

HELIBUG

Conversion Guide



HB7-RCT7 For T-Rex 600

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Version 1.0

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Revisions to this Manual

R1.0

- **02/15/11** – Initial Release

For the most current version of this manual, please refer to www.helibug.com, visit the T-Rex 600 conversion page for the HB7-RCT7 and download the most current guide

Errata

R1.0

None

Disclaimer

The author has made every attempt to depict the correct process for this conversion however ultimately the safe construction of this model is dependent upon its builder. The builder and pilot should follow all safety regulations and use common sense when operating this model.

I. Safety Concerns

WARNING!

The radio controlled model helicopter built from this conversion kit is not a toy and is not meant for children. It is a flying machine capable of causing property damage and serious bodily harm to both the operator/assembler and/or spectator if not built and operated correctly and responsibly. Rotating components, especially the main rotor blades, are an ever-present danger. Model helicopters operate differently than model cars and airplanes. Helicopters by their nature are not positively stable, meaning that even if properly assembled and adjusted, helicopters will not recover from an unwanted flight attitude, nor will they hold any particular orientation without constant control inputs from the pilot.

IT IS YOUR EXCLUSIVE RESPONSIBILITY TO PROPERLY BUILD, MAINTAIN AND OPERATE THE HELICOPTER.

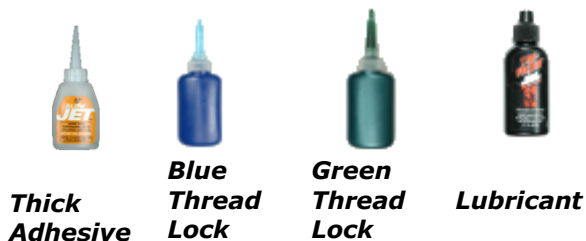
HELIBUG has spent considerable time making this product reliable and easy to build, but only the operator can insure that it is safe. Because the safe operation of this helicopter is beyond the control of the Manufacturer and distributor, the owner/operator assumes all risk of use.

II. Conversion Nomenclature

This conversion document will only address conversion specific differences from the standard Align build instructions. Unless otherwise indicated you should follow the original assembly instructions including all warnings, guidelines and tips.

2.A) Assembly Tips

1. Follow the order of assembly. The guide has been organized into major sections and has been developed in such a way that each step builds upon the work done in the previous step. Changing the order of assembly may result in unnecessary steps
2. Sand sharp edges on any frame plate that Velcro® or wires may rub against to prevent them from being damaged over time by vibration
3. **As a general rule any bolt that threads into a metal part should have thread lock applied**
4. Photographs will contain assembly icons that indicate use of thread lock, adhesive or lubricant as needed. If an assembly has more than one of the same part number, application of thread lock, adhesive or lubricant will apply to all of the same numbered parts in that photograph Examples of the icons are as follows:



III. Conversion Prerequisites

In order to assemble this kit, you will need significant components from an Align T-Rex 600 Nitro Pro or LE kit as well as some additional parts. They are as follows:

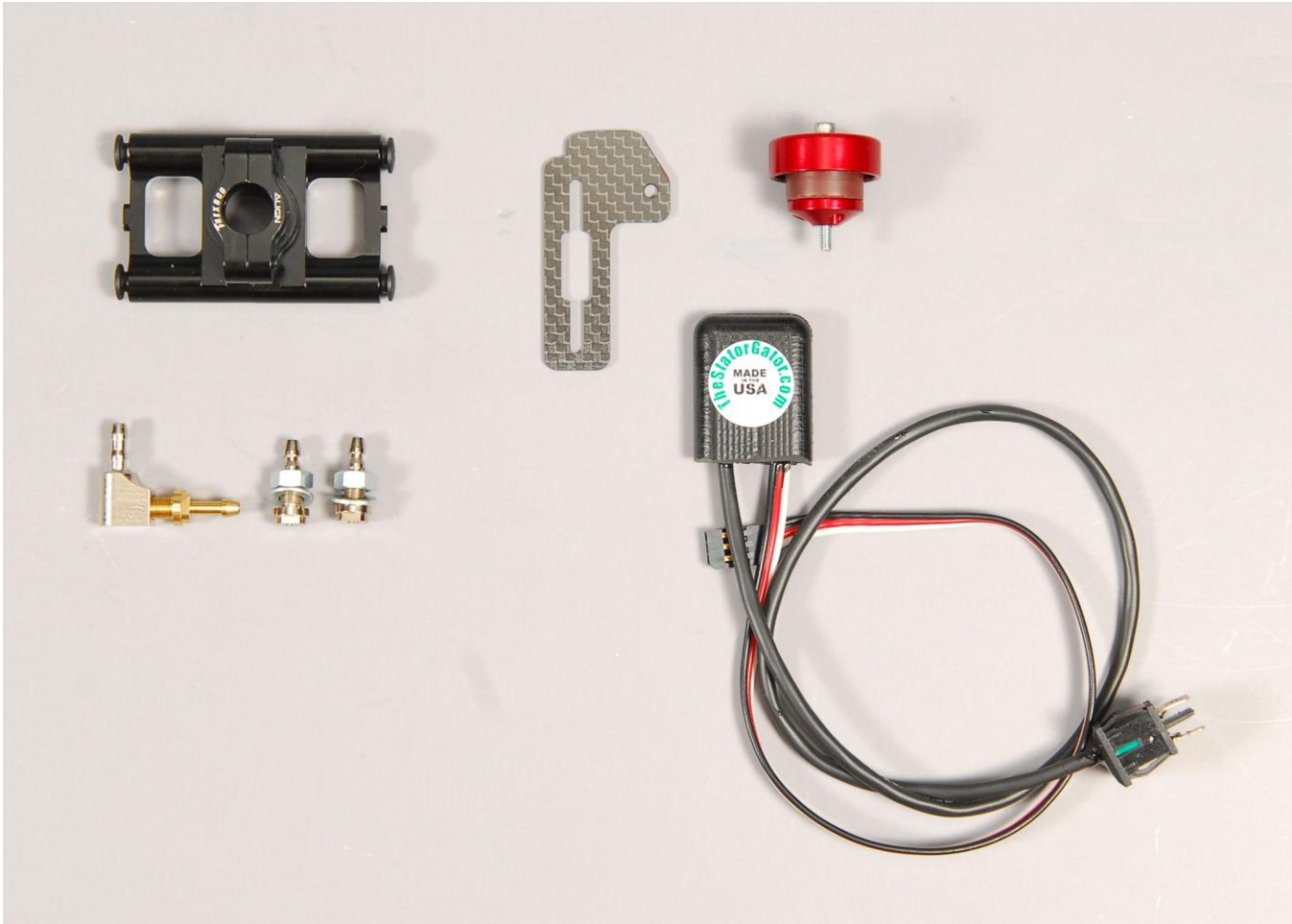
3.A) Donor Components Needed (as shown)



Basically you will need a complete Align T-Rex 600 model except for:

- main frame plates
- main frame bottom
- engine mounts
- main gear
- main drive hub
- clutch
- clutch bell
- start shaft and adapter
- fan
- cooling shroud

3.C) Optional Components



You may want to add some optional parts that simplify or improve the conversion. They are:

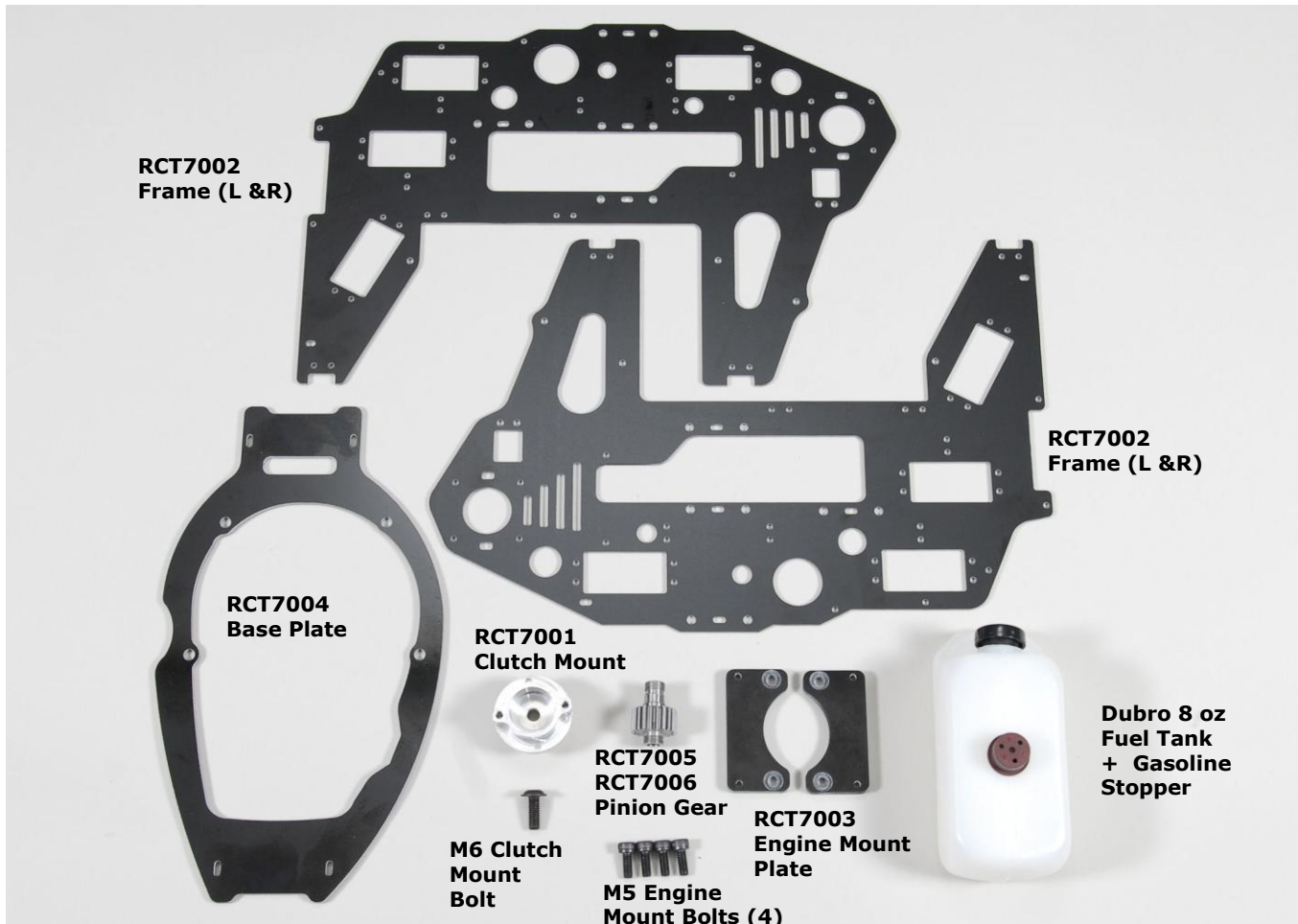
- Miniature Aircraft Fuel fittings (1 each 0410-90, 2 each 0405) or equivalent
- Zenoah Fuel pickup (1 each #5500-85400)
- Sullivan S478 Aluminum fuel tank cap
- Stator Gator GGS233-RC
- 1 pack Align H60150 tail rod guides (4 guides)
- 1 pack Align H60120 M3 Balls
- 1 each Align HN6105 Metal Engine Bearing Block
- 1 each ADA Racing Air Scoop (comes in colors)
- a switch mount (that you'll have to make)

3.D) Documentation

The most recent version of this document can be downloaded from:
www.helibug.com

IV. Pre Conversion Assemblies

4.A) Inventory



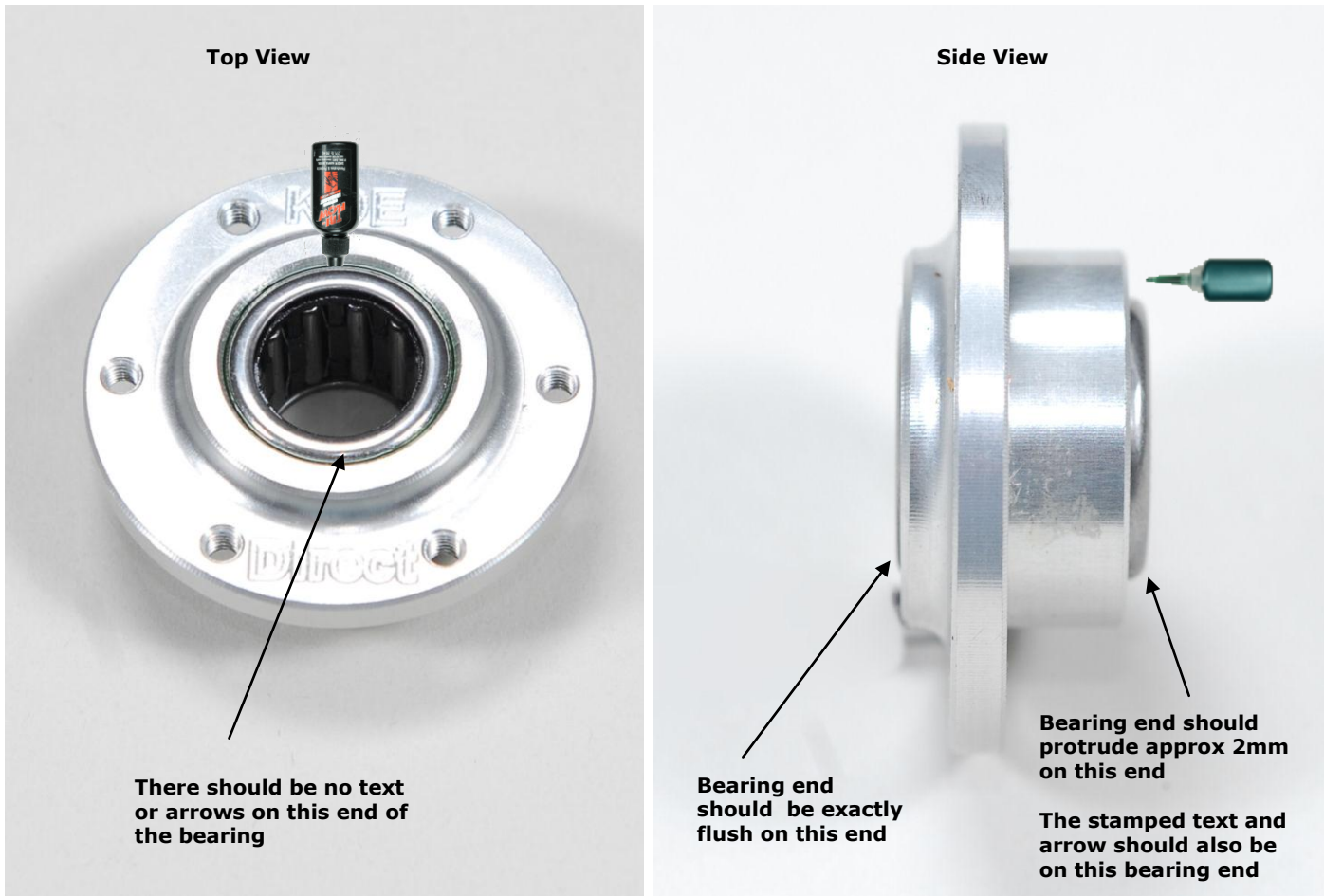
Inspect the conversion package and locate each of the parts listed above. All are required, if you cannot locate any part contact the manufacturer

You will also need the additional required parts previously shown. This kit is designed to be used with one of the T-Rex 700 clutch combinations listed

Finally you will need all of the parts shown previously from an existing T-Rex 600 Nitro Pro or LE

The guidance in this document will be applicable for both the 5.75 and 6.76 gear ratio conversions.

4.B) Assemble Main Drive



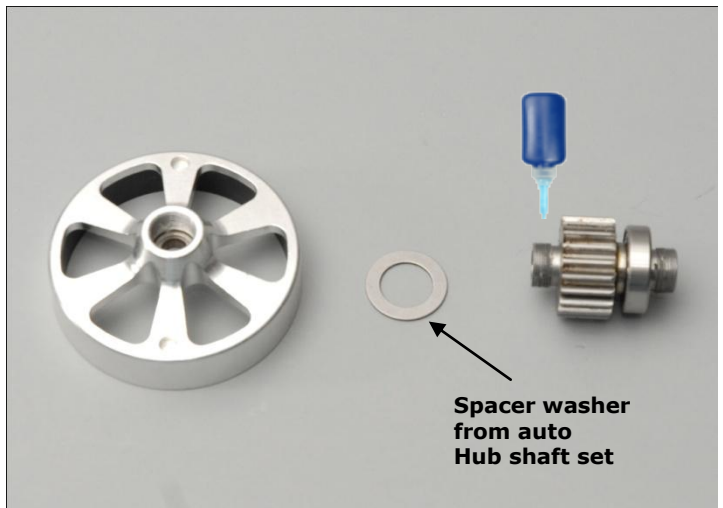
You will first assemble the main drive hub. These are part of the additional required parts listed.

1. Insert the one-way bearing into the drive hub in the direction shown.
2. The tolerances on these parts vary widely, you may need to heat the hub for the bearing to go in or it may fit loosely. If it fits loosely use green thread lock to secure it
3. It is important that you use the bearing position shown here instead of those depicted in the hub instructions. The position of this bearing will set the main drive gear position.
4. If necessary, this bearing can be relocated in the hub later in the event an additional adjustment is needed for the main drive gear position
5. Lubricate the one-way bearing



Install the assembled main drive hub into the new Align M1 main gear
Use the bolts from the original hub and make sure to use thread lock

4.C) Assemble Clutch Block



1. Depending upon which clutch combination you are using, you may need to remove the existing clutch liner and replace it. If so, carefully use a razor knife and sandpaper to remove the old line and adhesive and then use an h/d epoxy like JB Weld to install the new liner. This will need to dry for 24 hours

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2. This kit will have come with a new pinion gear that is either a 17 or 20 tooth gear. If you are using a new clutch bell, then this will just thread into it. If you are using an existing one you'll obviously have to remove the old pinion first.
3. In this installation, the clutch bell needs to be slightly lower to better engage the clutch as well as to set the proper spacing for the t/r drive gear
4. Before assembling the pinion/clutch include one of the spacer washers from the main drive sleeve kit acquired earlier
5. Use thread lock to assemble and tighten firmly
6. Assemble the rest of the bearing stack and starter shaft as usual. If you intend to only pull start the motor, you can invert the hex start coupler as shown.
7. It is recommended that you use the optional align metal clutch block as the plastic block can slightly distort from the larger torque from the motor. This can cause premature failure of the main gear.
8. Assemble the clutch block as usual

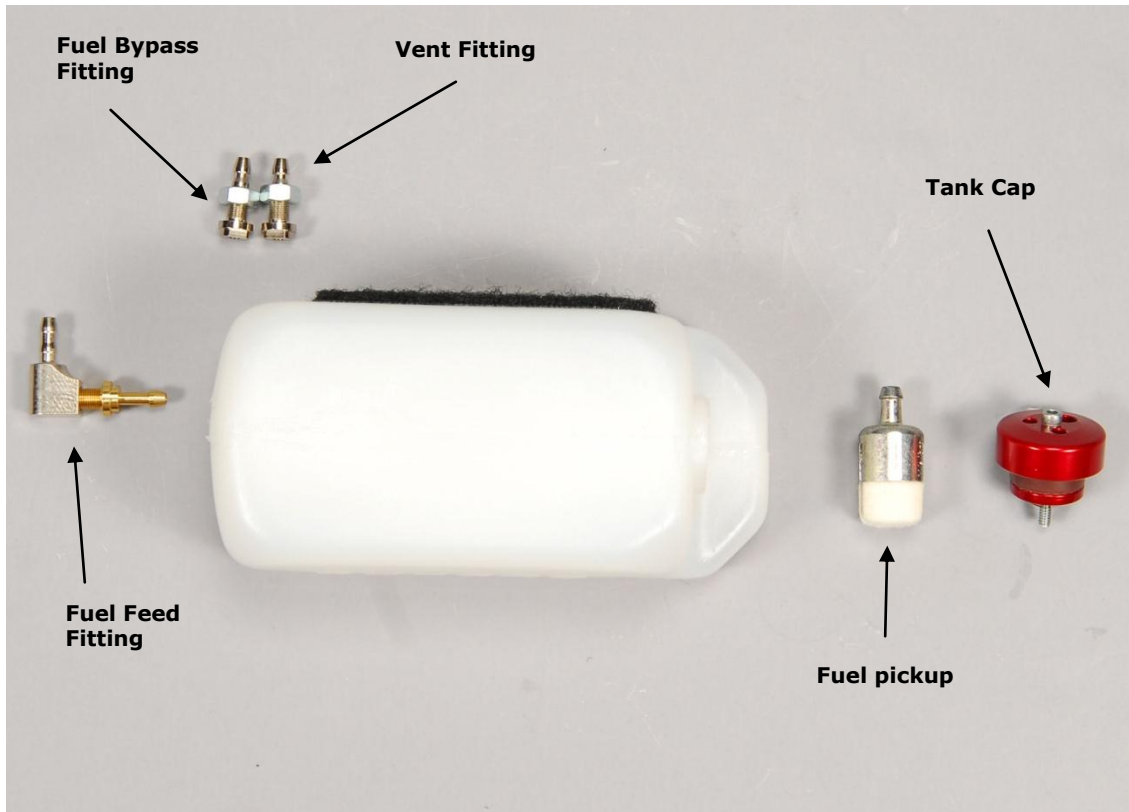


4.D) Assemble Fuel Tank

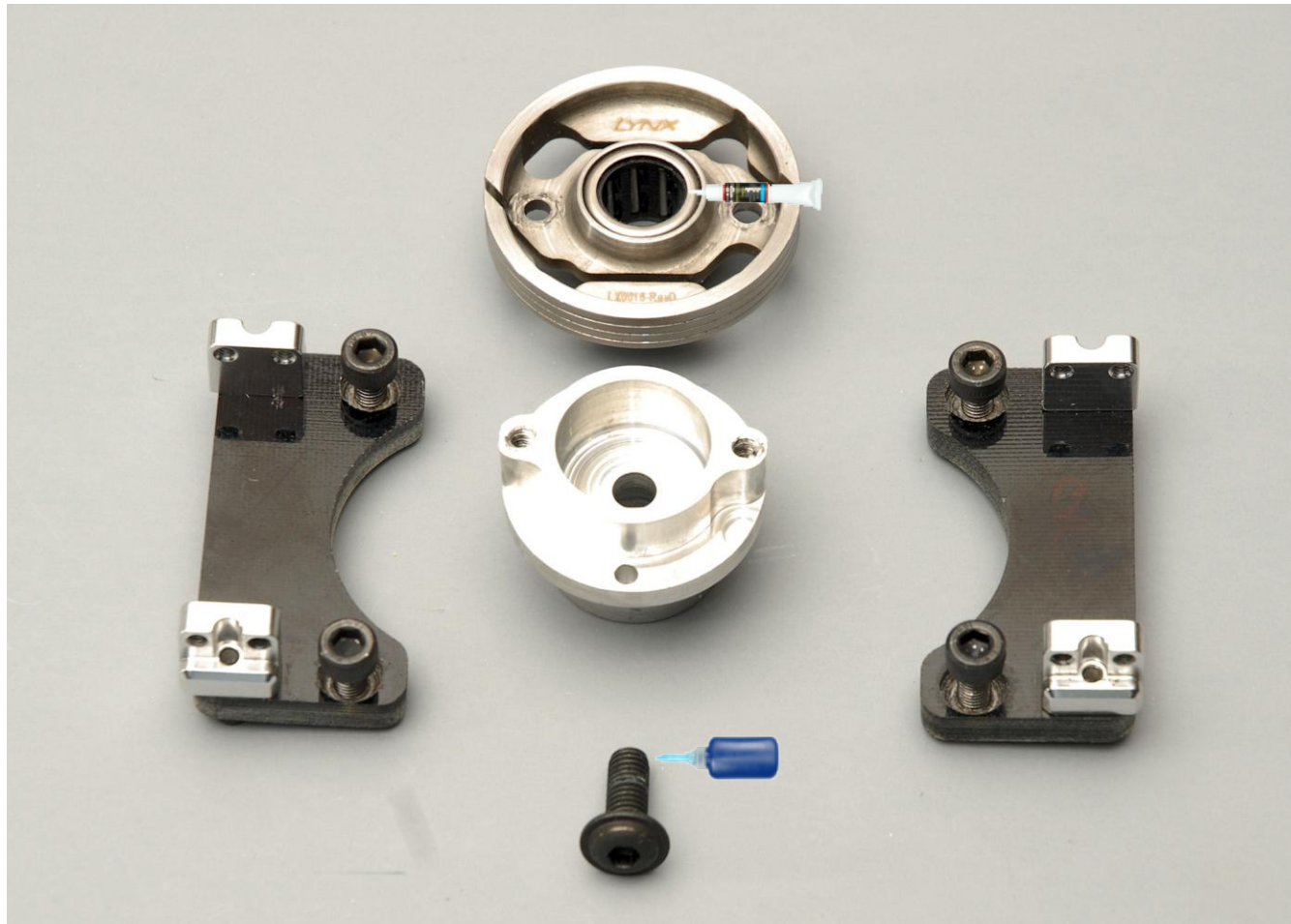
1. The conversion does not allow the use of the original fuel tank or mounting position due to motor size
2. The kit includes a Dubro fuel tank kit which contains the std components required to build an r/c fuel tank
3. It is recommended that you replace the h/w with more helicopter oriented fittings for simplicity of plumbing. Examples are provided in the optional component list
4. The following shows suggested positioning for these fittings

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5. It is **HIGHLY** recommended that you use a felt fuel pickup filter common with these types of motors. This will result in more consistent fuel delivery to the motor and will not require a separate filter to be placed in the fuel tank pickup line
6. Make sure to use either neoprene or Tygon fuel line inside the tank and that it is long enough and flexible enough to allow the clunk to move around in the tank as the helicopter maneuvers
7. Adhesive backed Velcro will be used to help hold the tank into final position
8. Final plumbing will be addressed in a later step



4.E) Engine Preparation



1. This kit uses the Zenoah/CY RC series of motors. This is a self contained motor that is practically ready to use right from the box.
2. There are a few steps to prepare it to be installed
3. This motor will be installed with the spark plug towards the rear of the model so that the carburetor is on the left side of the model. This means the throttle should close when the throttle arm is towards the front of the model. This arm may need to be repositioned on the carburetor. Since this carburetor butterfly is typically spring loaded, the position it automatically closes in will be the closed position. If the arm is not closing towards the front of the model, remove it and flip it around as shown. Also at this time you will need to install a linkage ball from the original kit as shown. Make sure these are secured with thread lock.
4. Locate the clutch adapter hub and M6 button head bolt.
5. Use a piston lock to lock the motor into a fixed internal position.
6. Place a drop of oil on the end of the engine crankshaft and set the clutch hub on it. With the engine locked into position twist the hub around a few times so that it seats on the crankshaft.
7. Now using thread lock, install the M6 bolt and tighten the assembly firmly
8. Using the original clutch bolts and thread lock now install your chosen clutch onto the hub and tighten firmly.

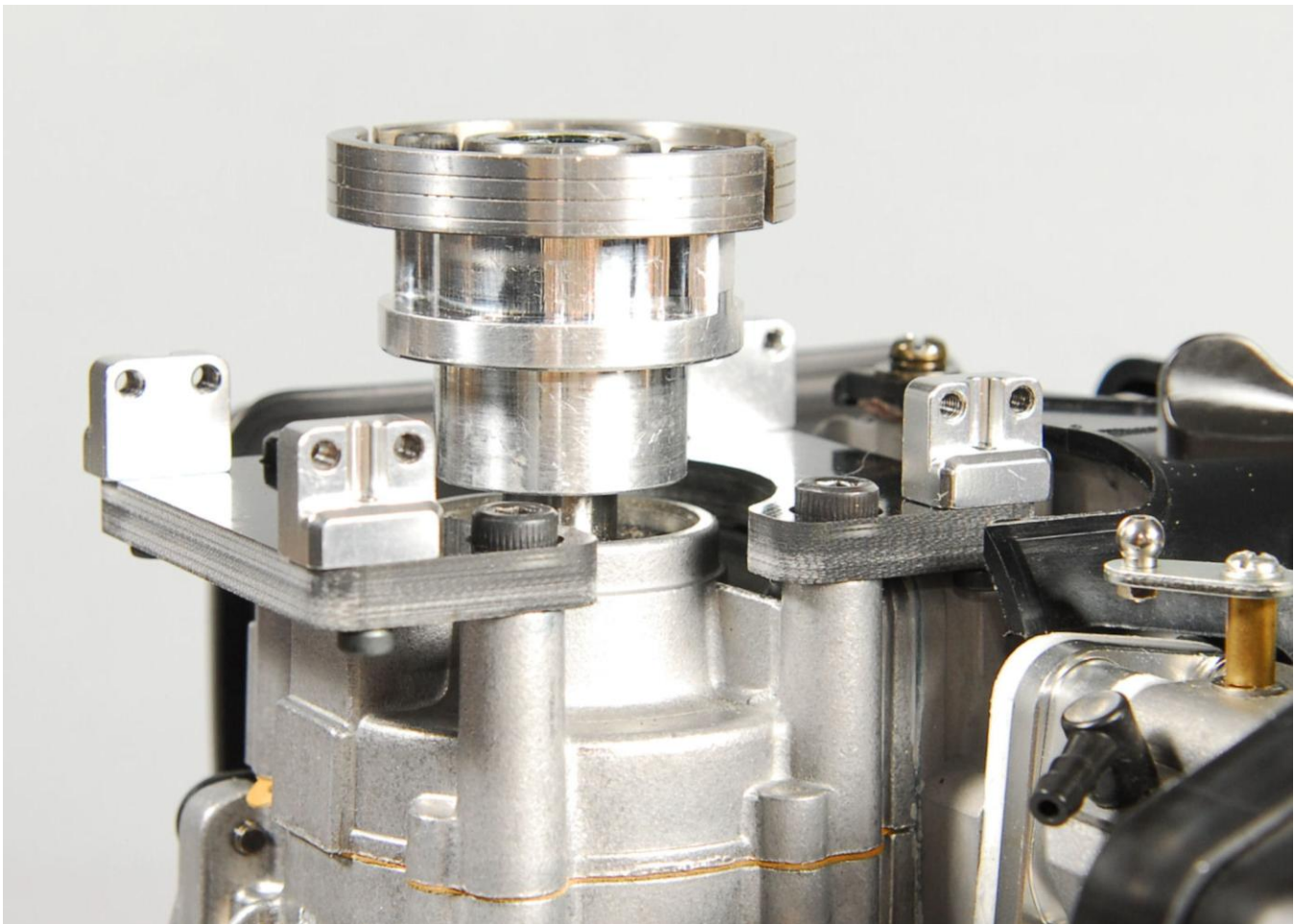
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9. If you have access to a dial indicator, check the run out on the top face and around the edge of the clutch bearing cavity. These run out values should both be less than .002" total run out. If not take steps to improve this as you would with the original stock assembly.

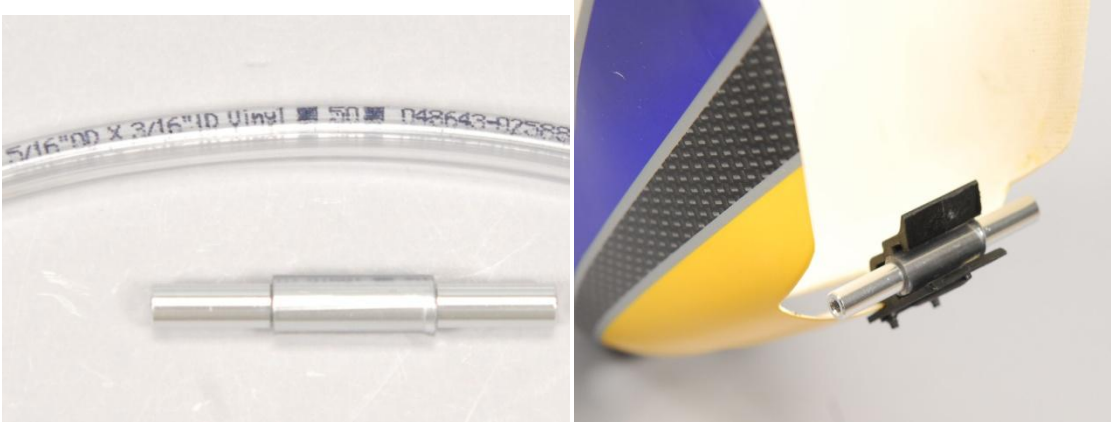
Locate the 4 new landing gear mount blocks and install them onto the engine mount plates as shown using M3 landing gear bolts but do not tighten these yet

Now locate 4 each M5 socket bolts and install the blocks on the front of the motor as shown using thread lock. The bolt holes in the engine mount blocks are precisely cut and will be a tight fit.

For final alignment of the metal mount blocks, locate one of the frame halves and place it on the engine mounts as shown. Temporarily install 8 bolts to tighten the metal blocks to the frame which will cause them to align. Now firmly tighten the 2 bolts that connect the metal mount blocks to the engine mount plates using thread lock. Repeat this process on the other side.

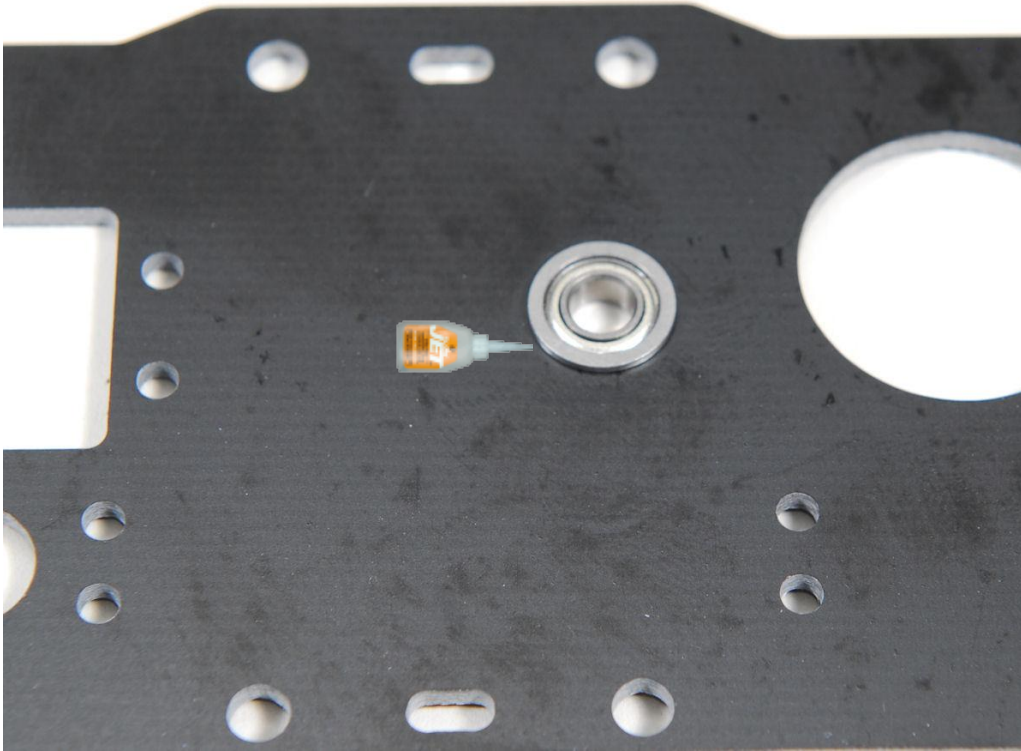


4.F) Canopy/Mount Preparation



1. Acquire a short piece of 5/16" OD x 3/16 ID vinyl tubing from a h/w store. Cut a short piece and slip it over the center of one of the required additional frame spacers as shown
2. Locate the canopy and its latch. You will need to install the canopy latch in the inverse of its normal position as shown as the canopy is positioned higher on the model than it its original version. The photo shows how the latch will interact with the vinyl sleeved frame spacer.

4.G) Frame Preparation

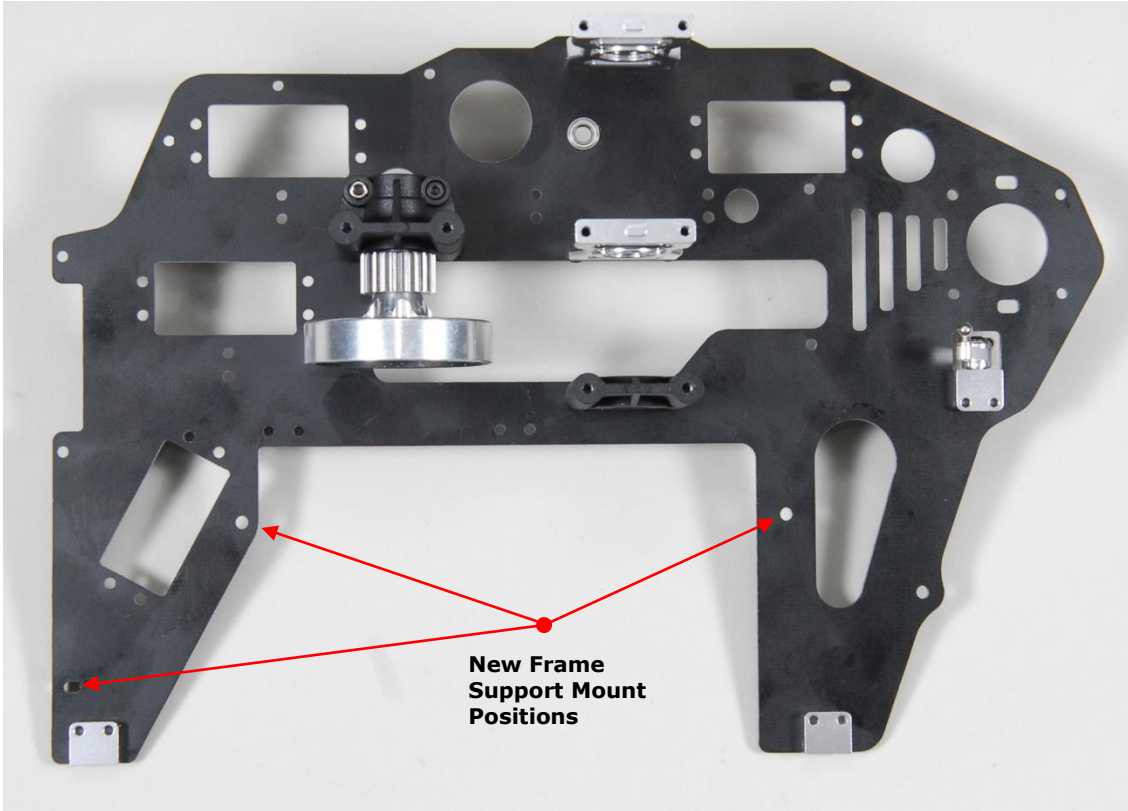


1. Locate the two frame halves (they are identical) and the two additional required M6 flanged bearings.
2. You will need to install one bearing in each frame as shown for the elevator bell crank shaft. The flanges should be on the outside of each frame half so with the frames held in identical alignment with each other either both flanged ends or both unflanged ends should touch each other.
3. Depending on the bearing/frame tolerances you may need to either slightly relieve these holes with sandpaper or a razor knife or you may need to use thick CA adhesive to hold them into place.

All of the pre-conversion work steps are now complete and the conversion is ready to be completed.

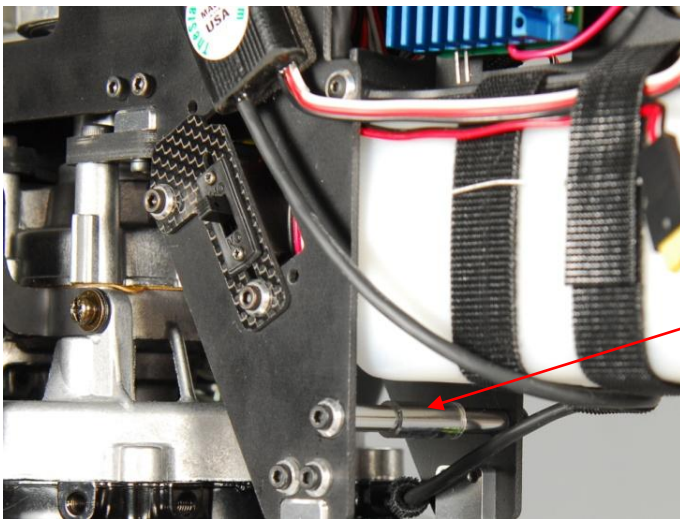
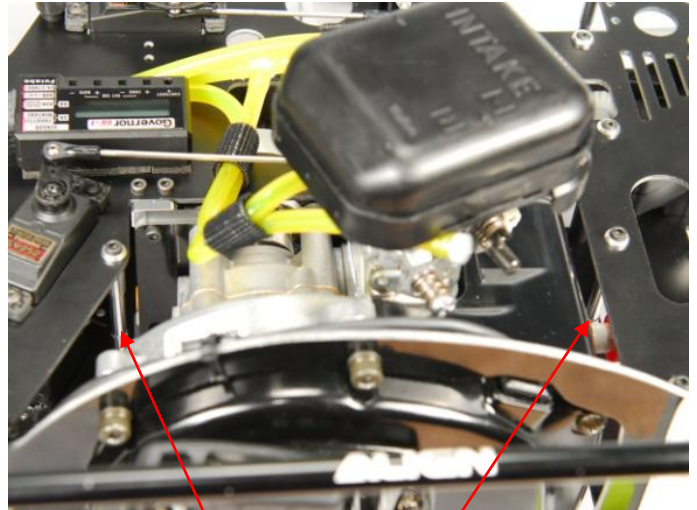
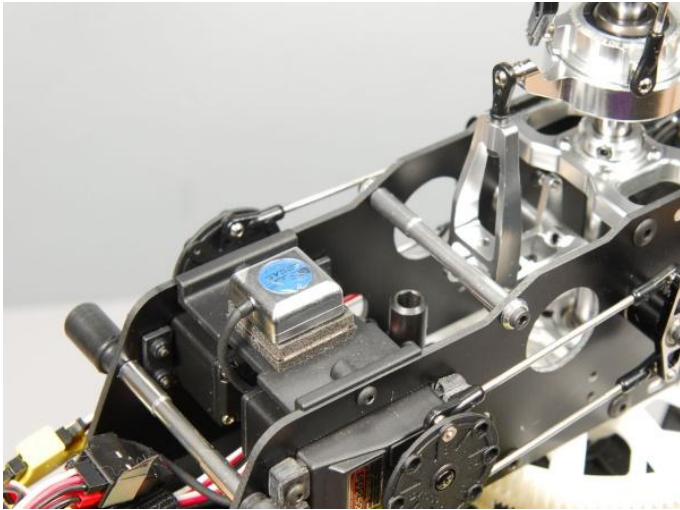
V. Conversion

5.A) Chassis Assembly



1. The frame assembly is not significantly different than the stock assembly with a couple of minor exceptions
2. Install frame spacers in the positions shown
3. Install the vinyl sleeved canopy mount spacer in the position shown.
4. You can install all the electronics and major components into the upper frame as normal except for the throttle servo position
5. There are changes to three of the control rod lengths.
6. You will need to relocate the electronics switch or make significant modifications to the canopy for it to fit in its original position
7. It is recommended to use a total of four tail rotor rod guides to prevent the rod from vibrating. If you chose to do this, you will need to replace the front t/r control rod ball (see detail that follows)

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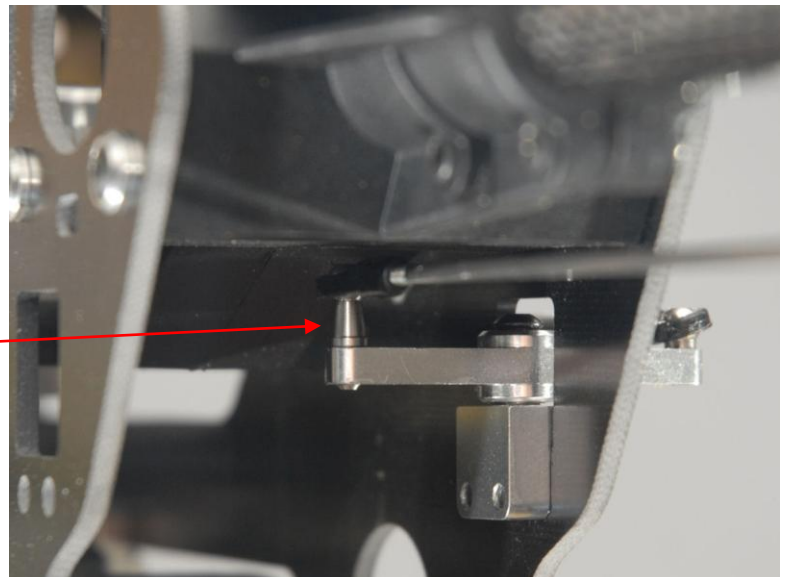
**New Frame
Support Mount
Positions**

Note the positions of the new frame support mounts

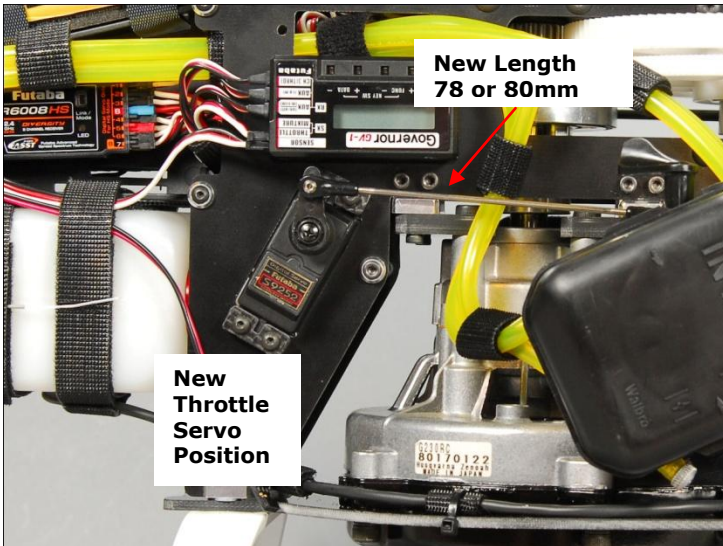
Also note a potential onboard electronics switch position.

If you add the additional t/r control rod guides, you should replace this control ball using a washout mixer ball from the M3 ball set in the optional components list

**Optional
Control Ball**



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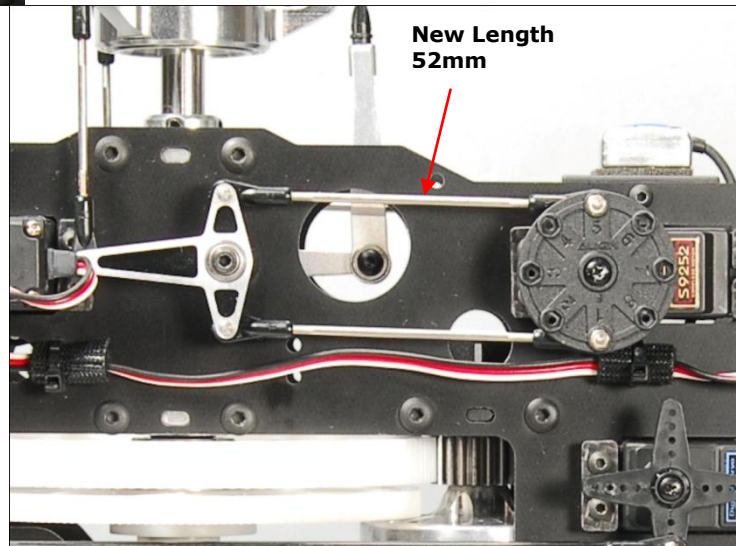


Note the new position for the throttle servo

It will be necessary to alter the length of the throttle servo control rod. Use the appropriate sized rod from the rod set listed in the Optional components parts list

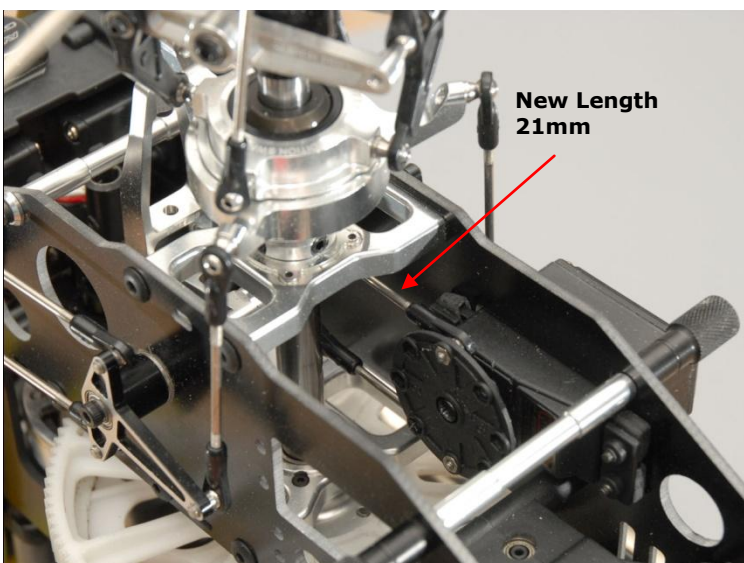
- 6.76 gear ratio = approx 80mm between link bases
- 5.75 gear ratio = approx 78mm between link bases

See the throttle setup section later in this document.



It will be necessary to alter the length of both the aileron and pitch servo control rods

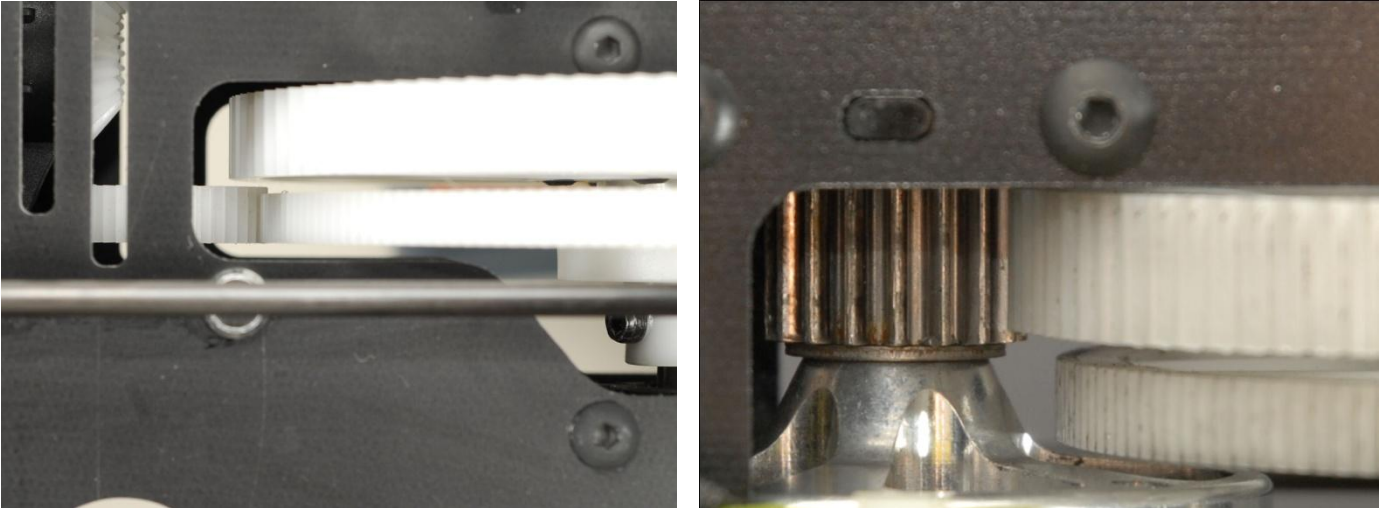
- approx 52mm between link bases



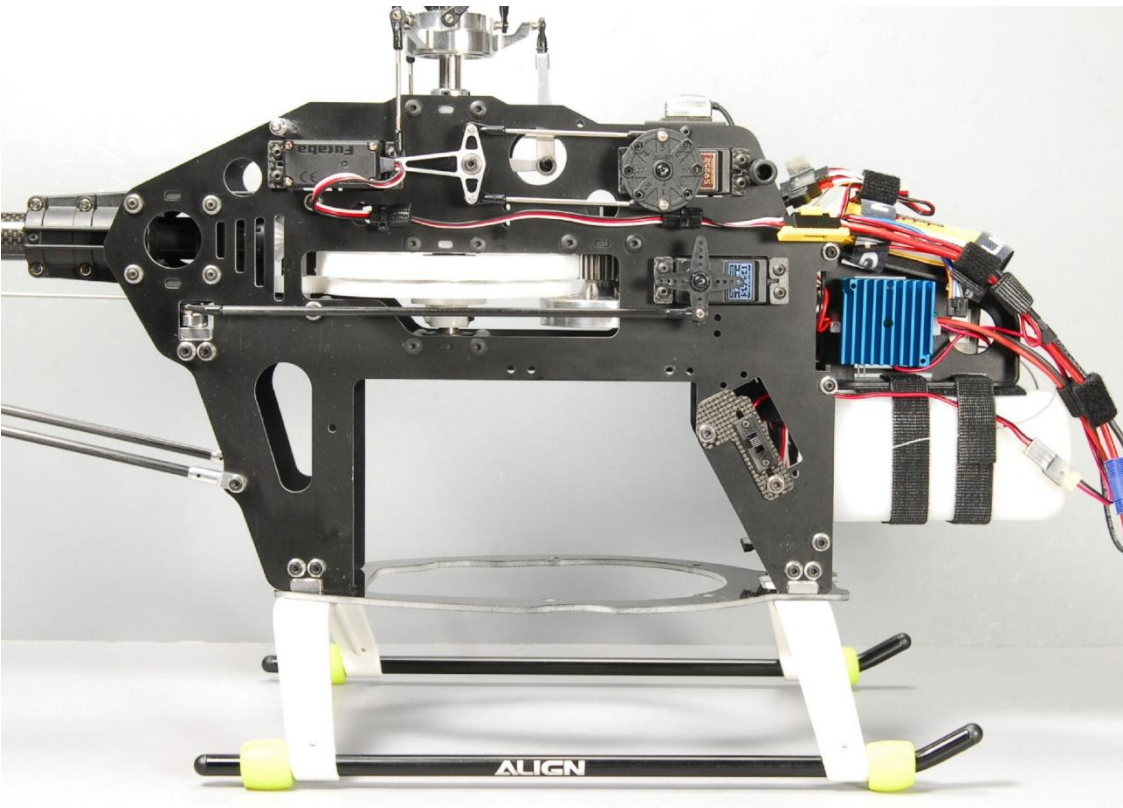
It will be necessary to alter the length of the elevator servo control rods

- approx 21mm between link bases

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If everything is properly installed the gear alignments will be similar to this

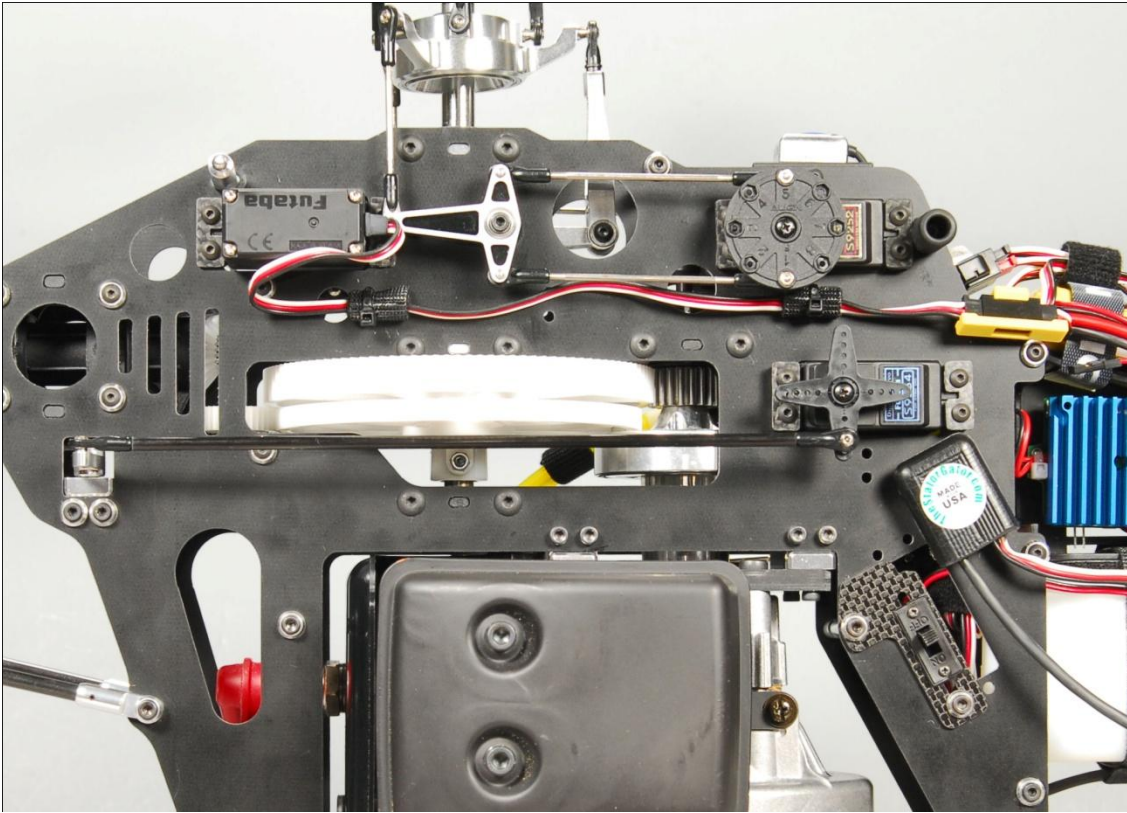


Don't yet fully tighten the 8 bolts that hold the bottom frame plate on, as it needs to be in place to get the frame fully aligned but will need to be removed to install the motor.

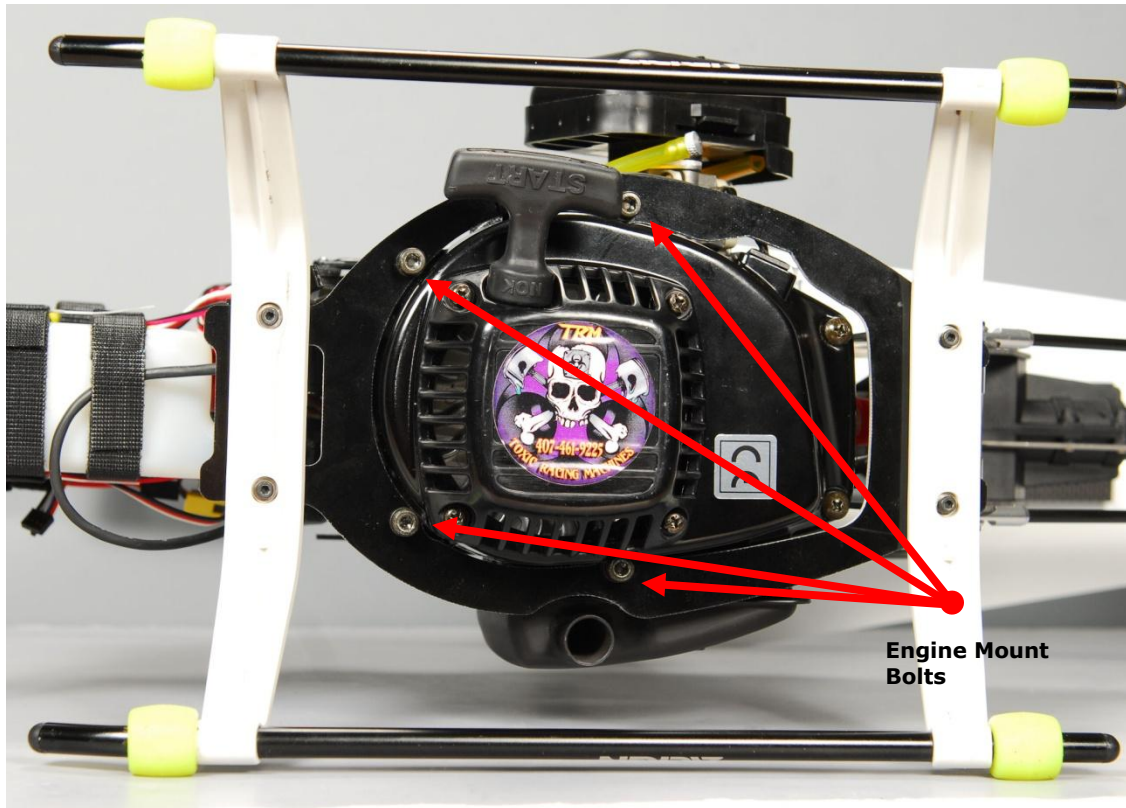
Also leave the 4 bolts that hold the clutch block assembly in place slightly loose at this point.

Remove the 8 bolts that hold the landing gear blocks in place now and drop the lower frame and landing gear off the model

5.B) Engine Installation



1. Slip the engine assembly into place as shown carefully aligning the clutch start shaft with the bearing in the clutch. This may take some minor movement of the motor for it to seat into place.
2. Now thread in 8 M3 engine mount bolts through the frame into the upper engine mount blocks. Only finger tighten these at this point. They may fit snugly in the frame as they are intended to position the motor.
3. Looking at the bottom of the motor, remove the 4 bolts that retain the fan cooling shroud from the motor. It will still be held in place by two Phillips head screws so it won't fall off

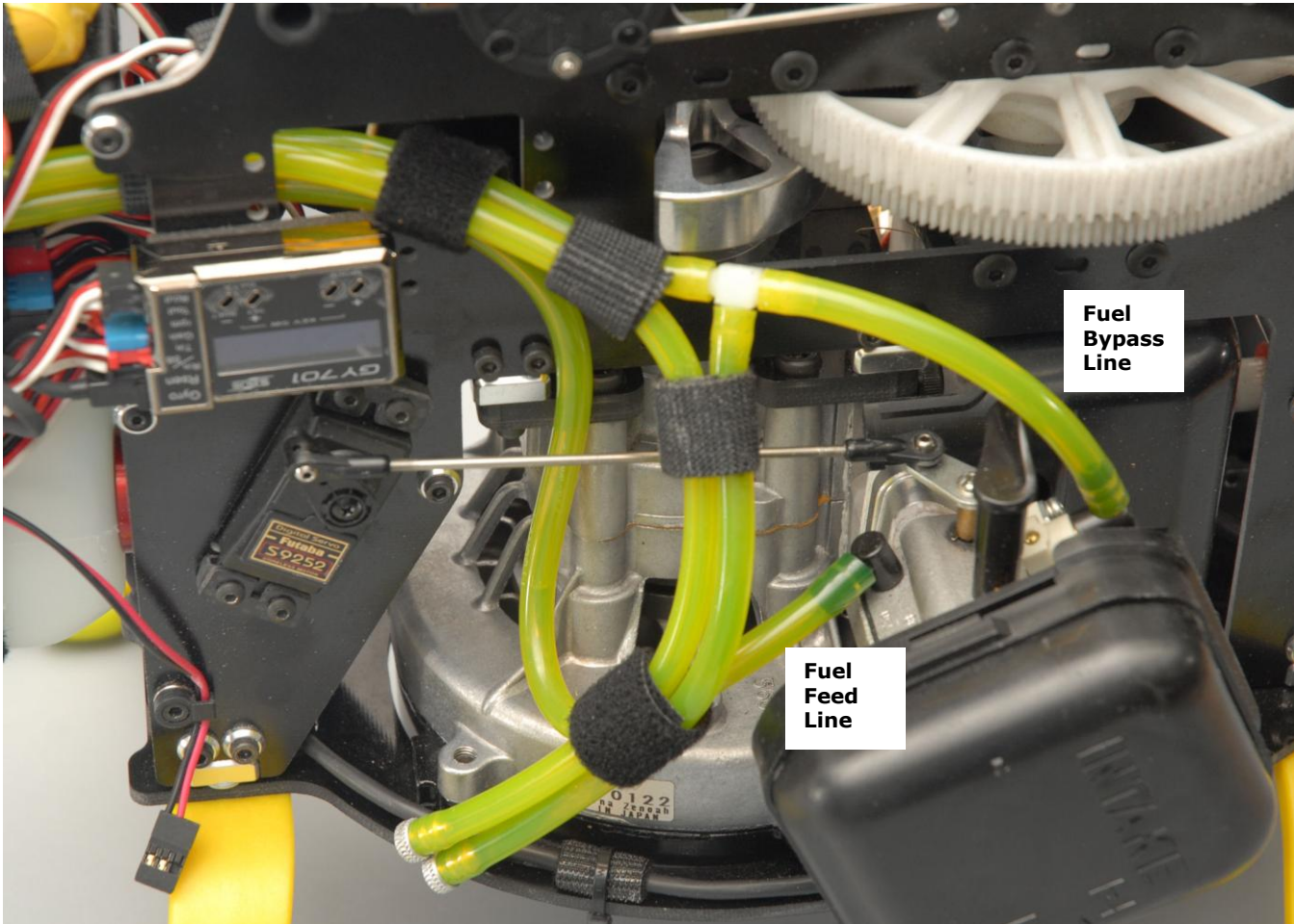


1. Now position the previously removed bottom frame plate/landing gear as shown, and lightly rethread the 4 M5 bolts through the bottom plate back into the fan shroud/motor but don't fully tighten yet
2. Set the model on the skids and fully install the 8 M3 bolts/caps that retain the lower plate to the frame using thread lock.
3. Remove the spark plug from the motor and either using a spin start or the pull starter to spin the motor over a few times. The purpose of this is for the motor/clutch/start shaft/frame position to settle into its correct position.
4. Now tighten the 4 M3 bolts/caps that retain the clutch block using thread lock as well as the 8 upper engine mount bolts. Do these one at a time so as to not disturb the alignment. When complete check to make sure that the clutch bell and main gear spin freely. If not, repeat this process until it does. If everything is properly positioned and aligned without binding, the gears will spin freely.
5. Finally fully install the 4 bolts on the bottom of the motor/frame plate using thread lock

5.C) Canopy Installation

The canopy will install with only minor modifications to allow for the deeper frames near the front. It will use the std rear mounts and the clip in the front will clip over the vinyl tubing on the front frame spacer.

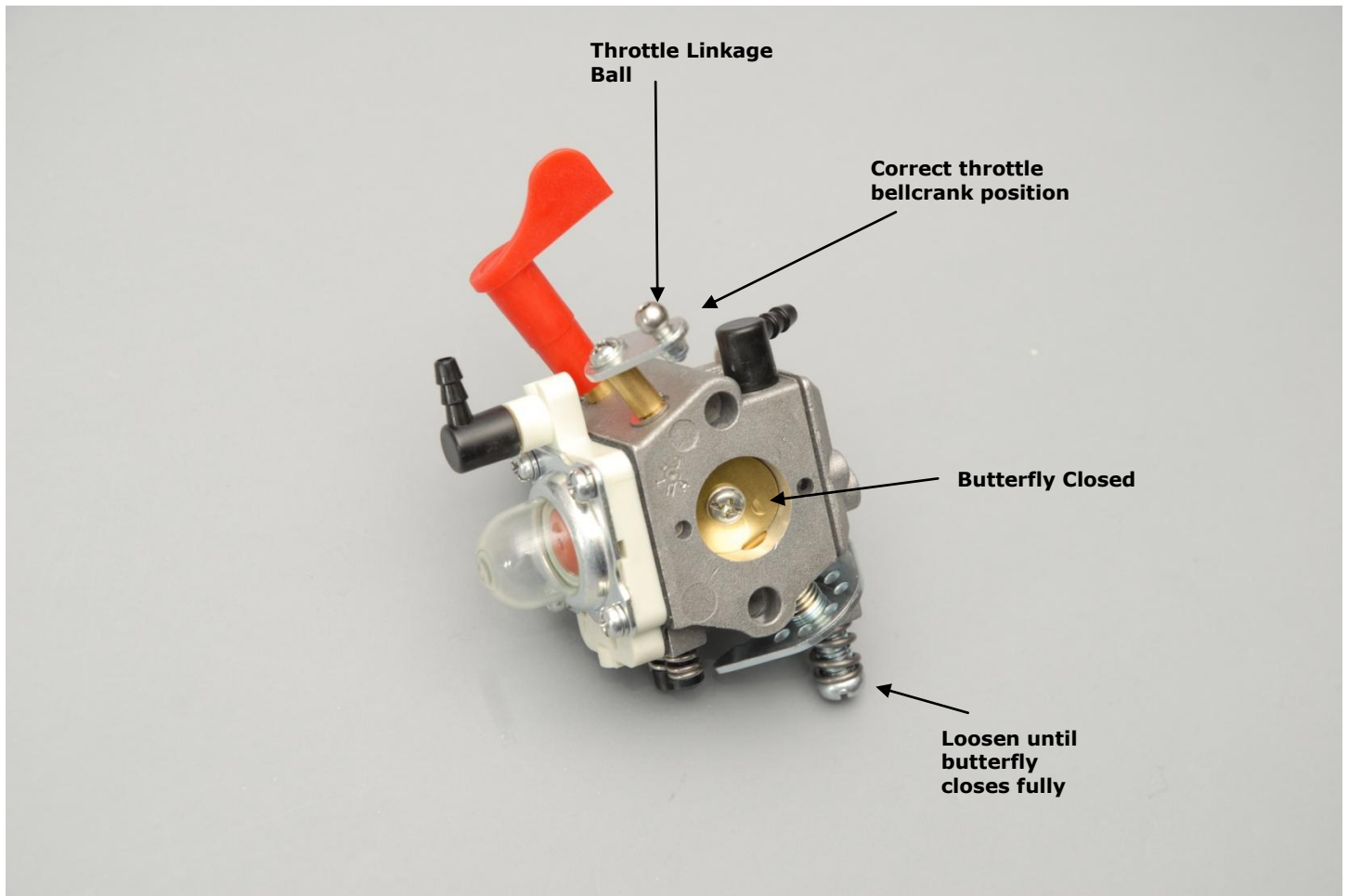
5.D) Fuel System Plumbing



This is only slightly different from normal glow plumbing

1. A fuel feed line is needed from the tanks fuel clunk to the inlet side of the carburetor
2. A fuel return line is needed from the carburetors primer outlet back to the fuel tank
3. Because these motors use a fuel pump, a vent is needed on the tank to prevent it from pulling a vacuum, which will cause the motor to go lean. This is typically done two ways, either by connecting a piece of fuel line to an additional fitting on the tank and then tightly looping the line into consecutive circles and binding them together. This acts as a fuel trap and lets air enter but makes it harder for fuel to escape. The other option is to use a one way valve common to small motors of this type. See suggestion in the optional components list.
4. You will still need a way to get fuel into the tank. You can either remove the fuel feed line from the carburetor and put fuel in/remove fuel through that line or you can use a T fitting in either the feed or overflow line to move fuel. Note - if you use the one way valve vent, you'll need an additional vent because it allows air INTO the tank not out as would be needed when filling the tank.

5.E) Throttle Setup



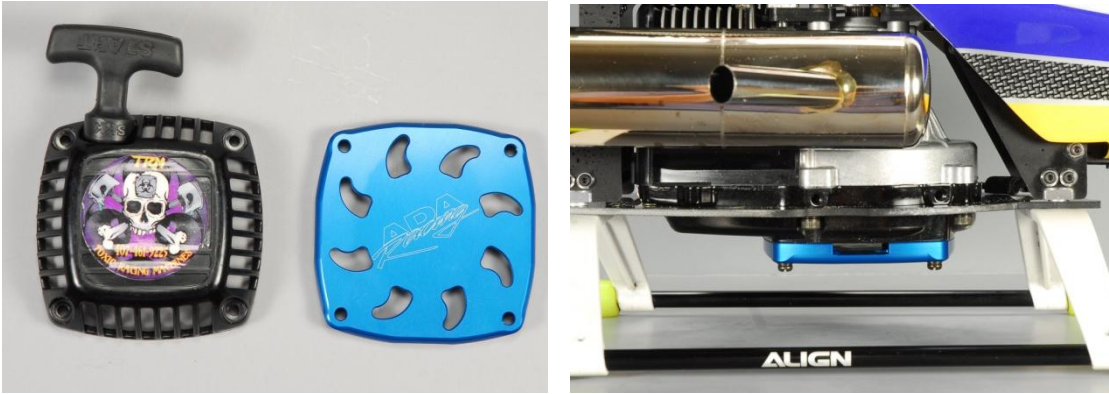
1. Throttle setup is considerably different for this gasoline powered motor than for a glow motor. The amount of throttle opening typically required is less.
2. The bell crank size on the carburetor is predefined
3. Make sure the linkage ball on the throttle servo is at approx 13mm from the arm center
4. The length of the throttle control arm will be approximately 80mm from the bottom of each ball link
5. Also make sure it's moving in the correct direction for opening/closing the throttle. If necessary remove the air cleaner cover and visibly inspect this. Having the throttle linkage reversed can be dangerous.
6. Adjust the "idle screw" on the carburetor so that the throttle butterfly can completely close
7. At full low throttle, low trim (or throttle cut) the butterfly should be completely closed
8. And at full throttle the butterfly will be fully open
9. A good starting place for a throttle curve will be 10%,20%,30%, 75%, 100%. This will need to be field adjusted based on gear ratio, blades, flying style, etc.
10. If you are using a governor, make sure you change the gear ratio. Some governors like the Align may not have a gear ratio adjustment. You will have to make your own gear ratio/head speed conversions to determine if this can be used.

5.F) Pitch Setup

Initially use the manual recommended pitch settings. You will find that you will need to either reduce the max pitch settings or adjust your flying style to not use them for extended periods of time as they tend to bog the motor more which will cause it to overheat.

VI. Optional Parts

6.A) Pull Starter Replacement

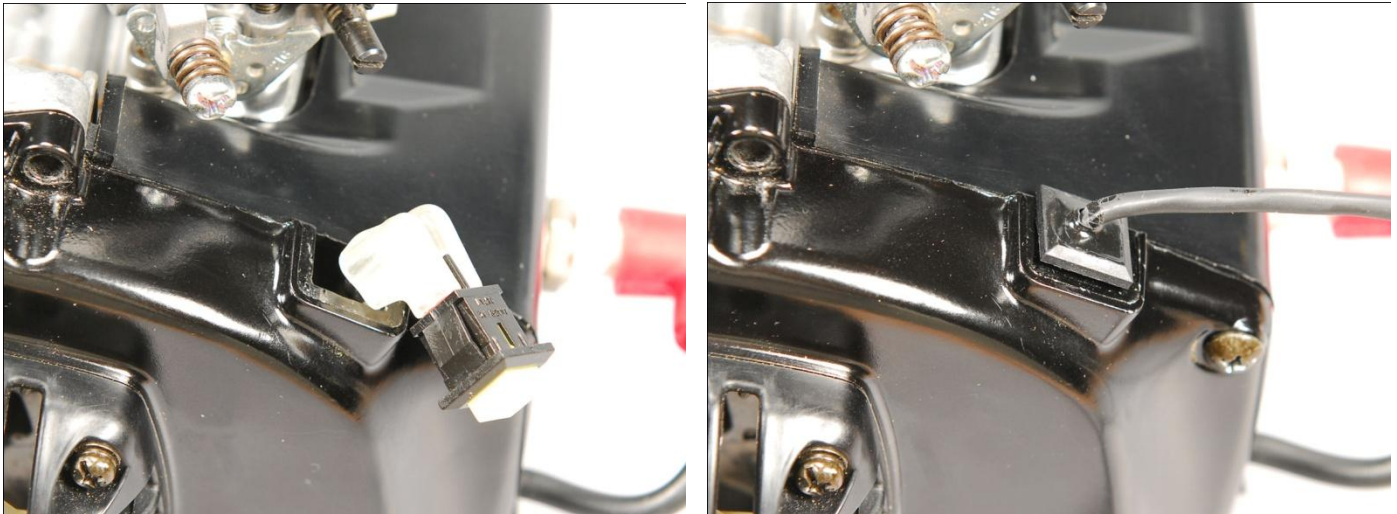


If you do not intend to pull start your motor and wish to increase the ground clearance, you can replace the pull start mechanism using optional parts as shown which will increase ground clearance by about 1 inch

6.B) Muffler

The Zenoah/CY motors come complete with a muffler that will function and the conversion has been designed to work with it. If you wish to replace it there are several available on the market that will work fine.

6.C) Stator Gator Governor Sensor



You may want to use an optional engine speed governor. If so you will need to adapt a sensor mount to detect engine speed.

One option is to use the Stator Gator sensor which replaces the kill switch button on the RC motor. To install simply remove the switch and plug the sensor in its place.

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