Fly Eagle Jets

BAe Hawk ¼.5 Scale

Wing Span: 82.4 Inches

Length: 97.6 Inches

Weight Range: 47-54 lbs. (With Fuel)

Servos: (8) High Torque Digital for all Surfaces and Nose Gear, more depending on air system

Recommended Engine Size: 160-180 Class Turbine

Writers Statement:

The FEJ BAe Hawk is one of the greatest planes to fly! The airframe was designed to be flown in a "scale manner", with intentional controlled turns and speeds, aerobatics and precision flying. Although there are no known airframe limitations at the writing of this manual, the Hawk should be flown within it's designed "scale flight envelope".

As with all "Flying Stab" airframe, it is important to understand the aerodynamic effects when an abrupt, high rate input is made to this surface…potentially causing a loss of lift on the Stab, resulting in a "snap". Keeping the inputs smooth and calculated will assure the pilot of incredible flights without any concerns.

This manual was written to enhance the experience of assembling and flying this airframe. It does not, in any form, express or imply any warranties, mandates or design changes and all assembly MUST conform to the intent of the Manufacturer and the design of the airframe.

Any and all issues, questions or inquiries regarding the FEJ BAe Hawk MUST be forwarded to Fly Eagle Jets directly.

Pre-Assembly:

Prior to beginning any construction, it is VERY important for the airframe and all parts to be fully inspected.

Also, depending on the paint scheme of your Hawk (Mine was the "50th Anniv. British Air Show Scheme"), it is necessary to "Wax" the entire Fuse, Wings and any exterior painted parts (not the Canopy Glass) with a "Carnauba" Auto Wax PRIOR to any construction to ensure a good protective coating from possible Epoxy over runs, CA drops, finger prints, tape adhesives, etc.

Fuse:

Take special care in examining ALL Fuse Formers for proper attachment to the Fuse skin. Furthermore, examine the Wing Spar clamps and area around them to be sure they appear to be properly attached with Epoxy and have no voids or the appearance of "weak spots" around them.

Check for proper alignment on the joining of both front and rear Fuse sections by placing ALL the 3mm supplied bolts. It is not necessary to final tighten them all, just make sure the fit is good. Both Fuse halves are fitted at the factory BUT…If any adjustment needs to be made, simply remove the necessary blind nut(s), attach with screws that do allow the sections to fit square, and then re-drill and re-align the remaining bolts and blind nuts.

NOTE: You can elect to join the Fuse at any time. It is suggested to wait till after you have completed the work on the Turbine Install and Tail Section for ease of access and not having to deal with a larger body when having to turn the fuse over. Plus, depending on the Turbine you go with, you may need access from the front of the rear Fuse section to make necessary modifications.

Wings:

Remove the Main Gears and inspect all areas around the Gear Mounting Plates for good and solid Epoxy and proper seating of materials together. The wings are made very well, with a solid CF Spar running from the Root to the Wing Tip. Remove servo hatches to inspect along the Spar and to make sure the floors of the Servo Bay's are smooth to seat the Servo Boxes properly, without epoxy drops or any material overspills. If there is material in the way, please sand and remove it now.

Go ahead and do a "dry fit" of the Wings to the Fuse, using the Wing Tube and Forward CF Spar. Check for proper fit and alignment. If you need to make any adjustments for the Bolt Tabs to line up or to fit into the Fuse, do it now!

Fin and Rudder:

- Place the fin into the Rudder Pivot Shaft on the Fuse.
- Holding the Rudder in place, slide the Vertical Fin into the Spar Tubes on top of the Fuse. As the Vertical Fin gets closer to being set in place, make sure the top pivot shaft of the Rudder sets into the Vertical Fin pivot point.
- Make certain the Vertical Fin assembly seats completely down onto the Fuse.
- Remove Vertical Fin and set aside for later.

Air System:

It is very wise to go ahead and test all of the air system cylinders NOW. We marked and removed all Gear Door and Speed Brake Cylinders, set up a small air system and water tested them all, using both in and out functions SEVERAL TIMES! Be very careful when you check for leaks…they could be tiny and it could take a good eye to see one. We only had one leak where the Air nipple met the Cylinder housing and were able to use some Thin CA to fix it (this is done without any air pressure in the system at all).

Now, check the Main and Nose Gear too. We did not submerge them. We set them up to function and allowed them to sit in the Up and Down positions for an hour each as we worked on other things. If you have a Gear or Door cylinder leak, contact FEJ immediately for a replacement. They are very good with customer service!

NOTE: If you are going to work on this plane over a extended period of time and need to wait to purchase your Turbine, please go forward and begin at "Section 2: Vertical Fin and Stab Installation"

Factory modifications since the maiden of this Hawk:

- **Two (2) additional Air cylinders on the Large Main Gear doors for a total of four (4)**
- **Larger Diameter Tail Pipe for use on 180 Class Turbine.**
- **Additional "Smoke Tank" available as an option**
- **Reduced Side Tank Capacities to ??? oz. for reduction in "Wet' Airframe weight.**

Manufacturer's "Minimum" Required Servo's:

Stab: (2) "Ganged" 8911's or similar minimum published torque.
Rudder: (1) 8911 or similar minimum published torque.
Ailerons: (1) Per surface, 8911 or similar published torque.
Flaps: (1) Per surface, 8711 or similar published torque.
Nose Gear Steering: (1) 8411 or similar.

Planning for Installation that will help achieve the proper CG:

CG = 230 to 240 mm from the Leading Edge Center Chord line of the Wings (not the Wing Fairings on the Fuse). The Factory suggests 230mm for your Maiden flight which is a good starting place. We have moved the CG back to 238mm and will probably go further back to 242 to 245mm.

This plane can make it under the 55 lb. weight limit, depending on your Turbine selection, the amount of accessories you put on the plane (i.e. Lighting system, smoke system, etc.), and the amount of Fuel you are planning to allow on board. Ours came in at 54.2 lbs. wet, with Lights, Smoke, extra batteries, etc. When we received the airframe from the Factory, the total weight with gear, cockpits, pilots, empty fuel cells, pipe, bypass…was EXACTLY 32.0 lbs.

The 55 lb. weight limit for Experimental Permit requirements includes fuel or "wet", not dry weight, per AMA guideline! The Fuel cells hold the following:

Center Tank: 96oz.
Side Tank(s): 44oz. x 2 = 88oz.
Total Fuel Capacity: 184oz. (1.43 Gallons)

With Jet A and Kero weight of roughly 7 lbs per gallon and 1.43 gallons, a fully utilized fuel system will add approx. 10 lbs of fuel to your plane.

TIP: Look at your published turbine fuel consumption rate from the manufacturer at FULL THROTTLE to get an idea of how you want to configure your fuel system! We elected to use all 3 cells and went with a Jet Cat P180. We fly our Hawk for 8 minutes and land with empty Side Tanks and just about a full Center Tank. Most of the flight is at just over ½ throttle, except for aerobatic maneuvers and vertical flight.

It is also important to take into consideration where you will need to install plumbing and radio equipment to keep from having to add lead to the nose area! You can put things wherever you would like but study our build and installation photos so you can plan and run Servo Extensions, air system lines and fuel plumbing accordingly. We had to add NO WEIGHT to the plane…only having to move a few batteries from the Nose to mid-cockpit area, under the radio deck.

Optional Accessories Available:

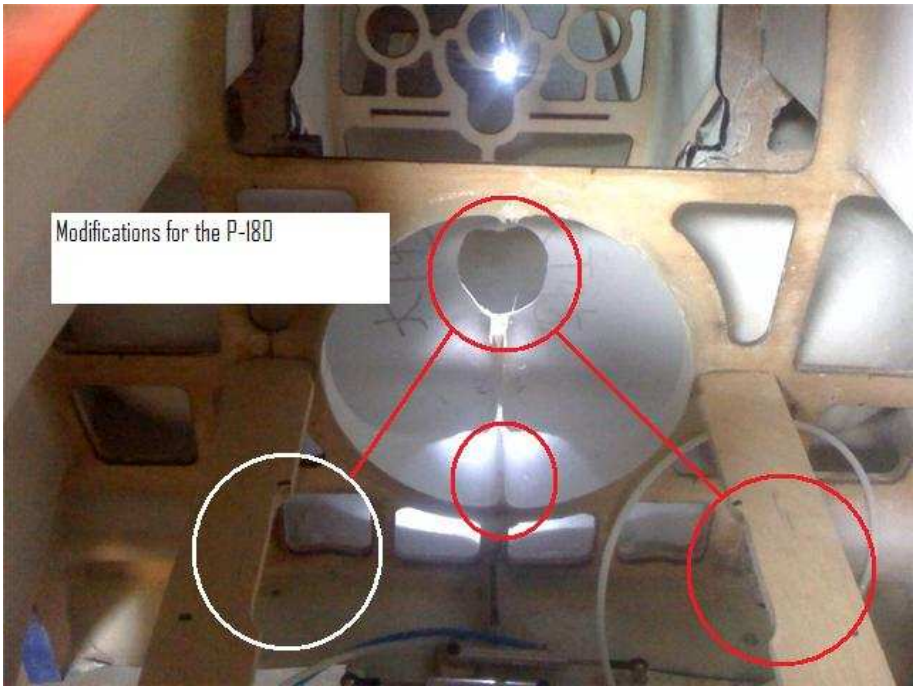
We had Dan Gill at Details4Scale (www.details4scale.com) create a scale lighting package for the ¼.5 Hawk. We also installed a TamJets Smoke System, using a Dubro 32 oz. Fuel Tank and mounted it almost center on the CG line (see plumbing install photos for location). The smoke system will add approx. 3.5 lbs to the build (Smoke Tank full), with battery too. Lights should add approx. 1.5 lbs including the Lighting Controller, depending on what battery you use .

Section 1: Turbine and Tail Pipe Installation

It is a good idea to take care of this part first since you will be able to see the placement of the Turbine on the Turbine Rails and what will be necessary to set the Tail Pipe in place.

We used a JetCat P180 and had to make the following modifications:

1. Cut the Intake where it meets the Turbine to allow for a further forward location and to allow for airflow to occur around the Turbine.
2. Cut a hole in the Intake joining seam to accommodate the Starter Motor and allow the Turbine to be placed forward to achieve proper mounting location and pipe clearances and distances.



NOTE: If your Turbine requires these or similar modifications, be careful to remove as little material as possible BUT make sure you allow for good airflow to occur from the intake where it meets with the front of the Turbine. There ought to be a gap there…the Turbine should NOT be seated up against the intake ring.

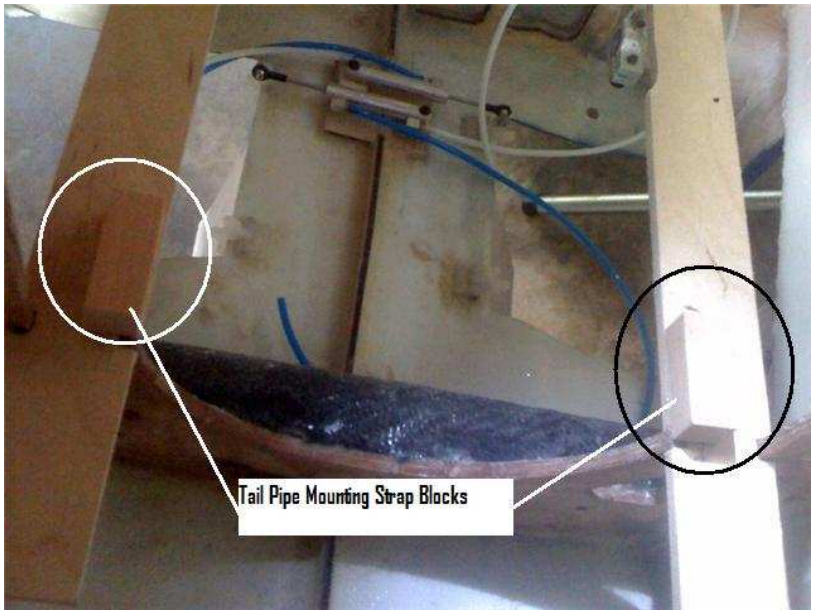
- The Hawk comes with two sets of Mounting Rails, a more narrow set or what seems to fit a JetCat well and the wider ones that might be good to use on a Jet Central install. Either way, test fit (and modify if needed) the ones that will best suit your turbine "footprint".
- Once the rails are in place, make sure they are seated ALL THE WAY down and not canted due to material on the Former, keeping them from making a solid and full contact with the Formers.
- Install the Tailpipe through the back of the Fuse and allow it to rest on the turbine rails. Set the pipe to where it protrudes about 1/8" out from the back of the Fuse. (This 1/8" is my preference since I do not like any tailpipe sitting either exactly flush or inside the Fuse). Simply set the Tail pipe mounting straps on the rails.

- Do not worry about centering the pipe and Turbine Tail Cone at this time…we are just working on the Turbine mounting location at this time.
- Once the Pipe is in place, set your Turbine in and MAKE SURE you allow for proper OFFSET of the Turbine Exhaust Cone and the Trumpet end of the Tailpipe. Be sure you have the Tail Pipe Trumpet in place for this offset measurement. Use the Turbine Manufacturers suggested gapping between the pipe and Turbine Exhaust Cone since this is critical to create a vacuum effect for heat to escape, thus allowing the Turbine to operate effectively and efficiently.
- Check to make sure the Turbine can sit down flat onto the rails without ANY issues with the back of the mounting plate, etc. If you need to, CAREFULLY use your Dremel and shave off what is necessary to achieve the Turbine being able sit flat on the rails. We will be adding a ½ By Pass later but we want to be certain the Turbine is seated properly onto the rails at this time.
- Mark by "outlining" the Turbine mounting bracket rail for the Turbine on the rails now. DO NOT mark or drill the holes yet!!! Double check your gap measurement for the Tail pipe.
- If you plan on twisting the pipe straps to "Horizontal", go ahead and mark and screw the pipe straps down onto the Turbine Rails temporarily now. READ TIP BELOW FIRST!

TIP: We keep the pipe straps as they are without twisting since it causes a more rigid "stance" on the rails and keeps the pipe from bouncing. This does change the pipe alignment by maybe 1/8" but we will allow for that by using "forward" shims on the Turbine Mounts later on when we align the Pipe and Turbine.

Using Blocks for Pipe Installation:

If you are using our "TIP", you will need to install hardwood blocks onto the Turbine Mounting Rails where the Pipe Strap holes are. CA These Blocks in to where they are at the inside edge of the Rails, not causing any deflection of the Straps when they are screwed in place.



- Once the block have been CA'd (or Epoxy if you choose), flip the Rails over, drill out and install small wood screws to reinforce the blocks to eliminate ANY possibility of separation from the Rails.

By-Pass Installation:

- If you are using a By-Pass, it is important to go ahead and pre-fit the lower half to allow for a proper Pipe and Turbine alignment. You will find trimming to be required to fit the By-Pass onto the Rails. Do so accordingly until you have a good fit.

- Prepare the inside of the By-Pass by scuffing with 80 grit sandpaper and cleaning with Acetone. Use BVM Heat Shield Paint to cover the inside of the By-Pass thoroughly. We used 4 uniform coats. (Use heat gun to accelerate drying time between coats but on final coat, let it dry over night)

- Drop the Turbine back in to see that the By-Pass has not caused any deflections of alignment or the proper mounting of the Turbine itself. Once you have adjusted the By-Pass to the Turbine Mounting Bracket, Rails, Rail Blocks and Pipe, screw it in place with small wood screws.

Turbine and Pipe Alignment:

- This is critical! There are many ways to do this and it is PARAMOUNT that you understand the importance of centering the pipe and turbine for safety reasons!!! On our build, it took a small #6 Washer under each side of the FORWARD Turbine Mounting Bracket to regain the change in the pipe setting with the blocks. You will still need to check this to be certain though.

- Not only is it important to make sure the turbine and pipe are aligned, it is IMPORTANT to keep the Centerline of the Fuse intact too. You can do this by marking the Fuse centerline on each side of the Turbine Hatch and running tape or a string along the marks and align the Turbine to thrust line to it.
- Go ahead and set the pipe in place with the wood screws to the blocks and set the Turbine in place. Look from the rear of the Fuse to see where the alignment is at this point. It is important to use a pen light to see better and not only to use the Tail Cone of the Turbine as reference but also the bolt ring that mounts the tail cone onto the Turbine Housing itself.
- Another trustworthy way is to use the Turbine Tail Cone and draw a outline of it on a piece of paper. Tape that to the Trumpet of the Pipe, set the Turbine in place and then push the Pipe to where it is right up against the back of the Turbine Tail Cone. Shine the Pen Light from the back of the Fuse through the Pipe to see the ring and align it accordingly. Once that is done, you can mark for drilling the holes on the Turbine Mounting Bracket.
- Drill and screw the Turbine down since it could cause some deflection when the Mounting Bracket is tightened down to the Rails. Check alignment one more time to make sure nothing moved.

TIP: It is suggested to install Blind Nuts for the Turbine Bracket but this is not necessary. We chose to double the Rails section where the Bracket Mounts to the Rails UNDERNEATH and install the Blind Nuts which gave us a better "depth" to use the Blind Nuts.

TIP: We installed Aluminum L Braces on the underside of the Mounting Rails (See Photos on next page). It is STRONGLY suggested to do this since it will allow for a greater strength and spread the load of the Turbine weight and stress through both Formers that hold the Mounting Rails.

Rear of Rail (Bottom View)

Front of Rail (Bottom View)

- Remove Turbine and Pipe to work on the Stab and Rudder section.

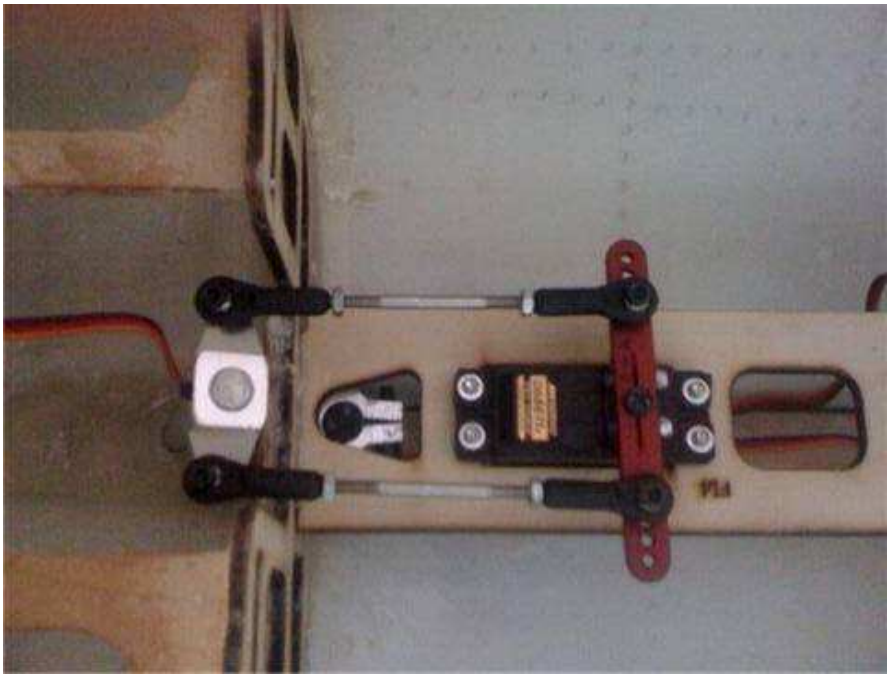
NOTE: Once again, we elected to do the Turbine/Pipe Installation first without the front Fuse Section or Tail Feathers installed simply for ease of working with such a large airframe.

Section 2: Vertical Fin and Stab Installation

This section is really a matter of following the Photo's. Study the Photo's for the installation of the Stab Servos and Rudder Servo before starting.

Rudder:

We used a JR 8611a Servo for the Rudder. We also used Dubro 4-40 Ball Links for both ends of the two Pushrods. It is best to work with the Fuse upside down AND to be in a "patient frame of mind"…this could take some time and it is a bit of a stretch with the hands and fingers to get it done!!!



- Place Vertical Fin Assembly in place, making certain the Assembly bottoms out onto the Fuse without having a gap.
- Tighten internal Spar clamps. Be careful not to over-tighten these and strip them out!
- Drill out and tap for 4-40 bolts and Locknuts on the Factory Tiller. Attach Ball links and 4-40 All-Threads to the Tiller, allowing enough material on the All-Thread to place a Ball Link on the opposite end and attach to a Servo Tiller Arm.
- Use Masking Tape to hold the Rudder at neutral and place factory Rudder Post Tiller (see photo) onto Rudder Post . Do not tighten down yet.
- Place the two (2) Ball Links onto the Servo Tiller Arm.
- Power up the Servo and center it.
- Place Tiller Arm on Servo as close to center as possible.
- Install Servo into Plywood box as shown in photo. Use Hex Head Servo Screws or whatever you prefer. It is important that you go back and Thin CA (to harden) all the screw points after you are certain everything fits and functions properly.
- Mark the 4-40 All Threads for the proper length, allowing for at least half of the Ball Link to be threaded onto the All Thread.
- Remove Factory Tiller from Rudder post and cut the All Threads to length. Remove the Ball Links from the Servo Tiller Arm and screw them onto the All Threads.
- Place Factory Tiller Arm back onto Rudder Post, making certain the Rudder has remained as close to center as possible.
- With the Servo powered up and the Servo Tiller Arm in centered position, adjust each Pushrod to where the Ball Link Screw can align and be screwed into the Servo Tiller Arm without the Servo binding.

TIP: Using a Hanger 9 or similar Volt Meter on the Servo as you adjust the arms is very helpful and will keep you from creating a bind, thus causing potential danger to the Servo and unnecessary drain on the Battery system.

- With the Servo Tiller Arm and Factory Tiller Arm in parallel, you can now tighten the set screw on the Tiller Arm to the Rudder Post. This will make a “mark” on the Rudder Post for you to be able to grind a flat spot for the Set Screw.
- Remove the necessary parts of the assembly to grind the Rudder Post for the Set Screw. Re-install all parts and use Loctite to tighten down the Set Screw.
- Remove masking tape from the Rudder. While keeping the Volt Meter on the Servo, check movement each way, making sure you have the movement going in the correct direction for final Sub-Trim.
- Mark the Rudder Servo wire for identification. You will add proper extension length and run the wire once the Stab is in place.

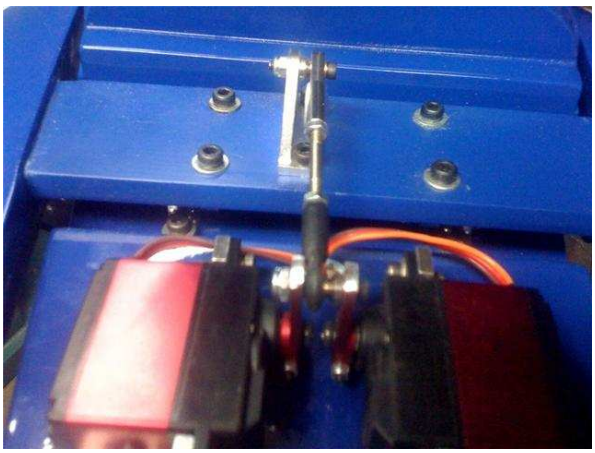
Stab:

We used two (2) JR 8711’s for this application. It is critical and highly suggested to use High Quality, High Torque Servos for this install!!! Although the Factory assembly for the Pushrods used Clevises and double Pushrods, we elected to use a more simple, single Pushrod and Ball Link setup. We have included both photos for you to decide for yourself but if you use the Factory Setup, MAKE CERTAIN you check the clearances on the Stab Cover as you install that assembly!

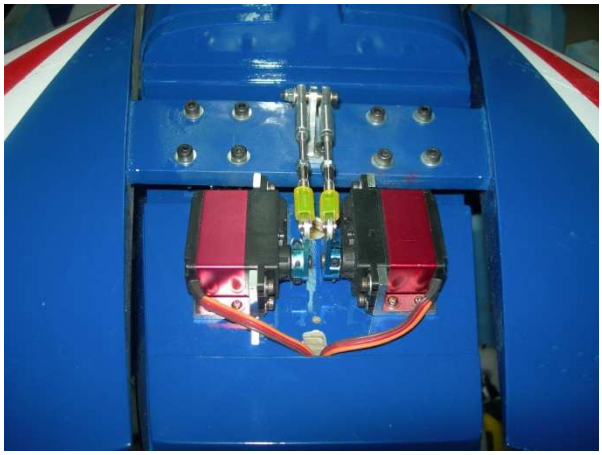
NOTE: Using two (2) High Torque Servos is a great thing BUT, in order to get the performance for this investment, you MUST use Volt Metering ON BOTH SERVOS to get them as close to matching as possible mechanically. To go further, we used the JR 12x Servo Matching program (rather than a Matchbox) to get them perfect, without any binding whatsoever all the way through the stroke of up and down. This did use two channels on the Rx but well worth it. Not only does neutral need to be dead on, so do the end points and travel timing too. There are other types of systems you can use to Servo Match for end points, travel speeds and centering. Make the investment and take the time to do this right!

Since our build, the Factory has changed the Plate between the two Stabs and the bolt pattern is modified for strength. For more pictures on the setup, refer to FEJ Website manual photos.

Our Install Setup



Factory Setup



- Install Titanium Bracket onto Stab Center Platform with Hex Bolts (see photo for proper orientation)
- Install Stab onto Factory Pivot Assembly using proper Hex Bolts.
- Make sure you have a good up and down movement occurring with the Pivot Assembly and the Stab.
- Power up both Servos to get them to center and place Servo Arms of your choice onto Servos
- Install Servo's into mounting locations (see Photo for correct orientation).

NOTE: "Stab Neutral" for your Maiden Flight is 15mm from the Stab Trailing Edge to the Stab Cover Hatch line. (See photo for this measurement)

Stab Neutral Setting

- Set up Pushrod assembly per Photo, making sure you check for proper clearance and function when the Stab Cover is in place.
- Prior to finalizing any of this install, make certain the two Servos are not binding and are matched as noted above.
- Adjust assembly for 15mm Neutral as noted above and check full movement at 100%. Adjust travel if the Stab hits the Fuse at the ends of the up or down stroke. Whatever you end up with on Travel Adjustment end points will be your 100% on High Rate.
- Place Stab Cover onto Assembly and pilot drill holes to secure the Cover as per the Photos.
- Mark the Servo Leads and attach the necessary Extensions to get the wiring to the Rx Deck.
- Run Stab Servo and Rudder Leads through the Fuse, securing them with Wire Ties or other "wire keepers" through the Formers and into the Rx Deck area.

Section 3: Joining the Fuse

Once the Fin and Stab installation is done, you can go ahead and join the two Fuse Halves together. Since you should have already checked for a good alignment already, this step should go easy.

- Install ALL Fuse joining Bolts with Washers AND Loctite!!!

Section 4: Fuel Cell Assembly

Pre-fit all Three (3) Fuel Cells into proper locations. Side Tanks fit snug into well fitted pocket areas while the Center Tank will need to be secured with foam and Velcro straps and be tucked under the plywood deck piece. We use our own Tank Hardware by choice…it is up to you to decide if you want to use the Factory Hardware or go with something else.

Since doing the Tank fittings is pretty straight forward, we are giving you “points of concern” to remember and use while putting the tanks together (assuming you are using all three tanks).

NOTE: As mentioned before, the Center tank holds approximately 96 oz. of Fuel, while each of the Side Tanks hold 44 oz. You will need to decide if you want to use all three Cells or go with the Center Tank and maybe a 32oz. Dubro or similar as a reserve tank. Our Hawk has a P180 and we land with almost a FULL center Fuel Cell after an 8 minute flight. This is your call though. If you are going with a 160-170 class Turbine, taking this weight off the plane will be to your advantage BUT we have no data regarding performance of the Plane with this size Turbine.

It is HIGHLY suggested to use a SOLID "Air Trap" for engines over a 120 Class Turbine. Flexible UAT's can collapse as larger engines draw their necessary fuel requirements, causing massive air bubbles in the system over time. Tom Cook at Jet Model Products makes a sold, all Aluminum "Air Accumulator". PST makes one too that is a bit less expensive. Some baulk at using them because they are solid and you cannot see inside. As Tom says, "why do you need to see inside? A proper functioning system is fully pressurized and there is nothing to see!"

- ☐ See Diagram below for proper Three Cell Plumbing Scheme.
- ☐ Clean out Tank(s) using Acetone, making sure you have looked inside and see there is no loose debris remaining in the tank.
- ☐ Install Hardware of choice.
- ☐ Leak test each cell individually, completely submerged under water, using some Tygon or other tubing on the Clunk and the Vent line, blowing into one of the lines while holding the other one closed to check while under pressure.

Our Tank Hardware Choice

Leak Test fully submerged in water

- ☐ Make sure Vent line in tank is as high on the cell as possible, touching the inside top of the cell for good pressurization.
- ☐ Double Safety Wire tie the clunks AND the Stopper fittings!
- ☐ Make sure the Clunk moves freely in all variations of turning the tanks and returns to the bottom when back to level and upright.

- Mark “V” Vent and “F” Clunk lines on the outside of the Tank around the Stopper to ensure proper orientation and hook up of fuel system. You will be amazed at how many folks hooked up the wrong lines and chased that one for a day at the field when they tried to start up the Turbine and run it for a while!!!
- Use 6mm Festo (or similar) tubing or 3/16” (5/16” is even better) I.D. Tygon fuel tubing for the complete plumbing scheme as shown below. The only reduction to 4mm should occur where the line from the UAT connects to the Fuel Pump.
- The GOAL is to keep all fuel lines, fittings, clunks, etc. the same diameters all the way through the system, all the way to the “IN” fitting of the Turbine Fuel Pump. Cavitation is not our friend! It can occur when using too many fittings and different sizes!
- Double check that you have secured ALL fittings with Safety Wire!!!
- Trial fit Side Tanks with Stopper and fittings in place to check clearances with the Former. We used Velcro strips on the Fuse Wall and side of Tanks to secure these tanks in place. Once you are happy with the fit and clearances, go ahead and run the Clunk and Vent Lines, leaving long enough lengths to complete the Fuel Plumbing scheme. Make sure the Clunk Lines to the T Fitting is exactly the same AND the Vent Lines to the T Fitting are exactly the same for each other too. This is to ensure proper/equal siphon and filling rates for each tank.

- Decide where you are going to put the Vent fitting to the outside of the Fuse. We used a 6mm Festo Bulkhead fitting for ours (see photo).
- Safety Wire tie all fittings and install the Side Tanks, pulling the Clunk Lines through to the cockpit area. Attach a T Fitting onto the Clunk Lines and Safety Wire tie them. You can run the single tubing side of the Vent T that will go to the Vent Line side of the Center Tank, but leave some extra length just in case you have to make a longer run.
- Run the Vent line to the outside Vent Fitting. You may need to do this prior to installing the Side Tanks, depending on where you put the fitting.
- Install UAT of choice (see photo for our location)

- Installation of Center Tank will occur after you have final locations for other components on the decking that holds the Center Tank in place (see photo). We used Foam and a Velco Strap to hold the Tank in place. Notice where the Stopper Assembly fits in the Former in front of it!
- The rest is up to you, based on where you put the Fuel Pump, Fuel and Propane Solenoids, etc. There is plenty of room to have access to run your fuel line to the Turbine and also run your ECU Interface connector, Power Leads, etc.

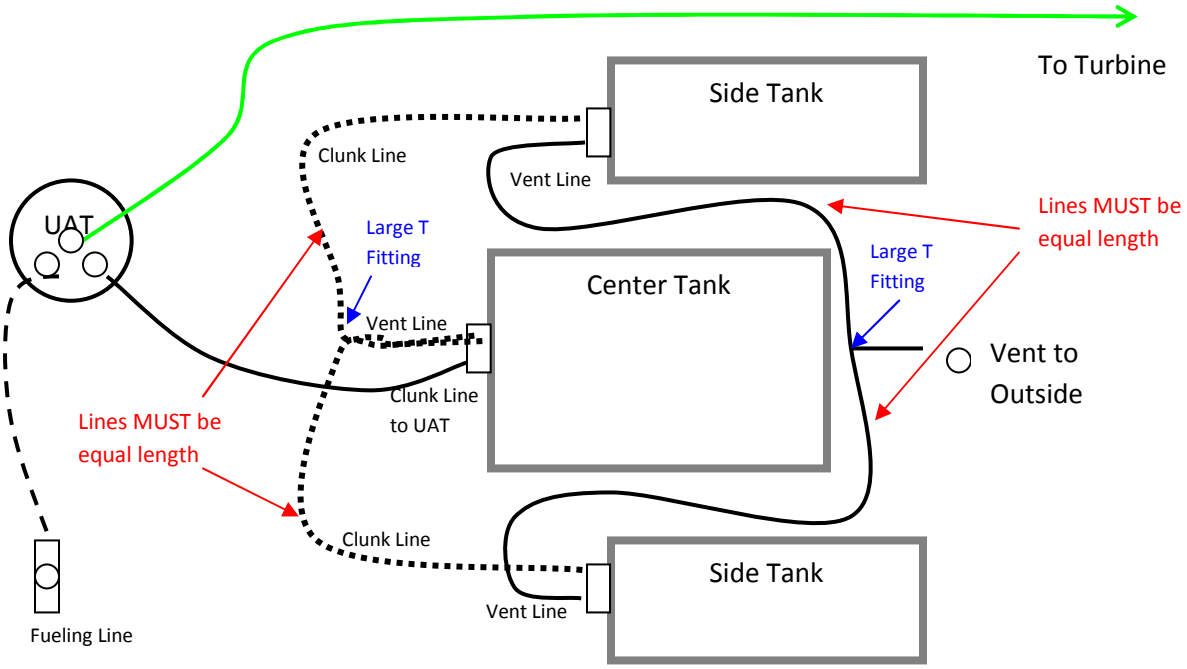
TIP: On the "In" side of the Fuel Pump, put a 4mm piece of Festo tubing over the fitting and cut it even with the fitting itself. Slide the 6mm line coming from the UAT over the 4mm piece, then safety wire tie. This keeps from having to place a reducer in the line, eliminating a potential "cavitation point".

Handling Fuel Cell Leaks:

If you have leaking along the seams, you will need to add epoxy and FG or Kevlar to reinforce the seam area that is leaking. Be sure and scuff the area with course sandpaper and clean it with Acetone before applying any patchwork.

If you have pinhole leaks, simply mark it (them) with a Sharpee. Dry the tank off, scuff it with Sandpaper and use thin CA on the pinhole. Then use Hysol or other Epoxy as a thicker layer over the hole and allow to fully dry before re-testing for leaks. ALWAYS re-test after you have repaired a leak. You may find another one you did not see!!!

Three Tank Plumbing Scheme:



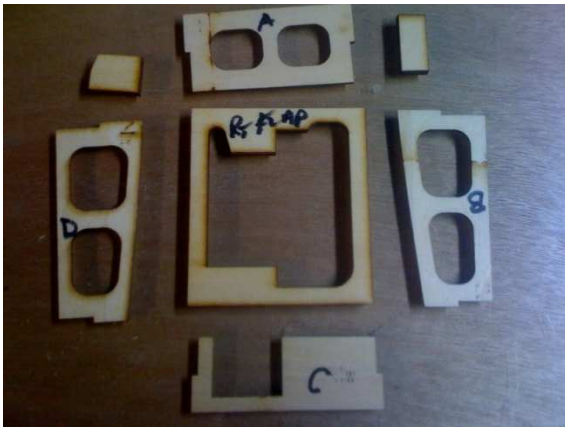
Section 5: Wings Construction

NOTE: FEJ Factory has changed the Flap control to be a concealed, inside pushrod assembly. Refer to current manual photos on the FEJ Website for this airframe. This manual will be updated soon with this change.

The wings come pre-hinged for the Flaps and the Ailerons. The Main Gears should be out of the wings now and been previously inspected for any possible weaknesses with the Gear Plates and the insides of the servo bays.

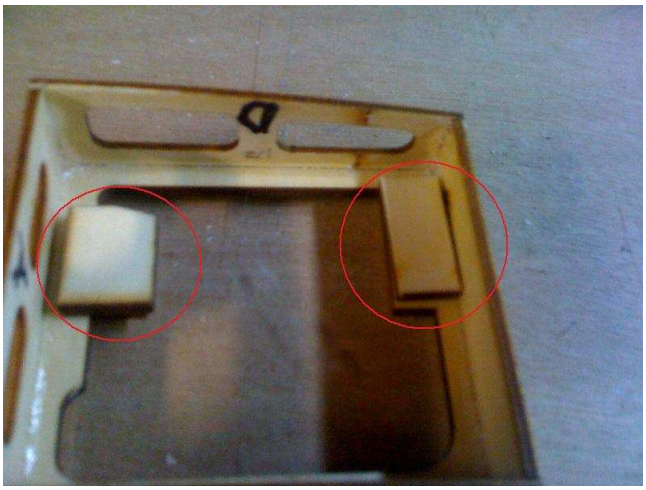
Building the Servo Box's

- You will find the Servo Box pieces in the bag of wood parts, bundled together. There will be four sets of side pieces rubber banded together, four Top Servo Plates with the Servo screw doublers in the center of them (punch those out and set aside).
- Study the following pictures CAREFULLY. NOTE: The "slightly curved surface" of the side pieces is for the TOP of the Wing Skin! Since you will be working from the bottom of the wing, this is important to remember!



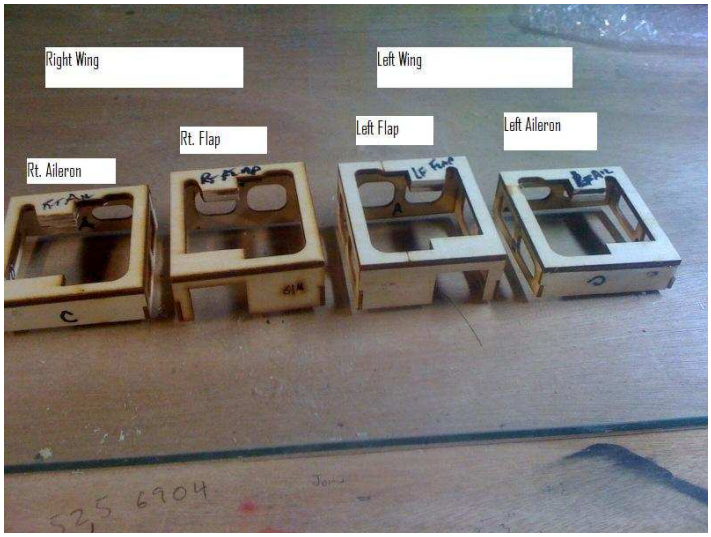
- Lay out all four sets with the Top Servo Plate in the center. Make sure you lay them out as if you will be working on the wings from the bottom. We did the RIGHT WING first. DO ONLY ONE BOX AT A TIME! <u>The taller sets are for the Flaps</u>.

- Tack glue (Gap Filling CA and Kicker) one corner of one of the side and forward (closest to the leading edge) pieces. After you have made sure the orientation is correct, tack glue the rest of the pieces to form the box. It does not have to be perfectly square since the Servo Plate will square it when you glue it.
- Check the pictures again and orient the Servo Plate according to the picture for which ever box you are making. Turn the Servo Box over to where the flat side is down, placing it on the Servo Plate. Tack glue it, making sure you are squaring the box as you do this.
- AFTER you have checked orientation one more time, use Thin CA and Kicker on the whole box now.
- Glue on the Servo Screw doublers per the photo.



- Build the Servo Box that will be in the same wing next.
- Set the two Servo Boxes next to each other, oriented as they would be glued into the wing. These photos are with the “curved sides down”.

- Now, build the one for the other wing…which will be opposite of these. Make sure you DO NOT make duplicate Boxes…it’s easy to make this mistake!!!



- Dry fit all Servo Boxes now. In order to insert the boxes into the bay areas, you MUST turn them and push them as far in before you try and set them in.
- NOTE: Prior to installing the Aileron Servo Boxes, you might have to “clip” the protruding Hinge for the box to fit properly. The Servo Boxes may already be notched to accommodate the hinge so check it before you cut the protruding hinge off.

- Hysol or Epoxy fillets all along the insides of each of the Servo Boxes. These have been CA’d but they MUST be strengthened with this step.

- When the boxes have dried, “score” the bottoms of the boxes with a sanding bar to open the wood pores from the laser burn in the wood edges which allows better adherence to the wing skin.

Gluing the Servo Boxes:

Once you are satisfied with locations and are certain of correct boxes for the given bay area, and have rough sanded and cleaned the inside wing skin of dust and debris…it's time to glue the boxes in.

The following is how we elected to glue them in with the goal of having a strong bond to both top and bottom wing skins AND spreading the "load" of the servo pulling and pushing the control surface to a wider effect than just the servo bay and box.

Study the sequence of pictures BEFORE you do this. Again, make sure the orientation and proper box is good!!!

TIP: Work with one wing at a time in case you get into some trouble and loose the Epoxy material!!! We do not use Hysol because it is hard to penetrate the cloth well and in order to do so, you have to heat it which is not a good practice!

- Cut four squares of CF, Kevlar or FG (2 oz.), one for each bay area. It is suggested the squares be 25% larger than the opening, the larger the better without getting too big!
- Prepare 30 minute Epoxy, West Systems or similar and coat the wing skin with the "brew" and place the cloth in the bay, making sure it is well placed and is saturated with the Epoxy mix.
- Add another "thick layer" of Epoxy on top of the square Cloth, trying to keep it heavy where the box sides will be coming into contact with it.
- Place the box to where it is centered in the Hatch opening. While pressing down on the box, use some scrap shims to put between the top of the box and the bottom wing skin in order to keep the box well against the top skin of the wing.
- Brush a good build up around the box sides, making sure you clean off any Epoxy that could have dripped unto the outer wing surface or the Hatch Cover tabs around the bays.
- Repeat steps for the other Wing and let dry. BE SURE to keep the wings flat while the Epoxy dries!

Finishing the Servo Boxes:

Inspect your work so far! If all looks good, it's time to shim and set the boxes to the bottom wing skins! YOU CANNOT SKIP THIS STEP!!!

- You received a wood products package that includes some small plywood triangles and rectangles…locate those and have them by your side as you complete this section.
- This is tedious work but make sure you have a very nice and snug fit at each corner of the boxes. The more material you can have against the bottom wing skin, the strong the construction will be. These shims are also used as hard points when drilling for the Servo Hatch Screws later on in this section.
- Do each corner of each box, one at a time, using thin CA to hold the shims in place. Some areas will need more than one shim while others will need to be sanded down and made thinner.
- Once you have fitted the shims in all four corners of all four bays, it's time to fill in and put a heavy fillet around the boxes and where they attach with shims.
- Allow the boxes to fully dry now.
- Check again for Epoxy drops or smears on the outer wing skins and clean them up right away!

TIP: We used the faster drying "gray" Hysol since it is thick and does not sag. You may need to build the fillets up several times during the drying time. The goal is to end up with a fully sealed box to the bottom wing skin.

Note: There are other ways to do these fillets and not have to use thick fillets. Some builders elect to "spread the load" around the whole perimeter of the box with CF or FG along with longer and wider pieces of plywood, similar to what was done when you installed the boxes to the top skin of the wing.

TIP: Geometry is critical for the greatest leverage and vantage point of the strength of the Servo. You might have a 450 inch/oz. servo BUT only get about half of its strength if you extend the distances from pivot points too far. Remember, the closer you can get the Pushrod to the center of the Servo pivot point, the more strength you have being utilized from the Servo itself. But, be careful to consider the Hatch Cover and how that can affect your travel and proper deflections of all surfaces.

Installation of Control Horns:

Since the Hawk comes with hinges already installed, we can move on to the Control Horns. Please look at the sequence photos so you can prepare the wings to be done at the same time since we recommend using Hysol for this step.

You can use the supplied CF Control Horns with no problem. My preference is to use the Air Power "Type A" CF hinges (just a preference of mine). I also like the "geometry" of them on the Flap and Ailerons for, in lieu of using the "Music Note" style included and designed for the Flaps.

NOTE: Before you mark the locations on the Control Surfaces as to where the Horns will be installed, you MUST have the Servos, Servo Arms AND Push rods you plan on using INSTALLED to get the proper alignment for where you will mark and cut the slots for them.

NOTE: The Aileron Pushrods will need to be Clevises, 4-40 All Thread Rod and CF Tube… and NOT Ball Links due to the narrow clearances of the Hatch Cover Blisters. The design we came up with is very strong and is suggested for the build. Also, we used 1 ½" Arms from SWB, cut down to just above the bottom threaded hole location.

We drilled each SWB Arm with an "exact diameter" hole to receive the Clevis pin, making sure there was no "slop" when the Clevis was fitted onto the Arm.

NOTE: The Flaps will operate as a "Pushing Action" to deploy them, so "plan" the Arm position accordingly. Also, because we are using Ball Links on the Flaps, we will be installing a "Double Control Horn" to give a center pull on the surface for strength and reduction in the flexing of the assembly when the Flaps are deployed in flight.

- Run Servo Extensions for the Ailerons and Flap Servos. Running the Aileron and Flap Servo Extensions will be a bit tedious since there is very little room allowed to run the leads to the proper location to exit the wing root. (See Photo for where to exit these leads)
- Run the Aileron leads to the Flap Hatch first and then make the final run with both to the wing root area where they are to exit, making sure you mark them for proper Servo identification.

Aileron Horns:

- Install Servos WITH Arms attached and zero'd out to center.
- Roughly Cut 4-40 All Thread Rod to allow for final trimming of length after the Horn dries.
- Lay the Pushrod to where it is perpendicular to the Servo Arm, giving as precise of a line as possible.
- Place Masking Tape over the area that will be slotted and lay the Pushrod back on to the tape and mark where the Control Horn will be set. It is suggested to place where the Clevis hole will be on the Control Horn to match the center of the Aileron hinge line for good geometry.
- Place the Horn over the centerline on the tape and outline the Horn onto the tape with a pen or pencil.
- Double check location and alignment before you turn on the Dremel!!! The Masking Tape will allow for a clean looking cut on the skin around the slot and keep the skin from chipping.
- Using a cutting wheel, dremel out the slot completely, allowing for a buildup of Hysol to occur UNDER the skin. When you penetrate the skin and begin clearing out the material inside, you

should notice a “hard point” between the slot and the leading edge of the control surface. I use a small rounded Dremel cutting bit to “open” up the area under the skin to make a pocket for the Hysol to build up around the base of the Horn and the material inside the surface.

- Drill a 1/16” hole in the pre-marked hole area of the Control Horn. If there is no pre marked hole, look at the pictures to see where we have the Clevises attached. Just make sure there is a good area of material all the way around the Horn and not too far up towards the top of the Horn. The Clevis Pin is just a bit larger than this so you will need to “open the hole up a bit to get the Clevis pin to fit. You want a good fit though so be careful not to make the hole too large.
- Set the Horn in place with the Pushrod and Clevises in place as it would be when dry. How does it look? Is the depth of the Horn good? Is the alignment correct…etc?
- Both Ailerons ought to be complete and ready for glue.
- DO NOT REMOVE THE MASKING TAPE TILL AFTER GLUEING THE HORNS IN.

Flap Horns:

- Assemble two sets of Double Horns and 4-40 Ball Links as shown in the photo.

- Attach a Ball link AND 4-40 ALL Thread on the Servo Arm as shown in the Photo.
- Place the Pushrod on the Flap from the Servo and get your alignment set to be perpendicular to the Servo Arm.
- Place masking tape on the Flap surface where the Pushrod aligned to center.

NOTE: After we did our installation of the horns for the Flaps, on our final field check, it was noticed that there was “slop” in our setup due to the Horn location being even with the hinge pivot centerline.

THIS IS NOT GOOD! The Horn locations need to be moved back from the Flap Leading Edge to start at about 3/8" or a bit more for a solid set up.

Set the Double Horn Assembly on the Flap with the BALLLINK CENTERLINE at least 3/8" back from the leading edge of the surface and align it to perpendicular again, using the Pushrod as a guide too. Once alignment is achieved, outline both Horns with a pen or pencil.

Use the same procedure as you did to cut out the Aileron Horn slots. Be very careful to keep the double horn slots separate. As with the Ailerons, you should see hard points in front of the Horn locations.

You will need to cut the Flaps 4-40 Pushrod to proper length to complete the next steps. This is not difficult since the Wing is flipped over and the Flaps do not travel past their "up" or neutral position.

Fit and double check alignment with all the pushrod assembly together.

Gluing The Horns In:

- Prepare the Horns by roughing up the lower portion that will embed into the skin with 80 Grit Sandpaper and clean with Acetone or similar.

TIP: Be sure and use the Aileron Servo Hatch Covers with the Pushrod Housings during this process to see that everything will fit and move without any problems. Also, check the Flap Hatch Covers for enough clearance to make the necessary travels occur for the Flaps to deploy. The height of the Ball Link on the Servo Arm will determine this the most!

- Time to Hysol all the horn assemblies in place! We used the "Gray" Hysol since it dries a bit quicker than Aeropoxy and has a just a little bit of "sagging" to it to allow it to "form" as it dries. Take your time on this step!
- Apply Hysol to the Horns themselves to fill all the "pressure holes" on the base of the horn.
- Apply Hysol to each slotted area, making sure to fill them up with no air pockets.
- Install each Horn and work one surface at a time. It is good practice to pull the Horn Assembly out after installing to see if there were air pockets. If need be, shoot some more Hysol into the slots and reset the assembly.
- Clean each horn area gently, removing excess Hysol, making it a clean install WITHOUT disturbing the Horn Assemblies as best as you can. The Masking Tape, when removed, will take move of the Hysol overspill away except for what is on the Horn itself.
- Once you are completely satisfied with the installation, use masking tape to keep the Horns from moving once you flip the Wings over to allow the Hysol to "sag" and dry.
- Flip the Wings over now, checking for movement of the Horns and Assemblies during the drying process.
- DO NOT DO ANY FURTHER WORK ON THE WINGS UNTIL THE HYSOL IS COMPLETELY DRY!!!

Completion of Control Horns:

- Once the Hysol is completely dry, CAREFULLY remove masking tape from around each of the Horns. Use a NEW Exacto blade to remove the pieces next to the Horns, being careful NOT to damage the Wing skin.
- Power up the Wing Servos doing one wing at a time. This will get everything close but you will need to make the final adjustments later. REMEMBER TO MAKE SURE YOU HAVE THE FLAP SERVOS AND AILERON SERVOS DEFLECTING THE RIGHT WAY!!! With the Pushrods attached to the Servo Arms and Horns, you will need to adjust the Flaps to "neutral or up" without any binding. This is to assure proper length and function of the Pushrod assemblies.
- Mechanically or Sub Trim adjust the Ailerons to even with Flaps and the Wing tip Trailing Edge.
- Once everything seems to be the proper length and any adjustments have been made, measure and cut the CF Pushrod tubes to proper length, undo one side of the assemblies and install the CF tubes. Tighten the Ball Links on the Flaps and Clevises on the Ailerons to the ends of the CF tubes.

Aileron Pushrod Assembly **Flap Pushrod Assembly**

- Complete these steps on the other Wing.
- Mark the Flap Servo Hatch Covers for proper slotting for the Arm travel. Place masking tape where the slot will be cut, using a Dremel and cutting wheel to make the proper slots. Be careful not to make it too wide…make it clean to!

- Install Flap Servo Hatch Covers with your choice of screws, making sure you drill a pilot hole into the Servo Box Shims for the screws to hit properly. You may need to do some sanding and shaping since the Covers are not exact along the skin edges.

- Before installing the Aileron Servo Covers, make sure you have a Tygon Safety Band around each Clevis to keep the Clevis from ever thinking of popping off!
- Install Aileron Hatch Covers, making certain there is free travel for the pushrod assemblies all the way through the movements and they are rubbing against the Pushrod Blister anywhere.

NOTE: We elected NOT to install the Scale "Horn Boots" on the Aileron Horns since it was a good inspection point for pre-flight. Also, this is not going to TopGun and it is under the wing and not visible for Scale appearance.

Final Installation Of Main Gears:

Because of the configuration of the Gear Plates and the Spars, it is only possible to put two of four Blind Nuts in. We did it but it is your choice to decide if that is of any advantage for you. We feel it does add strength to the Gear Mount BUT it is up to you.

The Gear system uses 4mm fittings and this ARF comes with very good quality 4mm air lines. Depending on the air system you will use will define whether or not it is necessary to use 4mm – 3mm reducers. In our build, we used the UP-3 Gear/Door system which comes with 3mm fittings. FEJ has a electronic sequencing system that carries 4mm fittings and reducers will not be necessary.

As you will see in the Photos, we have reducers coming off the Main Gears fairly close to the Gear itself. Again, we rely on Volume of air to carry the load on the air operations.

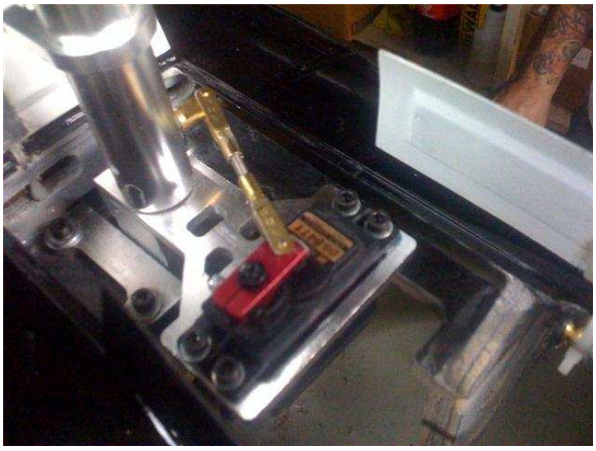
NOTE: It is very important to understand that air Volume is critical to operate these larger Gears. We installed two (2) Large Robart Air Tanks to achieve a high volume of air on board. With many flights we have found to be able to cycle the gear 5 times before there is a sizable depletion of air.

- ☐ Re-install Main Gears and run Air Lines ONLY AFTER gear and door cylinders have been thoroughly tested as noted in the first section of this Manual.
- ☐ Make certain all airlines are clear of sharp bends or kinks and exit to the appropriate area of the Wing Root.

Section 6: Installation of Nose Gear and Steering Servo

We elected to re-fit the Nose Gear plate with 6-32 Blind Nuts and Hex Bolts with Washers. This is a simple step since the Gear comes installed and all alignment marks are made.

- ☐ Make sure all Gear Door Cylinders have been thoroughly checked before installing the Nose Gear.
- ☐ Install Gear Steering Servo (We used a JR-8611a) See Photo.
- ☐ Power up and center Servo PRIOR to attaching arm set up, making sure you have the correct directional movement for steering.
- ☐ Use Servo Arm of your choice. We used the SWB Arm and set the steering rod up as we did for the Ailerons.
- ☐ Check for proper function and Geometry and Re-install the Nose Gear into Gear Plate.
- ☐ Run Air lines to location of Function Valve or Sequencer.



Section 7: Ventral Fin Installation:

There are several “favorite” ways to install these. Our method allows for strength in flight with the “opportunity” for minimal damage to the Fuse if the plane has to belly land, thus allowing the fins to break away rather than tear out a portion of the Fuse, creating the potential for even more damage.

- Test fit the Fins with the Airframe upside down, making sure the pins fit all the way through the inside Fuse blocks.

- Use Zap-A-Dap-A-Goo (or similar) directly onto the fin root and place on Fuse. (DO NOT score or rough surfaces for a better bond.

- Align Fins as perfectly as possible, using masking tape to hold them in place as the Glue dries.

- When Goo is completely dry, run a small bead of Hysol around the fins to secure a good "seal" all the way around. Use finger or small tool to make the Hysol a "fillet". Keep it small! Depending on your color scheme, use the Hysol with the closest color base match.

- If you want, use a touch up type paint to cover the Hysol to blend with your scheme after it dries.

Section 8: Air System Install and Completion:

Once again, this system is all about personal preference. For us, we like it simple and mechanical rather than electronic. We set all of our planes up with mechanical driven systems. We used a UP-3 Valve on the Gear and Door System with a JR 368 Micro Servo. These valves are pretty much pre-set for proper timing of gear and door closing sequence and as long as there are no system leaks, it is somewhat hands free and just a matter of setting the travel on the working servo for the plunger.

On Wheel Brakes, we used the UP-6 Valve and on the Speed Brake, we used a simple Robart Valve set up.

For the Gear and Door system, we used two (2) Large Robart Tanks. For Wheel Brakes and Speed Brake, we used the FEJ Air Tanks (one for each).

Study the photos to see where we located the Air Tanks.

Run all Air system lines accordingly, making sure your runs are clean and clear of kinks. It is IMPORTANT to secure all air lines around the Main Gears, Gear Doors and Brakes. Keep it simple, accessible for troubleshooting and keep it NEAT!

Section 9: Radio and Turbine Plumbing Installation:

It is pretty much your decision on how you want to install your own equipment. Look at our installation photos to see locations of things so you can have a good understanding to achieve the CG mark. Our on Board Systems consists of the following:

Radio:

- (1) JR 1222 and four (4) Satellite Rx's
- (1) JR Matchbox on Flaps
- (2) Fromeco Sahara Regulators
- (1) Fromeco Wolverine Switch
- (2) Fromeco 5200 Relion Lithium Ion 7.4v Batteries for Rx

ECU:

- (1) 5000 Mh LiPo 7.4v Battery

Smoke:

- (1) Fromeco 2200 Mh Relion Lithium Ion 7.4v Battery
- TamJet Smoke System
- (1) Dubro 32oz. Tank for Smoke Oil

Lights:

- (1) Duralite 4300 Mh 7.4v Lithium Ion Battery
- Details4 Scale Hawk Lighting system with Light Controller

NOTE: You will need to watch for clearance of the Cockpit tubs as you do the radio and air system installation. As you can see by our install photos, we have items in specific locations to not only make easy access, it allows for the cockpit tubs necessary clearances to sit down all the way.

There are three access decks to put your operating systems on and under. This is plenty of room and gives you no excuses for a sloppy install! We like to have full view and access to the Rx in order to re-bind and visually check the electronics side of things as we turn on the system.

TIP: To allow some flexibility on moving weight around to achieve your CG mark, DO NOT permanently locate the batteries. Leave them loose for now so you can move them as needed to achieve the CG mark.

Section 10: CG The Plane:

CG Mark: 230-240mm

- Factory Recommended CG Point for Maiden is 230mm Run Air lines to location of Function Valve or Sequencer.
- Fill the UAT all the way to full…typically approx. 4oz. of fuel capacity.
- Mark the bottom of the wings for your CG points.
- Set either ONE or BOTH pilots into the Cockpit Tubs, but do so however you plan on flying the plane.
- Make sure all items are on board that you intend on flying the plane with…with all three Fuel Cells EMPTY.
- Install CF re-enforced Turbine Hatch Bridge.
- Place Canopy and Turbine Hatch in place.

TIP: The Main Gear Doors are right on the CG mark and do not provide a solid surface to rest the full weight of the plane on the vertical points. We made marks at 230mm and 240mm straight back from the Root of the Wing Leading Edge Center Chord (not the Fuse Farings). Then we ran tape, using a straight edge long enough to ensure an accurate line out further on the Wings to get a more solid spot to rest the Vertical Points on. This took two sets of eyes!!! You DO NOT want to error on this step so get some help! We did this for 230mm and 240mm. Run Air lines to location of Function Valve or Sequencer.

- First and foremost, set the Rx and ECU Batteries “optimal locations” for good access to charge and remove if need be. Then set the other system batteries, based on the need to achieve your CG mark.
- ALWAYS shoot for DEAD ON and in perfect balance when you are setting the CG. Do NOT set it for “a bit nose heavy”. If you want “it a bit heavy”, mark the position and measure it from the Wing Leading Edge Center Chord at the Root and call it what it is!

After the Maiden, you can make adjustments as to how you like to fly the plane.

Section 11: Pre-Flight and Flying

This plane flies very docile and is intended to fly at "controlled speeds". It should not "jump off the runway" when taking off. It should not dive hard when inverted at 45 degrees climb. This plane ought to land with very little effort on keeping the AOA at a reasonable approach angle.

There were no surprises at all on the Maiden, mainly because we went over the plane many times prior to flight with "another set of eyes" that we respected in the building and flying Jets. We also made sure we had a very good range check AND that Fail Safe was set as required.

This being the first "production Hawk", we had no real data other than the CG reference point and the Stab Neutral setting. At the time of writing this Manual, we have not really changed anything other than Expo's on a few of the surfaces. The following was our Rates and Expo settings (these are personal preferences for a Maiden):

	High	**Expo**	**Mid**	**Expo**	**Low**	**Expo**
Aileron:	85%	+28%	65%	+28%	50%	+28%
Stab:	100%	+22%	75%	+ 22%	60%	+22%
Rudder:	100%	+25%	75%	+25%	50%	+25%

Flaps: No Flaps used for Take Off (Not needed)
30 degrees for Landing

You may want to do some experimenting on the Flap settings for landing. We found there was no real need for Flaps on Take off. MAKE SURE your Flaps are deploying evenly…if they are not, you will be trimming Aileron to offset the "roll" that could occur of they are uneven when they are deployed.

Stab Neutral Setting is 15mm from Trailing Edge of Stab to Stab Hatch. This should have been done when installing the Stab and Servos!

Also, as noted in Stab Installation Section, Stab travel MUST be adjusted to keep the surface from hitting the Fuse at each end point.

Nose Gear Steering: We mixed the Nose Gear with the Rudder and added full travel to 150% on the Nose Gear. And reduced the Rudder travel to 90%. This way, the plane could be steered with high rate on Rudder without over deflecting the Rudder surface.

- ☐ Check Nose Steering tracking
- ☐ Range Check according to your Radio System procedures
- ☐ Set Fail Safe
- ☐ Go FLY!

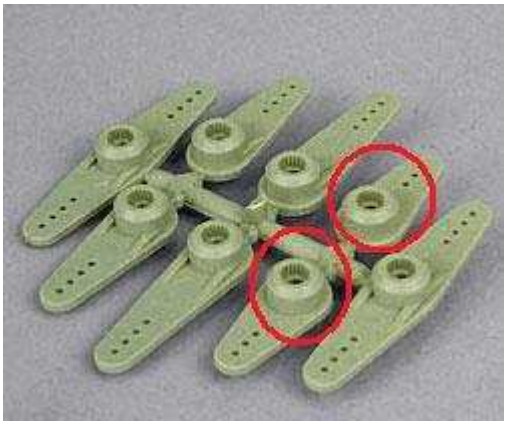
New Concealed Flap System Set Up:

This type of setup is very strong and a very clean looking install. Some of you may have built or owned a KingCat. This setup is almost exactly like the BVM KingCat Flap setup. The good news is, there is more room in the Servo Bay area to work and the Control Horn is already mounted from the Factory. This setup is preferred simply because the Flap surface is a larger surface and can be subject to "Blow Back" when deployed. This issue can occur for several reasons BUT with the geometry we will set the Servo Arm to achieve at full deploy, it will minimize the effort and maximize the effect of this surface.

NOTE: Make sure you have run the Aileron Servo Extensions BEFORE you do the Flaps! You do not need to do the complete install of the Ailerons but it's a good idea to have the leads done before this step.

For supply, you will need the following:

- 4-40 All Thread rod (12")
- CF Reinforcement tubing that fits over the 4-40 All Thread.
- Dubro (or equal) HD Servo Arms (see photo)
- 4-40 HD Stainless Steel Ball Links (2)
- 4-40 Gold Clevises (2)
- JR 8711 (2) Servos, or equal in torque
- Tygon Fuel tubing for Clevis locks on Control Horn side.



Since the amount of room you have for a larger Servo Arm is somewhat limited, you will need to do some programming to get a longer throw from your servo to achieve the Flap deflection of 35 degrees for landing.

JR 12x Programming:

- Set Flap System settings to UP 125 on the "Flaps Neutral" setting.
- Keep the "Mid Flaps" and "Landing Flaps" set at 0
- Keep your Sub Trim and Travel Adjustment at 0 as much as you can through the process, especially the Travel Adjustment.

- You could have an issue where one Pushrod will end up shorted than the other . This is due to the differences in the Servo Box mount and installation of the concealed Flap Horn. So this could take some time to get just right.
- Set the proper travel direction both Servo's now, making sure the Arm travels backwards, towards the Flap to deploy it.

Select two (2) Servos with as close of a center position and end points as possible. With the 12x set for maximum travel through the Flap System, work both servos to see how close they are together. We can use the "Balancing" program in the 12x later to do a final setup for fine tuning on matching.

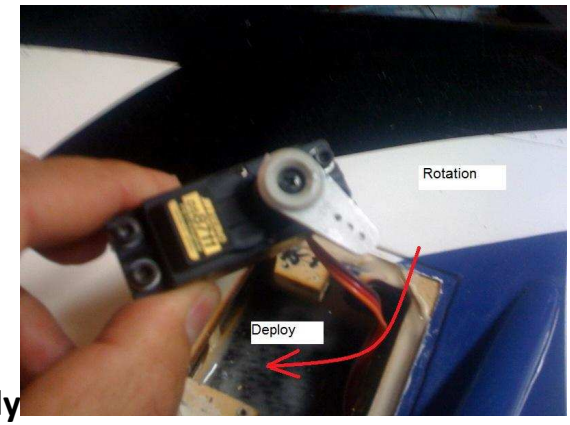
The Servo Arm in the UP position should be as seen in the picture below. With full programming as described, the Servo Arm in the Down position should be almost parallel to the Servo itself.

Servo Arm in "Landing Flaps" Position

Pushrod attached to Flap Horn

- Depending on how you built your Servo Box, you may need to Dremel out an area for the Pushrod to go through. Ours was on the wrong side of the box so we had to cut out ours out!
- Thread a Gold Clevis onto a 4" piece of 4-40 All Thread and attach to concealed Flap Horn, passing it into the Servo Bay area first.
- Install Servo into Bay with HD Servo Arm in place with two (2) screws to hold the Servo in place. See photo for "general position" of the beginning point of the Servo Arm in neutral postion.

Servo Arm in "Flaps Up" Position



Pushrod Assembly

- Length of the 4-40 All Thread is a "trial and error" exercise. What I did was put Gold Clevises on both ends and set the Servo in place with the HD Servo arm and eyeballed the fit into the hole on the Arm, screwing the Clevises in as needed. Once I got the fit confirmed, I trimmed the All Thread.
- Set the Servo with two (2) screws in the Bay and attach the pushrod assembly, making sure there is no bind with the Flaps in the up position. Also check to make certain the walls of the Servo Box does not interfere with the travel of the rod.

Check your travel for the deployment of the Flaps AFTER you have set the trim adjustments in the UP position. You may need to "fool" with this a bit but the goal is to have 35 Degrees in the Full Down position on the Flaps.

- Set the Landing Flap setting on your 12x Radio to 125 Down in the Flap System program and that should get you to 35 degrees ±
- If you want to use Mid Flap setting for Takeoff, set your Flaps at 12 degrees for this setting. We never used Flaps for Takeoff since it was not necessary at all.
- Once you feel good about this setup, you will need to cut and add the CF Reinforcement tubing to the pushrod assembly.
- The final step is installing the Hatch Cover for the Flap. Nice and neat!
- MAKE SURE you safety clip the Clevises on the Servo Arm side with the supplied clips that came with the Gold Clevises. Use the Tygon tubing to lock the Clevis on the Flap Horn side since the Horn is too think to use the safety clips.

Repeat these steps for the other Flap. Again, you may need to shorten or lengthen the pushrod assembly, depending on the Servo Box and Factory mounted Control Horn measurement difference from one side to the other. You will able to use Travel Adjustment and Balancing to fine tune this process of equal deploy and timing.