Warbird Series
Bearcat - 32
Assembly Manual

Specifications
Wing Span: 32 inches
Wing Area: 210 in^2
Fuselage Length: 26 inches
Weight (ready to fly): 11 to 13 oz.
Wing Loading: 7.5 to 8.9 oz/ft^2

Designed by Jim Vigani
Version 1.0a - 8/27/07

A Tech Hobbies,LLC Company

PO box 301
Edison, New Jersey 08817

Ph: (732)406-5726
Fax: (732)467-5504

Website: www.airfoilz.com
e-mail: info@airfoilz.com

© Copyright 2007 all rights reserved

Limited Warranty

AirfoilZ takes pride in the care and attention given to the manufacture of the components in this kit. The company warrants replacement of any materials found to be defective for their intended use prior to their use in the construction of the model, provided the purchaser requests such replacement within a one year period from the date of purchase, and the part is returned, if so requested by the Company. No other warranty, expressed or implied, is made by the company with respect to this kit. The purchaser assumes full responsibility for the risk and all liability for personal or property damage or injury resulting from the purchaser's use of the components of this kit whether assembled or not.

The Company reserves the right to provide a full refund to the purchaser if the model does not perform as advertised. Any refund is at the sole discretion of the Company.

© Copyright 2007 all rights reserved

Introduction:

Thank you for choosing the Bearcat - 32 airplane. We have taken great care to provide a design and kit components that, when properly assembled, will give you a high quality model with outstanding performance. While the assembly is not complicated, the quality and ultimate performance of your model will depend on the care you take while building. **Please read these instructions carefully and be sure that you understand them before you start.** Take care to assemble the components as shown and in proper alignment.

Warning

This radio-controlled model is not a toy and, if operated inappropriately can cause serious bodily injury and property damage. *It is the buyer's responsibility to assemble the kit correctly and properly install the motor, radio and all other equipment. The model must always be flown in accordance with the safety standards of the Academy of Model Aeronautics (AMA).*

This model is designed for high performance. While it is reasonably simple to assemble, it is not intended for the novice flier. ***Do not attempt to learn to fly with this model!*** *If you are an inexperienced modeler, we recommend that you get the assistance of an experienced modeler to help you with the assembly and initial flights. There are many local clubs that can offer help with assembly and flight instruction. Information on local clubs can be found through the Academy of Model Aeronautics. The AMA has over 2500 chartered clubs throughout the country. Information on the AMA can be found at www.modelaircraft.org.*

We do not recommend the use of hot glue for mounting components such as servos, control horns, receivers or speed controls.

Recommended Power System:

This plane has been designed to use a 125 watt+ power system. Recommended motors include the Hacker A20-26M, Hacker A 20-30M, and Scorpion 2212-22, a 15 amp speed controller, and a 1320 mAh, 3S Li-poly battery with an 8x6 to 8x8 propeller. We also have had great performance with an APC 9x7.5 slow flyer prop cut down to 8-inch diameter. Other power systems with similar capabilities can be used. Performance will vary depending on the specific power system selected. For information on alternate power systems please visit http://3dxhobbies.com or your local hobby shop.

© Copyright 2007 all rights reserved

Kit Contents:

Before you start the assembly of this model, check to make sure that there are no missing parts and that none of the parts have been damaged during shipment. If you have any questions with the assembly or flying of this model, please contact us and we will be happy to assist you. If you need replacement parts please provide the model name. The parts included in the kit are shown on the Part Sheet included with the kit. The kit does not include the 0.04 inch wire for the pushrods, the Dubro Mini E/Z Connectors, the Dubro E/Z Link.

Other items you may need that are not included with your kit:

Building Supplies:

In addition to the kit contents, we recommend having the following building supplies on hand to complete the kit assembly in accordance with this manual.

- Foam safe (odorless) CA
- Foam safe CA "Kicker"
- Thin CA
- Gorilla glue
- 5 and 15 minute epoxy
- Double back tape or spray adhesive
- Low tack masking tape (blue painter's tape)
- Sanding block with 100 grit sandpaper
- Sanding stick or emery board (150 grit)
- Soldering iron and resin core solder
- $^{1}/_{32}$ inch and 1/16 inch diameter drill bits
- Exacto knife with #11 blade
- Utility knife
- Small square
- 36 inch ruler
- Needle nose pliers
- $^{3}/_{8}$ inch diameter brass tubing
- Diagonal cutting pliers
- 0.04 inch diameter piano wire for pushrods
- 3 Dubro Mini E/Z Connectors
- 1 Dubro E/Z Link

Power and Control Equipment:

The following items are needed to provide power and control function to your model.

- Brushless outrunner motor with radial mount
- 4 motor mounting screws
- Brushless motor speed control
- 3 micro servos (Hitec HS55 or equivalent)
- 3S Li-poly battery pack (TP 1320 Pro-Lite or equivalent)
- LI-poly battery charger
- 3 channel micro receiver
- Y harness if 3 channel receiver selected
- 3 to 6 channel transmitter

© Copyright 2007 all rights reserved

Making a Sanding Block:

The leading edges of the elevator, the rudder, and both ailerons need to be beveled prior to installing the hinges. This is best performed by the use of a 2-inch wide by 12 inch long, 100 or 120 grit sanding block or sanding bar. In addition, other areas of the airframe need to be sanded as shown in this manual to complete the assembly and enhance appearance. If you do not have a suitable sanding block, one can be easily made by securing a piece of 100 grit sand paper to a 2 inch x 12 inch x ¾ inch wooden block. The sandpaper can be secured to the block using either double backed tape or spray adhesive. ***Make sure that the block is flat!*** A styrofoam block is great for general sanding of the fuselage and non-beveled edges of the control surfaces.

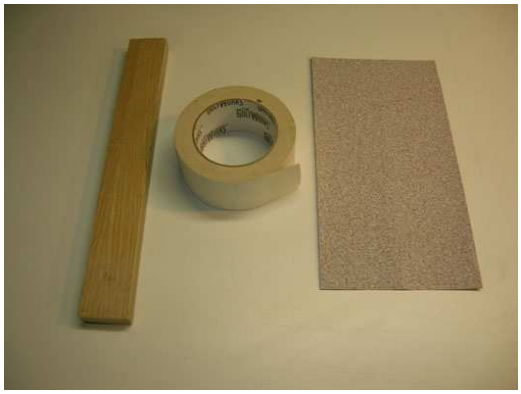


Figure: 1

Figure: 2

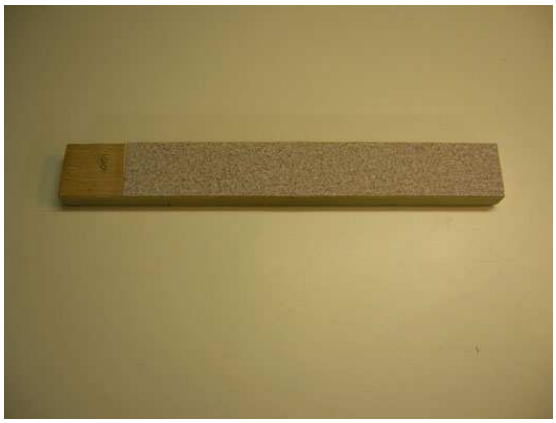


Figure: 3

General Comments on Assembly:

While not difficult to assemble, the Bearcat kit is intended for persons with some building experience. As such, the instructions are presented as a simple sequence that, when followed, will help ensure that the airframe turns out straight and light. Improperly aligned surfaces and unnecessary weight will only hinder its performance. Apply glue and epoxy in a thin uniform coat, using only enough to achieve a strong bond. Excess glue or epoxy will only add unnecessary weight and will not increase the strength of your model. Trial fit all components to ensure fit and

© Copyright 2007 all rights reserved

alignment before applying any glue or epoxy. Keeping joints tight fitting will minimize the amount of glue required and will ensure a strong bond. **When gluing foam to foam, or foam to wood, use only foam safe CA and foam safe kicker.** There are two basic methods that can be used when gluing flat pieces of foam together such as when gluing the foam doublers to the fuselage skin. The first method involves applying CA to the smaller part, positioning it in place and then spraying a light spray of foam safe kicker along the perimeter of the part. The second method involves applying CA to the smaller part, and lightly spraying the mating part with foam safe kicker. The parts are then joined.

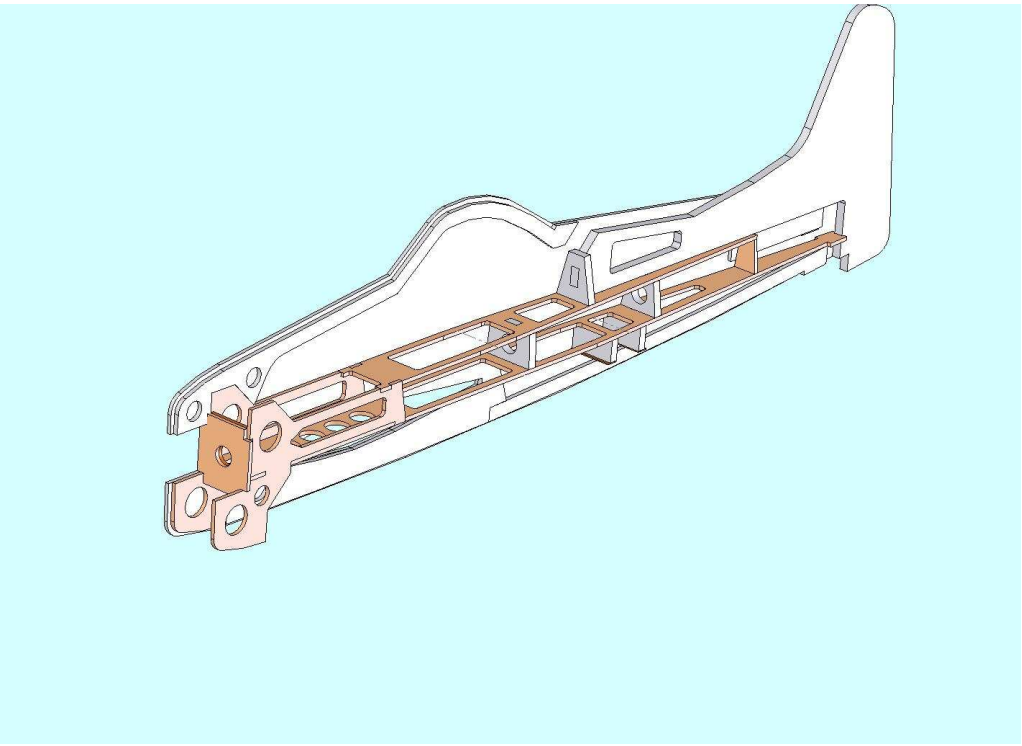
Use a light touch while sanding. Foam cuts very quickly and excess pressure can limit your ability to accurately shape the foam. Take extra care not to over sand. Avoid scratching the surface of the Depron foam.

Graphics:

The Bearcat comes unpainted. We used Krylon H_20 spray paint on the prototypes to paint the base color. Insignias, vinyl numbers and striping are included with the kit.

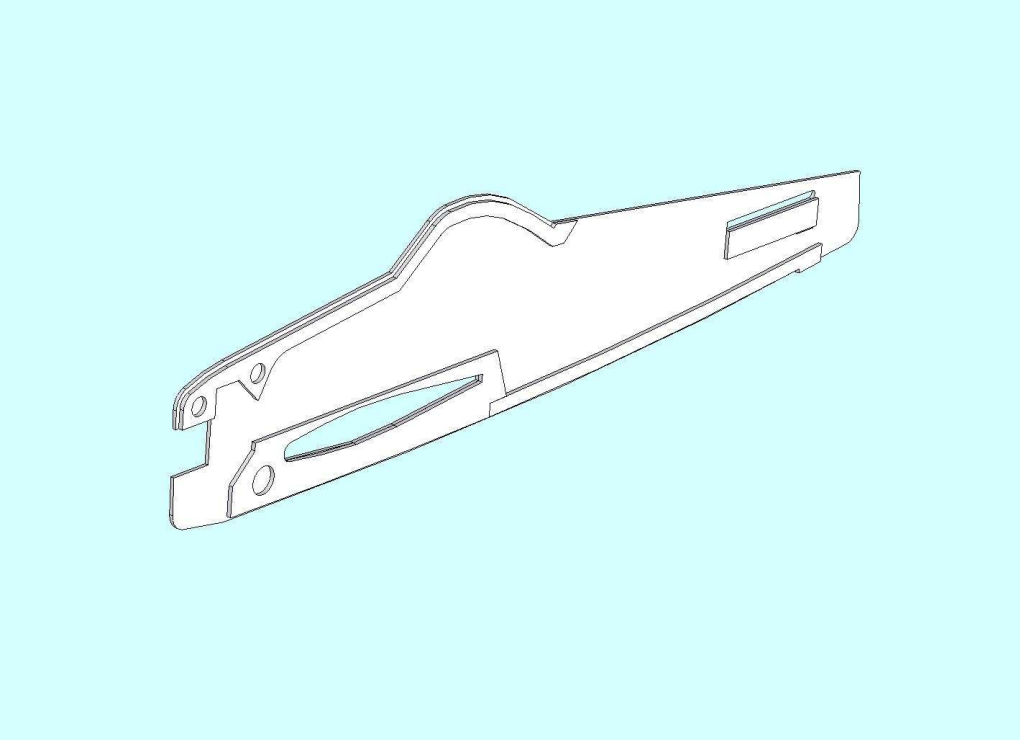
Fuselage Assembly:

The fuselage assembly on the Bearcat consists of a plywood and foam crutch assembly covered with a depron skin.

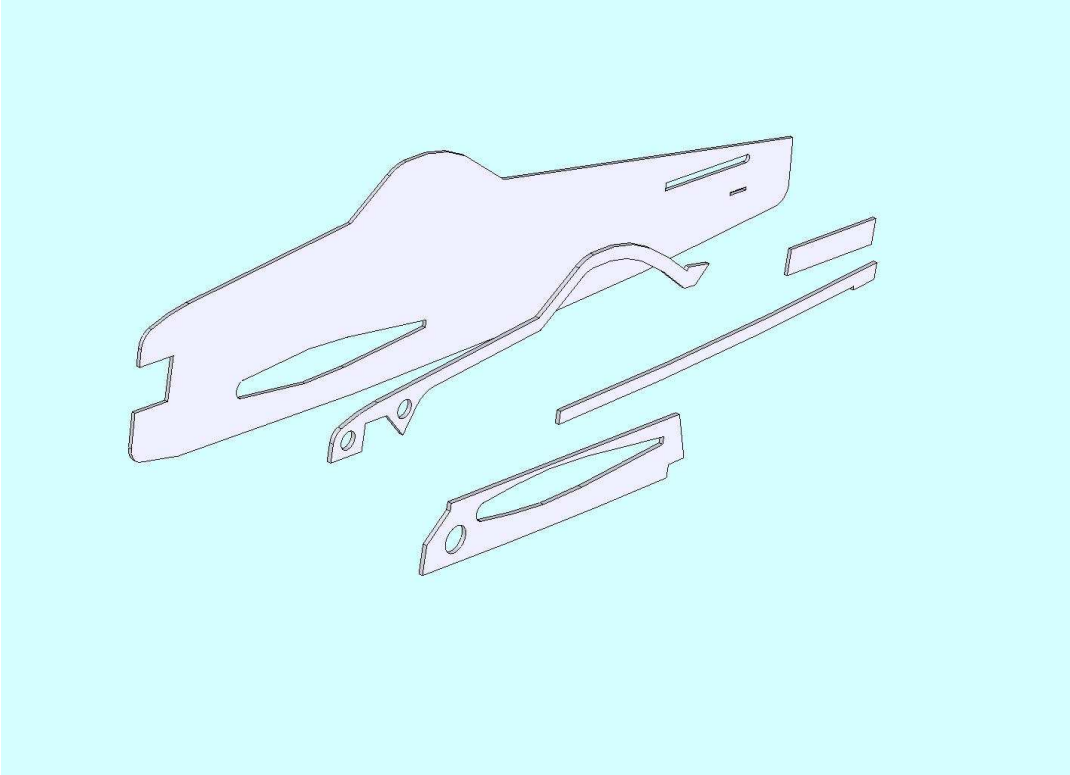


Fuse Assembly

© Copyright 2007 all rights reserved

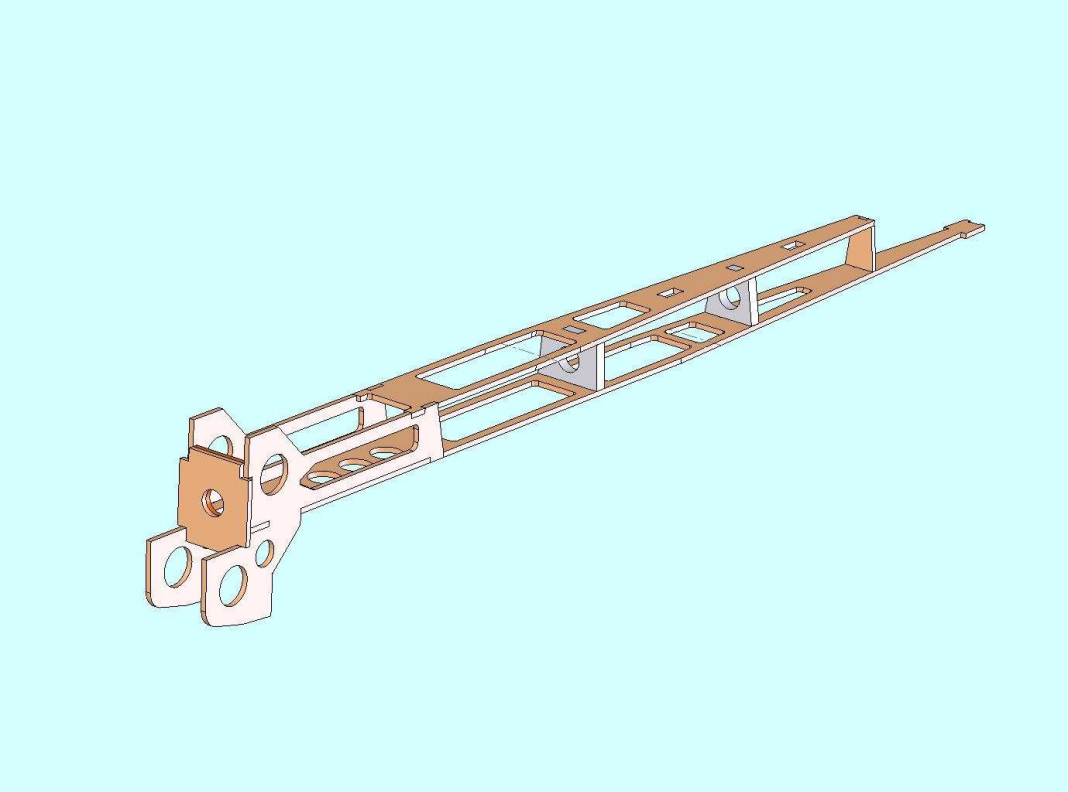


Skin Assembly

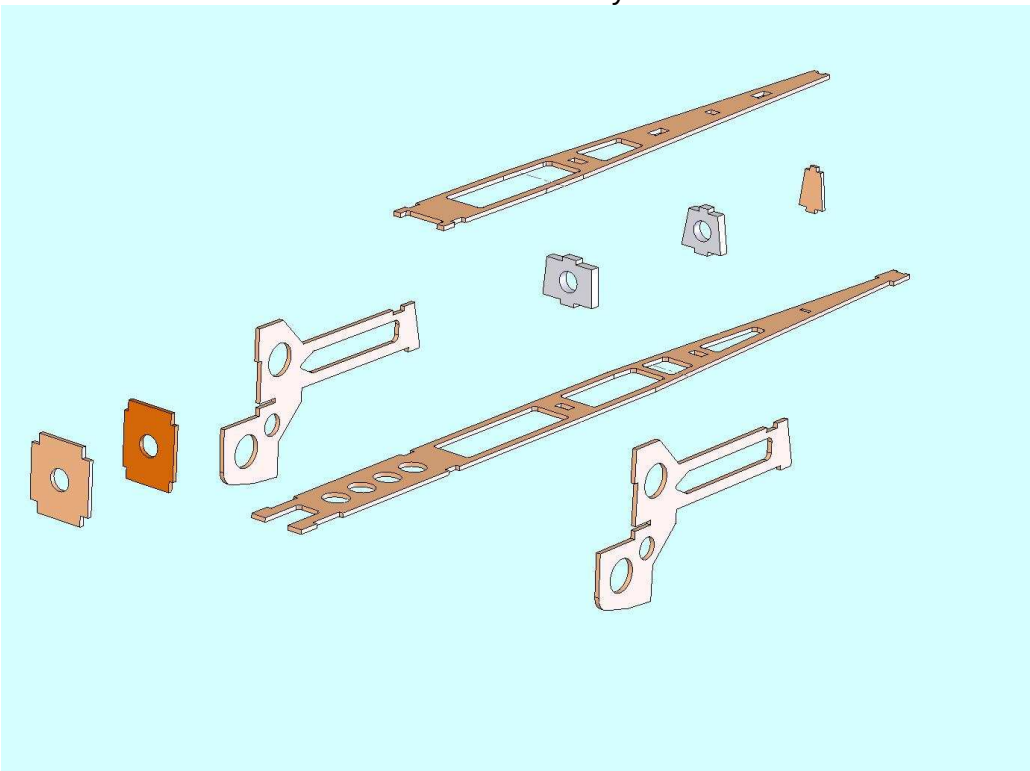


Skin Component Parts

© Copyright 2007 all rights reserved



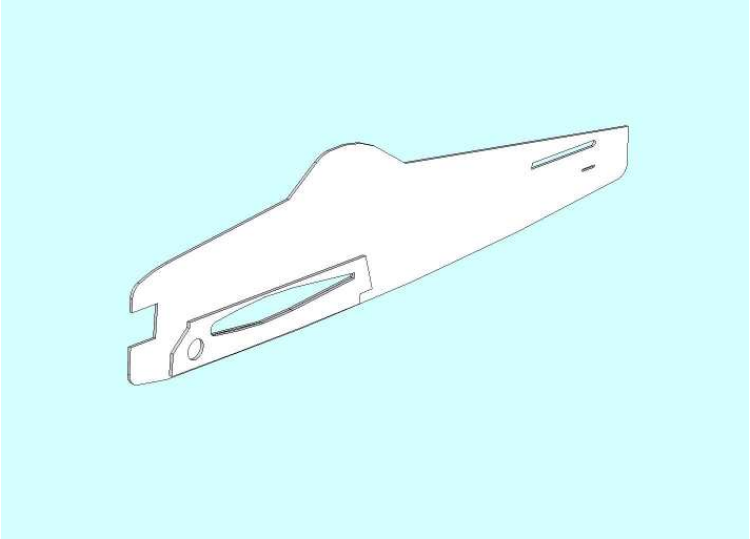
Crutch Assembly



Crutch Component Parts

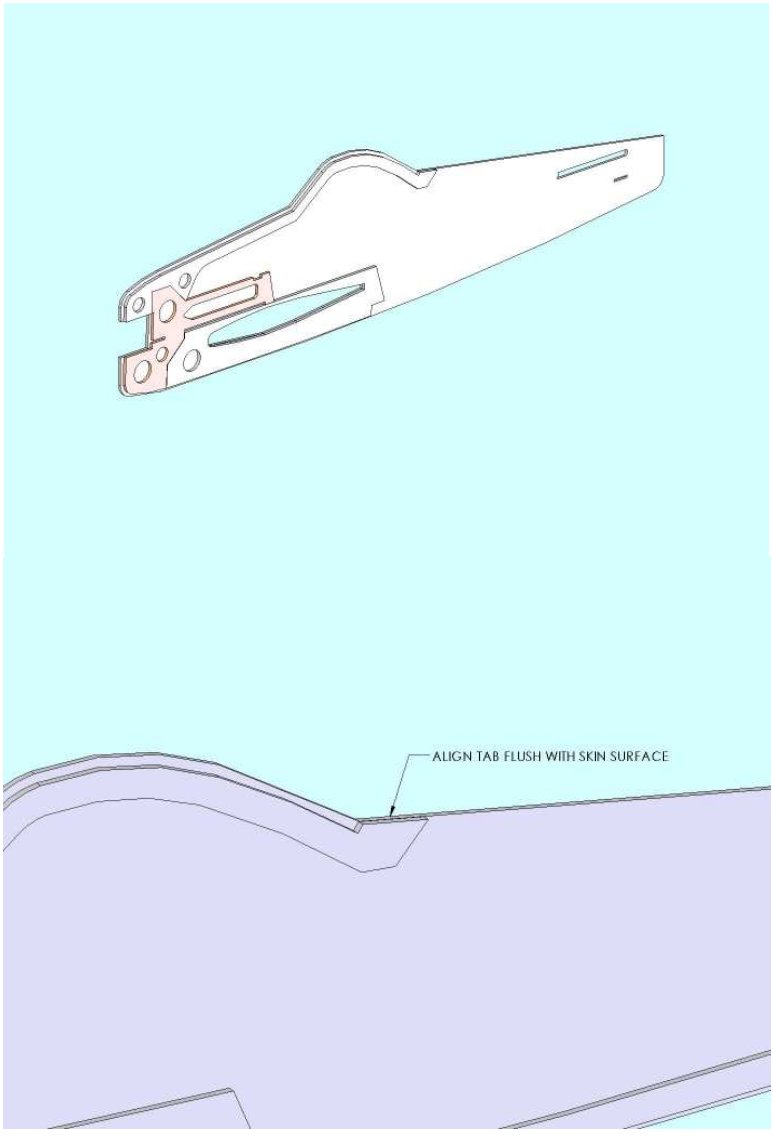
Follow the steps in the order outlined below to ensure accurate alignment of the components.

© Copyright 2007 all rights reserved



Step 1

Glue the wing root doubler in place with foam safe CA being careful to ensure the wing openings are in alignment. Tip: Before joining, apply CA to one part and lightly spray kicker on the other part.



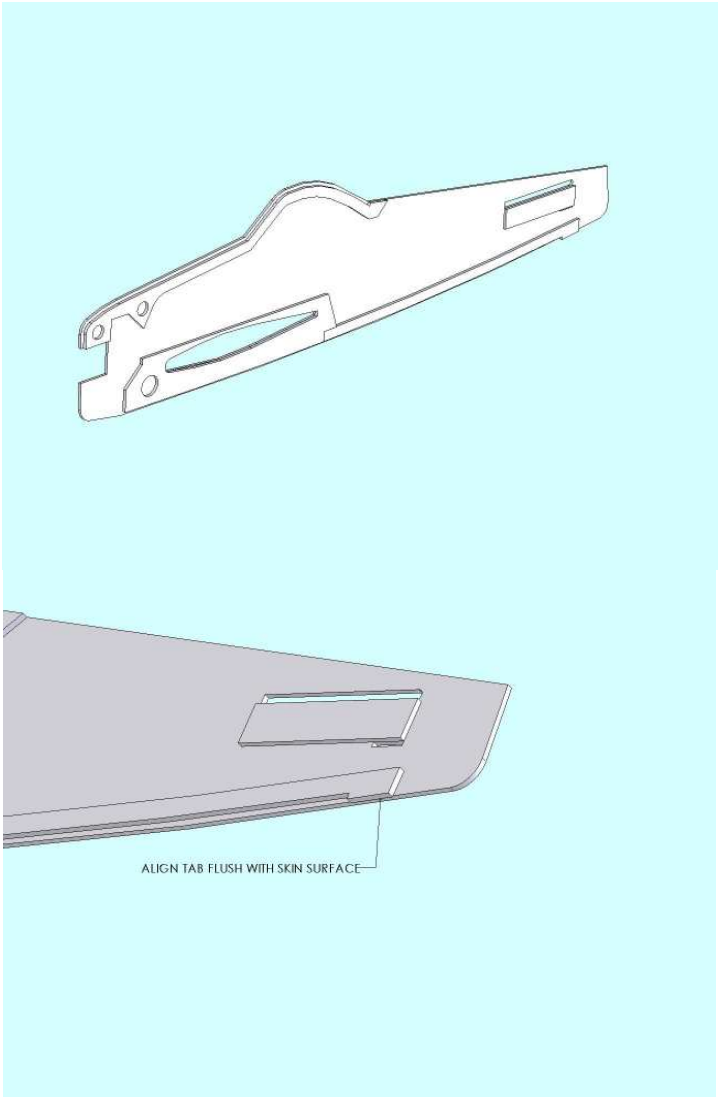
Step 2

Using the plywood nose doubler as a guide, glue the top front doubler in place with foam safe CA.

DO NOT GLUE THE PLYWOOD NOSE DOUBLER IN PLACE!

NOTE: The top front doubler needs to be positioned 3 mm from the edge of the skin. An alignment tab is provided at the rear of the part to ensure proper alignment.

© Copyright 2007 all rights reserved



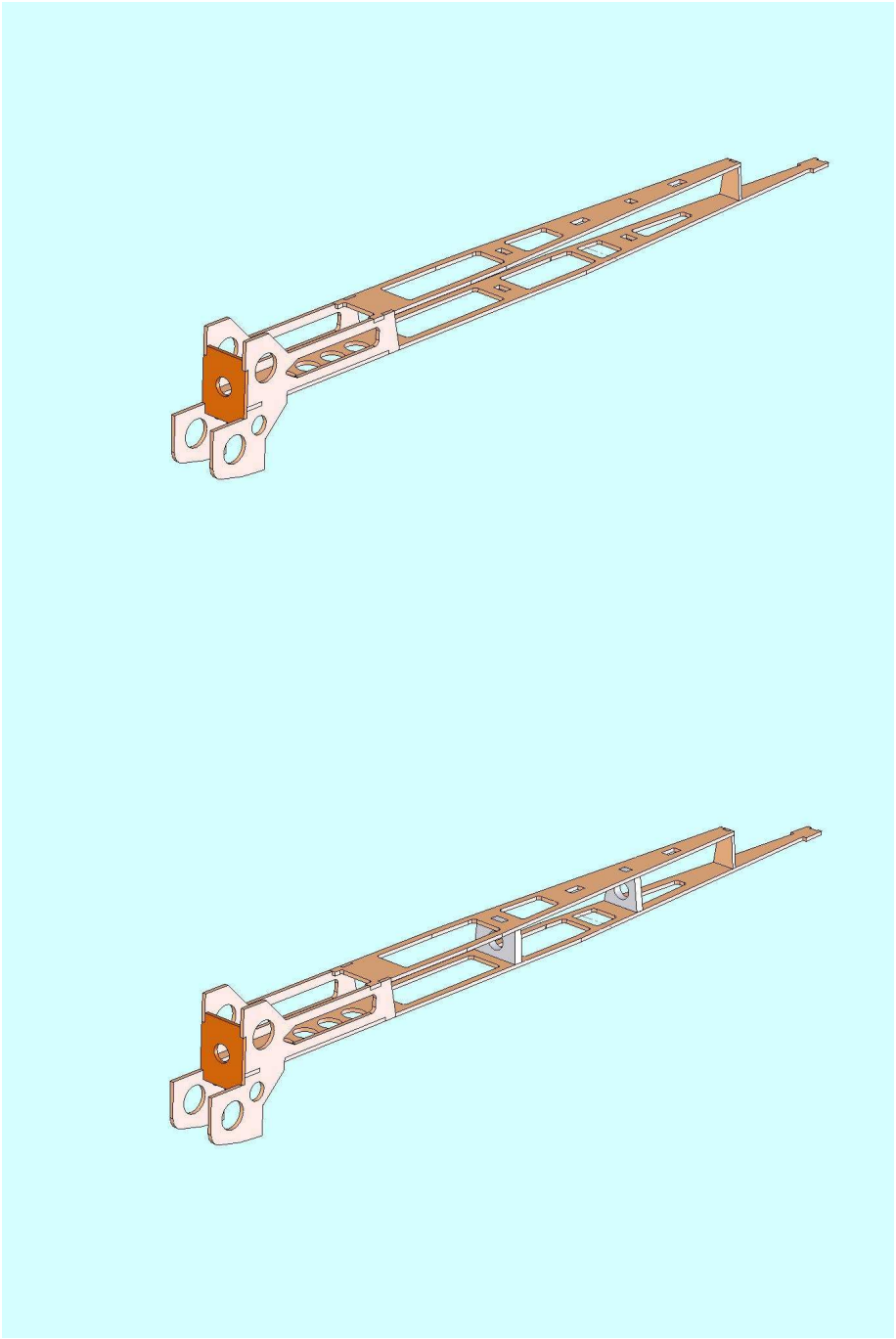
Step 3

Glue the lower rear doubler and the foam stab support in place with foam safe CA.

NOTE: The lower rear doubler needs to be positioned 3 mm from the edge of the skin. An alignment tab is provided at the rear of the part to ensure proper alignment.

Repeat Steps 1 to 3 for the other skin assembly making sure to make a LEFT and a RIGHT side version!

© Copyright 2007 all rights reserved



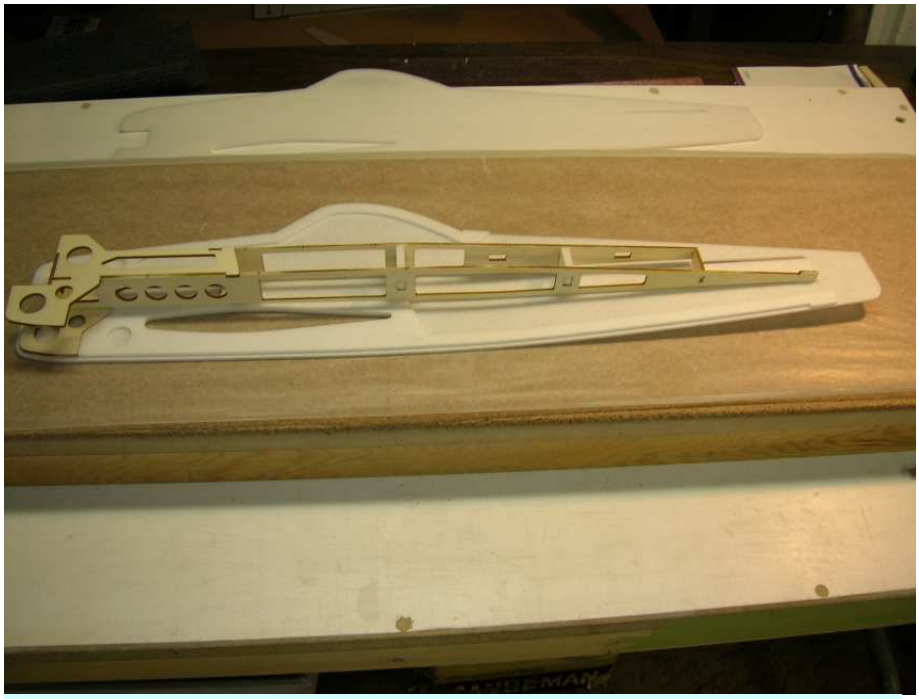
Step 4

Dry assemble all the plywood crutch pieces and check for fit. The pieces should snap together and self align. If the fit is tight, lightly sand the notches for a snug fit. Note: the motor mount and motor mount support are very similar in appearance. The motor mount is wider than the motor mount support. The motor mount support is shown in the picture.

Step 5

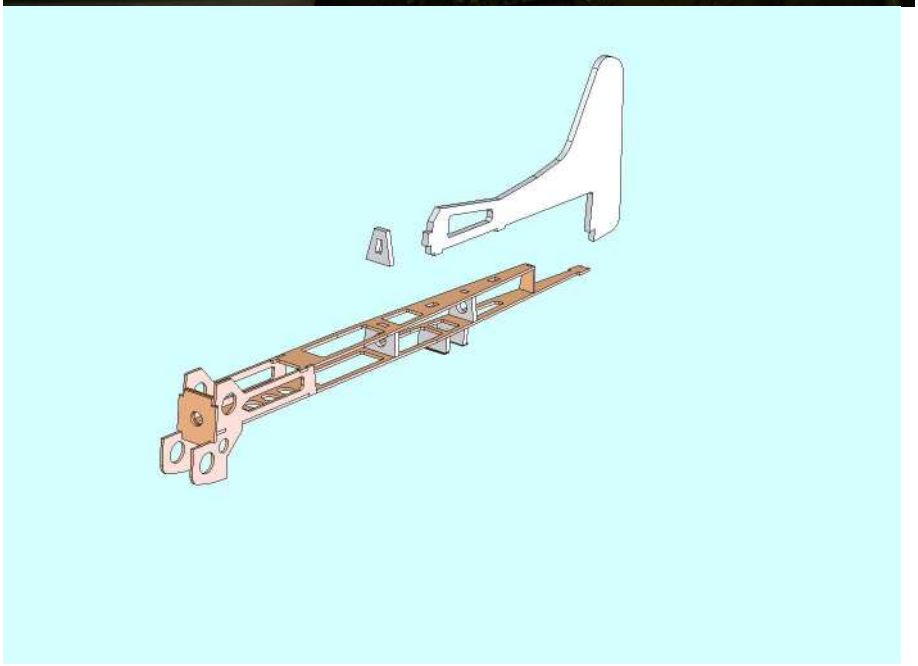
Glue the plywood crutch parts together with thin CA, then re-glue with medium CA. Insert foam formers and glue in place with medium foam safe CA.

© Copyright 2007 all rights reserved



Step 6

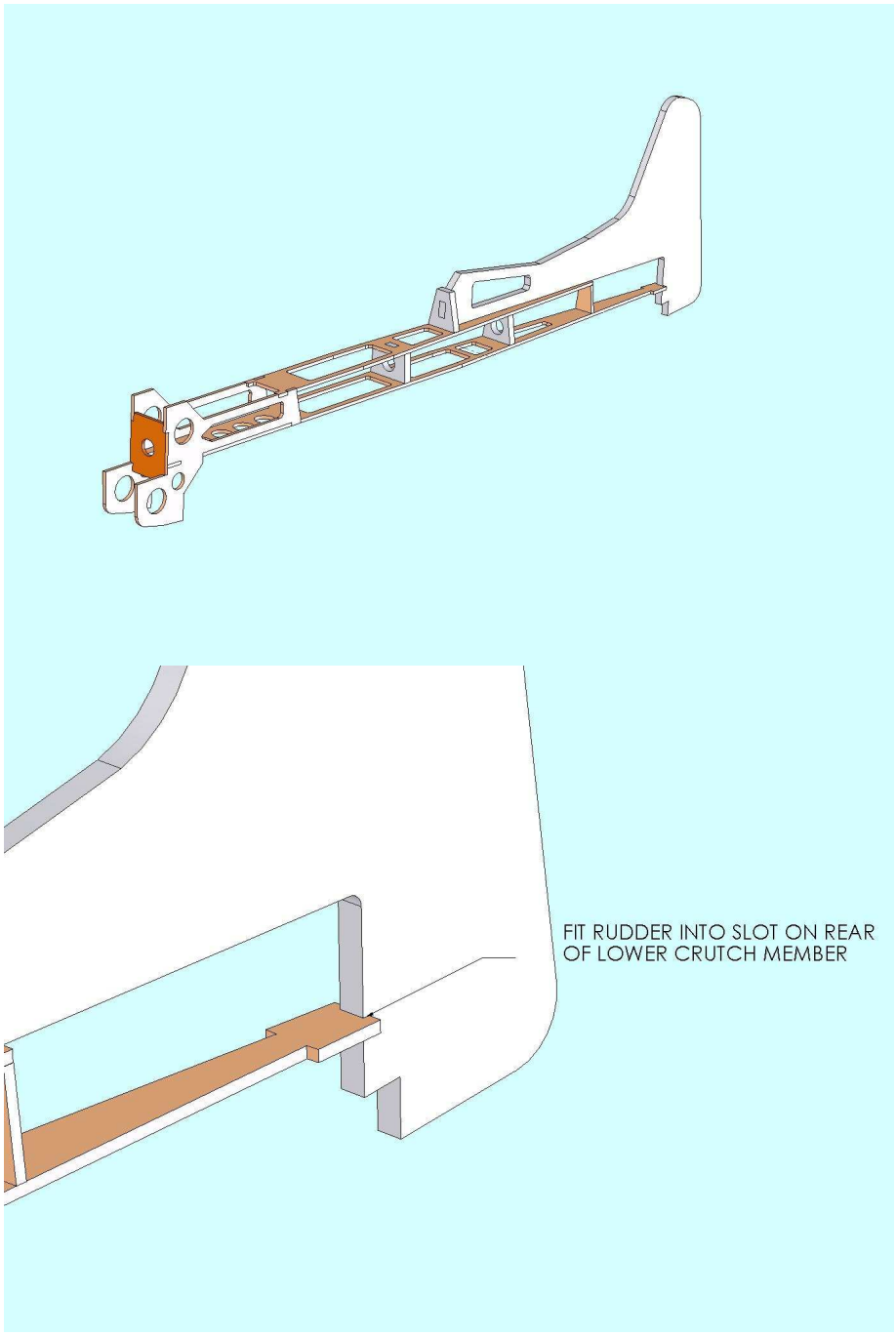
Test fit the skins on the crutch and check that the slot in the rear of the skin mates with the alignment tab on the rear of the crutch.



Step 7

Glue the rudder and turtle deck former in place with medium foam safe CA .

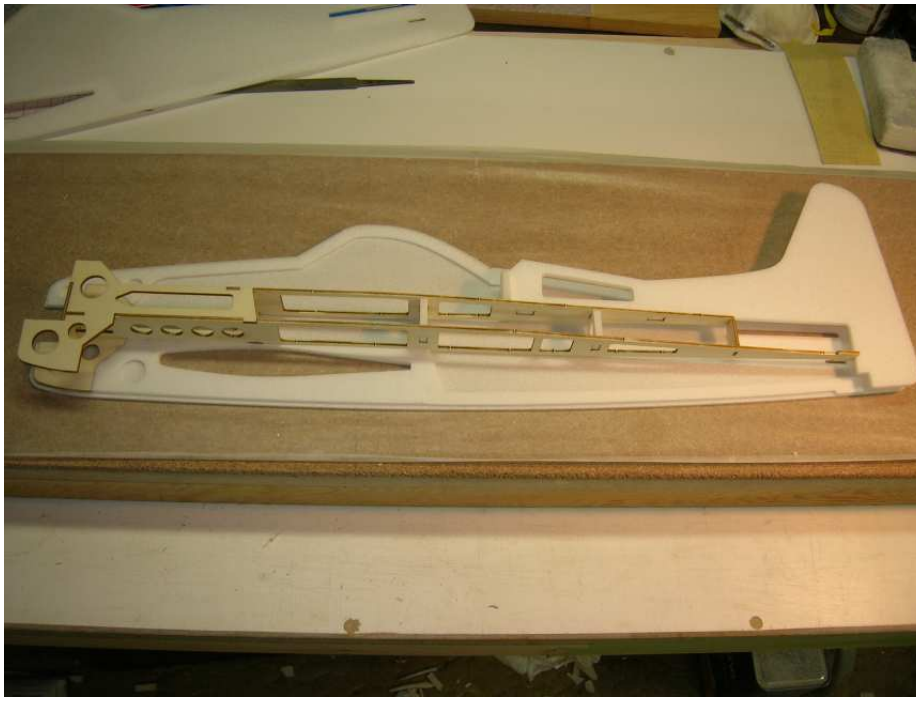
© Copyright 2007 all rights reserved



Step 7a

Before gluing, make sure the rudder is positioned into the rear slot on the lower crutch member.

© Copyright 2007 all rights reserved



Step 8

Glue the crutch to one skin assembly from the nose to just behind the wing opening with medium foam safe CA. After the glue has set, glue the skin to the lower crutch member from the wing opening to the rear tab, making sure the rear alignment tab is properly seated in the slot. DO NOT GLUE THE SKIN TO THE RUDDER JUST YET!

Repeat Step 8 for the other skin.

Step 9

Glue the top edges of the fuselage together with medium foam safe CA from just behind the canopy to just in front of the rudder forming the turtle deck.

© Copyright 2007 all rights reserved

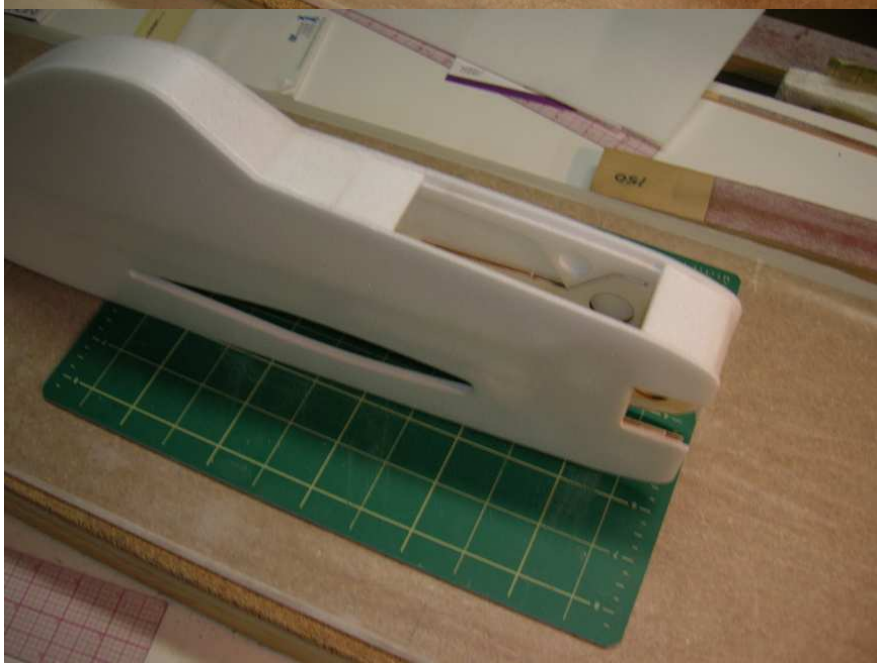
Step 10

After the glue for the top edges has set, glue the skins to the rudder with medium foam safe CA.

© Copyright 2007 all rights reserved

Step 11

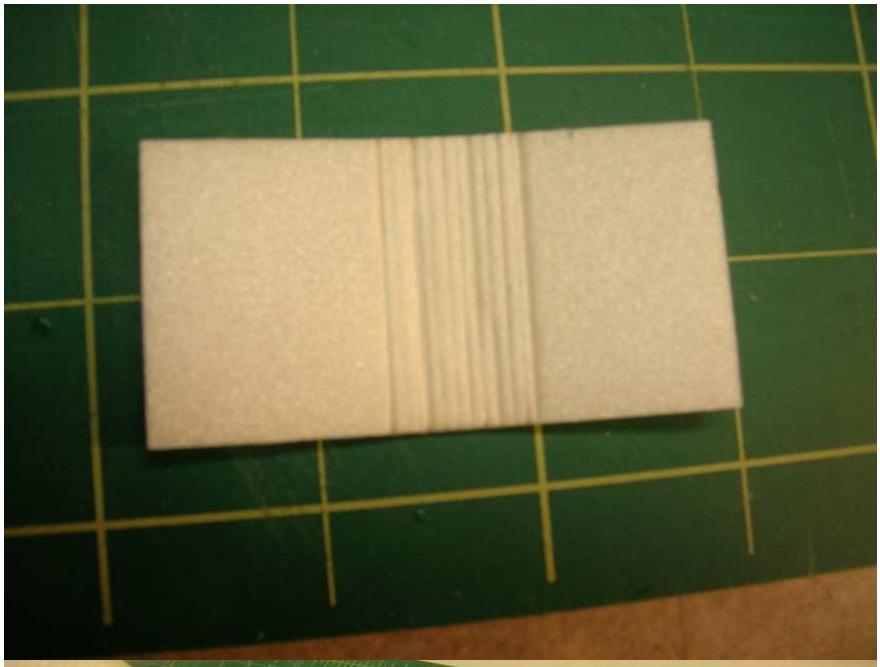
Glue the front deck in position with medium foam safe CA.



Step 12

Glue the canopy top skin and front top skin in place with medium foam safe CA. Tip: Before gluing, lightly score the backside of the top skin with a ballpoint pen to allow the foam to be bent around the nose without cracking. Pre-bend the foam before gluing in place.

© Copyright 2007 all rights reserved



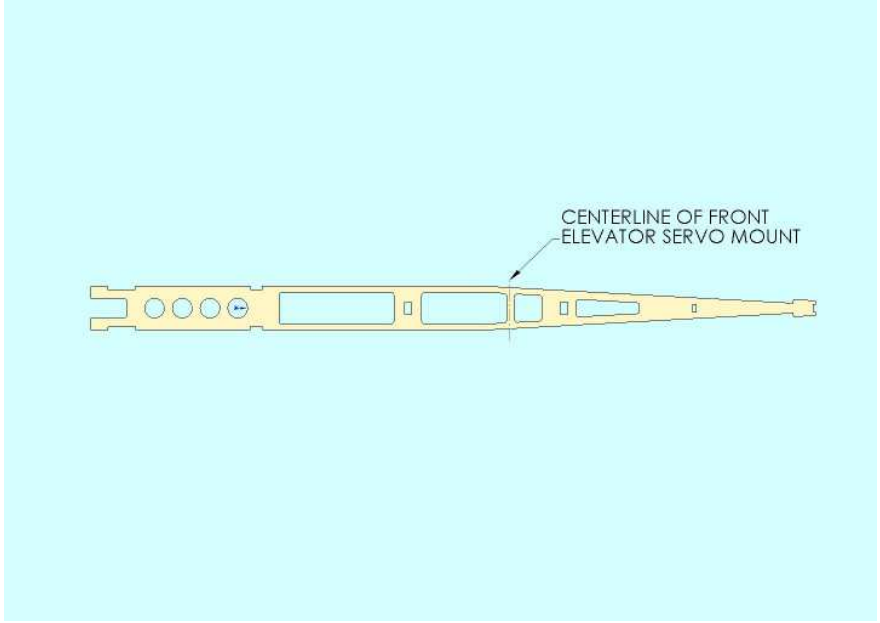
Step 13

Fit the hatch but do not glue.

© Copyright 2007 all rights reserved

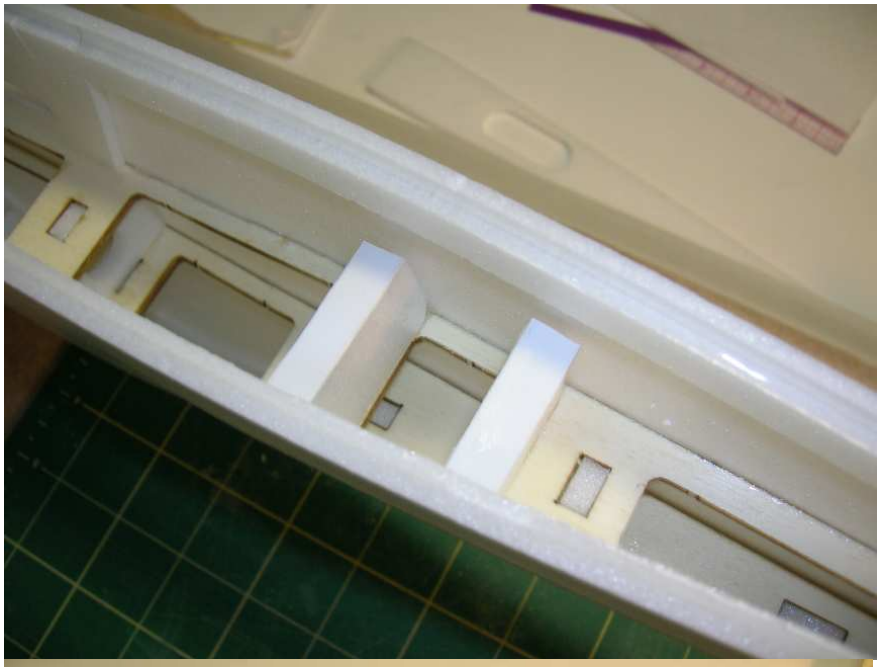
Step 14

Cut the elevator servo mount supports to size and glue in place with medium foam safe CA. Space the supports to match your servo.



The front servo mount is positioned directly over the crutch cross support.

© Copyright 2007 all rights reserved



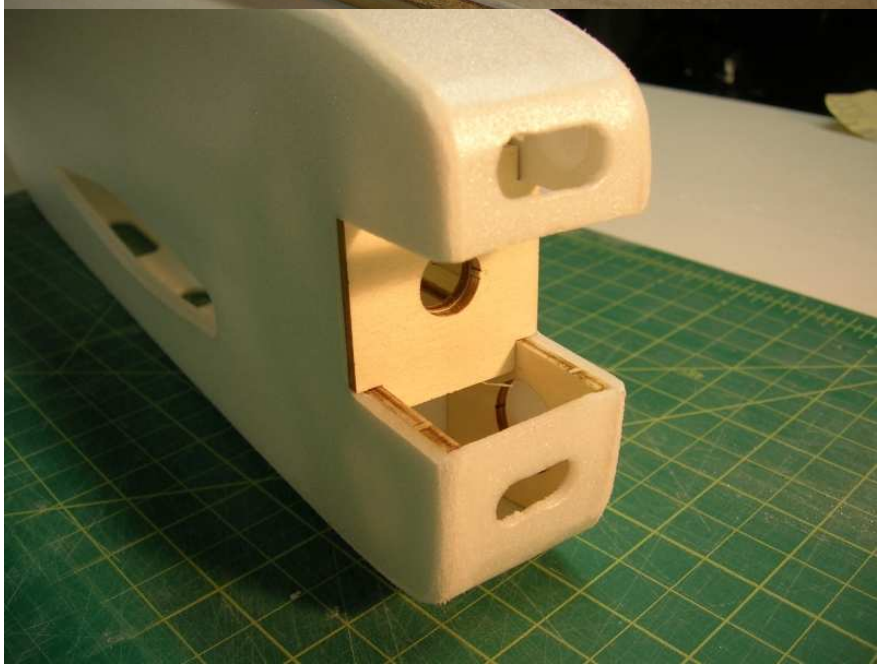
Step 15

Cap the servo mount supports with the plastic servo mounts.

Step 16

Glue the bottom skins in position with medium foam safe CA. Tip: Lightly score the backside of the bottom skin with a ballpoint pen to allow the foam to be bent around the nose without cracking. Pre-bend the foam before gluing in place.

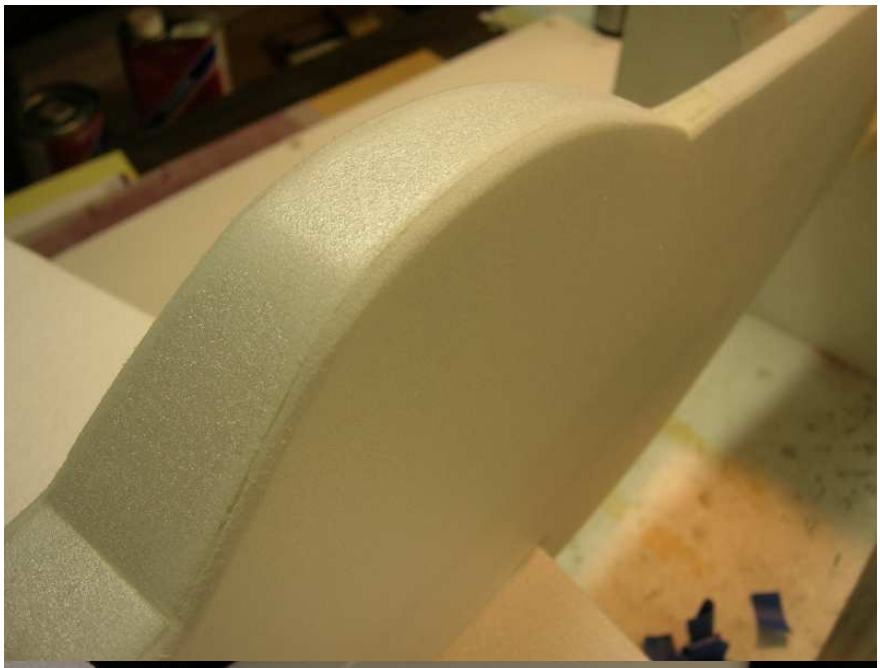
© Copyright 2007 all rights reserved



Step 17

Epoxy the motor mount in position being careful to make sure it is square and flush to the motor mount support. Cut cooling air inlet holes in nose. Tip: we find it easier to pre-drill the motor mounting holes with a 1/32" drill before gluing the motor mount in place.

© Copyright 2007 all rights reserved



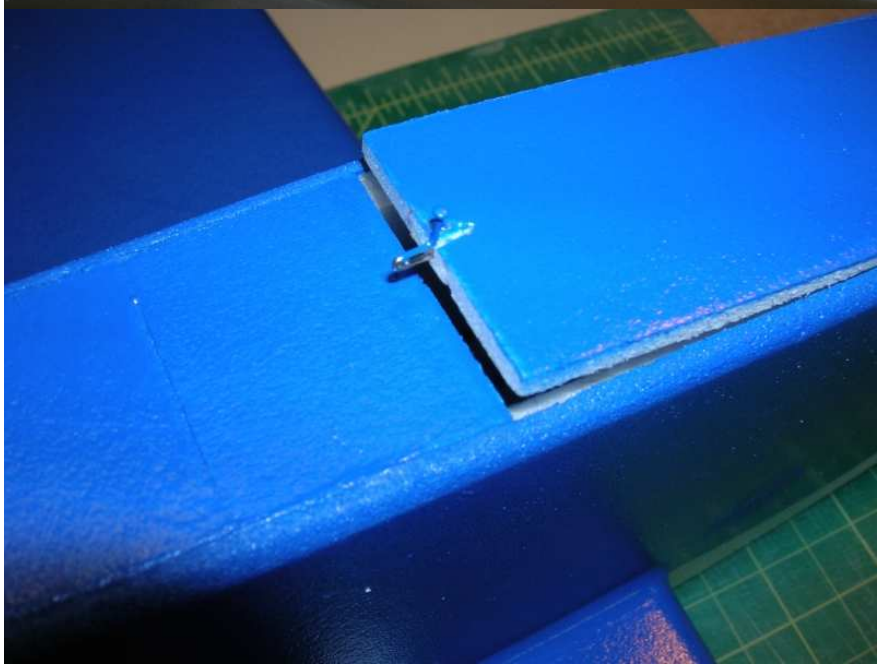
Step 18

Finish the fuselage by sanding and shaping the edges to a round shape. Be careful not to sand the surface of the fuselage as the sanding marks will affect the finish when painted.

Step 19

Hinge the battery hatch at the front with packing tape. A simple latch for the rear of the hatch can be fabricated from a straight pin bent into the shape shown. A small magnet can also be used.

© Copyright 2007 all rights reserved



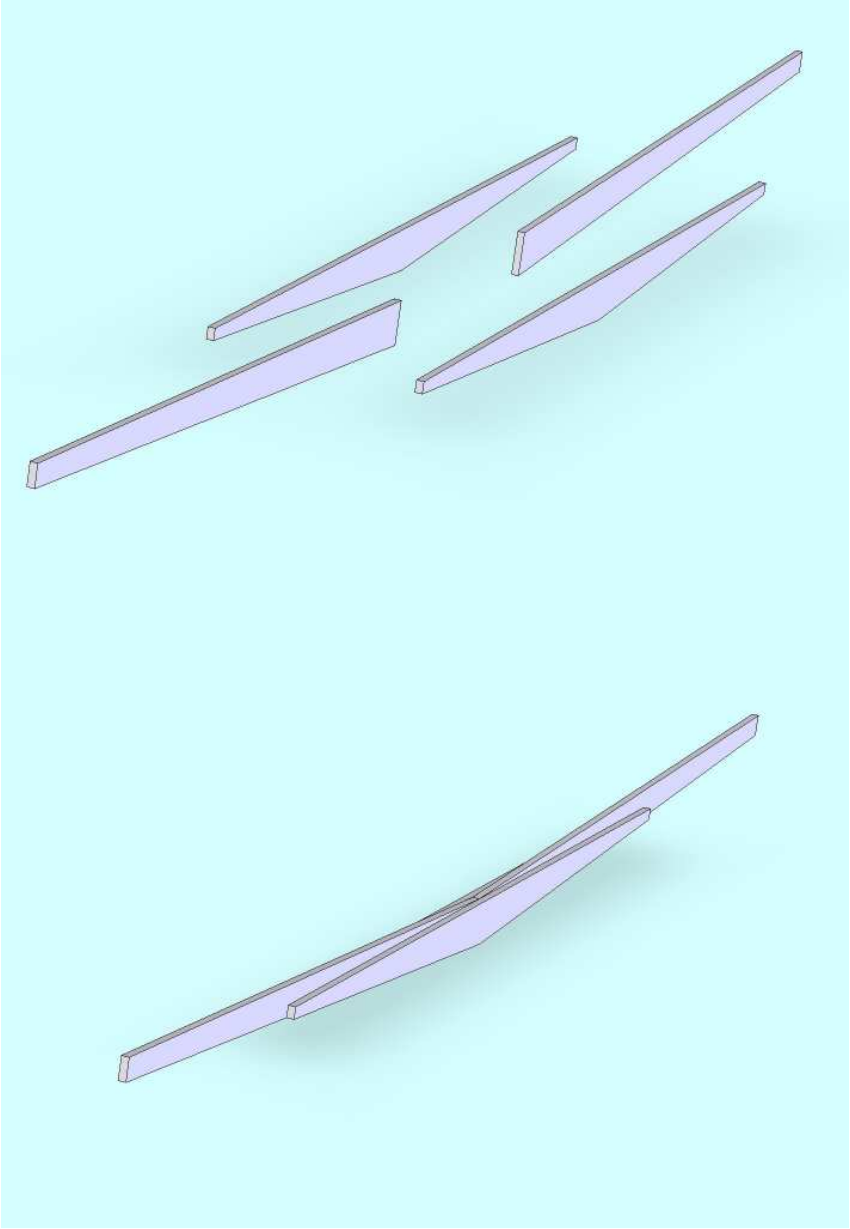
Step 19a

The bent pin latch is inserted into the hatch and slid under the front deck to secure the hatch in place.

© Copyright 2007 all rights reserved

Wing Assembly and Installation

Assembling the Spar:

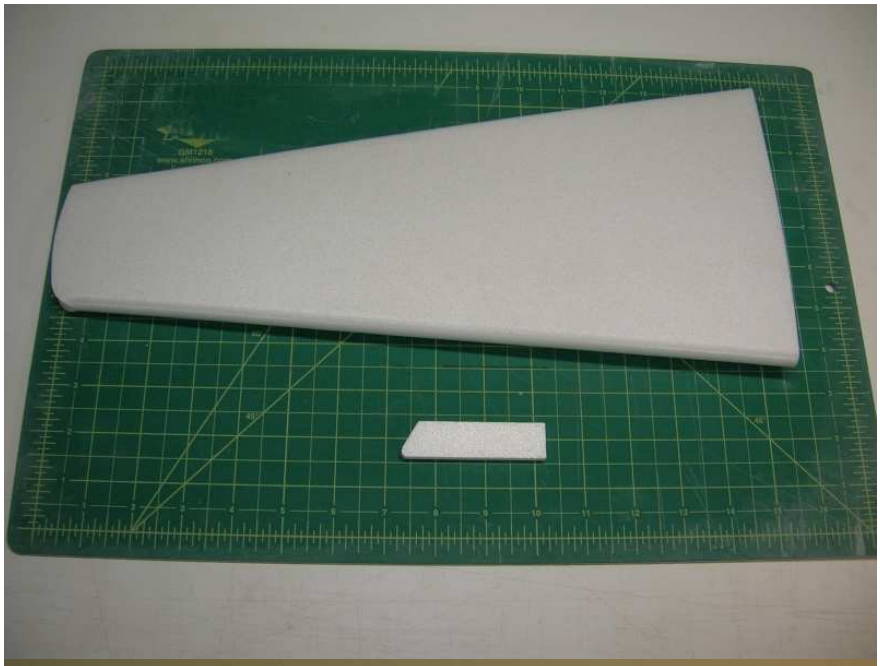


Step 20

Glue the spar sections together with thin CA being sure to match the bottom of the main spar sections with the bottom of the center doublers. Tip: Lightly sand the spar edges to help it slide into the wing.

© Copyright 2007 all rights reserved

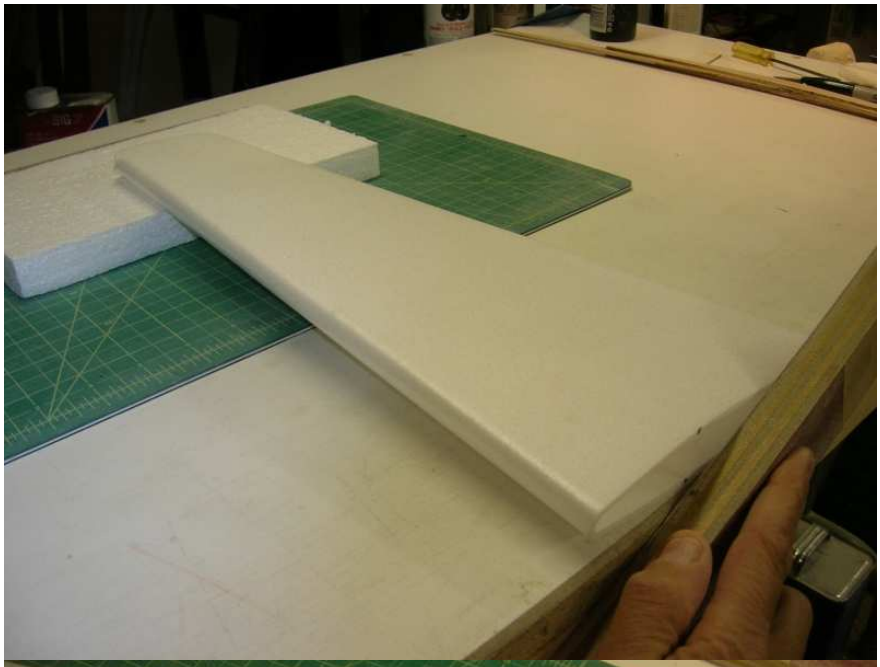
Wing Assembly:



Step 21

Temporarily insert the 6 mm foam wing chord spacer to shape the wing airfoil. DO NOT GLUE IN PLACE! Locate the spacer 2 3/8" from the wing leading edge. Tip: Recess the spacer approximately 1/8" to prevent it from moving while sanding the wing root dihedral angle.

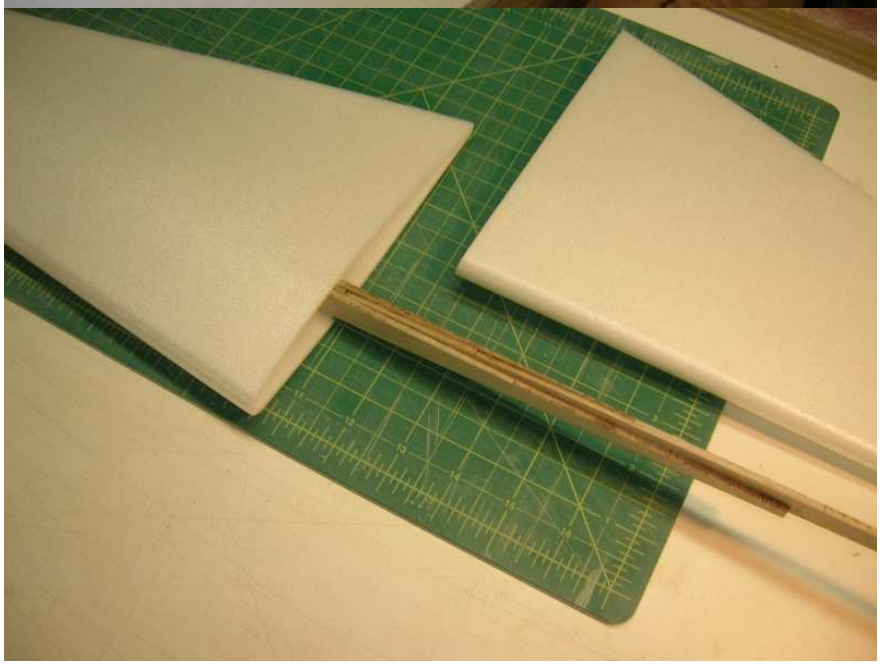
© Copyright 2007 all rights reserved



Step 22

Block up the wing tip 1-1/8" and sand in the wing root dihedral angle with your sanding block. Remove the spacer after sanding.

Make sure to make a LEFT and a RIGHT side version!



Step 23

Mark the center of the spar and test fit it in the wings. Position the spar centerline 2 3/8" from the leading edge. Glue the spar into place with Gorilla Glue or 15-minute epoxy making sure the wing root of both wings match at the center.

© Copyright 2007 all rights reserved

Step 23a

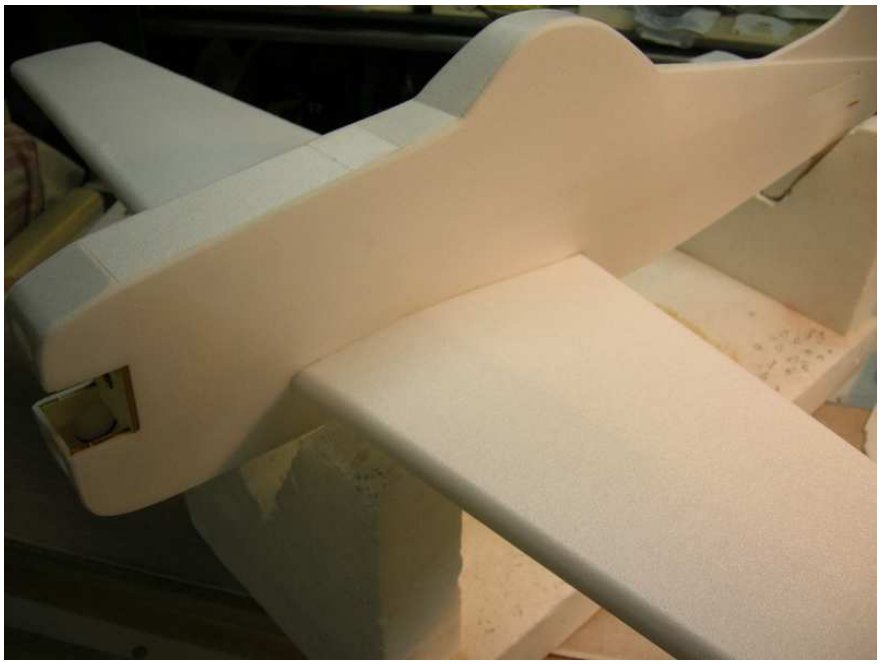
Glue the center seam with epoxy. Tip: Apply a small bead of glue on the top and bottom of 1/2 of the wing spar and slide into position in the wing. Repeat for the other wing making sure to align the root sections at the center seam. Apply the epoxy to the center seam after sliding the second wing on the spar, just before the two wings are pushed together.

Step 24

After the glue for the wing has set, glue the wing tips together with medium foam safe CA. Sand the wing tip edges to a round shape. Also lightly sand the wing trailing edges.

© Copyright 2007 all rights reserved

Wing/Fuselage Assembly:



Step 25

Test fit the wing in the fuselage. DO NOT FORCE! If the fit is tight, sand the fuselage opening to fit. Make sure the wing is centered on the fuselage and that there is equal amount of dihedral under each wing. With the wing properly aligned, tack glue it in place with medium foam safe CA.

© Copyright 2007 all rights reserved

Step 26

Permanently glue the wing in place by forming a fillet from mixture of 15 or 30-minute epoxy and micro balloons.

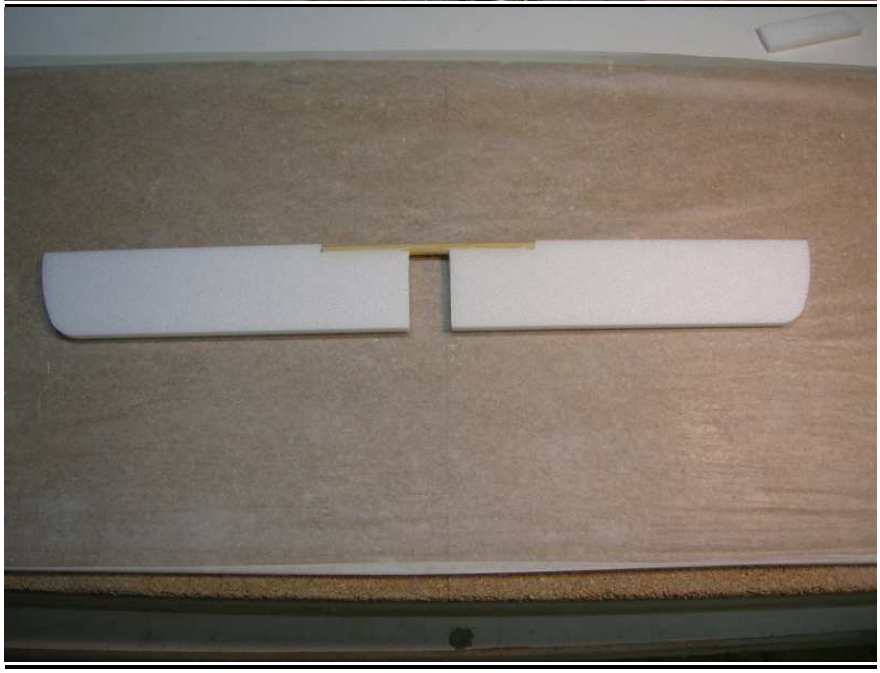
Tail Feather Assembly and Installation:

Installing the Elevator Joiner:

Step 27

Using the end of the 3/16" diameter wood elevator joiner, gently create a shallow grove in the elevator joiner cutout.

© Copyright 2007 all rights reserved



Step 28

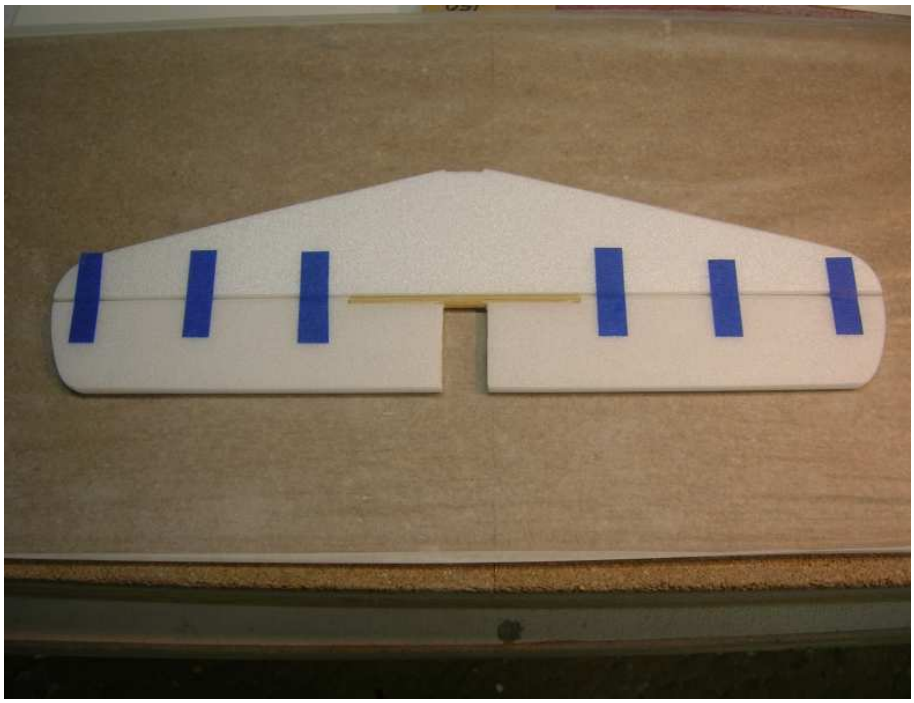
Secure the 3/16” diameter wood elevator joiner in place with epoxy. Cut out the foam bridge behind the wood joiner, between the elevator halves. Tip: For a lighter joint, a mixture of 15 minute epoxy and micro balloons can be used.

© Copyright 2007 all rights reserved

Assembling and Installing the Horizontal Stabilizer and Elevator:

Step 29

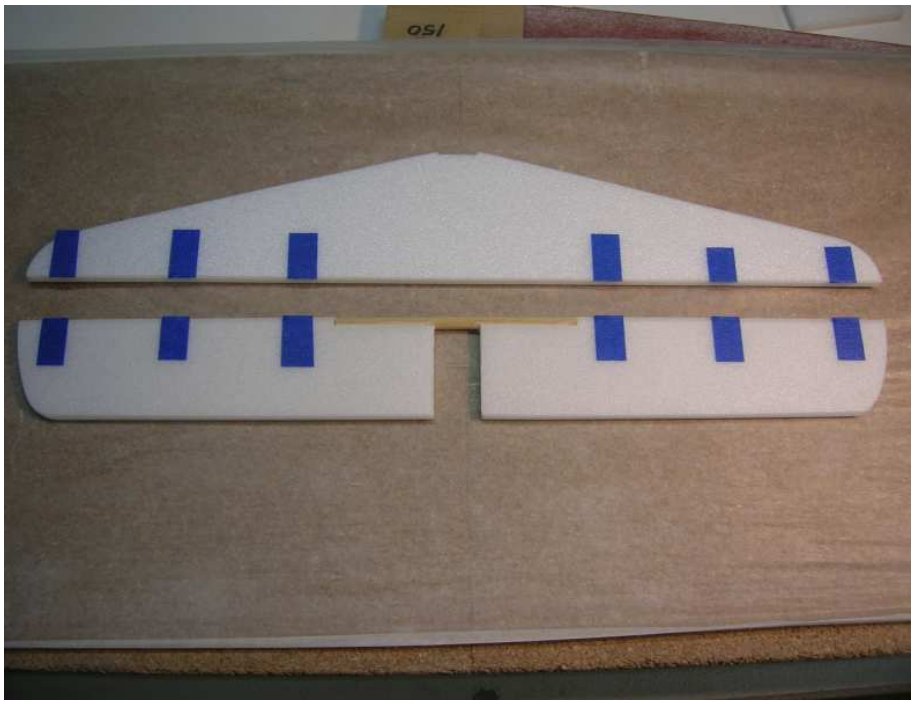
Using the sanding block, bevel the leading edge of the elevator as shown to allow for movement of the elevator when hinged. Lightly round the outside edges of the stabilizer and elevator with your sanding block.



Step 30

Temporarily secure the elevator to the stabilizer with tape. Mark the position of the elevator hinges with strips of $^{3}/_{8}$" wide painter's tape. Use 3 hinges on each side of the elevator. Cut the tape along the hinge line and remove the elevator.

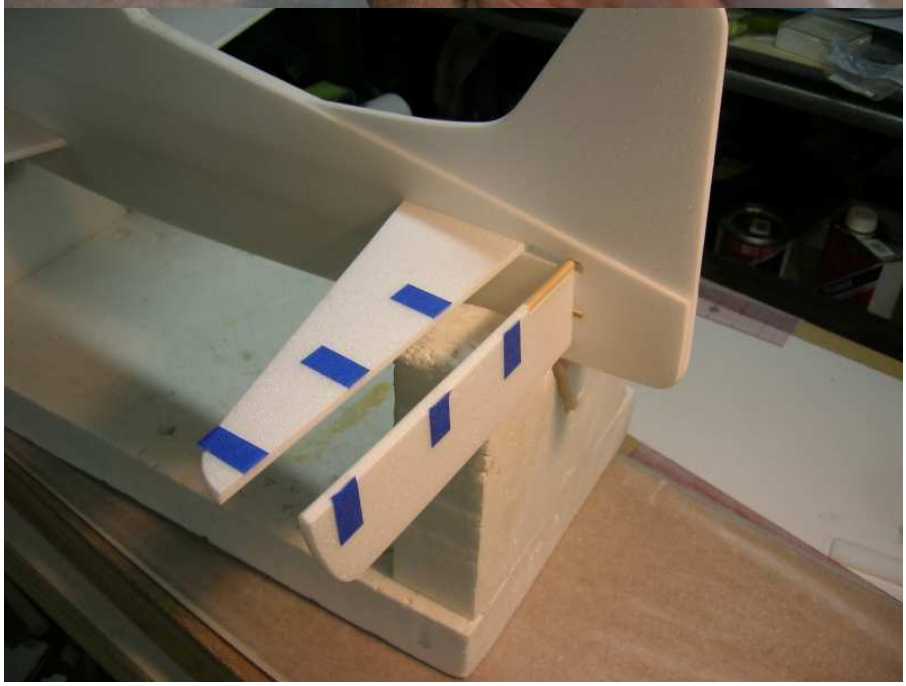
© Copyright 2007 all rights reserved



© Copyright 2007 all rights reserved

Step 31

Using your Exacto knife, carefully cut a slit along the centerline of both the stabilizer and elevator at each hinge location. Test fit the hinges into the slits. NOTE: Do not glue the hinges in place at this time.



Step 32

Test fit the stabilizer in the fuselage and check that it fits square to the fuselage and wing. Remove the stabilizer and insert the elevator in the fuselage slot. Insert the stabilizer in position, making sure it is square to the fuselage and the wing. Glue the stabilizer in place with medium foam safe CA

© Copyright 2007 all rights reserved

Step 33

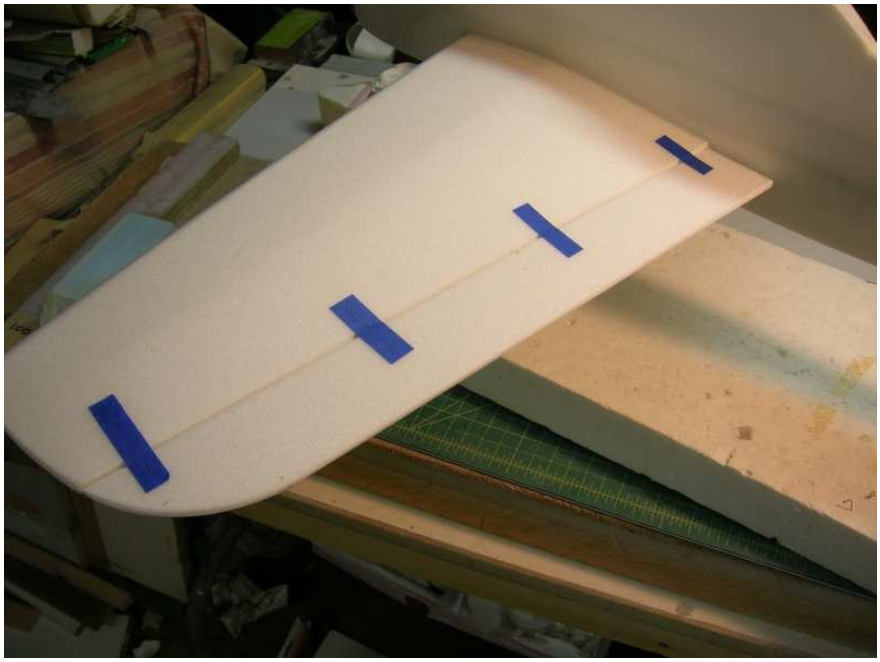
Epoxy the hinges in place.

Aileron Installation:

Step 34

Using the sanding block, bevel the leading edge of the ailerons as shown to allow for movement of the ailerons when hinged. Sand the trailing edge of the ailerons round using the sanding block.

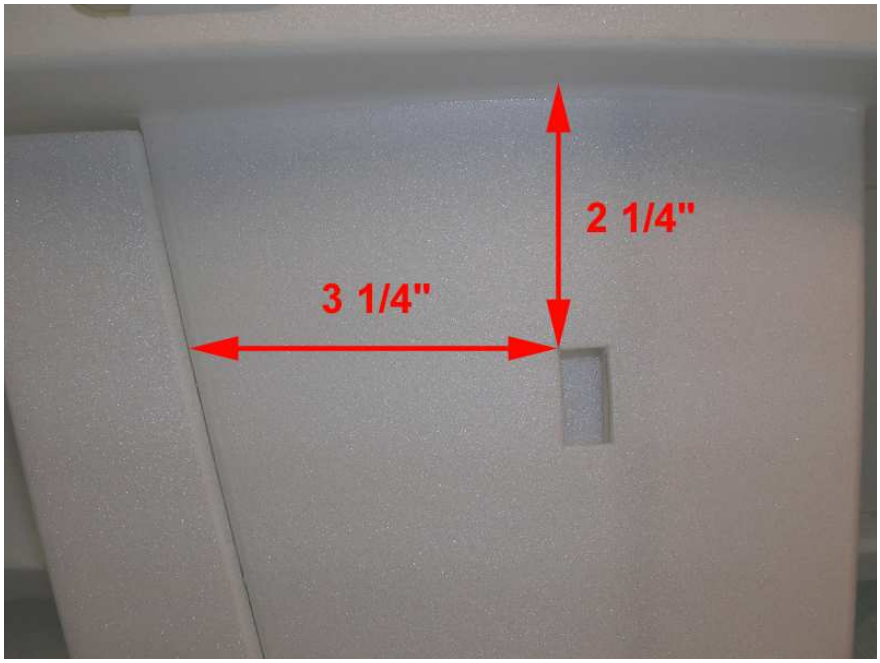
© Copyright 2007 all rights reserved



Step 35

Temporarily secure the ailerons to the wing with tape. Mark the position of the aileron hinges with strips of $^{3}/_{8}$" wide painter's tape. Use 4 hinges for each aileron. Cut the tape along the hinge line and remove the ailerons. Using your Exacto knife, carefully cut a slit along the centerline of both the aileron and the wing trailing edge at each hinge location. NOTE: that the wing has a glue seam along the centerline of the trailing edge. Make all the slits in the wing trailing edge as close as possible to the centerline, directly above the glue seam!

Aileron Servo Mount Installation:



Step 36

Mark the wing servo locations on the bottom surface of the wings. The recommend servo location using Hitec HS-55 servos is shown. Cut the hole in the wing skin for the servo using your Exacto knife..

© Copyright 2007 all rights reserved

Step 37

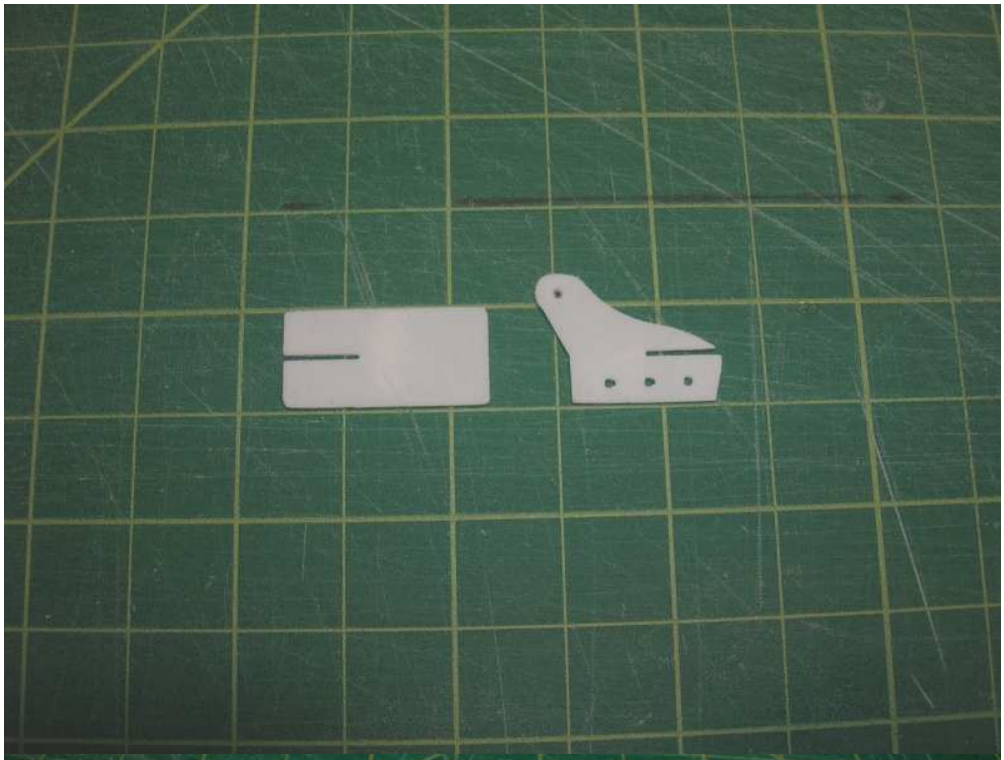
Test fit the servos in the holes. Mark the location of the plastic servo mounts and remove the servos. Glue the servo mounts in place with foam safe CA. Drill a 1/32 inch diameter pilot hole in the servo mounts at each servo mounting lug location.

Step 38

Cut an exit hole for the servo leads in the wing inside the fuselage, being careful to avoid cutting into the wing spar. Tip: A brass tube with one end sharpened makes a great punch.

Control Horn Installation:

© Copyright 2007 all rights reserved



Step 39

Sand the edges of the plastic control horn parts to remove the edge caused by the laser cutting. Drill a 1/32" diameter hole in the horn to accept the push rod. Test fit the components together.

© Copyright 2007 all rights reserved

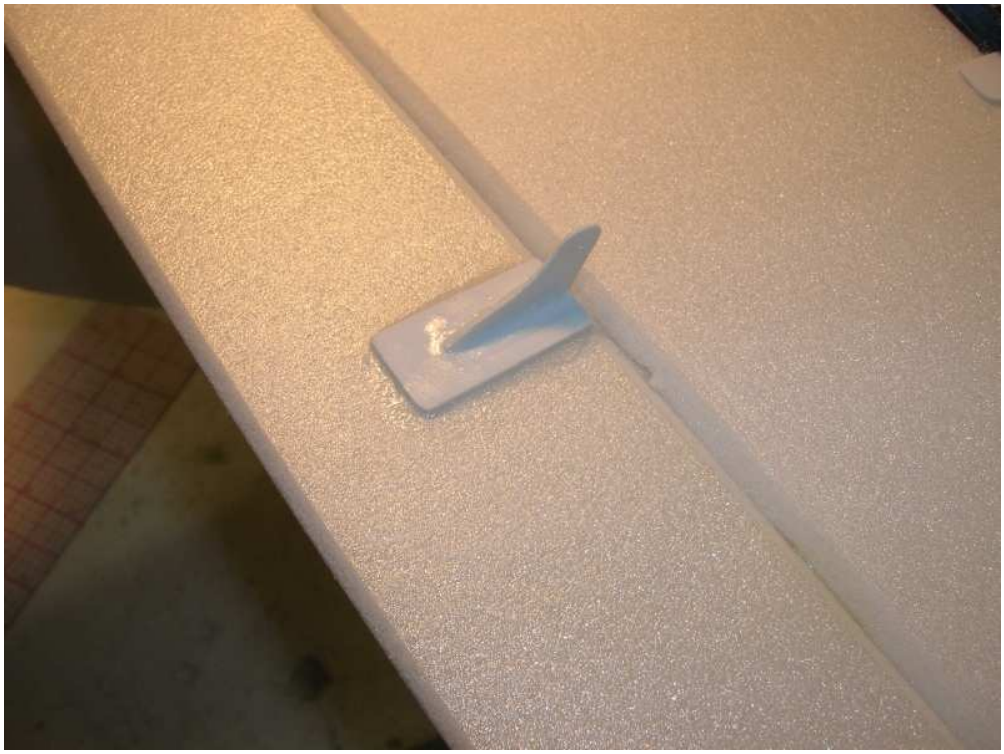
Step 40

Mark the location of the control horns on the control surface and cut a slit in the control surface with an Exacto knife to accept the control horn mounting tab.

Step 41

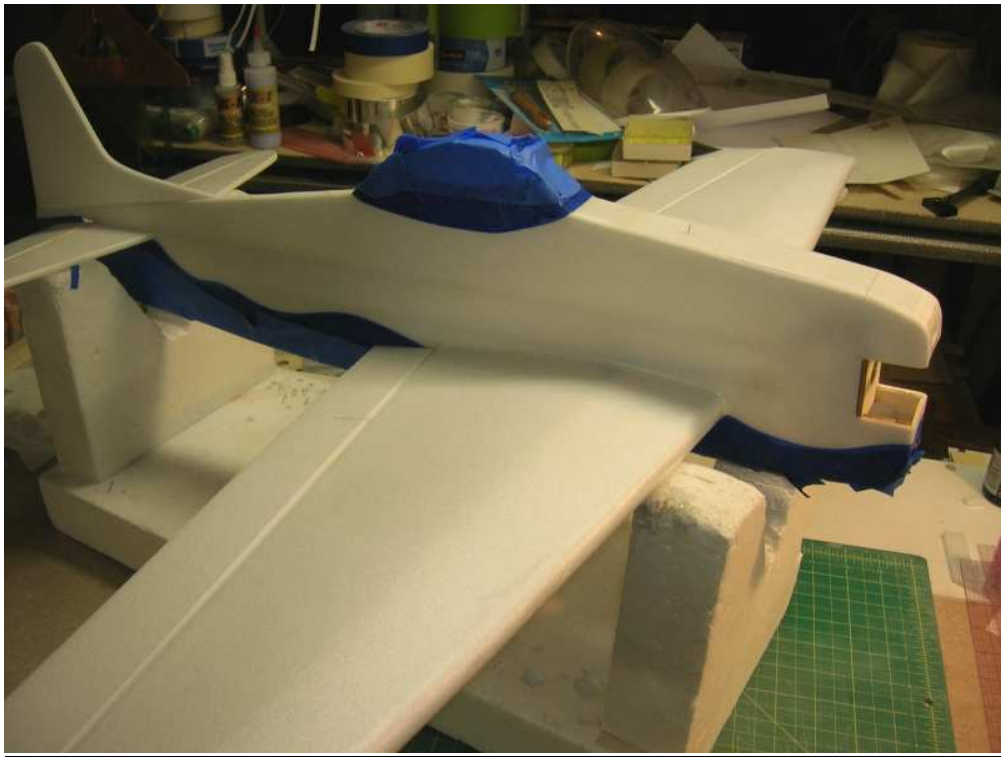
Glue the control horns in place with Medium foam safe CA.

© Copyright 2007 all rights reserved



Painting the airframe:

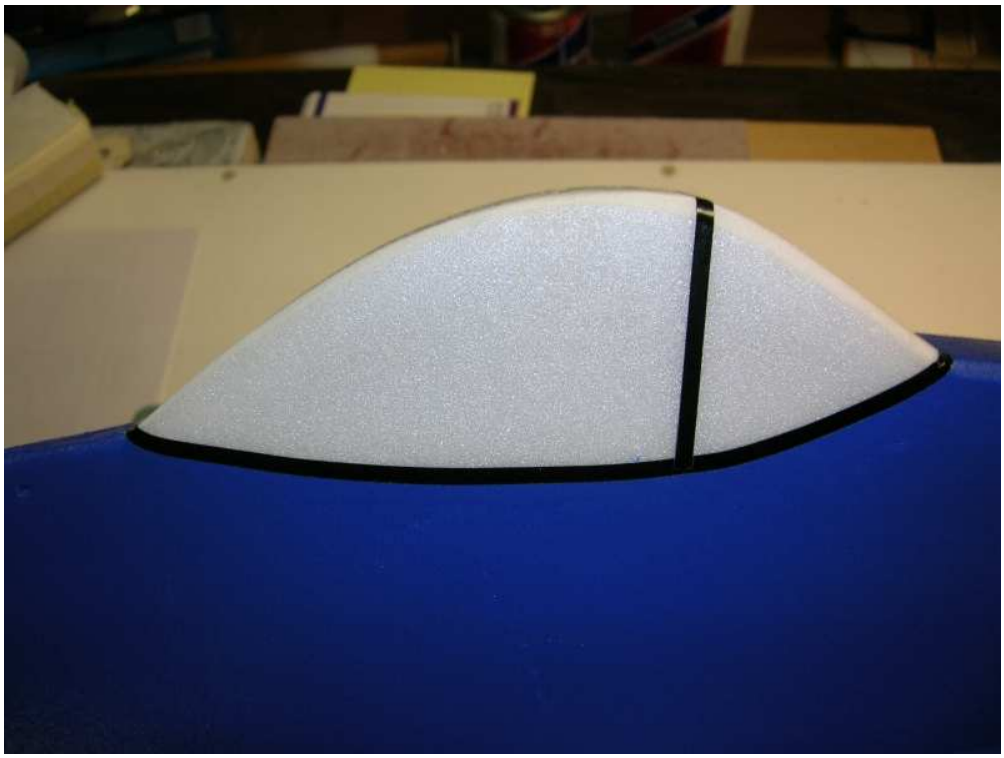
All the Bearcat prototypes were painted with Krylon H2O paint. This paint is foam safe and provides a great looking surface finish. As a precaution, keep the spray nozzle at least 12" away from the foam to prevent possible damage from the propellant.



Step 42

Mask the areas not to be painted with painters tape.

© Copyright 2007 all rights reserved



Step 43

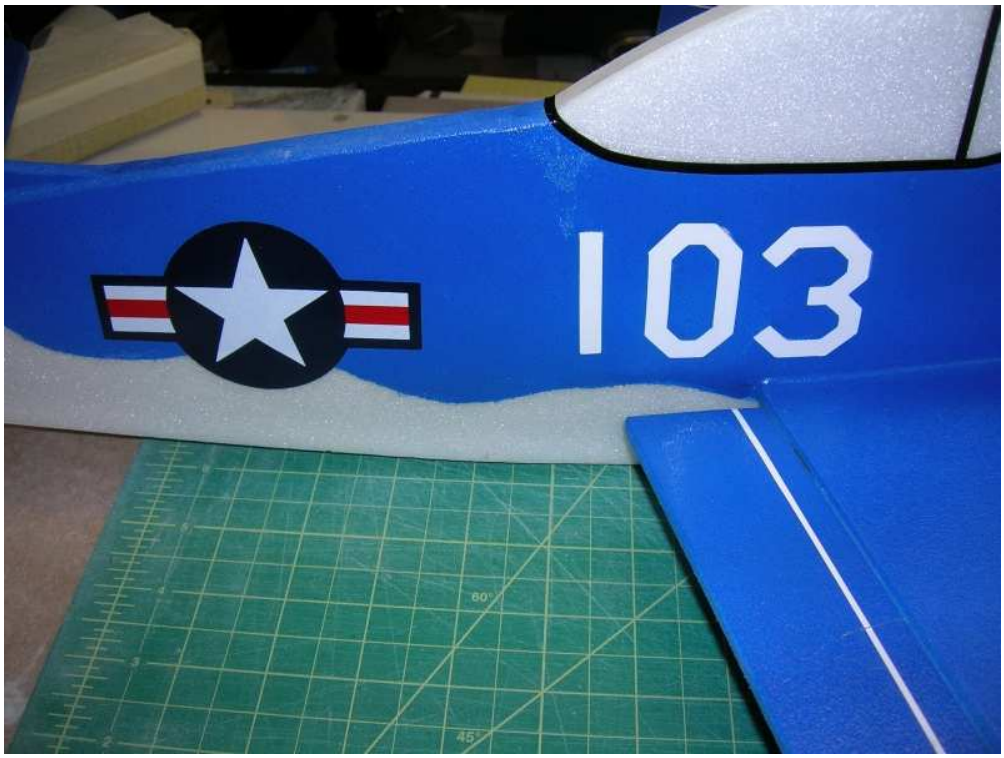
Apply several light coats of Krylon H2O paint being careful not to have the paint run. Remember, excess paint is excess weight!

When the paint is dry, remove the masking tape and outline the canopy with 1/8" wide black auto pinstripe tape.

Step 44a

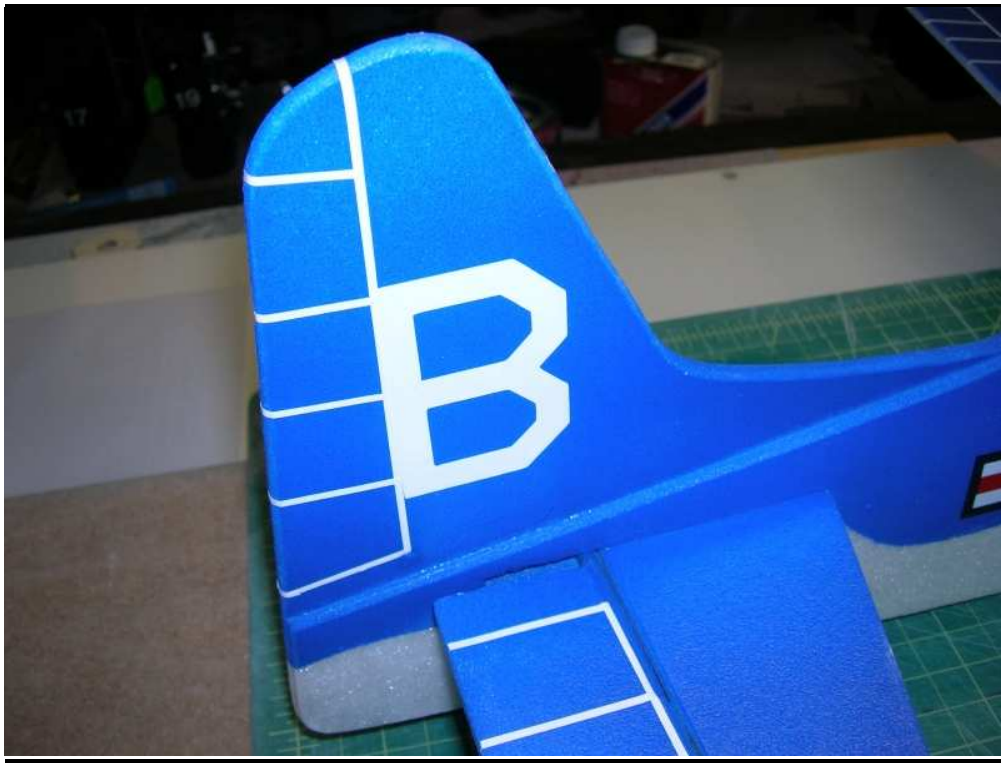
Apply the remaining graphics.

© Copyright 2007 all rights reserved



Step 44b

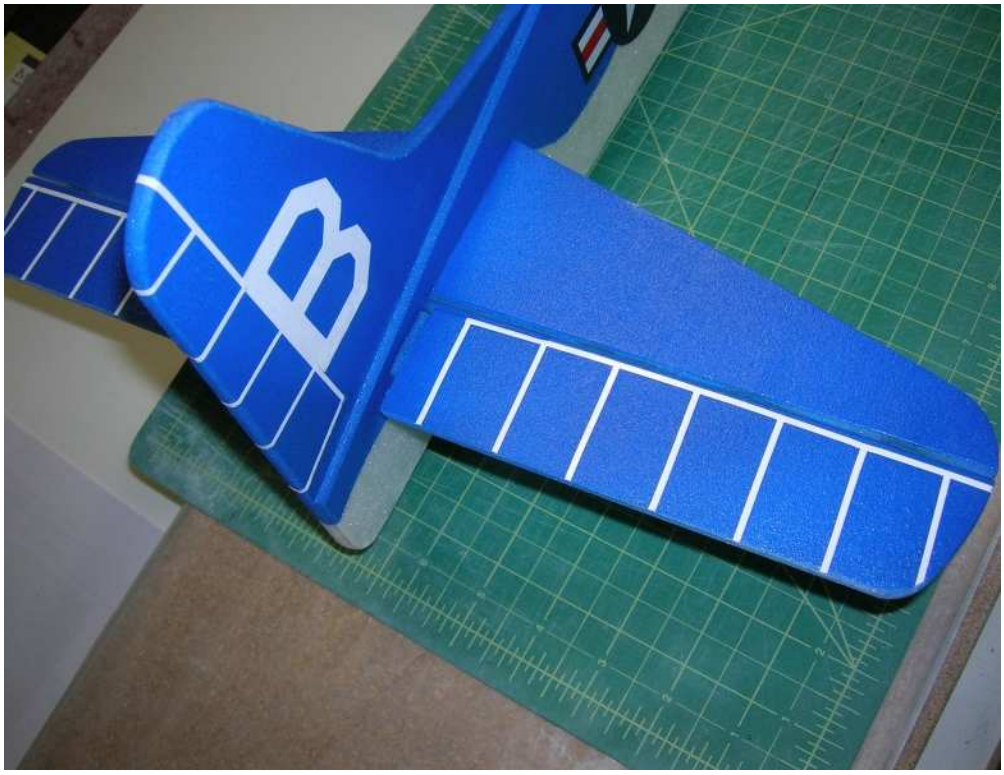
Apply the remaining graphics.



Step 44c

Apply the remaining graphics.

© Copyright 2007 all rights reserved



Step 44d

Apply the remaining graphics

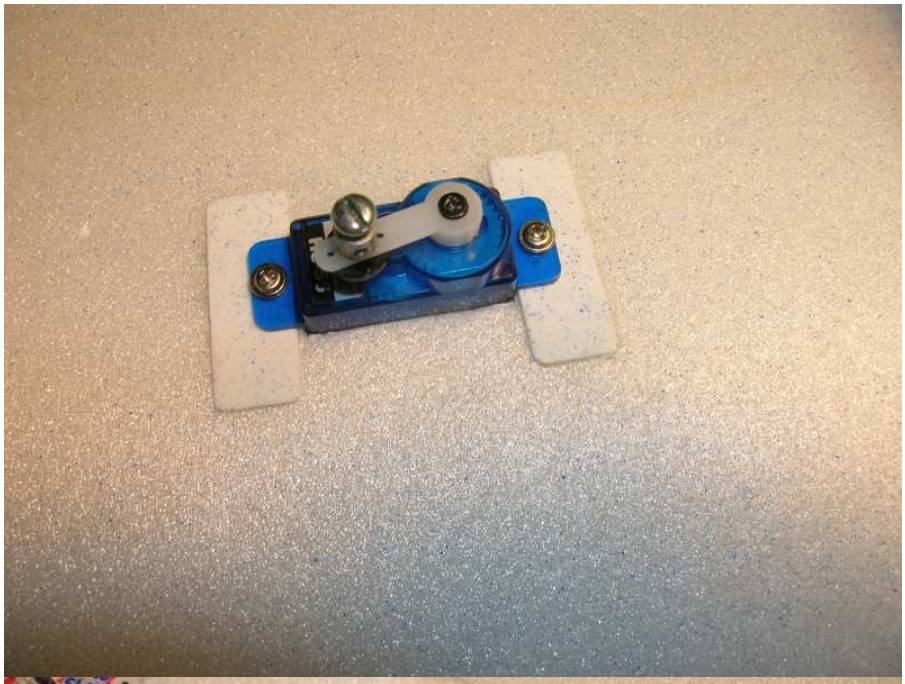
Step 45

Admire your work!

Motor, ESC, Servo, Receiver and Battery installation:

Aileron Servo Installation:

© Copyright 2007 all rights reserved



Step 46

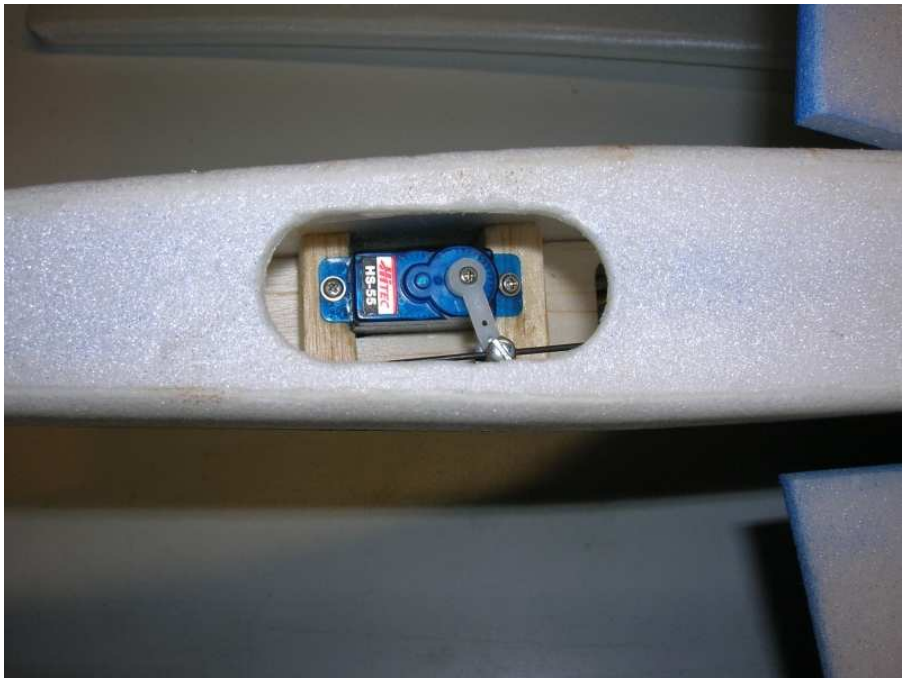
Secure the servos in place with the servo mounting screws provided with the servos. Do not over-tighten the screws as you may strip the screw holes.

Step 47

Route the aileron servo leads through the interior of the wing, and out through the exit hole.

Elevator Servo Installation:

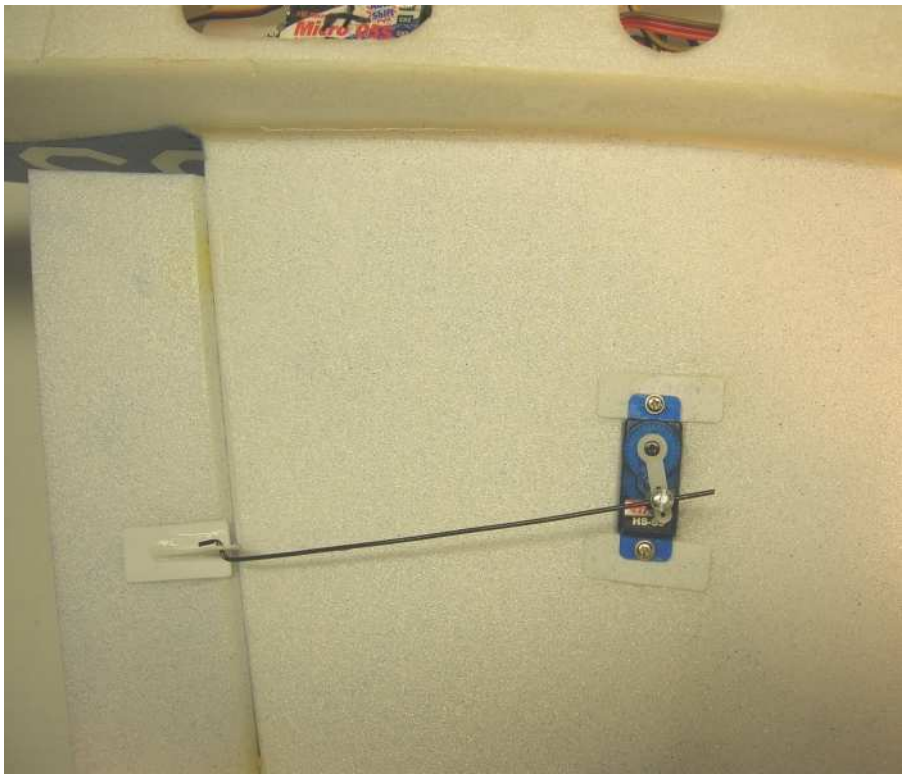
© Copyright 2007 all rights reserved



Step 48

Install the elevator servo on the servo mounts inside the fuselage. Pre-drill the screw holes with a 1/32" drill before installing the screws. Do not over-tighten the screws as you may strip the screw holes.

Push Rod Installation:



Step 48

Install the 1/32" diameter wire aileron push rods securing at one end with a Z bend and the other end with a Dubro Mini EZ connector.

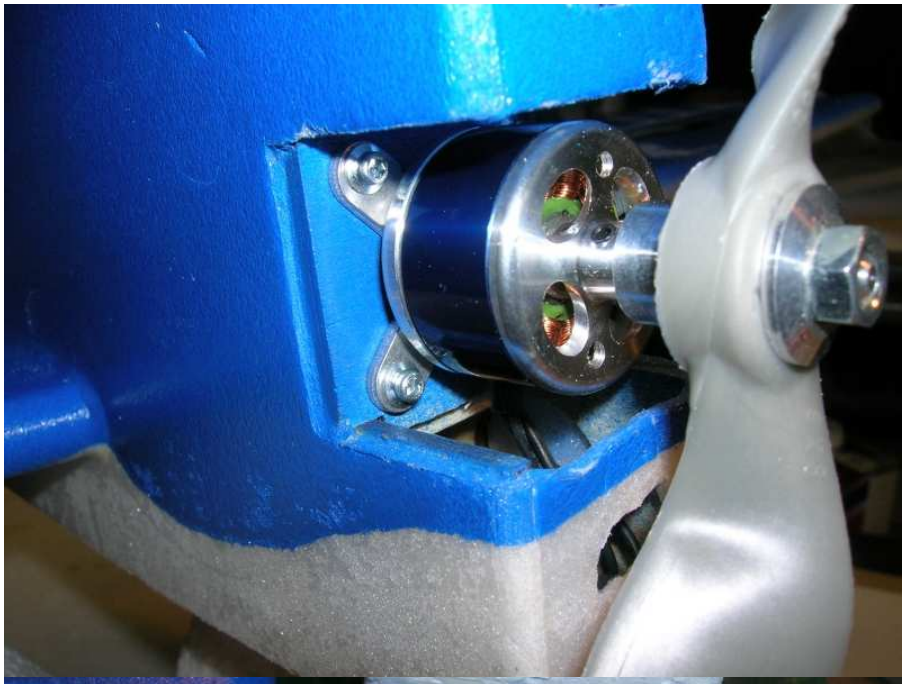
© Copyright 2007 all rights reserved

Step 50

Cut a 1/32” wide exit slot for the pushrod in the fuselage side with an Exacto knife.

Install the 1/32” diameter wire elevator push rod securing it at the servo end with a Dubro Mini E/Z Connector, and at the control horn end with a Dubro E/Z Link.

© Copyright 2007 all rights reserved



Step 51

Position the motor radial mount and mark the position of the mounting holes. Drill 1/32" diameter pilot holes in the plywood motor mount for the mounting screws. Mount the motor using #2 wood screws and #2 washers. Check to make sure the motor turns freely and there is no interference between the rotating motor components and the fuselage.

Step 52

Mount the ESC with Velcro inside the fuselage as shown.

© Copyright 2007 all rights reserved

Step 53

Mount the Receiver with Velcro strips inside the fuselage on the lower wing surface as shown.

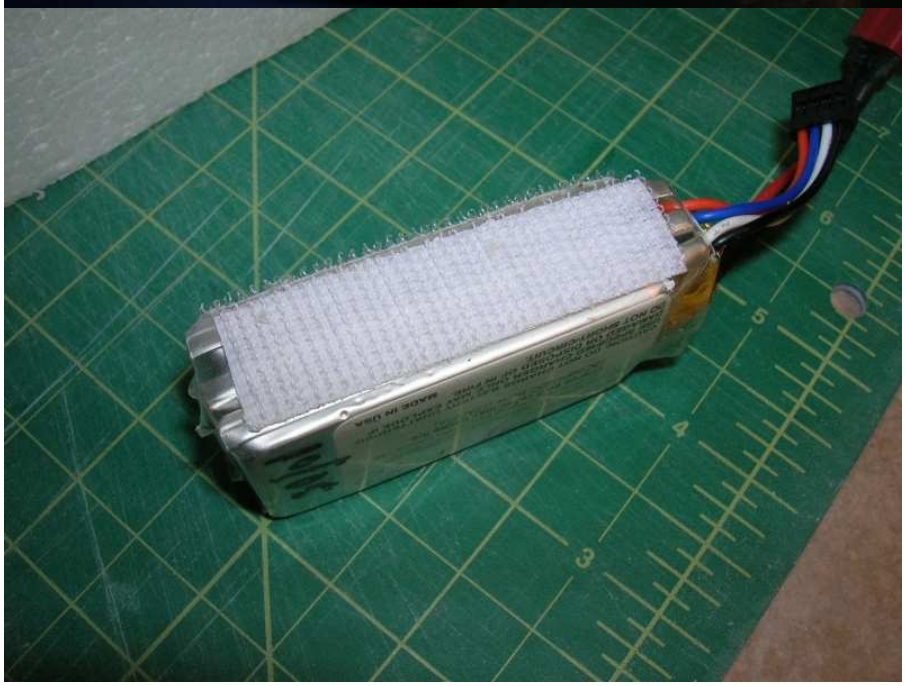
Step 54

Mount the battery with Velcro strips inside the fuselage as shown.

© Copyright 2007 all rights reserved

Step 54a

Velcro strips inside the fuselage on the top crutch.



Step 54b

Velcro strip on the battery.

Pre-flight checklist

Balancing:

We recommend that you perform initial flights with the CG at the spar location. (2 3/8 inches behind the leading edge, at the wing root). Adjust the CG to get the flight characteristics that suit your taste.

Electrical Components:

© Copyright 2007 all rights reserved

Check that all electrical components are securely attached and the all plugs are fully seated. Secured any extra length on servo leads neatly within the fuselage or the wing. Avoid loose or dangling wires. We recommend the use of a micro antenna such as the Azarr, or the RC Direct Peel & Stick Antenna.

Controls:

Check that all the control surfaces move in the correct direction. Adjust the position of the pushrods in the servos and control horns to give 25^0 of control surface travel for the ailerons and 15^0 for the elevator. If you radio has a dual rate function set the low rates to suit your taste. We recommend 25-40% expo to start.

Prior to each day's flying, always perform range check of your equipment in accordance with the manufactures instructions.

© Copyright 2007 all rights reserved