

# Rocketry – Level 3

## Step by step to launch

With the technology of model rockets you can launch a rocket 1000 feet in the air without a drop of glue. It's true that model rocketry has the potential to be complicated and difficult to get involved with, but there are plenty of basic, beginner options.

From the many manufacturers of rocket parts, equipment and sets, there's plenty to choose from, but the company that most people got started with is Estes. Estes has a variety of pre-assembled rockets for the beginner to kits for the intermediate rocket builder. Plus, Estes has a number of "starter sets" that include everything you need to fire your rocket, retrieve it and fire it again.



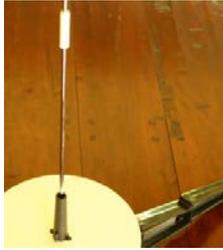
These starter kits are easy to find. They are available in most hobby stores. Target and Wal-Mart stores also carry them and you can find them on the internet. This walkthrough will look at the M-104 Patriot Missile "Ready-To-Fly" set that requires no soldering, gluing and only moderate instruction following.

The first thing to do is open the box and make sure all the parts are there. The M-104 set includes an already built rocket, launch pad, launch controller, parachute and wadding, engines and igniters for two flights. Everything's here, so we'll move on to the first step of assembly.



Start with the launch pad. Lay out the part and attached the legs to the hub. Next connect the two pieces of the launch rod by connecting the male and female parts and gently tapping the two pieces together on a hard surface, please use a brick or the driveway to force the joint together.

Finally, add the blast deflector shield and attached the safety cap to the top of the rod, where it always belongs when not launching rockets.



Next, wrapped an approximately four-inch piece of masking tape around the launch rod, about 8 inches up from the deflector shield. This will hold the rocket up so it isn't resting on the shield. Some rockets can sit nice and flat with their fins on the shield, other rockets have parts that prevent the rocket from sitting square on the shield. The tape holds the rocket up so engine clips or igniters aren't damaged by bumping against the deflector shield.



Now it's time for the rocket. The first thing to do is check the fit of the nose cone to the body of the rocket. If it's too tight, sand off some of the plastic in the nose cone with some high grit sandpaper. If it is too loose, added a single piece of masking tape. It's important that the fit be not too loose or too tight because you don't want the nose cone coming off before it's time for the parachute deploy. Alternately, you don't want the parachute to be locked in by too tight of a fit



You want to be able to use your rocket more than once, so it has to be recoverable – time for the parachute. Some smaller rockets use a streamer to slow their return rather than a parachute. The parachute is going to be attached to the rubber strip that attaches the nose cone to the body.

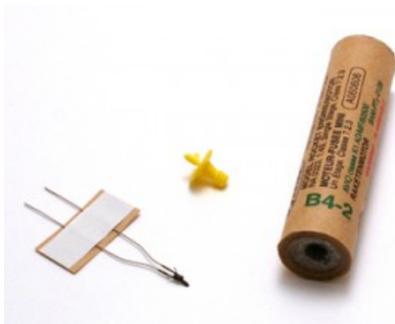
Tip: Cut the center out of the parachute. You will still have a controlled descent, but the rocket and parachute won't drift as much in the wind. This will make the retrieval easier and you will not have to chase it as far.



Now you're ready to attach the parachute. Gather the looped strings and slide them beneath the rubber strip, about an inch from the nose cone. Next, gather the parachute and fold it carefully, making sure not to tangle any strings.



The assembly is nearly finished, but first the wadding has to be added. The wadding acts as a shield to protect your parachute from the gases and sparks during the ejection phase of the engine burn. The amount of wadding used depends on the size of your rocket. The M-104 isn't that big so 4 sheets were enough – your kit should indicate how much wadding you should use. Loosely crumple the sheets into balls and insert into the rocket body. With care, fold the parachute into itself a couple of times, fold over then loosely wrap the excess strings around the 'chute. Pack the parachute into the rocket, on top of the rubber strip. Next, place the nose cone in the rocket. Make sure when you put the parachute, rubber strip and nose cone in that nothing seems too tight. It'll be important when the parachute pops that there aren't any problems caused by too much friction.

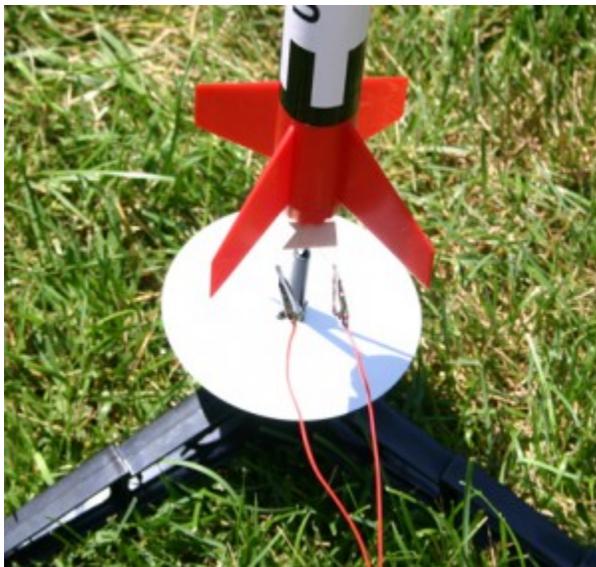


You've done everything you need to do at home. The rest of the steps should take place at your launch site. Remember to choose an open, safe location and never launch when winds are stronger than 10 mph. Selecting a launch site will be covered in Level 4. Set your launch pad on level ground and make sure the launch rod is perpendicular to the ground (or slightly tilted into the wind).

Just prior to launch, prepare the rocket's engine. There are many sizes of engines. Your kit will specify what size replacement you should use (for beginner engines, look for a letter from A-G on the package, specifying the amount of thrust the engine is capable of and that your rocket can safely handle). There are a couple ways that beginner rocket engines are mounted – either with a clip that holds the engine in or with a removable nozzle cap.



Never insert the ignited when the engine is outside the rocket this is shown for demonstration only



With the engine in place, insert the joined wire end of the igniter into the small hole on the engine. Hold the igniter in place by gently inserting a plastic plug. Don't drive it in too deeply or you risk damaging the igniter. Bend the igniter at roughly a 60-90 degree angle so the unjoined wires are more accessible.

Slide the rocket down the launch rod and remove the safety cap. Stretch out the wires to your launch controller and make sure that everyone is back the appropriate distance depending on the size engine in the rocket. Only when you're ready to launch, and with the key **OUT** of the controller, a responsible adult should attach the clips at the end of the controller to the igniter wires, as seen in the image to the right. Stand back as far as the controller wires allow, insert the safety key and begin your countdown.