

Discovery™

Specifications:

Length: 39.5"

Diameter 2.6"

Weight: 15oz

Recovery: 24" Nylon Chute

Motor Mount: 29mm

Fins: 3 - 1/8" Plywood

CG: 28" from nose tip

Recommended Motors:

Single Use	RMS
F20J-4 950'	F40W-7 1170'
F50T-6 1050'	G64W-7 1620'
G40W-7 1440'	
G80T-7 1410'	
G77R-7 1400'	

Parts List

1. (1) Molded nose cone
2. (1) Pre-slotted body tube
3. (1) Forward section body tube
4. (2) Centering rings
5. (1) Bulkhead
6. (1) Eyebolt, nut & washer
7. (1) 29mm motor tube
8. (3) laser-cut fins
9. (1) Kevlar® shock cord section
10. (1) Nylon shock cord section
11. (1) 9"x9" flameproof chute protector
12. (1) 24" Nylon chute
13. (2) 1/4" launch lugs
14. (1) Coupler

Required to complete: 5 minute epoxy, 120/220 sandpaper, masking tape, finishing filler/paint.

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 **madcow Rocketry®**
put some **FUN** in your rockets!

Please make sure you read all directions and understand how to assemble your model before you start construction. It is also a good idea to test fit each part before assembly – some manufacturing tolerances may require light sanding before final assembly.

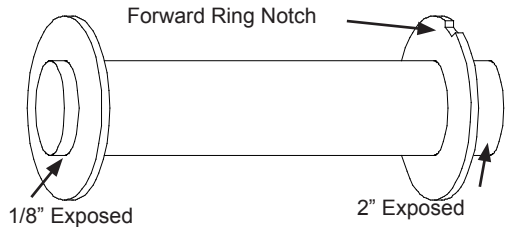
Laser cut parts will exhibit varying amounts of charring on the edges depending on the density of the plywood. The charred edges do not interfere with bonding and do not need to be cleaned before assembly. In most cases the charring will be cleaned up during sanding for finishing and painting.

Step 1 – Motor Mount Assembly

Test fit the centering rings over the motor mount tube and sand if necessary. The rings should have a snug fit but loose enough to move the ring over the motor tube without deforming it. Also test fit the centering rings in the body tube and sand if necessary. One of the rings will have a notch for the shock cord - this will be the forward ring.

Spread some epoxy on the outside of one end of the motor tube and slide the ring (without the notch) until there is approximately 1/8" of motor tube exposed. **IMPORTANT:** Make sure you clean the motor tube of any epoxy so as not to interfere with the fin tangs later.

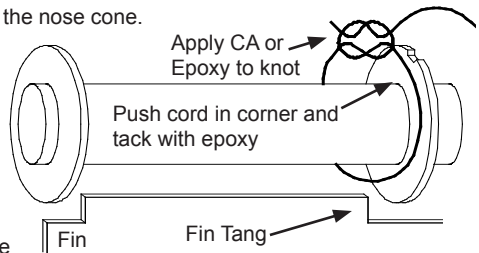
After the aft ring is dry, make a mark 2" from the other end of the motor tube. Spread some epoxy on the motor tube and slide the forward ring (with the notch) until it aligns with the mark.



Step 2 – Shock Cord Attachment

The shock cord in this kit consists of a shorter section of Kevlar and a longer section of nylon cording. The two sections should be tied together using a single overhand, ring bend or double fisherman's knot. The Kevlar section will be attached to the motor mount and the nylon section will be attached to the nose cone.

Wrap the end of the Kevlar shock cord around the forward end of the motor tube and tie a square knot or bowline knot near the notch in the forward centering ring. Apply some epoxy to the knot to make sure it doesn't come loose later. Make sure the Kevlar loop is seated against the forward centering ring so that it will not interfere with the fin tangs later. You can tack with epoxy or CA to hold in place.

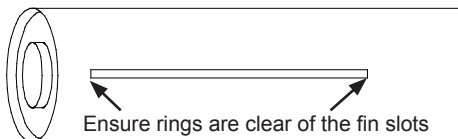


Step 3 – Insert Motor Tube Assembly into Body Tube

Wrap the shock cord into a small bundle and stuff it inside the motor tube for this next step. Make sure the cord passes over the notch in the forward centering ring. Test fit the motor tube assembly into the body tube to ensure a snug fit. Sand the centering rings if necessary.

When you are satisfied with the fit, spread some epoxy on the inside of the body tube and slide the forward centering ring of the motor assembly into the body tube. **Make sure you have the motor assembly facing the right way! (The shock cord goes**

over the forward centering ring) Spread some more epoxy on the inside edge of the body tube before sliding the rear centering ring into the body tube. Continue sliding the assembly inside the body tube until the aft end of the motor tube is even with the aft end of the body tube. It's a good idea to test fit a fin in each slot here before the epoxy sets. Hold the body tube with the motor tube assembly down until the epoxy sets. Make sure the weight of the motor assembly doesn't cause it to slide out of alignment.



Using a door jam or small section of angle stock, pencil a line halfway between two of the fins that extends from the front to the back of the body tube. This line will be used later to align the launch lugs.

Step 4 – Fin Assembly

Test fit each of the fins into the pre cut fin slots. The fin should seat firmly against the motor tube - sand each fin if necessary. When you are satisfied with the fit, apply some epoxy to the end of the fin tang that will contact the motor tube as well as the fin root that will contact the body tube. Also, spread a thin layer of epoxy on each side of the fin tang. Slide the fin into place and check the alignment. Continue rechecking the fin alignment until you are sure the epoxy has set. Clean any excess epoxy from around the fin joint. Repeat for the remaining fins. Next, apply epoxy fillets to both sides of each fin. Carefully smooth the epoxy fillets with your finger before the epoxy sets. Allow each fillet to set before rotating the airframe for the next fillet.

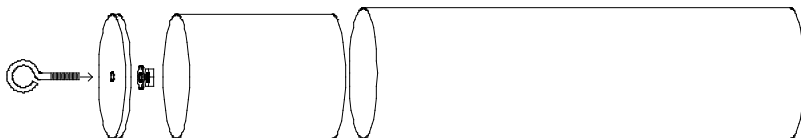
Step 5 – Launch Lug Attachment

Mark the CG point along the launch lug line you made in the previous step. Make sure you measure the CG point from the tip of the nose cone and NOT the end of the body tube. Apply a small amount of epoxy on the launch lug line about $\frac{3}{4}$ " long on the CG mark. Press one of the launch lugs into the epoxy and ensure that it is aligned with the launch lug line previously drawn on the body tube. You can sit down the tube and look through the launch lug to make sure it is straight. Similarly epoxy the second launch lug about $\frac{1}{2}$ " from the aft end of the body tube. Site down both launch lugs and make sure they are both aligned. If you have a $\frac{1}{4}$ " launch rod, you can use this to ensure that both lugs are aligned properly.

Step 6 – Forward Section Assembly

Insert the eyebolt through the hole in the center of the bulkhead and secure using the washer and nut. **IMPORTANT: Apply some epoxy to the nut and eyebolt threads to ensure the nut doesn't come loose later.** Apply some epoxy to the inside of the coupler and push the bulkhead in so there is about a $\frac{1}{8}$ " to $\frac{1}{4}$ " of coupler exposed. After the epoxy has set, apply a fillet of epoxy around the inside edge of the coupler bulkhead joint.

Next mark the coupler 2" from the forward edge. Apply some epoxy to the inside of the forward body tube section and slide the coupler up to the mark. There should be 3" of coupler exposed. Make sure the coupler is straight and the body tubes are aligned properly when they are assembled later.



Step 7 – Final Assembly

Insert the largest motor you intend to fly (or simulate the weight with a substitute). Ensure the CG is forward of the recommended CG. The CG is measured from the tip of the nose cone. If the CG is behind the specified point, add weight inside the nose cone by pouring lead shot into the nose cone tip and adding some epoxy. **IMPORTANT: Screw in a screw through the plastic nose cone into the lead to hold it in place. Grind or cut off the screw head before filling and applying the nose cone finish. The epoxy will not stick to the inside of the nose cone and if you do not anchor with a screw, the liftoff force will cause the weight to become dislodged causing an unstable model.** You can also place the lead in the base of the nose cone so that it cannot become dislodged during liftoff, but you will have to use more weight.

Step 8 – Flying Your Model

Attach the end of the shock cord and the parachute to the payload section eyebolt. You can also attach the chute protector to the shock cord just below that. When packing your chute, wrap the chute protector around the chute with the opening in the chute protector facing forward. Always make sure your chute is well protected as the hot ejection motor gasses will melt the nylon chute.

IMPORTANT: always use positive motor retention to secure the motor. Failure to use motor retention will cause the motor to be ejected instead of the parachute making for a dangerous ballistic reentry.

IMPORTANT: some motors do not have a thrust ring that rides against the back of the motor tube. You can construct a thrust ring by wrapping a 1/4" wide strip of masking tape around the aft end of the motor until you have a layer of masking tape approximately the same thickness of the motor tube. Do not fly without a thrust ring as the motor will fly through the rocket causing a dangerously unstable free flying rocket motor.

IMPORTANT: always remember to check your balance point and ensure your CG is ahead of the specified CG point.

IMPORTANT: Always follow the NAR safety code and remember that rockets are not toys and can be dangerous if not prepared and used properly. If you are a beginner, it is a good idea to fly with a club or other group of experienced rocketeers until you have gained some experience.

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IMPORTANT: Please contact us via phone or email if you have any questions about constructing or flying your model.



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