

HD HOLVERSON
DESIGNS, INC.

SWINGER™

FLYING MODEL
ROCKET KIT

cat# HD02004

**SWING
WING
ROCKET
GLIDER**

**LASER-CUT
BALSA**



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requires assembly
skill level 5
difficult or exacting

**A STAND-OUT
AT ANY
LAUNCH!**

**RELIABLE
PISTON
ACTUATION**

**EASY
PREPPING
IN SECONDS**

efficient
elliptical
wing design

easy-to-follow instructions
are designed to be
filed and collected

diameter: 19mm (.74"), length: 56.7cm
(22.32"), span 53.3cm (21.75"),
net weight: 70g (2.5 oz.),
launch weight 96g (3.4 oz.)

recommended engines
B4-2 (first flight), C6-3

predicted altitudes:
B4-2: 56m (185'),
C6-3: 119m (590')

**made
in the
USA**



SPECTACULAR SWING WING ACTION...

**...FOR
BEAUTIFUL
FLIGHTS!**

HOLVERSON DESIGNS, INC.
25075 CO HWY L20
Soldier, Iowa 51572
<http://www.pionet.net/~holverson>

975
K102004



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Thank you! We would like to thank you for purchasing this Holverson Designs flying model rocket. We hope that you enjoy building and flying this model as much as we have. Please let us know if you like your kit, or if you have any questions or need technical advise. Contact us at: Holverson Designs, Inc. 25075 CO HWY L20, Soldier, Iowa 51572 or <http://www.pionet.net/~holverson>

This instruction sheet is laid out to allow you to start a rocket plans reference file. Save your entire set of instructions for future reference.

Why is the Swinger™ unique?

The Swinger™ is unique because it's a performance rocket glider (abbreviated "RG"), with swing wing variable geometry, utilizing a piston actuation. (For more about the piston mechanism see technical insight on next page).

A rocket glider is one of the more challenging areas of model rocketry since it combines the art and sciences of both rocketry and aerodynamics in one design. Ascending like a rocket and returning via lifting wings poses several challenging tasks for you as a rocket modeler, especially since the aerodynamic and balance concerns of free flight rockets and gliders are different. This gets even more challenging because a RG must remain complete and not drop a portion of itself to make the transition into glide configuration. A boost glider simply drops a pop-pod (like the Silver Hawk™) or engine casing

(like the Zoomie™).

A regular model rocket remains stable in flight because its aerodynamic center (in rocketry, called "center of pressure" or simply "CP") must be at least one caliber or 10% of the rocket's length behind the center of gravity (abbreviated "CG"). The rearward CP will tend to rotate the rocket around its CG, like a wind vane, pointing its nose into the direction of flight. However, this much distance (called the "static margin") between the CG and the aerodynamic center (called the "neutral point" or "NP" in aircraft) would make a glider far too nose heavy and would rapidly nose dive into the ground. Most aircraft prefer very small static margins. In most rocket gliders, the static margin must be wide in the boost and coast phases of flight and then drastically narrowed for gliding flight. This is usually done by shifting the CG, CP, or both.

In the Swinger's™ case, the CP shifts by

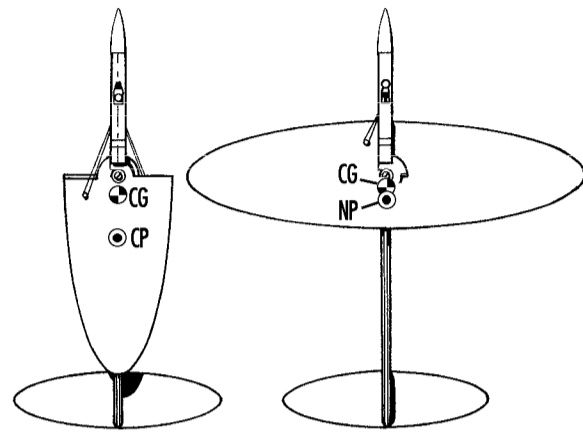
changing the geometry, in what is called a variable geometry configuration. In boost and coast the wings are locked back with the CP rearward. When the ejection charge triggers the release mechanism the wings swing forward taking the NP with it, and transitioning the Swinger™ for a stable glide.

The change in geometry is activated by the positive action of the model rocket motor's ejection charge forcing a balsa piston mechanism to release the wings (see technical insight, next page). The piston mechanism is much easier and quicker to prep for flight than the burn string release used on most swing wing RGs.

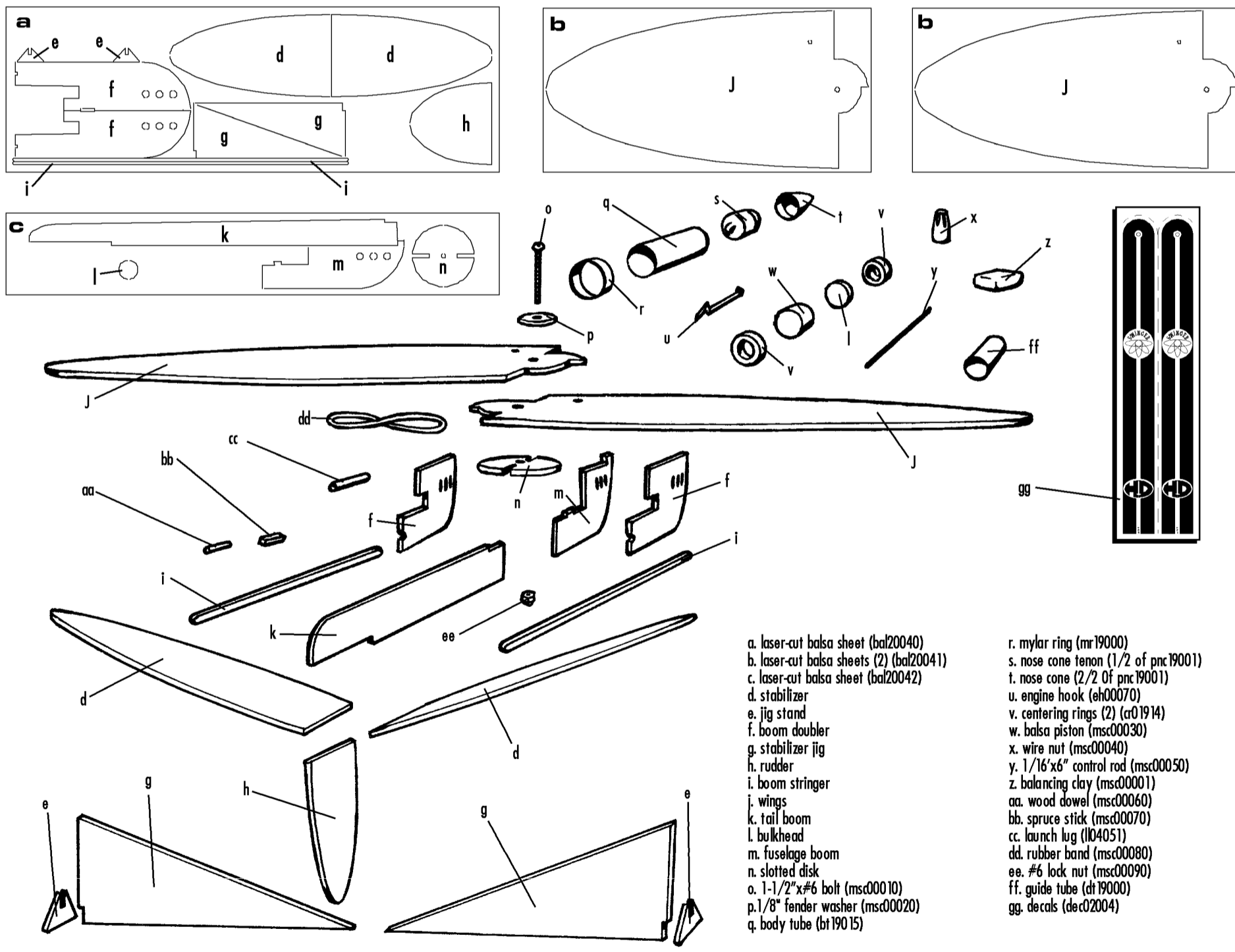
The balancing of lifting and gravity forces to allow a conventional boost to altitude, followed by the proper functioning of the piston activated release mechanism, and finally a transition to gliding flight and smooth aircraft-like landing require that you build your Swinger™ as well as you can.

boost

glide



parts views Check the parts in your kit with this illustration. This drawing shows how the parts go together. It is not intended to be used to assemble your kit.



- a. laser-cut balsa sheet (bal20040)
- b. laser-cut balsa sheets (2) (bal20041)
- c. laser-cut balsa sheet (bal20042)
- d. stabilizer
- e. jig stand
- f. boom doubler
- g. stabilizer jig
- h. rudder
- i. boom stringer
- j. wings
- k. tail boom
- l. bulkhead
- m. fuselage boom
- n. slotted disk
- o. 1-1/2"x#6 bolt (msc00010)
- p. 1/8" fender washer (msc00020)
- q. body tube (bt19015)
- r. mylar ring (mr19000)
- s. nose cone tenon (1/2 of pnc19001)
- t. nose cone (2/2 of pnc19001)
- u. engine hook (eh00070)
- v. centering rings (2) (ar01914)
- w. balsa piston (msc00030)
- x. wire nut (msc00040)
- y. 1/16"x6" control rod (msc00050)
- z. balancing clay (msc00001)
- aa. wood dowel (msc00060)
- bb. spruce stick (msc00070)
- cc. launch lug (lk4051)
- dd. rubber band (msc00080)
- ee. #6 lock nut (msc00090)
- ff. guide tube (dt19000)
- gg. decals (dec02004)

required building materials

- carpenter's (preferred) or white glue
- pencil
- sandpaper: 120, 200, and 400 grit
- hobby knife
- half meter (18") ruler or straight edge
- cotton swabs
- "slow" cyanoacrylate (CA) glue
- scissors
- screw driver
- pliers
- hobby saw
- plastic model glue (tube type or liquid)

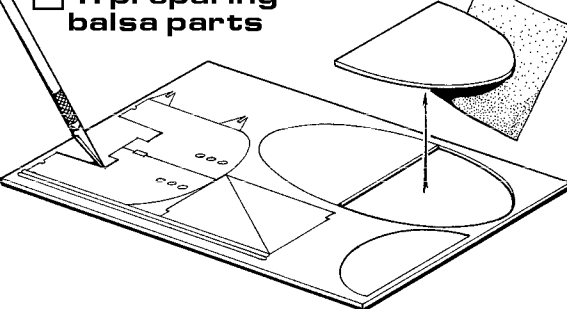
optional building materials

- 1.5mm (1/16") drill bit
- spent engine casing
- sanding block
- nail file
- masking tape
- paint brush
- sanding sealer or aerogloss
- spray paint
- food coloring or marker pens
- japanese tissue
- razor plane

getting started

- This is a complicated model. Get the big picture first by studying the exploded view diagram before beginning assembly. This view will show you where parts are to be used and what names they have.
- You will need a flat surface to work on. A piece of flat cardboard works great to protect your table top and allow you to pin parts or glue and sand. When the cardboard gets too rough, replace it with a new sheet.
- After reading the instructions and visualizing the assembly steps, work slowly and carefully and most of all, have fun!
- The more care you use in building your Swinger™, the better it will perform and the more fun you will have flying it!
- Also read Holverson Designs Technical Report #1 if you are interested in building a performance competition Swinger™. The supplement has information on streamlining the wings and fins.

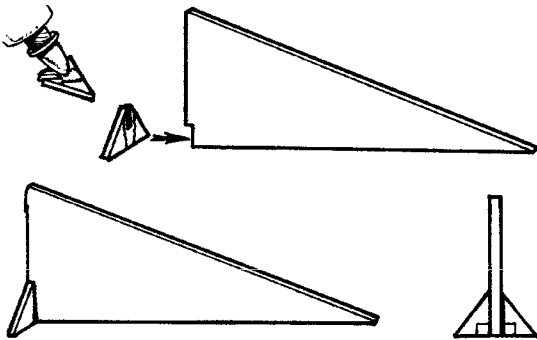
1. preparing balsa parts



NOTE: There are four balsa sheets. Label each part on the four sheets and remove as needed. Follow this step each time you prepare a part for use. You will be removing the stabilizer jigs first.

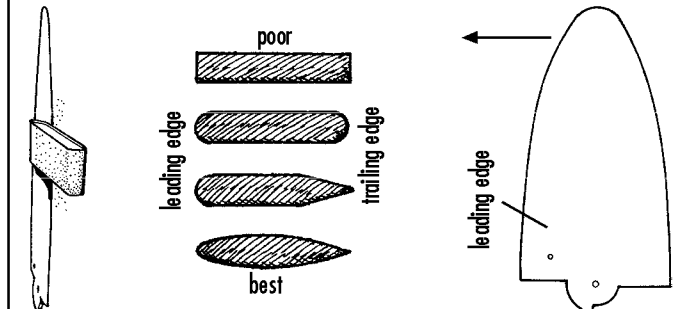
- Carefully cut the pieces out of the balsa sheets.
- Carefully sand edges smooth, removing any burrs. Remove as little balsa as possible.

2. assemble the stabilizer jig



- Glue jig stand into notch of jig as shown.
- Make sure jig stands vertically with sides perpendicular to the work surface as shown.
- Allow to dry.

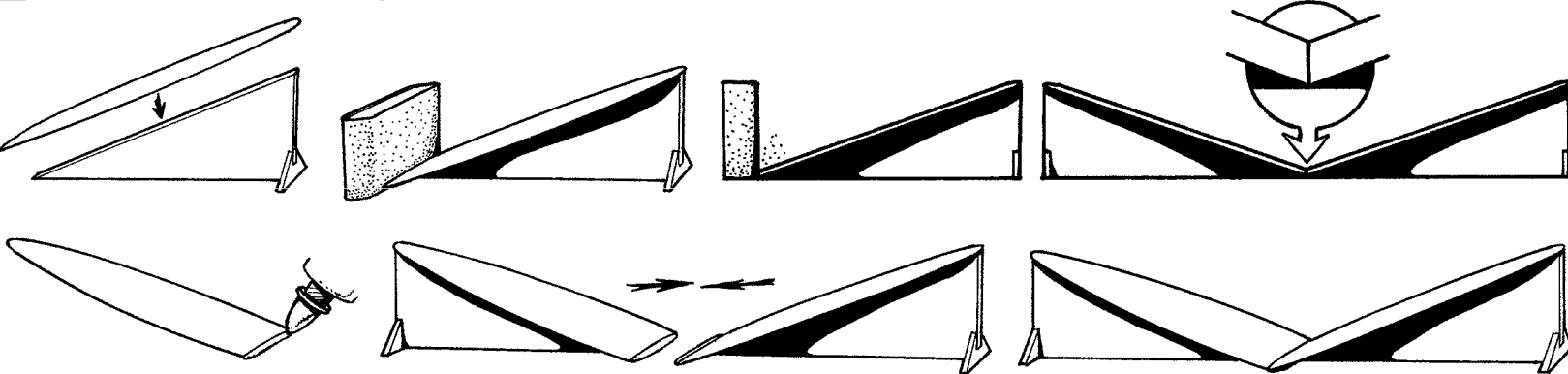
3. streamline the airfoils



- Sand the wings, stabilizers, and rudders into a streamlined cross section. Our Swinger™ prototypes used symmetric airfoils with rounded leading edges and tapered trailing edges and tips. Fully airfoiled surfaces can be used as long as symmetrical cross sections remain.

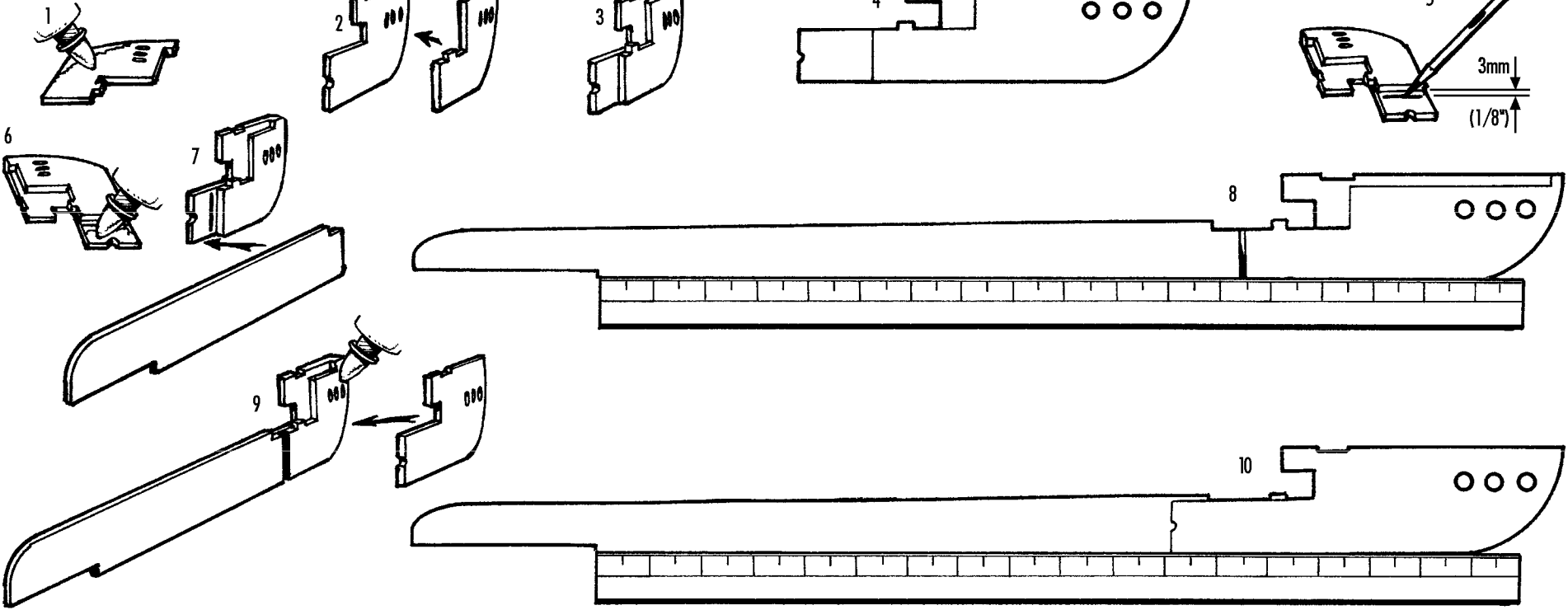
NOTE: The edge of the wing near the small hole is always the leading edge.

4. stabilizer assembly



- When stabilizer jigs are dry, position jig on work surface as shown. Set one stabilizer on each jig.
- Sand root edge of each stabilizer perpendicular to the work surface. When properly sanded, the inner edges of each stabilizer should join tightly together with no gaps.
- Lightly coat stabilizer roots with glue and allow to dry.
- When dry, apply a second generous glue bead to root and press stabilizers together as shown.
- Smooth glue seam and wipe off excess glue. Allow to dry thoroughly.

5. boom assembly



NOTE: THE EXACT NATURE OF THIS STEP IS ONE OF THE REASONS WHY THIS KIT WAS GIVEN A SKILL LEVEL 5. The boom and fuselage must be precisely aligned to maintain proper decalage between the wing and tail. This relationship most seriously affects the flight performance. Use slow CA for assembly.

- Lay wax paper on an absolutely flat work surface.

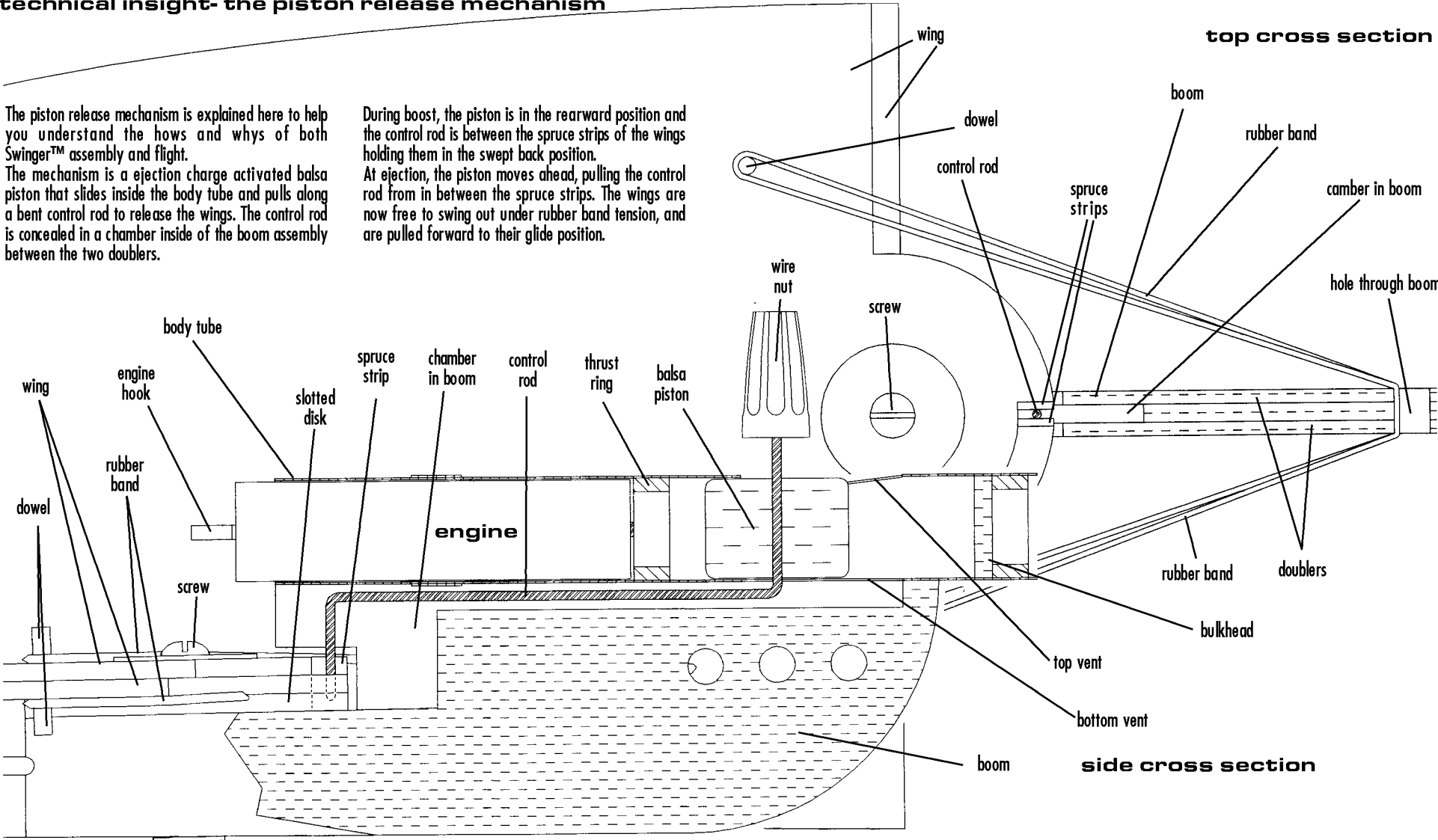
- Glue one fuselage doubler to side of fuselage boom. Make sure bottom and forward edges are absolutely flush and even.
- Once the glue is dry, mark the inside of the attached doubler 3mm (1/8") behind the rear of the fuselage boom.
- Glue tail boom to fuselage doubler, with the forward edge at the 3mm

- (1/8") mark. Make sure the bottom of whole assembly is flat and square.
- Double check straightness of bottom with an 18" ruler or straight edge before glue sets.
- Glue second fuselage doubler to opposite side of fuselage boom. Make sure bottom and forward edges are absolutely flush and even.

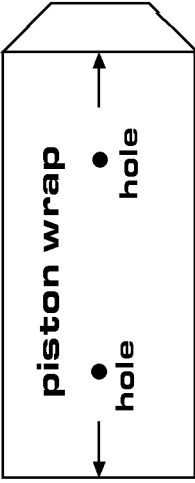
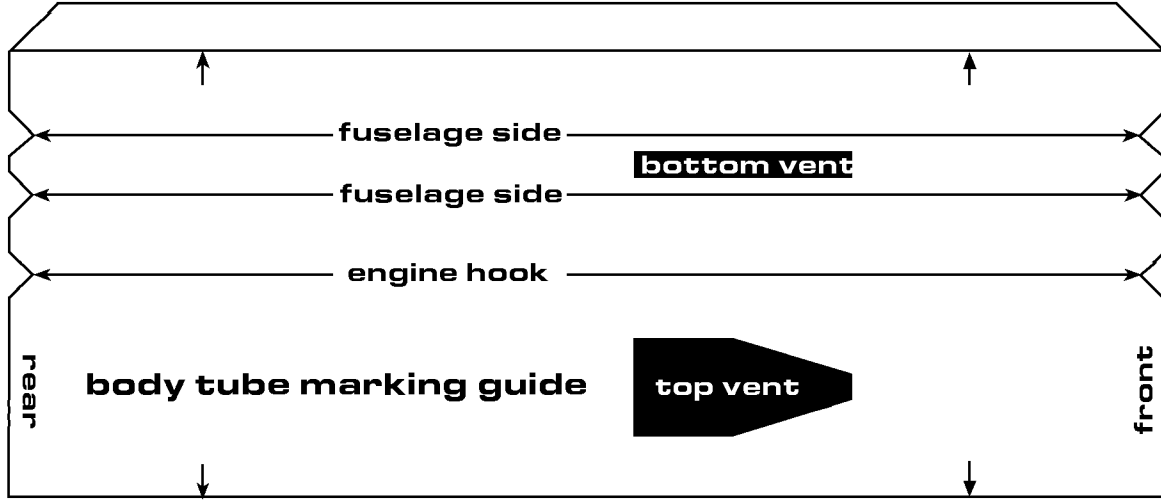
technical insight- the piston release mechanism

The piston release mechanism is explained here to help you understand the hows and whys of both Swinger™ assembly and flight. The mechanism is an ejection charge activated balsa piston that slides inside the body tube and pulls along a bent control rod to release the wings. The control rod is concealed in a chamber inside of the boom assembly between the two doublers.

During boost, the piston is in the rearward position and the control rod is between the spruce strips of the wings holding them in the swept back position. At ejection, the piston moves ahead, pulling the control rod from in between the spruce strips. The wings are now free to swing out under rubber band tension, and are pulled forward to their glide position.



PATTERN SECTION



6. slotted disk attachment

•Glue slotted disk into notches where fuselage and tail booms meet.
•Make sure disk is perpendicular to sides of fuselage-boom assembly. The center hole should align with the hole in boom assembly.

7. bulk-head assembly

•Apply glue to end of one engine block.
•Glue balsa disk to engine block.

8. body-tube marking guide

•Cut out tube marking guide from patterns section as carefully as possible.
•Using scissors and hobby knife, remove as carefully as possible all blackened areas from marking guide.
•Wrap guide around body tube. Make sure alignment arrow-heads match.

9. body-tube marking

Diagrams showing a pencil marking a body tube with a marking guide. The guide is wrapped around the tube, and lines are drawn along its edges. Two 90-degree angles are indicated at the bottom.

•Use a pencil to mark, as accurately as possible, alignment notches and vent holes.
•Find a convenient channel or groove, such as a door jam or molding to use as a guide. Draw straight lines connecting fuselage side and engine hook marks.
•Label lines "fuselage sides" and "engine hook" as shown on the marking guide. Also mark front and rear ends of body tube.

10. cutting the body tube

•Using a sharp, fresh, razor blade or hobby knife, cut out hole markings on body tube. Make several passes to cleanly cut through tube without tearing paper.

11. marking the piston

•Cut out the piston marking guide from patterns section. Make holes in guide as indicated by black dots.
•Wrap guide around piston. Make sure alignment arrow heads match.
•Use a pencil to mark the two hole positions on piston.

12. making piston hole

•Using a 1.5mm (1/16") drill bit, carefully twist bit with your fingers into indicated hole marks on one side of piston and exiting from indicated hole on other side of piston. ENTRY AND EXIT HOLES SHOULD BE 180° APART.
•The control rod can be twirled to nibble through the piston if the drill bit is not available.

13. preparing the piston

•Drop piston through body tube. Piston should fall freely through. If not, sand the piston until it slips freely through body tube.
•Since the piston will be subjected to the heat of ejection charges, apply CA or epoxy to one end of piston to make it more flame resistant.

14. fuselage and boom streamlining

Diagrams showing the fuselage and boom being sanded. Labels include "top view", "front view", "rear view", and "side view". Arrows point to edges to be rounded, with the instruction "DON'T ROUND THIS EDGE!" pointing to the bottom edge of the boom.

NOTE: DO NOT ROUND BODY TUBE OR STABILIZER MOUNTING SURFACES.
•Sand all other edges on fuselage and boom round.

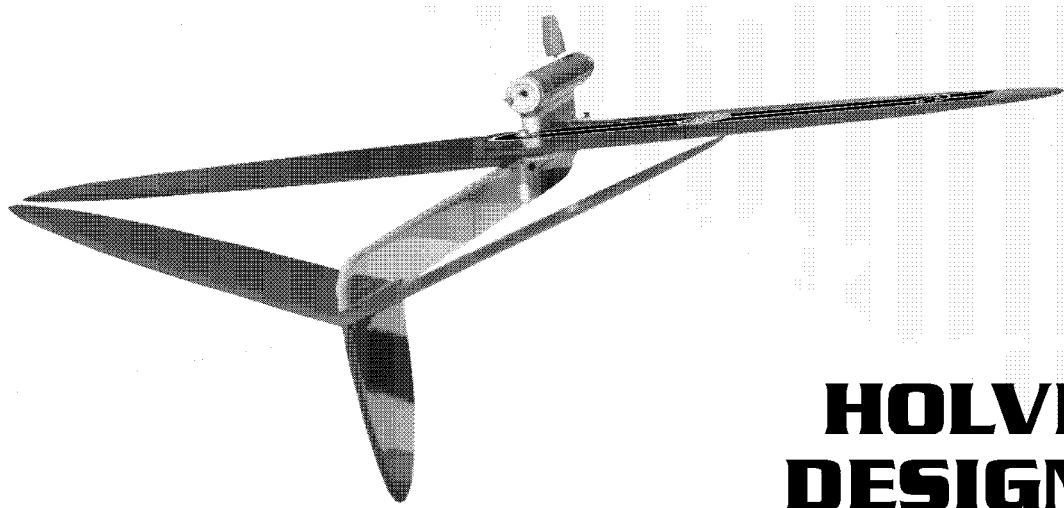
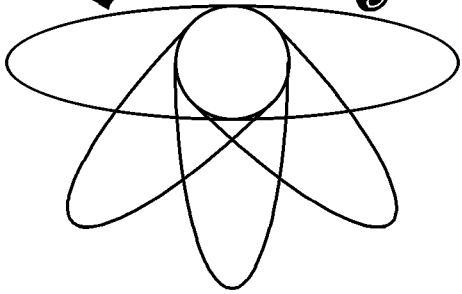
15. stabilizer attachment

•When stabilizer joint is dry, apply a liberal bead of glue to root of stabilizer.
•With stabilizers resting in jigs, attach boom as shown.
•Make sure boom is straight with stabilizers and sides of boom and fuselage are perpendicular to work surface.

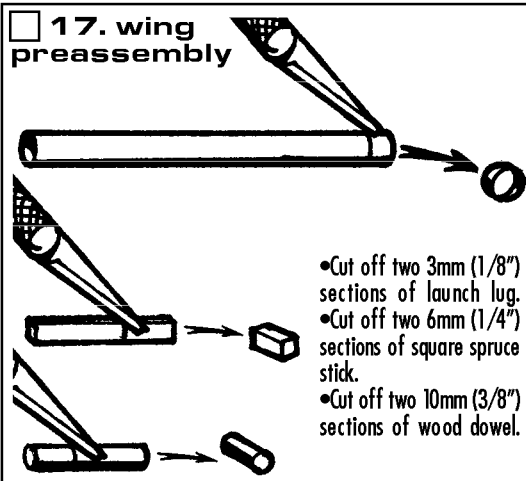
16. nose cone assembly

•Apply a ring of model airplane glue or CA inside nose cone.
•Attach tenon as shown.

SWINGER

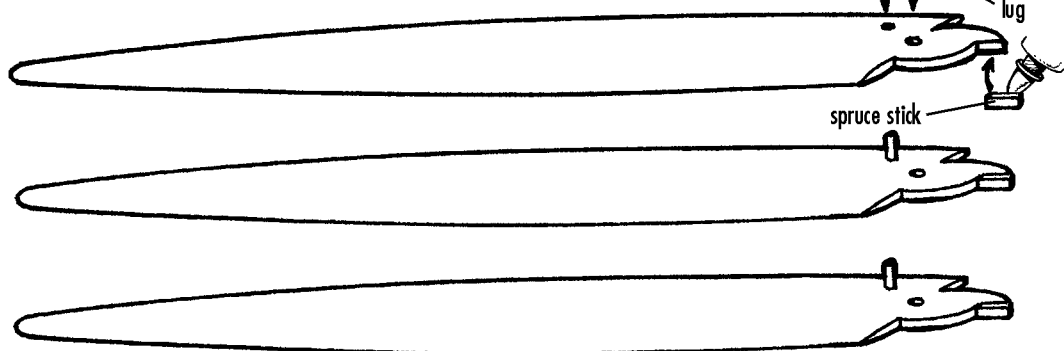


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- Cut off two 3mm (1/8") sections of launch lug.
- Cut off two 6mm (1/4") sections of square spruce stick.
- Cut off two 10mm (3/8") sections of wood dowel.

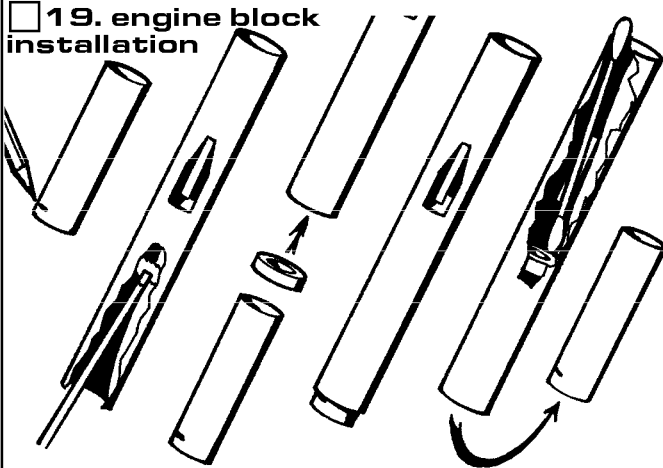
18. wing assembly



NOTE: Both wings are identical. They should be assembled so that either can be used as a left or right wing.

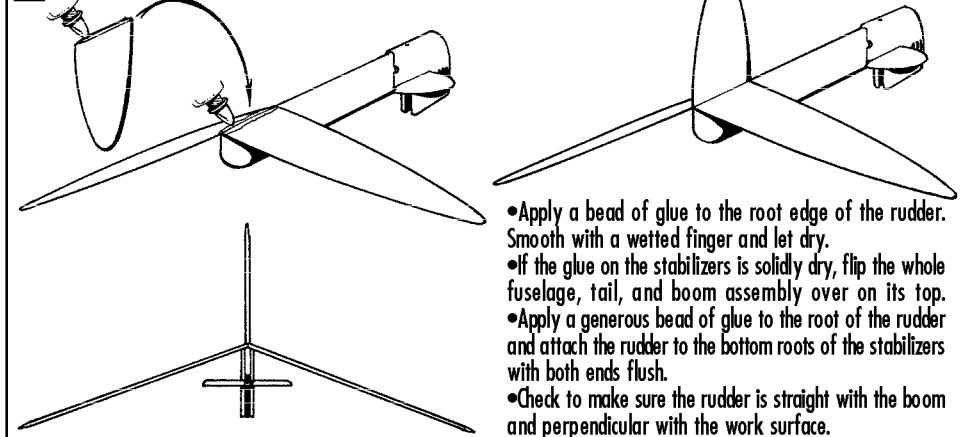
- Glue each 3mm (1/8") launch lug section into hole near center of root. Ends of lug should be flush with both surfaces of wing.
- NOTE: Use CA to reinforce around lug. Wht CA around lug, but keep CA from getting into center of lug.
- Glue each 10mm (3/8") dowel section into small hole near leading edge. BOTTOM OF DOWEL SHOULD BE FLUSH WITH BOTTOM OF WING.
- Glue each 6mm (1/4") spruce square section into notch at the root as shown.

19. engine block installation



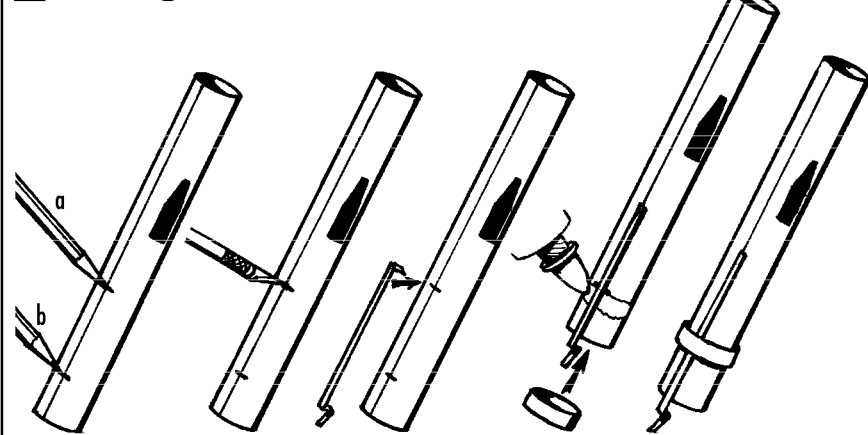
- Mark guide tube 6mm (1/4") from end.
- Use a scrap stick of balsa to apply a bead of glue 57mm (2.25") inside rear end of body tube.
- Insert the second engine block (NOT engine block from step 7) into rear end of body tube. Press into place with guide tube. Use a smooth even motion until guide tube reaches the mark.
- Quickly remove guide tube. GUIDE TUBE IS NOT PART OF FINISHED MODEL ROCKET.
- Remove excess glue from inside body tube with a wetted cotton swab.

20. rudder attachment



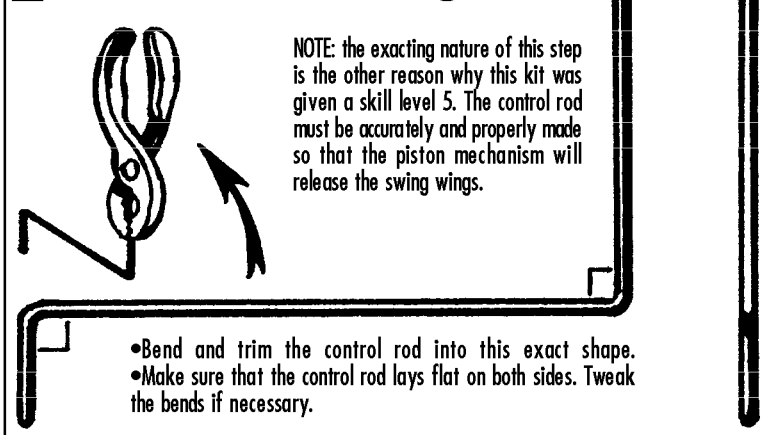
- Apply a bead of glue to the root edge of the rudder. Smooth with a wetted finger and let dry.
- If the glue on the stabilizers is solidly dry, flip the whole fuselage, tail, and boom assembly over on its top.
- Apply a generous bead of glue to the root of the rudder and attach the rudder to the bottom roots of the stabilizers with both ends flush.
- Check to make sure the rudder is straight with the boom and perpendicular with the work surface.

21. engine hook attachment



- Mark body tube at "a" at 64mm (2.5") and "b" 19mm (.75") from the rear of the body tube across line marked for engine hook.
- Cut a slot 5mm (3/16") across mark "a".
- Insert the engine hook into slot made above and align it with line along the body tube.
- Run a bead of glue around the body tube about 6mm (1/4") aft of the second marking.
- Slide the mylar ring on the engine tube, over the engine hook, until its forward edge meets mark "b".

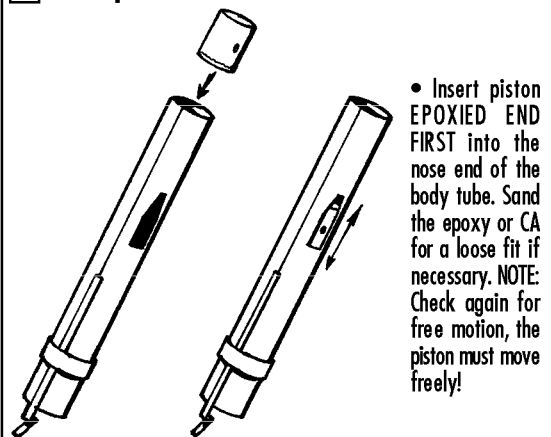
22. control rod bending



NOTE: the exacting nature of this step is the other reason why this kit was given a skill level 5. The control rod must be accurately and properly made so that the piston mechanism will release the swing wings.

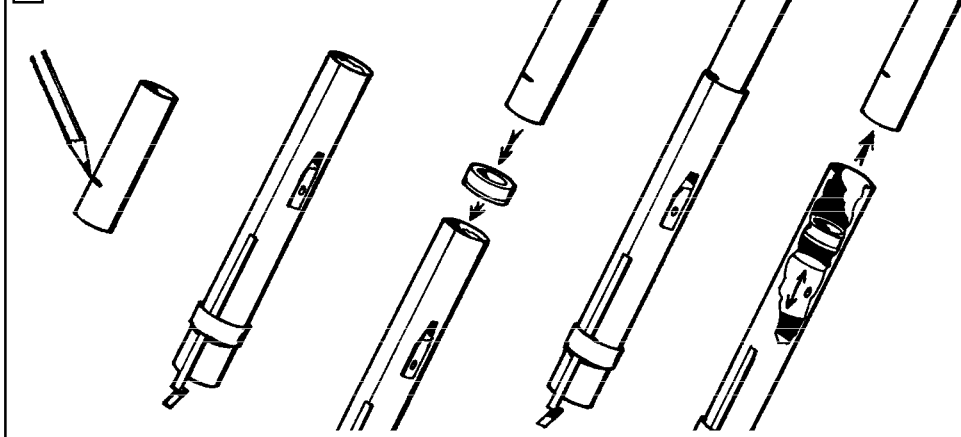
- Bend and trim the control rod into this exact shape.
- Make sure that the control rod lays flat on both sides. Tweak the bends if necessary.

23. piston insertion



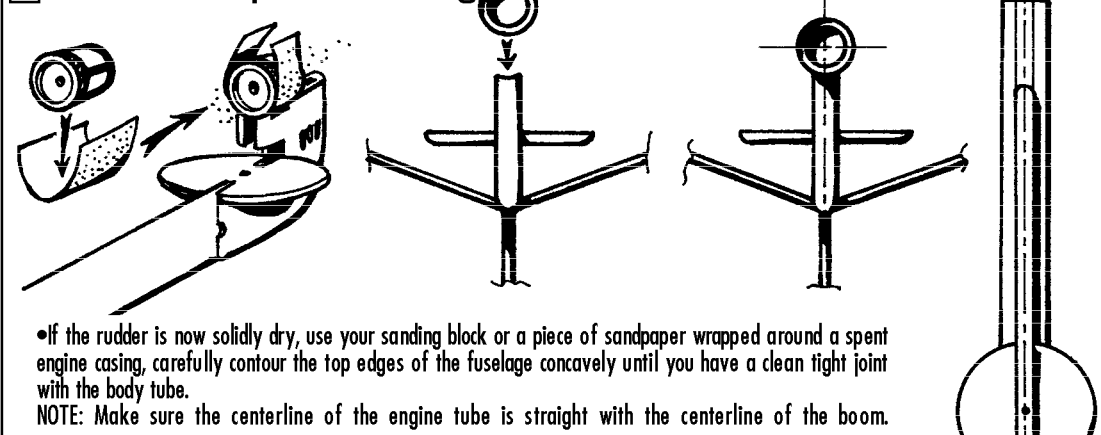
- Insert piston EPOXIED END FIRST into the nose end of the body tube. Sand the epoxy or CA for a loose fit if necessary. NOTE: Check again for free motion, the piston must move freely!

24. bulkhead installation



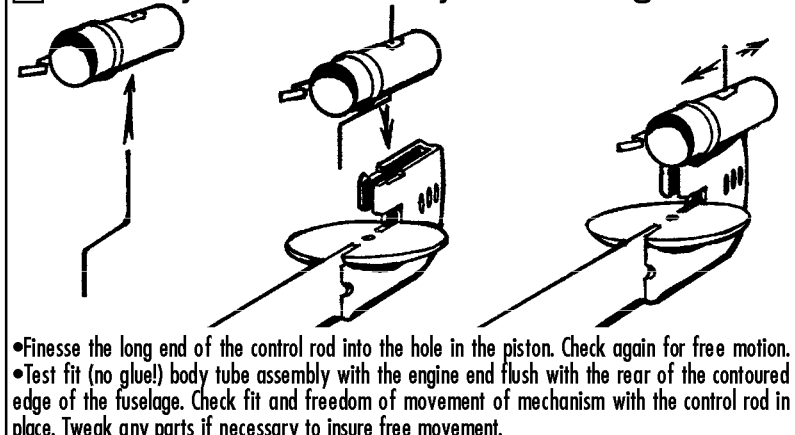
- Mark guide tube 19mm (3/4") from the end.
- Apply a bead of glue inside of the nose end of the body tube.
- NOTE: MAKE SURE THE PISTON IS STILL INSIDE THE BODY TUBE!
- Insert the bulkhead Balsa disk first into the nose end of body tube. Press into place with the guide tube in a smooth even motion until the guide tube reaches the new mark.
- QUICKLY REMOVE THE GUIDE TUBE. IT IS NOT PART OF THE FINISHED ROCKET.
- NOTE: the bulkhead should now be 19mm (.75") inside the body tube.
- Clean up any excess glue inside the body tube with a wetted cotton swab.
- Check to make sure the piston still moves freely until the glue sets up.

25. boom top contouring



- If the rudder is now solidly dry, use your sanding block or a piece of sandpaper wrapped around a spent engine casing, carefully contour the top edges of the fuselage concavely until you have a clean tight joint with the body tube.
- NOTE: Make sure the centerline of the engine tube is straight with the centerline of the boom.

26. body tube assembly test fitting



- Finesse the long end of the control rod into the hole in the piston. Check again for free motion.
- Test fit (no glue!) body tube assembly with the engine end flush with the rear of the contoured edge of the fuselage. Check fit and freedom of movement of mechanism with the control rod in place. Tweak any parts if necessary to insure free movement.

27. body tube attachment

bottom vent between boom sides

- Pre-glue the body tube to the fuselage by first running a bead of glue around the contoured edge of the fuselage. Press the body tube and the fuselage edge together (positioned like the above step) and then pull apart. Smooth the glue flat with a wetted finger. Allow the glue to dry. Make sure no glue adheres to the control rod.
- When the glue is dry, run another bead around the contoured edge. Press the body tube and fuselage together again.
- Make sure the body tube is straight and square with the boom. Look down into the top hole in the body tube and check to make sure that the bottom vent is exactly centered between the two fuselage sides. If necessary, turn tube to align this before the glue sets.
- As the glue dries, check to make sure the control rod mechanism still moves freely.

28. apply fillets

- After the body tube assembly is dry, apply glue as fillets, into the areas shown by arrows.
- Apply a glue bead along the length of a joint. Then use your finger tip to sculpt a radius to blend the two joining surfaces together.
- Now would be a good time to read ahead to trimming and flight instructions as the fillets slowly dry.

29. nose cone modification

- Cut the flat base off the bottom of the nose cone. This is easily done with a razor saw. Sand smooth if necessary.

30. wire nut attachment

- Twist and CA the wire nut on the exposed end of the control rod.

31. launch lug attachment

- After your fillets have dried completely, apply a bead of glue to the launch lug.
- Adhere the launch lug to one of the fillets under the slotted disk.

32. boom reinforcement

- Apply glue to one side of each stringer.
- Attach each stringer starting by placing its rounded end in the notch on the rear edge of the fuselage doubler and running the stringer down the middle of the side of the boom, extending to the stabilizer area.

33. preparation for wing fitting

- Sand away any rough glue on the wings.
- Sand spruce stick flush if it protrudes farther than the balsa.
- Insert #6 screw through the bottom of the hole in the boom until about 5.5mm (7/32") of the screw protrudes from the top of the slotted disk.

34. custom fitting wings for gliding flight

rubber band

rubber band through hole and around peg

before fitting

after fitting

sand this edge

- Place both wings in their marked places on the protruding screw.
- Insert the rubber band through the fuselage hole, that will snap the wings forward with the least tension, and around the two dowels on the wings.
- Check the wings for fit. The fitted wings will stick out perpendicularly from the fuselage.
- If they are not perpendicular, remove the rubber band and wings.
- Use a nail file or other small file to individually sand a little off the forward root edges of the wings.
- Replace the wings in their respective places and retest the fit.
- Remove, sand, and replace the wings as many times as needed to get a proper fit.

Note: if the wings sweep forward of perpendicular, glue on a shim made of scrap balsa to the forward root edge and sand down to fit.

35. custom fitting wings for boost

swing wings back over center

move piston assembly back

control rod is between spruce strips

before fitting

after fitting

sand this edge

- Once the wings have been fitted for gliding flight, they can be fitted for boost.
- Place both wings in their marked places on the protruding screw.
- Insert the rubber band through the fuselage hole and around the two dowels on the wings. Pull the wings back and over center. Move the control rod mechanism back to latch wings in their boost position (the rear of the control rod should catch on the spruce pieces).
- Notice the wings for fit. Fitted wings will stick straight back.
- If they are not straight back release the latch and remove the rubber band and wings.
- Use a nail file or other small file to individually sand a little off the spruce strip.
- Mount wings in their respective places, attach the rubber band, latch the wings, and retest the fit.
- Remove, sand, and replace the wings as many times as needed to get a proper fit.

NOTE: If the wings do not stick straight back, glue on another piece of spruce to spruce strip and sand down to fit.

36. wing final attachment

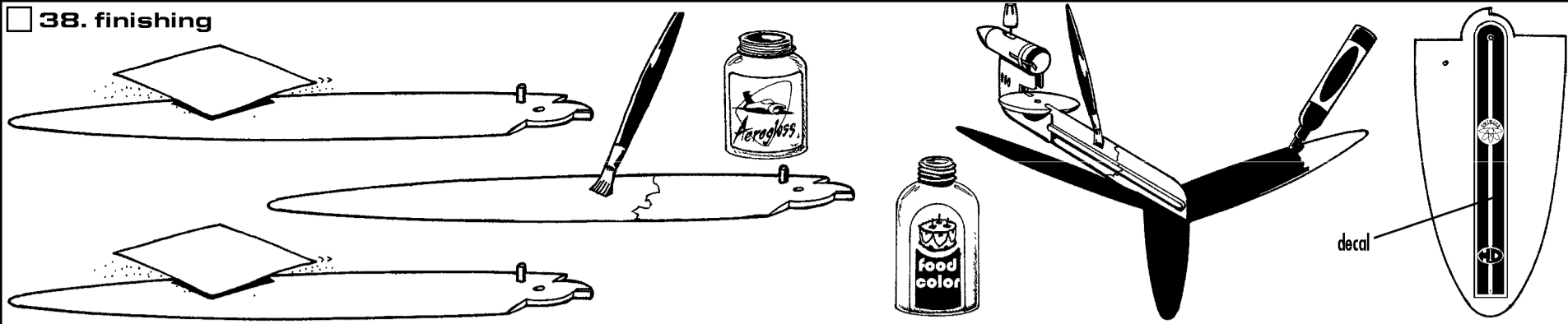
lock nut is as tight as possible still allowing free movement of wings

- Once the wings have been custom fitted they can now be properly attached.
- Place the 9/16x1/8" fender washer on the #6 screw.
- Insert the screw and washer through the top of the wings and through the slotted disk and boom.
- Insert the rubber band through the fuselage hole that will snap the wings forward with the least tension and around the two dowels on the wings.
- Thread the lock nut on the bottom of the #6 screw. Use your screw driver and pliers to tighten the nut as much as possible while allowing the wings to be pulled easily ahead by the rubber band.

37. nose cone attachment

- Slip nose cone into forward end of body tube. Add tape for snug fit if necessary since you don't want to lose nose cone in flight. Nose cone will probably be removed for trimming.

38. finishing



NOTE: The wings may be temporarily removed for finishing. Rocket gliders fly better when they are as light as possible and have a smooth finish for better airflow. However smooth finishes add weight, so a compromise between a smooth appearance and weight must be found. There are several ways that you can finish your Swinger™. Some methods add weight and strength than others.

Because you will have to track your model on both sky and ground, it's best to use very bright, high visibility colors. Food Coloring does not add strength but it is very light weight and easy to apply. Simply brush it on the model.

Japanese tissue is a technique borrowed from model aviation. It's relatively light and adds strength. Tissueing requires that the surfaces are sanded lightly with 200-400 grit-sand paper to prep them for covering. The

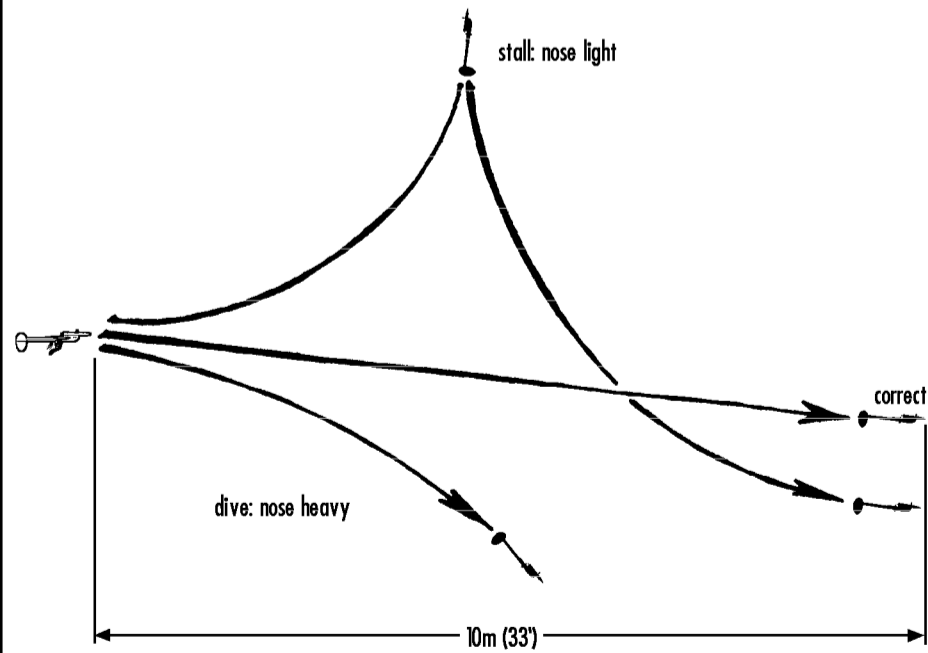
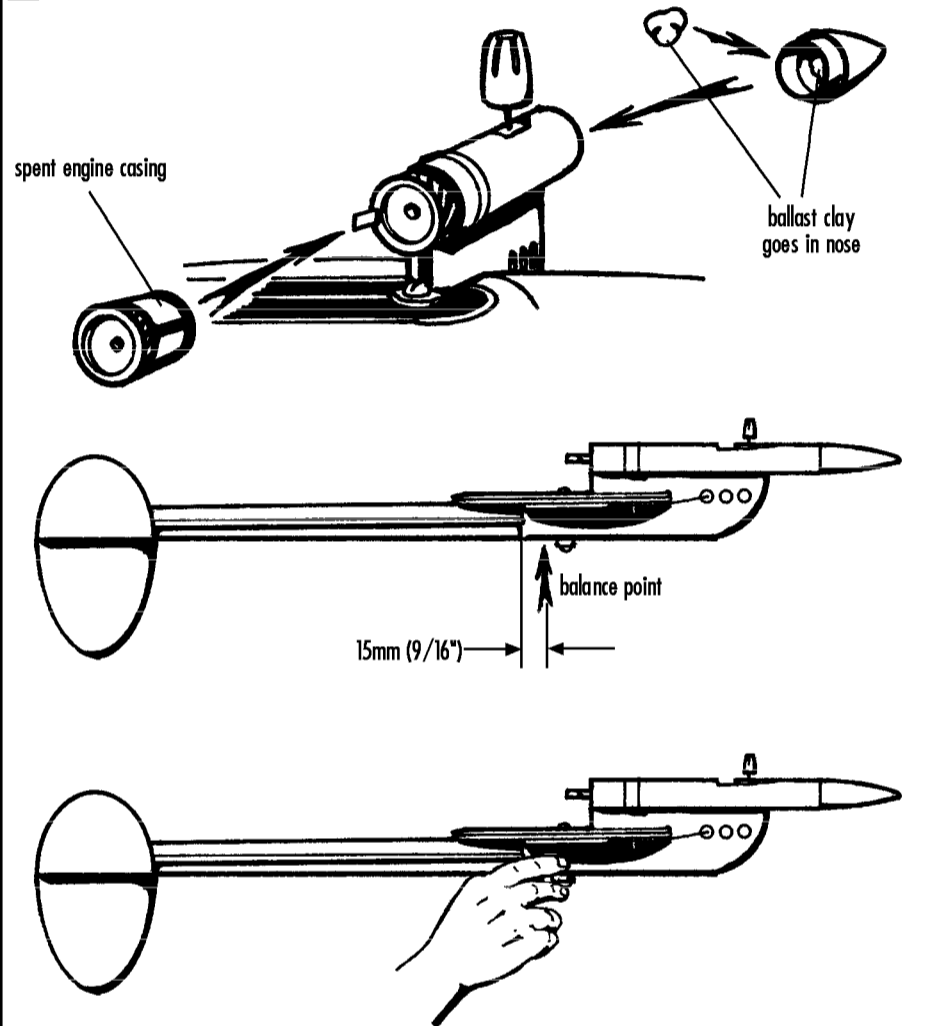
surface is then coated with a special aircraft dope and the tissue applied while the dope is still quite wet. The tissue is trimmed and sanded when the dope dries. A final coat of dope is applied and sanded smooth when dry. Monocote is another technique borrowed from model aviation, using a heat shrinking plastic covering. It is not as lightweight as Japanese tissue and requires a special shrinking iron. Follow the coating manufacturer's instructions when applying.

Aerogloss is a type of pigmented sanding sealer. It adds a little strength and is relatively heavy. Sand the balsa surfaces lightly with 200-400 grit-sand paper to prep them. Apply a coat of Aerogloss. Sand the aerogloss smooth when dry. Apply a second and last coat. Sand this smooth when dry. Spray paint is the heaviest and should be used sparingly if used at all. First the balsa surfaces need to be sealed. Sand the balsa surfaces lightly with

200-400 grit-sand paper to prep them. Apply a coat of sanding sealer. To save weight, use one part thinner to two parts sealer. Sand the aerogloss smooth when dry. Apply a second and last coat. Sand this smooth when dry. Use a rag dampened in denatured alcohol to wipe away all sanding dust. Let the alcohol evaporate thoroughly and then apply the spray paint. Apply the paint in even strokes parallel to the surface being painted. Use the least amount of paint possible to cover. To aid in painting, make a painting wand. Hold your Swinger™ horizontally with a spent engine on a 1/2" wood dowel.

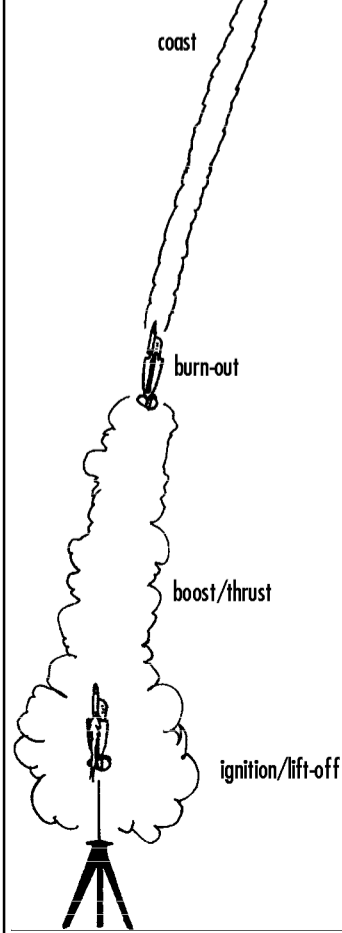
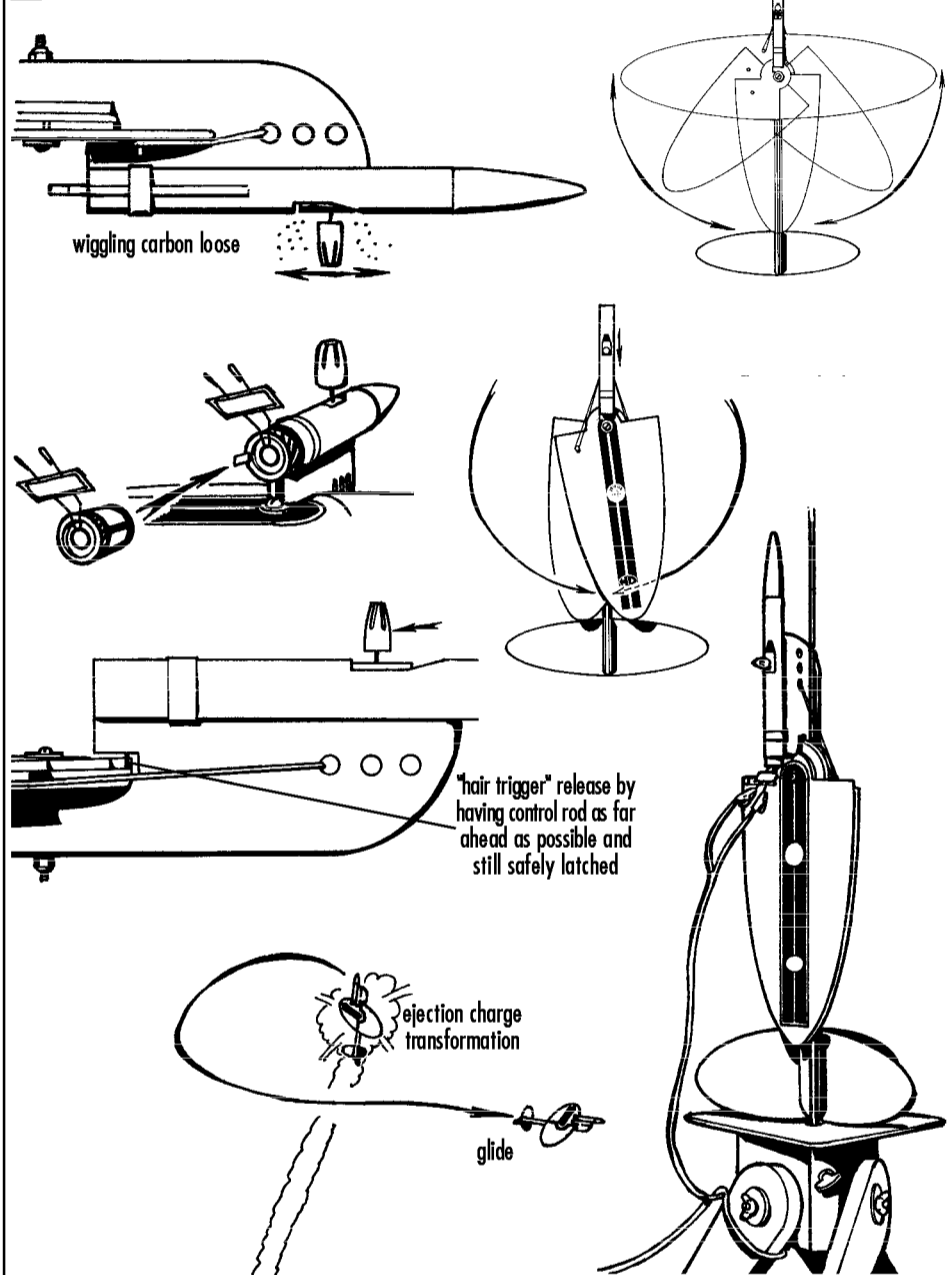
The Decals can be applied once the chosen finish has dried. Trim it, remove the backing, and place one middle span of the top of the top wing and the other on the middle span of the bottom of the bottom wing. The top decal will keep engine exhaust from scorching the wing. The bottom decal will balance the top one.

39. trimming



- Your Swinger™ will have to be trimmed before each flight.
- First insert a spent engine into the Swinger™. Your Swinger™ will not trim properly without it! This is a step that even experienced rocketeers can easily forget and the absence of the engine can really frustrate trimming procedures.
- Statically balance the Swinger™ by adding small amounts of clay inside the nose cone until it balances 15mm (9/16") ahead of the rear edge of the slotted disk. Or if it is initially nose heavy, add small amounts of clay to the rear of the tail.
- Now toss test your Swinger™, preferably in a park or field filled with soft grass. Grip it by the boom under the slotted disk. Gently toss in a smooth motion. Always toss it into the wind.
- A properly trimmed Swinger™ should have a flat glide of about 10 meters (33').
- If it stalls, add nose weight or delete tail weight until a correct glide is achieved.
- If it dives, remove nose weight or add tail weight until a correct glide is achieved.
- If it turns too sharply in one direction, check the tightness of the locknut.
- Trim your Swinger™ using the least clay possible.
- If the Swinger™ seems to be unusually hard to trim, check to make sure that there is a spent engine in the mount.

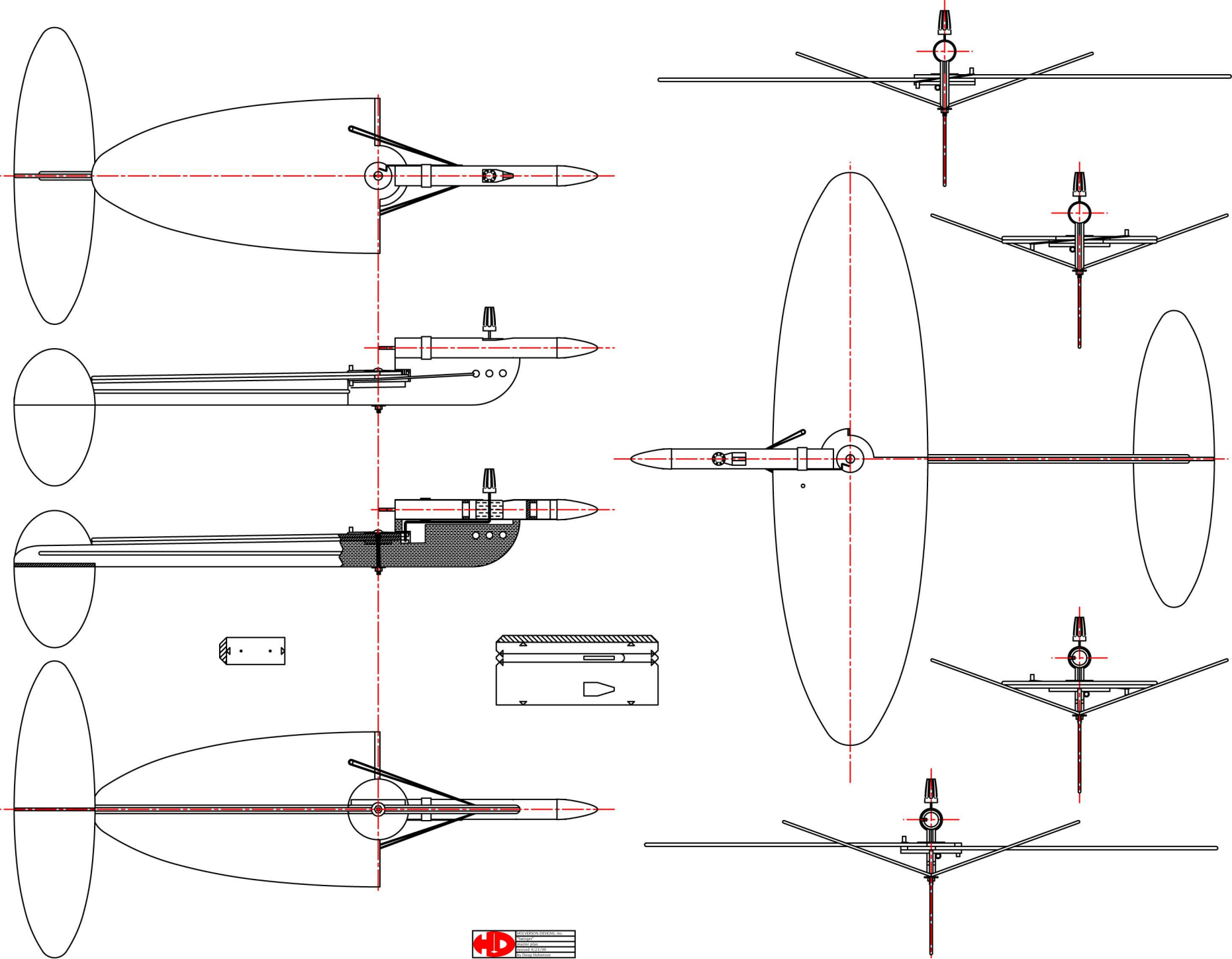
40. launching



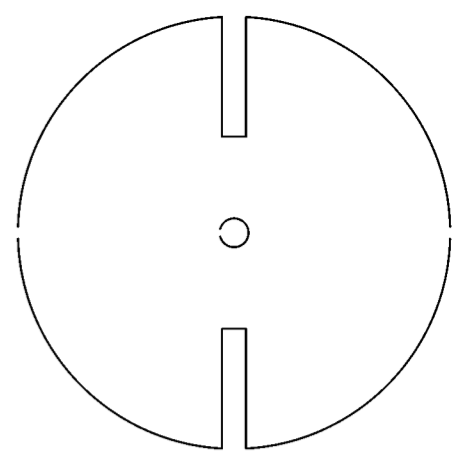
- Check the piston mechanism for free movement. If the operation is sticky, flip the model upside down and wiggle the mechanism until enough ejection residue is knocked loose to permit free piston movement.
- Check the swing wings for free movement. If necessary, use your screw driver and pliers to adjust the lock nut so it is as tight as possible while allowing the wings to be pulled easily ahead by the rubber band.
- Check the trim of your Swinger™ before each flight and retrim it if necessary. Balsa gliders are temperamental about holding their trim over changes in the climate.
- Prep the engine according to the manufacturer's suggestions. B4-2 (first flight) and C6-3 are the recommended engines. Insert engine into the body tube.
- Latch the wings in boost position. Pull the wings back, over center, and move the piston mechanism back until the control rod latches between the two spruce strips. For reliable deployment, it is recommended that you "hair trigger" the mechanism by positioning the control rod as far forward on the spruce strips as possible while still holding the wings back.
- Launch your Swinger™ from a pad with an 3mm (1/8") rod and electric launch controller. IF YOU TILT THE ROD, MAKE SURE THAT THE ROCKET GLIDER IS TILTED WITH ITS TOP TOWARDS THE WIND.

what to expect

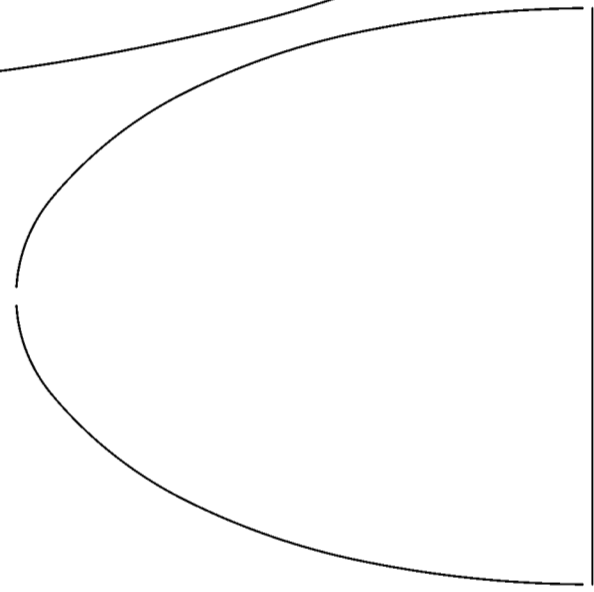
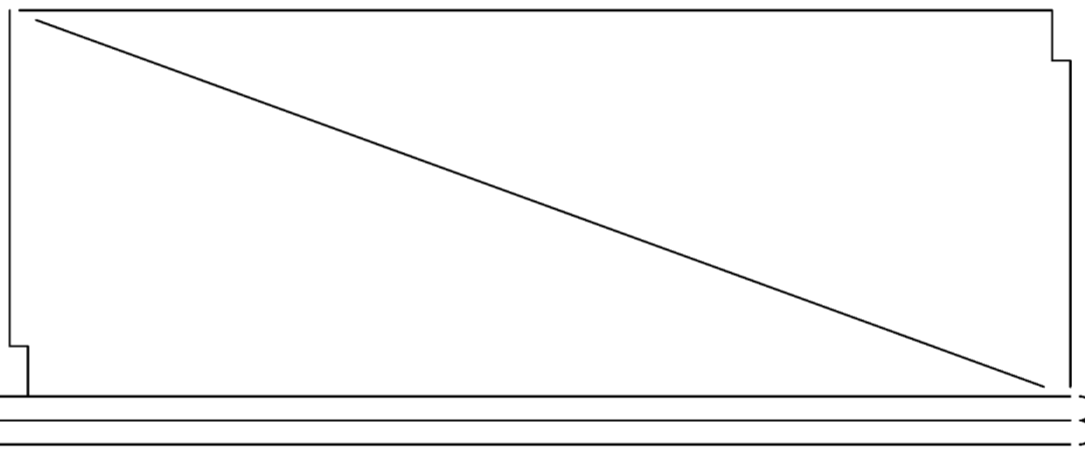
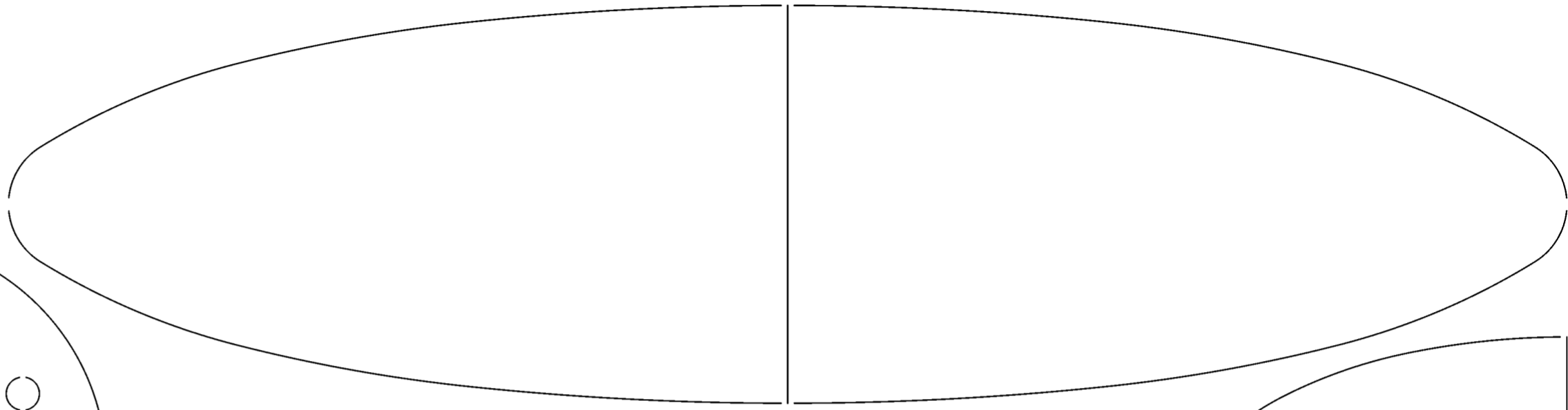
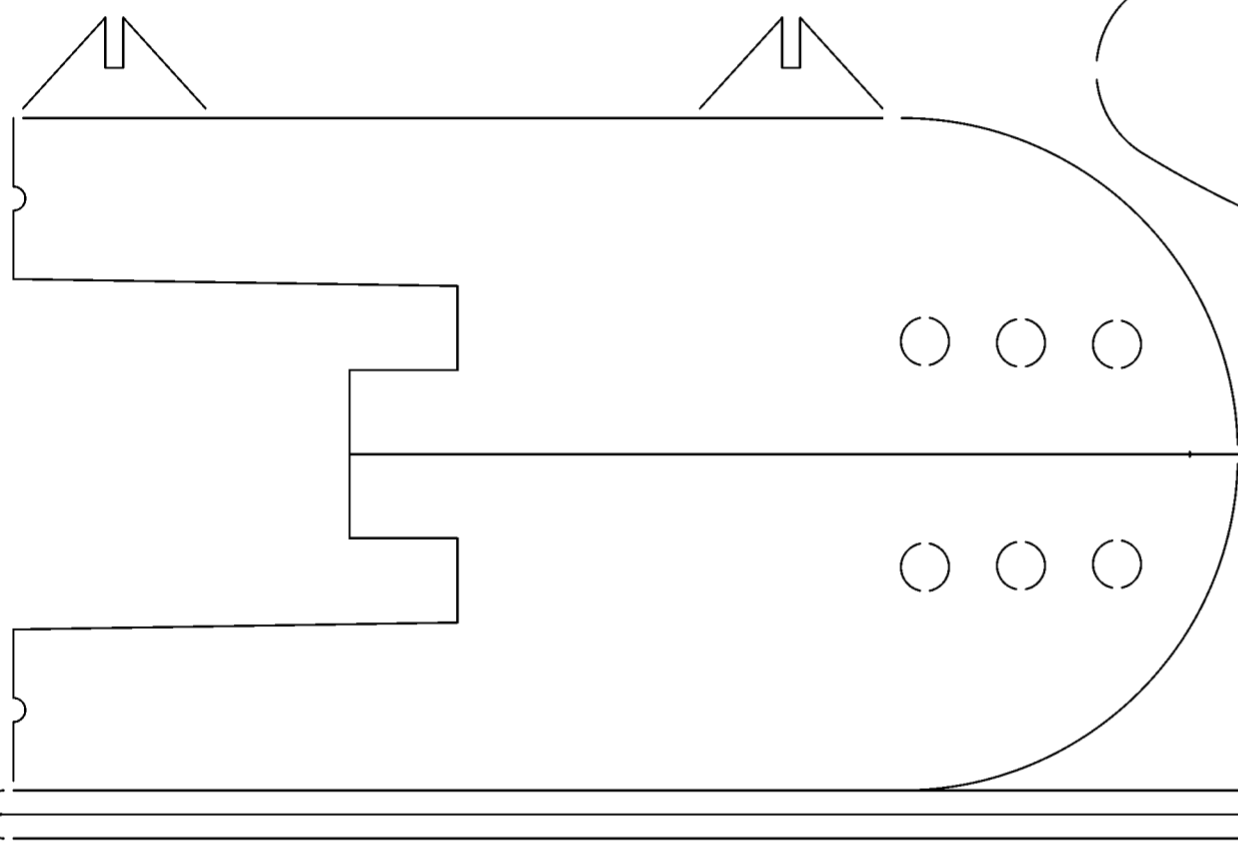
- The Swinger™ will fly in a shallow vertical arc during boost, coast and then level-off around ejection. The wings will snap out like a switch-blade when the ejection charge activates the piston mechanism. The Swinger™ will orientate itself (sometimes doing sort of a half Immelman) and settle into a beautiful circling glide. The Swinger™ can deliver quite spectacular flights!
- If the Swinger™ stalls or dives in during glide, you will need to retrim it!
- Have fun flying your Swinger!



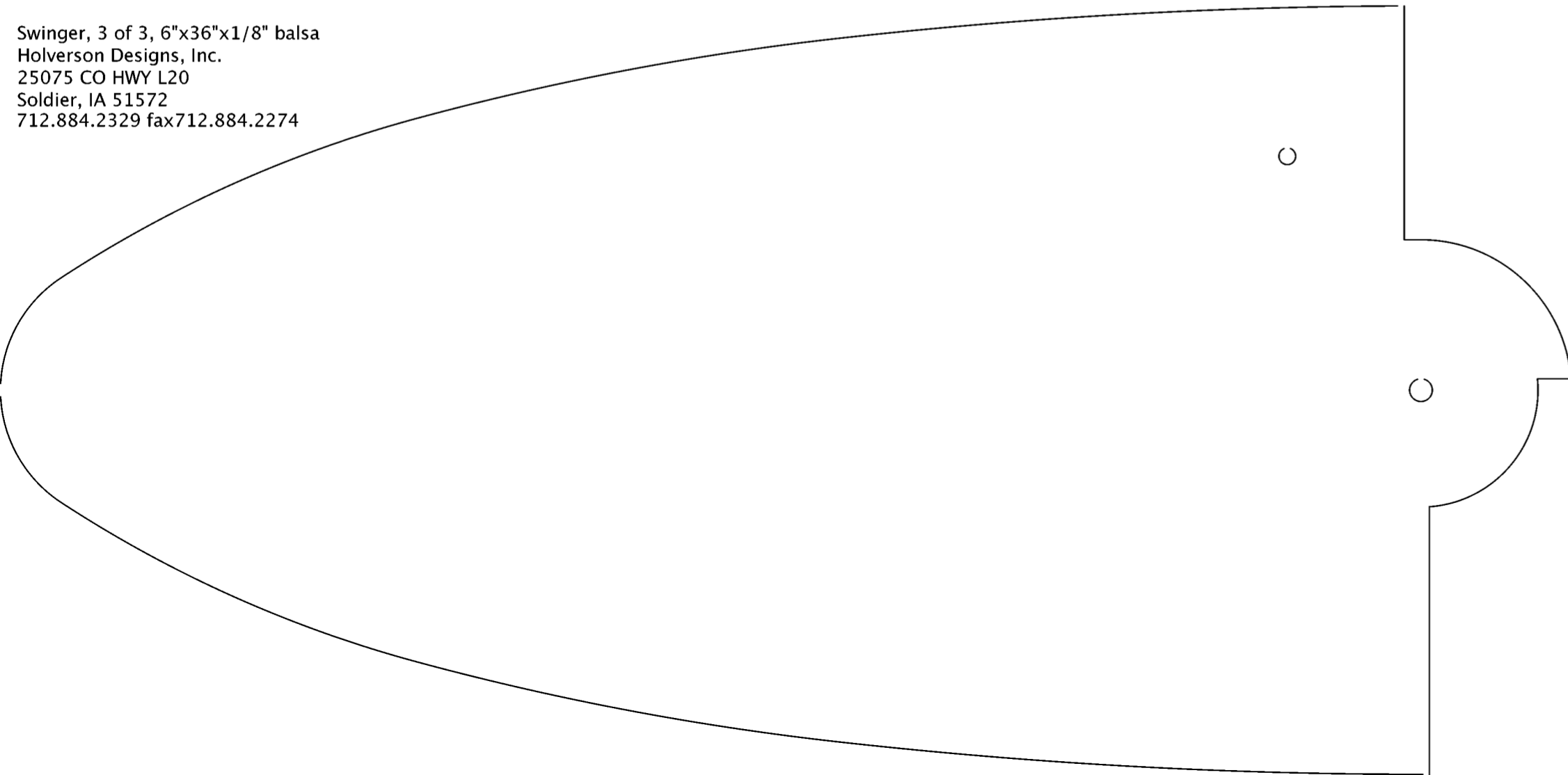
Swinger, 1 of 3, 3"x36"x1/8" hard balsa
Holverson Designs, Inc.
25075 CO HWY L20
Soldier, IA 51572
712.884.2329 fax712.884.2274

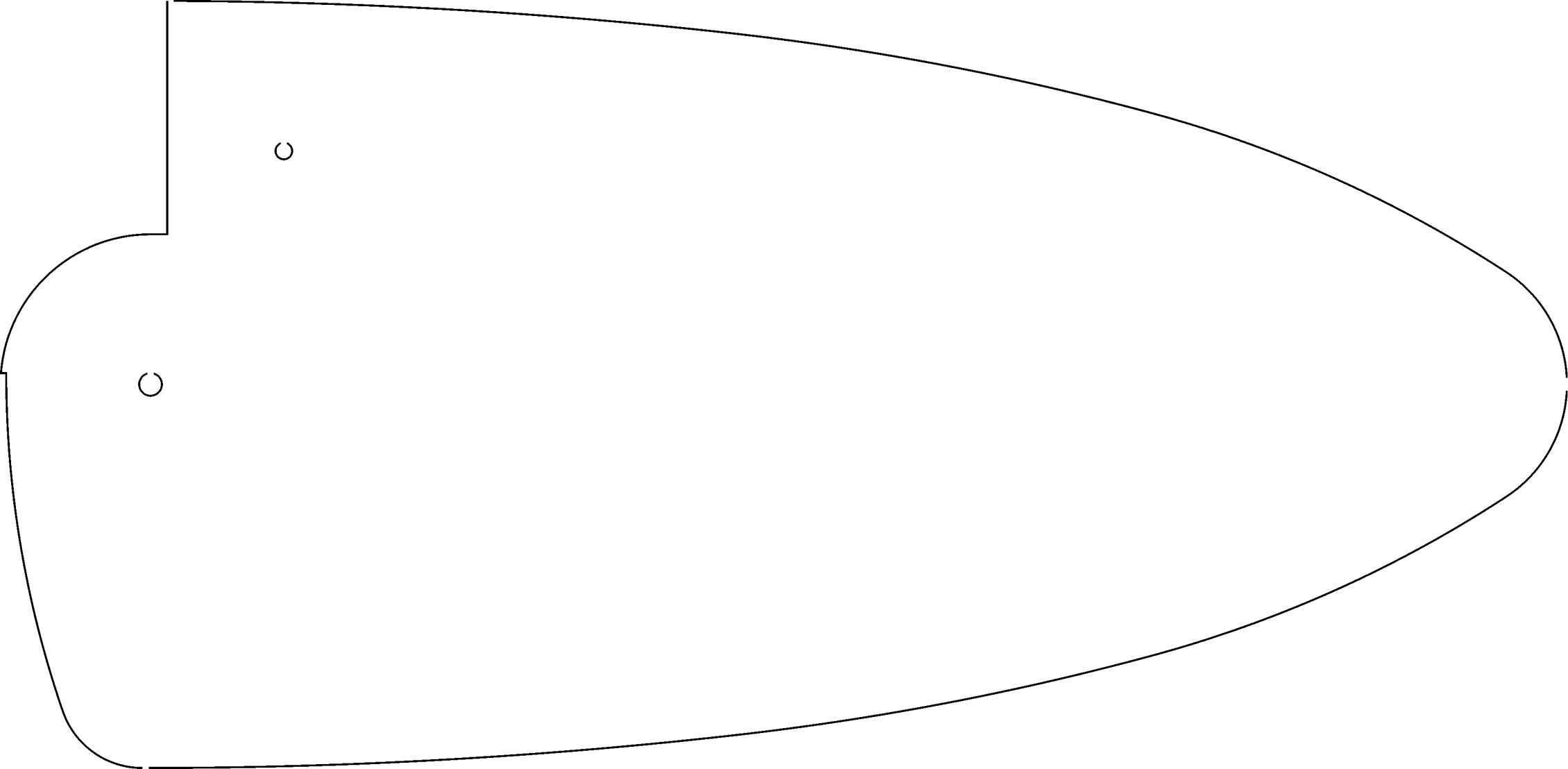


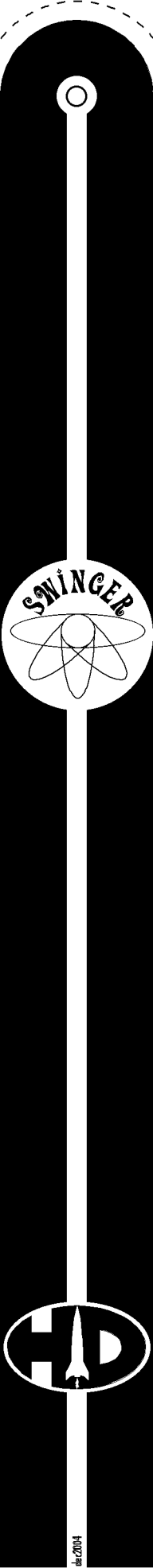
Swinger, 2 of 3, 6"x36"x3/32" balsa
Holverson Designs, Inc.
25075 CO HWY L20
Soldier, IA 51572
712.884.2329 fax712.884.2274



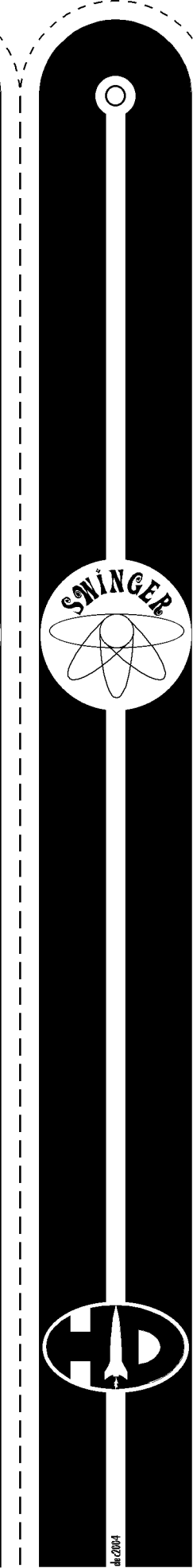
Swinger, 3 of 3, 6"x36"x1/8" balsa
Holverson Designs, Inc.
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Soldier, IA 51572
712.884.2329 fax712.884.2274







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