Foam Plate Glider: Sonic Silhouette

About this project:

The Foam Plate Glider Sonic Silhouette is the first in a series of flying glider projects made from foam plates. This project is designed as a hand thrown glider, launched from the ground, or launch from an elevated location for longer flights. Although fun for all ages, younger children may require help hand-launching this glider.

Get some Sonic glider time in with this awesome building project! You'll be a glider pilot in no time!

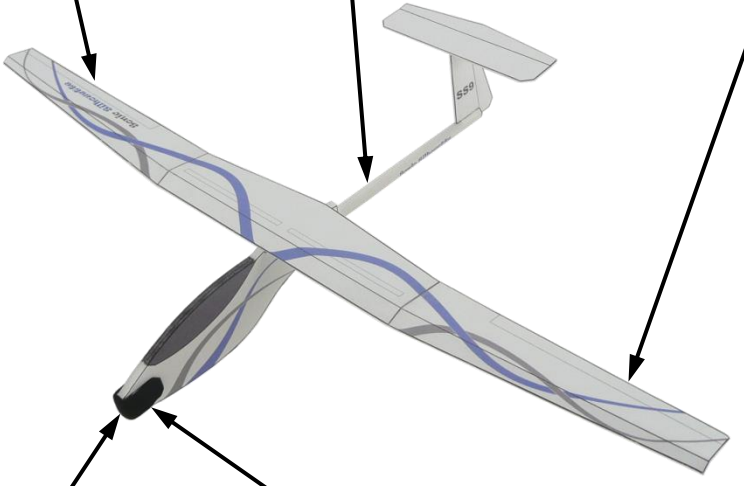
What's it made of?

The Sonic Silhouette is made from foam plates, a plastic drinking straw, and full-sheet printer labels for the airframe. Metal washers provide the nose weight, and craft foam adds a soft tip.

Full sheet ink jet labels

Drinking straws

Foam plates



Foam craft sheet

Metal washers

Project Construction

Check out my way cool Sonic Dad gauges for project difficulty, time, and cost. Cost of this project depends on how many items you have on hand. If you purchase all items new, cost will be higher than the approximate cost shown.

SHOPPING LIST

Quantity	Item needed	Where to find it	See Figure
1 pkg	10.25" diameter disposable foam plates (Home Store brand from Dollar Tree stores recommended SKU#16449)	Dollar Tree, Dollartree.com online store	Page 2, A, C
1 pkg	Avery full sheet ink-jet printer labels #48165	Wal-Mart, office supply store	Page 2, B, C
1 pkg	#10 size SAE flat washer	Wal-Mart, home improvement store, hardware store	Page 2, NN
1 sheet	2mm craft foam sheet (black or the color of your choice)	Wal-Mart, craft store	Page 2, OO, PP, QQ
1 pkg	Regular plastic drinking straws (1/4" diameter)	Wal-Mart, craft store	Page 2, K, L

SUPPLIES AND TOOLS NEEDED

Item needed	Where to find it
Sharp scissors	Discount retail store, home improvement store
Low temp hot glue gun	Discount retail store, home improvement store, craft store
Metal ruler or straight edge	Discount retail store, home improvement store, craft store
X-acto knife with sharp blades	Discount retail store, home improvement store, craft store
Gule stick	Discount retail store, craft store
½" wide clear tape	Discount retail store, craft store
(Optional) black marker	Discount retail store, home improvement store

Rev:03/15/13

Step 1

Use a sharp pair of scissors to cut the rim off of three foam plates. Be sure not to remove any of the flat surface of the plate. For best results, cut about half way up on the radius between the flat surface and the rim as shown. (fig. A)

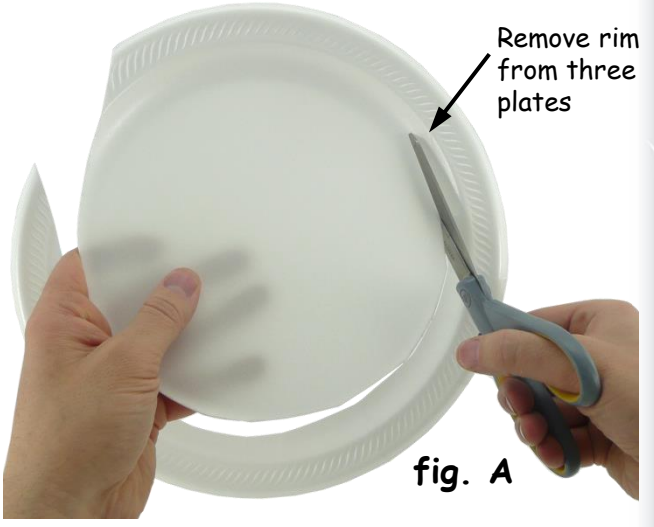


fig. A

Cut around groups of graphics

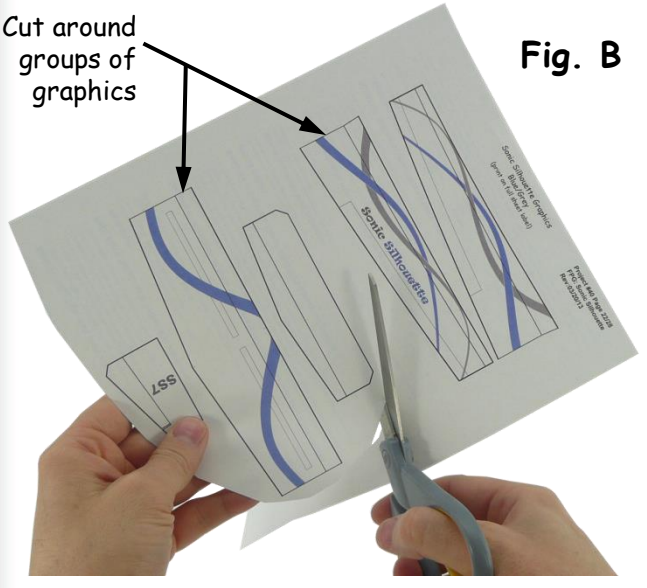


Fig. B

Step 2

Choose which one of the three glider colors you would like to make from pages 20 through 25. Print the two graphic pages required on full-sheet printer labels. Use a sharp pair of scissors to roughly cut out the groups of graphics as shown in figures B through E. Cut the graphics out with about 1/4" margin around the edges. (fig. B)

Step 3

Apply the two wingtips and camber gauge graphics to the first foam plate as shown. (fig. C)

Apply these graphics to first plate

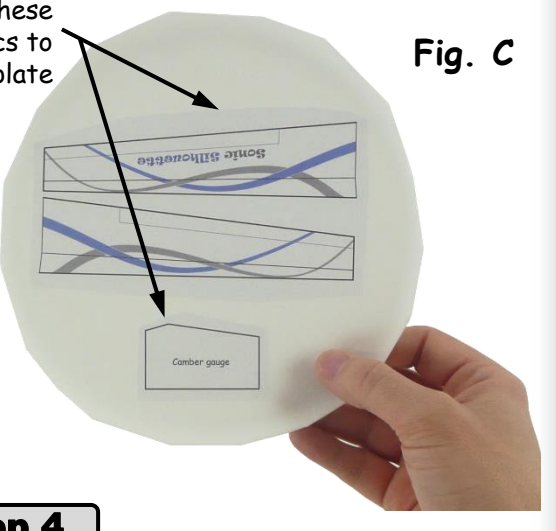


Fig. C

Apply these graphics to second plate

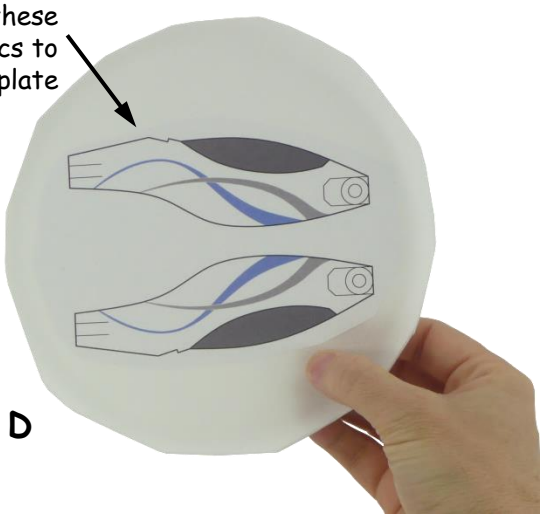


Fig. D

Step 4

Apply the fuselage graphics to the second foam plate as shown. (fig. D)

Step 5

Apply the center wing section and stabilizers to the third foam plate as shown. (fig. E)

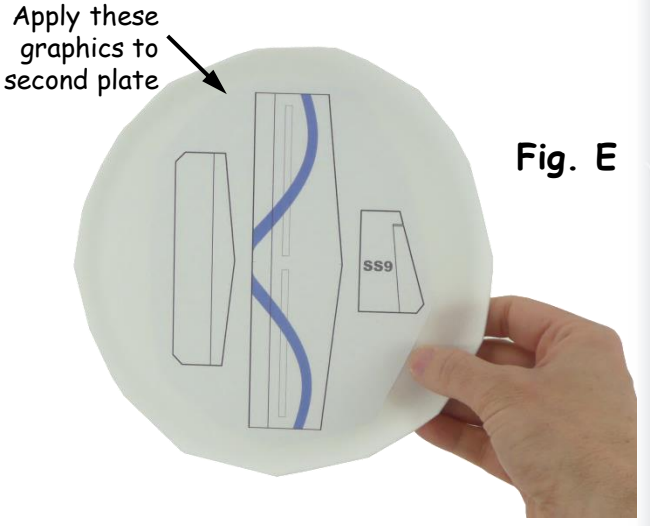
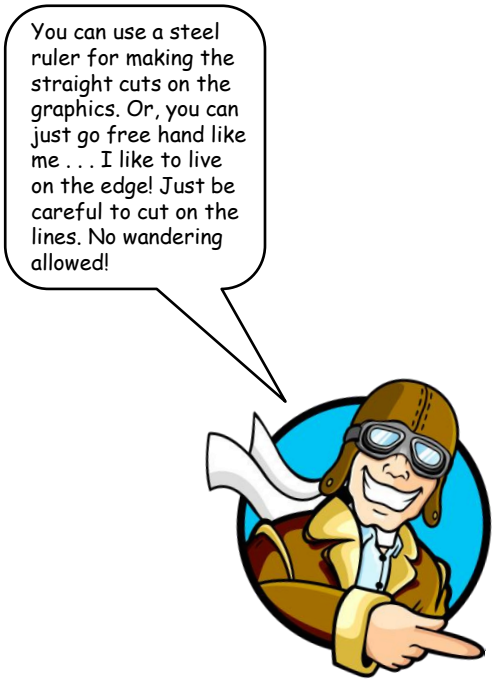


Fig. E



Step 6

Place the foam piece on a surface suitable for cutting. Use an X-acto knife with a new, sharp blade for cutting the foam pieces. You can use a metal ruler as a cutting guide on the straight cuts. For all of the other cuts, carefully cut freehand along the outside on the lines as shown. (fig. F)

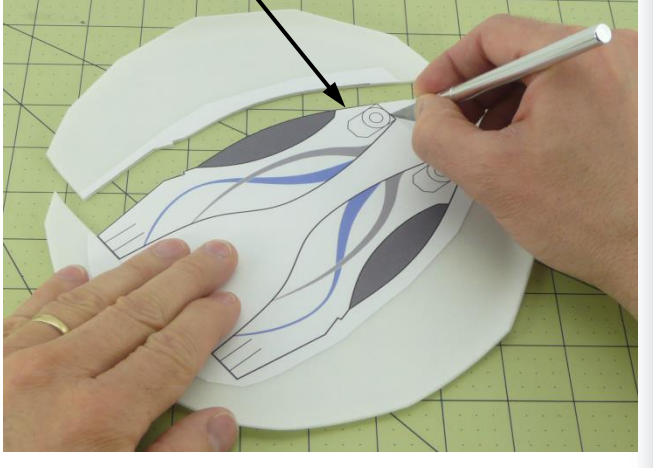


fig. F

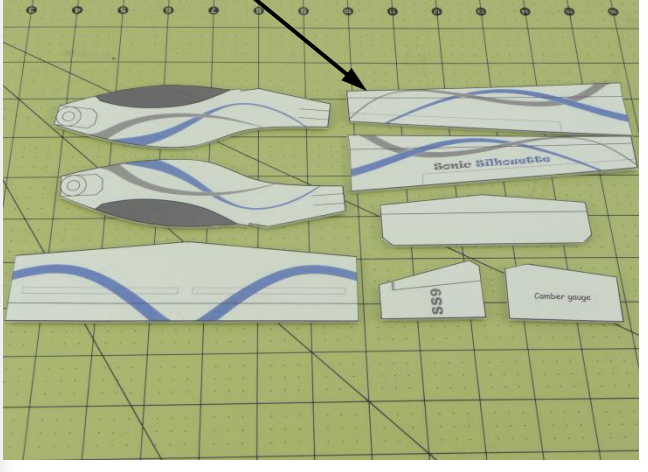


fig. G

Step 7

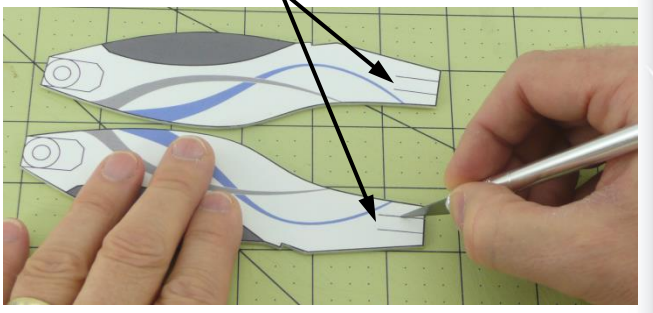
Cut out all of the foam pieces shown. (fig. G)

Step 8

Use an X-acto knife to cut the four tail boom mounting slots as show. Be careful to cut exactly on the lines. (fig. H)

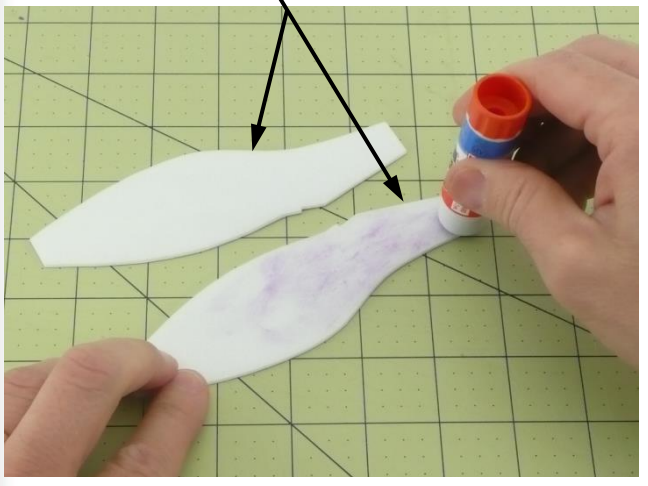
Cut on the four tail boom slot lines

fig. H



Apply a thin coat of glue on both pieces

fig. I



Step 9

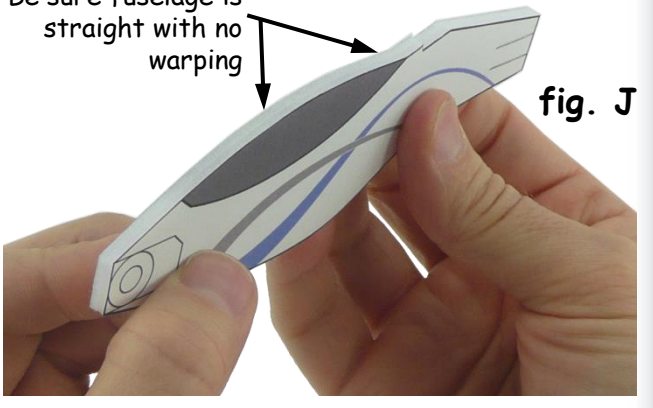
Lay both fuselage pieces on your work surface with the foam side up as shown. Use a glue stick to apply a thin, even film of glue over the entire surface of both pieces. For good adhesion, be sure the entire surface is covered. (fig. I)

Step 10

Stick the fuselage halves together, lining up all the edges flush. Lay the fuselage on a flat surface to make sure it is straight with no warping. Allow the glue to dry for a few minutes before proceeding. (fig. J)

Be sure fuselage is straight with no warping

fig. J



Align graphic straight along straw's axis

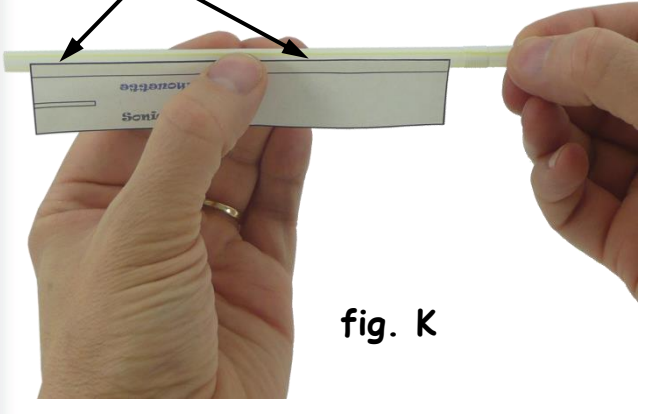


fig. K

Step 11

Use the tail boom graphic that you printed in a previous step. Cut the graphic out using scissors, or an X-acto knife with a sharp blade and a straight edge. Remove the backing and apply to a regular plastic drinking straw measuring 1/4" in diameter. Careful alignment is key to a great looking tail boom. Start by sticking down the left corner on the center and along the axis of the straw, then carefully align the label straight along the axis, then stick the right corner down as shown. (fig. K)

Step 12

Press the first edge of the label down on the straw by carefully sliding your thumb back and forth. Now, apply the label all the way around the straw by slowly turning the straw with one hand while sliding your thumb and fingers back and forth all the way across the label with your other hand. Rotate and apply until the label is applied all the way around the straw. Be sure the seam on the label is pressed down firmly all the way along. (fig. L)

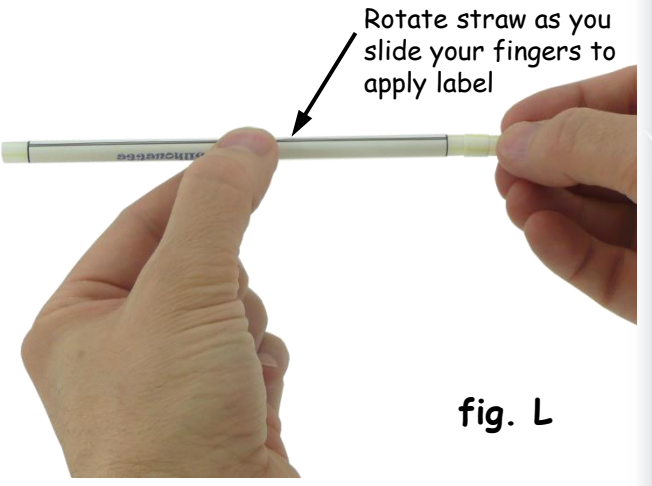


fig. L

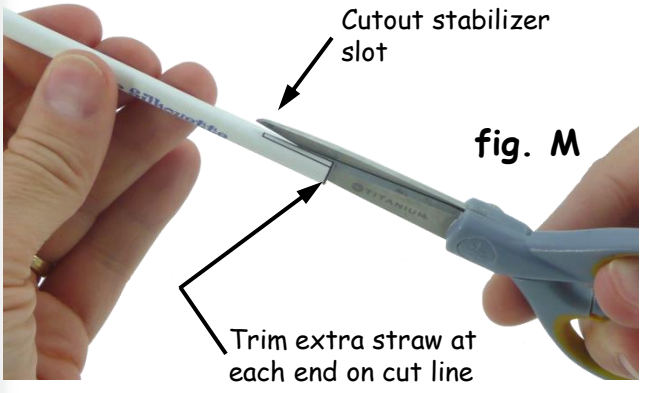


fig. M

Step 13

Use a sharp pair of scissors to trim off the extra straw on each side of the graphic. Use the cut lines on each end as a guide. Carefully cut out the stabilizer slot on the cut lines as shown. (fig. M)

Step 14

Use a sharp pair of scissors to carefully cut out the stabilizer graphic Peal the backing and carefully apply the graphic to the foam side of the stabilizer as shown. For best results, align one corner first, then the bottom edge, then the whole graphic. (fig. N)

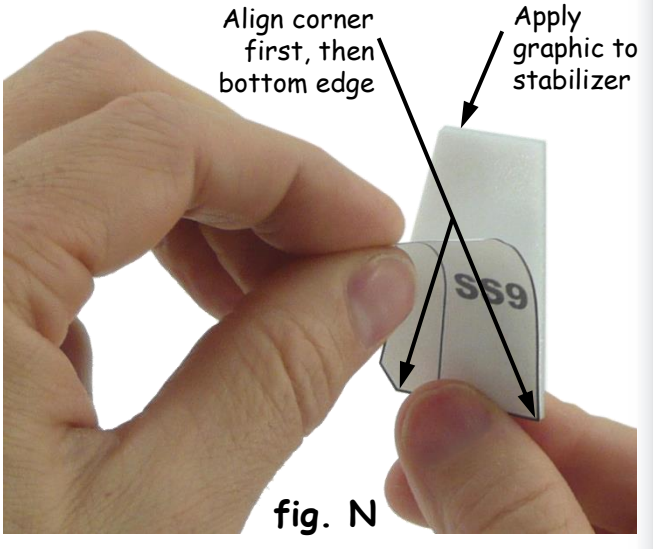


fig. N

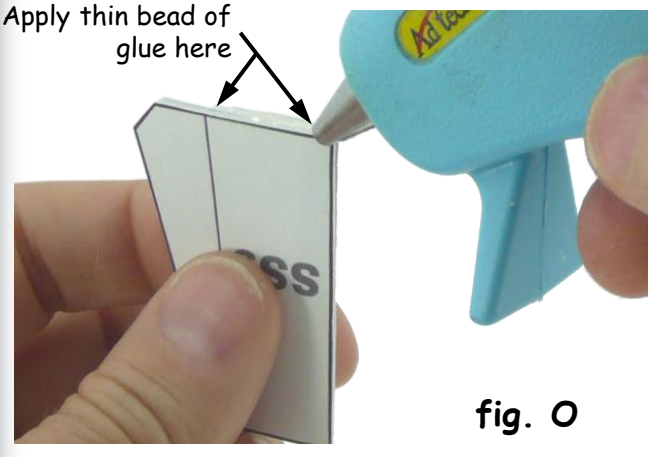


fig. O

Step 15

Using a low-temp hot glue gun, apply a thin bead of glue on the bottom edge of the stabilizer in the location shown. (fig. O)

Step 16

Working quickly while the glue is still hot, insert the stabilizer into the slot and against the inside bottom of the straw as shown. Quickly align the stabilizer so it is flat against the bottom, and centered inside the straw. (fig. P)

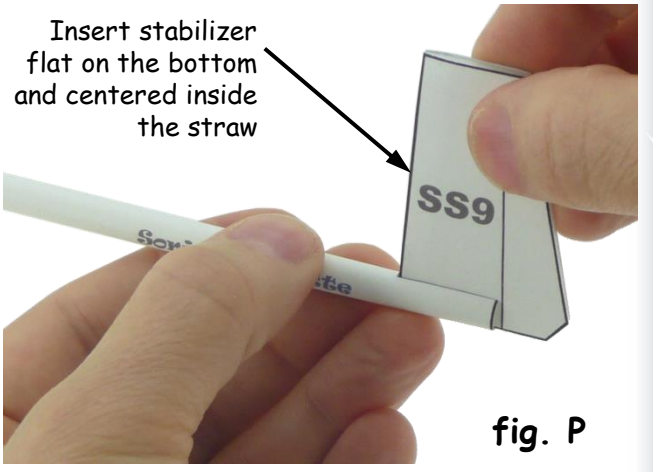


fig. P

Apply tape from one side around the bottom to the other side

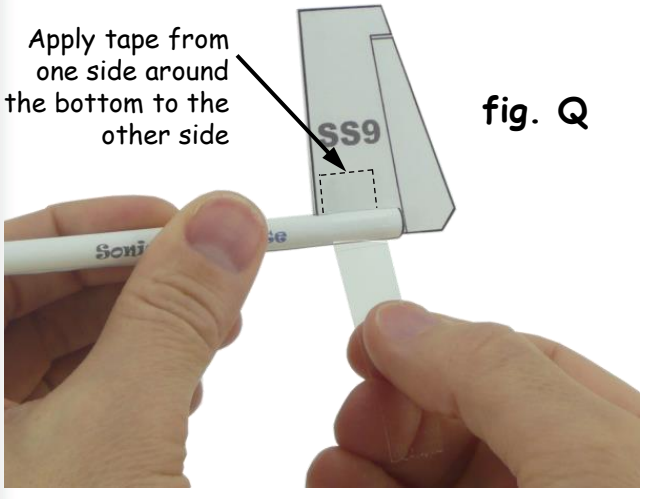


fig. Q

Step 17

Apply a piece of clear tape on one side on the stabilizer, about 1/2" up from the boom as shown. Wrap the tape down around the boom and onto the other side of the stabilizer. Trim the length of the tape on the other side before applying. (fig. Q)

Step 18

Use the Stabilizer Centerline Template to mark a centerline on the foam side of the horizontal stabilizer as shown. Make your mark from the leading edge back to about where the elevator begins. If you mark all the way across, the end of the line will show after you attach the stabilizer. (fig. R)

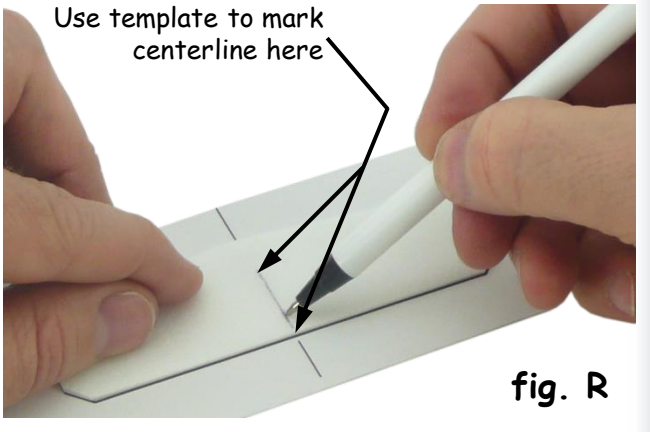


fig. R

Carefully crease foam for elevator

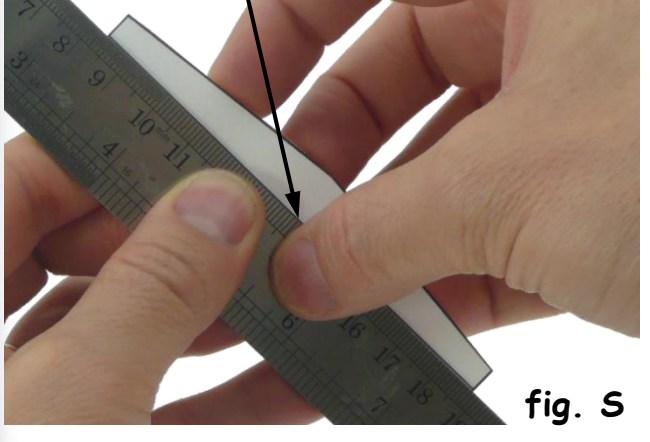


fig. S

Step 19

Use a steel ruler to make a crease in the horizontal stabilizer, creating a movable elevator. Align the ruler on the elevator line as shown. Carefully apply pressure to the foam on the back side of the ruler to create a crease in the foam. Be careful not to crack the foam when making the crease. (fig. S)

Step 20

Using a low-temp hot glue gun, apply a thin bead of glue on the top edge of the stabilizer in the location shown. (fig. T)

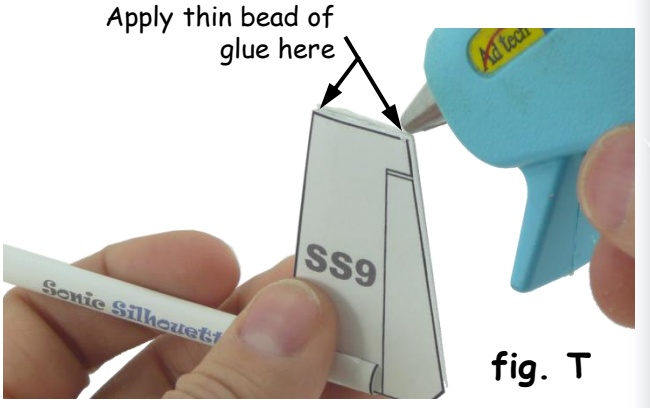


fig. T

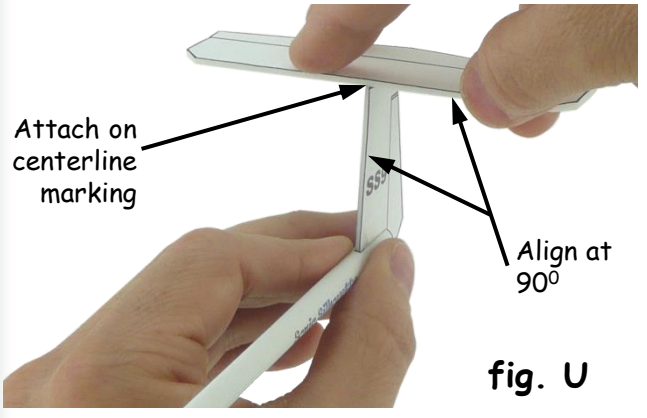


fig. U

Step 21

Working quickly while the glue is still hot, attach the horizontal stabilizer to the vertical stabilizer as shown. Use the centerline marking on the bottom to align the horizontal stabilizer in the center. Be sure the stabilizers are lined up flush at the leading edges. Also be sure the horizontal stabilizer is aligned 90⁰ to the vertical as shown. Hold the stabilizer in position until the glue cools. (fig. U)

Installing the tail boom will take a little patience and finesse. I designed the fit to be tight so the joint is secure. Just take your time and carefully work the tail boom into the slots about half way like this. Installing the boom with the tail rotated like this makes it easier to get it started in the slots. We will rotate the tail in the next step. Be gentile; remember the empennage is your friend!

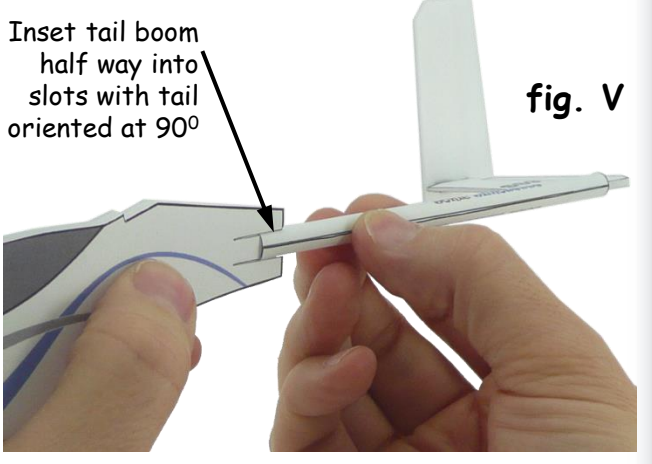


fig. V

Step 22

Carefully insert the tail boom into the slots in the fuselage with the tail rotated 90⁰ in the orientation shown. The fit between the tail boom and fuselage is designed to be snug, so care must be taken during instillation to avoid damaging the foam. (fig. V)

Step 23

Now rotate the tail upright and carefully push it all the way to the end of the slots as shown. This is a snug fit and will require some care to prevent damage as you install the tail. Check the alignment of the tail; be sure the vertical stabilizer is straight up and down. Carefully rotate the tail boom to make small adjustments as necessary. (fig. W)

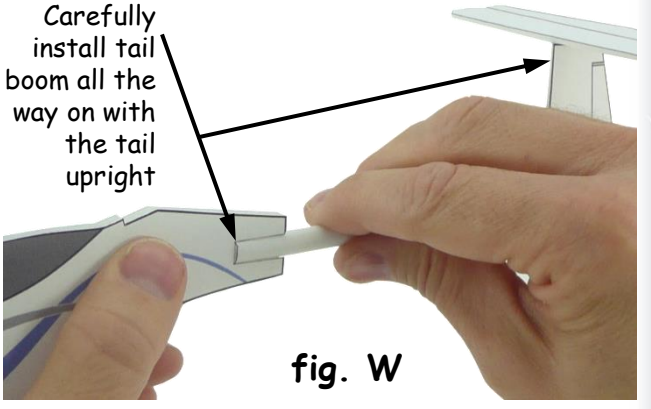


fig. W

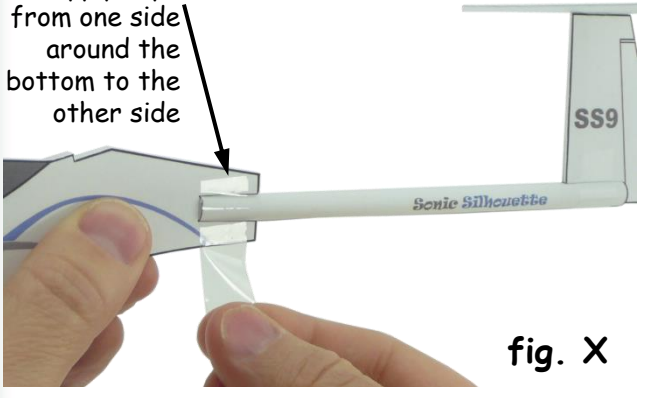


fig. X

Step 24

Apply a piece of clear tape on one side of the fuselage and over the tail boom as shown. Wrap the tape down around the bottom and onto the other side of the fuselage. Trim the length of the tape even with the top of the fuselage on the other side. (fig. X)

Step 25

To improve the efficiency of the wing, use the handle of your X-acto knife to carefully taper the foam side of the leading and trailing edges of all thee wing pieces. It's helpful to place the foam wing pieces near the edge of a raised surface as shown. (fig. Y)

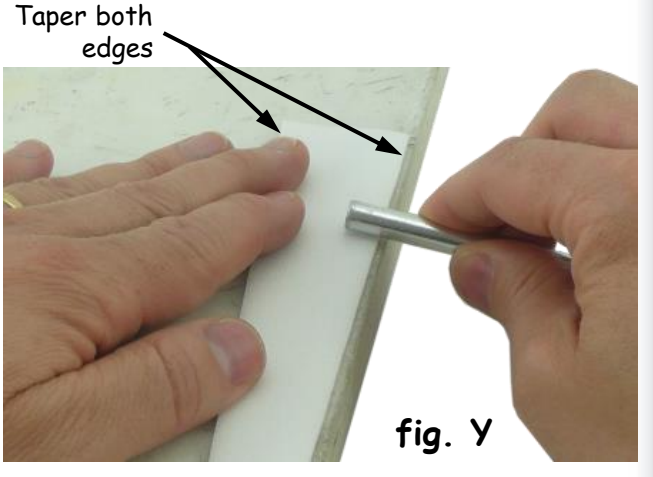


fig. Y

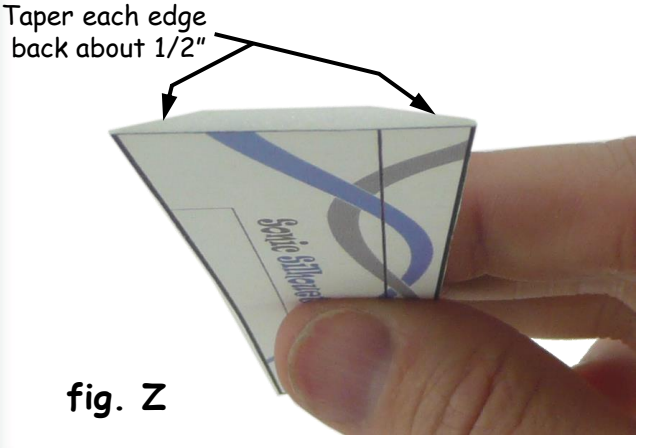


fig. Z

Step 26

Taper the edges of the wing pieces about 1/2" back as shown. It's helpful to practice on a spare piece of foam. (fig. Z)

Step 27

Use a metal ruler to crease the foam on the leading edge of each wing piece. Align the ruler with the leading edge line as shown. (fig. AA)

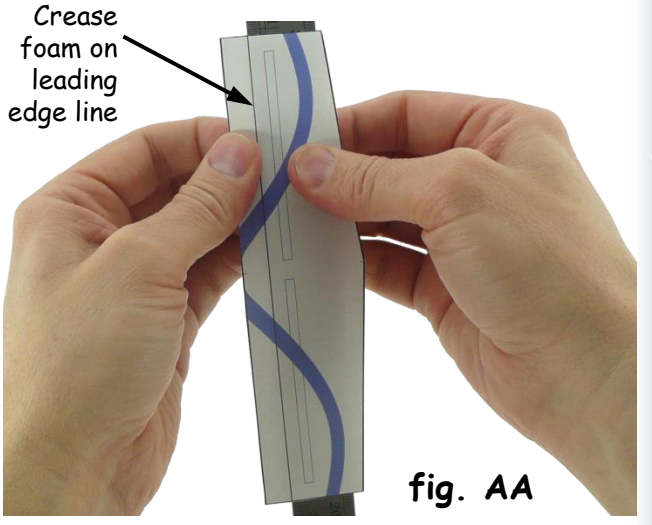


fig. AA

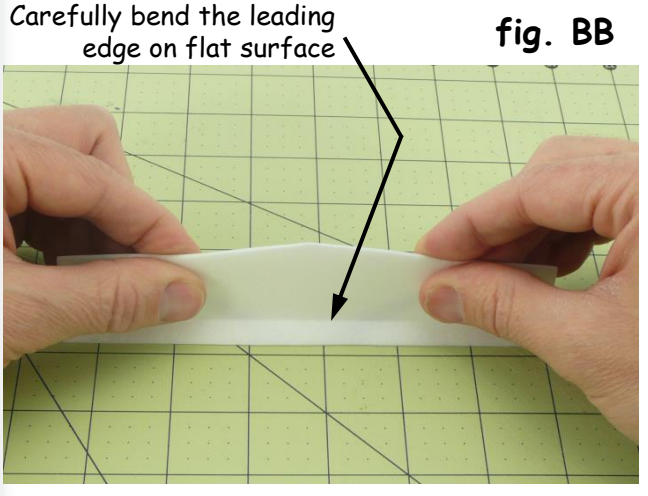


fig. BB

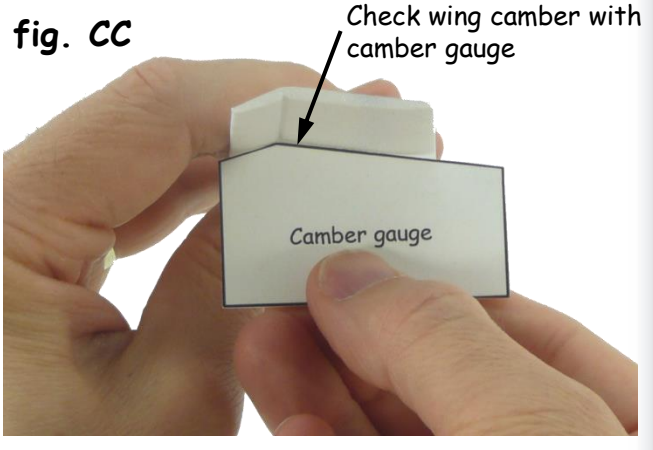
Step 28

Hold the wing piece vertically on a flat surface and gently bend the leading edge over as shown. Carefully fold the leading edge down on all three wing pieces. (fig. BB)

Step 29

Use the camber gauge to check the camber in all three wing pieces. Adjust the camber to match the gauge if necessary. (fig. CC)

fig. CC



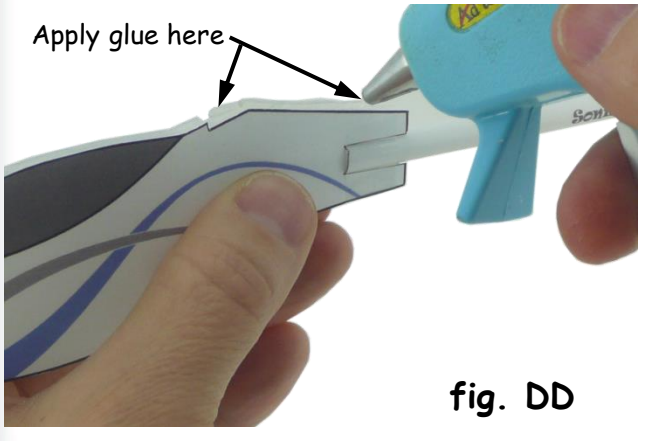


fig. DD

Step 30

Apply a bead of low-temp hot glue in the location shown. (fig. DD)

Step 31

Working quickly while the glue is still hot, attach the center wing section to the fuselage as shown. Be sure the wing is tight against the fuselage and all the way forward against the step as shown. (fig. EE)

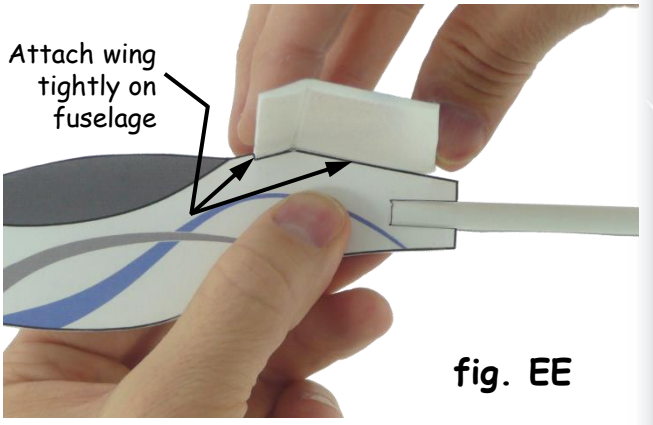


fig. EE

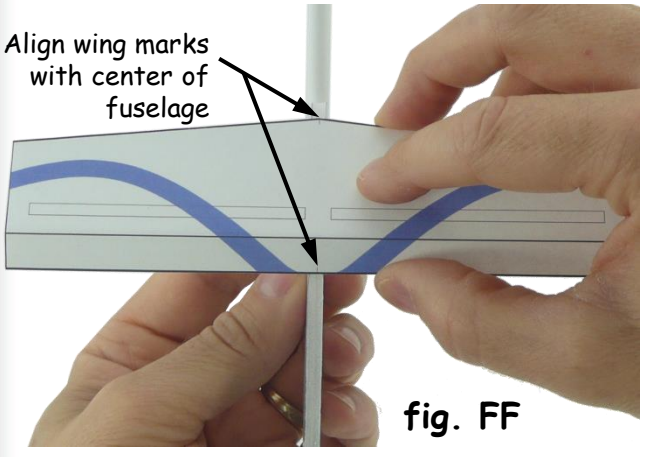


fig. FF

Step 32

While the glue is still hot, check the position of the wing looking down on it as shown. The small alignment marks on the wing should be aligned in the center on the fuselage as shown. (fig. FF)

Step 33

Before the glue cools, check the wing alignment from the front. Be sure the wing is aligned 90^0 from the fuselage as shown. (fig. GG)

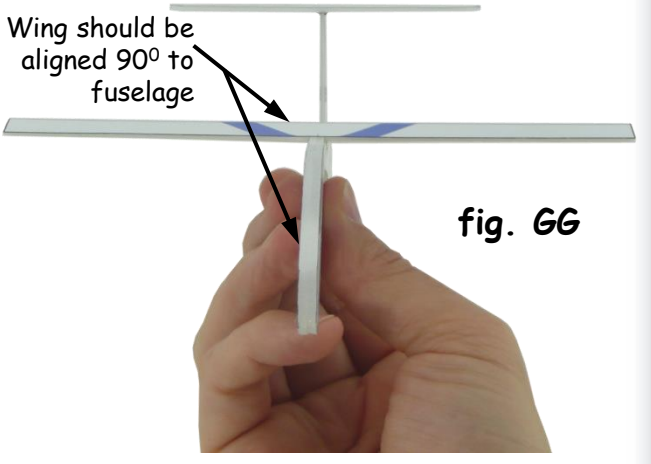


fig. GG

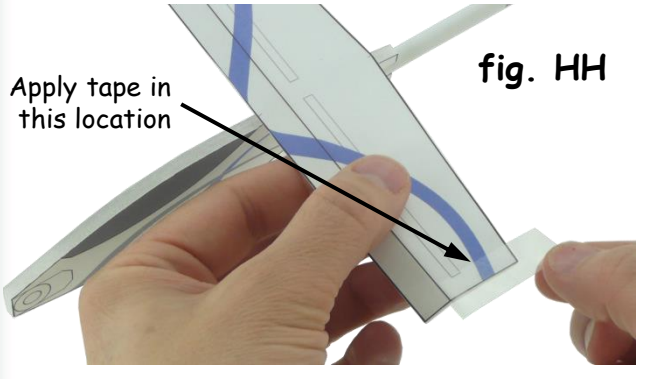


fig. HH

Step 34

Apply a piece of clear tape to the wing in the location shown. Trim the end of the tape so that it extends past the wing about 3/4". (fig. HH)

Step 35

Holding the tape back with your thumb, carefully align the wingtip piece as shown. After you are sure the two pieces are aligned with each other, hold the wingtip piece tightly against the center section with the wingtip elevated as shown, and apply the tape. (fig. II)

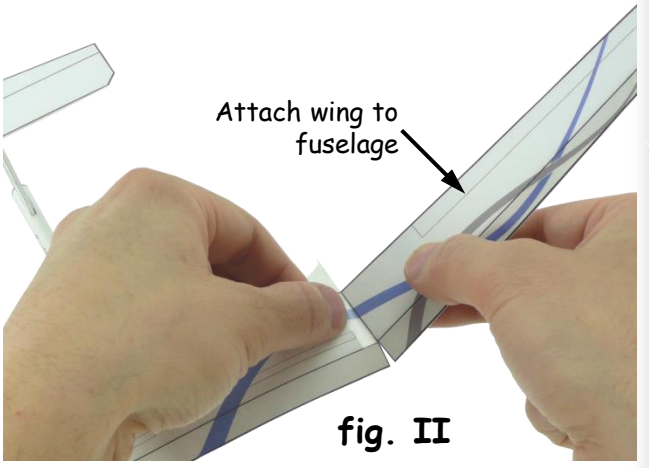


fig. II

Attaching each wingtip piece is a bit tricky, but I know you can do it! Just be sure you have the two pieces aligned well. I like to stick the tape on with the wingtip elevated like this. This will help the tape joint to be a little tighter when you pull the wingtip down into position. Take your time and you'll get it. If you don't get it right the first time, you can carefully remove the tape and try again.

Step 36

Now pull the wingtip down into position and wrap the loose end of the tape tightly around the trailing edge and under the wing as shown. (fig. JJ)

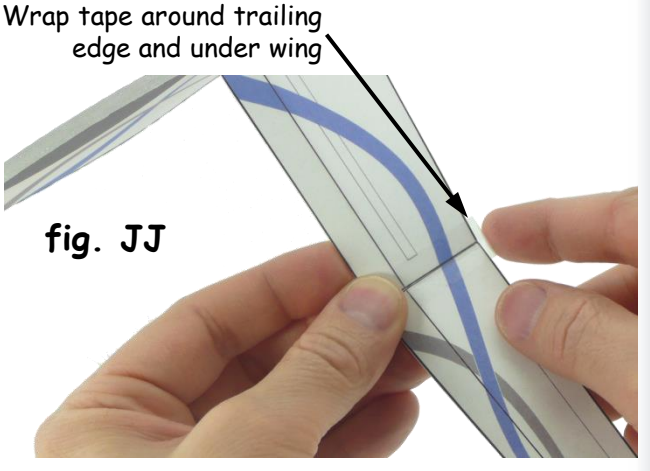


fig. JJ

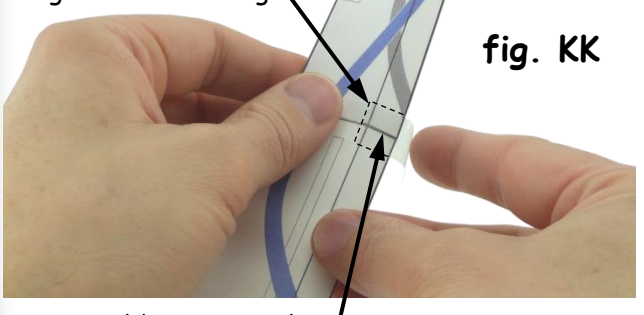


fig. KK

Step 37

While holding the leading edge joint together tightly, apply a piece of tape in the location shown. Be sure the joint is tight before applying the tape. A tight fit is important because the leading edge joint will establish the dihedral angle in the wingtip. Trim the length of the tape leaving about 3/4" and wrap tightly under the wing. (fig. KK)

Step 38

The dihedral angle in each side of the wing should match. If they don't look even, small adjustments can be made by carefully bending the wingtip up or down slightly. (fig. LL)

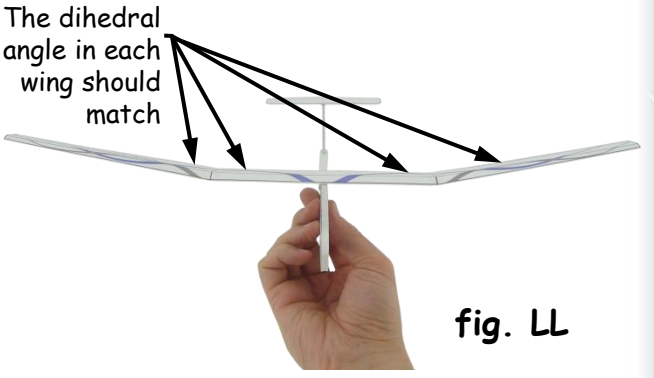
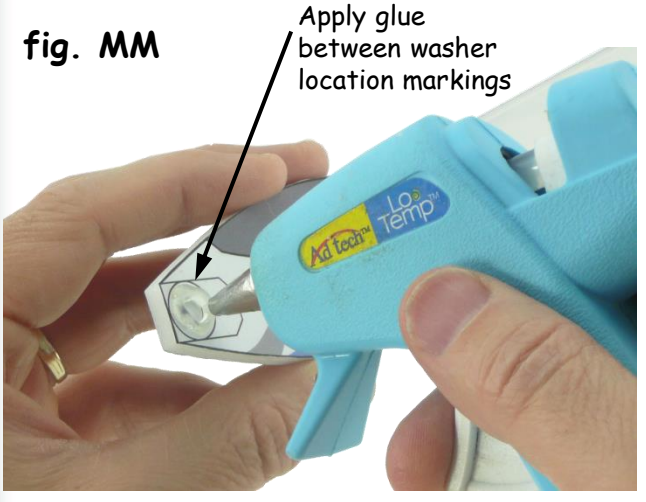


fig. LL

fig. MM



Step 39

Apply a small bead of low-temp hot glue between the washer location markings on one side of the fuselage as shown. (fig. MM)

Step 40

Working quickly while the glue is still hot, attach a #10 flat washer on the location marking. Attach the second washer to the other side of the fuselage as shown. (fig. NN)

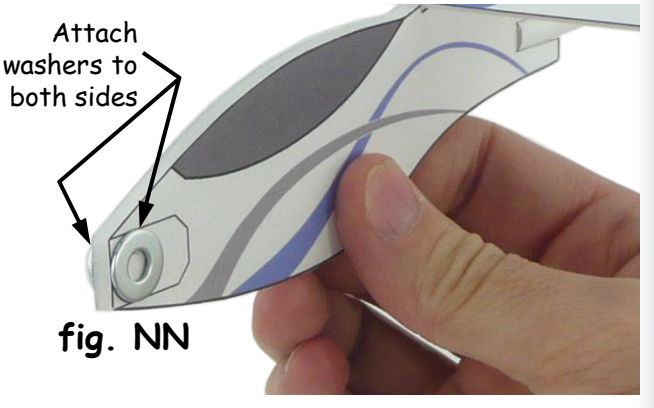
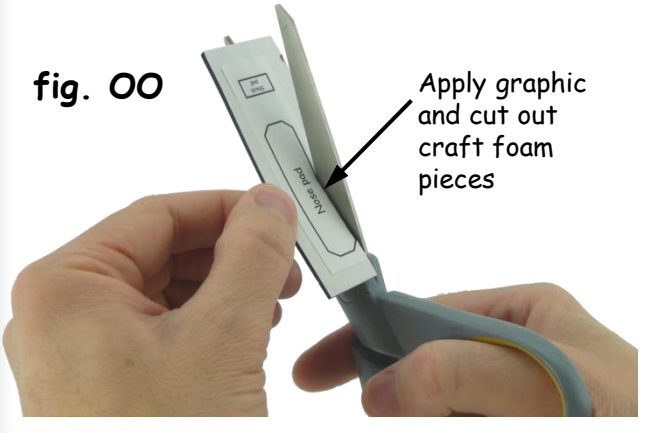


fig. NN

fig. OO



Step 41

Remove the backing and apply the shock and nose pad cutting template to a piece of black adhesive-backed craft foam. Apply the graphic on the back side of the foam piece as shown. Use a sharp pair of scissors to cut out both pieces. (fig. OO)

Step 42

Remove the backing on the shock pad foam piece. Apply the shock pad to the nose of the fuselage as shown. (fig. PP)

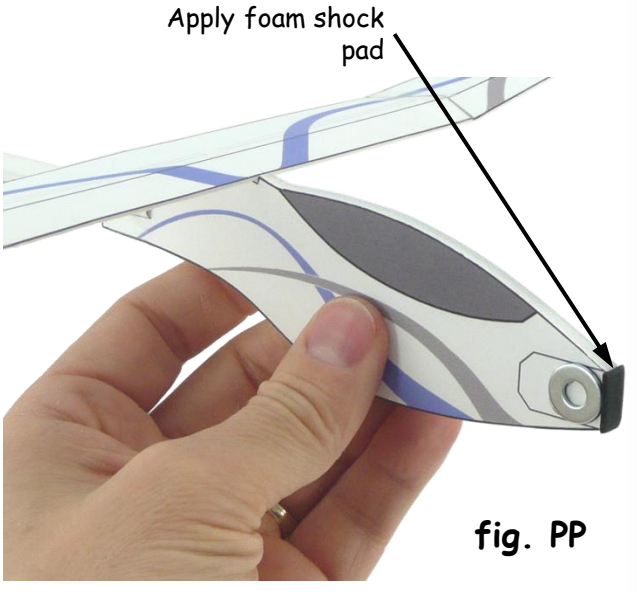


fig. PP

Use location lines to apply pad around nose

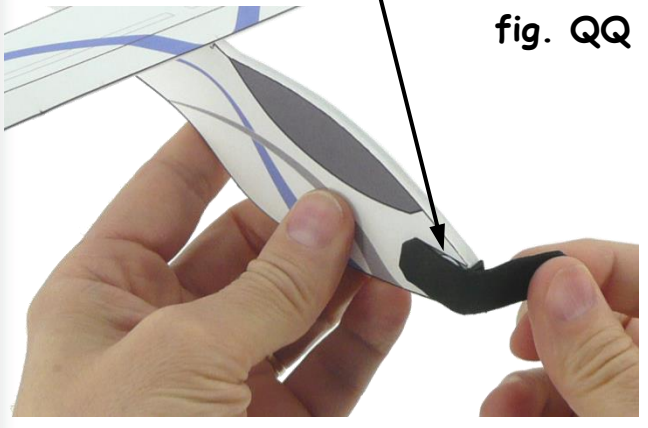


fig. QQ

Step 43

Peal the backing and apply the nose pad to one side of the fuselage as shown. Use the location lines as a guide. Wrap the pad around the nose; then apply to the other side using the markings for location. (fig. QQ)

Step 44

If you wish, you can use a permanent black marker to color the foam on the canopy as shown. (fig. RR)

Color foam above canopy black

fig. RR

Adjusting Your Sonic Silhouette

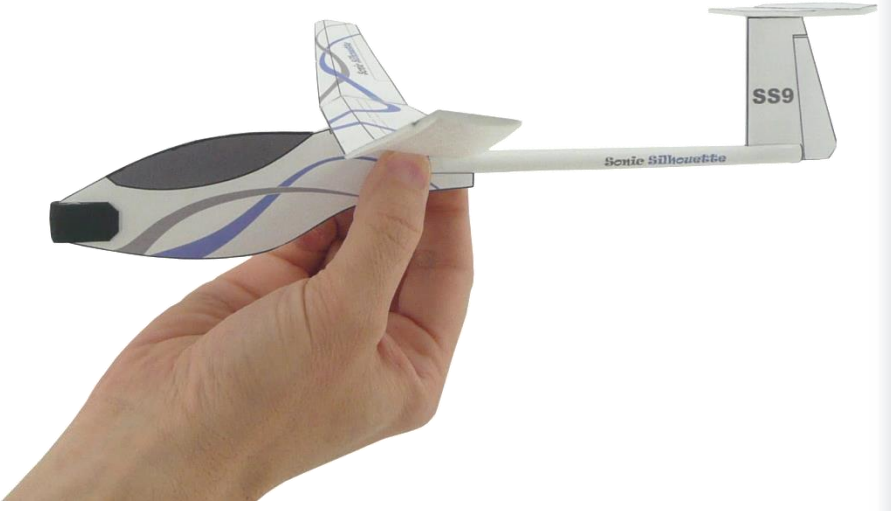
The primary adjustment for a great flying glider is the elevator. I will help you find the best position for the elevator in the next section. To increase the elevator angle carefully bend it up like this. If you need to decrease the elevator angle, just carefully bend it down in the same way.

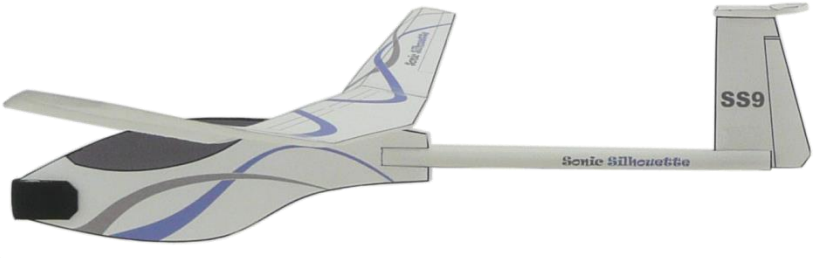
Rigging the wings of your glider is also very important for good flights. You should check to be sure you have the same camber throughout the wing and matching camber between each wing. Also check to be sure there is no twist in each wing. The best way to do that is to look at your glider nose-on, then tilt it up just enough to see the under side of the wings like this. Now, compare the amount of visible wing at the tips; they should be the same. If you see more or less surface on one side, then carefully warp the wingtip until they match.

Flying Your Sonic Silhouette

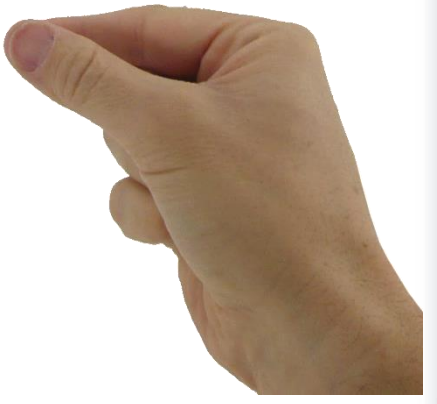
Hand Launching

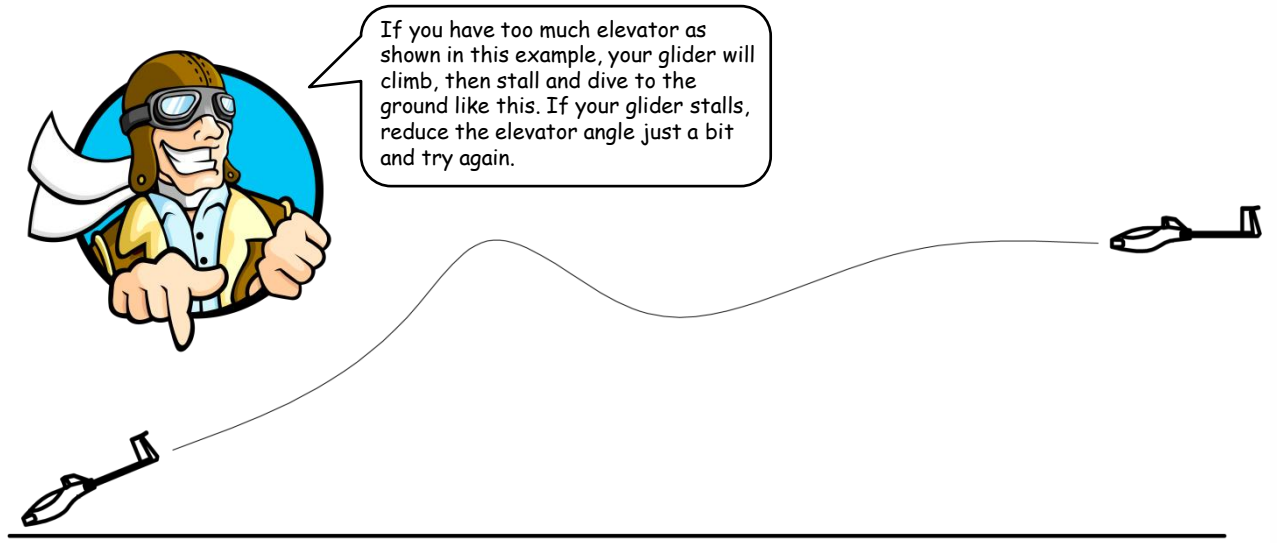
A good launch is key to a good flight. I'll show you how to launch your glider first, then we'll look at trimming the elevator for a nice glide. Grip your Sonic Silhouette on the fuselage like this. Start your hand launch with your arm back and the plane level.

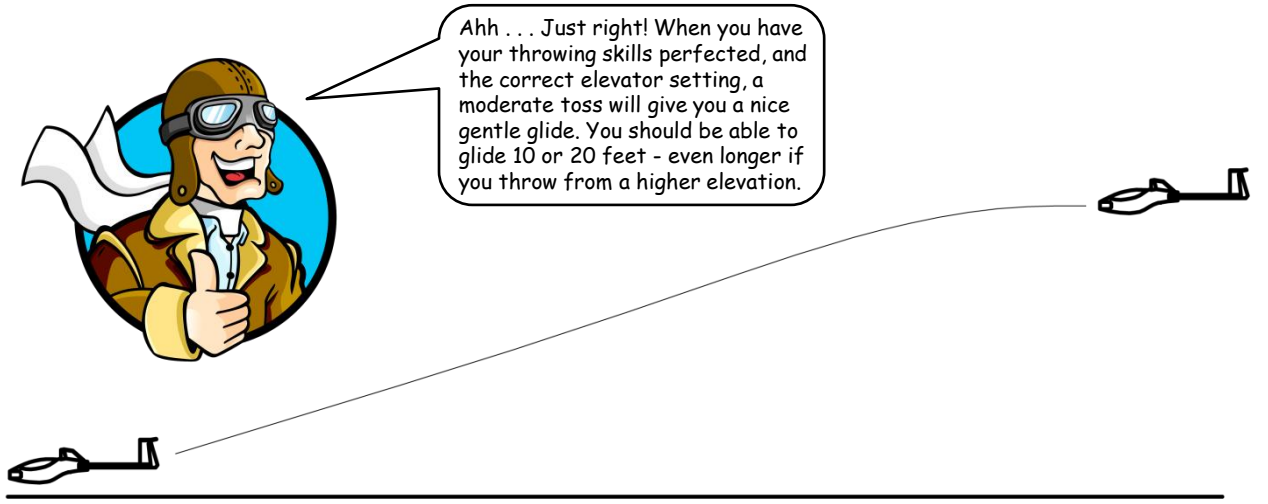




Now give your glider a nice smooth toss, keeping the wings and nose level as you release. You don't want to release the glider with the wings in a bank, or the nose raised or lowered. A nice level release is what you want to practice. You will also want to practice adjusting the speed of your throw. Too slow and your glider wont have enough airspeed to fly. Too fast and your release will be hard to control. Just a nice moderate speed is all you need.







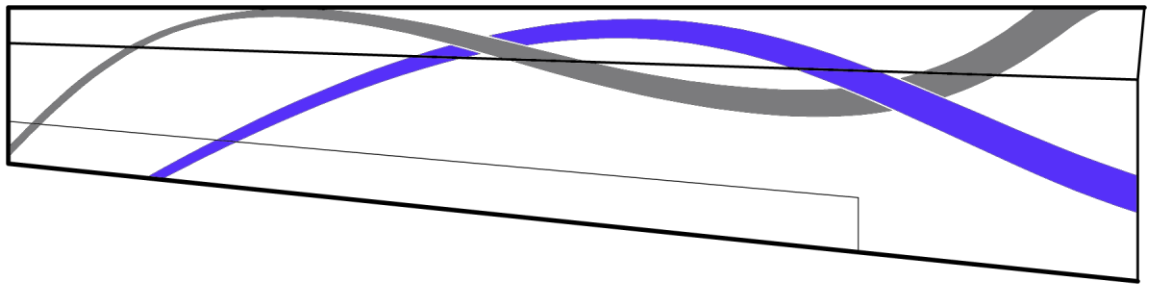
Try this!

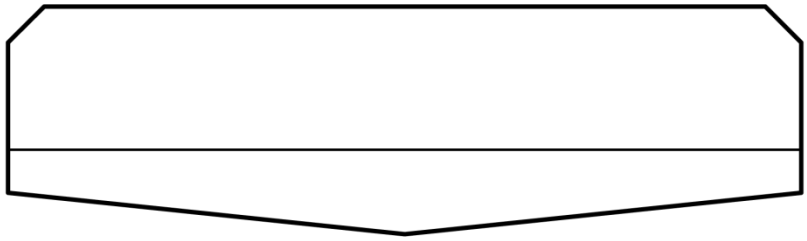
Once you get the hang of hand-launching your glider, try improving your piloting skills with some cool tricks.
Glider Catch: You can really hone your piloting skills by playing catch with another person. Start about 10' apart, then keep moving apart as your skills improve. Try throwing the glider a bit harder for more distance. If you throw a little nose down and with a little extra speed, the glider will fly farther and rise back up to the person catching it.

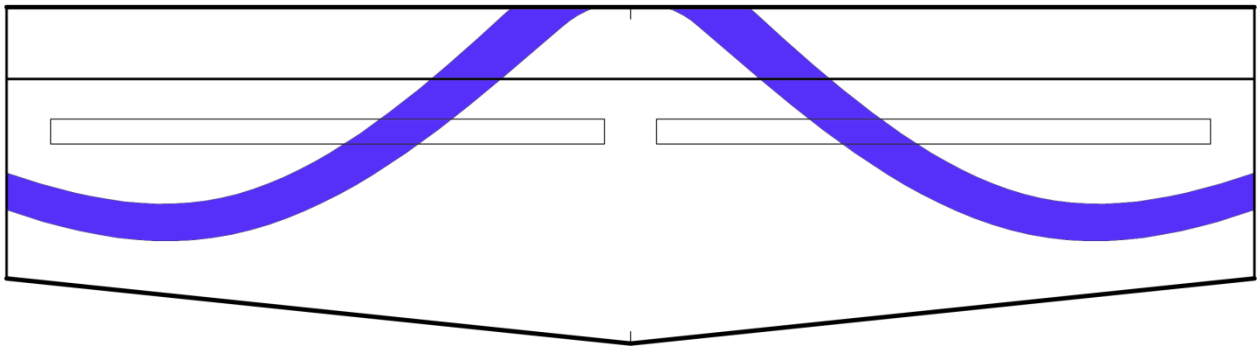
Distance: You can have a gliding contest to see who can throw the glider the farthest. Long flights require a balance between a good throw and the right elevator setting. Experiment with your glider. Try throwing it at different speeds and with different elevator settings. You can get even longer flights if you stand on an elevated place like a hill or a tree house. Push the edge of the envelope!

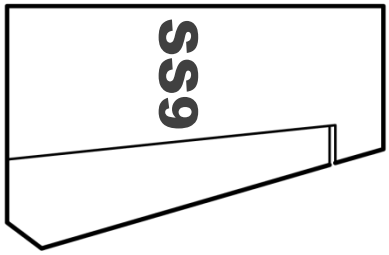
Notice to Airmen: The Sonic Silhouette glider is best used at moderate ambient temperatures. If the glider is built at room temperature then taken to extreme hot or cold environments, the wings will warp slightly because the paper label and foam expand and contract at different rates with temperature changes. The warping can be worked out of the wings and horizontal stabilizer with your fingers if you wish to remain at the new temp.

Sonic Silhouette Graphics
Blue/Grey
(print on full sheet label)

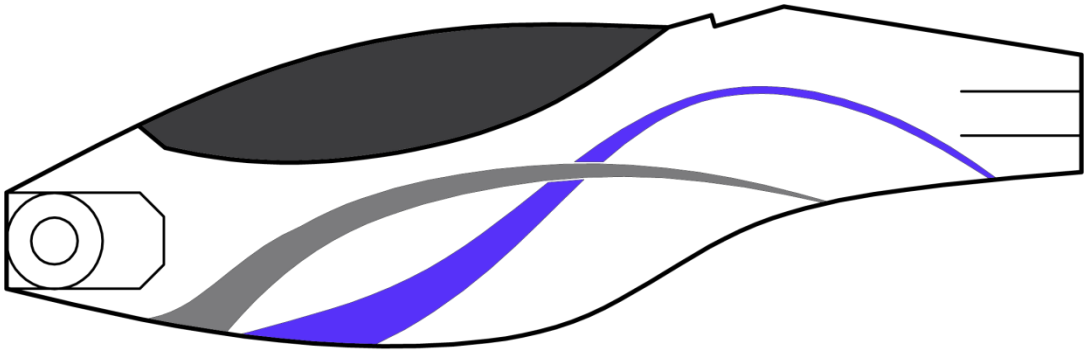


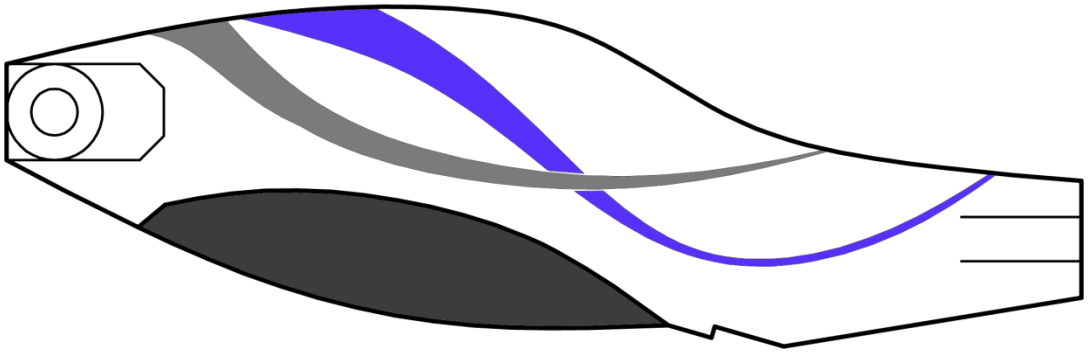






Sonic Silhouette Graphics
Blue/Grey
(print on full sheet label)





Camber gauge

Centerline marking template

6SS

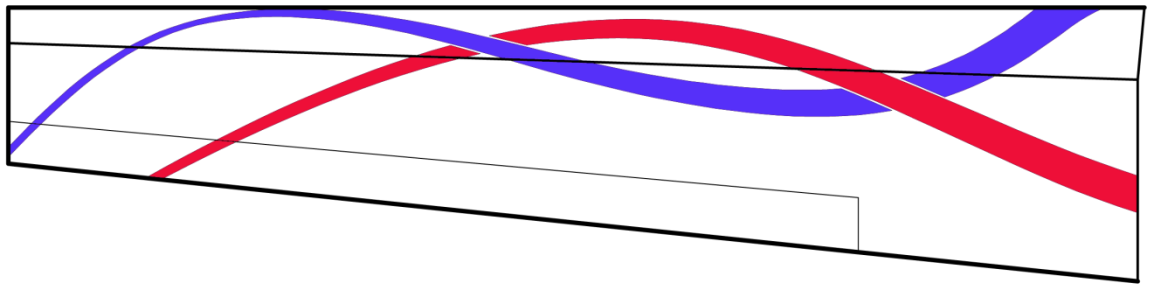
Nose pad

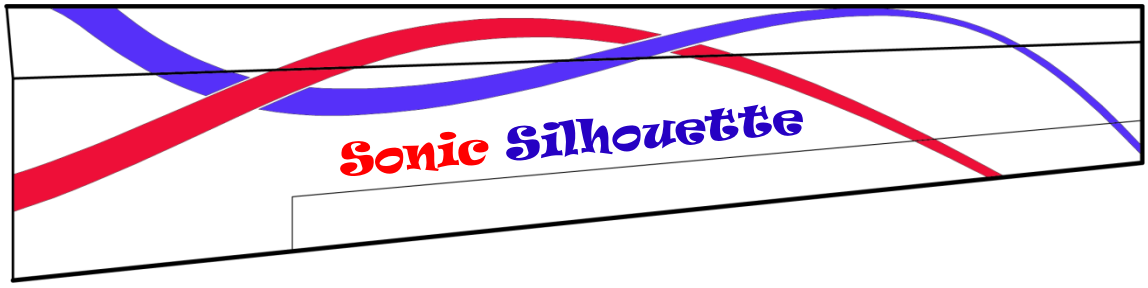
Shock pad

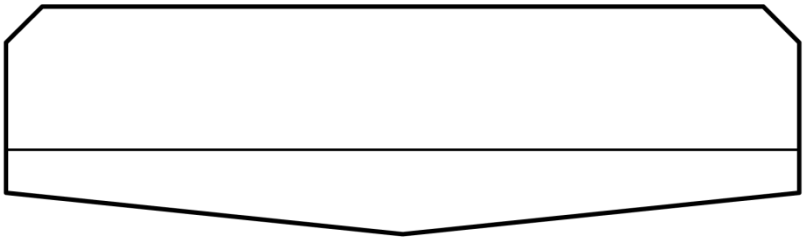
Sonic Silhouette

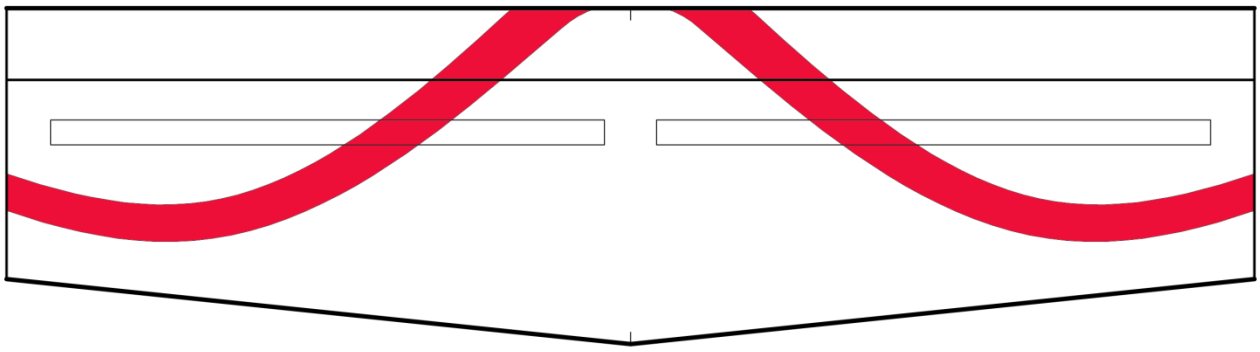
Sonic Silhouette

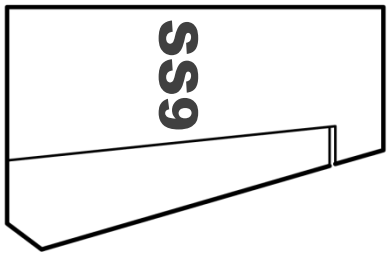
Sonic Silhouette Graphics
Red/Blue
(print on full sheet label)



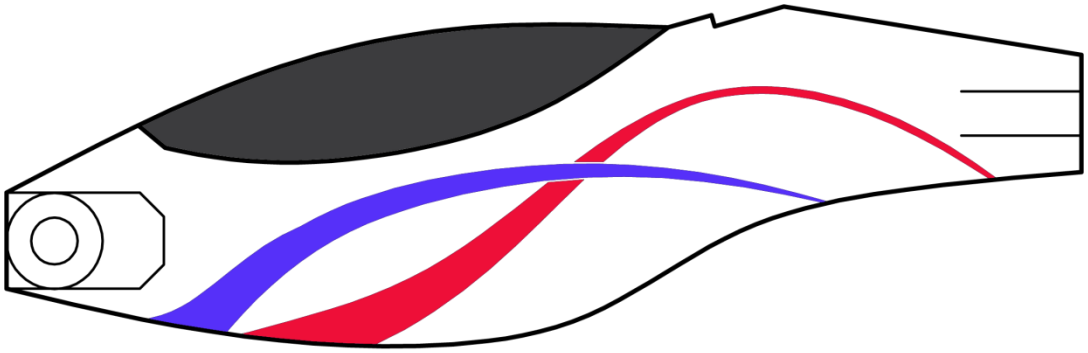


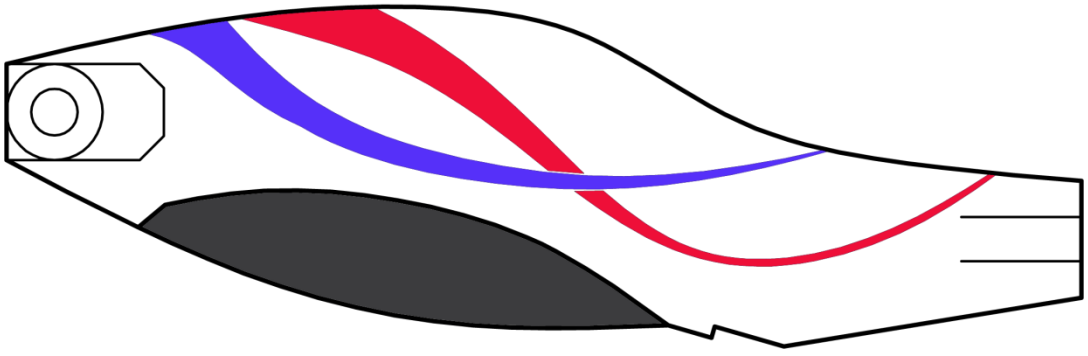






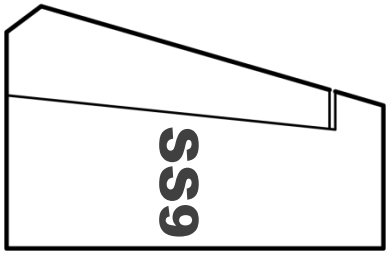
Sonic Silhouette Graphics
Red/Blue
(print on full sheet label)





Camber gauge

Centerline marking template



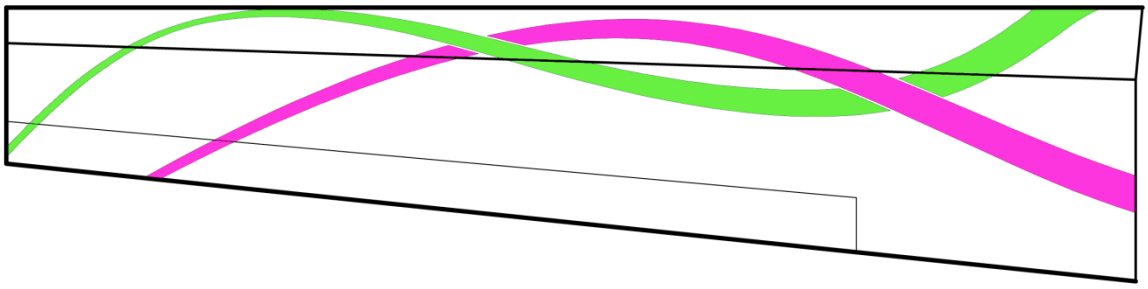
Nose pad

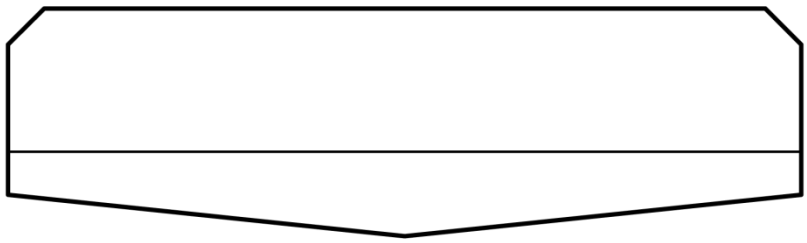
Shock pad

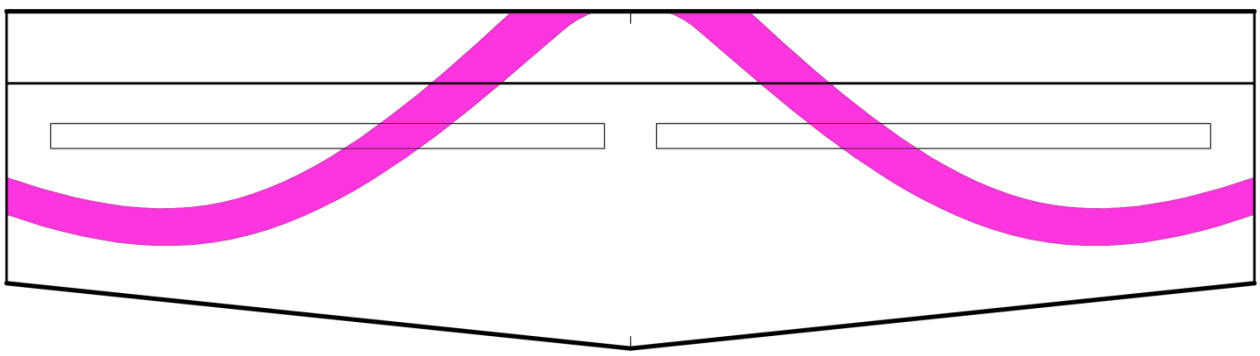
Sonic Silhouette

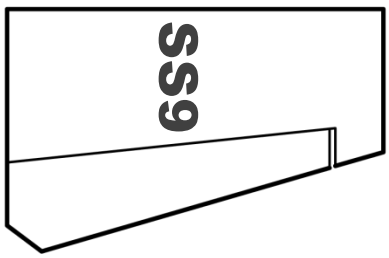
Sonic Silhouette

Sonic Silhouette Graphics
Green/Pink
(print on full sheet label)

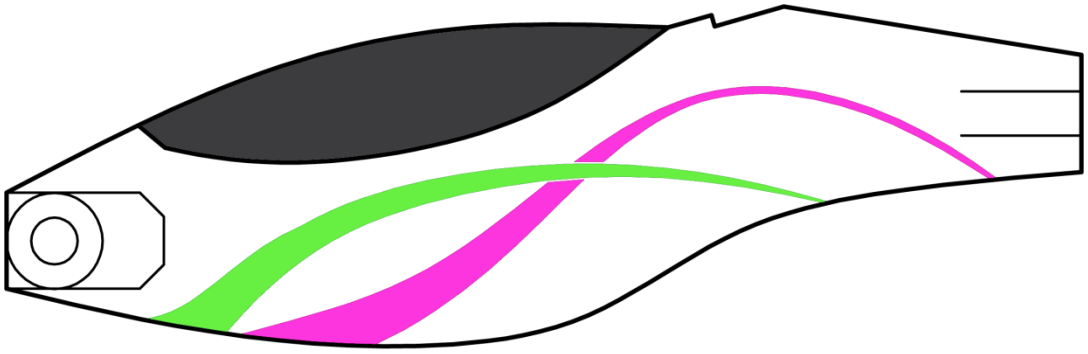


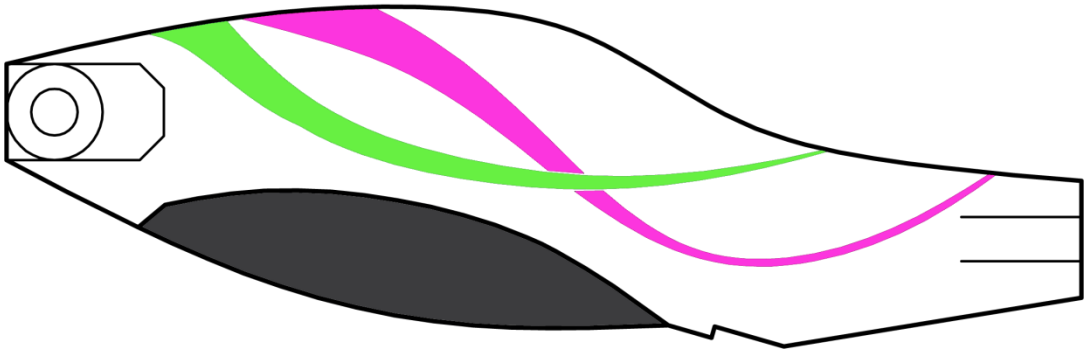






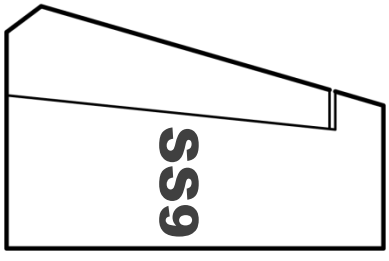
Sonic Silhouette Graphics
Green/Pink
(print on full sheet label)





Camber gauge

Centerline marking template



Nose pad

Shock pad

Sonic Silhouette

Sonic Silhouette