

Estes Industries, Inc. *Devoted to . . . Safety . . . Education . . . Enjoyment . . . in rocketry*

BOX 227 -- PENROSE, COLORADO

----- DESIGN AND FLIGHT INFORMATION

Most model rockets require parachutes, streamers, or other drag members to break their aerodynamic stability during their descent. These systems usually work well, but they have some disadvantages. Parachutes and streamers add unnecessary weight and bulk. If the wind is blowing, a parachute rocket will end up a long way from the launch area. If trees are present any rocket which returns in two pieces connected with a string is likely to end up 40 feet off the ground looking like a fancy bird's nest.

The Astron Scout is radically different in its design. Although, at first thought, it would seem impossible to make a rocket fly upward and then refuse to fly down again, it can be done. This is where the Astron Scout differs from most model rockets. It flies up and then comes tumbling down, head over heels, in one piece with no parachute to carry with the wind or catch in a tree. Carefully read the enclosed technical report, no. TR-1. Then read the following paragraphs. You will not only learn how this rocket does the "impossible," but you will also learn one of the most important principles of all rocketry, large or small, regardless of the type of recovery system employed.

The Astron Scout rocket is designed so that, in flight, the engine sits forward against the nose cone. With the engine in this position, the center of gravity is approximately 5/8" ahead of the center of pressure. According to the principles outlined in Technical Report TR-1, your rocket will be stable and fly straight.

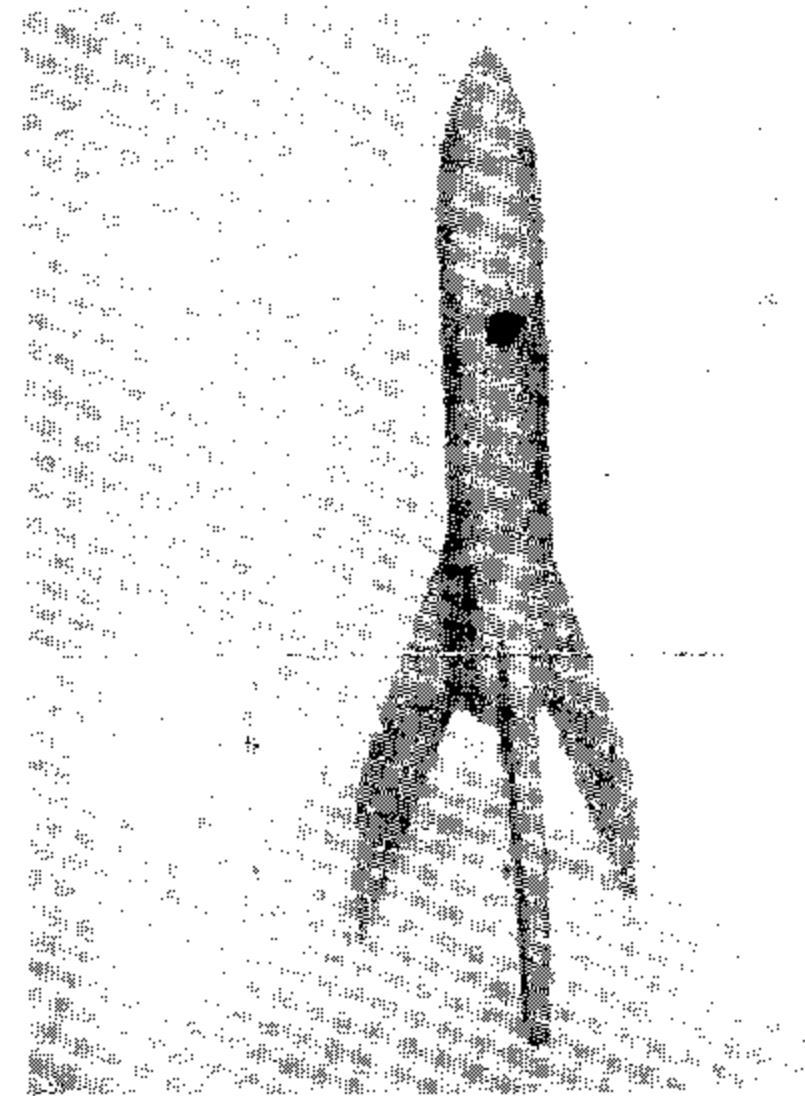
When the rocket reaches its peak altitude, an ejection charge, built into the engine, is activated. This pressurizes the forward end of the rocket body and forces the expended engine casing rearward. The engine casing is caught by the motor catch hook and held in this rear position. This shifting of weight moves the center of gravity rearward approximately 3/4 inch so that the center of gravity is now behind the center of pressure. With the center of gravity behind the center of pressure the rocket can not fly straight and will return, tumbling, to a soft landing, since the wind drag on an unstable object is extremely high.

If you do not understand this principle your rocket will still perform correctly. If you do understand it, you have learned one of the most important principles of all rocketry and should be able to begin designing your own model rockets.

FLYING YOUR ROCKET: The best place to fly your rocket will be on a model rocket range. Most ranges are set up by organized groups of rocket enthusiasts. If there is no model rocket club in your area, you may wish to start one. Estes Industries has available a Guide for Rocket Clubs which contains considerable information on forming and operating a model rocket club. To obtain a copy, send a stamped, self-addressed envelope to Estes Industries.

If you do not belong to a club and have no model rocket range available, it is best to select a place, free of trees and houses, that is large enough in which to recover your rocket. Generally such a location should be at least 1000 feet on each side, with the rocket launched from the center of the area. Since the Astron Scout lands harder than some rockets, it is particularly ideal if the area is

ASTRON SCOUT



may interfere with the proper fit of the engine. You can remove this deposit by scraping with a knife blade or similar object.

When the new engine is being installed in the rocket body check to be sure it is loose enough to easily slide forward against the nose cone. With the engine resting against the nose cone you should be able to expel it by firmly shaking your rocket. DO NOT FIRE YOUR ROCKET if you can not do this.

Before the Astron Scout rocket is put on the launch pad, be sure the engine is installed in the rocket body with the nozzle end of the engine even with the rear of the body tube. The engine is retained in this position by bending the retaining wire over the end of the engine. Upon ignition, the thrust of the engine will move it forward against the nose cone. It will stay there until the ejection charge forces it rearward at the apex of the flight.

ENGINES: The Astron Scout model rocket is designed to be flown only with Series I and Series II engines manufactured by Estes Industries. The weight distribution (center of gravity--center of pressure relationship) of this rocket is very critical and other types of engines will not work. The types recommended are the 1/4A.8-2, 1/2A.8-2, A.8-3, A.8-4, and B.8-4. They will all perform satisfactorily. You should be able to reach about 420 feet using the 1/2A engines and over 1200 feet with the B engines. **CAUTION:** For beginners and those limited to small flying fields, the 1/4A and 1/2A engines are the best. A small rocket 1200 feet up is very difficult to see and may come down several hundred feet from the launching area. Learn to fly your rocket with the smaller engines before going to the larger ones. This way you will lose fewer rockets.

LAUNCHING YOUR ROCKET: Much greater realism and safety are possible by launching your rocket electrically. To add to the realism, a count down is usually given: "5 - 4 - 3 - 2 - 1 - Mark." The launch switch is depressed at "Mark," and in a fraction of a second the rocket is zooming skyward. If a group is present, a count down is a must in

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REPLACING THE ENGINE: After each flight of the Astron Scout the expended engine must be removed and replaced with a new one. To remove the engine, spring the motor catch hook out of the way and pull the engine out before releasing the hook. Next, be sure the paper cap ejected from the old engine is removed. Check to make sure the rocket body is free of debris and residue build up. After you have flown your rocket several times a deposit of ejection charge residue may build up on the inside of the rocket body. If this deposit becomes excessive it



may interfere with the proper fit of the engine. You can remove this deposit by scraping with a knife blade or similar object.

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For launching you may construct an ignition system of your own design, or you may order one from Estes Industries or from the store where you purchased your rocket. The launching rail for the Astron Scout must be at least 30" long.

STORING YOUR ROCKET: In dry climates you need pay no special attention to the storing of your rocket. Just set it up on a shelf. In extremely humid climates it will be necessary to protect your rocket from moisture. It should always be kept in a dry place. If you are storing your rocket for a long period of time under extremely high humidity, it should be dried thoroughly and placed in a tightly closed polyethylene bag. The residue which builds up on the inside of the rocket body is extremely hygroscopic, and will become damp and sticky if exposed to excessive humidity.

ASTRON SCOUT

----- ASSEMBLY INSTRUCTIONS -----

The Astron Scout Rocket Kit consists of the following parts as illustrated in the drawing at right:

1. Nose cone, part no. BNC-30D
2. Body tube, part no. BT-30A
3. Three fins, part no. BFS-60S
4. Motor hook, part no. MH-1
5. Motor retaining wire, part no. RW-1
6. Reinforcing material for fins and motor hook, part no. GR-1
7. Launching lug, part no. LL-1

For assembling your rocket you will also need a sharp knife or razor blade, a piece of fine grit sandpaper, fast drying model glue or cement, a sharp pencil, and a pair of scissors.

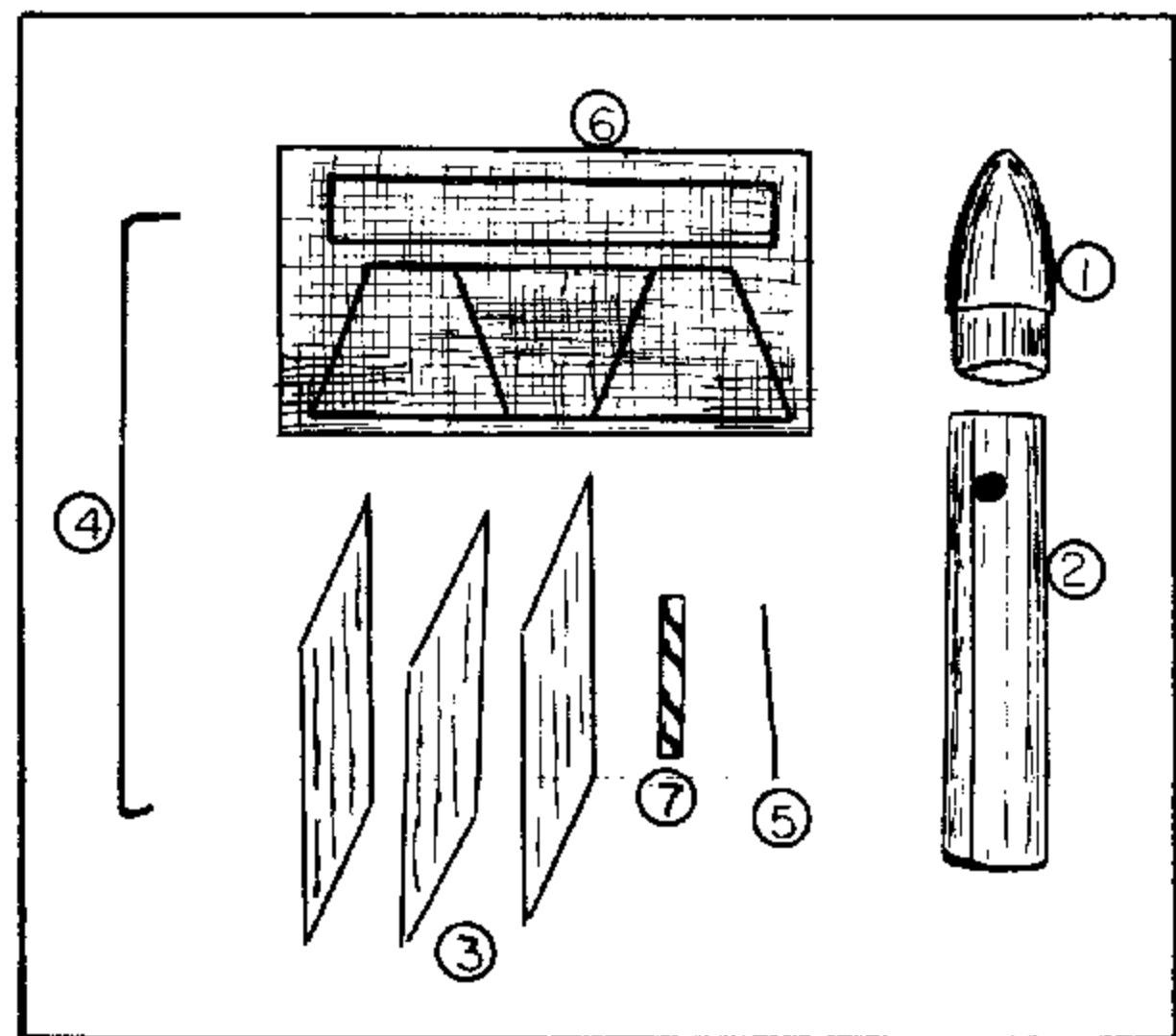
Check to be sure your kit is complete. Then read the complete instructions, steps one through eight, before beginning construction.

1. **FITTING THE NOSE CONE:** Apply glue to the upper $3/8$ " of the body tube (end with the holes) and to the lower $3/8$ " mating surface of the nose cone. Fit the pieces together immediately after application of the glue. Wipe off any excess glue.

2. **MARKING THE TUBE:** Before the fins are glued to the body it will be necessary to mark the tube to position the fins equally around its circumference. To do this, center the lower end of the body exactly on the bottom view drawing below. Turn the tube so that the small ($1/16$ " hole at the top of the tube is exactly over the catch hook position, indicated on the drawing by (4), with the large hole over the opposite (lower right hand in the drawing) fin. Using a sharp pencil, mark the tube base exactly on the outside edges of the fins (3) in the drawing. The two marks for each fin should be $3/16$ " apart if this has been done correctly. If this step is carried out properly, the motor hook (4) will fall exactly between two of the fins on the rocket.

3. **ATTACHING THE FINS:** Apply a light coating of glue to one end of one fin and press this end of the fin to the body between two of the marks made in step 2. One side of the fin should then be exactly on one mark, the other side on the other. Align the fin by sighting down the body from the top and adjusting the fin until it is exactly in line with, and parallel to, the center axis of the body. This must be done carefully or the performance of the rocket will be impaired. Repeat this procedure with the other two fins, being careful not to move the previously attached fins out of line. Do not set the rocket or the fins or apply any pressure to them until the glue has dried.

4. **THE MOTOR CATCH HOOK:** The motor catch hook extends from rear the forward end of the body tube to approximately $1\ 1/2$ inch beyond the rear of the body tube. To install, first punch the long 90 degree end of the motor hook through the small hole at the upper end of the body tube into the balsa nose cone. Be careful to punch this hole straight into the nose cone so that the small end can be positioned to point directly to the center axis of the rocket as (4) in the bottom view drawing. Next, work a small amount of glue into this hole. Then apply glue to the body tube along the line where the wire will be secured. Immediately place the wire in position, being sure it is running exactly parallel to the body tube and is securely against it. Wipe off any excess glue.

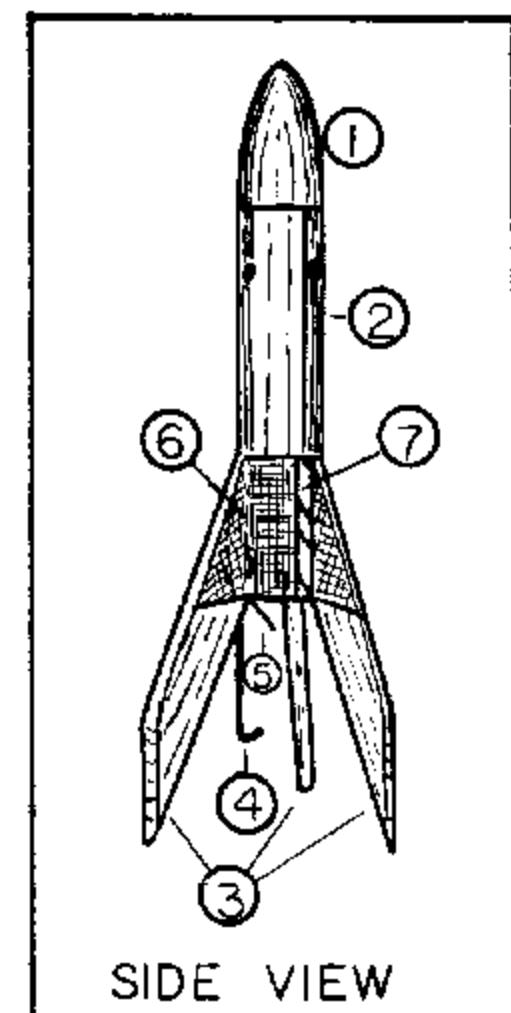


5. **THE MOTOR RETAINING WIRE.** Glue the small copper motor retaining wire along the body tube, leaving $3/8$ inch of its length projecting beyond the rear end of the body tube.

6. **APPLYING THE GAUZE REINFORCING.** The gauze reinforcing is necessary if your rocket is to be flown more than once or twice. First, cut all pieces from the gauze strip, closely following the lines. Then apply the three fin reinforcements, one at a time, in the following manner:

- A. Apply glue over the area to be reinforced.
- B. Quickly spread the glue evenly with your finger and then apply the gauze with the narrow end forward.
- C. Smooth the gauze evenly until it is free from all wrinkles. (If the gauze projects beyond the edges of the fins or back of the tube, it may be trimmed after drying thoroughly.)
- D. Immediately apply a coat of glue over the gauze and spread evenly and smoothly with your finger. Be sure the gauze fits tightly into all corners and over wires as closely as possible to provide maximum strength.

After all three fin reinforcements have been completed, apply the long motor hook reinforcement covering the entire attached part of the motor hook wire. This double reinforcement is necessary over the rear of the motor hook since considerable stress is applied to this joint when the engine is put into or removed from the rocket. Next, apply successive coats of glue over all reinforcements until the holes in the gauze have been filled with glue and the surface is smooth. Two or three coats should be adequate. Be sure to smooth each coat thoroughly, using your finger. Allow a few minutes between coats for drying. (For the more experi-



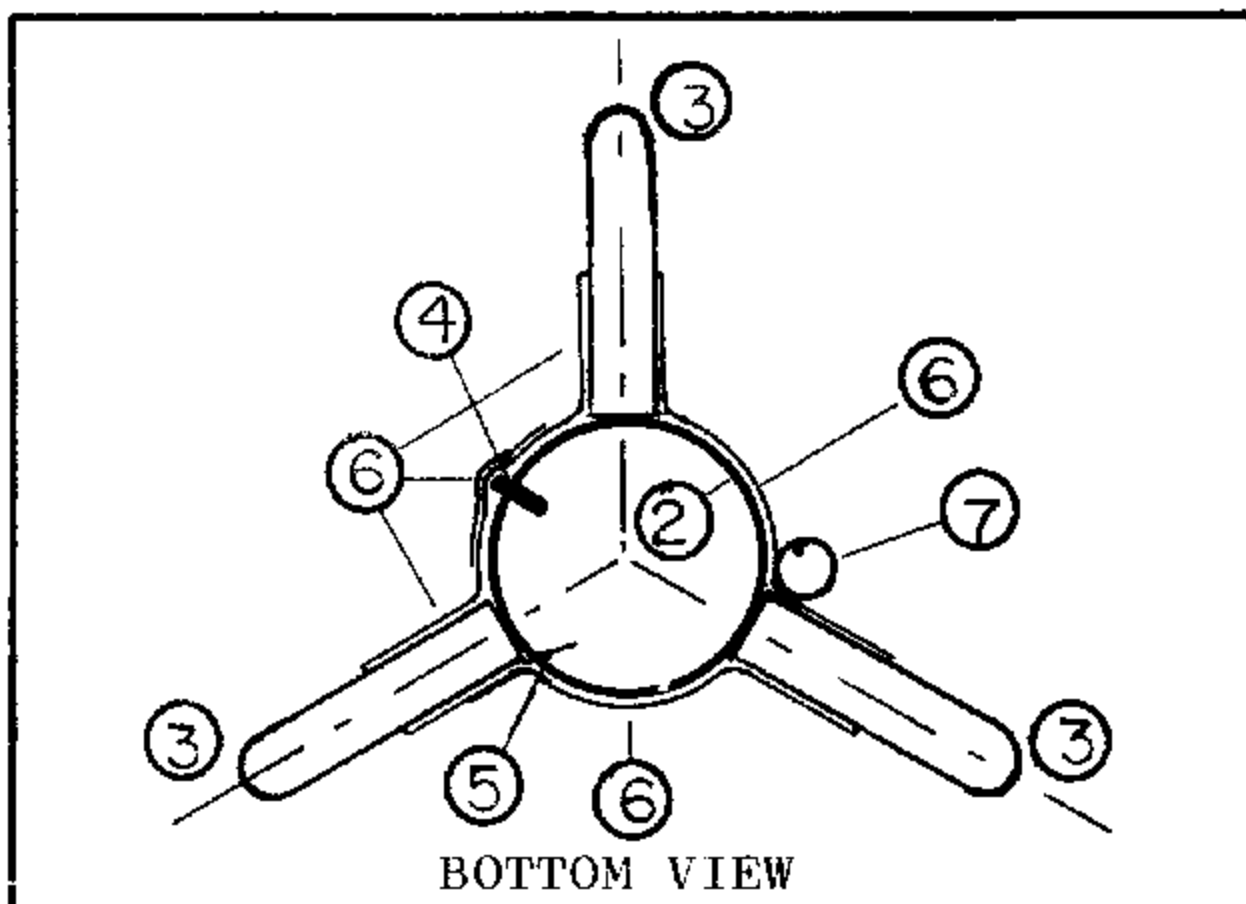
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1. FITTING THE NOSE CONE: Apply glue to the upper $\frac{3}{8}$ " of the body tube (end with the holes) and to the lower $\frac{3}{8}$ " mating surface of the nose cone. Fit the pieces together immediately after application of the glue. Wipe off any excess glue.

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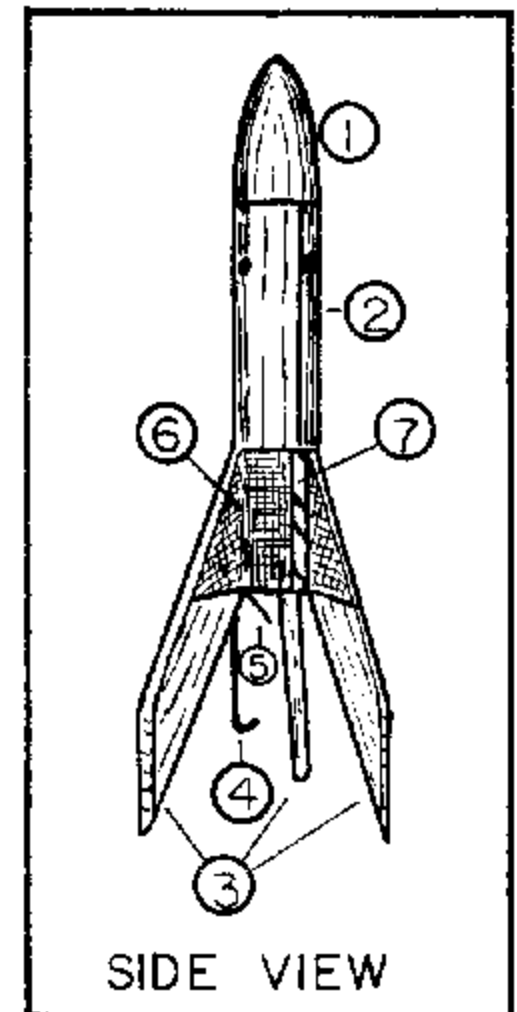


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7. THE LAUNCHING LUG: The launching lug should be thoroughly glued into the corner made by a fin and the body tube as shown in the drawing. Be sure the lug is aligned with the body tube so the rocket will be launched in a vertical direction.

8. FINISHING. Sand the forward and outer edges of the fins until rounded. Sand the nose cone and remaining surfaces until smooth. Then coat with sanding sealer, sand again with very fine grit sandpaper, and paint your rocket according to standard modeling procedures. When finishing your Astron Scout remember that the smoother the finish, the less wind drag, and the better the rocket will fly.