

POLECAT AEROSPACE

4" BULLPUP

The Bullpup was the first successful guided tactical air-to-ground missile of the U.S. Navy and the U.S. Air Force. Although it had severe limitations, it was produced in very large numbers.

The Bullpup was a roll-stabilized missile, powered by an Aerojet MK 8 solid-fuel rocket motor, and with a simple derivative of a standard 113 kg (250 lb) bomb as warhead. After visual identification of the target, the pilot launched the missile, and used two small flares at the back of the missile to track its flightpath. Using a small control stick to transmit radio commands to the missile, he manually guided the missile to its target. This system was extremely simple, and therefore the missile could be used with almost every aircraft, even including Sikorsky HUS-1 (UH-34D) helicopters. Of course, this simple manual guidance principle also had severe drawbacks, the main one being that the aircraft, the missile, and the target essentially had to remain in a straight line during guidance, making the aircraft vulnerable to ground fire (and thereby somewhat negating one of the original reasons for using missiles instead of bombs).

This kit is a very versatile model rocket. It will fly well on motors ranging from high thrust G motors up through J motors.

This kit features:

- Through the wall fin mounting for main and guide fins
- Fiberglass molded nose cone, pre-slotted
- Fiberglass molded boat tail
- Pre-fiberglassed and pre-slotted body tube
- Baltic Birch fins and centering rings
- 38mm motor mount
- Tubular nylon shock cord
- Shock cord mounting hardware

Polecat Aerospace
9033 Rieti Lane
Stockton, CA 95212
209-986-5829
jackgaribaldi@msn.com
<http://whatsuphobbies.com>



List of Materials:

- (1) 4" Fiberglass nose cone, Pre-slotted
- (1) 4" Fiberglass boat tail
- (1) 4" Fiberglassed body tube, pre-slotted
- (1) Nose cone bulkhead, 1/4" plywood,
- (2) Main centering rings, 1/4" plywood, 4" diameter, 38mm hole
- (4) Main Fins, 1/4" plywood
- (4) Guide Fins, 1/4" plywood
- (1) 38mm motor tube
- (2) Eye Bolts with hardware
- (2) Rail guides and screws
- (1) Tubular Nylon (10' x 9/16")
- (2) Rail guide mounting blocks



Construction

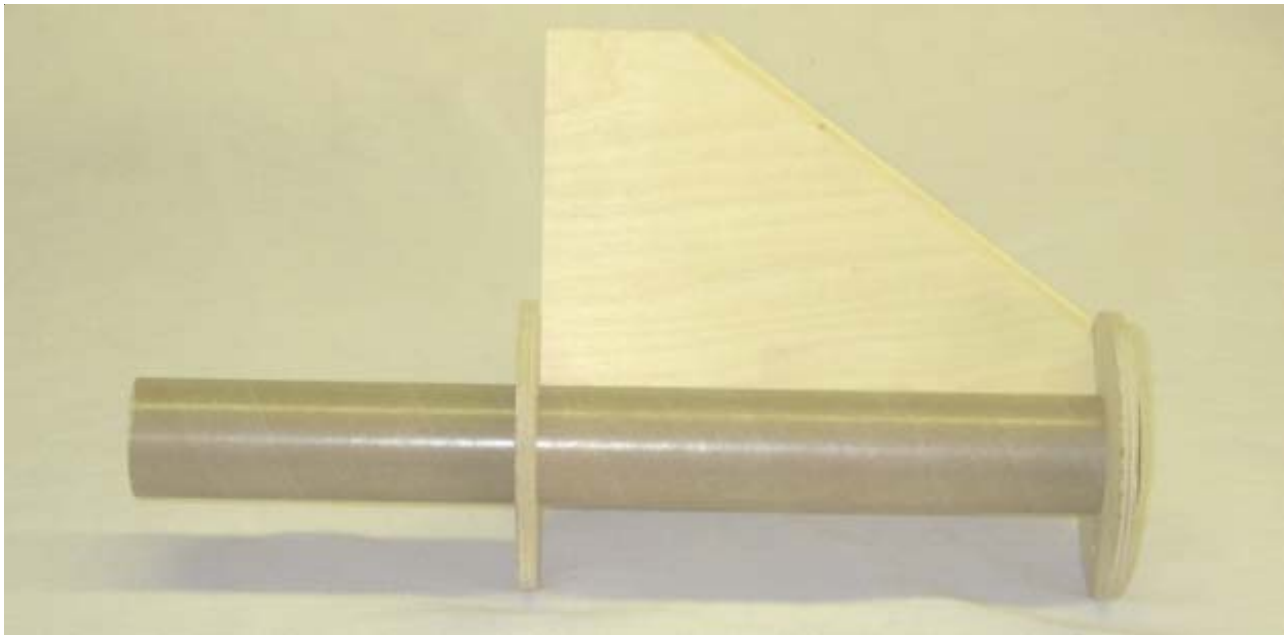
Please read and understand each step. The construction methods used in this kit differ from others in many ways. It is important to follow the instructions to ensure you get the most out of your kit.

1. Drill a 3/16" hole in one of the main (4") centering rings for the shock cord hardware.



2. Slide the centering ring with the 3/16" hole onto the 38mm motor mount tube. Take care not to distort the end of the motor tube. Sand if necessary to get the ring on easily. It is important to slide the ring onto the tube before applying the epoxy. Apply a ring of epoxy onto the motor mount tube 1/4" from the end of the tube, then slide the centering ring over the epoxy, securing it 1/4" from the end of the tube. This ensures there is no excess epoxy where the fin will seat. Allow to cure.





3. Slide the remaining 4" centering ring onto the motor tube and position it so that a fin fits between the two rings as shown. Test fit all four fins to make sure every fin will fit between the rings. Leave enough clearance so that the fins can be slid in without being too tight.



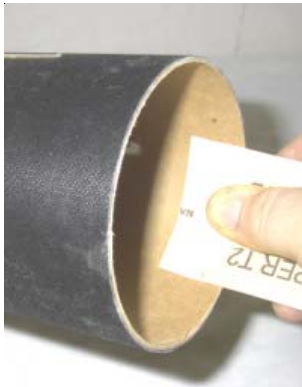
4. Mark the position of the lower centering ring. Slide the ring TOWARD THE OTHER RING and apply epoxy to the motor tube where the ring will be positioned. Slide the ring back into place. Test fit all fins to ensure they will slide in between the rings. Remove the fins and set aside to cure.

5. Mount the shock cord hardware in the hole drilled into the forward centering ring. Make sure you use a nut and washer on both sides of the centering ring. The washer goes closest to the centering ring. Apply a small amount of epoxy to the threads to keep the nuts from loosening over time.

5A. Epoxy the plywood rail guide mounting blocks to the upper and lower centering rings as described in the Supplemental Sheet found with the "General Building Notes".

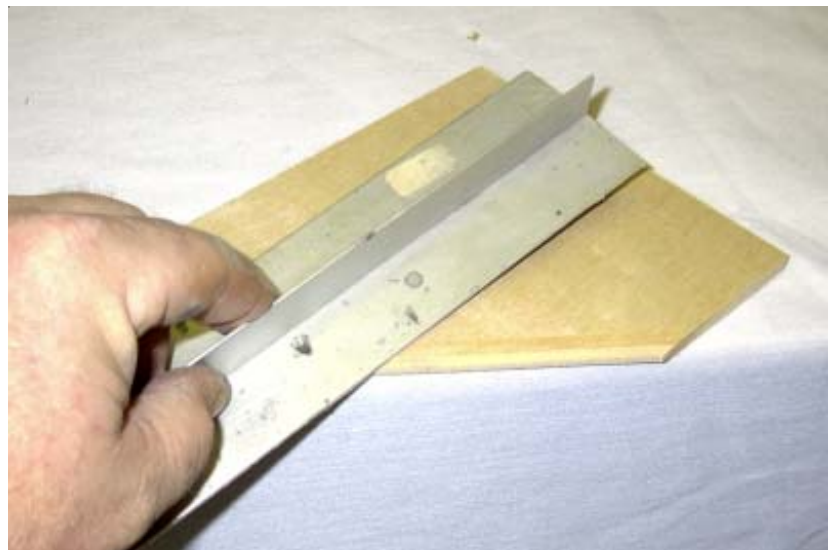


6. Attach the shock cord to the hardware in the upper centering ring by tying a secure knot in the shock cord. Secure the knot with a drop of CA adhesive or a small amount of epoxy. Wrap the remaining shock cord up and place it into the end of the motor mount tube. This will allow you to assemble the rocket without getting epoxy on the shock cord.



7. Using 100 grit sand paper, lightly sand the inside edge of the slotted end of the body tube. This will make it much easier to slide the centering ring/motor mount assembly into place. Remove the assembly and apply epoxy to the inside of the main body tube where the centering rings will rest (at the ends of the fin slots). Slide the motor mount assembly into place making sure that you can see both centering rings through the fin slots as shown above. Allow to cure. NOTE: Be sure that the eye bolt hardware or rail guide blocks are not in line with the fin slots.

8. OPTIONAL - Sand the leading edge of all fins to a curve. This is best done with a sanding block or tee at the edge of a hard surface. If you intend to sand the fins, it is easier to do this before you glue them into place.



9. Test fit all four fins into position, removing any epoxy or obstructions that prevents the fin from sliding all the way to the motor mount tube. Apply epoxy to the root edges, to the sides of the fins where they will meet the body tube, and to the front and rear edges that will contact the centering rings. Epoxy all fins into place ensuring they are perpendicular to the motor tube and at right angles to each other. Stand vertically to cure.

If you did not install the plywood rail guide mounting blocks, drill a 1/8" hole through the body tube and into the center of the centering rings. They should be aligned with each other along the long axis of the body tube, and centered between two fins. You can use a dowel or measuring tape to measure the distance from the ends of the body tube to the centering ring. Add one half the thickness of the rings to this dimension. The 8-32 screws will self tap into these holes. The rail guides should spin on the mounting screws to prevent the guides from binding on the rail.



10. Sand the small centering ring as shown. This will make it easy to slide the ring onto the motor tube without damaging the end of the tube. Position this ring into the fiberglass boat tail as shown. Make sure you put the sanded edge pointing inside the boat tail. Epoxy this ring into place, taking care to keep the ring perpendicular with the long axis of the boat tail. Epoxy the boat tail assembly onto the back of the rocket. Allow to cure.

11. Position one of the guide fins into the nose cone. Secure with tape as shown. The tape will prevent epoxy from leaking out of the slot while it cures.



12. Epoxy the guide fin into place. You may want to use micro balloons or silica to thicken the epoxy to create an internal fillet to strengthen the fin joint. Epoxy one fin at a time, repeating the taping and gluing for each fin. Resist the temptation to do several fins at once, this can result in dripping epoxy inside the nose cone, a difficult mess to clean up. As you epoxy fins into place, ensure they are perpendicular to the line of the nose cone and at 90 degrees to each other.



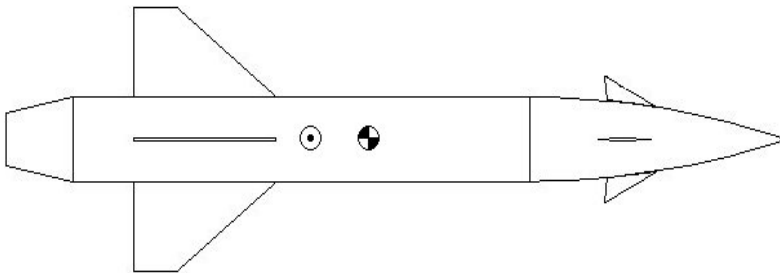
13. See step 15 for drilling a hole in the nose cone bulkhead for adding weight as it is easiest to do it now. Drill a 3/16" hole in the center of the nose cone bulkhead. Mount the shock cord hardware as before in this hole. Remember to secure the hardware with epoxy to keep it from loosening over time. Remove the shock cord from the motor tube and attach to the eye bolt in the nose cone bulkhead. Position the nose cone bulkhead into place. It should touch the guide fins without being forced into the nose cone. Sand if necessary. Epoxy securely into place.

14. Drill a 1/8" pressure relief hole on the body tube 4" above the top centering ring. This will prevent the nose cone from separating prematurely during the rocket's ascent.

15. Depending on the motor(s) you elect to fly your 4" Bullpup on, you will most likely need to add nose weight. The rocket should balance on or slightly forward of the CG symbol shown on the drawing below. You can drill a small hole in the nose cone bulkhead and pour lead shot or small fishing sinkers into the nose cone for ballast. Once you determine the correct amount of weight for your rocket, secure the weight with epoxy.

DO NOT ATTEMPT TO FLY YOUR BULLPUP WITHOUT TESTING THE BALANCE. Incorrect balance **WILL** result in an unstable flight.

16. Motor retention can be done with screw eyes, friction fit, or after market motor retainers.



We at Polecat Aerospace hope you enjoy your 4" Bullpup. We would appreciate any comments or suggestions you may have.



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