MAINTENANCE MANUAL

TAG Aviation Pty Ltd

Mobile 61 418 620195
Email: neil@tagaviation.com.au. Web: www.tagaviation.com.au



Issue 2
January 2018

MAINTENANCE MANUAL FOR TITANIUM EXPLORER GYROPLANE

- Gyroplane model Titanium Explorer___
- Gyroplane serial Nº _____
- Engine model Rotax _____
- Engine serial Nº _____
- Registration Number _____
- Aircraft manufacturer and type certificate holder: TAG Aviation Pty Ltd
- Owner _____
  _____
  _____
  _____

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage or retrieval system, without permission from TAG Aviation Pty Ltd

Amendments to this Manual

As necessary, TAG Aviation Pty Ltd will issue updates to this manual and will notify owners in the form of replacement pages with changes identified by change bars in the margin.

Aircraft operators must ensure that this manual is amended and complied without delay upon receipt, in accordance with the amendment instructions that will accompany the updates.

Amendment Record

Amend't No.	Description of Amendment	Pages affected	Date

Contents

Section I – INTRODUCTION

1.1 General.
1.2 Applicability.
1.3 Terminology.
1.4 Conversion table.
1.5 Periodic maintenance.
1.6 Gyroplane deterioration.
1.7 Cleaning.
1.8 Road transport.
1.9 Gyroplane identification.
1.10 Bolts torque and sealing.
1.11 Consumables.

Section II – DESCRIPTION OF THE AIRCRAFT

2.1 General.
2.2 Constructional details.
2.3 Overall dimensions.
2.4 Technical data and performances.
2.5 Engine.
2.6 Main parts.

Section III – MAINTENANCE DESCRIPTION

3.1 Maintenance schedule.
3.2 Periodical maintenance.

Section IV – SYSTEMS

4.1 Airframe.
4.2 Rotor controls.
4.3 Steering controls.
4.4 Rotor head.
4.5 Rotor.
4.6 Prerotator.
4.7 Throttle and choke systems.
4.8 Landing gear.
4.9 Various.
4.10 Electrical/Pneumatic systems.
4.11 Propeller.
4.12 Engine.
4.13 Fuel system.
4.14 Cooling system.
4.15 Oil system.

Section V – FUNCTIONAL TEST FLIGHT

5.1 Functional test flight
5.2 Weight limitations and balance
5.3 Standard equipment list
5.4 Table : weights of additional equipment , extras and options.
5.5 Weight & Balance report

Section VI - Instructions for Rotor blade assembly

SECTION I – INTRODUCTION

1.1 GENERAL

This maintenance manual contains the necessary information for safe and efficient operation of the Titanium Explorer series of gyroplanes. It explains the maintenance processes to keep this aircraft airworthy and in good condition.

This guide describes the correct maintenance for the parts manufactured by TAG Aviation Pty Ltd , The instructions for the engine maintenance and servicing are not included in this manual. To carry out engine maintenance appropriately, please refer to the updated engine´s maintenance manual for your engine type

Some of the operations described in this manual should be carried out only by approved maintenance TAG Aviation staff. See "Maintenance Schedule".

The owner/operator of this aircraft is responsible for keeping it properly maintained according with the maintenance manuals, provided with this gyroplane.

Maintenance tasks must be performed by experienced mechanics.

Special inspections have to be performed after any operational incident, including:

- Hard landing.
- Strikes in flight with birds, trees…
- Rotor contact with obstacles.
- Lightning strike.
- Rotor over-speed.
- Engine failure.

Contact TAG Aviation Pty Ltd for advice in case of any doubt.

1.2 APPLICABILITY

This manual is applicable to all Titanium Explorer gyroplanes.

1.3 TERMINOLOGY

Aerodynamics

CAS	Calibrated air speed. The indicated air speed corrected for position and instrument error.
IAS	Indicated air speed. The speed indicated in the air speed indicator.
TAS	True Air speed. The calibrated air speed corrected for altitude and temperature.
Vno	Turbulence speed. The max speed to fly in turbulent air.
Vne	Never exceed speed.
Vy	Best rate of climb speed.
Vx	Best angle of climb speed.

Meteorology

OAT	Outside Air Temperature expressed in degrees Celsius (°C).
ISA	International Standard Atmosphere.
Hp	Standard altimeter setting. 1013 mb (or hectopascals).

1.4 CONVERSION TABLE

Temperature	*from*	**Symbol**	*to*	**Symbol**	*Factor*
	Fahrenheit	Fº	Celsius	Cº	5/9*(F-32)
	Celsius	Cº	Fahrenheit	Fº	9/5*C+32
Weight	*from*		*to*		
	Kilograms	Kg	Pounds	Lb	*2,205
	Pounds	Lb	Kilograms	Kg	* 0,4536
Speed	*from*		*to*		
	Metres per second	m/s	Feet per minute	ft/min	* 196,86
	Feet per minute	ft/min	Metres per second	m/s	* 0,00508
	Kilometres per hour	km/h	Knots	Kts	* 0,54
	Knots	kts	Kilometres per hour	Km/h	* 1,852
	Knots	Kts	Miles per hour	mph	* 1,15
	Miles per hour	mph	Knots	Kts	* 0,87
Pressure	*from*		*to*		
	Atmospheres	Atm	Pounds per square inch	psi	* 14,8
	Pounds per square inch	psi	Atmospheres	Atm	* 0,06756
Distance	*from*		*to*		
	Kilometres	Km	Nautical Miles	nm	* 0,540
	Nautical miles	nm	Kilometres	Km.	* 1.852

	Statute miles	sm	Nautical Miles	nm	* 0,87
	Nautical Miles	nm	Statute miles	sm	* 1,15
	Meters	m	Feet	ft	* 3.281
	Centimetres	cm	Inches	in	* 0,3937
	Inches	in	Centimetres	cm.	* 2.54
Volume	*from*		*to*		
	Litres	lt	US Gallons	US gal	* 0,2642
	US Gallons	US gal	Litres	lt	* 3.785
Area	*from*		*to*		
	Square Meters	m²	Square Feet	ft²	* 10,76
	Square Feet	ft²	Square Meters	m²	* 0,0929

1.5 PERIODIC MAINTENANCE

Certain parts require scheduled maintenance regardless of flight hours. This maintenance must be carried out in addition to the flight hours related maintenance.

The 100-hrs maintenance should be carried out every 100 flight hours or, as an anual inspection, every 12 months, whichever comes first.

All rubber parts and hoses should be replaced every 5 years or 500 flight hours, whichever comes first.

1.6 GYROPLANE DETERIORATION

High humidity, especially in combination with salt-containing atmosphere will lead to deterioration and corrosion of some parts of the gyroplane.
Protect the metal parts of the gyroplane such as the engine, rotor head, rotor hub bar, control systems, etc., with WD-40 or ACF-50 oil.

Sunlight and heat impact can degrade the composite parts of the gyroplane. Whenever possible place the gyro in a protected area.

The manufacturer takes no responsibility for damage due to improper usage.

1.7 CLEANING

It is important to keep the gyroplane and its engine clean and maintain it in good condition. In addition, during cleaning, faults and damaged parts can be detected.

Rotor blades and propeller should be always clean as they are very important to obtain the best performance.

In order to protect the gyroplane from dust, humidity, bird soil, etc., is advisable to cover it when parked in the hangar.

Caution

Do not use a water high-pressure cleaning machine as it can damage electrical connections, bearings or paint.
Do not use solvents or gasoline as it can damage some parts of the gyroplane.

Use car soap diluted in water to clean the external parts, windscreen should be cleaned only with polycarbonate soup or a suitable polish such as Mr sheen

Protect all metal parts of the gyroplane and engine against corrosion, especially if the gyro is exposed to high humidity conditions, with "WD-40" or ACF-50 oil.

1.8 ROAD TRANSPORT

Take the rotor blades off and package them carefully because they can be damaged during transportation. For safety, transport the gyro with minimum fuel content in its tank.

1.9 GYROPLANE IDENTIFICATION

The gyroplane identification placard is placed on the right side of the mast, near the engine mounting bracket.

Please provide your gyroplane serial number for identification if you need to contact TAG Aviation Pty Ltd for any reason.



1.10 BOLTS TORQUE

All bolts of the gyroplane should be tightened with their corresponding torque. The maintenance technician should have a torque wrench from 5N/m to 60N/m at hand to carry out all maintenance tasks.

Some bolts have a special tightening torque as given in this manual. If none is specified, the general torque setting are as following:

KIND OF BOLT	TORQUE	TOLERANCE
Metric -5	6 N/m	+/- 1
Metric – 6	10 N/m	+/- 1
Metric – 8	25 N/m	+/- 1
Metric – 10	53 N/m	+/- 2
AN-4	10 N/m	+/- 1
AN-5	18 N/m	+/- 1
AN-6	23 N/m	+/- 2
AN-7	32 N/m	+/- 2
AN-8	72 N/m	+/-2

Critical threads have an inspection lacquer or torque seal, usually in red, which allows easy verification that components have not moved relative to each other. This is called “sealing” in this manual.

1.11 CONSUMABLES

Consumables used to perform the maintenance or assembly parts in the gyroplane:

- Lubricants:
  - Oil WD-40.
  - Spray grease TAC -2.
  - Grease Molykote BR2 Plus.
  - Big Bear grease
  - Grease "water repellent" Brugarolas JET-70.
  - Oil ACF-50.
  - Valvoline sae-90.

- Threadlockers:
  - Loctite 243.
  - Loctite 270.
  - Loctite 641.
  - Loctite 638.

- Engine oil: (see latest issue of engine maintenance manual)

- Coolant: 50/50 Antifreeze and water (see latest issue of engine maintenance manual).

- "Meguiar´s Mirror Glaze" or Mr Sheen furniture polish for the windscreens.

Section II – DESCRIPTION OF THE AIRCRAFT

2.1 GENERAL

The Titanium Explorer gyroplane is designed as a 2-seater, tandem-configured three-axis aircraft with dual controls and single engine, ideal for flight instruction purposes.

In addition to flight training and general recreational flying and because of the gyroplanes flight characteristics , some countries allow this aircraft to be used for tasks such as air transportation, forestry, border, livestock and traffic surveillance, electrical pylon inspection and film photography, fumigation, crop spray etc. These are typically the kind of activities that benefit from the very low speeds at which this gyroplane can operate as well as its characteristic zero downwash. The manoeuvring capability of the aircraft in all configurations is exceptionally high, and since it is impossible for the machine to enter into a stall or a spin, it has an unequalled flight safety record. Its characteristic short take-off and landing runs make it particularly suitable for operation from fields of modest dimension.

2.2 CONSTRUCTIONAL DETAILS

The **Airframe** consist of a three piece TIG (Tungsten-Inert-Gas) welded Titanium frame to guarantee lifetime absence of corrosion. The gyroplane has a tricycle landing gear with front wheel.

The **cockpit** is made from composite materials, ensuring high strength with low weight. The high-sided open cockpits have clear polycarbonate windshields to protect the occupants from wind effects while offering excellent all-round visibility.

The layout of the **instrument panel** is ergonomic with controls located in proximity of the appropriate set of instruments.

The **rotor blades** are made from Carbon Fibre

The **power unit** consists of a pusher piston engine and a three or four bladed composite propeller.

The **tail plane** is made from composite materials and consists of a fixed horizontal stabilizer with winglets at the ends and a vertical surface in the centre subdivided in a fixed fin and counterbalanced rudder .

2.3 OVERALL DIMENSIONS

Total length: 5,1 meters

Cockpit Width: 0,78 meters

Landing Gear width: 1,86 meters

Rotor diameter: 8,40 / 8,60 meters.



2.4 TECHNICAL DATA AND PERFORMANCES

The following performance parameters were determined by flight testing with average piloting skills, aircraft with 450 kg MTOW, in good condition and clean rotor blades and propeller. The parameters apply to standard conditions ISA (15ºC temperature, sea level and standard pressure).

Gyroplane data	**With Rotax 912 ULS (100 HP)**	**With Rotax 914 TURBO (115 HP)**
Empty weight (standard equipment)	268 kg	276 kg
MTOW	575 kg	575 kg
Useful load (standard equipment)	307 kg	301 kg
Vne	100 mph	100 mph
Cruise speed	60 – 85 mph	60 – 90 mph
Min speed (level flight/full power))	30 mph	25 mph
Rate of climb	650 ft/min	1000 ft/min
Take-off distance	100 m	70 m
Landing distance	0 – 30 m	0 – 30 m
Fuel	Gasoline	
Fuel capacity	83 litres	
Unusable fuel	1 litre	
Fuel consumption	15 – 20 l/h	

2.5 ENGINE

- Manufacturer …… Rotax
- Take-off power:
  - 912 ULS…….…… 100 hp
  - 914 UL…….. 115 hp
- Max. engine speed…….…….…… 5800 rpm
- Cooling system…….. Air/liquid
- Coolant……. 50% water/antifreeze
- Electric installation……. 12v

2.6 MAIN PARTS



Parts:

1 – Rotor blades.
2 – Hub bar.
3 – Rotor head.
4 – Mast.
5 – Rear keel.
6 – Landing gear.
7 – Main wheels.
8 – Front wheel.
9 – Cockpit.
10 – Landing light.
11 – Windscreens.
12 – Engine.
13 – Tail planes.

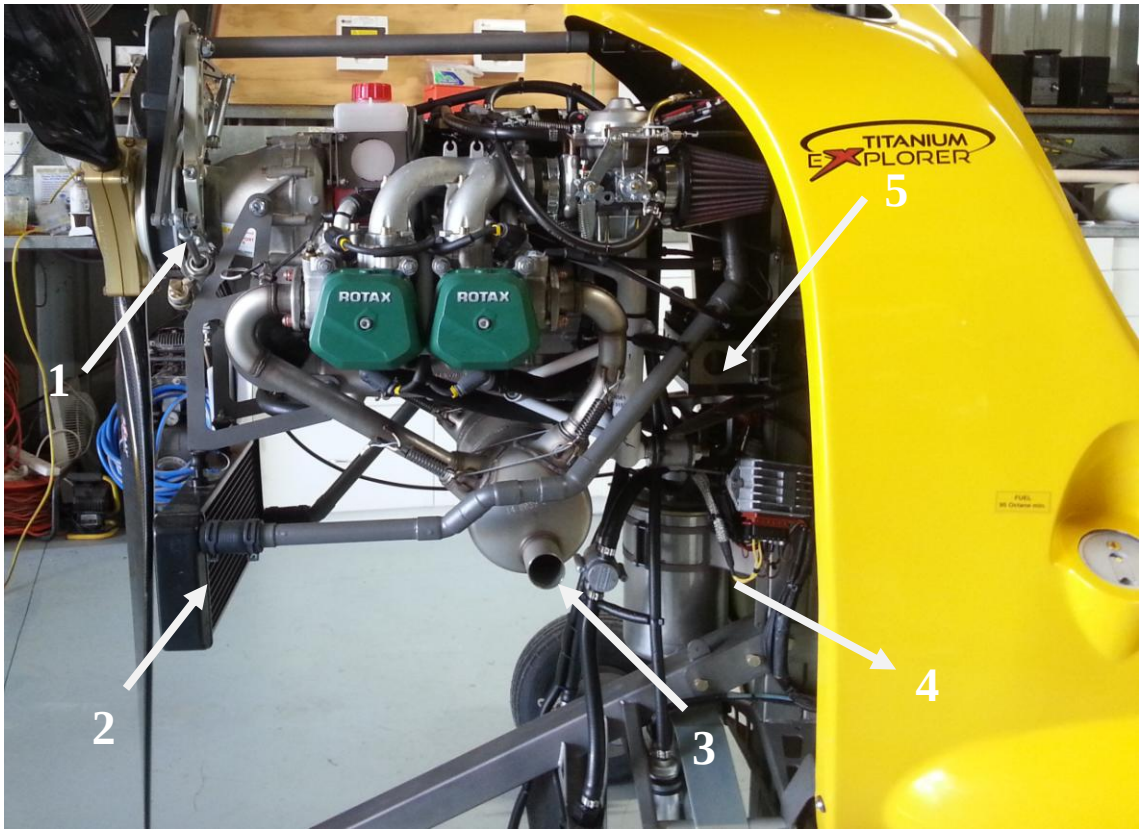


Parts:

1 – Propeller.
2 – Oil cooler.
3 – Water cooler.
4 – Vertical stabilizer.
5 – Rudder.
6 – Winglet.
7 – Horizontal stabilizer.
8 – Control rods.



Parts:
1 – Engine.
2 – Water tank.
3 – Horizontal prerotator transmission.
4 – Prerotator system.
5 – Carburettor.
6 – Oil tank.
7 – Air filter (914).



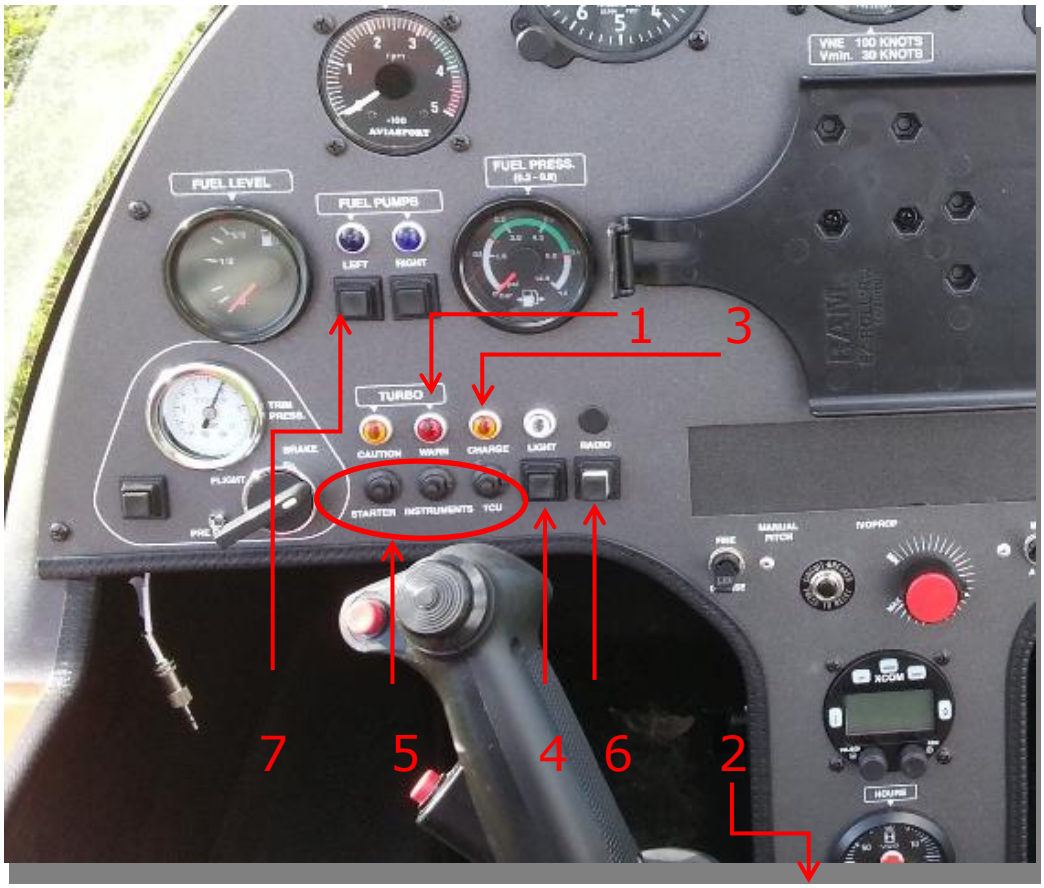
Parts:

1 – Prerotator pneumatic cylinder.
2 – Water cooler.
3 – Exhaust muffler.
4 – Fuel tank filler.
5 – Battery.



Parts:

1 – Compass.
2 – Altimeter.
3 – Airspeed indicator.
4 – Vertical speed indicator (optional).
5 – Rotor rpm.
6 – Engine rpm.
7 – Oil pressure.
8 – Trim pressure.
9 – Radio (optional).
10 - EGT (optional).
11 – Manifold pressure (optional).
12 – Fuel pressure.
13 – Oil temperature.
14 – CHT.
15 – Pneumatic valve.
16 – Ignition key.



Parts:

1 – Caution and warning turbo lights (just in 914 engine).
2 – Headset jack.
3 – Battery charge.
4 – Landing light and strobe (optional).
5 – Breakers.
6 – Master.
7 – Fuel pumps (only one for 912 engine).

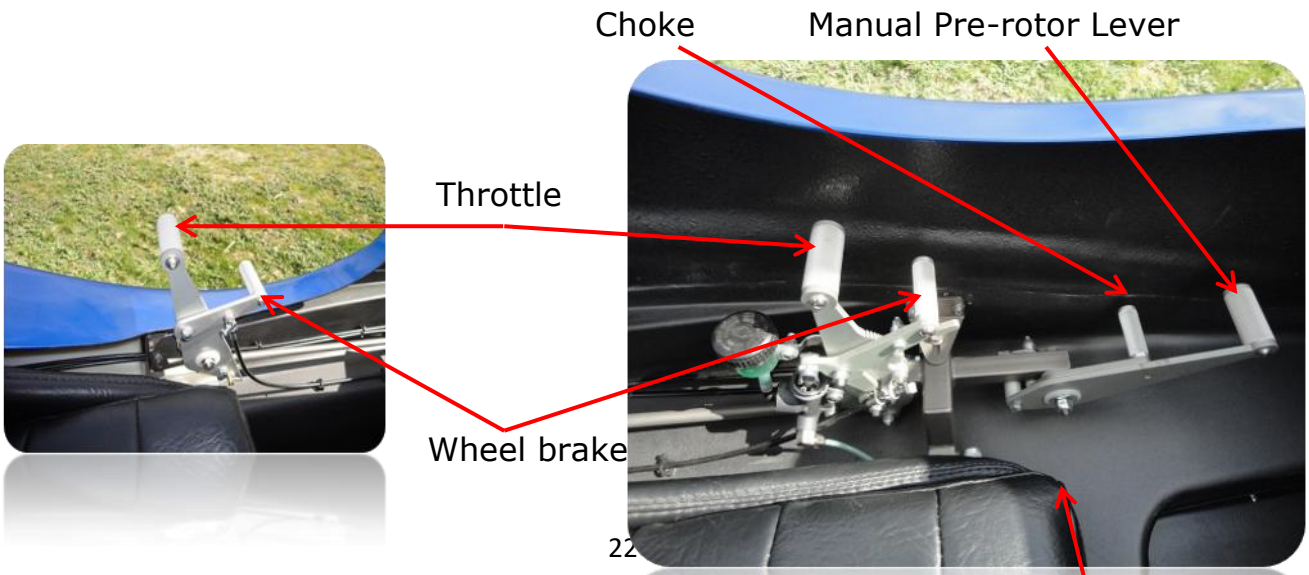
Front/Rear Stick



Front pedals



Throttle, brake and roll trim



Roll trim

Section III – MAINTENANCE DESCRIPTION

3.1 MAINTENANCE SCHEDULE

The 100-hrs maintenance should be carried out every 100 flight hours or, as an anual inspection, every 12 months, whichever comes first.

Task Nº	DESCRIPTION	25 hr	100 hr	200 hr	300 hr	400 hr	500 hr	600 hr	700 hr	800 hr	900 hr
	1 - AIRFRAME										
1.1	Inspection of the mast	X	X	X	X	X	X	X	X	X	X
1.2	Verify bolts tensions in mast	X	X	X	X	X	X	X	X	X	X
1.3	Verify the fastening bolts of seats and harnesses			X		X		X		X	
1.4	Verify the cockpit and instrument panel		X	X	X	X	X	X	X	X	X
1.5	Re-tight cockpit bolts	X			X			X			X
1.6	Inspection of the airframe (only by approved staff)						X				
	2 - ROTOR CONTROLS										
2.1	Verify bolt tension on control system	X	X	X	X	X	X	X	X	X	X
2.2	Verify the absence of play	X	X	X	X	X	X	X	X	X	X
2.3	Inspect the control rods	X	X	X	X	X	X	X	X	X	X
2.4	Adjust friction in roll (if needed)		X	X	X	X	X	X	X	X	X
2.5	Verify bolt tension on the control fork	x	X		X		X		X		X
2.6	Replace the bolts of the control fork				X		X			X	
2.7	Rotor controls overhaul (only by approved staff)						X				
	3 – STEERING CONTROLS										
3.1	Inspection of the front wheel fork		X	X	X	X	X	X	X	X	X
3.2	Inspect the pedal push rods for straightness		X	X	X	X	X	X	X	X	X
3.3	Inspect the pedals		X	X	X	X	X	X	X	X	X
3.4	Inspect the system		X	X	X	X	X	X	X	X	X
3.5	Verify rudder cable tension	X	X	X	X	X	X	X	X	X	X
3.6	Inspect or Replace rudder control cable						X				

Task Nº	DESCRIPTION	25 hr	100 hr	200 hr	300 hr	400 hr	500 hr	600 hr	700 hr	800 hr	900 hr
	4 – ROTOR HEAD										
4.1	Verify bolt tension	X	X	X	X	X	X	X	X	X	X

4.2	Inspect the rotor head		X	X	X	X	X	X	X	X	X
4.3	Adjust tension of roll and pitch pivot bolts	X	X	X	X	X	X	X	X	X	X
4.4	Grease the roll and pitch pivots			X		X		X		X	
4.5	Inspect the prerotator ring gear and bendix pinion		X	X	X	X	X	X	X	X	X
4.6	Grease the prerotator		X	X	X	X	X	X	X	X	X
4.7	Inspect the top bearing of starter gear		X	X	X	X	X	X	X	X	X
4.8	Inspect the rotor brake pad			X		X		X		X	
4.9	Clean/degrease the ring gear and rotor brake		X	X	X	X	X	X	X	X	X
4.10	Replace rotor head bolts						X				
4.11	Inspect teeter towers (only by approved staff)						X				
	5 – ROTOR BLADES										
5.1	Inspect the rotor for damage	X	X	X	X	X	X	X	X	X	X
5.2	Verify tightening of teeter bolt	X		X		X		X		X	
5.3	Perform general inspection of rotor (only by approved staff)						X				
5.4	Check rotor blade balance (only by approved staff)	X	X	X	X	X	X	X	X	X	X
5.5	Verify rotor blades bolt tension	X	X	X	X	X	X	X	X	X	X
	6 – PREROTATOR										
6.1	Verify tension of bolts	X	X	X	X	X	X	X	X	X	X
6.2	Inspect prerotator		X	X	X	X	X	X	X	X	X
6.3	Replace the belt						X				
6.4	Adjust prerotator cable		X	X	X	X	X	X	X	X	X
6.5	Adjust the prerotator rubber pulley stop		X	X	X	X	X	X	X	X	X
6.6	Inspect the universal joints for play		X	X	X	X	X	X	X	X	X
6.7	Inspect the Orings		X	X	X	X	X	X	X	X	X
6.8	Inspect the rod end bearing of the piston		X	X	X	X	X	X	X	X	X
6.9	Inspect the prerotator gearbox		X	X	X	X	X	X	X	X	X
6.10	Replace the bearing of the tensioner						X				
6.11	Replace the prerotator cable Bowden						X				
	7 – THROTTLE AND CHOKE SYSTEMS										
7.1	Inspect the system for smooth operation	X	X	X	X	X	X	X	X	X	X
7.2	Inspect the levers for damage	X	X	X	X	X	X	X	X	X	X
7.3	Adjust levers friction	X	X	X	X	X	X	X	X	X	X
7.4	Inspect the choke system	x	x	x	x	x	x	x	x	x	x
7.5	Inspect the locking wires	x	x	x	x	x	x	x	x	x	x
7.6	Adjust carburettor synchronization			x		x		x		x	
7.7	Replace carburettors cable Bowden						X				

.Task Nº	DESCRIPTION	25 hr	100 hr	200 hr	300 hr	400 hr	500 hr	600 hr	700 hr	800 hr	900 hr
	8 – LANDING GEAR										
8.1	Inspect Tires	X	X	X	X	X	X	X	X	X	X
8.2	Verify tension of landing gear bolts	x	x	x	x	x	x	x	x	x	x
8.3	Check wheel bearings	x		x		x		x		x	
8.4	Inspect landing gear	X	X	X	X	X	X	X	X	X	X

8.5	Brake pads		x	x	x	x	x	x	x	x	x
	9 - VARIOUS										
9.1	Inspect tail planes	x	x	x	x	x	x	x	x	x	x
9.2	Verify tension on tail planes attachment bolts				x		x			x	
9.3	Replace tail planes bolts						x				
9.4	Verify conditions of windscreens		x	x	x	x	x	x	x	x	x
9.5	Verify placards		x	x	x	x	x	x	x	x	x
	10 – ELECTRICAL/PNEUMATIC SYSTEM										
10.1	Inspect the harnesses		x		x		x		x		x
10.2	Check the battery level			x		x		x		x	
10.3	Instrument panel						x				
10.4	Oil the compressor		x	x	x	x	x	x	x	x	x
	11 - PROPELLER										
11.1	Inspection of the propeller	x	x	x	x	x	x	x	x	x	x
11.2	Verify tension of the propeller bolts			x		x		x		x	
11.3	Propeller pitch			x		x		x		x	
11.3	Replace the propeller bolts					x					
11.4	Overhaul									x	
	12 – ENGINE (see engine´s maintenance manual)										
12.1	Verify tension of engine bolts	x	x	x	x	x	x	x	x	x	x
12.2	Replace the engine silent-blocks						x				
12.3	Replace engine attachment bolts						x				
12.4	Inspect the locking wire for the air filters	x	x	x	x	x	x	x	x	x	x
12.5	Inspect the exhaust	x	x	x	x	x	x	x	x	x	x
	13 – FUEL SYSTEM										
13.1	Clean the gascolator	x	x	x	x	x	x	x	x	x	x
13.2	Clean the filters of the 914 fuel pumps				x			x			x
13.3	Inspect hoses		x	x	x	x	x	x	x	x	x
13.4	Replace the fuel hoses						x				
13.5	Perform the fuel tank test			x		x		x		x	

Task Nº	DESCRIPTION	25 hr	100 hr	200 hr	300 hr	400 hr	500 hr	600 hr	700 hr	800 hr	900 hr
	14 – COOLING SYSTEM										
14.1	Inspection of the system	x	x	x	x	x	x	x	x	x	x
14.2	Replace the silent-blocks			x		x		x		x	
14.3	Replace hoses and coolant						x				
	15 – OIL SYSTEM										
15.1	Inspection of the system	x	x	x	x	x	x	x	x	x	x
15.2	Replace the hoses and clamps						x				

3.2 PERIODIC MAINTENANCE

Certain parts require scheduled maintenance regardless of the number of flying hours. This maintenance must be carried out in addition to the flight hours related maintenance.

The 100-hrs maintenance program should be carried out as an annnual inspection if the gyroplane has not reached 100 flying hours within the last 12-month period.

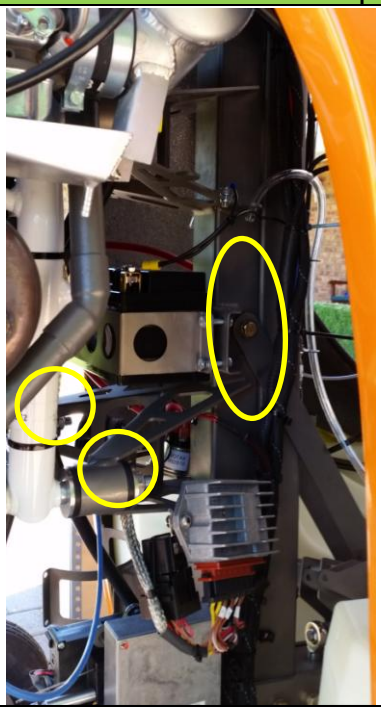
All rubber parts and hoses should be replaced every 5 years independently of the number of flight hours.

Remove the bolts of the rotor controls, rotor head and rotor blades/hub bar every **two years** and confirm the absence of corrosion or wear. Apply WD-40 or ACF-50 oil to the unthreaded part of the bolt. Elastic stop nuts should be replaced after each single use and tighten with their corresponding torque. Any corrosion should be investigated to ensure that it does not threaten the strength of the parts involved. If in doubt replace corroded parts!

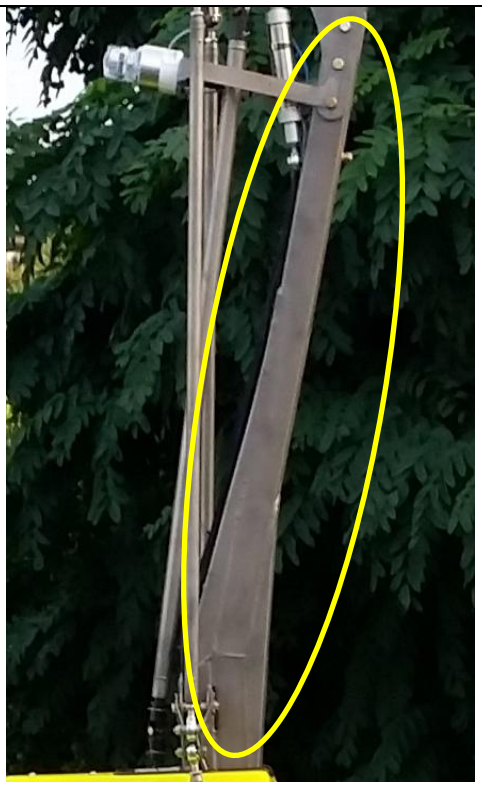
Section IV – SYSTEMS

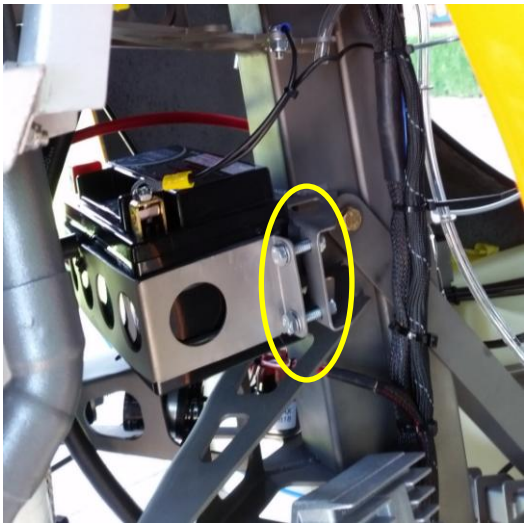
4.1 AIRFRAME

The main airframe of the gyroplane is constructed from TIG-welded Titanium. The airframe consists of a three piece unit which does not have replaceable parts.
Any repair or modification to the airframe by a third party is not allowed or approved.

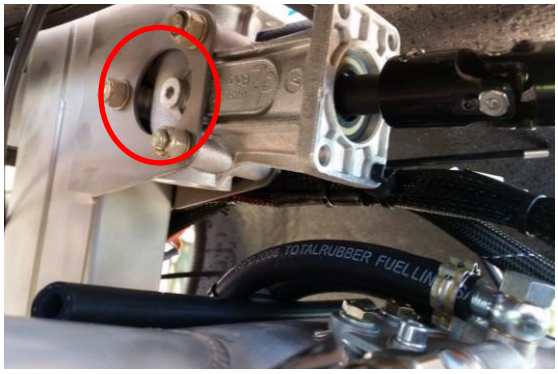
1.1 Inspection of the mast	
	Inspect the mast and its welds to confirm the absence of cracks in the tube , folding mast plates and the engine brackets. Inspect the welds of the bracket for the 90º prerotator gear box.

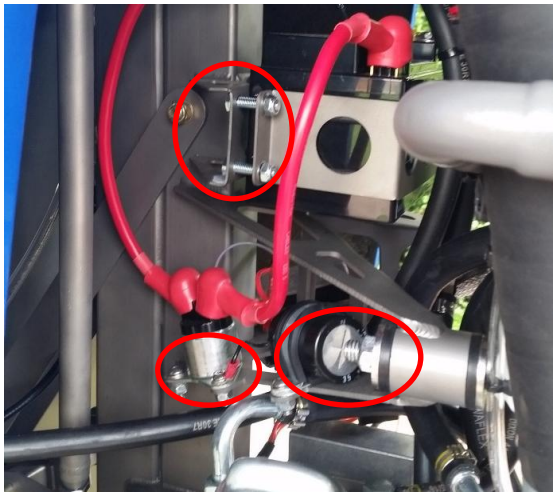


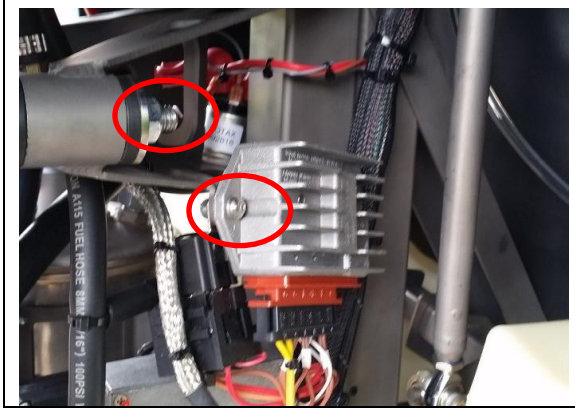


1.2 Verify tension of bolts in mast	
	Check tension of the battery bracket bolts

	Inspect the oil tank bracket and the mast reinforcement bolts for corrosion . Tension bolts







Verify tension of nuts and bolts in:

- Rear four point harness

- 90º Prerotator box.

- Battery bracket.

- Engine brackets.

- Starter relay.

- Regulator.



Inspect the mast and all bolts at the bottom of the mast for corrosion .

Spray the shaft of the bolt with Tac-2 spray grease to prevent corrosion .

Tension all mast bolts .

1.3 Verify tension of bolts on seats and harnesses

- Check tension of the four M-6 attachment bolts for each seat.
- Check tension of the bolts for the harnesses.

Note

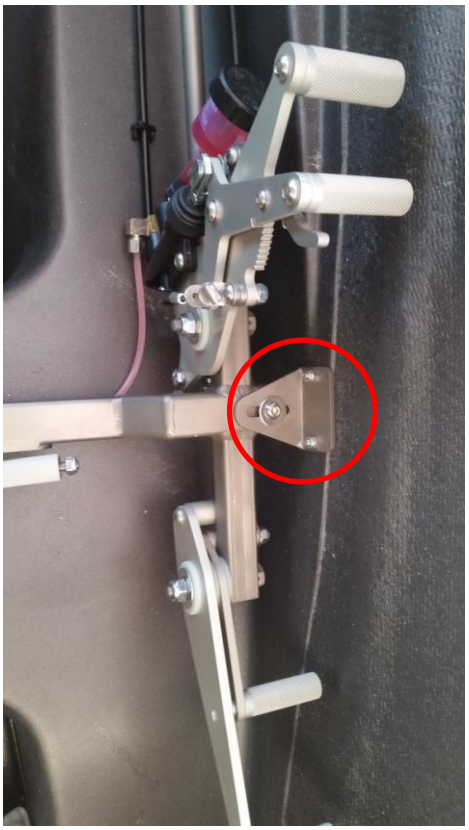
The M-10 bolts for the harness in the rear seat should be tightened to 25 N/m.

1.4 Verify cockpit and instrument panel

Verify that the cockpit and instrument panel are secured.
Be careful not to over tighten the instrument panel screws , you may strip the rubber nuts

1.5 Re-tight cockpit bolts



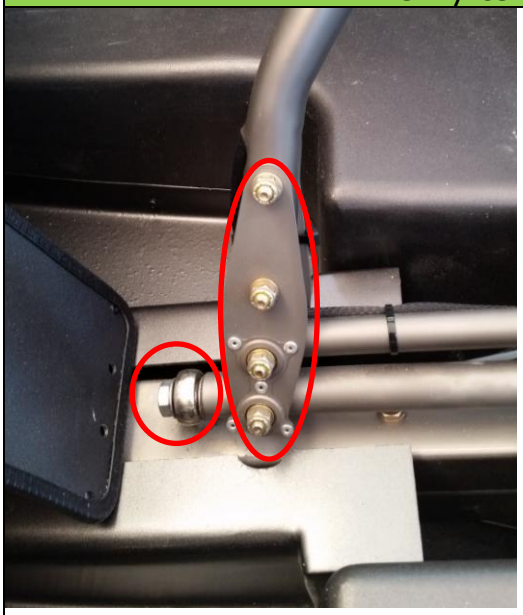
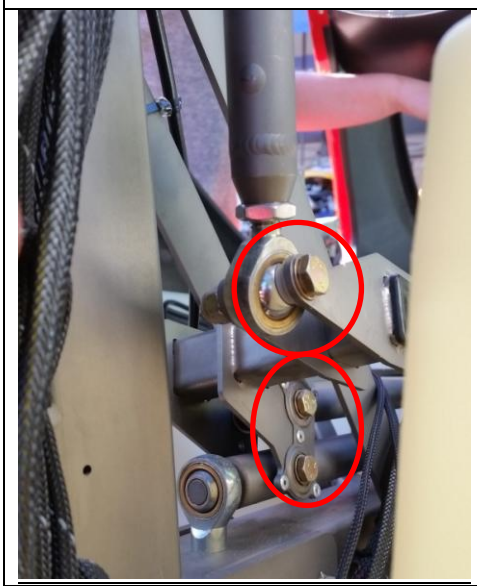




Re-tighten the cockpit bolts.

M-4 bolts are to be gently tightened by hand with its corresponding wrench.

1.6 Inspection of the airframe
Inspection of all welds for possible cracks in the airframe.

2.1 Verify tension of control bolts	
 	Verify tension of the control bolts in control columns, control fork and vertical control rods.

2.1 Verify tension of control bolts



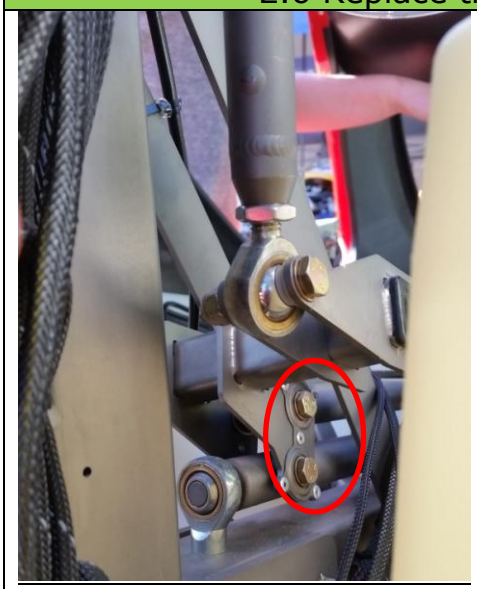


2.2 Verify the absence of play
With the rotor brake "ON", hold the front stick and make some pressure fore and aft to check if there is play in the whole control system. Few millimetres of play at the top end of the stick are permissible; 8 mm or more are not acceptable.

2.3 Inspect the control rods
Visually inspect the vertical control rods for wear or cracks.

2.4 Adjust the friction in roll (if needed)	
	Some friction in the roll axis of the rotor controls is helpful in dampening resonant vibrations during flight. On the ground, carefully adjust the amount of friction; it should be a compromise between handle and friction.

2.5 Verify tension of bolts on the control fork	
	Replace the nuts, re-tighten the bolts of the control fork and mark the thread and nut with red paint.

2.6 Replace the bolts of the control fork	
	Replace the bolts and nuts of the control fork and mark the thread and nut with red paint.

2.7 Rotor controls overhaul



Dismount the whole rotor control system from the gyroplane.

Inspect every control rod (2 horizontal and 4 vertical) for straightness, cracks or damage.

Inspect the control fork for cracks or damage.

Replace the bearings of the control columns (8x).



Replace the bearings of the control fork.



Replace the rod end bearings of the vertical rods (8x).

Assembly the new rod end bearings so as to obtain the following measurements between centres:

Upper rods:

- Right: 900mm.
- Left: 882mm.

Lower rods:

Right and left: 770mm.

Replace all bolts and nuts of the control system, 10 for the horizontal rods and 10 for the vertical rods.

3.1 Inspection of front wheel fork



Inspect the front wheel fork for straightness, cracks or damage.

Lift the nose of the gyro up and verify that the fork is free to rotate by hand.

Check for excessive play in the suspension rubbers

3.2 Inspect the steering control rods for straightness

Inspect the steering control rods for straightness through the front wheel hole and inside the cockpit.

3.3 Inspect the pedals





Inspect the front and rear pedals for straightness, cracks or damage.

Verify the absence of play.

3.4 Inspect the system
Inspect the entire rudder cable for wear or damage. Inspect the rudder cable pulleys for free motion and damage . Inspect the conditions of the cable retainers of the rudder.

3.5 Verify rudder cable tension	
	Verify rudder cable tension. With the front wheel straight, the tension should be between 45 and 55 pounds. It is important that the tension of this cable is within limits to avoid rudder flutter at high speeds. Adjust the tension by tightening the turnbuckle near the rear pedals. Secure it again with safety wire. After adjusting the cable , check the offset of the rudder

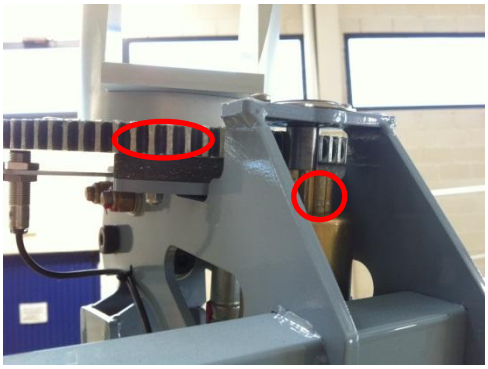
3.6 Replace rudder control cable.
Replace the rudder cable and turnbuckle.

4.1 Verify tension of bolts	
	Verify the tension of all bolts of the rotor head.

4.2 Inspect the rotor head	
	Inspect the rotor head for cracks. Inspect the rotor head for deformities or twisting using a ruler.

4.3 Adjust tightening of roll and pitch pivot bolts	
	Adjust the tightening of roll and pitch bolts. Tight them up to 20N/m and slacken about ¼ of turn, or sufficiently to operate the controls easily. Secure with a new safety pin.

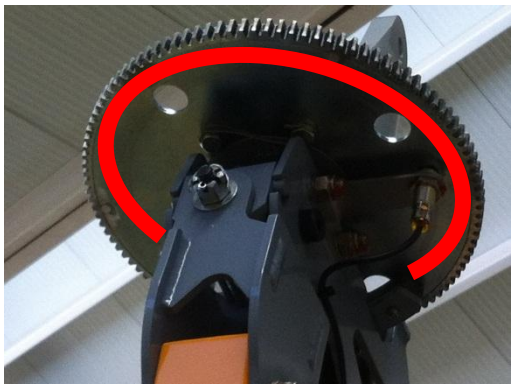
4.4 Grease the roll and pitch pivots	
	Grease the rotor head pivots with Molycote grease or Big foot grease Push the greaser until you see the grease coming out of the pitch and roll bolts . Clean off excessive grease .

4.5 Inspect prerotator ring gear and bendix pinion	
	Inspect the prerotator ring gear and its starter gear and pinion for wear or damage.

4.6 Grease the prerotator	
	Engage the starter gear with the ring gear and grease the interior body of the starter gear and pinion with Tac-2 spray grease or similar .

4.7 inspect the top bearing of the starter gear	
	Check the top bearing for wear and replace if needed

4.8 Inspect the rotor brake pad	
	Inspect the brake pad for excessive wear or damage. Replace if needed

4.9 Clean/de-grease the ring gear and rotor brake.	
	Clean/de-grease the ring gear and rotor brake.

4.10 Replace rotor head bolts	
	Replace the rotor head bolts and nuts . Check tension

4.11 Inspect teeter towers (only by approved staff)



Disassemble the teeter towers, clean the interior of the hole of the main gear axle and inspect it carefully for cracks, use a lantern. Oil it with WD-40 to prevent rusting.

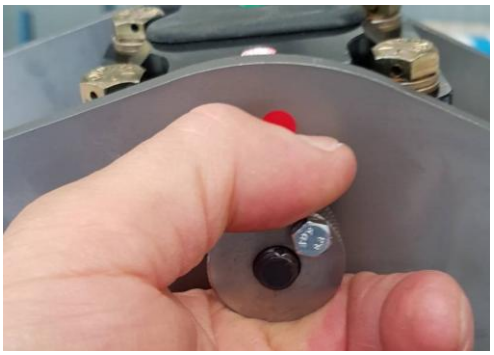


Clean and inspect carefully the teeter towers for cracks or damage.



4.5 ROTOR

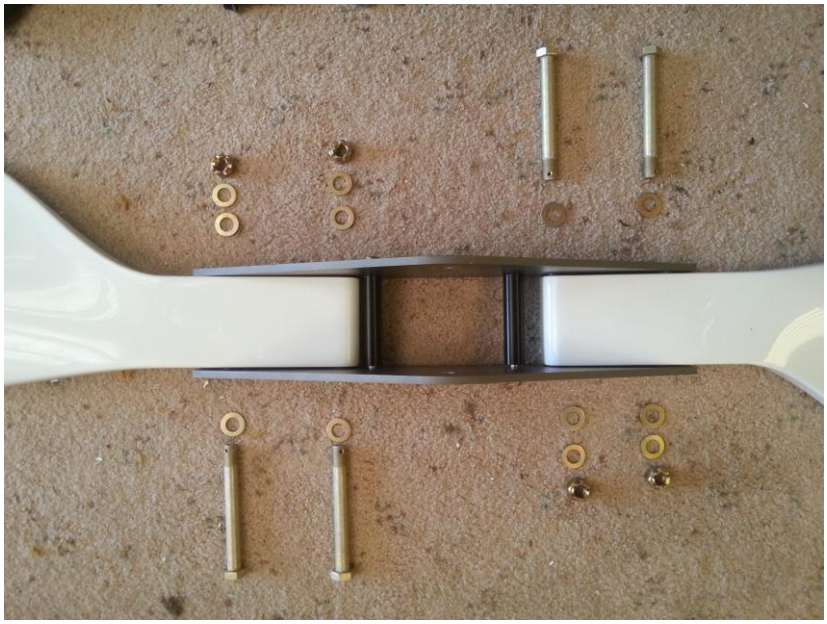
5.1 Inspect the rotor
Visually inspect the rotor blades for cracks, wear, deformities… Visually inspect the hub bar for cracks, wear, deformities…

5.2 Verify tightening of teeter bolt	
	**Old style , using castle headed nut** Tight the nut to 2 N/m then align the slot in the nut with the next split pin hole on the bolt . Secure with a new safety pin.
	**New style teeter nut** Only do up the lock nut to Hand tight

	Instructions : Hold the lock nut with multi grips and tighten the M5 lock bolt to 6 NM . Make sure the lock nut can't turn on the bolt and then insert a new split pin .

5.3 Perform general inspection of the rotor (only by approved staff)	
	Disassemble the rotor from the gyroplane and put it over trestles. Disassembly the bearings from the block and replace. Mark each rotor blade with its side of the hub bar. Mark the block with the hub bar. Remove the rotor blades from the hub bar. Check for cracks or damage





Assemble and rebalance

5.4 Check rotor blade balance

It is very important to have smooth rotor blades on a gyroplane , out of balance rotor blades can cause damage to the gyroplanes mast and instruments .

It usually takes up to 20 hours for a new set of rotor blades to find there centre and stretch into place .

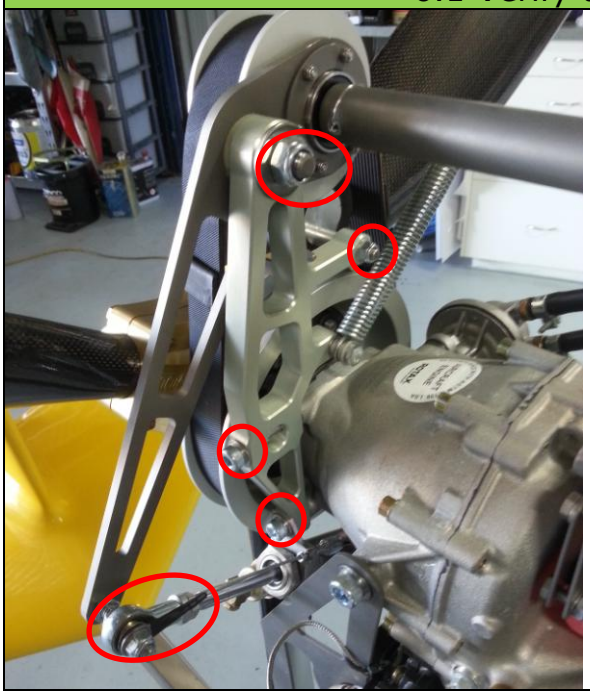
It is Mandatory for a new set of rotor blades to be check balanced at or before 25 hours

5.5 Verify rotor blade bolt tension

It is important to check the rotor blade bolt tension ,loose bolts can cause severe rotor shake .

Torque AN8 rotor blade bolts to 72 Nm

4.6 PREROTATOR

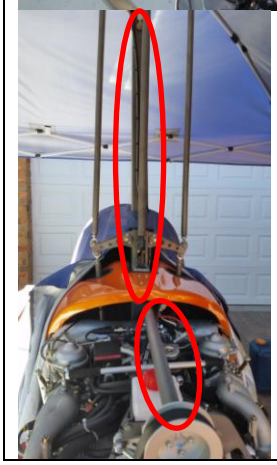
6.1 Verify tension of bolts	
	Verify tension of the prerotator bolts.

6.2 Inspect the prerotator



Inspect the prerotator tensioner and bracket for cracks or damage.

Inspect the belt for damage or deformities.



Inspect the horizontal and vertical shafts for cracks or deformities.

6.3 Replace the belt

Remove the propeller and replace the belt. Install new bolts (6x) in the propeller.

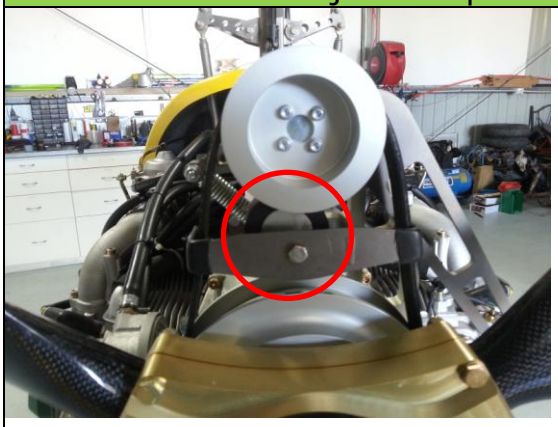
6.4 Adjust the prerotator cable



Adjust the length of the prerotator cable .

With the parking brakes ON, throttle in idle position pull the prerotator lever, the distance should be 12 cm.

6.5 Adjust the prerotator rubber pulley stop



Adjust the prerotator´s brake rubber pulley stop if needed.

The small prerotator´s pulley must rest on the rubber pulley, so the prerotator´s shafts will be braked.

Adjust the height of this part turning eccentric pulley.

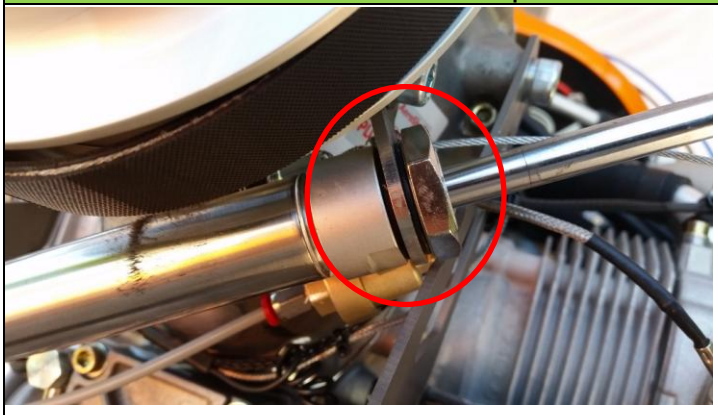
6.6 Inspect the universal joints for play



Inspect the universal joints for excessive play.

Hold the vertical shaft and gently try to turn both ways to check the play of the joints.

6.7 Inspect the O-rings



Inspect the O-rings for damage.

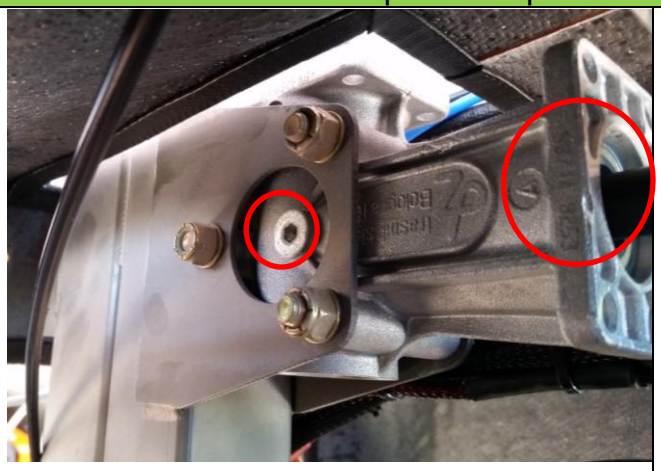
Replace the O-rings when needed.
When installing, use Loctite 243 and tighten gently by hand.

6.8 Check the rod end bearing for play



Check the rod end bearing for play .

6.9 Inspect the prerotator gear box.



Verify that the prerotator gear box has not oil leaks.

In case of leaks replace the oil seals.

6.10 Replace the bearing of the tensioner

Replace the bearing of the tensioner.
Grease with Molycote before assembling.

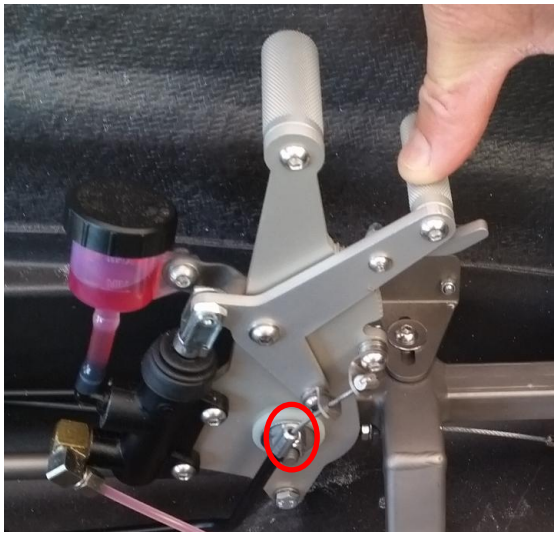
6.11 Replace the prerotator cable bowden
Replace the prerotator cable Bowden

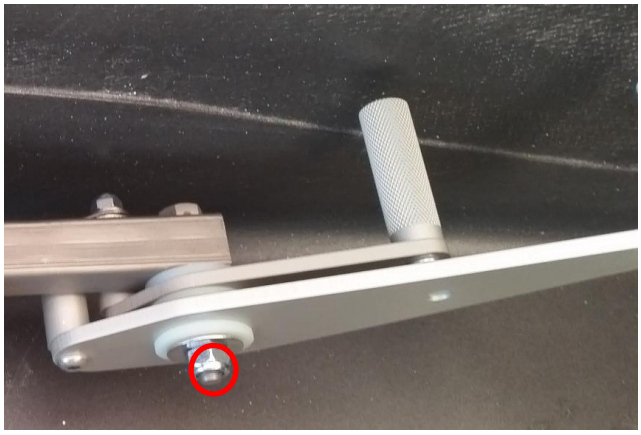
4.7 THROTTLE AND CHOKE SYSTEMS

7.1 Inspect the system for smooth operation
Operate the throttle from idle to full power position to confirm a smooth operation.

7.2 Inspect the levers for damage
Inspect the front and rear levers for damage or malfunction.

7.3 Adjust the levers friction.





Adjust the friction of throttle levers for smooth operation. If the friction is too strong, it is difficult to operate with precision, if it is too slack it will move by itself during flight.

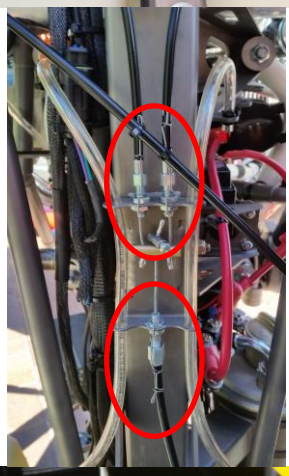
Adjust the brake lever friction for smooth operation and with no play.

7.4 Inspect the choke system

Operate the choke system to confirm its smooth operation.

7.5 Inspect the locking wires







Inspect the safety locking wires of throttle and choke systems. Replace if necessary.

7.6 Adjust carburettor synchronization
Adjust the carburettor synchronization according with the latest issue of the Rotax maintenance manual.

7.7 Replace Bowden cables
Replace carburettor and choke Bowden cables. Afterwards, it is necessary to re-adjust the carburettor synchronization.

4.8 LANDING GEAR

8.1 Inspect tyres	
	Verify tires pressure: - Front wheel: 21 psi. - Main wheels: 27 psi . Check the tires for wear, replace when needed. Inspect the wheel rims for cracks or damage.

8.2 Verify tension of landing gear bolt	
	Check tension of the 4 bolts that fix it to the frame and re-tight the bolts that fix the wheel axles.

8.3 Check wheel bearings	
	Check all wheel bearings for excessive play . Replace if needed .

8.4 Inspect landing gear
Inspect the landing gear for cracks or damage.

8.5 Brake pads
Inspect the wheel brake pads for wear, replace when needed.

4.9 VARIOUS

9.1 Inspect tail plane
Inspect tail plane and rudder for cracks or damage.

9.2 verify tension of tail plane attachment bolts	
	Check tension of tail plane attachment bolts (4x).

9.3 Replace tail planes bolts
Replace tail planes bolts, use Loctite 243 to secure them.

9.4 Verify conditions of windscreens
Verify the absence of scratches or cracks. Polish them often with “Meguiars Mirror Glaze”. or Mr sheen polish

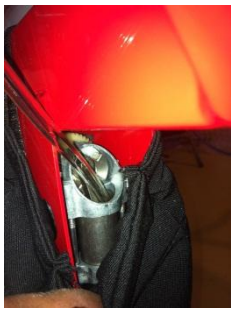
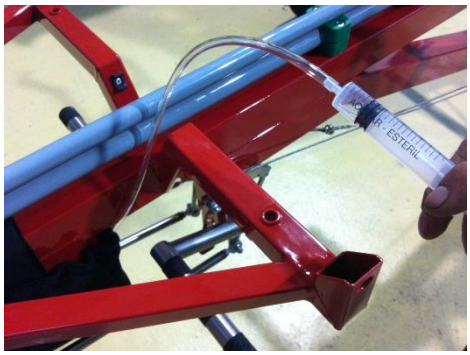
9.5 Verify placards
Verify all placards, when fitted, are readable and in good condition, replace if necessary.

4.10 ELECTRICAL/PNEUMATIC SYSTEMS

10.1 Inspect the harnesses
Inspect the routing and connections of the electrical and pneumatic harnesses for damage, wear, replacement of cable ties…

10.2 Check the battery
Check the battery for any leaks or cracks

10.3 Instrument panel
Remove the instrument panel for cleaning and inspect all wires and connections for damage, wear…

10.4 Oil the compressor	
 	Lubricate the compressor (new system) with engine oil. Remove the cover of the compressor and lubricate it with 3 or 4 drops of engine oil.

4.11 PROPELLER

11.1 Inspection of the propeller
Inspect the propeller blades and hub for cracks or damages.

11.2 Verify tension of the propeller bolts
Check tension of all the propeller bolts.

11.3 Propeller pitch
Verify that the pitch of all propeller blades are the same.

11.4 Replace the propeller bolts
Replace the 6 propeller bolts of the centre of the hub.

11.5 Overhaul
Send the propeller to TAG Aviation or the propeller manufacturers factory for overhaul.

4.12 ENGINE

The instructions for the engine maintenance and servicing are not included in this manual. To carry out engine maintenance appropriately, please refer to the updated engine maintenance manual.

12.1 Verify the sealing of engine bolts
Check the tension of the engine bolts.

12.2 Replace the engine silent-blocks
Replace the engine silent-blocks.

12.3 Replace the engine attachment bolts
Replace the engine attachment bolts.

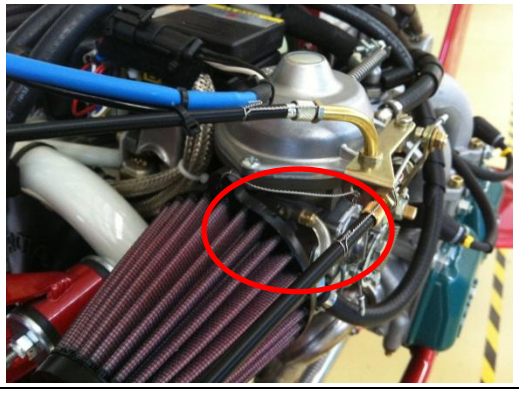
12.4 Inspect the safety locking wires of air filter(s)



Inspect the safety locking wires of air filter(s).

Safety locking wires in 914 UL air filter.

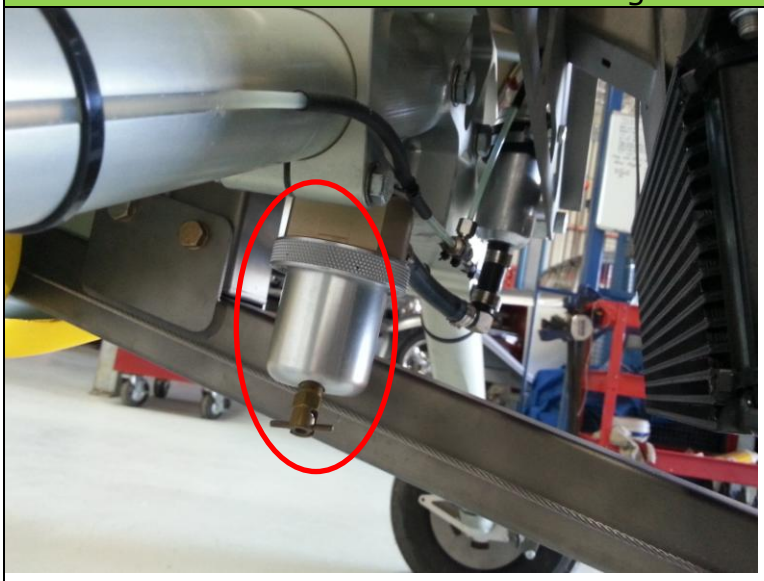




Safety locking wire in 912 ULS air filters.

12.5 Inspect the exhaust system
Inspect the exhaust system for cracks or damage. Inspect the after muffler for cracks or damage. Replace the springs and safety wire of the exhaust system of the 912 engine.

4.13 FUEL SYSTEM

13.1 Clean the gascolator	
	Open and clean the gascolator and filter. Lock wire or paint movement marks

13.2 Clean the filters of the 914 pumps	
	Carefully remove the fuel filters inside the electrical fuel pumps of the 914 and clean them.

13.3 Inspect hoses
Inspect the routing of the fuel hoses for wear or damage.

13.4 Replace the fuel hoses.
Replace the fuel hoses and clamps.

13.5 Perform fuel tank test
procedure: - Fill the tank completely with fuel. - Open the outlet of the tank and measure the time to get one litre. - The max. time to get one litre to flow should be less than **40 seconds.**

4.14 COOLING SYSTEM

14.1 Inspection of the system
Verify the absence of leaks in the system. Inspect the conditions of the silent-blocks of the cooler. Check coolant level, the black tank should be full, the white tank should be filled to one fifth. Inspect the rubber washer and spring of the cap of the black tank.

14.2 Replace the silent-blocks
Replace the Vibration-blocks of the cooler.

14.3 Replace hoses and coolant
Replace the rubber hoses and clamps of the system. Replace the coolant. (See Rotax engine´s maintenance manual for approved coolants, 50%water / 50% pure antifreeze.

4.15 OIL SYSTEM

15.1 Inspection of the system
Verify the absence of leaks in the system. Inspect the hoses for wear or damage.

15.2 Replace hoses
Replace the hoses and clamps.

Section V – FUNCTIONAL TEST FLIGHT

5.1 FUNCTIONAL TEST FLIGHT

A functional test flight (FTF) should be done every year. This test determines whether the gyroplane or its equipment is functioning according to established specifications while the aircraft operates in its intended environment. A FTF is to be performed when it is not possible to determine proper operation by a ground test.

5.2 WEIGHT LIMITATIONS AND BALANCE

It is the pilots responsibility to know the weight limitations and the balance of the gyroplane before each flight .

Never exceed the MTOW and Never exceed the maximum pilot weight , doing so can overstress the frame and mast structure .

The gyroplane is registered with standard equipment , any upgrades or additions to the standard equipment must be added to the gyroplanes registered weight before each flight .

This gyroplane is fitted with storage compartments , if luggage is added to these storage compartments , the weight of the luggage and or any extras , options and additions forward of the rear seat such as listed in the table below must be deducted from the maximum pilot weight .

Any luggage ,options and extras forward of the front seat must be calculated by a factor of 1.5

Any options and extras forward of the front instrument panel must be calculated by a factor of 2.

Example

If you fit the larger 15x600x6 front wheel ,this is 2,330kg heavier than the standard 400x4 front wheel .

Multiply 2.330kg by a factor of 2 equals 4.660 kg.

Deduct 4.660kg from the maximum 120 kg pilot weight .

This reduces the Maximum pilot weight to 115.34 kg .

5.3 STANDARD EQUIPMENT

1. Rear brake lever.
2. Joystick front and back seat
3. Key-lockable glove box
4. 3 blade Bolly propeller
5. 27.25 ft carbon fibre rotor blades
6. Electro-pneumatic rotor brake and pitch trim
7. Mechanical roll trim
8. Hydraulic wheel brakes with parking system
9. 83 litre fuel tank
10. Landing light
11. 12V power outlet plug
12. Oil thermostat
13. Extra electrical fuel pump in 912 ULS engine
14. Propeller protector. (stone guard)
15. Storage compartments (196 litres).
16. 4 point harness seat belts

INSTRUMENTATION

1. Airspeed indicator
2. Vertical speed indicator
3. Altimeter
4. Rotor trim/ brake pressure
5. Rotor tachometer
6. Engine tachometer
7. Cylinder head temperature
8. Oil temperature
9. Oil pressure
10. Fuel level indicator
11. Hour meter

Listed in the table below are the weights of many of the additions and upgrades to help with the calculations in determining the MTOW and Maximum pilot weights .

WARNING

Never exceed the MTOW.

Never exceed the Maximum pilot weight .

Doing so may overstress the frame and mast of the Gyroplane .

5.4 Table : weights of additional equipment , extras and options.

	Description	Weight	Factor of 1.5	Factor of 2	Total
1	Xcom 760 VHF radio , antenna and harness	1.010 kg	1.515 kg		
2	Funke ATR833 VHF Radio, antenna and harness	1.070 kg	1.605 kg		
3	GME TX3100 , Antenna and harness	0.720 kg	1.080 kg		
4	Rear instruments	1.700 kg			
5	Instrument sun visor	0.750 kg	1.125 kg		
6	Large front wheel 15 x 600 x 6	2.330 kg		4.660 kg	
7	Funke Transponder Mode S	0.754 kg	1.131 kg		
8	Large rear wheels 600 x 6	5.000 kg			
9	Rear mud flaps	0.780 kg			
10	Epirb ?	?			
10	Flycom helmet	0.775 kg			
11	4 blade Bolly propeller , add extra	1.110 kg			
12	GPS ?	?			
13	Ipad mini , mount and power supply	0.487 kg	0.730 kg		
14	Ipad pro 10.5 , mount and power supply Luggage ?	0.650 kg	0.975 kg		
15	Gyro cover	1.100 kg			
16	28ft Rotor Blades. ADD	1.550 kg			
17	Vertical card compass	0.310 kg	0.465 kg		
18	Nav /Strobe lights ?	?			
19	Manifold pressure Gauge	0.160 kg	0.240 kg		
20	EGT	0.250 kg	0.375 kg		
21	Fuel pressure Gauge	0.215 kg	0.322 kg		
22	4 Blade Bolly propeller	1.100 kg			

23	Rotor bag	0.230 kg			
	TOTAL				

Test Nº	Description	Results/Comments	Done
1	Weights		
	Aircraft weight:		
	Fuel weight:		
	Pilot weight:		
	Pilot equipment:		
	VHF /UHF Radio:		
	Options & extras:		
	Luggage :		
	Passenger weight:		
Test Nº	Description	Results/Comments	Done
2	Ground test Test manoeuvring stability, steering, throttle and wheel brake systems.		
3	Prerotator Test the prerotator system for correct function.		
4	Take off Take off with full power using a standard technique described in the POH. Note any unusual characteristic.		
5	Engine power/propeller pitch Note the max engine rpm climbing at Vy (50 Knots)		
6	Instruments Check every flight or engine instrument,		

	check radio/intercom for correct function.		
7	Climb Note the time required to climbing 1000 feet. Airport elevation: QNH: Temp:		
8	Controls Test rotor and rudder controls in flight. Note any unusual characteristic.		
9	Speeds Test general stability at speeds from 0 to 90 Knots		
10	Trim Test trim function at speeds from 0 to 90 Knots		
11	Landing Land with engine at idle speed and note any unusual behaviour.		

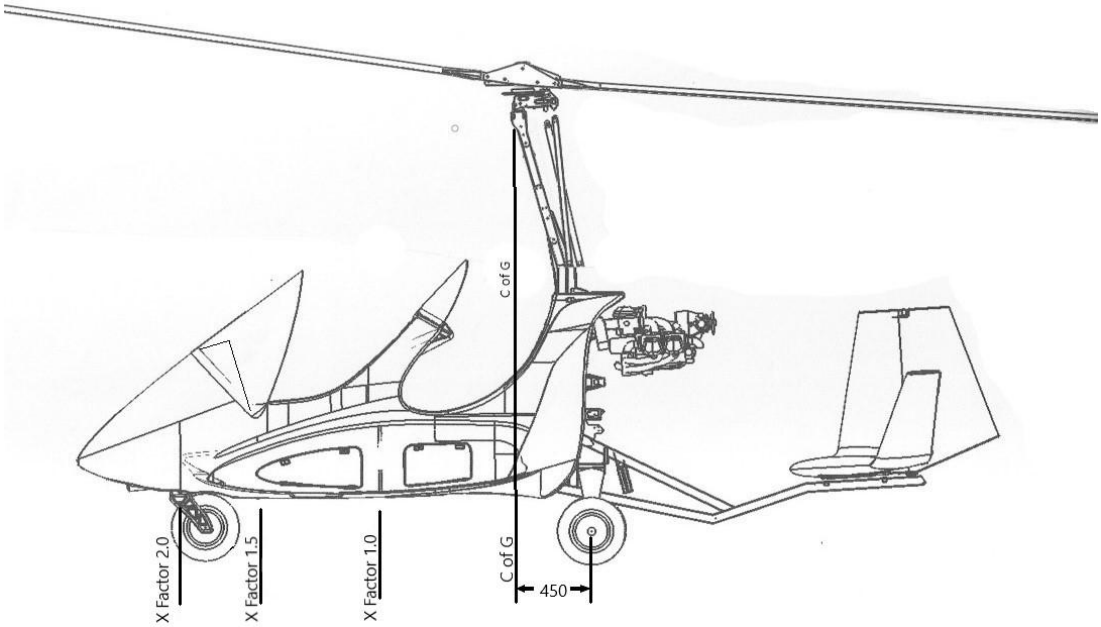
5.5 WEIGHT & BALANCE REPORT

Model Serial Number:		
Date of Manufacture:		
Engine Fitted:	Rotax 912 ULS (100HP)	Rotax 914 (115 HP) and Rotax 912 uls Turbo (137 HP)
Weight Empty:	268 kg	274 kg
MTOW:	575 kg	575 kg
Vne:	100 Knots	100 Knots
Minimum Speed Vmin	30 Knots	25 Knots
Fuel Capacity:	83 litres	83 Litres
Unusable Fuel:	1 litre	1 Litre
Cockpit Load:	Minimum Front: 70 kg	
	Maximum Front: 120 kg	Maximum Rear: 125 kg
Ballast:	Pilot minimum weight, front cockpit: 70 kg	
Useful Load:	307 kg	301 kg
Maximum Storage Compartment Weight:	Front: 5kg Each Side.	Rear: 8kg Each Side.

Caution: Combination of Pilot and Luggage Weight must not exceed Maximum Pilot weight.

Hang Test:	**Rotax 912 ULS (100HP)**
One Person Minimum Weight:	3.4 Degrees Nose Down.
Two People Maximum Weight:	8.4 Degrees Nose Down.

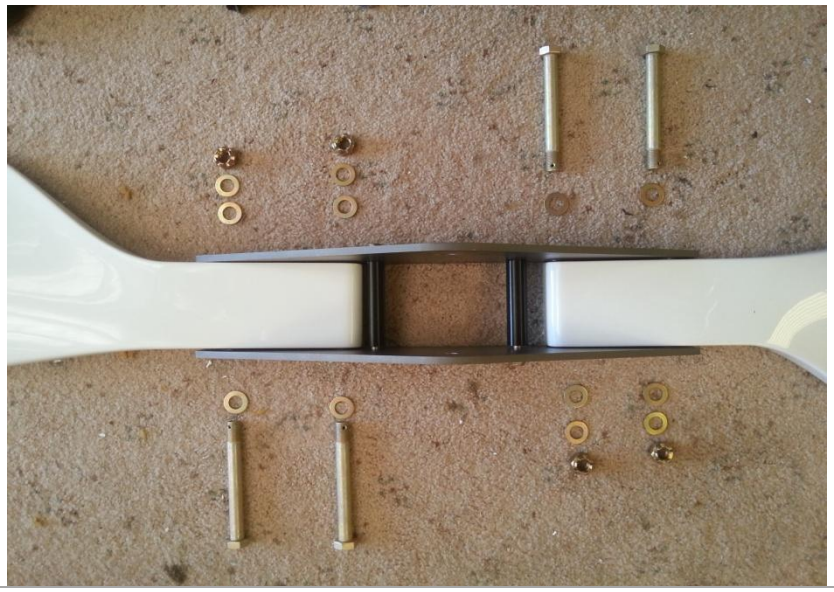
C of G
X Factor 1.0 means any additional equipment added to standard equipment multiply by a factor of 0ne.
X Factor 1.5 means any additional equipment added to standard equipment multiply by a factor of 1.5
X Factor 2.0 means any additional equipment added to standard equipment multiply by a factor of 2



Comments/Remarks:

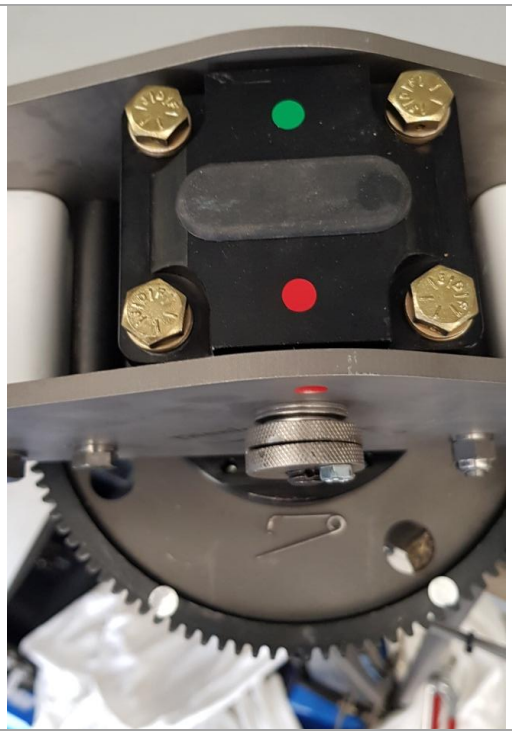
Date:	Location:
Pilot Name:	License Nº:

Section VI - Instructions for Rotor blade assembly

Step 1	 
	Instructions : Place both rotor blades on tables with conning angle and insert the AN-8 bolts with washers and nuts . Only do up the nuts so they just touch the hub bar at this stage If the hub bar is already attached to the blade marked with a yellow dot then the above only applies to the blade that you are attaching .

Step 2	
	Instructions : Prepare some wooden blocks with the 2 outer ones cut on an angle
step 3	
	Instructions : Remove the 2 x Nylon teeter stops and bolts and place the wooden blocks between the blades and tap down the outer 2 blocks with the tapper so that it pushes the 2 rotor blades apart and hard against the bolts . NOTE : best to put some paper between the wooden block and the rotor to protect the paint .

Step 4	
	Instructions : tighten the nuts to 72NM
Step 5	
	Instructions : Replace the 2 x nylon teeter stops and bolts , only do up these bolts so you just can't turn them with your fingers (over tightening will change the balance of the blades)

Step 6	
	Instructions : Lift the assembled rotors onto the rotor tower and Insert the teeter bolt from the green side with 2 washers under the head and 2 washers behind the lock nut . .
Step 7	
	Instructions : Only do up the lock nut to Hand tight

Step 8	
	Instructions : Hold the lock nut with multi grips and tighten the M5 lock bolt to 7 NM . Make sure the lock nut can't turn on the bolt and then insert the split pin .