

POLECAT AEROSPACE

10" 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 K motors up through N 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
- Fiberglass electronics bay
- 98mm motor mount
- Tubular nylon shock cords
- Shock cord mounting hardware
- Dual deployment / electronics ready

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List of Materials:

- | | | | |
|------|--------------------------------|------|--------------------------------|
| (1) | Slotted nosecone | (1) | 10" boat tail |
| (1) | Body tube - slotted | (1) | 18" body tube |
| (1) | 11" coupler | (4) | Main fins |
| (4) | guide fins (nose) | (1) | Nose bulkhead |
| (1) | Upper electronics bay bulkhead | (1) | Lower electronics bay bulkhead |
| (1) | upper centering ring drilled | (1) | Lower centering ring |
| (1) | boat tail centering ring | (1) | 98mm motor tube |
| (2) | electronics bay slides | (1) | Electronics mount |
| (4) | U-bolts with plates | (24) | 1/4"-20 nuts |
| (20) | 1/4"-20 washers | (4) | 12" long 1/4-20 threaded rods |
| (1) | 20' shock cord (apogee) | (1) | 10' shock cord (main) |
| (2) | launch lugs | | |

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.

Fin can / motor assembly

Locate the upper main centering ring and shock cord mounting hardware as shown. Mount the shock cord mounting hardware as follows:

Put two nuts and two washers on the U-bolt

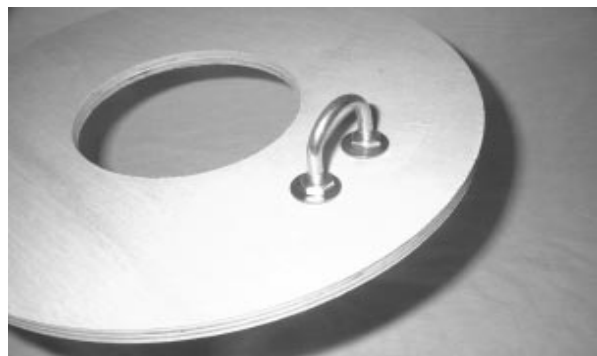
Put the U-bolt through the centering ring

Put the U-bolt backing plate on

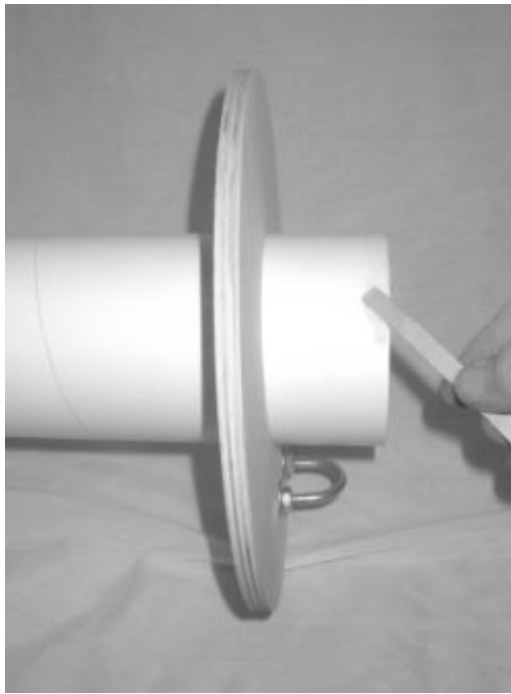
Put two nuts on

Tighten snugly with a 7/16 wrench

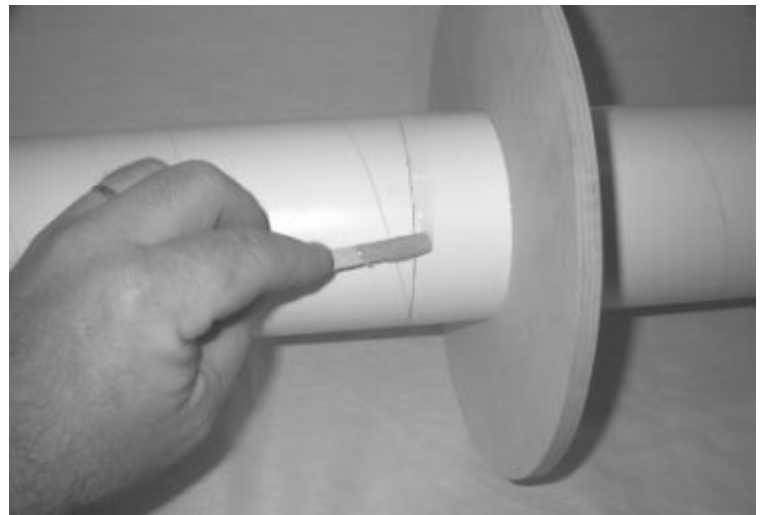
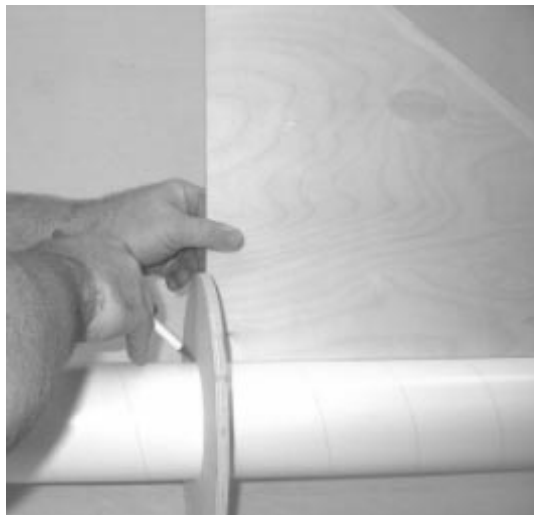
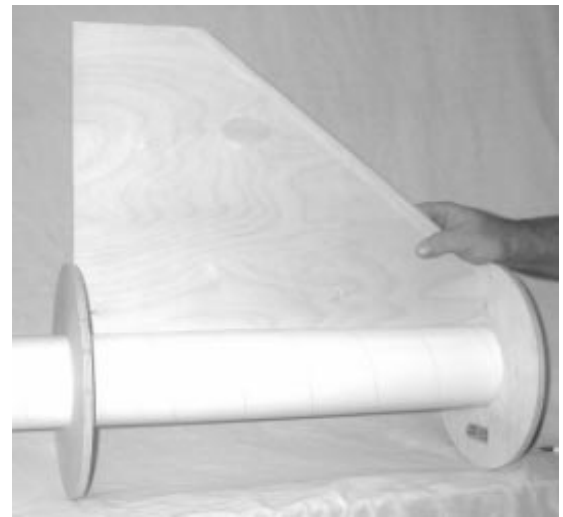
Secure the nuts with Epoxy or thread sealer to prevent the nuts from loosening



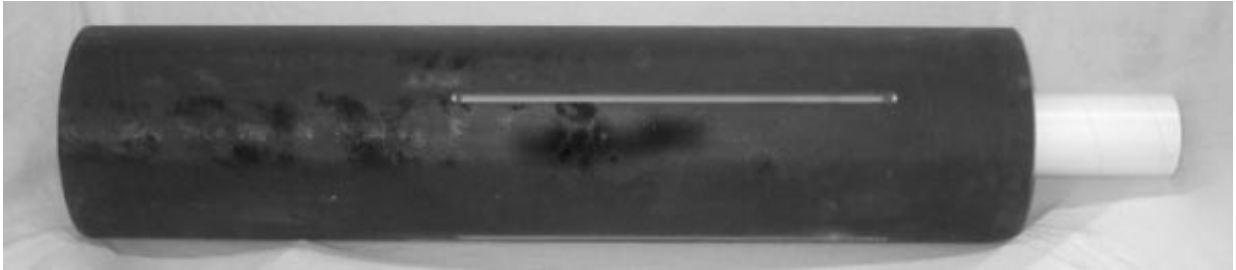
Slide the upper centering ring onto the motor mount tube. The ring is slid onto the tube first to prevent a fillet of epoxy from forming between the rings that would prevent the fins from seating onto the motor tube. Apply epoxy to the end of the motor tube as shown. Slide the upper centering ring over the epoxied area leaving no more than 1/16" of the motor tube exposed. This is critical as the motor tube is the exact length needed. Ensure the ring is perpendicular to the tube. Allow to cure completely.



Slide the lower centering ring onto the tube and using a main fin as a gauge, mark a line on the motor tube below the aft ring. Ensure that all 4 fins fit between the 2 rings. Remove the fins and slide the lower ring toward the upper ring. Apply epoxy where the ring will seat as shown. Slide the ring back to its position and allow to cure. **NOTE: THE FINS ARE NOT GLUED AT THIS TIME.**



Slide the motor mount tube assembly into the slotted main body tube so that the motor tube protrudes out toward the slotted end as shown. Ensure that the 2 centering rings are visible at either end of the fin slots for all 4 slots. When a satisfactory fit is achieved, remove the motor mount assembly, apply epoxy to the inside of the main body tube where the motor mount centering rings will rest and slide the motor mount assembly back into place. Take care not to trowl all the epoxy for the back ring forward as you slide the assembly into place. NOTE: ENSURE THAT THE SHOCK CORD U-BOLT IS NOT IN LINE WITH ON OF THE FIN SLOTS. Stand vertically (motor tube down) and allow to cure completely.



Position the aft centering ring into the boat tail. Seat it as far as it will go, pushing it firmly into place. It will be positioned about 3/8" from the end of the boat tail. The boat tail is made out of very heavy fiberglass cloth because it will bear all the force of the rocket landing. Once you have the aft ring in position, ensuring that it is perpendicular with the verticle axis of the boat tail, secure it with epoxy mixed with silica or microbaloons.



Slide the boat tail assembly into the aft end of the main body tube and seat the motor tube into the aft motor tube centering ring carefully ensuring not to damage the motor tube. When a satisfactory fits is achieved, remove the boat tail and apply ample epoxy to the boat tail lip and the end of the motor tube and glue into place. NOTE: There will be a 1/16" lip on the back of the main body tube.



Slide one fin into place ensuring that the fin root is in solid contact with the motor tube. Repeat for the remaining fins. After a satisfactory test fit of all 4 fins, remove all the fins. Using a stick, apply epoxy to the motor mount centering rings where the fin will be in contact with them and on the root of the fin. Slide the fin into place ensuring good contact is made with the fin root and the motor tube. **FAILURE TO SEAT THE FINS PROPERLY WILL RESULT IN AIRFRAME FAILURE.**



After all four fins have set, fill the joints at the leading and trailing edge with filler.



This completes construction of the fin can / motor assembly section of the rocket.

Electronics bay assembly

Prepare the lower electronics bay bulkhead (grooved) with shock cord retention U-bolt as shown. NOTE: The U-bolt faces away from the grooved edge.

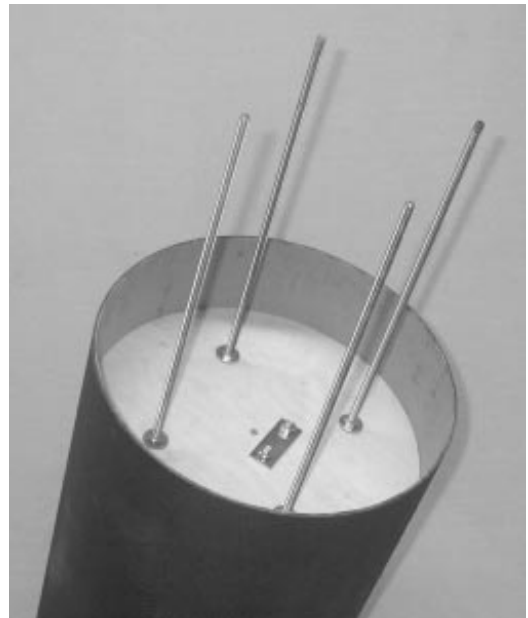


Prepare the upper electronics bay bulkhead with the 4 threaded rods as shown. NOTE: The upper electronics bay bulkhead is not the bulkhead with the grooved edge.



Spread a generous bead of epoxy around the inside of the upper body tube 2 1/2" in from the end. Slide the electronics bay assembly into the end of the upper body tube that you just epoxied before the epoxy sets. Push this bulkhead into the upper body tube exactly 3". This bulkhead is a tight fit and may require using a hammer and block of wood to position it. Take care not to damage the tube by hammering on the bulkhead. If there is any epoxy remaining visible on the side of the bulkhead with the threaded rods, wipe it away. The coupler needs to seat against the bulkhead here. Stand this assemble upright with the rods pointing downward and allow the epoxy to cure completely.

NOTE: Ensure that the forward electronics bay is exactly perpendicular in the tube. Failure to keep this aligned correctly can result in structural failure of the rocket in flight.



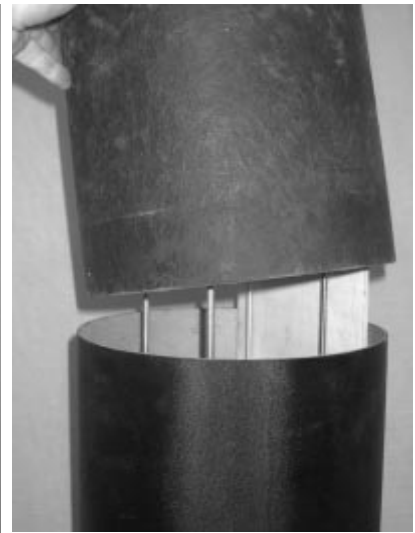
Epoxy the 2 electronics mounting plate slides onto the 1/4" mount plate as shown. Clamp and allow to cure completely.

You may elect to mount your electronics to the mount at this time.



Seat the fiberglass coupler into the upper body tube.

NOTE: Unless desired, there is no need to glue the coupler in place.



The electronics bay is secured with (4) 1/4"-20 nuts with washers.

NOTE: Do not over tighten.

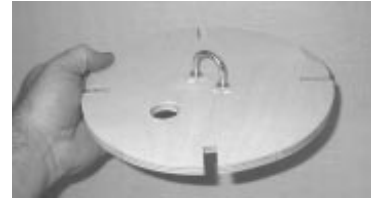
If you are using a barometric altimeter, drill a pressure hole through the upper body tube and coupler. If you do not glue the coupler into position, ensure the pressure hole lines up or your altimeter will fail.

This completes the electronics bay assembly.



Nose cone assembly

Assemble the nose cone bulkhead as shown. Seat the nose cone bulkhead into place aligning the 4 notches in the bulkhead with the slots in the nose cone, as best as possible. Do not force the bulkhead into the nose cone, it will distort the shape. Push it gently into place ensuring it is seated and parallel with the base of the nose cone.



Seat all 4 forward guide fins into the nose cone ensuring not to break the small tip of each guide fin when seating them. The small tip provides a guide to the depth of the fin. When a satisfactory fit is achieved and all 4 fins are straight in their slot, epoxy the bulkhead and all 4 fins in place at the same time. Ensure that the guide fins are slid as far toward the front of the nose cone as they will go. Fill any small gaps with filler.



Final assembly

Mount the launch lugs both on the Fin can / motor assembly section. Position the upper launch lug 3" from the top of the Fin can / motor assembly section. The other lug should be positioned 6" up from the joint of the main body tube and the boat tail. If you elect, you can replace the launch lugs with rail guides (not provided in the kit).

Drill pressure holes in the Fin can / motor assembly. This will prevent the rocket from ejecting due to sudden decrease in pressure during an ascent.

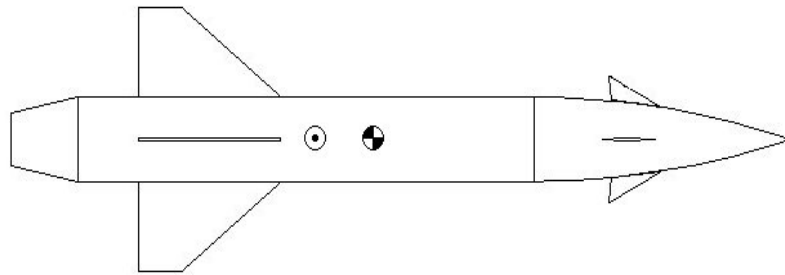
Attach the 20' section of shock cord between the Fin can / motor assembly and the Electronics bay assembly. This section is for apogee deployment. The hole in the center of the lower electronics bay bulkhead is for the charge wires to pass through.

Attach the 10' section of shock cord between the Electronics bay assembly and the nose cone. This is for the main deployment.

Attach the drogue parachute (3' recommended) to the shock cord one foot away from the Electronics bay.

Attach the main parachute (12' - 14' recommended) to the shock cord one foot away from the nose cone.

You will be required to add nose weight to your Bullpup to balance it. **DO NOT ATTEMPT TO FLY THE ROCKET WITHOUT BALANCING IT.** There is a 1" hole in the nose cone bulkhead. This is used to allow weight to be added to the nose cone. Lead buckshot is recommended. Simulate the weight of the largest motor you plan to fly in your Bullpup in the aft end of the rocket and add weight sufficient to balance the rocket. Secure the weight with epoxy. **CAUTION:** Large quantities of epoxy can generate a lot of heat. This can damage the nose cone. Use slow curing epoxy to secure the nose weight.



We at Polecat Aerospace hope you enjoy your 10" Bullpup. We would appreciate any comments or suggestions you may have.

Happy Flying!

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