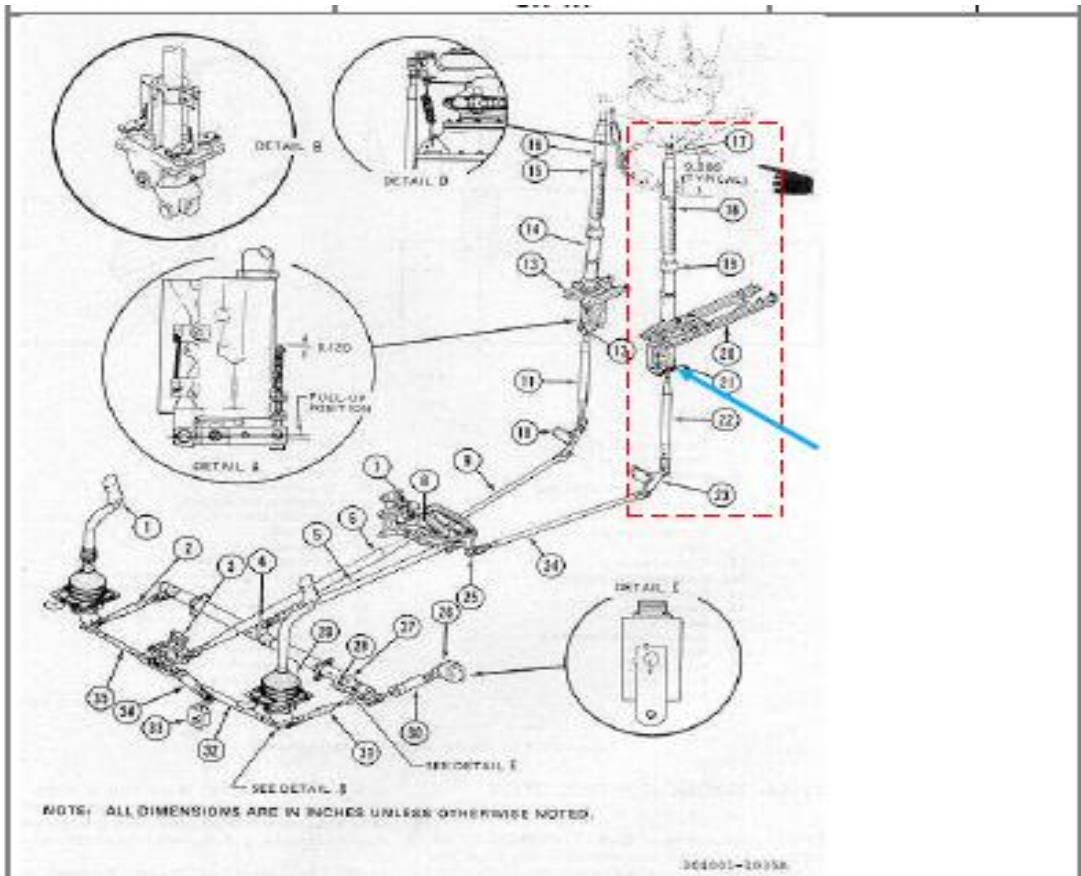


Figure 11-11. Cyclic control system (Sheet 1 of 2)

Diagram 2: LH Cyclic control Hydraulic Servo assembly

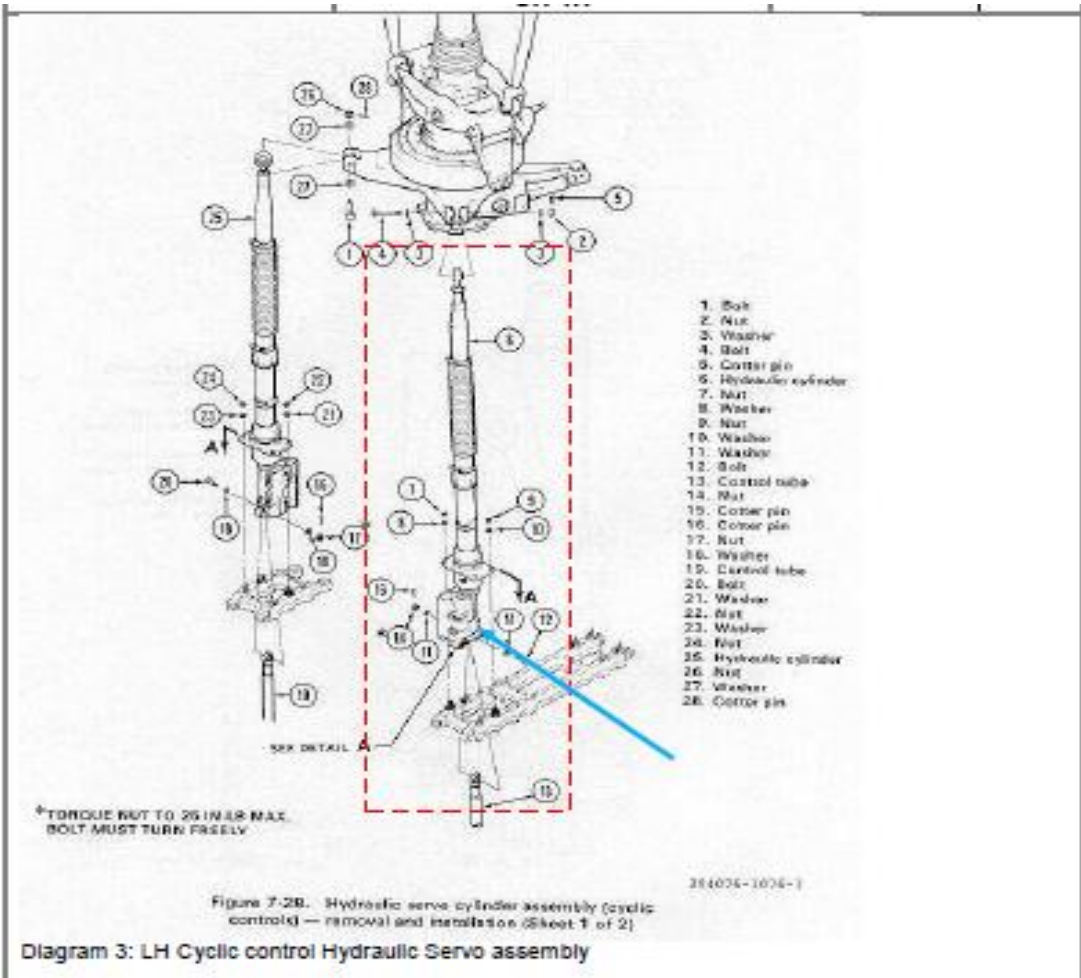


Figure 7-28. Hydraulic servo cylinder assembly (cyclic control) - removal and installation (Sheet 1 of 2)

Diagram 3: LH Cyclic control Hydraulic Servo assembly



Photo 5: As received condition of Hydraulic Servo assy. (digital)



Photo 6: Position of control tube after impact (digital)



Photo 7: Hydraulic actuator (digital)



Photo 8: Hydraulic actuator - removed (digital)



Photo 9: Hydraulic actuator feedline (digital)



Photo 10: Hydraulic actuator - teardown (digital)



Photo 11: Hydraulic actuator - teardown (digital)



Photo 12: Hydraulic Servo Assembly (X-ray)

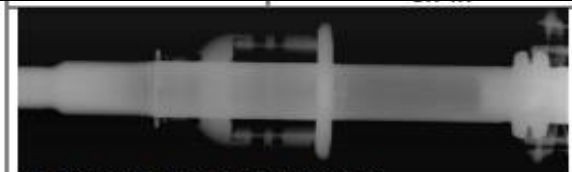


Photo 13: Hydraulic Servo Assembly (X-ray)



Photo 14: Hydraulic Servo Assembly (X-ray)



Photo 15: Hydraulic Servo Assembly (X-ray)



Photo 16: Disassembled Hydraulic Servo assy. (digital)



Photo 17: Internal area - Hydraulic Control Valve (digital)



Photo 18: Feed holes – Control Tube (digital)



Photo 19: Feed holes – Control Tube (digital)



Photo 20: Hydraulic seal conditions – 3x positions – Control Tube (digital)

## 6.2. ITEM 2: Cockpit Warning Light Panel.

The visual inspection of the as-received Cockpit Warning Light Panel (Photo's 4, 21 and 22) revealed extensive post-impact fire- but limited impact related damages.

The following warning lights were selected for this inspection: Hydraulic pressure "HYD PRESSURE", Main Transmission Oil Pressure "XMSN OIL PRESS" and Master Caution (Figure 1, red dashed square).

*The selection is based on light bulb condition, relevance and position relative to the HYD PRESSURE caution light in order to determine the status of the HYD PRESSURE indicator (Photo 22, red arrow) on impact, if possible.*

The selected warning light bulb holders and bulbs (Photo's 23 and 24) were removed from the panel for inspection.

*The Master Caution (Photo 27) was selected as a possible reference assuming that it would be operational considering the possible influences of the impact forces on other component/s linked to the same panel prior to final impact. The XMSN OIL PRESS was selected as a*







Photo 23: Selected warning light bulb holders, removed (digital)



Photo 24: Light bulbs removed (digital)

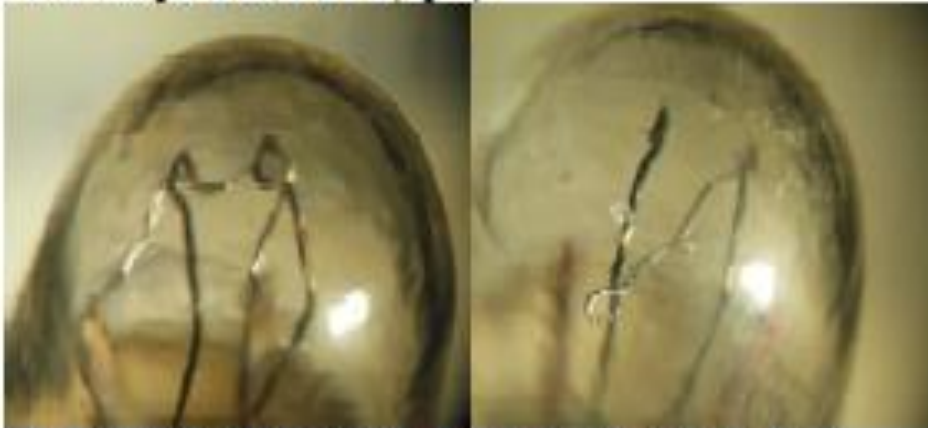


Photo 25: Hydraulic Pressure – light bulb filament condition (stereo)



Photo 26: Main Transmission Oil Pressure - light bulb filament condition (stereo)



Photo 27: Master Caution - light bulb filament condition (stereo)

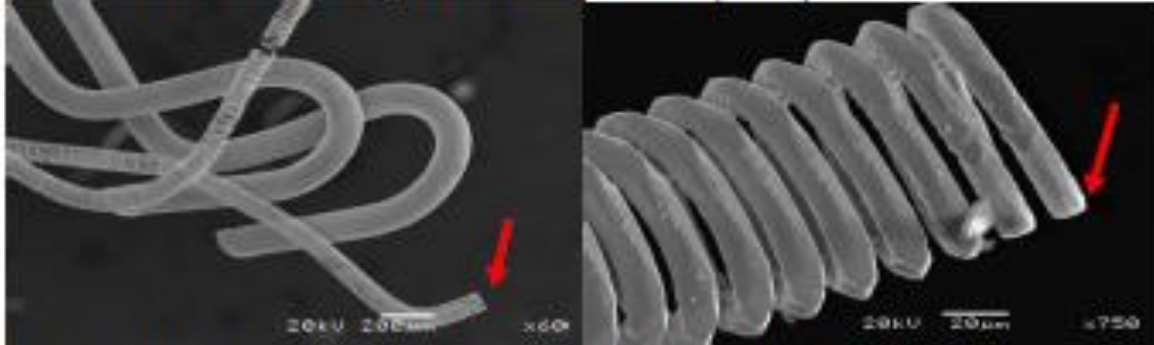


Photo 28: Hydraulic pressure light bulb filament condition (x60 - x750, SEM)

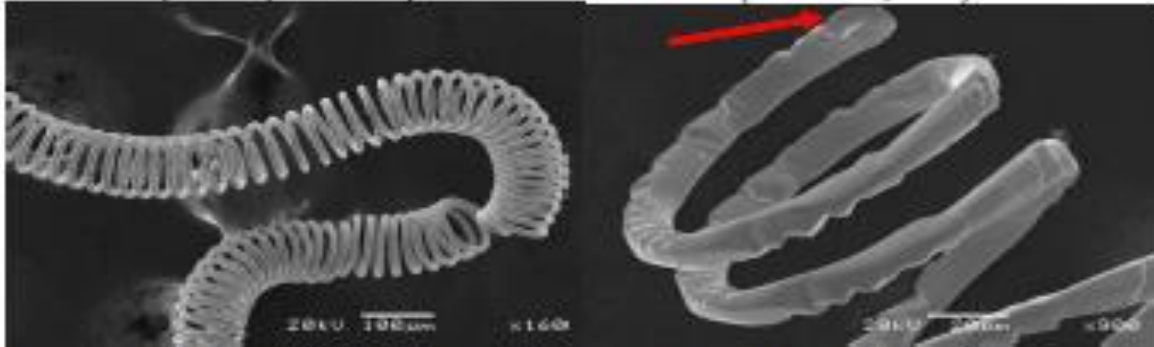


Photo 29: Hydraulic pressure light bulb filament condition (x160 - x900, SEM)

## 7. DISCUSSION AND CONCLUSIONS

### Applicable Notes:

1. All conclusions are based on the investigation results obtained from the supplied parts only.
2. Deductions are based on the information presented to this investigation as being factual.

7.1. ITEM 1: LH Cyclic Hydraulic Servo Assembly.

The investigation results revealed no clear indications of pre-existing fractures, obstructions, seal failures or other clear discrepancies that may have been detrimental to the operation thereof prior to impact.

7.2. ITEM 2: Cockpit Warning Light Panel.

*Considering the perceived low forward- and vertical speeds prevalent on impact no constructive comparative analysis between the warning indicator bulb filaments could be attained.*

Inspecting the HYD PRESSURE warning indicator bulbs in isolation proved that the filament fractured under low temperature conditions signifying that it was inoperative at the time of impact.

8. RECOMMENDATIONS

- 8.1. ITEM 1: Taking into account the negative effects of hydraulic support failure towards the controllability of the aircraft as well as the complexity thereof, it is recommended that the Main Rotor hydraulic assist system in its totality be exposed to a detailed inspection, if possible.

9. DECLARATION

- 9.1. All digital images have been acquired by the author and displayed in an un-tampered manner.

**Appendix B**

**1. Aircraft Status dated 2015/01/27**



# Aircraft Status

Aircraft status report was compiled by:

**FFA AVIATION AMO 1116**

**Tel:** 013 7418222  
**Fax:** 013 741 8012  
**Address:** P O box 15052  
WEST ACRES  
NELSPRUIT  
1200

**Hanger E4  
NELSPRUIT AIRFIELD  
NELSPRUIT  
1200**

Note: All items included in this report

Aircraft status report generated for:

**Registration:**

**BELL 205 UH-1H**

**ZU-UHI**

**Airframe status      Monthly usage**

<b>Hours:</b>	3,385.80	15
<b>Cycles:</b>	3,267	30
<b>Landings:</b>	27,815	30

**Customer**

**Company:** <System record>  
**Contact:**  
**Tel:**  
**Fax:**  
**Address:**

Report data last updated: 2015-01-27

Note: The usage above is used to calculate the expected due date (Expected Due) as an indication in the report by using the last usage date as starting point for these calculations.

The aircraft Status program is a good faith effort by AvData software to track and trace the maintenance history of a particular aircraft component. However this listing may not be represented as 100% accurate or all inclusive and the legal onus for such maintenance remains with the owner/operator in terms of the CAR's.





# Aircraft Status

Description / Part	Installed	Frequency	To Go	When Due	Expected due	
<b>ROTATING BOLT KIT</b>						
204-1629-2 S/N:NA	2008-02-28 2757.20 h	1000h	371h	3757h	2017-02-17	
<b>MAW ROTOR HEAD ASSEMBLY</b>						
204-012-101-139 S/N:ABG-6808	2011-02-16 2757.20 h	1200h	571h	3957h	2018-03-30	
<b>MAIN ROTOR YOKE</b>						
204-011-102-17 S/N:JI-1-89894	2011-02-16 2757.20 h	7200h	6571h	9957h	2051-07-22	
<b>MAIN ROTOR TRUNNION ASSY</b>						
204-011-105-1 S/N:A1-10536	2011-02-16 2757.20 h	15000h	14371h	17757h	2094-11-09	
<b>TT STRAPS RED</b>						
204-310-101-101 S/N:LPFS-21494	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>TT STRAP WHITE</b>						
204-310-101-101 S/N:LPFS-21490	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>MAIN ROTOR HEAD INBOARD FITTING</b>						
204-012-102-5 S/N:IT-2508	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>MAIN ROTOR HEAD INBOARD FITTING</b>						
204-012-102-5 S/N:IT-2460	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>MAIN ROTOR HEAD OUTBOARD FITTING</b>						
204-012-103-1 S/N:EAC-4458	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>MAIN ROTOR HEAD OUTBOARD FITTING</b>						
204-012-103-1 S/N:EAC-4462	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>PW</b>						
204-012-104-5 S/N:05489-A	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>PIN</b>						
204-012-104-5 S/N:08600-A	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>PIN</b>						
204-012-104-5 S/N:06948-A	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>PW</b>						
204-012-104-5 S/N:06519-A	2011-02-16 2757.20 h	2400h	1771h	5157h	2024-11-26	
<b>CLEVIS (DRAG BRACE) RED BLADE</b>						
204-011-179-1 S/N:A1-10887	2011-02-16 2757.20 h	3600h	2971h	6357h	2031-07-27	
<b>CLEVIS (DRAG BRACE) WHITE BLADE</b>						
204-011-179-1 S/N:A1-02672	2011-02-16 2757.20 h	3600h	2971h	6357h	2031-07-27	
<b>SCISSOR LEVER2</b>						
204-011-406-15 S/N:1718	2006-12-14 2413.00 h	3600h	2627h	6013h	2029-08-28	
<b>COLLECTIVE LEVER</b>						
212-010-403-6 S/N:A450	2011-02-18 2449.10 h	4800h	3863h	7249h	2036-07-08	
<b>COLLECTIVE LEVER</b>						
212-010-403-6 S/N:A0499	2013-06-21 2449.10 h	4800h	3863h	7249h	2036-07-08	
<b>SCISSORS &amp; SLEEVE ASSY.</b>						
204-011-401-011 S/N:1754	2006-12-14 2413.00 h	1200h	227h	3613h	2016-05-01	
<b>MAW ROTOR GRIP ASSY.</b>	1x	No Date 0.00 h	24000h	20614h	24000h	2114-02-09
<b>MAW ROTOR GRIP ASSY</b>	1x	No Date 0.00 h	24000h	20614h	24000h	2114-02-09
<b>SCISSOR LEVER 1</b>						
	No Date 0.00 h	3600h	214h	3600h	2016-04-05	

## TAIL ROTOR

<b>TAIL ROTOR BLADE RED</b>					
204-011-752-101 S/N:A-28954	2014-09-12 3346.70 h	1200h	1161h	4547h	2021-07-07

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www.avdata.co.za/status

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2. Aircraft Status dated 2014/02/27

# Aircraft Status

Aircraft status report was compiled by:

FFA AVIATION AMO 1116

Tel: 013 7418222  
Fax: 013 741 8012  
Address: P O box 15052  
WEST ACRES  
NELSPRUIT  
1200

Hanger E4  
NELSPRUIT AIRFIELD  
NELSPRUIT  
1200

Note: All items included in this report

Aircraft status report generated for:

Registration:

ZU-UHI

BELL 205 UH-1H

Airframe status Monthly usage

Hours:	3,222.40	7
Cycles:	366	30
Landings:	23,568	5,675

Customer

Company: <System record>  
Contact:  
Tel:  
Fax:  
Address:

Report data last updated: 2014-02-03

Note: The usage above is used to calculate the expected due date (Expected Due) as an indication in the report by using the last usage date as starting point for these calculations.

The aircraft Status program is a good faith effort by AvData software to track and trace the maintenance history of a particular aircraft component. However this listing may not be represented as 100% accurate or all inclusive and the legal onus for such maintenance remains with the owner/operator in terms of the CAR's.

*- Rotating Bolt Kit - 135 hrs*



# Aircraft Status

Description / Part	Installed	Frequency	To Go	When Due	Expected due
<b>FIRST GP DISC SEAL CYCLE</b>					
	2011-02-22 0 c	6900c	6534c	6900c	2032-03-24
<b>GP SPACER</b>					
1-100-294-03 S/N:1903304285	2011-02-16 2575.20 h	25000h	24353h	27575h	2113-04-08
<b>GP SPACER CYCLE</b>					
	2011-02-22 0 c	7000c	6634c	7000c	2032-07-04
<b>SECOND GP DISC</b>					
1-100-963-05 S/N:39566-538	2011-02-16 2757.20 h	25000h	24036h	27757h	2113-04-08
<b>SECOND GP DISC CYCLE</b>					
	2011-02-22 0 c	10100c	8734c	10100c	2041-02-10
<b>FIRST PT DISC</b>					
1-100-009-05 S/N:31280-271	2011-02-16 2757.20 h	25000h	24035h	27757h	2113-04-08
<b>FIRST PT DISC CYCLES</b>					
	2011-02-22 0 c	6000c	5634c	6000c	2029-09-24
<b>PT SPACER</b>					
1-140-169-04 S/N:100214	2011-02-16 2757.20 h	25000h	24535h	27757h	2113-04-08
<b>PT SPACER CYCLES</b>					
	2011-02-22 0 c	15000c	14634c	15000c	2054-09-18
<b>FCU</b>					
1-170-340-60 S/N:622AL4071	2011-02-16 2757.20 h	2500h	2035h	6257h	2009-10-07
<b>SECOND PT DISC</b>					
S/N:a274	No Date 0.00 h	25000h	21778h	25000h	2113-04-08
<b>SECOND PT DISC CYCLES</b>					
	2011-02-22 0 c	15000c	11143c	11549c	2045-02-18
<b>GOVERNER</b>					
1-160-850-16 S/N:602AM10434	2011-02-16 2757.20 h	3000h	2535h	5757h	2046-01-27
<b>OIL COOLER BLOWER BEARING</b>					
15819-11 S/N:N/A	2013-06-28 3199.50 h	450h	427h	3650h	2019-06-25
<b>MAINROTOR</b>					
<b>MAIN ROTOR BLADE RED</b>					
204-011-250-113 S/N:A-FS 11855	2012-11-16 3037.00 h	2500h	2315h	5537h	2043-04-19
<b>MAIN ROTOR BLADE WHITE</b>					
204-011-250-113 S/N:A-FS 11843	2012-05-29 3037.00 h	2500h	2315h	5537h	2043-04-19
<b>TRANSMISSION</b>					
204-040-018-005 S/N:A12-2687	2011-02-16 2757.20 h	2000h	1535h	4757h	2033-06-16
<b>STABILIZER BAR CENTER FRAME1</b>					
240-011-326-7	2011-02-16 2757.20 h	16000h	14535h	17757h	2113-04-08
<b>STABILIZER BAR CENTER FRAME2</b>					
204-011-326-7 S/N:3807	2011-02-16 2757.20 h	15000h	14535h	17757h	2113-04-08
<b>SWASH PLATE</b>					
204-011-400-11 S/N:3488	2011-02-16 2757.20 h	1200h	735h	3957h	2023-05-13
<b>SUPPORT</b>					
204-011-452-1 S/N:A 8342	2011-02-16 2413.10 h	3000h	2794h	6013h	2049-04-21
<b>MAIN ROTOR MAST ASSEMBLY</b>					
204-011-450-7 S/N:244	2011-02-04 2757.20 h	2000h	2035h	5257h	2039-10-07
<b>MAINROTOR MAST BEARING</b>					
213-040-136-1 S/N:ZV12805	2011-02-04 2757.20 h	1500h	1036h	4257h	2027-02-23
<b>MAIN ROTOR MAST POLE</b>					
204-011-450-7 S/N:244	2010-10-06 2413.10 h	15000h	14191h	17413h	2113-04-08

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# Aircraft Status

Description / Part	Installed	Frequency	To Go	When Due	Expected due
<b>ROTATING BOLT KIT</b>					
204-1629-2 S/N:WA	2008-02-28 2757.20 h	600h	136h	3357h	2015-10-17
<b>MAIN ROTOR HUB ASSEMBLY</b>					
204-012-101-139 S/N:ABG-8508	2011-02-16 2757.20 h	1200h	735h	3967h	2023-05-13
<b>MAIN ROTOR YOKE</b>					
204-011-102-17 S/N:JI-1-89894	2011-02-16 2757.20 h	7200h	8735h	9957h	2099-01-25
<b>MAIN ROTOR TRUNNION ASSY</b>					
204-011-105-1 S/N:A1-10536	2011-02-16 2757.20 h	15000h	14535h	17757h	2113-04-08
<b>TT STRAPS RED</b>					
204-310-101-101 S/N:LPPS-21494	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>TT STRAP WHITE</b>					
204-310-101-101 S/N:LPPS-21490	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>MAIN ROTOR HEAD INBOARD FITTING</b>					
204-012-102-5 S/N:IT-2506	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>MAIN ROTOR HEAD INBOARD FITTING</b>					
204-012-102-5 S/N:IT-2460	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>MAIN ROTOR HEAD OUTBOARD FITTING</b>					
204-012-103-1 S/N:EAC-4456	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>MAIN ROTOR HEAD OUTBOARD FITTING</b>					
204-012-103-1 S/N:EAC-4462	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>PIN</b>					
204-012-104-5 S/N:05469-A	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>PIN</b>					
204-012-104-5 S/N:08850-A	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>PIN</b>					
204-012-104-5 S/N:08945-A	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>PIN</b>					
204-012-104-5 S/N:06519-A	2011-02-16 2757.20 h	2400h	1935h	5157h	2038-07-03
<b>CLEVIS DRAG BRACE RED BLADE</b>					
204-011-179-1 S/N:A1-10667	2011-02-16 2757.20 h	3600h	3135h	6367h	2053-08-23
<b>CLEVIS DRAG BRACE WHITE BLADE</b>					
204-011-179-1 S/N:A1-02872	2011-02-16 2757.20 h	3600h	3135h	6367h	2053-08-23
<b>SCISSOR LEVER1</b>					
204-011-406-15 S/N:1754	2011-02-16 2413.00 h	3600h	2791h	6013h	2049-04-20
<b>SCISSOR LEVER2</b>					
204-011-406-15 S/N:1716	2006-12-14 2413.00 h	3600h	2791h	6013h	2049-04-20
<b>COLLECTIVE LEVER</b>					
212-010-403-5 S/N:A498	2011-02-16 2449.10 h	4800h	4027h	7249h	2064-11-24
<b>COLLECTIVE LEVER</b>					
212-010-403-5 S/N:A0499	2013-08-21 2449.10 h	4800h	4027h	7249h	2064-11-24
<b>TAIL ROTOR</b>					
<b>TAIL ROTOR BLADE RED</b>					
204-011-702-15 S/N:AFS16535	2011-02-16 2757.20 h	1200h	735h	3967h	2023-05-13
<b>TAIL ROTOR BLADE WHITE</b>					
204-011-702-15 S/N:AFS16506	2011-02-16 2757.20 h	1200h	735h	3967h	2023-05-13
<b>TAIL ROTOR YOKE</b>					
204-011-722-5 S/N:AFS3598	2011-02-16 2757.20 h	1500h	1035h	4257h	2027-02-23

# Appendix C. Manufacture requirements

TM 65-1520-210-23-1

## SECTION V. OVERHAUL AND RETIREMENT SCHEDULE

### 1-63. INTRODUCTION.

This section lists units of operating equipment that are to be overhauled or retired at the period specified. Removal of equipment for overhaul may be accomplished at the inspection nearest the time when overhaul is due unless otherwise specified in TM 1-1500-328-23.

#### WARNING

TM 1-1500-328-23 should be referred to concerning mutilation/destruction of items when they have reached the established life expectancy (finite life) before the items are forwarded for property disposal.

### 1-63. OVERHAUL INTERVAL.

1-64. Description - Overhaul Interval. The maximum authorized operating time on calendar interval of parts prior to removal for overhaul at category of maintenance authorized in accordance with the Maintenance Allocation Chart (Table 1-8 and Appendix B).

### 1-65. RETIREMENT SCHEDULE.

1-66. Description - Retirement Schedule. The operating time or calendar interval specified for removal, condemnation and disposal of parts in accordance with TM 1-1500-328-23 (Table 1-8).

#### NOTE

Items replaced on a calendar basis (for the purpose of overhaul or retirement) will not be listed on 2408-16 Component Installation and Removal Record, but will be listed on DA Form 2408-18, Equipment Inspection List, for scheduling purposes.

Table 1-8. Overhaul and Retirement Schedule

AREA	OVERHAUL INTERVAL (HOURS)	RETIREMENT INTERVAL (HOURS)	ITEM AND PART NUMBER	
4	1200		Main Rotor	
		2500	Main Rotor Blade Assembly	204-011-250-5/113
		10,000	Composite Main Rotor Blade	205-015-150-101
		7200	Main Rotor Yoke	204-011-102-17
			Main Rotor Hub Assembly	204-012-101-130/141
		5000	Plate Assembly	204-011-207-165
		5000	Bolt	M821250H098006
		2400	Inboard Strap Fitting	204-012-102-1/5
		2400	Outboard Strap Fitting	204-012-103-1
		2400	Strap Pin	204-012-104-1,-3,-5
		2400	Retention Strap	2601399, 204-012-112-6
				204-012-122-1/5
		3600	Clevis	204-011-142-3
		3600	Clevis	204-011-179-1
		15000	Center Frame Assembly	204-011-307-1
		5 YRS	Stabilizer Bar Tube	204-011-328-11
		2400	Retention Strap	2608850
2400	Strap Fitting Inboard Main	204-012-102-9		
2400	Strap Assy Main Rotor	204-310-101-101		
2400	Strap Assy Main Rotor	2601136		
5000	Support Assembly	204-011-208-101		

1-110 Change 34

Table 1-8. Overhaul and Retirement Schedule (Cont)

AREA	OVERHAUL INTERVAL (HOURS)	RETIREMENT INTERVAL (HOURS)	ITEM AND PART NUMBER	
5	2400		Engine	T53-L-13B
			NOTE Deleted	
		600	Rotor Controls Parts Kit (See figure 1-15) Synchronized Elevator	204-1629-2
		3600	Elevator Assembly	205-030-858-19,-21
		4800	Elevator Horn Assembly	205-001-914-1/-25

1-112 Change 42

Appendix D. Aircraft Maintenance Records  
1 Service Records

COMPONENT NAME SWITCH PARTS ASSEMBLY  
 PART NUMBER 204-211-600-11  
 SERIAL NUMBER 3468

HISTORICAL SERVICE RECORD

INSTALLATION DATA				AC HOURS SCH. FOR OIH		REMOVAL DATA		
DATE	INSTALLED ON A/C NO.	BY (ACTIVITY)	INSTALLED AT A/C HRS.	COMP. HRS. SINCE NEW	COMP. HRS. SINCE OIH	REMOVED AT A/C HRS.	DATE	REASON FOR REMOVAL
06-10-06	20-UHT	EXECUTIVE	2413.0	2313.05	694.35		ENTERED IN ERROR	
06-10-06	21-UHT	EXECUTIVE	2413.1	2313.05	694.35			

TECHNICAL DIRECTIVES AND HISTORY OF OVERHAUL


DIRECTIVE NUMBER IF APPLICABLE	TIME/DATE EFFECTIVITY	DESCRIPTION	COMPLIANCE BY (ACTIVITY)	DATE
	2-03-09	AFTER ATTACHED TO A/C INSTALLED IN SWITCHESS ASSEMBLY CLEANED & INSTALLED AFTER WIPED SWITCHESS TIL 200 BORES 5/16 260 BORES		21-03-07

**AIRFRAME PARTICULARS**

AIRCRAFT MANUFACTURER..... BELL HELICOPTER  
 MODEL DESIGNATION..... UH-1H  
 SERIAL NUMBER..... 13729

**INSTALLED ENGINE PARTICULARS**

ENGINE MANUFACTURER..... HONEYWELL LYCOMING

	MODEL DESIGNATION	SERIAL NUMBER
1	<u>T53-L-13B</u>	<u>30172 30121D</u> 
2		<i>SEE A/F + ENG Log Book</i>
3		
4		

**INSTALLED PROPELLER PARTICULARS**

PROPELLER MANUFACTURER..... N/A

	MODEL DESIGNATION	SERIAL NUMBER
1		
2		
3		
4		

*Note: The abovementioned information is to be completed when this logbook is opened and must never be amended.*

I hereby certify that the particulars as stated above are a true reflection of the historical records pertaining to this aircraft and these records are available in the applicable aircraft logbook.

Name T.E. FOUCHÉ Signature 


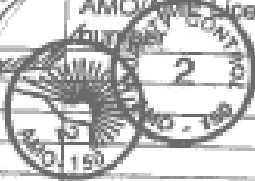


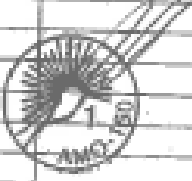

AME Number 26724 2672 AMO certificate stamp  Date 06.10.06

**CLASS 2 PRODUCT OVERHAUL AND/OR REPLACEMENT RECORD**

Component Designation	Serial No	Total Time	Release note No	* Installed By AME/AMO	Date of Installation
TR Gearbox					
204-040-02-13	ABC 13223	00:00	EXECUTIVE	AME 152	28/01/07
Main rotor blade					
204-011-20-113	1519		EXECUTIVE	AME 152	28/01/07
Main rotor blade					
204-011-20-113	1519		EXECUTIVE	AME 152	28/01/07
Main rotor blade					
204-011-20-5	1268	154-2	EXECUTIVE	AME 152	28/01/07
Main rotor blade					
204-011-20-5	1496	155-2	EXECUTIVE	AME 152	28/01/07
Tail rotor blade	C 2859	301-1			
Tail rotor blade	C 2859	775-0	EXECUTIVE	AME 152	28/01/07
42° Gearbox					
90° Gearbox					
204-040-012-13	ABC 50013	00:00	Tail	AME 1116	23/11/2010
62° Gearbox					
202-040-003-23	HPI-62EM	00:00	TRANSAXLE	AME 1116	23/11/2010
Main Transmission					
204-040-004-005	A12-2687	00:00	MEI 2500	AME 1116	23/11/2010
Drive Shaft					
S/C P 2041-103	N/A	1671-0	MEI 2640	AME 1116	23/11/2010
Pin Bush 1051					
205-032-000-71	ABD-05062	00:00	MEI 2643	AME 1116	23/11/2010
Main rotor hub					
204-02-104-139	ABC-6408	00:00	MEI 2642	AME 1116	23/11/2010
STAMP TT					
LPS-21494	LPS-21494	00:00	MEI 2642	AME 1116	23/11/2010
STAMP TT					
204-310-104-101	LPS-21490	00:00	MEI 2642	AME 1116	23/11/2010
Tail rotor blade					
204-011-702-15	AFS 19496	834-6	MEI 2650	AME 1116	23/11/2010
Tail rotor blade					
204-011-702-15	AFS 18936	622-5	MEI 2650	AME 1116	23/11/2010
Tail rotor hub					
204-011-801-121	A-FS 3579	315-0	MEI 2650	AME 1116	23/11/2010
Main rotor blade					
204-011-250-113	AMA-64630	2200	MEI 2684	AME 1116	04/02/2011
Main rotor blade					
204-011-250-113	A 9518	1925	MEI 2684	AME 1116	04/02/2011
STABILIZER ROD AS					
004-011-326-009	3507	00:00	FRISK 78	AME 1116	04/02/2011
Tail rotor blade					
204-011-702-15	AFS 19535	0-0	P30469	AME 1116	04/02/2011
Tail rotor blade					
AFS 16506	AFS 16506	02-0	EC2 637	AME 1116	04/02/2011
Main rotor blade					
204-011-250-113	A-FS 11955	1464	753	AME 1116	26/05/2012
Main rotor blade					
204-011-250-113	A-FS 11843	1464	754	AME 1116	26/05/2012

\* Note: A signature in this column will be taken as certification that the maintenance specified has been carried out and all requirements as laid down in the Civil Aviation Regulations 1997, as amended have been met in every respect.

SCHEDULE INSPECTION RECORD

SCHEDULED INSPECTIONS PERFORMED					
DATE	Total Time	Landings/ Cycles	Inspection Type	Signature *	AMC Licence
21.10.06	2899.28 2413.40	NA. RW 243,000 uncorrected	1000 HR		
29/03/07	2449.1	EW 1778.2	Page 1		
16/01/2007	2553.2	5243.2 Av	Page 2		

\* Note: A signature in this column will be taken as certification that the maintenance specified has been carried out and all requirements as laid down in the Civil Aviation Regulations 1997, as amended have been met in every respect.





ZU-UHI Comments from the operator

The Investigating team has considered submission from the operator in respect of the aircraft accident ZU-UHI, subsequently we reviewed the said submission. Below are the comments which are non-editorial specific to technical aspects of the Final report upon which no agreement could be reached.

Comments from the operator:

Page 3

The operator doesn't agree that some components were overflowed and below is the operator's comments to that effect.

1. Para 1.17.4: Overflowed components

We would need to examine the component log cards relating to:

- (I) The Swash Plate Assembly, and
- (II) The Rotating Bolt Kit

The CAA has all these records and we request an opportunity to examine them to fully respond to these statements.

According to the recollection of our maintenance personnel

- (I) ZU-UHI was fitted with an upgraded Bell Dash 20 Bolt kit, which has a life limit of 1,000 hours and not the 600 hours life limit applicable to the NAS bolt kit.
- (II) ZU-UHI was fitted with a re-conditioned Swash Plate Assembly with a life limit of 1,200 hours, after the accident on 25<sup>th</sup> January 2007. ZS-UHI has certainly not flown more than 1,200 hours since its rebuild after the 2007 accident.
- (III) Moreover, at the MPI on 13 January 2015 (3,385.9 airframe hours). The airframe hours at the time of the accident is recorded as 3,460.1 in the accident report on page 6.
- (IV) It should be noted that the AME signed out the aircraft without any notation on the life limit of the Swash Plate Assembly expiring soon, let alone being overflowed by 540 hours some 74,2 later at the time of the accident.
- (V) The operator submitted two Aircraft Status Report (See Appendix B(1 & 2) below. These reports indicate the following amongst others:

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2. Para 2.2: reference to "...the aircraft was not maintained in accordance with [the] manufacturer's prescribed procedures and requirements" needs to be weighed against the resolution of the comments on paragraph 12 above.

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3. Para 3.1.2: See comments on the Issue of maintenance in paragraph 12 above

4. Para 3.1.16: See comments on overflown components In Paragraph 12 above.

-END-