AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9615		
Aircraft registration	**ZS-VDM**	**Date of accident**	22 April 2017		**Time of accident**	0810Z	
Type of aircraft	Bell 430 (Helicopter)		**Type of operation**		Private (Part 91)		
Pilot-in-command licence type	Commercial		**Age**	30	**Licence valid**	Yes	
Pilot-in-command flying experience	Total flying hours		1 480.0		Hours on type	91.3	
Last point of departure	Grand Central Aerodrome (FAGC), Gauteng Province						
Next point of intended landing	Spartan Helistop, Kempton Park, Gauteng Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Spartan Helistop (GPS position; 26°07'20.0" South 028°13'02.0" East), elevation of 5516 feet AMSL							
Meteorological information	Surface wind; 360°/6kt, Temperature; 20ºC, Dew point; 5°C, CAVOK						
Number of people on board	1 + 1	**No. of people injured**	0	**No. of people killed**	0		

Synopsis

The pilot, accompanied by a passenger who was also a helicopter pilot departed from Grand Central aerodrome (FAGC) at approximately 0810Z. This was a ferry/positioning flight with their destination being the Spartan helistop, which is located within the industrial area of Kempton Park, which was in close proximity to OR Tambo International Aerodrome (FAOR).

This was the pilot-in-command (PIC) first landing at this location, therefore the presence of the second pilot, who was not type rated on the Bell 430 but flew with to assist the pilot with the approach, landing and take-off procedure as he flew in and out of the area on a regular basis. She approached the helistop from the south, flying into wind and he descended from hover flight in to the demarcated helistop. After touchdown with all three main wheels firmly on the ground the helicopter started to roll forward slowly due to a slight downslope on the helistop surface. The pilot indicated that she applied brakes but it had no effect and the helicopter continued to roll forward, she then applied aft cyclic in order to tilt the main rotor thrust to prevent the helicopter from rolling forward. However as she applied aft cyclic, the helicopter started shaking violently and rotated through 90º along its vertical axis. She then closed the throttles in order to shut down the engines. The pilot and passenger exited the helicopter without any injuries. They assessed the situation and it was established that the main rotor blades had severed the tail boom which caused the helicopter to start shacking violently. The helicopter sustained extensive damage to the main rotor transmission, the transmission platform, tail boom structure and the main rotor blades. The investigation revealed that the pilot applied excessive aft cyclic resulting in the main rotor blades making contact with the left vertical stabilizer and then severed the tail boom.

Probable cause

In an attempt to stop the helicopter from rolling forward the pilot applied aft cyclic stick, which caused a substantial aft tilt moment of the main rotor disk to such an extent that the main rotor blades made contact with the left vertical stabilizer and severed the tail boom.

SRP date	12 September 2017	Release date	19 September 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner : Quantum Leap Investment 572 (Pty) Ltd
Name of Operator : National Airways Corporation
Manufacturer : Bell Helicopter Textron
Model : 430
Nationality : South African
Registration markings : ZS-VDM
Place : Spartan Helistop, Kempton Park
Date : 22 April 2017
Time : 0810Z

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 The pilot-in-command (PIC), was accompanied by a passenger who was also a helicopter pilot, he was however not type rated on the Bell 430, but was well familiar with the helistop as he flew in and out of there on a regular basis. He flew with in order to provide the pilot flying with visual guidance on the approach, landing and take-off path. He was occupying the left front cockpit seat and was also doing the radio work.

1.1.2 According to available evidence this was a private flight, operated under the provisions of Part 91 of the South African Civil Aviation Regulations of 2011 as the helicopter was being positioned from FAGC to the Spartan helistop.

1.1.3 They took off from Grand Central aerodrome (FAGC) at approximately 1000Z and flew to Spartan, which was a licenced helistop, located within an industrial area in Kempton Park. During an interview with the pilot she indicated that this was her first landing at this helistop. She stated that she did not land on her first approach but first flew over the helistop in order to inspect the site and familiarise herself with the environment. On the second approach she decided to land and flew the approach into the prevailing wind, which was 360° at 6 knots (surface wind) as provided by OR Tambo International aerodrome air traffic control (ATC). Once overhead the demarcated area (helistop) while in hover flight she lowered the collective pitch lever, and commenced with the descent onto the helistop. The touch down was uneventful and all three main wheels were on the ground.

1.1.4 As she was lowering the collective pitch lever further she noted that the helicopter started rolling forward slowly due to a slight downslope on the right hand side of the helistop as the pilot landed. She applied toe brakes but it had no effect in stopping the helicopter. She indicated that she did not ask the passenger/pilot that was seated in the co-pilot seat to apply the toe brakes on his side, nor had she applied the park brake after touchdown, which was located on the lower centre panel next to the collective pitch lever.

1.1.5 She state that she was unable to bring the helicopter to a stop after she applied the toe brakes again, she then opted to apply slight aft cyclic stick in order to tilt the rotor thrust aft hoping that it will assist in slowing down the forward roll movement. Seconds after she applied aft cyclic the helicopter started to shake uncontrollably whereupon it bounced and rotated through 90º. She then closed the throttles in the hope that the shaking would subside. Once the helicopter came to a standstill she shut down the engines in order to prevent a possible fire. The pilot further stated that during her training on the Bell430 helicopter, the effects of excessive cyclic imput was never demonstrated to her.

1.1.6 Neither of the two occupants was injured. They exited the helicopter after it came to a stop. It was observed that the main rotor blades had severed the tail-boom and substantial damage was caused to the main transmission, with transmission oil leaking from the transmission deck onto the ground from both sides of the fuselage.

The transmission deck and associated components were extensively damaged to such an extent that the helicopter could not be economically repaired.

1.1.7 The approach and landing as well as the subsequent accident event were captured on video by a person who was standing on the ground. The sequence of events as described by the pilot corresponds with the video footage.

1.1.8 The accident occurred during daylight conditions at a geographical position that was determined to be 26°07'20.0" South 028°13'02.0" East at an elevation of 5 516 feet above mean sea level (AMSL).

1.2 Injuries to persons

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

1.3 Damage to aircraft

1.3.1 The helicopter sustained substantial damage when the main rotor blades severed the tail boom. Damage was also caused to the main transmission, the transmission deck and the airframe structure.

Figure 1: The helicopter as it came to rest on the helistop

1.4 Other damage

1.4.1 Minor damage was caused to some vegetation when a section of one of the main rotor blades separated and was projected some distance from the helistop.

1.4.2 A fencing wall of the nearby residential property was damaged by the same piece of main rotor blade that separated.

1.5 Personnel information

Nationality	South African	Gender	Female	Age	30
Licence number	0272273939	Licence type	Commercial		
Licence valid	Yes	Type endorsed	Yes		
Ratings	Night Rating, Flight Instructor Grade 3				
Medical expiry date	31 October 2017				
Restrictions	None				
Previous accidents	None				

The pilot completed her conversion onto the Bell 430 on 8 September 2015. The

91.3 flying hours reflected in the table below was the pilot's flying hours on the Bell 430 helicopter that she logged as pilot-in-command (PIC). During an interview with her she stated that she had flown extensively as co-pilot on the Bell 430 while based in another African country where the helicopter was utilized for transporting the President of that country. The type of operation required a multi crew (two pilots) operation, however she was not allowed to log those flying hours on the Bell 430.

Flying experience:

Total hours	1 480.0
Total past 90-days	94.5
Total on type past 90-days	5.1
Total on type	91.3

1.6 Aircraft Information

1.6.1 Bell 430

The Bell 430 is a single pilot, nine place (optional 10-place), twin Rolls-Royce engine, intermediate (light utility) helicopter with a four-bladed main rotor, and a tail rotor that provides directional control. The tri-cycle landing gear is fully retractable with a self-centering 360° swivelling nose wheel. The nose gear is not equipped with a nose wheel lock. The main wheels are equipped with independent hydraulic braking system actuated by pedals mounted to the top of the directional control pedals. The airframe is a semi-monocoque structure with metal and composite covering and consists of a fuselage, a pair of stub wings, and a tail boom with horizontal and vertical stabilizers. The primary load-carrying structures are the cabin roof and floor assemblies, each contain two longitudinal beams, and bulkheads joining the two assemblies. The main rotor diameter is 12.80m (42 feet) and its overall length is 15.32m (50.3 feet). At the time of this accident the Bell 430 was no longer in production. One hundred and thirty six of these airframes where build.

Figure 2: A Bell 430 type helicopter

Airframe:

Type	Bell 430	
Serial number	49024	
Manufacturer	Bell Helicopter Textron	
Year of manufacture	1997	
Total airframe hours (at time of accident)	5 926.2	
Last Inspection (hours & date)	5 892.8	10 October 2016
Hours since last inspection	33.4	
C of A (issue date)	9 November 2016	
C of A (expiry date)	29 December 2017	
C of R (issue date) (present owner)	12 January 2007	
Operating categories	Standard Part 127	

Engine No. 1:

Type	Rolls Royce 250-C40B
Serial number	CAE-844050
Hours since new	5 926.2

Engine No. 2:

Type	Rolls Royce 250-C40B
Serial number	CAE-844051
Hours since new	5 926.2

1.7 Meteorological information

1.7.1 The weather information entered in the table below was obtained from the pilot's questionnaire.

Wind direction	350°	Wind speed	7 kts	Visibility	+10km
Temperature	17°C	Cloud cover	CAVOK	Cloud base	CAVOK
Dew point	8°C				

1.7.2 The meteorological aeronautical report (METAR) that was issued for FAOR on 22 April 2017 at 1000Z, could be found below;

FAOR 221000Z 03005KT 330V110 9999 SCT049 20/05 Q1027 NOSIG=

FAOR	-	ICAO location indicator for OR Tambo Aerodrome
221000Z	-	Date and time of issue (UTC)
030°	-	Wind direction (from True North): in degrees
05kt	-	Wind strength (knots)
9999m	-	Visibility
SCT049	-	Scattered cloud (3-4 octas) at 4900 feet above ground level
20°C	-	Dry bulb temperature
05°C	-	Dew-point temperature
1027	-	Barometric pressure: (QNH in hPa)
NOSIG	-	No significant change

1.7.3 The crew of ZS-VDM was in radio communication with ATC at FAOR, which provided them with the surface wind data shortly before landing which was 360° at 6 knots.

1.8 Aids to navigation

1.8.1 The helicopter was equipped with standard navigational equipment as required by the regulator, which was serviceable at the time of the flight.

1.9 Communication

1.9.1 The helicopter was equipped with standard communication equipment as required by the regulator, which was serviceable at the time of the flight.

1.9.2 The Spartan helistop fell within the OR Tambo International aerodrome (FAOR) CTR boundary, below the Johannesburg TMA. All pilots routing to and from the helistop needs to comply with all rules and regulations for entering and flying through controlled airspace.

1.9.3 The passenger/pilot was doing the radio work for this flight and was in communication with FAOR air traffic control (ATC) on the VHF frequency 118.1 MHz. The communication information was made available to the investigating authority and it was noted that at 0805Z the passenger/pilot first made contact with air traffic control advising them that they were inbound from the north for Spartan. ATC provided them with the QNH, which was 1028hPa and to report finals for Spartan. At 0810Z the pilot called ATC informing them they were turning finals Spartan, where upon the ATC provide them with the prevailing wind, which was 360° at 6 knots. The helicopter was identified on radar.

1.10 Aerodrome information

Helistop location	Spartan, Kempton Park
Helistop co-ordinates	26°07’20.0” South 028°13’02.0” East
Helistop elevation	5 516 feet above mean sea level
Helistop dimensions	20 m wide and 25 m in length
Hours of operation	VFR daylight hours only
Type of operation	Private use only
Helistop surface	Concrete
Approach facilities	None
Helistop status	Approved by the regulator
Reference number	CA15/2/373

1.10.1 The data sheet displayed in Figure 6 on page 11 of this report was obtained from the South African Civil Aviation Authority (SACAA) website (www.caa.co.za) under the subheading Aeronautical Information (Aerodromes and Helistops Directory) as this was a SACAA approved helistop. It should be noted that the data sheet does not make any reference to the presence of a slope on the helistop surface.

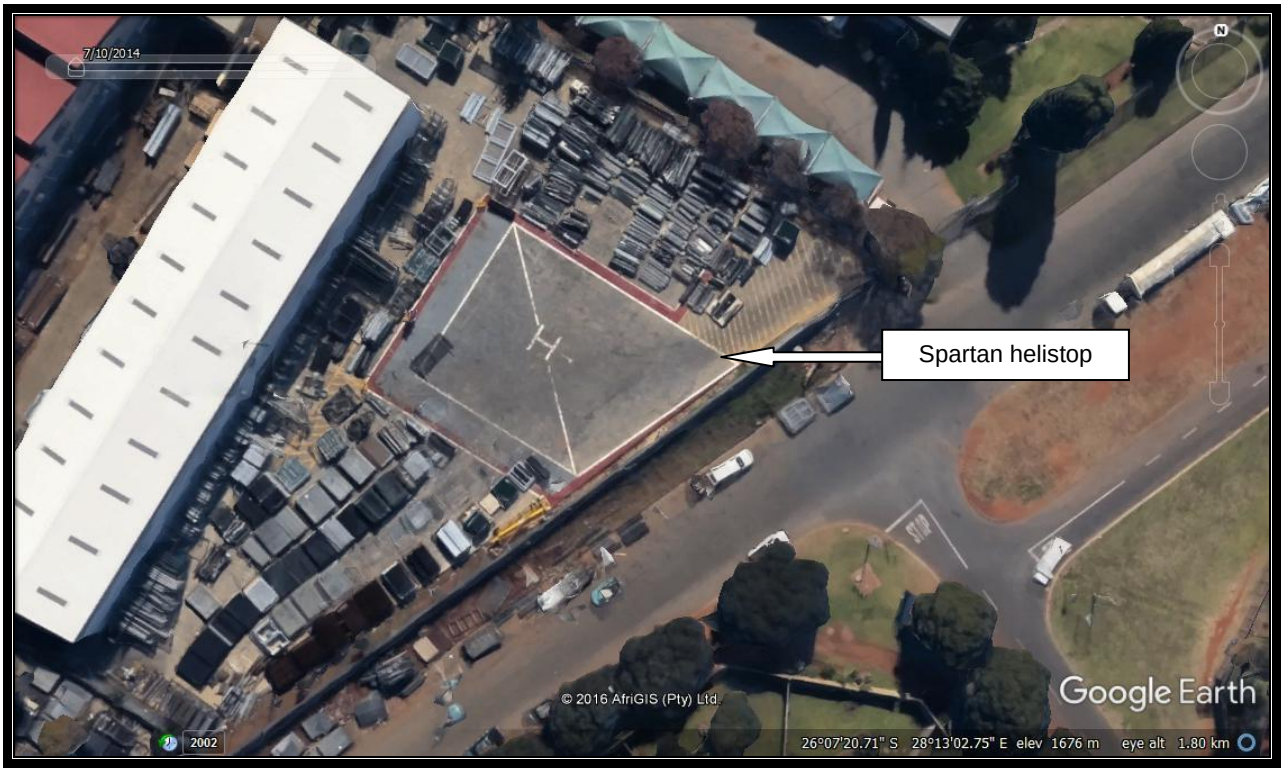


Figure 3: Google Earth overlay depicting the Spartan helistop.

Figure 4: Google Earth overlay, indicating Spartan helistop in relation to FAOR

Figure 5: A photograph of the Spartan helistop with an AS350B2 parked on it.

AD 3 HELIPORTS

AD 3.1 Heliport location indicator and name

3.1.1 SPARTAN HELISTOP (373)

AD 3.2 HELIPORT GEOGRAPHICAL AND ADMINISTRATIVE DATA

1	Heliport reference point coordinates and site at heliport	Ref. Point: S260720 E0281302
2	Direction and distance from city	Isando - Spartan Industrial zone
3	Elevation / Reference temperature	Elev: 5516T
5	MAG VAR / Annual change	Nil INFO AVBL
6	Heliport Operator, address, telephone, telefax, e-mail address, AFS address and, if available, website address;	Authority and Remarks: Cochrane Steel Private Bag X1337, ISANDO, 1600 TEL: (011) 394 1788 FAX: (011) 975 7729 CELL: (082) 336 4054 E-mail: hmitchell@cochrane.co.za
7	Types of traffic (IFR/VFR)	VFR
8	Remarks	For Private usage.

AD 3.3 OPERATIONAL HOURS

1	Heliport Operator	Operational hours: HJ

AD 3.6 RESCUE AND FIRE FIGHTING SERVICES

2	Rescue Equipment	3 x 9KG Dry Powder Extiguisher; 1 x 50KG Foam Mobile Trolley.

AD 3.8 APRONS, TAXIWAYS AND CHECK LOCATIONS/ POSITIONS DATA

1	Apron / helicopter stands surface and strength	Surface: Concrete

AD 3.12 HELIPORT DATA

2	TLOF dimensions	15M x 15M
4	FATO dimensions and SFC type	20x25, Concrete
5	TLOF, SFC and BRG strength	Max 5000 KG

Civil Aviation Authority

Figure 6: The Spartan helistop directory (sources from the SACAA website)

1.10.1 Introduction

The Spartan helistop is a private helistop owned by a large international steel company located in the Spartan Industrial area. It was designed for day time VFR operations only. Every helicopter pilot that intending to make use of the helistop is to ensure that he/she is familiar with the standard operating procedures before any intended flight. The helistop had stacked steel structures on the north and southerly side of the helistop. The helistop had a slight north easterly down slope for water drainage.

1.10.2 Aircraft & Type of Operations:

The helistop has a weight restriction of 5 000 kg, only light helicopters are permitted to operate from the helistop. The company operate AS350B2 and B3 and only similar types of helicopters may be permitted to operate into and out of the helistop. These would typically be light single engine helicopters. No other helicopter operator shall be permitted to carry out an operation from this helistop except with written approval of the company and or under subcontract and under supervision of the company.

1.11 Flight recorders

1.11.1 The helicopter was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was it required by the regulations to be fitted to this type of helicopter.

1.12 Wreckage and impact information

1.12.1 The helicopter had landed on the helistop and all three main wheels were on the ground. It then started rolling forward slowly, the pilot stated that she applied the toe brakes but it had no effect, she then applied back pressure on the cyclic control stick in an attempt to stop the forward rolling motion. The main rotor blades contacted with vertical stabiliser and severed the tail boom.

1.12.2 Following the impairment of the tail boom and associated tail rotor drive train and the destruction of the main rotor drive transmission the helicopter immediately started to shake violently, to such an extent that it rotated through 90° while on the

ground before coming to a stop, remaining upright. It was noted that as a result of the violent shaking the right main gear axle had failed partially. The aft lift link on the left side of the main rotor gearbox also failed, which resulted in extensive structural damage to the transmission platform. The number two engine input drive shaft broke out of the main rotor gearbox input drive housing. An excessive amount of transmission oil leaked from the main rotor transmission, the oil can be seen in Figure 1 on page 5 of this report, which provides a good indication of the downslope of the surface to the right as the helicopter came to a stop.

Figure 7: The severed tail boom structure.

Figure 8: Damage to one of the main rotor blades.

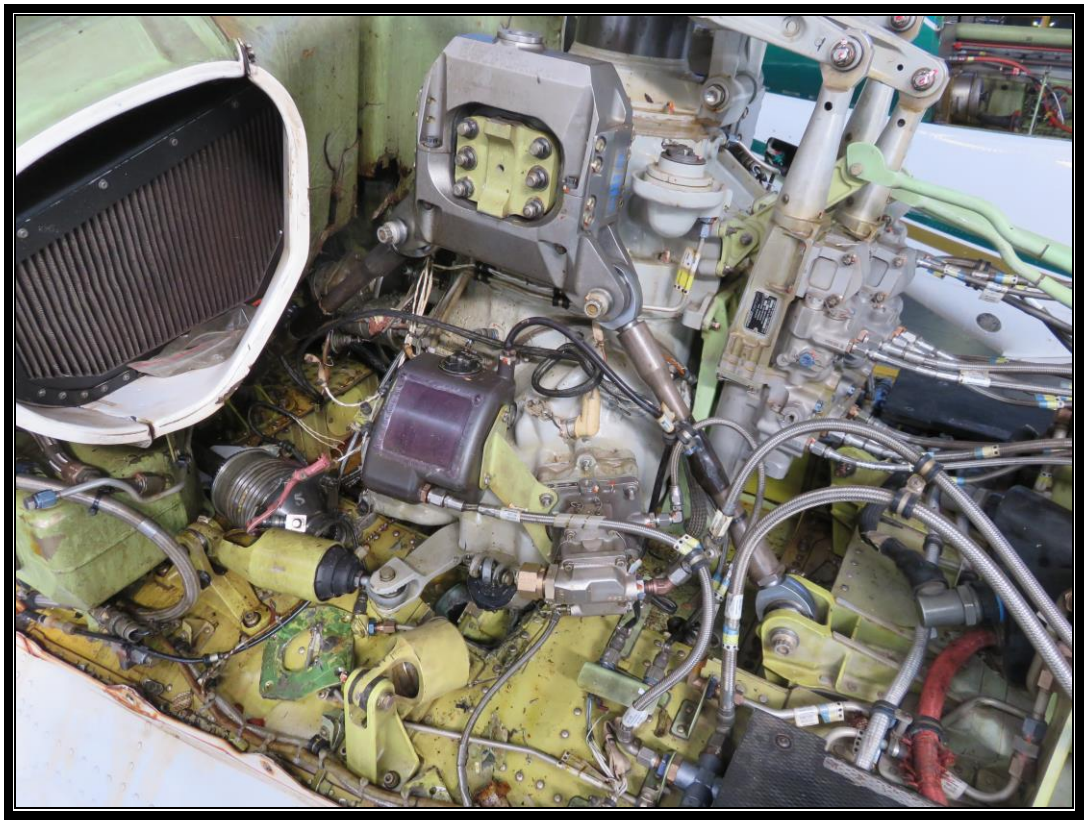


Figure 9: A view of the transmission deck taken from the right-hand side of the fuselage.

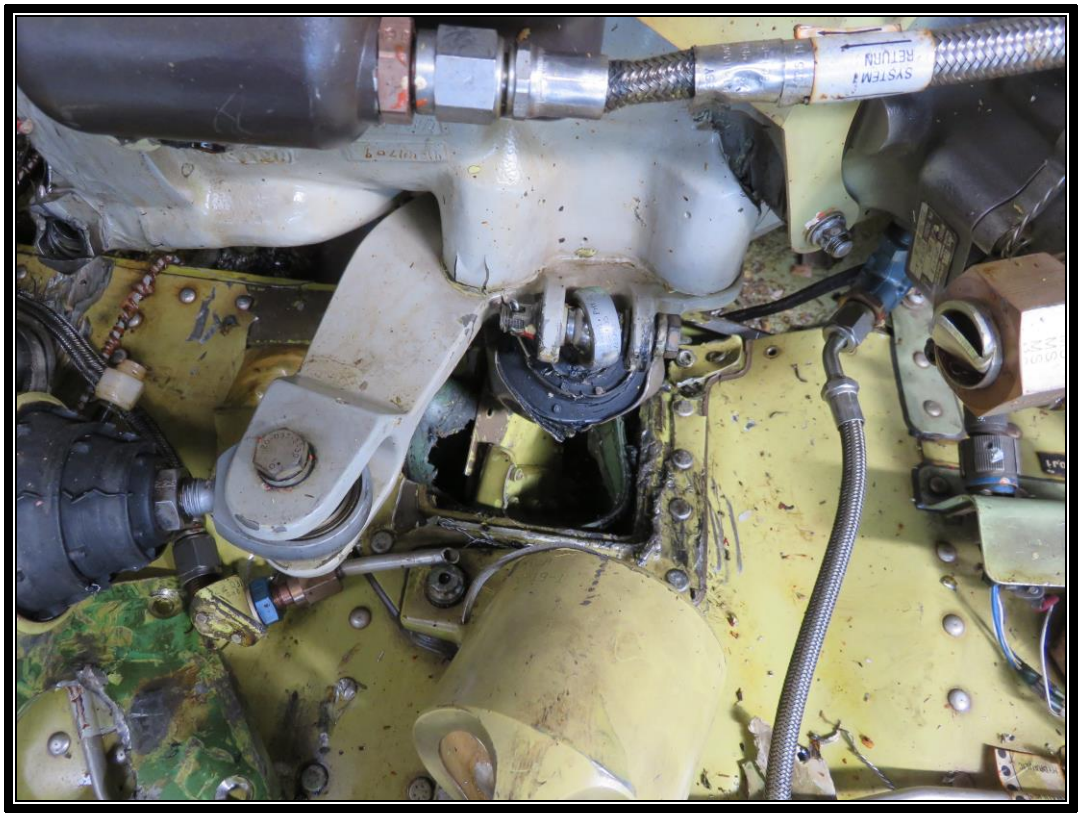


Figure 10: Structural damage caused by a lateral isolation mount that failed.

Figure 11: Damage caused by tail rotor drive shaft that failed aft of the rotor brake assembly.

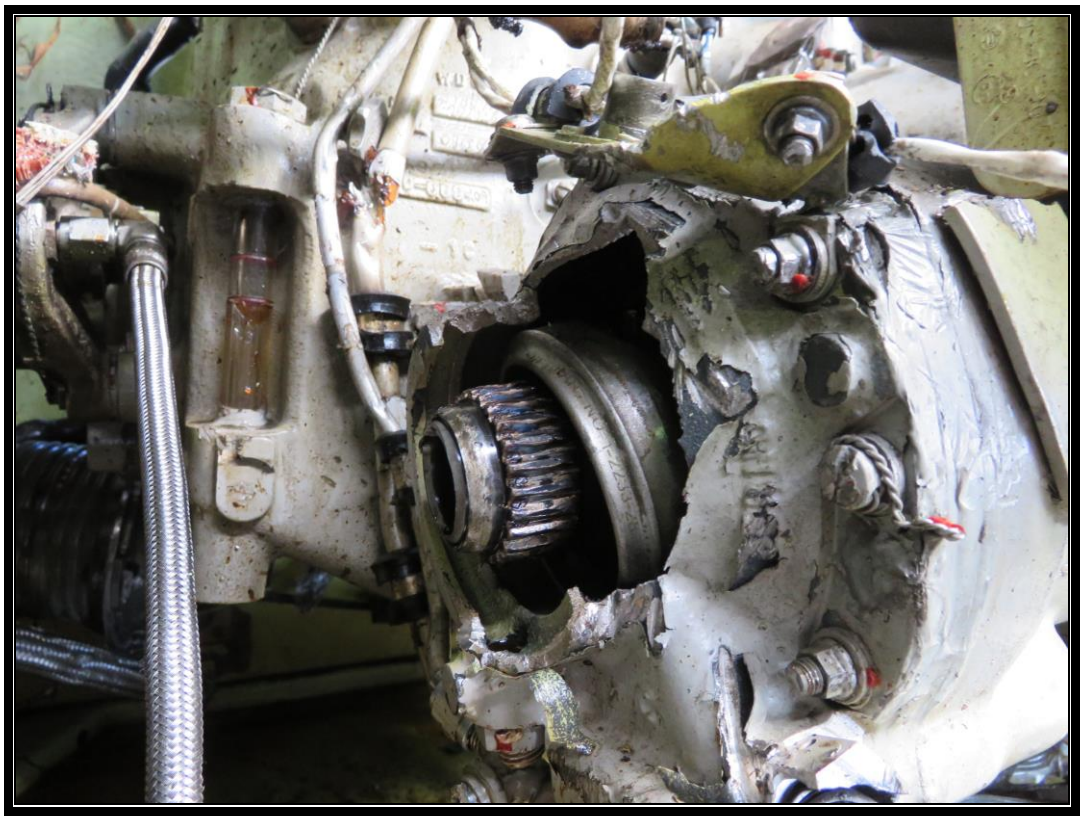


Figure 12: Number 2 engine drive shaft coupling housing on the main rotor gearbox.

1.13 Medical and pathological information

1.13.1 Not applicable.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.14.2 According to the passenger/pilot that flew with, he observed smoke emanating from the No. 1 engine after they had disembarked from the helicopter but it was for a brief period then it dissipated. The smoke was as a result of oil making contact with the hot surfaces of the engine.

1.15 Survival aspects

1.15.1 The accident was survivable both occupants were properly restraint by making use of the helicopter equipped four-point safety harness. The cockpit/cabin area remained intact.

1.16 Tests and research

1.16.1 Due to the damage caused to the helicopter and the hydraulic system it was not possible to test the toe brake system for functionality.

1.17 Organizational and management information

1.17.1 According to available information this was a private flight, the helicopter was being ferried/positioned from FAGC to the Spartan helistop.

1.17.2 The last maintenance inspection prior to the accident flight was certified on 11 October 2016 by an aircraft maintenance organisation (AMO) that was in possession of a valid AMO approval certificate. No mechanical defect was reported with the helicopter prior to or during the accident flight.

1.17.3 Spartan Helistop is a licenced heliport approved by the regulator. The helistop directory is published on the SACAA website and did not make any reference with regard to the slight slope on the surface for water drainage.

1.18 Additional information

1.18.1 Wheel brakes

Wheel brakes are hydraulic actuated disc brakes controlled by master cylinders attached to anti-torque control pedals. Brakes are energised by pressing pedals on top of anti-torque control pedals. Brake pedals may be pressed individually or simultaneously to apply brakes to left, right or both main wheels. The nose wheel is of the castering type and does not contain a brake assembly.

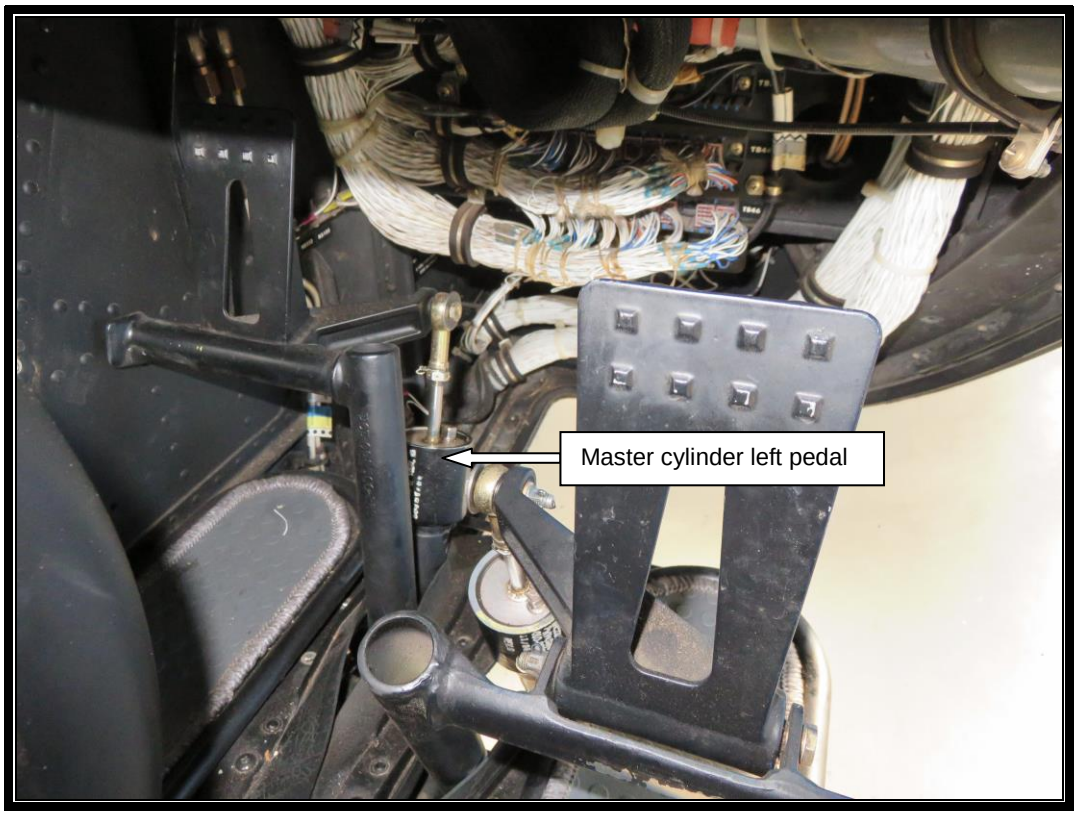


Figure 13: The anti-torque rudder pedals with toe brakes attached to the master cylinders

1.18.2 Parking brake

The parking brake handle is located at the right rear of the pedestal. Brakes can be set by pressing both brake pedals simultaneously and pulling up on the PARKING BRAKE handle. This action traps hydraulic fluid in the parking brake valve, lock wheel brakes, and illuminates PARK BRK caution message on the Integrated

Instrument Display System (IIDS). Parking brakes are released by pressing both brake pedals to allow PARKING BRAKE handle to retract.

The information contained in paragraph 1.18.1 and 1.18.2 was obtained from the Bell 430 Flight Manual. Additional information as well as illustrations relating to the wheel and park brake systems can be found attached to this report as Annexure A.

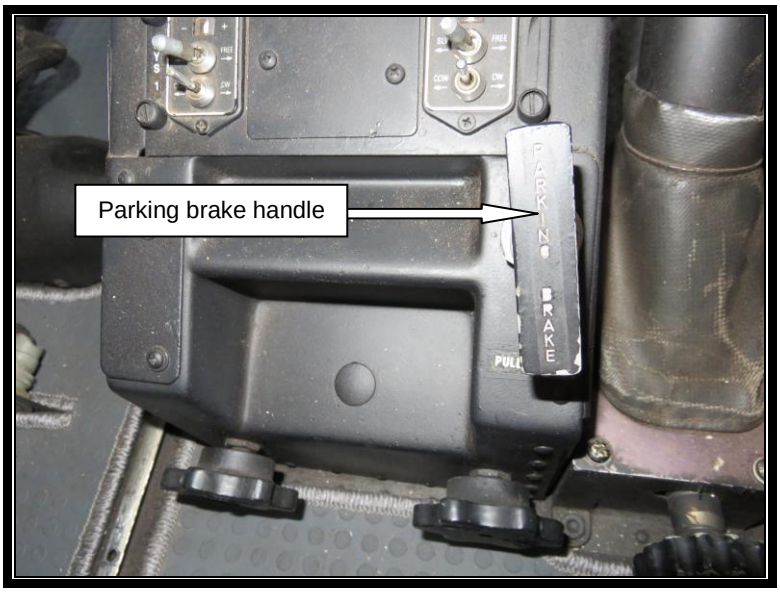


Figure 14: The parking brake handle

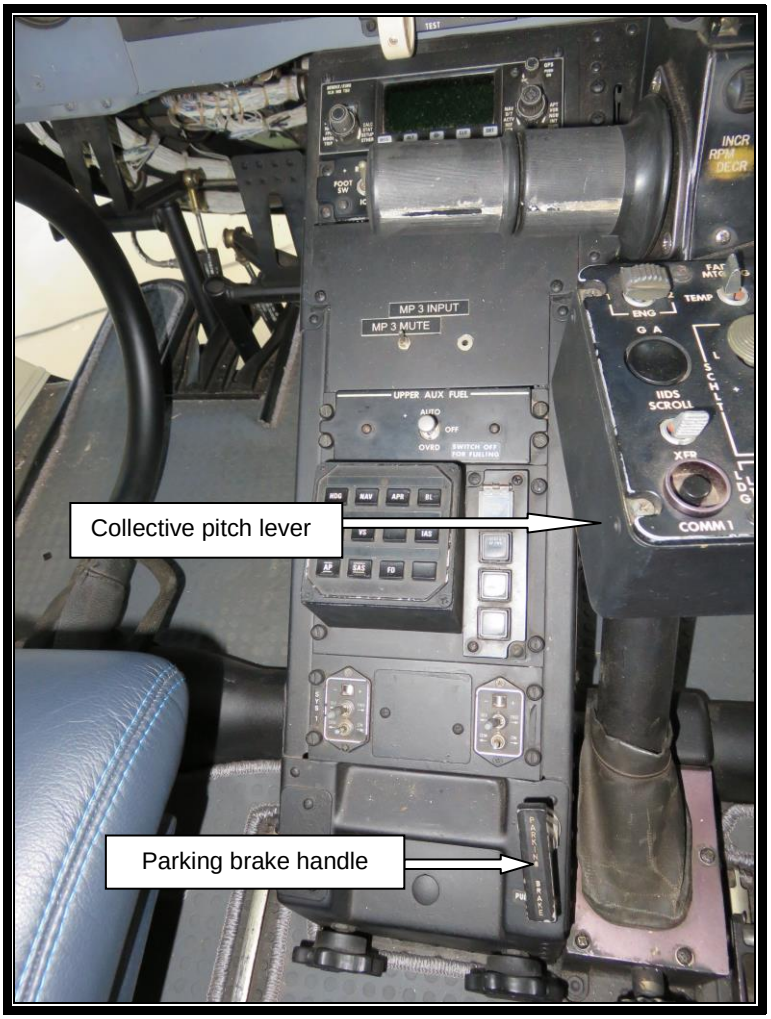


Figure 15: The parking brake handle next to the collective pitch lever

1.19 Useful or effective investigation techniques

1.19.1 No new methods were applied.

2. ANALYSIS

2.1 Man (Pilot)

The pilot was appropriately qualified and type rated to conduct the flight as per the provisions contained in the Civil Aviation Regulations (CARs) of 2011. She held a valid commercial pilot licence and the helicopter type were endorsed in it. This was her first landing at this helistop, which was located within an industrial area (steel factory). The owners of the helistop indicate in the procedures that prior approval was required in order to land there. The passenger/pilot that accompanied her on the flight was well acquainted with the approach, landing and take-off procedures as

he was employed by the company that owns the helistop. He was not type rated on the Bell 430 helicopter and all his landings at the helistop were conducted with helicopters that were equipped with skid landing gear. He was therefore not aware what effect the slope would have had on a wheeled landing gear equipped helicopter and therefore did not brief the pilot accordingly. The slope gradient was minimal, but in this instance it was adequate to allow the helicopter to start rolling forward once the wheels were on the ground.

The pilot stated that although she had applied toe brakes, it had no effect in stopping the helicopter. She never asked the pilot that was seated next to her to apply toe brakes on his side, as these were two independent braking systems. Due to the damage suffered by the helicopter, this system could not be tested for functionality.

The pilot also did not opt to apply the parking brake after touch down. The helicopter manufacturer indicates that the park brake could only be applied once the helicopter is on the ground, which it was. Several other retractable wheeled landing gear equipped helicopters provide the crew with an option to land with the park brake on from hover flight; this was not the case with this helicopter.

She also did not opt to apply power and became airborne again; she acted instinctively once she applied the toe brakes which did not have the desired effect and she then applied aft cyclic stick input.

She indicated that she never regard the amount of aft cyclic to be excessive, however from the video footage it could be seen that the rotor disk aft deflection was at a substantial angle when the main rotor blades severed the tail boom.

2.2 Machine (Helicopter)

The helicopter was maintained in accordance with the approved maintenance schedule and there was no reported defects documented prior to the flight that could have contributed or have caused the accident. What was of an operational concern was the fact that the park brake could only be activated once the helicopter was on the ground, which is unlike many other helicopter types equipped with wheeled landing gear systems where the helicopter can be landed with the park brake activated from hover flight. It was also noted that the nose wheel was not centered when the helicopter came to a stop. The nose gear system was equipped with a self-centering actuator, but it was not equipped with a nose wheel lock

mechanism. In many other helicopter types the nose gear can be locked in the centre position by a mechanical mechanism, this allowed the nose gear to remain in the centre position following touch down. The pilot/crew then has the option to unlock the nose gear from inside the cockpit before the pilot starts to taxi once on the ground. The brake system was damaged in such a way that the tests could not be conducted to verify serviceability and operation.

2.3 Mission

This was a ferry/positioning flight from a licensed aerodrome to an approved helistop that was located within an industrial area. The pilot was appropriately rated to conduct the flight however this was her first landing at this helistop. The passenger/pilot that accompanied her was well acquainted with the helistop and flew with to guide her with the approach, landing and take-off path. The flight was uneventful until after the wheels were on the ground then the helicopter started moving forward and pilot intervention followed once she was unable to bring the helicopter to a stop with the toe brakes.

2.4 Environment

The prevailing weather conditions at the time had no influence on this accident. The surface wind was reported to be 360° at 6 knots by ATC at FAOR, which was well within the operating limitations of this helicopter type. The pilot did follow the unmanned approach procedure to determine the wind direction, approach path, break away point and exit point. There was also a windsock located on top of the building, which was in close proximity to the helistop, and provided the pilot with a good indication of the prevailing wind conditions at the helistop. Visibility was more than 10 km.

2.5 Spartan helistop

This was an approved facility and the helistop directory (see Figure 6 on page 12 of this report) was published on the regulating authority's website. The helistop dimensions were 20 m in width and 25 m in length. The helicopter main rotor diameter was 12.80 m and its overall length 15.80 m. The helistop was surrounded by staggered steel products as well as a roadway on the one side. The surface had a slope to the one side to assist with water drainage, this information was not contained in the helistop directory, nor was the pilot made aware of such a slope by the passenger/pilot that flew with her. Even though the pilot made use of all the

information available to her during her planning for the flight essential information was absent; which had a direct effect on the outcome of this accident.

The helicopter being substantially larger than the 'regular' type of helicopters that land at this helistop placed additional pressure on the pilot as the risk factor automatically increased and the landing had to be in such a way that she had to make use of the maximum helistop surface available. It can be seen from the helistop layout (Figure 3 on page 10) that it was nor square nor a round facility. The pilot therefore touched down in a north-easterly direction in order to optimise the helistop surface to its maximum. The landing was uneventful as the helicopter settled under its own weight.

2.6 Conclusion

This was the pilot first landing at this helistop; she planned the flight with all the possible information available to her and also opted to take a passenger/pilot with her who was well acquainted with the helistop. Essential information was not available during her planning phase and that was with relation to the slope on the helistop surface. After landing, the helicopter started moving on the surface, the toe brakes on the pilot side (right-hand side) had not the desired effect to stop the helicopter. Although the pilot had several other options to stop the movement she acted instinctively by applying aft cyclic, which deflected the main rotor disk aft, which resulted in main rotor blade contact with the tail boom structure, which resulted in substantial damage.

3. CONCLUSION

3.1 Findings

Pilot

3.1.1 The pilot was the holder of a valid commercial helicopter pilot licence and had the Bell 430 endorsed in her licence.

3.1.2 The pilot was the holder of a valid aviation medical certificate that was issued by a designated aviation medical examiner with no restrictions.

3.1.3 This was the pilot first landing at this helistop, which was located within an industrial area (steel factory).

3.1.4 The pilot was accompanied by a passenger who was also a helicopter pilot, he was well familiar with the helistop and the appropriate approach, landing and take-off procedures.

3.1.5 The pilot applied the toe brakes to stop the movement on the ground, which had no effect. She then applied aft cyclic input in order to stop the movement, which resulted in the main rotor blades making contact with the fuselage and tail boom.

3.1.6 The pilot did not opt to activate the park brake after the wheels was on the ground.

3.1.7 The pilot was not aware of the aft cyclic limitations of this helicopter type once on the ground with the collective pitch lever fully down or nearly fully down.

3.1.8 The pilot did not opt to become airborne again and reposition the helicopter back onto the helipad in order to avoid the forward movement.

3.1.9 The pilot did not opt to request the pilot who was seated in the left front cockpit seat to apply toe brakes on his side in order to stop the forward movement.

The helicopter

3.1.10 The helicopter was in possession of a valid certificate of airworthiness at the time of the accident.

3.1.11 There were no recorded defects with the helicopter prior to or during the accident flight.

3.1.12 The functionality of the toe brake system could not be tested due to the damage caused during the accident sequence.

Spartan helistop

3.1.13 The Spartan helistop was a private helipad and approval needed to be obtained from the land owner prior to any helicopter intended landing at the helistop. This requirement was complied with.

3.1.14 The Spartan helistop was an approved facility to be used for daylight, VFR conditions only.

3.1.15 The helistop directory that was published on the SACAA website did not make any reference with regard to the slight slope on the surface for water drainage.

3.1.16 The standard operating procedure for Spartan helistop made reference to helicopters in the range of the AS350B2/B3 and Bell 206/407 series, which was equipped with skid gear.

Environment

3.1.17 The prevailing weather conditions at the time had no influence on the accident.

3.2 Probable cause

3.2.1 In an attempt to stop the helicopter from rolling forward the pilot applied aft cyclic stick, which caused a substantial aft tilt moment of the main rotor disk to such an extent that the main rotor blades made contact with the tail boom structure.

3.3 Contributory factors:

3.3.1 This was the pilot's first landing at this helistop, she was not aware that the surface had a downslope gradient for water drainage. Such information was not published on the helistop directory for Spartan, which was available on the website of the regulating authority.

3.3.2 The pilot was not aware of the aft cyclic limitations of this helicopter as they were not covered in during her training. Improper use of flight controls

3.3.3 The pilot did not apply power and return to hover flight in order to avoid the forward rolling movement and reposition the helicopter on the helistop.

4. SAFETY RECOMMENDATIONS

4.1 It is recommended to the Director of Civil Aviation in the interest of aviation safety that the pilot be subjected to retraining of dual flying on the Bell 430 before she act again as pilot-in-command. The investigation revealed that the pilot was not aware of the aft cyclic inputs with the main rotor blades turning, the collective pitch lever fully down and the helicopter stationary on a flat surface.

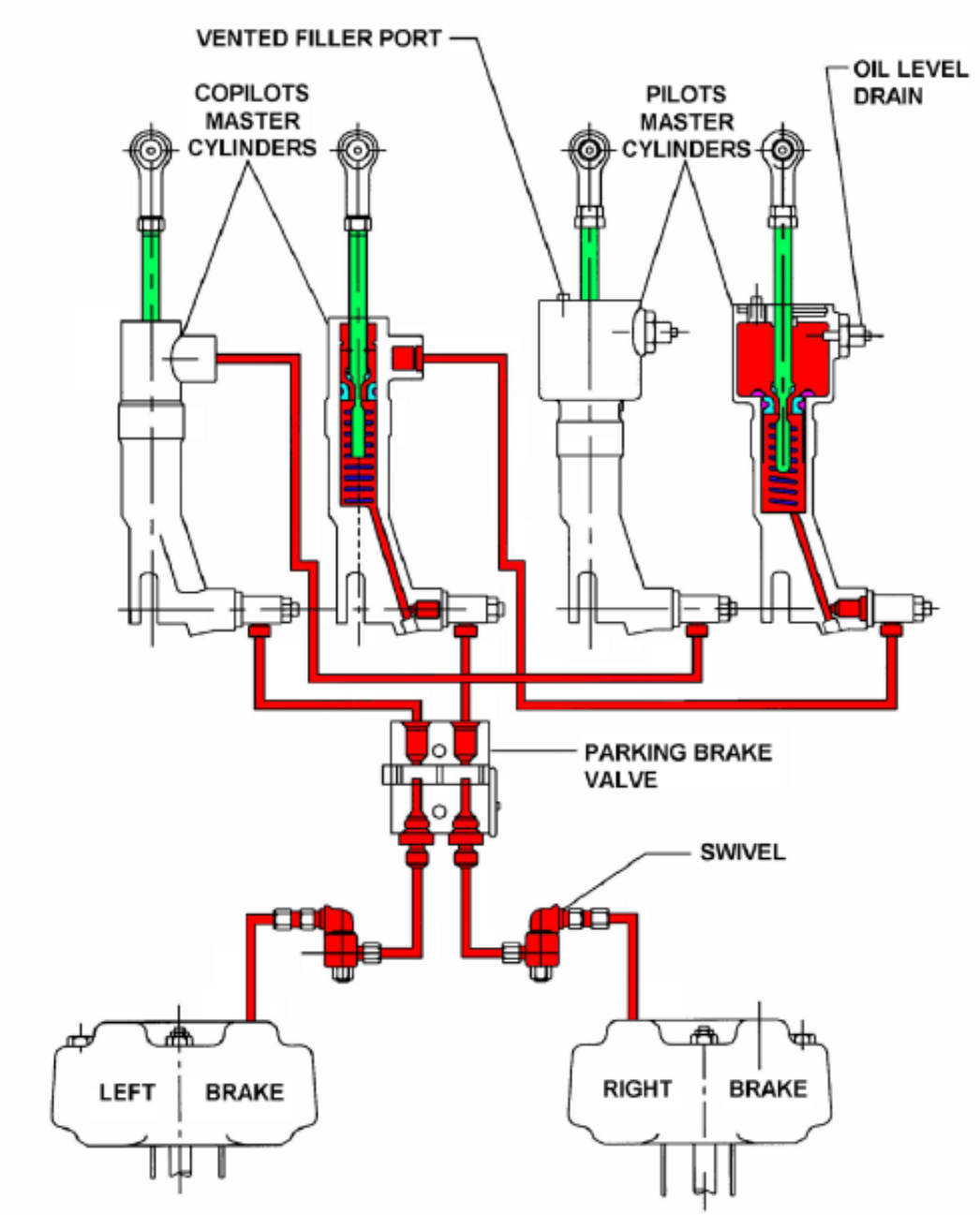
4.2 It is recommended to the Director of Civil Aviation that the information on the Helistop Directory for Spartan be amended and that the helistop longitudinal as well as the lateral slope information be included in the publication which was essential information that was absent in the directory as published. (Reference to the helistop directory in question can be found in Figure 6 on page 12 of this report).

5. APPENDICES

5.1 Annexure A (Bell 430 Wheel and Park brake system)

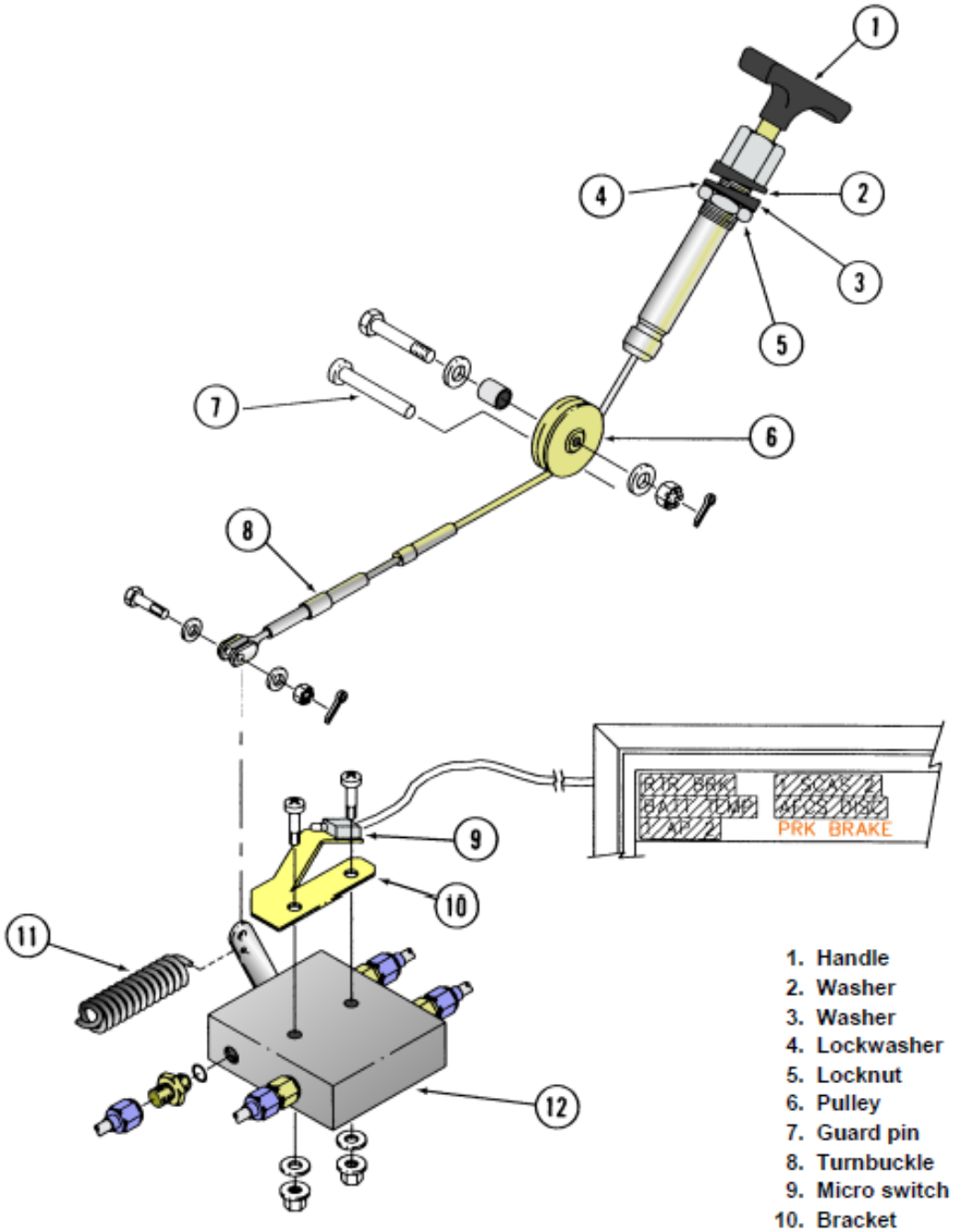
HYDRAULIC SYSTEMS

Wheel Brake System



Two master cylinders are installed on the pilot's tail rotor pedals assembly. Each master cylinder contains an internal reservoir and piston which, when operated, applies hydraulic pressure through hoses and lines to it's respective main landing gear brake assembly. The reservoir is serviced is serviced to the oil drain level on the pilots master cylinder only. A parking brake valve, controlled by a detented "T" handle on the center console and mounted beneath the center console floor, traps hydraulic pressure to keep the wheel brakes applied for the helicopter parking.

Parking Brake Control



1. Handle
2. Washer
3. Washer
4. Lockwasher
5. Locknut
6. Pulley
7. Guard pin
8. Turnbuckle
9. Micro switch
10. Bracket
11. Spring
12. Brake valve

Parking Brake Control

The parking brake control consists of a handle found on the center pedestal, control cables and a valve assembly. If the parking brake is to be set, the foot brakes must be applied first to charge the system with pressure. Once pressure is applied, the "t" handle on the center pedestal is pulled upwards. This shuttles the valve found under the center pedestal to trap the pressurized hydraulic fluid in the system. This then holds the brakes in the engaged position. At the same time, a micro-switch is closed causing an indication on the IIDS to illuminate PRK BRK.

NOTE

Hydraulic pressure in the system does not activate the micro-switch. Only pulling the handle will close the electrical circuit. You are able to have an indication on the IIDS without having the brakes set.

Rotor Brake and Wheel Brake System

The rotor brake reservoir is located on the forward left side of the cabin roof. The master cylinder is mounted to the right of the pilot and the brake assembly is mounted on the tail rotor drive quill on the aft side of the transmission. The wheel brake system, if equipped, consists of master cylinders for the pilot and copilot, parking brake feature and wheel brakes for each main gear.