



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9328	
Aircraft Registration	ZU-RRP	Date of Accident	13 June 2014		Time of Accident	1245Z
Type of Aircraft	Auto Gyro GMBH		Type of Operation		Private	
Pilot-in-command Licence Type		Private Pilot	Age	44	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	491,8		Hours on Type	8,8
Last point of departure		Stellenbosch Airfield-Cape Town(Western Cape Province)				
Next point of intended landing		Stellenbosch Airfield-Cape Town (Western Cape Province)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Left-hand side of Runway 01 at Stellenbosch Airfield, during take-off roll, GPS coordinates S33° 58'50.0" E 018° 49' 22 .0"; elevation: 321 feet above mean sea level.						
Meteorological Information		Wind direction: (NNE) 23°; Wind speed: 20 knots; temperature: 22,4°C; cloud and visibility ok (CAVOK); cloud cover: minimal; cloud base 4739 (as reported by the pilot)				
Number of people on board		1 + 0	No. of people injured	1	No. of people killed	0
Synopsis						
<p>According to the pilot the aircraft indications on the engine parameters were normal. Seconds after entering the threshold of Runway 01 in preparation for take-off, the pilot completed his pre-rotation take-off procedures. At 210 revolutions per minute (RPM) the pilot disengaged the brake and throttled up. Feeling drag on the rotor, he increased the engine RPM. The front end pitched up, which resulted in the tail section making contact with the runway. The pilot lost control of the aircraft and it started cartwheeling to the left of the runway.</p> <p>One of the witnesses reported that he was about 80 metres from the aircraft. The witness further stated that, everything happened too fast, but it looked as if the rotor disc moved back and to the right, as the witness could see the bottom of the rotor disc. The tail section hit the ground, and it looked as if the rotor tip struck the runway to the right rear of the aircraft. The aircraft then lifted briefly and rolled to the left. The aircraft hit the ground nose first, bounced and flipped three times. It then struck the ground again and ended up with the bottom of the aircraft facing the witness. The gyroplane was extensively damaged during the accident sequence. The pilot was seriously injured.</p> <p>The investigations found no abnormalities on the aircraft. However, it was established that the pilot took off prematurely (induced the aircraft), which resulted in the gyrocopter making contact with the runway, the pilot losing control and the gyrocopter veering off to the left of Runway 01.</p>						
Probable Cause						
<p>The pilot rotated prematurely which resulted in the nose pitching up and tail made contact with the runway, this then resulted on the main rotor blades making contact with the runway and separating from the aircraft. Contributing factors: Poor take off technique, lack of experience.</p>						
ASP Date				Release Date		



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : P. Roux
Manufacturer : Auto Gyro (GMBH)
Model : Calidus
Nationality : South African
Registration Marks : ZU-RRP
Place : Left-hand side of Runway 01 at Stellenbosch Airfield
Date : 13 June 2014
Time : 1245Z

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 given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

- 1.1.1 The pilot reported that he was preparing for a solo private flight when the accident happened. He reported that he entered the runway and continued with pre-rotation procedures. At 210 revolution per minute (RPM) the pilot disengaged the brake and throttled up. Feeling drag on the rotor, he increased the engine RPM. The nose pitched up, which resulted in the tail section making contact with the runway and the pilot losing control of the aircraft. The aircraft started cartwheeling to the left of Runway 01. The flight lasted for 0.3 minutes from start-up. The pilot reported that there was nothing wrong with the aircraft and that he lacked experience on flying the aircraft type.
- 1.1.2 The eye witness, who was 250 metres from where the aircraft took off, was also a gyrocopter instructor. He reported that he saw the aircraft taxiing to holding point of Runway 01 at Stellenbosch airfield. He then walked from the AMO to have a better view of the take-off. The witness reported that he could clearly see the pre-rotation of the rotor blades.
- 1.1.3 The witness further reported that when the gyrocopter started the forward movement, the rotor RPM were at least 200-220 RPM. After about 150 metres, with the joystick clearly still in the forward position, the witness reported that he knew something was wrong. The aircraft was accelerating very fast and after about 200 metres he noticed that the pilot pulled back the joystick quickly.
- 1.1.4 At this stage he was about 80 metres from the aircraft. The witness stated that everything happened too fast, but it looked as if the rotor disc moved back and to the right, as the witness could see the bottom of the rotor disc. The tail section then hit the ground, and it looked as if the rotor tip struck the runway to the right rear of the aircraft. The aircraft then lifted briefly and rolled to the left.
- 1.1.5 The aircraft hit the ground nose first, then bounced and flipped three times. It struck the ground again and ended up with the bottom of the aircraft facing the witness.

- 1.1.6 The second witness reported that he was standing 500 metres from the holding point of Runway 01. He reported that the pilot pre-rotated the aircraft, pulled the stick back as is normally done and started the roll for the take-off. After a second or two the pilot pushed the stick forward, and a couple of seconds later pulled the stick back. The aircraft tail section hit the runway and the aircraft veered off to the left of the runway. The main rotor made contact with the runway surface and one rotor blade separated while the other blade remained on the mast. The aircraft rolled three times before coming to rest on its side.
- 1.1.7 The accident occurred in daylight at Stellenbosch airfield on the left hand side of Runway 01, after take-off near second sets of the power lines near the road (GPS coordinates S33° 58'50.0" E 018° 49' 22 .0"; elevation:321 feet above mean sea level.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

- 1.3.1 The aircraft was extensively damaged during the accident.



Figure 1 Wreck at the crash site

1.4 Other Damage

- 1.4.1 There were scratch marks on the runway and damage to the grass where the propeller blades struck the ground after the aircraft veered off the runway.



Figure 2 Scratch marks on the runway and the damage caused by propeller strike

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	46
Licence Number	0279001705	Licence Type	Private		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	28 January 2017				
Restrictions	None				
Previous Accidents	None				

The pilot renewed his medical certificate on 26 January 2014 after it had expired on 02 December 2013. There was no evidence of any flight after expiry and before renewal of his medical certificate.

Flying Experience:

Total Hours	491,8
Total Past 90 Days	25,0
Total on Type Past 90 Days	8,8
Total on Type	8,8

NB: The pilot stated that he did 2, 8 hours on type in Germany at the factory which were not added to his South African hours when completing the AIID: Pilot questionnaire. The investigator added the 2, 8 hours to the flying experience as reflected above.

1.6 Aircraft Information

Airframe:

Type	Calidus	
Serial Number	C00288	
Manufacturer	Auto Gyro (GMBH)	
Total Airframe Hours (At time of Accident)	18,0	
Last Annual inspection(AI)(Date & Hours)	13 June 2014	New
Hours since Last Annual Inspection	New (18)	
Last Hour since Last Mandatory Periodic Inspection (MPI)(Date & Hours)	13 June 2014	New
Hours since Last Mandatory Periodic Inspection	New (18)	
Authority to Fly (Expiry Date)	29 January 2015	
C of R (Issue Date) (Present owner)	21 January 2014	
Operating Categories	Private operations	

Note: The aircraft was inspected on 31 January 2014 by SACAA for the authority to fly. The following tests/ flights were done prior to the issue of the Authority to Fly: Factory test by factory test pilot during October 2013; test flight; climb test, and proving flight by the owner between 24 January 2014 and 29 January 2014. A total of 5,8 test hours was flown.

The aircraft was manufactured and assembled by Auto Gyro GMBH (factory). The aircraft was inspected and test flown at the factory. All necessary adjustments were made, the aircraft inspection was carried out as per Part 24 and the aircraft was found airworthy. The aircraft fuselage is made of fiberglass/composite.

According to available records, the aircraft was manufactured by Auto Gyro in October 2013 and was never registered in Germany or any other country until it was bought by the owner (South African citizen).

Engine:

Type and Model	Piston ROTAX 914 UL
Serial Number	7682860
Hours since New	18.0
Hours since Overhaul	TBO not reached

Propeller:

Type	IVO Medium VP 3B
Serial Number	9M1912/9M1913/9M1912
Hours since New	18,0
Hours since Overhaul	TBO not reached

Main Rotor:

Type	AutoGyro GmbH
Serial Number	6123 and 6124
Hours since New	18.0
Hours since Overhaul	TBO not reached

Aircraft Mass and Balance:

Basic Empty Weight	285 kg
Pilot	102 kg
Fuel on board	25,2 kg
Take-off weight	412,2

The MAUW of this aircraft is 500 kg approved as per flight manual; therefore the aircraft's weight was within its limits: 500 kg-412,2 kg = 87,8 kg. The field elevation was 321 feet above mean sea level, temperature 22,4°C and QNH 1010.

1.7 Meteorological Information

1.7.1 The following weather information was obtained from the pilot questionnaire:

Wind direction	23°(NNE)	Wind speed	20 knots	Visibility	10 km
Temperature	22,4 °C	Cloud cover	Clear	Cloud base	4739 feet
Dew point	11 °C				

The pilot indicated to the investigator that the weather was okay/fine for the flight at the time of the accident. He also estimated that the wind speed could have been 20 knots as per the wind sock at the airstrip. The pilot stated that he did not obtain official weather information and no flight plan had been filed.

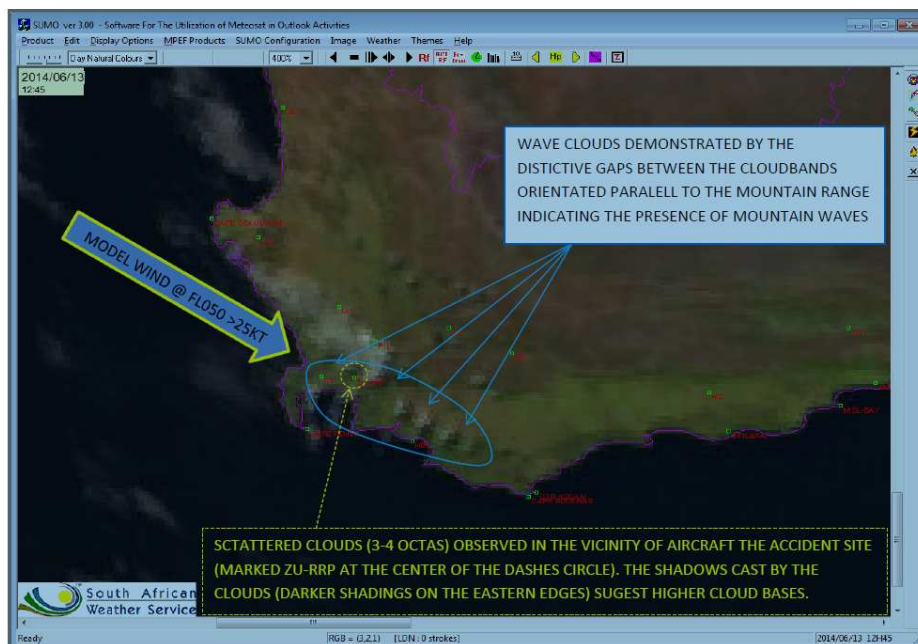
1.7.2 The following weather information was obtained from South African Weather Services (SAWS):

According to SAWS this is the summary of observed weather conditions close to the estimated time and place of occurrence of the aircraft accident.

The reported upper air data also suggested the likelihood of mountain waves over the south-western Cape areas.

Surface data: metars for Cape Town Weather Office (FACT) indicating the likely surface conditions in the Stellenbosch area within the estimated time (1200-1330 UTC) of occurrence of the aircraft accident as reflected below:

Wind direction	330°	Wind speed	10 knots	Visibility	10 km
Temperature	24 °C	Cloud cover	Clear sky	Cloud base	N/A
Dew point	08 °C	QNH		1010	



According to upper winds and temperature chart valid below, strong north-westerly winds (>25 knots) indicated at FL050 and over the western parts of the Western Cape at 1200 UTC in line with the satellite image, which suggested the presence of mountain waves at FACT.

1.8 Aids to Navigation

1.8.1 The gyroplane was equipped with standard navigational equipment approved by the regulator for the aircraft type. No defects were reported prior to or during the flight. The aircraft was fitted with a compass and a Dynon Skyview GPS.

1.9 Communications

1.9.1 The gyroplane was equipped with Filser radio ATR 833 (funkwerk) VHF (very high frequency) radio equipment certified and approved by the regulator for this aircraft type. No defects were reported before or during the flight.

1.10 Aerodrome Information

1.10.1 The accident occurred at Stellenbosch aerodrome on the left side of Runway 01.

Aerodrome location	Stellenbosch Aerodrome in Western Cape Province
Aerodrome co-ordinates	S25°56'22.89" E027°55'32.07"
Aerodrome elevation	321 feet above mean sea level
Runway designations	01/19
Runway dimensions	760 m x 16 m
Runway used	01
Runway surface	Asphalt
Approach facilities	None

1.11 Flight Recorders

- 1.11.1 The gyroplane was not fitted with a Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR). Neither recorder was required to be fitted to the gyrocopter by the relevant aviation regulations.

1.12 Wreckage and Impact Information

- 1.12.1 The aircraft tail section hit the runway and the aircraft veered off to the left of Runway 01. The main rotor made contact with the runway surface and one rotor blade separated, while the other blade remained on the mast. The aircraft rolled three times before coming to rest on its left side. The nose of the aircraft contacted the ground first, then the main undercarriage and then the aircraft flipped over. All damage to the aircraft was caused during the accident sequence. The left hand side vertical stabiliser was damaged when the aircraft rolled to the left before coming to a halt. The cockpit instrumentation panel was also damaged during the accident sequence. One of the main rotor blades separated from the aircraft and one of the propeller blades was damaged.
- 1.12.2 The nose wheel was bent rearwards and the front right-hand side fuselage was damaged, possibly when the aircraft was rolling.



Figure 3 Marks caused when the gyrocopter veered off the runway and position of the wreck after the accident

- 1.12.3 The mast was also damaged by the impact with the ground.
- 1.12.4 The main wreckage was lying on its left side and the cockpit area was slightly damaged during the ground impact.
- 1.12.5 The engine was intact and sustained no visible damage. The only damage that could be identified was on one of the propeller blades and the main rotor blade, which separated from the gyrocopter after striking the runway.

1.13 Medical and Pathological Information

- 1.13.1 The pilot was wearing the safety harness installed on the gyrocopter at the time of the accident and the safety harness did not fail.
- 1.13.2 The pilot sustained serious injuries and was taken to hospital by the medical services.

1.14 Fire

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

1.15 Survival Aspects

- 1.15.1 The accident was considered survivable due to the low impact loads and damage to the cockpit. The pilot made use of the safety harness installed in the gyrocopter and the safety harness did not fail. It was unlatched by the medical services when they were freeing the pilot from the aircraft.



Figure 4 Emergency services assisting the pilot after the accident.

1.16. Tests and Research:

- 1.16.1 Not applicable.

1.17 Organisational and Management Information

- 1.17.1 On the day of the accident the gyroplane was privately operated by the pilot, who was also the owner of the aircraft.
- 1.17.2 Available records indicate that the gyrocopter was correctly maintained as required by the manufacturer and the regulator.
- 1.17.3 The pilot reported that the week prior to the accident was extremely stressful, as he was working under pressure. After the accident, when he thought back, he admitted that he was not in the right frame of mind for the flight prior to conducting a circuit.
- 1.17.4 The pilot file was transferred to metro file by the SACAA Authority, and this made it difficult for the investigator to locate the file. RAASA was contacted in this regard, as they are responsible for the records and updates of the pilot records and no information was found at the time of drafting this report.

1.18 Additional Information

- 1.18.1 The following information was extracted from Flight Manual Calidus (AutoGyro_FIM_Calidus) Revision 2.4, issued 24 June 2013, pages 4-6 to 4-9.

Take-Off Procedures

Check relative wind
Maintain control stick in forward position with right hand
Switch pneumatic mode selector to FLIGHT and return to brake with left hand
Hold wheel brake without having locking pawl engaged
Release trim pressure by trimming full forward
While holding wheel brake adjust 1800 RPM with throttle
Activate and hold pre-rotator
Let pneumatic clutch fully engage (stabilization at about 110 rotor RPM). There may be a little throttle required to prevent engine RPM from dropping below 1800 RPM
Carefully increase throttle to achieve 200-220 rotor RPM
Release pre-rotor button
Bring control stick fully aft
Release wheel brake with throttle unchanged

Monitor rotor speed and adequately increase throttle to take-off

WARNINGS

Before activating the pre-rotator, check area is clear

Prior to releasing the wheel brakes make sure that the control stick is fully aft. A take-off run with flat rotor system may have fatal consequences.

With the rotor speed below green arc relative speed must be built-up carefully to allow rotor speed to increase first. If the situation cannot be corrected, abort take-off run.

CAUTION

Do not engage pre-rotator at too high engine RPM or until too high rotor RPM as this will lead to pre-rotator drive damage.

NOTE

Perform take-off into the wind and with least possible crosswind component.

NOTE

To avoid unintended engagement in flight the pre-rotator can only be activated with the control stick in its most forward position.

TAKE-OFF RUN

Check min.5400RPM for take-off. Otherwise, abort take-off

Minimize lateral drift by applying appropriate lateral control stick input into cross wind direction.

Maintain directional control i.e. runway alignment with sensitive pedal input.

When nose comes up allow nose wheel to float at about 10-15 cm above the runway by a balanced reduction of control stick back pressure.

Maintain attitude until speed increases and gyroplane lifts off.

Allow gyroplane to build-up speed in ground effect

WARNING

Gyroplanes are fully controllable at very low speeds without exhibiting any signs of wing stall or soft flight controls, as it would be perceived in a fixed wing aircraft. However, operation behind the power curve may have fatal consequences during take-off, initial climb or in any other situation within ground proximity. Always allow aircraft to build-up safe climb speed before allowing it to gain height.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1 Man

2.1.1 The pilot did not fly the aircraft frequently enough in the period before the accident flight. Although he had had experience on an autogyro, he was not familiar with the accident aircraft, which was a new and different model. The pilot flew only 8,8 hours on the type in the 3 months (90 days) before the accident. The long intervals between these flights may have had an impact on the competency of the pilot and therefore contributed to the accident.

2.1.2 The pilot reported that upon feeling the drag he increased the engine RPM, and while increasing the RPM the nose of the aircraft jumped up, which caused the tail section to make contact with the runway. The main rotor blade struck the runway and separated from the mast. The pilot lost control of the aircraft, which resulted in its veering off to the left of Runway 01.

2.1.3 The investigation established the possibility that when the nose came up to allow the nose wheel to float about 10-15 cm above the runway, the pilot was slow or did not react quickly enough to balance

reduction of control stick back pressure so as to maintain attitude until the speed increased and the gyroplane lifted off the ground.

2.1.4 The pilot reported that a week prior to the accident he was stressed, as he was working under pressure. It is therefore possible that the pilot did not have enough sleep or rest over a prolonged period of time, which reduced his efficiency or ability to concentrate when flying the aircraft. Although it is not a directly contributing factor the investigation could not exclude it as a contributing factor to the accident.

2.2 Machine

2.2.1 The pilot reported that during take-off run he pushed the control stick forward and did not pull it back in time for climbing. Although the take-off procedure of the aircraft type specifies that take-off should start with the control stick held forward, holding the control stick like this for a long time allows the main rotor disc to reach a high speed unloaded, causing it to have high resistance for take-off load. When holding the control stick in the forward position, the pilot should also allow for disc loading with relative air flow to avoid disc flapping.

2.2.2 On-site investigations did not reveal any abnormalities. Both the propeller and the main rotor blade damage showed that the engine was under power when the aircraft crashed. The pilot also reported that there were no abnormalities, except that he lacked experience on the aircraft type. It is concluded that the pilot may have inadvertently overpitched the aircraft during lift-off after adding more power, which resulted in the tail hitting the runway. The aircraft did not have any defect prior to the accident, and no engine anomalies were encountered during operation before the accident.

2.2.3 When the pilot attempted to lift off by pulling back the control column quickly after increasing power, the leading rotor blade encountered resistance due to the high load forces of the air, causing it to flap in the direction of rotation. The flapping rotor blade pulled the aircraft in the direction of the flapping side. The lagging rotor blade was in a stalled state, which exacerbated the situation by allowing the aircraft to roll to the left. When the rotor blade struck the ground during the roll, the pilot lost control.

2.2.4 The POH states that because of ground effect, the gyrocopter might be able to become airborne at airspeed lower than the minimum level flight speed. In this situation, the gyrocopter is flying well behind the power curve and at such a high angle of attack that unless a correction is made, there will be little or no acceleration toward the best angle climb speed. This condition of lift-off at low airspeed and a high angle of attack is encountered in gyroplanes capable of jump take-offs. The accident aircraft touched down with its tail after lift-off. This means that during the rolling take-off the aircraft was forced into the air too early, meaning the aircraft did not have the minimum flying speed at the time of lift-off. Based on the statement the investigation concluded that the pilot was too slow to correct or compensate for the nose pitch up which resulted in the tail making contact with the ground due to lack of experience on the aircraft type.

2.2.5 Gyroplanes experience a slight delay between control input and the reaction of the aircraft. This delay may cause an inexperienced pilot to apply more control input than required, causing a greater aircraft response than was desired. Once the error has been recognized, opposite control input is applied to correct the flight attitude. Because of the nature of the delay in aircraft response, it is possible for the corrections to be out of synchronisation with the movements of the aircraft and aggravate the undesired changes in attitude. The pilot reported that he did not have enough experience on this type of aircraft, although he had flown similar gyrocopters.

2.2.6 The mass and balance of the aircraft were within prescribed limits and there was sufficient fuel (35 litres) on board for the flight. This is based on the information that there was only the pilot on board, and he stated that he weighed 102 kilograms.

2.2.7 There was no record of any malfunction or defect that could have contributed to the cause of the accident. The aircraft was serviceable prior to the accident. The pilot reported that prior to take-off he did not refuel the aircraft, as it had a total of 35 litres of fuel on board.

2.2.8 As with most other rotor-wing aircraft, gyroplanes experience a slight delay between control input and the reaction of the aircraft. This delay may cause an inexperienced pilot to apply more control input than required, causing a greater-than-desired aircraft response. Once the error has been recognized, opposite control input is applied to correct the flight attitude. Because of the nature of

the delay in aircraft response, it is possible for the corrections to be out of synchronization with the movements of the aircraft and aggravate the undesired changes in attitude. The result is PIO, or unintentional oscillations that can grow rapidly in magnitude.

It is therefore possible that the pilot may have applied more control input than required, causing a greater aircraft response than was desired during the take-off roll, which resulted in the gyroplane's tail making contact with the runway.

2.3 Environment:

2.3.1 The reported weather conditions were not considered a factor contributing to the accident. The weather report from South African Weather Services reported fine conditions. However, the pilot reported a wind speed of 20 knots.

2.3.2 According to upper winds and the temperature chart as reflected on the report, strong north-westerly winds (>25 knots) were indicated at FL050 and over the western parts of the Western Cape at 1200 UTC in line with the satellite image which suggested the presence of mountain waves at FACT. This did not affect the investigation, as the pilot did not make any mention of having difficulty in handling the aircraft due to the weather and he reported that the wind speed at the time was 20 knots.

2.4 Mission

2.4.1 The pilot had flown privately at the same airport before; therefore he was familiar with the flight path for his route. This flight was not different from the other flights he had conducted.

3. CONCLUSION

3.1 Findings:

3.1.1 The aircraft had a valid authority to fly, a valid certificate of registration and had been maintained in compliance with existing regulations and procedures.

3.1.2 The maintenance records indicated that the aircraft was maintained in accordance with existing Civil Aviation regulations.

3.1.3 The pilot was properly licensed and medically fit. However, he reported that he had been working under pressure for a week before the accident and therefore did not have adequate rest to operate the flight. The pilot sustained serious injuries during the accident.

3.1.4 There was no evidence that incapacitation or physiological factors affected the pilot's performance.

3.1.5 The pilot's actions and statement indicated that his knowledge and understanding of the aircraft systems and operation was not adequate. He did not correctly apply recommended procedures.

3.1.6 The gyroplane touched the runway with its tail and the main rotor blade struck the runway, which resulted in the pilot losing directional control of the gyroplane.

3.1.7 The mass and balance of the aircraft were found to be within the prescribed limits.

3.1.8 The aircraft was airworthy when dispatched for the flight.

3.1.9 There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident.

3.1.10 There was no reported evidence of airframe failure, engine failure or systems malfunction prior to the accident.

3.1.11 All control surfaces were accounted for, and all damage to the aircraft was attributed to the severe impact forces with the ground during the accident sequence.

3.1.12 The damage to the main rotor blades and propeller blades was consistent with the engine producing power at impact.

3.2 Probable Cause/s

3.2.1 The pilot rotated prematurely which resulted in the nose pitching up and tail made contact with the runway, this then resulted on the main rotor blades making contact with the runway and separating from the aircraft. Contributing factors: Poor take off technique, lack of experience.

3.2.2 Contributing factors:

Poor take off technique.

Lack of experience.

4. SAFETY RECOMMENDATIONS

4.1 Not applicable.

5. APPENDICES

5.1 None