Volume II, Number VII - September/October 1994

Flamethrower®

Official Newsletter of the Student Experimental Payload Program

Rockets, Rockets Everywhere

As summer came to a close and the the autumn colors made their appearance, so did a large number of launches, rockets and events. The SEP Program Launch Field in Athens has been put to good use by young and old alike. With such events as the steam rocket, high power launches and the continued water rocket trials, rocketeers all over the area have learned where the field is located and that a scheduled launch is sure to bring a crowd and a really good time. In addition to the launches in the 150 acre Athens field, the SEP Program has been active in other areas as well. The 13th annual Rocket City Classic held in Huntsville by HARA was strongly supported by the SEP Program and its team members, many of which are also members of the Huntsville Area Rocketry Association. With motor restrictions in place, the Classic caters more to the model rocket arena than high power, which is great for bringing out numerous students and novice rocketeers, as well as a good assortment of old timers and well known international record holders.

While launches are the "high point" of rocketry, it is important to keep in mind that the purpose of the SEP Program is to serve as an educational organization. Our primary goal is to introduce students to the exciting opportunities available through model and high power rocketry, and to inform teachers of the resources that are available. Many of the teachers that are on the mailing list and who regularly participate in the SEP Program are amazed with how much information is available. They did not know that there is an organization out there willing to walk them through the lessons so they can build rockets with their classes. Or someone who is willing to come and talk to their class or school about space exploration and how they can begin to get involved through the use of rocketry. As the word spreads, the mission of the SEP Program becomes more obvious every day.

A Note from the Program Director

It almost seems a shame when the real world interfers with rocketry activities, but that is often the case. This issue of *The Flamethrower* is running a little late and for that I apologize. This isn't the first time that I have had to shelve the more fun activities in order to help put food on the table. In fact, I just recently found out that my company won a contract it had bid on and while that is wonderful news, the contract will tie up Friday evenings and Saturday mornings for the next new weeks . . . no trip to Danville.

On the other hand, activities and demonstrations are starting to pick up now that the school year is well underway. At a recent meeting with the technology coordinators for the Huntsville City School System, Vince Huegele of HARA and myself presented information to the teachers letting them know about the resources that were available. While the teachers seemed interested, as of yet there has been no response for even a demonstration. I have a feeling that they will want to wait until a few days before Space Week, and all try to schedule at the same time. Currently the SEP Program is involved in several after school workshops for middle grade students. Hopefully this will help the teachers realize that space exploration and aerospace technology is a year round educational opportunity and not just limited to one week in March.

As the year progresses, there will be several new opportunities in addition to the regular demonstrations and launches. Thrust Aerospace is interested in developing a scholarship program for payload entries (see related article in this issue of *The Flamethrower*), and the SEP Program has taken on the responsibility of serving in the capacity of the educational coordinator for the newly reorganized *Sport Rocketry* magazine. Also, there are several new pieces of literature under development by the SEP team and talk of a video production covering the model and high power areas of rocketry. We'll keep you posted.

Greg Warren

Flamethrower

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Editor: Greg Warren

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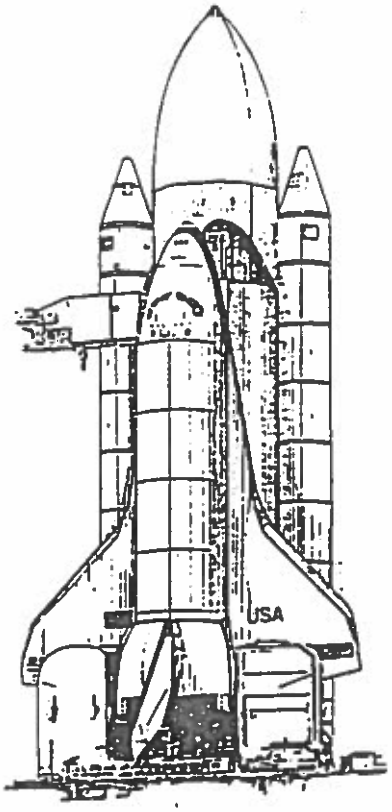
Student Experimental Payload Program
Post Office Box 1934
Huntsville, Alabama 35807

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 Gangl: NASA Space Program Consultant
and numerous others who offer their support

NASA Shuttle Manifest



September 1994

- Vehicle: Discovery
- Mission: Lidar In-Space Technology Exp.
- Orbit: 57° inclination/161 st. miles
- Duration: Ten days
- Liftoff: Pad 39-A / Landing: Kennedy
- Crew: Richard Richards, Carl Meade, Susan Helms, Blaine Hammond, Mark Lee

October 1994

- Vehicle: Atlantis
- Mission: Atlas-03/CRISTA-SPAS
- Orbit: 57.0° inclination/185 st. miles
- Duration: Ten days
- Liftoff: Pad 39-A / Landing: Kennedy
- Crew: Donald McMonagle, Curtis Brown, Ellen Ochoa, Scott Parazynski, Joseph Tanner, Jean-Francois Clervoy

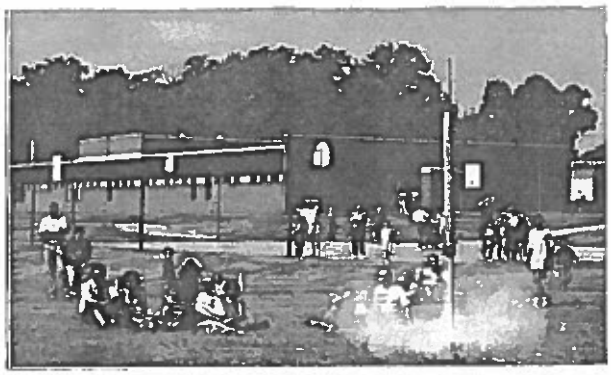
December 1994

- Vehicle: Columbia
- Mission: ASTRO-02
- Orbit: 28.5° inclination/218 st. miles
- Duration: Thirteen days
- Liftoff: Pad 39-B / Landing: Kennedy
- Crew: Stephen Oswald, Ronald Parise, Tamara Jernigan, John Grunsfeld, Wendy Lawrence, Samuel Durrance, William Gregory

Thrust Aerospace Offers Scholarship

Sonny Carri, owner of Thrust Aerospace, has been in contact with the SEP Program over the past few months to discuss a scholarship award. The results of the conversations have yielded the following: Thrust Aerospace will sponsor a scholarship award of $100 dollars to the most unique and best executed payload submitted to the SEP Program during the 1994-95 Mission flights in April. The payload will be judged by SEP Team members on originality, completeness, abstract, use of the Scientific Method of Investigation and PFA (Post Flight Analysis) follow-up. In addition to the $100 scholarship for the student or team that wins, the sponsor school will receive a matching award of $100.

Also in the works is an additional scholarship program offered by Thrust Aerospace for a streamer duration competition. This competition is still in the planning stages and is scheduled to begin with the 1995-96 school year. Look for more information and full details in the Jan/Feb issue of *The Flamethrower*.

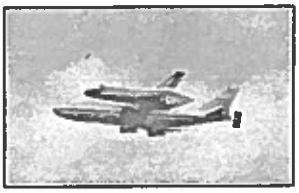


Classes for the "Latch Key" Kids

With the increasing number of families that find it necessary for both parents to work, many children find themselves with no one to go home to. These elementary grade students often stay after school in a program known as "Latch Key", in which adult volunteers remain at school for an hour or so to entertain students by reading stories or playing interactive games.

The SEP Program has also gotten involved in Latch Key by offering after school workshops for students interested in rocketry. One afternoon a week, over a six week period, a SEP Team member meets with the students to conduct a rocketry workshop. During the workshops, the students learn about the history of the space program, build model rockets, and are treated to a variety of launches such as the 2-1/2" diameter pencil rocket shown above. The classes are provided free of charge and are proving to be very popular. Currently, the SEP Program is conducting the workshops in four schools.

Space Shuttle Buzzes Rocket City on 8 Oct.



As if to emphasize the importance of science and rocketry at the annual Super Science Saturday held at the A.S.F.L. (see story below), the Space Shuttle flew over Huntsville and stopped by the airport on its way to Houston for refurbishment.

The mid-morning flyby was hampered by low clouds but thousands of onlookers from all around the city were able to catch a glimpse of the orbiter as it rode piggyback on its customized 747.

Science Day at A.S.F.L.

On October 8th, the Academy of Science and Foreign Language held its annual Super Science Day. The event was attended by several dozen local business and organizations ranging from NASA, who brought out scale models and set up several hands-on lab areas, to a petting zoo who brought out llamas and a tiger cub.

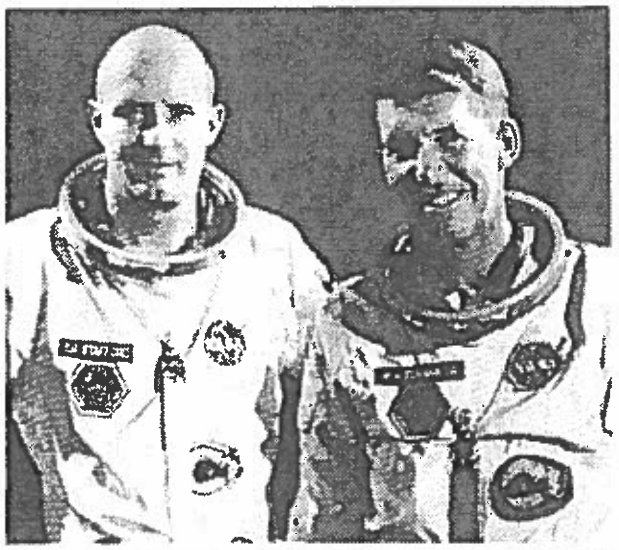
Among the participants handing out brochures and information was the SEP Program, along with HARA to represent the local model rocket club. The attendance seemed light compared to last year, but there were interested parties nonetheless. Also included in the day's activities were several launches from a small field beside the school. Hopefully, the efforts will pay off by increasing the number of people who now know about the resources that the SEP Program and the local NAR section have to offer.

Time Traveler - Log Entry Data [29 years ago]
Subject: Gemini VI **Source:** All We Did Was Fly To The Moon (Eagle Press ©1983) **Date:** 1965

Gemini VI was launched 11 days after Gemini VII due to three unscheduled delays. Their original Agena target failed to go into orbit, scrubbing their lift-off on October 25, 1965. NASA then decided to have Gemini VI rendezous with Gemini VII. This was accomplished on December 15. Gemini VI was launched second because it had the radar. Gemini VII was 1,400 miles ahead of Gemini VI and 188 miles high, and it took Gemini VI six hours (four orbits) to catch up. They rendezvoused over the Western Pacific at night and stayed together for seven hours (five orbits).

GTA-6 on the patch refers to the original flight configuration of Gemini-Titan- Agena. On such a GTA mission the Titan rocket boosted the Gemini spacecraft into earth orbit where they separated. The Gemini then took off in pursuit of the Agena target rocket that had been launched earlier. Once it found the Agena, the Gemini would attach itself to one end. This procedure was essential to the forthcoming Apollo missions to the Moon.

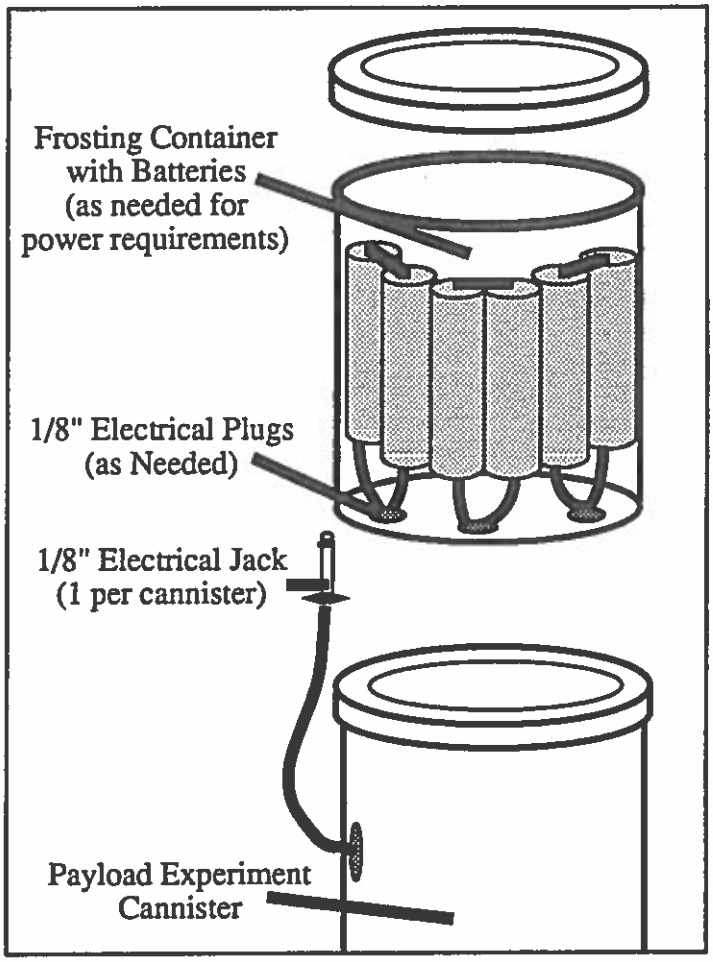
Visual Reference Data
Astronauts Stafford(L) and Schirra(R)



Tech Brief
Modular Payload Containers

As the technology continues to develop to allow smaller, more lightweight and yet sophisticated payloads to be lofted skyward, it becomes necessary to simplify the payload swap-out procedure. Most people are familiar with the technique of utilizing tube couplers as payload containers, but in the SEP Program, we have been using a more simple technique for several years. Based on the standard 4 inch diameter tube, we use the small, plastic Betty Crocker Frosting containers for payload cannisters. The containers fit perfectly inside the airframe and stack on top of each other, allowing several to be inserted inside a single payload bay. Another advantage is the airtight plastic lid that accompanies each container, critical to some of the payloads submitted to the SEP Program by students.

On the more advanced side, the SEP Program uses one cannister as the "power module" for the other cannisters inside the payload bay. The method is simple. One cannister is outfitted with battery holders, and 1/8" electrical plugs are placed in a circle around the bottom. Each subsequent cannister is wired as is appropriate for the individual experiment and an adequate amount of wire, terminating in a 1/8" jack, leads to the power module. Be sure to put the power module at the top of the stack for additional ballast.



Rocket City Classic

For the XIIIth year in a row, the Huntsville Area Rocketry Association held its annual Classic, drawing in nearly 100 spectators and participants. The entire operation ran smoothly and has become an anticipated event in the north Alabama area. As the photos above illustrate, everyone had a good time and plenty of smoke trails filled the air.

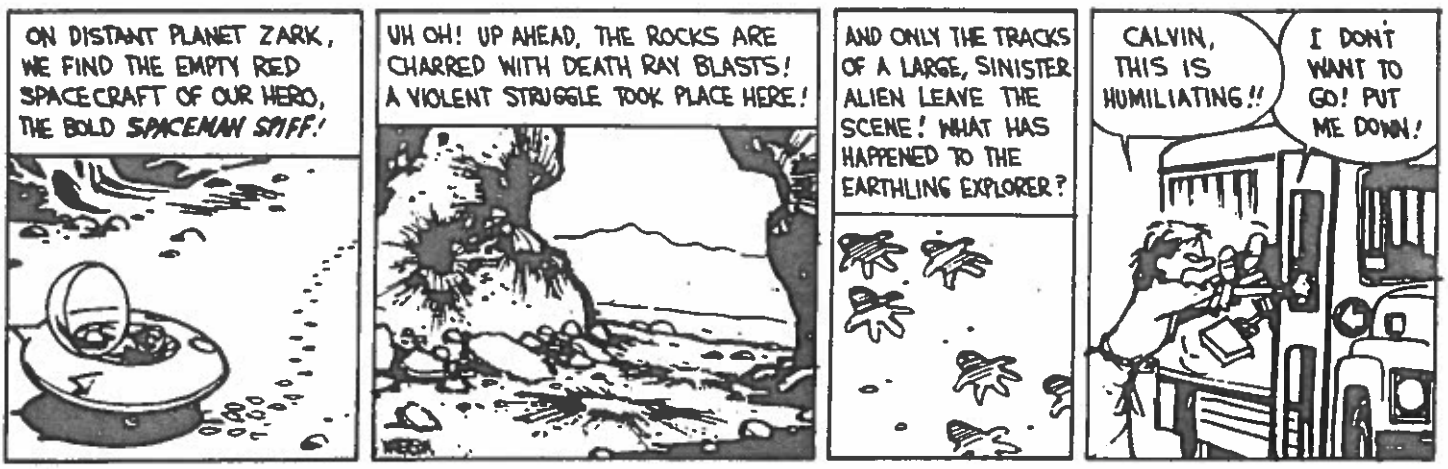
The SEP Program was on hand to provide the launch control system, launch pads and PA system, while everyone pitched in to provide safety checks, contest registration, timer, and launch control duties. The Classic has become a fine example of teamwork and dedication, resulting in a day of fun and excitement, and of course a few "Heads UP!" launches to keep everyone on their toes.

VCR Alert

In November the Discovery Channel will air "The Space Shuttle". During this world premiere, the shuttle's explosive launch and delicate landing are orchestrated by a team working behind the scenes to guarantee a safe celestial journey. From the astronauts to the flight navigation team, experts add a human dimension to this technological achievement. Don't miss it!

Air dates (Eastern Time):

Sunday, 13 November, 9:00 p.m. and midnight
Saturday, 19 November, 8:00 p.m. and 11:00 p.m.
Sunday, 20 November, noon
Saturday, 26 November, 4:00 p.m.



From "The Indespensable Calvin & Hobbes" by Bill Watterson ©1992 p. 239

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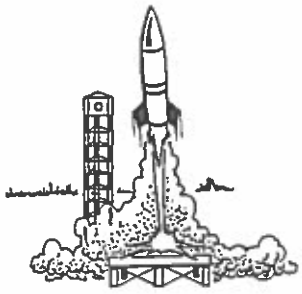
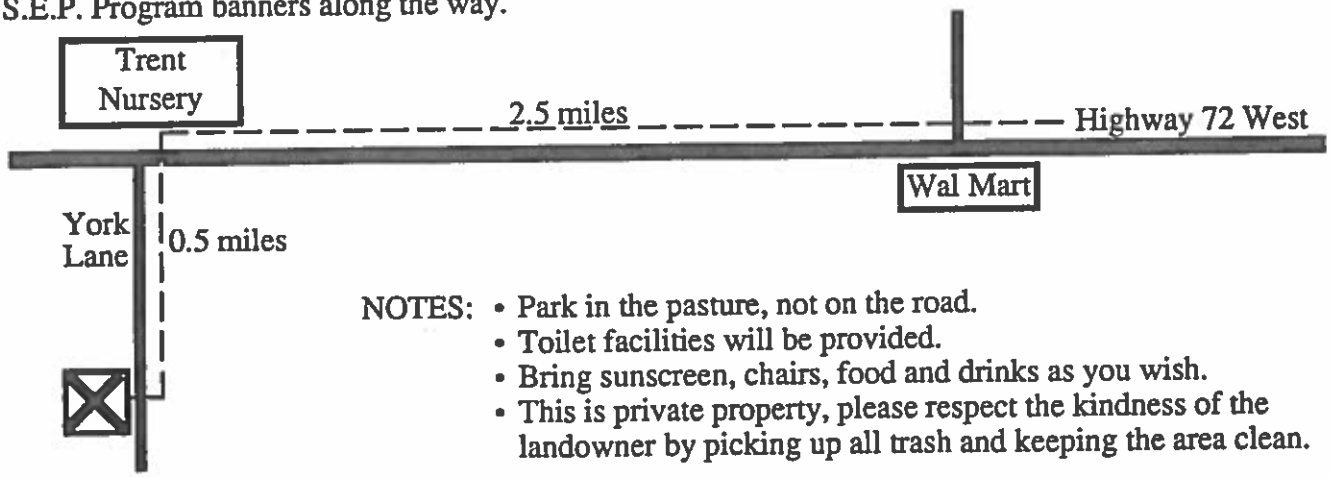
S.E.P. Program
High Power Launch

When: Saturday 19 November 1994
Where: Athens, AL (see map below)
Time: Range opens at 10:00 a.m.
Waiver: FAA approved to 10,000 ft. AGL

The public is invited to attend the November launch of the Student Experimental Payload Program at the Athens Field. This is an open range event with pads for model and high power rockets, as well as experimental craft. The N.A.R. Safety Code will be obeyed for all model rockets, and the Tripoli Code for all rockets rated "G" and above. There is no registration fee. This event is conducted on private property, spectators and participants attend at your own risk. Flight waivers must be signed by all participants.



Directions: Travel **WEST** on **Highway 72** to Athens. Once entering Athens, continue on Highway 72 West until you reach **Wal Mart** on the left. Continue on Highway 72 for **2.5 miles** past the traffic light at Wal Mart. Turn **LEFT** onto **York Lane** (Trent Nursery on Hwy 72 will be on your right), and travel **0.5 miles**. The launch will take place in the large pasture to your right. Look for S.E.P. Program banners along the way.



NOTES:
- Park in the pasture, not on the road.
- Toilet facilities will be provided.
- Bring sunscreen, chairs, food and drinks as you wish.
- This is private property, please respect the kindness of the landowner by picking up all trash and keeping the area clean.

The Student Experimental Payload Program is a non-profit organization dedicated to hands-on aerospace education. For more information call (205) 230-0353.

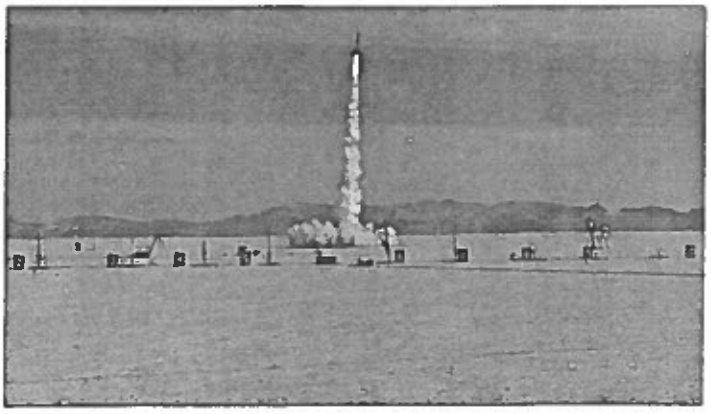
Fireballs IV

By Neal J. Redmond
(Traveling High Power Reporter)

Each year Tripoli conducts an experimental launch known as FIREBALLS, where the rockets and sky are unlimited. This year, the September 17-18th event had an official FAA waiver of 80,000 feet AGL. The location, Gerlack, Nevada, is literally at the end of the pavement. There you will find a gypsum mine and Bruno's Country Club, which serves as the only motel, cafe, casino and saloon for 70 miles. Bruno's is a family place until the local miners show up at around 9:00 p.m., then it might be considered a good time to retire to your room to prepare for the next day's launch activities.

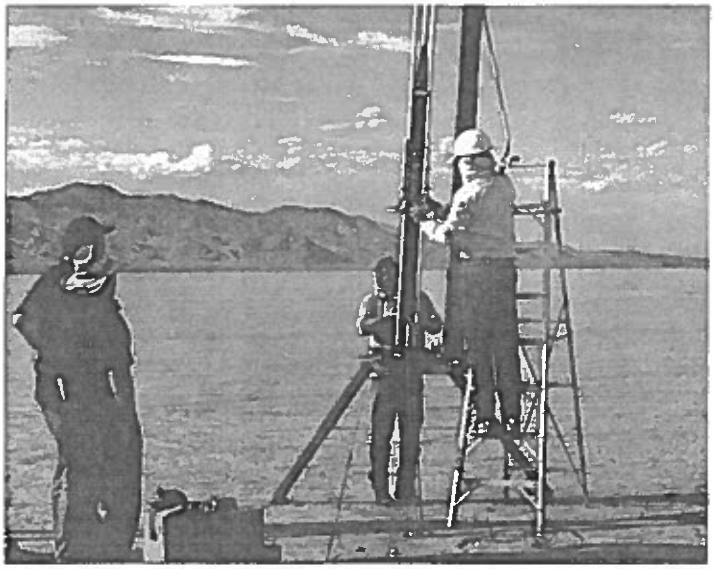
From Bruno's it is dead reckoning over a mine access "road" onto the Black Rock Dry Lake Bed, then another 18 miles North on the Lake Bed to the launch site. The entrance point to the dry lake bed is not well marked so you might consider taking an Indian guide your first time there. The bed itself is so flat that the launch site is over the horizon from the entrance. The night dew evaporates from the gypsum, causing a morning fog that gives the place an alien world appearance. Adding to that feeling is the fact that there is no organic material on the lake bed. It has been purged of all life and is therefore perfect for High Power Rocketry.

AEROPAC hosted the operations and installed a high tech communications and public address system. You could hear the warnings from a great distance. That proved to be a benefit when, on one occasion, a land shark moving at nearly 100 mph entered a nearby tent. The Public Address system gave everyone an adequate warning, possibly avoiding a serious injury. The land shark flight profile (which, by the way was caused by sequentially delayed cluster motor ignitions), caused a great deal of excitement and renewed our awareness that what we were doing requires constant vigilance toward safety.



Durng the event, motors ranging up to "M" powered rockets are launched out of a normal Tripoli flight line with appropriate stand-off distances. The "K" and "L" size motors are seen on nearly every rack of flights. Several complex rockets, including cluster air starts, multi-stages and odd ball rocket shapes are common. One entry included a "Rudolph the Red Nosed Reindeer" head (only) but it did include the antlers. I was really surprised at how stable Rudolph could fly, but any youngster knows that.

Remote launch towers at 2 and 5 miles from the flight line were busy setting up for the really big stuff. Frank Kosden was on hand with his team setting up a single stage metal sounding rocket attempting 20,000 feet. Also in the prep stage was his two stage "O" to "O" motor which could have possibly claimed the altitude record and pushed the 80,000 foot FAA waiver. However, complications and delays kept the rocket earthbound until the next launch window.



Another High Power, high visibility rocket was a scale Phoenix missile flown on an experimental Aerotech 4" diameter motor (M2400). Karl Baumann says that his ADEPT altimeter read 28,300 feet, but the ground tracking station lost it after 16,000 feet. My own calculations on this motor show that it's capable of MACH 2.5+ with a minimum diameter carbon composite airframe. Dynacom also launched an all fiberglass Tarantula on an "M" motor, but the recovery system failed and it became an expensive pile of rubble.

Dynacom wasn't the only one learning lessons the hard way during Fireballs IV. A lady sporting a nicely painted 4" diameter rocket quickly discovered that a J800 is too much for spiral wound paper. I offered her my K1100 for the flight, but she was able to destroy it with her own motor. Lesson learned: high impulse requires high tech, such as kevlar, epoxy bonded fiber glass or carbon composites.

Even this wasn't enough for Ian Furlong, who fired up a two stage "M" to "L" rocket only to have the second stage break off at high speed and impact the ground under full second stage thrust. Ian was understandably disappointed, but I think it was the most spectacular crash of the event. Design rules change when you enter the transonic arena, and when you're pushing the edge, sometimes you fall off.

And speaking of pushing the edge, there was a Nitrous Oxide/HTPB Hybrid Motor launched which was both successful and impressive. The gas plume glowed a nice orange color and made a howling sound. Burn time was over ten seconds, but despite a successful launch and stable flight, a failed recovery system reduced it to worthless twisted metal.

Fireballs is reminiscent of the early atmospheric research sounding rocket days; avionics of all sorts, altimeters, 8mm cameras, telemetry, etc. all combine with plenty of smoke and fire. If you've never seen it, try Fireballs next year, it has to be the ultimate in High Power hobby fun.

Construction of the "HL-20 Lifting Body"

QUEST™ Shaping the future of model rocketry

Manufacturer:	Quest
Length:	8.5 inches
Wingspan:	7.25 inches
Motors:	(1) B6-2 or (1) C6-3
Price:	$8.99

If at first glance this seems to be a rather short article to review the construction of a rocket kit, that's because it is. I have had the pleasure of building numerous model and high power rockets over the years, but I have yet to see any go together as quickly and smoothly as the Quest Space Clipper and the other flying cone, the HL-20 Lifting Body. Unlike the Space Clipper (see the review in Jan/Feb Flamethrower), the HL-20 does have fins (i.e. wings) and is designed to glide back.

Construction of the HL-20 is similar to the Space Clipper in that it is a pre-printed aeroshroud wrapped around a forming bulkhead. The interior is a motor tube with a nose cone glued in place. There is a streamer recovery mechanism inside the shroud which is attached to the motor casing. Upon ejection, the motor is blown clear of the HL-20 and the vehicle begins its spiral back to earth while the less fortunate spent motor descends in a less graceful manner. Now on to the actual construction.

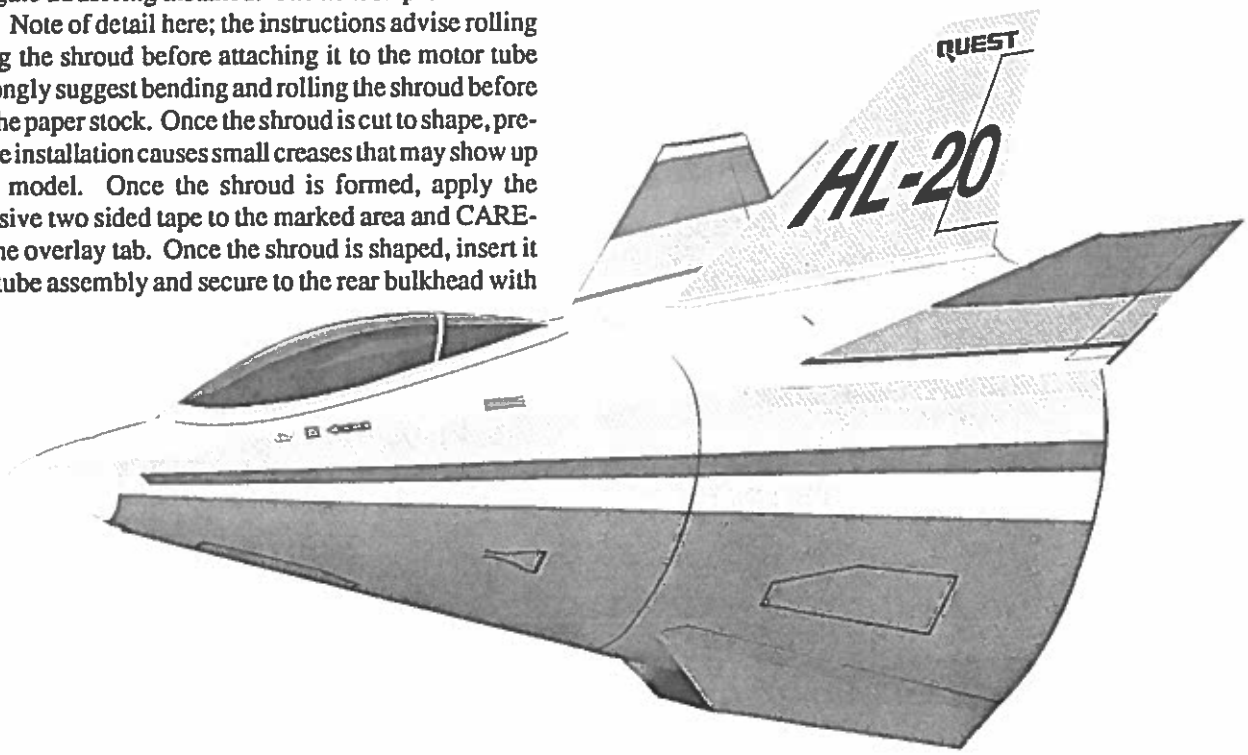
The most time consuming part of the kit is cutting out all the preprinted material that comprises the airframe. The parts include the aeroshroud, a left and right wing, a rudder, and a couple of discs and odd pieces used elsewhere in the assembly. The motor tube is attached to the only bulkhead in the kit, nose cone secured to the form and an engine thrust ring installed. The next step is to install the aeroshroud. Note of detail here; the instructions advise rolling and pre-forming the shroud before attaching it to the motor tube assembly. I strongly suggest bending and rolling the shroud before cutting it from the paper stock. Once the shroud is cut to shape, pre-bending it before installation causes small creases that may show up in the finished model. Once the shroud is formed, apply the extremely adhesive two sided tape to the marked area and CAREFULLY align the overlay tab. Once the shroud is shaped, insert it onto the motor tube assembly and secure to the rear bulkhead with glue. Take care to align the bulkhead to the proper mark on the shroud, or your model will take on a lopsided appearance.

Cutting and bending the wings and rudders is simple and straight forward. The parts come with glue tabs so simply cut on the solid lines, bend on the dotted lines, and attach. Everything about this kit is simple and straight forward, which makes the assembly even more enjoyable for someone like myself who wants to fly the rocket within moments after making the purchase. After inserting the ballast (you get to put in your two cents worth, literally), the model is finished. Now comes the true test, will this odd shaped paper shroud really fly, and will it glide back as per publication?

My first motor was a B6-2. The model roared off the pad, fishtailed wildly (but still managed to go almost straight up), and blew the motor out with a rather loud bang. I then witnessed a short (but surprisingly stable) glide with a slow counter-clockwise bank. The second motor was the C6-3. If I thought the first flight fishtailed, I underestimated the capability of a paper cone to travel in sprials. This flight was faster, more twisted, and higher than the first - but the glide pattern was graceful, smooth and longer.

Subsequent inspection revealed that my ballast had moved during the drying process. After moving it to the proper location, the flights were much more stable, although still not completely without some fishtailing. The fifth flight ended the career of the model after a disagreement with a tree trunk. One tree, one target, bulls-eye! My wife has often pointed out that if I can't put a rocket in a tree, I can put it *into* a tree. Minor repairs and it'll be gracing the skies with its smooth and circular glide once again.

Final opinion: *Do It!* For $9.00 you can't go wrong and it's worth that amount to have a successful and attractive flying cone. The kit also includes a tech sheet on how flying cones work, but it doesn't give you a clue as to how they can find a single tree in an otherwise unobstructed launch area.



Science Lab

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

A Simple Water Rocket

Activity Description:

This activity is designed for class or small group participation to study the principle of action and reaction.

Materials:

1 20 oz. PLASTIC soda bottle and cap
1 Tire Valve, 1-1/2" in length
1 Foot Pump with Hose Latch Mechanism
1 Drill with 9/16" Drill Bit
1 Pair of Small Needle Nose Pliers
1 Drinking Straw
1 36" Dowel which fits through drinking straw
* Tape
* Scissors
* Poster Board

Procedure:

1. Using the small needle nose pliers, remove the valve from inside the valve stem so that there is clear passage through the entire stem.

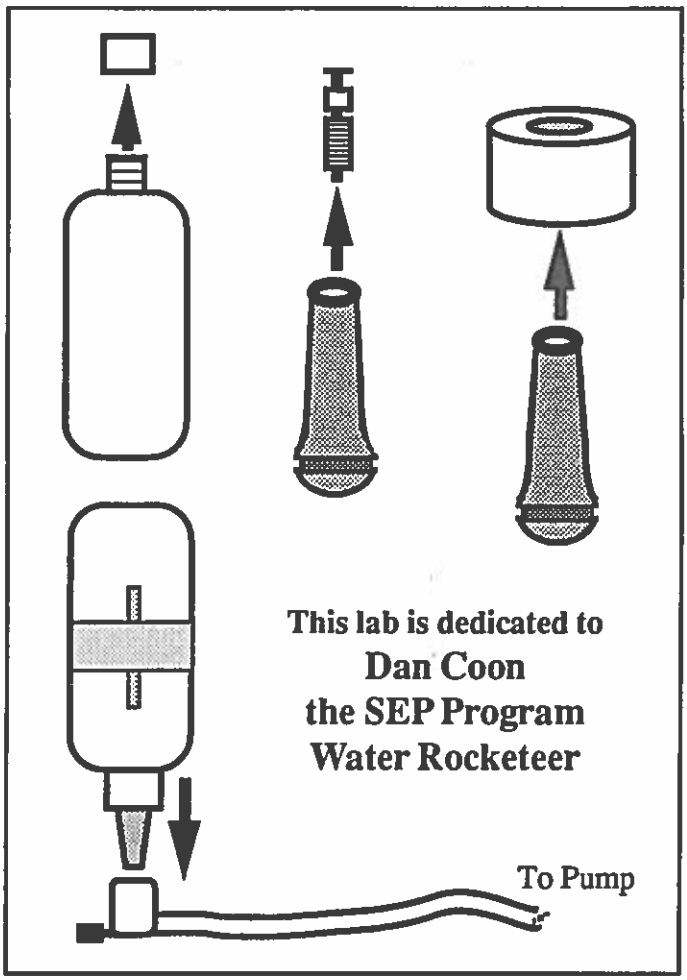
2. Drill a 9/16" hole in the bottle cap and insert the valve stem so that the stem protrudes out of the cap. Screw the cap back onto the bottle.

3. Tape a 3" section of the drinking straw to the side of the plastic bottle.

4. Secure the Hose Latch of the pump to the valve stem and pressurize the bottle.
   NOTE: Do Not Exceed 90 PSI.

5. Insert the dowel into the ground and slide the drinking straw/bottle over the dowel.

6. While standing to the side and after a proper countdown, release the hose latch and watch the bottle take off.



Discussion:

The escaping air will cause the bottle to rise, while the dowel serves as a passive guidance system, just like on model rockets. Try experimenting with different pressures, and adding water into the bottle. Try adding poster board fins to the bottle. Record your results to determine the amount of water and pressure that delivers the maximum altitude.

Let us hear from you:
Write a report about what you think it would be like to ride onboard a 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.

U.S. Postal Service

has released a commemorative stamp set celebrating the 25th anniversary of the first moon landing. "That's one small step for man, one giant leap for mankind." Neil Armstrong, July 20, 1969. visit your local post office to obtain the stamp set.

Balsa USA

has come out with its line of triple distilled "Gold" CA glues, said to be so pure that thin, thick and gel formulas are all that is required for bonding balsa, spruce, plywood, fiberglass, and plastics. No specialty formulas required. Gold CAs are also 25% to 50% stronger and possess up to five times greater shock or impact strength. These products are definitely worth investigating. Balsa USA; P.O. Box 164; Marinette, WI 54143.

QCR

Qualified Competition Rockets now offers a new "ultimate folded wing RIG glider" 33 folded wing III, 18mm pod, use C6-3 or D3-3 engine, glider weight is 46 grams. PLUGS, ultimate recovery system protection, are constructed of flame resistant material. PLUGS have several advantages over wadding - less weight, less volume required inside airframe, simple one piece constuction. For complete information contact: QCR; 7021 forest View Drive; Springfield, VA 22150.

Thrust Aerospace

has published their first catalog of model rocketry components and accessories. Items included in volume IA are G10/FR4 glass epoxy sheets, ultra high visibility mylar streamers, rocket body tool and premium quality launch rods. Custom services also available. Contact: Thrust Aerospace; 405 Tarrytown Road; Suite 203; White Plains, NY 10607.

North Coast Rocketry

POWERCLUB members can now purchase the AEGIS-X, an experimental surface-to-air missile prototype. The kit features custom decals, plywood fins, Gorilla shock cord mount and bright ripstop nylon parachute. Contact: North Coast Rocketry; 4848 S. Highland Drive; Suite 424; Salt Lake City, UT 84117.

Quest Aerospace

offers advanced modelers the opportunity to perform exciting payload experiments with the two-stage, skill level 3 Zenith II Payloader. In addition to the transparent red payload bay, this 22.75" tall rocket includes self adhesive decals and die-cut balsa fins. Its estimated maximum altitude is 1,500 feet. For more information see your nearest hobby shop or call 1-800-682-8948.

K&B Manufacturing, Inc.

produces a "Matched Finish System" for best appearance when com-leting your rocket kits. Learn more by contacting: K&B MFG., Inc.; 2100 CollegeDrive, Lake Havasu City, AZ 86403.

Aero Design Research

announces its new mailing address: P.O. box 727; Defiance, OH 43512. ADR is in the process of building a new office/shop facility. Designer Kevin Fitzgerald is currently working on a 1/30th scale German WWII Sanger Antipodal Bomber, release date is set for October 1, 1994. Artist Pat Cannon has completed the first in a series of rocketry note pads. Three different sets are available; SET I includes Patriot, Scud, Hawk, Harpoon. SET II includes ASROC, Sparrow, Hellfire, Trident. SET III contains Buran, Ariane, Nike, Hercules, Maverick. Their 1994 catalog will be available in late summer, cost is $1.00.

Rocket R&D

introduces the "OX" launch pad which provides a five foot base yet stores in its own 28" x 12" x 5" box. With four 3/4" tubular steel legs, 12" square blast deflector and full azimuth rotation this is the last high power pad you'll ever need. Contact: Rocket R&D; 308 East Elm; Urbana, IL 61801 or call (217) 344-2449.

Estes Industries

"Broadsword" stands over three feet tall, is 2.6" in diameter, includes a huge self adhesive decal and features slow, realistic lift-offs. This is one impressive kit you will want to add to your fleet. Contact your nearest hobby dealer or write: Estes Industries; Department 652; 1295 H Street; Penrose, CO 81240.

MRC

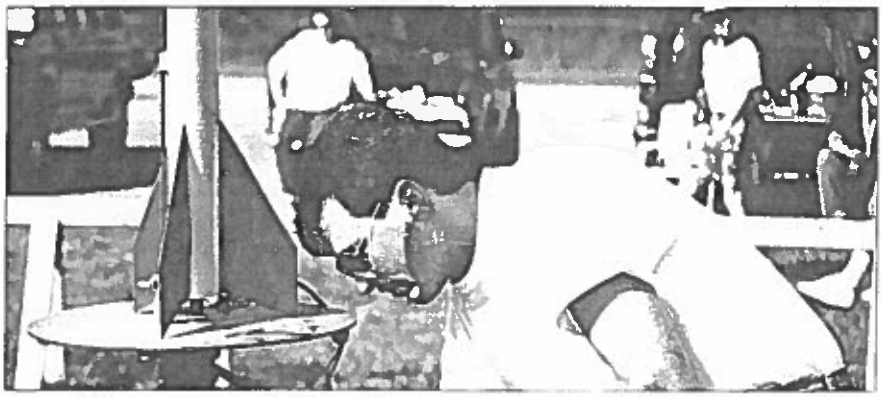
Model Rectifier Corporation offers a number of traditional model rocket products. Two lines of particular interest are the High Performance Series and the Concept II line. The kits feature quality parts with easy to follow instructions and are competitively priced. Contact: MRC; 200 Carter Drive; Edison, NJ 08817.

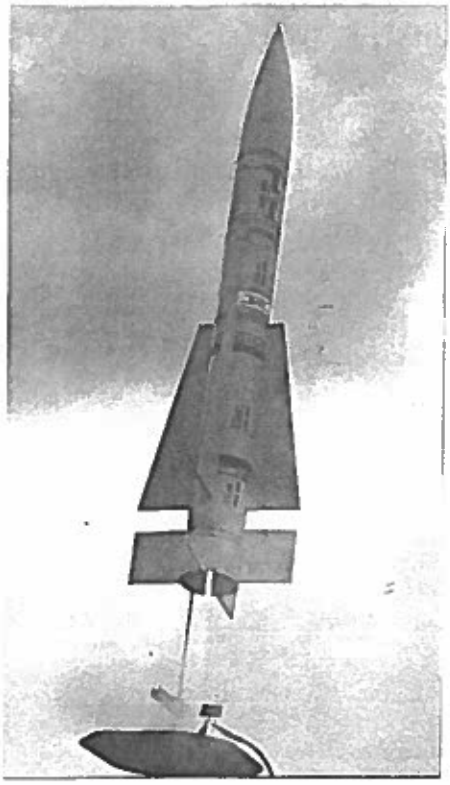
DAP, Inc.

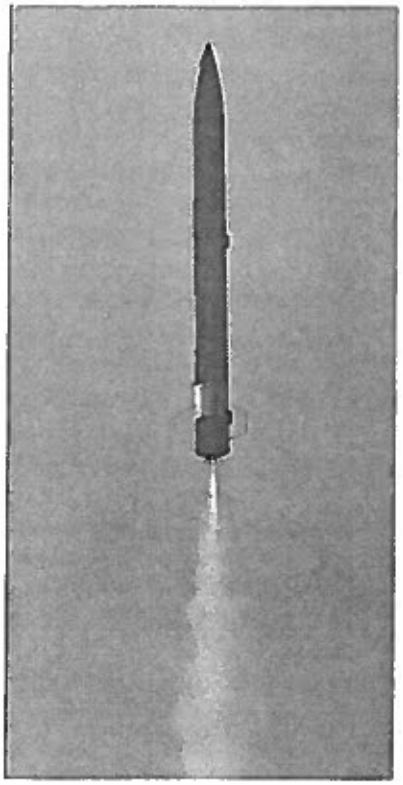
of Dayton, Ohio offers two superior glues for use with hobby rocketry - Weldwood Hobby 'n Craft Glue and Weldwood Carpenter's Glue. Both versions set fast and provide a strong bond. Visit a local dealer or write: DAP, Inc.; Dayton, OH 45401.

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.







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