

# BlackHawk



## Engine Guide and Maintenance Manual

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## Thank You from BlackHawk...

Thank you for choosing BlackHawk Paramotors. We strive to produce the finest Paramotor Engines available, and hope the Lite 125 and Talon 190 will provide you with years of amazing flight experiences. This manual will provide the necessary information to properly care for your engine. Please read this entire manual before using your Paramotor. A thorough understanding of this manual will help to keep you safe and maximize the engines full life span.

Please retain a copy of this manual for future reference, and to pass it down to the next owner, should you decide to sell this Paramotor.

Fly safe, and enjoy all this sport has to offer.

-The BlackHawk Team



### SAFETY NOTICE:

This sport is as safe as **YOU** make it. By purchasing BlackHawk equipment, you are fully responsible for being a certified Paramotor Pilot, and accept all risks inherent with this type of activity (including possible serious injury or death). Using this equipment in any other way than what it was originally designed for and/ or intended use greatly increases these risks. BlackHawk Paramotor USA Inc., it's employees, representatives, or dealers, shall not be held liable for personal, third party, or property damages or injuries in any way.

**Note:** BlackHawk is not accountable or responsible for the engine work that you perform on your or any other Paramotor engine. If you damage your Paramotor while you are performing the work on it, then you are accountable for the damage. If you feel you are not qualified to perform the work, then please contact us or a qualified BlackHawk Dealer for assistance.

**Note:** If you do not fully understand all the contents of this manual, contact your primary Powered Paragliding Instructor or qualified BlackHawk Dealer prior to use. Pilot safety is paramount and our first priority.

**Note:** Make sure you completely read and fully understand the entire contents of this Lite 125 and Talon 190 Engine manual prior to using this equipment in any way.



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## Preface:

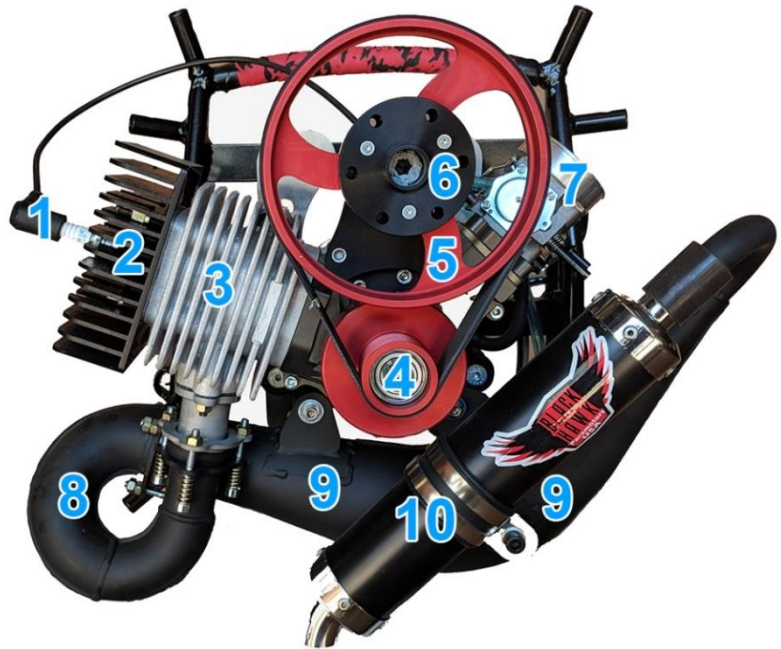
The information in this manual focuses on using BlackHawk 125 Lite and Talon 190 motors, but the mechanical principals and maintenance techniques that we are using with our engines could be applied to other manufacturer's engines as long as you have those specific engine settings for what we are discussing in this manual. If you're a novice with motors, then 2 stroke motors can seem like they are notorious unreliable. Any expert would disagree and say that is because you just do not understand them. The goal of this manual is to help give you that basic understanding so that you have the most fun with your Paramotor. We understand that not all Paramotor enthusiasts are mechanically inclined, and that is why we have tried to explain this information in a straight forward and simple way. Is there a more complicated way to explain this information to you, of course there is, but it's not necessary.

One thing to keep in mind, as you become familiar with your Paramotor you will begin to understand the characteristics of your engine, what it sounds like and how it feels as you rev your engine through the different RPM ranges. Understanding the feel and sound of your engine as it operates normally is important, this is quickest way to determine if something is changing with how your engine performs. If something does not feel or sound right as you perform a pre-flight engine check, then do not fly. The last thing you want is for your engine to fail while you are in flight.

We will say this multiple times throughout this manual as we want to make sure you understand - BlackHawk is not accountable or responsible for the engine work that you perform on your or any other Paramotor engine. If you damage your Paramotor while you are performing the work on it, then you are accountable for the damage. If you feel you are not qualified to perform the work, then please contact us or a qualified BlackHawk Dealer for assistance.

## Lite 125 Engine Component List

1. Spark Plug
2. Cylinder Head
3. Cylinder chamber
4. Clutch and Lower Pulley Array
5. Upper Pulley
6. Propeller Mount
7. Carburetor
8. J-Pipe
9. Expansion Chamber
10. Stinger Exhaust Silencer



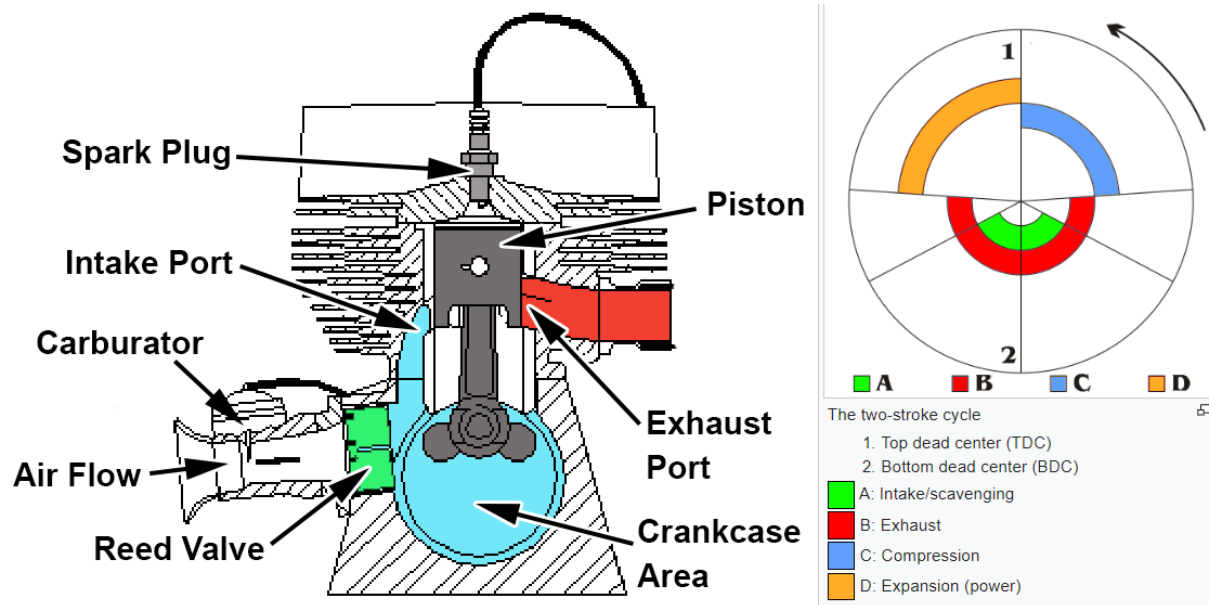
## Talon 190 Engine Component List

1. Spark Plug
2. Cylinder Head
3. Cylinder chamber
4. Clutch and Lower Pulley Array
5. Upper Pulley and Propeller Mount
6. Carburetor
7. J-Pipe
8. Expansion Chamber
9. Stinger Exhaust Silencer

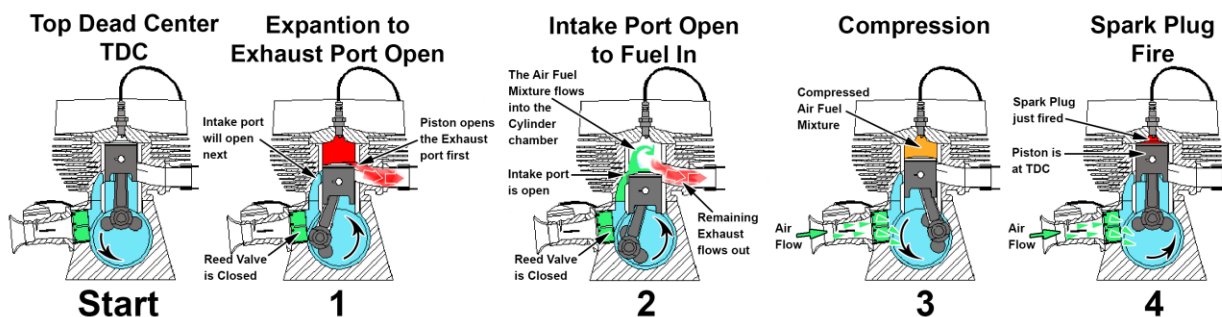


## The Basics of How a 2-Stroke Engine Works

A 2 Stroke engine is the simplest form of an engine design. There are very few moving parts, and they provide more horsepower for their size and weight compared to a 4 stroke engine. In order to understand how to work on your Paramotor you need to understand the basics of how a 2 stroke engine works. The explanation we provide in this manual is a simple explanation in order to provide a person who does not understand a 2 stroke engine enough information to use this manual competently. If you want to understand more about 2 Stroke engines, then visit the Wiki page at [https://en.wikipedia.org/wiki/Two-stroke\\_engine](https://en.wikipedia.org/wiki/Two-stroke_engine)



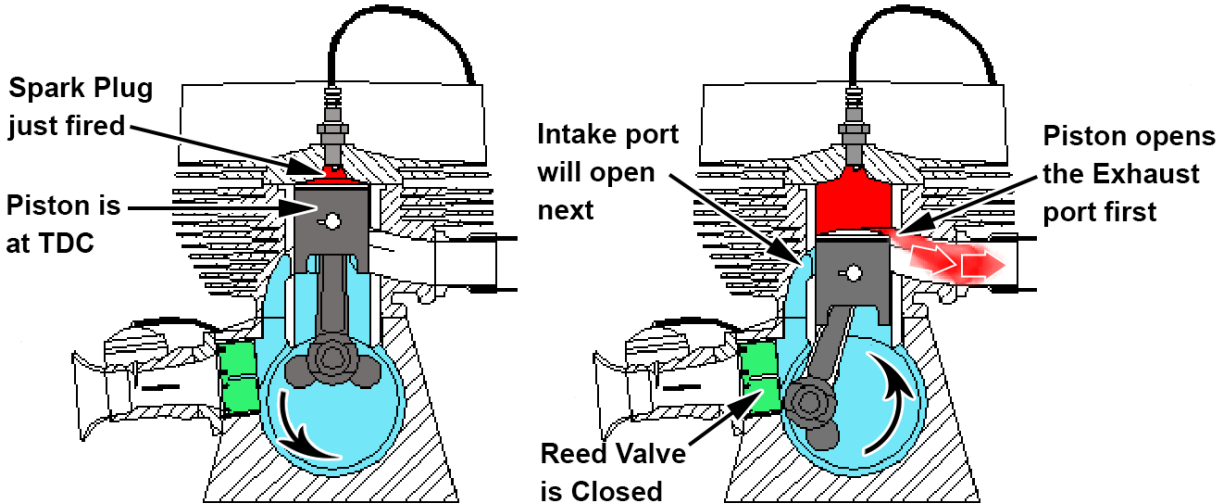
Above is a diagram of a 2 stroke engine. You can see there are no belts, gears, or other moving parts except for the piston and the crankcase area. The reed valves only allow the air fuel mixture to flow into the crankcase area, and the control of the intake and exhaust ports are handled by the position of the piston as it moves up and down in the cylinder wall.



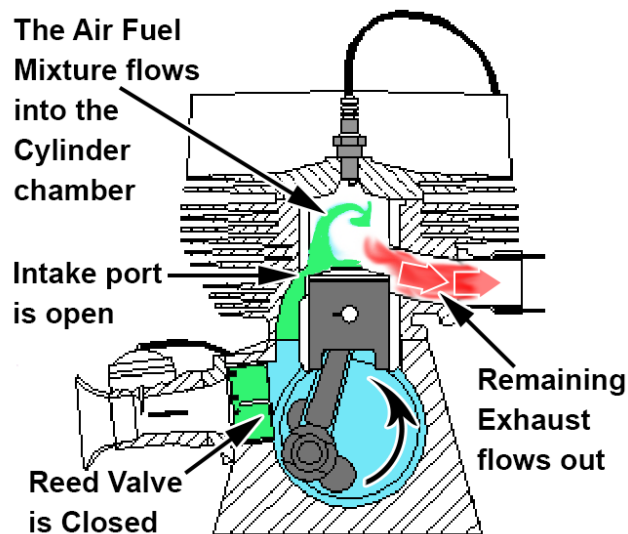
The diagram above shows the 4 different phases the engine goes through as it performs one revolution or cycle.



When thinking about the operation of a 2 Stroke motor, the piston in the diagram should start at Top Dead Center (TDC). This is the starting and ending point of a full cycle or revolution of the engine crankcase. Just before the piston reaches the top of the stroke (TDC) the spark plug ignites the air fuel mixture as shown in the picture below.



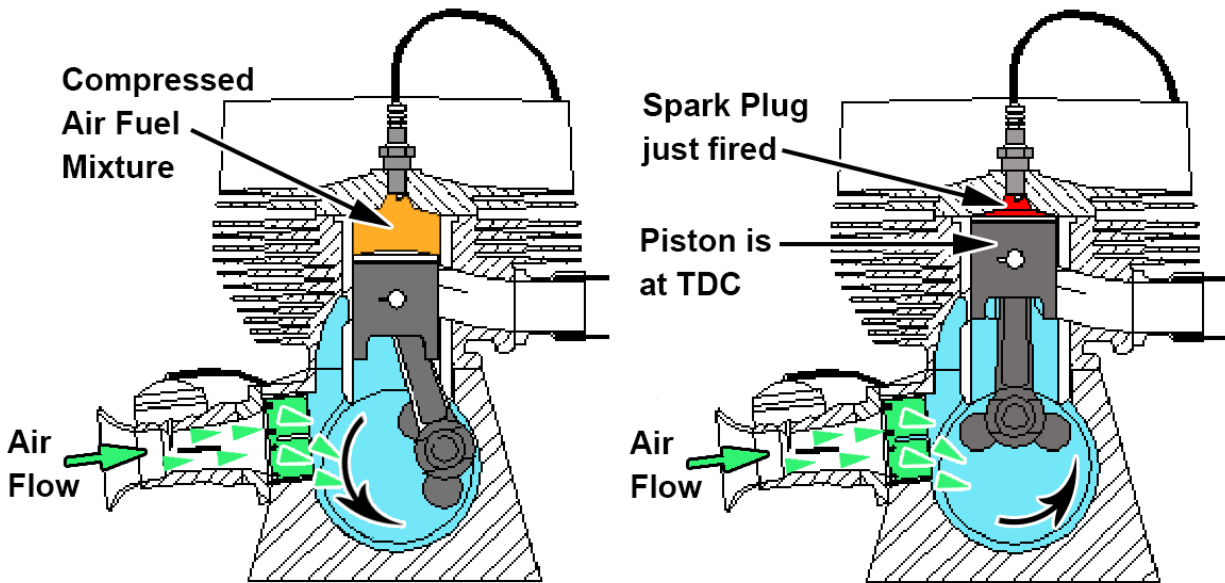
The expanding mixture drives the piston downward until it begins to uncover the exhaust port. The majority of the pressure in the cylinder is released after the port begins to open, and the burnt air fuel mixture begins to flow out of the engine.



During the down stroke, the falling piston creates a positive pressure in the crankcase area which causes the reed valve to close. The air fuel mixture in the crankcase is compressed until the piston travels down far enough to uncover the intake port opening, at which point the new air fuel mixture flows up into the cylinder chamber. As the cylinder is letting the new air fuel mixture in, the final residual exhaust gases are pushed out of the exhaust port.



As the engine finishes the down stroke, the engine begins its up stroke. The piston moves up the cylinder wall, and this will shut off the intake port first and then the exhaust port last. The piston is now compressing the air fuel mixture in the cylinder chamber. During the up stroke, the piston creates a vacuum in the crankcase area, and this causes the reed valve to open, and pulls the new air fuel mixture into the engine crankcase area.



The 2 Stroke engine is now back at the beginning of its engine cycle where the piston is at TDC. The spark plug has just fired, and the engine is just beginning its down stroke again.





## How to use a Torque Wrench



If you do not own one of these tools you will need to get one to perform the work on your Paramotor engine. These allow you to tighten the bolt to a specific tightness without over or under tightening the bolt. This is very important, because if a bolt is over tightened, they can shear off when the bolt expands due to the heat of the engine. It's also just as dangerous if the bolt is not tightened enough and it becomes loose while in flight. By using the Torque setting that is called out in this manual for the bolt that you are working on you will avoid these types of issues.

- Important to remember, that when working on Paramotor engines the Torque settings is in Inch/Pounds (In/lbs) and not Foot/Pounds (Ft/lbs). If you apply Foot/Pounds to the bolts on the engine; you will strip and break them off.

You can find torque wrenches on Amazon for a good price, make sure to buy a torque wrench that measures the force by Inch/ Pounds

### How to set the Torque Wrench

When you get the Torque Wrench it should be set to zero inch / pounds as shown in the picture. When you go to set the torque on the wrench you will turn the handle to the right (clockwise) to add torque. There are 2 measure points on the torque wrench.

- The major torque settings are located on the bar of the wrench and are divided by 10 or 15 inch/pound marks depending on the wrench you have.
- The minor torque settings are located on the handle that you twist. At the top of the handle you will see the single pound settings. When you start at the zero mark that means zero pounds are added to the major mark setting. If the handle is on the 5 mark, then that would mean you are adding 5 torque inch /pounds to the major torque setting that handle has reached or crossed over. If the handle is under a major torque setting bar, then it has not reached that major torque setting.
  - Note, when the handle is at the zero mark, then the major torque setting should be aligned with the center line on the bar that defines the major torque setting.

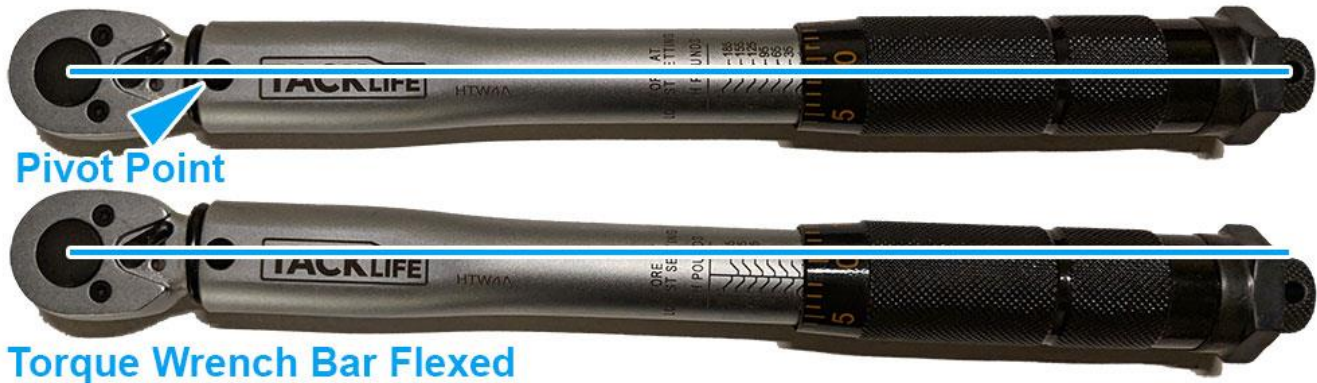


As an example in the picture above the Torque Wrench on the right is set to 25 inch/pounds. You can



see the minor torque setting on the handle aligns to the 5 mark, and the major torque setting is above the 20 mark on the bar. This adds up to 25 inch/pounds on the torque wrench settings.

When using the Torque wrench you want to use an even smooth pulling force as you tighten the bolt. Do Not jerk on the wrench or use a high burst of force as you will over tighten the bolt.



1. As you are tightening the bolt, and when the Torque wrench reaches the torque force setting, the wrench will make a tink sound, and the bar at the top of the wrench head will flex around its pivot point so it does not apply any more force to the bolt.
2. You want to stop at this point, and then try again to make sure you have reached the correct torque force setting
3. Apply a slow force to retry tightening the bolt again to make sure the bolt has reached the correct torque force setting. The torque wrench should make a tink sound, and flex again as it did before.
  - a. If you can tighten the bolt a little more before it reaches the torque setting, then that is OK and this is why you try again to make sure it's done right.
  - b. Try to avoid over tightening the bolt. This can be done when you keep moving the torque wrench after it makes a tink sound. Just because the torque wrench will flex, you can move it past this point and apply more torque to the bolt then what is specified by the torque wrench.

### How to Store the Torque Wrench

Once you are done using the Torque wrench it is very important to set the torque setting back to zero. Most people do not realize that if you leave and store the torque wrench at a higher torque setting than zero, then over the life time of the wrench the spring that applies the torque force gets compressed, and will not measure the torque force correctly. This is very dangerous when you think about the issues this could cause. Are you going to break the Torque wrench if you store it wrong once or twice, probably not, but its more about how long it was stored for in that condition. It also depends on the setting you left it at. If the torque setting was left on the highest setting for over a year, then yes that could be a problem. Either get a new one, or have it tested by a mechanic.



## Fuel to Oil mixture

The Oil to Fuel mixture you use with your BlackHawk Paramotor will always be a 40 to 1 mixture ratio, or 2.5% by volume. BlackHawk engines are designed to use this fuel mixture to help assure the lifespan of the engine can reach 150-200hrs.

### Recommended Oil for BlackHawk Motors:

- (22964) Maxima Formula K2 2-Stroke Synthetic Premix

Please be aware that other Paramotor manufacturer may use a different fuel to oil mixture ratio. Please do not assume to use a different fuel to oil mixture because your friend told you it would be better, or you read it on the internet that some famous person uses this fuel mixture. BlackHawk has done a lot of testing with our engines, and the 40 to 1 mixture works the best from cold to hot conditions when flying in high or low in altitudes.

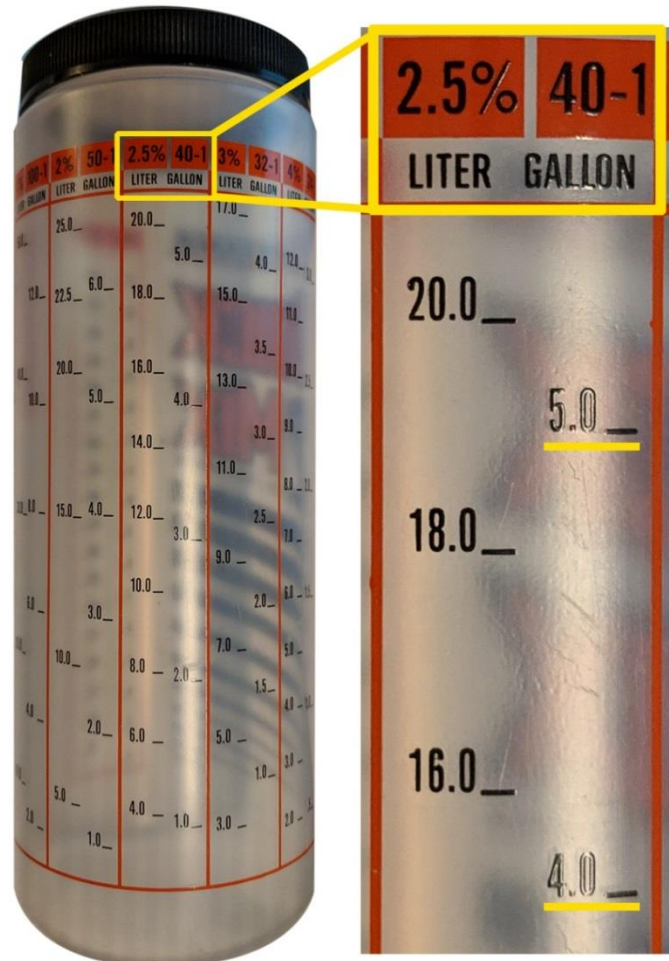
## How to Use the Fuel Mixture Jar

BlackHawk provides a fuel mixture jar that will easily help you measure the correct amount of oil for the fuel. The fuel you should be using is regular Super Unleaded gas for your car (the higher the octane the better). You will then mix in the oil so that it will work correctly for your Paramotor 2 stroke engine.

The orange bar across the top of the mixture jar has different fuel to oil mixture ratios columns, and the one you want to use says 2.5% 40-1. There are 2 sets of numbers in that column. The numbers on the left are used for Liter measurements, and the numbers on the right are used for Gallon measurements.

Gallons Example - If you had 5 gallons of gas, you would use the mixture jar and pour enough oil in the mixture jar so that it reaches the 5 gallon mark as shown in the picture above. You would then pour the oil from the mixture jar into the container of gas, and mix this around thoroughly. You now have gas with a 40 to 1 oil mixture.

Liter Example - If you had 20 liters of petrol, you would use the mixture jar and pour enough oil in the mixture jar so that it reaches the 20 liter mark as shown in the picture above. You would then pour the oil from the mixture jar into the container of gas, and mix this around thoroughly. You now have gas with a 40 to 1 oil mixture.







## Using a Tachometer and Temperature Sensor



BlackHawk highly recommends that you get a digital Tachometer and Temperature Sensor for your Paramotor engine. This will allow you to monitor your engines performance while in flight and prevent a major problem from occurring if you're paying attention to them. Imagine your car without an engine temp or check engine light, the same is true for your Paramotor engine.

### Temperature Sensor

This will allow you to monitor the temperature of engine while in flight and will help prevent you from overheating the engine. If you are performing a full throttle climb you can use the temp sensor to monitor the engine, and if the engine reaches 400°F you can lower your throttle input to reduce the stress on the engine and that will lower the engine temperature. Never let you engine go over 400°F, and never keep your engine at the 400°F temperature for an extended amount of time, we recommend you keep it below 90 seconds at 400°F to keep the maximum engine lifespan.

Installation: The temperature sensor is an O-ring that will fit around Spark Plug, and will fit between the Cylinder head and where the Spark Plug screw together. Make sure the temperature sensor wire does not touch the cooling fins on the Cylinder head as it could cause the sensor to not work correctly due to the high heat. Zip tie the sensor wire to the Spark Plug wire to keep it safe as shown in the picture.



### Tachometer Sensor

This will allow you to monitor how the engine performs based on the RPM engine is running at. This sensor will allow you to determine when the clutch on the propeller begins to engage. You can also know when the power band of the engine begins based on the RPM range. If for some reason you are not getting the high RPM range you normally get with your engine, this is the first sign that something is not adjusted right on your engine.

Installation: The Tachometer sensor is just a wire that wraps around the spark plug wire going to the spark plug. You want to make 3 to 4 wraps around the spark plug wire as close to the spark plug boot. Then test and make sure you are getting a RPM reading. Once the RPM sensor is working you can take

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2 zip ties to hold the wrapped wire in place. In some cases the instructions for these tachometer sensors will tell you to make 10 wraps around the spark plug wire. **Do Not Do This** as it will cause an electrical drain of the current that should be going to the Spark Plug itself. If you have a weak spark, then your engine will underperform and run weak. The setup instructions for the tachometer can be found on the packaging if you need more information about how to set it up.

## Tips and Tricks to keep your 2 stroke motor fine-tuned:

The Tips and Tricks of this manual come from the most common questions we get at BlackHawk. This section is designed to give you the specific information that you regularly check with your engine either as a post flight check or as one of the more commonly performed maintenance windows. These Tips and Tricks will help make sure your engine is in great working condition and assure you get the longest lifespan from your engine.

### Torque Settings for each Engine

There are 2 major torque settings that you regularly need to check on your Paramotor engine. The Propeller bolts and the Cylinder Head bolts. These bolts are put under a lot of pressure and stress during a normal flight and can become loose due to that stress.

#### Propeller Bolts

The Propeller Bolts use a torque settings of 100 In/lbs on a 6mm hex bolt, and there are 6 bolts that hold the propeller to the pulley. You want to make sure you use the mounting plate that is basically a giant washer to spread the pressure of the 6 bolts across the propeller. In some cases the propeller will use a spacer plate between the propeller and the pulley. The rule of thumb is the prop bolt should screw into the propeller mount by at least 1/2" to securely hold the prop in place. Do not remove any spacer plates thinking it will make the motor, or propeller perform better.

When you tighten the bolts on the propeller you need to use a cross tightening pattern as shown in the picture. Begin by putting all 6 bolts in place. You want to use a little force when tightening the bolts so the mounting plates are snug, but nothing is tight. Then begin with bolt 1, use the torque wrench and tighten this bolt to 100 In/lbs. Now you can move to bolt 2, and tighten it in the same way, then move to bolt 3, then 4, then 5, and 6. Once you have completed the first round, then go through and do a second round, and confirm the bolts are tightened to the correct torque setting. In most cases the first and second bolt will turn a little more to reach the correct torque setting. This is because they reach the torque setting faster because they are under a higher load holding the weight of the





propeller until the rest of the bolts are tightened. Any time you have a torque pattern you want to run through the pattern until all the bolts do not move when using the torque wrench. You should only hear one click from the torque wrench when the bolt has reached the correct torque setting. Do not over-tighten the bolt, this can be done by apply more force to the torque wrench after you hear the click, and the wrench may click multiple times to let you know you are applying to much force.

### Cylinder Head Bolts

The Engine Cylinder Head Nut should be checked often to assure they are at the proper tightness. When these nuts become lose you will lose engine compression, and you will begin to see oil leaks around the cylinder. These nuts should only be tightened when the engine is cold to ensure you are setting them at the proper torque settings. The best time to check the Engine Head Nuts is in the morning before you do any flights, and the engine has been off for at least 8hrs. This will assure your engine is at room temperature. Do not attempt to adjust or tighten the cylinder head nuts after a flight, this will cause you to over-tighten the nuts due to the elevated temperature of the engine. Depending on the engine you are working on they use different torque settings:

- 125 Lite = 120 In/lbs on a 13mm nut
- Talon 190 = 180 In/lbs on a 13mm nut
- Titan 210 = 180 In/lbs on a 13mm nut
- Airmax 220 = 180 In/lbs on a 13mm nut

Just like the propeller bolts you want to use a cross pattern when checking the tightness of the nuts on the head cylinder. Start with nut 1 and work you way through to nut 4. This will assure they are evenly tightened across the cylinder head. Use the picture below as a guide to tighten the cylinder head nuts.



Just like the propeller bolts, you want to make sure you are using Inch / Pounds and not Foot / Pounds on the torque wrench when adjusting the nuts, and you want to make sure you run through the cross pattern until there is no movement from the wrench when testing the torque of the nut.





## Cylinder Head Temperature

The Cylinder Head temperature on your Paramotor can cause the most stress on your engine. The higher the temperature of the engine the more wear you put on the cylinder and piston chamber. High temperature is often known as an engine killer, and for the 2 Stroke Engine the highest engine temperature the engine can handle is 464°F / 240°C. You never want to have your engine reach that temperature because in most cases it will already have seized.

When flying your Paramotor keep these general rules in mind to help assure your engine does not over heat:

- Do not run engine at max power / full throttle, for more than 60sec without a temperature sensor. This will help assure you do not go over 410°F / 210°C.
- If you have a temperature sensor on your engine you can use this, and when the engine reaches 410°F / 210°C you will need to back off the throttle.
  - Just reducing the throttle by a little (300 rpm) will greatly reduce the cylinder head temperature on your engine
- If you are flying on a hot day, hotter than your normally fly, this is when you want to pay attention to engine temperature as it will climb up to 15°F / 8°C hotter than normal.
- Keep in mind that if you change the propeller on your engine for a larger size or different pitch; that this can greatly increase the running temperature of your engine.

### 125 Lite Engine Temp Specs:

- The average running engine temperature during flight should be anywhere from 330°F / 166°C to 360°F / 182°C. This temperature can fluctuate due to the ambient outside temperature by +/- 15°F / 8°C.



### Talon 190 Engine Temp Specs:

- The average running engine temperature during flight should be anywhere from 270°F / 132°C to 360°F / 182°C. This temperature can fluctuate due to the ambient outside temperature by +/- 15°F / 8°C.





## What to Adjust if your Engine is running to HOT

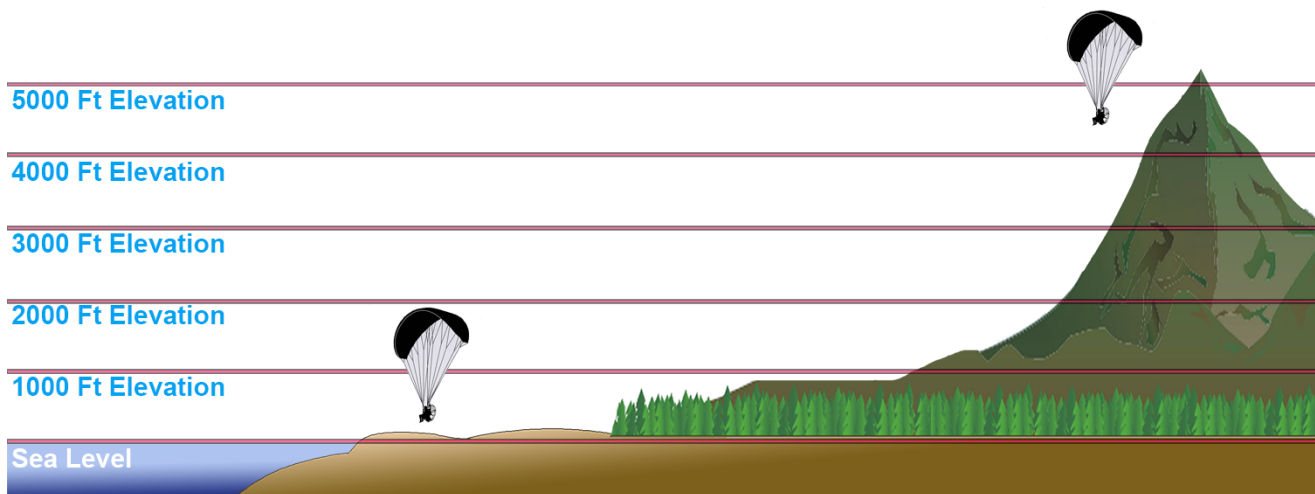
The most common reason that your 2 stroke engine will run hotter than normal is usually due to the Fuel Air mixture, and that you do not have enough Fuel in the mixture (also known as the engine is running lean). You would think not having enough fuel would cause the engine to run weak or cooler, but just the opposite occurs. The more air you add to the fuel mixture the hotter it will burn, and can make the engine run so hot it will melt a hole in the piston head. When you add more fuel to the fuel air mixture (also known as running a little rich) it does not completely burn all the fuel, and this acts as a coolant to help moderate and cool the combustion temperature. If your engine has been running normally and it just started to run hot, then there are a couple of things we want to check to make sure the Fuel to Air mixture is set correctly.

### Spark Plug:

The Spark Plug is the fastest way to check if your engine is running to hot. In most cases you will have a Spark Plug that has a greyish white tip. This is all explained in our Spark Plug section of this manual.

### Elevation Change:

If you normally fly at the beach, and then you travelled to the mountains you want to make sure you adjust the Fuel to Air mixture on the carburetor. This is a common mistake with new pilots to not adjusting the Fuel to Air mixture based on the starting elevation. This is something each pilot will learn about their engine, and were to adjust the Fuel to Air mixture based on the elevation they launch from. This does not affect how you fly, but will help assure you engine is running correctly. If you have travelled to a different location, and there is a significant elevation change, it's best to make a quick 15min flight, and then pull the spark plug to make sure you are not running to rich or to lean. Use the Spark Plug guide on page (21) to get better idea of how to judge the spark plug based on it color.



### Flying at the Beach

A common mistake with new Paramotor pilots is not understanding what happens to the fuel air mixture as you fly at different starting elevations. If you fly at a lower elevation like the beach, the engine will need to run richer because there is more oxygen in the air. If you have been flying in the mountains your mixture will be a little leaner because there is less oxygen in the air at higher altitudes. The danger occurs when you normally fly at a higher elevation, and you go fly at the beach for a special



event. This is when you could hurt your engine because it will be running too lean to fly at the lower elevation and you could over heat and burn out your engine.

### **Flying in the Mountains**

When you begin your flight let's say starting elevation is 5000ft. You will need to run the engine a little leaner as the amount of oxygen in the air is less, and so you will not burn as much fuel. There is less concern about killing your engine when moving from the beach to the mountains to fly as you will be running the engine too rich, and this could cause the engine to miss-fire or run rough during your flight.

### **Air Temperature and Density**

The Air temperature you fly in can also affect the density of the air and how the air fuel mixture works in your engine. Warm humid air is less dense than cold dry air and if you were flying in these conditions you should check your spark plug to make sure you are not running too rich. If you are flying in a cold dry location the air is more dense than warm humid air, and you run the risk of running lean and overheating your engine. Being aware of these environmental conditions at any elevation will help assure your engine is always running correctly.

### **Inlet Carb Filter could be clogged:**

Another reason that your engine could begin to overheat is due to the Inlet Carb Filter where the fuel comes into the carburetor becomes clogged. This is just a little screen inside the carburetor that keeps particles from entering your engine through the fuel. As you run your Paramotor this will filter out particles and begin to restrict the fuel that can enter the carburetor. As a part of the maintenance you perform on your Paramotor you want to periodically check on, and clean this filter to assure your carburetor is working correctly. This will make sure the fuel can easily enter the carburetor which impacts the Fuel to Air mixture. Please read the carburetor section of this manual to learn how to clean the inlet carb filter.

### **Vacuum Leak around the engine:**

While a vacuum leak is less common, it can occur if you neglect the maintenance on your engine. The most common bolts to check would be the Cylinder Head bolts to make sure these are tightened to the correct torque specification. A visual cue that you may have a vacuum leak is you will see an oil leak from where parts come together. This can occur around the engine crankcase parts all the way up to the cylinder head. A vacuum leak will force your engine to run lean causing it to run hotter than normal, and in extreme cases you will notice a loss of power.

The other areas to check are parts on your engine that use a gasket to create the seal between the part listed below and the engine. These include:

- Cylinder Base
- Cylinder Head Gasket
- Carb Mounting Gasket
- Reed Valve Gaskets
- Crankcase Seals

If you feel you still have a vacuum leak after inspecting the areas listed above, then you may have another issue, and you should contact the engine manufacturer. As you fly your Paramotor you will

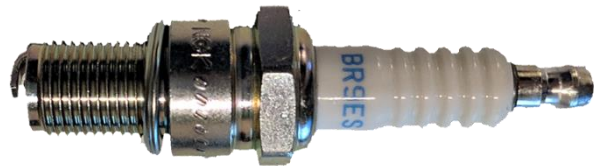


become familiar with its normal engine operating temperature. When the normal operating temperature starts to climb this is a sign that you need to check the engine and perform some maintenance to assure its proper operation.

## Spark Plug

The Spark Plug on your Paramotor is something that you will check often as it will tell you how well your engine is running based on the Fuel to Air mixture that your carburetor is set at. The Fuel to Air and the operation of the spark plug have a direct effect on the power your engine provides and the temperature it will operate at. Here are some specifications on the Spark Plug used with the Talon 190 and 125 lite

- Spark Plug = NGK BR9ES
- Spark Plug Gap = .025 of an inch
- Spark Plug Socket Wrench = 13/16 of an inch



## Spark Plug 15-min Flight Check

When checking the Spark Plug on your engine you need to follow specific procedure to assure the engine reaches a normal operating temperature. There is no need to run the engine at an excessively high RPM, nor can you check the Spark Plug when the engine is cold. The best way to perform a Spark Plug check is by performing a quick 15min flight. Follow the steps listed below:




1. The first thing to keep in mind is to be safe. Please fly in safe conditions, and make sure your Paramotor and Paraglider equipment is ready for a flight.
2. Begin by climbing to safe altitude. There is no need to use extra throttle to get up quickly, just fly like you normally would.
  - a. You do not want to fly to high up, or too far away from your Landing Zone. You want to fly in that area so you can land quickly and check the spark plug.
3. Next, fly for about 15 minutes, and cruise at a level altitude. You want to keep the engine at an even RPM as much as possible.
  - a. The goal is to have the engine reach its normal operating temperature and keep it there for at least 5min. If you have a Temperature Sensor you can use this to monitor the engine temperature.
4. Once you are done with you 15min flight you can come in for a landing. When doing this you want to keep the engine idling as you land. If you do not feel safe doing this, then turn the engine off close to your landing point so the engine will be hot when you check the Spark Plug.
  - a. The goal when coming in for a landing is to try and keep the engine as close to its running temperature when you check the spark plug. This will make sure the color of the spark plug correctly matches the diagrams in this manual as shown below.
5. If you check the Spark Plug when the engine is cold, the color of the Spark Plug will darken, due to the fuel and oil vapors that are left in the cylinder after it has been run.





6. Once you have landed you will need to remove the Spark Plug and then check the color of the Spark Plug and use the reference in this manual as your guide to determine if the engine is running lean or rich.
  - a. When making mixture adjustments on the carb, do 1/16 of a turn in the direction that is needed to correct the air-fuel mixture
7. Repeat this process a minimum of 3 times if you notices your engine is running to rich or lean to assure you have the correct Spark Plug color after a 15min flight.

### Spark Plug Pictures for Lean to Rich running Engines

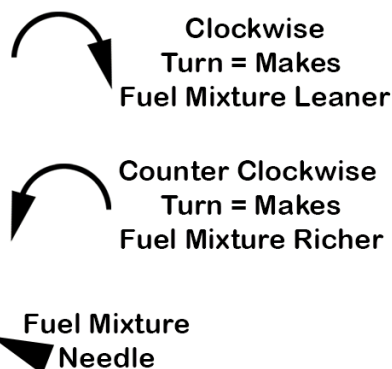
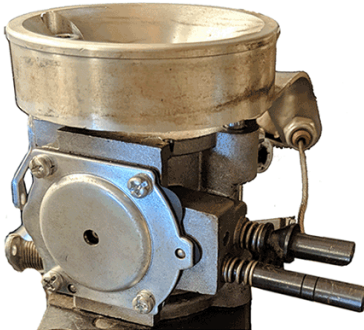
This section provides a visual representation of how the Spark Plug can look depending on how the engine is running. If the engine is running to lean, the spark plug can look greyish white. If the engine is running to rich the spark plug will look black, sometimes a glossy black if it's really rich. The goal is to get a good dark coffee brown color on the spark plug, which represents the correct color on the spark plug itself, and assures you that the Fuel to Air mixture on your carb is set correctly. This will also help assure you get the most power and longest lifespan out of your engine. Use the chart below as a guide to determine the correct Fuel to Air mixture that your engine is burning.

<b>Spark Plug - Lean Major</b> <ul style="list-style-type: none"><li>• The Spark Plug head will look greyish white in color.</li><li>• There will be very little to no carbon buildup</li><li>• This can cause the cylinder head to quickly overheat even at a normal idle speed, and if you give the engine some throttle it will burn a hole in the piston head within seconds killing your engine.</li></ul>	
<b>Spark Plug - Lean Minor</b> <ul style="list-style-type: none"><li>• The Spark Plug head will look very lite tan in color.</li><li>• There will be some minor carbon buildup</li><li>• This can cause the cylinder head temperature to be elevated, and may overheat when giving the engine full throttle.</li><li>• This will cut the engine lifespan by 1/2</li></ul>	
<b>Spark Plug - Normal</b> <ul style="list-style-type: none"><li>• The Spark Plug head will look dark coffee in color</li><li>• There will be a thin layer of carbon buildup</li><li>• This will optimize the lifespan of the engine, and it helps the engine run cooler</li></ul> <p>Warning – The color of this picture can change due to the color settings on the screen, monitor, or from the printer if this is printed. Use this as a reference, but the color should be dark brown coffee.</p>	

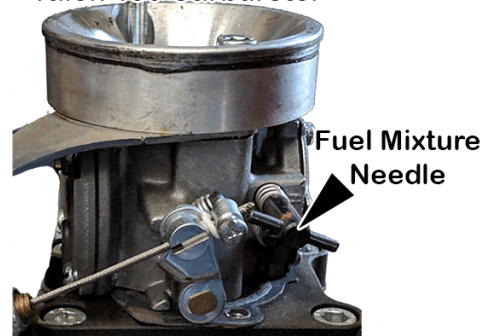


<p><b>Spark Plug - Rich Minor</b></p> <ul style="list-style-type: none"> <li>• The Spark Plug head will look black, but dry</li> <li>• There will be a good amount of carbon buildup <ul style="list-style-type: none"> <li>• Carbon deposits will start building up in the decompression port</li> <li>• Carbon deposits will build up around the piston rings causing the engine to loose compression</li> </ul> </li> <li>• This will increase the chance of fouling the spark plug and causing engine miss-fires</li> <li>• This will cause more maintenance to keep the engine running</li> </ul>	
<p><b>Spark Plug - Rich Major</b></p> <ul style="list-style-type: none"> <li>• The Spark Plug head will look glossy black in color and look wet.</li> <li>• There will be a major amount of carbon buildup <ul style="list-style-type: none"> <li>• Carbon deposits will rapidly build up in the decompression port</li> <li>• Carbon deposits will rapidly build up around the piston rings causing the engine to loose compression</li> </ul> </li> <li>• The engine will run rough due to the dab mixture of Fuel to Air</li> <li>• Uncontrolled Detonation of fuel in the cylinder that can cause the engine to overheat and burn up</li> </ul>	

**Lite 125 Carburetor**



**Talon 190 Carburetor**



If you find that you need to adjust the fuel mixture on your Paramotor, then you need to understand how to adjust the fuel mixture on the carburetor. Use the picture above to locate the fuel mixture needle and follow the steps below.

#### Engine is running to Lean

- Adjust the Fuel Mixture Needle by a 1/16 of a turn Counter Clockwise
- Perform a Spark Plug Flight Check and verify the color of the Spark Plug
- Repeat these steps until you get a dark brown coffee color on your Spark Plug

#### Engine is running to Rich

- Adjust the Fuel Mixture Needle by 1/16 of a turn Clockwise
- Perform a Spark Plug Flight Check and verify the color of the Spark Plug
- Repeat these steps until you get a dark brown coffee color on your Spark Plug





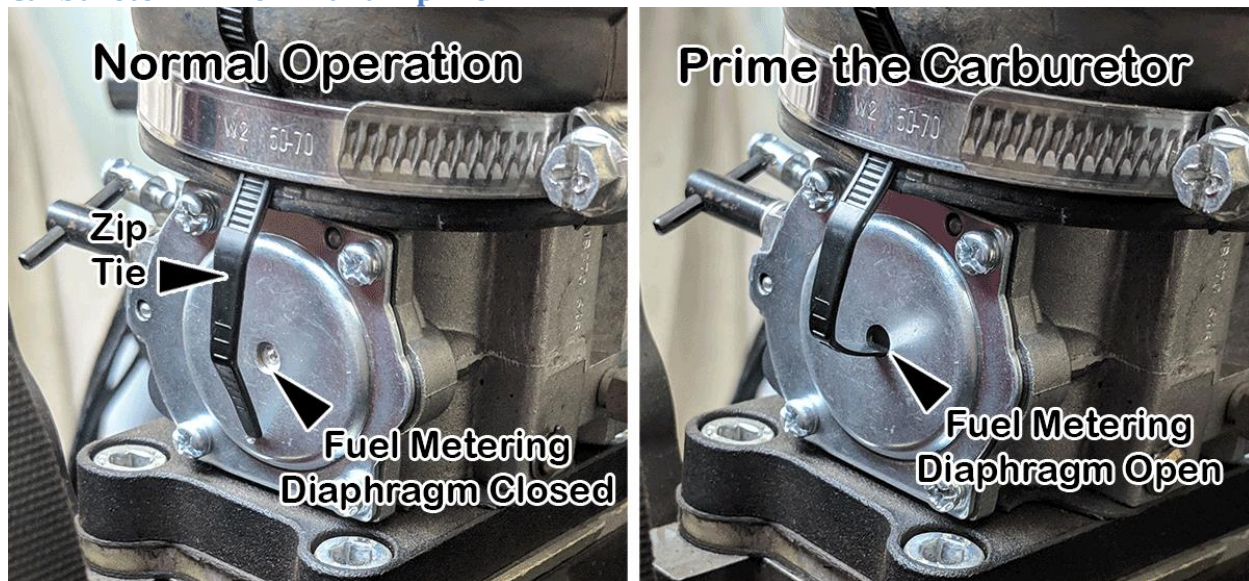
## How to Start and Stop your Paramotor

There are two different scenarios when starting your Paramotor. You either have gas in the fuel line and the carburetor has already been primed and you are ready to go fly, or you have no gas in your Paramotor and the fuel line is empty. The key point is if you have gas up and into the carburetor. This section will show you how to prime the carburetor with fuel, and then what you need to be aware of when starting your Paramotor. When starting your Paramotor it should always be done on your back. That is the safest way to start it. The other option is to secure the Paramotor to a fence post or tree stump so that it cannot get out of control.

### Prime the Carburetor:

If you have a new Paramotor, or if you just pulled it out of storage you are going to need to understand how to Prime the Carburetor so you can start your Paramotor correctly and easily. The last thing you want to do is to pull on the starter over and over again trying to get the fuel into the engine so it will run. The first thing we suggest is to use a Zip Tie mounted to the Airbox so that you can easily setup the carburetor to be primed with fuel.

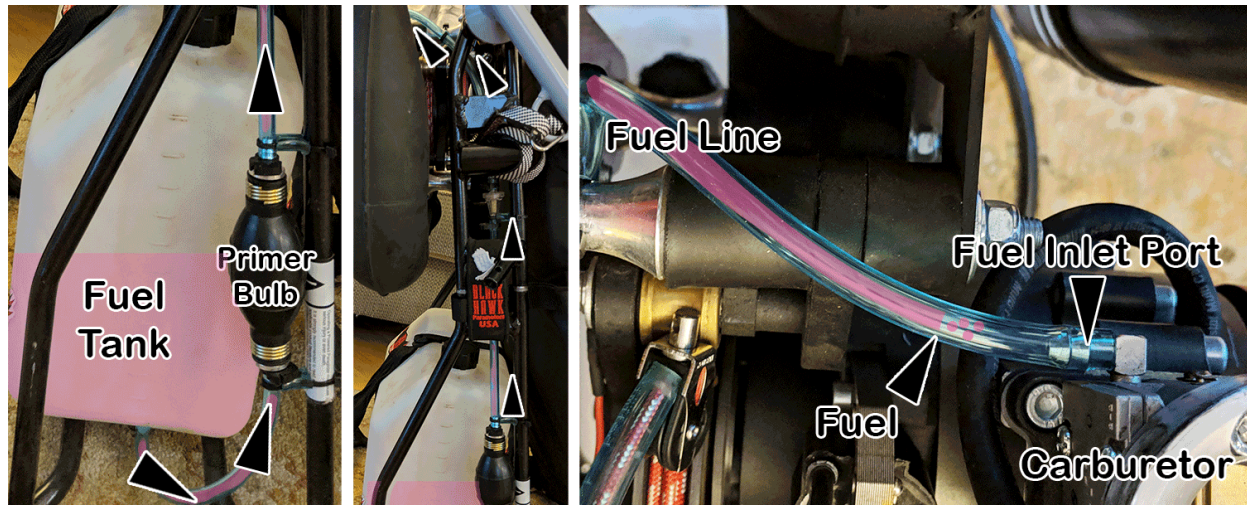
### Carburetor Primer with a Zip Tie:



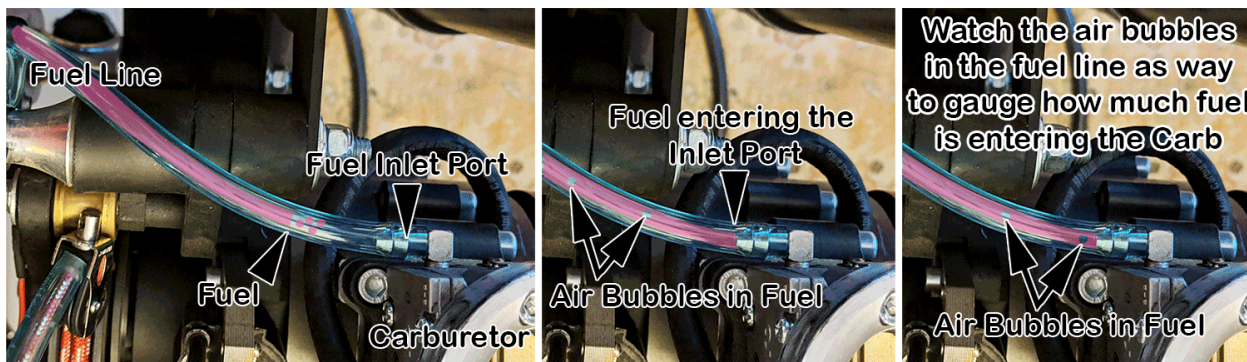
You can use the tip of a zip tie and slide that under the hose clamp so it is held tightly with the Airbox. The zip tie is used to open the fuel metering diaphragm so you can easily prime the carburetor with the fuel primer bulb from the gas tank. Once the fuel has reached the carburetor you need to remove the zip tie from the fuel metering hole on the side of the carburetor so you can start the engine, and have it will run normally.

### Prime the Fuel to the Carburetor:

Set the carburetor so it can be primed with the fuel metering diaphragm open as shown in the picture above. Make sure you have fuel in the fuel tank, and then use the primer bulb next to the fuel tank to pull fuel from the fuel tank up and through to the carburetor. Gently squeeze the primer bulb and you can watch as the fuel travels up the fuel through the fuel filter and up to the carb.



When the fuel reaches the fuel inlet port on the carburetor, STOP. You need to be very careful at this point as you can easily flood the engine by adding too much fuel while the carburetor is open to be primed. Any excess fuel that you add with the primer bulb will flow directly into the engine and you can flood the engine with too much fuel.



When the fuel reaches the fuel inlet port on the carburetor you want to make sure it's the solid line of fuel. Then squeeze the primer bulb just a little bit more or  $1/4$  to  $1/2$  squeeze to get fuel into the carburetor diaphragms. There should be some small air bubbles in the fuel line, use these as a way to measure how much fuel is flowing into the carburetor when you are squeezing the primer bulb. If you are in a quiet place you can put your ear next to the carburetor and you can hear when the fuel squirt into the carb jets and into the engine. The goal is to not over-prime or flood the engine during this step.

At this point you should have enough fuel in the carburetor to give it a start. Set the fuel metering diaphragm on the carburetor so it is now closed or make sure the zip tie is removed so the engine will run normally when you start it. The Paramotor should start in 3 to 4 pulls if you are using a pull start. If the Paramotor does not start quickly, then don't be afraid to set the carburetor back to the primer position, and then give the primer bulb another  $1/8$  to  $1/4$  squeeze to add more fuel into the carburetor. Then try starting it again. It's much easier to add another small squeeze of fuel then to pull on the starter 10 or more times.



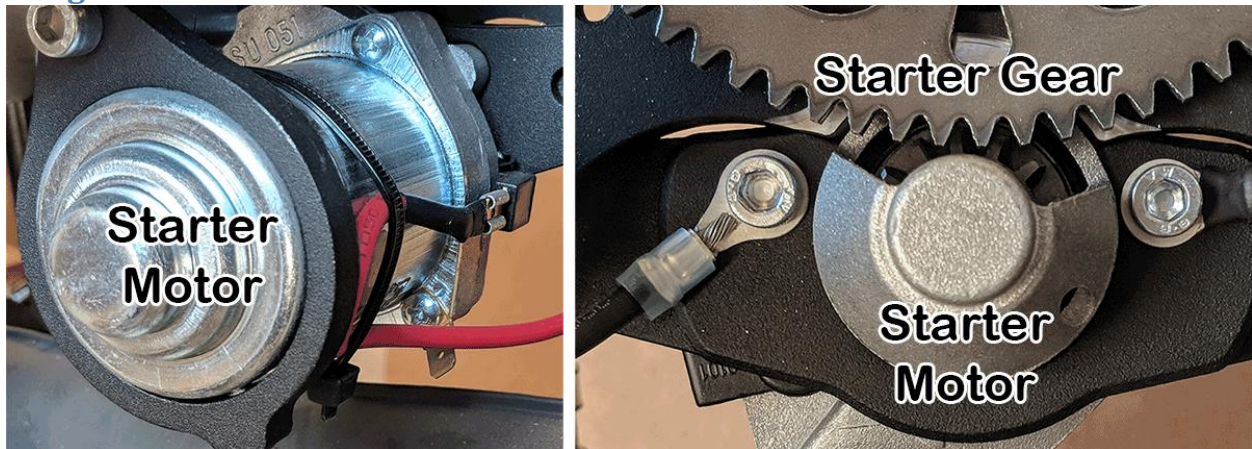


## How to Stop the Paramotor Engine with the Kill Switch

When you need to turn the Paramotor engine off, you press and hold the red kill switch on the throttle handle for 5 seconds. The kill switch grounds the coil preventing any electricity going to the spark plug, and the engine stops running. If you momentarily press the kill switch you will not turn off the Paramotor engine, instead it might sputter a little bit, but it will continue to run. When you are turning the engine off there is no need to run the engine at a high rpm, and then hit the kill switch. This only floods the motor the next time you want to start it.



## Starting Your Paramotor



### Electric Starter:

If you have an electric starter on your Paramotor, then make sure the battery is plugged in, and you can press the red starter button on the bottom of the Paramotor throttle handle. Use the starter motor in short burst of 4-5seconds to get the motor started. Do not run the starter for 30 seconds trying to get you motor to start as this will over heat and burn out the starter motor. Since electric start Paramotors are easy to start you should only start them on your back. Starting a Paramotor on your back is the safest way to start any Paramotor.



### Pull Start:

If you have a Pull Starter for your Paramotor, then there are 2 different versions depending on what Paramotor you have. When using a pull start the safest way to start the Paramotor is mounted on your back. If you have a friend have him help you start the motor while it's on your back. The only other option would be to mount the Paramotor to a rack, or a post, or a tree; something that will securely hold the Paramotor frame in place while the engine is running. You should never rev the engine beyond 2500 rpm so that the propeller does not spin or engage while the Paramotor is on the ground. Once the Paramotor RPM becomes stable around 2200 rpm you should turn the engine off and put the Paramotor on your back to warm it up the rest of the way.

- **Talon 190 Pull Start:** The pull start used on a Talon 190 is called a Flash Start. The Flash Start is a unique pull start as it aides the starting of the engine. Slowly pull on the starter cable and you want to listen and feel the engine. The engine will turn around until it reaches top dead center on the stroke, and when it goes just pass this point you will hear a k-thunk from the engine compression as it passes top dead center. The compression stroke is what winds up the spring on the Flash Start. Now you can let the pull start retract, and on the second pull, pull on the starter until you hear a click. This is the point where the Flash Start is ready to engage. Now give a normal pull on the starter, and the Flash start will engage and help turn the engine as it starts without have to yank on the starter cable.
- **Lite 125 Pull Start:** the pull start used on a Lite 125 is a direct drive pull starter. As you pull on the starter cable it will turn the engine directly.

### Starting the Paramotor after it has been Primed

Once you have started your Paramotor, and you have gas flowing into the carburetor you can easily start your Paramotor again. As long as you do not run out of gas your Paramotor engine should be ready to start the next day. If you find it hard to start, then just set the carb to the primer position and give the primer bulb a 1/8 to 1/4 squeeze to add more fuel to the carburetor. If you are in a quiet place you can listen to the carburetor as fuel squirts into the motor. Do not flood it. In most cases the engine is going to start easily unless it has been sitting for 3-4 days.



## **When to Store your Paramotor**

The biggest factor to determine when you are going to store the Paramotor or remove the fuel is based on the next time you are going to fly. If you are not planning to fly in the next 2 weeks, then you should remove the fuel from your Paramotor engine as it will become bad. Remember modern car fuel absorbs water from the air, and after 2 weeks it can absorb enough water to cause your engine to run rough.

### **Short Term Storage – Less than 30 days**

If you are going to store your Paramotor for more than 2 weeks, then you should run the engine dry. While the engine is off remove as much fuel as you can from the gas tank. Then start the Paramotor and run the engine until there is no gas left to run on. This can take up to 10 minutes as you want to let the engine idle to burn off the fuel that is left. Please be careful when you run the engine dry as most times this is done with the Paramotor on the ground, and it should be secured to something.

### **Best way to Store your Paramotor**

The best place to store your Paramotor is in a cool even temperature room between 60 and 85 degrees Fahrenheit. Remember high heat, humidity, and direct sun light kill the rubber parts on your Paramotor engine. If you put your Paramotor engine in a shed that sits out in the sun and the temperature in the shed reaches a 120 °F, then you are not really helping your Paramotor engine.

### **Long Term Storage – More than 30 days**

If you are not going to use your Paramotor for more than 30 days, then you should take some extra steps to ensure the engine parts do not wear-out prematurely.

- Run the engine dry as explained above
- Disconnect the battery
- Remove the Spark Plug and squirt in a teaspoon of 2 stroke oil into the cylinder chamber. Then re-install the spark plug and then slowly turn the engine over a couple of times to spread the oil around using the starter. (Do Not Try to Start the Engine)
- Remove the Propeller and store this in a dry location
- Loosen the pulley to remove the tension from the belt so that it does not get stretched out while not in use
- Plug the Exhaust pipe with a rag, this keeps the bugs out
- Cover the Airbox with a plastic bag, again to keep the bugs out
- Cover the engine with a cloth and store the Paramotor in a dry location
- Once a month charge the battery and turn the engine over to spread the oil around inside the cylinder chamber



## Tips and Tricks when your motor won't start

If you have been yanking on your starter over and over, or if you have worn out the battery with your electric starter, then there is a bigger issue at hand. When your engine will not start it's usually due to a common issue and in most cases 2-stroke engines can be the easiest engine to diagnose. You may not be able to fix it, but if you follow our trouble shooting steps below you should be able to determine the root cause.

Before we begin with any troubleshooting steps, please make sure you check the basics:

- You have fuel in the fuel tank.
- You have properly primed the carb before starting, so gas is readily in the carburetor
- Your engine kill switch is not engaged falsely, meaning the button is working correctly

There are 3 primary parts to any engine that we will walk you through in the steps below to make sure your engine is working correctly

- Air – Air is entering the 2 stroke engine correctly, a compression of fuel and air is built in the piston chamber. There should be no vacuum leaks in the engine crank case, and the piston does not have a hole in it
- Spark – The spark plug is working correctly
- Fuel – The Air to Fuel mixture is correctly being done by the carburetor and getting into the piston chamber so the spark plug can ignite it

As a preliminary step you should pull the start cord on the engine (not trying to start it), and feel as you pull the cord that the engine has a resistance from the compression build up as the engine turns over, and then a release of this pressure as it completes its engine cycle and the exhaust port is opened. This would mean the basic parts of the engine are working because you can build compression in the piston chamber. If there is no resistance, or the engine is making some horrible noises as it is turned over, then something major is broken and you will need to tear the engine apart to get a better understanding of the problem.

## 2-Stroke troubleshooting

### Step 1 – Check the Air

Check to make sure your engine is getting air correctly. In most cases this is a visual inspection of the carburetor and the throttle linkage. Make sure the carburetor throttle valve is working correctly. In most cases Air is not the problem

### Step 2 – Check the Spark Plug

The Spark plug is the next thing to check because it confirms 2 different parts of the engine functionality:

1. By pulling the spark plug you can check if the spark plug is wet. This would mean the engine is getting fuel, and we need to focus our attention on the spark plug itself or the electrical system on the Paramotor that gives the spark plug its electricity





2. If the Spark plug is dry, then we know we should be looking at the carburetor. But you should still check that the spark plug is generating a spark just to make sure.

In order to check if the spark plug can generate a spark you will need some assistance from a friend. You want to pull the spark plug from the engine. You want to inspect the spark plug. If there is a bunch of carbon build up; then you may want to replace the spark plug to assure it can generate a spark. The next step is to put the spark plug cap back on the spark plug, and then lay the spark plug on the engine so that the spark plug is touching metal to metal on the cooling fins, or touching the spark plug inlet. You want to be able to see the bottom of the spark plug so you can see if it will generate a spark. This is where your friend comes in to help. Have your friend pull the starter on the engine, and then you can watch the spark plug to see if it is creating a spark. If you are using a pull starter the engine will turn over very easy as there is no compression build up without the spark plug installed correctly. You want the engine to turn over quickly as you pull on the starter so it generates the electricity for the spark plug. If you have an electric starter just start your engine as you normally do. If your spark plug is working correctly you should see a very bright blue spark. If the color of the spark is orange in color this is a sign of a weak spark.

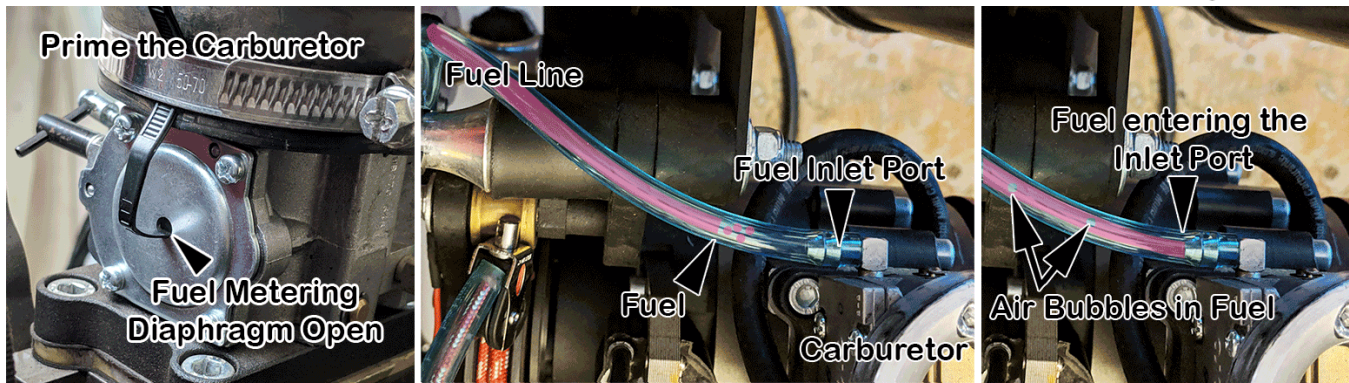
If the spark plug was wet when you inspected it; then this is a sign that you have flooded the engine. The best way to fix this with the spark plug out is to start the engine, and let the piston push out the excess fuel through the spark plug port that is open without a spark plug in it. You should do this until you stop seeing fuel mist come out of the spark plug port. If you are not in a rush you can remove the Airbox and spark plug and let the engine sit for a couple of hours and the fuel will evaporate out.

After you install the spark plug you should start the engine with your hand off the throttle, and it should be in the idle position until you hear the engine begin to pop as the fuel is ignited correctly. Be careful and perform this step safely if you are not starting the motor on your back. There is a big chance the engine can rev up quickly. Never hold the throttle wide open when starting the engine.

If the spark plug is not producing a spark, then first try another spark plug and see if that works. If that does not work, then verify the spark plug boot is securely attached to the spark plug wire. If that does not fix the issue then there is a problem with the electrical system on your Paramotor. You will need to contact BlackHawk Paramotors or an authorized dealer to get more information on what needs to be checked with the electrical system.

### **Step 3 – Check the Fuel / Carburetor**

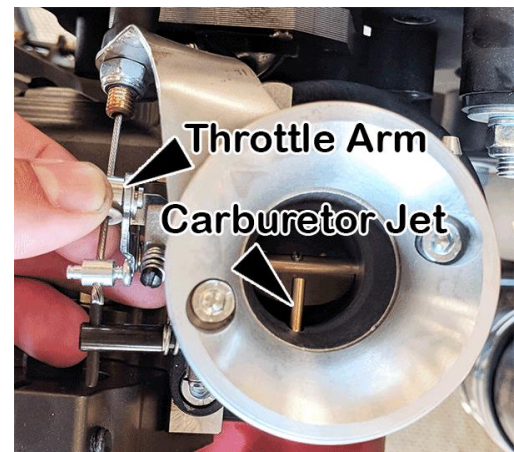
Fuel can be a tricky one because you assume if fuel is getting to the carburetor, then it should be working. Since the Paramotor engine does not use much fuel you will not see the fuel running in the fuel line as it goes into the carburetor. You should see the fuel in the fuel line and it should be going into the carburetor itself. If the fuel has not reached the carburetor; that is your first problem you need to check.



The first thing to do is to make sure you have fuel going to and into the carburetor. Check that the fuel metering diaphragm is open when you are using the primer bulb to get fuel into the carburetor. If the fuel metering diaphragm is not open you will not be able to prime the carburetor correctly, and this could make it look like your carburetor is not working correctly.

Next make sure the fuel you are using is not older than 2 weeks. Most car fuels contain Ethanol, and this will absorb water from the air over time. If the fuel is older than 2 weeks, then it could have absorbed enough water to cause the fuel to become bad and it will not burn correctly. If you see anything remotely white colored in the fuel, this is water. If the fuel smells like varnish or has a weak gas smell; that's another sign that the fuel is old. In most cases the engine will start when the fuel is old, but it will run rough.

The next part to check is the carburetor jets. You will need to remove the air filter from the carburetor so you can see into the carb itself. Then open the fuel metering diaphragm on the carb, and then use the primer bulb to pump fuel into the carburetor. If the carburetor jets are working correctly, then you should see fuel drip from the jets in the carburetor. You will need to hold the throttle valve fully open so you can see the fuel coming out of the jets. If you do not see any fuel coming out of the jet, then in most cases you will need to pull and rebuild the carburetor and clean the jets to fix this issue. You can contact BlackHawk for a carburetor rebuild kit, and BlackHawk has a video on YouTube that shows you how to rebuild the carburetor for a Talon 190 or Lite 125.



These are the tips and tricks to trouble shoot an 2-stroke Paramotor engine that was recently starting and working. If this is a Paramotor that has not been running for over a year, there could be other issues that need to be addressed that go above and beyond these simple trouble shooting tips. BlackHawk is always willing to assist you get your Paramotor in working condition.



## Engine Maintenance

The maintenance of your Paramotor engine should be taken as a proactive step to assure that your motor works reliably before you take a flight. If you take proper care of your motor and perform the maintenance as required you can extend the lifespan of the engine for up to 200hrs of flight time. The last thing you want is for your engine to fail mid-flight leaving you with predicament that could have been avoided.

When you think about the maintenance of your engine you need to think about how often you fly.

- Active pilots can fly up to 100hrs per year or more, and will most likely leave the fuel in their engine between flights. Leaving the fuel in can actually cause less stress on rubber parts for the carburetor and fuel lines. Active pilots are more likely to fix or replace items that wear out sooner like the carburetor gas filter.
- Seasonal pilots may only fly 10-20hrs per year and then may not fly for 6 months, and will most likely remove the fuel from the engine between flights. Seasonal pilots may have to replace items because they age quickly like the rubber tubes for the gas line. Not using your equipment can require more maintenance due to how the parts age because oil and fuel have been used in the engine and this degrades gaskets, diaphragms, fuel lines, filters, etc.

Keep these tips in mind when you think about the maintenance of your Paramotor engine.

- Please be aware that the climate you live in can greatly affect the rubber parts on your Paramotor, direct sunlight and/or high temperatures and/or high humidity are the worst conditions and degrade these components faster than normal.
- Keeping your engine clean will help ensure proper operation, and identify any vacuum leaks
- Older versions of the 125 and 190 might have different maintenance timeframes, but the principal ideas listed below are correct and should be followed. Please check with BlackHawk if you have an older version.

### Maintenance Window for Active Pilots

The maintenance windows for active pilots are broken down by the number of hours the engine has been flown. Using a tachometer with a time gauge is the best way to determine when the maintenance on your engine should be done. Also keeping a log of the maintenance you have performed can be a very helpful tool to make sure you are up to date on the maintenance of your Paramotor engine.

- 10hr
  - Verify the Cylinder Head Nuts and Propeller Bolts are at the correct torque setting
  - Inspect the Pull Start cord and verify it's not frayed and pulls freely
  - Verify the Fuel lines are secure and not cracking
  - Verify the electrical wiring and spark plug wires are secure
  - Check the belt tension and make sure it's not slipping
  - Check the spark plug gap - .025"



- Inspect the carb inlet screen, make sure it is free of debris
- Clean the inside of the Airbox with a carburetor cleaner spray
- Exhaust Coupling – using your hands verify these do not rotate around the joint. You only need to tighten the bolts used in these coupling to the point where it prevents the coupling from rotating by hand. This is shown in the Engine Repair section under the Exhaust Port Coupling Section
- 25hr
  - Perform all the steps from the 10hr check, plus these
  - Change the Spark Plug for a new one
  - Change the Fuel Filter in the fuel line coming from the gas tank
- 50hr
  - Perform all the steps from the 10hr and 25hr check, plus these
  - Verify and Check the Belt it may need to be replaced
    - Inspect the inside of the belt to verify the micro V's are not missing sections of the rib within the belt. There are about 11 – 15 ribs on the belt depending on the engine you are using. As the belt ages these ribs begin to break off in sections, and that is a sign you need to replace the belt.
    - Verify the belt is not showing any signs of cracking on the edges
    - Verify the belt is not fraying apart on the edges
  - Check the Fuel lines and Primer Bulb
    - If fuel lines are not pliable or feel stiff when squeezed, replace them
    - If the Primer Bulb feels stiff its best to replace this
  - Drain and clean the fuel tank
    - Remove the fuel tank from the Paramotor and disconnect the fuel line. Then use regular gas to rinse out the inside of the tank.
    - Make sure the internal fuel inlet at the bottom of the tank is free of any debris that might get stuck there
  - Verify the vent on the Fuel Cap is not clogged
    - The fuel cap has a small hole in the top of it, and if you remove the rubber gasket, you can hold the fuel cap up to the light and you should be able to see light coming through the vent hole.
- 100hrs
  - Perform all the steps from the 10hr, 25hr, and 50hr check, plus these
  - Change the belt it should be replaced for safety reasons
    - The belt has reached its lifespan and for safety reasons should be replaced at this time
  - Pull and remove the cylinder and clean the decompression port
    - If you are not sure how this is done, please contact BlackHawk for assistance



- Decarbonize piston rings
  - If you are not sure how this is done, please contact BlackHawk for assistance
- Replace Exhaust Bolts and Springs
  - There are 3 sets of exhaust couplings on the motor, and the spring will wear out over time and break.
  - You can get the replacement bolts, springs, and nuts from BlackHawk.
- Inspect the Isolation Mounts, verify no cracking or dry rot and replace as necessary.
  - It is OK to just replace one isolation mount, you do not have to replace all of them at the same time if 1 goes bad.
  - You can get the replacement isolation mounts from BlackHawk.
- Regardless of the amount of hours you have flown it is highly recommended that you replace the carburetor diaphragms once a year.

### **Maintenance Window for Seasonal Pilots**

The maintenance windows for seasonal pilots are broken down by the number of months the engine has not been used. If your Paramotor sits idle for that amount of time listed below, then you should perform a check of the listed items. The rubber parts are going to age quickly and become brittle, and are the most likely parts to fail if your Paramotor has been idle for a long period of time, especially once they have been used with gas. Keep in mind that you still need to perform the maintenance of an active pilot as the parts that wear down as you use your Paramotor are not necessarily the same as the parts that get old with age.

#### **4months**

- Inspect the Fuel Filter as it may block fuel from passing through if it's too old
- Inspect the Fuel lines as they may become stiff and brittle, and may leak fuel during flight if not checked
- Inspect the Primer Bulb as it may become stiff and brittle over time, and may leak fuel during flight if not checked
- Inspect the Carburetor diaphragms for flexibility, these may need to be replaced in the carb as they become stiff and brittle over time

#### **○ 8 months**

- Replace the Fuel filter
- Replace the Fuel lines and Primer Bulb
- Inspect the belt for any signs of cracking or dry rotting and replace as necessary
- Inspect the Engine Mounts for any signs of cracking or dry rotting and replace as necessary

#### **○ 1 year**

- Replace the Carb diaphragms and gaskets





- Verify and Check the Belt it may need to be replaced because it can become brittle over time and will shred in flight

## Break In a New Paramotor Engine

If you have received your Paramotor directly instead of picking it up at the dealer or instructor, then your engine has not been broken in. Breaking in a new Paramotor should only be performed by an expert like an instructor or a certified Paramotor dealer. We have provided these instructions as a way to educate our users, but if you are not trained correctly you can damage the Paramotor engine quickly.

When working with a new engine that has never been started before; it is very important to follow the steps outlined below to assure you get the longest lifespan out of your motor. A brand new engine can generate more friction and heat because the piston rings are not seated yet. When you break in a 2-stroke engine, you are controlling the temperature of the engine as you break in and seat the piston rings. The heating and cooling cycles of the initial engine runs will correctly seat the piston rings. This will assure the engine creates the correct compression ratio, and power that the engine was designed for.



Since we will be talking about the engine temperature and the engine RPM during the break-in period it is very important to have a Tachometer and Temperature gauge on your new engine to measure these points correctly. If you do not have a Tachometer and Temperature gauge, then we recommend that you work with a Paramotor expert to help you out with these steps.

When you begin to break in the Paramotor engine it will be off your back on the ground for these first few steps. Please make sure the Paramotor is secured to a rack, and fence post, a tree, or something secure that will hold the Paramotor frame securely while the engine is running before you try to start the engine. Make sure you have fuel in your tank and that you have primed the fuel up to the carburetor. Check the throttle handle and make sure there is a 1/8 inch play in the handle so that it is not pulling on the throttle cable engaging the engine prematurely. The goal of the first few steps is to make sure the carburetor is adjusted correctly and to get the Paramotor to start and to idle correctly. Once the Paramotor starts, we do not want to let the Paramotor idle for long periods of time (over 2-min) as this may damage the motor because it may be running rough during the initial break-in period.

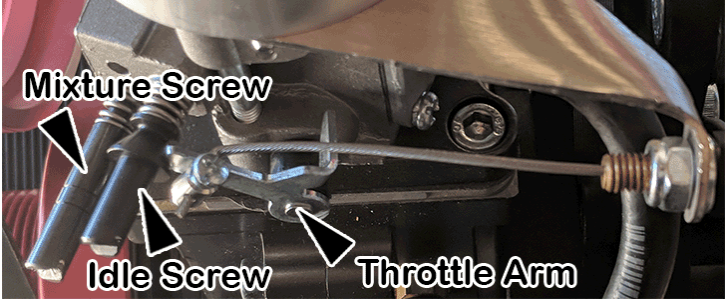
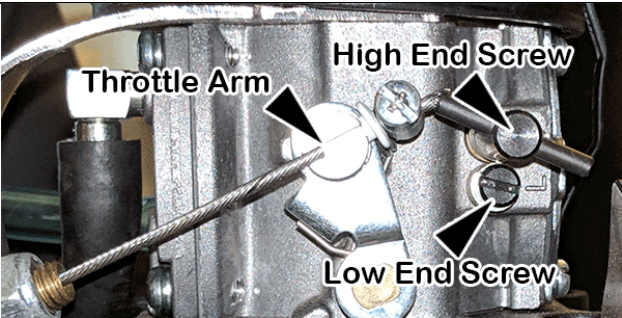
## Carburetor Check

Before you try to start the Paramotor engine you want to make sure the carburetor mixture screws are





set correctly. BlackHawk will always set the carburetor correctly at the shop before it is shipped, but the forces during shipping can cause the mixture screws to get misaligned. So it is always best to check them especially if this is a brand new engine.

<p>BlackHawk Lite 125</p> <p>Airmax WG8 Carburetor</p>	 <ul style="list-style-type: none"> <li>• Idle Screw <ul style="list-style-type: none"> <li>○ The throttle arm rests against the cone on the idle screw. The small end of the cone is a low idle point, and big side of the cone is the high idle point. Adjust the idle screw so that the throttle arm rests in the middle of the cone.</li> </ul> </li> <li>• Mixture Screw <ul style="list-style-type: none"> <li>○ The mixture screw should be set to 2 1/4 turns out</li> <li>○ Turn the mixture screw clockwise just until it stops, do not try to tighten the screw. Then turn the screw counter clockwise 2 full turns, plus 1/4 a turn more</li> </ul> </li> </ul>
<p>Blackhawk Talon 190</p> <p>Walbro WB37 Carburetor</p>	<p>These settings are defined to be rich on purpose in order to avoid any damage to your engine.</p>  <ul style="list-style-type: none"> <li>• Low End Screw <ul style="list-style-type: none"> <li>○ This requires a small flat tip screw driver</li> <li>○ The mixture screw should be set to 1-1/8 turns</li> <li>○ Turn the mixture screw clockwise just until it stops, do not try to tighten the screw. Then turn the screw counter clockwise 1 full turns plus 1/8 a turn more</li> </ul> </li> <li>• High End Screw <ul style="list-style-type: none"> <li>○ This mixture is identified with a T-Handle</li> <li>○ The mixture screw should be set to 1-1/4</li> <li>○ Turn the mixture screw clockwise just until it stops, do not try to tighten the screw. Then turn counter clockwise 1 full turns plus 1/4 turn</li> </ul> </li> </ul>



**Note** – On new engines if the default mixture screw setting on the carburetor are set correctly, and if the engine is running very rough, and / or will not idle correctly, please call BlackHawk right away. This should not be occurring, and we want to work with you to verify the engine is setup correctly before any major damage occurs.

Once you have verified the carburetor settings and the fuel has been primed up to the carburetor, then you are ready to get your Paramotor started. You can perform this initial step with the Paramotor on the ground, but it should be secured to an rack, fence post, tree, or object that can hold it safely while the engine is running. Do not attempt to start the motor without it being secured. This should only be done as a step to verify the Paramotor will start correctly before you put the Paramotor on your back for the next stage of the break-in. Do not let the Paramotor idle for an excessive amount of time, and do not idle up the motor to a high RPM as it is not safe while the Paramotor is on the ground.

### Startup

Once you have verified the engine will start correctly, it is now time to put the Paramotor on your back so that you can rev up and hold the engine pasts its idle RPM. The goal of this stage is to get the engine up to its running temperature of 200-250 °F, but you want to keep the engine at an RPM of 2800-3000 RPM. By keeping the RPM very low we prevent the engine from heating up to quickly, but we are running the engine above its idle RPM which should help it run smoother. As the engine heats up you should notice the engine will begin to run smoother. When you let off the throttle the idle RPM should also be smoother then when you first started the engine. Once your engine reaches a running temperature of 200-250 °F, this stage is complete. During this initial startup phase do not run the engine at a high RPM, you want to keep the engine around 3000RPM to properly warm up the engine parts, and to prevent the piston rings from seizing.

### Mid-Range to Idle RPM Test

Once you have hit the 200-250 °F engine temperature you can now slowly bring the engine RPM up through the midrange rpm which is approximately 5500 RPM. Then once you hit that RPM you can slowly bring the engine RPM back down to engine idle, and that should be 2000RPM-2200RPM.

- If the engine returns to an idle speed of 2000-2200RPM then this stage is complete
- If the engine is idling more or less than 2000RPM-2200RPM,
  - turn off the engine, and take the Paramotor off
  - then make an idle speed adjustment on the carb to achieve the 2000-2200RPM
  - then put the Paramotor back on, and test the midrange RPM back down to the idle speed RPM to make sure the Paramotor idles at 2000-220RPM
  - Repeat these steps as necessary during the Break-in to set the idle speed correctly on the engine
- You never want to make a carb idle speed or a mixture adjustment while the engine is cold. This should only be done when the cylinder head temperature is greater than 200°F

During this stage you want to watch the engine temperature to make sure the engine temperature does not go over the specified cylinder head temperature called out on page (17) of this manual. If the engine is over-heating at this stage, then stop the break-in and call BlackHawk as something is wrong.



## Engine RUN-IN Test

Once the Engine Idle RPM has been established you will want to perform a run-in on the engine. A good run-in will prolong the life of your engine. Before you begin this process please make sure you have a full tank of gas. This process needs to be done with the Paramotor on your back, or secured to a rack, fence post, tree, or something secure that will hold the Paramotor frame and engine in place while the propeller is spinning and generating up to 100-Lbs of thrust. Due to the amount of time it takes to complete a run-in we recommend performing this test on the ground and secured.

1. Begin by starting the Paramotor engine, and then bring the RPM up to 2500RPM and hold it there for 5min
2. Then bring up the RPM on the engine to 3000-3500RPM for 15min
3. Then bring up the RPM on the engine to 4000RPM for another 15min
4. Turn the engine off and perform a visual inspection to assure there are no oil leaks. Then check the bolts on the propeller to make sure they are correctly torqued
  - a. Please make sure you are careful not to touch the cooling fins or the exhaust as these parts will be very hot from the engine test. You may need to use gloves to protect your hands
5. Start the engine again and bring it back up to 4000 RPM in steps
  - a. Start at 2500RPM for 5min
  - b. Then go to 3000-3500RPM for 5min
  - c. Then up to 4000RPM for 5min
6. Then bring up the RPM on the engine to 4500RPM for 15min
7. Turn the engine off and again perform another visual inspection and check the torque on the nuts and bolts
8. Let the engine fully cool down (8hrs) and then check the cylinder head nuts, and make sure they are correctly torqued

## Full Power RPM Test

Once the Engine RUN-IN has been completed you will want to perform a Full RPM test on the engine. During this stage you need to briefly bring the engine up to full power to ensure you can achieve the full power RPM listed below. This only needs to be done for a couple of seconds to verify the engine will achieve this RPM range.

- BlackHawk 125 Lite = Full Power RPM is 9400-9600
- BlackHawk Talon 190 = Full Power RPM is 7800-8000

## Post Break-In Check List

After you have run your Paramotor for 10min and you have achieved the full power RPM, and the engine is working within the temperature ranges during the test, you can now turn the engine off and let it fully cool off. During this phase you want to make sure the bolts on the engine are tight, and that nothing has come loose during the break in phase. Please perform the checks in the list below:



- Check the Prop bolts and assure they are tightened at the correct torque
- Check the Engine mounts and make sure they are tight
- Check the Exhaust bolts, and make sure the mounts cannot be turned by hand
- Perform a general check over the engine to assure the wires and cables are working correctly, and are secure to the Paramotor frame. Nothing should be loose that could possibly hit the prop
- Visual inspection of the cage and netting, make sure the straps are tight and the netting on the cage is tight.
  - When the netting on the cage is tight this will add some structural integrity to the cage
  - When the netting is loose, this can cause the cage to flex and could allow prop strike
- Visual inspection of the harness looking for any fraying or loose points where the harness should be tightened
- Check the straps that hold the gas tank, and make sure the gas tank is held in tight. Make sure the strap is secured so that there is no chance the strap can strike the prop
- Do not check the Cylinder Head Bolts, this needs to be done after the engine has been off for 8hrs
  - Once the cylinder head bolts have properly cooled, then check them for the correct torque

### Initial Break-in Period

The first 10 hours that you fly and use your Paramotor are the most critical for correctly setting the piston rings to assure your engine has the longest lifespan. During this time you should avoid over-stressing the engine. This can be done with excessive loads by doing tandem rides, or using full throttle on the engine for excessive periods of time. You should always vary the RPM of the engine while you are flying, this helps correctly set the piston rings. You should also monitor the temperature of the engine during this period and avoid reaching or going over 400°F / 204°C.

### Your First Flights

After you have performed the Break-In of the engine you are ready to perform the first flight with your Paramotor. The goal of the first few flights is to take multiple quick 15min flights. After each flight you want to examine the Spark Plug to ensure you have the correct air to fuel mixture. Please read the section below to understand how to make the air-fuel adjustments to get the correct air fuel mixture which will align with the spark plug colors. Please refer to the Spark Plug section on page (21) to understand what color you are looking for on the Spark plug for the best air to fuel mixture.

### 15-min flights and spark plug check

Begin by taking a normal 15min flight to get your engine up to its normal operating temperature. This does not mean running the engine at full throttle. The goal is climb out safely, and then cruise at a safe altitude for about 15min. You want the engine to reach its normal operating temperature, if you have a temperature gauge use that as your reference. You want to keep the engine running until you land on the ground within safe reason as you want the engine to be as close as it can be to its normal engine temperature when checking the spark plug color.



Once you have landed you will need to remove the Spark Plug quickly, and then check the color of the Spark Plug using the reference in this manual as your guide to determine if the engine is running lean or rich. When making mixture adjustments on the carburetor, do a 1/16 of a turn in the direction that is needed to correct the air-fuel mixture:

- Turn the mixture screw counter clockwise if the Spark Plug shows its running to lean
- Turn the mixture screw clockwise if the Spark Plug shows its running to rich

Repeat this process as necessary until you have the correct Spark Plug color after a 15min flight. Once the Spark Plug color is correct, you are now setup to take longer flights, and can use the full fuel tank. Keep in mind during this 10hr break in period that you want to avoid using full throttle for more than necessary to fly safe.

**Note** – On new engines if the default mixture screw setting on the carb is set correctly, and the engine is running lean, this is a possible sign of a faulty carb, please call BlackHawk right away to verify with us.

## Flight Checks

Pre Flight and Post Flight checks help assure you have a safe flight each and every time. Post Flight checks are the most important as it helps assure your next flight is safe, and if you find an issue it's not just before you want to fly.

### Post Flight Checks

A Post Flight check should be performed after each and every flight. This is the best way to get familiar with your Paramotor because you will easily identify when something is coming loose, or when it looks out of place. Please perform each step listed below:

- Check the Prop bolts and assure they are at the correct torque
- Check Engine mounts bolts, and engine mount shock absorbers / isolation mounts
- Check Exhaust bolts and springs on the exhaust couplings
- Perform a general check over the engine to assure wires or cables are working correctly
- Visual inspection of the cage and netting
- Visual inspection of the harness looking for any fraying
  - Swing Arms, no loose play
  - J-Bars, verify the security clip is fully locked
  - Verify Malians are locked and secure
  - Carbineer straps and the Carbineers themselves
- Check the fuel tank strap that hold the gas tank, make sure it is tight and that the strap is tucked away so that it cannot strike the prop
- Check the drive belt tension





- If you grab the edge of the drive belt in the middle between the two pulleys, the belt should not deflect more than a 1/8 to 1/4 of an inch
- Do not check the Cylinder Head Bolts torque, this needs to be done after the engine has been off for 8hrs and is completely cooled
  - Please make sure this is done as a Pre-Flight Check

## Pre Flight Check

This is done to ensure the work that you did on your Post Flight check was done correctly. It is a second review of the work that was done on your post flight check, and to ensure your engine is running correctly before you take your next flight. We are going to assume that for the pre-flight check that the engine is cold, and has not been flown for the day yet.

- Make sure you have enough fuel for your flight
- Check the Cylinder Head Bolts torque as this needs to be done when the engine is cold
- Best Practice to Startup a Cold Engine
  - Warm up the engine (Paramotor on the ground)
    - You can start engine on the ground secured to a rack, fence post, tree, or something that will hold the Paramotor frame securely while the engine is running for this part only
    - Do not rev engine past 2500 RPM to prevent the prop from spinning
    - Only run the engine on the ground until it reaches a temp of 200f or until the idle RPM starts to level and smooth out
  - Start the engine (Paramotor mounted on your back)
    - Harness checklist
      - Verify the Harness is in good condition
      - Verify the carabineers are working correctly
      - When you strap yourself into the harness you should perform a quick checklist to make sure you are safe
        - Check the legs straps, waist strap, chest strap, and chin strap on your helmet
    - You can now start and rev the engine past 2500RPM
      - Make sure to rev up the engine close to full RPM or the RPM that you will use for take-off. You only need to hold the high RPM for a few seconds
      - Make sure the throttle up RPM is smooth and not erratic or jumpy



## Troubleshooting Matrix

Problem	Possible Cause	Solution
Engine will not start	Air Fuel Mixture is Incorrect	Verify the carburetor air fuel mixture settings are correct
	Engine is Flooded	Remove the spark plug and pull start the engine to clear the cylinder of fuel. Dry the spark plug off with a rag, and then re-install it. Try not to flood the engine again.
	Engine Parts are Seized	Contact the engine manufacturer as major work is needed
	Low Compression	Check for engine vacuum leaks, check the cylinder head bolts torque, check the reed valves as a broken reed valve can cause low compression. Last step is check the piston rings as they may be worn and seized
	No Fuel	Check the gas tank, check the fuel lines, check the fuel filter, and check the carburetor inlet screen
	No Spark	Ensure that the kill switch is not engaged. Try a new spark plug. Check the spark plug boot is attached to the spark plug wire. Check the magnets on the flywheel are not rusted. Change the coil as last step.
Poor Running at Idle	Air Fuel Mixture is Incorrect	Fuel mixture setting could be set to rich, the fuel metering needle may not be seating properly allowing excess fuel to enter the carburetor and making it run rich, Check the spark plug as it may be fouled.
	Ignition Coil is Faulty	Check the magnets on the flywheel are not rusted, change the coil as a last step.
	Low Compression	Check for engine vacuum leaks, check the cylinder head bolts torque, check the reed valves as a broken reed valve can cause low compression. Last step is check the piston rings as they may be worn and seized
	Weak Spark	Try a new spark plug, check the spark plug boot is attached to the spark plug wire, check the magnets on the flywheel are not rusted, change the coil
Poor Running at High RPM	Air Fuel Mixture is Incorrect	Verify the carburetor air to fuel mixture settings are correct, the engine may be running rich.
	Engine does not rev up correctly	Verify the carburetor air to fuel mixture settings are correct, the engine may be running rich.
	Incorrect Spark	Try a new spark plug, check the spark plug boot is attached to the spark plug wire, check the magnets on the flywheel are not rusted, change the coil
	Knocking	This could be caused by bad gas that is older than 2 weeks. Gas can absorb water and this will cause a knocking sound in the engine
	Low Compression	Low compression will prevent the engine from reaching its high RPM



Overheating	Air Fuel Mixture is Incorrect	The Air fuel mixture is set to lean, and/or the carburetor inlet screen could be getting clogged preventing gas from reaching the carburetor.
	Vacuum Leak	If the engine has a vacuum leak this will cause the air fuel mixture to run lean
	Incorrect Fuel to Oil Ratio	The oil to fuel mixture could be higher than the 40-1 ratio, or the fuel has no 2-stroke oil mixed in, and this would cause the engine to overheat
Pull Start Flywheel	Starter is not engaging the engine	The starter pawls need to be inspected to ensure they are spreading out and grabbing the hub. Inspect the hub to ensure its not cracked or broken internally
	Pull Start Not Retracting	Ensure the starter cord is on the pulley, and not wedged between the pulley wheel and the starting housing. Check if the recoil spring is broken in the pull start, and would need to be replaced.
Excessive Smoke from Exhaust	Air Fuel Mixture is Incorrect	Carburetor mixture settings could be running to rich
	Incorrect Fuel to Oil Ratio	The amount of oil in the fuel could be over the 40-1 ratio causing the engine to burn an excessive amount of oil
	Worn or stuck Piston Rings	The piston rings are stuck in and not expanding to create the proper seal in the cylinder, and this would create excessive smoke from the exhaust
Oil Leaking from Engine	Cylinder Head Nuts	Verify the torque settings on the cylinder head bolts are correct
	Vacuum Leak	If you see an oil leak on the cylinder or any part that connects to the engine case, this is a sign of a vacuum leak and needs to be fixed
Propeller Clutch	Clutch Pads are Worn	The propeller will normally engage at the proper RPM around 2500-2600RPM, and as the pads become worn the propeller will not engage until a higher RPM is reached. The pads should be inspected for wear when the propeller does not begin to engage until around or after 3500RPM

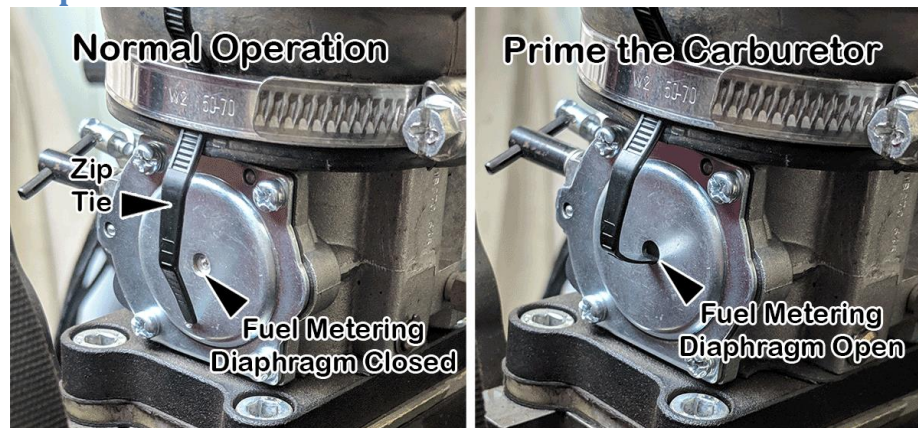


## Engine Repair Section

In the section of the manual we explain how to replace the common parts that will wear over time. This section of the manual will be updated over time with more information on how to work on your Paramotor. BlackHawk is not accountable or responsible for the engine work that you perform on your or any other Paramotor engine. If you damage your Paramotor while you are performing the work on it, then you are accountable for the damage. If you feel you are not qualified to perform the work, then please contact us or a qualified BlackHawk Dealer for assistance.

### Carburetor Section

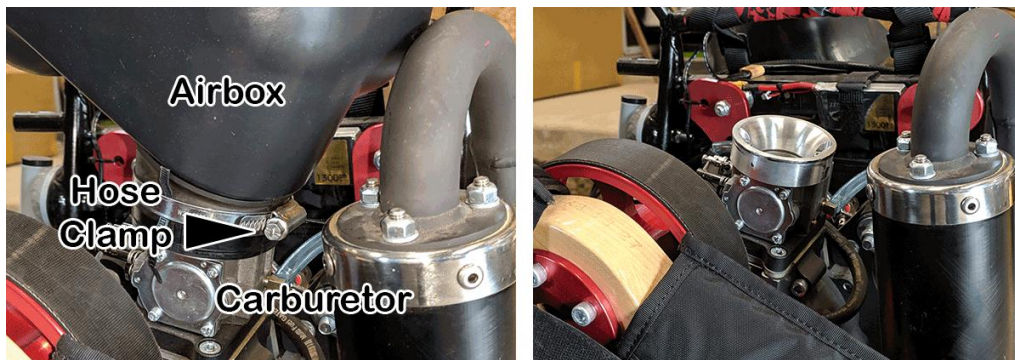
#### Zip Tie Primer Setup



You can use the tip of a zip tie and slide that under the hose clamp so it is held tightly with the Airbox. The zip tie is used to open the fuel metering diaphragm so you can easily prime the carburetor with the fuel primer bulb from the gas tank. Once the fuel has reached the carburetor you need to remove the zip tie from the fuel metering hole on the side of the carburetor so you can start the engine, and have it will run normally.

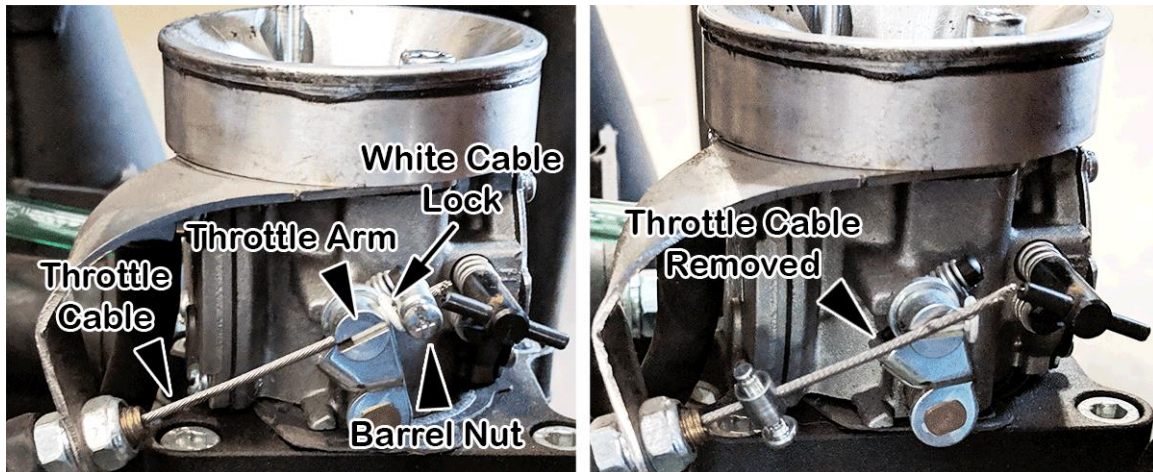
#### Remove the Carburetor from the Talon 190 Engine:

The instructions below explain how to remove the carburetor from a Talon 190 engine.

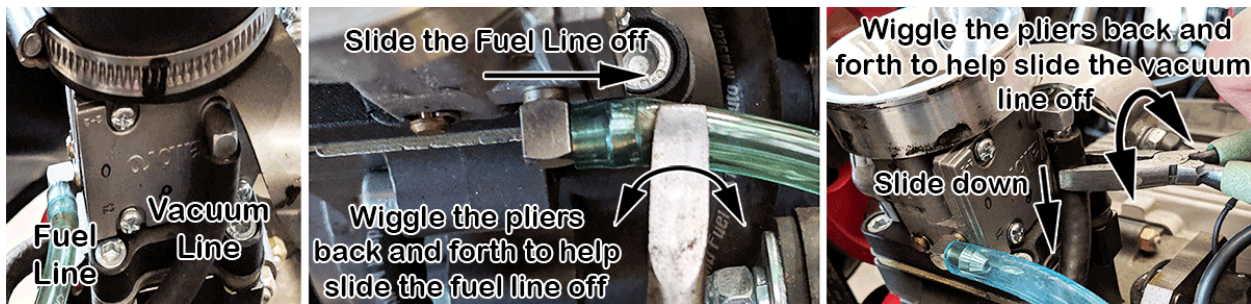


1. Remove the air box from the carburetor by loosening the hose clamp that holds the Airbox to the carburetor.

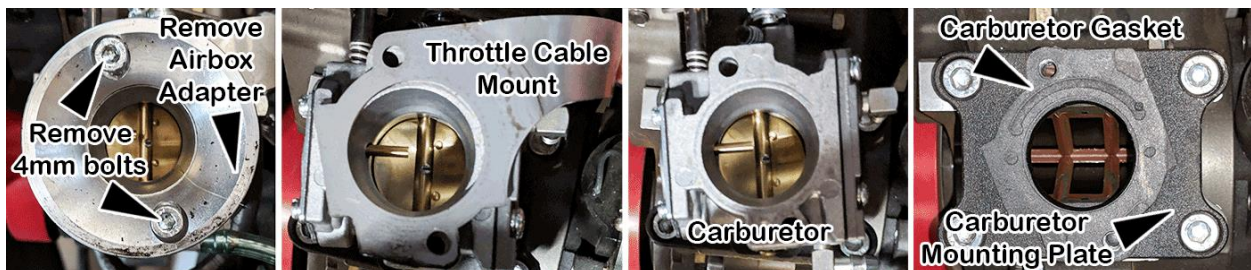




2. Disconnect the throttle cable from the throttle arm on the carburetor. Loosen the Barrel nut so it can slide off the cable, then you can slide the white cable lock off the cable, and the throttle cable will slide out the side of the throttle arm.



3. Disconnect the fuel line. You can use a pair of pliers and grab the fuel line firmly, and slide and wiggle the pliers back and forth to remove the fuel line.
4. Disconnect the vacuum line. Again use a pair of pliers to grab the vacuum line firmly, and slide and wiggle them back and forth to remove the vacuum line.

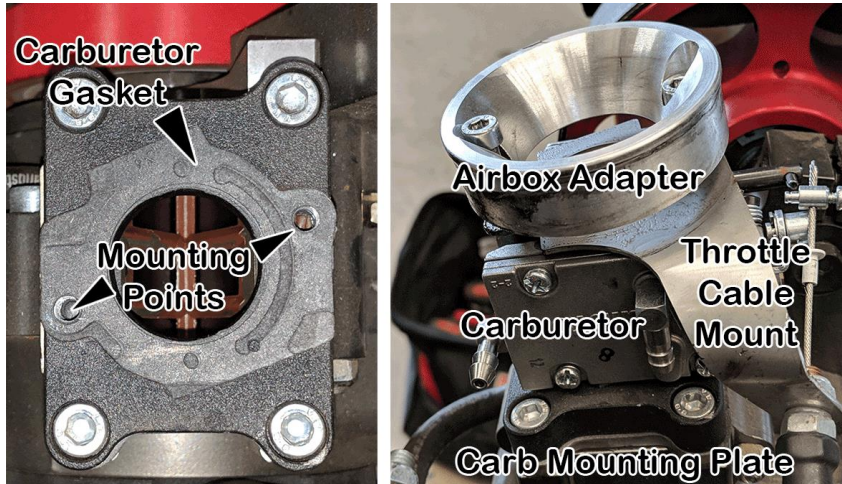


5. Un-screw the 2x 4-mm hex bolts that hold the carburetor assembly to the carburetor mounting plate. Now you can remove the bolts with the Airbox adapter that sits on top of the carburetor.
6. Remove the throttle cable mount that holds the throttle cable next to the carburetor.
7. You can now remove the carburetor from the engine.

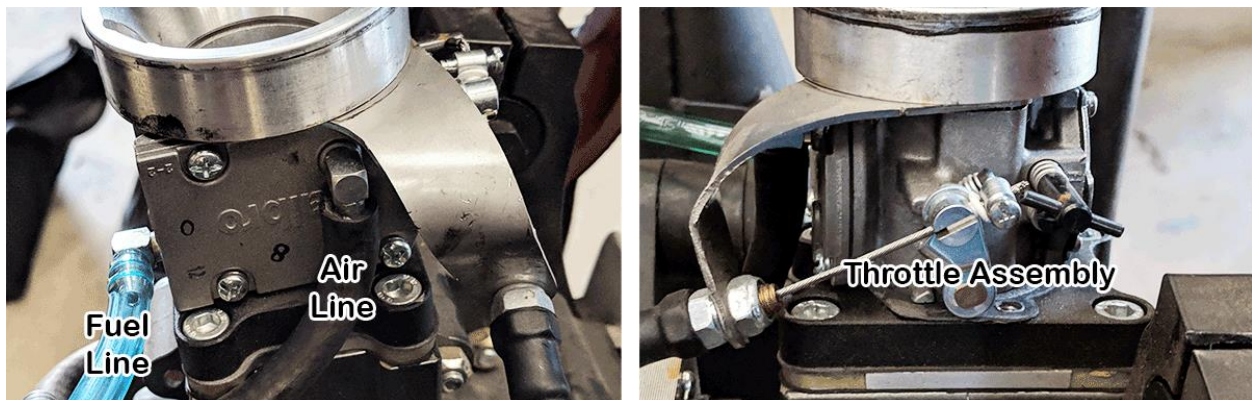


## Re-Install the Carburetor on the Engine:

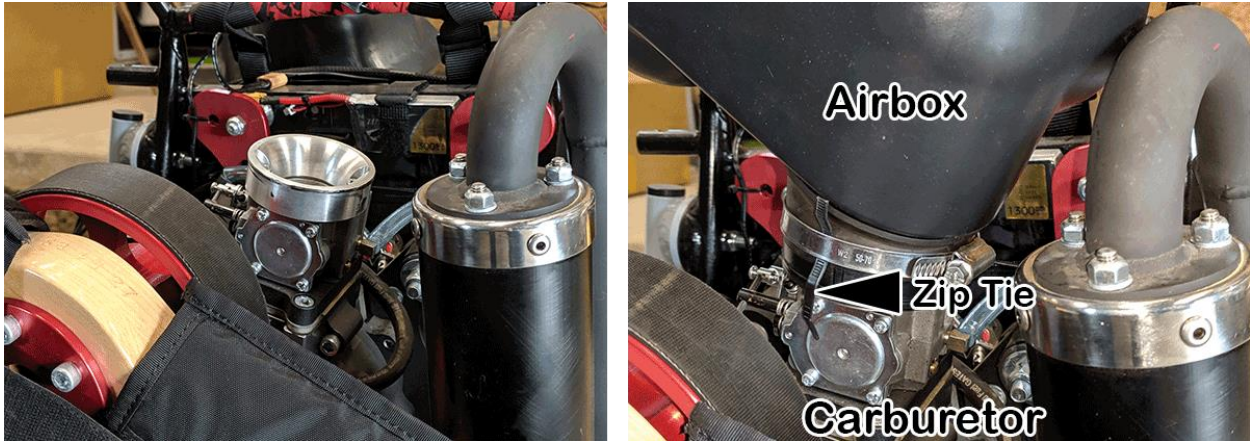
1. Inspect the Carburetor mounting gasket on the engine. If it looks like it is not worn, then you do not need to replace it. If it is torn in any way from when you remove the carburetor it is best to replace it.



2. Use the 4mm bolts to help align the parts as you place the Airbox adapter on top of the throttle cable plate, and put that on top of the carburetor. Then mount the assembly to the engine using the mounting points as shown above. Tighten the bolts when you have the carb mounted correctly.

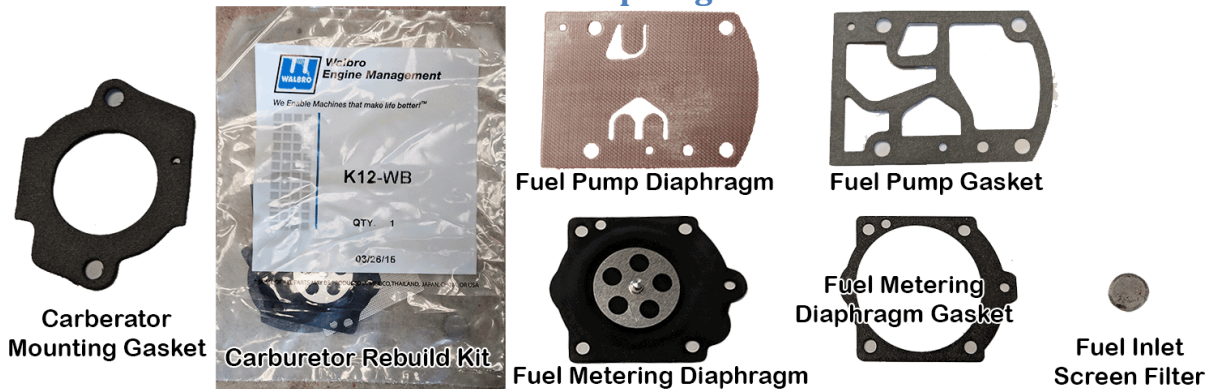


3. Now you can connect the fuel line and the vacuum line from the engine crankcase to the carburetor.
4. Re-assemble the throttle. Make sure you do not pull on the throttle cable to much as this can cause the throttle not to reset back to the idle position. There should always be a little bit of slack or play in the throttle line when you test the throttle from the throttle handle.



5. Install the Airbox back on the carburetor using the hose clamp, and you have completed the carburetor install.

### Talon 190 Carburetor Rebuild Kit and the diaphragms used



The carburetor kit will come with more parts then are used with these instructions. You only need to replace the diaphragms, gaskets, and the fuel Inlet screen filter shown in the picture above. Make sure you use the same size fuel inlet screen filter as there are 2 different sizes in the carburetor rebuild kit. You can keep the rest of the parts as they may be helpful later on.

### Talon 190 Carburetor Diaphragm Replacement:



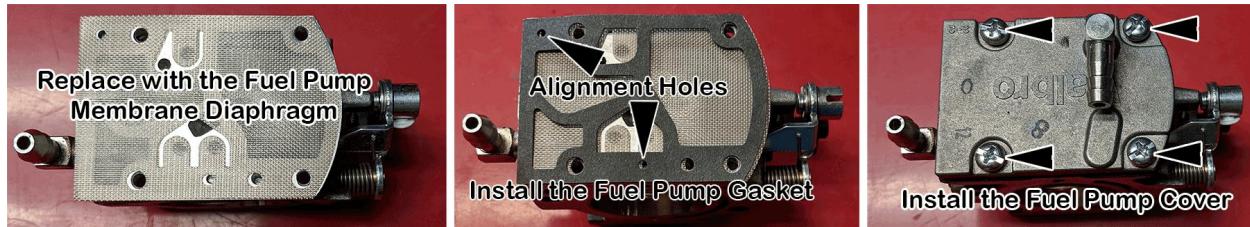
1. Working with the carburetor on a work bench, remove the 4x screws holding the fuel pump cover on the fuel pump side of the carburetor.
2. Remove the gasket and the diaphragm from the fuel pump. Spray the inlet holes on the fuel pump with carburetor cleaner as shown by the yellow arrows, this will help assure your fuel



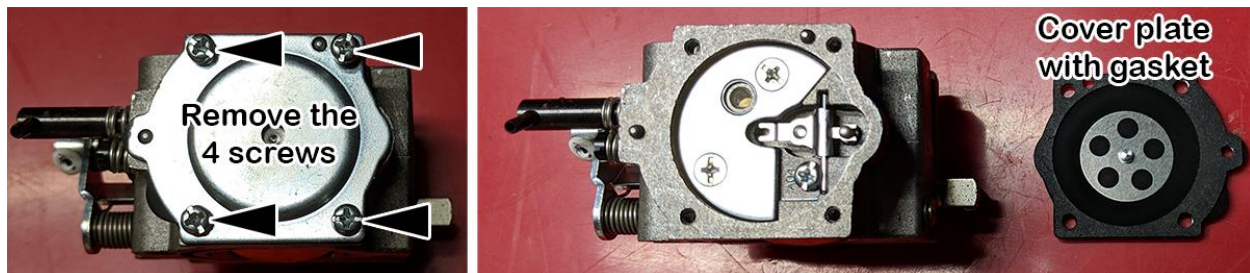


mixture ports are clean and clear of debris. Please wear safety goggles to protect your eyes from the carburetor cleaner.

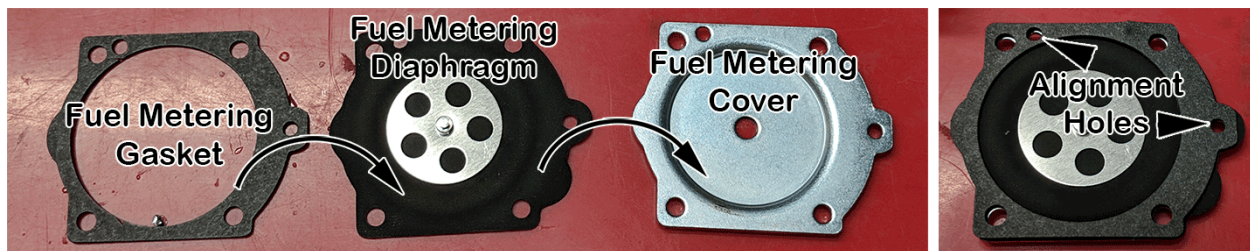
3. Remove and replace the fuel inlet screen filter. If you press down on one side of the screen with a small screw driver it will rotate out and you can grab it easily.



4. The Carburetor kit may come with both a rubber and a membrane diaphragm. Use the membrane diaphragm as it is more durable and longer lasting. The rubber diaphragm will be colored black while the membrane diaphragm is a tan color.
5. Install the fuel pump gasket on top of the diaphragm. Make sure the alignment holes are correctly lined up as shown by the arrows in the picture above.
6. Install the fuel pump cover back on the fuel pump side of the carburetor, and tighten the 4x screws that hold it in place.
7. Flip the carburetor over to the other side so we can replace the fuel metering diaphragm and gasket.



8. Remove the 4 screws holding the fuel metering cover plate to the carburetor and remove the fuel metering cover plate.
9. Remove the gasket and fuel meter diaphragm from the inside of the cover plate.



10. Re-assemble the fuel metering diaphragm as shown above. The gaskets goes on top of the fuel meter diaphragm, and that assembly goes on top of the cover plate. Make sure the alignment holes in both the gasket and the diaphragm are lined up correctly as shown above.

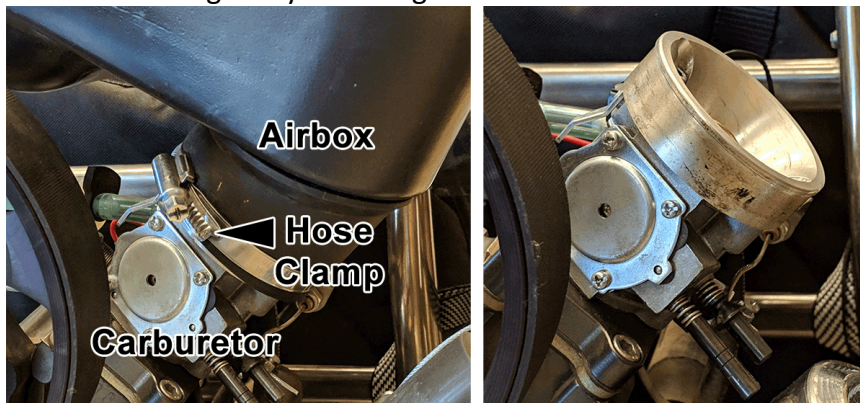




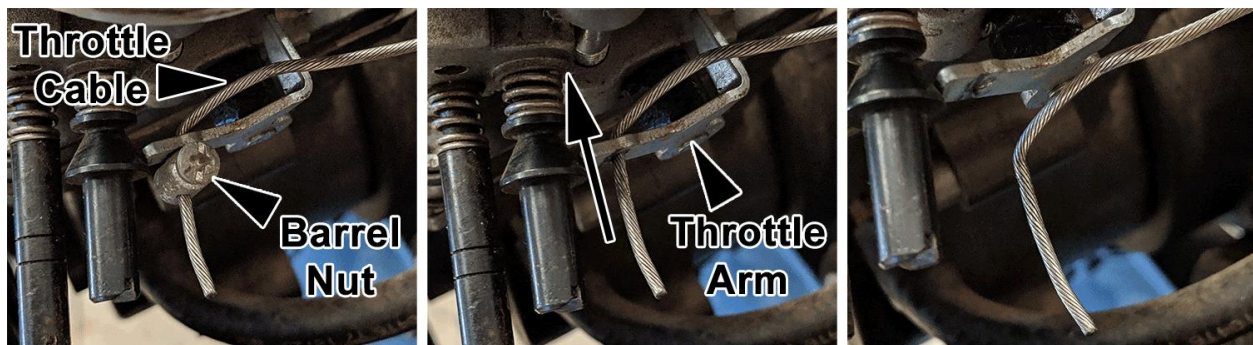
11. Install the fuel metering cover plate back on the carburetor using the 4x screws from step 9

### Remove the Carburetor from the Lite 125

These instructions will guide you through how to remove the carburetor from the BlackHawk Lite 125

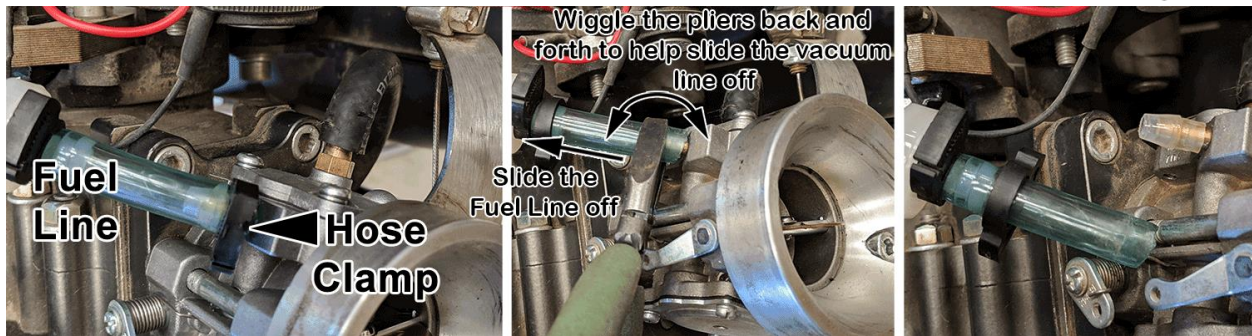


1. Remove the air box from the carburetor by loosening the hose clamp that holds the Airbox to the carburetor.

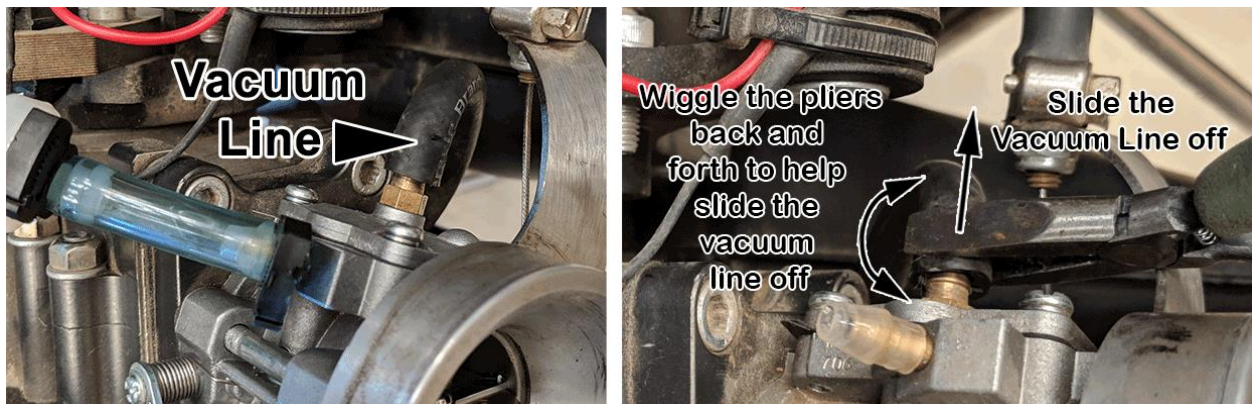


2. Disconnect the throttle cable from the throttle arm on the carburetor. Loosen the Barrel nut so it can slide off the cable. Then you can slide the throttle cable out of the throttle arm in the direction of the arrow so it becomes free from the carburetor.

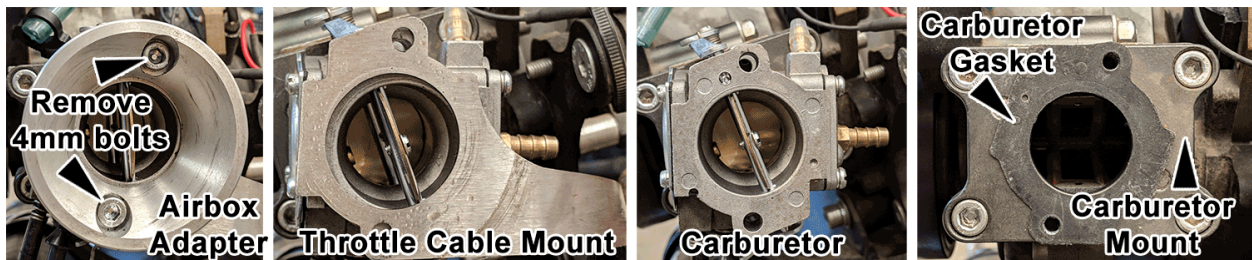




3. Disconnect the fuel line. Remove the hose clamp first. You will need a pair of needle nose pliers so you can pry the inside and outside clamps arms apart to unlock the hose clamp. Once the hose clamp is removed you can use a pair of pliers and grab the fuel line firmly, and slide and wiggle the pliers back and forth to remove the fuel line.



4. Disconnect the vacuum line. Again use a pair of pliers to grab the vacuum line firmly, and slide and wiggle them back and forth to remove the vacuum line.



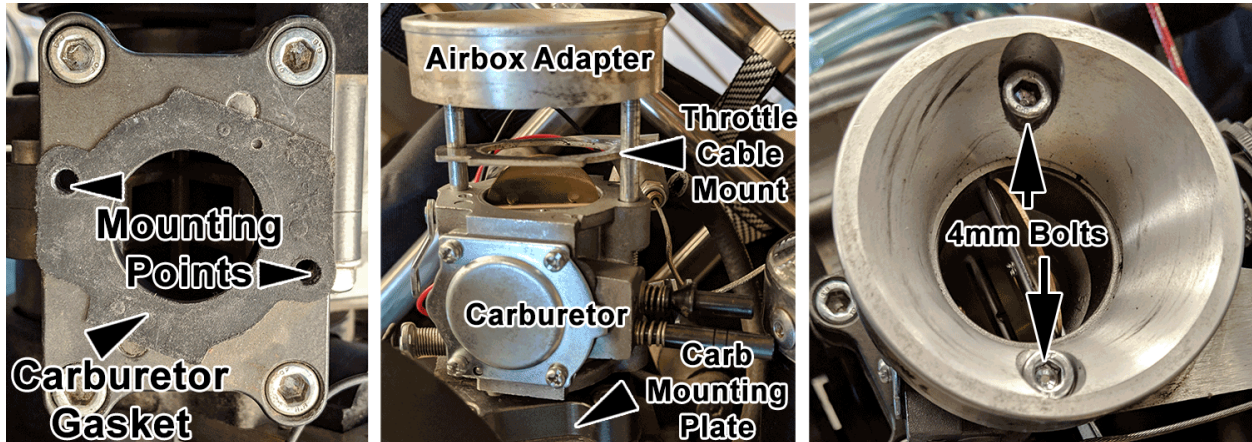
5. Un-screw the 2x 4-mm hex bolts that hold the carburetor assembly to the carburetor mounting plate. Now you can remove the bolts with the Airbox adapter that sits on top of the carburetor.
6. Remove the throttle cable mount that holds the throttle cable next to the carburetor.
7. You can now remove the carburetor from the engine.



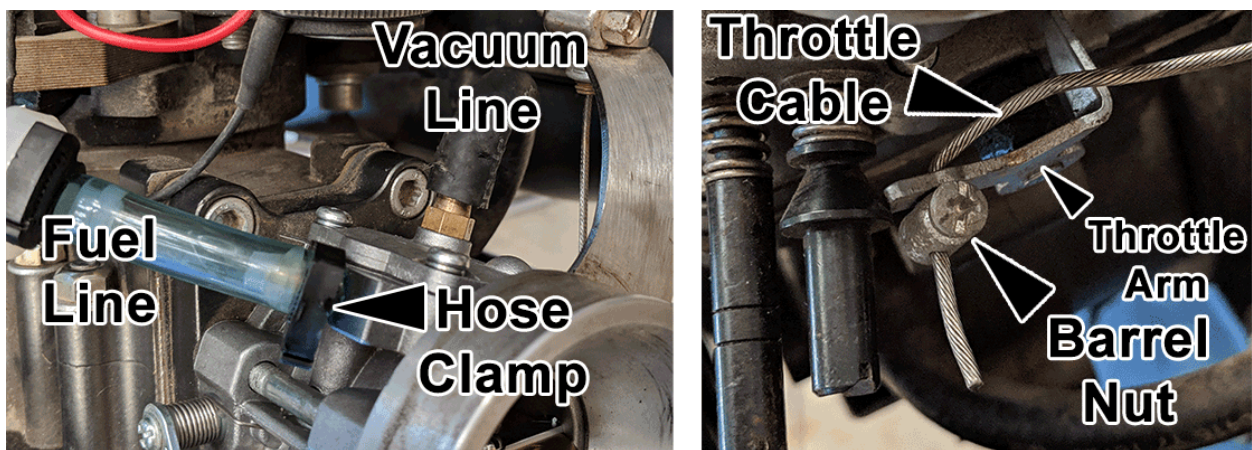


### Re-Install the Carburetor on the Engine:

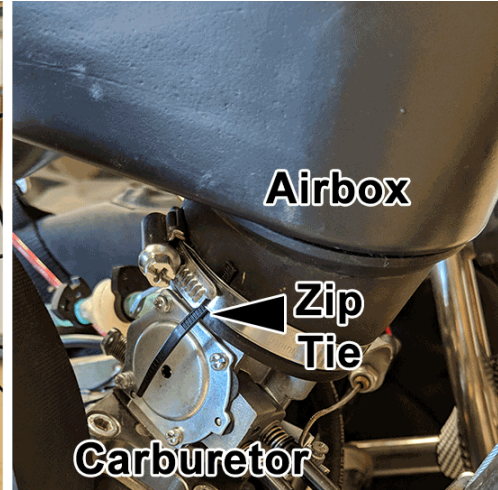
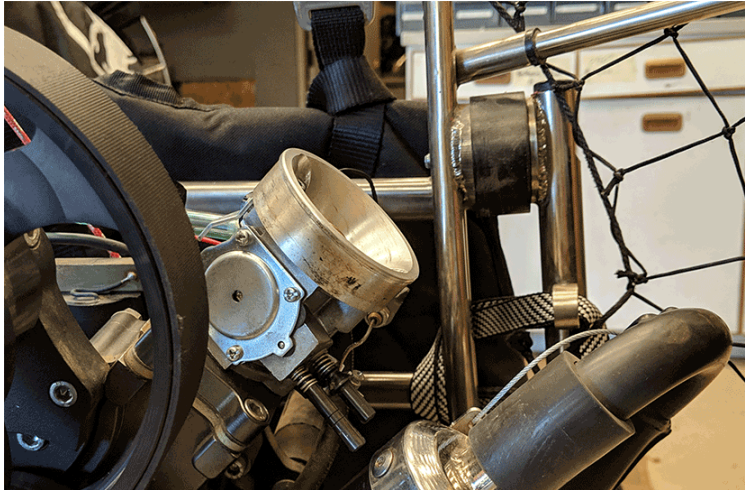
1. Inspect the Carburetor mounting gasket on the engine. If it looks like it is not worn, then you do not need to replace it. If it is torn in any way from when you remove the carburetor it is best to replace it.



2. Use the 4mm bolts to help align the parts as you place the Airbox adapter on top of the throttle cable mount, and put that on top of the carburetor. Then mount the assembly to the engine using the mounting points as shown above. Tighten the bolts when have the carburetor mounted correctly.

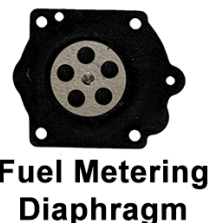
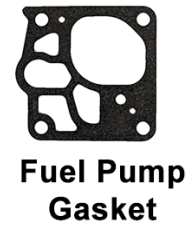


3. Now you can connect the fuel line and the vacuum line from the engine crankcase to the carburetor. Make sure to re-install the hose clamp on the fuel line, and on the fuel inlet port on the carburetor. The fuel line will come off or leak fuel if the hose clamp is not installed correctly.
4. Re-assemble the throttle. Make sure to install the barrel nut close to the throttle arm so there is no slack or lose play in the throttle line. There should always be a little bit of slack or play in the throttle line when you test the throttle from the throttle handle.



5. Install the Airbox back on the carburetor using the hose clamp, and you have completed the carburetor rebuild.
6. You can use the tip of a zip tie and slide that under the hose clamp so its held tightly with the Airbox. The zip tie is used to open the fuel metering diaphragm so you can easily prime the carburetor with the fuel primer bulb. Once the fuel has reached the carburetor you need to remove the zip tie from the fuel metering hole on the side of the carburetor so it will run normally.

### Lite 125 Carburetor Rebuild Kit and the diaphragms used

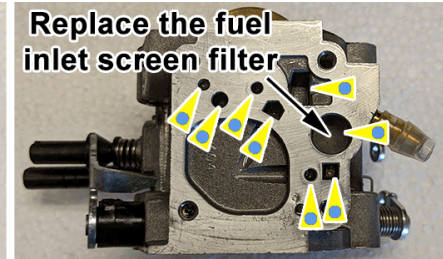
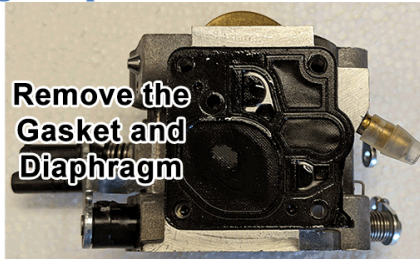


The carburetor kit will come with more parts then are used with these instructions. You only need to replace the diaphragms, gaskets, and the fuel Inlet screen filter shown in the picture above. You can keep the rest of the parts as they may be helpful later on.

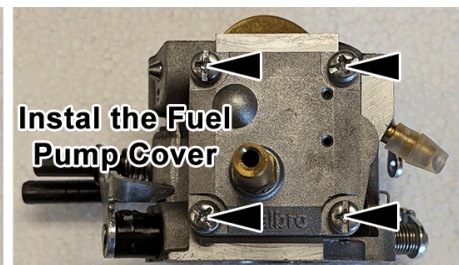
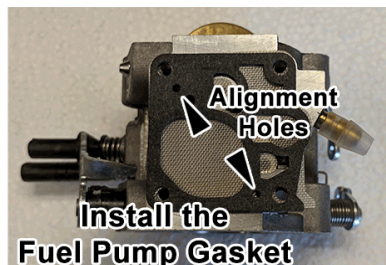
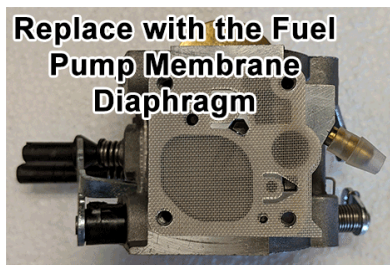




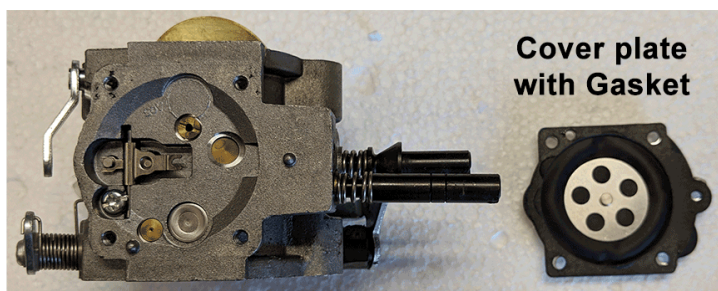
## Lite 125 Carburetor Diaphragm Replacement:



1. Working with the carburetor on a work bench, remove the 4x screws holding fuel pump cover on the fuel pump side of the carburetor.
2. Remove the gasket and the diaphragm from the fuel pump.
3. Spray the inlet holes on the fuel pump with carburetor cleaner, this will help assure your fuel mixture ports are clean and clear of debris. Please wear safety goggles to protect your eyes from the carburetor cleaner.
4. Remove and replace the fuel inlet screen filter. If you press down on one side of the screen with a small screw driver it will rotate out and you can grab it easily.

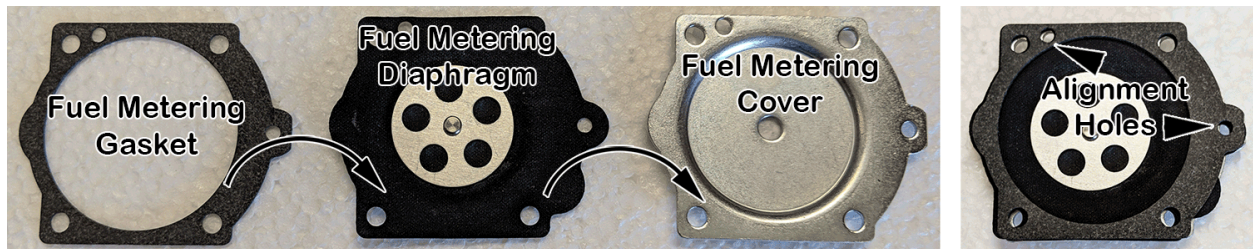


5. The Carburetor kit may come with both a rubber and a membrane diaphragm. Use the membrane diaphragm as it is more durable and longer lasting. The rubber diaphragm will be colored black while the membrane diaphragm is a tan color.
6. Install the fuel pump gasket on top of the diaphragm. Make sure the alignment holes are correctly lined up as shown by the arrows in the picture above.
7. Install the fuel pump cover back on the fuel pump side of the carburetor, and tighten the 4x screws that hold it in place.
8. Flip the carburetor over to the other side so we can replace the fuel metering diaphragm and gasket.





9. Remove the 4 screws holding the fuel metering cover plate to the carburetor and remove the fuel metering cover plate.
10. Remove the gasket and fuel meter diaphragm from the inside of the cover plate.



11. Re-assemble the fuel metering diaphragm as shown above. The gaskets goes on top of the fuel meter diaphragm, and that assembly goes on top of the cover plate. Make sure the alignment holes in both the gasket and the diaphragm are lined up correctly as shown above.



12. Install the fuel metering cover plate back on the carburetor using the 4x screws from step 16.

### Carburetor Complete Rebuild Video

If you are looking for more information about how to rebuild the carburetors used for the BlackHawk Lite 125 and Talon 190 Paramotors, then please visit the BlackHawk YouTube channel.

YouTube URL for the Carburetor Rebuild Video: <https://www.youtube.com/watch?v=YLBWab2-S4s>





## Fuel Line Section

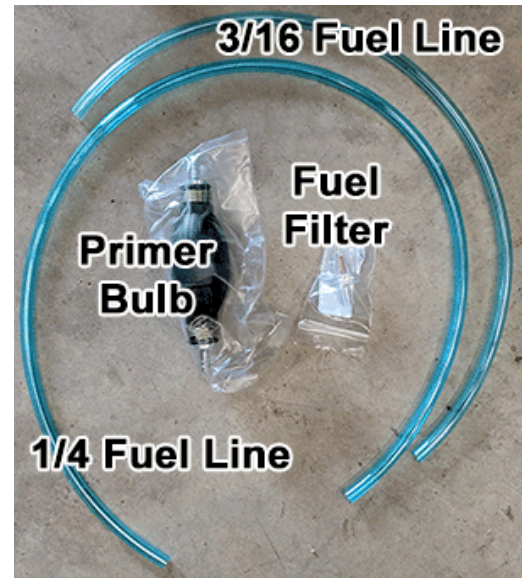
You can tell when the fuel lines are getting old because the fuel lines will turn dark brown from the oil residue in the fuel and become brittle. When the primer bulb gets old, it will become stiff like a rock, and it will be very hard to pump any fuel. When this occurs these parts need to be replaced.

### Talon 190, Titan 210, Airmax 220 Fuel Line Parts:

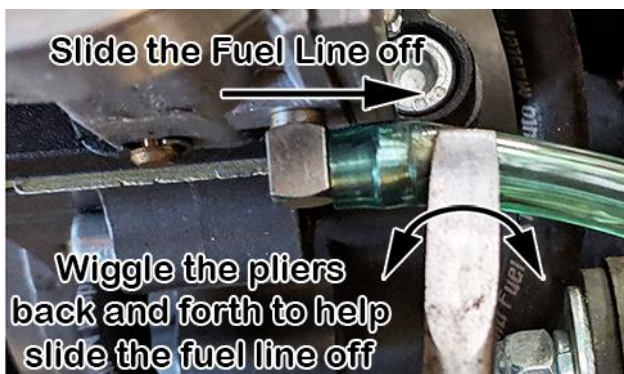
- Fuel line 1 = 1/4 inch internal diameter
- Fuel line 2 = 3/16 inch internal diameter
- Fuel Filter
- Fuel Primer Bulb
- 4x Fuel Clamp
- 4x Zip ties

### Lite 80, 90, 125 Fuel Line Parts:

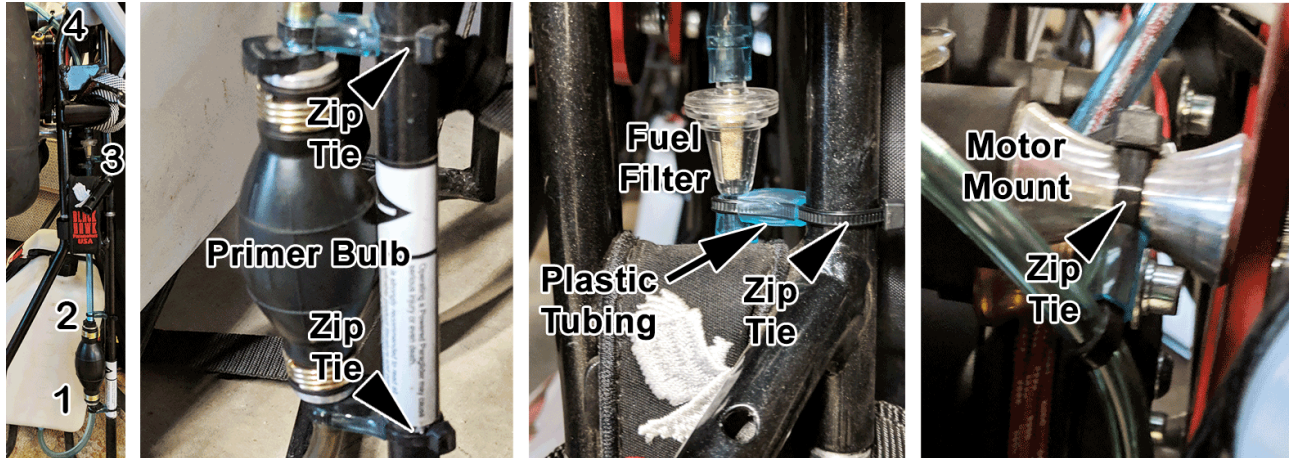
- Fuel line 1 = 1/4 inch internal diameter
- Fuel Filter
- Fuel Primer Bulb
- 4x Fuel Clamp
- 4x Zip ties



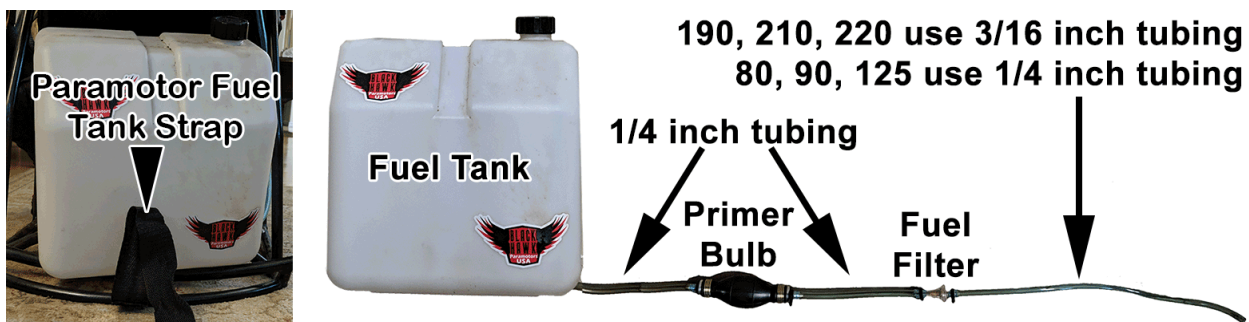
## Fuel Line Replacement Instructions:



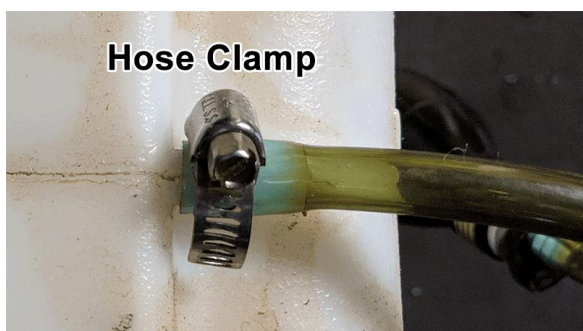
1. Begin by removing the fuel line from the carburetor. You can use a pair of pliers to firmly grip the fuel line, and wiggle them back and forth, and slide the fuel line off.



2. Remove the 4 zip ties that hold the fuel line to the Paramotor frame as shown by the picture above. You want to keep the plastic tubing that is being used as a spacer with the zip ties to hold the fuel line in place. These will be used again later to hold the new fuel line to the Paramotor frame.

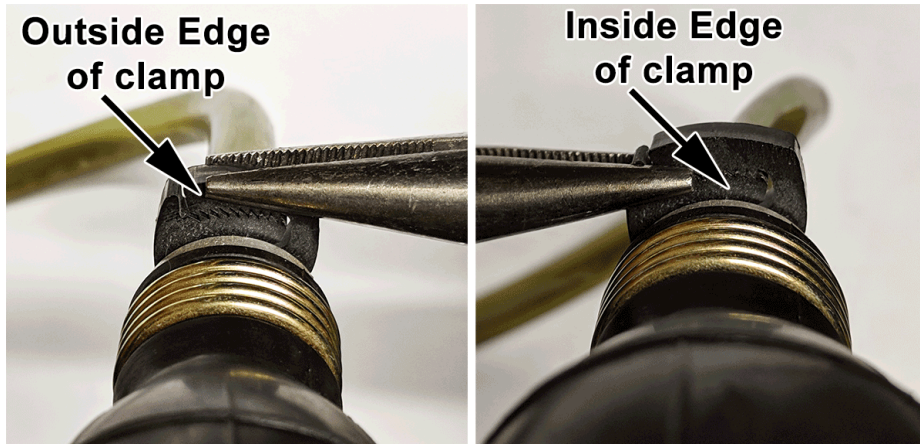


3. Un-strap the Fuel Tank from the Paramotor frame, and remove the fuel tank, and fuel line assemble from the Paramotor frame

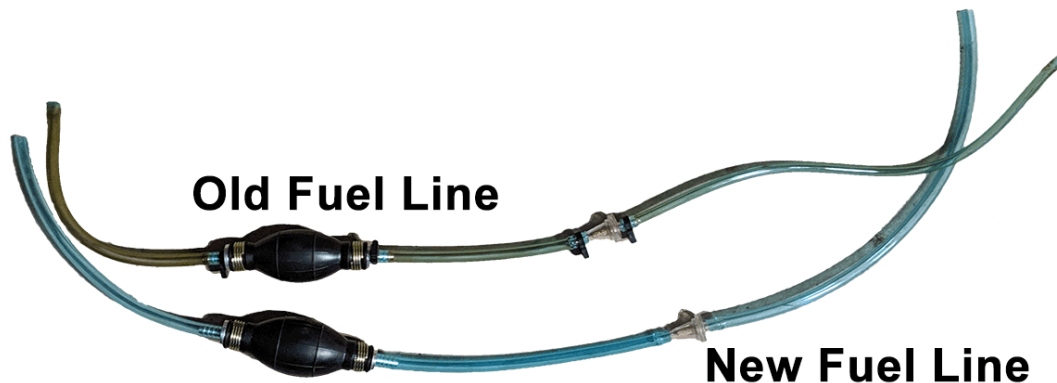


4. Remove the fuel line from the fuel tank by loosening the hose clamp at the bottom of the fuel tank





5. Remove the 4x fuel clamps used for the primer bulb and fuel filter. You will need a pair of needle nose pliers. Use the pliers to bend the outside edge of the clamp down and away. Then use the pliers on the inside edge of the clamp and bend this up towards you. By spreading each edge of the clamp away from each other, this will cause it to open. If the clamp is stuck, you may need to use two sets of needle nose pliers to bend the inside and outside edges apart in one motion.



6. Rebuild the new fuel line to look like your old one. Use the same length fuel line between the fuel tank and the primer bulb, and then from the primer bulb to the fuel filter. Leave the 3/16 fuel line extra-long from the fuel filter up to the carburetor. We will trim this down when we attach the fuel line to the Paramotor frame.
  - a. **Lite 80, 90, 125 Motors:**
    - i. Use the 1/4 inch fuel line from the fuel tank all the way up to the carburetor
  - b. **Talon 190, Titan 210, Airmax 220 Motors:**
    - i. Use the 1/4 inch fuel line from the fuel tank up to the primer bulb and then up to the fuel filter
    - ii. Use the 3/16 inch fuel line from the fuel filter up to the carburetor. You might need to use a heat gun or a blow dryer to heat up the fuel line so it will be flexible enough to fit over the fuel filter connector.



- c. The primer bulb has an arrow indicating in which direction it will pump the fuel. Make sure the arrow is pointed towards the carburetor. You can also squeeze the primer bulb with your finger over the end so you know which end pushes the fuel, and which end pulls the fuel. The end that pushes the fuel should be pointed towards the carburetor.
- d. The fuel filter has an arrow indicating in which direction fuel should flow through it. Make sure the arrow is pointed towards the carburetor. The small end of the cone points towards the gas tank

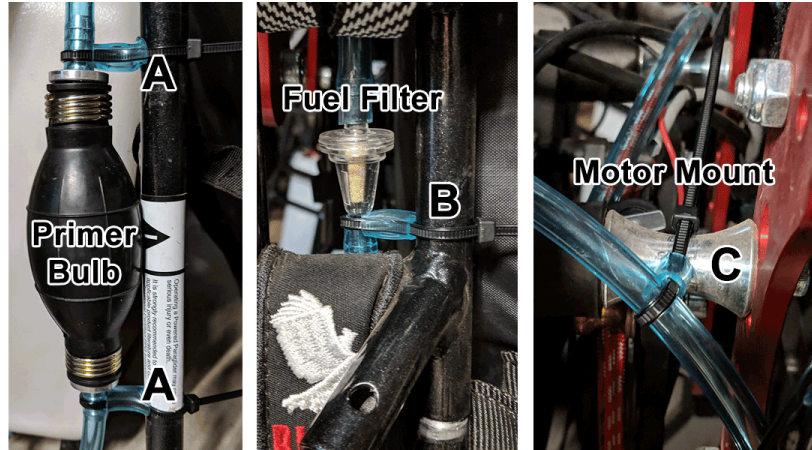
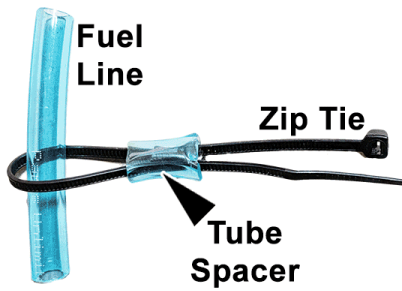


7. Use the fuel clamps from step 5 and re-install these around the primer bulb and fuel filter

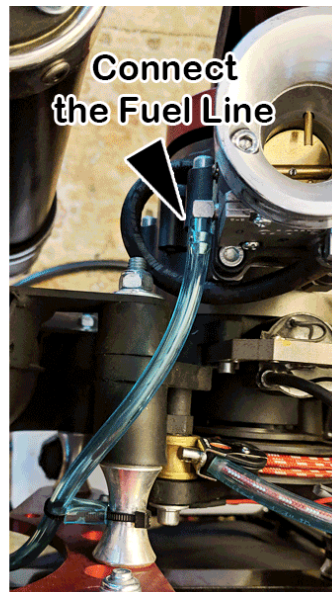


8. Connect the new fuel line to the fuel tank and then install the fuel tank with the new fuel line assembly back in the Paramotor frame. Use the fuel tank strap to hold the fuel tank in place to the Paramotor frame.





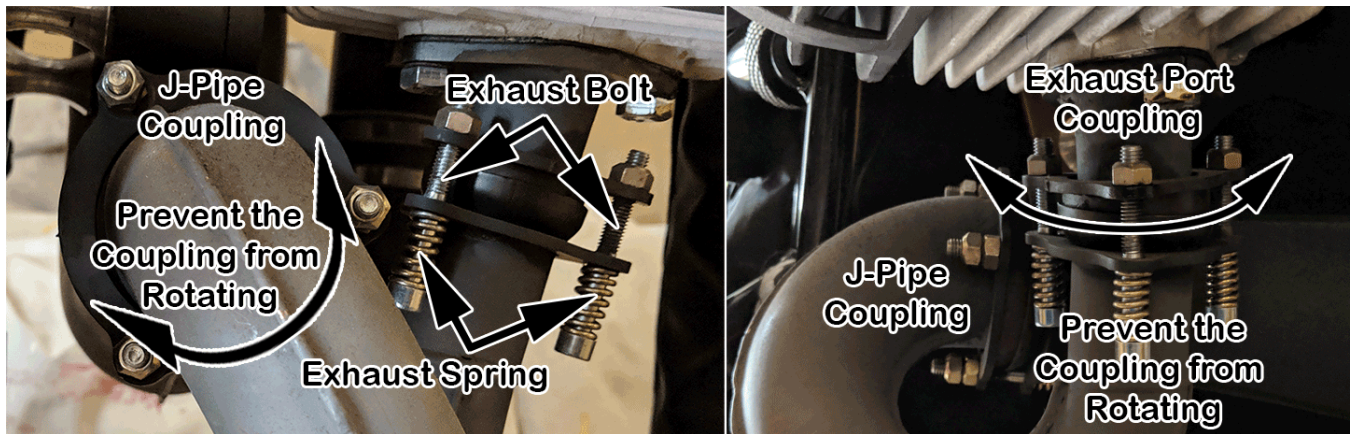
9. Use the zip tie assembly with tube spacer to hold the fuel line to the Paramotor frame. You want the zip tie to hold the fuel line firmly to the Paramotor frame. Do not over-tighten the zip tie to the point where it pinches the fuel line.
  - a. Use 2 zip ties on the top and bottom of the primer bulb
  - b. Use 1 zip tie on the bottom side of the fuel filter
  - c. Use 1 zip tie on the upper motor mount to hold the fuel line in place before it reaches the carburetor



10. Now you can hold the fuel line up to the fuel inlet port on the carburetor and determine where to cut the fuel line so it connects to the carburetor in a straight line. The fuel line should not have any kinks or bends between the zip tie mount, and the carburetor inlet port.
11. Cut the fuel line to the correct length and insert the fuel line to the fuel inlet port on the carburetor.
12. This completes the steps to replace the Fuel Line with primer bulb and fuel filter



## Exhaust Port Couplings Section



The Exhaust port couplings hold the exhaust assembly together. They are designed to flex with the vibration of the engine as regular bolts would just shear off after a couple of flights. There are 2 Exhaust couplings:

- **Exhaust Port Coupling** holds the J-Pipe to the exhaust port coming of the head of the engine.
- **J-Pipe Coupling** holds the J-Pipe to the Expansion Chamber part of the exhaust

The couplings use a spring tightened bolt to hold the 2 parts of the coupling together. The bolts on the coupling only need to be tightened to the point where if you grab the coupling with your hand it should not rotate around the exhaust pipe. Each bolt should be evenly tightened to assure the coupling applies even pressure while holding the exhaust pipes together.

- Only tighten the bolt / spring assembly enough to the point where you cannot rotate the coupling assembly by hand
- Do not try to re-use high temp steel locking nuts. Once they are removed they should be replaced
- If you want to be extra safe you can use 2 locking nuts on each bolt assembly to assure they do not loosen or fall off

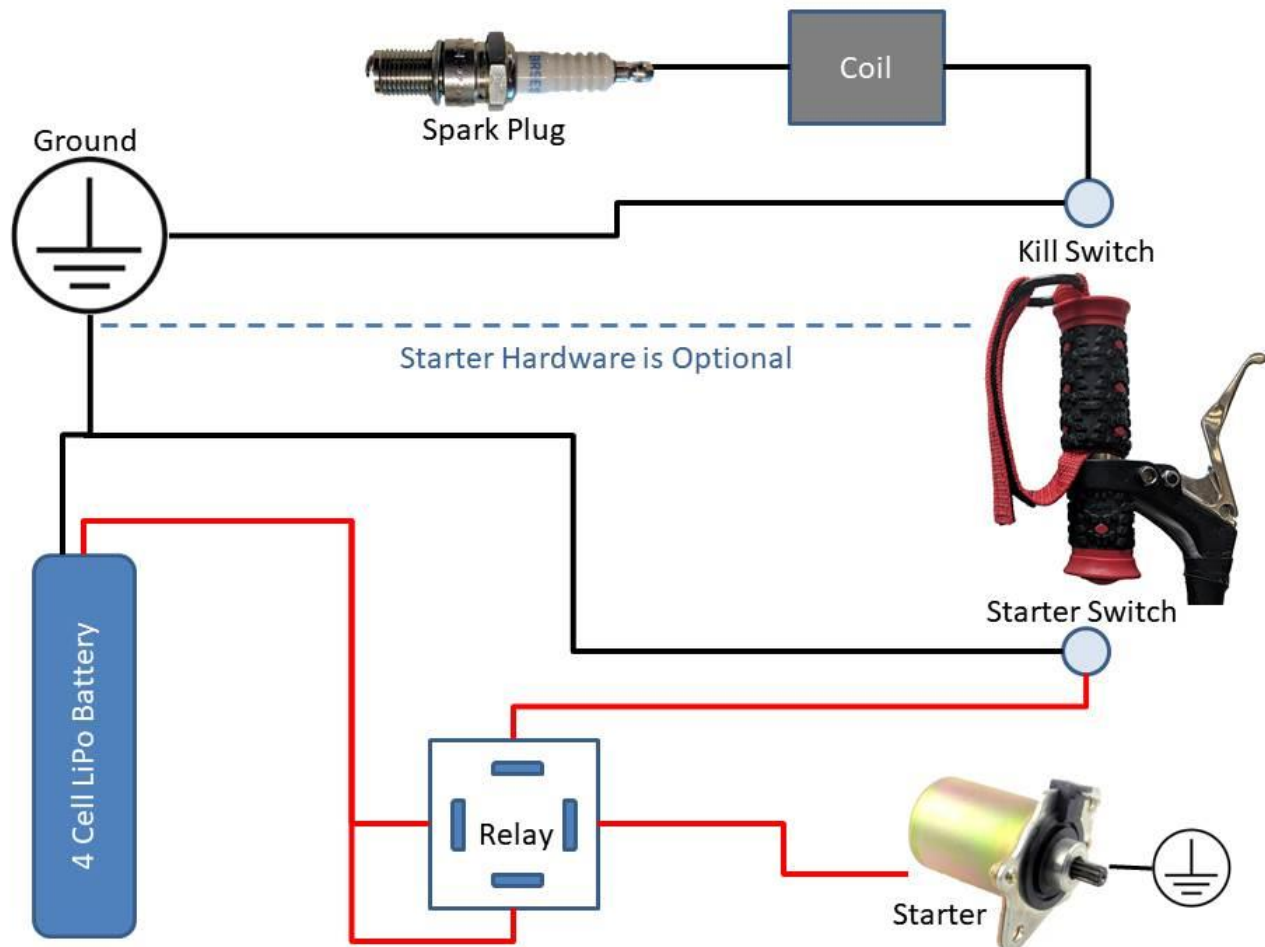
Replace the nuts, bolts, and the springs if they look rusted, or if the bolt threads are excessively wearing against the coupling flange. In some instances the spring will break and the bolt will begin to rattle when the engine is run giving you a clear sign these need to be replaced. Make sure to check the exhaust port coupling bolts and springs with each flight check as the vibration of the engine will cause the bolts and springs to wear over time.





## Electrical Diagram

The basic electrical diagram below shows how the kill switch and starter switch work on your Paramotor. The kill switch part of the diagram is used on almost every modern Paramotor out there. The Starter Hardware is optional, and does not come with every Paramotor, and is specific to how BlackHawk wires the starter.



- The kill switch works by diverting the power going to the coil to the electrical ground. This removes the power going to the Spark Plug and essentially kills the motor.
- The starter switch works by activating the power relay. The relay then connects the power going to the starter motor, and that turns it on. If the relay is bad the starter motor will not engage. The sign that a relay is going bad is it will start to work intermittently.



## Warranty

BlackHawk engines are manufactured with top quality engine parts; our warranty is valid against manufacturing defects only. BlackHawk will inspect all parts returned under warranty repair to determine if they are defective against our manufacturing standards.

### Duration of Warranty

BlackHawk offers a 2 year warranty from the date of the sale, or the date the engine was shipped to the customer or dealership in lieu of the customer. The warranty includes the cost of replacement parts, and the labor to install the faulty parts. The warranty does not cover the shipping or transportation of your Paramotor or Paramotor engine parts to or from our offices, dealerships, or repair facilities.

### The Following Situations Void the BlackHawk Warranty

- Alterations to the engine that are not approved by BlackHawk (HE)
- Wear and Tear to the engine and its components caused by the customer not following or adhering to the instructions in this manual
- Engine work (other than maintenance that is defined in this engine manual) that is performed by anyone other than BlackHawk or a certified BlackHawk dealership
- Accidental falls, crashes, or dropping of the engine or its components
- Overheating and seizure of the engine due to prolonged high speed running of the engine, running with excessive loads, running with inadequate loads, running with insufficient 2-stroke engine oil mixed with the fuel, or running with no 2-stroke engine oil mixed with the fuel, or with a carburetor that is not tuned correctly
- The presence of dirt, sand, or foreign debris or bodies in the carburetor of the engine
- Corrosion of the engine or its components through the inadequate preparation, and/ or the improper storage of the Paramotor engine
- Corrosion of the engine or components that have occurred due to stone chips, or any other impact, or abnormal stress that could cause damage
- Running the engine without an Airbox fitted to the carburetor
- Mis-assembly of the any engine part or component not assembled by BlackHawk (HE) or by a certified BlackHawk dealership. This includes: parts disassembled for shipping purposes, and all electrical components including the starter.
- Incidental or consequential loss or damage
- Not adhering to Service Bulletins that talk about the maintenance or updated engine settings that come from BlackHawk
- If the Paramotor engine is used for any racing purposes
- Electrical components like the relay, starter, start & kill switches, or wiring are not covered under these warranty terms