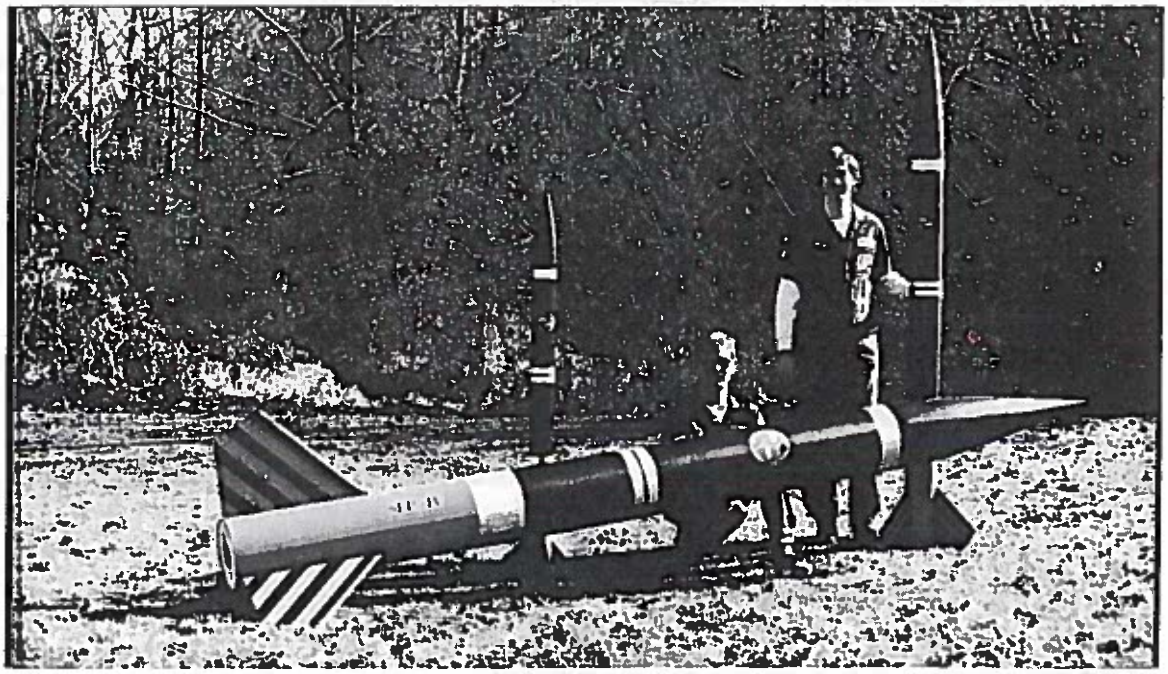
Volume II, Number III - January/February 1994

Flamethrower®

Official Newsletter of the Student Experimental Payload Program



It's Payload Time

With the SEP Team and the rocket fleet ready to go (for the most part), it is time for participating students to begin submitting abstracts for their experiments. The missions are scheduled for mid April, but the deadline for submitting abstracts and experiments will vary depending on which catagory you enter. You can find out additional information from the related articles on page 3. The missions this year will center more around the six inch (SEP II) and eight inch (SEP III) diameter rockets instead of the four inch rockets used last year. This will provide students with a larger payload bay to work with as well as allow the use of onboard computers and telemetry packages that would not fit inside the SEP I rockets. Many students (and some teachers) have already started calling the SEP Operations Center for information on submitting the abstracts.

It is unlikely that the 12 inch diameter Leviathan (SEP IV) will be flight certified for payloads before the missions in April. But if events go as planned, spectators may be treated to a low altitude test flight of the 16 foot tall rocket in the near future. A launch tower is currently being designed and discussions are underway to secure the proper motors for a series of certification flights to three thousand feet. These test flights must prove successful before placing student experiments onboard the rocket. We'll keep you posted as to the progress.

Other events are also underway as the new year is off to a busy start. Among the busy schedule for space week (there appears to be a "two-week" space week this year), the SEP Team is planning several workshops, and additional demonstrations for groups such as 4-H and the Boy Scouts. Also, the 2nd annual Space Art Contest is now in progress, and select individuals continue their search for the perfect Water Rocket - steam or CO_2? There's more information on these and other subjects on the pages that follow.

A Note from the Program Director

Now that the holiday season is behind us, the SEP team is in the process of encouraging school students to get started on the design and construction of their payload experiments. It will not be long before the deadline is upon us and the manifest is underway. Shortly after that will be the launches of several missions during April.

Word of the SEP Program is spreading across the country, thanks in part to several published articles in various periodicals. We have had requests for information packets from 38 states at present, and now have a mailing list that includes 250 school in eight states Many have promised at least one payload from their school, but as the team discovered last year promises and delivery are two different things. However, one organization that shows particular interst is the LaFayette Planetarium and Museum of Natural History. The curriculum director has set up several workshops with science teachers in the Louisiana area and has distributed SEP Program information packages to these teachers. Many have filled out the response card and requested additional information directly from the SEP Operations Center, and are currently working with their classes to develop payload experiments. It seems a sure bet that the payload manifest this spring will include experiments from more than just Alabama. The 4-H clubs and Boy Scouts in the North Alabama area have also expressed and interest in getting involved with the program, in addition to having the SEP Team perform rocketry demonstrations at their regional meets.

Although still in its development stage, the SEP Program continues to grow at a very pleasing rate. And as the program becomes more refined and new resources are tapped, it is sure to get bigger and better.

Greg Warren

Flamethrower

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Editor: Greg Warren

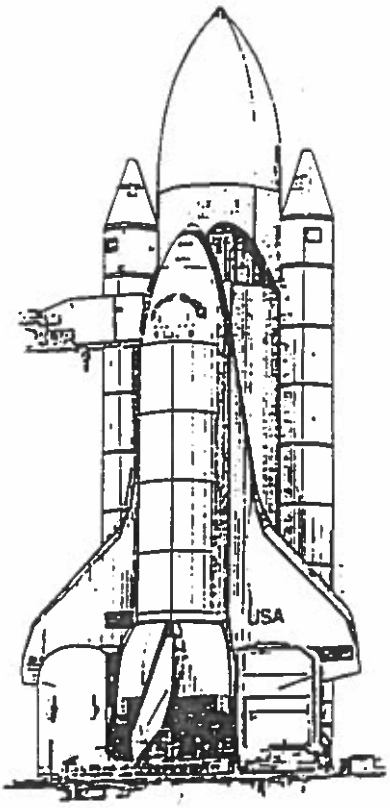
The Flamethrower is the official newlsetter of the Student Experimental Paylaod Program. Issues are published every two months with an update published between issues. Subscription rate is $10.00 per year. The editor welcomes any material submitted for publication. Contributing editors are noted per article. When submitting photos, please include return postage and address or materials will be kept on file at our office. Send articles or subscription payments to:

Student Experimental Payload Program
Post Office Box 1934
Huntsville, Alabama 35807

The Student Experimental Payload Program is a non-profit organization dedicated to hands-on aerospace education. Team members include:

Greg Warren: Program Director
Joe Robertson: Technical Consultant
Dan Coon: Technical Consultant
Ken Pearce: Payload Integration
Guy McClure: Educational Consultant, High School Level
Pam Fowler: Educational Consultant, Middle School Level
Karen Warren: Educational Consultant, Elementary School Level
Todd Gangi: NASA Space Program Consultant
and numerous others who offer their support

NASA Shuttle Manifest



January 1994

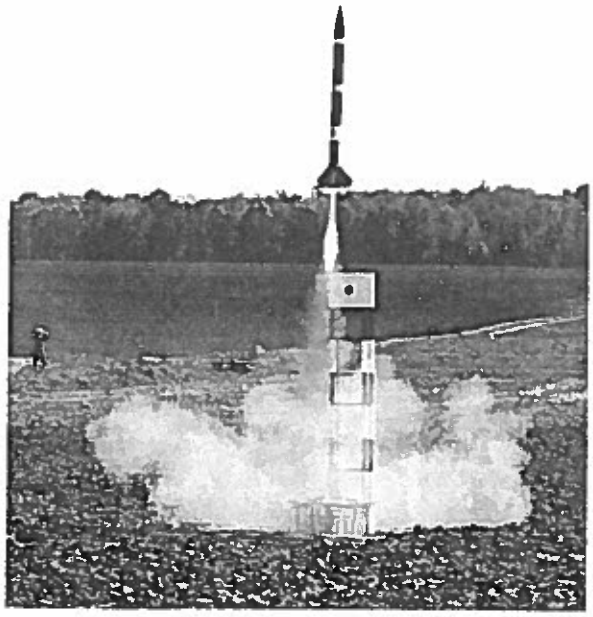
- Vehicle: Discovery
- Mission: Spacehab-2, Wake Shield-01
- Orbit: 57.0° inclination/218 st. miles
- Duration: Nine days
- Liftoff: Pad 39-B/ Landing: Kennedy
- Crew: Charles Bolden, Ronald Sega, Jan Davis, Kenneth Reightler, Franklin Chang-Diaz, Russian MS Sergei Krkalev

February 1994

- Vehicle: Columbia
- Mission: OAST-2 and USMP-2
- Orbit: 2.39° inclination/185 st. miles
- Duration: Fourteen days
- Liftoff: Pad 39-A/ Landing: Kennedy
- Crew: John Casper, Marsha Ivins, Pierre Thuot, Charles Gemar, Andrew Allen

April 1994

- Vehicle: Endeavour
- Mission: Space Radar Lab-1
- Orbit: 57° inclination/138 st. miles
- Duration: Nine days
- Liftoff: Pad 39-A / Landing: Kennedy
- Crew: Sidney Gutierrez, Kevin Chilton, Linda Godwin, Thomas Jones, Jay Apt, Michael Clifford



1994 SEP Launch Schedule

At this time, there are two separate launch dates scheduled with each capable of handling several missions (flights). Although your payload may be targeted for either of the launch dates, depending on the size and requirements of the individual experiment, the deadline to submit abstracts is the same for all participants. The SEP Operations Center will review the abstracts and return a response within three days so that all students will have the maximum time to work on their experiments. This year, in an effort to save time, abstracts may be faxed to the SEP Operations Center at (205) 230-0353 for review.

Abstract Deadline	4 March
First Launch Schedule	
Payload Experiments	8 April
Live Payloads (ship overnight)	15 April
First Launch (10:00 a.m.)	16 April
Alternate Launch (10:00 a.m.)	17 April
Second Launch Schedule	
Payload Experiments	15 April
Live Payloads (ship overnight)	22 April
First Launch (10:00 a.m.)	23 April
Alternate Launch (10:00 a.m.)	24 April
Post Flight Analysis Reports	13 May

If you have any questions concerning this schedule, please contact the Program Director at the SEP Operations Center (205) 230-0353. A map and directions to the launch site for those who wish to attend the launches will be available soon.

Writing an Abstract

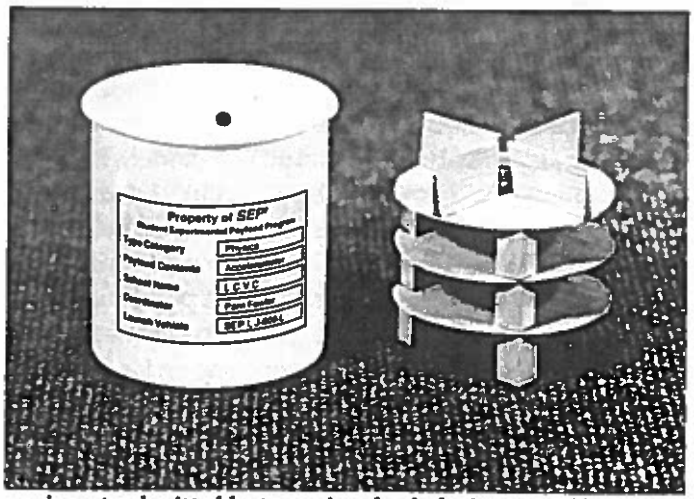
Many students who would like to participate in the SEP Program are frightened by the prospect of having to write an abstract. This is due in part to the fact that many students do not know what an abstract is, and decide if they cannot complete the first step, why bother getting involved? It really isn't as bad as it may sound.

An abstract is a brief summary of points pertaining to a specific task. What this amounts to is a short explanation of what your experiment should accomplish, and how it should achieve that goal. Most abstracts submitted to the SEP Program are only about a half page typed, and states the objective of the experiment followed by a short description of how the experiment will work. It does not go into detail about the design or research that will be conducted, the comparison of like experiments that have been performed, and it does not explain the scientific processes that will be utilized. That is left up to the PFA, or Post Flight Analysis report, which is written after the mission has been completed. The PFA can be, and usually is, several pages. There will be more information in the next issue of the Flamethrower concerning the PFA report and its requirements.

Don't let the task of writing a couple of paragraphs keep you from participating in an exciting hands-on aerospace experience. Even the PFA can be enjoyable, although it requires a little more thought and time. The abstract lets the SEP Program know what you are going to attempt. The PFA lets everyone know what happened, and why.

Ideas for Payloads

This is probably the biggest problem facing students that want to participate in the SEP Program. "I can't come up with a good idea," has been heard so many times by our team members that it has become a serious issue. A publication concerning this situation will be included in the Payload Design Kit that is required by each student or team submitting an experiment for launch. Keep in mind that experiments do not have to be elaborate or complex to be scientifically valid. Dozens of schools launched crickets last year during the SEP missions, but it was a new experience for each of them *individually*. The objective is to have fun while learning about science, not break new ground or make new discoveries that will shake the scientific community. Of course, if you succeed in acomplishing that, well, that's okay, too.



This experiment submitted last year involved placing a steel ball over several thin layers of balsa wood. The objective was to see if the accelerational forces would crush the layers, then reconstruct then it and calculate the pressure.

Time Traveler - Log Entry Data [30 years ago]
Subject: Gemini Project **Source:** All We Did Was Fly To The Moon (Eagle Press ©1983) **Date:** 1963

Between the pioneering flights in Mercury and the astounding successes of Apollo came Gemini. The Gemini Spacecraft was really little more than a two man version of Mercury with the support equipment moved "out back" into an instrument unit. The Gemini Project challenged the unknowns that we had to accomplish before a moon mission was possible. Some of these challenges included:

- Rendezvous and Docking
- Long term flights
- Multiple-hour work outside the spacecraft
- Pinpoint reentrys
- Trained flight and ground crews
- Advanced reliable systems such as fuel cells, cryogenic storage of hydrogen and oxygen, ablative thrusters, onboard digital computers, inertial guidance systems and rendezvous radar.

During the Gemini Project, America caught up with and surpassed the Soviet Union in the Race to the Moon. A race which would end in six years with the Apollo 11 mission.

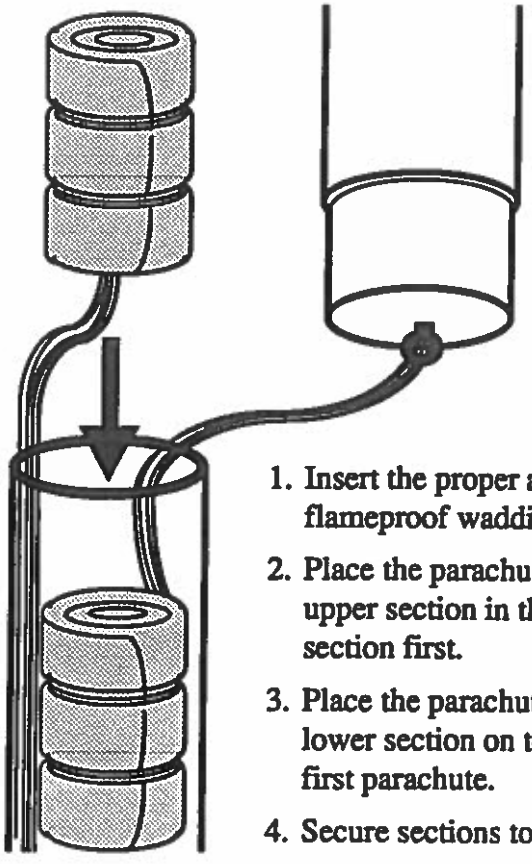
Visual Reference Data
The Gemini Capsule

Tech Brief

Reliable Parachute Deployment

Very few things in rocketry are as delightful as having a beautiful, stable flight go into that ever-so-familiar arc, only to be followed by the anticipated pop of an ejection charge. But that wonderous feeling can turn sour when you see your rocket descending booster-section first with a shock cord and nose cone, but no parachute in sight. The ensuing THUD can turn your stomach, not to mention risk spectators.

Often, this problem can be avoided in rockets by reversing the order in which the parachutes are packed into the airframe. For rockets that have separate parachutes (i.e. one for the nose cone and payload section, and one for the booster section), the solution is easy. Place the parachute for the payload/nose cone section into the booster section first, then insert the parachute for the booster section on top, next to the payload bulkhead. By switching the order of the parachute locations, the ejection charge will cause the payload section to pull out the parachute on top (the recovery system for the booster section) in order to deploy the parachute which is underneath (the recovery system for the payload section). In the event the ejection charge is weak and only one parachute is deployed, the inflation of the first parachute will force the remaining one out, and you have a successful recovery.



1. Insert the proper amount of flameproof wadding.
2. Place the parachute for the upper section in the lower section first.
3. Place the parachute for the lower section on top of the first parachute.
4. Secure sections together.

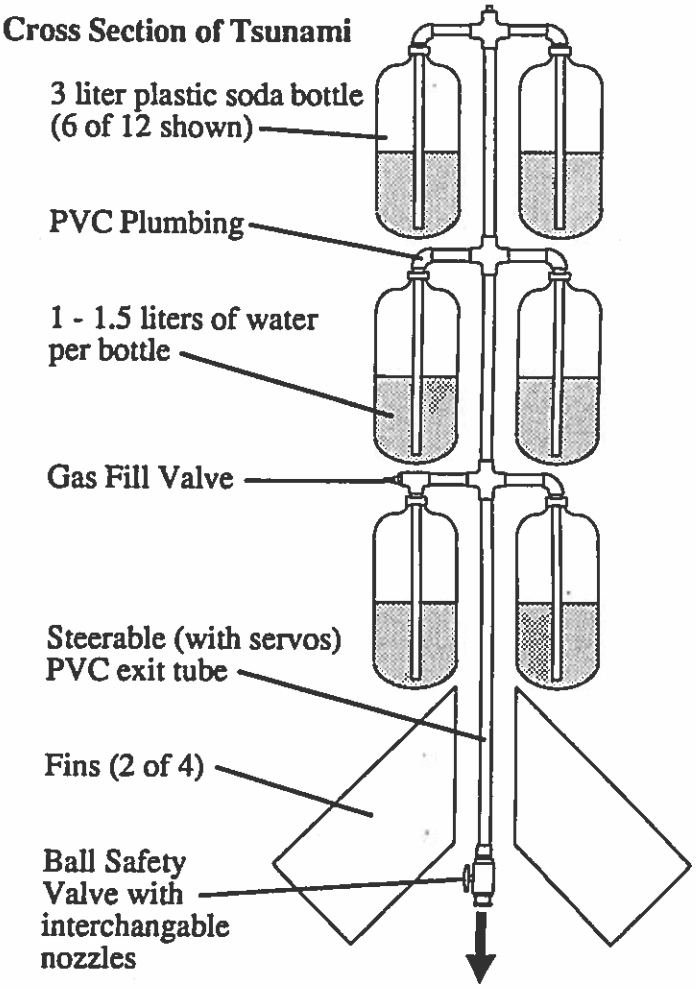
Get Ready for a Tsunami

tsu•na•mi\(t)su-'nam-e*n* [Jap]: 1) a great sea wave produced by sub-marine earth movement or volcanic eruption. 2) a tidal wave in the Pacific ocean caused by undersea earthquakes, often reaching heights of 100 feet or more. 3) a water propelled rocket currently under construction by SEP Team member Dan Coon.

When people talk to Dan about rocketry, they have to change some of the terminology that might be considered standard. For instance, "propellant" becomes "water" and "motor casing" becomes "soda bottle". There is no such thing as "burn time" and "tracking smoke" is replaced by "Kool Aid". Such is the case when the vehicle you are developing is a water rocket. Dan has spent several months researching, developing, refining and test launching his creation to bring it to its current phase. Included in his tests was a single 3 liter bottle, 4 fin "mini water rocket" that consistantly reached altitudes of 75 to 100 feet. This testbed vehicle helped solve some of the technical problems facing Dan in his endeavors.

Along the way, he has video taped his progress and run calculations to maximize the rocket's performance. The final goal of the project is to install radio controlled servos for nozzle actuation, and a separate radio control unit for the dual 36" parachute recovery system. In addition, the finished version will house a poloroid camera which will also be servo controlled.

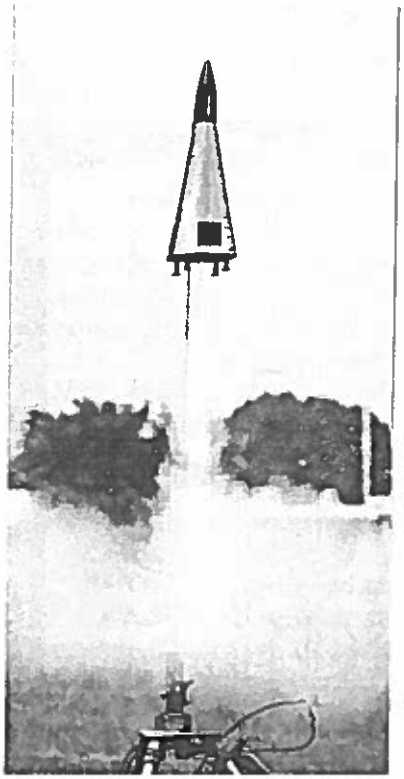
Since the completed rocket is designed to be flown at school demonstrations, the poloroid camera will allow the SEP Team to present students at the host school with an instant aerial view from the rocket. This is sure to add a new facet of excitement to an already interesting activity. The poloroid will be affixed to a pre made plaque and given to the students as a memento of the rocketry demonstration. And because the rocket has no burning fuel, it can be launched in a smaller area without risk of safety violations. In addition to the camera, the Tsunami can also be fitted with an empty payload bay for launching crickets, altimeters, or other small payloads at the school sites. The following is specific data pertaining to the Tsunami. Currently, Dan intends to have the vehicle finished in time for the demonstrations during Space Week in March.



Height: 5' 8"
Fins: 4 (balsa forms with styrofoam inlay, 3/4" thickness)
Construction: Wooden frame, PVC plumbing and plastic 3 liter soda bottles
Weight: 8.5 pounds structural (including 1.5 lbs. for parachutes & servos)
Guidance: Active, real time with radio controlled servos
Fuel: 1 or 1.5 liters of water in each of the 12 soda bottles
Fuel Weight: Average weight of 39.6 pounds of water
Liftoff weight: 51.6 pounds when fully tanked and pressurized
Nozzle: Interchangable, depending on water amount and payload
Pressurization: 100 to 120 psi using carbon dioxide
Thrust: 140 pounds for 1.1 seconds (using nozzle diameter of 0.95")
Maximum Velocity: 49 miles per hour
Maximum Acceleration: 2.7 G
Expected Altitude: 100 to 150 feet, perfect for demonstrations

Dan Coon stands beside the latest version of "Tsunami".
See page 11 for a photo of the latest low impulse static test.

Construction of the "Space Clipper"



Manufacturer:	Quest
Diameter:	4.0" (Base)
Length:	13.5"
Fins:	None
Recovery:	Parachute
Motors:	C6-3 (only)

The Space Clipper™ by Quest is a semi-scale model of the McDonnell Douglas DC-Y Delta Clipper. For those of you not informed of this latest entry into the space race for reusable rockets, the DC-Y is a Single-Stage-To-Orbit (SSTO) spacecraft that has no expendable parts. In other words, it takes off from the launch pad and enters earth orbit, completes its mission and returns to earth to land on its landing legs. After a short refurbishment period, it is prepped and ready to go again. The DC-Y is unlike anything currently being used by the space industry.

The 1/122 semi-scale version produced by Quest also breaks away from the norm. The first thing most people will notice is that this kit has no fins. The model is in fact a stabilized flying cone. Upon opening the bag, builders will be greeted with the usual assortment of precision machined parts that have become a trademark of Quest kits. If you set aside the motor mount assembly (nothing special here, assemble in the usual fashion) and the dual 12" parachutes, shock cord and Kevlar line (assemble as per standard Quest kits), the components begin to take on a very unique look. You are left with an assortment of paper struts, small discs, a few assorted launch lugs and a large sheet of rolled up paper with a cone template printed on it. This is the major complement of the kit. Get ready for some different kind of rocket building steps.

The internal support structure is much easier to build than it might appear. Every piece in my kit fit perfectly, and by following the well illustrated steps in the instructions I encountered no delays, defects or problems. The only mishap I encountered was my own fault. The framework has die cut holes in the uprights and cross members and after punching out the small black discs, I discarded them thinking they were scrap. Bad move. Some of these discs are used to form the landing pads for the launch legs. So after rummaging through the trash, I was able to locate the missing pieces and proceed. Other than that, I was surprised at how well the parts went together, and how quickly. While the internal support structure was drying, I went on to the aeroshroud.

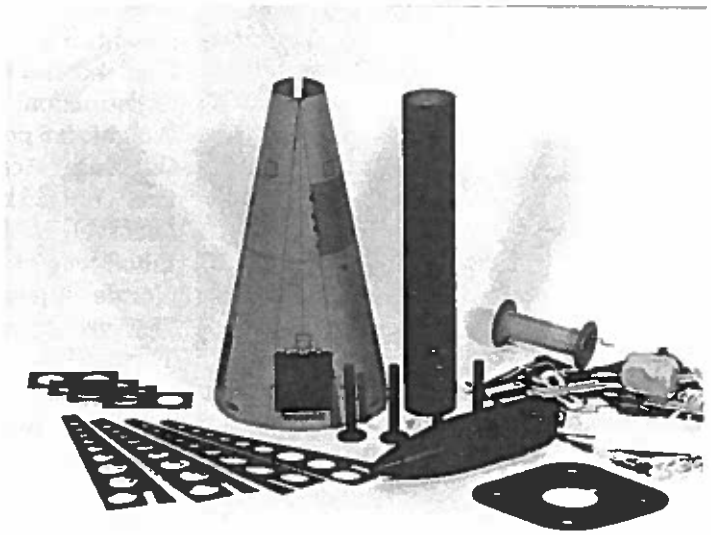
The aeroshroud has a detailed print pattern that serves as the finish to the rocket. Be careful not to damage, stain or otherwise dirty the paper or it will show on your finished work. My complements to Quest for having the insight to provide a strip of self-adhesive tape for the tab on the shroud instead of having the builder deal with glue. Be sure to roll the aeroshroud carefully several times to get the proper shape BEFORE applying the tape. The manufacturer uses very good adhesive for the tape strip. Once you peel the backing off and press the shroud together, you better have it where you want it, because that's where it is going to stay.

I must admit I did not expect the shroud to fit on the framework. I knew it would either be too tight or too loose, too long or a tad too short. I was wrong. I have never had pieces in a kit fit together so well. Somebody at Quest really did their homework. The shroud fit perfectly over the framework and after a couple of final assembly steps, the model was finished. Finished, that is, because this model requires absolutely NO PAINTING. I like that.

The finished model is balanced for flight by adding clay into the nose cone. A long length of launch lug is secured to the body tube within the framework during assembly, and the launch procedure is standard as per N.A.R. regulations. Since this was a Quest kit, it only seemed right to use Quest C6-3 motors for the flight. After a standard countdown the model rose straight and true for about 300 feet, began a graceful arc, and popped the two parachutes right on que. It couldn't have been any prettier. As I watched the aeroshroud descend, I was sure that at least one of the landing legs would be damaged but again, a pleasant surprise. A soft landing on the grass left the model in perfect condition, ready to fly again.

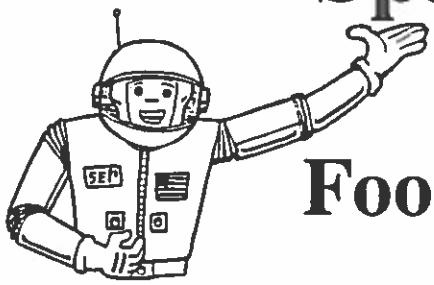
The Space Clipper also comes with 3-D maneuvering flaps and motor nozzles if you want to make your kit a static model (i.e., do not fly). These extra details are nice additions, but I built my kit for liftoff compatibiliy. Maybe later I'll put on the remaining parts and set it on the shelf. Also included in the kit is an information sheet about the actual McDonnell Douglas DC-Y Delta Clipper and a technical report about cone-stabilized rockets.

Final opinion: If you are serious about rockets, you should get this kit. If, for no other reason, you should add the Quest Space Clipper to your collection because it is different and explores a new aspect of conventional rocketry. And, because of its appearance it is sure to be a conversation piece at school demonstrations. Sure it goes up, it pops, it comes down on parachutes - but it has no fins!



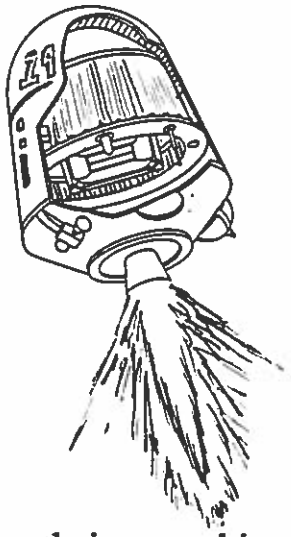
Announcing the 2nd Annual

Space Art Contest



This year's theme:

Footprints on a Planet



Twenty five years ago, Neil Armstrong and "Buzz" Aldrin stepped from their spaceship onto the surface of the moon. High above, Michael Collins orbited the moon and waited for them to complete their mission. Can you imagine what it would be like to be the first person to step onto another planet. What would you expect to find?

Share your vision with others that are interested in space exploration. Enter the 2nd annual Space Art Contest. See the entry requirements below.

Theme: Footprints on a Planet

Who May Enter: Any student in grades K-8

Divisions:
Level I (Kindergarten, First and Second Grades)
Level II (Third, Fourth and Fifth Grades)
Level III (Sixth, Seventh and Eighth Grades)

Instructions: On a half sheet of poster board, draw, paint, color or otherwise illustrate a scene of what it would look like to land on and explore an alien world. Planets, spacecraft and spacesuits may be factual or ficticious.

Each entry should have the name and grade of the student, as well as the name, address and phone number of the school, printed ON THE BACK of the poster. Entries which have any of the above information on the front of the poster will be disqualified from judging for prizes.

Awards: Each student that enters will receive a Certificate of Participation. First, Second and Third Place winners for each Division will receive a medallion in addition to a Place Certificate.

Shipping: Entries may be bundled together and shipped as a single unit to the address shown. Appropriate return postage must be included or entries will not be returned to orgin. Ship to:

SEP Program
Space Art Contest
P.O. Box 1934
Huntsville, Alabama 35807

Deadline: All entries must be postmarked no later than Friday, April 29, 1994.

Public Use: Entry into contest grants permission for sponsor to publish, promote and otherwise display artwork without monetary compensation to submitting party. If an entry is displayed, credit will be given to the student and school.

Sponsor: The Student Experimental Payload (SEP) Program is a non-profit organization which is dedicated to hands-on aerospace education. Funding for the SEP Program is provided by the AmSouth Fund for Educational Excellence; AmSouth Bancorporation, Birmingham, Alabama.

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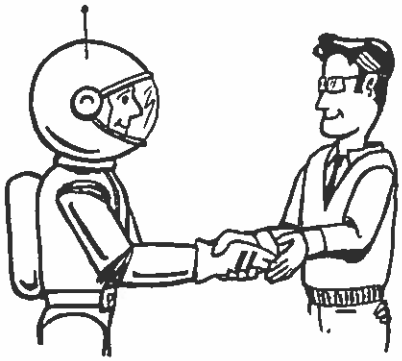
Snags

Sometimes the best efforts can be foiled by something as trivial as paperwork. Two rather important projects for the SEP Program have hit separate yet similar snags that have slowed their progress. The redesigned Teacher Resource Kit has been detained because of a problem with copyrighted material. The SEP Program had made a request to NASA to use particular printed pieces in the kit. This permission was granted and a copy of the semi-completed Teacher Resource Kit was shipped off to NASA Headquarters for a review and final approval. But, since the SEP Program had changed some of the material to better suit the needs of model and high power rocketry (instead of talking about BIG rockets), it caused some stir because it was not the original text material.



Likewise, the video production that the SEP Program is working on also involves using NASA footage of a shuttle launch and sounding rockets. There was no problem securing the footage or permission to use it until the SEP Program was notified that some of the footage actually belongs to a private company. The SEP Program Director has contacted the company in an effort to secure the rights to use the footage in the final production.

Although this has caused a slight delay in the completion of the projects, it is better to be safe than sorry. Both delays are well on their way to being cleared up by the end of February.

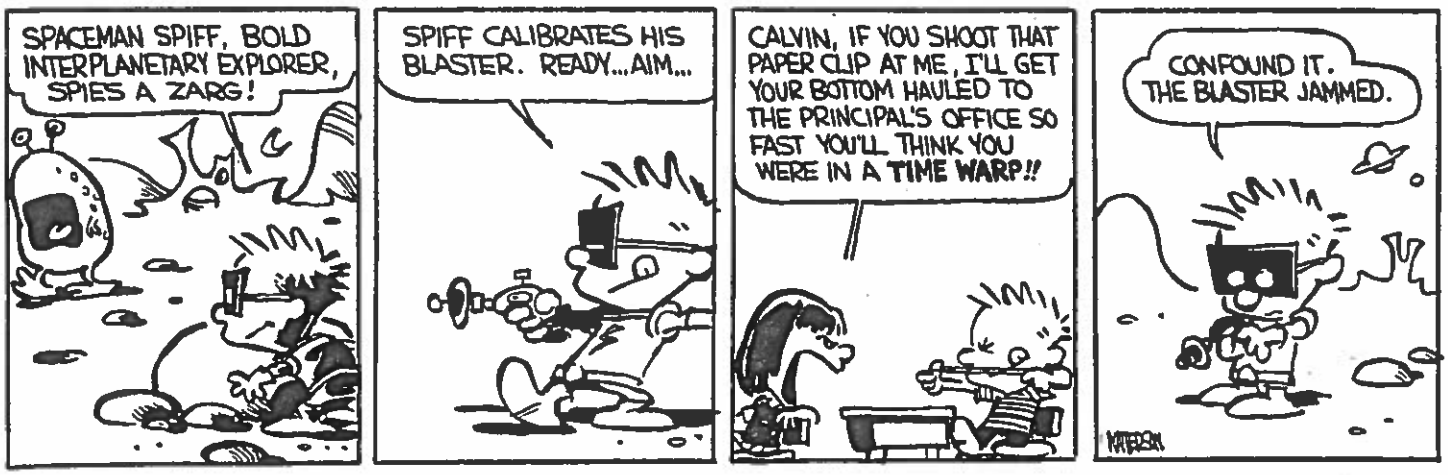
The SEP Team at Green Valley Elementary during 1993 Space Week.

Alabama Space Week

Last year the SEP team went to eleven schools during the five day Space Week and talked to over 3,000 students about rocketry, space travel and aerospace careers. The team was apparently so popular that it will be difficult to meet the demands that have started coming in this year. Alabama Space Week is slated for March 14-18, but Huntsville is having a separate Space Week from March 21-25. This "two week Space Week" will allow more time to travel around to different schools, and give the team more experience in working with large groups.

Besides the demonstrations for the students, the SEP Team will be involved with several workshops for teachers. These workshops will center around helping teachers new to rocketry get over their fear of kit construction, and teaching them how to conduct a launch for their class. If scheduling will permit, the SEP Team will be assisting several schools in launching their own class built rockets after conclusion of the SEP demonstration at their particular school.

One exciting aspect for the SEP Team is the trip to Green Valley elementary in Birmingham. The team will be conducting two demonstrations for the local school system and, if plans work out, will hit the road for the final demonstration. That final launch will take place on Saturday, March 26 at Auburn University. But unlike the typical model rocket demonstrations, there is sufficient fields to launch the SEP I rocket with payloads onboard. As of this writing, the launch is still in the planning stages and the FAA must grant the flight waiver, as the SEP I is capable of flights up to 10,000 feet.

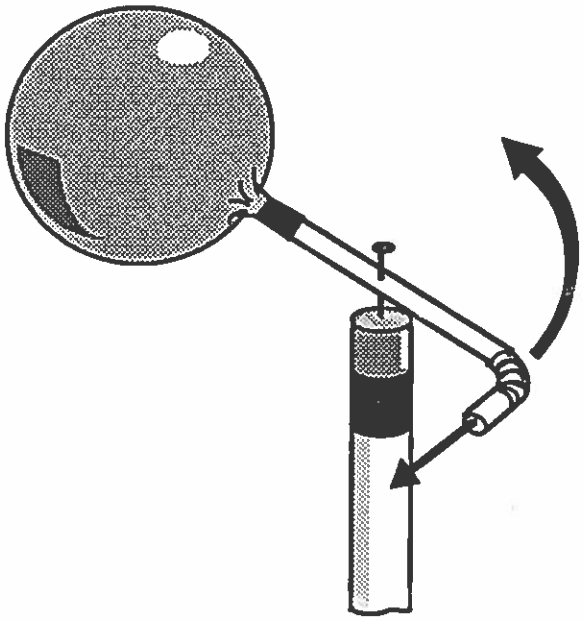


From "Calvin and Hobbes" by Bill Watterson, p. 71 ©1987

Science Lab

Provided to the Student Experimental Payload Program
courtesy of NASA/Aerospace Education Services

Rocket Powered Pinwheel



Activity Description:

By utilizing the action-reaction principle, students will be able to demonstrate rocket propulsion using air as a fuel.

Materials:

Wooden pencil (with an eraser still attached)
Straight pin
Round party balloon
Flexible soda straw
Plastic tape

Procedure:

1. Prestretch the balloon by inflating it several times.
2. Slip the nozzle end of the balloon over the long straight portion of the soda straw. Secure it to the straw with a piece of tape.
3. Bend the short length of the soda straw at a right angle (90°) on the flexible joint.
4. Find the balancing point of this assembly by placing the soda straw over an outstretched finger.
5. At the balancing point, push the straight pin through the soda straw and into the eraser of the pencil. Push the pin until it enters the wood of the pencil.
6. Spin the straw/balloon assembly a few times in order to loosen the pivot point.
7. While holding the pencil, inflate the balloon by blowing through the bent section of the soda straw.

Operating the Pinwheel

When you are ready to see the rocket powered pinwheel in operation, release the air trapped inside the balloon by letting it travel through the straw. The pinwheel should begin spinning immediately.

Discussion:

The pinwheel spins due to the action-reaction principle described in Newton's third law of motion. Stated simply, the law says every action is accompanied by an opposite and equal reaction. In this case the balloon produces an action by squeezing on the air inside, causing it to rush out of the straw. The air, traveling around the bend in the straw, imparts a reactionary force at a right angle to the straw. The result is motion in an opposite direction from that in which the air is escaping from the straw.

Let us hear from you:
Write a report about what you think it would be like to travel onboard a real rocket. Reports or stories should be no more than two pages double spaced. Be sure to include your name, school and grade for possible publication.

News from Manufacturers

As listed in Sport Rocketry magazine,
official publication of the National Association of Rocketry.

Orion Rocket Works

announces the release of their new catalog. Many firsts are designed into the kits: front engine power, two-tube two engine, three "E" in-line cluster, "D"-"E" two stage and ejection gas porting. Orion kits are designed for rocketeers looking for more excitement in the design and performance of their rockets. Catalog $2.00. Contact: Orion Rocket Works; P.O. Box 232504; Leucadia, CA 92923

Cortiss Technology

announces a new and improved line of airframes in its new 1994 catalog. The new airframes are G-10 fiberglass, which are compatible with standard cardboard and phenolic tubing. Eight industry standard inside diameters are available. The tubing is convolutely wound (no spiral seams to fill). Pre-slotted G-10 airframes are also available, along with several supporting components for the airframes. The standard cardboard airframe kits are still in the catalog, along with kits using the new G-10 tubing and pre-cut G-10 fins. Catalog $2.00. Contact: Cortiss Technology, 3653 Slopeview Dr., San Jose, CA 95148-2828 (408) 238-3467.

Dry Set

"No matter how you put markings on your models now . . . this is better." Dry-Set markings are a major improvement over water transfer and pressure sensitive decals. With Dry-Set, only a veneer of color (microns thin) is transferred to the model. There is no carrier film, no halo, and no edge to catch dirt and grime. Dry-Set markings look like paint - because in effect they are - only better. For more information contact: Dry-Set, 7029 Sanger Avenue, Woodway, TX 76710 (817) 741-0379.

Testor Corporation

offers a wide variety of products for the modeler. Some of these include: paints, cements, paint brushes, hobby tools, how-to videos, and ozone safe airbrush kits. You can see a variety of these items at your local hobby retailer or write for a free catalog. Contact: Testor U.S.A., 620 Buckbee Street, Rockford, IL 61104

North Coast Rocketry

plans to release their new Impulse Model Rocket Motors in January '94. The first two versions will be an F30 and a G50. The unique propellant formulation provides plenty of "fire and smoke" for crowd pleasing flights. NCR is currently awaiting approval from both the DOT and NAR. New kits have also been added to the NCR line. For additional information, contact: North Coast Rocketry 4848 S. Highland Drive; Suite 424; Salt Lake City, UT 84417

Quest Aerospace

introduced its 1994 catalog (both a retail version and an educational version) at the Chicago Model and Hobby Show. A number of new kits have been added to the Quest line for '94. Big Rage, Commander, Gamma-Ray, HL-20, X-30 National Aerospace Plane and Zenith II Payloader to name just a few. Catalog $1.00: Quest Aerospace; P.O. Box 42390; Phoenix, AZ 85080-2390

Riteco Supply, Inc.

is a new source for premium grade, super thin "bending" plywood. 6 ft. x 3 ft. sheets, open knot free, flexible, strong yet lightweight, die cuts extremely well, 3-ply construction. Sheets are suitable for hobby work, model making. Retail or wholesale. Contact: Riteco Supply, inc., 12999 F.M. 529, Houston, TX 77041 (713) 896-6200.

Estes Industries

During the 1993 RCHTA Hobby Show in Rosemont, Illinois, Estes Industries announced a number of new products for the rocketeer. Releases include the Manta (E2X series), the Turbo Coptor (E2X series), the Maniac (Challenge series), the Mongoose (Beta series), and the Rocket Builders Tube Marking Guide. Three kits from the Star Wars series have also been reintroduced as Commemorative series models. The new Strato Blaster was available for inspection as well. Estes indicated that their 1994 catalog would be available during early '94. For more information, contact:
Estes Industries; 1295 H Street; Penrose, CO 81240

Apogee Components

Several unique competition rocket engines (NAR certified) produced by Apogee Components are scheduled for release during December '93 or January '94. The new C4 engines are 18mm in diameter, 51 mm in length and include delays of 3, 5 and 7 seconds. D3 engines are also 18mm in diameter with a length of 73mm with the same delays as the C engines. For more information, contact: Apogee Components; 19828 N. 43rd Drive, Glendale, AZ 85308

Wahoo International, Inc.

markets all purpose repair/filler products that could prove useful to rocketeers while out at the rocket range. It is a mixture of high-strength, fiber reinforced polyester resin and a solar-activated catalyst. It remains in a liquid state until direct sunlight hits it. Use Solarez for repairing wood and plastics (except styrofoam). For more information contact: Wahoo International, Inc., Oceanside, CA 92054

Excel Hobby Blade, Inc.

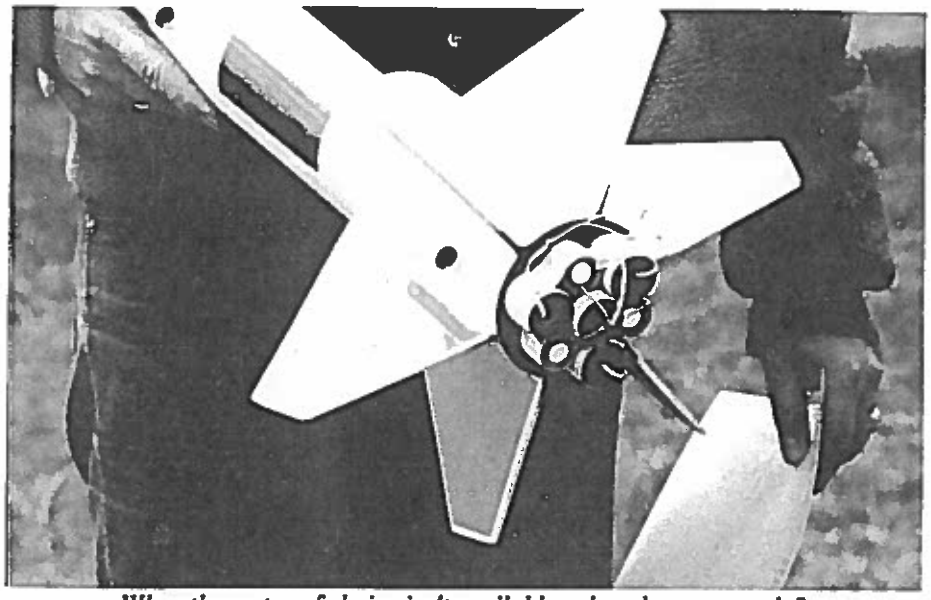
offers many fine tools for the modeler. Items included in the current catalog are blades and knives, clamps, tweezers, files, and sanding sticks. Free catalog: Excel, 481 Getty Avenue, Paterson, NJ 07503.

Labco

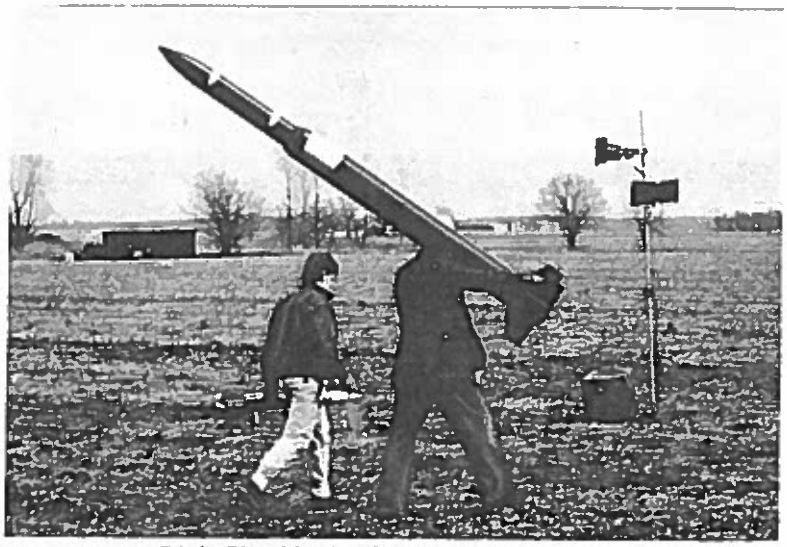
real decals that you can make using your personal computer and printer. Completely water proof once the edges have been sealed. These decals are not vinyl cut but are made by you with any computer graphics software. The decal paper can be used in laser printers, most dot matrix printers, and ink jet printers that use smudge proof ink. Introductory packet contains three 9"x12" sheets of Labco paper with comprehensive instructions and a finished sample decal. Contact: Labco, 27563 Dover, Warren, MI 48093.

Photo Gallery

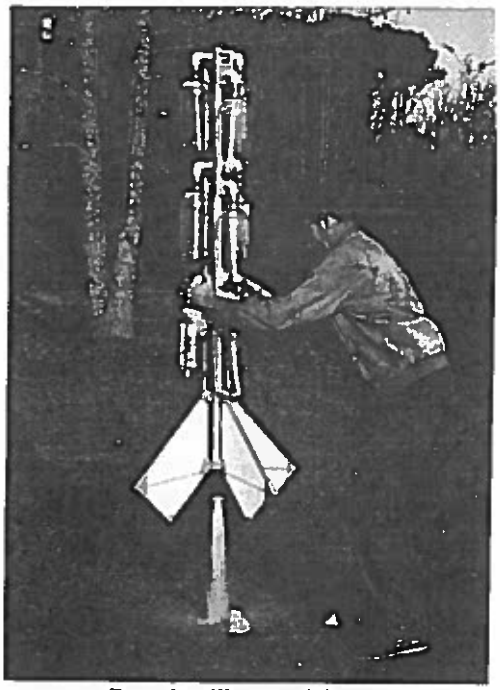
Rocketry is fun, exciting and educational. If you are not a member of a rocketry club, talk to your teacher about starting one in your school, or contact the SEP Program to get the name and address of the NAR section that is nearest you. Join thousands of other people just like yourself in the world's leading hands-on aerospace hobby.



When the motor of choice isn't available, what else can you do? This particular combination proved to be a little more than the rocket could handle.

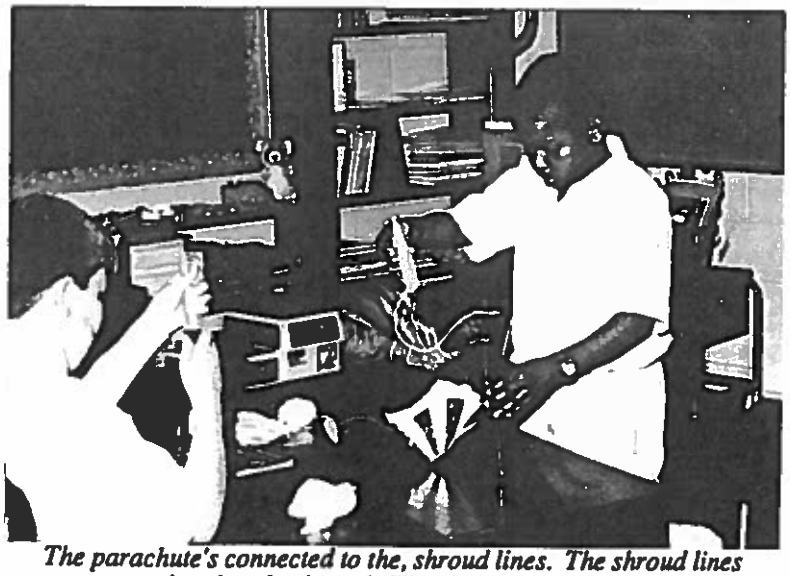


Right Shoulder Rocket . . . Left, Right, Left.



Dan, it will never lift you.

No! . . . I built it, I get to keep it!



The parachute's connected to the, shroud lines. The shroud lines connected to the, shock cord. The shock cord's connected . . .

SPORT ROCKETRY

OFFICIAL JOURNAL OF THE NATIONAL ASSOCIATION OF ROCKETRY

NAR®

The National Association of Rocketry (NAR) is the official non-profit national organization for model rocketry. The NAR establishes safety rules, certifies records, provides technical data and news, sponsors contests and promotes model rocketry.

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