



MGM-157 Scorch™

Flying Model Rocket Instructions
Designed by Matt Steele / Kit Graphics by Dr. Steve Kristal

VEHICLE DATA SHEET

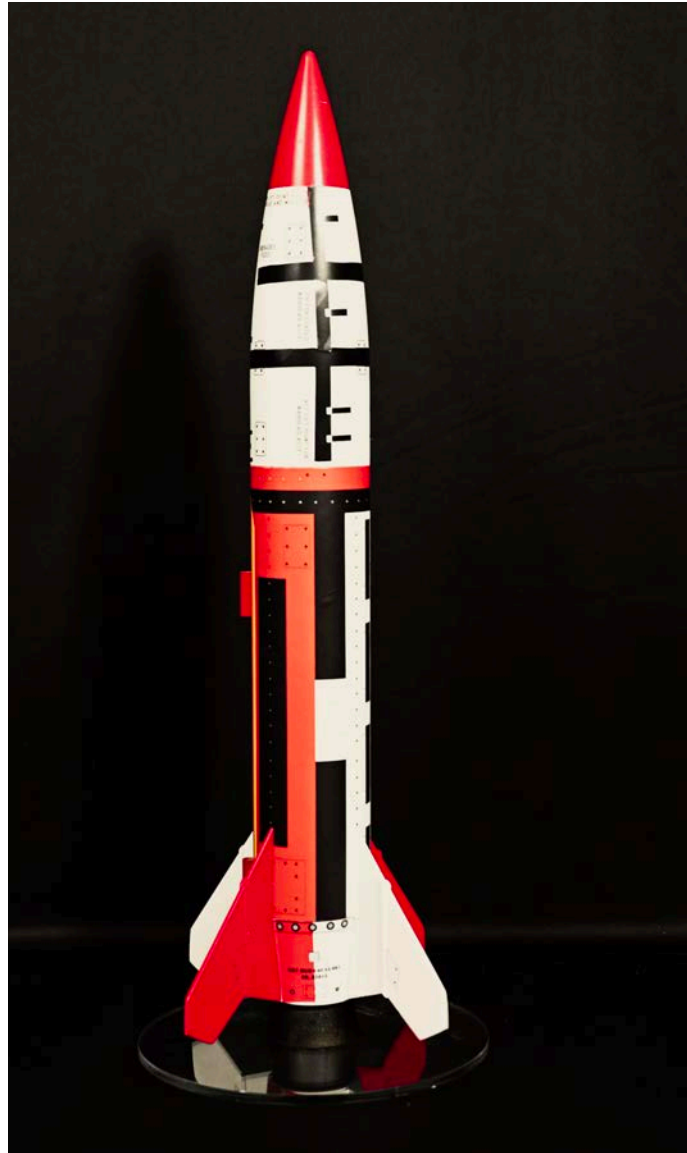
Physical Data

Parameter	Dimension
Length	23.25" (59 cm)
Diameter	2.64" (6.7 cm)
Weight	15 oz. (425 g)

- A 30"-36" thin mil nylon parachute is recommended for this model (not included). The NCR 36" Ripstop Nylon High Visibility Parachute (Part #822) is recommended.

Predicted Altitudes

Motor	Predicted Altitude
Estes F15-6	938 ft. (286 m)
Aerotech F20-7W	1,496 ft. (456 m)
Aerotech F42-8T	1,350 ft. (412 m)
Aerotech F50-9T	1,727 ft. (527 m)
Aerotech F67-9W	1,550 ft. (472 m)
Aerotech G64-10W	2,989 ft. (911 m)



- This kit is recommended for adults(18 and older) only. Launch systems, model rocket motors, launch supplies, tools, and building materials are not included.
- Do not modify the design of the rocket! Changes to the design may affect the stability, and hence, the safety of the rocket.
- North Coast Rocketry certifies that it has exercised reasonable care in the design and manufacture of its products. However, as we cannot control the use of our products once sold, we cannot assume any responsibility or liability for product usage.
- North Coast rocketry shall not be held responsible for personal injury or property damage resulting from the use of our product. The buyer assumes all risks and liabilities arising from the use of our product and uses our product on these conditions.
- North Coast Rocketry makes no warranty regarding our products, except for defects in materials or workmanship for a period of one year after purchase.
- If any of these terms are unacceptable, please return the item to the point of purchase.

NCR 9210 (10/21)

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Parts List

ID	Part #	Description
A	3004	Nose Cone, Short
B	1109	Body Tube
C	9578	Tail Cone
D	1132	Motor Tube
E	7223	Scorch Fin Set (4 each)
F	9592	2.5 oz Nose Weight
G	2102	Forward Centering Ring
H	9501	Launch Lugs (2)
J	9579	Cable
K	9503	Loop Sleeve Connectors (2)
L	9530	Kevlar Line
M	9531	Elastic Line
N	9508	Shrink Tube (2)
O	9526	Quick Link
P	8225	Scorch Body Wrap
Q	8226	Scorch Tail Cone Wrap
R	8227	Scorch Nose Decal
S	8228	Scorch Nose Black Stripe Sheet
T	8200	NCR Decal
U	9591	SRM Nozzle
V	9581	Motor Retainer - Male
W	9582	Motor Retainer - Female
X	9593	Fin Hinge Detail (8)
Y	1137	Nose Masking Tube
Z	2112	Nose Masking Tube Centering Ring

Before You Start:

Thank you for purchasing this North Coast Rocketry® model kit. We hope you have an enjoyable time constructing and flying this model rocket. Please read all of these instructions to become familiar with them before starting construction. The sequence is important. Check off each step as it is completed.

The following materials are necessary for construction:

5 minute epoxy; 30 minute epoxy; gap filling (thick) cyanoacrylate adhesive (CA); #220, #320 and #400 sandpaper; Tamiya white spray primer or Rustoleum gray spray primer filler; and spray paint in the following colors:

- Tamiya Gloss White
- Tamiya Ferrari Red
- Tamiya Flat Clearcoat

Tamiya paints are preferred for all colors.

The following tools are required for construction:

Modeling knife or single edge razor blade; pliers or crimping tool; safety glasses; heat gun or hair dryer, 6" hemostats; Dremel or other rotary tool with a sanding drum; and an 18" long ruler.

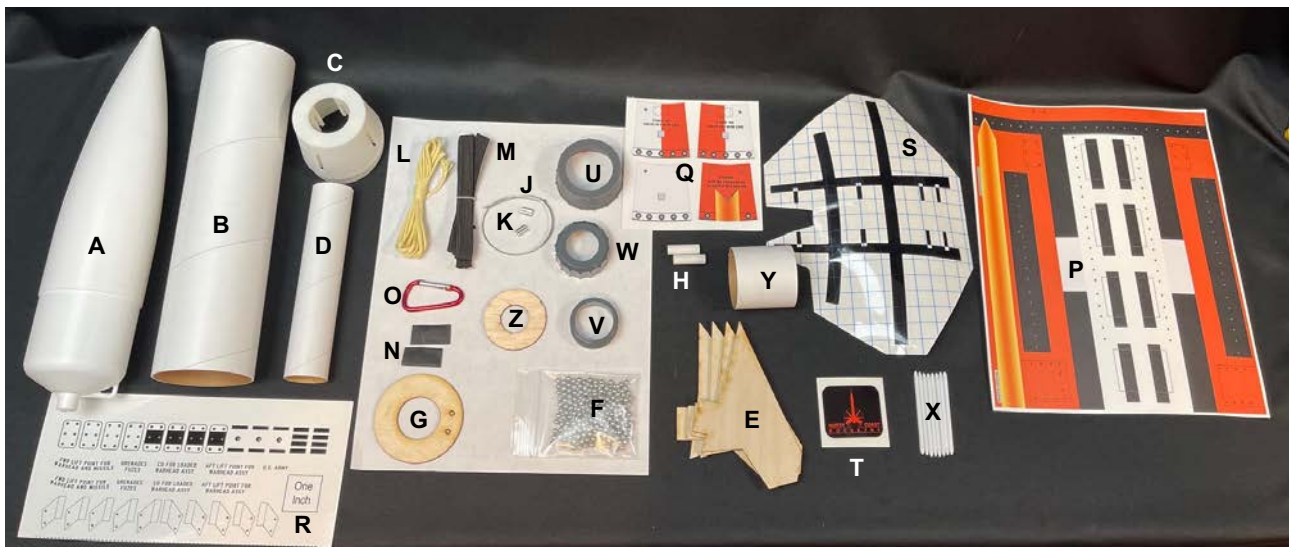
Check the kit for completeness, using the parts list and reference photograph. If parts are missing or damaged, or if for any reason you are dissatisfied with this product, please let us know at www.NorthCoastRocketry.com. We will gladly replace any item found to be defective. Our goal is for you to be satisfied with your purchase, and to have fun!

Please be extremely careful using CA and epoxy. Avoid getting either in your eyes or on your skin. Use safety glasses when using adhesives and when cutting. Be sure to use adhesives and paints only in areas with adequate ventilation, and do not breathe in fumes.

In each step, test fit parts together before bonding. It is sometimes necessary to sand lightly or build up some parts to obtain a precision fit.

Plywood parts, being natural wood products, have a tendency to warp. Reverse any warps by lightly misting the part's concave side, then placing it between two heavy, flat objects to dry. Seal the part with balsa fillercoat or spray primer as soon as possible afterwards.

3D Printed parts made by Galactic Manufacturing and Bob Avery.



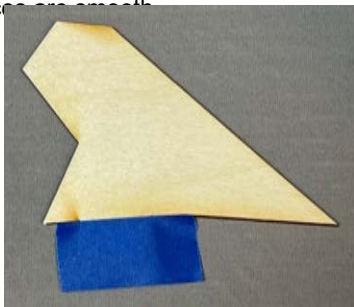
Assembly Instructions

- Locate the two launch lugs. Mask and area about an 1/8" wide – this is where they will be glued to the tube. Paint them red. Set aside to dry.

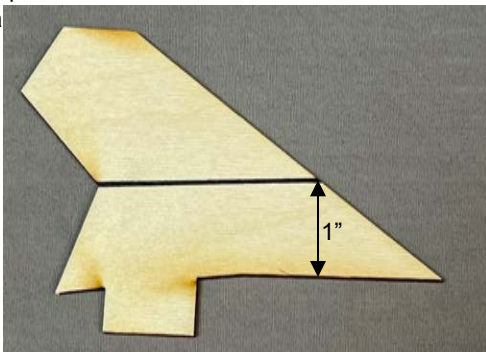


- Locate the fins. Round the leading and trailing edges of the fins with coarse #100 grit sandpaper. Leave the root edge of the fins and the fin tabs flat. Fine sand the parts with #180, #220, #320, and #400 sandpaper. Note: Plywood is a natural wood product; as such, we can not control factors such as warping after it leaves our facility. If your plywood parts are warped, place them under a stack of books for 24-48 hours to flatten them.

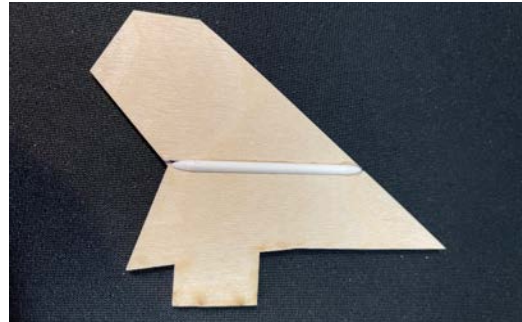
- Cover the fin tab area with a strip of 1/2" wide masking tape. The fins can best be sealed with finishing epoxy, balsa filler coat, or primer paint. Apply a coat of filler, sand smooth, and repeat the process until the wood grain is filled and the surfaces are smooth.



- On each fin, make a mark on the leading edge of the fin 1" from the root edge of the fin. Draw a line the length of the fin that intersects with the point at the aft edge of the fin. Turn the fin over and repeat the process. Mark the other three fins in a similar manner.



- Locate the 8 fin hinge details. Align the aft edge of the fin hinge detail with the aft edge of the fin. Using CA or epoxy, bond one fin hinge detail on the lines on the fin. Flip the fin over and repeat the process. Repeat for the other three fins.



- Prime and fill the fins with gray filler/primer. When the wood grain is filled, apply two coats of white paint before applying the final color coat. Paint two fins red and two fins white. Set aside to dry.

- Locate the SRM nozzle. Test fit the female portion of the motor retainer into it, taking care to ensure that the flat side is closer to the larger open end of the nozzle. Using CA or epoxy, bond the female portion of the motor retainer into the SRM nozzle. When the assembly has cured, paint flat black.



- Test fit the male portion of the motor retainer on to one end of the motor tube. Using CA or epoxy, bond the male portion of the motor retainer to the motor tube.



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□ Test fit the tail cone to the motor tube/motor retainer assembly, with the closed end of the tail cone touching the male motor retainer. You may have to sand the tail cone (using a Dremel and a rotary tungsten carbide sanding drum) to get a good, precise fit. Using CA or epoxy, bond the tail cone to the motor tube/motor retainer assembly.



□ Locate the forward centering ring (the one with the two holes in it) and the steel cable and one of the loop/sleeve connectors. Thread one of the loop/sleeve connectors on to the cable. Then, thread the cable down through the top of one hole in the centering ring. Pull it back through the other hole and thread the end of the cable back through the loop/sleeve connector, making a 1-2" loop. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the connector.

□ Place the other loop/sleeve connector on the free end of the cable. Slide both of the heat shrink sections onto the cable. Make a 1" diameter loop and thread the free end back through the loop/sleeve connector. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the connector.



□ Slide the heat shrink tubing over each loop/sleeve connector, and, using a heat gun or hair dryer, shrink the tubing over the connector to prevent the parachute from snagging on it.



□ Tie one end of the aramid shock line onto the top cable loop and triple knot it. Secure the knot with a drop of CA. Trim the excess off.

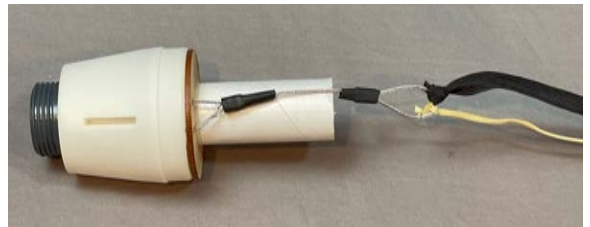
□ Tie one end of the elastic shock line onto the top cable loop and triple knot it. Trim the excess off.



□ Coil up both the aramid and elastic shock lines and stuff them into the forward end of the motor tube. This will keep them out of the way when the motor mount is bonded in place.

□ Test fit the forward centering ring on the motor tube and body tube to ensure they fit properly. Sand the rings if the fit is too tight; add tape to the motor tube if that joint is too loose.

□ Take the forward centering ring (the one with the two holes in it) and slide it onto the motor tube until it touches the top of the tail cone shoulder. Be sure the ring and the shoulder are aligned. Using epoxy, bond the ring to the motor tube, being sure to keep epoxy off the shoulder.



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- Mask the threads of the male motor retainer to prevent paint from getting on the part. Prime the tail cone with white primer. Paint the entire tail cone white. There is no need to paint the body tube – it will be covered in a wrap. Set the assembly aside to dry.
- Locate the nose cone. Because of the recovery system approach NCR uses, the molded attachment point is not used. Using a 1/4" drill, drill a hole in the aft end of the nose cone.



- Trim any flash away from the nose cone with a sharp knife. Sand lightly with #400 sandpaper before painting.
- Prime the nose cone with white primer. Paint the approximate top half of the nose cone red. Set aside to dry.
- Locate the Nose Masking Tube and the Nose Masking Tube Centering Ring. Glue the ring inside the tube flush with one edge of the tube.



- Place the Nose Masking Tube Assembly over the tip of the nose cone. Press the tube firmly in place. Cover any exposed portions of the red nose tip with tape and/or a plastic bag. Mask the nose cone shoulder with tape before painting the cone (which I forgot to do for the photo!). Spray the tube/nose cone joint first with a coat of red paint to seal the joint. When the red has dried, paint the exposed section of the nose cone white. Repeat for 2-3 coats to ensure a good white color.

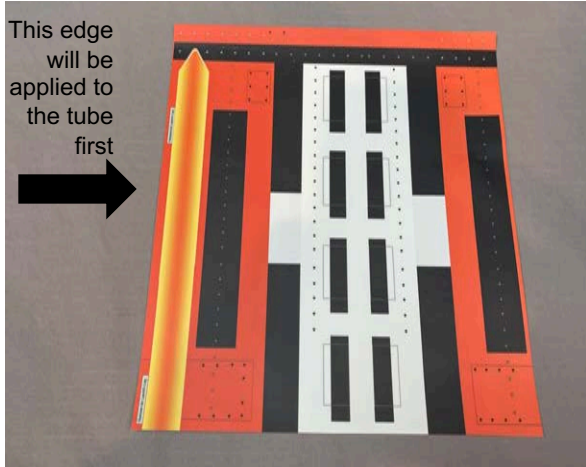


- When the white paint has thoroughly dried, remove the Nose Masking Tube Assembly.



- Use a sharp knife with a brand-new blade and a good straight edge to trim away the white edges of the main body tube wrap from the sheet. The wrap is designed to fit precisely around the body tube with a very slight (~1/16" overlap), so precision cutting is important.
- Locate the edge of the wrap next to the orange tunnel and launch lug cutouts. This is the edge of the wrap which is stuck down first. *NOTE: Do NOT cut the launch lug cutouts out now. (That is the last step.)*

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□ The next step is to flip the wrap over and draw a line down the length of the wrap ~1/2" from the edge that will be applied first (i.e. under the tunnel/launch lug edge).

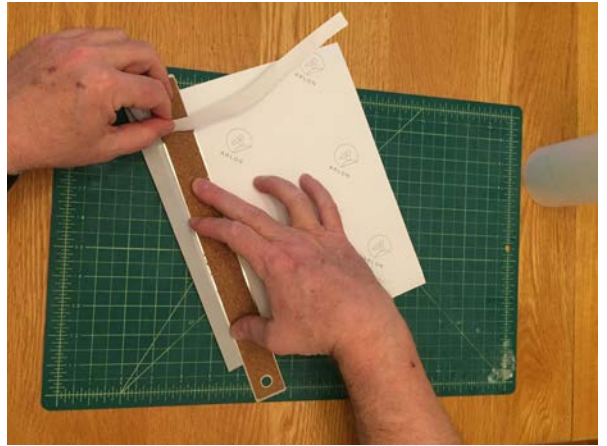


□ Now you want to fold back the backing paper along the line you've drawn. The plan is to tear off that piece of backing paper and then stick it back down into place. So don't worry, there is no preciseness necessary for this step. The next several photos show how to fold the paper back. Try to be careful not to let stuff fall onto the exposed sticky back of the wrap.

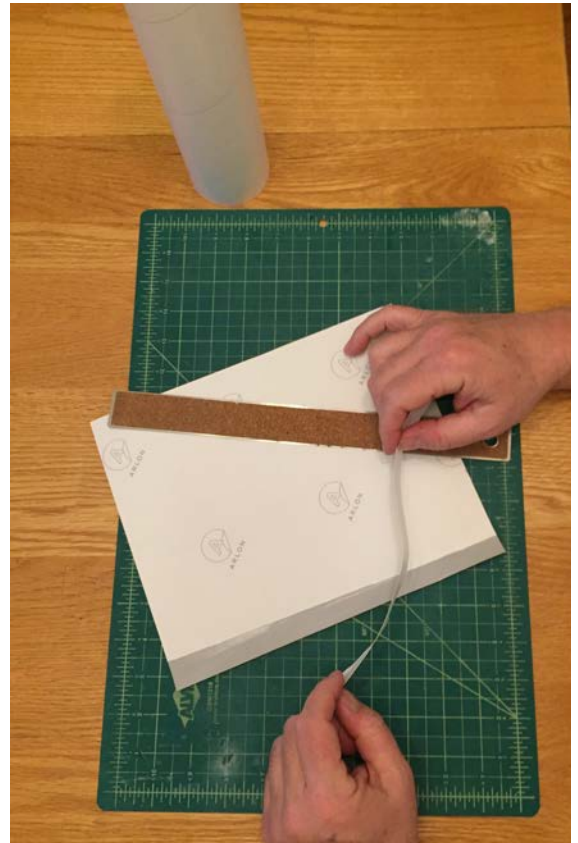


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□ Once you have that edge folded back, the next step is to tear off that strip. It is easiest to use a thin metal ruler slid into the crease, and then work your way along the ruler tearing off the strip.



□ Once the paper strip is removed, the next step is to replace it back where it was. The idea is to keep the back of the wrap completely covered so as to make positioning it very easy. The narrow strip is now easily removed once the wrap is properly positioned. Note from the next few photos that the strip for this tutorial is not very straight but that makes no difference. The strip does not have to be precise at all, just torn off and replaced smoothly and nicely.



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□ On a clean work surface, position the wrap on the tube. The wrap is sized to be ever so slightly longer than the 10" body tube. After the wrap is applied, the upper edge off is trimmed off. To position the wrap, begin by sitting the tube upright on the table and starting to position the wrap with the bottom edge also flat on the table. Note that nothing is being stuck to the tube at this point.



□ Next, begin to adjust the wrap so that the lines which run horizontally around the tube line up with each other. Note that the Launch Lug edge of the wrap goes underneath the other edge. Before removing the backing paper, the two edges just barely touch. But once the backing paper is fully removed, there will be more overlap.



□ Once you have the upper edge aligned, check to be sure the lower half of the wrap is aligned as well.

□ Once you have the wrap precisely aligned, check the top and bottom of the wrap again to be sure you haven't inadvertently left either the top or bottom of the tube uncovered. Once the wrap is properly positioned, take one hand and grasp the tube and wrap at the middle point of the tube. Release the edge of the wrap with the removable backing strip, then use your free hand to remove the strip.



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□ Once the strip is removed, use your free hand to begin to apply the exposed sticky edge of the wrap to the tube. Begin at the middle of the wrap directly across from your gripping hand, and press the wrap to the tube. Work your way out from the middle to each end. The strip you've exposed and now pressed into position will keep the wrap aligned for the rest of the application.

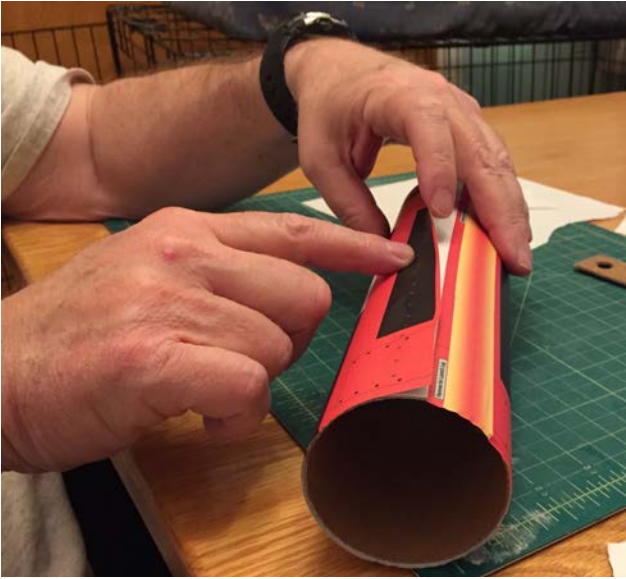


□ Now that applying the wrap has begun, it is a simple matter to release the rest of the wrap and begin applying it. It is important to go slowly, pressing the wrap into position sequentially, moving always from the middle of the wrap out to each side. Do NOT remove all of the backing at once. If you develop little bubbles you can rub them out or gently pull part of the wrap up to reapply it. Be careful doing this though because the vinyl is slightly stretchable and you want to be sure not to deform it as you are rubbing it into position.



□ As you get to the end of the wrap you can remove the final bit of backing and rub the rest of the wrap into place.

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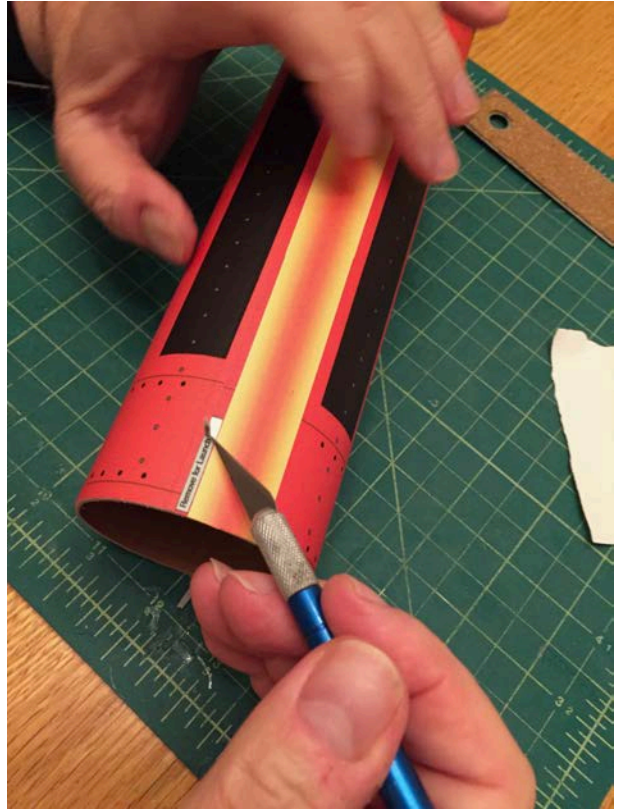


□ Once the wrap is completely applied, use a piece of the backing paper to burnish the overlap to be sure it sticks.

□ Trim away the edge which extends beyond the end of the tube by taking a sharp knife with a new blade and sequentially pushing it in from the outside of the tube and working your way around the tube.



□ Remove the wrapping covering the Launch Lug positions. Use your sharp knife to incise all four edges of each Launch Lug location. Once all four edges are cut, slip the knife point under one edge and gently lift the covering piece away.



□ Apply epoxy to the unpainted area on the launch lugs and bond the two launch lugs in place. Use a 1/4" dowel or launch rod to ensure they are aligned. Fillet the lugs for added strength.

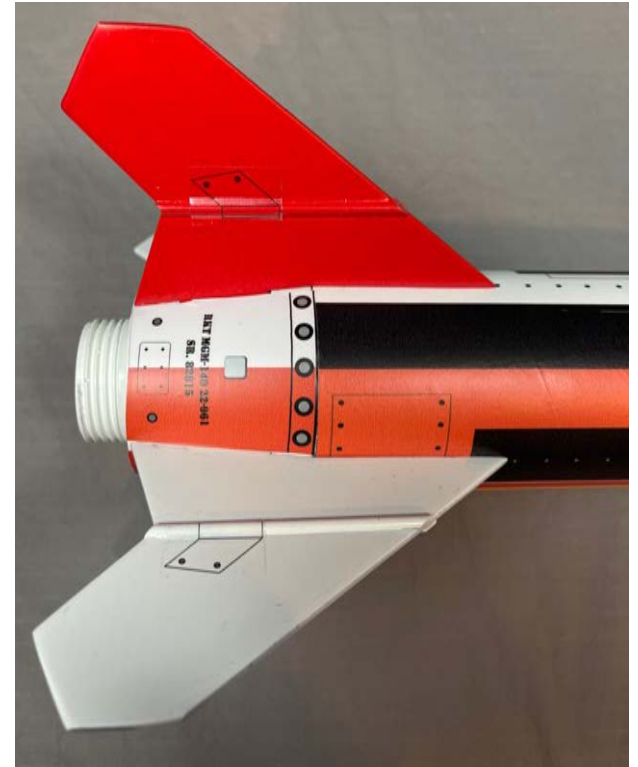
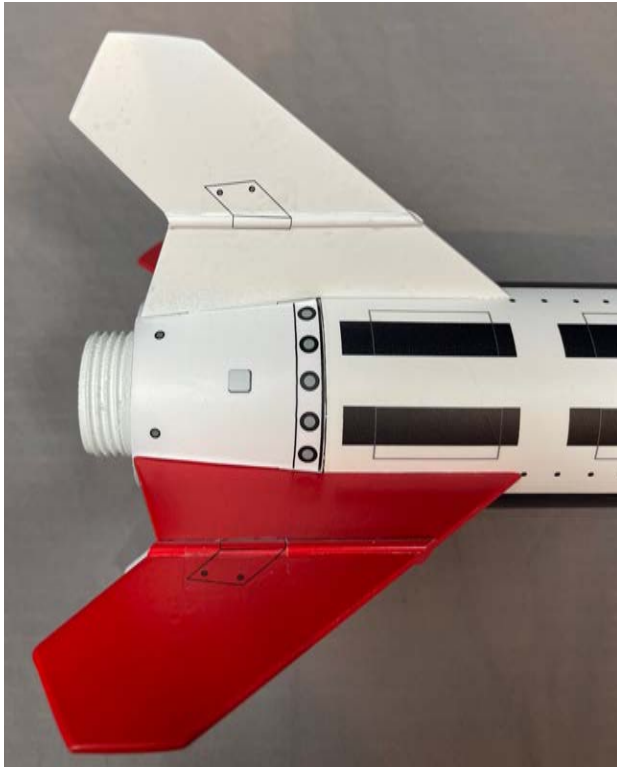
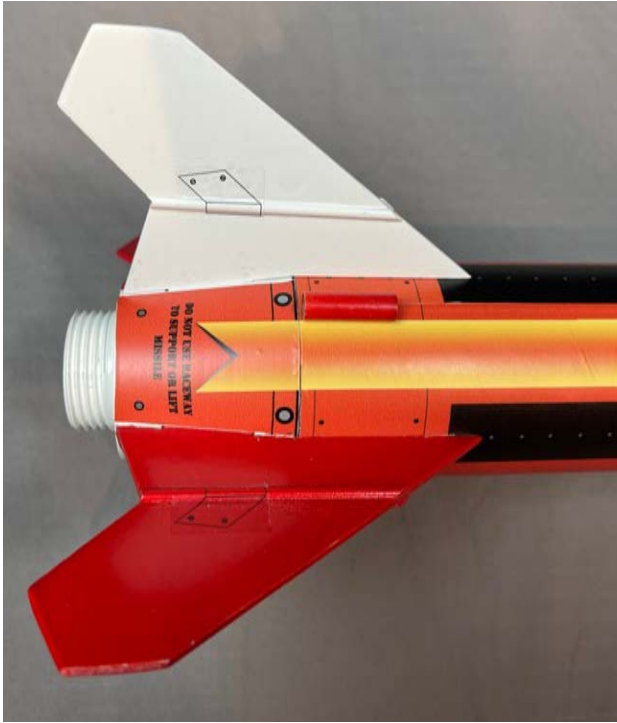
□ Locate the tail cone markings and cut each section out. Starting with the quadrant with the orange conduit section, apply the markings as shown on the next page.

□ Test fit the tail cone assembly into the body tube to ensure it fits properly. Sand the ring and shoulder if the fit is too tight. Carefully position the tail cone so that the tail cone conduit lines up with the conduit on the body tube. Using epoxy, bond the tail cone in place.



□ Using epoxy, glue the fins in place on the lower body tube. Alternate red and white fins.

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□ Carefully remove the clear top layer of the black nose cone markings. Center the wrap on one seam of the nose cone for easy alignment. Remove the backing paper from the center of the stripe and position the stripe decal on the model. You may find it easier to trim the excess backing paper away before applying the stripe. Remove the backing paper from the left half of the stripe and lay it in place; repeat for the right half. Burnish the decal to stay in place.



□ Apply the marking decals. These are **wet type** decals. Carefully cut out each decal from the sheet, leaving as little extra material around the printed portions. Slide the decals into warm water and soak them for 30-60 seconds. Remove the backing paper and position the decal on the model. See the following pages for locations.

□ Pour the nose wight BBs into a small paper cup. Mix up a small batch of 30-minute epoxy and pour over the nose weight in the cup. Mix the two together. Carefully pour the epoxy/weight mixture into the hole in the nose cone. Work all the BBs into the tip. Set aside to cure.

□ Insert one end of the Kevlar line into the center hole, and then route it back out the drilled hole in the nose cone. Tie the line to itself with a double knot. Secure the knot with CA.



□ Tie the free end of the elastic to the Quick Link, then attach the Quick Link to the nose cone loop.

□ Attach a 24"-36" parachute to the Kevlar loop at the nose cone.

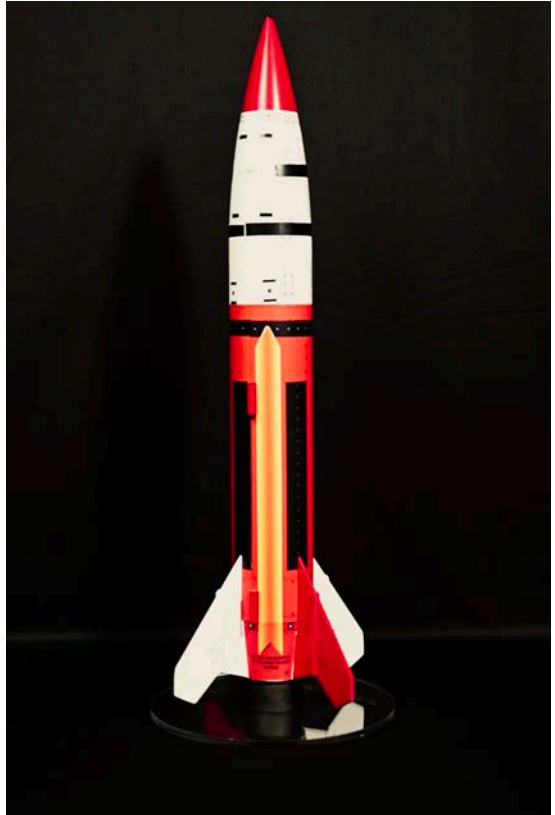
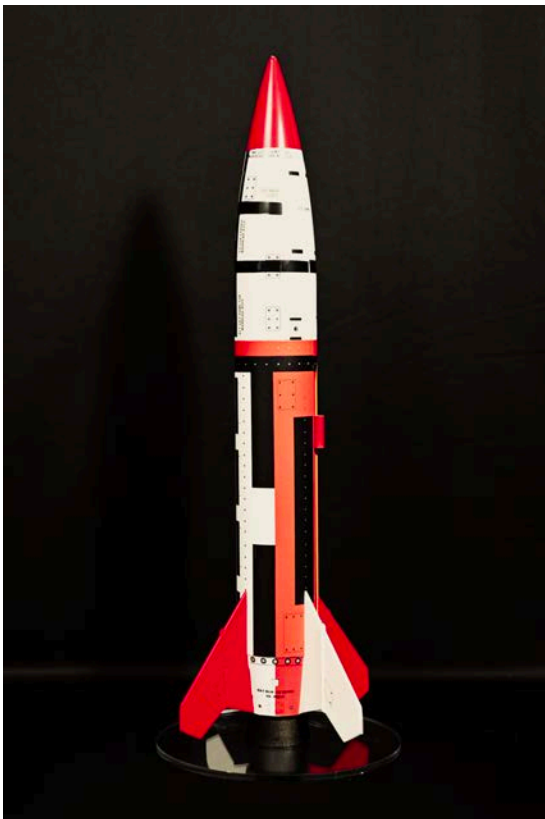
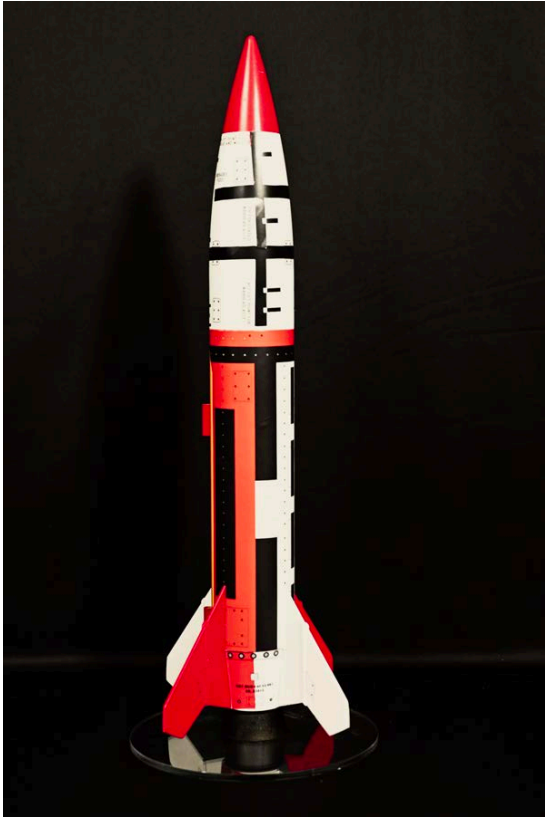
□ Spray the entire model with a clear coat to protect the finish. Apply 3-4 very light coats. Not only will the clear protect the wrap, but it actually encases it preventing the edges from peeling up.



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Flight Preparations

IMPORTANT! READ BEFORE LAUNCHING!

- Select one of the recommend motors shown on the first page. For an updated list of recommended motors, check the kit listing at NorthCoastrocketry.com.
- Install the motor into the motor mount until the lip of the case is touching the tube. If your motor has no lip, wrap ¼" wide masking tape around the aft ¼" of the motor until it is 1/8" thick. Screw the motor retainer/nozzle assembly in place.
- Remove the nose cone. Check to ensure the shock cord is securely mounted. Check for any damaged, burnt or frayed sections of the shock cord and replace if necessary. Install wadding, using an amount at least equal to one diameter (3" or so) to protect the parachute.
- Carefully fold the parachute.
- Insert the shock cord into the model. Place most of it between the exposed motor tube and the outer tube. Place a sheet of wadding over the top of the motor tube, then carefully insert the parachute into the remaining space in the tube. The sequence is very important! Replace the nose cone. Ensure the nose cone is snug but slides freely.
- The model's calculated center of pressure is 17.4" aft of the tip of nose cone.
- Check the model's center of gravity prior to flight. **The Center of Gravity (balance point) should be no farther aft than 11.9" aft of the nose tip with the motor, wadding, and recovery system installed.**
- Install the igniter per manufacturer's instructions.
- Perform a pre-launch check to ensure that:
 - The fins and launch lugs are not broken, damaged, or loose in any way;
 - The body tube and other components are not damaged or dented;
 - The model slides freely on the launch rod or rail, with no binding, sticking or misalignment of the launch lugs or buttons;
 - If any problems are detected, correct them before attempting to fly.

Flight Instructions

- Fly your rocket from the largest field possible on a clear and calm day. At a minimum, you need a field at least 1.5 times the expected altitude. For example, if you expect your model to fly to 1,000 ft (305 m), then the field should be at least 1,500 ft (457 m) on each side.
- Do not fly near trees, power lines, or tall buildings. Do not fly in the vicinity of low flying airplanes or airports.
- Be sure that the area is clear of dry weeds, grass, or other flammable materials that may be ignited by the rocket exhaust. Always use a large blast deflector.
- Use a launch pad with at least a 5 ft (1.5m) rod or rail. Fly from a minimum distance of 30 ft (9 m) for safety and a better view of the flight.
- Follow ALL Federal, State, and local regulations and ordinances when flying model rockets
- ALWAYS follow the NAR Safety Code when flying model rockets.

Flight Profile

Give a five second countdown to warn all others in the area of a launch. When the launch button is pressed, an electrical current causes the igniter to heat up, igniting the propellant in the motor. This may take as long as one second. The motor quickly builds up thrust and moves the rocket into the air. When the motor's propellant is consumed, a delay grain generates tracking smoke. When the delay grain is consumed near peak altitude, the motor's ejection charge fires, activating the model's recovery system. The recovery system permits the safe landing of the model to the ground.

Fly safely and have fun!

National Association of Rocketry MODEL ROCKET SAFETY CODE

March 2009 Revision

ALWAYS FOLLOW THIS CODE WHEN USING NORTH COAST ROCKETRY® PRODUCTS!

Materials. I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.

Motors. I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.

Ignition System. I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.

Misfires. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

Launch Safety. I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance.

Launcher. I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.

Size. My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse.

Flight Safety. I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.

Launch Site. I will launch my rocket outdoors, in an open area at least as large as shown in the table below in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

Recovery System. I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.

Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft.)
0.00--1.25	1/4A, 1/2A	50
1.26--2.50	A	100
2.51--5.00	B	200
5.01--10.00	C	400
10.01--20.00	D	500
20.01--40.00	E	1,000
40.01--80.00	F	1,000
80.01--160.00	G	1,000
160.01--320.00	Two Gs	1,500

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