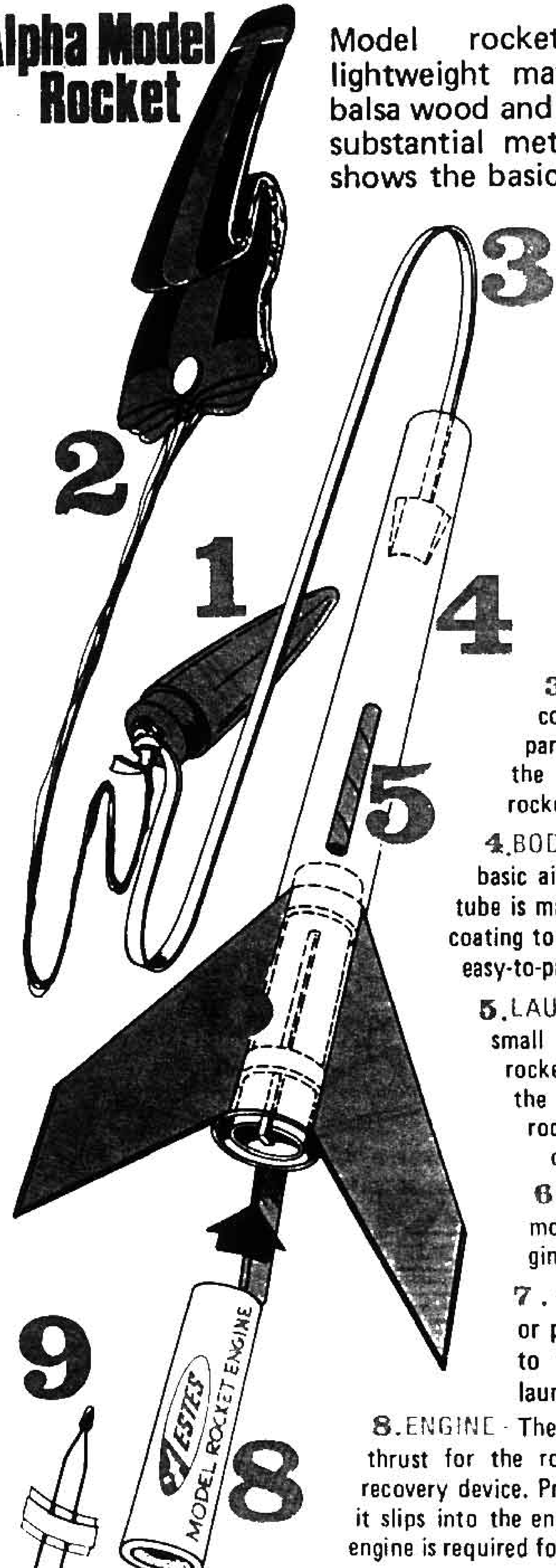
Basic Model Rocket Components

Alpha Model Rocket



Model rockets are constructed of lightweight materials such as paper, balsa wood and plastic, and include no substantial metal parts. The diagram shows the basic components found in most model rocket kits.

1. NOSE CONE - Usually made of plastic or balsa, the nose cone guides the air around the rocket.

2. PARACHUTE and SHROUD LINES - The parachute (like all types of model rocket recovery devices) is designed to slow the rocket's descent to a gentle landing. Parachutes are made of thin plastic. The shroud lines attach the parachute to the nose cone.

3. SHOCK CORD - The shock cord absorbs the shock of the parachute's opening and connects the nose cone to the body of the rocket.

4. BODY TUBE - The body tube is the basic airframe of the rocket. The body tube is made of rolled paper with a special coating to add strength and make the tube easy-to-paint.

5. LAUNCH LUG - The launch lug is a small tube located on the side of the rocket. It slips over the launch rod on the launch pad and helps guide the rocket during the first few feet of flight.

6. ENGINE MOUNT - The engine mount centers and holds the engine in place in the body tube.

7. FINS - Usually made of balsa or plastic, the fins provide guidance to the rocket after it leaves the launch rod.

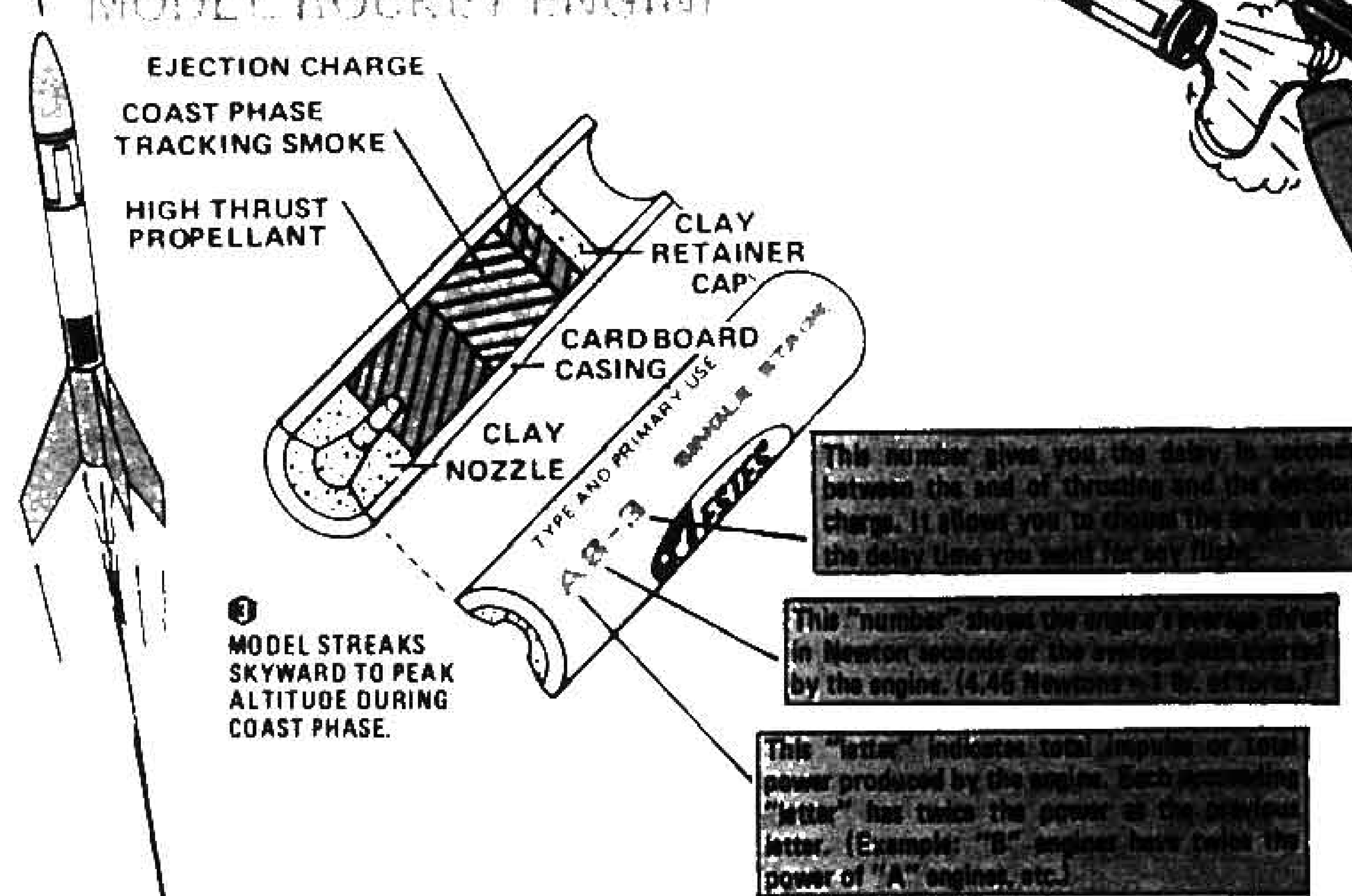
8. ENGINE - The model rocket engine provides the thrust for the rocket flight and also ejects the recovery device. Pre-manufactured and ready-to-use, it slips into the engine mount of the rocket. A new engine is required for each flight.

9. IGNITER - The electrical igniter provides a safe and reliable method of igniting the rocket engine.

Model rocketry is recommended for ages 10 to adult. Adult supervision is suggested for those under 12 years of age when flying model rockets.

Flight Profile and Engine Selection

Flight Profile



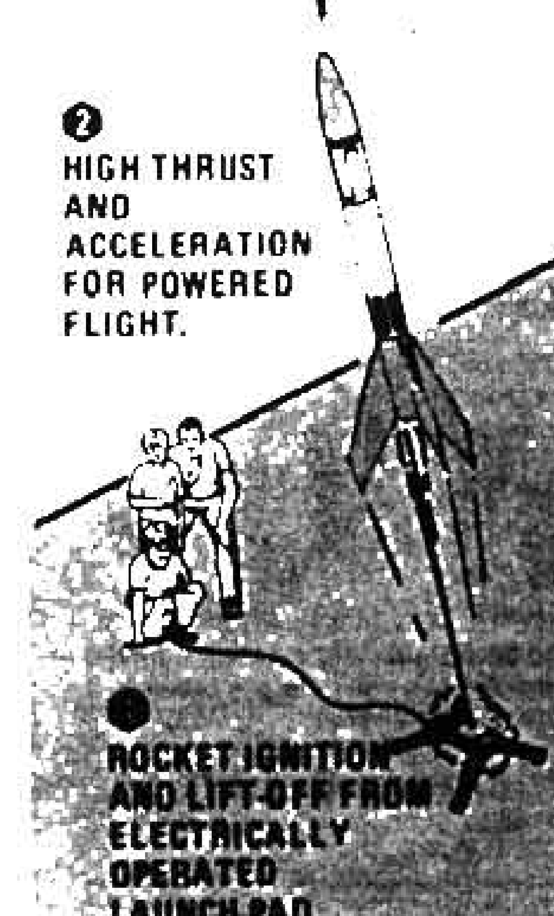
Recommended Launch Area:

In choosing a launch area, the larger the better. Football fields, parks, and playgrounds are great. The chart below shows the smallest recommended sizes. Remember, the larger the launch area, the better your chance of recovering your rocket. Choose a large field away from power lines, tall buildings, tall trees, and low flying aircraft.

MAKE SURE THE AREA WHERE YOU SET UP YOUR LAUNCHER IS CLEAR OF OBSTRUCTIONS AND HAS NO DRY WEEDS OR HIGHLY FLAMMABLE MATERIALS.

Engine Types	Minimum Launch Site Dimension*	Maximum Altitude
1/4A – 1/2A	50 Feet	200 Feet
A	100 Feet	400 Feet
B	200 Feet	800 Feet
C	400 Feet	1600 Feet
D	500 Feet	1800 Feet

*Minimum Launch Site Dimension for Circular Area is Diameter in Feet, and for Rectangular Area is Shortest Side in Feet.



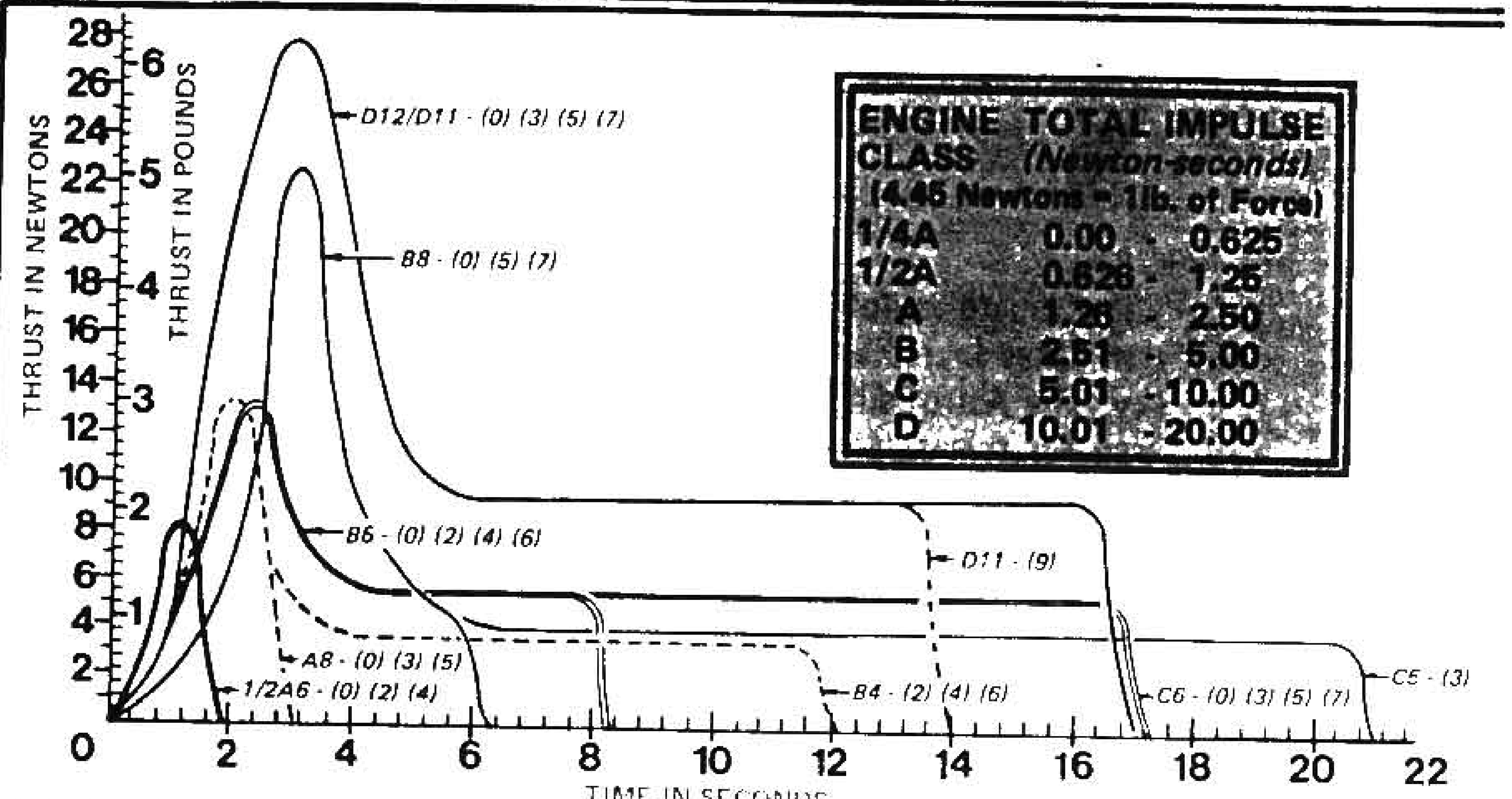
Estes model rocket engines are safety and contest certified by the National Association of Rocketry (N.A.R.) and meet the specifications and requirements set-forth by the National Fire Protection Association.

Safety

165 Million Safe Launchings

Today's modern model rocket engine is the result of over 20 years of engineering effort by Estes Industries. Consequently, today's rocketeer has dependable, safety-proven engines for his use. Because model rocket engines are pre-manufactured and self-contained, there is no need for the model rocketeer to handle any hazardous propellants. Over 165 million safe model rocket flights have proven that Estes model rocket engines are safe. Estes engines are manufactured under controlled conditions within exacting tolerance limits. You can count on them for consistent performance from one launch to the next. The Model Rocketeer's Safety Code found on page 8 of this booklet has contributed greatly to this safety record. Be sure to read and follow it carefully.

Thrust/Time Curve



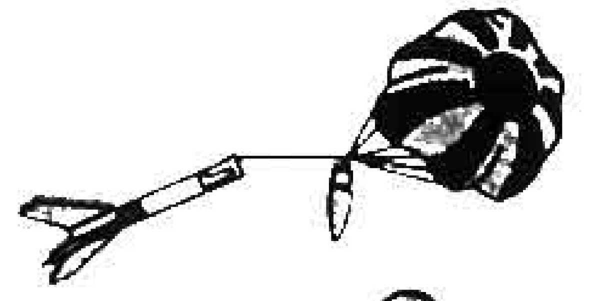
ENGINE CLASS	TOTAL IMPULSE (Newton-seconds) (4.45 Newtons = 1lb. of Force)
1/4A	0.00 - 0.625
1/2A	0.626 - 1.25
A	1.26 - 2.50
B	2.51 - 5.00
C	5.01 - 10.00
D	10.01 - 20.00

Thrust/time curves show the relative power of one engine in comparison to others. The graph above shows thrust/time curves for all Estes engines. In a thrust/time curve, the thrust in Newtons (4.45 Newtons = 1 lb. of force) of the engine is plotted against the thrust duration in seconds. The shape of the curve can tell a great deal about the way the engine works. The size of the curve relates directly to the Total Impulse (a measure of the total power of the engine). The chart above lists Total Impulse for most types of model rocket engines. You can see how the power of the engine doubles with each engine type. A type "B" engine is twice as powerful as an "A" engine and so on.

Recovery

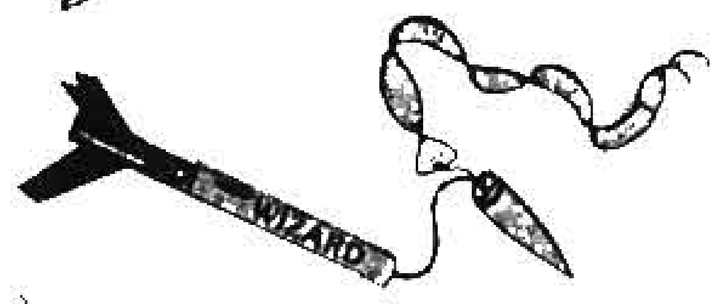
PARACHUTE RECOVERY

At apogee (the rocket's peak of flight) the engine's ejection charge pops the nose cone off and pushes out a plastic parachute which fills with air and allows for a gentle recovery of medium and heavier weight models.



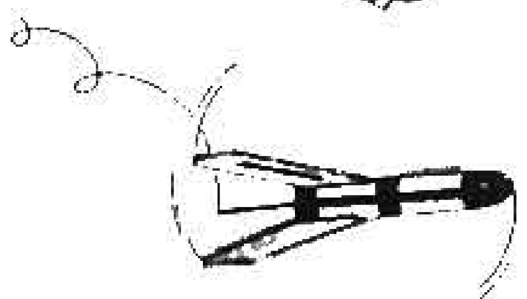
STREAMER RECOVERY

The engine's ejection charge deploys a long, narrow crepe paper or plastic streamer which unfurls and flaps against the wind slowing the rocket's descent.



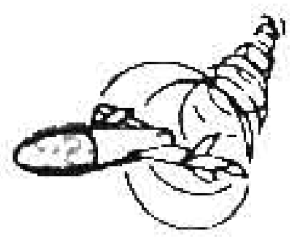
TUMBLE RECOVERY

In lightweight models, the engine's ejection charge can shift the position of the engine thus changing the stability of the model allowing it to tumble gently, end over end, to Earth.



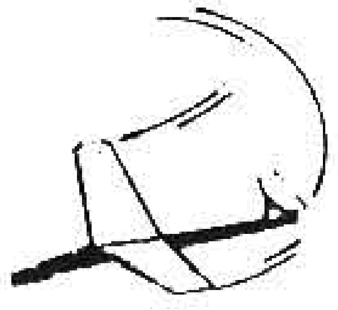
ROTOR RECOVERY

The engine's ejection charge deploys spin surfaces causing the rocket to rotate, thus slowing its descent.



GLIDER RECOVERY

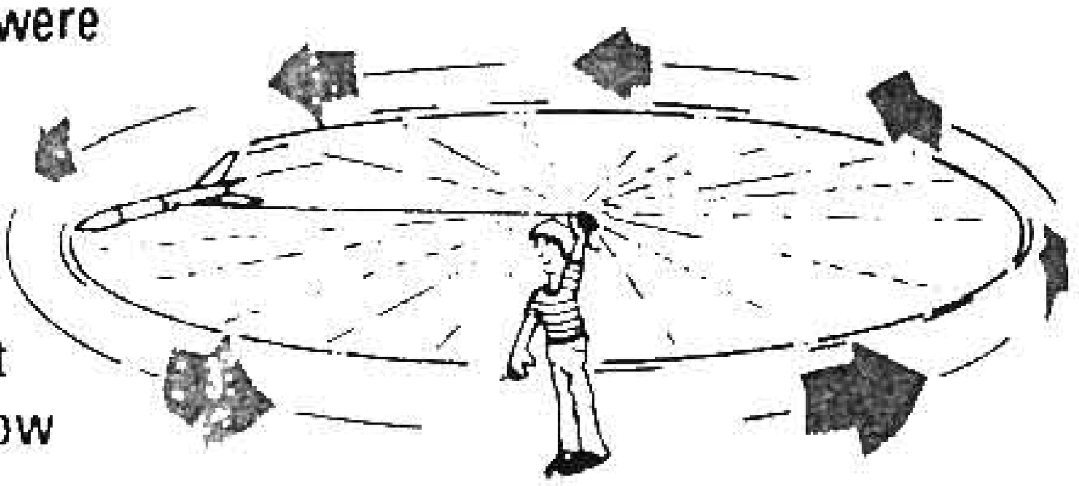
Boosted into the air on a rocket, the glider is released at the peak of flight and glides back while the carrier rocket or boost pod is usually recovered by parachute.



Stability

Always test your model for stability before flying it. Testing stability is easy to do, just use the swing test described below.

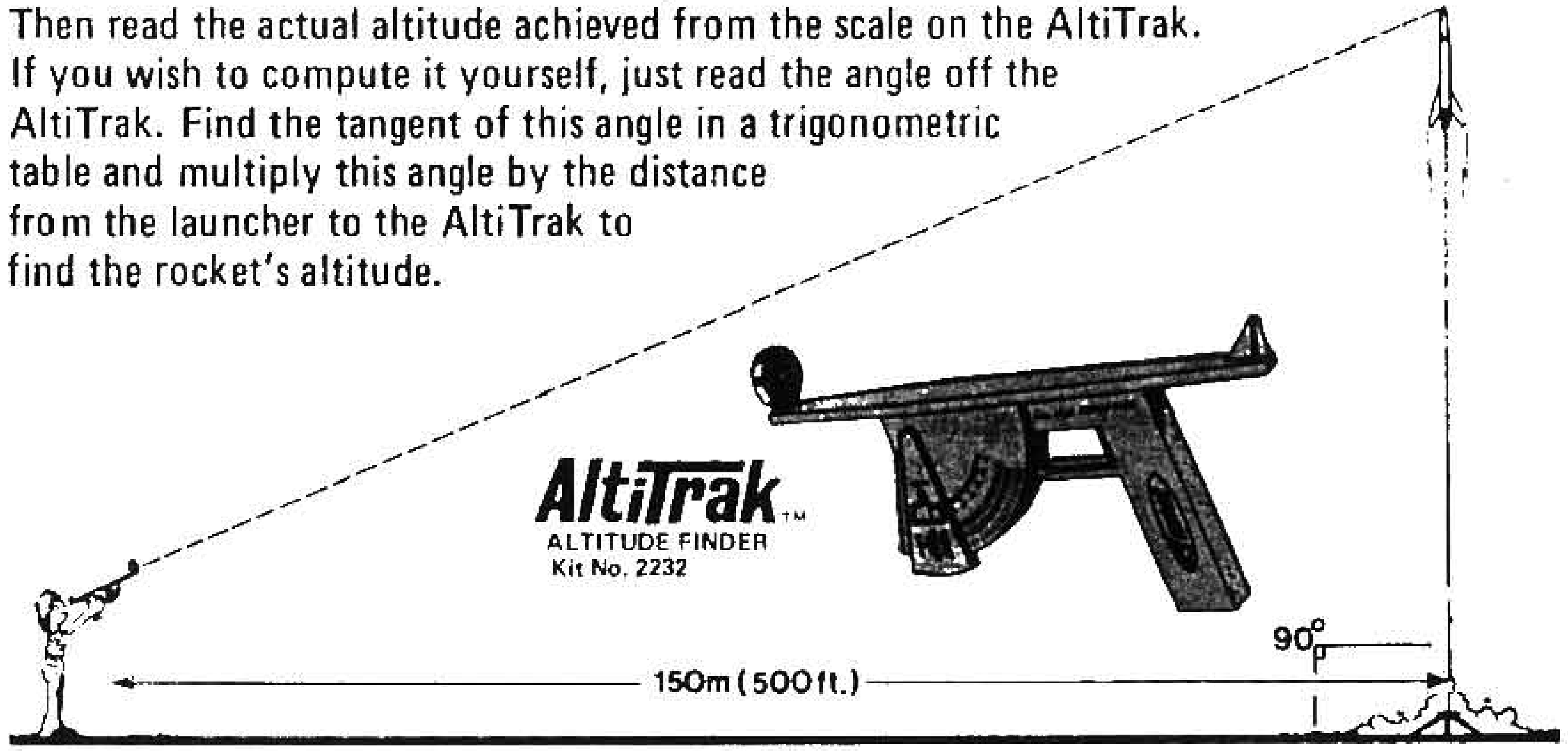
Find the rocket's center of gravity (CG) by balancing the rocket on a straight edge. The rocket should be fully loaded, just as if you were about to put it on the launcher. Tie one end of a 6 to 8 foot string around the rocket at the CG. Now swing the rocket around your head and watch it as it passes your eyes. If the nose of the rocket points straight into the oncoming air it is stable. You can now launch your rocket safely.



If your model does not point into the wind, correct the stability by adding a small nose weight and try the test again.

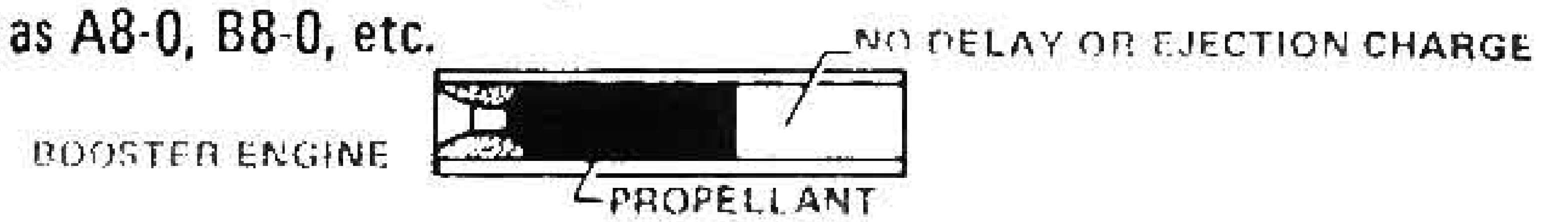
Altitude Tracking

Finding the altitude of your rocket is easy with the Estes AltiTrak (#2232) altitude finder. Locate yourself at 150 meters (500 feet) from the launch site at right angles to the direction of the wind. The AltiTrak will measure the angle between the ground and a line drawn between you and the rocket at peak altitude. Just follow your rocket's flight with the AltiTrak and lock it in when your rocket reaches it's peak altitude. Then read the actual altitude achieved from the scale on the AltiTrak. If you wish to compute it yourself, just read the angle off the AltiTrak. Find the tangent of this angle in a trigonometric table and multiply this angle by the distance from the launcher to the AltiTrak to find the rocket's altitude.

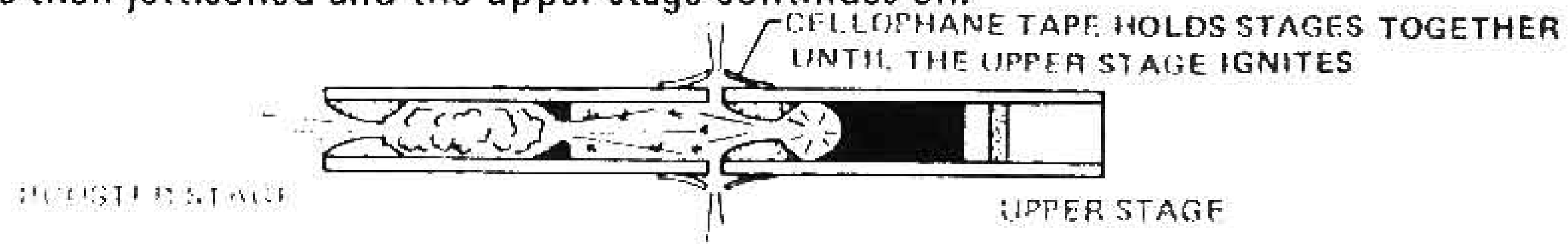


Multi-Staging

Using more than one stage in a model rocket allows you to achieve higher altitudes. Once the power of the engine in one stage is used up, the extra weight of the stage and expended engine is dropped away, and the rocket continues thrusting under the power of the upper stage engine. All booster engines have a "0" (zero) at the end of their type designation such as A8-0, B8-0, etc.



Use only booster engines in lower stages. Booster engines contain only the propellant portion of the engine - no delay or ejection charge. After the booster engine has completed most of its thrusting period, it ignites the engine above it in mid-flight. The lower booster stage is then jettisoned and the upper stage continues on.



When flying multi-staged models, never use more than three stages. Also, be especially sure to swing test the rocket with each stage in place, and also without each stage to be sure the rocket will be stable in all configurations during flight.