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Plywood Big Daddy Upgrade Set Product Documentation

Rocketry Works' Plywood Big Daddy Upgrade set replaces the balsa and cardboard fins and centering rings of the Estes Big Daddy kit with a stronger fin can unit. It can support either the original 24mm motor mount, or a 29mm motor mount that can be used with 24mm motors with a motor adapter. Options available with this upgrade kit are the 29mm motor tube, a motor retainer to match the selected motor mount size, Kevlar shock cord, a nylon parachute, ¼ inch launch rod or 1010 rail guides, and additional nose weight.

However, with the heavier construction, and the option to fly larger, heavier motors, the upgrade set requires additional nose weight to maintain stability. And with additional nose weight, you won't be able to fly the upgraded kit on C and D motors. Be sure to download the appropriate Rocksim file to determine the correct amount of nose weight and suitable motors for your upgraded Big Daddy. If you aren't familiar with Rocksim, give us a call at 520 405 3009 and we'll be happy to help you understand how to use software models to make good stability and motor selection choices.

You can find an electronic version of these instructions and generic simulation files here: https://www.rocketryworks.com/plywood-big-daddy-upgrade-set/

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Tools Required

- Wood Glue or 5 minute epoxy for assembling the motor mount and fins
- 15 or 30 minute epoxy for securing the nose weight in the nose cone
- Sandpaper: 80 grit, 120 grit, and 220 grit
- Mixing cup and stir stick for expoxy
- Use the plastic bag from the Big Daddy Upgrade Kit as a drop cloth to keep your work surface clean.
- Use nitrile or latex gloves to keep your hands clean if you use epoxy, and be sure to measure the proportions of epoxy resin and hardener by weight or volume according to the manufacturer's instructions.

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What's in the Kit

The core kit includes centering rings, shock cord anchor, and through the wall fins, but options include a 29mm motor tube, shock cord, nylon parachute, ¼ inch launch lugs, 1010 rail guides, and additional nose weight.

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What You'll Need from the Estes Big Daddy Kit

From the Estes Big Daddy kit, you'll need the nose cone, the airframe tube, and the decals, plus possibly the 3/16 inch launch lug, the 24 inch plastic parachute, and the elastic shock cord, depending on which options you choose from the upgrade kit.

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Test Fit the Motor Mount Parts

Test fitting verifies that the parts fit well together, and they familiarize you with what you're about to glue together. You may need to sand parts to ensure a proper fit.

1. Test fit the centering rings on the motor tube, positioning the centering rings.
   The centering rings will slide onto the motor tube easier by sliding the engraved side on first.
2. Test fit the shock cord mount into the slot in the forward centering ring, securing the mount with the angled cross piece.
3. Test fit the motor retainer body onto the aft end of the motor mount and mark the position of its forward edge on the motor tube.
4. Slide the centering rings toward the ends of the motor tube, and check that the fin tabs fit between the centering rings.
5. Remove the fins, and slide the centering rings an inch or two from the end of the tube.
   Note that these are NOT the final positions of the centering rings, but they allow for better application of adhesive.

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Assemble the Motor Mount

These instructions assume that you are using a composite motor with the Big Daddy, not an Estes black powder motor. Composite motors have a thrust ring near the nozzle that secures the motor inside the motor mount. If you plan to use Estes motors with your upgraded Big Daddy, be sure to follow the portions of the original instructions relating to the motor mount assembly.

1. Apply a bead of adhesive--wood glue or 5 minute epoxy--to the outside of the forward end of the motor tube, and slide the forward centering ring into the adhesive, leaving ¼ inch of the motor tube forward of the centering ring.
2. Apply a drop of adhesive to the shock cord mount anchor to prevent it from coming loose.

3. Remove the motor retainer body from the motor tube and set it aside for now.
4. Apply adhesive to the outside of the aft end of the motor tube forward of the mark indicating the forward position of the motor retainer.

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5. Slide the aft centering ring into the adhesive and wipe away any excess adhesive.
6. Coat the inside of the motor retainer body with adhesive, making sure to fill the divots on the inside surface with adhesive.
7. Slide the motor retainer body onto the aft end of the motor tube, twisting to distribute the adhesive evenly on the tube.

   Important! Immediately wipe away any adhesive that winds up on the inside of the motor tube. It will block the motor once it hardens.
8. Make sure the centering rings are perpendicular to the motor tube, and that there is no adhesive in the motor tube, on the motor retainer body threads or on the motor tube between the centering rings.
9. Allow the adhesive to harden.

Aft End of Motor Mount

Completed Motor Mount

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Test Fit the Motor Mount, Fins, and Airframe

With the motor mount assembled, we will test fit the motor mount and fins in the airframe tube. Like the test fit steps in the motor mount assembly, this identifies any fit problems you may need to sand to resolve, and it familiarizes you with what you'll do next.

1. Insert the motor mount with the shock cord mount end first into the aft end of the airframe tube so that you can just see the aft centering ring at the aft end of the fin slots.
2. Back the motor mount out slightly, so the aft centering ring is not blocking the fin slot.
3. Mark the location of the forward centering ring on the side of the airframe tube
4. Insert the 4 fins into the slots, and wiggle each of them slightly so you can feel the root edge of the fin tab touch the motor tube.
5. Slide the fins all the way to the aft end of the slots, so the trailing edge of the fin meets the aft end of the airframe.
6. Remove the fins and motor mount and get ready to apply glue.

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Glue the Motor Mount into the Airframe

Remember to work on the plastic bag or another drop cloth during this step; it can be a bit messy.

1. Tie the shock cord onto the shock cord mount, then bundle the shock cord and stow it inside the forward end of the motor tube.
   This will keep the shock cord out of the way, and make it easier to tie than fumbling around inside the airframe tube after the motor mount is glued into place.

2. Use a long, thin scrap of balsa from the Big Daddy Kit's original fins to apply a bead of adhesive to the inside of the airframe tube just aft of the mark you made indicating the location of the forward centering ring.
   To reduce the mess, try to avoid the fin slots, but make sure the bead reaches all sides of the tube, though it may be heavier in some areas than others.

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3. Insert the motor mount with the shock cord mount end first into the aft end of the airframe tube and align the forward centering ring with the mark you made when you test fit the parts.
   The forward centering ring should push the adhesive slightly forward, creating a strong seal inside the tube.
   Make sure the shock cord mount is not aligned with a fin slot so you don't get adhesive on shock cord mount
   Note: you may push some adhesive out of the fin slots. That's fine; just clean up any excess. And make sure the fins slots are clear of adhesive.
4. Let the forward centering ring adhesive harden.

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Glue the Fins into the Airframe

1. Test fit the fins again into each fin slot to make sure you didn't get any adhesive on the motor tube. The fins should touch the motor tube evenly, with the root edge of the fin resting evenly on the airframe tube.
   If you see any gaps, you may need to sand the fin tab to avoid adhesive on the motor tube.
2. Working with 1 fin at a time, apply a bead of epoxy to the entire root edge of the fin, including the fin tab and the ends of the fin that will bond to the outside of the airframe tube.
   You can be generous with the adhesive here, but be sure to work on a plastic drop cloth so you don't make too big a mess.

3. Insert each fin into the fin slot and wiggle the fin slightly to distribute the adhesive onto the motor tube.
4. Slide the fin to the aft end of the fin slot, so the trailing edge of the fin aligns with the aft end of the airframe tube.

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5. Wipe away any excess adhesive from the outside of the airframe tube.
6. Hold the fin in place, perpendicular to the airframe tube, until the adhesive hardens.
   It's easiest to stand the forward end of the airframe tube on a flat surface with the fins pointing straight up while the adhesive hardens.
   Important: Make sure the fin tab stays bonded to the motor tube as the adhesive hardens. The strength of the fin can depends on attachment at the motor tube and the airframe tube.
7. Repeat for each of the 4 fins.

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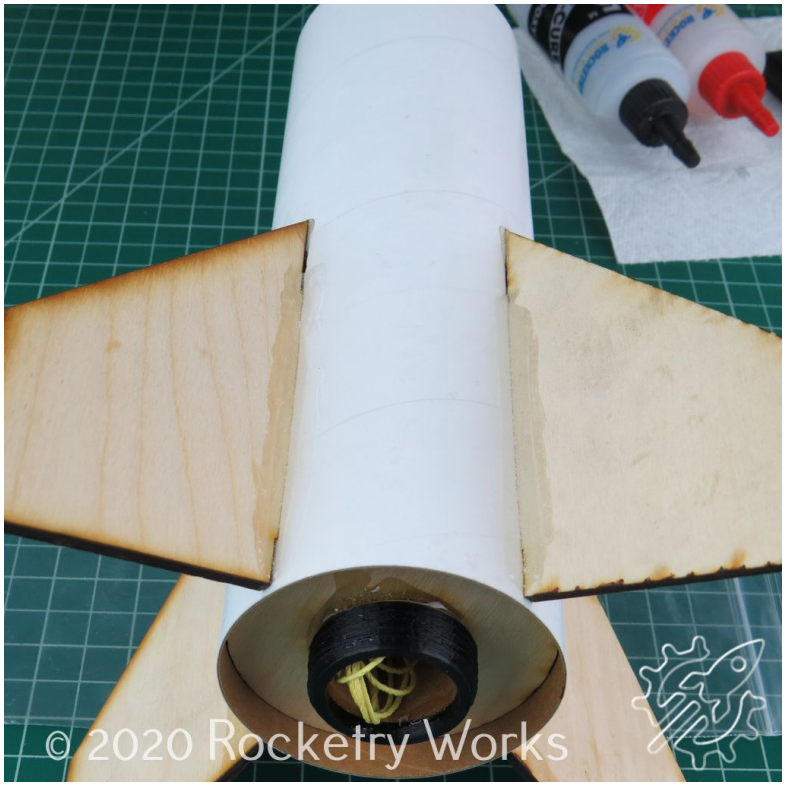
Add Fillets to the Fins

Fillets are a bead of glue spread evenly into the joint between the fin and the airframe tube. Good fillets create a strong joint that looks great and improves aerodynamics. You can use the same adhesive you used to glue the fins to the motor tube and airframe tube in the previous section, or you can change to a different adhesive--often, a longer curing epoxy will settle into the joint under the force of gravity by resting the rocket on its side once the glue from the previous section is hardened.

1. Working with the rocket on its side with 2 fins facing up at 45 degree angles, apply adhesive to the middle ¾ of the length of the fin-airframe joint.
   You don't want to apply adhesive to the ends of the joint, as that can drip around the fin and make a mess.



Note: The motor retainer cap makes a good spacer to keep the airframe tube level.

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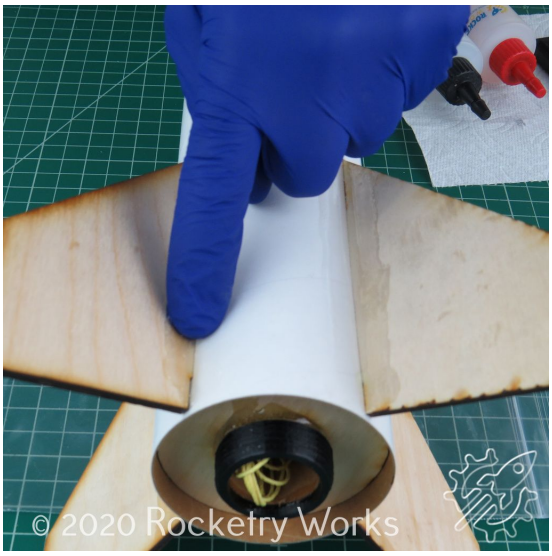
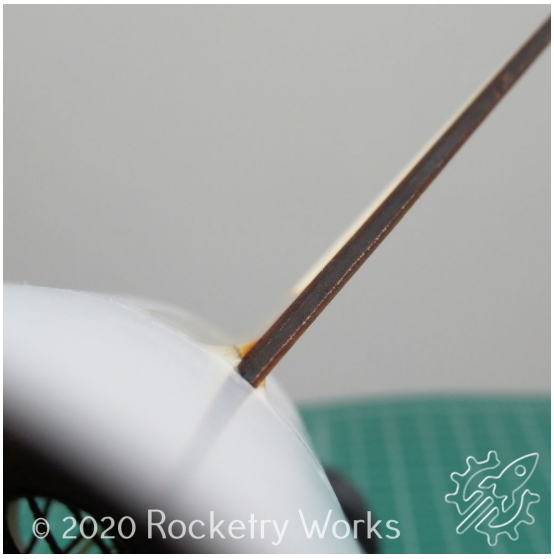
2. Use a gloved finger to smooth the adhesive into the full length of the joint, forming a U-shaped meniscus between the fin and the airframe over the full length of the joint.
   Rubbing alcohol will prevent epoxy from sticking to the glove, and it helps create a smooth finish to the fillet.



Gently smearing the adhesive into the joint



Cross section of the completed fillet

Note: Don't remove too much adhesive with your finger; you're looking to add a strong triangular bead of adhesive over the joint. And to improve the look of the fillet, clean up any excess adhesive that oozes around the sides of your finger before it starts to harden. Rubbing Alcohol helps with clean up.

3. You can work on 2 sides of facing fins at a time, allowing gravity to help keep the glue in the joint while it cures.
4. Let each pair of facing fillets harden before moving to the next pair.

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Add Nose Weight

You need to secure the No. 9 lead shot available as nose weight inside the tip of the nose cone with epoxy. This will take a bit of time, so it's best to work with slow curing epoxy like 15 minute or 30 minute epoxy.

1. Scratch up the inside of the nose cone tip with the end of a launch rod or another tool; this is critical, since epoxy will not stick well to smooth plastic.
2. Verify the amount of nose weight you'll need to stabilize the rocket, using a software model available here:
   https://www.rocketryworks.com/plywood-big-daddy-upgrade-set
   For stability with G motors, 150 grams of nose weight is likely needed, but you should verify in your simulation.
3. Mix about 20 ml total of 15 or 30 minute epoxy; this will be as much as you can mix in a 30 ml mixing cup without spilling.

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4. Stand the rocket on its fins, and use the airframe tube to hold the nose cone inverted.

Use the airframe tube to hold the nose cone upside down

Use a paper funnel to pour lead shot into the central hole in the aft end of the nose cone

5. Pour about half the epoxy (10 ml) through the central hole in the nose cone into the tip of the nose cone.
   Verify that the epoxy collected in the tip; static electricity in the plastic nose cone can cause the epoxy stream to deviate.
6. Use a paper funnel to pour about half the lead shot into the nose cone so it lands in the epoxy. The lead shot will sink into the epoxy over the next several minutes

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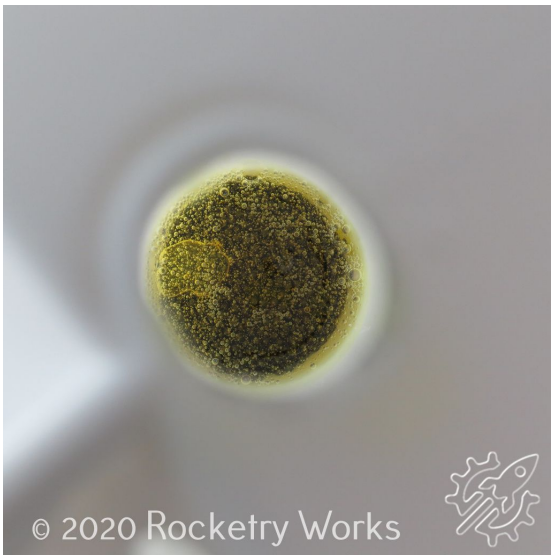
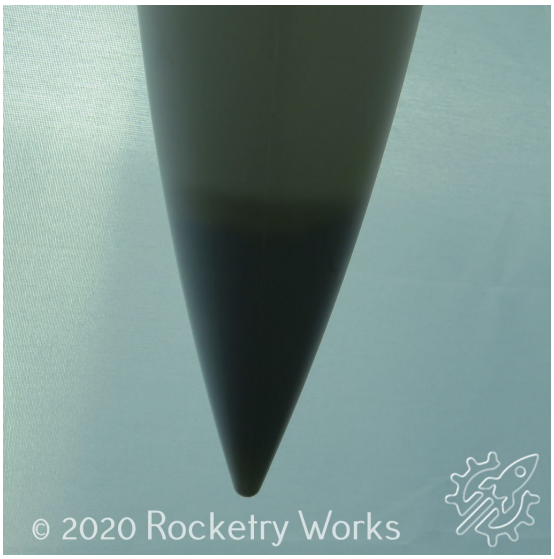
7. Add the rest of the epoxy, then the rest of the shot, until all the required shot is in the epoxy. The shot will continue to sink into the epoxy before the epoxy hardens. After working with lead shot, be sure to wash your hands and surfaces.. The epoxy envelops the lead shot so it is not a hazard once it is encased in epoxy.



Lead shot sinks into the epoxy before it cures



Finished photo of lead shot well secured into the tip of the nose cone

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Secure Launch Guidance

You can use either the Big Daddy's original 3/16 inch launch lug, or the optional conformal ¼ inch launch lugs or 1010 rail guides to provide guidance until the rocket is going fast enough for the fins to provide guidance. These instructions assume you are using Rocketry Works' conformal launch lugs or rail buttons. If you use the stock 3/16 inch launch lug, apply it 4.5 inches from the aft end of the rocket, midway between 2 fins.

1. Apply adhesive to the curved foot of the conformal launch lug or rail guide.
   Use enough adhesive that it will bubble up through the holes in the foot.
2. Attach one launch lug/rail guide midway between 2 fins, within 1 inch of the aft end of the rocket.
3. Apply adhesive to the curved foot of the second conformal launch lug or rail guide, and attach it to the airframe midway between the same 2 fins even with the forward tip of the fins.

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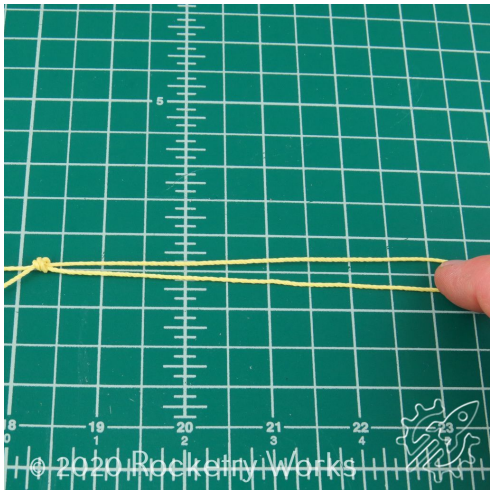
Connect the Shock Cord to the Nose Cone

The rocket is mostly finished; all you need to do is connect the airframe to the nose cone with the shock cord, and attach the parachute.

1. Using a hobby knife or a drill bit, drill a ¼ inch hole into the slanted part of the nose cone shoulder. With the additional weight in the nose, the flimsy loop on the aft end of the nose cone shoulder will not be strong enough to keep the nose cone attached to the airframe.
2. Sand the edges of both holes to remove any sharp corners that could cut the shock cord.
3. Pull the shock cord out of its temporary storage spot in the motor mount.
4. Tie an overhand knot in a 6 inch loop at the loose end of the shock cord



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5. Pass the loop at the end of the shock cord through the hole you drilled and the central hole at the aft end of the nose cone shoulder.
6. Pass the tip of the nose cone through the shock cord loop
7. Tighten the shock cord loop into a slip knot between the two holes.

Pass the shock cord loop over the nose cone

Tighten the shock cord loop

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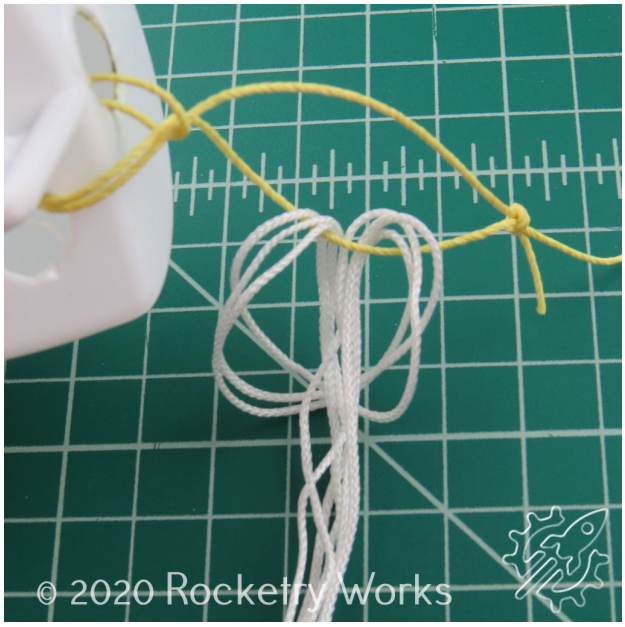
Attach the Parachute

1. Line up all the parachute's shroud lines to form a single loop.
2. Pass the shroud lines through the shock cord loop where it connects to the nose cone.
3. Pass the parachute through the loop formed by the shroud lines, and pull the shroud lines tight. The weight of the nose cone helps pull the parachute out of the airframe tube at deployment time.



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Paint it and Decal it

You can follow the original Big Daddy instructions for painting your rocket. Just be sure to tape the parts of the rocket that should not have paint:

- The nose cone shoulder
  You don't get paint on the nose cone shoulder, where it can bind inside the airframe tube. It works nicely to tape the nose cone shoulder and then stick it back into the airframe tube so the taped nose cone shoulder prevents paint from gumming up the inside of the tube as well.
- Tape the launch lugs or rail guide
  For launch lugs, you can roll up paper and stick the roll inside the launch lug to prevent paint from getting inside the launch lug. For rail guides, you should tape the whole rail guide.
- Leave the motor retainer cap off and tape the motor retainer threads to keep paint out of the threads and the inside of the motor tube.