

Gear to take to the launch site

After you have finished building or assembling your rocket. You are just about ready to take it out for its first launch. First, you need to gather all your gear before you head for the launch field.

I carry all my launch gear in a big yellow toolbox. The kind you find at your local hardware store. Some starter sets like the Quest Big Rage Deluxe come in a cardboard box that can double as a gear box.

Here is a list of essential items to take:

- Your rocket
- Launch pad complete with rod and blast plate
- Launch controller with fresh batteries
- Rocket engines
- Igniters
- Recovery wadding

As you get more serious about your launches, you'll probably take more rockets. You might find it helpful to take a few tools and quick repair parts with you too.

Picking a launch site

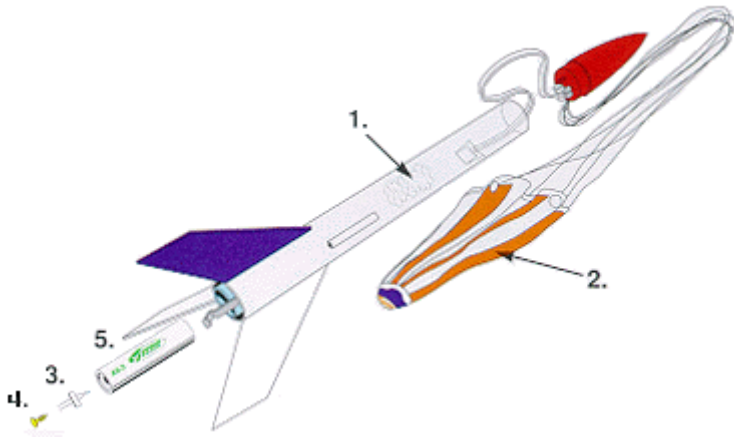
Now you are all packed and ready to go. The next step is choosing a good place for your launch.

The best launch sites are wide open areas away from trees, power lines, buildings, and other obstructions. Football fields, parks, and playgrounds make pretty good launch sites. Be sure your the site you choose is free from dry grass, leaves, or any other highly flammable materials.

As a general rule of thumb, your launch field should be at least as wide as 1/4th of the expected altitude of the rocket. For example if your rocket will fly up to 1000 feet, your launch field should be at least 250 feet in diameter. If the field is square, it should be at least 250 feet on the shortest side.

Rocket preflight preparation

When you get to your chosen launch site, setup your launch pad, and follow this simple sequence to prepare your rocket for flight:



1. Insert recovery wadding into the rocket(refer to the instructions for the correct amount).
2. Fold and insert the parachute or streamer and replace the nose cone.
3. Install an igniter into the engine.
4. Secure the igniter with a plug.
5. Insert the engine into the rocket's engine mount.

Launching your rocket

Every launch must be performed using a launch pad and an electronic launch controller. The rod on a launch pad helps the model rocket remain stable during the first crucial moments after liftoff and assures the rocket will safely climb straight up into the air.

1. Place the rocket on the launch pad.
2. Attach the launch controller clips to the igniter.
3. Be sure everyone is away from the rocket and ready for launch.
4. Stand back and insert the safety key into the launch controller.
5. Announce your countdown... 5,4,3,2,1, and press the launch button!



Model rocket flight profile

When the launch button is pushed, the electrically ignited rocket engine produces thrust that provides liftoff. The rocket accelerates into the sky. After the propellant is used up, a delay is activated allowing the rocket to coast. Smoke is emitted for tracking. As the rocket reaches its peak altitude, an ejection charge is activated, deploying the recovery system. The rocket returns safely to earth.

CONGRATULATIONS! You've completed your first successful launch.

Continue reading below to learn more about how model rocket engines work and read about U.S. Laws pertaining to model rocketry.

Estes Model Rocket Engines

These are the famous model rocket engines that made model rocketry the safe hobby it is today. They incorporate a safe, intelligent design, manufactured under precise and strict engineering tolerances. Estes model rocket engines have been proven consistent and reliable in more than 300,000,000 launches. They are the key to the outstanding safety record model rocketry has achieved over the past 40 years.

AeroTech Model Rocket Engines

AeroTech Composite Rocket Motors are the most technically advanced hobby motors in the world. These motors use the same solid propellant as America's space shuttle boosters. Pound for pound, this propellant delivers nearly three times the power of black powder model rocket motors, allowing you to fly larger rockets, heavier payloads, and achieve higher altitudes than ever before.

Propellant Types

Rocket engines come in many different propellant types each with its own special characteristics:

- **Black Powder (B)** Produces a slim white smoke trail and a sharp swish sound. This is the propellant that made model rocketry safe and fun for today's rocketeers.
- **White Lightning (W)** A brilliant white flame, dense bright white exhaust and a throaty roar are the hallmarks of this popular propellant.
- **Blue Thunder (T)** Produces a bright violet-blue flame with a minimum of exhaust smoke. These motors provide a higher level of thrust than White Lightning or Black Jack motors of the same total impulse.
- **Black Jack (J)** Provides the high visibility tracking of dense black exhaust. In addition to a distinctive lift off roar, these motors give your models lower acceleration and longer powered flight than White Lightning or Blue Thunder motors of the same total impulse.



- **Black Max (FJ)** Provides the high visibility tracking of dense black exhaust. In addition to a distinctive lift off roar, these motors provide slightly higher acceleration than White Lightning propellant.
- **Redline (R)** Unique liftoff characteristics for larger airframes and performance oriented flyers. The proprietary AeroTech formulation provides Redline with it's signature scarlet flame.

How a model rocket engine works

Insert engine into rocket. Insert igniter and igniter plug into engine. Place rocket over launch rod on launch pad, hook igniter clips to igniter.

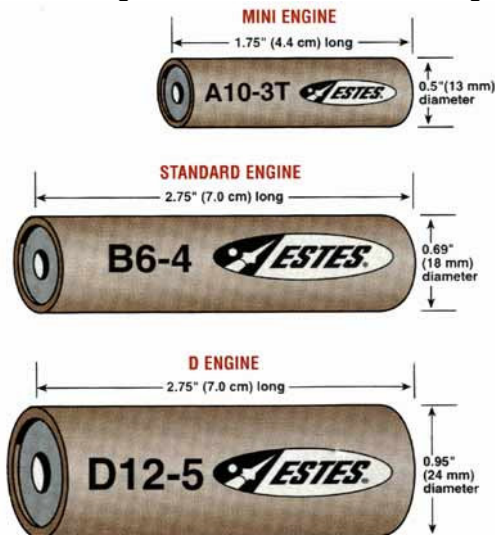


When launch button is pushed, engine produces thrust and boosts rocket into the sky. After propellant is used up, delay is activated allowing rocket to coast. Smoke is emitted for tracking. After delay, ejection charge is activated, deploying recovery system.

Selecting the Proper Engine

Launch Pad 2000 offers several Quest, Estes, and AeroTech model rocket engines that range in total impulse from 1/4A-F. These engines may be used with the rockets listed on these web pages or other Custom, Quest, or Estes model rockets. The description of each kit lists recommended engines. Select your engines based on these recommendations.

Rocket engines are labeled with a coding system that fully describes the engine.



The letter indicates the engines **total impulse in newton seconds**. Each succeeding letter has up to twice the impulse of the previous letter which results in approximately twice the altitude. For example: a B motor has twice the impulse of an A motor, and a C motor has twice the impulse of a B motor, and so on.

The first number after the letter shows the engines average thrust in newtons. (4.45 newtons = 1 pound)

The last number gives you the amount of delay between the end of thrusting and the ejection charge. Engines with a 0 second delay are used in the bottom stage of a multi-stage rocket.

Laws Pertaining to Model Rocketry

In the United States model rocketry is regulated by the following agencies and organizations:

U.S. Department of Transportation Rocket engines are classified for shipping and transport.

U.S. Consumer Product Safety Commission

Model rocket engines complying with certain requirements have been exempted from classification as a banned hazardous substance. Engines and/or their packaging have specific labeling and instruction requirements.

Federal Aviation Agency Has exempted model rockets weighing 16 oz. (453 g) with engine(s) or using less than 4 oz. (113 g) of propellant from regulation.

National Fire Protection Association

Developed and adopted ANSI/NFPA 1122 Code for Model Rocketry setting standards for the safety of the activity of model rocketry. To purchase a copy of NFPA 1122 write or call:

In addition, many states have adopted their own model rocketry laws and regulations.

States with additional legal regulatory requirements are:

California (effective July 1992)

- To purchase 1/4A through D engines, you must be 14 years of age or older.
- To purchase E or larger engines, you must be 18 years of age or older.
- Children as young as 12 may participate in an educational model rocketry program with adult supervision.
- Launch sites must be approved by the local fire marshal.
- The California State Fire Marshal's seal must be on all approved model rocket engines. Do not purchase engines without the seal.

State of California regulations can be obtained from: Chief Ron Coleman
CDF/Office of the State Fire Marshal Fire Engineering, FW Program
P.O. Box 944246 Sacramento, CA 94244-2460



Model Rocketry Safety Code

1. **Materials.** I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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. If my model rocket weighs more than one pound (453 grams) at liftoff or has more than four ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration regulations before flying.
8. **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.
9. **Launch Site.** I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and 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.

LAUNCH SITE DIMENSIONS				
Minimum Installed Total Impulse (Newton-seconds)		Equivalent Engine Type	Site Dimension	
			(feet)	(meters)
0.00	1.25	1/4A & 1/2A	50	15
1.26	2.50	A	100	30
2.51	5.00	B	200	60
5.01	10.00	C	400	120
10.01	20.00	D	500	150
20.01	40.00	E	1000	300
40.01	80.00	F	1000	300
80.01	160.00	G	1000	300
160.01	320.00	2Gs	1500	450

10. **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.
11. **Recovery Safety.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

Revision of February, 2001

This is the official Model Rocketry Safety Code of the National Association of Rocketry and the Model Rocket Manufacturers Association.

Important Note: "G" engines must be sold to and used by adults (18 and up) only.

To launch large model rockets weighing more than one lb. (453 g) but no more than 3.3 lbs. (1500 g) including propellant or rockets containing more than 4 oz. (113 g) but no more than 4.4 oz. (125 g) of propellant (net weight), you must notify and perhaps obtain authorization from the Federal Aviation Administration (FAA). Check your telephone directory for the FAA office nearest you or contact Estes Industries for further information.