SPADStick
.40 - .46 4 channel Sport Plane


Design and plans by Collin "Kraut" McGinnis

Span - 52"
Length - 46"

Building Supplies

(1) 7 inch piece of 2 1/2" PVC gutter downspout
(2) 4 mil and 2 mil Coroplast
(3) 3/4" plywood or HDPE for firewall
(4) 4 wood yardsticks
(5) 1/4 inch dowels
(6) Zip-ties and servo mounting tape
(7) 40 inches of plastic tubing for nose gear and throttle push rods
(8) Music wire for throttle and nose gear push rods
(9) #6 1/2 inch screws
(10) Medium CA and a propane torch for flashing and gluing the Coroplast
(11) Radio, engine, engine mount, fuel tank, landing gear and other misc items to complete the airframe
(12) 2 1/2" X 4" X 3/16" piece of plywood for the internal landing gear mount plate
(13) Misc tools like a scroll saw, utility knife, metal rulers (for a straight edge), dremel, etc....

If you are a big "Stick Plane" fan, I invite you try my SPAD version. This plane can be built in a few hours - for a few dollars - and the flight characteristics are virtually identical!
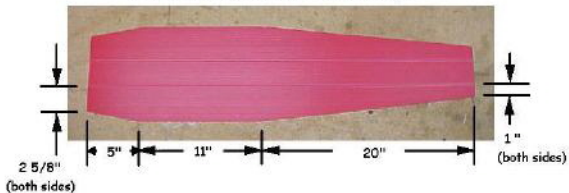
Fuselage

Crease two places the exact width of the American PVC

3 3/4"
2 1/2"
3 3/4"

36"
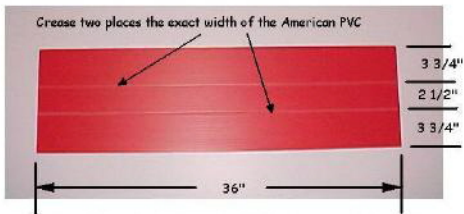
Cut a piece of Coroplast 36" X 10" - with the flutes running lengthwise.

American PVC fuselage formers

Cut two pieces of American PVC pipe - one 6 inches long, the other 1 inch long.
These will be used as formers for the fuselage
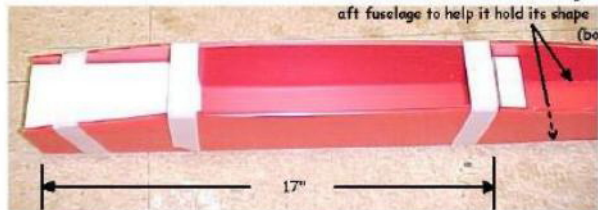
2 5/8"
(both sides)

5"   11"   20"

1"
(both sides)

Trim the upper fuselage sides to the correct taper as shown above

Fuselage (cont'd)

Add a bead of CA to the inside edge of the aft fuselage to help it hold its shape

(both sides)

17"

Flash the Coroplast - then glue the two formers to the bottom of the Coroplast - then fold the sides up and glue them in place. Use masking tape (or similar) to hold the sides in place while the glue cures.

Upper fuselage formers

Trim the ends to match the angle of the upper fuselage sides.
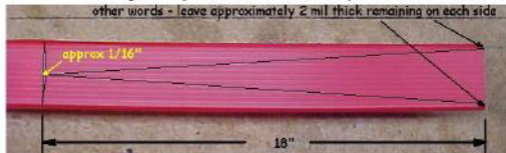

The Paintin' Place

16 1/2"
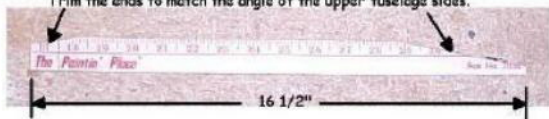
Make sure that you allow a 4 mil gap for the fore and aft covers.

After the glue dries on the PVC formers - make and attach the yardstick upper fuselage formers.

Fuselage - cont'd

Leave just enough width in the back to accept the 4 mil thick rudder - in other words - leave approximately 2 mil thick remaining on each side

approx 1/16"

18"

After the glue cures - cut out the bottom rear part of the fuselage as shown above. I like to insert a 20 inch piece of PVC into the fuselage to give me something to press against while cutting. I use a straight edge to help guide the cut - and make sure you apply a bunch of down pressure to keep the straightedge from slipping while cutting across the flutes. It is best to make several passes with the utility knife to help cut through the flutes.
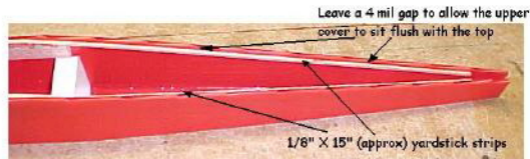
This is what the bottom rear part should look like after making the proper cuts. Notice how the edges of the corners hold their radius because of the CA bead that was run down the fold.

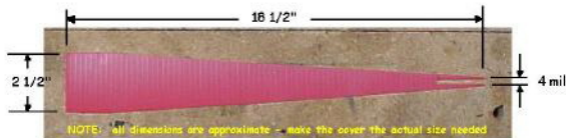1/2" x 16" yardstick doubler   4 mil gap for rudder
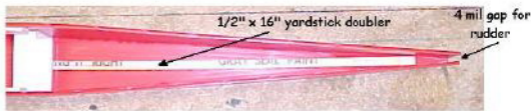
Flip the fuselage over and draw the two sides together - then join the two halves together using a 1/2" x 16" piece of yardstick as a doubler. Be very careful and make sure that the fuselage stays square and true. Note the 4 mil gap at the back where the rudder slides into.

Fuselage - cont'd

Leave a 4 mil gap to allow the upper cover to sit flush with the top

1/8" X 15" (approx) yardstick strips

Cut some 1/8" wide strips from a yardstick and glue them on the inside of the aft part of the fuselage - making sure that you set them 4 mil below the upper edge to allow the aft cover to sit flush with the top.

16 1/2"

2 1/2"

4 mil

NOTE: all dimensions are approximate - make the cover the actual size needed

Make an aft fuselage cover from 4 mil Coroplast. Notice the direction of the flutes. The cover will be installed after the vertical stabilizer is glued in place and the glue has dried.

Fuselage - cont'd
Vertical stabilizer/rudder
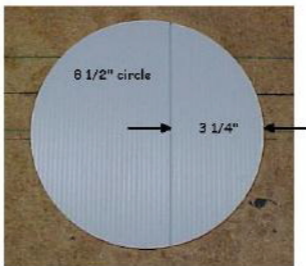
Cut an 8 1/2 " circle using a plate or similar template. Notice the direction of the flutes. After cutting out the vertical stabilizer - measure over 3 1/4" and cut out one flute to create the rudder.
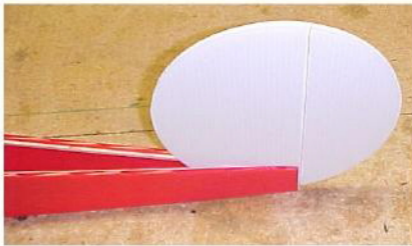

Glue in the vertical stab/rudder to the fuselage using Goop. Slide the tail into the fuselage aligning the rudder hinge with the rear of the fuselage. Make sure that the tail remains perfectly vertical while the Goop cures. Let the Goop dry overnight.

Fuselage - cont'd

Once the vertical stab/rudder has dried overnight - check the fit of the aft cover. Once the cover fits to your satisfaction - glue it in place onto the stringers using CA glue. Use masking tape (or similar) to hold the aft cover in place until the glue dries.
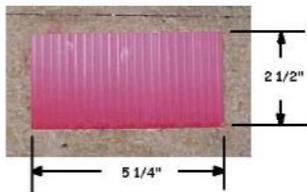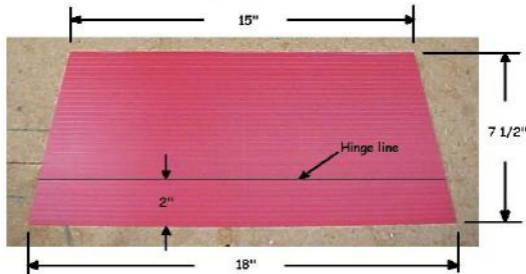

Cut out a hatch for the front of the fuselage using 4 mil Coroplast. Notice the direction of the flutes.

Fuselage - cont'd

This pictures shows how the forward hatch looks when it is installed. Use CA to attach to hatch to the upper fuselage formers.

Cut the tail out as shown above. Be sure that the flutes run lengthwise. After you finish cutting out the horizontal sta/elevator - glue it on the bottom of the fuselage with Goop. Make sure that the tail is mounted squarely in place. Let the glue dry overnight. I used some weights to hold the fuselage down firmly on the tail while the glue dried. The basic fuselage is done - I will address installing the firewall, the landing gear and the wing holddown dowels at a later time. Next is the wing!

Wing

Wing bottom - 4 mil Coroplast

Flutes

11"

48"
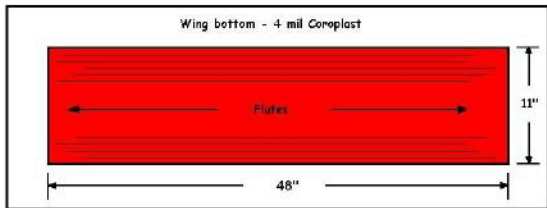
Cut a piece of 4 mil Coroplast down to 11" X 48" - with the flutes going lengthwise. This will be the bottom of the wing.

Wing top - 2 mil Coroplast

Flutes

13"

48"

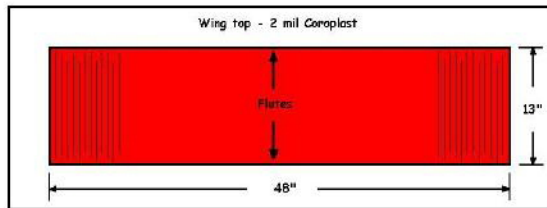Cut a piece of 2 mil Coroplast down to 13" X 48" with the flutes running chordwise. This piece will be the top of the wing.

Wing - cont'd

Upper Wing Panel (2 mil)

mark and score for leading edge

1 1/4"
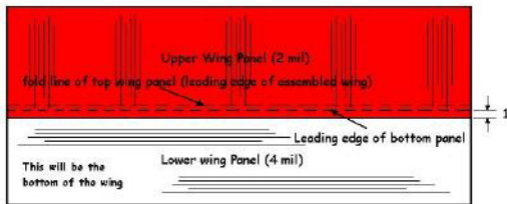
Measure and mark a line 1 1/4 inch in from the edge of the upper 2 mil wing panel. After you mark the line - score it with a blunt tool (go over it several times to make it nice and flexible). This will be your leading edge - so be sure and make it straight. After you have scored the line - the upper wing panel will be ready to be glued to the lower wing panel.

1"

Glue area for overlapped upper wing panel
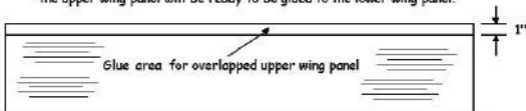
Mark the leading edge of the lower wing panel with a mark 1" in all the way across. This line will be the glue line of where the upper wing panel will go.

Upper Wing Panel (2 mil)

fold line of top wing panel (leading edge of assembled wing)

1

Leading edge of bottom panel

This will be the bottom of the wing

Lower wing Panel (4 mil)

Flash the two areas to be glued on the upper and lower wing panels then glue them together. You will notice that the fold area on the upper wing panel extends 1/4" past the leading edge of the lower wing panel - this is to allow clearance for the upper wing panel to arch to its shape.

Wing - cont'd

upper wing panel

1" gap (to clear the aileron tips - both sides)

lower wing panel

yardstick spars (2 ea overlapped 26"

7 3/4"
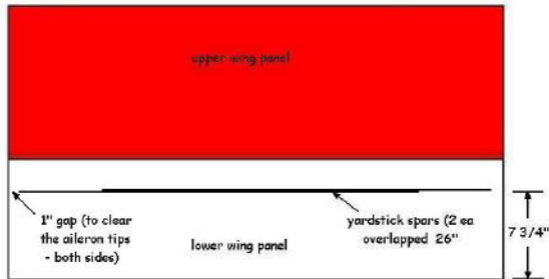
After the glue dries - flip the wing panels over and mark a line 7 3/4" from the trailing edge of the lower wing panel for the spar location. Take two yardsticks and glue them together - overlapping them 26 inches - that 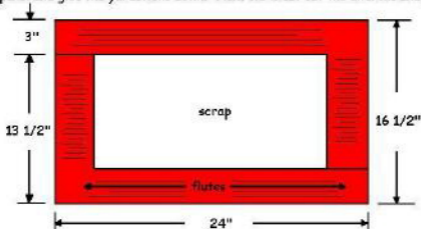gives you a spar that is 46 inches long. Flash the spar line on the lower wing panel and glue the yardsticks down. Next we'll cut out the ailerons and glue them on.

3"

13 1/2"

scrap

16 1/2"

flutes

24"

Take a piece of Coroplast that is 16 1/2" x 24" and cut the ailerons out of it. Notice the direction of the flutes. You will be making a left and a right. After you cut out the rough size of the ailerons - go to the next page to finish them up.

Wing - cont'd

L/H aileron

R/H aileron

hinge line

hinge line

1/2"

11"

2 1/2"

24"

24"
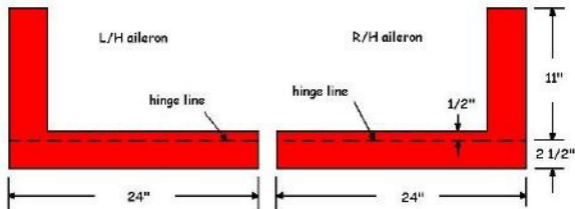
Seperate the ailerons, mark and cut out the hinge on the back side of the aileron. Make sure that you make a left and a right.

1"

1"

L/H aileron

R/H aileron

hinge line

hinge line
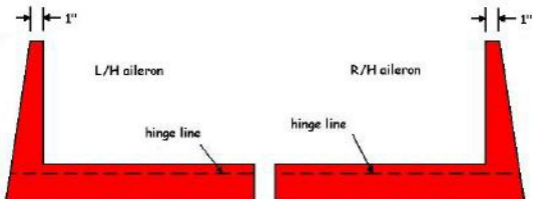
Next - trim the ends of the ailerons at an angle according to the drawing above. This gives the wingtips the cool "stick" look.

Wing - cont'd

4 mil aileron

2 mil doubler
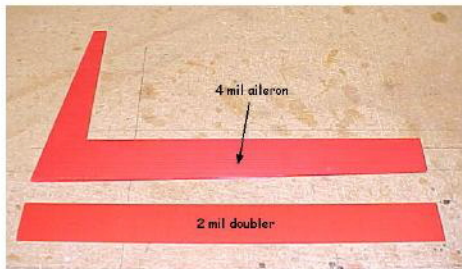
Once you get the ailerons cut out - cut out a piece of 2 mil that matches the outline of the aileron (not including the hinge). Flash and glue it on top of the 4 mil aileron. Do that for both ailerons. You can make the flutes on the 2 mil piece run either way - it doesn't really matter - but I made mine run the short way to match the flute direction on the upper wing panel.

After the glue dries - trim the ends to match the 4 mil piece if necessary.

Wing - cont'd

Aileron edge should be flush with
the side at the leading edge
(both sides)

4 inch gap - fill it in with a 1/2" x 4"
piece of scrap Coroplast

**Don't forget to apply glue to
the top of the spar before you
fold the upper panel over!!!!**

Flash the trailing edge on both the upper and lower wing panels and glue them down. You can
either glue the whole upper panel down as one piece - or you can split it in half and do each side.

Wing - cont'd

Cut out a piece of 2 mil Coroplast 4" x 12" - (with the flutes running the short way) for a wing center wrap. Flash the wing center section and the center wrap and glue it in place on the upper wing panel only. Trim to fit after the glue cures.

You can either install a single servo in the center (like most of the SPAD line has) - or you can install two individual servos (connected with a "Y" harness) for each aileron on the underside of the wing as I did. Either way will work just fine. Make two horns and install them on the ailerons and hook them up to the servo - ensuring that they move in the correct direction.

Follow the above measurements to determine where to install the wing holddown dowels. The wing holddown dowels are made from 1/4" dowels, cut them to 4 1/2" long. Make sure that the dowels are square and even. Don't forget to fuel proof them!!!!

Landing gear placement

If your are making your SPADStick a trike geared plane - mount the main landing gear 10 inches from the front edge. If you want to make yours a taildragger - mount the landing gear 5 inches from the front edge.

Fuel tank and firewall installation

The fuel tank and the firewall are installed in the same SPAD fashion as in "normal" PVC fuselaged planes. The only difference is that there is Coroplast surrounding the PVC! You will need to cut a relief in the Coroplast where the screws go in to hold the firewall in place. I figured out a really neat way to do that. I use a small, metal handled acid brush, and I heat it with my torch until it gets hot - then just lightly push it through the Coroplast - voila - a nice neat hole!!! Just make sure that you don't go too far - don't melt a hole in the PVC!!!
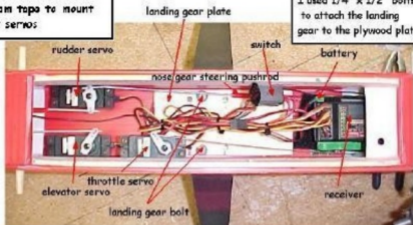
If you still aren't sure how to make and mount the fuel tank and/or the firewall - take a look at Dean's DPS instructions - they go into tremendous detail!

Final Assembly

I used double faced foam tape to mount my servos

landing gear plate

I used 1/4" x 1/2" bolts to attach the landing gear to the plywood plate

rudder servo

switch

battery

nose gear steering pushrod

throttle servo

elevator servo

landing gear bolt

receiver

I made an 1/8" x 2 1/2" x 4" plywood plate to stiffen up the fuselage for the landing gear. I used Goop to glue it down. For the nose gear pushrod - I used a piece of nyrod outer housing and I ran it into and down one of the flutes on the fuselage floor so that it comes out at the firewall in a convenient place (see below picture for a reference).

Dave Brown mount with a hole drilled for the nosegear wire

outer nyrod housing run through the flutes

Note the bulge in the flute on the bottom of the fuselage where the nyrod outer housing has been run through the flute. Insert the nosegear wire pushrod through the outer nyrod housing, hook it up to the rudder servo, then bend it at the nosegear end around 180 degrees so that the nosegear steering has some shock absorption to it.

Final Assembly - cont'd

For the elevator pushrod - I used a long 2-56 wire and a red nyrod outer housing as a guide. Cut a slot in the side of the fuselage where the housing exits. I made my housing exit slots approximately 2 inches long and 1 flute wide. The nyrod housing runs from where it exits the fuselage to within 2 inches of the servo. Use some canopy glue to glue the nyrod housing into place where it exits the fuselage. Make sure that the elevator pushrod has a straight shot from the servo to the elevator horn to prevent binding. Repeat on the other side for the rudder hookup (as shown below)

Final Assembly - cont'd

I used duel aileron servos - mounted on the bottom of the wing on my SPADStick prototype - but you could easily use a single servo on the top (like most SPAD designs).

Balance the SPADStick on the spar - making sure that the plane is not tail heavy. Also - make sure that the ailerons are not drooping at all - because if the ailerons are even slightly drooped - you could encounter pitch trim problems. It is best to set the ailerons at least parallel to the top of the fuselage - or even slightly higher (called reflexed). I used a Great Planes 8 ounce tank in my SPADStick - because it fits perfectly in the American PVC pipe. Double check all throws before flying to ensure that they are moving in the correct direction.

I hope that you enjoy your SPADStick as much as I have enjoyed mine!