



Stonebreaker

Stonebreaker Parts List

Item #	Item Name	Qty
10091	Engine Mount Tube (AT-24/3.75)	1
10160	Airframe Tube (AT-56/18)	2
13031	Centering Ring (CR-18/24)	1
13035	Centering Ring (CR-24/29)	2
15025	Centering Ring (CR-24/56) Cardstock	1
13056	Launch Lug (1/4" X 3")	1
15536	Balsa fin sheet	1
19470	Plastic Nose Cone PNC-56-A	1
24041	Regular Engine Hook	1
24042	E Size Engine Hook	1
29123	32" Plastic Parachute Pack	1
29520	300# Kevlar® Shock Cord x8ft	1
31055	Stonebreaker Instruction Sheet A	1
31056	Stonebreaker Instruction Sheet B	1
41026	Printed Decal Sheet	1
39018	Stonebreaker Face Card	1
47133	Plastic Bag	1

Skill Level 2

Previous Experience Suggested

Someday in the future, an asteroid or comet may threaten the destruction of the earth. Your urgent mission is to smash the asteroid to bits with the defender missile called the "Stonebreaker."

The Stonebreaker is a mid-power model rocket that is easy to build. If you've built a model rocket before, you'll have no problems building this kit. It is straight forward to assemble, and a breeze to decorate.

The body is painted a light grey, and the tip of the nose is painted black. All the other decoration is done by applying the colorful self-adhesive decals.

When you push the launch button though, be ready for this rocket to leave the pad with noise and authority. It won't hesitate on the pad like other big rockets; it jumps into the air quite quickly. The reason is that it is a low-mass rocket that has a very clean shape.

Needed Tools and Materials

- Hobby Knife with Sharp Blades
- Ruler
- Wood Glue (recommended) or White Glue
- Sand Paper 200 grit, 400grit and Sanding Block
- Masking Tape
- Pencil
- Scissors
- Paper Towel
- Wood Dowel

Optional Tools / Finishing Supplies

- 24mm Spent Engine casing to insert engine block
- Aluminum "angle" to draw lines on the tube
- Paint Supplies: Spray Paint, Brushes, etc
- Plastic Sheet (to cover the work surface)
- Safety Glasses (or general protection while building)
- Super Glue (CyA Adhesive medium viscosity)
- Wood Sealer/Sanding Sealer



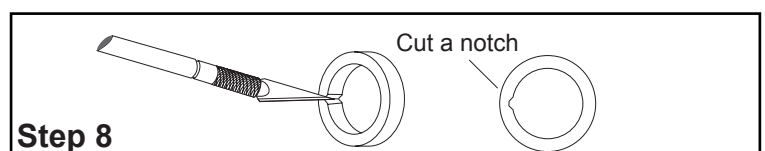
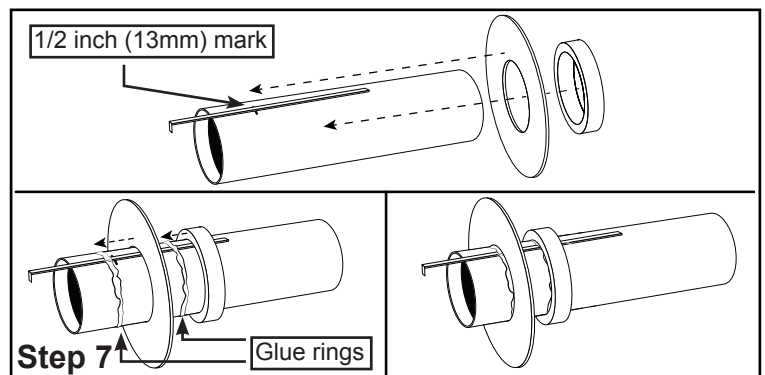
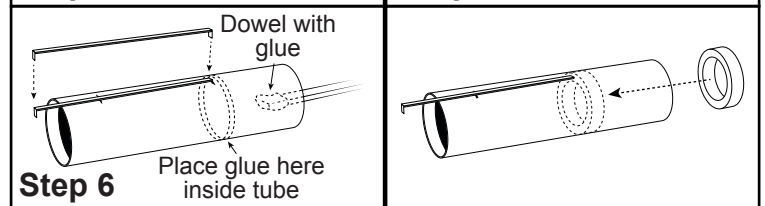
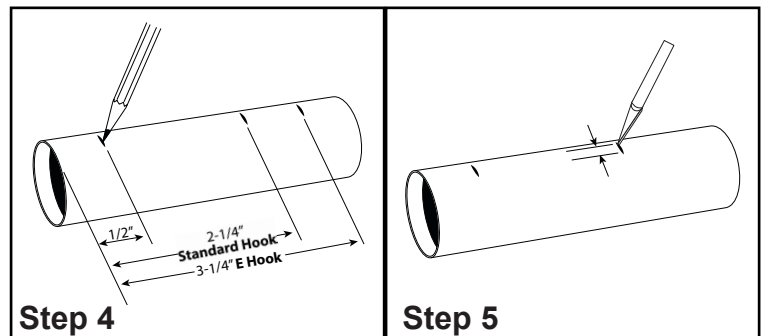
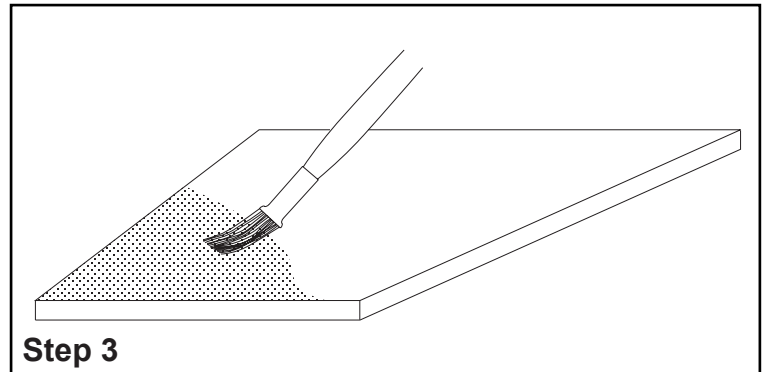
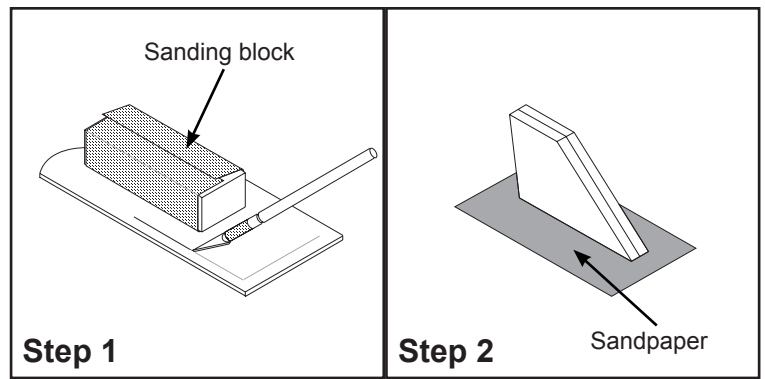
Mid-Power Rockets
Manufactured in the USA by:

Apogee Components Inc.
Colorado Springs, Colorado, USA

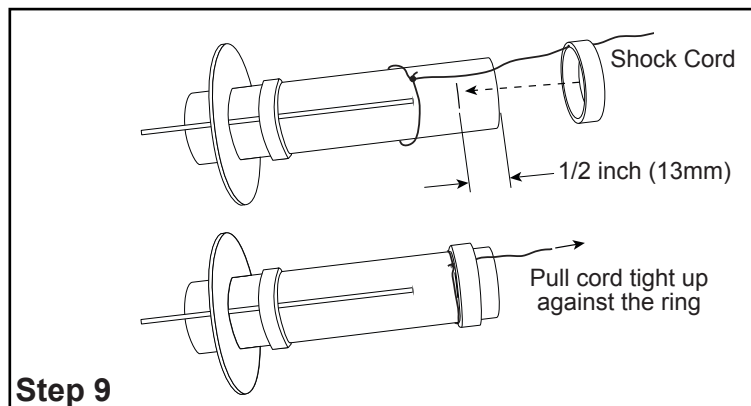
Visit us online at:
www.ApogeeRockets.com

Assembly Steps

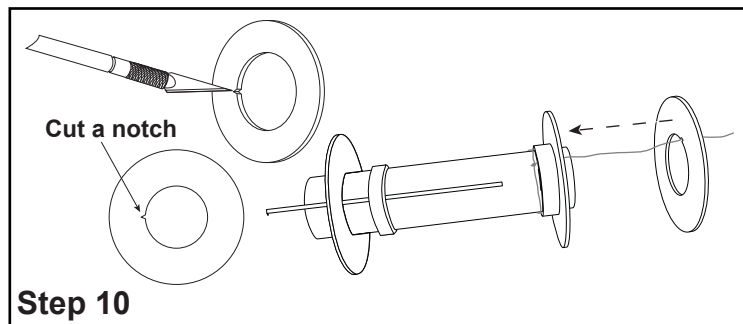
- 1. Using 400 grit sandpaper, fine sand the balsa die-cut sheets before removing the fins. Carefully remove all the pieces from the balsa sheet by freeing the edges with a sharp hobby knife.
- 2. Group the similarly shaped fins together, and gently sand the edges as shown in the illustration.
- 3. You can apply sanding sealer to the surfaces of the balsa fins and strakes. Coat both sides at the same time to minimize the chances of the fins warping. Do not allow the sanding sealer to get on the root edge of the fins. This could prevent the fin from bonding well to the body tube when it is glued on later. Set them aside to dry completely. When they are dry, sand the sealer smooth until you get a desirable surface finish. You may need to repeat this step several times depending on the level of quality you wish to achieve.
- 4. **Install your preferred engine hook:**
Regular "D" Engine Hook: Mark the body tube $1/2"$ (13mm) and then $2-1/4"$ (57mm) from one end as shown.
E Engine Hook: Mark the body tube $1/2"$ (13mm) and then $3-1/4"$ (83mm) from one end as shown.
- 5. Using a hobby knife, make a $1/8"$ (3mm) long cut in the body tube at the ($2-1/4"$ or $3-1/4"$) line you drew in the previous step.
- 6. Insert the correct engine hook into the slit. Place wood glue on the end of a wooden dowel or Q-Tip and smear glue around the inside of the motor mount tube just ahead of the engine hook. Slide the small green engine block ring inside the motor tube, and press it through the glue and up against the tip of the engine hook.
- 7. Remove the two large centering rings from the cardstock sheet. Slide one large centering ring and one large green ring about halfway over the tube as shown. Apply a bead of wood glue around the engine mount tube, at the $1/2$ inch (13 mm) mark, and then another bead of glue behind the large centering ring (another $1/2$ inch back from the first bead of glue) as shown. Now slide the cardstock ring into the first bead of glue, and then the green ring into the second bead. Check to be sure the large centering ring is aligned straight.
- 8. Find the other green ring that fits over the 24mm diameter engine mount tube. Cut a notch on the inside with a hobby knife.



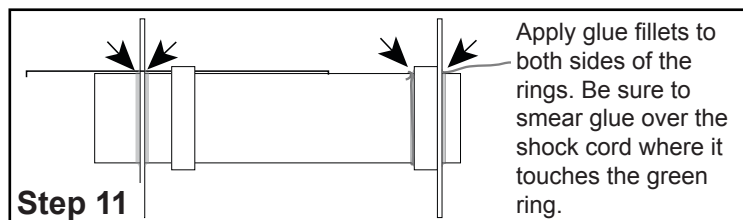
- 9. Mark a pencil line on the front of the engine mount tube 1/2 inch (12mm) from the end. Tie the yellow Kevlar® shock cord around the front end of the engine mount tube. Slide the green ring over the shock cord and onto the tube. The shock cord should fit into the notch on the inside of the ring. Pull the cord tight up against the ring. Pull the shock cord snug against the ring.



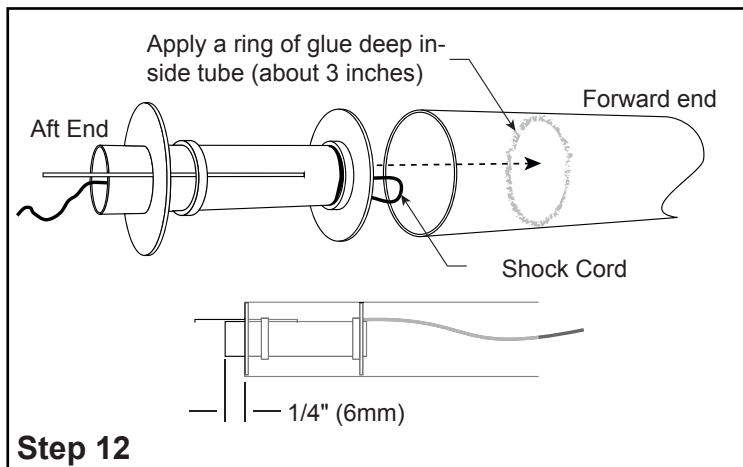
- 10. Apply a bead of wood glue 1/8 inch (3mm) from the forward end of the engine mount tube. Cut a notch into the remaining cardstock ring as shown. Then slide the remaining ring into the bead of glue. Check to be sure the ring is aligned straight on the tube. Allow the glue to dry.



- 11. After the glue on the engine mount is dry, put a fillet of glue on each side of both of the centering rings. These rings take a lot of stress at engine ejection, and you must make sure to have a good glue bond (Note: it is not necessary to use epoxy. Wood glue is plenty strong for this application).

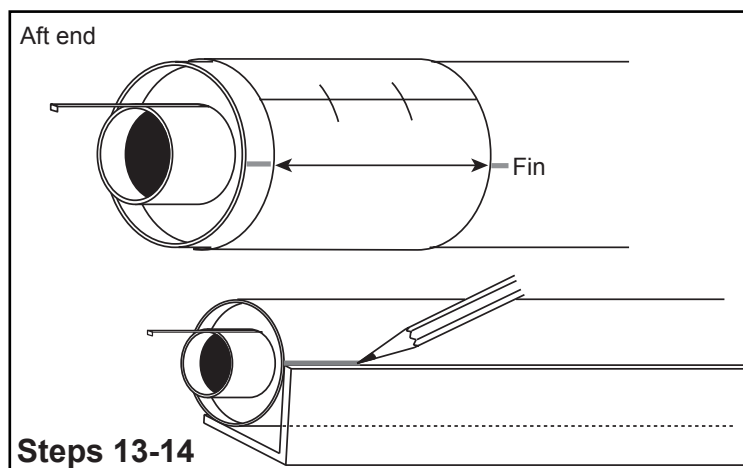


- 12. Reverse the direction of the shock cord so that it comes out of the aft end of the engine mount tube as shown. Apply wood glue deep inside the body tube using a scrap piece of wood or a dowel. Immediately insert the engine mount assembly into the body tube, and push with one FAST and SMOOTH motion until the aft end of the engine mount tube sticks out about 1/4 inch (6mm) as shown. Apply additional wood glue to the exposed centering ring/body tube. Wipe away excess glue with your finger. You can now feed the shock cord back through the body tube.

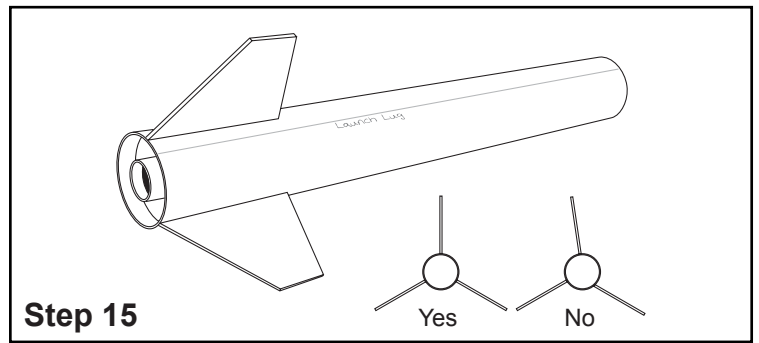


- 13. Cut out the tube marking guide from page 7. Wrap the guide around the aft end of the large white body tube and tape the ends together. Mark a small line at each of the arrow points. Remove the marking guide.

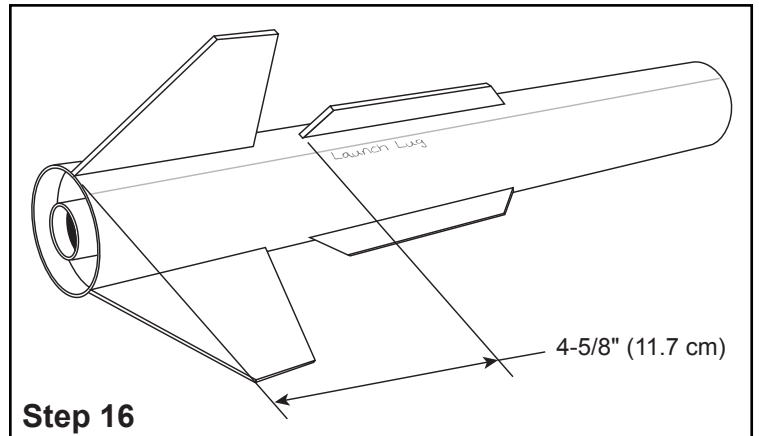
- 14. Using a your metal angle tool (a door frame will work, but it is not recommended on large diameter tubes), draw a pencil line down the outside of the body tube at each pencil mark. Label the launch lug line so you don't glue a fin in the wrong position.



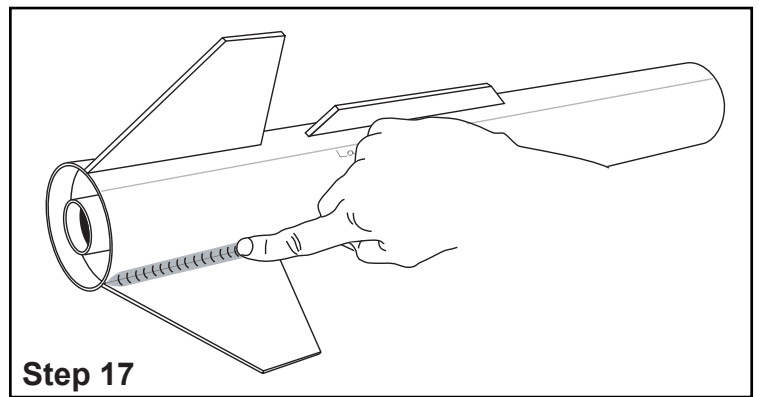
- 15. Apply a very thin layer of glue to the root edge of one of the large fins. Allow the glue to dry slightly for several minutes, and then attach it along one of the lines on the body tube, as shown in the illustration. Each fin is attached so that it is flush with the end of the tube. Make sure the fin is straight along the tube. Allow the fin to dry before proceeding with the next fin. Repeat this step two more times as you attach the other two fins.



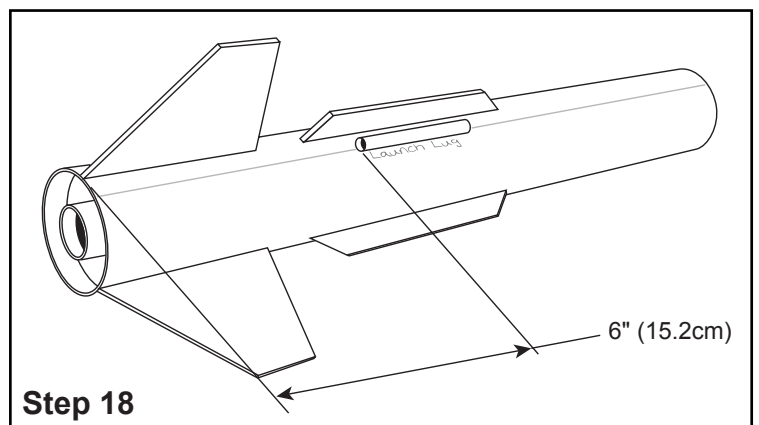
- 16. The strake fins are attached in the same way as the fins in the previous step. They are also attached along the same lines as the fins. Glue them into position, 4-5/8" (11.7 cm) from the aft end of the tube. Repeat this step two more times as you attach the other two strake fins. Allow the glue to dry before proceeding with the next assembly step.



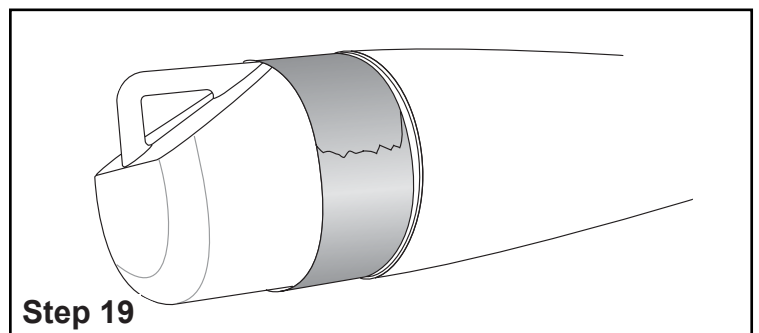
- 17. Apply a bead of wood glue to both sides of each fin-body tube joint. Pull your finger along the joint to smooth out and remove the excess glue. Lay the tube horizontally while the glue dries.



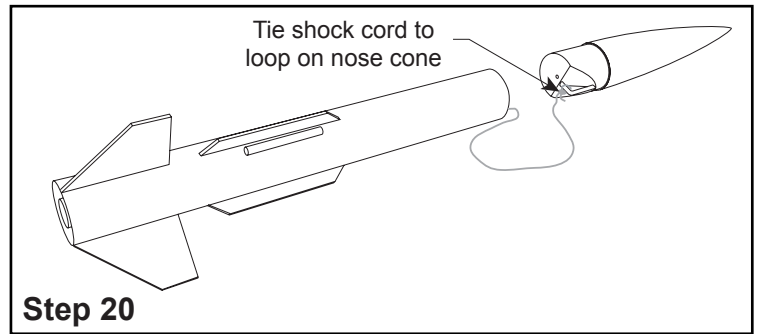
- 18. Using wood glue, attach the launch lug to the tube on the pencil line; position it 6.0 inches (15.2 cm) from the aft end of the tube. Allow the glue to dry.



- 19. Test fit the nose cone onto the front end of the rocket. You may need to apply two or three layers of masking tape to make the fit snug. When applying the masking tape, leave a slight gap between the edge of the nose portion and the edge of the tape.

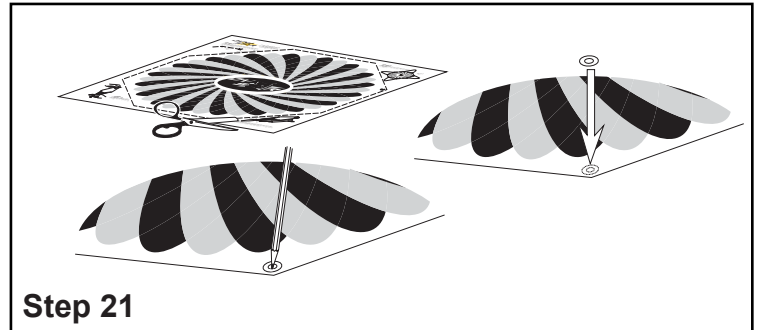


- 20. Tie the loose end of the shock cord to the loop on the base of the nose cone using two overhand knots. Apply a little bit of wood glue onto the knot to keep it from coming untied.



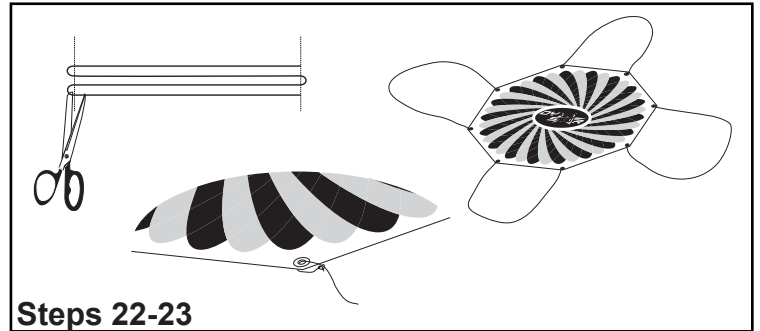
Parachute Assembly

- 21. Carefully cut out the parachute canopy along the dashed lines. Place one reinforcement ring on each of the marked corners. Take a sharp pencil or hobby knife and poke a hole through the plastic in the center of each ring.

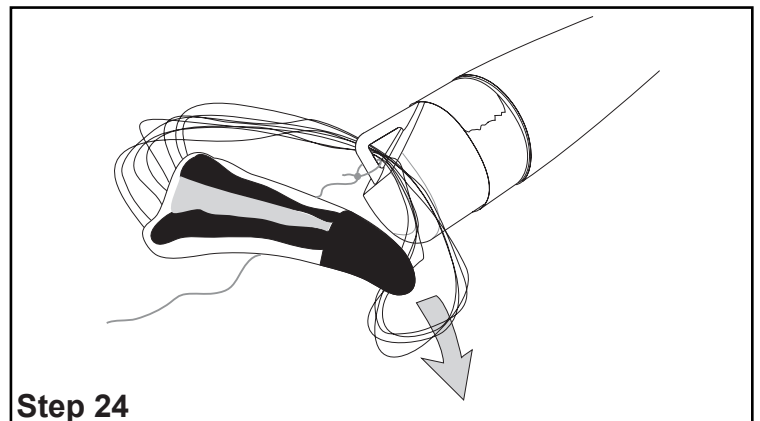


- 22. Fold the shroud line in half, and cut at the fold to make equal lengths; cut each piece in half again to make a total of four lines of equal length.

- 23. Pull each parachute line end through a parachute reinforcement ring and tie using two overhand knots. Repeat for all the corners as shown.



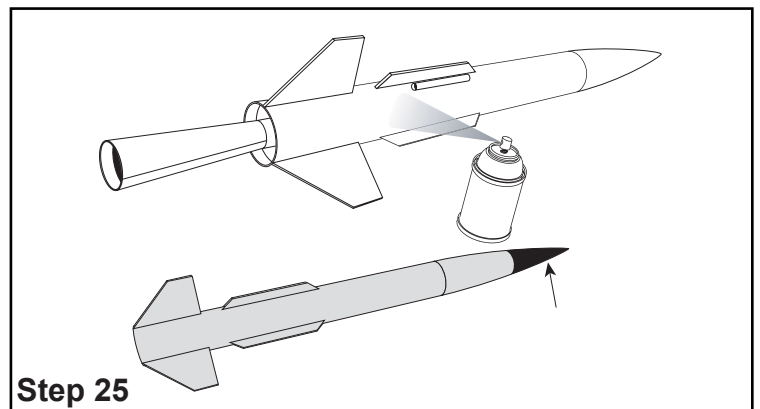
- 24. Holding the parachute at the center of its top, pull the lines together to even up the ends. Thread the 4 looped lines through the loop at the base of the nose cone. Take the top of the parachute and pull it through all 4 string loops at the same time and then pull to tighten the knot. This securely attaches the parachute to the rocket.



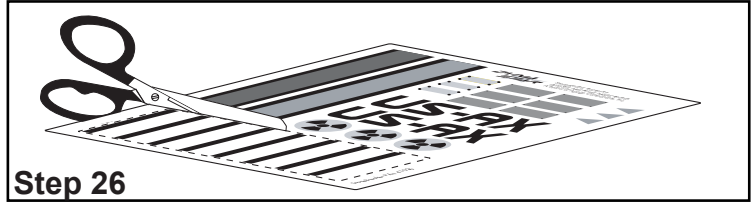
Painting the Stonebreaker Rocket

Be sure all the glue has completely dried before you paint your Stonebreaker model rocket kit.

- 25. Roll a piece of paper and insert it into the aft end of the body tube so you can hold the model while painting it. For best results, paint the model with primer before using the final paint colors. Follow the directions on the paint can, and always paint outdoors with the wind against your back. Start by painting the entire rocket light grey. When the paint has dried for 24 hours, paint the nose tip black. You can use the raised lines on the nose to help you mask off the top area.



- 26. Before applying the decals, let the paint harden at least 24 hours. Cut around the perimeter of the decal with a pair of scissors. Peel off the paper backing, and affix the decal in place on the model. Use the picture on page 1 for decal placement.
- 25. Congratulations! Your Stonebreaker is now complete.

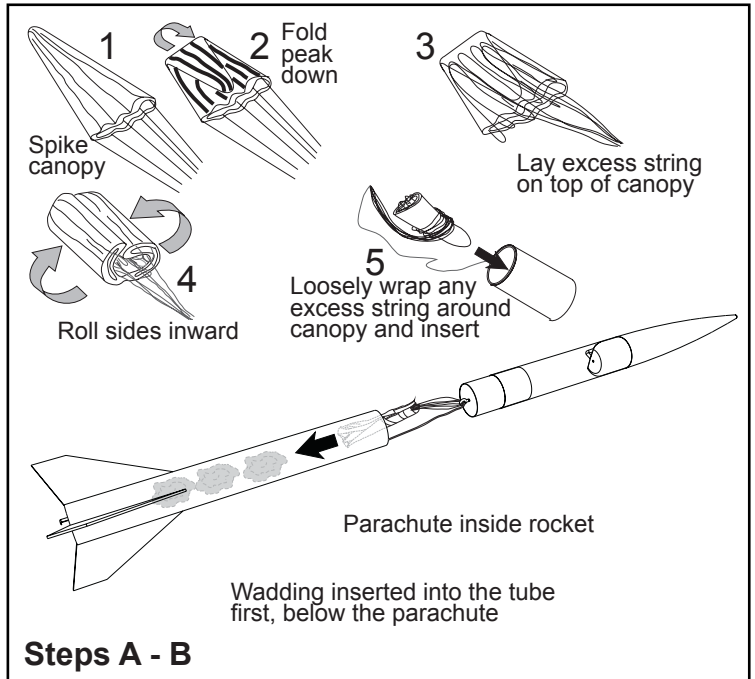


Launch Supplies Needed

To launch your rocket you will need the following supplies:

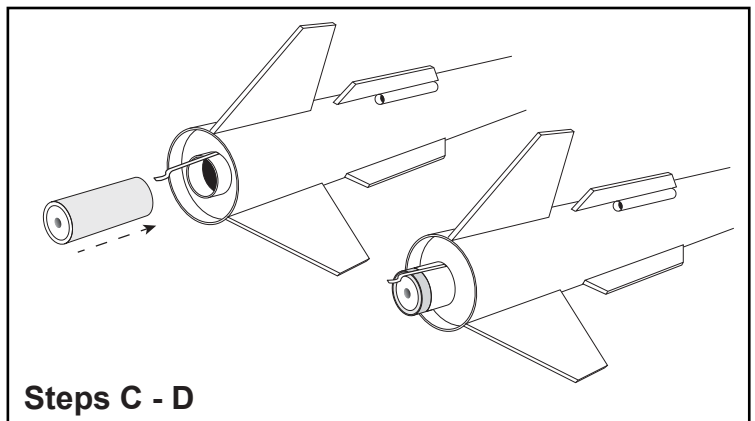
- A model rocket launching system
- Flame resistant recovery wadding
- Recommended 24mm Diameter Rocket Engines:
See the motor matrix below.

Motor	Manufacturer	Est. Altitude	
		Ft	m
C11-3	Estes	289	88.2
D12-5	Estes	639	194.8
E6-6	Apogee	1834	559.0
E9-6	Estes	1293	394.1
E15-7	Aerotech	1612	491.4
E30-7	Aerotech	1541	469.8
F24-7	Aerotech	2052	625



Rocket Preflight

- A. Loosely crumple and insert 8 sheets of recovery wadding into the body tube.
- B. Carefully fold the parachute and insert it into the tube with the shock cord. Then install the payload section into place.
- C. Fully insert the motor into the motor mount tube, hooking it into place with the engine hook.
- D. Insert and secure the engine igniter as directed on the package the engines came with.



Countdown and Launch Procedure

Fly your rocket on a large field that isn't near any power lines, trees, or low flying aircraft. The larger the field, the greater your chances of recovering your rocket. The launch area around the pad must be free of dry weeds and brown grass. Launch only during calm weather with very little or no wind and good visibility. Always use a launch pad that includes a blast deflector.

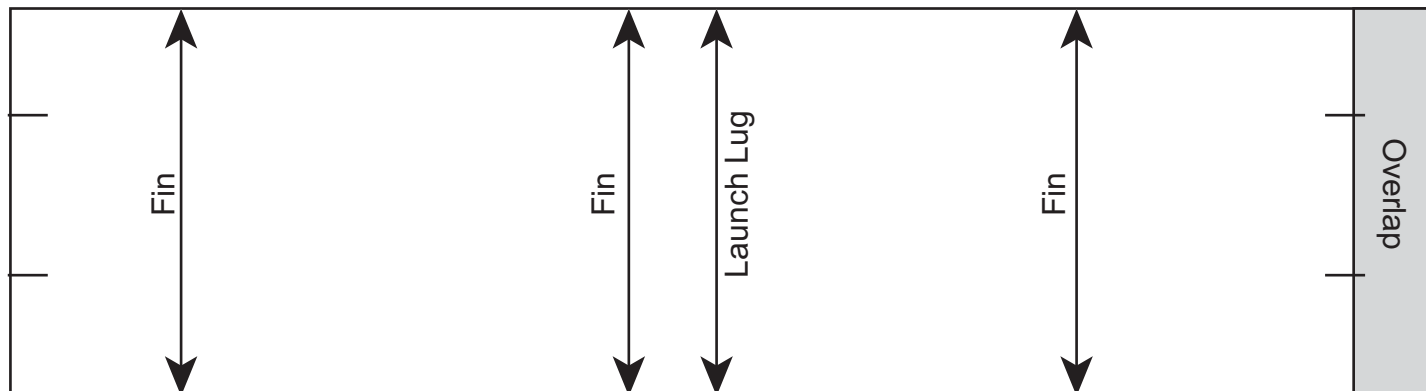
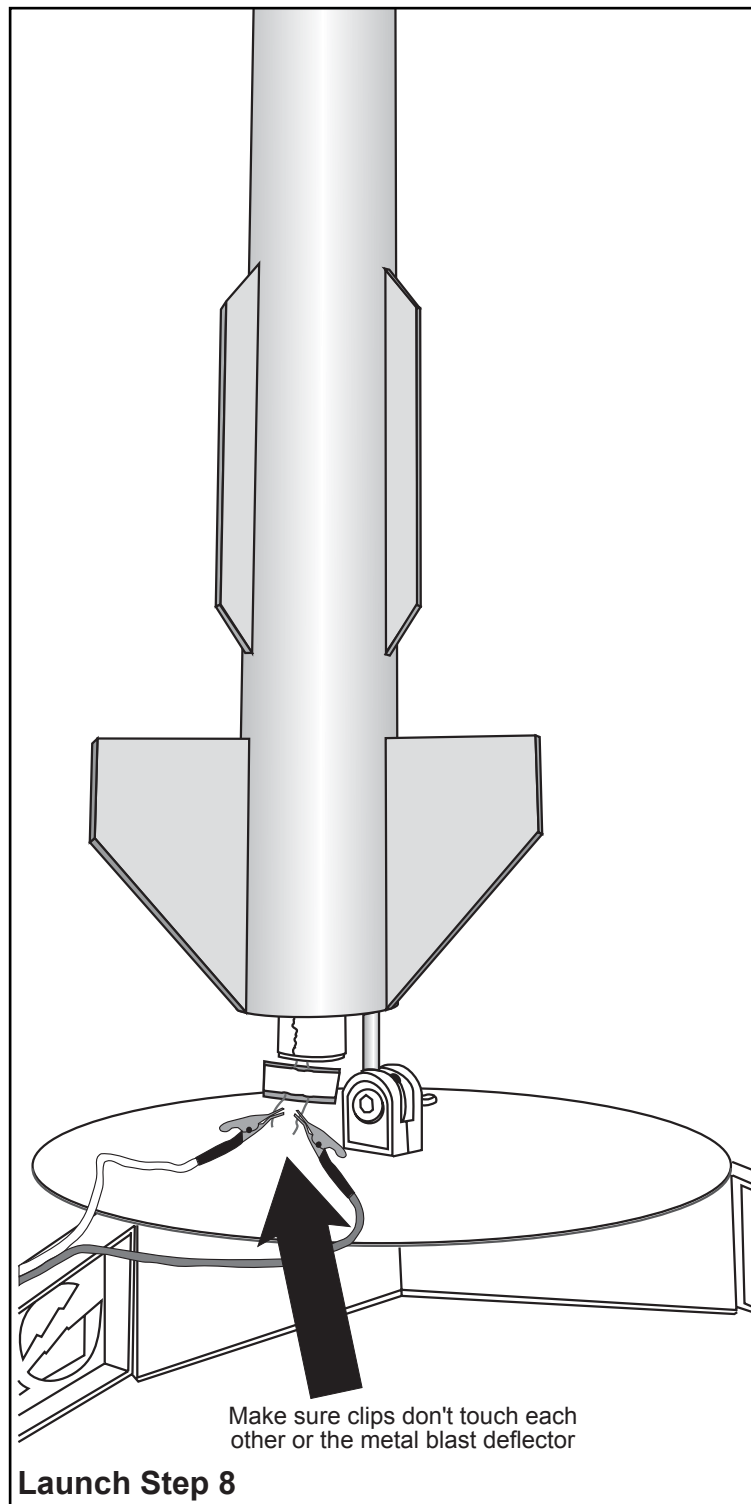
10. Remove the safety key from the launch controller
9. Slide the launch lugs over the launch rod to place the rocket on the pad. The rocket should slide freely over the rod.
8. Attach the micro-clips to the igniter. The clips must not touch each other or the metal blast deflector.
7. Stand back from your rocket as far as the launch wire allows (at least 5 meters - 15 feet).
6. Insert the safety key to arm the launch system. The light (or buzzer) on the controller should come on.

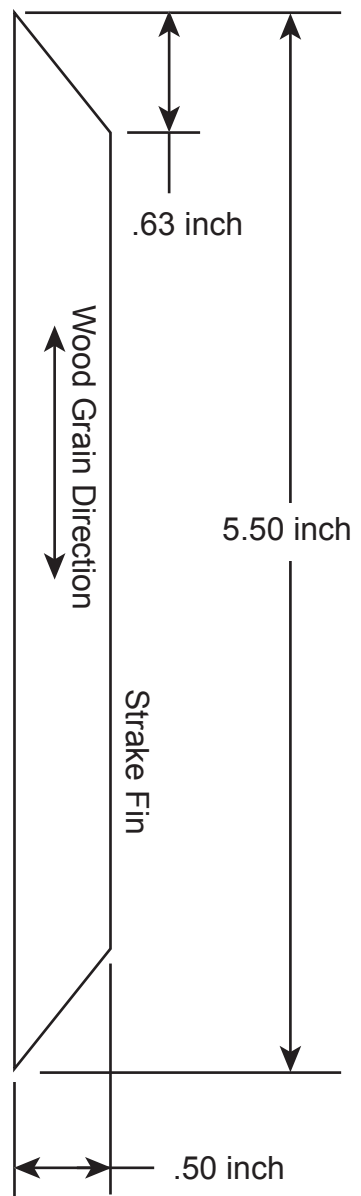
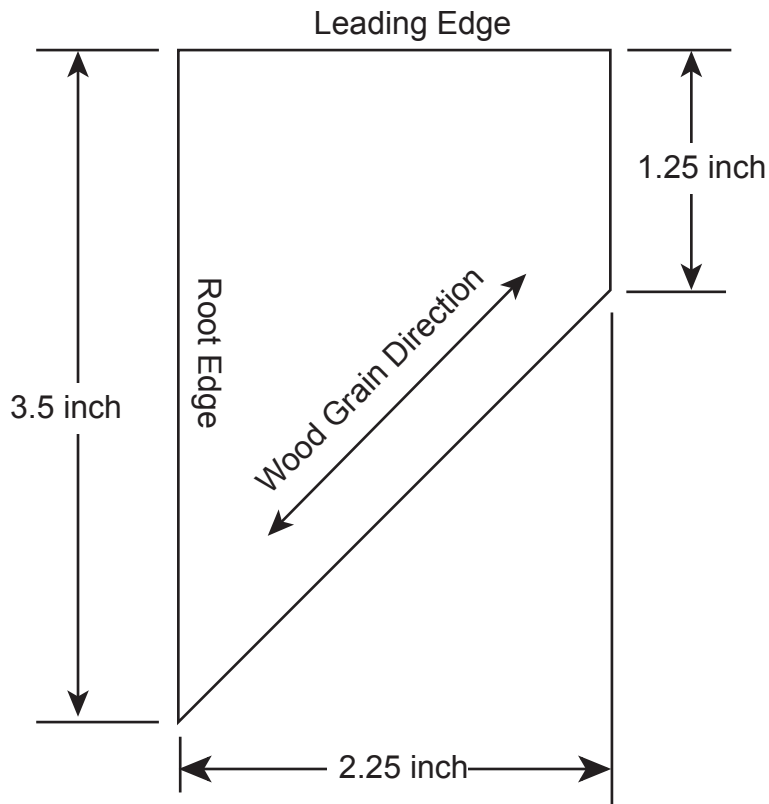
Give a loud countdown 5 ... 4 ... 3 ... 2 ... 1...
LAUNCH!

Push and hold the button until the engine ignites. Then remove the safety key and place the safety cap on the launch rod.

Misfire Procedure

Occasionally the igniter will burn, but the motor will fail to ignite. If this happens, the cause is that the pyrogen on the igniter was not in contact with the engine's propellant. When an ignition failure occurs, remove the safety key from the launch controller and wait 60 seconds before approaching the rocket. Remove the old igniter from the engine and install a new one. Make sure that the igniter is inserted fully into the engine and touches the propellant. Secure the igniter as directed on the engine package and repeat the countdown and launch procedure. Always follow the NATIONAL ASSOCIATION OF ROCKETRY Model Rocket Safety Code when launching model rockets.





Stonebreaker Fin Templates

Use these templates to make replacement fins, in case you break one off.

Use 1/8" (3mm) thick balsa wood sheet.

NEED MOTORS OR ACCESSORIES TO GO

Order online at www.ApogeeRockets.com or call us at **719-535-9335**. We're available M-F: 9:00am-5:00pm MST

Recommended items:	Weblink
Rocket Engines	https://www.apogeerockets.com/Rocket_Motors
Launch Pads	https://www.apogeerockets.com/Launch_Pads
Launch Controllers	https://www.apogeerockets.com/Launch_Controllers
Rocketry Tools	https://www.apogeerockets.com/Building_Supplies/Tools