american rocketeer

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CENTURI ENGINEERING COMPANY

Centuri

BOX 1988 PHOENIX, ARIZONA 85001

Build a "SUPER-SCALE"

SEE PAGE 2

Centuri introduces line of "SUPER-SCALE" models

A major benefit of Model Rocketry, as a growing and satisfying hobby, is its appeal to so many people. Some are intrigued by futuristic or Flash Gordon type designs. Some hard-core contest winners adamantly contend that the "sport" or multi-stage route is the only way to go. Others—and this represents a rapidly increasing number—are overwhelmingly impressed with the realism and meticulous detail of Centuri Super Scale models.

The Centuri Super Scale line currently includes 6 model kits. These are the Saturn V, the Saturn 1B, two scale versions (1/45 and 1/100) of the Little Joe II, the Nike Smoke, and the famous German V-2. The fact that these painstakingly accurate scale models actually fly comes as a surprise to many individuals who have not been previously associated with Model Rocketry. Even experienced Model Rocketeers who have closely inspected the Centuri Saturn V seem reluctant to believe the carefully-scaled, 43 inch tall, black-and-white beauty will really fly. Well, believe us—and the many thousands who are now proud owners of the Saturn V—it does fly. Beautifully!

Careful and time-consuming research went into the development of the Super Scale model kits. Inovations were developed in the use of metal foil and plastics so that the accuracy of dimension and scale detail are available with uniformity to every builder. Technological break-throughs in model rocket kit design have resulted in finished models which will draw envious expressions of praise in a static display, when ready to fly on the launch rack, or when arching upward in graceful powered flight. These sleek beauties will be proud additions to any Model Rocketeer's collection.

Thousands of Model Rocketeers have built and flown at least one of the Centuri Super Scale models. There are many who have built every kit in the line and have been lavish with their praise of the construction innovations, the scale accuracy, and the flight performance. We realize there are undoubtedly many rocketeers who have hesitated to build a Super Scale model because of stories they have heard from experienced modelers regarding the detailed work required to construct an acceptable scale model. Care and accuracy of workmanship are needed. This cannot be denied; however, most of the tedious and time-consuming detail work is a thing of the past. You will be pleased. The fact that Centuri Scale Models may be completed with less tedious and time-consuming detail work should not be interpreted as an unqualified invitation for the novice to build a complex and expensive model such as the Centuri Saturn V as his first effort in model rocketry. On the contrary, we urge the new rocketeer to develop his building and flying skills by means of a Centuri Beginner's Outfit or simple single-stage model rocket kit. Some diversified model rocket flying experience is recommended before attempts are made to launch a multi-engine, cluster-ignition model such as the Saturn V. Scale model kits are more complex than the very simple single-stage standbys such as the Astro-1 and the Micron. A greater degree of patience and careful attention to sequential steps in the instructions are followed carefully, however, the results will be uniform and satisfying.

Now, let's take a closer look at the whole Centuri Super Scale line. We will cover briefly the highlights of the full-sized rocket on which the Centuri model is based. We will also cover briefly unique construction and/or design innovations which have been incorporated into the model kit. Before discussing the specifics of each kit, however, it is appropriate to highlight a common feature of the line—the instruction sheet. No expense was spared to make the Super Scale instruction sheets of the highest possible quality and utility. Your comments regarding the adequacy and quality of these carefully-developed instructions will be appreciated. Do they tell the story adequately? Are they detailed enough? We think they are; however, your views are welcomed. If you have constructed one or more of the Super Scale line, let us have your views on the kit, the instructions, the packaging, and the flight performance. If you plan to build one of these fine Super Scale Models, keep a record of your observations and drop us a line. Help us provide the information you think most important. You are the ultimate judge.

SATURN-V

The recent exploits of the Saturn V booster in the Moon Shots are well known to everyone in the Free World. This regal beauty is the workhorse of the Apollo Program and is largely instrumental in assuring the United States' primacy in space. Not only did the Saturn V booster send man to the moon, but it is scheduled for many more history-making chores in the future U.S. space program. The Centuri Super Scale Saturn V is a replica of the booster which sent Apollo 8--with its stalwart Astronauts Borman, Lovell, and Anders--into its historical orbital reconnaissance of the Moon. The Centuri replica of SA-502 stands 43 inches high, while the NASA version is as high as a 34 story building.

Despite its massive and regal appearance, the Centuri Saturn V weighs less than 13 ounces at lift off. Using a 3 engine cluster, it will soar to altitudes in excess of 500 feet. This beautifully detailed kit uses many new materials and construction methods. Formed plastic body wrappers--a Centuri innovation--provide full-depth corrugations and all external details. The molded Apollo Capsule is rapidly and easily assembled and finished. The new hollow-core stabilizer fins are much faster to attach and finish. They will withstand 10 times as much landing shock as balsa-wood fins, thus adding to durability and flyability. Flight stability is achieved without the requirement for clear plastic fins, thus adding to the authenticity of the model when on display, on the launch pad, or in flight. The Centuri replica of Saturn booster SA-504 has one major advantage over its full-sized conterpart. It can be flown over and over again. The same advantage applies to all other model rockets made by Centuri. They are designed for reliability, durability, and many, many enjoyable and thrilling flights.

SATURN 1-B

The Saturn 1B was the forerunner of the Saturn V. It evolved from the C-1 and C-5 and was first launched in 1961. In 1964, the Saturn 1B placed nearly 40,000 pounds in Earth orbit. This represented a major advancement in the United States' payload capacity. During the early days of the Apollo program the 1B and V were used on alternate flights. The Centuri Saturn 1B Super Scale model is an exact replica of SA-205, the booster which lofted Apollo 7 into space with Astronauts Schirra, Eisele, and Cunningham aboard for a history-making 11 day orbital flight of the Earth. The model stands over 2 feet tall, yet weighs less than 5 ounces. It will fly straight and true to altitudes of 800 to 1000 feet and return safely on its two colorful parachutes. Advanced construction methods are used to great advantage in this precision-engineered model kit. These include diecut bulkheads and body discs, detailed corrugated body wrappers, hollow-core plastic fins, plastic pre-formed fuel tank shroud, and a fully-detailed molded plastic Apollo capsule, with its realistic and imposing escape tower and rockets. This kit requires patience and care; however, if you take your time and read the instructions carefully, following each step as illustrated in the correct sequence, you will be assured a finished model which will make you proud. It is imposing on display or in flight.

APOLLO LITTLE JOE II

The Little Joe II is a solid rocket booster designed and produced by the Convair Division of General Dynamics. It was designed for use in the NASA Apollo Program with the primary purpose of man-rating the Apollo Launch Escape System. This is the system which pulls the manned capsule to safety in the case of a catastrophic failure in the Saturn booster. There were several Little Joe launches, each with a slightly modified external configuration. The rocket used a cluster of up to seven solid propellant motors which produced a combined total thrust up to 860,000 pounds. The unmanned Launch Escape flight tests were conducted at the White Sands Missile Range in New Mexico from 1963 to 1966.

The Centuri Apollo Little Joe II kits are exact replicas of two rockets launched from White Sands. The 1/100 scale kit is a copy of NASA vehicle BP-12, flown on May 13, 1964. The 1/45 scale kit is a replica of CSM 002, launched on January 20, 1966. Slightly different scale detailing, markings, and construction techniques will yield two finished scale models of great beauty, durability, and reliability. The 1/45 scale kit rocket body is furnished with the corrugation and paint pattern already applied.

Minor detail modification must be completed by the builder to the already applied surfaces to assure detailed accuracy of the finished rocket. The instructions are clear and concise. A different construction technique is used for the 1/100 scale model. This smaller version is affectionately called "Baby Joe" by Centuri modelers. It requires no painting. All external surfaces are covered during construction with pre-finished paper wrappers and gleaming metalic foil. The molded plastic Apollo capsule and escape tower are identical to those provided with the Centuri Saturn 1B and Saturn V. The Baby Joe is a gleaming, high-flying little beauty which will be displayed and flown with pride.

NIKE-SMOKE

The famous Nike Smoke Rocketsonde is a sleek, streamlined rocket utilized by NASA and the Air Weather Services to measure upper atmosphere movements. The Nike portion of this famous rocket is a standard M-5 solid-propellant booster. The Smoke portion is a stainless steel nose cone containing a chemical payload which reacts with the water vapor in the atmosphere to form dense white smoke. Photographs taken from the ground of the movement of the white smoke permit scientists to determine and study high altitude wind patterns and wind velocities up to altitudes of 75,000 feet.

The Centuri Nike-Smoke is an exact 1/10 scale replica of this famous research rocket which has been launched in large numbers from Cape Kennedy and Wallops Island, Virginia. It is a large, lightweight, high-flying model rocket which requires but one engine for maximum and flawless performance. It is imposing on the launch pad and in flight. The large plastic nosecone may be given a beautiful smooth finish. The spacious parachute compartment and spring steel engine lock make it simple to prepare the Nike Smoke for many thrilling subsequent flights. Construction of the tapered two-piece plastic nosecone requires patience, care, and strict adherence to the detailed instructions. If proper procedures and suitable liquid cement are used precisely as stated in the instructions, the result will be an impressive, accurately-scaled, good-looking model which you will be proud to display and fly.

GERMAN V-2

The famous German V-2 rocket of World War II renoun is considered by many to be the forerunner of today's rocket technology. The V-2 was the first intermediate range missile to be operationally deployed in the history of man. This infamous wartime development of man's capability to operate in space today and land on the Moon. The V-2 was developed by a team of German scientists headed by Dr. Wernher von Braun of current NASA fame. The prototype version of the V-2 was first test flown in 1942. The V-2 was powered by a liquid oxygen and alcohol engine which would propel the 28 thousand pound missile to approximately 16 miles in height for a ballistic trajectory course to its intended target area. The accuracy was poor. The guidance system was elementary and unsophisticated by today's standards; however, as an example of man's first efforts to reach outside the earth's atmosphere it was very significant.

The Centuri 1/40 scale replica of the German V-2 is a model which will please the most discriminating hobbyist. The only details missing from this 14 inch tall, black-and-white beauty are the guidance control vanes located at the tail of the rocket. Since the Centuri V-2 is a flying scale model, it was necessary to eliminate these control vanes because they would have interfered with the installation and removal of the model rocket engine. Accurate scale cross section over the 14 inch length of this streamlined model is assured by the factory manufactured, pre-sanded nose and tail cones. These carefully pre-shaped cones fit precisely into the specially designed lightweight body tube to assure a rocket body which will lend itself to accurate finishing with a minimum amount of shaping and sanding. If the builder will take his time and follow the precisely developed instructions with care, he will have a Super Scale German V-2 which he will be proud to display and fly.

This has been a short description of the current Centuri Super Scale line. As additional Super Scale models are introduced they will be announced. New models are not manufactured until exhausting scale research is completed. The data is then carefully verified with manufacturers and authorities. In those cases where there are variations in detail and marking in the full-size rockets, a decision must be made regarding the model and marking selected as the basis for the scale model. When you purchase and build a Centuri Super Scale model, you can be assured of quality and accuracy of detail.

KEEP IT SAFE!

Occasionally, Centuri receives information from unhappy rocketeers or their parents that a local fire or police official has managed to implement a local ordinance against model rocketry. Fortunately, the number of officials who take such uninformed action is reducing as the true nature of model rocketry becomes better known. Many individuals equate model rockets to the old-fashioned Fourth of July skyrockets which impressed the spectators with their self-destruction and pyrotechnic display. Every model rocketeer knows that there is absolutely no comparison between the model rocket of today and the "skyrocket" of yesteryear. The model rocket is designed to impress the spectator with its safety, its realistic launching and flight, and its soft and safe return to earth for subsequent flights. There is no self-destruction or pyrotechnic display involved. If you run across any of these officials or individuals who try to stop model rocketry with the excuse or statement that they are fireworks, please refer him to the NFPA Code No. 41L, Code for Model Rocketry. Also, send his name to the Director of Educational Programs, Centuri Engineering. We will send the individual a personal letter and appropriate educational material on model rocketry. We recommend, also, that you do your best to sell such an individual on model rocketry by inviting him to a launch, letting him review the catalog, and doing your best to uphold the outstanding safety record currently enjoyed by our hobby. Clubs can do a great deal to build up the positive and educational aspects of model rocketry. Keep it safe! Educate!

Caught in the act!

Lee Piester (Right) and Keith Niskern (Left) are shown presenting a Centuri Little Joe to Mr. Durant, Director of the Aerospace Museum of The Smithsonian Institution. The presentation was made during a recent trip to Washington by the Arizona boys. Other models of Centuri's "Super Scale" line can be seen in the background.

The Smithsonian is truly the hall of fame for model builders. Thousands of models of every conceivable prototype proudly repose in the many galleries of the huge Smithsonian complex. Some of the most complex and equisitely detailed models ever built can be seen here. Is it any wonder, then, that we point with pride to a group of model rockets in the Arcade of the Aerospace Museum and say, "Those are ours!"

SPACE TEASERS

The Moon is now at the forefront of the news. Man took his first step on the Moon in July 1969 and opened a new era of exploration and adventure. Government Officials and scientists are now talking about Man's first steps on Mars. There will always be new horizons and new frontiers. In keeping with today's news, however, let's take a look at our knowledge of the Moon in the form of Space Teaser questions. See how many you can answer. See if your friends know the answers. Next time the conversation gets around to the Moon, amaze your friends with "Moon Facts."

Background: The Earth, with its eight sister planets, orbits around the Sun as the center of our solar system. It takes the Earth one year to complete a single orbit. The Moon orbits around the Earth in a similar manner and completes the trip in one Lunar Month. This Lunar Month is 28 Earth days long. The 'pull of gravity' on the Moon is approximately 1/6 of that on the earth. The weight of an object is an indication of the pull of gravity on that item. Radio signals travel at approximately the same speed as light, 186,282 miles per second.

Now using the background information above, along with other facts you have learned in School and Model Rocketry, jot down your answers to the following questions. Remember the questions and answers and increase your store of "Moon Facts."

1. Rounding off to the nearest whole number, how many lunar months are there in an Earth year of 365 days?.....

2. In a calendar month there are approximately 4½ weeks. How many weeks are there in a lunar month?.....

3. At the nearest point in its orbit, the Moon is 221,462 miles from the Earth. At the farthest point it is at a distance of 252,710 miles. What is the Moon's Apogee?..... Its Perigee? ..... What is the average distance?.....

4. During a 28 day Lunar Month the Moon will travel approximately 1,500,000 miles. To the nearest thousand, what is the speed of the Moon in miles per day?..... In miles per hour?.....

5. How much will a man weighing 180 pounds on the Earth weigh on the Moon?.....

6. Would a man find it less strenuous to walk or lift objects on the Earth or on the Moon?..... Why?.....

7. If a man on the Moon weighed 80 pounds, would be be considered overweight or underweight by Earth standards?..... If a man can lift 500 Earth pounds on the Moon without too much difficulty, how many pounds could he lift on the Earth with the same amount of effort?.....

8. How long would it take a radio message to get from the Houston Space Center to a Man on the Moon when the Moon is at its Apogee? ..... Its Perigee?.....

9. Radar uses radio waves. These waves bounce off the target and return to the transmitter of the signal. Using the average distance of the Moon from the Earth, how long will it take a radar signal to travel from the Earth transmitter to the Moon and back?..... What is the formula for this computation?.....

10. Using a similar procedure, we can determine the distance of a Space Ship from earth. How long will it take in minutes and seconds to send a radio message to a Space Ship 242,300 miles from the Earth?..... What would be the total time for a radar signal from initial transmission to reception of the return signal?.....

See, these questions are not too hard. The same mathematics and logic you use for Earth questions and answers can be applied with equal success to Space questions and answers. The distances are greater and the times are longer, however, it only means that Man must learn to operate and think in an expanded environment. Model Rocketry can help you think and plan in this type of expanded plane.

PUBLISHER'S NOTE

The AMERICAN ROCKETEER is published by Centuri Engineering Company for its customers and friends to further acquaint them with the hobby of model rocketry and the new products now available. It is sent free of charge to all Centuri customers who have ordered from us recently. Your continued support, by purchasing Centuri supplies, makes this newsletter possible.

We welcome your comments and suggestions for improving and expanding the AMERICAN ROCKETEER. Please send news clippings, photos, club news, and articles to:

American Rocketeer Publications
Centuri Engineering Company
P. O. Box 1988
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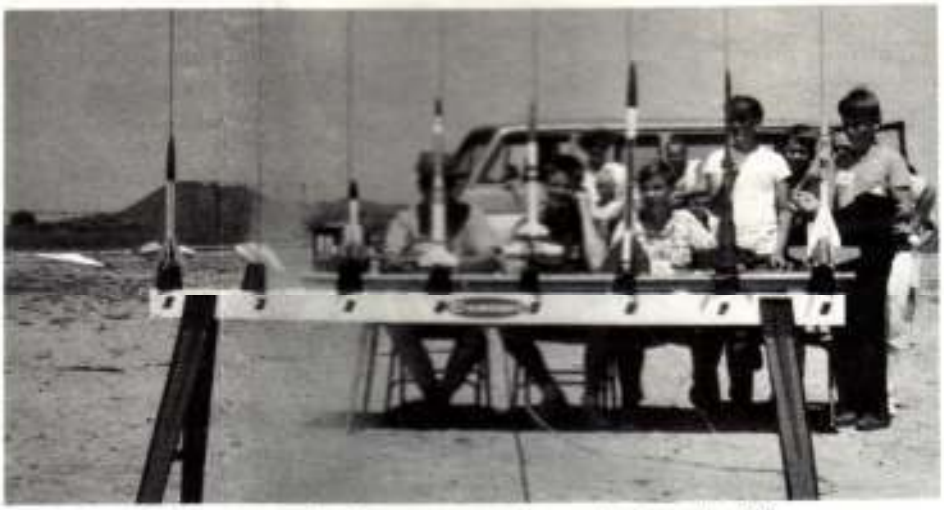
CONDUCTING A CLUB LAUNCH

This article is the second in a series concerning construction and operation of a club launch system. This story concerns itself with general launching requirements and proceedures. The first article (volume 3, # 1 American Rocketeer)* described in detail how to construct a club launch rack and firing panel. Future articles will deal with the specifics of contest proceedures, construction of communication systems, etc. The requirements and procedures listed below are general and may very in certain launch situations. The principles of adequate firing supervision and range safety, however, are basic and should always be followed in any group firing activity.

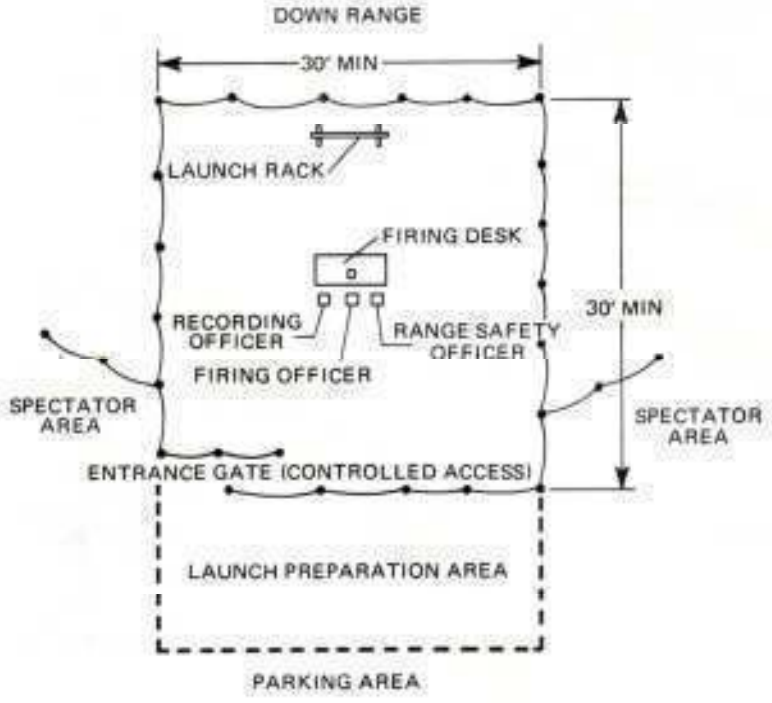


Efficient communications are a must for any large launch activity

1. The first requirement in conducting a club launch is to have the adult club advisor present to act as a general range safety officer. In case the club advisor cannot be present, an alternate should attend in his place. Although most rocketeers are very safety conscious, the adult participation is extremely important.

2. Assuming that you have a club launch system (such as described in the previous story) and a pair of tracking devices (such as Sky Trak), the next step is to obtain a launch site. The site should be in a cleared area, away from streets, power lines, trees and buildings. The site should have a recovery range with the shortest side measuring (in feet) at least ¼ of the highest estimated altitude. IE: If the highest estimated altitude is 1,000 feet, then the shortest side of the recovery range should measure at least 250 feet. In addition, you will need sufficient space for firing and preparation areas, spectator and parking areas. An open area behind the launch site, of equal size to the down range recovery area, will prevent the problems of being completely at the mercy of changing winds. Remember that the one-fourth altitude factor is an absolute minimum. Try always to obtain the largest possible launch site. Suitable sites can sometimes be found in city parks and school grounds. More often, however, launch sites are located in rural areas on public or private property. Always obtain permission from authorized officials or property owners to use the launch site (no matter how remote). Remember too, it is your responsibility to clean up the area after use.

3. The launch facilities should set up so the down range recovery area is not readily accessible to casual spectators. If there are power lines or buildings in the area, try to arrange to have these objects well behind the flight preparation area. The tracking stations must be set up so they will have an adequate baseline (1,000 feet is ideal) and so they will have an unobstructed view of the firing square. The position of the sun needs to be taken into consideration. You don't want to have a station tracking directly into sun on every launch. A walkie-talkie or ground line



communication system should be used to connect the tracking stations to the firing desk. The access road leading into the site should be behind the firing area. Signs will be needed for placement at the highway entrance ("Model Rocket Firing in Progress"), and for designating parking and spectator areas.

4. The firing square is roped off as shown in the illustration. It is very important to have this area enclosed--especially if spectators may be present. Many clubs use flag pennant strips such as those strung up about gas stations, grocery stores, etc. These pennants may be purchased at many display or art stores. A trip to some of the local gas stations, however, may yield a gratis supply "from a junk box in the back room". In lieu of pennant strips, a clothes line rope with strips of crepe paper tied to it will suffice. The rope is tied to stakes driven into the ground at 8 - 10 feet intervals. The rope should be at a height of about 3 feet from the ground. If a number of spectators are expected, it is a good idea to rope off a flight preparation area immediately behind the firing square.

This shot graphically demonstrates the need for a roped off firing area. Even though the crowd is large, no one is near the launching rack except the authorized launch personnel.

5. The firing square contains the launch rack, firing table, firing panel, communications equipment and power supply. The power supply for the launching should have an ample amperage rating. Quite often, a battery from one of the members' automobile is used for the power source. After a couple of sample launchings to determine wind direction and drift, the launch rack is angled to direct the descent path of the rockets into the down range recovery area. If the wind is too strong, postpone the meet. Once the facilities are set up, the following persons will be designated to man the firing square:

Setting up the rack. Note that kibitzers and casual spectators aren't allowed in the firing square even when launchings are not in progress.

A. Range Safety Officer: This is the man who runs the meet. He usually mans the PA system (if one is available). He keeps spectators informed as to what is currently taking place. He is responsible for seeing that unauthorized persons do not enter the firing square or go down range. He checks for aircraft or other vehicles in the area. He checks all models for safety before allowing them to be placed on the launch rack. He insures that all models on the launch rack are properly connected. Only after everything has been checked and okayed does the Safety Officer remove the firing key from his pocket, arm the panel and give permission to launch. Immediately after launch, he removes the key and puts it back in his pocket until the next rack of rockets is ready to fire.

B. Firing Officer: This person actually fires the rocket. He alerts tracking and recovery crews and, upon approval of the Safety Officer, gives the countdown and pushes the button. In many informal launches, the individual is allowed to fire his own rocket, eliminating the need for a regular firing officer.

Two men are needed at each tracking station. One man operates the tracking device while the other aids in following the "track" and handles communications with the launch site.

C. Recording Officer: After the model has been safety checked, the Recording Officer assigns it a launch rod number. He records the rocket in his flight log book and, upon launching, inserts pertinent data regarding the flight. The Recording Officer receives altitude figures from the tracking crews. In an informal firing, he will often complete altitude computation and insert the figures in the log. In large meets and contests, the Recording Officer receives the raw data and passes it on to a data reduction crew for final compilation.

"Tracking stations alert. Ready on # 2. Fire!"

In addition to the personnel in the firing square, there should be two men at each tracking station. One person tracks the flight and the other handles communications with the launch site. A recovery crew of at least two persons assist in recovering the rockets down range. In some contests, the owner of the rocket must retrieve his own bird. In this case, the recovery crew observes descent and aids the individual in locating his rocket.

Safety officer and firing officer observe the launch while communicating with the tracking stations. Note the table made from sawhorses and a piece of plywood.

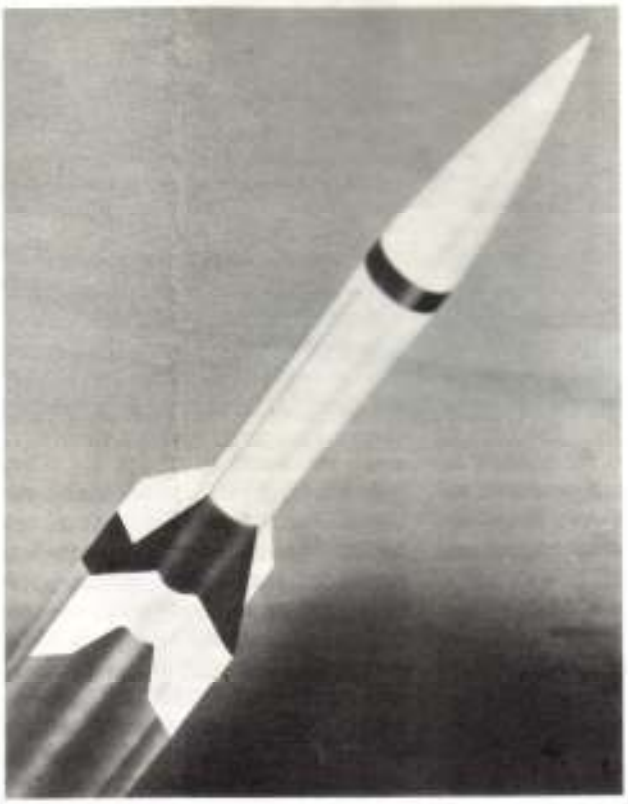
6. As we stated before, this is a general outline for conducting an informal meet. Large contests involving perhaps several clubs require much pre-planning. We hope to explore this in detail in a future issue of the American Rocketeer. The communications system, so important to a larger meet, will be discussed in the next issue. One thing to remember, large or small meets, with or without refined equipment: Always conduct a meet in a safe, serious manner. Save the horseplay for later. Follow the basic range safety procedures outlined in this article, whether the group comprises four or forty.

SIX NEW Centuri KITS

TWISTER

Low in price but high in performance, the "Twister" gets its name from the unusual spin effect produced by the canted fins. This high flyer should prove very popular with the younger set.

Catalog No. KA-2 . . . . . $1.50



MX-774

An inexpensive addition to a scale collection, the MX-774 is a faithful replica of the first large U. S. built liquid fuel rocket. Eleven inches in length, this model is capable of flights to 1600 feet (with a "C" engine).

Catalog No. KA-3 . . . . . $1.50

CENTURION

Large and pretentious, the Centurion features slow lift offs and spectacular flights. When completed, the kit stands 24 1/2" tall. The Centurion uses a new baffle ejection system that eliminates the need for parachute wadding. Keep your eye on this one . . .

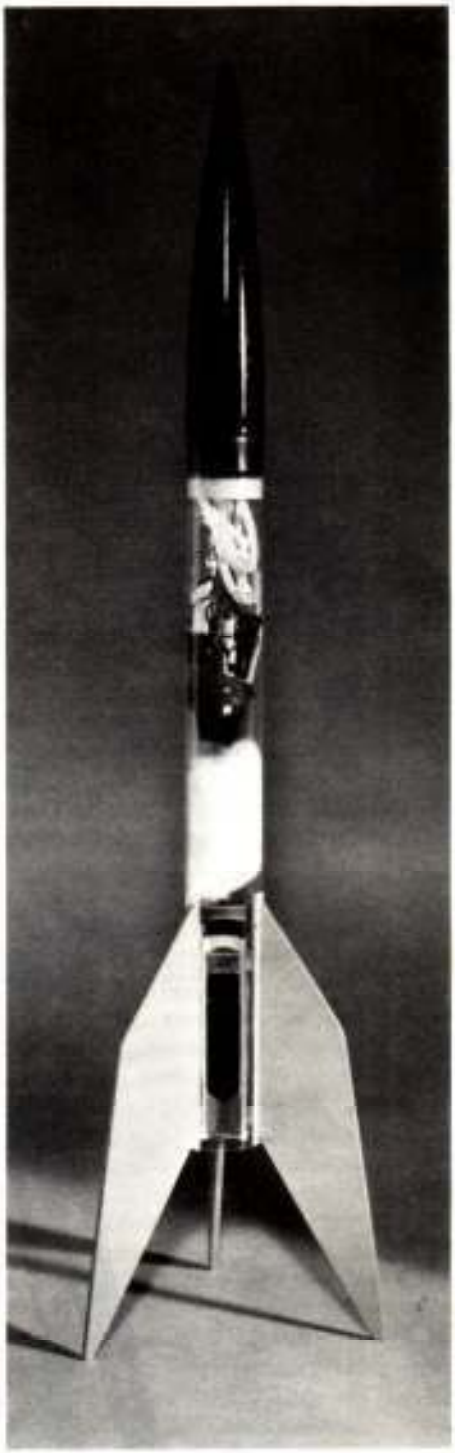
Catalog No. KC-2 . . . . . $3.00

QUASAR

Atomic powered for deep space flight, the Quasar also carries air breathing ram jet engines for operations in the atmosphere (naturally).

Reminiscent of the science fiction ships of our younger days (remember), the Quasar was designed to fill a void in the more imaginative end of the rocket spectrom. Complete with large colorful decals, this kit should be a most competent void filler.

Catalog No. KC-7 . . . . . $4.00



Long Tom

Standing an impressive 35½" tall, the Long Tom is sure to be high on the local popularity list. This attractive two stage kit will be perfect for demonstration flying. Featuring Centuri's new *"pass port" staging system, the Long Tom is a sure fire performer every time.

Catalog No. KC-4 . . . . . $3.00

*Patent Pending

VISIBLE ASTRO

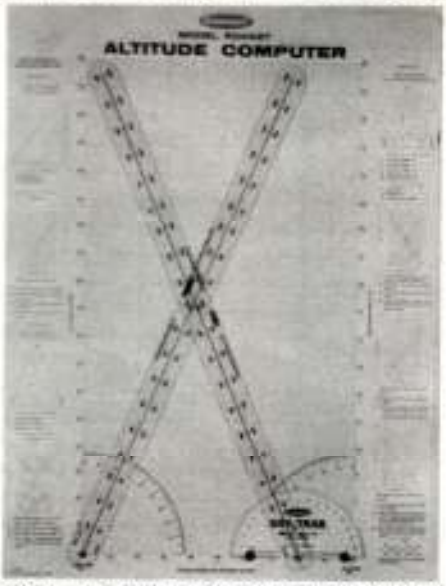
This kit will prove very popular with teachers, camp counselors, and students looking for educational science fair projects. Complete with plastic cutaway rocket engine, the Visible Astro is ideal for demonstrating all phases of model rocketry construction and flight sequences.

Catalog No. KC-10 . . . . . $3.00

SKY-TRAK

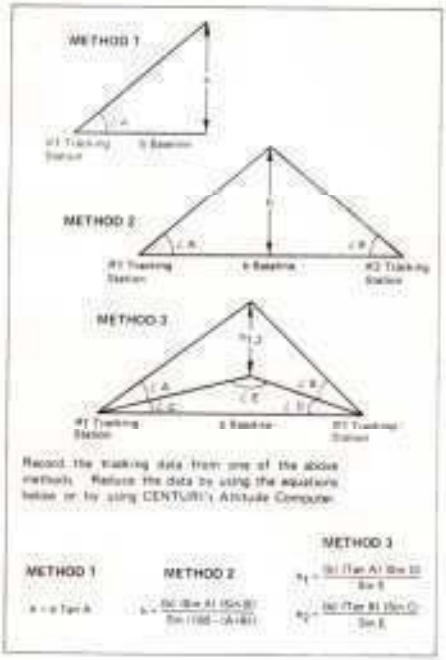
ROCKET ALTITUDE TRACKING OUTFIT

"Wow, did you see that! How high did it go? It must have been more than 2,000 feet." Everywhere rocketeers gather to fly you hear such questions, posed by participants as well as spectators. The varying estimates are amazing—from 500 to 2,000 feet. Do you really know how high your models fly? How do you know? True, use of the Centuri Technical Information Report 100 (TIR-100) will provide you a theoretical altitude. But, how can we compare theory and fact? The answer is simple. Use the improved Centuri Sky Trak. This high-quality tracker will enable you to compute the altitude with ease and precision. Centuri designed the Sky Trak to provide rocketeers with a rugged, accurate, portable, and handsome instrument. It features deluxe features not usually found on instruments in its price range. The Sky Trak consists of two major assemblies, the tripod legs and the sighting/measuring head. The two parts separate easily for storage in a compact and lightweight carrying case. The tripod legs and head mounting plate are adjustable to meet a wide variety of operational conditions. The Sky Trak is designed for simplicity of set-up and operation with no sacrifice of accuracy. Set-up in the field takes but a few seconds. The legs are swung into position with the angle fixed by an adjustable spider chain. Easily adjustable telescopic sections in each leg permit quick height adjustment. The spring-loaded head mount is leveled by adjusting three wing nuts. An easy-to-read 360° bubble helps make a vernier adjustment of the head level. When the set-up and leveling are complete, the spatial relationship of the Sky Trak to a second Sky Trak and to the launch pad is accomplished by "zeroing in" and locking the



easily adjustable horizontal and vertical protractors. Simply and quickly done! You are now ready to track. To assure long wear, the adjustable protractors are made from the highest-quality planished vinyl. The markings are imprinted carefully with a special impregnating ink. The resulting surface will withstand the rigors of years of adjustment and outdoor use. Model rockets accelerate rapidly and reach their apogee in a short period of time. The tracking system must be reliable and easy to use. The Sky Trak recognizes this need. Therefore, optics or lenses are not used. Optics are difficult to use and reduce the field of vision to an unacceptable degree. The Sky Trak employs a unique dual sighting system. The main sighting tube permits easy tracking of the rocket during its rapid ascent. At the apogee—to pinpoint the angle of elevation accurately—it is only necessary to line up the peep sight in the rear of the tube with a cross-hair in the front of the tube.

Simple, fast, and accurate! The eye transition from rapid tracking to precise measuring is easily accomplished with but a little practice. The Sky Trak provides accurate elevation and azimuth angles. What do we do now? The instructions, and various CENTURI publications, explain the mathematical methods of computing altitude from these data. Recognizing that most rocketeers do not wish to await the results of long computations, Centuri provides an easy-to-use Altitude Plotting Board with each Sky Trak, or set of two. The plotting board provides an instant read out. It may be used in conjunction with one or two Sky Traks. Direct reading figures are set-up for both 500 and 1,000 feet base-lines. An easily-attached, extra protractor is provided for base-lines between 500 and 1,000 feet. The plotting chart is printed on heavy coated paper which is put on the backing board by the purchaser. The plotting board measuring arms are made of clear, heavy acetate on which are printed precise and accurate measurement figures. Consider the design features, the portability, ruggedness, simplicity of use and accuracy. A two-unit Sky Trak set is the buy of the year. Answer the query: "How far is up?"



ORDERING INFORMATION

SINGLE TRACKER	2 COMPLETE TRACKERS
plus Altitude Computer and flight data sheets	plus Altitude Computer and flight data sheets
$24.50	**$44.50**
Cat No ALT–1	Cat No ALT–2

CENTURI EXPANDS TO INDUSTRIAL MARKETS

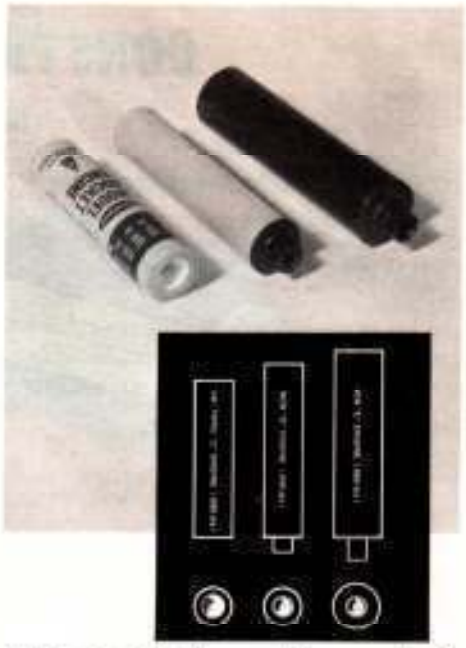
CENTURI Engineering has acquired an 80% interest in a new subsidiary company, called ENERJET, Inc., whose purpose will be to introduce the Model Rocket concept to the industrial and institutional sounding rocket and research field. The model rocket concept of rocket engine making and vehicle construction applied to these commercial uses, is unique and will result in "mission accomplishment" at greater reduced costs.

Of primary interest to ENERJET now are such applications as:

- Weather Sounding Rockets
- Air Polution Sampling Rockets
- Lightning Research Rockets
- Radiation Sampling Rockets
- Pyrotechnic Signaling and Warning Devices
- Hi-Altitude Emergency Flares for Sportsmen
- Military Infiltration Detector Devices
- Research Rocket Motors
- Educational Demonstration Rockets & Test Equipment

The key to ENERJET's success in this field will be a new, low cost method of rocket motor production, together with a newly developed high energy synthetic-propellant. For example, this new propellant releases such a high amount of impulse per pound of fuel, that a "D" type rocket engine (2.24 to 4.48 lb-sec total impulse) can be built into the same size rocket motor casing (2.75" long x .70" dia.) as is presently used to house a "C" type engine (a "D" type motor has twice the packaged power as a "C" type).*

Today most model rocket propellants have a specific impulse (impulse per pound) of 80 to 95. The new ENERJET propellant has a specific impulse of 175 to 215.



This means that the rocket powered with this new propellant will climb nearly twice as high as a rocket powered by the same amount (weight) of common m.r. propellant.

ENERJET will manufacture rocket motors with Total Impulses (average thrust x total thrusting time) of from 4 lb-sec all the way up to 400 lb-sec. ENERJET will maintain an "on-the-shelf" inventory of these motors.

Centuri Engineering will market motors of this type, for ENERJET, in the 4 to 18 lb-sec range (types "D", "E", & "F"). This group of engines will easily adapt to the existing line of Centuri rockets. These motors will be of great interest to the model rocketeer since they can provide single engine power for such models as the Saturn V, 45th Scale Little Joe, and a variety of high performance individually designed models. The rocketeer will be able to order these motors along with standard Centuri items. They will also be available through Centuri dealers.

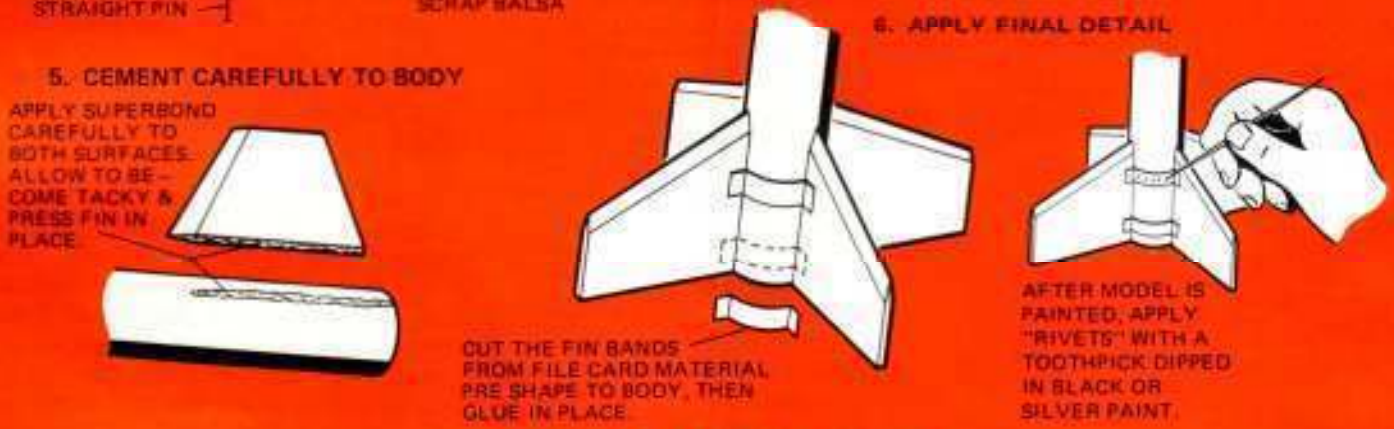
In addition to rocket motors, ENERJET will manufacture a series of standard low cost sounding rocket vehicles and modification components. ENERJET will work with companies and research groups to design special systems for accomplishing specific objectives.

Centuri's president, Leroy Piester, will also serve as president of ENERJET, Inc. Irv Wait, formerly president of Rocket Development Corporation in Indiana, will be vice-president.

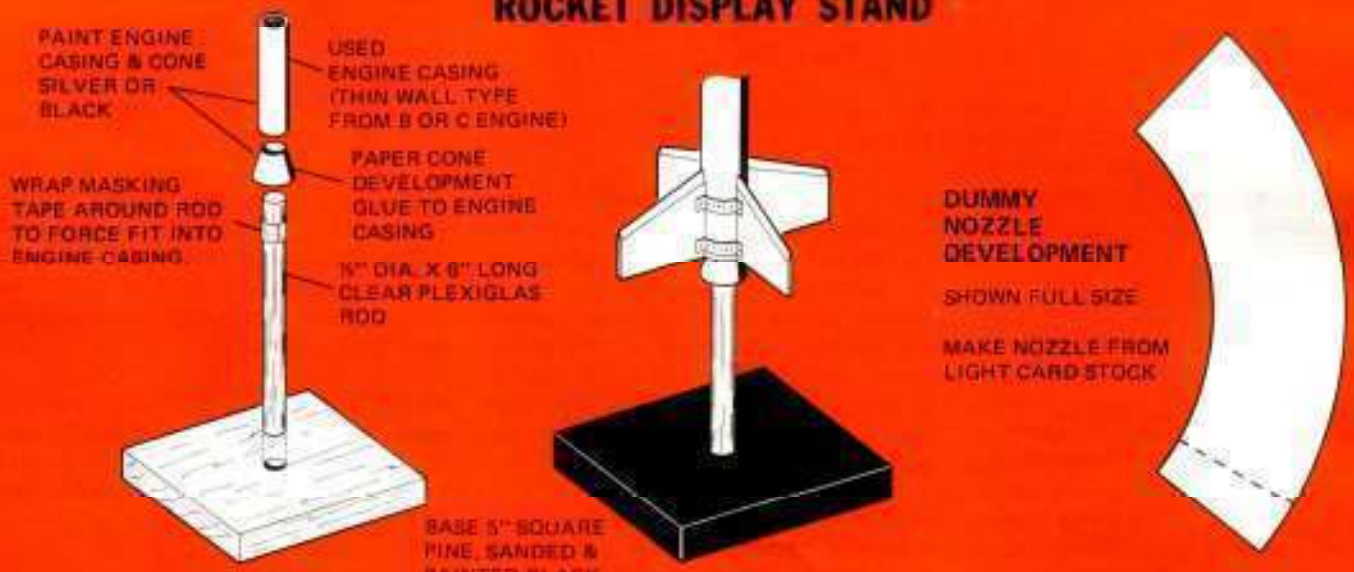
**Standards established by the National Association of Rocketry.*

CONSTRUCTION HINTS FROM R & D

MAKING REALISTIC SCALE FINS



ROCKET DISPLAY STAND



CENTURI PRESIDENT VIEWS APOLLO 10 LAUNCH!

President Piester poses beside Saturn on the afternoon before the launch.

Centuri's president, Leroy Piester, was one of the priviledged guests invited to the launch of Apollo 10 on May 15th of last year. Mr. Piester's invitation from NASA came as a result of his deep interest in rocketry and the space program.

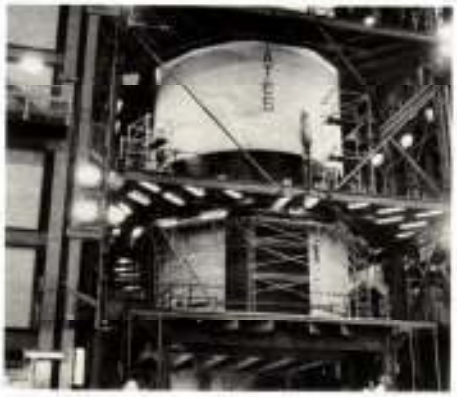
Mr. Piester arrived at the Space Center airport on the morning before the launch. Along with other NASA guests, he was given a guided tour of the facility. They drove through a rocket park that held one of every type missile ever to be launched at the Cape. They viewed the launch pads for the Mercury and Gemini flights which now seem like historic markers. They walked through the empty block houses that echo to ghostly countdowns of a previous chapter in space history.

By afternoon, the buses had arrived at the launch pad which supported the star of the show. The guests were just in time to see the service tower (not to be confused with the launch tower) backing away from the launch pad at one mph on the biggest tractor crawler in the world. The heavy river rock roadbed would be pulverized to sand after the passage of the hugh machine. Big was the word for the day as looking up at the mighty Saturn gave one the same thrill as looking up for the first time at the Empire State Building. It was inconceivable to think that this shining mass of metal could move upwards under its own power. Conversation was hushed as the gawking crowd tried to drink in the enormity of what was going to happen.

Looking up at the shrouded engines of the Apollo 11 booster.

From the launch site, the buses traveled the three miles to the vehicle assembly building. Inside the VAB, the guests observed the Apollo 11 and 12 rockets being "stacked" and made ready for their hour of glory. It was possible to walk directly beneath the Apollo 11 ship and look up into the hugh F-1 booster engines. There was a dull hum in the background as mammoth air conditioning systems pumped cool dry air into the 525 high building. The VAB is so large, that if the air conditioners were turned off, rain clouds would form inside.

The tractor crawler moves the service tower away from Launch Pad A.



Upper portion of the Saturn "stack" being readied in the VAB.

Next morning, everyone was back at Launch Complex 39. The viewing stands, placed near the VAB were filled with dignitaries, including Vice President Humphrey. Three miles away, Apollo 10 waited patiently, venting LOX vapors into the bright morning sky. Receiving special permission, Lee Piester moved forward with his cameras to the edge of a swamp, approximately 2 miles from Launch Pad A. Too far forward to hear the loudspeakers at the viewing stand, he listened to the countdown on a transistor radio. At T–2 minutes, cameras were given a last check and a concerned eye observed a slight overcast beginning to develope.

T–8, 7, 6–flames began to belch forth from the booster engines. T–4–the service arms were swung away. T–3, 2, 1–the Saturn began to move slowly upward. As the rocket cleared the tower, the shrill crackling sound of the engines began to reach the ears of the excited photographer. The sound increased and became overpowering in intensity. It was exactly the same sound, by the way, as the seeming static sound that you hear on your TV set during a launch. A wave of warm air surged across the swamp as the Saturn picked up speed and disappeared into the overcast. The sound began to fade and very soon was a faint crackling coming from high above the clouds.

Back on the ground, a cloud of steam formed as millions of gallons of water poured over the super heated launch tower. Scared seabirds voiced their displeasure as they winged across the marshy grass. The space odyssey was just beginning but only over the radio could it be followed. Human vision is far too limited to see all but the beginning, just as the human mind is overwhelmed by the thrill and the magnitude of such an event. It is something, we are sure, that Lee Piester will never forget.

NOTE: Although launches may be viewed only by invitation, the Kennedy Space Center may be toured by anyone during non launch periods. The Visitor Information Center at the Cape is open every day of the year (except Christmas Day). TWA operates several daily bus tours of the facility. These tours, lasting 2¼ hours, may be taken for a nominal fee. If you ever get the chance to go to Florida, you may be sure that you will be welcome at Cape Kennedy.

AUGMENTED PLUTO PROBE ROCKET

INTRODUCTION: The Pluto design is reminiscent of several augmented rockets used by NASA to launch orbital payloads. The open end augmenter tubes help stabilize the Pluto; thus permitting the use of small triangular fins. Dress the Pluto up with some official looking decals and you'll have a real attention getter for your next rocket meet.

PARTS LIST

1	ST138	Body Tube	1	PR713	Paper Reducer
4	ST56	Body Tubes	1	SC18	Shock Cord
1	ST79	Body Tube	1	CP16	Parachute
1	EM13	Engine Mount	1	BC71	Nose Cone
1	LL1	Launch Lug	1	AR13	Anchor Ring w/Lock Ring
1	Balsa	1/16"x2 1/2x3"	1	EL1	Engine Lock

ASSEMBLY INSTRUCTIONS

1 Assemble the EM13 engine mount. If you wish to use an engine lock, refer to Fig. 1 for modification of standard assembly instructions. Printed on EM header card. Cement the engine mount into the base of the ST138 body tube.

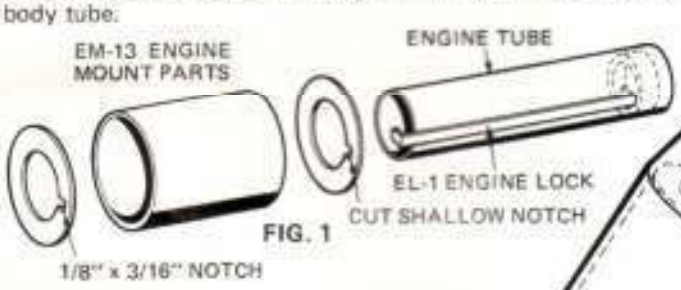


FIG. 1

2 Cut the four ST56 augmenter tubes as shown in Fig. 2. Cement the augmenter tubes to the main body at 90° intervals. The base of these tubes are extended ¼" past the bottom of the main body. Glue the launch lug in place.

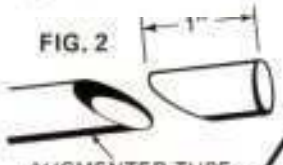


FIG. 2

FIG. 3

3 Cut out the fins (Fig. 3), fillercoat, sand and cement to the augmenter tubes.

4 Assemble the PR713 paper reducer and attach it to the ST79 "upper stage" body tube. Fillercoat and sand the nose cone and set in place.

5 Attach the shock cord to the anchor ring and cement into the main body. Attach the free end of the shock cord to the shroud line in the base of the "upper stage" (PR713). Assemble the CP16 parachute and attach the ends of the shroud line to the "upper stage" shroud line.

6 Paint the model the colors of your choice and apply decals.

Fly the Pluto with the following engines:

A8-3 B6-4 C6-5

DESIGN PAGE

FINLESS ROCKET

FINLESS ROCKET: An unusual design that is sure to draw interest on the launch pad, the finless rocket demonstrates that stability can be obtained thru use of shapes other than usual fin design. The tail fairings on Centuri's Saturn 5 work in exactly the same way, helping to give stability without the need for greatly oversized fins.

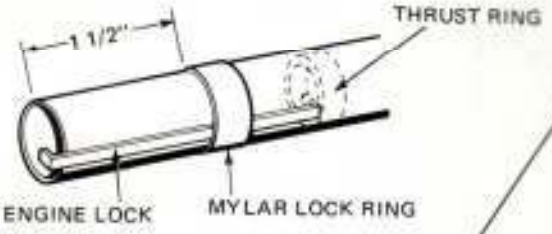
PARTS LIST

1	ST-718	Body Tube	1	SC-18	Shock Cord
1	TR-7	Thrust Ring	1	CPT-12	Parachute
1	BTC-7	Balsa Tube Coupler	1	EL-1	Engine Lock & Retainer Ring
1	BC-79	Nose Cone	1	Piece	Clay for Weight (.40 Oz.)
1	PR-7-20	Paper Reducer	1	SE-12	Screw Eye
2	LL-3	Launch Lug			

ASSEMBLY INSTRUCTIONS

1 Cut the ST-718 body tube at a point 4 1/2" from one end. The short piece will become the payload compartment, while the remaining 13 1/2" segment serves as the main body. Cement the thrust ring in place 2 5/8" from one end of the main body tube. Attach the engine lock as shown in Fig. 1.

FIG. 1



2 Only the paper wrapper and one die cut ring are used from the PR-7-20 package. Modify the die cut ring as shown in Fig. 2. Assemble the paper wrapper and cement to the die cut ring.

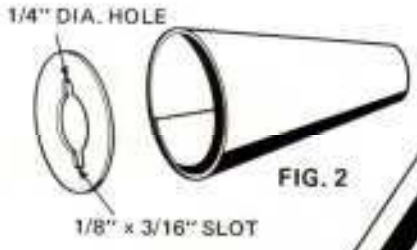
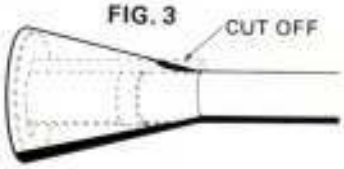


FIG. 2

3 Slip the paper wrapper down over the top of the body tube and cement in place at the base of the rocket. Cut a slot into the top of the paper wrapper for clearance of the launch lug. See Fig. 3. Cement the launch lug in place and trim the top to match the angle of the wrapper. Cement a second launch lug in place approximately 4" above the lower one.

FIG. 3



4 Cement the balsa tube coupler into the 4 1/2" long payload tube (1/2" of coupler should extend from the tube). Thread the screw eye into the base of the coupler.

5 Using the slit tube method, attach the shock cord to the main body. Tie the free end of the shock cord to the payload section screw eye. Assemble the parachute and tie the ends of the shroud lines to the screw eye.

6 Push a .40 oz. of clay into the payload tube. Sand and fillercoat the nose cone and rocket into place.

7 Paint and decal the rocket to fit your own taste. The rather interesting paint pattern illustrated above was used on one of the prototype flown by Centuri's R & D people.

Fly the finless rocket with the following engines:

A8-3 A5-2 B4-2

You'll be farther ahead with CENTURI parts! ! !