Section/division Accident and Incident Investigation Division

Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8768		
Aircraft Registration	**ZS-HFG**	**Date of Accident**	12 March 2010		**Time of Accident**	1200Z	
Type of Aircraft	Bell Jet Ranger 206B (Helicopter)		**Type of Operation**		Private		
Pilot-in-command Licence Type		Private (H)	**Age**	39	**Licence Valid**	Yes	
Pilot-in-command Flying Experience		Total Flying Hours	178.4		Hours on Type	62.4	
Last point of departure	Glenside Private Aerodrome Winterton (KwaZulu-Natal)						
Next point of intended landing	Glenside Private Aerodrome Winterton (KwaZulu-Natal)						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
On the farm Ambleside in the Winterton district at GPS position: S 28°48'20" E 29°32'14"							
Meteorological Information	Temperature: 34 ℃; dewpoint: 9 ℃; surface wind: 1 70°N/06 knots; cloud cover: nil; visibility: >10 km						
Number of people on board	1+3	**No. of people injured**	0+1	**No. of people killed**	0		

Synopsis

The pilot stated that on 12 March 2010 at approximately 1030Z he took off from Glenside Private Aerodrome in the Winterton area, accompanied by three passengers, on a scenic flight.

During the flight, he requested one of his passengers to take some aerial photos of his farm while he was orbiting overhead the farmstead.

The pilot reported that, while flying at a speed of approximately 30 knots and at a height of approximately 150 feet above ground level, the helicopter suddenly yawed through 90° to the right and then momentarily stopped. The pilot then raised the collective pitch lever, which accelerated the yaw to an extent which the pilot could not control. During the yaw to the right, the helicopter collided with a tree, breaking off a part of the tail boom and striking the ground.

One of the passengers sustained a laceration to his forehead and left eye while the pilot and the other two passengers did not sustain any injuries.

The aircraft was destroyed during the sequence of the accident.

Probable Cause

Following an unanticipated right yaw, the pilot followed an incorrect recovery technique that reduced the tail rotor effectiveness to such an extent that he was unable to recover from the yaw.

Contributing factor

Lack of training – improper training in loss of tail rotor effectiveness.
Low experience level of the pilot on the helicopter type.

IARC Date		Release Date	

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator	: Rotorway Aviation CC
Manufacturer	: Bell Helicopter Textron
Model	: 206B
Nationality	: South African
Registration Marks	: ZS-HFG
Place	: Farm Ambleside, Winterton, KwaZulu-Natal
Date	: 12 March 2010
Time	: 1200Z

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

Purpose of the Investigation:

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

Disclaimer:

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 12 March 2010 at approximately 1030Z the pilot, accompanied by his two children and another passenger, took off from Glenside Aerodrome on a visual flight rules (VFR) (by day) scenic flight into the Drakensberg.

1.1.2 After completing the scenic flight, the pilot flew over some farms in the area. He then requested one of his passengers, who was sitting in the left front seat, to take some aerial photos of his own farmstead while he was orbiting over his farmstead. The pilot descended to a height of approximately 150 feet above ground level (AGL) for the photo shoot.

1.1.3 During the photo shoot at a speed of approximately 30 knots, at a height of approximately 150 feet above ground level and with the nose of the helicopter facing in a north-westerly direction (approximately 240-250°M), the helicopter rapidly yawed through 90° to the right. The helicopter momentarily stopped before continuing the yaw to the right.

1.1.4 In an attempt to recover from the situation, the pilot raised the collective pitch lever and lowered the nose to get forward speed. However, this action increased the yaw into four (4) uncontrollable yaws before the aircraft collided with a tree. The pilot recalls hearing the low RPM horn sounding after the collision with the tree.

1.1.5 The helicopter then struck the ground nose down at a 30 degree angle in an open field adjacent to the tree.

1.1.6 The pilot and one of the passengers managed to evacuate the helicopter unassisted and then assisted the two children.

1.2 Injuries to persons

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

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed in the course of the accident. **(See Figure 1.)**

Figure 1: Damage caused to the helicopter because of the accident.

1.4 Other damage

1.4.1 Aircraft information
Minor damage was caused to the surrounding vegetation owing to main rotor blade impact.

1.5 Personnel information

Nationality	South African	Gender	Male	Age	39
Licence number	****************	Licence type	Private pilot (H)		
Licence valid	Yes	Type endorsed	Yes		
Ratings	None				
Medical expiry date	30 November 2011				
Restrictions	None				
Previous accidents	None				

Flying experience:

Total hours	178.4
Total past 90 days	4.8
Total on type past 90 days	4.8
Total on type	62.4

1.6 Aircraft information

Airframe:

Type	Bell 206B III helicopter	
Serial number	1864	
Manufacturer	Bell Helicopter Textron	
Year of manufacture	1975	
Total airframe hours (at time of accident)	6770.5	
Last MPI (date & hours)	3 March 2010	6766.2
Hours since last MPI	4.3	
C of A (issue date)	24 June 2004	
C of R (issue date) (present owner)	17 October 2007	
Operating categories	Standard	

1.6.1 Weight and balance

The following weight and balance calculation was done after the accident:

C of G calculation

	Weight (lbs)	**CG (inches)**	**Moment**
Helicopter empty weight	1800.7	117.5	211 582
Pilot (87kg)	192.0	65.0	12 480
Passenger (front)(100kg)	220.0	65.0	14 300
Passengers (aft)(40)	88.0	104	9 152
Baggage	20.0	148	2 960
Fuel	176.0	110.6	19 465
	2496.7	**108.11**	**269 939**
Minus front doors(removed)	22.0	66	1 425
	2474.7	**108.5**	**268 514**

At the time of the accident the helicopter was operated at a weight of 2474.7 lbs which is 725.3lbs below the helicopter's certified maximum all-up weight of 3200 lbs as stipulated in the Pilot Operating Handbook.

The weight and balance calculation falls within prescribed limitations as per the weight and balance graph in the Pilot Operating Manual (Page 1-6 Fig. 1-1). **(See Appendix A.)**

Engine:

Type	Rolls-Royce Allison 250-C20B
Serial number	CAE 821622F
Hours since new	6766.2
Hours since overhaul	Modular type engine

1.7 Meteorological Information

1.7.1 The weather information was obtained from the South African Weather Service. **(See Attachment B for the complete report.)**

Wind direction	170 °TN	Wind speed	6 knots	Visibility	>10km
Temperature	34 °C	Cloud cover	Nil	Cloud base	Nil
Dew point	9 °C				

1.8 Aids to navigation

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

1.9 Communications

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

1.10 Aerodrome Information

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

1.11 Flight recorders

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

1.12 Wreckage and impact information

1.12.1 Accident site

The accident site was at GPS position S 28°48’20” E 29°32’14” next to a hedgerow of tall trees (± 120-150 feet high). To the southern side of the trees were some tall buildings and pigsties. (**See Figure 2.)**

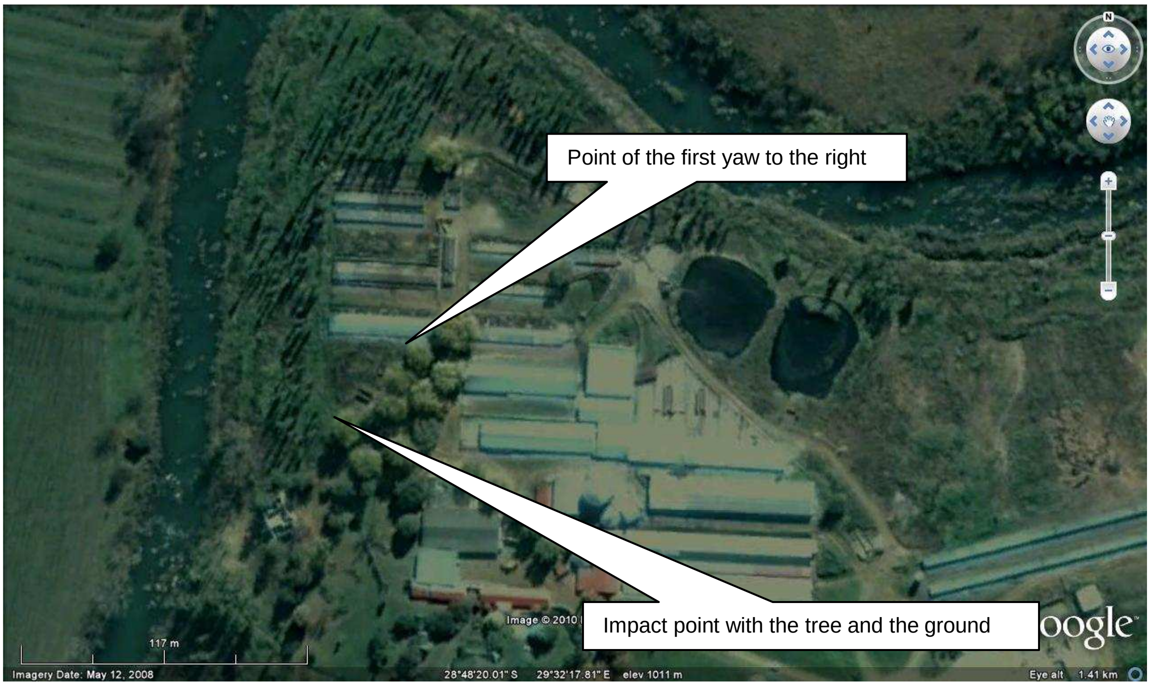

Figure 2: Accident site

1.12.2 Intended flight path and relative wind

On the day of the accident, the intended flight path was at approximately 240-250°M with a relative wind of 193°M at 6 knots. **(See Figure 3.)**

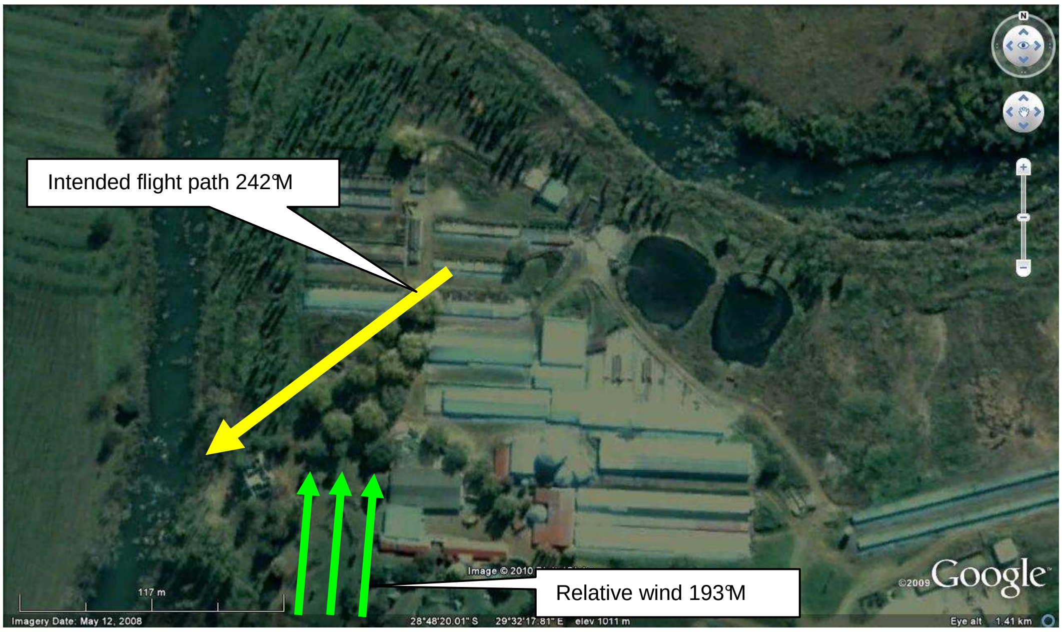

Figure 3: Intended flight path and relative wind direction

1.12.3 After the first sudden yaw to the right, the aircraft yawed to the right again in a north-westerly direction before the helicopter collided with a tree. **(See Figure 3.)** The main rotor blades made contact with the tree three times before the aircraft hit the ground. **(See Figure 4.)**

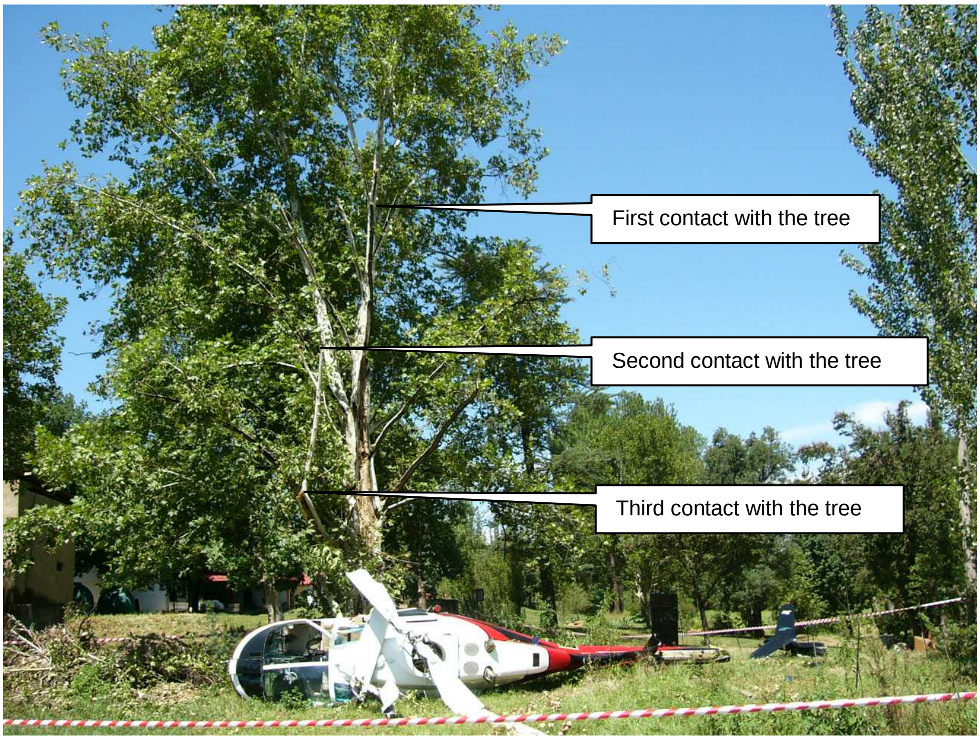

Figure 4: Main rotor blade contact marks with the tree before aircraft hit the ground.

1.12.2 Fuselage

Impact forces caused damage to the floor and roof structure of the fuselage and a push-pull rod within the broom box inside the fuselage was broken.

1.12.3 Cockpit

All cockpit windows were broken. The door of the pilot and the front passenger had been removed at the time of the accident.

1.12.4 Cockpit seats

The left front cockpit seat was damaged during the accident.

1.12.5 Cabin seats

No damage was caused to the cabin seats.

1.12.6 Main rotor blades

Both main rotor blades were still attached to the main rotor head but were destroyed.

1.12.7 Tail rotor blades

One of the tail rotor blades was severed from the tail rotor head assembly and was found about 19 metres from the main wreckage. Impact damage was visible on this blade while the other tail rotor blade was still attached to the tail rotor head assembly, with no visible damage.

1.12.8 Landing gear skid.

The skid gear was separated from the fuselage at the cross tube attachment points to the fuselage and was slightly distorted.

1.13 Medical and pathological information

1.12.1 The passenger occupying the left front seat sustained a laceration to his head and left eye. The pilot and other two passengers were not injured.

1.14 Fire

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

1.2 Survival aspects

1.2.1 This accident is considered survivable as a result of low impact forces on the cockpit and fuselage area, and because all occupants were wearing safety harnesses which did not fail during the sequence of the accident.

1.16 Tests and research

1.16.1 None

1.17 Organizational and management information

1.17.1 The helicopter was privately operated by the owner at the time of the accident.

1.17.2 The last mandatory periodic inspection (MPI) on the helicopter was certified on 3 March 2010 by a SACAA-approved aircraft maintenance organization (AMO) that was in possession of a valid AMO approval certificate.

1.17.3 A review of the SACAA-approved Flight Manual (dated 24 June 2004) determined that tail rotor control failure, in the form of complete loss of thrust and fixed pitch failure, is adequately covered.

1.17.4 No written procedures pertaining to the loss of tail rotor effectiveness (LTE) phenomenon are contained in the Bell 206B pilot operating handbook (POH).

1.17.5 No evidence could be found indicating the owner was aware of a Supplemental Operating & Emergency Procedure (OSN 206-83-10) issued on 31 October 1983. (**See Appendix C.)**

1.18 Additional Information

1.18.1 Loss of tail rotor effectiveness (LTE)

Quoted from: Rotorcraft Flying Handbook (Federal Aviation Administration) (p 11-12)

“Unanticipated yaw is the occurrence of an uncommanded yaw rate that does not subside of its own accord and, which, if not corrected, can result in the loss of helicopter control. This uncommanded yaw rate is referred to as loss of tail rotor effectiveness (LTE) and occurs to the right in helicopters with a counterclockwise rotating main rotor and to the left in helicopters with a clockwise main rotor rotation. Again, this discussion covers a helicopter with a counter-clockwise rotor system and an anti-torque rotor.

“LTE is not related to an equipment or maintenance malfunction and may occur in all single-rotor helicopters at airspeeds less than 30 knots. It is the result of the tail rotor not providing adequate thrust to maintain directional control, and is usually caused by either certain wind azimuths (directions) while hovering, or by an insufficient tail rotor thrust for a given power setting at higher altitudes.

“For any given main rotor torque setting in perfectly steady air, there is an exact amount of tail rotor thrust required to prevent the helicopter from yawing either left or right. This is known as tail rotor trim thrust. In order to maintain a constant heading while hovering, you should maintain tail rotor thrust equal to trim thrust.

“The required tail rotor thrust is modified by the effects of the wind. The wind can cause an uncommanded yaw by changing tail rotor effective thrust. Certain relative wind directions are more likely to cause tail rotor thrust variations than others. Flight and wind tunnel tests have identified three relative wind azimuth regions that can either singularly, or in combination, create an LTE conducive environment. These regions can overlap, and thrust variations may be more pronounced. Also, flight testing has determined that the tail rotor does not actually stall during the period. When operating in these areas at less than 30 knots, pilot workload increases dramatically.”

MAIN ROTOR DISC INTERFERENCE
(285-315°)

“Winds at velocities of 10 to 30 knots from the left front cause the main rotor vortex to be blown into the tail rotor by the relative wind. The effect of this main rotor disc vortex causes the tail rotor to operate in an extremely turbulent environment.

“During a right turn, the tail rotor experiences a reduction of thrust as it comes into the area of the main rotor disc vortex. The reduction in tail rotor thrust comes from the airflow changes experienced at the tail rotor as the main rotor disc vortex moves across the tail rotor disc. The effect of the main rotor disc vortex initially increases the angle of attack of the tail rotor blades, thus increasing tail rotor thrust. The increase in the angle of attack requires that right pedal pressure be added to reduce tail rotor thrust in order to maintain the same rate of turn. As the main rotor vortex passes the tail rotor, the tail rotor angle of attack is reduced. The reduction in the angle of attack causes a reduction in thrust and right yaw acceleration begins. This acceleration can be surprising, since you were previously adding right pedal to maintain the right turn rate. This thrust reduction occurs suddenly, and if uncorrected, develops into an uncontrollable rapid rotation about the mast. When operating within this region, be aware that the reduction in tail rotor thrust can happen quite suddenly, and be prepared to react quickly to counter this reduction with additional left pedal input." **(See Figure 5.)**

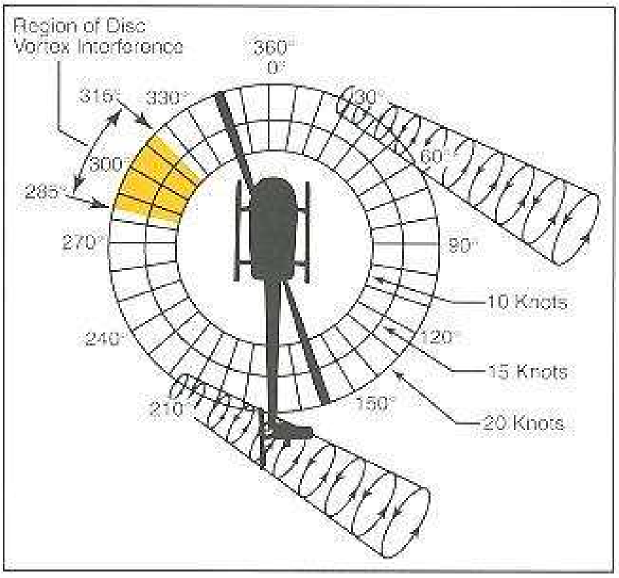

Figure 5: Main rotor disc vortex interference

WEATHERCOCK STABILITY
(120-240°)
"In this region, the helicopter attempts to weathervane its nose into the relative wind. Unless a resisting pedal input is made, the helicopter starts a slow, uncommanded turn either to the right or left depending upon the wind direction. If the pilot allows a right yaw rate to develop and the tail of the helicopter moves into this region, the yaw rate can accelerate rapidly. In order to avoid the onset of LTE in this downwind condition, it is imperative to maintain positive control of the yaw rate and devote full attention to flying the helicopter." **(See Figure 6.)**

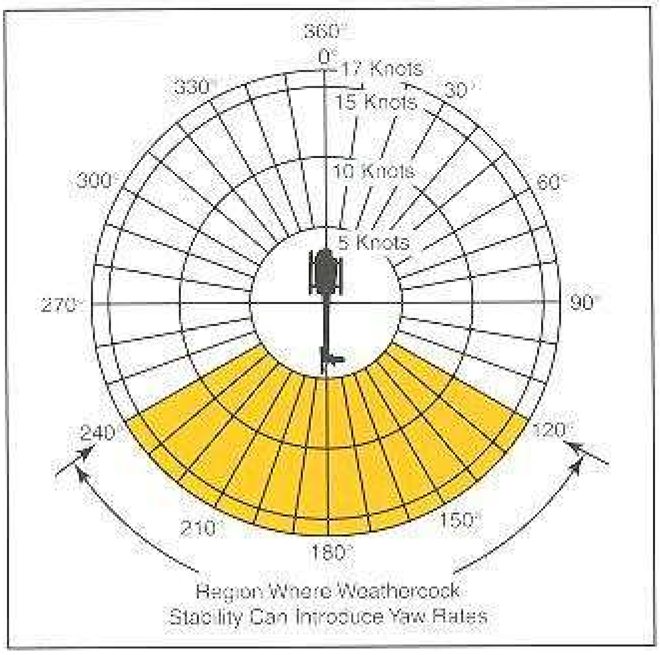

Figure 6: Weathercock stability

TAIL ROTOR VORTEX RING STATE
(210-330°)
"Winds within this region cause a tail rotor vortex ring state to develop. The result is a non-uniform, unsteady flow into the tail rotor. The vortex ring state causes tail rotor thrust variations, which result in yaw deviations. The net effect of the unsteady flow is an oscillation of tail rotor thrust. Rapid and continuous pedal movements are necessary to compensate for the rapid changes in tail rotor thrust when hovering in a left crosswind. Maintaining a precise heading in this region is difficult, but this characteristic presents no significant problem unless corrective action is delayed. However, high pedal workload, lack of concentration and over controlling can all lead to LTE.

"When the tail rotor thrust being generated is less than the thrust required, the helicopter yaws to the right. When hovering in left crosswinds, you must concentrated on smooth pedal coordination and not allow an uncontrolled right yaw to develop. If a right yaw rate is allowed to build, the helicopter can rotate into the wind azimuth region where weathercock stability then accelerates the right turn rate. Pilot workload during a tail rotor vortex ring state is high. Do not allow a right yaw rate to increase." **(See Figure 7.)**

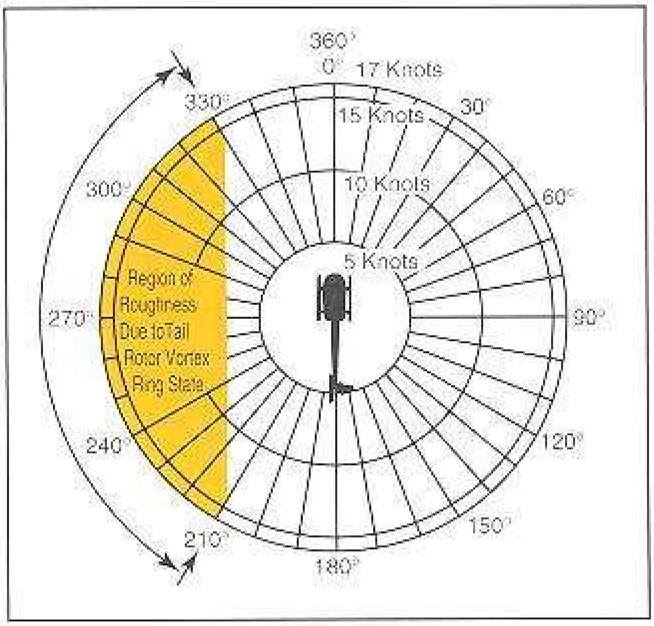

Figure 7: Tail rotor vortex ring state

RECOVERY TECHNIQUE
"If a sudden unanticipated right yaw occurs, the following recovery technique should be performed. Apply full left pedal while simultaneously moving cyclic control forward to increase speed. If altitude permits, reduce power. As recovery is affected, adjust controls for normal forward flight. Collective pitch reduction aids in arresting the yaw rate but may cause an excessive rate of descent. Any large, rapid increase in collective to prevent ground or obstacle contact may further increase the yaw rate and decrease rotor rpm. The decision to reduce collective must be based on your assessment of the altitude available for recovery. If the rotation cannot be stopped and ground contact is imminent, an autorotation may be the best course of

action. Maintain full left pedal until the rotation stops, then adjust to maintain heading."

1.18.2 Federal Aviation Administration (FAA) Advisory Circular 90-95

The following information was quoted from a FAA Advisory Circular:

4. "THE PHENOMENA OF Loss of Tail Rotor Effectiveness (LTE)

a. LTE is a critical, low speed aerodynamic flight characteristic which can result in an uncommanded rapid yaw rate which does not subside of its own accord and, if not corrected, can result in the loss of aircraft control.

b. LTE is not related to a maintenance malfunction and may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 knots. LTE is not necessarily the result of a control margin deficiency. The anti-torque control margin established during Federal Aviation Administration (FAA) testing is accurate and has been determined to adequately provide for the approved sideward/rearward flight velocities plus counteraction gusts of reasonable magnitudes. This testing is predicated on the assumption that the pilot is knowledgeable of the critical wind azimuth for the helicopter by not allowing excessive rates to develop.

c. LTE has been identified as a contributing factor in several accidents involving loss of control. Flight operations at low altitude and low airspeed in which the pilot is distracted from the dynamic conditions effecting control of the helicopter are particularly susceptible to this phenomena. The following are three examples of this type of accident:

(1) A helicopter collided with the ground following a loss of control during a landing approach. The pilot reported that he was on approach to a ridge line landing zone when, at 70 feet above ground level (AGL) and at an airspeed of 20 knots, a gust of wind induced loss of directional control. The helicopter began to rotate rapidly to the right about the mast. The pilot was unable to regain directional control before ground contact.

(2) A helicopter impacted the top of Pike's Peak at 14 000 feet mean sea level (MSL). The pilot said he had made a low pass over the summit into a 40-knot headwind before losing tail rotor effectiveness. He then lost directional control and struck the ground.

(3) A helicopter entered an uncommanded right turn and collided with the ground. The pilot was manoeuvring at approximately 300 feet AGL when the aircraft entered an uncommanded right turn. Unable to regain control, he closed the throttle and attempted an emergency landing into a city park.

5. UNDERSTANDING LTE PHENOMENA

To understand LTE, the pilot must first understand the function of the anti-torque system.

a. On U.S. manufactured single rotor helicopters, the main rotor rotates counterclockwise as viewed from above. The torque produced by the main rotor causes the fuselage of the helicopter to rotate in the opposite direction (nose right). The anti-torque system provides thrust which counteracts this torque and provides directional control while hovering.

This AC will focus on U.S. manufactured helicopters.

b. On some European and Russian manufactured helicopters, the main rotor rotates clockwise as viewed from above. In this case, the torque produced by the main rotor causes the fuselage of the helicopter to rotate in the opposite direction (nose left). The tail rotor thrust counteracts this torque and provides directional control while hovering.

c. Tail rotor thrust is the result of the application of anti-torque pedal by the pilot. If the tail rotor generates more thrust than is required to counter the main rotor torque, the helicopter will yaw or turn to the left about the vertical axis. If less tail rotor thrust is generated, the helicopter will yaw or turn to the right. By varying the thrust generated by the tail rotor, the pilot controls the heading when hovering.

d. In a no-wind condition, for a given main rotor torque setting, there is an exact amount of tail rotor thrust required to prevent the helicopter from yawing either left or right. This is known as tail rotor trim thrust. In order to maintain a constant heading while hovering, the pilot should maintain tail rotor thrust equal to trim thrust.

e. The environment in which helicopters fly, however, is not controlled. Helicopters are subjected to constantly changing wind direction and velocity. The required tail rotor thrust in actual flight is modified by the effects of the wind. If an uncommanded yaw occurs in flight, it may be because the wind reduced the tail rotor effective thrust.

f. The wind can also add to the anti-torque system thrust. In this case, the helicopter will react with a uncommanded left yaw. The wind can and will cause anti-torque system thrust variations to occur. Certain relative wind directions are more likely to cause tail rotor thrust variations than others. These relative wind directions or regions form an LTE-conducive environment.

6. CONDITIONS UNDER WHICH LTE MAY OCCUR

a. Any manoeuvre which requires the pilot to operate in a high-power, low-airspeed environment with a left crosswind or tailwind creates an environment where unanticipated right yaw may occur.

b. There is greater susceptibility to LTE in right turns. This is especially true during flight at low airspeed since the pilot may not be able to stop rotation. The helicopter will attempt to yaw to the right. Correct and timely pilot response to a right yaw is critical. The yaw is usually correctable if additional left pedal is applied immediately. If the response is incorrectly or slow, the yaw rate may rapidly increase to a point where recovery is not possible.

c. Computer simulation has shown that if the pilot delays in reversing the pedal control position when proceeding from a left crosswind situation (where a lot of right pedal is required due to the sideslip) to downwind, control would be lost, and the aircraft would rotate more than 360° before stopping.

d. The pilot must anticipate these variations, concentrate on flying the aircraft, and not allow a yaw rate to build. Caution should be exercised when executing right turns under conditions conductive to LTE."

1.18.3 Wind gusts

The following information is quoted from an article on Wind by Dave Acree:

"Wind gusts are a brief increase in wind speed above some average value. Gusts are caused by either random turbulence due to ground friction and by wind shear at the ground level or by convection currents in the atmosphere with the mean wind. In other words, when wind blows around buildings, trees and hills (turbulence) its speed is increased in an area for a short period of time."

1.18.4 No evidence could be found in the pilot's training file indicating that he had received any training on LTE during his initial helicopter training or during his conversion course onto the Bell 206. During the investigation of this accident various helicopter instructors and pilots were interviewed regarding the phenomenon of LTE and it came to the attention of the investigator that very little, and in some cases no time is spend during helicopter pilot training on the phenomenon of LTE.

1.18.4 After the accident, the wreckage of the helicopter was recovered to an approved AMO facility at Rand Aerodrome (FAGM). A thorough inspection was done on the wreckage and no evidence of structural, engine or system failure other than those as a result of the accident sequence, could be found.

1.19 Useful or effective investigation techniques

1.19.1 None

2. ANALYSIS

2.1 The pilot was conducting a visual flight rules (VFR) flight (by day) at the time of the accident.

2.2 Available evidence indicated the flight preparation for this flight was done properly as all documentation was completed and available at the time of the accident.

2.3 According to CAA records, the pilot was the holder of a private pilot license (helicopter) which was valid at the time of the accident. The pilot had the required rating for the flight and was in possession of a valid medical certificate without any medical restrictions imposed.

2.4 The aircraft's logbooks were verified and all records indicated that the airframe and engine was properly maintained and all work carried out was properly certified. Maintenance documents indicated that the last mandatory periodic inspection (MPI) was done on 3 March 2010 at 6766.2 hours by a CAA-approved AMO. The AMO was in possession of a valid AMO certificate.

2.5 An inspection of the aircraft after the accident revealed no technical defects other than damage that was caused to the aircraft during the accident sequence.

2.6 The weight of the helicopter at the time of the accident was found to be 2474.7 lbs which was 725.3 lbs below maximum all-up weight (MAUW).

2.7 At the time of the accident the pilot was flying at low speed, at a low altitude and at a high power setting. During the sudden yaw to the right, the pilot increased the collective pitch control to recover the aircraft from the sudden yaw to the right. According to the POH page 3-6 on tail rotor control failure, the following actions should be taken in the event of a complete loss of thrust:

"Reduce throttle to flight idle, immediately enter autorotation and maintained a minimum airspeed of 58 mph (50 knots) IAS during the descent."

2.8 Fine weather conditions prevailed at the time of the accident. However, the wind condition together with the buildings and trees at the scene of the accident could have caused a sudden wind gust. The sudden gust and or direction of the prevailing wind caused main rotor disc vortex interference which caused a loss of tail rotor effectiveness. According to the weather report obtained from the South African Weather Service, the wind at the time of the accident was between 285° and 315° relative to the aircraft heading.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was properly certified according to current regulations but was not properly trained in the LTE phenomenon. The pilot's experience level on the Bell 206 helicopter was 62.4 hours at the time of the accident.

3.1.2 The accident aircraft was properly certified, equipped and maintained in accordance with current regulations. An inspection of the helicopter after the accident revealed no evidence of structural, engine or system failure other than those as a result of the accident sequence.

3.1.3 The mass and balance of the aircraft was within prescribed limits.

3.1.4 Although the aircraft was destroyed during the sequence of the accident, the accident was regarded as survivable due to the low impact forces on the cockpit area and because the occupants had been wearing safety harnesses.

3.1.5 It could not be determined if normal wind conditions or a gust of wind caused the sudden yaw to the right.

3.1.6 During the slow flight at low altitude with a high power setting, the helicopter was positioned in such a way the relative wind to the helicopter caused main rotor disc vortex interference which could caused a loss of tail rotor effectiveness.

3.1.7 An incorrect recovery technique was applied by the pilot to recover the helicopter out of the sudden yaw to the right.

3.2 Probable cause/s

3.2.1 Following an unanticipated right yaw, the pilot followed the incorrect recovery technique which aggravated the loss of tail rotor effectiveness from which he could not recover.

3.3 Contributing factor

3.3.1 None

4. SAFETY RECOMMENDATIONS

4.1 It is recommended the Testing Standards Department within the SACAA re-emphasise that any PPL (H), CPL (H), ATPL (H) and Flight Instructor (H) training conducted by any ATOs include sufficient dedicated training on LTE and recovery actions.

5. APPENDICES

Appendix A	Weight and Balance Graph
Appendix B	Weather report
Appendix C	Operations Safety Notice 206-83-10

Report reviewed and amended by the Advisory Safety Panel on18 May 2010

-END-

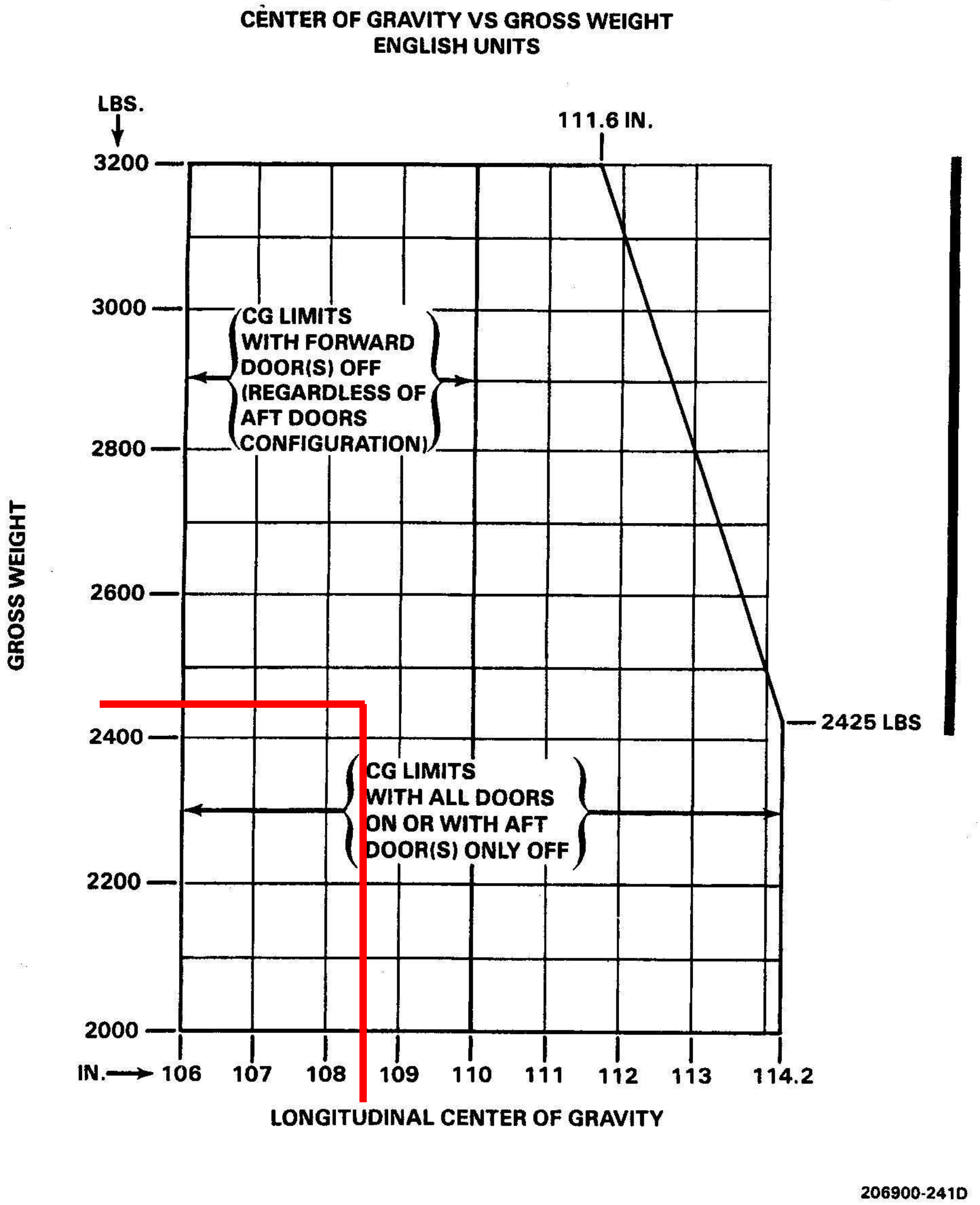

Figure 1-1. Center of gravity vs gross weight (Sheet 1 of 2)

-6 Rev. 2

South African Weather Service

AIRCRAFT ACCIDENT REPORT

Document Reference: ZS-HFG-2010-03-12-011
Document Type: Report
Version: 1

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Document Control

Version and Amendment Schedule

Version	Version Date	Author	Description of Amendments
1	2010/03/23	L Masimini	Document Created

Scope

The meteorological information provided in this report includes the following:

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

Purpose

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

Background

An aircraft accident/incident occurred on 12 March 2010 at approximately 1200Z.

The place of incident is Winterton, 41km to the southwest of Ladysmith in KwaZulu Natal, with geographic coordinates of S28° 48' 0" E29° 32' 0". The aircraft registration is ZS-HFG.

1. WEATHER CONDITIONS AT TIME OF INCIDENT

SURFACE ANALYSIS (1200Z 12 March 2010)

An area of low pressure systems is found over the central and eastern parts of the country with a weak cold front moving eastwards off the Eastern Cape coast. A low is located off the north coast of Kwa-Zulu Natal, propagating north-eastwards. These low pressure systems are producing an onshore flow along the south and south eastern coastlines resulting in low cloud formation, and trigger convective cloud development over the central and eastern interior of the country.

UPPER AIR (1200Z 12 March 2010)

There is a weak upper air trough to the southwest of the country, with some perturbations over the central and eastern interiors where convective development is observed. A jet stream associated with the upper air trough is found over the southern parts of the country.

SATELLITE IMAGE (1200Z 12 March 2010)

From the satellite image no cloud observed over Winterton.

2. WEATHER CONDITIONS IN THE VICINITY OF THE INCIDENT

No official observations are available at the time and place of the incident. The most likely weather conditions at Winterton, about the time of incident, is similar to that at Ladysmith given below:

Time: 12H00Z

Temperature:	34°C
Dew Point:	09°C
Surface Wind:	170°TN 06knots
Cloud cover:	Nil
Weather:	Nil
Visibility:	More than 10km

3. ATTACHMENTS

A: Surface Analysis (1200Z 12 March 2010)

B: Upper Air Chart valid for 1200Z 12 March 2010

C: Significant Weather Chart (low level) valid for 1200Z 12 March 2010

D: Satellite Image valid for 1200Z 12 March 2010

E: Upper Winds (low level) valid for 1200Z 12 March 2010

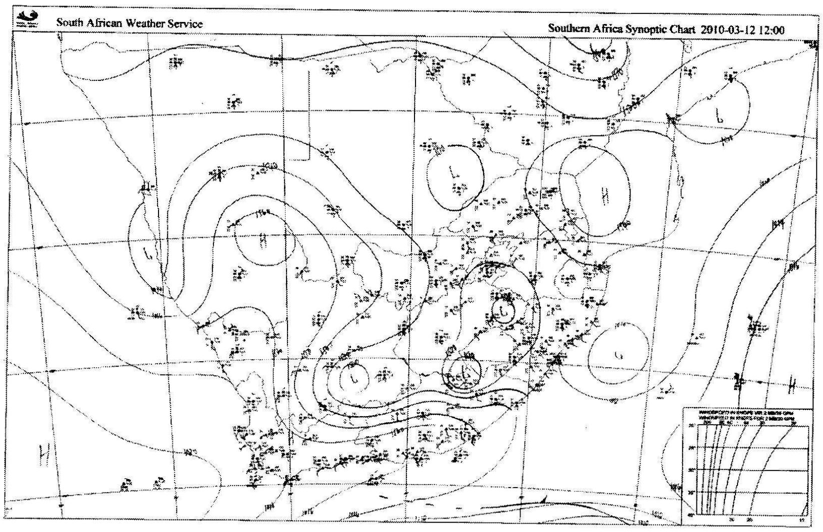
Recommendation

Nil

Conclusion

Nil

Attachment: A



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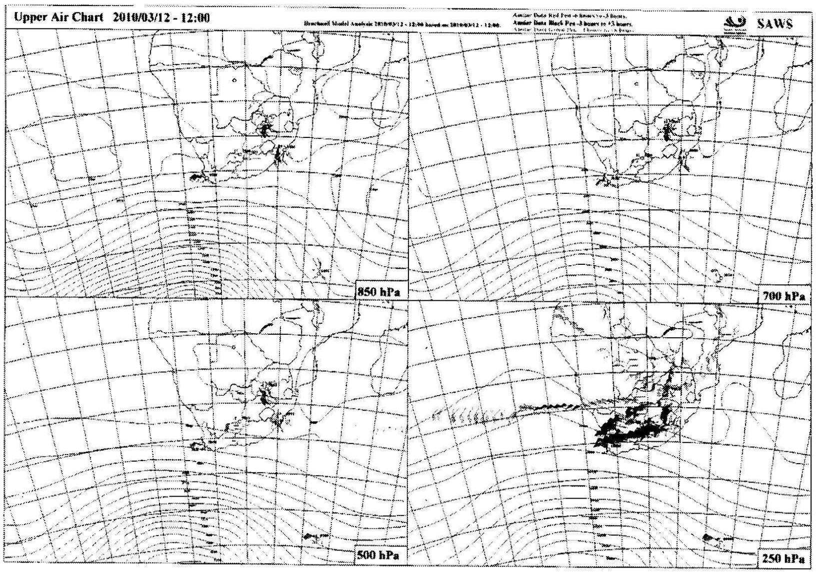
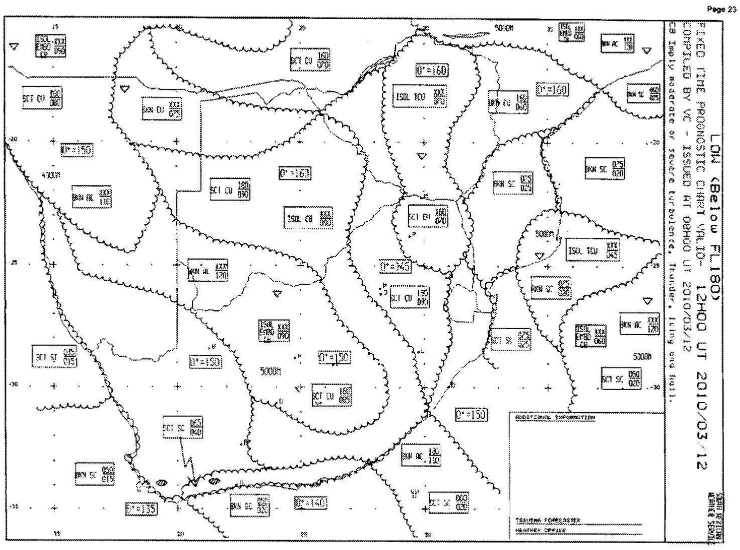


South African Weather Service

Attachment: C



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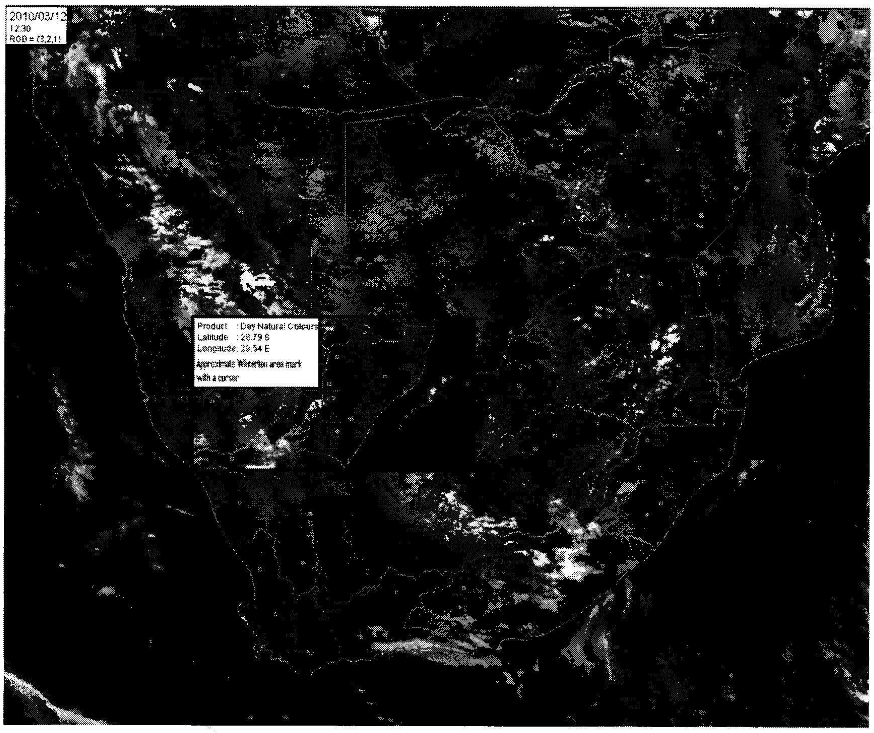

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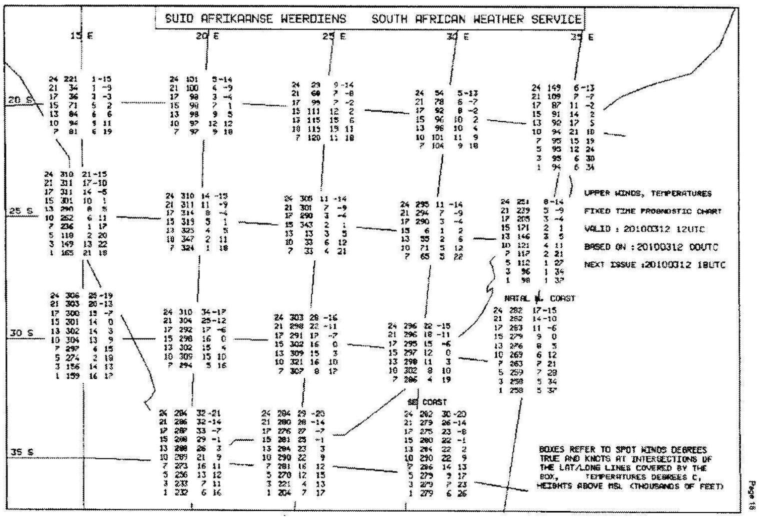

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OPERATIONS SAFETY NOTICE

OCTOBER 31, 1983

OSN 206-83-10

TO: 206A, 206B JRII, 206B JRIII, TH-57 SERIES HELICOPTER OPERATORS

SUBJECT: **SUPPLEMENTAL OPERATING & EMERGENCY PROCEDURES**

RECENT FLIGHT TESTING HAS REVEALED THAT THERE IS A REMOTE POSSIBILITY THAT AN UNANTICIPATED RIGHT YAW MAY OCCUR UNDER CERTAIN CONDITIONS NOT RELATED TO A MECHANICAL MALFUNCTION. THESE CONDITIONS MAY INCLUDE HIGH POWER DEMAND SITUATIONS WHILE HOVERING, AND/OR WHEN RELATIVE WIND AFFECTS AIRSPEED VERSUS GROUND SPEED. THE PURPOSE OF THIS OSN IS:

1. TO EMPHASIZE THE IMPORTANCE OF STAYING AWARE OF POWER AND WIND CONDITIONS.

2. TO PROVIDE A WIND AZIMUTH CHART.

3. TO RECOMMEND A TECHNIQUE FOR RECOVERY FROM AN UNANTICIPATED RIGHT YAW.

OPERATORS SHOULD:

- VERIFY THAT THE TAIL ROTOR IS RIGGED IN ACCORDANCE WITH THE MAINTENANCE MANUAL.

- MAINTAIN MAIN ROTOR RPM WITHIN THE GREEN ARC. NOTE: IF MAIN ROTOR RPM IS ALLOWED TO DECREASE THE ANTI-TORQUE THRUST REQUIRED TO BALANCE THIS CHANGE INCREASES.

- WHEN MANEUVERING BETWEEN HOVER AND 30 MPH:

  - BE AWARE THAT A TAIL WIND WILL REDUCE RELATIVE WIND SPEED IF A DOWN WIND TRANSLATION OCCURS. IF LOSS OF TRANSLATIONAL LIFT OCCURS IT CAN RESULT IN A HIGH POWER DEMAND AND AN ADDITIONAL ANTI-TORQUE REQUIREMENT.

  - BE ALERT DURING HOVER (ESPECIALLY OGE) AND HIGH POWER DEMAND SITUATIONS SUCH AS LOW SPEED DOWNWIND TURNS.

  - BE ALERT DURING HOVER IN WINDS OF ABOUT 8-12 KNOTS (ESPECIALLY OGE) SINCE THERE ARE NO STRONG INDICATIONS TO THE PILOT, TO THE POSSIBILITY OF A REDUCTION OF TRANSLATIONAL LIFT. THIS REDUCTION RESULTS IN AN UNEXPECTED HIGH POWER DEMAND AND INCREASED ANTI-TORQUE REQUIREMENTS.

- BE AWARE THAT IF A CONSIDERABLE AMOUNT OF LEFT PEDAL IS BEING MAINTAINED, THAT A SUFFICIENT AMOUNT OF LEFT PEDAL MAY NOT BE AVAILABLE TO COUNTERACT AN UNANTICIPATED RIGHT YAW.

- BE ALERT TO CHANGING AIRCRAFT FLIGHT AND WIND CONDITIONS SUCH AS EXPERIENCED WHEN FLYING ALONG RIDGE LINES AND AROUND BUILDINGS.

- OBSERVE THE RELATIVE WIND CONDITIONS SET OUT IN THE ATTACHED CHART.

- IF A SUDDEN UNANTICIPATED RIGHT YAW OCCURS THE RECOMMENDED RECOVERY TECHNIQUE IS:

1. APPLY FULL LEFT PEDAL.

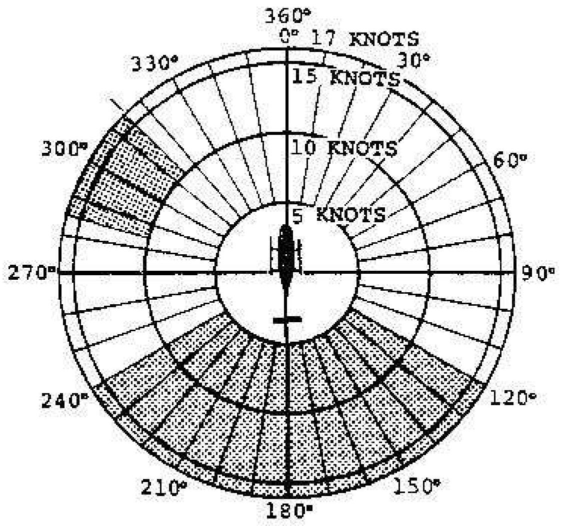
2. APPLY FORWARD CYCLIC, AND RECOVER.

3. IF ALTITUDE PERMITS, REDUCE POWER.

NOTE

THE TAIL ROTOR IS CONTINUING TO PROVIDE THRUST. THE TIME TO ARREST THE YAW RATE DEPENDS ON THE MAGNITUDE OF THE YAW RATE TO BE OVERCOME.

RELATIVE WIND CHART



NOTE

An unanticipated right yaw may occur when operating in the shaded areas of the chart.

NOTE

This chart refers to unanticipated right yaw and does not replace the critical relative wind azimuth chart in the performance section of the flight manual which refers to tail rotor control margin.