

Big Bertha

FLYING MODEL ROCKET

SKILL LEVEL 1

1. Beginner 2. Intermediate 3. Craftsman
4. Advanced 5. Expert

Big, burly rocket with slow, realistic lift-off for really spectacular flights. Perfect kit for a "big" second rocket. Ideal for demonstration launches. 24" from nose to tail, quick-release engine mount, and giant 18" parachute recovery make it a real favorite of rocketeers.

2 Feet Tall!



This is a hobby kit requiring assembly. Recommended for ages 10 to adult. Engines, launch system, glue and finishing supplies are not included. Adult supervision is suggested for those under 12 years of age when flying model rockets.

Specifications:

Length: 24" (61cm)
Diameter: 1.637" (41.6mm)
Weight: 2.2 oz. (62.4g)

Recommended Engines:

A8-3 B4-2 B6-2 (First flight)
B6-4 C6-5



A SUBSIDIARY OF DAMON

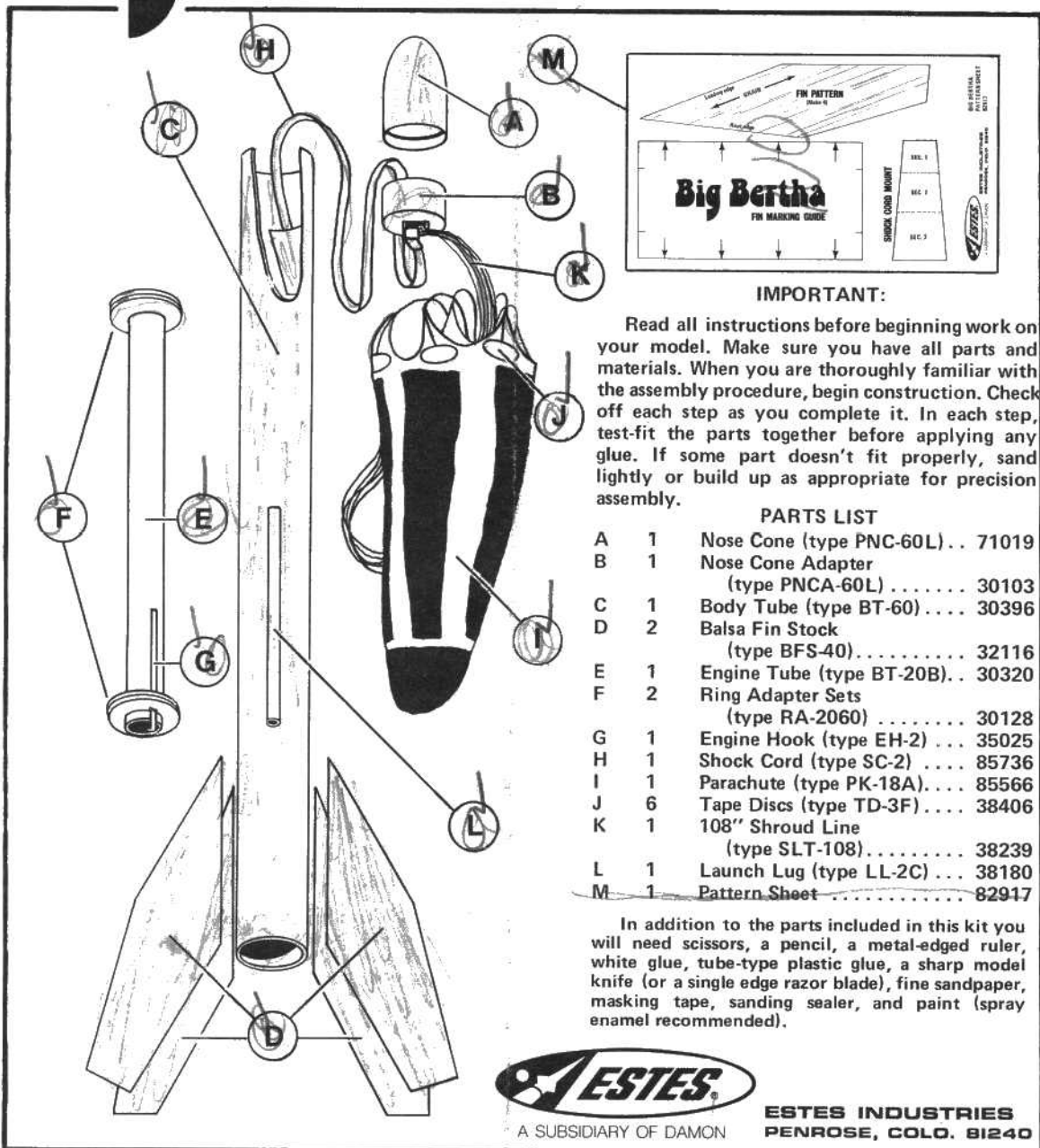
ESTES INDUSTRIES
PENROSE, COLO. 81240



Big Bertha

KIT NO.1223

SKILL LEVEL I



IMPORTANT:

Read all instructions before beginning work on your model. Make sure you have all parts and materials. When you are thoroughly familiar with the assembly procedure, begin construction. Check off each step as you complete it. In each step, test-fit the parts together before applying any glue. If some part doesn't fit properly, sand lightly or build up as appropriate for precision assembly.

PARTS LIST

A	1	Nose Cone (type PNC-60L) . . .	71019
B	1	Nose Cone Adapter (type PNCA-60L)	30103
C	1	Body Tube (type BT-60)	30396
D	2	Balsa Fin Stock (type BFS-40)	32116
E	1	Engine Tube (type BT-20B) . . .	30320
F	2	Ring Adapter Sets (type RA-2060)	30128
G	1	Engine Hook (type EH-2) . . .	35025
H	1	Shock Cord (type SC-2)	85736
I	1	Parachute (type PK-18A)	85566
J	6	Tape Discs (type TD-3F)	38406
K	1	108" Shroud Line (type SLT-108)	38239
L	1	Launch Lug (type LL-2C)	38180
M	1	Pattern Sheet	82917

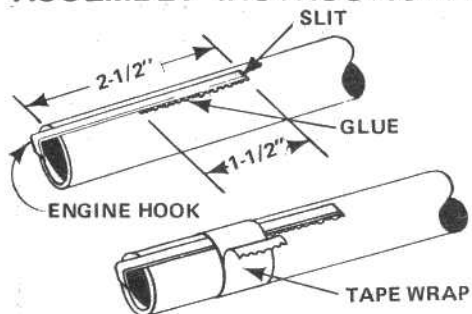
In addition to the parts included in this kit you will need scissors, a pencil, a metal-edged ruler, white glue, tube-type plastic glue, a sharp model knife (or a single edge razor blade), fine sandpaper, masking tape, sanding sealer, and paint (spray enamel recommended).



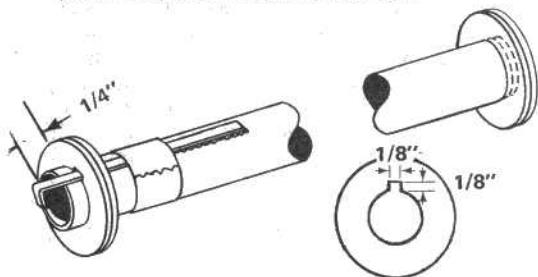
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ASSEMBLY INSTRUCTIONS



- 1** Measure 2-1/2" from one end of the engine tube (part E) and cut a 1/8" wide slit. Apply a 1-1/2" long line of glue to the tube as shown. Push one end of the engine hook (part G) into the slit and press the main part of the hook into the glue. Wrap at least three layers of masking tape around the tube and the engine hook at approximately the mid point of the hook.

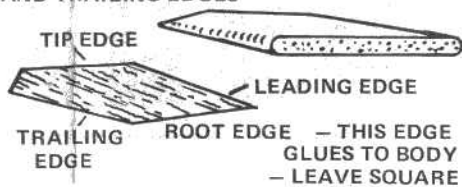


- 2** Separate the adapter rings from the die-cut cards (part F) and glue the rings together in pairs. When the glue has set, cut a 1/8" X 1/8" slot into one pair as shown above. Slide the slotted ring onto the engine hook end of the tube until 1/4" of the tube is through. Make sure engine hook is free to move up and down in the 1/8" X 1/8" slot. Slide the other ring onto the front of the tube until about 1/16" of the tube is through. Apply a line of glue at the ring tube joint on both sides of each ring. Be sure not to get glue on the engine hook where it passes through the ring. Let this assembly dry completely.

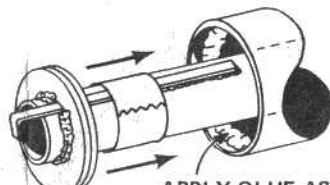


- 3** Cut out the fin pattern from the pattern sheet (part M). Lay the pattern on the balsa fin stock (part D) with the leading edge flush with the side edge of the sheet as shown above. Grain indicates arrows should parallel the grain in the wood. Trace out four fins, two on each sheet of

ROUND LEADING, TIP, AND TRAILING EDGES

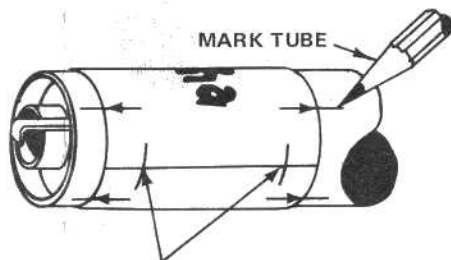


balsa. Cut out the fins carefully. Sand each side smooth and round all edges except the root edge of each fin.



APPLY GLUE AS SHOWN, THEN SLIDE ASSEMBLY INTO PLACE

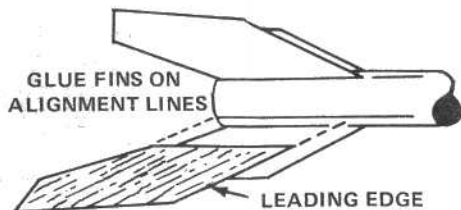
- 4** Check the fit of the engine holder tube assembly into the main body tube (part C). The front rings should be a smooth slide fit. The rear rings may be a tight slide fit, for they must only travel 1/4" into the body tube. Sand rings as needed to obtain the desired fit. Slide the front rings part way into the body tube and apply a line of glue about 1/4" inside the body tube. Slide the engine holder assembly in until the rear rings are 1/4" inside the body tube. Rub a line of glue around the ring-tube joint and support the body tube in a vertical position until this assembly is dry.



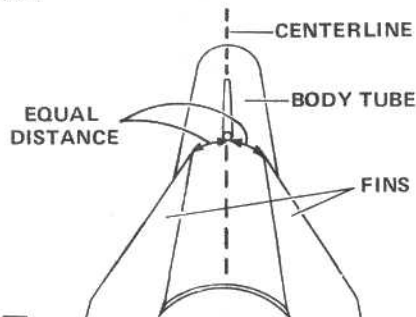
MATCH LINES

- 5** Cut out the fin spacing guide, wrap it around the rear end of the body and mark the tube at each of the arrow points. Draw a straight connecting line between each matching front and rear mark.

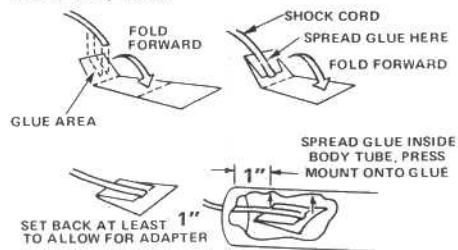
RUB A LINE OF GLUE INTO ROOT EDGE OF EACH FIN



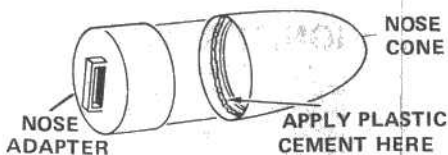
- 6** Rub a line of glue into the root edge of each fin and allow to dry. Glue the fins to the body tube with the edge of the fin along one of the lines drawn in step 5. Align the fin so it projects straight away from the body tube. Following the same procedure, attach the other three fins. Do not set the rocket on its fins while the glue is wet.



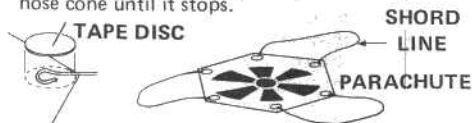
- 7** Glue the launching lug to the body tube so its rear is even with the front of the fins and is halfway between two fins as shown. Sight along the tube and align the lug so it runs parallel to the body tube.



- 8** Cut out the shock cord mount. Prefold it on the dotted lines, then flatten it out again. Smear glue over section 1. Lay the end of the shock cord into place and fold section 1 over. Apply glue to the back of section 1 and the exposed part of section 2 and fold again. Clamp the unit together with your fingers while the glue sets. Apply glue to the inside of the body tube over an area approximately 1" to 1-1/2" from the front end. The glue should cover a shape approximately the same as the shock cord mount. Press the mount onto the glue and hold it until the glue sets.



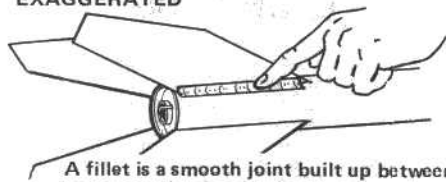
9 Trim away any excess plastic from the two nose cone pieces. Run a line of PLASTIC CEMENT around the nose cone just inside from the end. Push the adapter piece firmly into the nose cone until it stops.



10 Cut out the parachute on its edge lines as indicated on the plastic. Cut three 36 inch lengths of shroud line. Attach line ends to the surface of the parachute with tape discs as shown above. Pass shroud line loops through nose cone lug, pass parachute through loops and pull lines tight on lug. Set this knot with a drop of glue. Tie shock cord securely to nose cone lug.

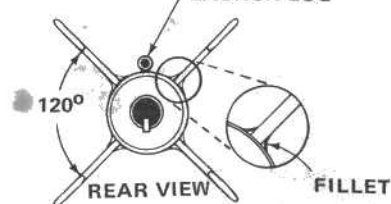
11 Reinforce the fin and launch lug joints with glue. Holding the rocket horizontally (level), apply a line of glue to both sides of each joint. Smooth out the glue with your finger. Keep the rocket level until the glue dries.

FILLETS SHOWN ARE SLIGHTLY EXAGGERATED



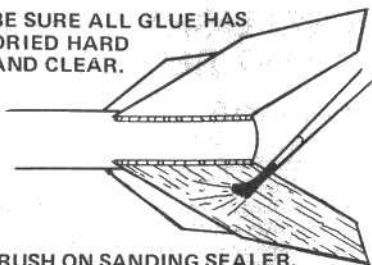
A fillet is a smooth joint built up between body and fin by applying glue along the joint and smoothing the glue with a finger.

LAUNCH LUG

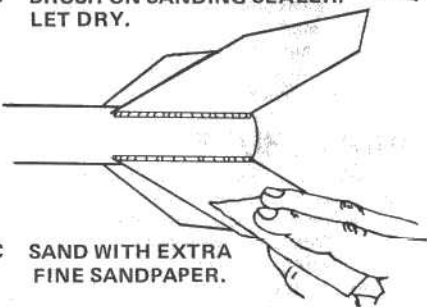


11 Reinforce the fin and launch lug joints with glue. Holding the rocket horizontally (level), apply a line of glue to both sides of each joint. Smooth out the glue with your finger. Keep the rocket level until the glue dries.

A BE SURE ALL GLUE HAS DRIED HARD AND CLEAR.



B BRUSH ON SANDING SEALER. LET DRY.



C SAND WITH EXTRA FINE SANDPAPER.

SPRAY PAINT FOR BEST RESULTS



SHAKE CAN PERIODICALLY

When all glue on the outside of the model is dry, prepare the balsa parts for painting. Apply at least two coats of sanding sealer to the fins. Let dry and sand lightly between coats. Do this until the tiny holes in the wood are filled and everything looks and feels smooth.

Push the parachute into the body tube, packing the shroud lines and shock cord over it. Push the base of the nose cone into the forward end of the body tube.

Give the rocket at least one clean base coat of glossy white enamel, then give it two or more coats of the final colors to produce the best appearance.

Trim color may be applied with tape, decals, or sprayed on.

Be sure to follow the *HIAA-NAR Model Rocketry Safety Code when carrying out your model rocket activities.
*HIAA-NAR - Hobby Industry Association of America
National Association of Rocketry

PREFLIGHT PREPARATION AND RECOVERY TIPS

WADDING

This material is used to protect your parachute from the heat of the engine's ejection charge. Recovery Wadding (Cat. No. 2274) is flame resistant, thus eliminating the possibility of recovery system failure.

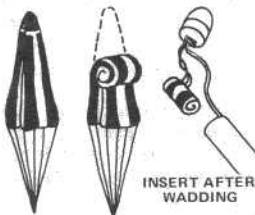
For maximum efficiency use enough wadding to fill the rocket body tube for a distance of twice the body diameter. Usually four or five squares will be adequate for this model rocket. When preparing the rocket for flight, crumple the wadding loosely to get the maximum bulk from it and still obtain a good seal against the wall of the tube. Pack the 'chute in over the wadding.

PARACHUTE

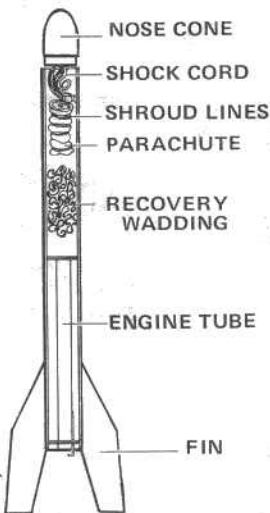
Fold the parachute into a triangular shape. Roll 'chute tightly as shown and wrap shroud lines around it. If 'chute is too large, unroll and repack until it slides easily into the rocket. A very tight fit may prevent parachute from ejecting properly.

Pack shock cord neatly into rocket and slide nose cone into place. NOTE: DO NOT pack parachute until you are actually ready to launch. For maximum parachute reliability, lightly dust the 'chute with ordinary talcum powder before each flight, especially in colder weather.

FOLD AND WRAP SHROUD LINES AROUND PARACHUTE



INSERT AFTER WADDING



NOSE CONE

Nose cone should separate easily from rocket body tube, but not be extremely loose. If fit is too tight, sand inside of body tube end and shoulder of nose cone with fine sandpaper.

If nose cone is too loose add a wrapping of transparent tape or masking tape to the shoulder of the nose cone.

ENGINE FIT

To activate parachute recovery gear correctly, the engine MUST be held in place SECURELY.

Make sure the end of the engine hook latches securely over the end of the engine.

ENGINE HOOK MUST LATCH SECURELY



IGNITER INSTALLATION

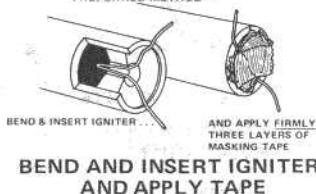
Estes standard Astron igniters are supplied in strips and should be cut apart (Scissors will work.) midway between the coated sections. Bend the igniter at the middle as shown and push it into the engine nozzle as far as it will go.

Estes "Solar" igniters (Cat. No. 2301) are supplied pre-cut and pre-shaped for direct insertion into the engine nozzle. Be sure to push the Solar igniter into the engine nozzle as far as it will go.

To operate properly, both types of igniters must touch the propellant grain. Spread the leads and apply three squares of masking tape to the nozzle and leads as shown. The eraser on the end of a pencil is good for pressing the tape securely into place.

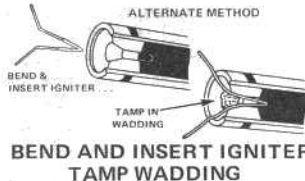
An Estes standard Astron igniter can also be held in place by rolling a 1" square of flame-proof wadding into a ball and inserting it into the nozzle with a pen or pencil to hold the igniter firmly in place.

PREFERRED METHOD



BEND AND INSERT IGNITER AND APPLY TAPE

ALTERNATE METHOD



BEND AND INSERT IGNITER TAMP WADDING

LAUNCHING

Lower the rocket into position on the launch rod. 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 an empty engine casing to make it easier to attach the clips and to keep the clips from touching the blast deflector plate and short-circuiting.

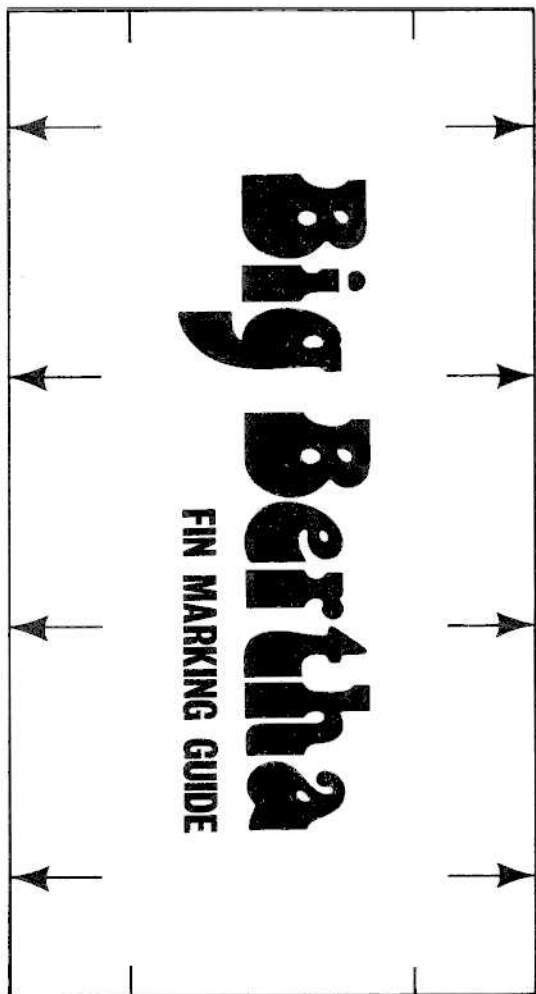
COUNTDOWN: Give a countdown before launching your rocket. First arm the launch panel. Then begin counting: "5-4-3-2-1-Launch." Press the button and hold it down until the rocket lifts-off.

ATTACH MICRO-CLIPS CLOSE TO NOZZLE

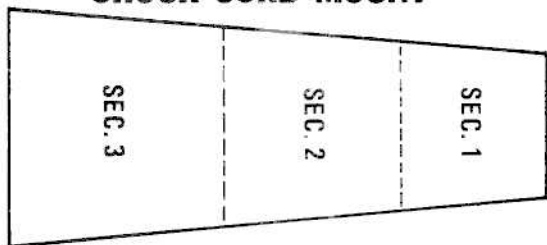


MISFIRE PROCEDURE

Occasionally the igniter will heat and burn into two parts 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.



SHOCK CORD MOUNT



A SUBSIDIARY OF DAMON

ESTES INDUSTRIES
PENROSE, COLO. 81240

BIG BERTHA
PATTERN SHEET
82917

Model Rocketry Safety Code



VERY IMPORTANT!

PLEASE READ AND BECOME FAMILIAR WITH THE MODEL ROCKETRY SAFETY CODE ON THE REVERSE SIDE OF THIS CARD. PLEASE SIGN WHERE INDICATED AND KEEP THIS CODE WITH YOU DURING ALL YOUR MODEL ROCKETRY ACTIVITIES.

CAUTION-WARNING: For your safety DO NOT alter, dismantle, or unwrap model rocket engines or their ingredients in any way. Soak unwanted engines in water to destroy.

BLAST-OFF!!

Join the **ESTES** aerospace CLUB

and become a member of the most exciting rocket club on earth.

Membership includes Viper rocket kit, ID card, membership certificate, iron-on emblem, decal sheet, range box stickers, EAC stationary, Technical Manual, copy of Model Rocket News, EAC Product Bulletin, and a variety of exclusive club services.



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ATTENTION ESTES ROCKETEERS

Would you like to do your teacher a favor (and do a good turn for yourself at the same time)? Send us your science teacher's name and address, and we'll send him a free catalog and a teacher's guide. This guide explains ways in which model rocketry can make the science class more fun. It shows your teacher how to provide exciting "space missions" in which you and your friends learn how the big rockets operate while you are building and launching your own model rockets. Simply include your teacher's name and school address, and your own name and address on the back of this coupon. Mail it today!



Model Rocketry Safety Code

- CONSTRUCTION** - My model rockets will be made of lightweight materials such as paper, wood, plastic and rubber, without any metal as structural parts.
- ENGINES** - I will use only pre-loaded factory made model rocket engines in the manner recommended by the manufacturer. I will not change in any way nor attempt to reload these engines.
- RECOVERY** - I will always use a recovery system in my model rockets that will return them safely to the ground so that they may be flown again.
- WEIGHT LIMITS** - My model rocket will weigh no more than 453 grams (16 ozs.) at liftoff, and the engines will contain no more than 113 grams (4 ozs.) of propellant.
- STABILITY** - I will check the stability of my model rockets before their first flight, except when launching models of already proven stability.
- LAUNCHING SYSTEM** - The system I use to launch my model rockets must be remotely controlled and electrically operated, and will contain a switch that will return to "off" when released. I will remain at least 10 feet away from any rocket that is being launched.
- LAUNCH SAFETY** - I will not let anyone approach a model rocket on a launcher until I have made sure that either the safety interlock key has been removed or the battery has been disconnected from my launcher.
- FLYING CONDITIONS** - I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft, or under any conditions which might be dangerous to people or property.
- LAUNCH AREA** - My model rockets will always be launched from a cleared area, free of any easy to burn materials, and I will only use non-flammable recovery wadding in my rockets.
- JET DEFLECTOR** - My launcher will have a jet deflector device to prevent the engine exhaust from hitting the ground directly.
- LAUNCH ROD** - To prevent accidental eye injury I will always place the launcher so the end of the rod is above eye level or cap the end of the rod with my hand when approaching it. I will never place my head or body over the launching rod. When my launcher is not in use I will always store it so that the launch rod is not in an upright position.
- POWER LINES** - I will never attempt to recover my rocket from a power line or other dangerous place.
- LAUNCH TARGETS & ANGLE** - I will not launch rockets so their flight path will carry them against targets on the ground, and will never use an explosive warhead nor a payload that is intended to be flammable. My launching device will always be pointed within 30 degrees of vertical.
- PRE-LAUNCH TEST** - When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

As a member of the Estes Model Rocketry Program, I promise to faithfully follow all rules of safe conduct as established in the above code.



This Solid Propellant Model Rocketry Safety Code is Approved by The National Association of Rocketry and The Hobby Industry Association of America.



Signed _____

84710A

REGISTER YOURSELF AS AN OFFICIAL ESTES MODEL ROCKETEER AND RECEIVE A FULL COLOR MODEL ROCKETRY CATALOG!

Register as an official Estes Rocketeer and receive the great new Estes Model Rocketry Catalog. This giant, full color catalog features more than 90 exciting model rocket kits including single and multi-stage vehicles, gliders, scale models, and exotic designs, plus launch equipment, engines, aerial cameras, telemetry devices, and much, much more. Simply fill out the coupon below.

ROCKETEER

REGISTRATION/CATALOG REQUEST

- Please register me as an official Estes Rocketeer and rush me your newest Estes catalog. I enclose 50¢ for postage and handling.
- Please send me an Estes Aerospace Club membership brochure and application.
- I have received an Estes Catalog within the last year.

Name _____ Age _____

Address _____

City _____ State _____ Zip _____

Send to:

Estes Industries
Dept. 188
Penrose, Colorado 81240



900,073A **CUT HERE**

Please send my teacher a free model rocketry catalog and teacher's guide.

Teacher's Name _____

SCHOOL Address _____

City _____ State _____ Zip _____

My Name _____

Address _____

City _____ State _____ Zip _____

Send to:
Estes Industries
Education Department
Department 194
Penrose, Colorado 81240

EDUCATOR REQUEST

