Skill Level 1 – Easy to Construct and Fly!

The Research Express rocket from Apogee Components is a simple to build payload carrying rocket. It is great for science fair projects. It is the perfect size for launching an altimeter, some toy action figures, or other little gizmos.

The kit is easy to build, and features a slotted body tube that allow the tabs on the laser cut fins to mount perfectly straight on the rocket. This allows the rocket to fly straight and true and it is a step up from rockets with molded plastic fins, because you build it all yourself!

With this kit, modelers will learn the advantages of having lightweight wooden fins. Not only does the model weigh less than a rocket with plastic fins, but the fins can be shaped (airfoiled), which lowers the drag and allows the rocket to achieve spectacular heights. Once this skill is mastered, it can be used on more complex model rockets.

The rocket uses standard size rocket engines (18mm diameter). It will never bore you, because it can be used with a variety of rocket motors, so you can pick how much performance you want.
Research Express Rocket Assembly

1. Fine sand the balsa laser-cut sheets using 200 grit sandpaper before removing the fins. Carefully remove all the pieces from the balsa sheet by freeing the edges with a sharp hobby knife.

2. (Optional) - With sandpaper, you can round-over or airfoil the leading and trailing edges of the fins to reduce drag to achieve higher flights.

3. Sealing and sanding the balsa fins also reduces drag by making the surface very smooth. It also improves the rocket's appearance. Apply a coat of sanding sealer to the fins with a paint brush. When the sealer is dry, lightly sand the sealed surfaces. Repeat the sealing and sanding procedure until the balsa grain is filled and the fins look and feel smooth.

Construction of 18mm Motor Mount

4. With a pencil, mark the tube 1/2 inch (13mm) from each end. Cut a notch with a hobby knife, 1/8 inch (3 mm) long at one of the marks. This slit end is now the forward end of the tube.

5. Insert one end of the engine hook into the slit as shown. Take the blue ring, and glue it inside the front end of the tube. It should butt up against the part of the engine hook that protrudes inside the tube.

6. Test fit the green 24-29 rings onto the motor mount tube. Sand the inside if necessary. Apply a bead of glue just past the mark at the aft end of the motor mount tube and quickly slip one of the green rings over the engine hook and onto the motor mount tube until it meets the mark you made at 1/2 inch (13 mm) from the end.

7. Cut a small notch on the inside of the other 24-29 centering ring. This notch will be for the shock cord to fit under the ring and over the engine mount tube.
8. Pass one end of the shock cord through the centering ring and tie the cord around the motor mount tube. Cinch the cord tight to the tube. Run a bead of wood glue around the forward end of the motor mount tube. Slip the ring onto the forward end of the motor mount tube with the ring even with the end of the tube.

9. Apply glue to the knot to ensure that it stays in place. Apply glue fillets to both sides of the centering rings and allow to dry.

10. Temporarily pass the shock cord through the motor mount and out the rear. This will keep it glue free when gluing the engine mount into the tube. Using a scrap stick of balsa, apply glue 2.5 inches (63.5 mm) inside the aft end of the big body tube. Also put glue on the aft ring. Quickly and smoothly insert the motor mount tube into the aft end of the body tube. The edge of the green centering ring should be even with the rear of the body tube. When the glue is dry, pass the shock cord back through the motor mount as shown, so that it comes out the front end of the rocket.

11. Apply glue to the root edges of one the fins, including on the base of the tab. Allow the glue to dry slightly for a few minutes, then attach it to the aft end of the body tube, as shown in the illustration. Repeat this step two more times as you attach the other two fins. Allow the glue to dry.

12. 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 tubes horizontally while the glue dries.

13. Using wood glue, attach the two launch lugs. They lay in the narrow cut-outs on the body tube. After the glue has dried, apply fillets of wood glue along the launch lugs.

14. Apply wood glue to the threads of the metal screw eye, and screw it into the plywood bulkhead. Do not twist it in past the threads on the shank. Apply glue to both sides of the bulkhead where it exits the hole.
15. Glue the bulkhead into the red tube coupler. Recess it slightly into the end of the tube. When the glue has dried, put a fillet of glue on both sides of the bulkhead.

16. Draw a line 1/2" (13mm) from the front end of the coupler with a pencil as shown.

17. Smear wood glue on the front end of the tube coupler, and on the inside edge of the short white tube. With one quick and smooth motion, slide the tube coupler into the white tube until the pencil line is inside the tube. Wipe off any excess glue that oozes out. Be sure the tubes are aligned straight with each other.

18. Using plastic model cement or super glue, smear some glue inside the nose cone, and slide the plastic shoulder in as far as it will go.

19. Apply masking tape to the outside of the shoulder of the nose cone to achieve a tight fit into the payload bay from step 17.

20. Slide the nose cone onto the payload bay tube.

Parachute Assembly

21. Cut out the plastic parachute with a pair of scissors and place the ring tabs over the circles on each of the points of the parachute, as shown in the illustration. Next, poke holes in the center of the rings with a sharpened pencil.
22. Find the shroud line and cut the string into three equal lengths and tie them through the ring holes as shown. Put a little bit of glue on the knots to secure them in place. Allow the glue to dry.

23. Tie the free end of the yellow shock cord to the screw eye on the base of the payload bay. Put a little bit of glue on the knot to secure it in place. Allow the glue to dry.

24. Holding the parachute at the center of its top, pull the lines together to even up the ends. Thread the three looped lines through the loop at the base of the payload bay.

25. Take the apex of the parachute and pull it through all three string loops at the same time and then pull to tighten the knot. This securely attaches the parachute to the rocket.

26. Fold the parachute up and insert it into the body tube with the shock cord. Finally, place the payload bay on top of the rocket.

**Painting And Decorating**

27. After all the glue has completely dried, you may now paint your Research Express rocket.

28. 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. Let the paint harden at least 24 hours before proceeding. You may paint the model your favorite color.

29. When the paint is dry, the stickers can be applied to the rocket as desired.
Launch Supplies Needed

To launch your rocket you will need the following supplies:
- A model rocket launching system
- Flame resistant recovery wadding
- Recommended Rocket Engines:
  See the motor matrix to the right.

Rocket Preflight

☐ A. Crumple and insert 4 sheets of recovery wadding into the body tube.
☐ B. Roll the streamer tightly and insert it into the tube with the shock cord. Then install the payload bay into place.
☐ C. Insert the rocket motor into the aft end of the rocket by bending the clip back and sliding it in.
☐ 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.

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 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 engines 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 insert 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 NAR* Model Rocket Safety Code when launching model rockets.

*National Association of Rocketry
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