MODEL ROCKET ENGINE INSTRUCTIONS

WARNING FLAMMABLE

STORAGE: Store engines in a cool, dry place. Never expose to temperatures above 150° Fahrenheit.

IN CASE OF FIRE: Fires near or among model rocket engines should be extinguished in a normal manner. Water or foam is recommended for preventing ignition of engines.

DISPOSAL: Damaged, defective, or unwanted engines should be destroyed by soaking in water.

FIRST AID: For minor burns use first-aid burn ointment. For severe burns consult a physician. In case propellant is swallowed, induce vomiting and call a physician.

ROCKET ENGINE SELECTION: Consult the current Estes catalog or the instructions which came with your model rocket kit for the recommended engines to use in the model. Always follow the model manufacturer's recommendations when mounting the engine in the model.
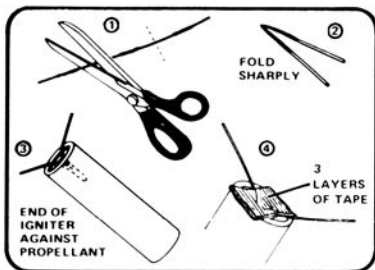

IGNITER INSTALLATION: Launch model rockets by electrical means only. To operate, the electrical igniter must be installed carefully:
1) Cut apart the igniters midway between the coated sections.
2) Fold one igniter sharply at the middle. The sharper the bend, the better.
3) Insert igniter into the nozzle. Make sure it goes in until you feel it touch the propellant. Spread the two igniter leads apart, being extra careful so you don't pull the igniter back out as you spread the leads. Make sure the bare leads do not touch each other. Igniter coating must touch propellant.
4) Press a 1/2 inch square of masking tape down over the leads and the rear of the nozzle to hold the igniter in place. Press the tape down very firmly. Firmly press down two more squares of tape on top of the first one. The engine is now ready for use.
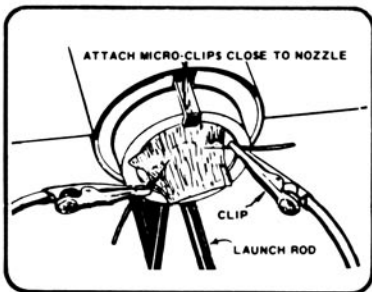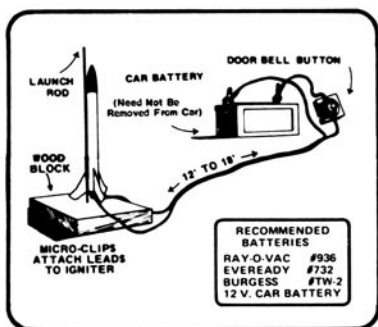

PREPARING FOR LAUNCHING: Double-check the recovery system of your model before launching. Parachute and streamer recovered models should have enough wadding between engine and recovery system to prevent scorching the parachute or streamer and assure positive ejection. The wadding should fill the tube for a distance of at least 1-1/2 body tube diameters.

Lower the rocket into position on the launch rod or rail. Clean the micro-clips, then clip one to each lead of the igniter. The clips must not touch each other, and the igniter leads must not cross. The rocket may be supported with a scrap of wood or an empty engine casing to make it easier to attach the clips and to keep the clips from short circuiting.

COUNTDOWN: Give a countdown before launching your rocket. First arm the launch panel. Then begin counting: "5-4-3-2-1-Launch". Press the switch at "launch". If the batteries are strong the engine will ignite immediately. As the batteries weaken there will be a short delay before ignition. Disarm the panel as soon as the rocket takes off.

MISFIRES: Occasionally the igniter will heat and burn into two pieces without igniting the engine. This is almost always caused by a failure to install it correctly. Disarm the launch panel, remove the model, clean the igniter residue from the nozzle, and install a new igniter. Follow the launching procedure again.

If the batteries are weak or the electrical system is defective, the igniter may not operate. After removing the model, connect the clips to a piece of #30 nichrome wire or a 12 volt lightbulb and check all contacts and batteries until the wire or light glows. The batteries must be strong enough to force at least two amperes of current through the igniter. If the current is low it will take the igniter several seconds to heat. The power supply should provide at least six volts to do the job quickly and efficiently.

This system requires at least 12 feet of 18 gauge, 2 conductor wire, a spring return switch (A door bell button will work.), a suitable launching stand with a 36'' long 1/8'' diameter launching rod to guide the model as it lifts off, two battery clips, two micro-clips, and a heavy capacity 6 or 12 volt battery. Car batteries are recommended for this type of system. When using a car battery it is not necessary to remove it from the car.

CLUSTERS: A cluster consists of two or more engines which are ignited at the same time. For information on cluster ignition and building techniques read Estes Industries Technical Report TR-6, Cat. No. 84726.

LAUNCH SYSTEMS: An Estes electrical launch system is recommended for all model rocket launching. Some rocketeers, however, prefer to design and build their own launching systems. A simple home-made launching system is illustrated.

MULTI-STAGING: Estes multi-stage models are designed to ignite their upper stages automatically. Full information on multi-stage techniques is contained in Technical Report TR-2, Cat. No. 84722.

——— ENGINE CLASSIFICATION ———
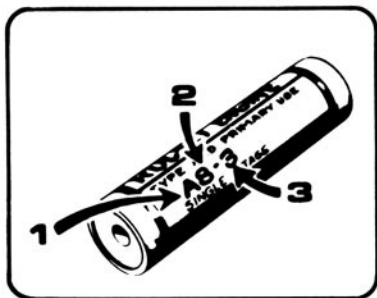
Estes engines are stamped with a code designation which gives important data on the engine's performance capabilities. Here's how to read this coding: (Refer to engine illustration above.)
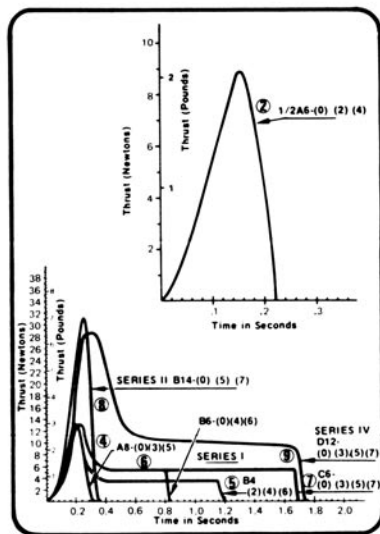
The label color of Estes engines indicates the recommended use. **GREEN** engines are for use in single stage models; **PURPLE** engines for the top stages of multi-stage rockets, and **RED** engines for all booster and intermediate stages of multi-stage models.

☐ **1** This portion indicates the "total impulse" or total power produced by the engine as shown in the chart.

Engine Type	Total Impulse		Average Thrust		Propellant Weight	Thrust Curve Number
	Pound-seconds	Newton-seconds	Pounds	Newtons		
½A6-	0.28	1.25	1.35	5.8	0.00344 lb.	2
A8-	0.56	2.50	1.80	7.7	0.00918 lb.	4
B4-	1.12	5.00	0.90	4.15	0.01836 lb.	5
B6-	1.12	5.00	1.35	5.8	0.01374 lb.	6
B14-	1.12	5.00	3.15	14.0	0.01374 lb.	8
C6-	2.25	10.00	1.35	5.8	0.02748 lb.	7
D12-	4.48	20.00	2.66	11.8	0.05496 lb.	9

☐ **2** This portion is the engine's average thrust in Newtons (1 Newton equals 0.224 pounds). For normal flying an average thrust of 3 to 7 Newtons is recommended.

☐ **3** This number gives the delay in seconds between burnout and ejection charge activation. Engines with "0" have no delay charge and are for use in booster stages only.

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