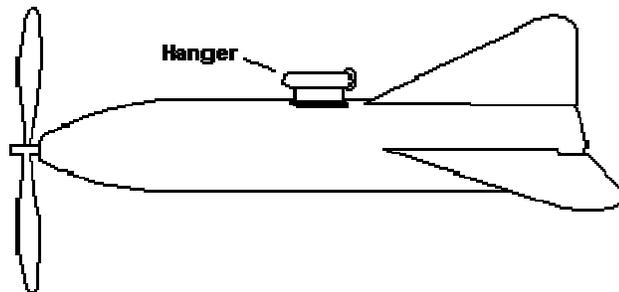


Space Derby 101

Space Derby Rocket Assembly Tips

1. **HAVE FUN!**
2. **Glue the two halves of the rocket body together, shape with a potato peeler, then sand.** *Carefully* align and glue the two halves of the rocket body with Elmer's glue, or something similar. After the glue dries for 15 minutes, shape the body with a potato-peeler until it looks roughly like a rocket. Then sand it into its final shape with medium grit sandpaper. Wrap sandpaper around the body, holding it with one hand while you twist the fuselage with your other hand. Design tips: Fast rockets are smooth, aerodynamically shaped, and lightweight. Make the shell of the rocket thin, but thick enough to hold the hanger that will be attached in step 4 and thick enough to support the pressure of a tightly wound rubber band.
3. **Cut notches for the plastic dowel.** The rubber bands will slip without these notches. Do **NOT** glue the dowel onto the body! The dowel will be held in the notches by the rubber bands - and must be removable so that broken rubber bands can be replaced.
4. **Hold the body upright on a nail when you paint.** Tap a long nail a few millimeters into a block of wood. Set the block on a newspaper-covered floor or table with the nail pointing straight up. Slide the rocket onto the nail, inserting the nail into the rocket's hollow center. Paint with a couple coats of primer, sanding lightly with fine sandpaper after each coat. Next spray on a topcoat. Don't use too much paint, you want a light rocket.



5. Attach the hanger, making sure that the rounded end points forward and that the hanger doesn't protrude into the rocket's hollow center chamber. **TAKE SPECIAL CARE WITH THIS STEP!** Glue it on with generous amounts of glue. Cut a groove for the hanger in the top-center of the rocket body. This 1" groove should be centered, 3" from the front and 3" from the rear of the body. Press the hanger into this groove, rounded end forward. The hanger must not protrude into the hollow chamber in the center of the body or it will interfere with the rubber band. The hanger must be firmly glued in place or it may detach during launch with disastrous consequence. Use a generous amount of glue to affix the hanger to the rocket body and allow the glue to dry overnight; a couple hours dry time may not be enough for Elmer's glue. *Warning: the rocket pictured on the front of the space derby kit box has an incorrectly attached hanger.* Don't use it as a guide. **Don't forget:**
 1. The hanger's rounded end must point forward.
 2. The hanger must not protrude into the rubber-band chamber.
 3. The hanger must be *very* firmly glued on.

6. **Cut and attach the fins.** Shape the fins with scissors, then cut slits in the rocket and press the fins into the slits. Glue in place. Design tip: some claim that the fins should be angled upward *very* slightly. In theory this lifts the rocket slightly off the line during flight, reducing friction.
7. **Trim and balance the propeller.** Sand loose pieces of plastic from the propeller. If the propeller is unbalanced, one side will swing to the floor when it is placed in a horizontal position. Sand the edges of the propeller to balance it.
8. **Don't tighten the cable tie.** The rubber bands have already been attached to the dowel and a loop made from a cable tie has been added. We'll use this loop to wind rockets at the races. Don't tighten it. (*Don't panic. This pre-assembly and the cable-tie are NOT part of the standard kit. Some packs/troops add this before kits are handed out.*)
9. **Pull rubber bands through with a wire hook.** You can make a hook from coat hanger wire.
10. **Fine tune.** Test the rocket's balance. Hold it lightly by the hanger with your fingers. If the rocket is nose-heavy, carve or sand a little wood off that end. If it's tail-heavy, remove wood from the tail area or from the fins. You may be able to unobtrusively take wood from the rocket's hollow center chamber. Some advocate lubricating the propeller with a touch of graphite at the point where it touches the bushing. Other lubricants may melt the plastic.

MORE SPACE DERBY HINTS and GUIDELINES

Lighter is definitely better: There is a limited amount of force and energy in two or three (2-3) rubber bands wound 100 times, so minimizing the mass of the unit can only help. We've seen a number of winners and the shapes of those winners differ dramatically. One thing in common with both of them is their weight. Both were very light and well balanced. The key is making it light without removing so much material that the winding of the rubber bands actually splits the ship in two or causes serious cracking. That's happened to potential winners in past years and the kids are pretty upset when it does.

The shape is not the key: We have seen a number of different shapes and the winners were very different. One was cigar-like while the other was more like a Klingon® vessel (from Star Trek©). A lot of shuttle look-a-likes have been used and various other configurations. As long as the vehicle is symmetrical and light, it seems to perform well.

No glue on the propeller assembly: Never use glue on the propeller assembly. Other than the fact that you may slip a bit and get some glue on the prop itself or on the bushing underneath, if you break a rubber band you have to be able to remove the propeller. In past years, we have had a number of problems including the rubber bands breaking during the winding and the actual propeller breaking. When this happens to a space vehicle where the assembly was glued in place, replacing the propeller unit is much more difficult.

Make sure the propeller is on correctly: Several Space vehicles have had the propellers on backwards. When looking at the hub (center) of the propeller closely, there will be rounded end and a rougher end that is not even. The rounded end goes towards the rocket ship and should be touching the small metal bushing. The rougher end has a little protrusion that is designed to catch the wire when it is bent over. Which leads to the next tip...

Don't cut the bent over wire too short: We were guilty of this one. In the attempt to be neat I cut it too short and then during the winding, the propeller can slip and spin around. Leave a little more than you think is necessary and you should be fine. Just bend it over to form an inverted 'U', with plenty to grab the prop, and then there should be no trouble.

Don't glue in the tail unit (white plastic dowel) that holds the rubber bands in place: Basically, for the same reason, the rubber bands can't be altered in any way without disassembling the unit. This actually happened to one Scout's vehicles and repairs were difficult.

The tail unit (white plastic dowel) needs notches to prevent spinning: After you are all done with your spaceship, make sure there are two depressions of 'V's cut into the tail to prevent the end unit from spinning during the winding or once the rubber bands start to unwind. It may wind up okay but when the pressure is released slightly it may start to spin. If you cut them too deep you will be essentially shortening the spaceship and decreasing the pull on the rubber bands. It's more of a trial and error type of thing. Start shallow and increase as needed.

Make sure the red plastic liner covers the entire hook: The red plastic sleeve that slips over the metal hook (on the inside of the propeller assembly) MUST be put in place. That is there to prevent the metal hook from cutting through the rubber bands during the winding. It sometimes takes a little effort to pull it all the way on, but it can be done. You can always grab the end of the wire with some pliers and work it on slowly, but make sure it goes all the way to the end of the hook.

Various fin/wing sizes and configurations work: We personally haven't had a lot of luck in this department - I guess I have to read up on my aerodynamics. What I've seen is winners with small fins all over the ship and winners with just two big wings and a tail like the space shuttle. The bigger wings seem to cause less spinning when the ship is released for a more level flight, while the smaller fins seem to allow the ship to carry its speed a bit better. The bottom line is they both seem to work if everything else is done right. My personal opinion is that the bigger wings seem a bit better but you'll have to figure that one out on your own. Why we keep using the small fins is a mystery to me.

Attaching the Hanger to the top of the rocket: Attach the hanger, making sure that the rounded end points forward and the hanger doesn't protrude into the rocket's hollow center chamber. Glue it on with generous amounts of glue. Cut a groove for the hanger in the top-center of the rocket body. This 1" groove should be centered, 3" from the front and 3" from the rear of the body. Press the hanger into this groove, rounded end forward. The hanger must not protrude into the hollow chamber in the center of the body or it will interfere with the rubber band. The hanger must be firmly glued in place or it may detach during launch with disastrous consequence. Use a generous amount of glue to affix the hanger to the rocket body and allow the glue to dry overnight; a couple hours dry time may not be enough for Elmer's glue.

Use no more than 2 or 3 official BSA rubber bands: This is our regulation as well as a general guideline. Each kit comes with 4 official BSA rubber bands. For fairness, please refrain from purchasing non-BSA rubber bands. We will have plenty of extra official BSA rubber bands, as well as "grease," available on-site at the derby. Note: More rubber bands may mean more power, but it also risks crowding in the hull as well as tangling during the race.

Remember: This is for fun...so have fun!

--these hints were compiled and edited from www.buckskin.org