AEROJET

Hummingbird

1.8 Meter Sport Jet

Wingspan	1600mm / 63 Inch
Length	1800mm / 71 Inch
Weight	8.93kg / 19lbs 11oz with UAT full
Turbine	80n-100n / 18-22 lbs.
CG	5mm (25/32) in front of spar
Ailerons	20mm (25/32) Low & 24 mm (15/16) High
Elevator	19mm (3/4) Low & 24 mm (15/16) High.
Rudder	30mm (1 3/16) Low & 45mm (1 25-32) High
Flaps	30mm (1 3/16) Take Off 55mm (2 11/64) Landing

The Assembly manual will cover the ARF Pro and PNP versions of the Hummingbird, although most of the work is already completed for the PNP version. There are 8 servos used for all control surfaces and Steering are all capable of 8.4v. Therefore we suggest you use a MAX of 7.4v / 2S LiPO to power your radio. When powering up the servos for the first time, Make sure that the Flap servos are operating in the correct and desired orientation and that the Flaps have free movement or are not resting on a stand or table that would prevent movement.

DS830MG Digital Servo Voltage Range: DC6.0-8.4V
Speed and Torque:
27Kg.cm/ 375 oz /0.14sec/60°@6.0V
32Kg.cm/ 444 oz / 0.12sec/60°@7.4V
35Kg.cm/ 486 oz / 0.10sec/60°@8.4V
Motor: Coreless Teeth: 25T

DS396MG Digital Servo Voltage Range: DC6.0-8.4V
Speed and Torque:
9Kg.cm/ 124 oz /0.12sec/60°@6.0V
11.3Kg.cm/ 156 oz / 0.10sec/60°@7.4V
12.9Kg.cm/ 179 oz / 0.09sec/60°@8.4V
Motor: Coreless Teeth: 25T

DS635MG Digital Servo Voltage Range: DC6.0-8.4V
Speed and Torque:
28Kg.cm/ 388 oz /0.14sec/60°@6.0V
32Kg.cm/ 444 oz / 0.12sec/60°@7.4V
35Kg.cm/ 486 oz / 0.10sec/60°@8.4V
Motor: Coreless Teeth: 25T

Installation Planning:

The Humming Bird is well matched to modern small turbines in the 80N to 100N range. The Global Jet Club prototype was flown using an AceX80 with good performance characteristics at less than 20 pounds with Thrust Vectoring.

The fuel system consists of 2 tanks plus a UAT the UAT is not included) with a capacity of 2.8 liters or 95 ounces allowing for a wide choice of engines.

On first appearance the servo leads extending into the cockpit appear relatively short. However there is plenty of extra length under the equipment board to reach nearly anywhere you chose to install your systems.

The gear and brakes have a JP Hobbies ER-120 control unit. GJC strongly believes that the Aerojet AG-63 Anti-Slip Brake Gyro is a much better choice for braking. The unit provides gyro stabilization for the nose wheel steering and applies brake power independently to each wheel to track straight ahead while stopping. The Aerojet AG-63 is sold separately

Available Options:

Thrust Vectoring unit – preinstalled with servos and pushrods

Aerojet AG-63 Anti-Slip Brake Gyro

Hardware:

The hardware included with your Jet consist of, Fuel line, Spare retract mounting screws, Engine mount extension plates, Replacement nose gear steering pin, and a Torx wrench for removing the struts from the retracts

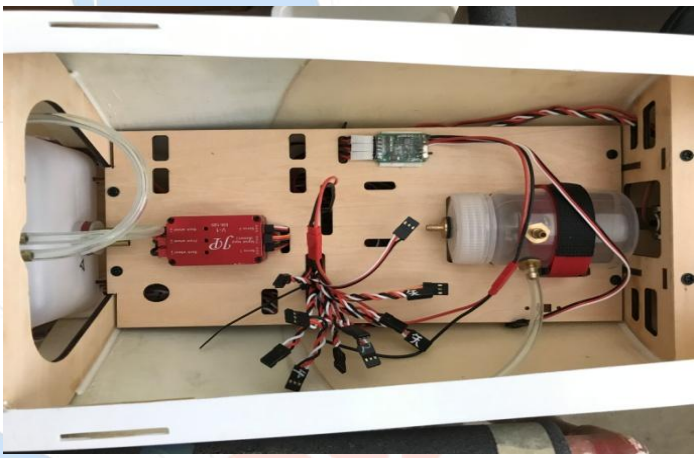
Getting Started:

Begin in the nose area, by removing the fuel tanks and straps. Detach the vent line from the upper tank. This action will make engine installation and thrust vectoring setup easier.

Remove the main equipment plate in the cockpit. Having it out will make device placement planning and routing your servo leads easier.

Cut the zip ties on the servo wire bundle and pull them out of the plate. Mark & unplug the leads to the retract controller and light controller. Some leads have Chinese marks on them, others do not. Elevators are “Z’, Rudder is “R” and nose wheel steering is “4”.

If you require to Remove the forward equipment plate. You can get it out with the gear up but much easier with the gear down.



Transmitter & Receiver:

GJC suggests you establish a base setup in your transmitter early on and use the assembly process to complete your final settings.

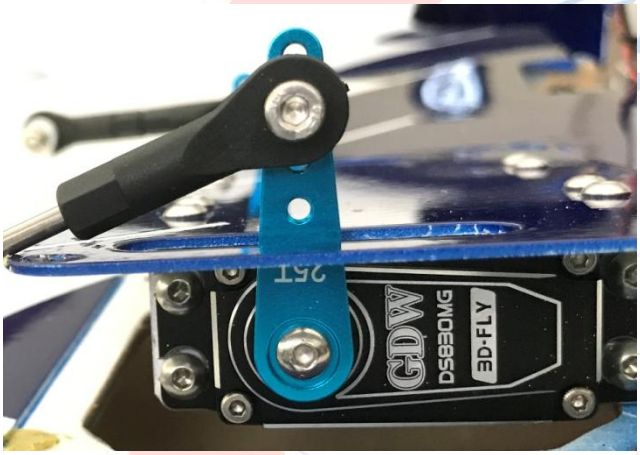
As an example, this is an 11 to 14 channel setup:

2 x Ailerons
2 x Elevators
2 x Flaps
1 x Rudder
1 x Nose Wheel steering
1 x Landing Gear
1 x Brakes
1 x Throttle
1 x Lights (possible Y harness to gear)
2 x Thrust Vectoring (optional)
Gyro – possible 1 or 2 channels for mode & gain (optional)

Live Hinges:

The wings, stabilizers and rudder use a live hinge system which means the composite wing skin becomes the hinge for the ailerons, flaps, elevators and rudder. While flexible and strong, the hinges have increasing resistance when deflecting to the required angles for flight. This puts an extra strain on the servos and might chatter or make noise. As the flying surface experience use, that noise or chatter will be reduced over time. You can expedite the loosening process by disconnecting the linkages and flexed to increasing large angles to “break in” the hinge. Perhaps a dozen flexes to not exceed 70 or 80 degrees will accomplish this. Be careful, too much flexing or exceeding the desired angle can and will damage a Live Hinge.

Stabilizers:



[ ] Disconnect the servo linkages from the horns on the elevators.

[ ] Flex the elevators to loosen up the hinges so that they move freely about 30 degrees in either direction.

[ ] Using your transmitter, center the servo horns such that they are exactly perpendicular to the servo. You may want to use a receiver “bench” setup to accomplish this step.

[ ] Check for correct polarity – up is up, down is down. Set Reversing as required

[ ] Mechanically adjust the linkages to center the elevators as close as possible. Do this with the servo connected to the receiver system. Use the inboard fixed section of the stabilizer as your primary reference.

[ ] Verify the servo can move the elevators about 30 mm up and down comfortably. If not, you may need to flex the hinges again to further break them in.

[ ] Using the inboard fixed section of the stabilizer as a reference, set the control throws, end points and dual rates per the Control Setup & Cg table.

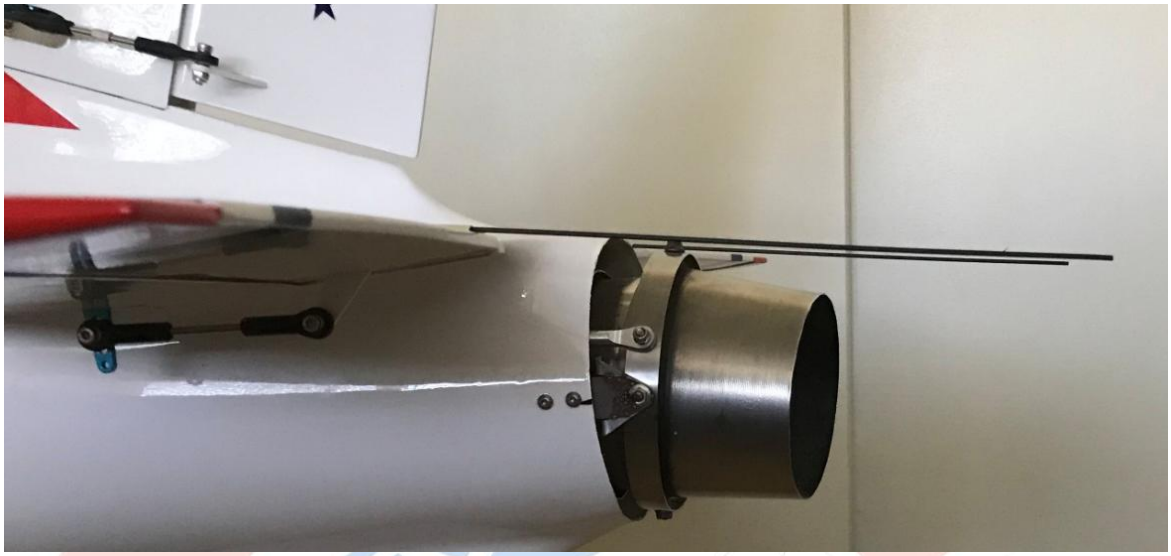
[ ] The stab spar slides very easily through the fuselage tube. You may want to put small strips of tape on the spar to provide more friction.

[ ] Center the spar in the tube, plug in the servos and attach the stabs to the fuselage. The clamps on each side require a 3mm ball driver or hex wrench. Try to keep as much of the servo wire in the stab as possible.

[ ] Connect your receiver bench setup to the elevator servo extensions in the fuselage. They are marked with something that resembles a “Z”. You will have to test for which is left versus right. Mark them as such for reference later.

[ ] Match centers and end points of the elevator halves. Some builders prefer angle gauges but I prefer to use rods to extend the face of the surface and visually match the sticks at center and end points. Assuming you achieved decent centering mechanically, choose an elevator as the master and match the other side via subtrim and endpoint adjustments. Use high rate on your dual rates for this comparison. A good setup will eliminate roll coupling in your pull-ups & loops.

[ ] Re-measure to verify proper control throws and dual rates.



Fin & Rudder:

[ ] Disconnect the linkage from the rudder horn & flex the rudder increasing to large angles. The surface should move as freely as possible about 1 ½" either side.

[ ] Using your transmitter & bench setup, center the servo horn such that it is exactly perpendicular to the servo.

[ ] Plug in the servo and mount the fin on the fuselage and tighten the clamp. Keep as much wire in the fin as possible.

[ ] Connect the receiver setup to the rudder extension in the forward fuselage marked "R".

[ ] Check for correct polarity – right is right, left is left. Set Reversing as required

[ ] Mechanically adjust the linkage to center the rudder as close as possible, matching it to the molding on the fuselage. Do this with the servo connected to the receiver system. Finish centering using subtrim.

[ ] Verify the servo can move the rudder about 30 – 40 mm left and right comfortably. If not, you may need to flex the hinge again to further break it in.

[ ] Using the fuselage molding as a reference, set the rudder control throw, end points and dual rates per the Control Setup & Cg table.

Thrust Vectoring:

There may be some clearance issues with the Yaw portion of the Optional Thrust Vectoring (TV). Some trimming might be required so that your pushrods do not touch any of the wood formers.

Installation:

[ ] Note in the top photos how the push rod is attached to the bottom of the servo horn and that the pushrod rubs against the bulkhead by the pipe bell mouth. You will have to disconnect the thrust vectoring pushrods from the servo horns. Move the Yaw pushrod above the pipe. If necessary, use a Dremel drum sander to grind away a portion of the bulkhead to clear the pushrod. Try not to nick the pipe or bell mouth. You do not need to remove the pipe.

[ ] Center the control horns on the TV servos with your transmitter. The servo leads are easy to identify in the cockpit.

[ ] Tape a straight edge of some length across the TV exhaust nozzle and adjust the yaw vectoring push rod to center the nozzle. See photo.

[ ] The linkage on yaw push rod may not be very tight inside the pushrod and the pushrod could easily rotate. This will prevent any trim changes or control rod linkages from disconnecting in flight. You may have to use CA to keep it from rotating. Check the pitch TV pushrod for the same condition.

[ ] In the same manner, tape a straight edge vertically to the exhaust nozzle to assist in centering the pitch portion of TV.

[ ] There is no good reference to use for measuring so you may want to align the centering visually or level the fuselage and use a square from the table or a bubble level.

You may find some rubbing of the pitch pushrod in the back of the fuselage. We are flying as is and have not incounterred any issues

In our setup, we drove each axis directly from the respective stick with no includes for trims, Dual Rates, etc. Most radios will require the use of a mix. Set up a switch on your transmitter to control the mix.

Set the end points for each thrust vectoring axis. Set it such that at maximum throw the nozzle just clears touching the pipe in each axis. We included a bit of negative expo such that the nozzle reacts slightly more quickly at neutral,

[ ] The use of TV for takeoffs and landings is **not recommended.**

Turbine Installation:

We used an AceX80 to power our Hummingbirdthis jet. The engine formers are a little too wide for the our Turbine, mounting extensions are supplied for this type engine.

Make sure to center the and align your Turbine with the pipe.

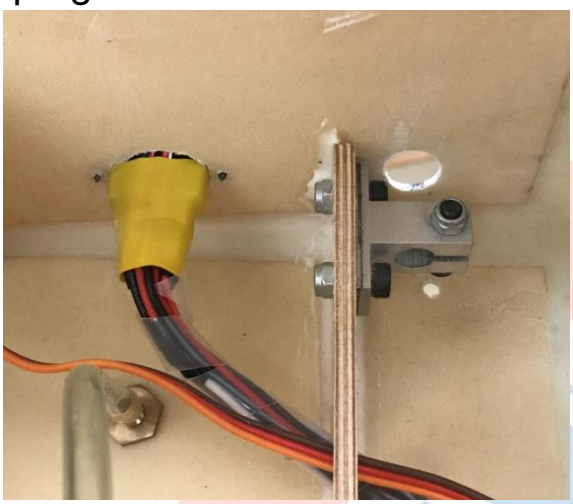
Refer to your engine manufacturer instructions for engine to pipe spacing. With this style bellmouth you do not measure the bellmouth portion and establish your spacing from pipe itself. For the AceX80, we used 20 mm.

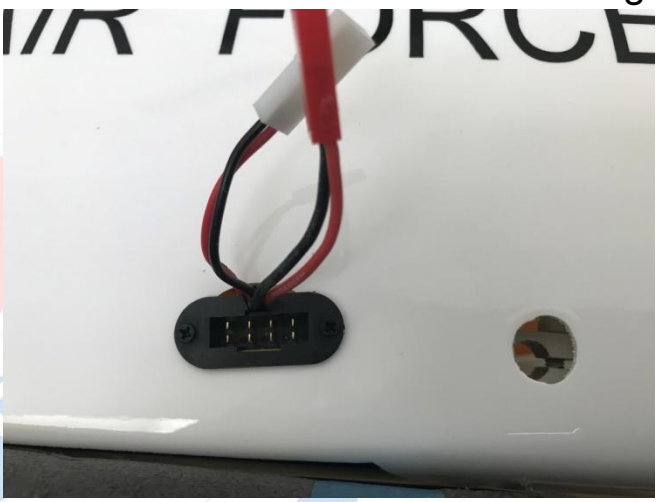
Notch out the formers as necessary to clear the bolts attaching the Turbine extension mounts. Or make notches as required for your engine. We drilled new holes in our extensions to make bolting up to the bearers more convenient.

We used 3 mm bolts and blind nuts to attach the engine to the formers. You could choose to epoxy ¼” ply plates underneath the mounting area to give more depth and use wood screws.

Wings:

Note in the photos the fuselage side of the wing electrical connection and the mounting clamp. The plug and socket are a Multiplex style. The red plug is the brake connection and the white connection is for the gear light.





Disconnect the servo linkages from the aileron horns and the flap horn.

Flex the aileron hinges to give a free range of 45 degrees either side. The flaps will need to be increasing flexed to nearly 90 degrees to give a good range of motion to 40 or 50 degrees. You may want to flex the flaps a number of times more than the other surfaces to free them up.

Unscrew the servo plate from the wings and raise the servos up.

[ ] Insert the wing spar in the fuselage and slide a wing on but do not attach.

[ ] Plug in the servo cables. The main cable has a flange to assure correct polarity.

[ ] The aileron and flap servo extensions in the wire bundles are not marked. You will have to test them and mark them for reference.

[ ] Check for correct polarity of the ailerons and flaps. Reverse as required.

[ ] Use the transmitter to set the aileron servo control horns perpendicular to the servo.

[ ] Set the flap switch or lever to the mid position – servo center. Use the transmitter to set the flap servo control horns perpendicular to the servo.

[ ] Screw the servo plate back to the wing.

[ ] Mechanically adjust the linkage to center the aileron as close as possible, matching it to the outboard section of the wing. Do this with the servo connected to the receiver system. Finish centering using subtrim.

[ ] Verify the servo can move the aileron about 30 mm up and down comfortably.

[ ] Using the outboard section of the wing as a reference, set the aileron control throw, end points and dual rates per the Control Setup & Cg table.

[ ] Set the up position end point of the flap to match the inboard end of the aileron.

[ ] Set the full down end point of the flap per the Control Setup & Cg table. Half flaps will be set later.

[ ] **Repeat the above steps for the other wing.**

[ ] Invert the fuselage, mount both wings to the fuselage with all the cables plugged in and clamp.

[ ] In the cockpit connect the ailerons & flaps.

[ ] Power up the radio system with the flaps full up. Check alignment of surfaces on both wings. Note that the flaps probably do not align well with the fuselage wing moldings. The above alignment of controls on the wing has proven to be correct.

[ ] Move the flaps to half down. Check the surface alignment using sticks or your preferred method. The linkages only allow mechanical adjustment in one direction. Once the flas are aligned at the half position mechanically or via subtrim, use the flap system to set the actual desired half flap position.

[ ] Set the flaps to full down and match the flaps using endpoints. The use the flap system to achieve the proper setting in the Control Setup & Cg table.

[ ] Recheck the up position. It will likely need readjustment. Run thru the positions several times until satisfied the flaps are aligned and at the proper throw.

[ ] Set the flap speed as desired. We used 2 seconds.

[ ] Setup Crow and check throw and proper operation. Measure the throw at the outboard portion of the aileron.

Gear & Brakes:

[ ] Turn the aircraft upright.

[ ] Connect the Gear leads and Brake leads to the JP controller. If using the Assan AG63, you can set that up later.

[ ] Cycle the gear 3 or 4 times.

[ ] The brakes are on/off with this controller so just turn them on a couple times and check if the wheels lock up.

Lights:

[ ] The switch on the Light controller provides for “Always On” or “On/Off via Gear Position”

[ ] Unless all three leads are connected to the controller, the gear lights will flicker.

[ ] Power up the Light controller and plug into or Y into a gear channel.

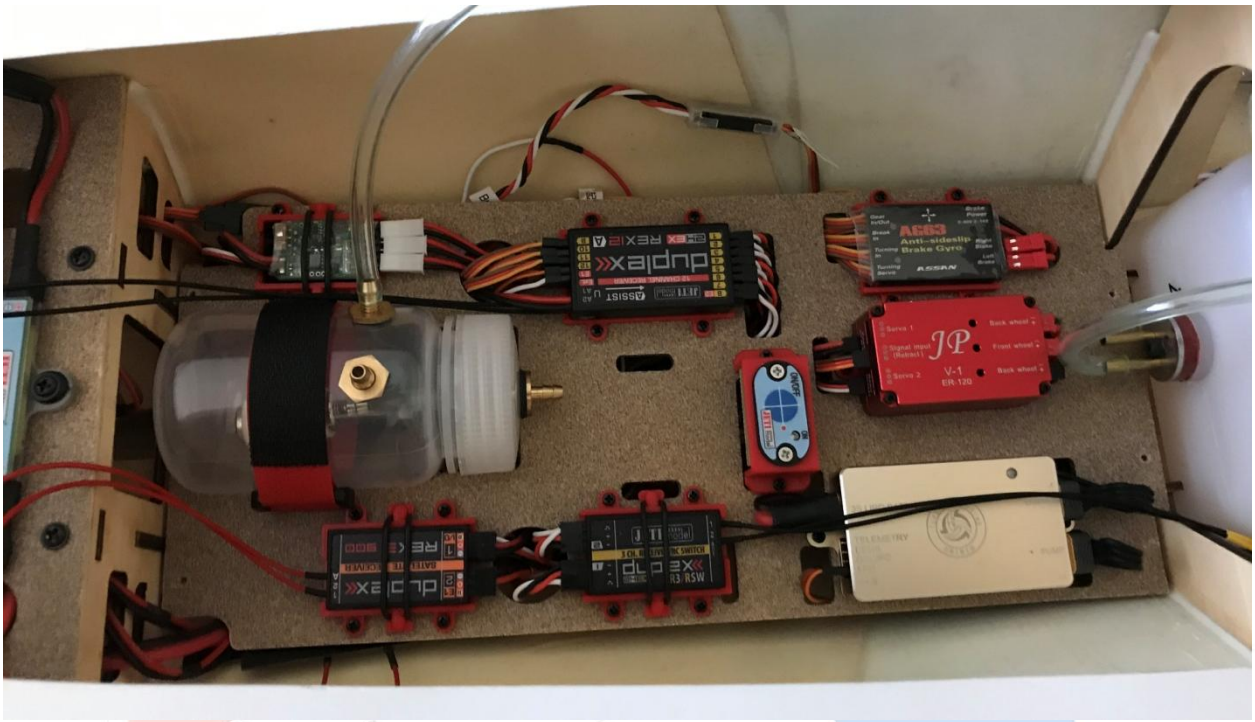
[ ] Cycle the gear to check the lights.

Nose Wheel Steering:

[ ] Now is an opportunity to plug in the steering and check it. Set the servo horn to center, check polarity & reversing. Set end points and steering trim if used.

Equipment Plates:

Below are photos examples of our Jeti system installation.



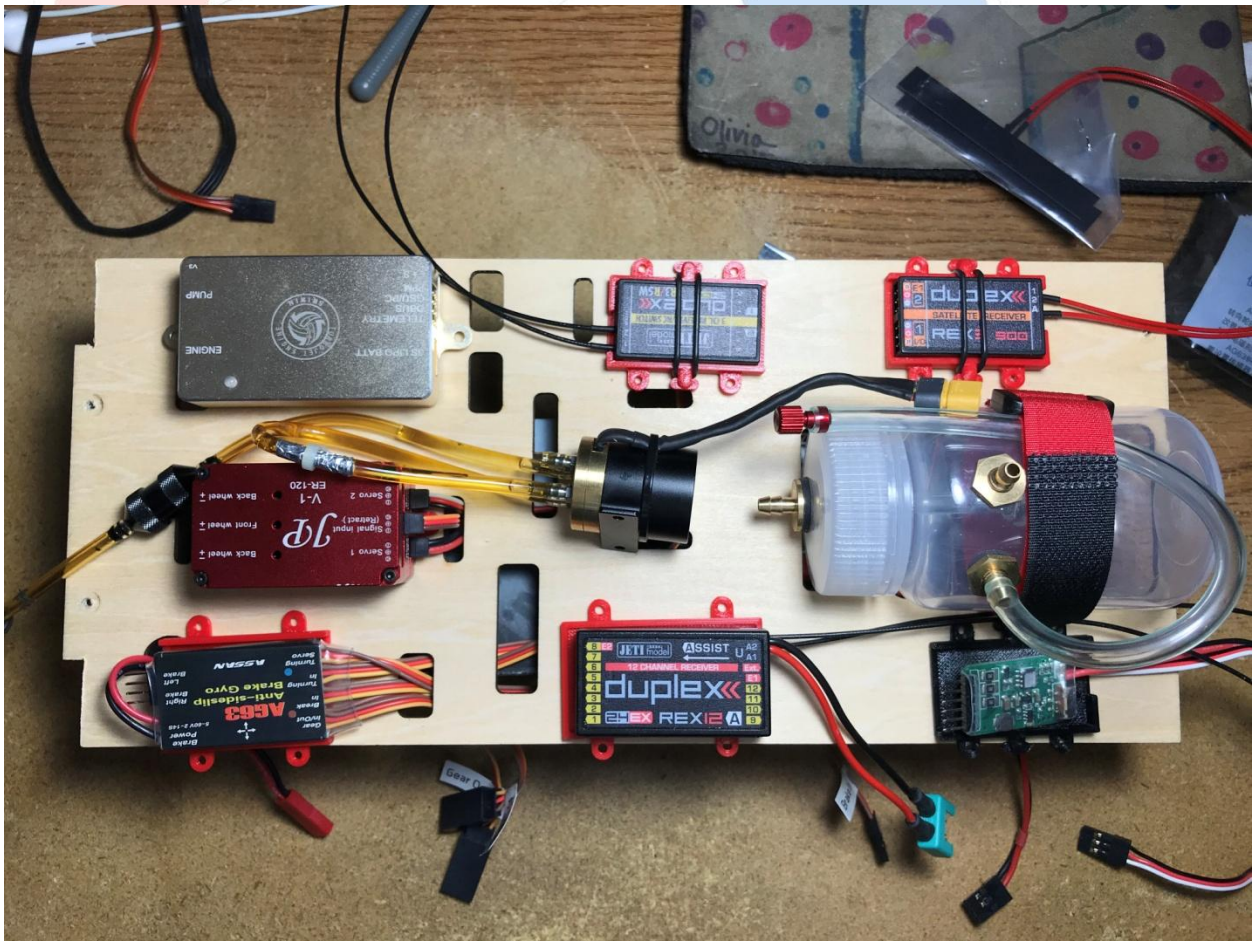
We painted our board “Pebble” color Krylon Fine Texture Stone paint, both for looks and some protection from fuel.

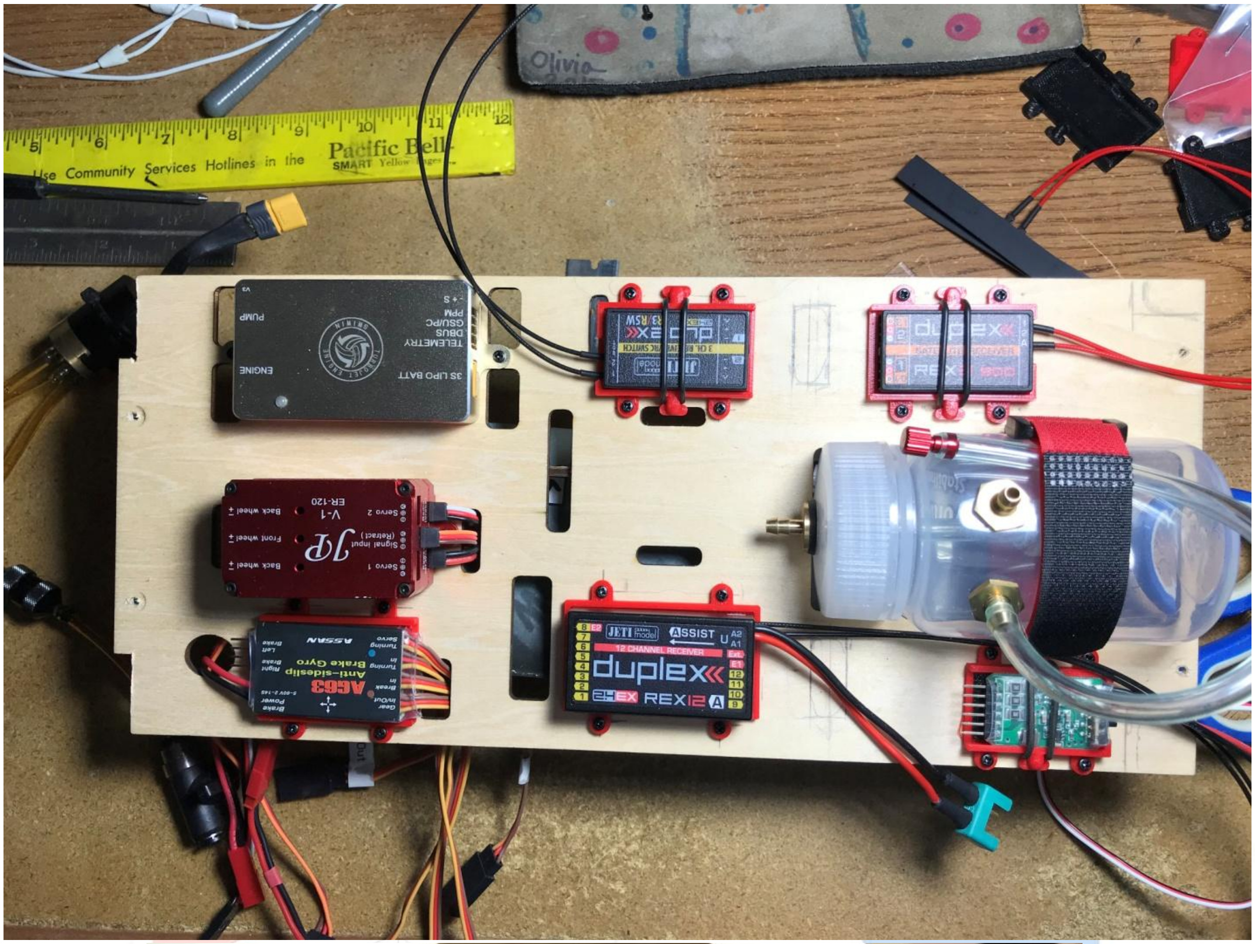
The forward corners have been trimmed to provide additional clearance for the cables going into the nose. Two additional round cutouts were made to facilitate routing wires.

Note the JP Gear controller is was not in an optimum place for the fuel lines. You might want to chose a different location for your fuel pump

We 3D printed a number of mounts for the Jeti equipment and other devices. GJC does **not** provide a printing service or sell these parts. The .stl files can be requested if you want to print them yourself.

With the equipment boards out of the airplane, take all your systems and plan a suitable arrangement on the board. Be sure to consider engine fuel system, batteries and Center of Gravity.





Use Community Services Hotlines in the
Pacific Bell
3S LIPO BATT
ENGINE
PUMP
TELEMETRY
ER-120
V-1
Brake Gyro
Anti-sideslip
AG63
JETI model
ASSIST
12 CHANNEL RECEIVER
duplex
REX12

JETI model
SPS 20
Single pole electronic switch
IN
OUT

Once satisfied with your arrangement, install your systems. The forward board with batteries can go in last. All of the cables are long enough to be routed and plugged in with the main board out of the fuselage.

You may want to spend some time organizing and zip tying the cables under the board. ECU and battery cables running to other locations should be plugged in and routed.

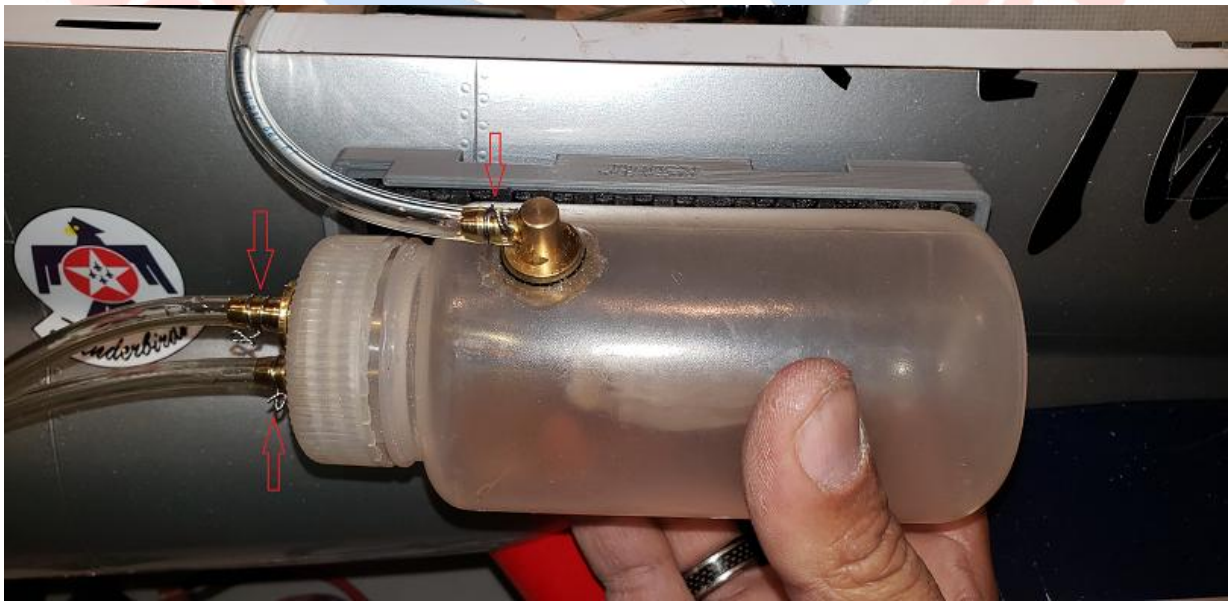
With all connections made, temporarily lay the board into the fuselage. Attach the wings with the cables plugged in. Connect your batteries and run thru a check of all the controls. Check flight surfaces, gear, brakes, lights, etc. Fix any misconnects.

[ ] Power down and remove the wings.

[ ] Screw down the main equipment board trying to keep all the cables neatly stowed underneath. Make sure the UAT strap is in place.

Fuel System:

Reinstall the fuel tanks and UAT. Complete any remaining installation of the engine pump and cables. We recommend you use safety wire all fuel connections with double wraps of .020 stainless wire.



Center of Gravity:

Lay in the forward equipment plate with batteries in position. Do not screw it down. Reattach the wings with all cables plugged in, put the gear in the down position down and Fill the UAT. Install the canopy to the fuselage and perform the CG check via the method you prefer.

Adjust batteries or other items, add ballast, etc. to bring CG to proper location.

AEROJET

The Aerojet Hummingbird is available from:

BANANA HOBBY .com
the NEWEST and HOTTEST in RC

(626) 629-8552
https://www.bananahobby.com
Info@bananahobby.com

GLOBALJET.CLUB

https://globaljet.club/
Phone
1-888-573-3883
1-702-582-9635
Email
globaljetclub@gmail.com
Address
Irvine, CA 92612