Aegea Assembly Notes:

Contact the author via email: richardj@attglobal.net.

The Aegea model is a thermal Duration (TD) model made up of components from Phil Barnes [1](bagged wing and tail group) and Terry Luckenback [2] (Pretty Mantis fuse). Due to its construction and design, the model is quite rugged but still offers the pilot an exemplary model for contest TD work.

The Aegea is a "builders" kit and requires some thought before construction. The attached notes document the major steps of my models assembly.

The model has the following specifications:
Airfoil: AG series
Wingspan: 130"
Approximate wing area: 1,100Sq"
Weight (ready to fly): 66-69oz
Controls: Ailerons, Dual Flap, rudder & Elevator
Tail versions: + tail and V-tail

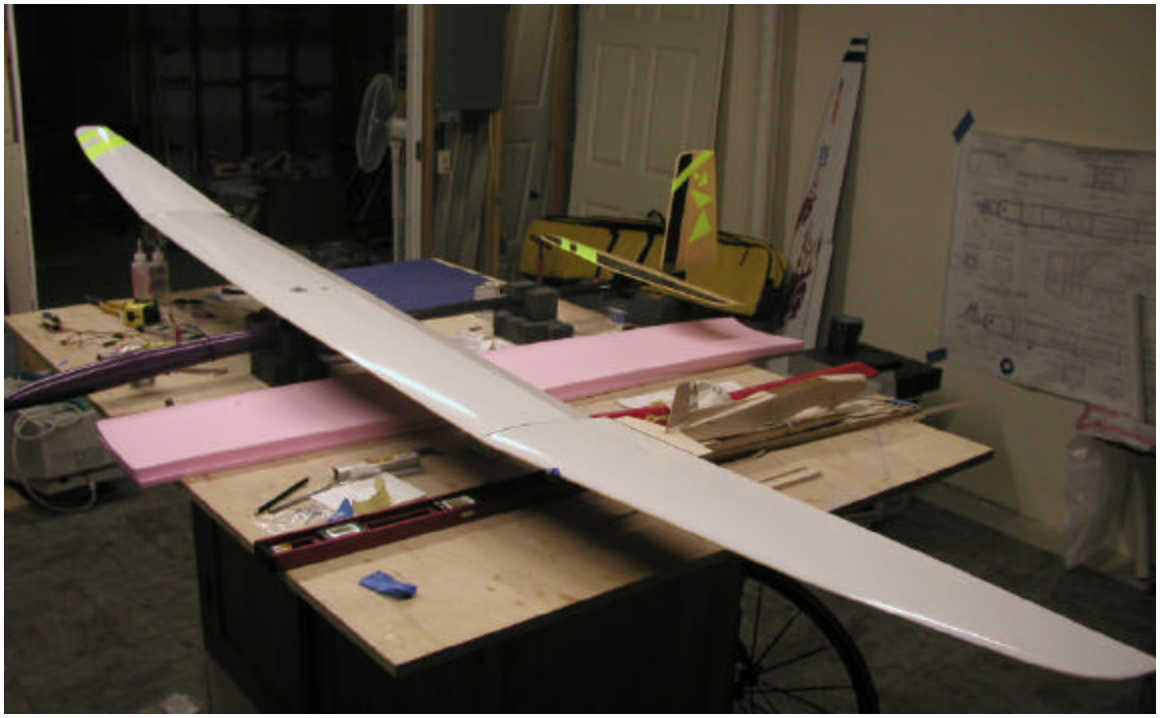

Figure 1 Finished model in the "Shop"

[1] Contact Phil Barnes at philipdbarnes@verizon.net
[2] Contact Terry Luchenbach at; terrylasw20@juno.com

Figure 2 Aegea after initial flights

The kit of parts is purchased from Phil Barnes and consists of the three piece 130” Aegea wing and a tail group of either a V- tail or set of Horizontal and Vertical stabs to build the more common (currently) + tail.

The fuse is delivered as three pieces, a front section that includes the wing pylon and slip on nose cone and a carbon boom with approx. 1” diameter.

Note: This build document will discuss the +tail version only.

Fuselage Assembly

The fuselage assembly consists of:

1. Wing pylon completion
2. Assembly of the tail group
3. Assembly of the pushrods and control linkages
4. Fixing the Boom to the fuse
5. Installation of the radio equipment tray
6. Painting & Finishing

We'll look at these one by one.

Wing Pylon Completion

The wing pylon work includes position of the wing hold-down blind nut, ballast support and the position of the adjustable tow hook assembly.

The sketch in Fig 4. Details the parts in the assembly.

Note: The 0.5" diameter dowel is **optional** and creates some difficulties with interference with the control pushrod sleeve's and wiring.

The important items here are to measure and mark the assembly well before you start using the epoxy!

Figure 3 Adjustable Tow Hook

The tow hook slot was cut in the bottom of the fuse with a Dremel tool. The location of the CG on the model is 4.25" from the wing LE. This location is approx. 1" (towards the rear) away from the wing hold-down bolt position.

The adjustable tow hook was assembled with a tow hook, washer (bend to mate with fuselage shape), 1.5' x 0.75" piece of ¼" Ply and a blind nut.

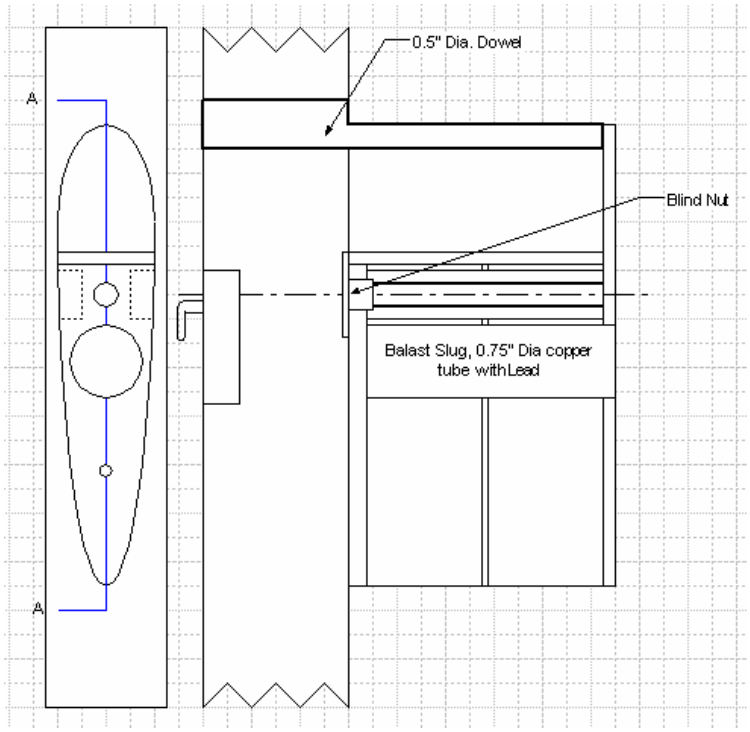

Figure 4 Wing Pylon layout

I started by making a kit the individual parts that will be used:
Note: Make a cardboard template to fit the pylon.

The lower part of the internal structure was assembled with two identical pieces of 1/8th ply wood, thus a ¼" thick base was created with 10ply layers.

Figure 5 the partial "kit" of wing pylon parts

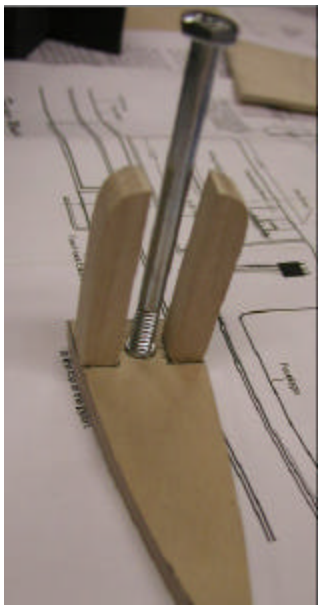

Figure 6 Wing Pylon pieces checking assembly

The space in the front of the pylon will house the Receiver and wing connection wiring make sure that enough space is allowed.

Figure 7 Wing Pylon blind nut piece

Once fitted to the shape of the pylon, the Boom was covered with Seran wrap and inserted in the rear of the fuse.

Figure 8 Wing Pylon with RX in place

In Fig 8, you will notice the position of the RX in the front of the Pylon. Location of the Ballast slug and the rear nylon screw to stop the wing from turning in the event a tip touches down first on landing.
Note that a ballast slug consisting of 0.75" copper tube and a mixture of lead shot and epoxy will net a ~ 5oz ballast slug. The 0.75" tube with melted lead provides almost 7.5oz. Care and attention should be taken if the melted option is chosen as molten lead is dangerous however you handle it!

Pylon Final Finishing

I chose to paint my fuse before assembly; a simple way to complete this is to first wash down the assembly and "scrub" with 200grit wet and dry. This will remove any wax and Key the surface to accept a primer filler type spray paint preparation. When the assembly is dry spray with the primer filler. Rub this down with wet and dry and spray again with the primer filler. Ensure all or any air holes in the fuse are filled. Choose your planned color and spray a top coat.

One important action with regard to finishing is to ensure that the pylon and wing mate well. Rough up the top lip of the pylon. Attach a piece of Wax paper to the center of the wing center section making usre you cover the area where the wing and pylon mate. Mix up a small batch of 30 minute epoxy and micro-balloons to a thick consistency. Paste the epoxy onto the top edge of the pylon all the way round. Pay particular attention to the front area of the pylon and this portion requires the most build-up. Bolt on the wing ensuring that it is correctly positions with respect to the fuse.

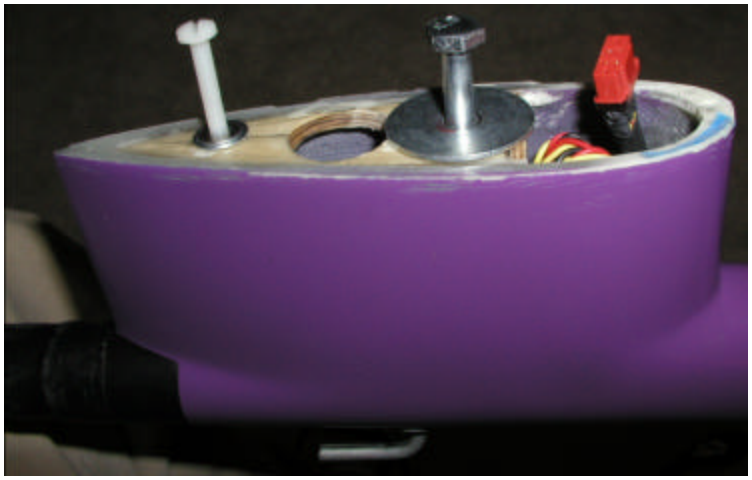

Figure 9 Wing pylon complete, Note Epoxy skim to match wing shape to pylon

Installation of the Rudder – Elevator pushrods

Note: the pushrod assembly and rudder – Elevator control set-up should be completed in one key step. This will ensure the correct placement of the slots in the boom and the support structure.

The elevator and Rudder pushrods need to be quite long. I used carbon rods from CST. The pushrods are supported inside the boom with a piece of balsa that has been assembled using approx. 8 pieces cut cross-grain Fig 10. Be sure to trial fit this assembly in place in the boom before making the final joints.
The pushrods need to be affixed to this balsa assembly. I did this by wrapping them with masking tape and epoxying in place.

Figure 10 Pushrod support balsa laid on wing

Assembly of the tail group

Elevator -

The tail group assembly starts with marking out the positions of the Rudder stab on the boom. Once that has been determined I left a 1/8" to ¼" gap and then placed the Elevator.

Mask off the section of the boom that will not have any of the tail group attached and sand the clear area to ensure good adhesion of epoxy.

Once the elevator position has been determined it time to make the hard points In the elevator. Do this by cutting away the surface Kevlar to approx. 0.5 diameter in two positions approx 1" apart centrally on the Horizontal stab. Dig out the foam and fill with 30 min, epoxy. Ensure that the hard points are level with the under surface of the stab. See fig 11.

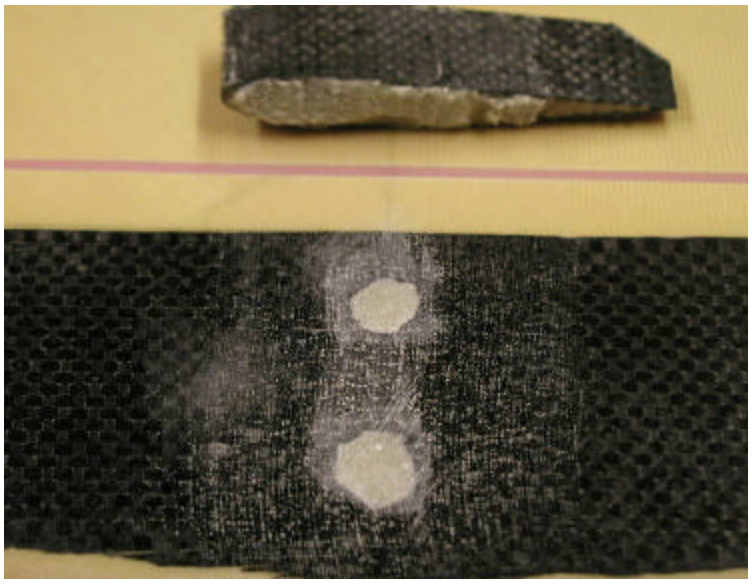

Figure 11 Tail pylon and hard points in Elevator stab

Preparing the Horizontal Stab pylon.

Phil recommends that the horizontal stab is prepared with Epoxy hard points that have the threads “molded” in. I didn’t like that method based on my experience. My solution was to build a small tray that fitted through the boom and included two blind nuts. Another idea would be to make the hard points in the pylon and then add the blind nuts to the pylon. If I was to build another Aegea I would build the pylon that way. Its worth the extra weight for the security!

Once the Pylon is prepared it needs to have its lower surface prepared to mate with the boom. I used sandpaper wrapped around the boom and was careful to move the pylon along the boom to sand the correct profile. Once that is done affix the Pylon to the prepared boom with thin CA.

Once the Pylon is in position wrap the whole assembly with Kevlar or glass. I lightly sprayed 3M77 onto the Kevlar and positioned it round the Boom/Pylon. Once in place I used 30 min epoxy to secure it. Wrap the joint with seran wrap once glued. If you have positioned your control rods correctly you’ll be able to include a wrap of the control rod exit slots at the same time. Don’t worry if you have to use multiple pieces to complete the wraps.

Figure 12 View of Horizontal Stab Pylon and Rudder pushrod exiting fuse

Figure 13 Tail group from below

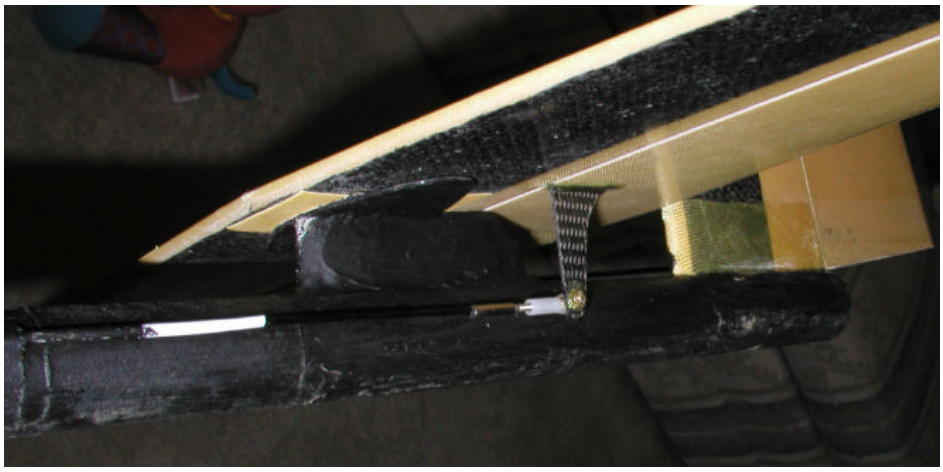

Figure 14 Tail group photo

Rudder –

Prepare the Rudder by sanding its lower surface to mate with the boom. I used sandpaper wrapped around the boom and was careful to move the rudder along the boom to sand the correct profile. Once that is done affix the Rudder to the prepared boom with Thin CA.

Once the Rudder is in position wrap the whole assembly with Kevlar or glass. Sand the rudder for about 1" up each side. I lightly sprayed 3M77 onto the Kevlar and positioned it round the Boom and about 1" up either side of the Rudder. Once in place I used 30 min epoxy to secure it. Wrap the joint with seran wrap once glued.

Figure 15 Kevlar wrap around boom and Vertical stab

Figure 16 Elevator Control horn with ball joint & pushrod

The elevator control rod uses a Ball joint as this will allow simple removal of the horizontal stab for transportation.

Finally add the carbon piece to the Tail Pylon.

Figure 17 +Tail group in place

Fixing the Boom to the Fuselage

Once the tail group has been mounted on the boom and the control rods are in place its time to mount the Boom to the fuse and glue. There are a couple of things to consider while making this joint. Firstly, the joint needs to reinforced and secondly, the boom needs to be inserted at least 1.5" (I would make sure that you insert the boom as far as you can use the Tow hook blind nut block (in its rear most position) as a limit. Also ensure that there is no space between the top of the boom and the lower wing pylon block (that's the one with the blind nut for the wing) this will help resist the Boom twisting out of the fuse.

Note: Be sure to have the wing mounted on the fuse and some support blocks under each side of the wing so that you can "sight" the Rudder stab and ensure everything is square.

Measure and mark off the insertion depth for the boom in the fuse and using 220grit sandpaper scrub the surface of the boom to prepare for glue.

Mix up a batch of 30min epoxy and add to both sides of the joint.

Insert the boom.

With the wing supported off the bench with blocks I used some 2x4 wood block, place a builders-square on the wing so that the 90 Deg vertical is visible as you look down the model from front to rear twist the boom until the "sight" picture has the vertical fin at 90Deg to the wing.

Once the glue joint is dry, prepare a wrap of Kevlar or glass around the joint. I used two wraps. Cut the piece, spray with 3M77 and place. Use 30min epoxy on the Kevlar fabric. The first wraps goes around the boom only and was around 1" wide. The second and most important wrap goes about 3" down the boom and also includes the rear portion of the fuse.

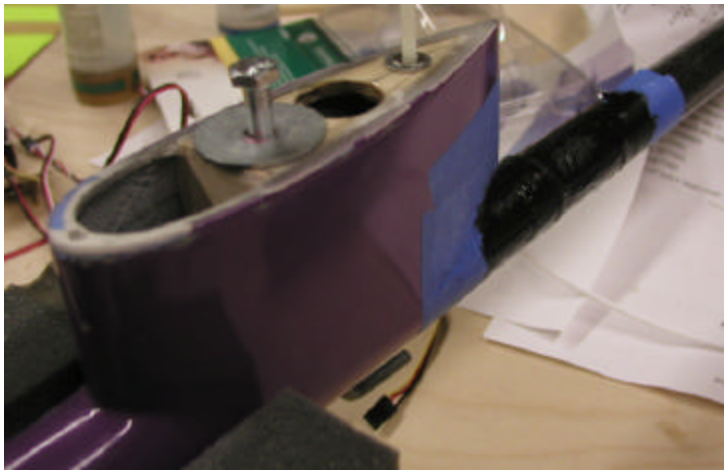

Figure 18 detailing the fuse- boom Kevlar wrap after painting

Installation of the Radio tray

The radio equipment tray fits into the forward part of the fuselage; this can be made of Plywood (not lite-ply) or carbon plate. Since the battery on most Aegea sits behind the radio tray i.e. between the servos and the wing pylon, ensure there is enough room to move the battery as needed.

Make a template out of stiff cardboard, use the template to manufacture the radio tray and trial fit. Cut the holes for the servos and switch. Ensure that the tray is positioned correctly to allow the servos to reach the desired depth. Glass the servo tray in place.

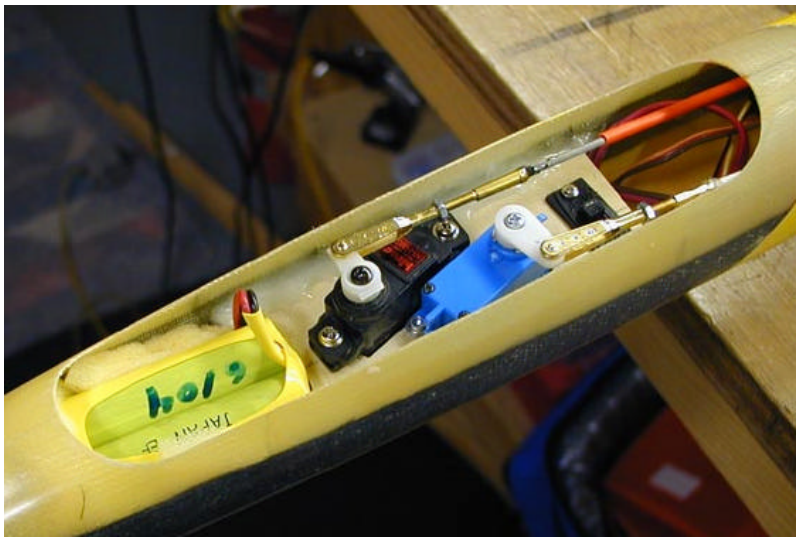

Figure 19 Rudder & Elevator servo layout

Battery switch:

I made my own battery switch assembly. You must use high quality DC coaxial jacks designed for this purpose. I use and recommend the Switchcraft 712A power jack used with the Switchcraft 760 power plug. Both are available at many electronic supply houses, or online at http://www.mouser.com.

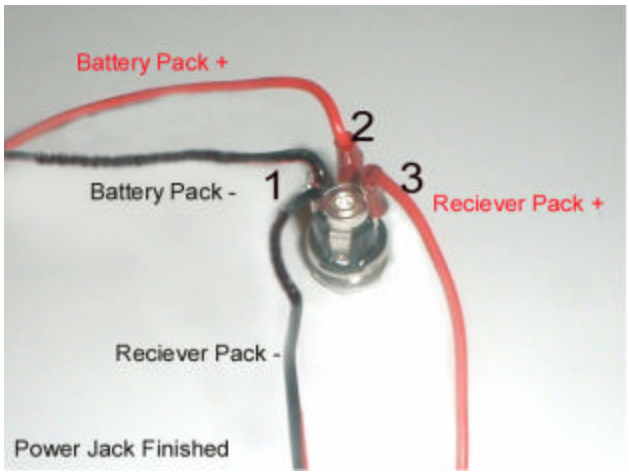

Figure 20 connections in the battery on/off switch

The switch assembly was mounted on the top section of the forward fuselage.

Final Finishing:
I used a flat black epoxy type paint to cover my joints on the boom

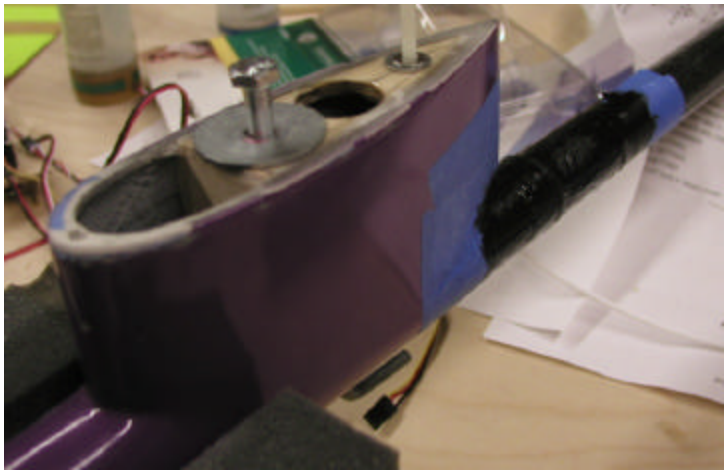

Figure 21 Epoxy paint on the Fuse-Boom Kevlar wraps (2)

Note: A smooth finish was not required on the boom / fuse joint as the texture would provide a helpful surface to hold when launching the model.

Wing completion.

The wing is delivered in three pieces (center section and left/right tips). Completion of the wing includes the following steps:

1. Sanding the joiners
2. Wing Incidence pins
3. Wiring
4. Servo mounting
5. Rear locating hole

Sanding the Wing Joiners

As delivered, the wing joiners will not fit into the wing tubes. To bring them down to size, I used 60 and 100grit wet and dry with the joiner mounted in the drill press. Great care must be taken if you choose to follow this method. If the paper grabs (and it will occasionally) you must be ready for it and let go … or risk losing your fingers!!!. Trial fit the joiners and then finish/ fine sand with 400grit wet/dry for a silky fit in the wing tubes.

Incidence pins

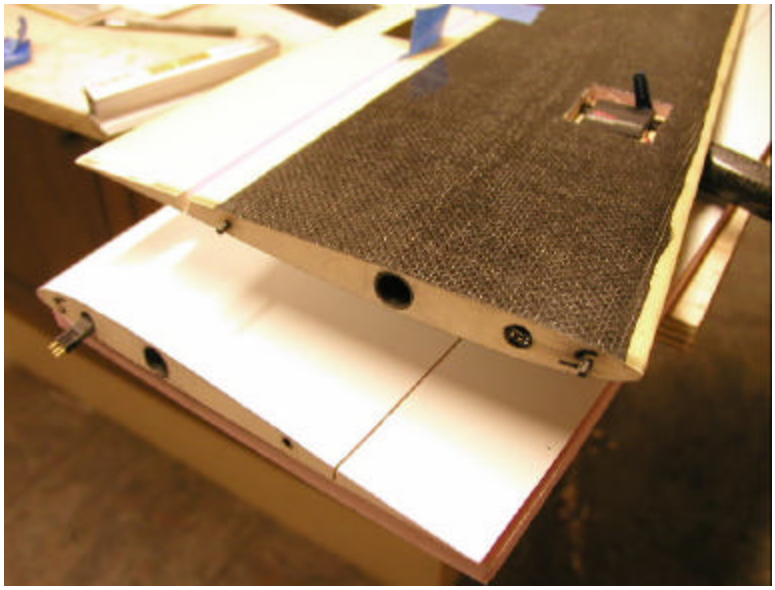

Figure 22 Wing part views with carbon incidence pins and connectors

Add 1/8th carbon rod incidence pins to the wing tips. Align the wing panels by looking at the underside of the mated joint.

Wiring

Recommended wiring as follows:

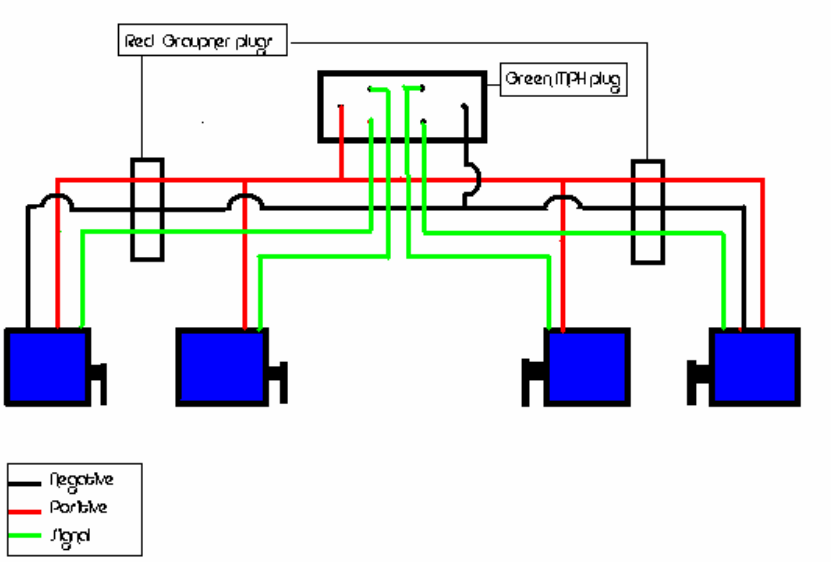

Figure 23 wing wiring diagram

Note: This drawing came from the HKM-USA website and details the general arrangement of wiring in a four servo wing.

I used the heavy gauge servo wire since the runs were longer than usual (130" wing). Should you choose to use individual wires it would be worth the time to twist them together to reduce the possibility of noise.

Servo installation

Particular care should be taken when installing the servos. Ensure that the top skin of the wing is well supported. Add side plates of 3/32 ply around the servos or box the servo's in place. I used laser cut servo mounts for my HS5125 thin wing servos and supported the sides with ply. Ensure there is no play in the top wing skin to reduce the possibility of buckling.

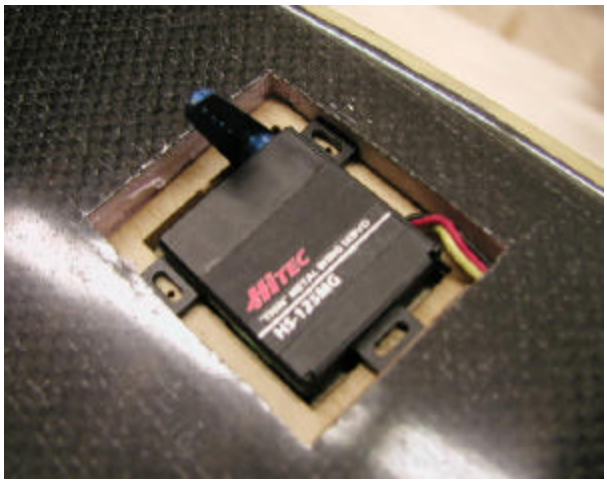

Figure 24 Aileron Wing servo installation HS5125

Rear Location hole

To reduce the possibility of the wing turning if a wingtip is caught when landing, I installed a rear mounting bolt. Create a hard point in the wing (as per the elevator hard point instructions) and mount the wing on the fuse. Drill a hole through the hard point of the wing into the wing pylon top ply piece. Re-drill the top of the pylon & fit a blind nut.

Final work:

Note: Wing joint areas should be covered with a clear tape thereby allowing wing connections to be taped for use and not remove surface paint with tape removal.

Initial Set-up (I used this initial set-up, modify to suit personal taste)

CG	4-1/4 to 4- 3/8" from LE
TOW HOOK POSITION	1/8th in-front of CG
CROSS TAIL ELEVATOR	Max deflection Up & down, use EXPO on initial flights
CROSS TAIL RUDDER	1" each side
AILERONS	1" up, ¼" down, use EXPO on initial flights
DIFFERENTIAL	20%-25%
BUTTERFLY	Flaps All the way down (to boom), ailerons 0.5" up
ELEVATOR COMPENSATION CROSS TAIL	3/8th down
AILERON RUDDER MIX CROSS TAIL	Zero required
THERMAL CHAMBER	Flaps 1/8th down
LAUNCH SETTING	Flaps and Ailerons 3/8ths" down

Notes and Revision control

Date	Revision level	Notes
2/14/05	A	First release
2/15/05	B	Altered reference to Figures and added details on the fuse/boom wraps