MODEL ROCKET NEWS

Volume 9, No. 1
February 1969

Photo by NASA

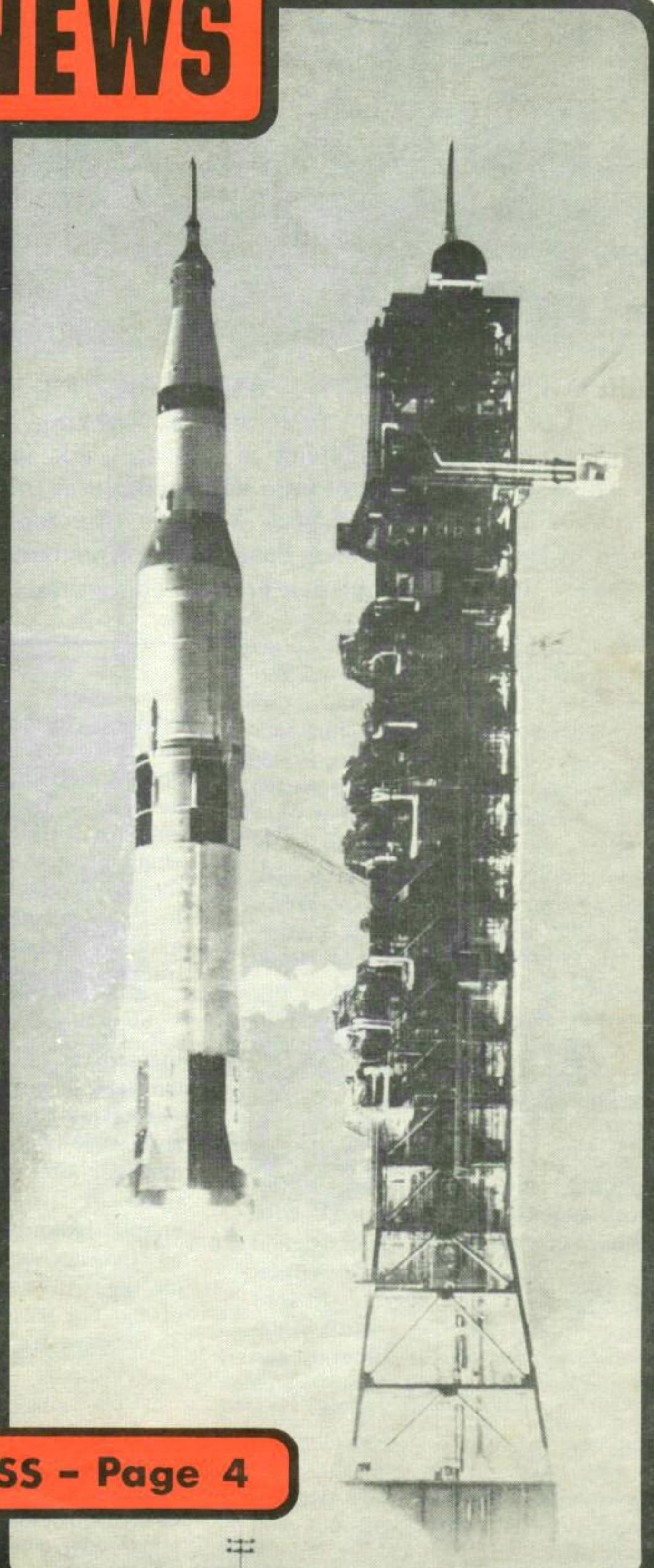
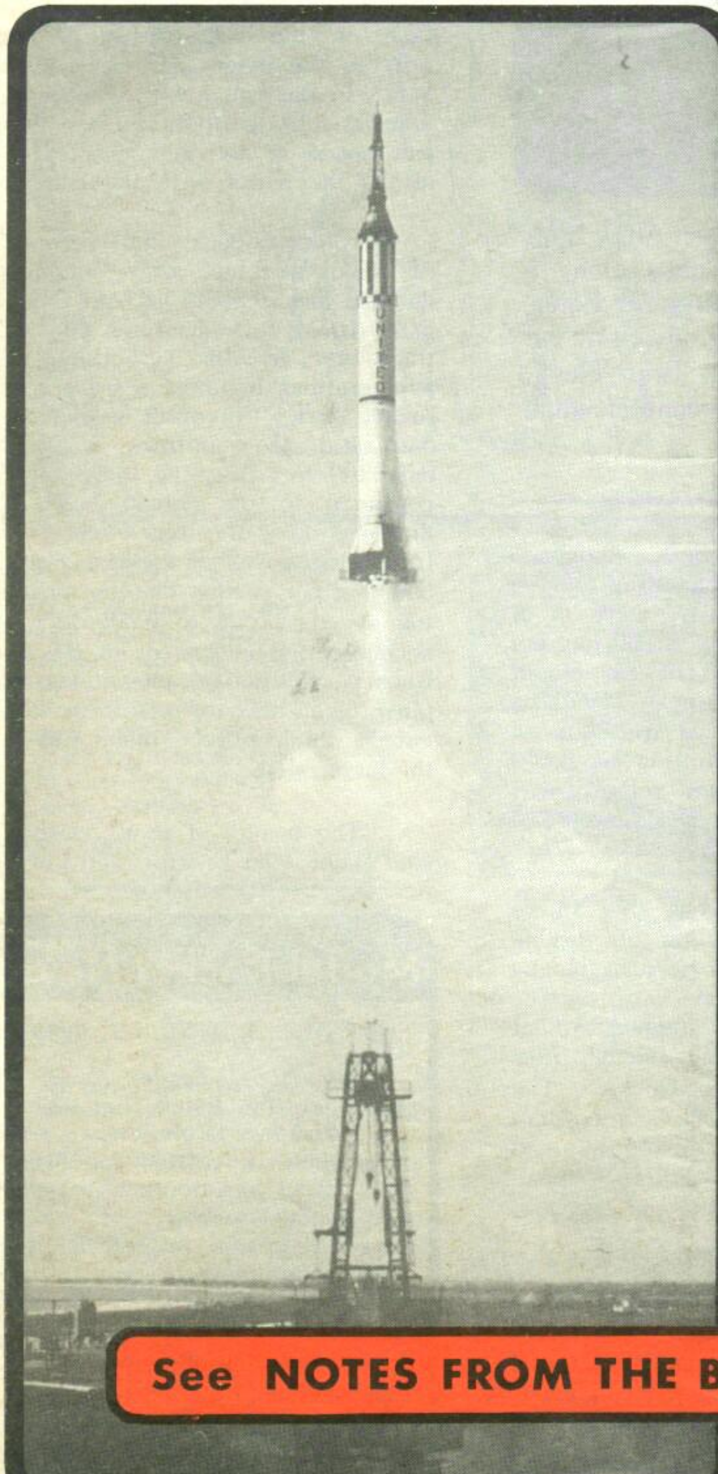
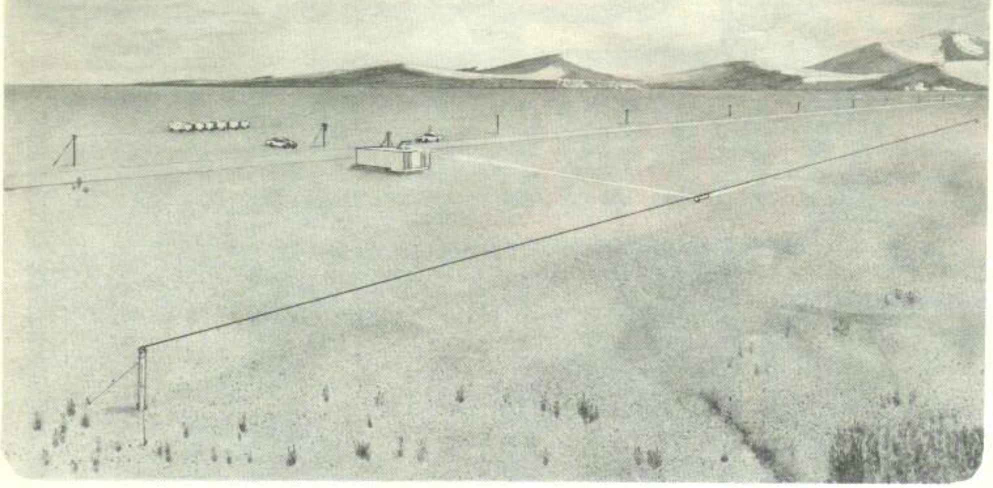


Photo by NASA



See NOTES FROM THE BOSS - Page 4

MODEL ROCKETS HELP IN LASER EXPERIMENTS



AIR FORCE MISSILE DEVELOPMENT CENTER, Holloman AFB, N.M. A model rocket engine propelling a streaking cigar case along a 1,000-foot piano wire is playing an important role in helping Air Force engineers check out and calibrate an experimental tracking device at the Air Force Missile Development Center's Directorate of Test Track, located at Holloman Air Force Base, N.M. Directorate personnel manage the famous Holloman 35,588 foot high-speed test track.

Nicknamed the "minitrack", the low-cost testing system shows the ingenuity of track engineers: the "minisled" structure is an aluminum cigar case and the nosecone is an ordinary ping pong ball. The entire "sled" is wrapped in reflective tape to allow for easier tracking. It travels along a 1,000-foot length of piano wire supported by poles made from discarded rocket cases. The tiny solid rockets, made by Estes Industries, Inc., Penrose, Colo., are precisely employed to attain certain pre-calculated speeds through the use of thrust data provided by the manufacturer.

Taking the thrust data and combining them with four other factors--aerodynamic drag, wire friction, mass of the small sleds, and rate of fuel consumption--track engineers feed the varying factors into a large computer which then combines the factors to calculate the sled performance. The result is a velocity profile which gives the engineers the exact performance of the tiny sled. The profile gives three readouts to the track people: acceleration, velocity, and position versus time.

Howard Clark, aerospace engineer at the track, said: "The minitrack is actually capable of speeds well in excess of 660 feet per second. By virtue of its closer spacing, the minitrack simulates angular rates produced by sleds on the main track travelling at 6,600 feet per second. This velocity will exercise the tracker at its proposed tracking rates."

The arresting gear also shows ingenuity: it consists of varying numbers of polyurethane foam blocks suspended from the wire. The microsled is usually stopped without damage after passing through from three to five of the blocks. The unique braking system is necessary as the acceleration levels attained on the wire closely approach those of the big solid rockets on the main 35,588-foot track.

The simulation technique being developed by the minitrack involves the check out of an automatic laser tracking device which is designed to enable cameras to lock on and track a full-size supersonic sled. Cameramen have a great deal of trouble manually tracking a fast-moving rocket sled which may reach speeds of over 4,400 miles per hour (6,600 feet per second). With the ever increasing velocities of the Holloman sleds, the problem is continually becoming more difficult.

Located in a van 100 feet from the minitrack is the laser tracking mechanism itself. The tracker utilizes a revolving mirror to transmit the image of the sled to fixed cameras inside the van. The laser, which is also housed in the van, transmits a thin beam of coherent light through the mirror system to the reflective tape on the minisled which then reflects the laser light back to the van. In the van a servo-mechanism automatically corrects for the angle and speed of the moving sled and aligns the mirror with the cameras.

In order to perfect this technique of laser tracking, track engineers decided that it would be both cheaper and easier to simulate the sled trajectory, angular velocities, and accelerations by using a small model rocket sled. Operating on a ten-to-one ratio, the minitrack is set up only 100 feet from the laser van as compared to the normal 1,000-foot distance from the big track. The little sled moves at speeds of up to 660 feet per second thereby simulating speeds of up to 6,600 feet per second of full size sleds on the main track. Reflective tape takes the place of an array of reflective corner cubes which reflect laser light on the larger sled.

"The beauty of it all is this," said Major John Frazier, chief of the

Model Rocket News

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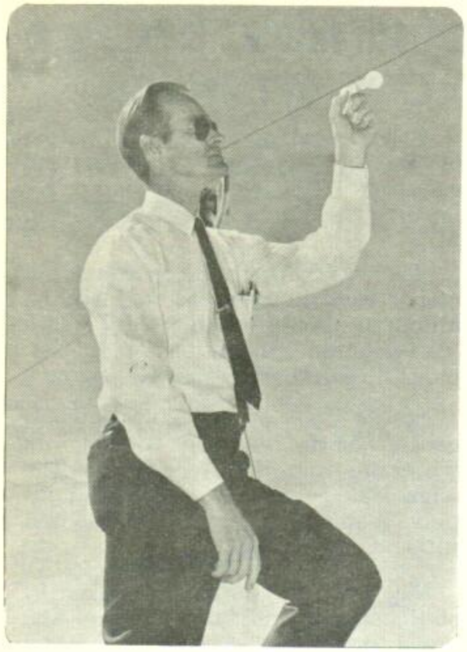
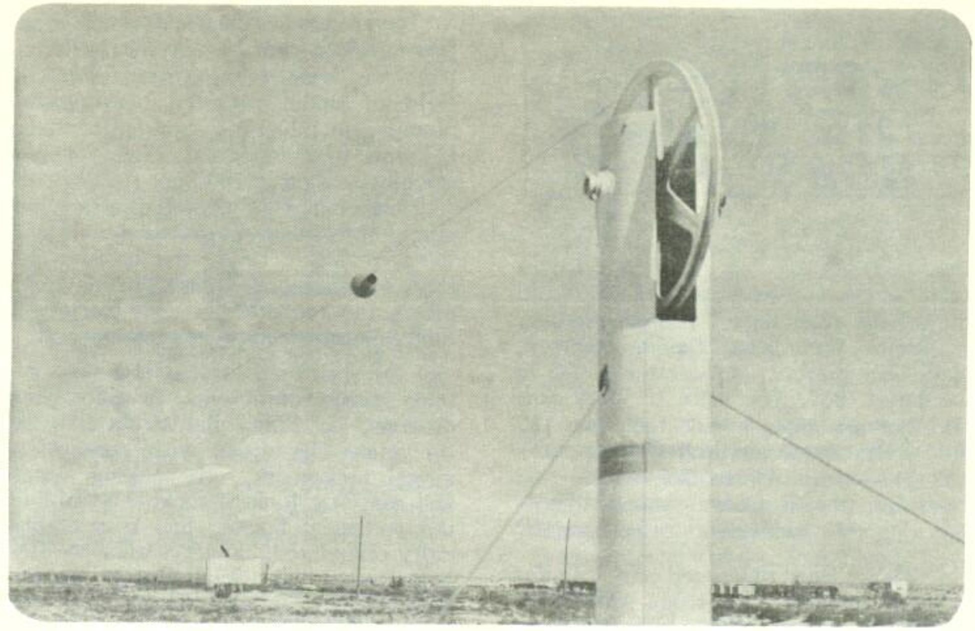
The *Model Rocket News* is published by Estes Industries, Inc., Penrose, Colorado. This publication is written for America's model rocketeers to promote safe youth rocketry, distribute current technical information and make model rocketry more enjoyable and educational. Current issues of the *MRN* are distributed free of charge to all active Estes customers.

Vernon Estes -------- Publisher
William Simon --------- Editor
Gene Street ----- Chief Illustrator



Howard Clark, aerospace engineer at the Air Force Missile Development Center's Directorate of Test Track, hangs a minisled on the minitrack. (USAF PHOTO)

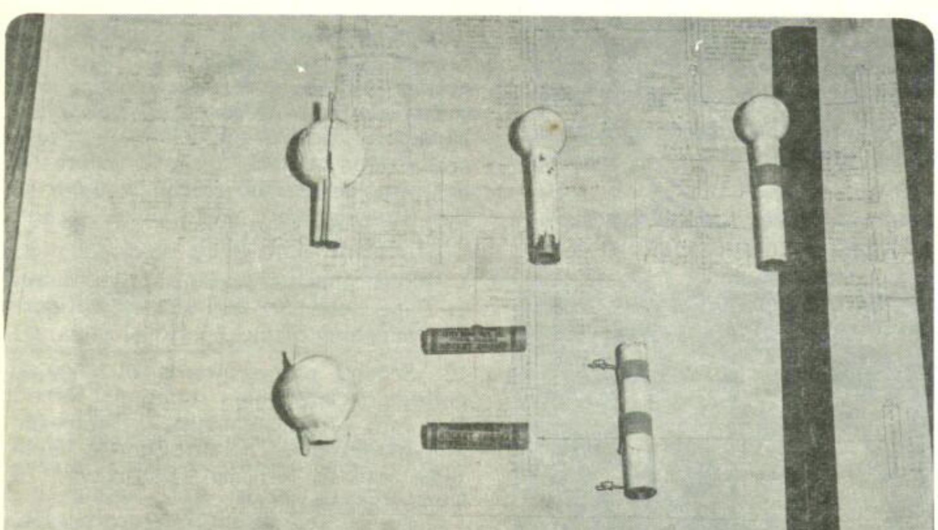


The scene is the flat desert of the Tularosa Basin in southern New Mexico, which has seen some of the earliest rocket experiments in the United States. Now, Air Force engineers are utilizing model rockets in the check out and calibration of an experimental tracking device at the Air Force Missile Development Center's Directorate of Test Track, located at Holloman Air Force Base, N.M. In the foreground is one of the two supporting poles of the piano wire "track", made from discarded rocket cases. On the wire is a tiny sled, made from an aluminum cigar case, a ping pong ball, and reflecting tape. The sled is propelled by a small solid fuel rocket engine down the wire past the white van in the background. The van contains an experimental automatic laser tracking device which is designed to enable cameras to lock on and track a full-size supersonic sled. In order to perfect this technique, track engineers decided that it would be both cheaper and easier to simulate the sled trajectory, angular velocities, and accelerations by using a small model rocket sled. (USAF PHOTO)

Track Technology Division, whose engineers designed the minitrack. "Running these small sleds does not interfere in any way with regularly scheduled track runs. The minitrack can be operated simultaneously with the big track and we can launch as many as 20 sleds in one day instead of only one full-scale sled every 15 or 20 days on the main track." Due to the number of other track projects no more than one of the full scale monorail check out tests can be run every two weeks.

Perhaps the most striking item about the minitrack is its price: for one small sled, the total cost is less than two dollars, with propulsion costs of about 30 cents. This compares with several thousand dollars for a big sled run.

Small sled, big saving!



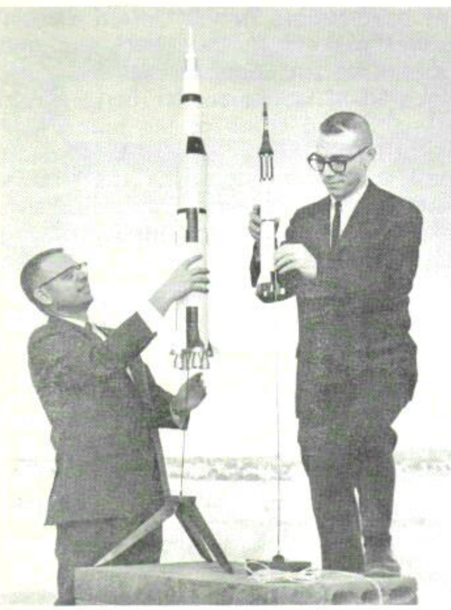
Aluminum cigar cases, ping pong balls, reflective tape, and model rocket engines. These dissimilar items make up the "minisleds" being used by Air Force engineers. The two rocket engines in the center foreground reveal the small size of the vehicles being tracked by the Laser device. (USAF PHOTO)

EDITOR'S NOTE:

Rocket sled experiments should be left to the professionals--they are not recommended for model builders. Many acres of clear ground (desert) are necessary to avoid any possible fire hazard. In addition, a very strong wire--long enough to let the engine burn out and to let the vehicle slow down--securely anchored at both ends is essential. Then, too, a fool-proof method of attaching the vehicle to the wire must be developed and, above all, strict safety controls must be present to keep anyone from getting too close to the track when it is in operation. It's a whole lot easier, less expensive, and safer to fly your bird straight up.

If you're 14 years old now (that's the average age of America's model rocketeers), you were about 4 years old during the planning of Project Mercury in 1958. When Ham, the chimpanzee, made his historic sub-orbital flight in January, 1961, you were 6 years old. His Mercury capsule ride took him 157 miles into space and lasted 16 minutes and 39 seconds. When Ham was plucked from the Atlantic he was happy, "smiling, hungry, and ready to go again."

Thus, Ham pioneered the way for our first manned rocket flight which took place on May 5, 1961 (see Mercury-Redstone lift-off on front cover) with



VERN ESTES, PRESIDENT OF ESTES INDUSTRIES AND BILL SIMON, VICE PRESIDENT, DISPLAY NEW SATURN V AND MERCURY-REDSTONE MODELS. THE FULLY DETAILED 43-1/2" HIGH SATURN V WILL BE THE FIRST ESTES KIT USING MOLDED PLASTIC FOR ITS TOWER AND OTHER INTRICATE DETAIL PARTS. IT IS EXPECTED TO RETAIL FOR ABOUT $9.00.

astronaut Allan B. Shepard at the controls. On July 21st of the same year Virgil Grissom's flight ended the Mercury-Redstone series.

With the highly successful Mercury-Redstone flights behind us, we went on to orbital flights using the Mercury-Atlas combination; the Gemini-Titan and the Apollo Uprated Saturn I. Then last December 21st a U. S. team of astronauts lifted off on a historic journey around the moon. As they roared into space they rode atop the mighty Saturn V, shown at lift-off on the front cover.

Over these same 10-plus years, from 1958 to the present, Estes Industries has been working to develop the field of model rocketry. We started planning in 1958, and soon built "Mabel I," the first automatic engine-making machine. Then in 1960 our first kit, the Astron Scout, was marketed. For many years the Scout was America's most flown rocket. Today the broad Estes line of rocket designs and payloads offers the rocketeer a wide variety of learning experiences.

As America's scientists have met their prime objectives in our space program, so Estes Industries has met its prime objectives with non-professional rocketeers. By making a safe and realistic form of rockets available, the basement bomber has been practically eliminated. In 1958 when we first began planning, hundreds of fingers, hands and eyes were being lost each year and scores of boys were being killed in backyard experiments. Now when we hear or read about a young man's rocket activities, it's about a contest or science fair winner, a family launching activity or some other favorable event. Model rocketry has now proven itself as a safe, educational and enjoyable hobby and we're proud of these accomplishments. America's rocketeers themselves deserve a large part of the credit. Not only have they accepted responsibility in keeping their activity safe, but the close, friendly relationship we've enjoyed with them has provided the guiding light for development of our program and products.

As Estes Industries waves goodby to 1968 and our first 10 years of model rocketry we offer a salute to our astronauts by making available to America's modelers the first and the last of our manned space vehicles. The Mercury-Redstone and the 1-to-242 scale Saturn V are available now. Our new 43-1/2 inch high, 1-to-100 scale Saturn V will be announced in the '69 Estes catalog, now scheduled for the last part of March.

Best wishes for successful flying in '69.

Vern

SVEN ENGLUND, ESTES LAUNCHSTAKES WINNER, RECEIVES TROPHY AT NARAM - 10.

OCT., NOV., DEC. '68 D.O.M. WINNERS

The Design of the Month Contest winners for October, November and December, 1968, were announced recently by the Estes Industries judging staff.

The $50 first place award for October went to Don Vail of Arcadia, California. Don's winning entry was a rocket-powered adaptation of a badminton "birdie" for Series III engines.

Steven Cook of Arlington Heights, Illinois, won the November contest with his remote-controlled launcher. The design was especially notable for its safety features to prevent accidental ignition.

The December award was taken by Bob Houston of Fremont, Nebraska, who entered the "Starfighter II," a model featuring an extremely sleek appearance.

All Estes rocketeers are encouraged to enter the Design of the Month Contest. Plans for rockets, launchers, instruments, etc., may be entered. A new contest begins on the first of each month so entries compete only with other entries received in that month.

Any plan or design received at Estes Industries that is not specifically addressed to some other contest or department is automatically entered in the Design of the Month Contest. For complete details, see the contest announcement in the August, 1968 issue of the Model Rocket News.

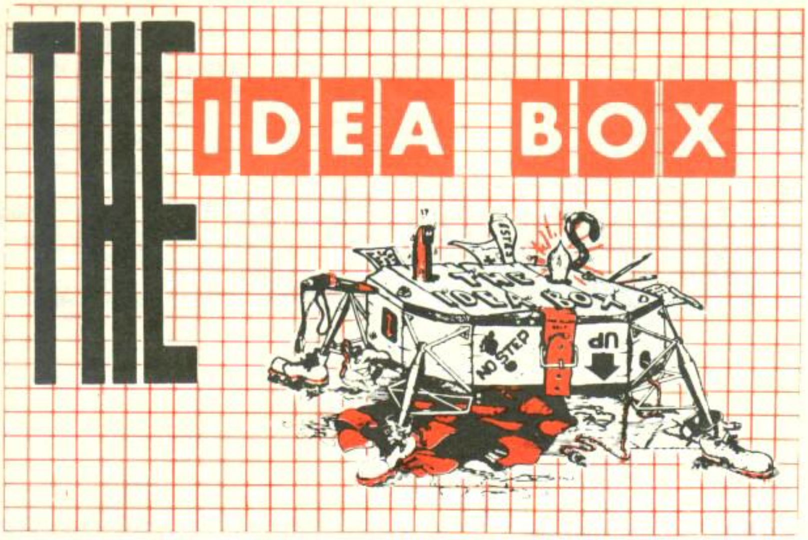
Sven Englund Wins "LAUNCHSTAKES"

First place winner in the Estes "Launchstakes" is Sven Englund, 15, of New Canaan, Connecticut. Sven, an active model rocketeer since 1965, is a member of the New Canaan YMCA Space Pioneers. He has previously won several awards in model rocket competition and was among the trophy winners at the 10th annual NAR model rocket contest in August, 1968.

Sven plans to take his prize (a trip to Cape Kennedy) this summer to view the launching of the Apollo 11 mission.

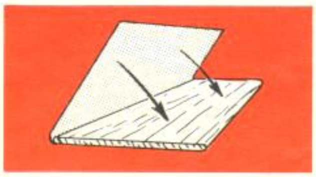
Second place awards of $500.00 college scholarships went to Robert Rodgers from Norman, Oklahoma; Jim Flasck of St. Claire Shores, Michigan; and L. William Tabilio, Jr., of Timonium, Maryland.

The "Launchstakes," a lucky-number sweepstakes which closed December 20th, was open to all who wished to enter. The contest was sponsored by Estes Industries as a 10th anniversary Christmas present to rocketeers.



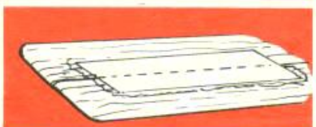
Several Uses for PRM-1

AS A COVERING FOR FINS...



Cut the PRM so one piece serves as the sides and leading edge. Seal the tip and trailing edges with white glue.

AS A HINGE...



Apply a pre-creased strip over the two pieces to be hinged and press firmly into place. Apply a thin film of glue around the perimeter of the hinge. Be careful not to allow the glue to seep into the joint between the pieces.

AS QUICK PATCHES...

Restore contour of damaged leading edges. Cut the PRM to size and apply to damaged area. Seal edges with a thin film of glue.

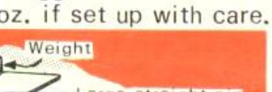
Torn or dented body tubes may be strengthened by a strip of PRM.

AS DECORATING MATERIAL...

Draw and cut out:

Letters FAI ACE

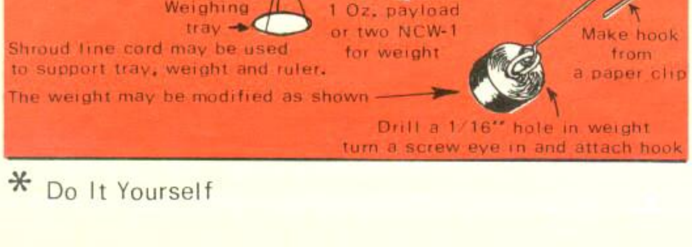
Numerals 5075



Roll Pattern

Ruler, Cardboard, Shock Cord & Known Weight = D.I.Y.* Scale

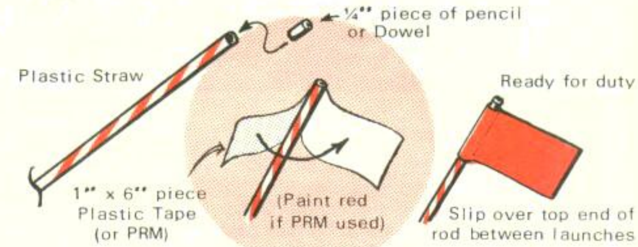
David Laws of Winfield, Kansas suggested this scale which will measure to within 0.01 oz. if set up with care.



* Do It Yourself

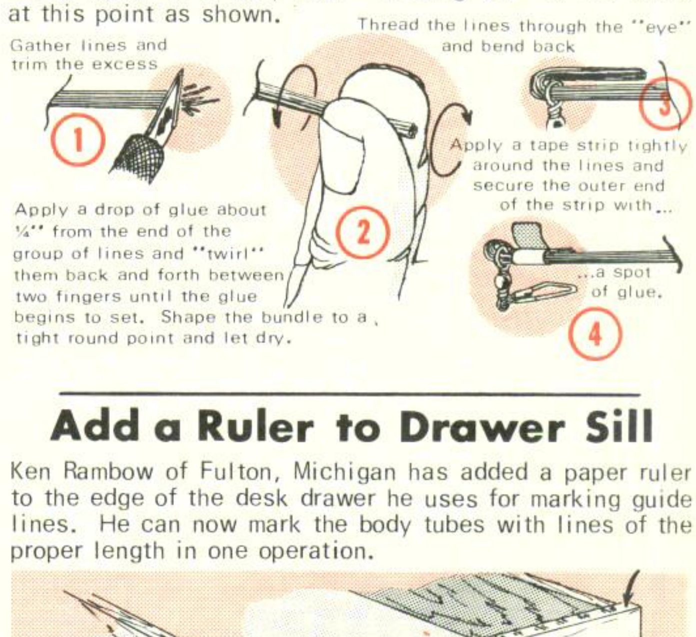
Safety Cap for Launch Rod

This safety cap by Herbert H. Masten of Lavonia, Georgia works well as a wind direction indicator in addition to its primary function. The tube may be a plastic straw or an LL-2D launching lug. The flag may be of red plastic tape or of painted PRM-1.



Snap-Swivel "Threading" Easier still - With Glue!

Trip Barber of Charlotte, N.C. offers this easy way of attaching shroud lines to snap-swivels. The method also lends itself to a very neat "binding off" of the lines at this point as shown.



Add a Ruler to Drawer Sill

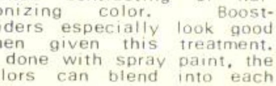
Ken Rambow of Fulton, Michigan has added a paper ruler to the edge of the desk drawer he uses for marking guide lines. He can now mark the body tubes with lines of the proper length in one operation.

PAINT CORNER

PREPARATION OF THE WOOD

Before applying any sealer or primer, sand the wood surface with #320 grit paper or SP-320. Now shake talc or baby powder onto the surface and rub into the wood with a finger. Flow on the first coat of sealer and let dry completely. Sand as usual and you will find that frequently only one more coat of sealer is needed (instead of 4 or 5) to get a mirror-smooth finish.

DARE TO BE DIFFERENT



For a different appearance, try outlining the major features of a model in a darker contrasting or harmonizing color. Boost-gliders especially look good when given this treatment. If done with spray paint, the colors can blend into each other.

Estes Industries Rocket Plan No. 59

GANYMEDE 274

FUTURISTIC DESIGN . . .
ANOTHER FINE SPORTS FLYER

PUBLISHED AS A SERVICE TO ITS CUSTOMERS BY ESTES INDUSTRIES, INC., BOX 227, PENROSE, COLO. 81240

1. Cut a slot 3/32" wide and 1/16" deep in one AR-2050 spacing ring.
2. Slit the BT-20J body tube 1/4" from one end and apply glue in the area as shown.
3. Push one end of the engine holder into the slit and press the main part of the hook into the glue.
4. Slide the non-slotted ring onto the front of the tube. Apply a line of glue to both sides at the tube-ring joint.
5. Install the slotted ring (engine holder in slot) 3/4" from the rear of the tube. Glue this ring on both sides also.

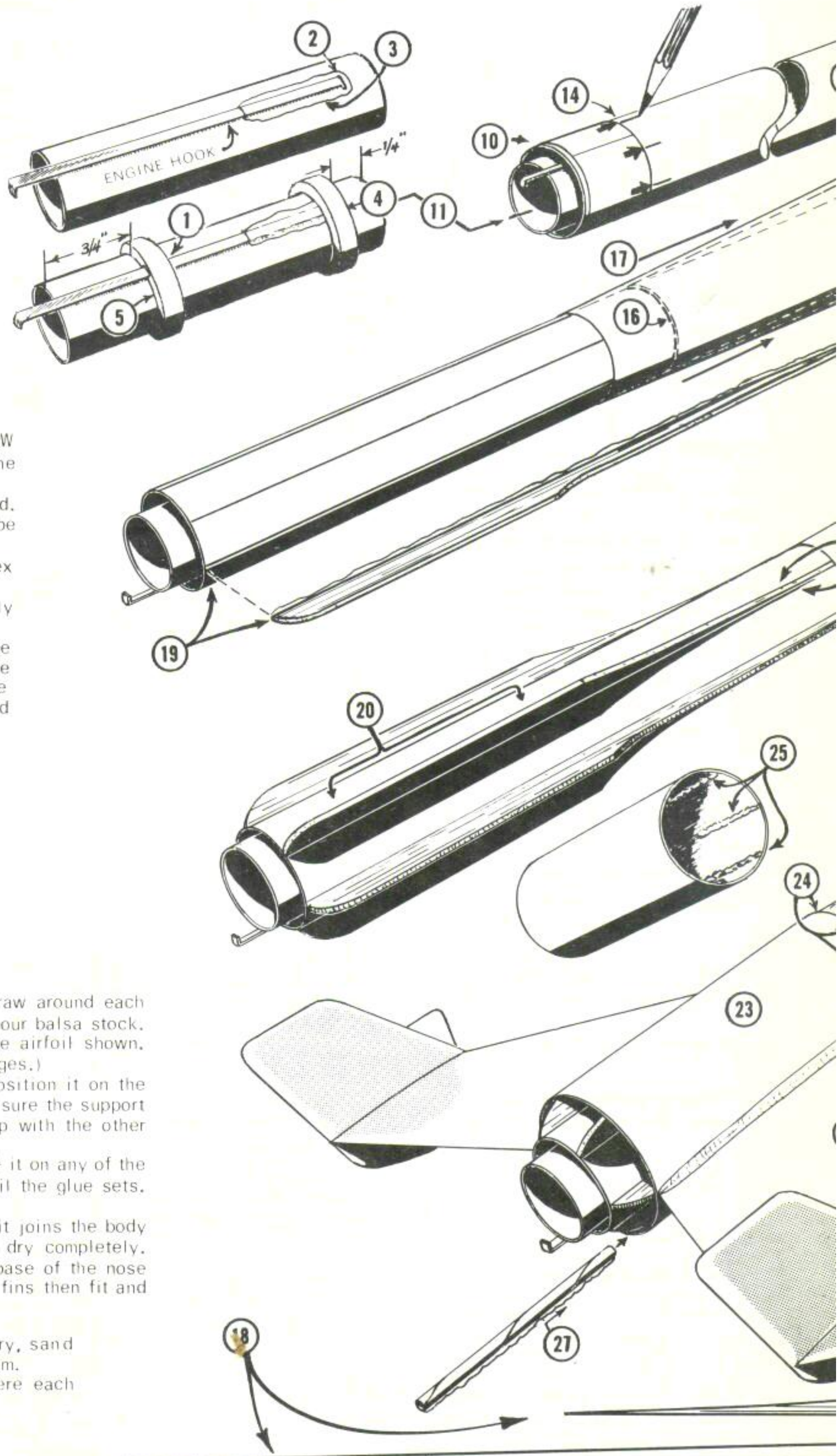
6. Cut a 1/8" by 1/16" hole 1-1/2" from one end of the BT-50W body tube.
7. Tie a knot at one end of the shock cord, leaving about 1" of cord on the short side of the knot.
8. Insert the other end of the shock cord into the hole in the body tube and pull it on through until the knot is against the tube.
9. Anchor the short end of cord on the outside of the tube with a strip of masking tape. (Apply extra glue to the knot.)

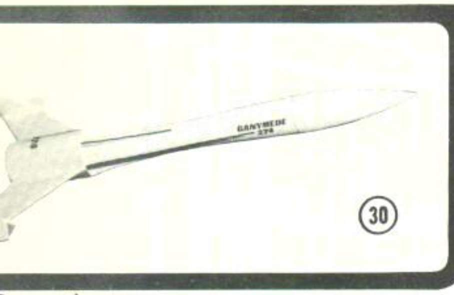
10. Spread glue around the inside of the other end of the BT-50W body covering an area 3/4" to 2-1/2" from the end of the tube.
11. Pick up the engine mount unit by the extended hook end. Push it into the body tube until 1/4" of the engine tube projects from the body tube.
12. Trace the cone pattern and the tube marking guide onto index paper and cut them out.
13. Pre-form the paper cone by wrapping it around itself. Apply glue to the flap area and join the edges.
14. Wrap the tube marking guide around the rear of the body tube with the arrows pointing forward. Rotate the guide until the joint in the guide lines up with the engine hook. Mark the body tube at each arrow point. Remove the guide and extend the lines to the ends of the body tube.

15. Slide the nose cone into the body tube. Slide the paper cone onto the body tube from the rear and seat its forward end against the outer shoulder of the nose cone.
16. Mark the body tube at the rear edge of the paper cone. Slide the cone back, exposing the mark. Put a line of glue around the tube at the mark.
17. Grasp the nose cone in one hand. With the other hand slide the paper cone forward, seat its forward end on the outer shoulder of the nose cone.

18. Trace the fin and fin support pattern onto stiff paper. Draw around each pattern piece, making the correct number of each piece on your balsa stock. Cut out all pieces carefully and sand all fin pieces to the airfoil shown. (The fin supports are sanded smooth without rounding the edges.)
19. Apply glue to the root edge of one long fin support and position it on the second guide line on either side of the engine hook. Make sure the support sticks straight away from the body tube. Repeat this step with the other long fin support, placing it on the opposite side of the tube.
20. Apply glue to the root edge of a short fin support and locate it on any of the four remaining guide lines. Align and hold it in place until the glue sets. Attach the other short fin supports in the same way.
21. Apply a fillet of glue to both sides of each support where it joins the body tube. Support the assembly horizontally and allow it to dry completely.
22. Assemble the parachute kit; install the screw eye in the base of the nose cone; fit and glue the vertical fins to the tips of the main fins then fit and glue the main fin tip extensions into place.

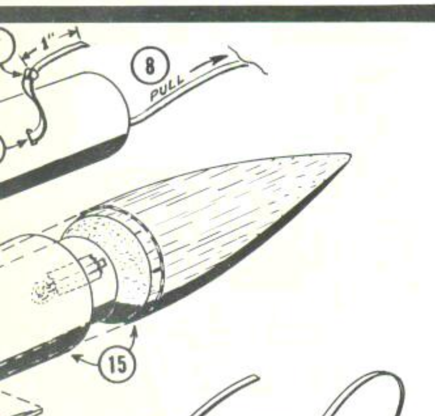
23. Check the fit of the BT-60J fin support tube. If necessary, sand the fin supports until the the tube makes a slide fit over them.
24. Put the fin support tube in place and mark the tube where each support touches. Remove the tube.

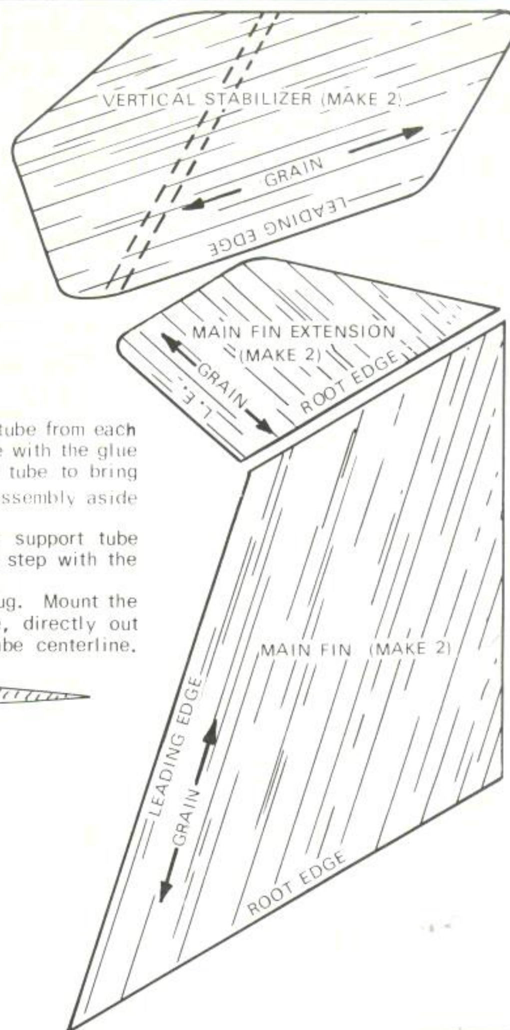




PARTS LIST

- 1 Body tube Part #BT-50W
- 1 Body tube Part #BT-60J
- 1 Body tube Part #BT-20J
- 1 Nose cone Part #BNC-50AD
- 1 Sheet balsa fin stock Part #BFS-30L
- 1 Screw eye Part #SE-1
- 1 1/8" shock cord Part #SC-1
- 1 12" Parachute kit Part #PK-12
- 1 Engine holder Part #EH-2
- 2 Spacing ring Part #AR-2050
- 1 Launching lug Part #LL-2B
- 1 Sheet index paper or giant post card

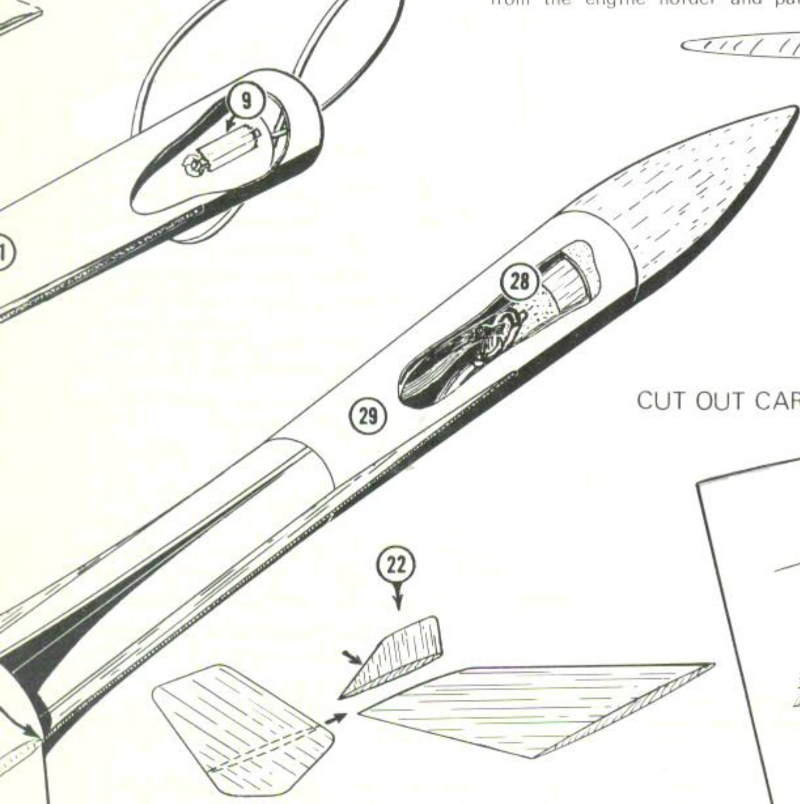




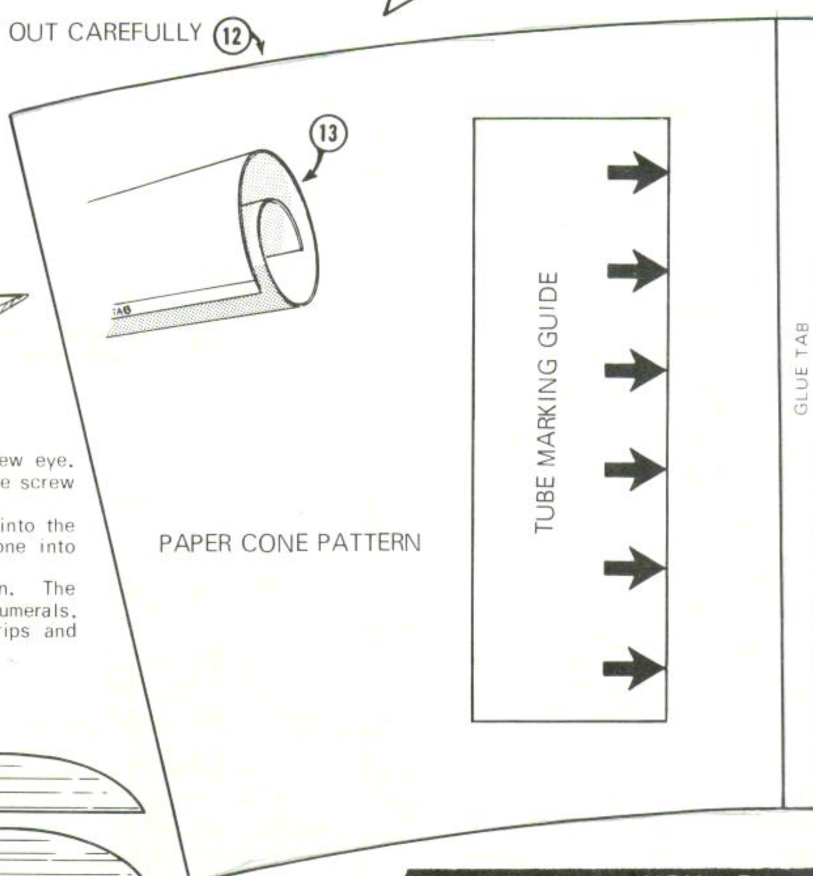
25 Apply a 1" long line of glue down the inside of the tube from each mark made in step 24. Slide the tube back into place with the glue lines BETWEEN the supports. Turn the fin support tube to bring each glue line into contact with a support. Set the assembly aside to dry.

26 Glue the right fin assembly (see #22) to the fin support tube straight out from the long fin support. Repeat this step with the left fin assembly.

27 Apply a line of glue to one side of the launching lug. Mount the lug on the inside surface of the fin support tube, directly out from the engine holder and parallel to the body tube centerline.



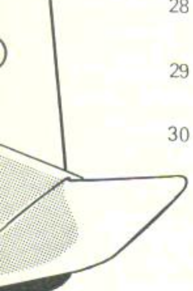
CUT OUT CAREFULLY (12)

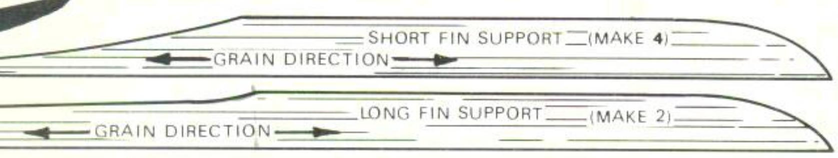


28 Tie the free end of the shock cord to the screw eye. Gather and tie the free ends of shroud line to the screw eye.

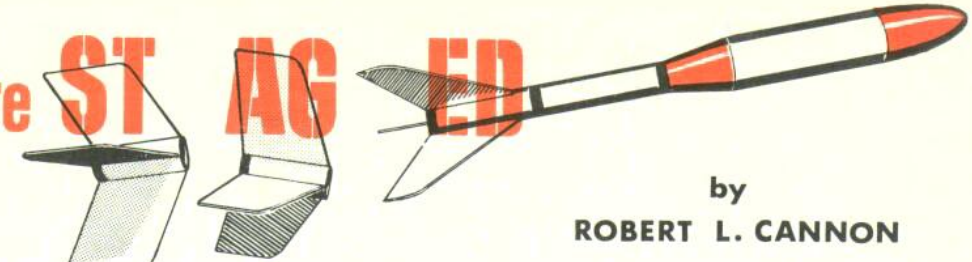
29 Pack the parachute, shroud lines, shock cord into the front of the body tube and slide the nose cone into place.

30 Seal and paint the model in a normal fashion. The original is all white with black letters and numerals. Decorating tape was cut into 3/32" wide strips and applied to the edges of all the fin supports.





WHY ROCKETS are STAGED



Another ACTION Article

by
ROBERT L. CANNON

This article is designed to help you better understand some ideas which are important to rocketry and model rocketry. To get the most benefit from this article follow the instructions carefully.

You will need a pencil and a strip of cardboard or thick paper about three inches wide and ten inches long. Place this strip of paper over the first column of the article. Move the paper strip down until it comes to the first dotted line. Study the material. Fill in the blank (or blanks).

Then move the paper down to uncover the answer. Check to make sure you gave the correct answer (or answers). The answer need not be in the exact words given if the answer expresses the correct idea. If you gave a correct answer (or answers), move the strip on down to the next line.

If you had an incorrect answer, review to learn the information correctly. After this review, correct the answer and then proceed to the next paragraph.

Continue in this manner through the article. Happy learning!

An *unbalanced force* is a force which is not matched by an opposing force.

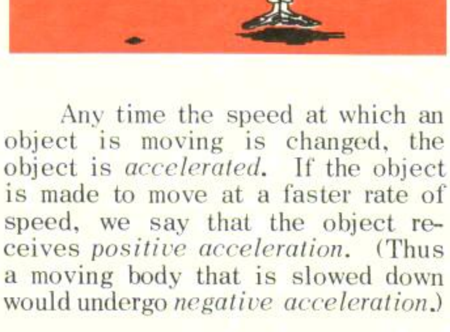
If one football player charges into another player who is not expecting the charge and is not ready for it, the player who is hit receives an unbalanced force. He probably gets knocked several feet!

The increase in performance of an upper stage as compared to a complete rocket can be demonstrated with a model rocket. To perform the experiment, prepare an Astron Farside or similar large multi-stage model using 1/2A6-0 engines in the booster stages and a 1/2A6-4 engine in the upper stage. Launch the rocket and carefully observe the rate at which it accelerates as each stage ignites. (It will help to have several people observing and then compare results.) Try to determine which had the "hottest" acceleration--the entire vehicle at lift-off or the upper stage by itself just after it ignited.

If you hold a ball at arm's length and then release the ball, what happens? The ball__________.

- -

falls



Any time the speed at which an object is moving is changed, the object is *accelerated*. If the object is made to move at a faster rate of speed, we say that the object receives *positive acceleration*. (Thus a moving body that is slowed down would undergo *negative acceleration*.)

An unbalanced force acting on an object causes the object to __________.

- -

accelerate

When you released the ball you were holding, the ball received __________ acceleration because of the force of __________.

- -

positive *gravity*

To properly describe a *force* we need to know the *magnitude* (amount) of the force and the *direction* in which the force is acting.

An unbalanced __________ accelerates an object in the direction in which the __________ is acting.

- -

force *force*

The harder you throw a ball, the farther it will go. When you throw the ball with only a little force, the ball receives only a small acceleration. If you throw the ball as hard as you can, the ball receives a large acceleration. The greater the acceleration you give the ball, the faster the ball can go.

A large force produces a______ acceleration than a smaller force on the same object.

- -

larger

A large acceleration produces ________speed change than a small acceleration for the same length of time.

- -

more

All moving objects possess *momentum*. The momentum of a moving object is determined by multiplying the *mass* (the quantity of matter, roughly similar to weight when comparing objects on the surface of the Earth) of the object times the *velocity* (speed) of the object.

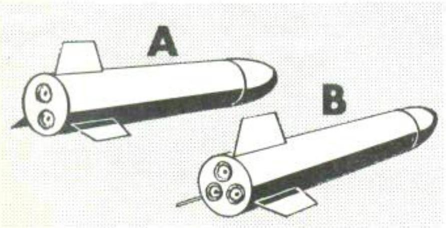
MASS x VELOCITY = MOMENTUM

Which has more momentum, a ball moving at a given velocity or an identical ball moving at a higher velocity? The ball moving at the ______________ velocity has a greater momentum.

---

higher

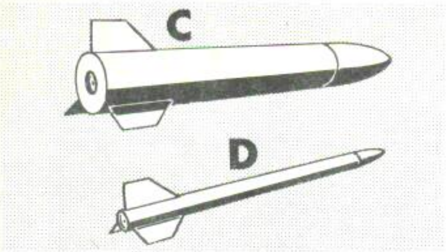
The greater the unbalanced force acting on an object, the greater is the acceleration the force produces.



Which rocket will accelerate more if the individual engines produce equal thrust and the rockets have equal total masses? Rocket___will accelerate more than the other rocket.

B

The more massive an object is, the greater is the force needed to achieve a given acceleration (rate of speed change). In other words, a given force will accelerate an object of low mass more than it would accelerate an object of greater mass.



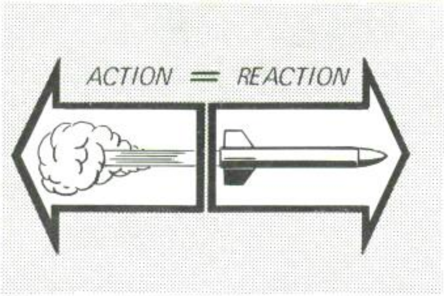
The engines of rockets C and D produce the same thrust. Rocket C has much more mass than Rocket D. Rocket______will accelerate faster than the other rocket.

D

A rocket engine can produce a certain amount of thrust under ideal conditions. To cause a satellite payload to reach the desired velocity the rocket must accelerate the satellite payload from zero velocity to the desired velocity.

The entire rocket (satellite payload, engine, propellant, body, etc.) is accelerated by the engine's thrust.

The total momentum achieved by a rocket is equal to the total momentum achieved by the rocket's exhaust gases.



If the same thrust is applied to a small mass as to a large mass, which will receive more acceleration -- the small mass or large mass?

The small mass.

Reducing the mass which the engine's thrust must accelerate will enable a given level of thrust to give a rocket a higher velocity.

The less the total mass of the rocket, the__________the velocity the payload can reach when the rocket's engine is operated for a specified time.

---

greater

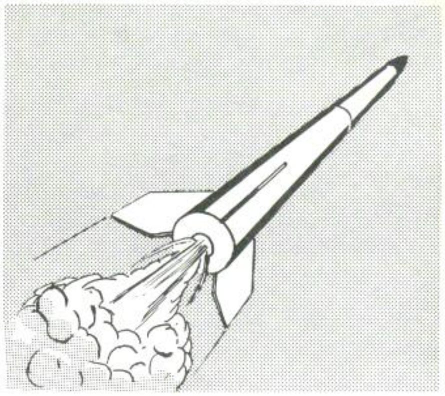
The mass of a satellite does not change as it moves from its position resting atop the rocket on the launch pad to its insertion into orbit. Since the satellite had zero momentum (its mass times zero velocity equals zero momentum) on the launch pad but a large momentum as it follows its orbit, the satellite has undergone a tremendous change in its momentum. (The momentum possessed by all objects on Earth because of Earth's motions is ignored in this article.)

A small engine producing a small thrust but operating for a long period of time can make a given payload mass reach a high velocity. A larger engine producing greater thrust could make the same payload mass reach the same velocity by operating for a _______________ period of time.

---

shorter

A small rocket engine producing a small thrust may not be able to lift a rocket with the payload and the necessary propellant, so a large engine or a cluster of small engines are often necessary to lift a rocket from the launch pad.



As the rocket's engine operates the propellant is converted to gases which leave the rocket, reducing the rocket's mass. As a result, a steady thrust level can produce an__________ in the rate at which the rocket accelerates.

---

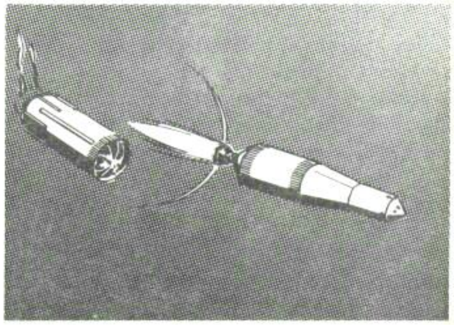
increase

The greater the mass of a rocket, the___________is the acceleration produced for a given total thrust.

---

less

As the propellant in each stage of a multi-stage rocket is used, that stage can be dropped. This reduces the mass of the rocket (by removing the engine, propellant, and other parts of that stage). As a result, the thrust of the next stage's engine pushes a smaller mass. This allows that engine to give the rocket more acceleration than it could were the rocket more massive.



As a rocket's stages separate from the rest of the rocket, the rocket's total mass_____________.

---

decreases

Thus staging allows a payload to reach a______________velocity for a specific mass of propellant than would be achieved by using only a single-stage rocket.

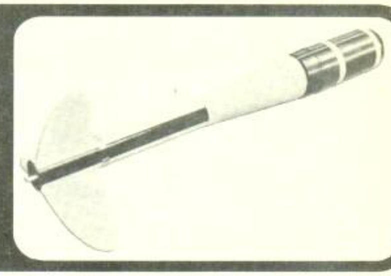
---

greater

Estes Industries Rocket Plan No. 60

CAMROC CARRIER

High Performance Single Engine Bird for Photographic Missions



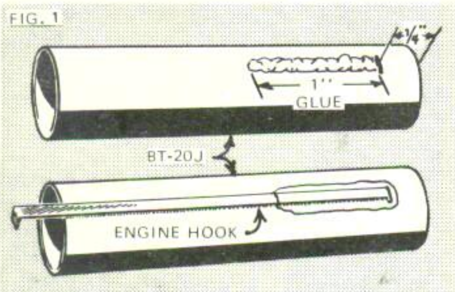
PUBLISHED AS A SERVICE TO ITS CUSTOMERS BY ESTES INDUSTRIES, INC., BOX 227, PENROSE, CO. 81240

Want to take a photo from 1000 feet up? The Camroc Carrier can do it–and use only one C6-7 engine in the process. Ultra-low drag design and light weight result in exceptional performance. When high altitude isn't necessary, a B6-6 will boost the Carrier to a respectable altitude for taking good aerial photos. If you have successfully built three or four single stage rockets, you can build the Camroc Carrier. All you need to do is use moderate care.

Here's how it goes together. . . .

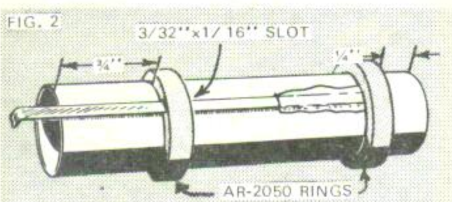
CAMROC CARRIER INSTRUCTIONS

FIG. 1



☐ 1. Cut a 1/8" long slit in the BT-20J engine mount tube 1/4" from the end as shown. Apply a line of glue 1" long along the tube starting at the slit. Push one end of the engine hook into the slit and press the main part of the hook into the glue. Hold the hook in place with a piece of masking tape at its middle while the glue dries.

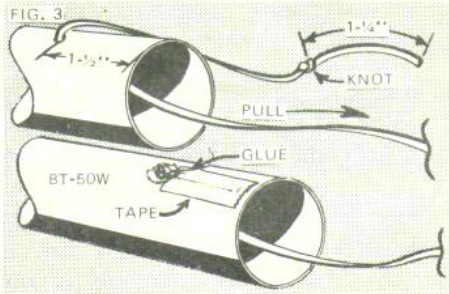
FIG. 2



☐ 2. Cut a 3/32" wide slot 1/16" deep on the inside of one of the AR-2050 rings. Glue this ring to the engine mount tube 3/4" from the rear end (the end with the over-hanging hook) so the slot is over the hook. Avoid getting glue in the slot. Glue the other ring to the front of the engine mount tube 1/4" from the end as illustrated.

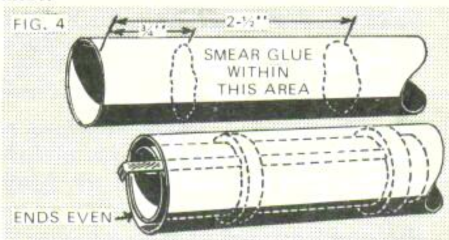
☐ 3. Very carefully trace the cone pattern onto heavy paper (about the thickness of an index card) or draw one directly on the paper to the dimensions shown. Cut out this cone and preform it by wrapping it around itself once. Apply glue to the flap area and join the edges as shown. Clamp the joint with your fingers until the glue sets.

FIG. 3



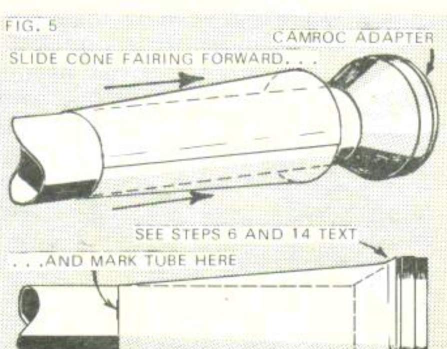
☐ 4. Cut a small hole in the BT-50W body tube 1-1/2" from one end. Tie a knot in the shock cord 1-1/4" from one end and insert the other end into the hole. Pull the shock cord through until the knot is against the hole. Anchor the short end of the shock cord along the outside of the tube with masking tape, self-adhesive paper (PRM-1) or glue -soaked gauze. Apply extra glue to the knot.

FIG. 4



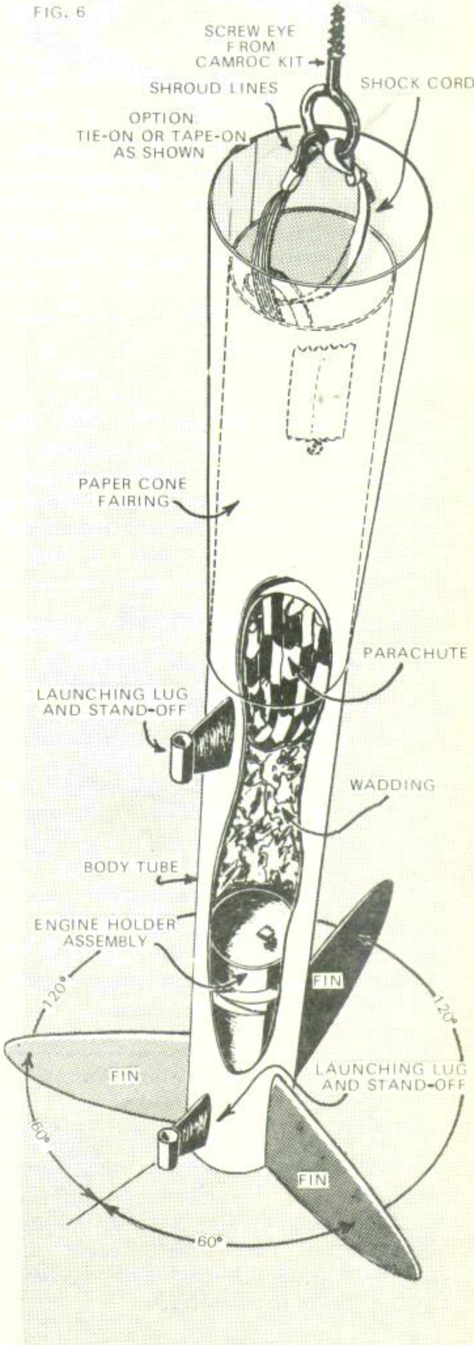
☐ 5. Smear glue around the inside of the other end of the BT-50W body tube to cover an area extending from 3/4" to 2-1/2" from the end of the tube. Immediately insert the engine mount unit, being careful to turn it so the projecting engine hook will be on the outside of the tube. Push the engine mount in with one smooth motion until the ends of the tubes are even.

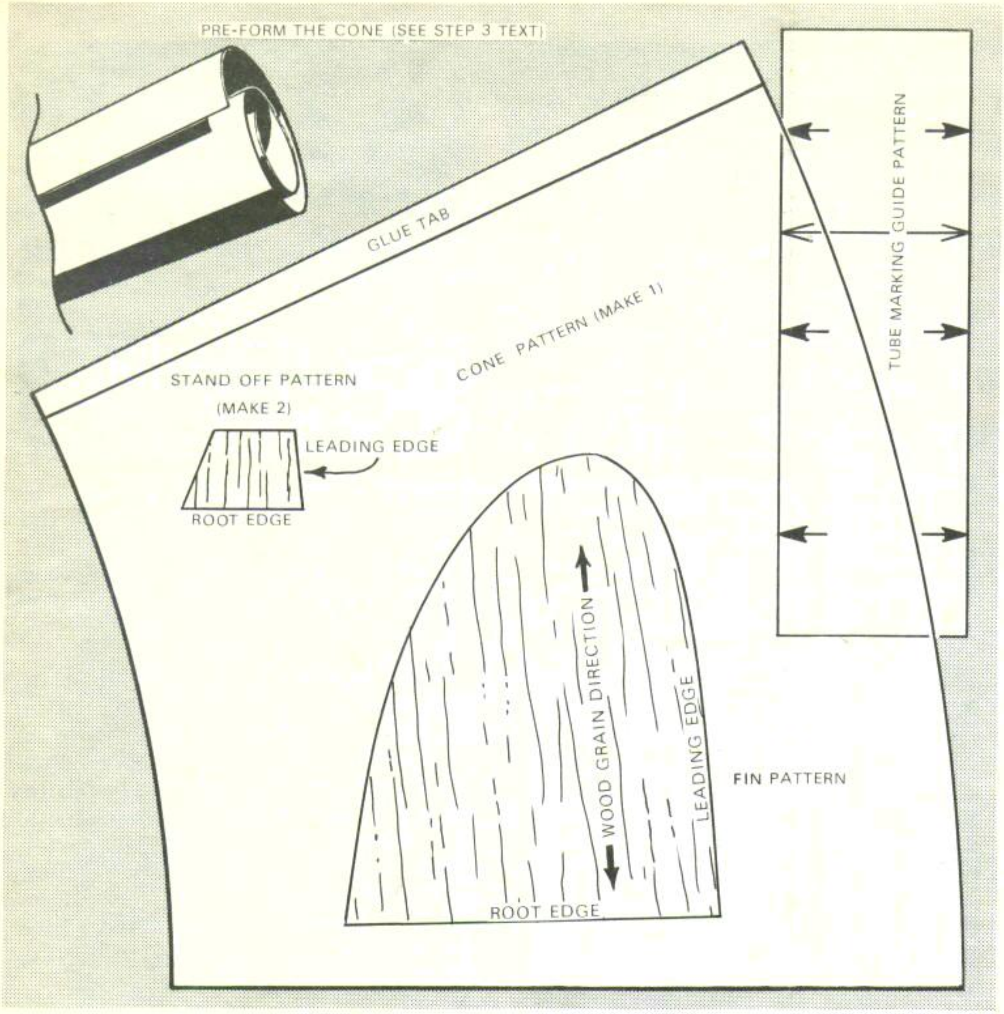
FIG. 5



☐ 6. Slide the adapter from your Camroc kit into place in the front end of the tube. Slide the paper cone onto the tube from the other end and bring it forward until it seats against the Camroc adapter. Mark the tube at the rear of the cone. Slide the cone back out of the way, smear glue all the way around the tube at the mark and bring the cone forward into place again. (For best results, pull the Camroc adapter out 1/16" before sliding the cone forward. This will provide a tight seal at the adapter/cone joint in flight.)

FIG. 6

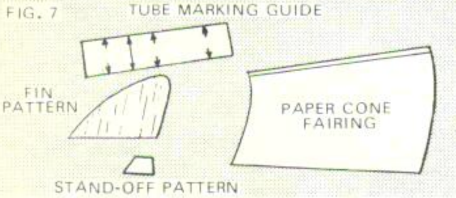




PARTS LIST

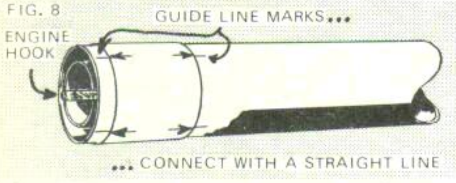
- 1 Body Tube--Part #BT-50W
- 1 Body Tube--Part #BT-20J
- 2 Adapter Rings--Part #AR-2050
- 1 Engine Holder--Part #EH-2
- 1 Parachute Kit--Part #PK-12
- 1 Shock Cord--Part #SC-3
- 1 Launch Lug--Part #LL-2A
- 1 Fin Stock--Part #BFS-30
- 1 Camroc--Part #C-1

FIG. 7



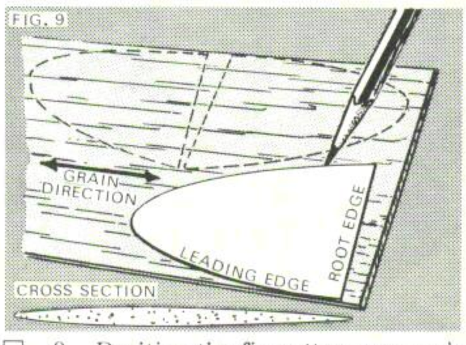
☐ 7. Carefully trace the fin pattern, stand-off pattern and tube marking guide onto a separate piece of paper (typing paper will do). Cut out the copies you have made.

FIG. 8



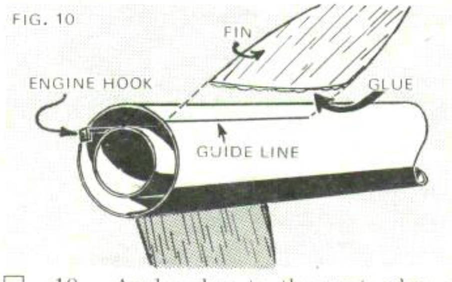
☐ 8. Wrap the tube marking guide copy around the rear of the body so the engine hook is half-way between two fin arrows. Mark the body tube at each of the arrow points. Draw a straight line connecting each pair of marks as shown.

FIG. 9



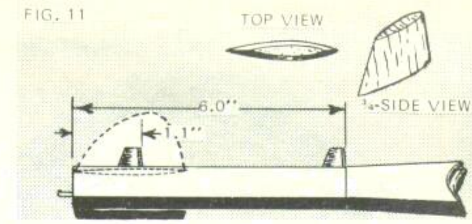
☐ 9. Position the fin pattern you made on the balsa sheet with the grain of the wood parallel to the leading edge of the fin as shown. Trace around the pattern, then reposition and trace two more identical fins. Cut the fins out carefully and sand them to the airfoil shown.

FIG. 10



☐ 10. Apply glue to the root edge of one of the fins. Attach the fin to the rocket's body with the fin centered on one of the lines drawn in step 8. Align the fin so it projects straight away from the body tube. Following the same procedure, attach the other two fins. Do not set the rocket on its fins while the glue is wet.

FIG. 11

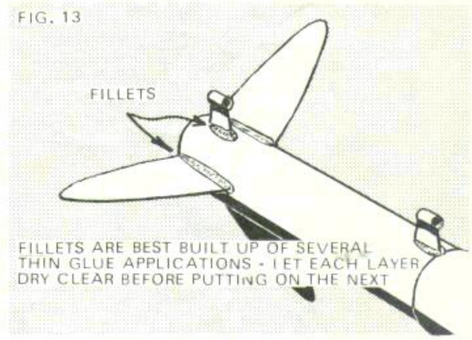


☐ 11. Trace two copies of the launch lug stand-off onto the balsa. Make sure the grain of the wood goes in the direction shown on the pattern. Cut out the stand-off pieces, sand them to the airfoil shape illustrated, and glue them to the body in the positions shown. Align these pieces carefully to get good Camroc flights.

FIG. 12

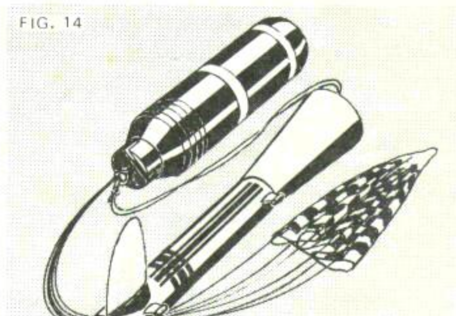
☐ 12. Cut two 3/8" long pieces of launch lug. Glue one piece to each stand-off. Check alignment by sighting through the two pieces.

FIG. 13



☐ 13. Assemble a 12" parachute while waiting for the glue to dry. After it is dry apply a fillet of glue to each fin-body joint as shown. Support the model horizontally while the fillets dry.

FIG. 14



TIE SHOCK CORD AND SHROUD LINES TO SCREW EYE IN BASE OF CAMROC

☐ 14. Seal and paint the model in a normal fashion. After all paint work is finished, connect the parachute, Camroc and rocket as shown. NOTE: Follow the "Preparing for Flight" procedure detailed in the instructions which came with your Camroc. Make sure the base of the Camroc adapter fits tightly in the body tube. When the Camroc is in place on the rocket the cone should show a slight lip all the way around as illustrated.

Focus on THE WOOD SHOP

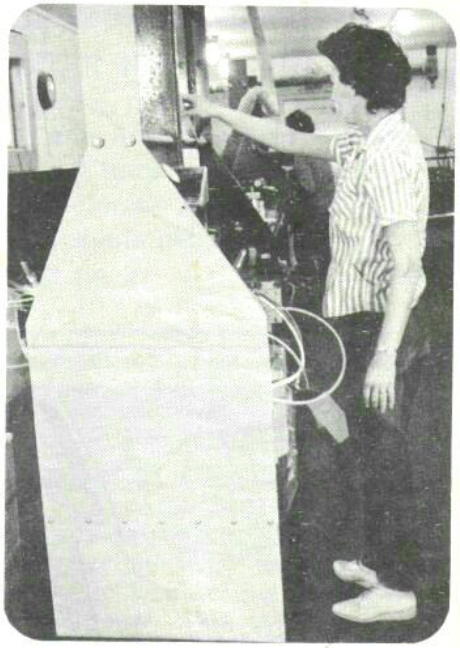
Producto Del Equador
Pais Amazonico
No Usar Ganchos
Fragil Manejese Con Cuidado
Mantengase Seco-La Balsa
Puede Denarse Irremediablemente
Al Mojarse

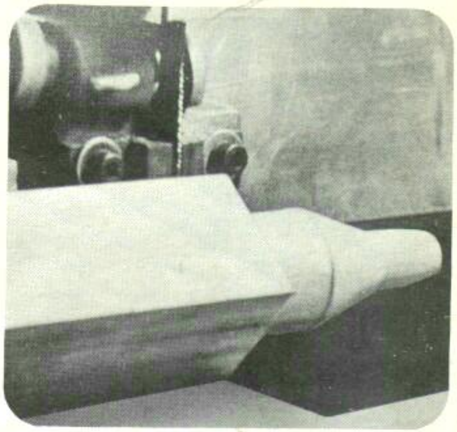
Appearing on each box of pre-cut balsa wood arriving at Estes Industries, these words simply say: "Product of Equador, Amazon Region. Use no Hooks. Fragile, Handle with Care. Keep Dry -- Balsa may be Severely Damaged by Moisture." These cardboard boxes contain the raw fin stock to be cut to the sizes needed by model rocketeers. Other balsa material for nose cones and adapters comes in bales of various sizes. Originating in Equador, South America, all of the balsa wood for the products of Estes Industries is carried by ship to Houston, Texas, moved by box car to Canon City, Colorado, then trucked to our plant. Its destination is the Wood Shop where it is prepared for America's model rocketeers.

The Wood Shop uses several machines to make nose cones, adapters and balsa parts. Quality and precision are the two major goals of the department. The original machine, named "Mary Poppins" because of the loud "pop" she made every time she finished a nose cone, was created by Vern Estes in 1959. She was fashioned from an old junk lathe, surplus government stuff and a multitude of "nuts and bolts." After faithfully serving the company for nine years Mary was recently retired.

Mary's daughters, each fully automatic, are continuing her work. Their only requirements are that they be fed periodically with balsa wood, serviced regularly and adjusted to make the various products. Here a strange transformation takes place; as the balsa lumber is fed in, half of it turns to tiny pieces and flies up a pipe--the other half pops out at regular intervals as finished nose cones.

Although the preparation of balsa products is the main task of the Wood Shop crew, they are also responsible for producing several other items which are vital to rocketeers. Flameproof wadding, for example, is produced in the Wood Shop by an automatic process in which a flameproofing chemical is





applied to the paper and "set" in place. This chemical makes the wadding self-extinguishing so that a flame or spark will go out as soon as the source of heat that ignited it is removed.

Igniters are another product of the Wood Shop. Consisting of a length of nichrome wire with a plastic-coated high resistance area at its center, each must meet both physical and electrical requirements to assure safe ignition of model rocket engines. Although the igniter production equipment is automatic in the operation, close supervision and control is maintained to insure proper quality.

Other major tasks performed in this area include production of parts for Tilt-A-Pads and Altiscopes, manufacture of launch rods and engine hooks, and many conversion operations on tubes, glue, wire and plastic. The Wood Shop ranks as one of the most vital departments here at Estes Industries and one of the most important to model rocketeers.