

**EVOLUTION AIRCRAFT INC.**  
**REV**  
**Operating and Maintenance**  
**Instruction Manual**  
**Version 1.0**  
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## **Introduction:**

**REV is a STOL (short takeoff and landing) single seat trike powered by a Polini Thor 250 engine. Its most notable key features are NO FRONT STRUT, All wheel suspension and it Folds onto an available REV trike dolly cart for set up and storage in under 10 minutes.**

**Components used are of the highest quality and technology on the market today. From the battery to the engine, from the bolts to the Powder Coat, only the Best of the Best is used.**

**The Polini Thor 250 engine is dual ignition, liquid cooled, counterbalanced crankshaft (for super smooth running) with a gear box and centrifugal clutch. This system has proven to be the highest quality, best running engine in its class. The Polini provides plenty of power at 36.5 HP for impressive climb and continuous cruise.**

**Stopping power comes from the available Black Max Super STOL braking system utilizing 2 calipers and 4 brake pads all on one rotor!**

**The suspension comes from 4 "flex rods". The entire front end is a swing arm giving the nose wheel equal travel. The entire front end disconnects and "unplugs" to fold the trike in lieu of a folding mast. In its folded form the rear wheels are lifted off the ground creating a counterbalance effect which makes putting the wing up and down quite effortless.**

**Instrumentation comes from a super bright color display from MGL . The Xtreme EFIS provides valuable information about the engine and flight.**

**Features include:**

- 1. Cantilever mast with no front strut required (standard)**
- 2. All wheel suspension (standard)**
- 3. Quick fold cart for easy storage (available)**
- 4. MGL Xtreme color instrument panel (standard)**
- 5. Tundra tires (Available)**
- 6. Electric start and pull start (standard)**
- 7. Earth X lithium battery. (standard)**
- 8. Dual hydraulic disc brake (Available)**
- 9. 4130 Chrome Moly high reinforcements in high stress areas**
- 10. Real Aircraft seat belt**
- 11. Extra padded seat cover (Available)**
- 12. 3/4" chrome moly front axle (standard)**
- 13. AN aircraft hardware throughout (standard)**
- 14. Tefzel aircraft wire (standard)**
- 15. Cannon plug for quick disconnect (standard)**

# Folding the Trike



Click the link below to see how to fold the trike

<https://www.youtube.com/watch?v=20l8Dh0BCdE>

# **To fold the trike:**

- 1. Disconnect throttle and wiring**
- 2. Lift nose wheel and slide the cart underneath the REV**
- 3. Use bungee cord to lift the front of the cart and attach it to the swan catch to help line up pins that secure cart to frame**
- 4. Install 2 cart/frame pins**
- 5. Release bungee cord and allow cart to lock its rear wheels against drag links of the REV's suspension**
- 6. Secure control bar into the chalices of the cart**
- 7. Remove front end of trike by removing the 2 speed pins that hold it on**
- 8. Lower the cart to the ground**
- 9. Remove the tip battens**
- 10. Fold in the sprogs**
- 11. Loosen the haul back cable**
- 12. Remove all battens except for the nose battens and the longest root battens**
- 13. Ensure the prop is vertical and Ensure engine is cool to the touch**
- 14. Fold wing back (Chock wheels on dolly cart for ease) Either using 2 people walk the tips back towards each other or connect both ends of a 40' rope to each wing tip strap and pull the center of the rope back for single person folding**
- 15. Once the wing is folded, Carefully pull the fabric up and over to the outside of the folded wing**
- 16. Insert wing standoffs between the cross tube and the roll cage mast at the very rear of the trike**
- 17. Roll up fabric and secure with straps**
- 18. Secure front end in cart for storage**
- 19. Walk right wing out a few feet and turn prop horizontal by turning it counterclockwise, then bring the right wing back in so that the prop is above both wings**
- 20. Pad the prop where it contacts the cross tube/leading edge of the wing**
- 21. Tie wings together to press and hold the wing standoffs in position**

## **Engine**





The Polini THOR 250 is distinguished by being liquid cooled with dual ignition securing an extraordinarily consistent performance and higher performance characteristics at every rpm. With its small size and extremely compact layout, the new THOR 250 has an extraordinary power to weight ratio. The cylinder is cast in aluminum alloy and provides greater thermal stability and is Nickel-silicon coated; It is particularly resistant to wear and abrasion, reducing friction on the piston. The piston is gravity cast in light alloy with high silicon content. It allows for thermal expansion, reducing the coupling play. The design of the piston crown is specific to optimize the compression ratio. The advanced technology and the high performance of the new THOR 250, is more powerful, dynamic, responsive and sensitive to the flight. Also the THOR 250 is provided with a balancer; feature that cancels the vibrations guaranteeing flying comfort never experienced in flight and a longer life in this class of motor. Polini has addressed a great attention to safety. The THOR 250 adopts the centrifugal clutch in oil bath totally mechanically reduced with helical teeth. The counter rotating weight significantly decrease the torque effect as well.

**Click the link for the Engine manual**

[http://www.flying-expert.com/menu/ewExternalFiles/Munuale\\_Polini\\_250.pdf](http://www.flying-expert.com/menu/ewExternalFiles/Munuale_Polini_250.pdf)

## TECHNICAL LIST

### THOR 250 DUAL SPARK

<b>Polini Engine</b>	<b>2 stroke single cylinder</b>
<b>Cooling</b>	<b>Liquid cooled</b>
<b>Bore for stroke</b>	<b>72mm x 60mm</b>
<b>Displacement</b>	<b>244 cc</b>
<b>Power</b>	<b>36.5 HP at 7500 R.P.M.</b>
<b>Cylinder</b>	<b>Aluminum with Gilnisil coating</b>
<b>Compression ratio</b>	<b>11.5:1</b>
<b>Piston</b>	<b>Two chromium plated rings mm 1</b>
<b>Intake</b>	<b>Reed valve in the crankcase</b>
<b>Carburetor</b>	<b>Polini PWK</b>
<b>Air filter</b>	<b>Air box</b>
<b>Ignition 1</b>	<b>Electronic</b>
<b>Ignition 2</b>	<b>Electronic with battery</b>
<b>Battery charger</b>	<b>Output power 80 W at 5500 RPM</b>
<b>Spark plug hood</b>	<b>5k <math>\Omega</math> resistance</b>
<b>Fuel type</b>	<b>Lead free fuel with 50:1 synthetic oil</b>
<b>Gear reduction unit</b>	<b>Helical teeth in oil bath with 2.8 reduction ratio</b>
<b>Starting</b>	<b>Electric starter + pull start</b>
<b>Clutch</b>	<b>Centrifugal clutch in oil bath</b>
<b>Muffler</b>	<b>Expansion with oval silencer</b>
<b>Engine weight</b>	<b>43lbs without radiator</b>
<b>Propeller rotation</b>	<b>Clockwise</b>

## Engine Basics:

# Fluids:

The Polini Thor 250 requires **50:1 premixed** 2 stroke **Synthetic oil** and **91minimum** (93 recommended) **lead free fuel**. The gear box requires a **SPECIAL OIL** Recommended is **Use Shell Advance Gear SAE 10 W 40 API GL-3**

# Re-torque

It WILL be necessary to re-torque the head bolts of the engine at 1 hour, 5 hours, 25 hours, 50 hours and every 100 hours of use.

Torque is **12 Nm (105 inch pounds) for the head screws and 18 Nm (160 inch pounds) for the head nuts.**

## Torque prop to 100 inch pounds

During preflight it is important to look for any obvious leaks or loose bolts

# Starting:

**Warning:** make sure hand throttle is set to idle and foot throttle is returned to idle. It is strongly recommended that you are seat belted into the pilot seat when starting the engine

1. Turn the key clockwise to turn the master switch on.
2. Bright light should illuminate on black control panel on left side of seat
3. Move switch forward to "ON " position
4. Press start button

The engine will normally start easily without the use of the remote choke when temperatures are above 50F

# Life span

It is recommended to rebuild the engine every 300 hours

12- SERVICING TABLE	
Every use	Check the bolts and screws tightening Check the silent-block conditions
After the first 10 hours	Replace the gear oil Check the carburation
Every 50 hours	Replace spark plug NGK BR 10 ES Clean the air filter Replace the gear oil
Every 100 hours or every year	Check the starter wearing and eventually replace the rope and the lockpins Replace the air filter Replace the starter rope and the lockpins Replace the diaphragm and clean it Replace the silent-block Replace the fuel system pipes replace muffler springs Check the reed valve
Every 100 hours	Check the piston, the piston rings and the small end bearing Decarbonize and clean the decompression hole
Every 150 hours	Remove the gear and check the clutch and bell wear Replace the piston, the piston rings and the small end bearing replace the silencer deadening material Replace the reed valve
Every 300 hours	Replace all the bearings and seals Replace the crankshaft Replace the cylinder

TECHNICAL SCHEDULE	THOR 250	THOR 250 DUAL SPARK
Polini engine	2-stroke monocylinder	2-stroke monocylinder
Cooling	Liquid cooled	Liquid cooled
Bore for stroke	72 x 60	72 x 60
Displacement	244 cm3	244 cm3
Power	36 HP at 7500 R.P.M.	36,5 HP at 7500 R.P.M.
Cylinder	aluminum with Glinisil coating	aluminum with Glinisil coating
Compression ratio	11,5:1	11,5:1
Piston	Two chromium plated rings (mm 1) -	Two chromium plated rings (mm 1) -
Intake	Reed valve in the crankcase	Reed valve in the crankcase
Carburetor	Ø 28 bowl carb.	Ø 28 bowl carb.
Air filter	Air box	Air box
Ignition 1	Electronic with possible battery charge	Electronic
Ignition 2	-	Battery fed
Battery charger arrangement	output power: 80W at 5500 rpm	output power: 80W at 5500 rpm
Spark plug hood	5k resistance	5k resistance
Fuel type	Lead free petrol with 2% synthetic oil	Lead free petrol with 2% synthetic oil
Gear reduction unit	Helical teeth in oil bath with 2,8 reduction ratio	Helical teeth in oil bath with 2,8 reduction ratio
Starter	Pull starter with self-winding rope-FLASH STARTER (electric starter as OPTIONAL)	Electric+Pull starter with self-winding rope -FLASH STARTER
Clutch	Centrifugal in oil bath	Centrifugal in oil bath
Muffler	Expansion with aluminum silencer	Expansion with aluminum silencer
Engine weight	18 Kg (19 Kg with elect. starter) without radiator	18,5 Kg (19,5 Kg + electric starter) without radiator
Propeller rotation	Clockwise	Clockwise

13. ENGINE PROBLEM DIAGNOSTIC	CAUSE	SOLUTION
The engine doesn't start	Out of petrol	Add petrol
	Petrol doesn't reach the carburetor	Check the fuel system circuit
	Old or wrong petrol	Empty the tank and the fuel system circuit and replace the petrol.
	Flooded engine	Remove the spark plug, start the engine, dry or replace the spark plug.
	Defective spark plug	Replace it
	Blackened or wet spark plug	Clean and dry the spark plug or replace it
	Earth switching off cable	Check the tightening
	Spark plug hood wrong installed	Check it
	Carburetor has problems	Clean and check it; eventually replace the diaphragm
	No spark	Check the ignition, coil and wiring
The engine doesn't idle	Dirty carburetor	Clean and check the carburetor
	Out-of-adjustment screws	Calibrate the carburetor again
	Defective spark plug	Replace it
The engine doesn't reach the maximum rpm	Wrong carburetion	Calibrate the carburetor
	The carburetor has problems	Clean and check it; eventually replace the diaphragm
	The reed valve has problems	Replace the reeds or the whole reed valve
	Dirty air filter	Clean or replace it
	Dirty exhaust	Clean or replace the deadening material
Engine revs up when idling	Out-of-adjustment screws	Calibrate the carburetor
	Air through the gaskets	Replace the gaskets and seals

TIGHTENING TORQUE VALUE for ENGINE BOLTS AND SCREWS	M	N.m	Kgf.m	Lbf.ft	Locking compound
HEAD SCREWS	6	12	1,2	8,8	
HEAD NUTS	8	18	1,8	13,2	
CLUTCH NUT	20	100	10	74	
CRANKSHAFT NUT (IGNITION SIDE)	12	80	8	39	
PROPELLER CENTRAL NUT (LEFT THREAD)	10	80	8	39	
SPARK PLUG		20	2	14,8	
CRANKCASE SCREW	6	8	0,8	5,9	
COUNTERSHAFT NUT	12	60	6	44,2	
INTAKE MANIFOLD LOCKING SCREWS	6	8	0,8	5,9	
MUFFLER STUDS NUTS	8	18	1,8	13,2	LOCTITE 270
SILENCER LOCKING SCREWS	8	15	1,5	11,1	LOCTITE 243
MUFFLER LOCKING SCREWS	8	15	1,5	11,1	LOCTITE 243

STANDARD TIGHTENING TORQUE VALUE	N.m	Kgf.m	Lbf.ft
5MM BOLT AND NUT	6	0,6	4,44
6MM BOLT AND NUT	10	1	7,40
8MM BOLT AND NUT	25	2,5	18,50
10MM BOLT AND NUT	45	4,5	33,30
12MM BOLT AND NUT	55	5,5	40,70

ENGLISH

ENGLISH

# Engine Details:

**INTRODUCTION** Read this use and maintenance manual carefully throughout before flying with your new engine. This manual contains important information that will help you to achieve the best satisfactions with the use of the Thor engine. To ensure care-free and satisfying usage you must get to know your new engine thoroughly and set it up correctly before you start using it.

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## **1 - GENERAL**

Polini Motor and the distributor decline any and all responsibilities whatsoever - either direct or indirect - for the use of the engine, above all in the case the engine is modified or manumitted by third parties. Polini does not assume responsibility for damages caused by little servicing or wrong assembly, excluding the pieces from the warranty. Any technical modifications introduced by the buyer assumes all the responsibilities for possible damage; spare parts for any modification are not under warranty. We advise you that any engine modification made by the buyer or the removal of original parts may make the engine dangerous to be used!

The user is invited to respect and follow what is written in the use and maintenance manual for their own, and third parties safety. When you use this engine you are making a very dangerous action, so you may have the maximum care before, during and after flying, in order to avoid serious accidents. We invite you to be careful to prevent accidents or damages and to keep always in mind that:

- The engine can't solve all the flight problems, so it is important to avoid dangerous maneuverings. One of the most common errors is to fly over zones where it is not allowed to land; you have always to take into consideration the possibility of engine failure or the need to make an emergency landing. It is forbidden to fly over built-up areas, urban centers, to drop things or liquids when flying.
- The lack of engine power can disturb the flight stability: the engine could stop suddenly and you may be obliged to make an emergency landing on a safety area.

Before using it, for your own and third parties safety, it is necessary to be sure that the weather conditions are good, or at least adequate for safety of flight, in order not to compromise the engine working well. Rain or unfavorable weather conditions, besides being dangerous, could also damage the engine, not allowing proper operation. It is not allowed to use the engine when raining or with strong wind. Only fly if the wind and its direction and the conditions grant a safe flight. It is important to check the weather forecast for the hours close to the flight and to know the takeoff and landing areas. Because of the risks inherent to the engine use, and the flight, Polini doesn't give any warranty against accidents, breakings, injuries or death. Flying always requires great attention. Be aware that you fly at your risk. Before every use check the condition of your engine. This engine is not covered by any insurance. By using it you automatically assume all the risks inherent the Weight Shift control sport or the personal responsibility towards damages to yourself or to third parties, accidents, injuries or death. We invite you to carefully read the instructions contained in this manual since they are helpful for a better knowledge of the products and the use itself and useful to prevent and contain the risks.

## WARRANTY

All the Polini engines are manufactured with high quality materials which grant a product without defects, under the conditions that the buyer purchases the products from a Polini authorized dealer **VALIDITY OF THE WARRANTY**

**The warranty is valid for a period of 12 months from the date of purchase by the end user.**

It is necessary to activate the warranty by filling the form out (see last page) and keeping the payment slip or the invoice.

## COVERAGE

The present warranty covers the engine damages caused by defective parts, in shape or materials, for projects not in conformity with the use indicated, wrong assembly by the manufacturer. The warranty includes spare parts only. Delivery costs are charged to the user.

The warranty doesn't cover damaged caused by:

- - Engine modifications not approved by Polini;
- - Wear and tear of the parts;
- - Carelessness, lack of servicing, accidents, installations or wrong maintenance;
- - Accidental falls or engine fall or of its components;
- - Engine improper use or misuse;
- - Assembly of parts or components not proper for the engine use;
- - Engine overheating or stop after long usage, beyond the term indicated by Polini;
- - Missing or irregular engine servicing as suggested by Polini, use of improper fuel or oils, presence of dirty parts or foreign bodies in the engine, even if sucked in.
- - Engine overwork because overloaded;
- - Use of propellers not certified by Polini
- - Deterioration of the engine or parts of it because of improperly storage;
- - Faulty engine assembly, including the use of not original Polini parts or coming from third parties;

### - Final user obligations

Claims shall be done by delivering the engine to a Polini authorized dealer. The user shall provide the original document that proves the purchasing or the warranty ticket authenticated by Polini or by its distributor. To keep the validity of the warranty the user shall carry out recurrent servicing according to the use and maintenance manual.

### Limited liability

Pursuant to this warranty, Polini's obligations are limited to the defective parts reparation or, at its discretion, to change one or more parts, necessary to remedy every malfunctioning caused by defective materials or labor covered by the warranty. Polini or the distributor can't be held responsible for problems or damages to persons/things/ animals during the engine life. We remind you that this product **is not certificated and it is only dedicated to experimental aircraft** and that it can break or suddenly stop working. No warranty or compensation is foreseen for damages caused to:

- - persons/animals/things during the engine use
- - persons/animals/things caused by a collide with the propeller or with parts detached from the engine
- - frame, parts and/or propeller caused by the collide with parts coming out from the engine
- - costs for rescue, shipping, phone or rent after the collide, problems or loss of time, or other indirect damages.

**Danger! This not-certified engine can suddenly stop working.** The engine stop can require emergency landings causing injuries or death. The aircraft thrusts by this engine should fly in open spaces only or during the daylight. The buyer assumes all the risks for the use and he knows that by using it the engine can suddenly stop working. This product is not covered by products and public liability. Who flies with this engine or only switches it on assumes all the risks inherent to engine flying sport and all the

responsibilities for damages to things or persons or death caused by the use of this product.

On accounts of this, the guarantee does not cover damages caused by the installation of the engines on machines that requires certified engines, on machines that are not adequate, on machines that requires different type of engine. The vendor won't be responsible for damages caused by the users or third parties.

## 2 - FUEL

Thor is a 2-stroke engine that needs oil/petrol mixture. **Only use good lead-free fuel** purchased by a gas station with **93 octane**. Add good 2% **synthetic oil (50:1)** to the fuel. It is possible to use a 1,5% oil mixture with the following oils:

MOTUL 800-VALVOLINE RACING 2T FULL SYNTHETIC SAE 50 - BARDAL KXT - ELF 976 – ELF 909

**Never keep the fuel in containers for a long time because its quality will be degraded.** Only use certified metallic containers for fuel. Mix up the petrol with the oil ONLY when you are using it.

**WARNING:** The nature of the carbon deposits on the cylinder head, spark plug and exhaust port give important information about the fuel mixture burning in your engine. Remember that mixes that contain too much oil do not extend the engine's life.

**ATTENTION:** Fuel is extremely flammable and explosive. Carry out these operations in a well ventilate place and with the engine switched off. Refrain from smoking and avoid all naked flames or sparks where petrol is being drained or where re-fuelling is being performed.

For THOR engines you have to use a **high-octane** gasoline (**not less than US 91**)

## 3- ENGINE STARTING

Start the engine only when all is in good conditions and perfectly working and check that there aren't persons, things or animals around. Furthermore check that all the nuts are well tightened.

### 3.1- MANUAL STARTER

Fill in the fuel system till the petrol reaches the carburetor hole and then pump up three times (using the Polini manual bulb- Code 316.0016) to fill in the bowl. To start the engine pull upwards the black level placed in the upper side of the carburetor. Operate the starter without accelerating till the engine starts. Once it runs switch it off, disconnect the starter and start the engine again slightly accelerating. For your safety only start the engine after your harness has been COMPLETELY secured!

### 3.2- ELECTRIC STARTER

Fill the fuel system in as shown in the previous paragraph. If your engine is equipped with a Polini throttle control press the two black buttons together and slightly accelerate till the engine runs. If necessary operate the starter to make the engine starter easier when it is cold. If the engine is not equipped with a Polini throttle control please refer to the instructions of the vehicle's manufacturer to find out the switch on/off buttons.

### 3.3- THOR 250 DUAL SPARK ELECTRIC STARTER AND IGNITIONS TESTS

Fill the fuel system as indicated in paragraph 3.1. Thor 250 DUAL SPARK engine has a control console with a cut-out switch (photo 1) that must be fixed in a comfortable position and easy to be reached by the pilot.

The engine has two separated ignitions and the console let you check the correct working of both the ignitions. When the ignition is on OFF position the engine is switched off and the electric starter does not work. By moving the switch to ON position the led will light.

Use the central black key (START) to start the engine. After having started the engine keep KEY 1 pressed to disable ignition 1 and it is possible to check the correct working of ignition 2. The engine must keep on working. Now release KEY 1. Repeat the test keeping KEY 2 pressed. It disables ignition 2 and it is possible to check the correct working of ignition 1. The engine must keep on working. Now release KEY 2.

Now to end the test press KEY1 and KEY2 simultaneously, so disabling both the ignitions. The engine now has to stop. Now start the engine again and it is ready to fly. NOTE 1: to switch the engine off in standard conditions use the switch moving the switch to the OFF position.

NOTE 2: The secondary electronic ignition works using the battery. This ignition, if fed, (switch in ON position) has an electric input even with the engine switched off. This input can discharge the battery in a few days. It is important to re-position the cut-out switch in OFF position. (LED switched off) NOTE 3: If the battery should be completely discharged it is possible to use the engine by starting it manually. Keep into consideration that till the battery does not reach a minimum charge level the engine will work with one ignition only.

**ATTENTION:** keep the switch in your hand during all the stages and be ready to operate it in case of any technical fault. If necessary keep it pressed till the engine has completely stopped. Once the engine starts we suggest testing the right functioning of the kill switch button. After having checked it, start the engine again without accelerating and without using the starter. Now start the engine and leave it idling until it warms up to normal operating temperature.

#### 4- RUNNING IN

It is possible to make a fast analysis of the carburetion by checking the spark plug color. To do it, switch the engine off after having run it for some second under charge. Remove the spark plug unscrewing it with the proper tool and verify the color of the porcelain that must be of light-brown color with tendency to dark. A light color of the spark plug electrode means a lean carburetion; if you use the engine in this conditions may cause the engine failure. Do not use the engine in these conditions and apply to an authorized retailer to set it up. Run your engine in as instructed below to ensure that the engine transmission bed in correctly and to ensure continuous reliability future. Once the engine starts, leave it idling until it warms up to normal temperature. **We suggest running the engine 15 minutes medium-low engine power output gently accelerating and with different intensity.** Now we suggest checking the correct idling calibration. During the first flights or for the **first 5 gallons of fuel we suggest not keeping the engine at the maximum rpm for too long.** **Do not stay at a constant rpm** even if of medium power. **We suggest varying the engine rpm.** Check the carburetion after the first landing. Repeat the running in every time you change one of the following parts: piston, piston rings, cylinder, crankshaft or main bearings.

#### 5- ENGINE SWITCHING OFF

Switch the engine off by pressing the button till the complete stop.

If the engine is equipped with the Polini throttle control the switch off button is of red color and you find it in the upper side; otherwise refer to the frame/throttle's manufacturer to find out the switch off button. For the Thor 250 Dual Spark move the lever of the control board in OFF position to disconnect simultaneously both the ignitions and switch the engine off

#### 6- CARBURETION

The carburetion setting must be executed by professional people only. Using a screwdriver, remove the filter cover and then the filter. Wash the filtering material with water and mild soap. Dry the filter carefully, and then moisten it with oil for filters. Clean filter box inside using a cloth and check the presence of foreign bodies. Now reassemble all the parts being careful to place correctly the 4 bars that maintain the filter in its position and tight the 4 screws again. Wash the filter for maximum 2-3 times and then replace it with a new one.

**WARNING.** If the filter becomes clogged with fine dust as well as normal dirt, replace it with a new one.

**WARNING.** Dirty air filters choke the engine and cause poor performance. Torn or broken filters can allow dirt to enter the engine and cause rapid deterioration of the piston rings, piston and barrel.

#### 7- CLEANING

Clean the engine when it is switched off and cold to avoid burns. Clean the engine with a soft cloth soaked with neutral cleansing and non-aggressive.

**WARNING:** Do not use acids that may damage the engine.

**8- CARRIAGE ATTENTION:** During the carriage of the engine it is strictly recommended to maintain the propeller locked together with its nut in order to avoid that the flange thread that sticks out may be damaged or in case of fall it might break the crankshaft.



## 8.1- CARRIAGE OF THE ENGINE WITH BOWL CARBURETOR

The bowl carburetor has a breather pipe studied to carry the engine when lying. To empty the carburetor unscrew half turn the breather brass nut (highlighted in photo 2 with an arrow) and wait till all the fuel enters the tank. Tighten the brass connection again. Now the carburetor is empty and you can lay the engine ready to be carried. **ATTENTION:** never unscrew more than half a turn the breather nut to avoid damaging the OR seal. Never tight too hard.

## 9- ORDINARY SERVICING

**ATTENTION:** THE SERVICING OPERATIONS MUST BE DONE BY QUALIFIED PEOPLE ONLY. IF THE INSTRUCTIONS MENTIONED BELOW WILL RESULT NOT CLEAR, WE SUGGEST ASKING FOR SPECIALISTS BY POLINI MOTORI RETAILERS OR WHOLESALERS. FOLLOW CAREFULLY WHAT DESCRIBED BELOW.

Maintenances and servicing necessary for the best set up of your engine should be done regularly, or on all occasions before you start your engine. All the tasks and adjustments described below can be done easily by following the instructions given in this manual. Refer to your POLINI MOTORI dealer for scheduled services and repairs, and insist that only original spare parts are used to replace worn or broken components. Refer to the servicing tables in sections 12 below for the frequency with which the various servicing operations must be performed.

### 9.1- REMOVE AND CLEAN THE AIR FILTER

Dirty air filter is one of the most common causes of poor engine performance. Clean the filter periodically or change it. Remove the filter loosening the clamps, unscrew the 4 screws

### 9.2- CHECKING OF THE GEAR OIL LEVEL

Operate when the engine is cold. Maintain the engine in vertical position and remove the oil level screw on the transmission crankcase. (photo 3). **Check that the oil level reaches the lower edge of the level hole.** If there is too much oil, let it flow out from the hole until it stops flowing and collect the oil in a suitable container. If there is not enough oil, top up as required through the breather hole located at the top. After checking it, tighten the screws. **Use ELF Moto Gear Oil 10 W 40 ANTI Clutch Slippage or Shell advance gear SAE 10 W 40 API GL-3**

### 9.3- GEAR OIL REPLACEMENT

Change the oil when the engine is cold. Unscrew the screw on the lower side of the clutch/gear group (Photo 3-A). Collect the oil flowing out in a suitable container. Wait till the oil has completely flown out and, if necessary, tilt the engine to the side to make this operation easier. Tighten the screw tight. Unscrew the breather pipe in the top side of the crankcase and fill it out with 100cc of ELF Moto Gear Oil 10 W 40 ANTI Clutch Slippage oil. Fit the pipe and its tube again. As an alternative you can use also oil: Shell advance gear SAE 10 W 40 API GL-3 or an oil with 10W40 viscosity compatible with clutch (similar to motorcycle engine oil)

**WARNING:** Do not throw used oil into the environment. Dispose of it correctly through authorized collection points.

### 9.4- STARTER ROPE REPLACEMENT (Flash Starter)

Remove the starter from the engine unscrewing the 4 screws (Photo 4). Remove the handle rope. Be careful since the central wheel will turn till the spring is completely discharged: keep it and discharge it slowly to avoid damages or possible injuries. Remove the central screw and its cover (photo 5). **Attention!** Under the cover there are two teeth for the starter jaw (check their condition and if worn replace them); under them 2 small calipers. Be very careful not to lose these small parts. Prepare the new rope and tie a knot at the top. Remove the plastic wheel and the old rope. Thread the new rope in its hole (photo 6), wind up the rope on the wheel (according to the entrance sense of the rope on the wheel) (Photo 7). Now insert the plastic wheel in its housing again, and check through the hole that the internal spring hook is perfectly coupled (Photo 8), place the springs, the teeth for the starter jaw and screw the cover again using medium thread-locker. All the parts in movement, including the springs, must be well lubricated. Now go on by charging the return spring: take the head of the rope leaving 10-20 cm coming out the hole with “u” shape on the wheel side. Turn the wheel three times in counter clock-wise until it stops in front of the exit hole on the aluminum case. Keeping the plastic wheel stopped, pass the rope through the case hole. Insert the handle and the washer and tie a single knot as shown in photo 9.

**ATTENTION:** verify that the return spring does not reach the end of the stroke. Pull the rope completely and turn the wheel again to check that it can make at least one turn before stopping. This test is very important because the spring hasn't been studied to reach

the end of the stroke and, if it happens, the spring will break. Reassemble the starter in the engine and tight the 4 screws (M5) with strength (see the tightening torque values table).

### 9.5- HOW TO CHECK THE COOLING SYSTEM LEVEL

Periodically check the cooling system: when the engine is cold the coolant must reach half of the bottle. If necessary add some liquid, using the one specific for aluminum radiator.

**ATTENTION:** never open the cap when the engine is hot, you could get burned.

### 9.6- HOW TO EMPTY THE COOLING SYSTEM

If necessary empty the cooling system by unscrewing the proper screw (see photo 10) and collect the leaking liquid. Remove the cap to make this operation easier.

**ATTENTION:** Do not empty it when the engine is hot, you could get burned.

### 9.7- HOW TO FILL IN THE COOLING SYSTEM

Fill in the cooling system using coolant specific for aluminum radiator until the reservoir is 3/4 full. For systems with low radiator make the air exits from the breather screw of the 90° pipe fitted on the head (photo 11).

## 10- OPERATION WHEN FLYING

Maximum acceleration is recommended only to take off (full power) or when really necessary! In order to avoid a poor mixture from acceleration/ascent to level flight conditions, loosen the engine till a descending phase and then gradually accelerate again till achieving a level flight or a glide angle or any desired angle. In this way you will be sure to maintain firm and efficient carburation, avoid being over rpm with a minimum valve/throttle opening. **We remind you that two stroke engines do not stand full throttle for extended periods of time. Take care of your engine by varying the throttle.** This way the engine will have constant performance during its life.

### 10.1- TEMPERATURE THERESHOLDS

Your engine is equipped with a thermocouple to read the water temperature to which it is possible to connect a specific instrument (928.830.003) that detects the water temperature, the rpm and the operation hours (not supplied) (Standard operating temperatures: min & max. **130F-185F**). If you use the engine in cold weather conditions and the water temperature does not reach the minimum of 130° we suggest you should install a thermostat with 140°F opening (code 928.830.009). Eventually the EGT temperature can be checked using a proper gauge. The EGT temperature detected in this position in standard conditions of use should be around 932F-1148F maximum temperature 1200F.

## 11- ENGINE FITTING ON THE FRAME

Fix the engine on the frame using the two h. 60 aluminum spacers supplied which must be positioned in the bottom (photo 13). Fit the spark plug on the head and the water connection with the two screws and OR provided. Place the propeller mounting flange and secure it with the supplied nut using a 19 bush and lock it with a torque wrench to **60 Nm using medium threat seal. (Photo n.14)** Connect the fuel pipe to the tank. To prevent any residue of dirt entering the carburetor it is recommended to put a fuel filter (not supplied). Furthermore connect a breather pipe from the reservoir system to the tank. Rotate the filter case and fix it firmly to the frame using the hole made on the outside.

## COOLING SYSTEM

We recommend you should install the radiator in the higher side than the cylinder (see assembly diagram A). Fix the big bracket supplied between the two vibration-dumping mountings at the top and the frame (see pic.15). Fit the two rubbers on the bracket and place the radiator. To fix the radiator in the top side a bracket and a rubber are provided; the bracket has to be then connected to the frame using some brackets (not supplied)

Using the special steel clamp place and fix the water charging bottle at least 50 mm. above the radiator. Cut to size the water pipes and mount them. Close the supplied clamps using special pliers for its fitting (see photo 16)

It is possible to place the radiator even in the bottom (see diagram B). To facilitate the passage of the water tube on the head you will have to use a special 90° connector - cod. 928.225.004 (not supplied) and if the tubes should be too short purchase new ones: 16 x 23 tube no. 928.230.002; 4 x 6 tube no. 143.230.001; cod 6 x 9 no.928.230.004 pipe sold in 1 mt. long piece. In this case you should be very careful to radiator position that must have a proper housing and a strong fixing. Fill the cooling system using coolant specifically designed for aluminum radiators up to 1/2 of the water charge bottle. For the circuit with low radiator let the air go out of the 90° breather placed on the head. See Photo 17.

Check the level and proceed with the bleeding operation after having run the engine for the first time that must be done by connecting the choke wire to the carburetor. Connect the switch-off wire that comes out from the coil to an earth-connected switch. Then start the engine for a few seconds; stop the engine, check the level and if necessary top up with liquid.

### **IMPORTANT WARNINGS**

If for technical or constructional requirements the radiator has to be mounted in a different location than those suggested, it is recommended the utmost attention to the passage of the water pipes that must not have tight folds and they should not facilitate the formation of air bubbles inside the cooling system. If so add some air breathers.

### **THOR 250 DUAL SPARK**

The engine is supplied with all the electrical connections already engaged. It is anyway necessary to fix on the engine the ignition box in a proper position so that it does not suffer any vibration. Connect all the red wires with eyelet to the battery positive pole and the black cables with the eyelet to the negative battery pole. For any doubt please refer to the attached electrical schedule.

## **11.1- ENGINE WITH ELECTRIC STARTER**

The REV uses an Earth X Lithium battery. **Warning: DO NOT USE A DESULFINATING BATTERY CHARGER TO CHARGE THE BATTERY AND NEVER JUMP THE BATTERY**

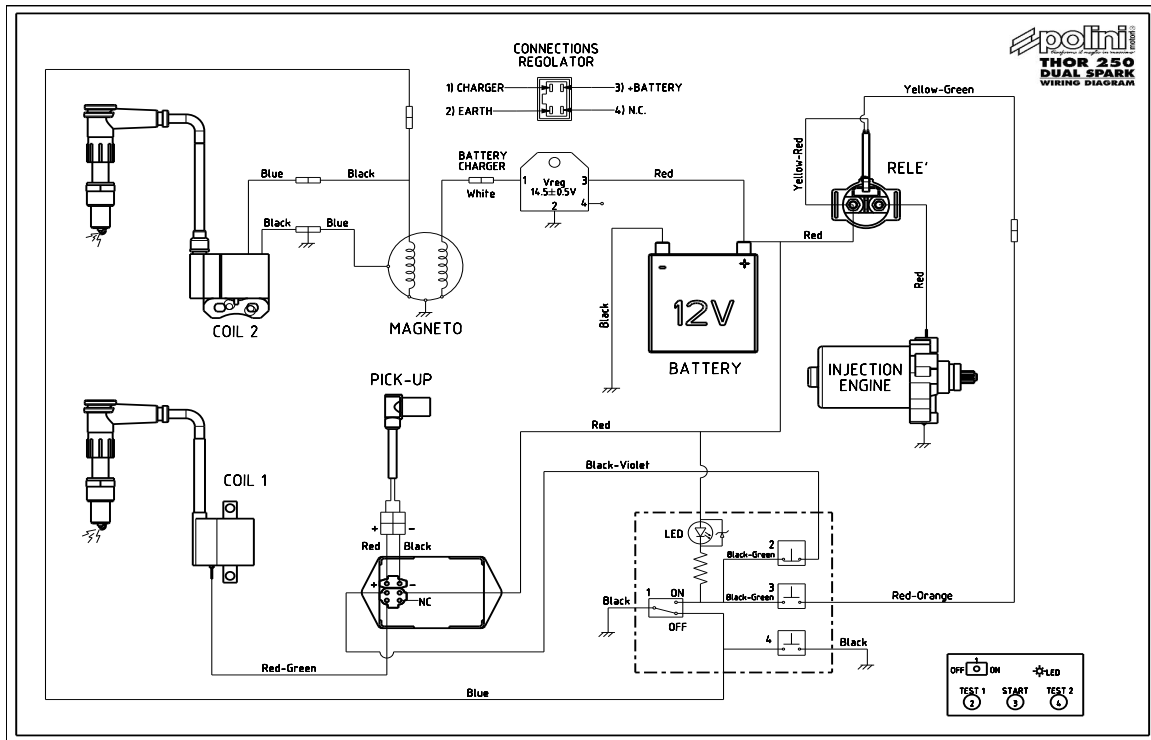
## **11.2- FUEL SYSTEM**

Prearrange the frame with a proper tank and its pump to let the fuel reach the carburetor. Connect the fuel pipe to the manifold on the carburetor, fix it using a clamp and verify that there is no air coming in.

## **11.3- THROTTLE CONTROL**

Fix it to the carburetor by using the proper support (not supplied). After assembling the throttle control, check that its travel is enough to reach the carburetor throttle valve opening and check that recovery is good in order to avoid the engine staying accelerated. Connect the electrical wires of the throttle, one on the mass wire of the coil and the other on the + of the coil (female connector)

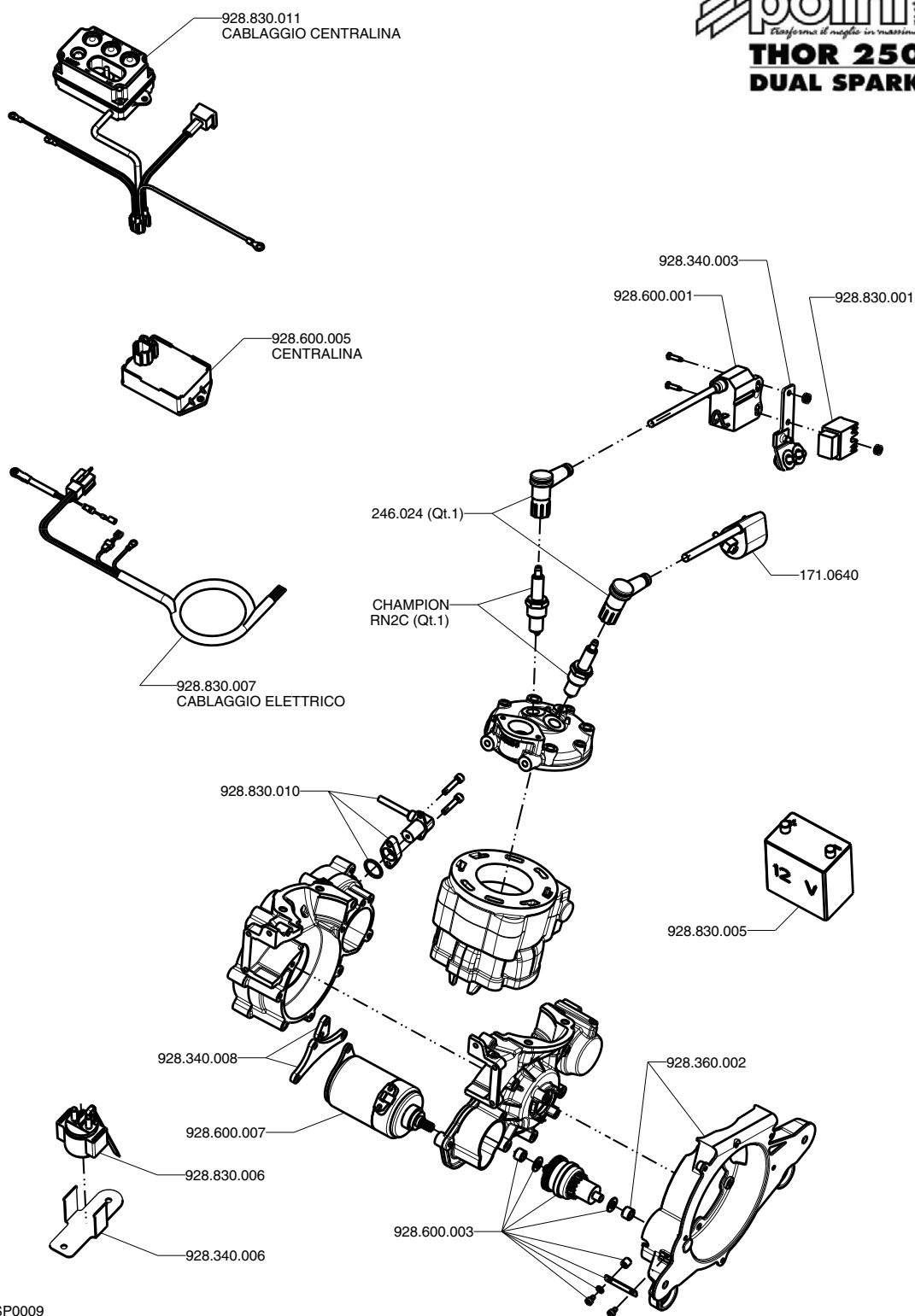
# Wiring Diagram:



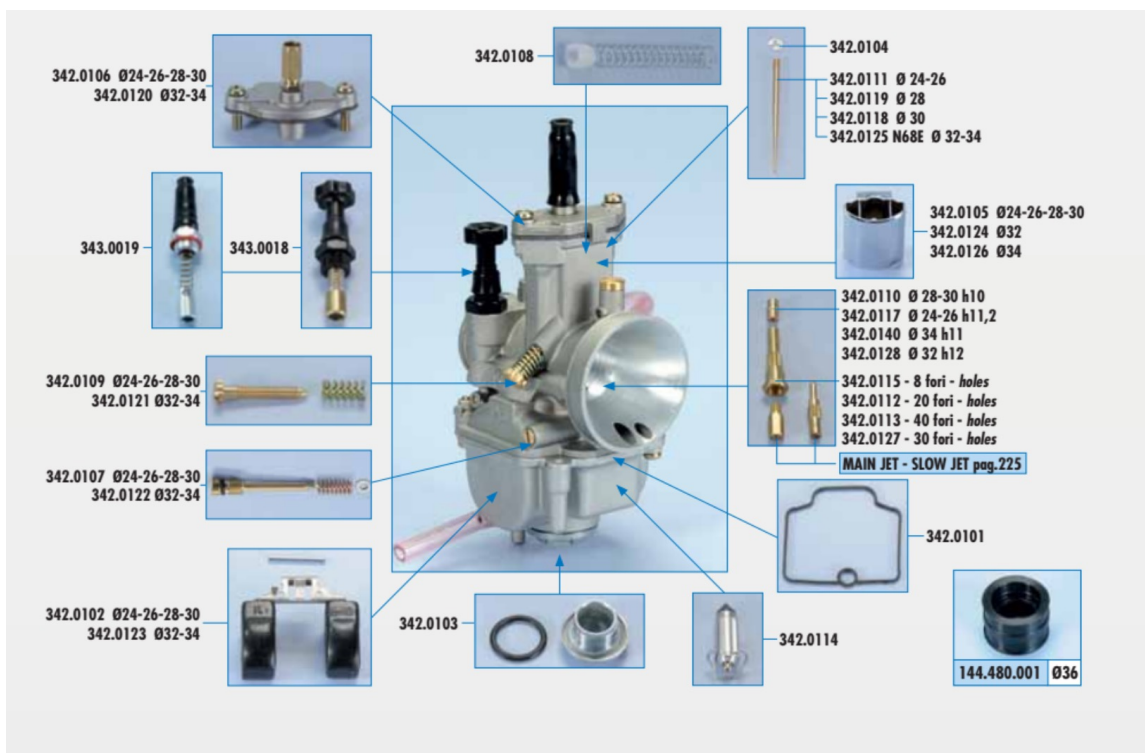


**(Zoom for details in digital format)**





ESP0009



# Prop

Any running propeller can present a potential danger for the pilot, the passenger and/or the spectators. Never let non pilots touch the propeller, even when the engine is stopped. Always be extremely careful as soon as an engine equipped with a propeller may turn.

Warning: before turning the propeller with the hand, always verifying attentively that the driving ignition is off.

**NG-D propellers => max 3000 RPM Max power : 36.5 hp on engines with a reduction gear** The clean carbon propeller with a sponge using some water with soap, or a window cleaner.

- **Maintenance before each flight: visual inspection of the propeller and check of the screws**
- **Periodic maintenance: check torque every 25 hours of flight or every 3 months TORQUE 100 inch pounds**

If an incident or prop strike require repair, this must be approved by Hélices E-PROPS in its workshops, or by a specialist after discussions with the E-PROP Team.

All the blades have a reference number and a serial number. These references are important for determining with the E-PROP team what modifications or the possible replacement in necessary. The final checks of the propeller, and in particular balancing, are made by Hélices E-PROPS before the delivery. Any modification of the propeller can damage the balancing and generate vibrations which could damage the engine.

In case of incident, please contact Hélices E-PROPS as soon as possible.

**Hélices E-PROPS** Aérodrome de Sisteron 04200 Vaumeilh – France ☎ 33 (0)4 92 34 00 00 - [helices@e-props.fr](mailto:helices@e-props.fr) [www.e-props.fr](http://www.e-props.fr)



# EFIS MGL Xtreme

For complete instruction manual click here:

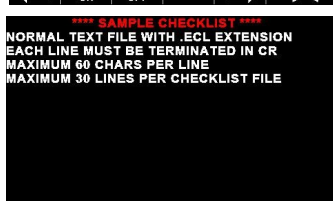
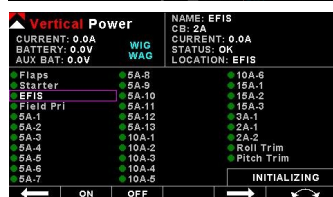
[http://mglavionics.com/html/xtreme\\_efis.html](http://mglavionics.com/html/xtreme_efis.html)



## XTreme - EFIS

Electronic Flight Information System

Operating Manual – English 1.07



# Basic Features

- Powerful 32 bit ARM processor
- 4.3" high resolution 480x272, sunlight readable, wide viewing angle, 600 nits TFT LCD display
- LED backlight (brightness can be adjusted for low light flying conditions)
- SD Card interface for data recording, user splash screens, checklists, graphic information pages, firmware upgrades, navigation and route files etc
- 1/8" NPT female fittings for Altitude and Airspeed pitot tube connections
- Rotary control plus 5 independent buttons for easy menu navigation and user input
- External active GPS antenna connection
- Built in RTC (Real Time Clock)
- Wide input supply voltage range of 8 to 30V DC
- Built in voltage reversal and over voltage protection for harsh electrical environments
- Light weight design

# Optional Features

- Optional BLight pressurized fuel gauge
- Optional MGL Avionics compass sensor unit (SP2/SP6)
- Optional MGL Avionics AHRS sensor unit (SP4/SP5/SP7)

# System overview

The RDAC (where all the sensors run to) is located behind the pilot seat just opposite of the battery. This design keeps all of the sensor leads short and without the need of extension cables and keeps the wiring lighter and simpler. This RDAC (brain box) is easily accessible by removing the pilot seat by removing the 4 bolts that secure it to the frame. *NOTE due to imperfection in the seat mold, the rear left seat bolt corner has 2 washers that shim the seat in order to make the seat perfectly straight. Be sure to reinstall these washers when putting the seat back in* Most of the sensor wires are very small gauge and can come loose during the life of the machine. Simply retighten any loose sensor wires if a sensor appears to fail. The RDAC is completely labeled making it very simple to figure out. The RDAC has a green blinking light which indicates it is getting power when the key is turned on. If it is not blinking green it is probably not getting power and will not work without being powered. There are only 3 wires which are bundled together in a single shielded cable that connect the RDAC to the EFIS (monitor). If an RDAC fail notice displays on the EFIS, it is referring to a connection break between the EFIS and the RDAC or lack of power to the RDAC. All of the parameters (VNE caution temperatures and warnings are fully programmable under the menu settings. There are 5 different screens to scroll through, but it is recommended to turn off 3 of the 5 screens which are

not useful for the REVs set up. These other screens include satellite info and artificial horizon. This leaves a screen with large, easy to read round dials for flight instruments and a screen with mostly easy to read bar graphs for engine monitoring. When only 2 screens display it allows the user to use the left square button to toggle between the 2 screens instead of having to go through all 5 screens to get back to the other useful screen.

## Using the EFIS

Pressing the left button will scroll between screens

Pressing the round knob in will bring up a menu. Turning the knob to highlight and then pushing in to select will allow you to navigate the system.

Barometric pressure is located in the top right corner of the EFIS display. Turn the rotary control to change the local pressure setting. The local pressure can be displayed in mB or in "HG. This is used to set the altimeter to MSL or AGL Note: this must be checked and adjusted before each flight in order for it to be accurate

CHT (cylinder head temperature) and EGT (exhaust gas temperature) alternate in the same location. **CHT must remain below 170F and EGTs must remain below 1200F.** these are important to monitor. If one of these temperatures goes too high a red WARNING box will appear and flash on the screen.

Tachometer is displayed on the right side of the screen. Full throttle should yield between 7000-7500 RPM

Airspeed may or may not be accurate and needs to be calibrated. Using the GPS and making different headings comparing the GPS to the airspeed it is possible to calibrate the airspeed. We recommend your airspeed be set to 120% as a base value to get closer to a correct reading. The value can be adjusted up to 150%

Ground Speed This is labeled GS EFIS display. The ground speed value will only be displayed when a valid 2D or 3D GPS fix has been achieved.

VSI is vertical air speed or the rate in which climbing or descending. + means it is climbing and - means it is descending

Hobbs meter tells the number of hours on the engine which is important for scheduled maintenance

Voltage shows the battery voltage when the engine is off and the charging voltage when the engine is running. Keep in mind the voltage is higher (13.1-13.6 volts) than expected lead acid battery voltage.

# Wing:

For complete instruction manual click here:

<http://northwing.com/Mustang3-Wing-Manual.pdf>

# Braking System

## **WARNING: this system does NOT use brake fluid**

The brake system is a combination of a Matco master cylinder which uses an internal “intensifier kit” with a black Max caliper system.

Bleeding the brakes should be done by **pressure bleeding** the system with ATF (automatic transmission fluid). Fluid should be added with some form of a pressurized container (pump sprayer or oil can) with a hose that secures firmly around the lowest bleed screw on the caliper. Loosen Allen set screw at top of caliper to allow all air to escape from the system as ATF fluid is injected into the lowest bleed on the caliper. When all air has escaped, tighten the top bleed screw. Then loosen the large set screw in the top of the Master cylinder and continue to pump ATF fluid into the caliper until all the air is out of the master cylinder. Then tighten large setscrew and the bleed screw supplying the ATF fluid. **Caution:** tightening the setscrew may cause the caliper to activate the brake pads. Ensure the brake pads are not dragging by elevating the nose wheel and spinning the wheel. If the wheel does not spin freely, loosen the large setscrew in the master cylinder while pressing the brake pedal down until a small amount of fluid leaks out. Then tighten the setscrew and test again. Once the wheel spins freely make sure the pedal is hard and not spongy

## **To replace the brake pads:**

1. Elevate the front wheel by putting something under the frame such as a stool with padding
2. Loosen all 8 Allen head screws in the triple trees (horizontal CNC fork tube clamps)
3. Once fork tube and nose wheel are free, remove the bolt that go through the port (left) side of the axle
4. Remove the through bolt that secures the caliper to the axle
5. Loosen the setscrew that tightens the caliper to the axle
6. Slide the caliper with the free floating rotor off the axle
7. Separate the rotor from the caliper
8. Remove the piston side brake pad first and then the other
9. Install new pads and reverse steps for reassembly

# Support Cables

The 5 support cables on carriage can be removed easily by locating which nut to remove first. The angle of the bolts that secure the cables are orientated in such a way that as one of the nuts is loosened it will relax the cable being removed. The tension of the cables is controlled by twisting the cables. Twisting counterclockwise tightens the cable by shortening its overall length and clockwise loosens it. This tensioning method is effective and lighter and simpler than adding a tensioning mechanism. When replacing a cable try and get the cable snug so that it is difficult to expose only 3-4 threads on the bolt that secures it. Start the nut by hand onto the 3-4 threads and then carefully tighten down the nut with a 7/16" socket and wrench which will start to tension the cable even further. When the nut is all the way down the cable should be extremely tight. CAUTION: the X brace behind the pilot seat must be done at the same time in order to not rack (shift) the frame.

# BATTERY

**WARNING:**  
**DO NOT CHARGE WITH A DESULFATING BATTERY CHARGER**

**Do NOT use Schumacher battery chargers with Earth X batteries.**

**Recommended to Use the simple noncomputerized 1-2 amp battery charger. These are readily available as the cheapest chargers on the shelf at Walmart and auto part stores.**

Model: ETX12A,

Nominal Voltage	13.2 V
Ah (Lead-acid equivalent)	12
Ah (1 hour discharge rate)	4 (1C rate)
Pulse Crank Amps (PCA)	220A (3 sec @ 25 °C, voltage >9V)
Cold Crank Amps (CCA)	135A (modified SAE test, 3 sec@ 0°F, voltage >7.2V)
Max Continuous Discharge Amps	40A
Standard Charge Voltage	13.9 - 14.6 V
Maximum Charge Voltage	15 V
Recommended Charger/Maintainer Amps	.8 - 5A
Max Charge Amps	20A (from vehicle charging system)
Life (Charge cycles)	4000 cycles @ 1C discharge rate, 25°C (20% depth of discharge) 2000 cycles @10C discharge rate, 25°C (80% depth of discharge)
Life (Years)	8 Years

Weight	1.3 lb. (.6Kg)
Dimensions	ETX12A 4.5in x 2.6in x 3.7in (113mmX66mmX95mm)
Environmental Rating (resistance to water intrusion)	IP 66 (wash down with a high pressure washer)
Operating Temperature	-30 °C to +60 °C
Storage Temperature	-40 °C to +70 °C



	Model	Safe to use	BMS Reset	Suggested Use
	<b>Lithium TM-271/TM-291</b>	Yes	Yes	Use as charger, maintainer and it will reset EarthX's BMS over-discharge protection
ate/ Optimate	<b>Lithium TM-271/TM-485</b>	Yes	Yes	Use as charger, maintainer and will reset EarthX's BMS over-discharge protection
ate/Optimate	Any model	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
ry Minder	BM3B	Yes	No	Use as charger
N Decker	BC15BD	No	No	Do not use, as full time desulfating charger
N Decker	All Models	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
tie	Lithium US	Yes	Yes	Use as charger, maintainer and it will reset EarthX's BMS over-discharge protection
in	Battery Tender Jr	Yes	No	Use as charger, maintainer, but will not reset EarthX's BMS over-discharge protection
in	Battery Tender (original)	Yes	No	Can be used for charging only. Maintenance voltage is too low.
in	Battery Tender Plus	Yes	No	Can be used for charging only. Maintenance voltage is too low.
ooost	Duraboost 750	Yes	No	Can be used for charging. Can not find a maintenance voltage in manual so if it is less
ooost	Duraboost 1000	Yes	No	Can be used for charging. Can not find a maintenance voltage in manual so if it is less
	Tender Jr	Yes	No	Use as charger, maintainer, but will not reset EarthX's BMS over-discharge protection
e	Tender Jr	Yes	No	Use as charger, maintainer, but will not reset EarthX's BMS over-discharge protection
Genius	All Models except the lithium specific one	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
gy	4cell LiFePO4 Smart Charger	Yes	Yes	Use as charger, maintainer and it will reset EarthX's BMS over-discharge protection
SEY	Ultimizer	Yes	No	Use as charger and maintainer
tech	Xtreme XC100	Yes	No	Can be used for charging only. While in operating, verify the pulse output is off.
ate/Optimate	<b>All lead acid charger models</b>	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
(like Multi XS 3600)	<b>All lead acid charger models</b>	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
nacher	Any model	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
i	Smart Shot 900	No	No	Can be used for charging. Can not find a maintenance voltage in manual so if it is less
i	Smart Shot 1.5mA	No	No	Do not use, as full time de-sulfating mode will damage a lithium battery
Note: is not an all-inclusive list				

Lithium batteries have a very low self-discharge rate which means the battery, if disconnected from your trike, could “hold its charge” for a year.

The ETX Lithium battery is compatible with most “modern” lead-acid battery chargers or 4cell LiFePO4 battery chargers. By “modern” we mean a charger that automatically turns off when the battery is fully charged, a charger with a micro-processor, or a charger with multiple mode charging. The “full charge” voltage for the ETX Lithium battery is 13.3V or higher. Some lead-acid battery trickle chargers maintenance mode voltage can be below 13.3V, which is too low for a lithium battery. For example, the **Battery Tender JR** has a maintenance mode voltage of 13.3V which is **compatible**, whereas the original Battery Tender has a maintenance mode voltage of 13.2V which is too low for a lithium battery. Never charge a faulty battery (a battery that will not accept a charge or hold a charge). **Never use the de-sulfate setting on your charger.** Be sure the charger’s output voltage level does not exceed 15V. If the charger does not display the voltage reading, then use a voltmeter to check the voltage while charging. If the battery gets hot while charging, discontinue charging and use. Do not charge battery in temperatures above 140 degrees F (60C), or in direct sunlight. When charging a battery, place it on a non-flammable surface, and remove any flammable items nearby. For maximum battery and vehicle starting system life, **do not crank an engine for more than 10 seconds within any 1 minute period.**

## Troubleshooting

The ETX Lithium battery is an extremely reliable battery with a longer useful life than comparable lead-acid batteries.

Despite the high reliability, you may encounter situations where the battery does not operate as expected. Here are some potential issues you may encounter with the appropriate troubleshooting procedures.

### Problem

The charger shuts down during the first few seconds of charging.

### Possible Causes and Solutions

Are you using a Constant Voltage (CV) charger? CV chargers may trip when first connected to a drained battery due to a high inrush of current. If this happens, reset the charger and try again. If the problem continues, try using a different charger.

### Problem

Zero voltage at the terminals or un-stable voltage (voltage reading drifts slowly to zero). With a lead-acid battery, finding a very low voltage at the terminals often indicates the battery has reached the end of its life. With an ETX Lithium battery this may not be true. **Possible Causes and Solutions**

The ETX series lithium battery has built-in over-discharge protection circuitry, which automatically disconnects the battery if the voltage drops below 11.5 volts (98% discharged). When the battery is “disconnected”, the voltage at the battery terminal should be zero.

Some volt-meters may initially indicate a voltage, but it will decay to zero within ten seconds or so. For a drained battery, simply connect the battery to a charger to restore charge (charge with 2A for 20-30 minutes), and then re-check the voltage. If the voltage is 12.8V or greater, the battery should be ok and can be fully charged. Not all chargers will charge a battery that displays zero volts, so check our website for a list of compatible chargers, and specifically chargers that will work for recharging an “over-discharged” battery for which the BMS’s over-discharge protection has activated. This condition is sometimes referred to as a BMS reset.

### Problem

The battery seems to suddenly stop working.

### Possible Causes and Solutions

A lithium battery voltage remains relatively constant while discharging, but when the battery runs out of power it does so abruptly. Try charging the battery for 30-60 minutes at 1 – 2 Amps. If the battery still does not work, or the measured voltage is less than 12V, the battery may be permanently damaged and needs to be replaced.

### Problem

The battery does not hold a charge.

### Possible Causes and Solutions

There may be a problem with the engine charging system: While the charging system is in operation, it should output approximately 13.9 -14.6 volts. If the voltage is below this level, the charging system needs to be repaired.

## Thank you

Thank you for your purchase of the REV. We hope that with proper maintenance you will receive years of enjoyable flying. If you need assistance or have questions please do not hesitate to call Evolution Aircraft at **1 (813) 810-9262**