Cluster Duck™

Flying Model Rocket Instructions
Designed by Matt Steele

VEHICLE DATA SHEET

Physical Data

Parameter	Dimension
Length	4.5” (105 cm)
Diameter	2.64” (6.7 cm)
Weight	14.5 oz. (411 g)
Recommended Motors:	C11-5 with 6 each A8-0/B6-0 D12-5 with 6 each A8-0/B6-0 C11-7/D12-7 with 6 each C6-0 E9-8/E12-8 with 6 each A8-0/ B6-0/C6-0

Predicted Altitudes

Motor	Predicted Altitude
D12-5/ 6 A8-0	386 ft. (118 m)
D12-5/ 6 B6-0	621 ft. (208 m)
C11-7/ 6 C6-0	1,123 ft. (342 m)
D12-7/ 6 C6-0	1,315 ft. (401 m)
E9-8/ 6 C6-0	1,543 ft. (470 m)

• A 36” nylon parachute is not included in this kit. The NCR 36" Ripstop Nylon High Visibility Parachute (Part #822) is recommended for this kit.

• 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.

Parts List

ID	Part #	Description
A	3001	Nose Cone
B	1108	2.6” Diameter Body Tube
C	1112	24mm Motor Tube
D	7205	Cluster Duck Fin Set (6 each)
E	1111	18mm Motor Tubes (6 each)
F	9519	Long Motor Hook
G	9521	18mm Engine Block (6 each)
H	2106	Forward Centering Ring
I	2105	Aft Centering Ring
J	9501	Launch Lugs (2)
K	9522	Cable
L	9503	Loop Sleeve Connectors (2)
M	9504	Kevlar Line
N	9505	Elastic Line
O	9520	24mm Engine Block
P	8207	Cluster Duck Decal
Q	8209	Black Stripe Decal (2)
R		NCR Decal
S	9523	Shrink Tube (2)
T	9523	Quick Link

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; 15 or 30 minute epoxy; gap filling (thick) cyanoacrylate adhesive (CA); balsa filler coat; ¾” wide masking tape, an 18” (45.7 cm) wood dowel; a sanding block with #220, #320 and #400 sandpaper; spray primer; and spray paint in the color(s) of your choice.

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, 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 or 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!

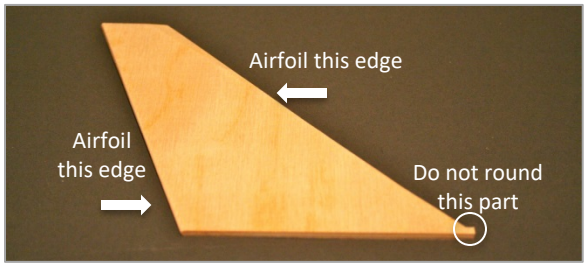
Please be extremely careful using CA and epoxy. Avoid getting either in your eyes or on your skin. Use safety glasses when using adhesives and when cutting. Be sure to use adhesives and paints only in areas with adequate ventilation, and do not breathe in fumes.

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.

Assembly Instructions

☐ Round the leading and trailing edges of the fins with coarse #100 grit sandpaper. Leave the root and tip edges of the fins flat, but sand off the lasercutting char to reveal virgin wood. Do not round alignment guide at the forward end of the fin. Fine sand the parts with #180, #220, #320, and #400 sandpaper. 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.

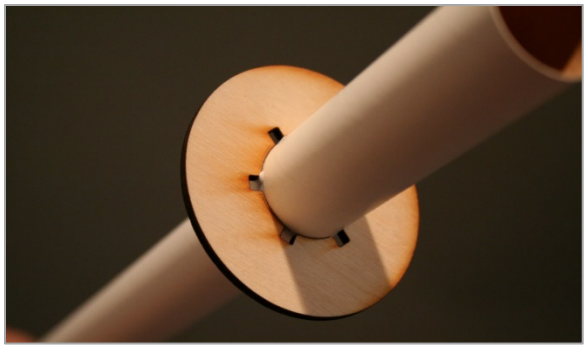


☐ It is a good idea to sand and seal the fins prior to bonding it on the airframe. Cover the fin root with a strip of ½" wide masking tape. The fins can best be sealed with finishing epoxy, balsa filler coat, or primer paint. Apply a coat of filler, sand smooth, and repeat the process until the wood grain is filled and the surfaces are smooth.

☐ Mark the 24mm diameter x 17" long core motor tube with a mark 3.875" from one end. This end will be the aft end. Mark the tube 0.25" from the other end. This will be the forward end.

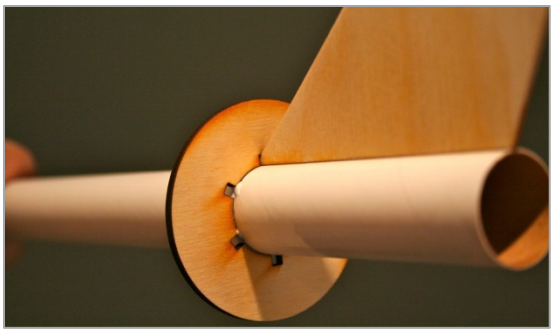
☐ Make a mark 3.5" inside the 24mm diameter x 17" long core motor tube. Using epoxy or CA, glue the 24mm engine block in place.

☐ Test fit the aft 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. Place the ring at the 3.375" mark. Carefully mark where the wood makes contact with the tube. This is where the glue will be applied to the ring.

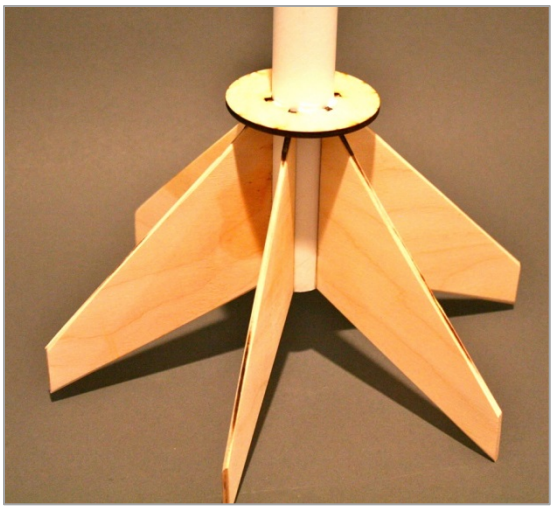


☐ Using epoxy, glue the aft centering ring in place, taking care not to get any glue in the slots. After the epoxy has cured, trim away any excess adhesive in the slots.

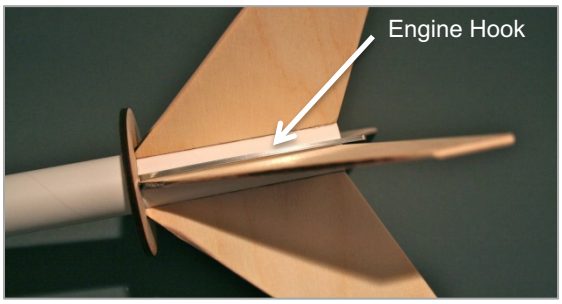
☐ Test fit one of the fin into the ring by sliding the fin alignment tab into the slot. Remove the fin, add epoxy to the root edge and alignment tab, and slide back into place. Make sure the fin is perpendicular to the tube. Set aside to cure.



☐ Repeat for the other five fins.

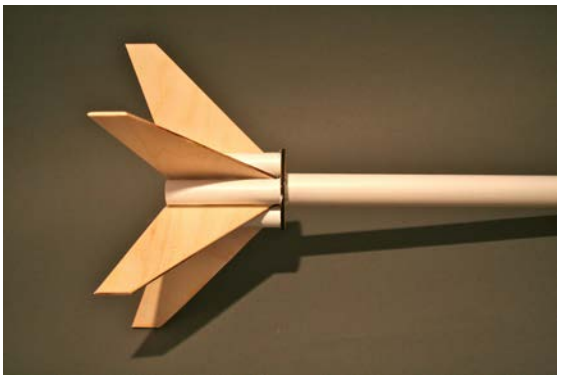


☐ Make a mark 3.5" from the aft end of the tube, next to one of the fin roots. Using a sharp knife, cut a 0.125' wide slot in the tube. Insert the engine hook into the slot. Using epoxy or CA, apply a light coat of adhesive to the top 1" of the hook.



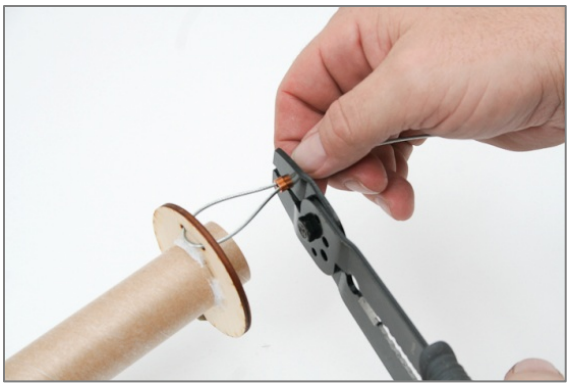
☐ Locate the one 18mm diameter motor tubes. On one end, make a mark 1.5” inside. Using epoxy or CA, glue the 18mm engine block in place. Repeat for the other five tubes.

☐ Test fit one of the 18mm tubes in between the fins as shown. Using epoxy, glue the 18mm motor tube to the 24mm motor tube, the fins, and the aft centering ring. Fillet the joint between the tube and the fins. Repeat for the other five tubes.



☐ Locate the forward centering ring (the one with the two holes in it) and slide it onto the motor tube at the forward 0.25” mark. Using epoxy, bond the ring in place.

☐ Locate the steel cable and the 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. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the joint. Slide both of the heat shrink sections onto the cable.

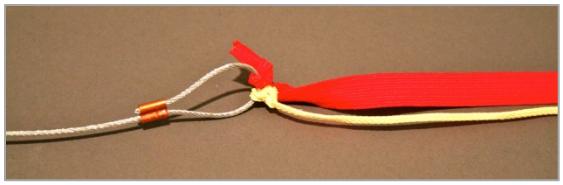


☐ Place the other loop/sleeve connector on the free end of the cable. Make a 1-2” diameter loop and thread the free end back through the loop/sleeve connector. Crimp the loop/sleeve connector with a crimping tool or a pair of pliers. Apply a drop of CA to the joint.

☐ 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.

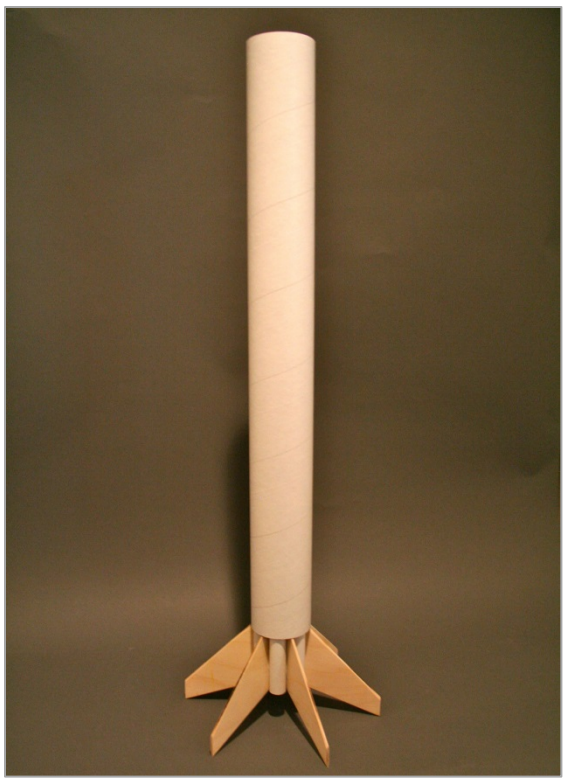
☐ Tie one end of the elastic shock line onto the top cable loop and triple knot it. Trim the excess off.



☐ 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 then motor mount is bonded in place.

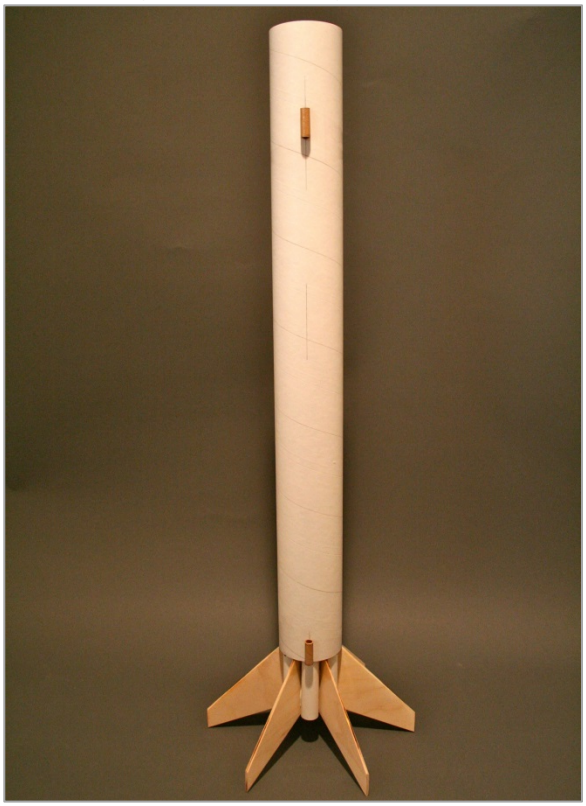
☐ Test fit the motor mount assembly into the main airframe tube. Check to see that the motor mount fits snugly. Remove the motor mount.

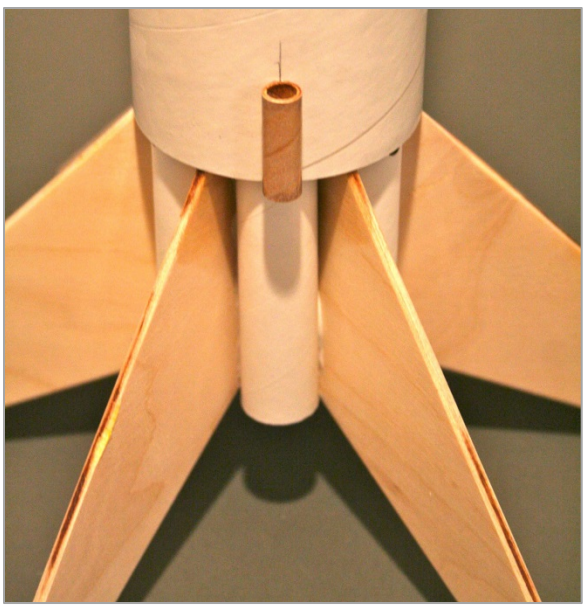
☐ Mark a long stick or dowel 14” from one end. This will be used to apply epoxy to the forward ring/airframe tube joint. Mix a large batch of epoxy (For best results, used 15 or 30 minute epoxy). Spread a band of epoxy inside the tube about 14” from the aft end of the airframe tube. Insert the motor mount assembly until the fins touch the end of the airframe tube. Set the assembly upright on a sheet of wax paper to fully cure.



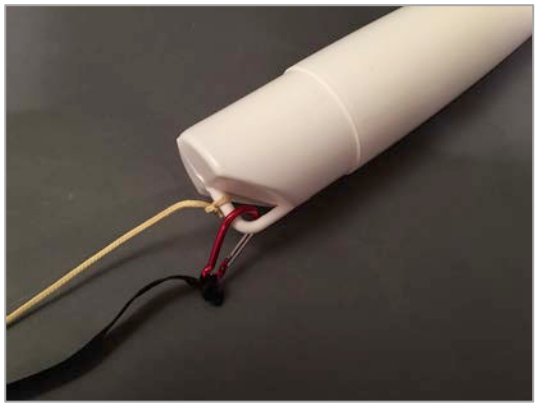
☐ Make the main airframe tube with a line the entire length of the tube. Make the line on the main airframe tube 3” from the top of the tube.

☐ Locate the launch lugs. Epoxy one at the aft end of the main airframe tube on the line. Epoxy the other on the line, 3” from the top of the tube. Fillet both lugs for added strength.





☐ Tie the aramid line to the nose cone with a triple knot. Secure the knot with a drop of CA. Locate and tie the free end of the elastic to the Quick Link, then attach the Quick Link to the eyebolt. Snap the Quick Link onto the nose cone.



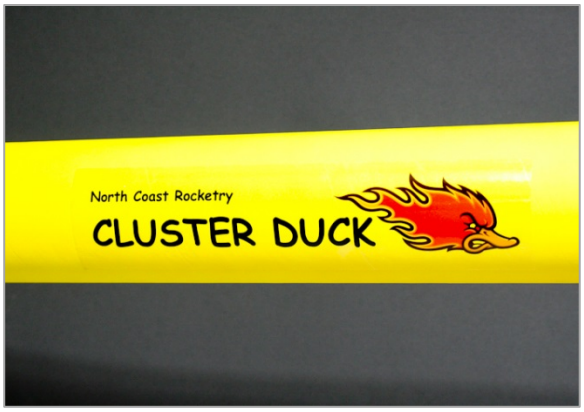
☐ Attach a 36” parachute to the nose cone.

☐ Trim any flash away from the nose cone with a sharp knife. Sand lightly with #400 sandpaper before painting.

☐ Clean the rocket body with a rag or paper towel. The rocket may now be painted.

☐ Paint the rocket with a base coat of primer and let it dry. For best results, apply two coats of white paint before applying the final color coat. Consult the box cover artwork and the NCR website for suggested paint schemes.

☐ Apply the decals as desired. Carefully cut out each decal from the sheet, leaving as little extra material around the printed portions. Peel away the backing paper and position the decal on the model. Burnish the decal to stay in place.



☐ Spray the entire model with a clear coat to protect the finish.

North Coast Rocketry

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.

□ If you use a short Estes 24mm engine (2.75”), insert a 0.75” spacer in the main engine tube before inserting the motor. Install the motor(s) into the motor mount until all but the last ½” in exposed. Endure the motor is snug in the motor tube, and that it will not move forward or aft. Using ¾’ wide masking tape, wrap the aft end of the motor and the motor tube to secure the motor in place.

□ Remove the nose cone. Remove the elastic cord from the nose and untangle if necessary, then re-attach. Check for any damaged, burnt or frayed sections of the shock cord and replace if necessary. Check to ensure the shock cord is securely mounted.

□ Install wadding, using an amount at least equal to one diameter (3” or so) to protect the parachute.

□ Carefully lay the canopy of the parachute out on a flat surface with the underside of the canopy facing up. Pull the shroud lines towards you. Fold the canopy in half by bringing the “top” half of the canopy down toward you. Fold the left corner over to make a quarter disk. Place the shroud lines on the parachute, then fold it lengthwise again. Then, from the top to bottom of the chute, fold it into three sections in a manner resembling a “Z”. Place the chute in the tube with the shroud lines facing out.

□ Insert the shock cord into the model, followed by the parachute. 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 34” aft of the nose cone.

□ Check the model’s center of gravity prior to flight. **The Center of Gravity (balance point) should be no farther aft than 31.5” 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 or 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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Visit www.nar.org for details!