

.46NX Evolution[®] Engine

USER GUIDE



HORIZON
H O B B Y

© 2008 Manufactured exclusively for Horizon Hobby, Inc. 877-504-0233
www.horizonhobby.com

12955



Introduction

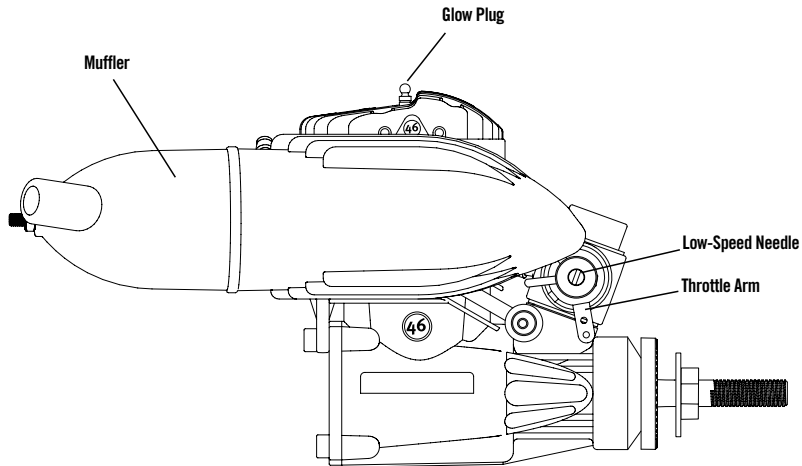
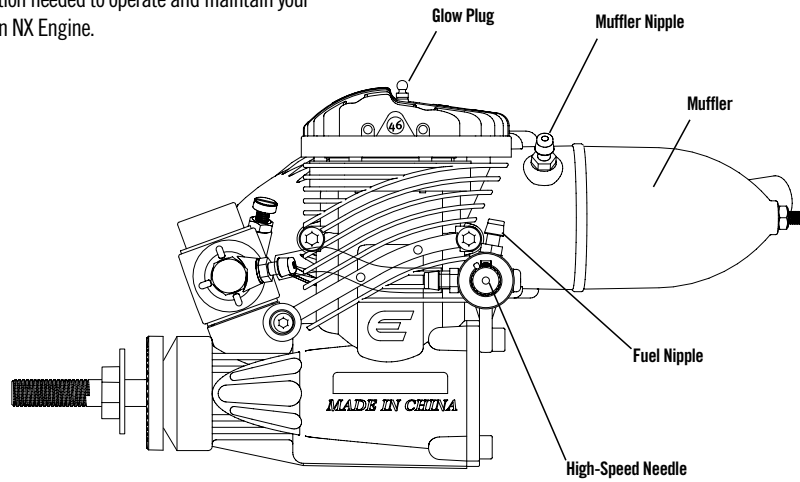
Congratulations on your purchase of the newest and one of the most technically advanced 2-stroke model airplane engines in the world. Whether you are new to the sport of model aviation or an experienced flier, you will enjoy the features of the new Evolution® Engines NX Engine.

The Evolution NX Engine is designed to be the most powerful in its class, extremely easy to start and operate, and provide years of enjoyable service. It incorporates many unique design features, such as our Set Right™ needle valve assemblies. Every feature is designed to ensure success with your new engine.

This user's guide is intended to provide the basic information needed to operate and maintain your Evolution NX Engine.

Every Evolution engine has been baseline adjusted at the factory and is ready to fly. We recommend a short break-in period to become familiar with the engine.

Important: While the Evolution engine is extremely easy to operate, if this is your first experience flying a model airplane, it is highly recommended that you have the help of an experienced modeler during the first few flights. Your local hobby shop or flying club can put you in touch with an experienced pilot in your area.



Mounting the Engine



Securely tighten all engine mounting screws and re-check tightness before each flying session.

Most model airplanes include an engine mount. It is extremely important that the engine mount be securely mounted to the airplane's firewall and that the engine is securely mounted to the engine mount. Follow the instructions included with the airplane for mounting the engine.

Important: Before each flying session, check that all engine mounting screws are securely tightened.

Installing the Muffler



The muffler mounting accessory package includes mounting screws (2), lock washers (2), muffler gaskets (2) and an L-wrench.



Using the included muffler mounting screws and lock washers, attach the muffler with the included hex wrench. Be sure the lock washers are placed over the screws and that one gasket is placed between the muffler and the engine. A second gasket is included as a spare. Securely tighten both screws with moderate torque.

Important: After five runs, retighten the muffler mounting screws. Heat and vibration from these first few runs can cause the gasket to compress. Once the muffler screws are retightened, they will remain tight and leak-free until the muffler is removed. Also, tighten the muffler thru-bolt at this time as well—loosen the lock nut on the back of the muffler, tighten the thru-bolt via the screwhead at the front of the muffler then retighten the lock nut at the rear.

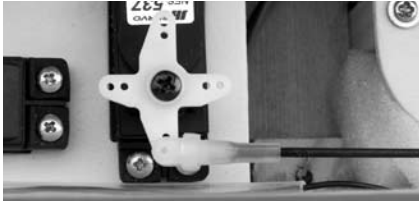


Attach the linkage to the throttle arm.

Throttle Linkage

A clevis is recommended for attaching the throttle linkage to the throttle. Attach the throttle linkage to the hole in the throttle arm (see photo above). Turn on the radio. With the throttle stick at 1/2 throttle, install the arm on the servo so that the arm is 90° to the throttle pushrod.

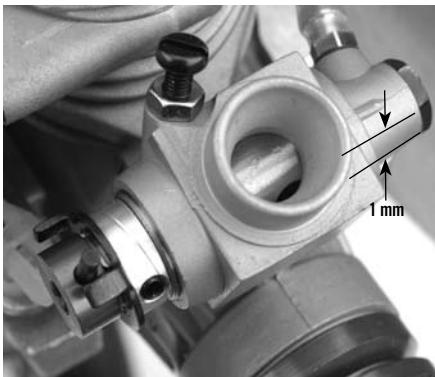
Select a servo arm that has a hole located 11mm or 7/16" out from center and attach the other end of the throttle linkage. (see photos below)



Linkage 11mm out



1/2 throttle

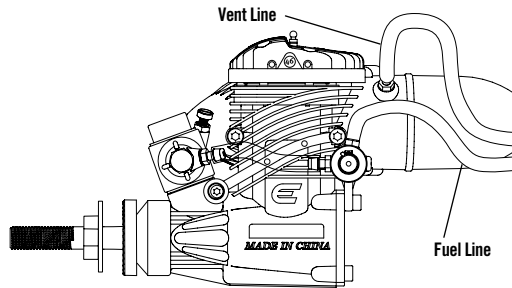
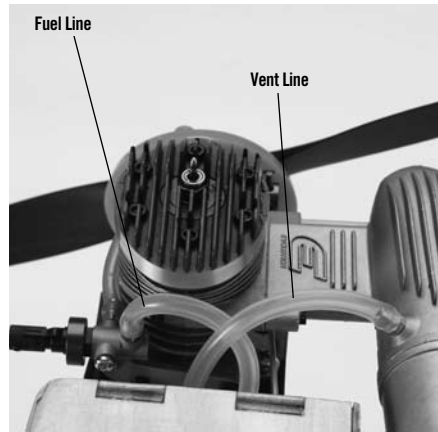


At low throttle, mid-trim, the throttle barrel should be 1 mm open.

With low throttle and mid-trim (idle position), the throttle barrel should be open 1mm, giving a low rpm idle (see photo above). Adjust the length of the pushrod until the throttle barrel is exactly 1mm open. Check to be sure the servo is moving in the correct direction. Full throttle should open the throttle barrel fully, while low throttle, low-trim should completely close the throttle barrel. Reverse the servo throw if necessary.

Note: It may be necessary to slightly adjust the length of the throttle pushrod to achieve the correct mid-trim, low-stick idle position.

Attaching the Fuel Lines

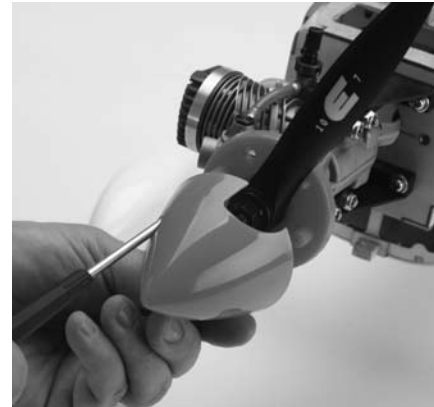


Using medium silicon fuel tubing, attach the fuel tank's clunk line to the fuel nipple. This line will supply fuel to the engine. Attach the vent line to the muffler pressure nipple. This line pressurizes the fuel tank with the muffler pressure, creating consistent fuel flow, regardless of the airplane's attitude.

Attaching the Propeller and Spinner



Securely tighten the prop nut using an adjustable wrench.



Remove the prop nut and prop washer from the engine. Install the spinner back plate. Install the propeller, the prop washer and then the prop nut in that order (see photo). Securely tighten the prop nut using an adjustable wrench. Install the spinner cone.

Starting the Evolution Engine

Fuel

We recommend using high quality Cool Power Omega, Hangar 9® AeroBlend™ or Power Master fuels containing 10 to 15% Nitro. The Evolution Engine has been test run using these fuels. If another brand of fuel is used, it may be necessary to slightly adjust the needle valves to compensate for the differences in fuel.

Glow Plug

The Evolution engine comes with a specially designed "Super Plug" that prevents idle and transition flameouts. The plug's unique shape directs incoming fuel/air mixture away from the plug element. When replacing the plug, be sure to replace it with another Evolution 2- or 4-cycle Super Plug (EVO6P1)

Starting the Engine

- Step 1.** Fill the tank with the above-mentioned 10 or 15% fuel.
- Step 2.** Reattach the fuel lines, making sure the vent and clunk line are attached to the fuel nipple and the muffler pressure nipple.
- Caution:** Do not attach the glow driver yet.
- Step 3.** With the throttle fully open, place your thumb over the carburetor and flip the prop clockwise through 6 complete revolutions, thus priming the engine.
- Step 4.** Close the throttle to the idle position and have a helper hold your airplane.



The Hangar 9 START KIT (HANSTART) includes everything needed, except fuel and starter, to get the Evolution Engine running.

Step 5. Attach the glow driver.

Step 6. Turn the engine over using an electric starter.
The engine should fire within seconds of applying the starter.

Step 7. Allow the engine to idle for 30 seconds. Adjust the throttle trim if necessary to achieve a constant slow idle.

Step 8. With the glow driver still attached and a helper securely holding the airplane, advance the throttle smoothly to full throttle. The engine will transition to full rpm.

Step 9. Reduce the throttle to idle and remove the glow driver.

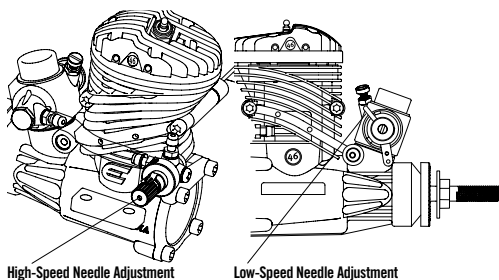
Needle Limiters

The high- and low-speed needles have limiters that prevent over-adjustment. If your engine starts from the above procedure, but won't reliably continue to run with the glow driver removed, follow the steps above right.



Step 1. High-Speed Needle Adjustment

With the engine running, advance the throttle to full throttle while a helper securely holds your



Note that the needle adjustment range is limited, preventing adjustment beyond the practical range.

airplane. Carefully pinch and release the fuel line to temporarily restrict the fuel flow.

Caution: Do not reach over the propeller while the engine is running.

Correct: If the high-speed needle adjustment is correct, the engine will increase rpm slightly (about 300 rpm) and then die.

Too Rich: If the engine increases a lot (1,000 rpm or greater), the high-speed needle is too rich and must be leaned or turned clockwise.

Too Lean: If the engine doesn't increase rpm and simply dies, the high-speed needle is lean and must be richened or turned counterclockwise.

Step 2. Low-Speed Needle Adjustment

The low-speed or idle needle valve, included with the SetRight assembly, is preadjusted at the factory for best performance at close to sea level conditions. It may be necessary to fine-tune the low-speed adjustment using the following procedure:

1. Start the engine and let it warm up, prior to attempting any adjustments. Make sure that the high-speed adjustment process is complete before attempting to adjust the low-speed needle valve.

2. Close the throttle slowly. You will adjust the low-speed needle setting by rotating the SetRight adjustment bar clockwise to lean the engine and counterclockwise to richen the engine.

Caution: Do not attempt to adjust the low-speed needle valve while the engine is running.

3. The fuel mixture should be adjusted as follows: The fuel mixture is too rich if, when opening the throttle rapidly, the engine emits smoke and "stutters" or "stumbles." Correct this by rotating the SetRight adjustment bar clockwise in small increments. Continue this process until the engine transitions smoothly from low rpm idle to high rpm without hesitation upon opening the throttle rapidly.

Step 2. Low-Speed Needle Adjustment, cont.

4. The fuel mixture may be too lean if the engine stops at the lowest idle position or it stops when the throttle is rapidly opened from the idle position. Correct this by rotating the SetRight adjustment bar counterclockwise in small increments until the engine transitions smoothly without hesitation upon opening the throttle rapidly from idle.

SetRight Needle Valves

The design of the SetRight needle valve system is such that, during normal operating conditions, the typical user will find that the range of adjustment allowed by the system is more than adequate for most situations. As a matter of fact, we intended this to be used as a tool to identify operating problems. If you find that the range of adjustment allowed by the SetRight needle is inadequate after your initial period of running, then a problem in your engine system has occurred. This might be a bad glow plug, dirty or old fuel, an air leak in the fuel system somewhere or any number of other reasons. Do not make any permanent adjustment range changes to the SetRight needle system if it was once working correctly for you and now does not. Investigate other problems first.

However, occasionally due to atmospheric, altitude or fuel conditions, you may find that the range of adjustment built into the SetRight needle valve system is inadequate for your needs. These conditions are rare and easy to fix.

High-Speed SetRight Needle Valve Correction

Should the high-speed SetRight needle valve need to be adjusted outside of the factory-established parameters, simply pull out the detent spring on the high-speed needle assembly and move the needle valve in the desired direction so the SetRight pin passes the spring detent. You now have re-established a new range for your purposes. You can also loosen the setscrew on the collar holding the detent spring and rotate this in the desired direction.

Low-Speed SetRight Needle Valve Correction

Should the low-speed SetRight needle valve need to be adjusted outside the factory-established parameters, follow these steps:

A. Loosen the setscrew found on the ring of the SetRight assembly to which the adjustment bar is attached.

Low-Speed SetRight Needle Valve Correction, cont.

B. Rotate the needle valve itself (small slot-headed screw inside the blue ring of the SetRight assembly) clockwise to lean the mixture or counterclockwise to richen the mixture as desired.

C. Retighten the setscrew on the ring of the SetRight assembly and you have re-established a new range of motion.

Why would fuel go "bad"?

The largest portion of the fuel is methanol (alcohol). Methanol is hygroscopic; it attracts moisture. This can cause your fuel to be contaminated with water, which will cause poor engine performance. Additionally, the UV rays in sunlight will eventually break down the nitromethane if the fuel jug is stored in sunlight for long periods of time.

How can you tell when your fuel has gone "bad"?

The first indication will generally be the inability to start the engine at previously run needle-valve settings. Another clue might be that the engine has very poor idle, runs but bogs down tremendously during run up and/or will not attain the same rpms that you are used to.

How do I keep my fuel fresh?

If you have the opportunity, look for someone at a flying field on a sunny day who has a jug of fuel that is only 1/4 full. What you may notice is that there are droplets attached to the top and sides of the container. This is the moisture in the air that is condensing inside the jug because of the greenhouse effect of the semi-translucent plastic jug. This will also occur within a metal fuel can as the sun warms the contents.

You can combat the effects of the moisture in the air by squeezing all the extra air from your fuel container at the end of the day or transferring your fuel into smaller containers as the level of the fuel is reduced in your

gallon jug. Many pilots will invest in 1/2 gallon or quart-size containers and only bring that amount of fuel to the field on any given day. This allows their main supply of fuel to stay at home in a controlled storage environment, virtually insuring problem-free fuel.

How to Tell If Your Glow Plug Is Bad

The glow plugs on the market today are designed to provide good service to the user and may last a long time or a short time, all dependent upon the way you choose to operate your engine.

Physical indications that you might need to change the glow plug are:

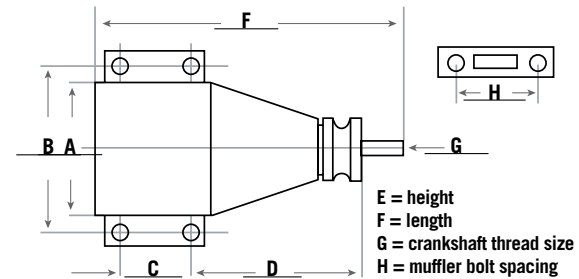
1. Twisted or mangled glow plug element (usually caused by too high a compression ratio).
2. Small "bumps" are attached to the glow plug element. This will generally be most noticeable during the break-in process. These are actually tiny pieces of aluminum that have attached to the element and will severely hinder the operation of the glow plug.
3. The glow plug element is no longer shiny but is dull, almost a white powder color. (This just comes with age and is a by-product of the catalytic reaction). The shinier the wire, the better the catalytic reaction can be.

Operating indications that you need to change your glow plug are:

1. The glow element will not light with a charged glow igniter. This indicates that there is a physical short or breakage in the element wire itself.
2. Glow plug lights but the engine will not continue running once the battery is disconnected. (This is usually an indication of the microscopic particles we discussed earlier.)
3. Glow plug lights, engine runs but there is a perceptible loss of rpm at full throttle when the battery is disconnected. This is a typical indication that the white powder residue is building to the point that the catalytic reaction of the glow plug is no longer anywhere close to being optimum.

NX Evolution Engines Specifications

Items	Disp (c.i.)	Bore (mm)	Stroke (mm)	Weight (oz)	Crank K (ISO)	Cylinder	Propeller
EVOE0461	.467"	.864"	.797"	13.76	1/4X28	ABC	11X6



Dimensions (mm)	A	B	C	D	E	F	G	H
EVOE0461	36	44	17.5	52.5	90.5	108	1/4X28	37

Troubleshooting Guide

Engine Won't Fire

- Glow starter not charged
 - Charge glow starter
- Glow plug burnt out
 - Replace glow plug
- No fuel is getting to the carburetor
 - Check tank, fuel lines reversed
- The starter is reversed
 - Reverse the polarity on the starter cables

Engine Quits Repeatedly

- Needles need adjusting
 - See adjustment procedure
- Bad or old fuel
 - Replace with fresh fuel
- Worn out glow plug
 - Replace with new EVOGP1 glow plug

Engine Runs Inconsistently

- Hole in fuel line
 - Replace fuel line
- Bad or old fuel
 - Replace with fresh fuel

Maintenance

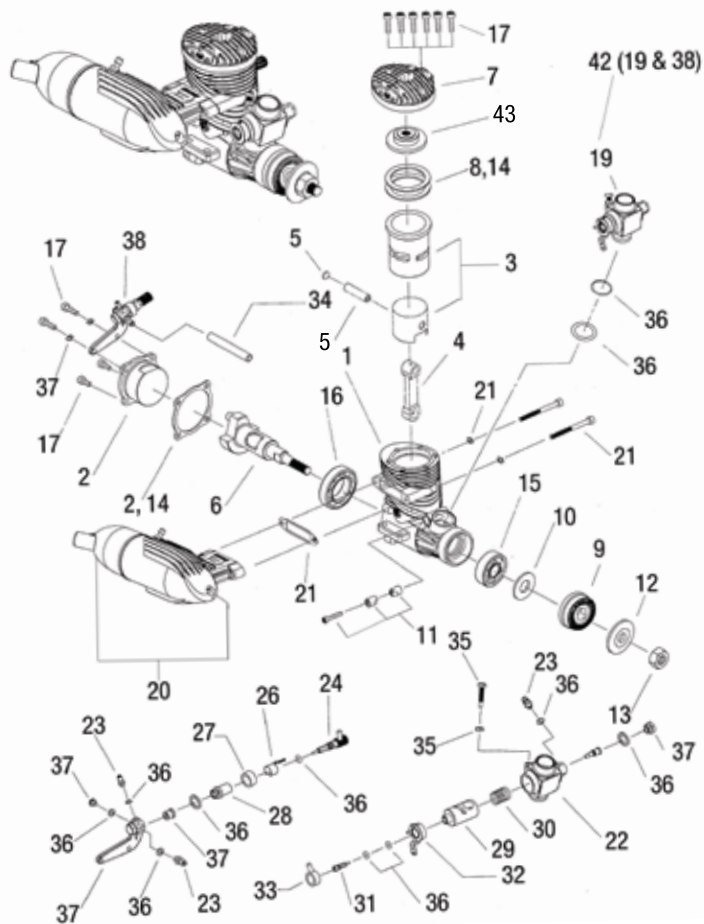
After each flying session:

1. Fully drain the fuel from the tank.
2. Start the engine and run it until the fuel is completely run out of the engine.
3. Try starting the engine three more times or until it will no longer fire. This gets all the fuel out of the engine.

If the engine will not be used within 10 days, several drops (about 10) of after run oil (EVOX10000 Evolution Engine's Blue Block Rust Inhibitor) should be applied into the carburetor and the engine should be turned over for a few seconds with the starter. This will prevent rust and corrosion.

If you need additional help or have any questions, please call Horizon's Service Center. Horizon has trained technicians who are qualified to answer your engine questions.

Evolution/Horizon Service Center
4105 Fieldstone Road
Champaign, IL 61822
877-504-0233



No.	Description	No.	Description
1	Crankcase	20	Muffler
2	Rear Cover with Gasket	21	Muffler Mounting Screwset
3	Piston & Liner Set (ABC)	22	Carburetor Body
4	Connecting Rod (Dual Bushing)	23	Fuel Nipple
5	Wrist Pin w/Clips (Teflon)	24	High-Speed Needle Valve
6	Crankshaft (1/4 X 28)	25	Spraybar Bracket (Remote)
7	Head Clamp	26	High-Speed Needle Valve Ratchet
8	Cylinder Head Shim	27	Collar w/Setscrew
9	Prop Driver	28	Spraybar (Remote)
10	Spacer Washer	29	Throttle Barrel
11	Carburetor Retainer (Drawbar)	30	Throttle Barrel Spring
12	Prop Washer	31	Idle Needle
13	Prop Nut (1/4 X 28)	32	Throttle Arm
14	Gasket Set, Engine	33	Idle Needle Limit Collar
15	Ball Bearing, Front (Rubber Seal)	34	45mm Fuel Tube
16	Ball Bearing, Rear (Open Race)	35	Idle Needle Stop Screw w/Nut
17	Screw Set, Engine	36	Carburetor Gasket, O-Ring Set
18	Flywheel (Evo-Alpha)	37	Small Parts Set, Carburetor
19	Carburetor, Complete	38	Needle Valve Assembly
		43	Head Button

Cross-Reference of Evolution .46 NX Part Numbers

No.	Description			
1	Crankcase	EVO046101	23 Fuel Nipple & Gasket	EVO100114
2	Rear Cover w/Gasket	EVO100E46D	24 High-Speed Needle Valve	EVO100829A
3	Piston & Liner Set (ABC)	EVO046203	25 Spraybar Bracket (Remote)	EVO100870A
4	Connecting Rod Set (Dual Bushing)	EVO100204	26 High-Speed Needle Valve Ratchet	EVO100833
5	Wrist Pin w/Clips (Teflon)	EVO040213	27 Collar w/Setscrew	EVO100834A
6	Crankshaft	EVO046210	28 Spraybar, Remote	EVO100830
7	Head Clamp	EVO046103B	29 Throttle Barrel	EVO100813
8	Cylinder Head Shim	EVO040112	30 Spring, Throttle Barrel	EVO100814A
9	Prop Driver	EVO040219	31 Idle Needle	EVO100844A
10	Spacer Washer	EVO100219B	32 Throttle Arm	EVO100864A
11	Carburetor Retainer (Drawbar)	EVO100129	33 Idle Needle Limit Collar	EVO100850A
12	Prop Washer	EVO100220	34 45mm Fuel Tube	EVO100878A
13	Prop Nut	EVO100221	35 Idle Stop Screw w/Nut	EVO100825F
14	Gasket Set, Engine	EVO100416	36 Carburetor Gasket/O-Ring Set	EVO100E46B
15	Ball Bearing, Front (Rubber seal)	EVO100109	37 Small Parts Set, Carburetor	EVO100E46C
16	Ball Bearing, Rear (Open Race)	EVO100110	38 Needle Valve Assembly	EVO046874A
17	Screw Set, Engine	EVO100901	39 Drive Key	N/A
18	Flywheel (Evolution)	N/A	40 Sleeve Index Pin	N/A
19	Carburetor Complete	EVO100801A	41 Propeller Washer & Nut Set	EVO040228
20	Muffler	EVO100601	42 Carburetor w/Remote NV Assembly	N/A
21	Muffler Mounting Screw Set w/Gasket	EVO100E46A	43 Head Button	EVO046128
22	Carburetor Body (w/Spraybar)	EVO100863		

Warranty Period

Exclusive Warranty- Horizon Hobby, Inc., (Horizon) warranties that the Products purchased (the "Product") will be free from defects in materials and workmanship for a period of 2 years from the date of purchase by the Purchaser.

Limited Warranty

(a) This warranty is limited to the original Purchaser ("Purchaser") and is not transferable. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER. This warranty covers only those Products purchased from an authorized Horizon dealer. Third party transactions are not covered by this warranty. Proof of purchase is required for warranty claims. Further, Horizon reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.

(b) Limitations- HORIZON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCT. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

(c) Purchaser Remedy- Horizon's sole obligation hereunder shall be that Horizon will, at its option, (i) repair or (ii) replace, any Product determined by Horizon to be defective. In the event of a defect, these are the Purchaser's exclusive remedies. Horizon reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Horizon. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of or to any part of the Product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than Horizon. Return of any goods by Purchaser must be approved in writing by Horizon before shipment.

Damage Limits

HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCT, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. Further, in no event shall the liability of Horizon exceed the individual price of the Product on which liability is asserted. As Horizon has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability.

If you as the Purchaser or user are not prepared to accept the liability associated with the use of this Product, you are advised to return this Product immediately in new and unused condition to the place of purchase.

LAW: These Terms are governed by Illinois law (without regard to conflict of law principals).

Safety Precautions

This is a sophisticated hobby Product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this Product in a safe and responsible manner could result in injury or damage to the Product or other property. This Product is not intended for use by children without direct adult supervision. The Product manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or injury.

Questions, Assistance, and Repairs

Your local hobby store and/or place of purchase cannot provide warranty support or repair. Once assembly, setup or use of the Product has been started, you must contact Horizon directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. For questions or assistance, please direct your email to productsupport@horizonhobby.com, or call 877.504.0233 toll free to speak to a service technician.

Inspection or Repairs

If this Product needs to be inspected or repaired, please call for a Return Merchandise Authorization (RMA). Pack the Product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as Horizon is not responsible for merchandise until it arrives and is accepted at our facility. A Service Repair Request is available at www.horizonhobby.com on the "Support" tab. If you do not have internet access, please include a letter with your complete name, street address, email address and phone number where you can be reached during business days, your RMA number, a list of the included items, method of payment for any non-warranty expenses and a brief summary of the problem. Your original sales receipt must also be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

Warranty Inspection and Repairs

TO RECEIVE WARRANTY SERVICE, YOU MUST INCLUDE YOUR ORIGINAL SALES RECEIPT verifying the proof-of-purchase date. Provided warranty conditions have been met, your Product will be repaired or replaced free of charge. Repair or replacement decisions are at the sole discretion of Horizon Hobby.

Non-Warranty Repairs

SHOULD YOUR REPAIR NOT BE COVERED BY WARRANTY, THE REPAIR WILL BE COMPLETED AND PAYMENT WILL BE REQUIRED WITHOUT NOTIFICATION OR ESTIMATE OF THE EXPENSE UNLESS THE EXPENSE EXCEEDS 50% OF THE RETAIL PURCHASE COST. By submitting the item for repair you are agreeing to payment of the repair without notification. Repair estimates are available upon request. You must include this request with your repair. Non-warranty repair estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight. Please advise us of your preferred method of payment. Horizon accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. If you choose to pay by credit card, please include your credit card number and expiration date. Any repair left unpaid or unclaimed after 90 days

will be considered abandoned and will be disposed of accordingly. PLEASE NOTE: NON-WARRANTY REPAIR IS ONLY AVAILABLE ON ELECTRONICS AND MODEL ENGINES.

Electronics and engines requiring inspection or repair should be shipped to the following address:

Horizon Service Center
4105 Fieldstone Road
Champaign, Illinois 61822

All other Products requiring warranty inspection or repair should be shipped to the following address:

Horizon Product Support
4105 Fieldstone Road
Champaign, Illinois 61822

PLEASE CALL 877-504-0233 WITH ANY QUESTIONS OR CONCERNS REGARDING THIS PRODUCT OR WARRANTY.