



Kit Contents

Part No.	QTY.	Dimensions	Description
001201a	3	Laser Cut 3mm Foam	Foam Kit Parts
001201b	7	Laser Cut 2mm Foam	Foam Kit Parts
001202	1	.230" x 32" Dia. Carbon	Main Carbon Spar
001203	2	.125" x 7.25" Carbon	Wing Tip Spar
001204	1	.125" x 5" Carbon	Elevator Joiner
001205	1	6" x 2 1/4" x 1/8" Laser Cut Birch	Motor Mount and Beveller
001206	1	Velcro	Battery Mount Strap
001207	1	.040" x 48" Carbon Rod	Aileron/Elev./Rud. Pushrods
001208	1	CD ROM	Instruction/Plans CD
001209	4	Dubro EZ Connectors	Pushrod Assembly's
001210	4	Dubro Micro Clevis Set	Pushrod Assembly's
001211	13	Robart Hinge Points	Hinging
001212	4	.030" x .121" x 48" Carbon Strips	Fuse Spars
001213	1	.125" x 11" Carbon Tube	Rear Wing Spar
001214	1	1/16"x 6" Plastic Tube	Pushrod Guides
001215	4	CNC Machined Carbon Fiber	Control Horns
001216	1	Laser Cut Plastic	Velcro Strap Doublers
001217	1	8.5"x11"	Decals

Additional items you will need to make your plane tear up the sky!

<input type="checkbox"/> 2- 2" wheels (Optional)	<input type="checkbox"/> 4- 1/8" wheel collars (Optional with gear)	<input type="checkbox"/> 4-6 Ch Radio System with 4 micro servos and mini or micro receiver (HS-55 or similar)
<input type="checkbox"/> Odorless Medium CA and accelerator. (Accelerator a must)	<input type="checkbox"/> Plugs – One set of Dean's micro for speed controller to motor and to battery/Charger.	<input type="checkbox"/> Castle Creations Phoenix 25 speed controller
<input type="checkbox"/> 5 or 15 minute Epoxy	<input type="checkbox"/> Li-Poly Battery pack (Falcon Batteries Predator 1600 mah 3s1p recommended)	<input type="checkbox"/> Li-Po Charger (Must be approved for Li-Po Cells!)
<input type="checkbox"/> Scotch Multitask clear tape	<input type="checkbox"/> Hacker A20-20L brushless outrunner motor	<input type="checkbox"/> Extra high quality flexible hook up wire.

Building Supplies that make it easy.

<input type="checkbox"/> Scissors	<input type="checkbox"/> #80/ #120 sand paper	<input type="checkbox"/> Steel straight edge
<input type="checkbox"/> Razor saw	<input type="checkbox"/> Hobby Knife and extra blades	<input type="checkbox"/> Small building square
<input type="checkbox"/> Denatured Alcohol	<input type="checkbox"/> Pencil and Pen	<input type="checkbox"/> Wire cutters
<input type="checkbox"/> Soldering iron	<input type="checkbox"/> Assorted screwdrivers	<input type="checkbox"/> Paper towels

Definitions

- **LE-** Leading Edge
- **CA-** "Super Glue"
- **Brushless-** New motors, no brushes, computer controlled.
- **3S1P-** 3 cells, 1 Pack
- **HA-** High Alpha Flight. Also called 3D flight.
- **TE-** Trailing Edge
- **Brushed-** Normal motor type, brushes, can, magnets.
- **Li-Poly-** New Battery packs. Lithium Polymer (Cell phone battery type)
- **3S2P-** 3 cells, 2 packs
- **"C" Rating-** the maximum charge or discharge rate of the cell. A 1000 mah pack rated at "10C" could provide a 10 amp discharge. All packs should be charged at "1C" (1000mah pack should charge at 1000 mah max. That means a 1 hour charge time.

General Construction Notes

- 1) Start by thoroughly reading this manual from front to back BEFORE YOU START BUILDING! This is not your average foamy, and many steps must be done in proper sequence. Also look carefully at the plans. Many items are addressed more clearly on the plans. It is HIGHLY RECOMMENDED that you print the plans out! You can print them on 8.5" x 11" paper and tape the pages together (tiled) or you can print the full size plans at Kinko's.
- 2) The foam is custom laser cut at the 3D Foamy Models Shop and has tabs to keep the parts in their sheets for shipping. You will want to CUT the tabs off, not just break them out.
- 3) Use odorless medium CA everywhere you can. Remember that accelerator is a must! It will take hours to dry on its own.... Hot melt glue works very well for mounting servos and electrical components, but hot melt glue is heavy so use it sparingly.
- 4) Glue everything to the plane (servos, speed controller, receiver, receiver, etc.). To ease disassembly (if required), wrap the items mentioned in shrink wrap or tape first. Then glue in place with the tape protecting the electronics. To disassemble, cut the part loose and then remove the tape.
- 5) PAINTING: Painting is not necessary. However, test the paint on a small scrap first. Check the "Painting" section for brands that work well. If masking for painting, use blue low adhesive tape or else when the tape is removed, the smooth surface of the foam may be inadvertently removed as well. An alternative to painting is vinyl film found at any sign shop. It is easy to use, self adhesive, and low cost.



Electronics Notes

There are many choices to make when deciding on your power system and it can get confusing. Below I listed everything out for you so you know exactly what works. This is the

setup that is recommended for the best performance. Items like the motor mount and servo installation were specifically designed to accommodate the items below. Other systems will work just fine, but it's up to you to adjust the airframe to suite your electronics and motor.

Motor: Hacker A20-20L brushless motor

Battery: 1600-2200 mAh **3S1P** Li Poly pack.

Speed Control: Castle Creations Phoenix 25 brushless controller.

Radio System: Hitec Electron 6 receiver. 4-Hitec HS-55 sub micro servos.

Charger: Must be approved and designed to charge Li Poly packs.

Prop: APC Slofly 10x4.7

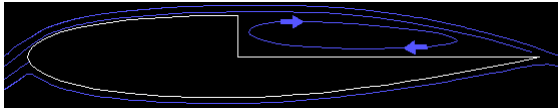
Stuff: Get a few feet of red/black high quality silicone wrapped hook up wire, 2 sets of Deans micro plugs, and some high quality 1/8" shrink tube.

About your Plane

Your 3DF Super Extra 300 was designed and manufactured by computer (CAD/CAM) for accuracy and construction ease. The level of engineering and laser cutting has been hailed by many as the highest in the industry. All parts have been precision cut on a CNC laser cutting system at the 3D Foamy Models shop. Not only are 3DF planes accurately manufactured, but they adhere to the full scale Extra 300 platform to IMAC guidelines. This makes your plane fly like the big planes do! It also makes it one of the best looking foamy's out there, and a great trainer for aerobatics. It's no surprise that competition IMAC pilots prefer our planes to practice competition routines.

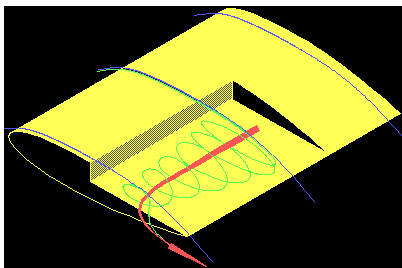
The foam used in your kit is the best quality available. Don't be fooled by cheap imitations of this incredible material. True Depron is only available from one place in the entire world! Depron is very forgiving and easy to paint. It is also easy to repair after mishaps. The composite laminate construction of the 3DF designs makes them one of the strongest performance foamy's in the world.

Some unique construction techniques have been introduced by 3D Foamy models. The first is the *G-Force PRO™* wing. It revolutionized the flight performance of foamy's.



All foamy's are NOT created equal..... 3D Foamy kits are the first to offer this radical new wing design! The *G-Force PRO™* wing is the heart of the aircraft. It is a core layer with beautiful lightning holes.... To top it off, servo bays and even the control horn slots are all cut,

ready for the cool 3D Foamy 3D control horns. (included) The beauty of the deal is the top and bottom LE wing skins. It allows for slower airspeeds on the down lines, totally eliminates high speed "hunting" (not much to start with though) and improves the tracking to the point that you WILL NOT think you are flying a "Flat" wing... The top wing cap covers the servo and lightening cutouts... The bottom wing cap makes it all symmetrical... By sanding the LE round, it creates a good separation point for good clean snaps. The caps carry back to MAC, then transition back into the hollow wing section. This creates a small vortex down the rest of the wing, allowing better aileron control, less wing rock, and a little more "lift" for slower landings. This also helps out with the glide ratio.... It looks awesome too.... the aileron servos and wires are completely hidden in the wing. No more servo leads dangling in the wind! Direct Drive rudder and elevator linkage is part of the PRO kits.... The servos are located as close as possible to the flight surface. It uses a short carbon pushrod for control... The plane flies like a 40%er, and so now the controls are setup the same too!



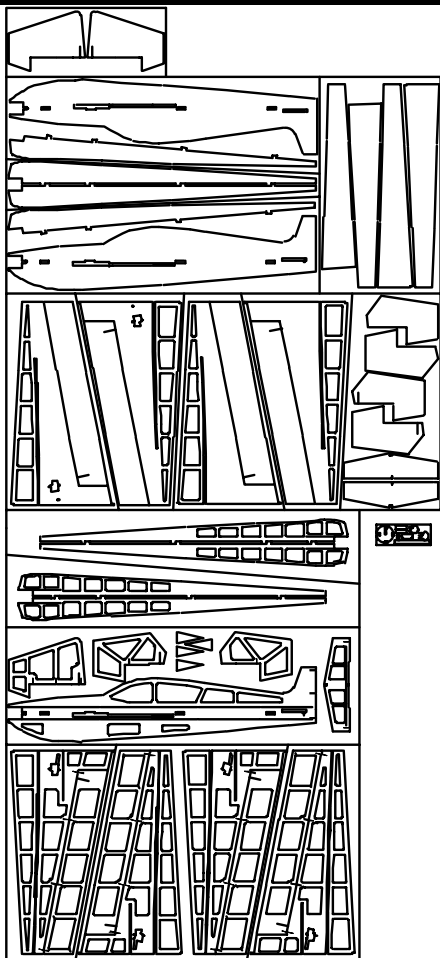
The second unique construction technique is the composite laminate method of the entire airframe. This includes the lightened core layer of foam, and then outer sheet layers. This weight saving; strength increasing technology allows a larger airframe at the same weight of a smaller model. Incorporated into this technology is our *Hinge Core™* design. Tapes are nice, but look bad and don't last. Hinges are the natural choice, but requires accurate placement and drilling of 26 holes in foam. For most modelers this is

a chore and leaves some frustrated. We fixed this with our new construction methods! It leaves you with perfect CAD/CAM manufactured hinging solution. No guessing, measuring, drilling or mistakes! Simply drop in the high quality Robart Hinge Points and you're done. I hope that you are going to enjoy building and flying this plane as much as I have!

-Levi Jordan

Construction

Airframe Construction



All parts have been accurately cut on a computer controlled laser cutting machine. Remove the aircraft parts from the foam packing sheets. Cut the tabs loose with a razor blade for best results.

Get friendly with your glue of choice. I prefer medium odorless CA and accelerator. It makes strong joints and is much cleaner, lighter, and faster than epoxy. Accelerator is a must! Test glue some scraps together to get the hang of it. It is different than normal CA. When the directions call for Epoxy, you NEED to use epoxy!

It is assumed that you will remove all lightening holes in the parts when you remove them from the parts sheets.

When instructed to CA the parts, it is assumed that you will use odorless CA. Normal CA will immediately melt the foam.

Specifications:

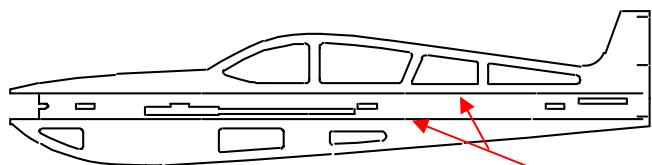
Weight: 10.5-17.7 oz

Span: 45"

Wing Area: 377.4

Loading: 4.0-6.7 oz/ft²

Radio: 4-5 ch w/ 4 micro servos

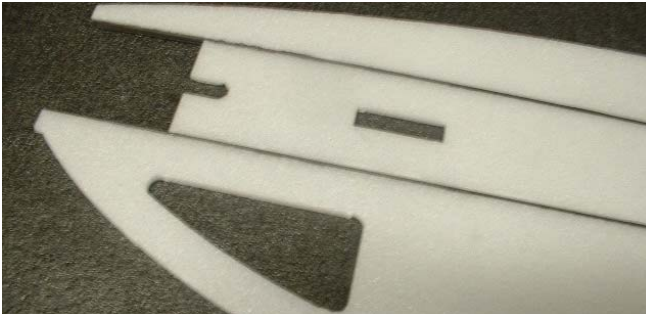
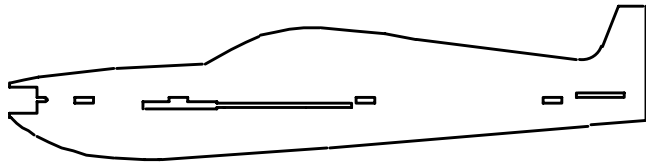


Step Cautions: Spars must be completely flush with the foam, no excess glue should be showing. Building flat is a must!

1. Locate the following parts

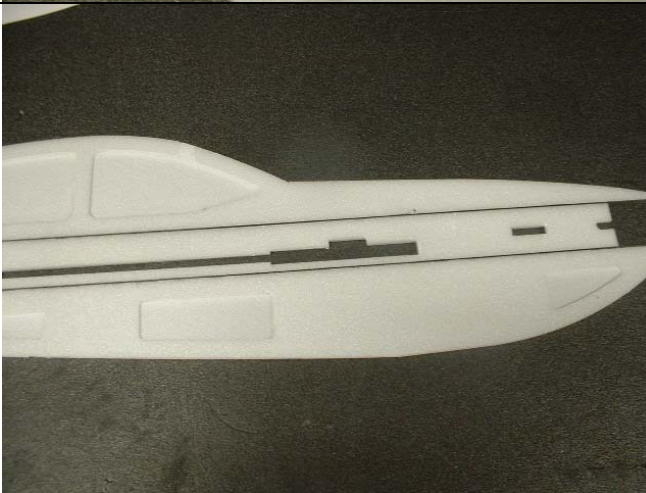
- a. Core layer of 3mm foam for the fuselage (1 ea.)
- b. Outer 2mm Layers (2 ea.)
- c. .030" x .121" x 48" Carbon Strips (2 ea.)

2. There are 2 long cuts in the 3mm fuse core. Cut the tabs along the cuts. Sand



any flashing at the tabs to allow a clean glue joint.

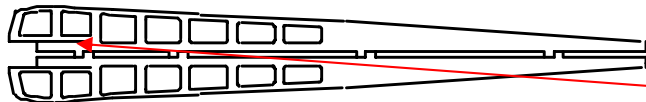
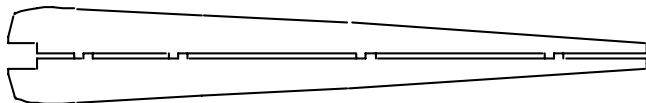
3. Cut the 2 carbon strips to 33.66" with a set of side cutters. You will be cutting it to fit from the very front of the nose (front of motor cutout area) to the end of the fuselage (stop at the end of the laser cut notch) Save the remaining carbon for later steps.
4. Open up the slots and use CA to glue the carbon into the 2 slots. Make sure there is no glue bumps on the surface of the carbon or foam.



Step Cautions: Medium CA is fast for laminating, but will not give you time to readjust if the parts are not perfectly aligned. UHU or Elmer's glue is recommended for all laminations.

Alternate Step: If you intend to use a stick mounted motor, refer to the alternate step at the end of the construction sequence at this time.

5. Inspect the spar areas and remove any bumps of glue. This is necessary so that the 2mm laminations get a full glue bond to the inner core and spars.
6. Apply glue (Elmer's recommended) in a VERY THIN layer on all the 3mm foam parts. Place one of the 2mm laminates over the 3mm core and align ALL holes so they perfectly match up.
7. Repeat the process for the other side of the fuselage.
8. Double check that all sides and cutouts are perfectly aligned. Place some books on top and let dry.



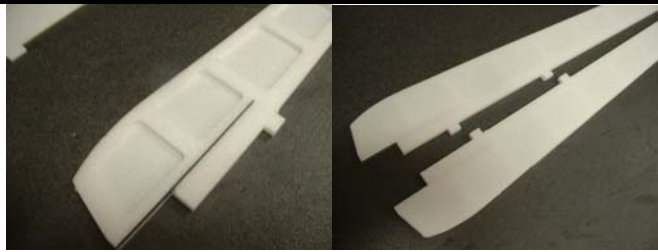
Step Cautions: when aligning the laminations to the core, reference the straight side of the side rails (the tabbed side). The outer laminations have a 1/32" overlap on the curved edges to accommodate the carbon longerons on the outside edge.

9. *Locate the following parts*

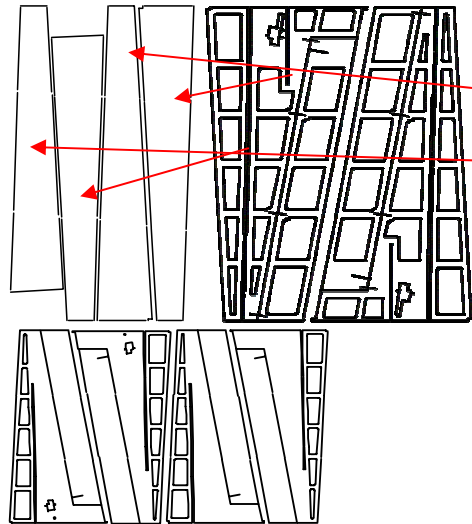
- a. Core layer of 3mm foam for the side rails (2 ea.)
- b. Outer 2mm Layers (4 ea.)
- c. .030" x .121" x 48" Carbon Strips (2 ea.)

10. There are 2 short cuts in the 3mm fuse core at the nose of the plane. Cut the tab along the cuts. Sand any flashing at the tabs to allow a clean glue joint.

11. Cut a scrap 16.5" carbon strip into 2 sections 4.6" in length. CA the carbon



- strips into the slots in the fuse core. Remove any excess glue as before.
12. Use the same method as above to laminate the 2mm top and bottoms to the two side rails.
 13. When thoroughly dry, cut 2 lengths of carbon strips to 31.50". CA one strip to each outer side of the fuselage side rails. There should be a 1/32" channel on the edge for the carbon strip. It will start at the tail of the plane, and stop 2.5" short of the nose.
 14. Set these parts aside. **DO NOT GLUE TO THE MAIN FUSE!**

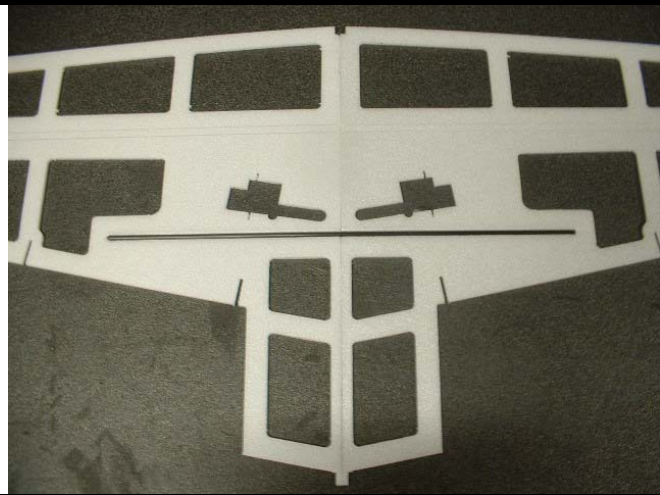


- Step Cautions:** Great care in aligning all laminations should be taken.
15. *Locate the following parts*
 - a. Core layer of 3mm foam for the wing (2 ea.) (Lots of lighting holes)
 - b. Lower 2mm wing skins (2 ea.) (Servo Cutouts)
 - c. Upper 2mm wing skins (2 ea.)
 - d. Forward 2mm LE Sheeting (4 ea.)
 - e. .125" x 11" Carbon Tube (1 ea.)
 - f. .125" x 7.25" Carbon Tube (2 ea.)
 - g. .230" x 32.5" Carbon Tube (1 ea.)

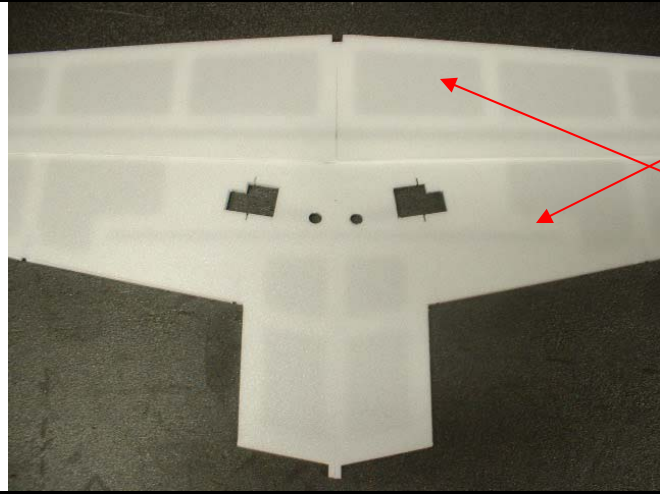


16. Remove all lightening hole materials and servo cutouts. Also **remove the ailerons from all wing parts**. Set the ailerons aside till later. Do not remove the forward part of the wing core. (forward of spar) Leaving this part attached will greatly assist in correct alignment for the spars.
17. Mix up a small 1/4 oz. batch of 5 min. epoxy. Coat the inside 1" of the main .230" x 32.5" carbon spar and also the outside 1" of the .125" x 7.25" tip spars. Slide the two tip spars 1" into the main wing spar. Use denatured alcohol to clean up excess epoxy on the end of the spar. Double check that you still have 6.25" of small spar extending out each end.

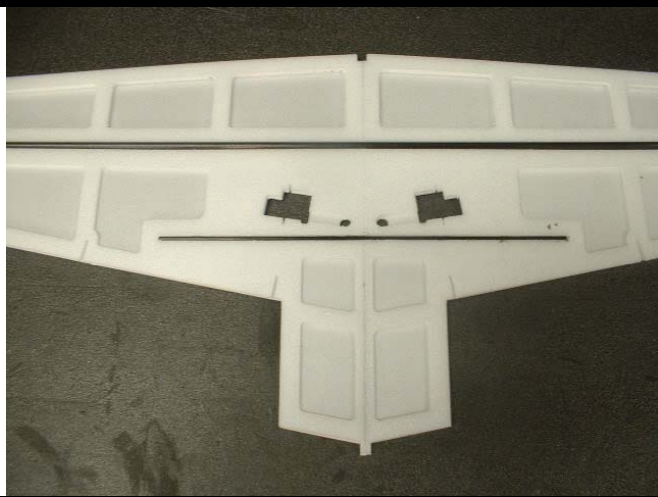
Hint: Building on wax paper will help keep the wing from getting glued to your building surface when installing spars and such.



18. Carefully align the two 3mm core layers together on a flat building surface. CA the two wing halves together at the center joint. Remove any excess glue to maintain a flat surface for the laminations.
19. CA the .125" x 11" rear spar into the precut slot.

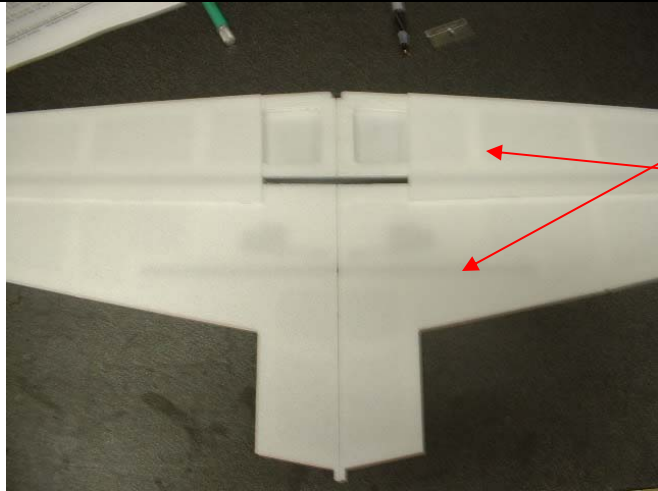


- Step Cautions:** Great care in aligning all laminations should be taken. Make sure to reference multiple places of the wing so that all laminations are perfectly aligned.
20. Laminate the lower 2mm wing skins to the main 3mm wing core. Use the same care and techniques as you have in past laminations.
 21. Laminate the Lower LE (The longer ones) to the bottom of the main wing assembly. You should now have a solid lower wing surface with no visible lighting holes.



Step Cautions: The wing spar slot is cut at an arc. This is the signature of the G-Force PRO™ wing. It pre loads the spar and removes 70% of the flex in the spar. This makes it the strongest foamy wing in the world. You will need to bend the spar into place.

22. Flip the wing over so you are looking at the top of the wing with all the lightning holes exposed. Bend the main wing spar to the shape of the spar slot. Test fit it in place. Remove the spar and then permanently glue it in place.

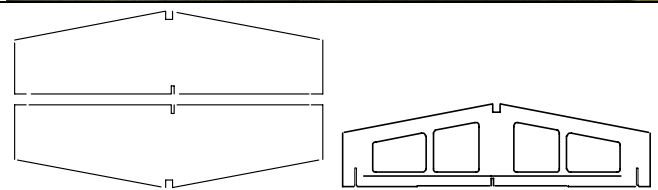


Step Cautions: Great care in aligning all laminations should be taken. Make sure to reference multiple places of the wing so that all laminations are perfectly aligned.

23. Laminate the upper 2mm wing skins to the main wing core.

24. Laminate the Upper LE (The shorter ones) to the LE on the top of the main wing assembly. You should now have a solid wing surface with a notch in the center section for the fuselage side rails to fit into.

25. Set aside till final assembly.



26. Locate the following parts

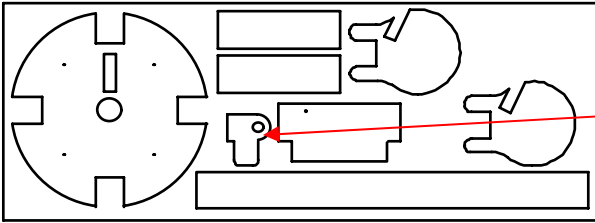
- a. Core layer of 3mm foam for the Hor. Stab (1 ea.)
- b. Top and bottom 2mm Stab laminations (2 ea.)

27. Cut the tabs loose in the laser cut spar slot near the TE of the horizontal stab.

28. Cut a 8.75" piece of carbon from the .030" fuse spar scraps.

29. CA the spar into the slot

30. Laminate the upper and lower 2mm sheeting to the 3mm stab core.

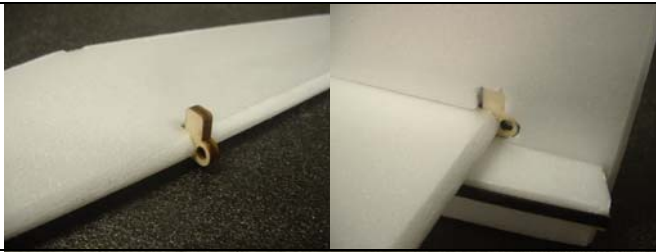


31. Locate the following parts

- a. Laser Cut 1/8" ply center hinge (1 ea.)

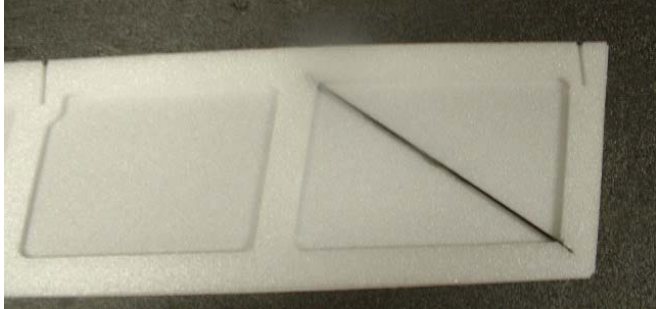
32. Glue the center hinge into the slot at the TE of the horizontal stab.

33. I like to round the LE and TE for looks.



34. Test fit the horizontal stab into the matching slot at the rear of the fuselage. Notice the notch and key that matches the ply center hinge. This will center the stab for you.

35. If the test fit is good, then go ahead and apply CA to the joint to mount it permanently. Use the corner of the 1/8" ply sheet as a square and make sure the whole stab is squared to the fuse.



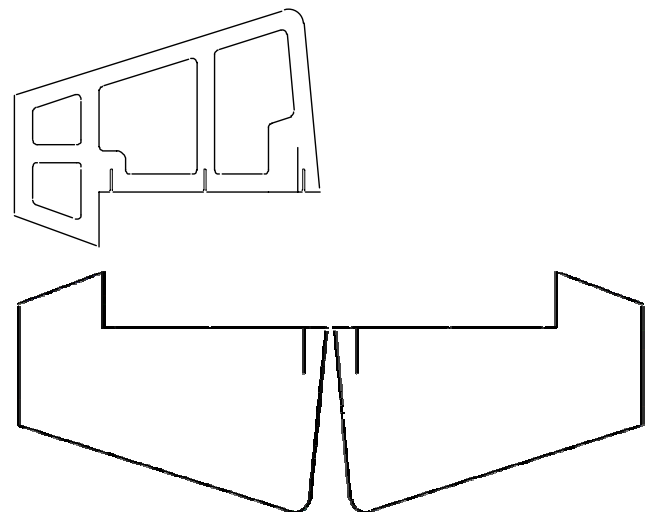
36. Locate the following parts

- a. 2mm aileron skins (4 ea.) (Removed from wing skins)
b. 3mm aileron cores (2 ea.) (Removed from wing core)
c. Scrap .030" x .121" carbon strip (cut to 4.17") (2 ea.)

37. The last lightening hole on the tip of the aileron has two .25" slots cut at a diagonal. This is for the diagonal .121" carbon strip. Cut 2 carbon strips to 4.17" from fuse spar scraps and CA the strips into each aileron.

38. Laminate the top and bottom 2mm aileron skins to the 3mm core.

39. Set aside till final assembly.

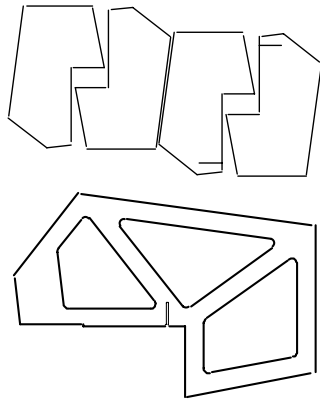


40. Locate the following parts

- a. 2mm rudder skins (1 ea.)
b. 3mm rudder cores (2 ea.)

41. Laminate the 2mm rudder skins to the 3mm rudder core.

42. Set aside till final assembly.



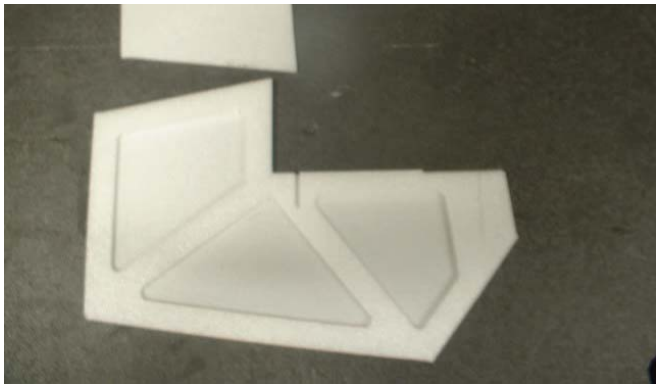
Step Cautions: Note that there are 2 different sides of the elevator and skins. Make sure you laminate the correct skins to the core. The slot is for the carbon control horn.

43. *Locate the following parts*

- a. 2mm elevator skins (4 ea.)
- b. 3mm elevator cores (2 ea.)

44. Laminate the skins to the elevator halves.

45. Set aside till final assembly.



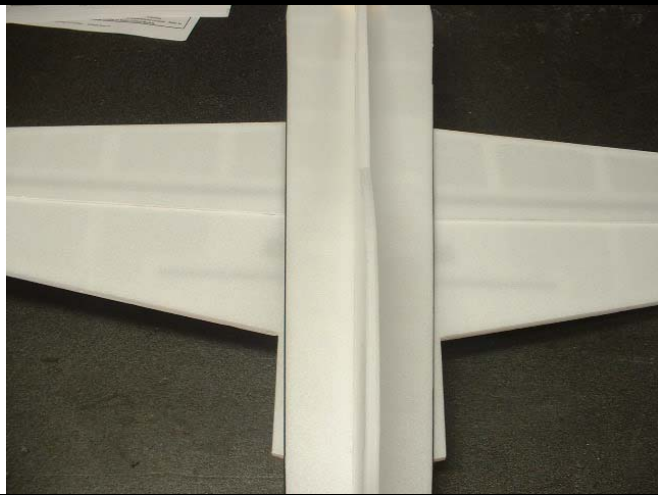
Step Cautions: You must install the wing before gluing the side rails on.

46. *Locate the following parts*

- a. Completed main fuselage (1 ea.)
- b. Completed wing assembly (1 ea.)
- c. Completed fuse rails (2 ea.)

47. First slide the wing into the slot on the fuse. You'll need to carefully work it to the center. With the wing at an angle, slide the fuse into the notch at the LE. Then move the TE so that the rear tab is aligned in the fuse. This makes sure the wing is centered and square. All you need to do is make sure it is 90° to the fuse sides. Use the 1/8" ply corner to check this, then CA the joint.





Step Cautions: The side rails are a main structural component and a tight fit to the fuse must be achieved.

48. The side rails are installed next. You'll need to test fit them and make any adjustments to the tabs for a smooth fit.

49. Apply CA to all parts of the wing and fuse where the side rails will be in contact. Align at 90° to the fuse and glue.



50. *Locate the following parts*

- a. Completed rudder (1 ea.)
- b. Completed ailerons (2 ea.)
- c. 1/8" laser cut ply (1 ea.)

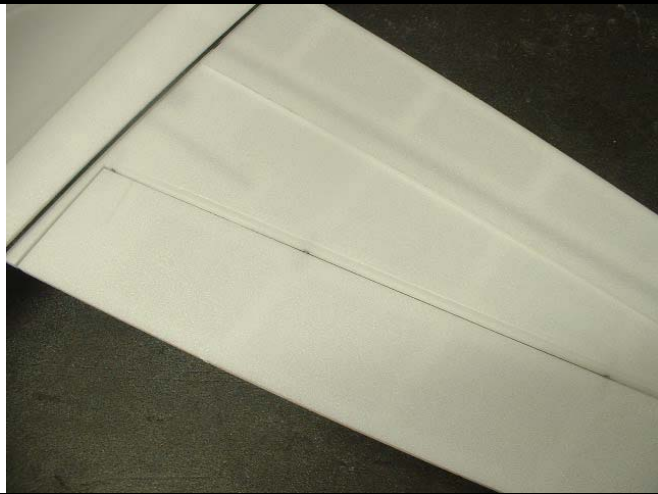
51. Build the "Little Stripper" tool as shown.

52. Use it to bevel the top and bottom of both sides of all the hinge line. This is called a double bevel and will allow a full 50° of throw.



Step Cautions: You don't want to glue the hinge closed, so take care when gluing them in. Also make sure the hinge is rotated and is pivoting at 90° to the surface.

53. Insert the Robart Hinge Points into the holes left from the Hinge Core™ construction. Remove one at a time and place a small drop of CA at the rear of the pocket. Press the hinge into place, stopping with the pin at the hinge line.



Step Cautions: You may want to use white glue for the hinge installs. It will give you time to place the ailerons correctly.

54. Slide the ailerons into the wing hinge holes. Test the movement. When happy, remove the aileron and place a drop of CA in all 4 holes. Press the aileron hinges into the pockets quickly.

55. Repeat the same process to hinge the rudder.



Locate the following parts

- a. Completed elevator halves (2 ea.)
- b. 5" x .125" carbon tube (1ea.)

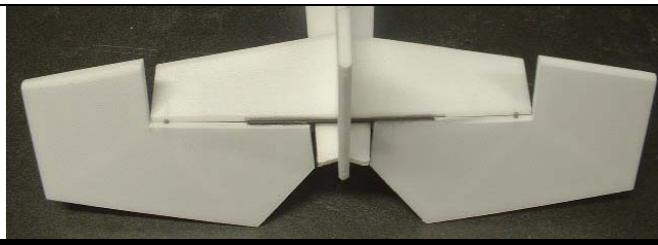
56. Epoxy the .125" tube to **ONE** side of the elevator. **Do not** glue the other elevator half to the tube yet! Clean any excess epoxy from the tube and foam with denatured alcohol.

57. Insert the elevator half with the tube through the ply hinge on the horizontal stab.

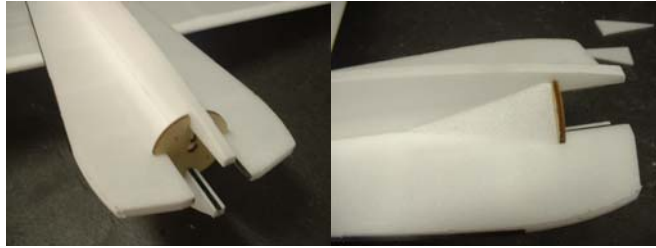
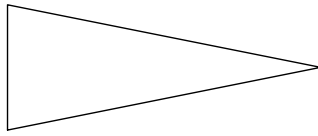
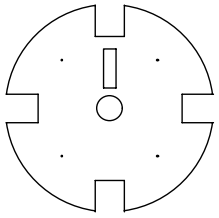
58. Tape the elevator to the stab to keep in centered.

59. Place some wax paper between the stab and the carbon spar.

60. Epoxy the other half of the elevator to the carbon tube. Tape the whole elevator inline with the stab. Both sides **MUST** be parallel and inline with the stab.



61. When dry, remove the tape and insert the 2 hinge points into the stab and elevator halves. I recommend using white glue to give you time to get both sides inline.



Locate the following parts

- a. Laser cut round 1/8" ply motor disk (1 ea.)
- b. 3mm foam triangles (4 ea.)

- 62. The motor mount is pre cut for mounting the Hacker A20-20L motor with the included back plate mount. (This bolt pattern is also common on other Outrunner back plate mounts) If you did the alternate step and built in the stick mount, you will still use the motor disk. However you may need to remove some of the lower mount to allow for motor can clearance.
- 63. Slide the motor mount onto the 4 rails. Press the disk all the way to the back of the cutouts. It is very important that the disk be at zero deg. Use a pen to mark the disk where the motor will mount to the foam.
- 64. When happy with the fit, pull the disk off and liberally apply EPOXY to all parts that will contact the plane. Push the disk back into place and let cure.
- 65. Bevel the 4 foam triangles to match the fuselage behind the motor disk.
- 66. CA these 4 triangles in place.
- 67. The main fuselage assembly is now complete. Continue with mounting your landing gear, or skip to the next section.

The Following steps are only for kits that included the molded Carbon Fiber landing gear. Skip ahead to the next section if you are not mounting a landing gear on your plane.

Caution: The gear is very strong, but it is still only mounted to foam. I only recommend using the landing gear on smooth take off and landing surfaces. Grass will most likely tear the gear off on a bad landing. The bolt on method makes it easy to remove for different flying locations.



- 68. Use the landing gear detail on the plans for mounting location and as a template for the next steps.
- 69. I sand the edges to a bevel for better looks. After sanding, **EPOXY** the plates to the side of the fuselage.
- 70. Repeat for the other side of the fuselage. **Make sure that the gear plates are EXACTLY lined up with each other!**



71. Use a sharp razorblade to cut out the foam that is in the gear-hole area.



72. Epoxy the 1" ply plate into the slot through the fuselage. It should be equally spaced on both sides of the plane.

73. Drill 1 .063 hole on each side of the gear and thread the 2-56 wood screw through the carbon gear into the wood mount. Cut off any excess length.



74. The 2-56 gear axles are included with the gear set. Bolt them on as needed for your wheel installation.

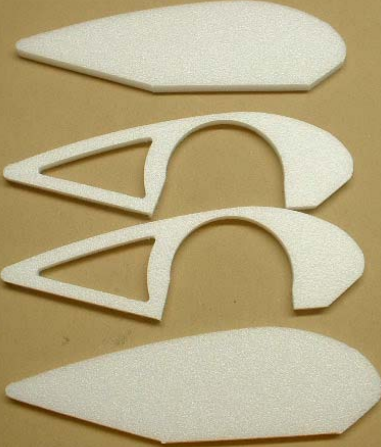




75. Cut a 1/8 piece of foam from the rear of the fuselage (bottom) for mounting the tail skid.

76. Epoxy the 1/4" wide lite ply mount into the cut out.

77. Use the supplied 2-56 wood screws to mount the skid to the airframe.

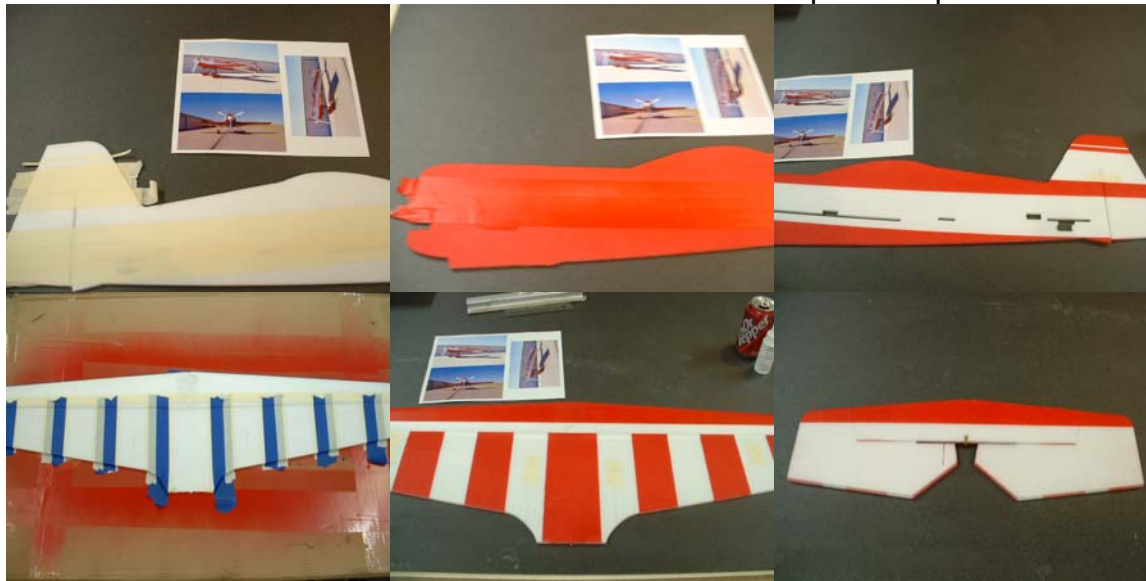
Note: If you plan on being rough with the gear, wrap a 2" strip of clear packing tape around the tail skid mount before bolting it on.

	<p>78. If you would like to add the wheel pants, build them now.</p> <p>79. You may need to use both inside cutouts depending on the wheel you have chosen to use.</p>
	<p>80. Glue them together with CA. You can leave them square or sand them to look contoured.</p>
	<p>81. Cover or paint the wheel pants as desired. Mount to the landing gear with double side tape. This allows them to fold back on bad landings, instead of breaking off.</p>

Painting

I **ONLY** Recommend using Testers Model Master Spray Enamel (small \$3.50 can) This paint will not attack the foam. If you airbrush the same paint works great too. Just make sure you use the model master brand paint thinner. Most hobby shops stock it. So do some craft stores. It is usually with the plastic model stuff.

82. Be weary of weight. Use light coats to keep weight to a minimum. A nicely painted plane is only ½ oz. heavier if painted carefully. 2-3 light mist coats are your best way to paint.
83. We offer some cool high quality decal sets to jazz up your paint job and add the final touch of class. Check them out online at www.3dfoamy.com
84. These pictures are of the SU-26 being painted. In this case, I choose to paint the plane before final assembly. This is helpful for complex paint schemes. The glue will still work fine over paint. Use the foams natural color in your paint scheme where ever possible. Mask off the areas you don't want painted then shoot it with a fine mist. Let it sit for 5 minutes then mist a second coat. It should almost be covered now. Repeat the process for each paint color.



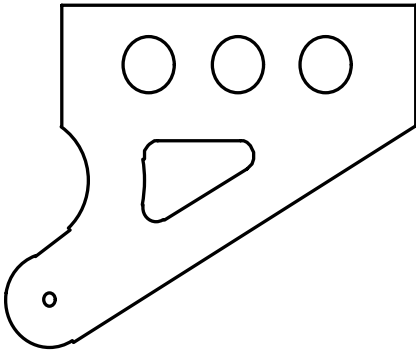
Note: If you will be landing the plane on its belly, then wrap a 2" strip of clear packing tape down the bottom of the planes fuselage. This will help keep the foam in one piece on your "not so great" landings!

Radio Installation



- 85.** The wing servos holes are precut and all you need to do is feed the wire under the wing skin through the servo wire channel. Wrap each servo with scotch tape and then CA or hot glue them into the base of the servo cutout.
- 86.** The rudder and elevator servos are mounted to the sides of the fuselage under the wing. Mount them with servo mount tape, or glue them in place.
- 87.** Run all servo wires to one central location for connection to the receiver. HS-55 servos have long lead wires, so no extensions should be needed. If you are using a 4 ch. Receiver, you will need to use a “Y” harness for the aileron servos.
- 88.** Use servo tape or Velcro to attach your receiver to the side of the fuselage.

89. Reference your receiver and radio manuals to attach the servo leads to the correct receiver channel.



Step Cautions: Pay attention to the side that you mount the control horns on. You want the rudder and elevator horns on opposite sides of the fuse, matching up with the corresponding servo.

Locate the following parts

- a. CNC machined carbon control Horn (4 ea.)

90. CA the control horns into the precut slots on the elevator, rudder, and ailerons.

Motor and Pushrod Installation

I know this plane has gone together fast and you are almost ready to fly, but now is the time to slow down and make quality count. You'll be very happy in the air if you take the time to install your electronics right, and have slop free controls!



91. If you purchased the Hacker A20-20L for power you'll simply use 4 wood screws and washers to mount it to the ply disk. The holes for the back plate mount are pre drilled for you. I used 4 servo screws and 2-56 washers for this install.



Locate the following parts

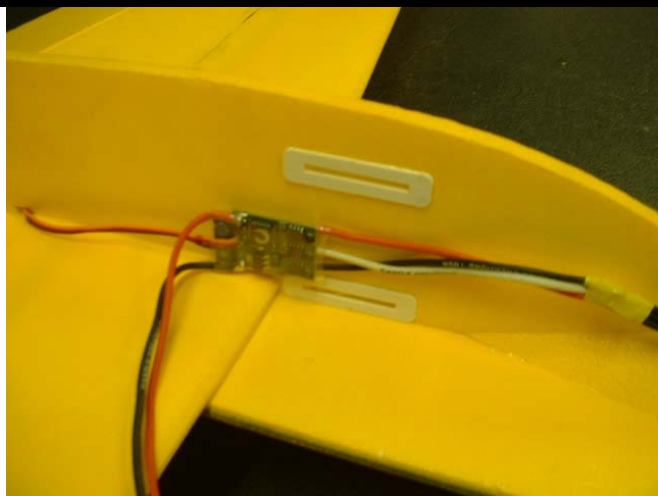
- a. 1/2" x 8" Velcro Rip Tie (1 ea.)
- b. .032" plastic battery strap mounts (4 ea.)

92. The CG position should be set at 3" back from the LE at the root of the wing. You may adjust this later (up to 4"), but test flights should be done first. Shift your battery on the fuse until the CG is achieved. Mark this place.

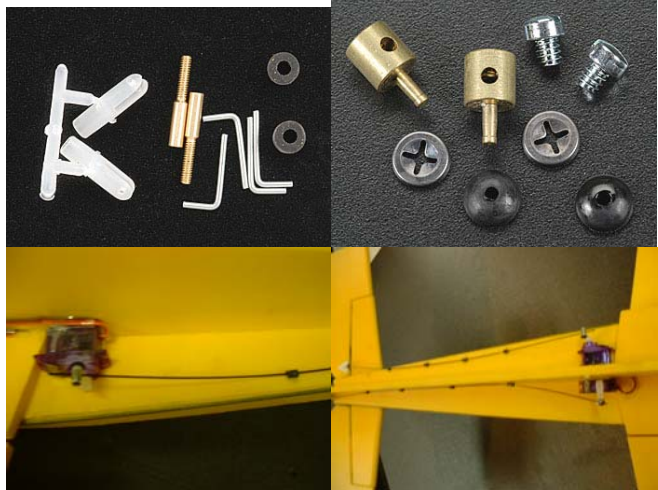
93. When everything is in the right spot, cut 2 slots in the fuselage to Velcro your pack through. CA the laser cut plastic doublers to both sides to keep the Velcro strap from cutting into the foam.

94. You will need to place some self adhesive Velcro strips on the fuselage for holding you pack from sliding under the Velcro strap. These are not included since many guys choose their own type.

Note: Don't skip the Velcro strap! You'll "Eject" your battery on the first snap roll!



95. Take some time and solder your battery, speed control and motor connections. Refer to the manuals included with these for instructions.
96. Fasten your ESC to the fuse side with hot glue or double side foam tape.
97. Tape all wires to the foam with Scotch Multitask Tape.



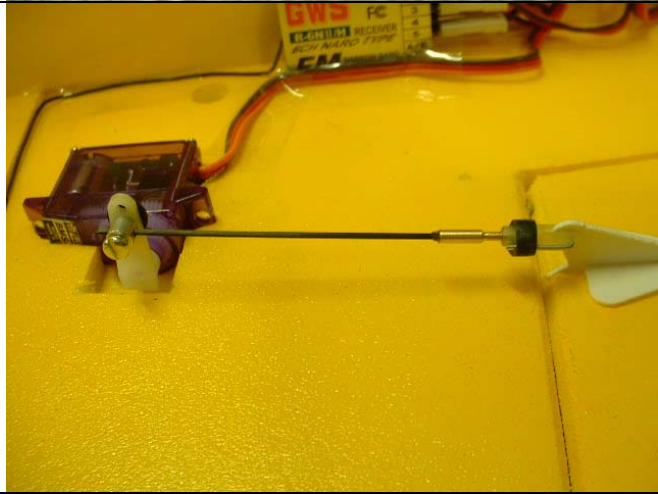
Step Cautions: Power up your servos and receiver and zero all trims before setting up the control system. This will save a lot of setup time later!

Locate the following parts

- a. .040" x 48" Carbon Rod (2 ea.)
 - b. Dubro Micro Clevis Set (4 ea.)
 - c. Dubro EZ Connectors (4 ea.)
 - d. 1/16"x 6" Plastic Tube (1 ea.)
98. Place all servo control arms on the servos. Use the longest arms that were supplied.
 99. Place the Dubro EZ Connector in the furthest hole on all the servo horns. Use the metal permanent clip on the back post.
 100. Cut eight 1/4" sections of the 1/16" plastic tube. Slide them onto the pushrod going along the fuselage.
 101. CA the eight pushrod guides onto the fuselage so that the pushrod takes the most direct route to the surface control horn. A small bend is fine, but large bends should be avoided.
 102. Repeat the above steps for the other long pushrod. It will be on the opposite fuselage side.

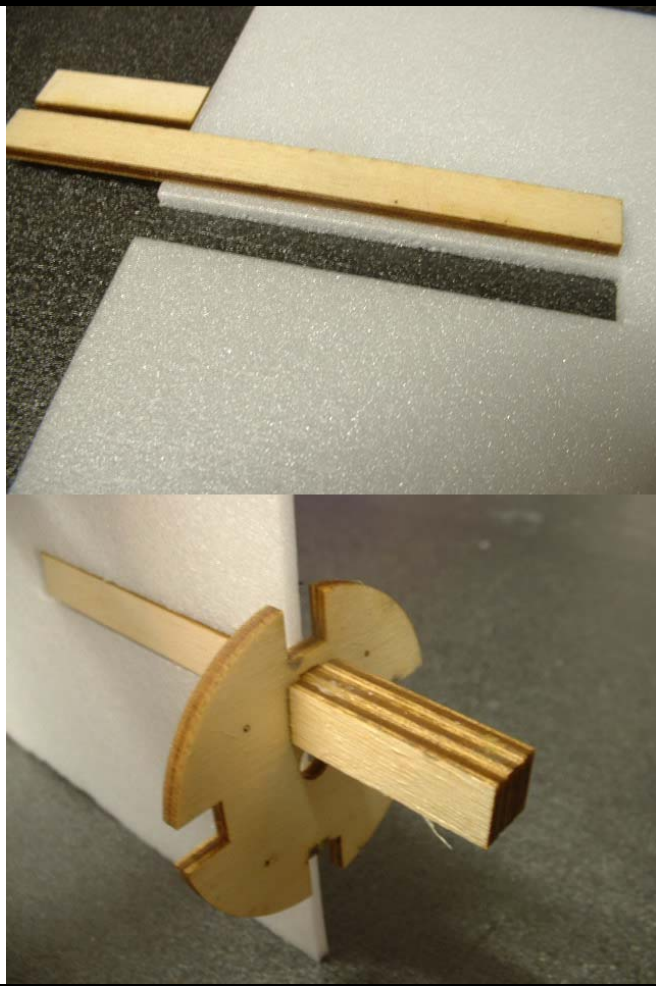


- 103.** Place a rubber grommet on the brass sleeve and then thread the nylon end of the connector $\frac{1}{4}$ " onto the brass coupler.
- 104.** Push the metal "L" through the control surface control horn and slide the grommet over it to secure.
- 105.** EPOXY the brass threaded coupler to the end of the .040 carbon pushrod. Use a scrap of carbon to get epoxy fully into the brass coupler.
- 106.** Cut the other end of the pushrod so that you have about $\frac{1}{4}$ " of carbon protruding past the Dubro EZ Connector.
- 107.** Center the control surface and GENTLY tighten the EZ connector set screw. BE CAUTIOUS not to over tighten the set screw. You may crush the carbon rod.
- 108.** Repeat the process for the other tail surface.



- 109.** Assemble another Dubro Pushrod Connector and EPOXY the coupler to one of the remaining lengths of .040 carbon rod.
- 110.** Attach it to the aileron control horn.
- 111.** Cut to length to match the aileron servo EZ connector. Leave $\frac{1}{4}$ " for adjustments.
- 112.** Once again, DO NOT over tighten the set screw, firm pressure is all that is needed.
- 113.** Repeat the process for the other aileron.
- 114.** This completes the final steps for airframe setup. Continue to the Flight Setup section for radio programming and final inspection.

Alternate Steps



Alternate Step for motor mounting.

- 115.** Take the ply motor plate and line it up with the main fuselage.
- 116.** Cut a 2.75" x 3/8" section of foam back from the firewall for the long 1/8" ply stick
- 117.** Continue assembly to the motor mounting section. At that time, insert the long laser cut ply motor mount into the notch. After test fitting, epoxy it permanently.
- 118.** Laminate the 2 shorter laser 1/8" ply doublers to the main motor stick. This will now accommodate most stick mounted motors.
- 119.** Depending on your motor, you may need to remove part of the lower rear ply disk for motor can clearance.
- 120.** This mock up picture shows how the long 1/8" ply piece goes back into the core 3mm foam layer.

Flight Setup



121. Double check all control rod installations. They should be slop free and bind free. If you have any binding, locate it, and fix it! Slop in the control surface should also be eliminated for the best precision and performance.

122. There are many radios to choose from... If you are just starting out, look for a radio with dual rates. Dual rates. Exponential and mixing. These features are almost a must if you plan on advancing into 3D aerobatics.

123. Adjust the travels so that you have 45 deg of throw for high (3D) rates and about 15-20 deg for low (normal) rates.

124. Travel adjustment can be done electronically on computer radios, or by placing the control lines in different servo hole locations.

125. The prototype was setup and flown on a JR 8103 Transmitter with a GWS 6ch. receiver. The following setup was used:

- a. 60% expo (on high rates only) –Softens controls around neutral.
- b. 20% aileron differential. (Less down aileron than up) –This reduces yaw/roll coupling at extreme throws.
- c. 100% Flap>Elevator mixing on Landing switch 1. (Down Flap/Up elevator.)

126. The plane is very true and will need very little tweaking for any yaw/roll or throttle/pitch coupling. But you can computerize it as much as you want to fit your flying style.

127. I prefer a zero thrust line. It will leave you with a truer flying airplane, but will require some rudder inputs during various maneuvers.

128. Set your CG in the recommended 3" location if you are new at 3D flight. You can experiment with CG later by shifting your battery pack around.

The CG is correct when the plane flies straight and level upright AND inverted hands off. Adjust battery position to obtain hands off flying. It doesn't take much movement of the battery to make a difference.

NOTE: It is important to have the CG correct to be able to fly the plane easily. The CG is correct when it flies as noted above, don't worry about where the location of the CG is on the wing, it's how it flies that matters.

Programming The Speed Controller

The Phoenix 25 is the recommended speed control because of the reliability and programming ease. The settings below are recommended for best performance on the Hacker A20-20L. Refer to your motor instructions for different setup options. If you choose a different ESC, set it up according to it's manual.

PHOENIX 25 BRUSHLESS SPEED CONTROLLER recommended set up:

- 9.1 Option 5 – 8.4v cut off for 3 cell LiPoly
- 9.2 Option 3 – Standard current limiting
- 9.3 Option 5 – Brake Disabled
- 9.4 Option 1 – Auto Calibrating throttle
- 9.5 Option 2 – Standard Advance Timing (may cause prop to jump at start up)
- 9.6 Option 3 – Soft cutoff
- 9.7 Option 3 – Fast Start (for fast throttle response – essential for hovering)

Battery Charging

There are many battery chargers available. If you use a Duralite Lilon charger the Rx charge jacks are for 2-cell packs and the Tx jack is for 3-cell packs. **You must use a Li-Ion or Li-Poly charger on Li-Ion/Li-Poly cells or you will damage the cell or the cell could explode.** All Li-Poly cells should only be charged at a 1C. This means if you have a 1500 mAh pack, it should only be charged at a maximum rate of 1500mah or 1.5 amps. Exceeding this will shorten the life of your cells, and can even cause a serious fire! However, accidents have only happened when neglect or abuse was involved. These batteries are very safe if used with in their recommended charge/discharge ranges. Just refer to your charger and battery manuals for the correct settings and charging process.

Flight Check List

- ✓ Check the CG. Set it as recommended.
- ✓ Check all control surface directions!
- ✓ Check all battery polarity connections.
- ✓ Check for any control binding, free as needed.
- ✓ Check your radio range. It should be at least 100' with the antenna down.
- ✓ Setup your speed control to match your battery pack.

The basics:

- Don't fly at full throttle all the time. Full power should only be used for goof up recovery and "punch outs" I fly at 1/3 to 1/2 power most of the time.
- Don't think you HAVE to fly low to fly 3D! Stay high and you'll have your plane much longer!
- Get used to moving the sticks while flipping from 3D to *normal* rates BEFORE you go fly.

- Stay out of the “Dead Zone” (don’t know? Read the bottom 3D instructional)

Take off:

- Holding the plane over head, advance to $\frac{3}{4}$ throttle and gently toss at a slight upward angle.
- Or, if using landing gear, take off as normal from a smooth surface.
- Or, Hold vertical, go to full throttle, and let go! (Only if you have better than 1:1 power to weight ratio!)

Landing:

- Approach as normal, hold about 1/3 power and feed in up elevator until you are in a nice flair about a foot off the ground. **Cut power** and continue to flair. It will plop down on the belly at almost a full stop.
- Or, if you have the landing gear, land as normal.
- Or, when hovering, just reach out and pick it up. (AMA likes this method best 😊)

REPAIRS

- Should the inevitable happen, here’s some tips.
- Cracks in the foam are fixed with some foam safe CA. Just use accelerator to speed up the process. Some clear Scotch tape will keep it strong.
- Almost anything is repairable. I cracked my plane in 5 pieces, and everyone thought it was finished. 15 minutes later it was flying. Just take some CA, accelerator and scotch tape to the field with you!

If you are using more then 2 bottles of CA a day for fixes... order some more kits! 😊

3D Flight

What does 3D mean?

The simplest way to explain it is any maneuver done while the wing is fully stalled.... It can be a tumble, a hover, a decent with the nose at 45 deg or almost anything else where the wing is not creating normal lift for flight, rather the engine thrust and flight control surfaces are doing the most work.

What makes a plane 3D capable?

All the 3D maneuvers are mixed up with conventional aerobatics to make a breathtaking routine.... But unlike other types of flying, a specific plane is needed. To fly 3D, you have to have a plane that's has lots of pitch and yaw control. Elevators taking up 50%-60% of horizontal stabilizer’s surface are a must. They need to be able to travel to 45 deg in either way. The same is true for the Rudder. Ailerons should also be large, but will require less throw than the rudder and elevator.

This plane is designed to fly as close as possible to its giant scale big brother. Most people practice the tricks with the little guy, and then when it is mastered, feel comfortable moving up to the BIG plane for air shows. Wing loadings are just right, so that you can still do snap maneuvers, but also float in 3D flight.

High Alpha

You will hear people talking about High Alpha.... it is simply a fancy name for flight at high angles of attack. It means that the wing is not producing enough normal lift to fly. In HA flight, the engines thrust, combined with the elevator or rudders deflection provides the plane with control and altitude. It is very much like a boat in water.... water is not flowing over the top of the boat, but rather against the bottom of it. Just like sticking your hand out the window of a car and rotating your palm back and forth. The same is applied to the fuselage side.... it too can keep you "suspended" in air when combined with enough thrust and rudder deflection. To be good at 3D a plane must be able to make a clean transition to HA flight from conventional flight.... with out snapping. The key to this is large control surfaces, lots of power, and high rates.

The "Dead Zone"

"Training wheels are for bikes".... 3D requires you to jump in all the way or stay out.... What I mean is in regards to control throws. Do NOT think that starting out with 25-30 deg of surface deflection will help you stay under control! That is the dead zone! It refers to the area of flight that just turns into a snap instead of getting into high alpha. You need the control authority and thrust to go right through the stall and into that "sweet spot" for hovering and harrier type maneuvers. This sweet spot is at 45 deg. of deflection on the elevator and rudder. Any more and you just add drag... Before you try out 3D, get very familiar with your radio, and be able to switch from high to low rates easily, fast, and at any time in the flight.

The Maneuvers

There are 5 basic 3D maneuvers that will give you the basics for all your advanced stuff. Check out the CD file called 3D Flight for a full course on how to do these, and other advanced 3D maneuvers.

The Harrier

- very slow forward flight in a very nose high (about 45 degrees) attitude.

Torque roll

- "hovering" vertically in place, rotating left around its roll axis.

The Elevator

- where the plane drops vertically while in a nose high attitude.

Waterfall

- a continuous tail-over-nose descending flip. It is not a loop, but the aircraft actually flops around its canopy.

The Blender

- a vertical diving roll that virtually stops its descent as it instantaneously enters into a flat spin.

All it takes is some practice and you can be flying them! Keep it high and stay alive!

Best of flying to you, and I hope you have enjoyed building this kit as much as I have designing them!
Remember to send your pictures and videos to post on the website!!!

“I live for this stuff!”

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