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Model Rocketry

Volume III, No. 2
November 1970

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Business Manager	Jerome Apt, III
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Cover Photo

Craig Streett of Ohio's CSAR section launches his Nike-Smoke from a scale pad during the NARAM-12 Space Systems competition. Complete NARAM coverage begins on page 19. See page 35 for NARAM results. *(Photo by George Flynn.)*

From the Editor

Winter is fast approaching, and if past experience is any indication rocketeers in the northern part of the country are heading indoors. Many rocketeers will give up launching activities until warmer weather arrives. Take a look at this month's Modroc Calendar – there is only *one* contest listed, and that one is scheduled for next April, Don't worry about launching in the winter, it will not hurt your rockets at all. In fact a soft snow blanket will keep a fast landing from damaging the bird!

Experience has proven that both the rocketeers and the rockets can withstand a winter launch. Last year, and for many years in the past, the Zenith Section in Minnesotta has proven that winter launching can be *FUN!* In fact, they flew a contest last December with a reported 36 inches of snow on the ground (the recovery crew used a snowmobile), in temperatures of five to ten degrees above zero.

You can't keep a group of serious rocketeers indoors all winter. Sure its a great time for building those highly detailed scale models, the complicated contest birds, and for doing the research for next year's R&D paper. But, if you really want those new designs to *work* when the contest season rolls around, you had better get out and *test it now.*

To encourage a little more activity this winter, we'll offer a 1/100th scale Saturn V rocket kit to the individual or club who can document having flown a model rocket in the *lowest temperature* during the Winter 1970-71. Bring your thermometer out to the launch field, and keep those rockets flying all winter long!

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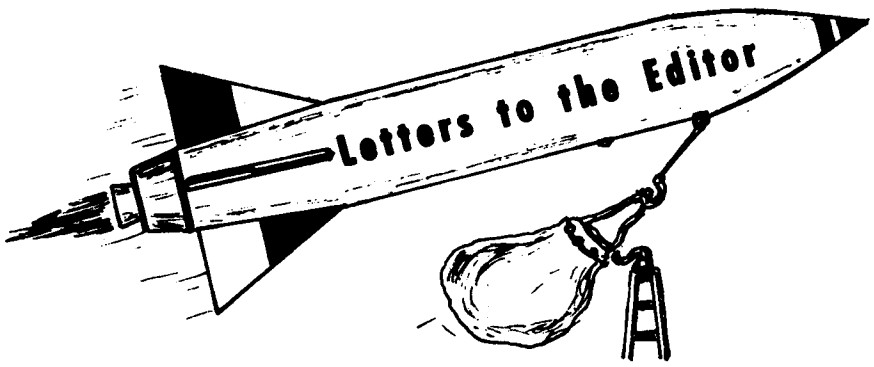


Model Rocketry as a Challange

Congratulations to Gordon Mandell for writing an excellant story on the average model rocketeer which appeared in the June issue of **Model Rocketry**. He says that the average model rocketeer does not stay with the hobby very long because he or she finds it too easy. No challange! And he is absolutely right. He also says that we are losing some of our hard core rocketeers, which is also true.

But what better way to remove the challange from the hobby then to let companies commercialize a good deal of the scientific equipment which model rocketeers use. What is happening is that more and more original thinking is being placed upon the model rocket industry. The result is that more rocketeers are attracted, but they soon quit because their is nothing to spark their interest any more.

The hard core rocketeer wants to be his own engineer. The industry is taking this out of the hobby by destroying the areas of originality once open to the rocketeer.

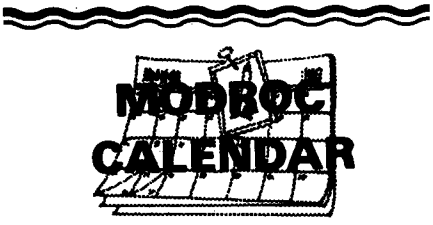
James Castiglione
Brooklyn, New York

It seems to us that the challange in instrumentation is not to build the transmitter or accelerometer or temperature sensor but to use the instrumentation to measure the interesting quantity. By marketing a transmitter, the manufacturer does not remove the challange, he changes the emphasis from assembly of the instrument to its use in a scientific experiment.

The same thing happens in the area of scale modeling. The good scale modeler may use a kit because if simplifies construction of the basic airframe. Then he uses the time he saved to do an even better than normal job of super-detailing on the model. He adds the little things – rivet heads, bolts, break lines, scratches, pipe, etc. – that are not included in the kit.

By making available these technical advances, the manufacturer does not remove the challanges of the hobby. In fact, by changing the emphasis, these new introductions extend the challanges available to the rocketeer.

–GJF



Pittsburgh Spring Convention – Spring 1971. Sponsored by the Steel City Section, the 6th Annual Convention will feature guest speakers, discussion groups, etc. Details to be announced.

MIT Model Rocket Convention – Spring 1971. Sponsored by the MIT Section, the Convention will feature R&D presentations, discussion groups, and a launch. Details from Convention, MIT Model Rocket Society, Box 110, MIT Branch PO, Cambridge, MA 02139.

ECRM-5 – April 16-18, 1971. Regional meet, sponsored by NARHAMS NAR Section, open to NAR members from Maryland, Virginia, North Carolina, Delaware, West Virginia, and Pennsylvania. Events: Scale, Sparrow B/G, Swift Rocket Glider, Class I PD, Class II Streamer Dur., Hawk B/G, Parachute Spot Landing. Site: Camp A. P. Hill, Va. Contact: J. Barrowman, 6809 97th Place, Seabrook, MD 20801.

ATTENTION
CONTEST DIRECTORS
Mail notices of your contests at least 90 days in advance for listing in Model Rocketry's "Modroc Calendar":
Modroc Calendar
Box 214
Astor Station
Boston, Mass. 02123

Triad

I was very interested in the July edition of the *Escape Tower*. Bob Parks "Triad" design is very similar to one I conceived

almost two years ago in October 1968. My design, designated the "Triple-X," was finally finished the next year, and fired three times. Its third launching, on September 13, 1969, was completely successful.

Ronald L. Atkins
Jamaica, NY

Rhode Island Activities

Recently I noticed the ever-growing amount of letters in the Club News Column in your Magazine. I must say I was surprised to see all the new rocket clubs being formed in our area. So I, as president of our club, decided to write you and tell you about our club.

Our club is the Aquidneck Island Model Rocket Club, or AIMROC. We formed last fall and are sponsored by the Avica Corporation of Middletown, R.I. (which makes parts for the real Saturn Five). We have been a very active club ever since we were formed. We've had over ten club launches, including one inter-state competition. Several of our members attended the MIT convention and found it very interesting. We've held public demonstrations and on one occasion the vice president and I gave a lecture on rocketry to a local Rotary Club. Our club has a multiple launcher, altitude trackers, and a public address system for use at our launches. We are proud of our achievements in the model rocketry field and the public is very interested in our progress. Since our sponsor makes parts for the real Saturn, we bought the Estes model Saturn Five which we assembled and presented to the company president. He was very pleased and the Saturn was launched with a 'D' engine at the company annual picnic in August.

Bill Thomson
President, AIMROC
Middletown, R.I.

Closed Breech Launchers

When I heard about Washington State banning closed-breech launchers, it made me wonder what model rocketry was coming to. Even the suggested automatic 10% decrease in the tracked altitude isn't a good solution. If we're going to handicap those rocketeers who want to win enough to build a closed breech launcher, we might as well be consistent and reduce by 10% the score of anyone using in competition a pop-pod B/G, tower launcher, or any new innovation beneficial to the sport.

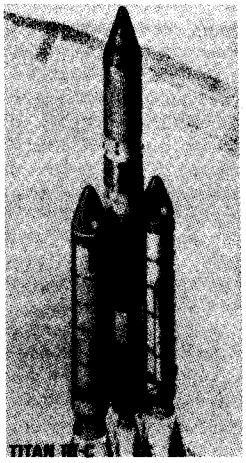
Bruce McRynolds
Santa Ana, California

A Critical Problem

Several times **Model Rocketry** has commented on the problem of the high turnover rate in our hobby. Also, the "big" problem of turnover has been correctly analyzed as the result of deficiencies within the hobby. I personally am interested in research, so Gordon Mandell's comments at the MIT convention echo my feelings on that subject. However, I think that there is another problem that is nearly as serious and its solution is in the hands of every rocketeer. The problem — a lack of pride and good judgment among rocketeers.

It has been stated that the *average* level of workmanship in model rocketry is very *low*. I think that this statement is true and it is going to be a difficult problem to solve. Perhaps the introduction of easy-to-assemble plastic kits will help. If the average modeler doesn't improve, we will have a poor public relations situation on our hands. If a modeler doesn't have enough pride to do a good job on his own models, he isn't going to be much of an example for prospective model rocketeers.

What is really disturbing, though, is a trend that has been showing up in competition in the last few years. First, let me say that I haven't regularly competed in contests for about five years so some may feel that I'm not qualified to talk about competition. I think that my viewpoint may be closer to that of an observer (public official?) or a novice. The trend that



disturbs me is that of a seeming lack of preparation by contestants for contests. From reading reports about various competitions and record trials, it appears that successful flights in some events are the exception rather than the rule. B/G events are particularly notable for their number of DQ's. What kind of image does this give the hobby when some of our better modelers can't even take time to test fly models before entering them in competition? Apart from the impression that a model failure makes on the public, we are taking a big chance with our safety record. If this trend of fly-it-regardless continues, someone is going to get hurt. We all have to remember that model rocketry is on probation in the eyes of many public officials. If there is a sudden rash of accidents, many model rocketeers may find themselves outlawed in their own town.

I realize that there are probably some modelers that will think "Well, there just isn't time to test my models" if they read this letter. Just remember that we are in the public eye at all times, so try to take safety seriously.

Robert E. Cramer
NAR#12663
Midland, Michigan

The Role of Science

I am writing in answer to Gordon Mandell's article, "The Role of Science in Model Rocketry" in June 1970. I wholeheartedly agree with Mr. Mandell's proposition that developments in the science quadrant of model rocketry are what retain the experienced modelers and prevent the hobby from becoming just another fad. These advances also serve as a yardstick of our progress and growth. There is a major stumbling block that non-adult rocketeers have in aiding the scientific growth of the hobby. This problem is neither lack of technical know-how, (here's where **Model Rocketry** has done its part) nor lack of experience, *but an absence of financial support*. It's true – most talented young rocketeers are stopped by a lack of money and equipment. The only solution I see is an N.A.R. review board to look over rocketeer applications for funds, and decide on the most promising experiments and provide these with the necessary money. All developments would be published in **Model Rocketry**, so the whole hobby could benefit and thereby steadily advance.

The progress we have made up to now has been slow, but with this system, I believe we can make great strides forward and gather greater public and government support.

I would appreciate hearing from other rocketeers with ideas pro or con.

Jim McGraw
2800 Millcreek Rd.
Wilmington, Del. 19808

Sponsors for research are hard to find even in the professional scientific field these days. Fortunately, many of the areas of model rocket research which currently need investigation require no sophisticated (and expensive) equipment, and very little outlay of funds. The simple experiment of comparing the altitude achieved for a tower launched rocket with and without a launch lug to give a measure of the drag introduced by the lug has been suggested in several issues of **Model Rocketry**. *To date, no one has reported doing this simple and inexpensive experiment. Some research may be hindered for lack of funds, however there are so many inexpensive projects suitable for investigation that the lack of funds can not explain the general lack of interest in R&D.*

– GJF

2001 Commentary

As I was looking back over the April, 1970 issue of **Model Rocketry** I came across Charles Andres' article on computers. In the second paragraph, the author states that HAL in the movie "2001: A Space Odyssey" is Stanley Kubrick's way of informing the viewers that IBM will still be in business in the year 2001. This is completely incorrect.

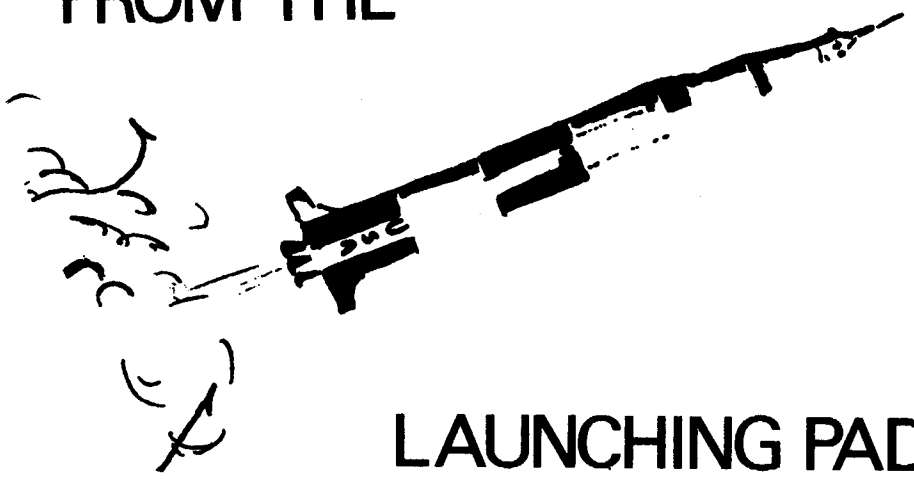
First, before there is any mention of HAL in the movie, there are several shots showing equipment marked with the IBM label, such as the IBM Newspads that Bowman and Poole are watching as they eat dinner in the centrifuge of the Discovery. Later, when the shipboard astronauts put on the spacesuits used for EVA, one will see IBM on the left forearm control unit for the suit functions and even later than that when Bowman prepares to enter HAL's logic center IBM appears on the sealed door leading into the center. In short there was no reason for Kubrick to make anagrams to hint that IBM would still be around since he openly states the fact over and over.

Second, the novel **2001: A Space Odyssey**, written by Arthur Charles Clarke is based upon the original screen-play and so predates even the film's final version. In Part III "Between Planets," Chap. 16, pp. 95-96 I quote: "Hal (for *H*euristically programmed *AL*gorithmic computer, no less) was a masterwork of the third computer breakthrough."

You see, we of S.O.T.O.S. have seen 2001 about 300-400 times between us and read the book about 100 times, which is an average of about 10 viewing and 3 readings each. We thank you for the correction.

William M. Devine
Tulsa, Oklahoma

FROM THE



LAUNCHING PAD

In commenting on the recent NARHAMS' sponsored Capitol Area Regional Meet, Chuck Gordon reports in this month's NAR Section News that "due to the relatively *small* number of contestants (60 to 65) the atmosphere was relaxed." That's right, rocketry has been growing so fast in the DC area, and in the rest of the United States, that sixty-five contestants is considered a relatively small number for a Regional. Just a few years ago, sixty-five contestants would be considered good attendance for a NARAM. Now we're seeing that many rocketeers competing at the larger regionals. This year's Nationals attracted approximately 200 participants, more than double last year. The DC area shows what can happen if just a few rocketeers set out to promote the hobby. Their effort started several years ago with only two sections in the DC area. Today, as a result of demonstration launches, newspaper publicity, numberous contests and other activities, that same DC area has 7 or 8 active Sections and several hundred NAR members. In fact, rocketry has grown so fast in the DC area that they have trouble trying to find any one Section with enough energy and time to handle the paperwork necessary to accommodate their "Nationals size" regionals.

Centuri has come up with two items specially designed for educators and clubs or individuals involved in model rocket lectures, demonstrations, or displays. Their new Cut-a-way Engine Display (KE-7) includes a 3½ times actual size plastic engine cut-away, to allow rocketeers to explain the functions of the nozzle, casing, propellent, delay charge, and ejection charge to interested individuals. The Visible Astro (KC-10) is a 16" long display model employing a clear plastic body tube to allow the engine, wading, shock cord, chute, etc. to be seen in "flight configuration." With these two new items now available from Centuri the job of clubs and individuals explaining model rocketry to the public should be greatly simplified.

Don't forget the Estes Phantom Electro-Launch (FS-8) with clear plastic construction when you're planning a model rocket demo launch. Its clear plastic base emphasizes the use of electrical ignition by showing the 8 D-cells used for ignition. Estes also distributes a "Phantom Engine" cut in half lengthwise for display purposes. Note that this engine contains only non-combustible materials to simulate propellant. Do *not* try to make your own display engines by cutting open a live engine!

Educators and clubs doing model rocket demo work should contact the Estes and Centuri Educational Directors for more information on these and other materials designed for this type of activity.

We've had several letters over the last few months asking us to provide an index to the articles in **Model Rocketry**. Unfortunately, we didn't have an index, so there was nothing we could do to help, but one of the correspondents suggested that if we didn't have one he would be glad to prepare it. Thus Doug List of the ABM NAR Section in Bethlehem, Pennsylvania got himself roped into doing the indexing work for Volumes I and II of **MRm**. Last week he finished the index for Volume I, which we'll be publishing next month. The Volume II index comes later. Doug commented in his letter accompanying the index: "It does take a lot of time!" and I don't think anyone will dispute that. Doug's work, however, will make it a lot easier for everyone else to find things in their **MRm** back issues. Thanks Doug!

Doug Malewicki's performance – a second in spot landing at NARAM-12 – with his Radio Control B/G certainly proves the feasibility of RC B/G flying. A number of readers have written recently for more information on this new area of model rocketry. Right now Bob Parks is working on a D-engine powered "Flop-Wing" which will be radio controlled. His glider uses the lightest readily available RC unit – the Commander set from Ace Radio Control. Their new "Micro Gem" receivers almost seem to have been designed with model rocket applications in mind. Measuring only 1-1/16" X 1-1/2" X 1/2",

WHAT'S YOUR FAVORITE ARTICLE THIS MONTH?

Vote here for your favorite articles. Let us know what type of material you want to read. List them in order – the most liked first, etc.

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Clip this section out or use a facsimilie. Paste it on a postcard or put in an envelope and mail to:

Reader Survey
Model Rocketry Magazine
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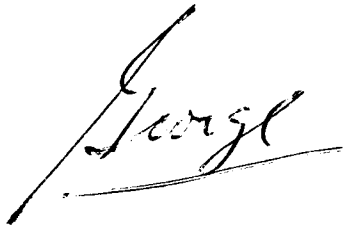
and weighing about 0.7 ounces, this unit will fit into a small nose pod. Use it with one of the Bentert actuators, of the type used by Doug Malewicki in his RC glider, and the while RC package including batteries will weigh just over an ounce! Give Bob Parks a couple of more months to work the bugs out of his RC glider design, and we'll have a complete set of plans in **Model Rocketry.** If you're interested in experimenting with an RC package on your own glider design, check with Ace Radio Control (Dept. MR, Higginsville, MO. 64037) for the lightest RC equipment being manufactured. (Their complete RC Handbook/Catalog is available for $1.00, refundable on your first order.) With that 9 second burning FSI F7 engine available, it shouldn't be too much longer before someone will succeed in RC'ing a rocket on the way up.

Model rocketry has spread to Italy. The August 1970 issue of **Modelli,** a monthly Italian hobby magazine, features two articles on model rocketry. The first, an explanation of model rocket stability, explains the CP-CG condition for static stability and indicates a method of calculating the CP and CG. This is followed by a set of plans for a tracking scope, and an explanation of the two scope triangulation method of altitude determination.

At last June's Wisconsin Model Rocket Meet a new event—*Eggloft Duration* - was flown for the first time. Their results were quite good with the best time, 129.5 seconds, turned in by Tom Roberts' F100 Bird. Two other entrants turned in durations of over one minute, and the sponsoring Mariner Rocket Society reports that it was "quite exciting." The NAR Contest Board is in the processes of rewriting the Sporting Code, so anyone who has a proposal for a new event or a gripe about an old one send a note to Richard Sipes, Contest Director, 5012 60th Ave., Hyattsville, MD. 20781.

Those rocketeers planning to compete in the new Rocket Glider event shouldn't overlook the fact that your R/G must be trimmed with a *spent* engine in place. In this new event, everything that leaves the pad must come down with the glider – no pop-pods, or ejected engines are permitted. But if you trim your R/G to glide with the *live* engine in place, it will stall across the sky after burnout. Good luck!



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ASTROBEE-D

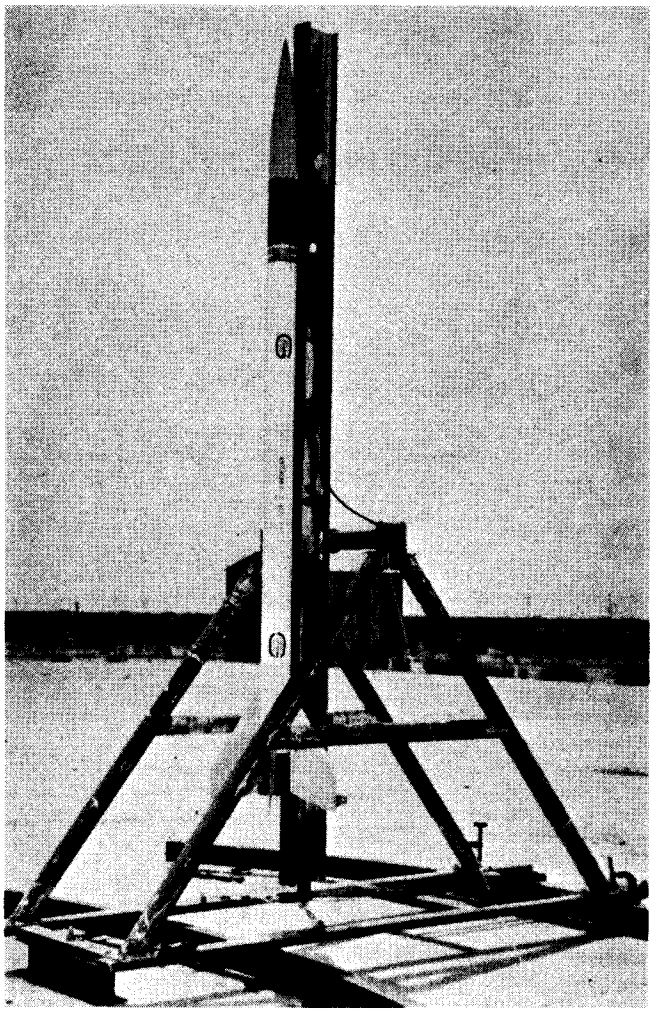
by G. Harry Stine

The Astrobee D is a small, single-staged, fin stabilized, free-ballistic rocketsonde propelled by a dual-thrust solid propellant rocket motor. It was designed and developed by Aerojet-General Corporation for use in synoptic meteorological soundings and for carrying scientific instruments into the D Region of the ionosphere.

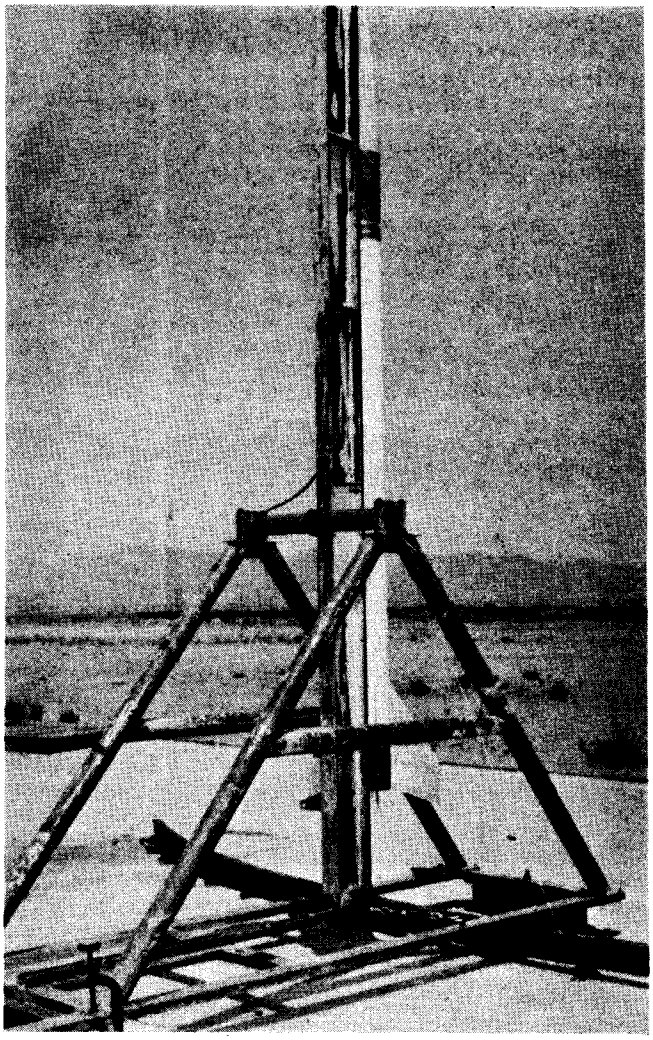
The propellant of the Astrobee D is a new type developed by Aerojet-General Corporation. Know as HTPB (Hydroxyl Terminated Polybutadiene), it has a high specific impulse at very low burning rates and uses low-cost raw materials. With HTPB propellant, Aerojet-General engineers were able to design dual-thrust characteristics into the Astrobee D rocket motor, permitting high liftoff accelerations without the necessity of adding auxiliary boost motors. The dual-thrust capability provides great flexibility in the choice of launchers and launch sites, and also greatly reduces the wind effect on impact dispersion.

The Astrobee D is capable of carrying payloads ranging in weight from 7.5 to 50 pounds to altitudes from 90 to 50 miles respectively.

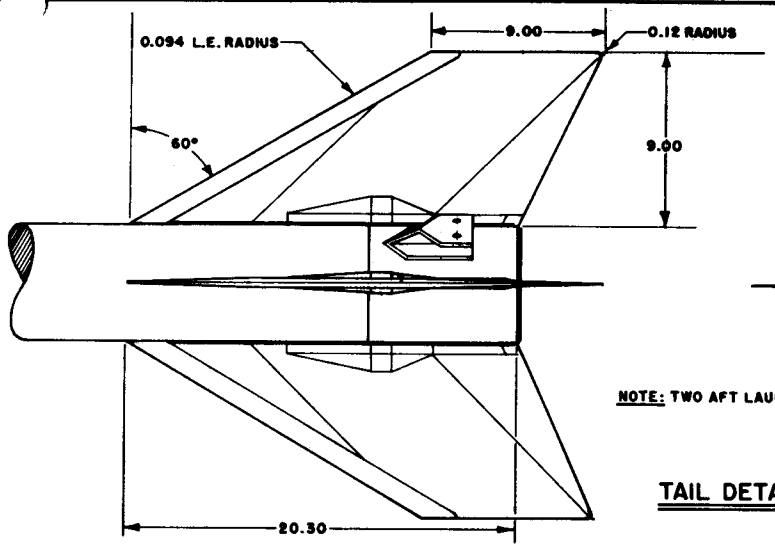
Because of the simplicity, small size, and low weight of the Astrobee D, it can be handled in the field by a crew of two or



Astrobee–D Flight S/N-002 on the launcher, Launch Complex 35, Navy Launch Area, White Sands Missile Range, New Mexico, 8 June 1970. View looking southeast. Note that two Aerojet-General insignia and the stenciled lettering "ASTROBEE D ADD 010" appears on this side of the missile.



View of the Astrobee-D Flight S/N-002 on the launch pad looking northwest. Note that there are no markings or insignia on this side of the 002 vehicle. The launcher color is yellow. The light spots on the launcher are silver where the yellow paint has worn off.



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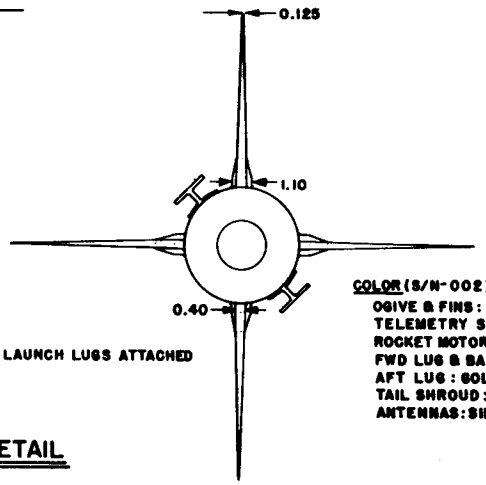


NOTE: TWO AFT LAUNCH LUGS ATTACHED

DATA SOURCES:

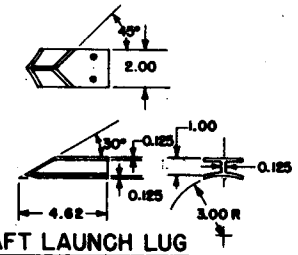
AEROJET-GENERAL CORPORATION DRAWINGS NO. 1370004, 1370011, 1371693, & 1372152.

WHITE SANDS MISSILE RANGE PHOTOGRAPHS, NO NEGATIVE NUMBERS GIVEN.

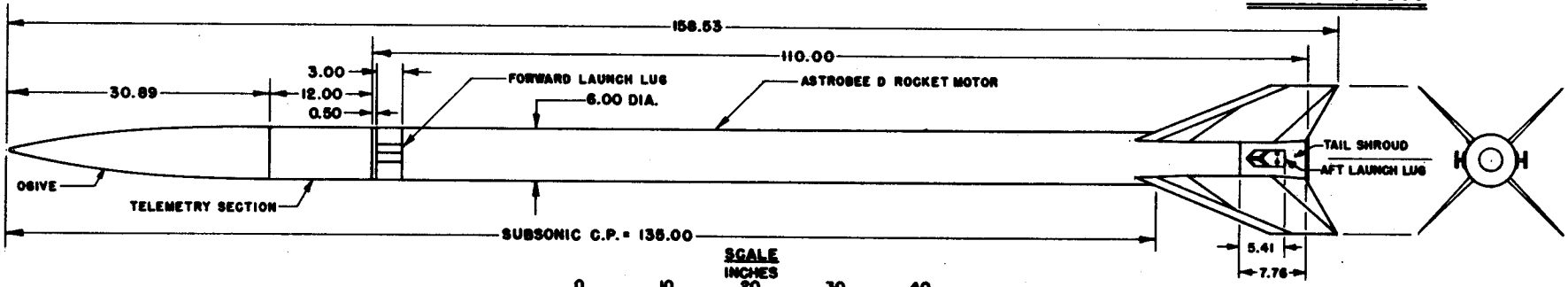
"ASTROBEE D FLIGHT TEST SYNOPSIS" SPACE GENERAL CORPORATION

COLOR (S/N-002):

OGIVE & FINS: LIGHT GRAY
TELEMETRY SECTION: DARK GRAY
ROCKET MOTOR: FLAT WHITE
FWD LUG & BAND: SILVER
AFT LUG: GOLD
TAIL SHROUD: BLACK
ANTENNAS: SILVER



AFT LAUNCH LUG



SCALE
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CENTIMETERS

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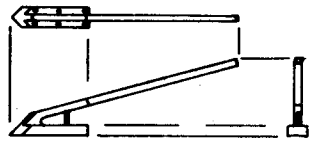
OVERALL EXTERNAL VIEWS



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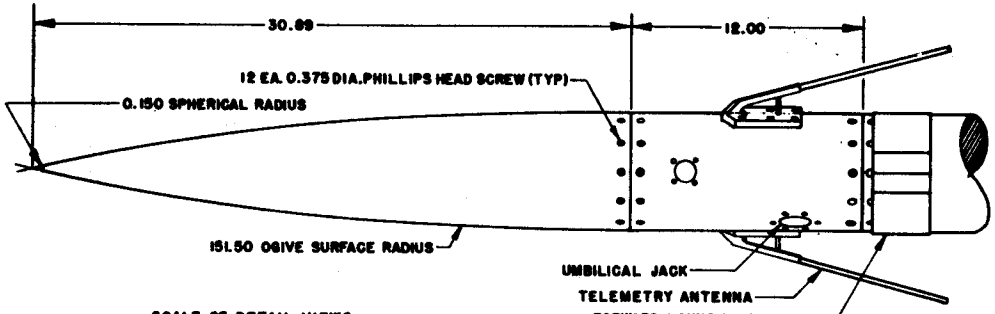

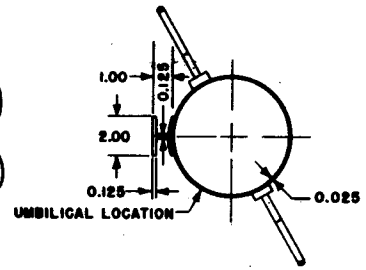

NOSE DETAIL

SCALE OF DETAIL VIEWS
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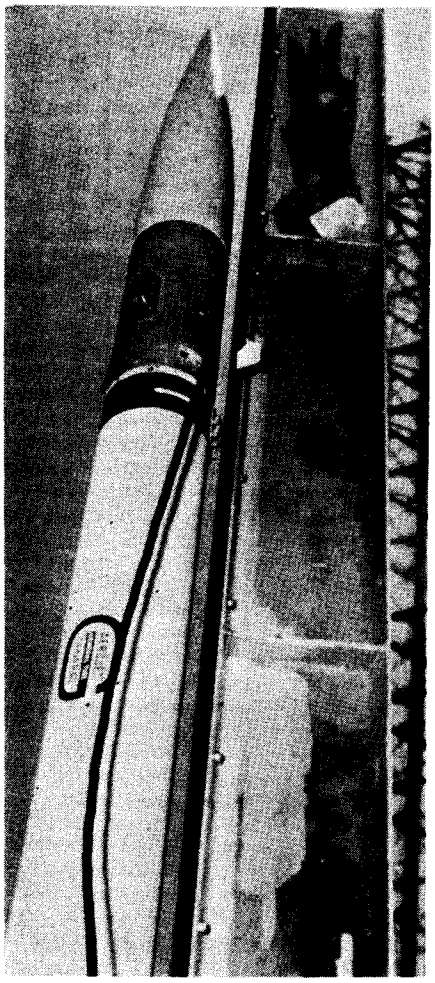
0 10 20 30 40 50
CENTIMETERS

AEROJET-GENERAL CORP.

ASTROBEE D

FLIGHT S/N-002

DRAWN BY G. HARRY STINE 11 SEPTEMBER 1970



West side of the Astrobee-D Flight S/N-002 nose section. Note that the antenna attachment plate is not flush with the rocket body. Also note the placement of the Aerojet-General insignia.

three people. It was engineered from its inception to facilitate low-cost production and ease of field handling.

History

The unique HTPB solid propellant was developed by the Aerojet Solid Propulsion Company for Aerojet's Space General Corporation who designed the vehicle. The Astrobee D rocket motor was successfully static tested in December 1969. A total of 5 static tests were made.

Two flight tests were made from the Navy Launch Area (Launch Complex 35) at White Sands Missile Range, New Mexico on June 8, 1970. NASA provided the instruments for the diagnostic payload while the USAF Cambridge Research Laboratory supplied the instrument components. Launch support was provided by the Naval Ordance Missile Test Facility at WSMR. The test conductor was Chief Warrant Officer Lloyd C. Briggs, USN, and R.B. Jenkins of Aerojet-General Corporation, manager for Astrobee vehicles, served as program manager. The two vehicles were launched from a simple rail originally used for the Spin-drift program at WSMR. Flight S/N-001 weighed 227.0 pounds at liftoff carrying 33.2 pounds of payload; burnout was at an altitude of 44,500 feet and a velocity of 4910 ft/sec.; apogee was 320,500 feet at 147.3 seconds; and the impact was at 298.0 seconds at a distance of 179,500 feet north. Flight S/N-002 was launched in the afternoon with 33.2 pounds of payload and a liftoff weight of 227.5 pounds; burnout was at 43,500 feet and 5050 ft/sec; apogee occurred at 320,00 feet at 147.1 seconds; impact was at 297 seconds at a range of 224,000 feet. Both flights were highly successful. Diagnostic flight measurements were telemetered to the ground to provide data on altitudes, accelerations, chamber pressure, vibration, and four temperature measurements on the surface of the nose ogive.

Description and Operation

The basic Astrobee D rocket motor consists of only four parts: forward closure, motor chamber, aft closure, and one-piece molded nozzle with integral fin attachments. The fin assembly and the forward payload housing were designed to be fabricated from glass phenolic materials which provide good insulation from the high temperatures of the flight environment while at the same time being inexpensive to fabricate. Because of difficulties in obtaining the proper material properties, the fins of Flights S/N-001 and S/N-002 were fabricated of magnesium with a thermal coating.

The payload housing consists of a 5-caliber tangent ogive 30 inches long having a useable volume of about 500 cubic inches. To provide additional payload volume, cylindrical payload extensions 6 inches long or 12 inches long may be added. Both Flight S/N-001 and S/N-002 used 12-inch payload extensions.

The Astrobee D may be used with a variety of launchers. The forward launch lug is split longitudinally with each half attached to a metal band which wraps around the forward end of the rocket motor. When the Astrobee D leaves the launch rail, the split lug is no longer restrained by the launch rail and flies apart; aerodynamic forces then separate the released metal band from the rocket. The aft launch lugs are securely fastened to the tail shroud and remain with the vehicle during flight.

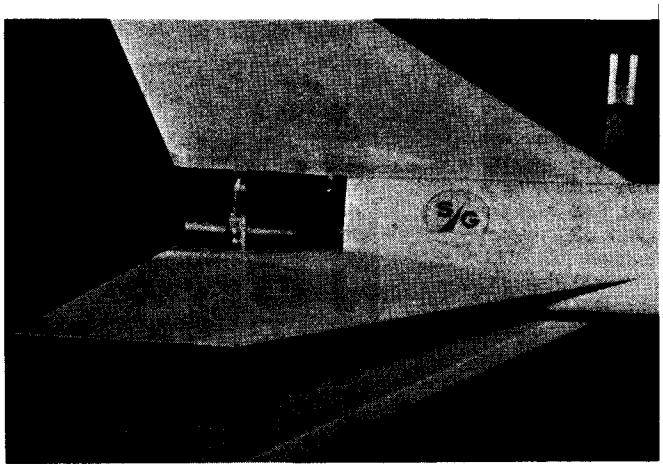
Field assembly of the Astrobee D is very simple, requiring only standard screwdrivers and Allen wrenches. Proper alignment of the fins to achieve a predetermined roll rate in flight is accomplished either with a special Aerojet-General fin alignment gauge or by means of standard leveling and survey procedures.

No special environmental conditions are required for the Astrobee D because of the

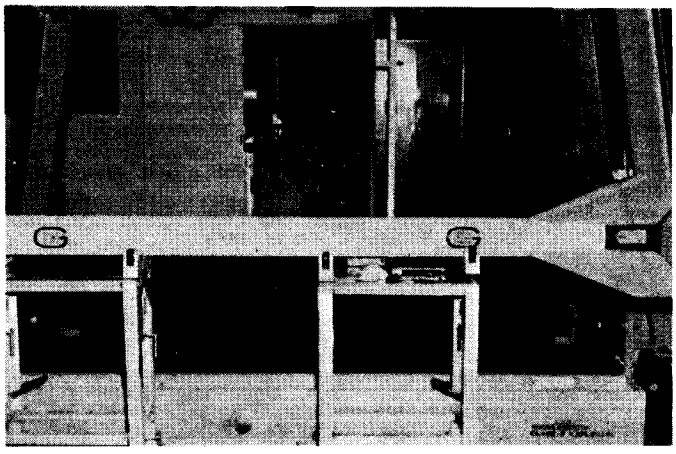
The Space-General insignia on the Astrobee-D tail section. The background is dull gray (about 25% gray) the circle white, "S/G", and symbol are dull dark blue.

The Aerojet-General insignia as it appears on the side of the Astrobee-D. The large letter "G" is red with black lettering "AEROJET GENERAL" on the white background of the rocket. The lettering "GENERAL TIRE" on the crossbar of the "G" is in white.

NOTE: Astroscale data is obtained from the most accurate and reliable sources available. It is checked for technical and historical accuracy. Every effort is made to reference all data sources for authenticity. Astroscale data is not official NAR Plans or information and it may be used as the total scale substantiation data in NAR and FAI competition. Please DO NOT attempt to obtain original copies of the photographs, drawings, and other data references herein because it has been supplied by the sources with the understanding that publication such as this will relieve them of the expense and effort of supplying additional copies of original data, much of which is of no use whatever to modelers. In addition, some Astroscale data has been extremely difficult to obtain or is not generally available to non-users of the vehicle.



A view of the Astrobee-D tail section and fins of the S/N-001 Flight. The tail shroud and aft launch lug have been removed so that the one-piece plastic nozzle and fin mount is visible. Note the root fairing shape of the fins. The "S/G" insignia appears just foward of the tail shroud.



Overall view of the Astrobee-D Flight S/N-001 motor section in the assembly shop prior to installation of the nose ogive, telemetry section, and forward launch lug. Lettering on the white body is one-inch black stencil letters reading "ASTROBEE D ADD 009." Note the rear launch lug and Aerojet-General insignia.

extended operational range of the HTPB propellant.

Ignition is by means of electrical igniter and squibb placed at the forward end of the grain core. Boost acceleration is about 25 g with a 10-pound payload and a maximum of 18 g during sustainer thrusting.

No recovery was attempted in Flights S/N-001 and S/N-002. However, self-contained timers and ejection systems are available for deploying payloads at altitude and for complete recovery of special payload.

WEIGHTS: (Flight S/N-002)
- Gross weight = 227.5 pounds
- Motor weight = 181.0 pounds
- Propellant weight = 135 pounds
- Payload weight = 33.2 pounds
- Burnout weight = 92.5 pounds

PERFORMANCE: (Flight S/N-002)
- Burnout velocity = 5050 ft/sec
- Burnout altitude = 43,500 ft
- Launcher elevation = 81.6° from horizontal
- Apogee altitude = 320,000 feet
- Apogee time = 147.1 sec
- Impact time = 297.0 sec
- Impact range = 224,000 ft
- Maximum roll rate = 12.2 cps
- Maximum acceleration, boost = 21.8 g
- Maximum acceleration, sustain = 19.0 g

PROPULSION:
- Type: Aerojet-General HTPB Astrobee D
- Total impulse: 35,000 lb-sec
- Action time, boost: 2.0 sec
- Max. boost thrust: 5200 lb
- Action time, sustain: 15.5 sec
- Average thrust, sustain: 2000 lb
- Specific impulse: 259 lb-sec/lb
- Propellant: HTPB (Hydroxyl Terminated Polybutadiene) solid propellant.
- Burn rate: 0.125 in/sec at 1000 psi

COLOR DATA: (Flight S/N-002)
- Nose ogive and fins: Flat light gray
- Rocket motor: Flat white
- Telemetry section: Flat dark gray
- Tail Shroud: Flat black
- Forward launch lug and band: silver
- Aft launch lugs: gold
- Antennas: silver

Markings: "Astrobee D ADD 010" in black stenciled letters 1" high on one side of rocket motor halfway back. Red and black Aerojet-General logo in two places on one side of rocket motor, same side as stenciled lettering. No markings on other side of rocket motor. Small black-and-silver identification plate on telemetry section between unbilical connection and base.

Data Sources

Aerojet-General Corporation drawings No. 1370004, 1370011, 1371693, and 1372152.

Aerojet-General "Booster," Vol. XV, No. 1, July 1970, page 4.

News release No. 253, dated June 9, 1970, by C.R. Poisall, Information Office, White Sands Missile Range, New Mexico.

"Aviation Week & Space Technology," Volume 93, Number 3, July 20, 1970, page 55.

"Astrobee D" brochure, Space Division, Aerojet-General Corporation.

"Astrobee D Flight Test Synopsis," Space General, a Division of Aerojet-General Corporation.

3 color photos and 8 black-and-white photos, White Sands Missile Range and Aerojet-General Corporation, no negative numbers given.

The Experimenter's Notebook:

CAPACITOR DISCHARGE

by Forrest Mims

(Editor's Note: In most areas of research no experiment is a total failure. From even what may appear to be a totally unsuccessful experiment much knowledge may be gained. This month's edition of The Experimenter's Notebook reviews an interesting case of the unsuccessful success.)

There are literally dozens of ways to apply course corrections to a rocket in flight. I have spent several years studying a new technique of rocket control, lateral ejection of ram air (see **Model Rocketry**, February and March, 1970). However, as I occasionally interrupt my projects with a miniature crash program on a topic of a non-related nature, in July of 1969 the Capacitor Discharge Rocket Control project was initiated. The concept behind the project was to cause a model rocket to acquire course changes following the ejection of an acoustical shock wave from one side of the rocket forward of the center of gravity.

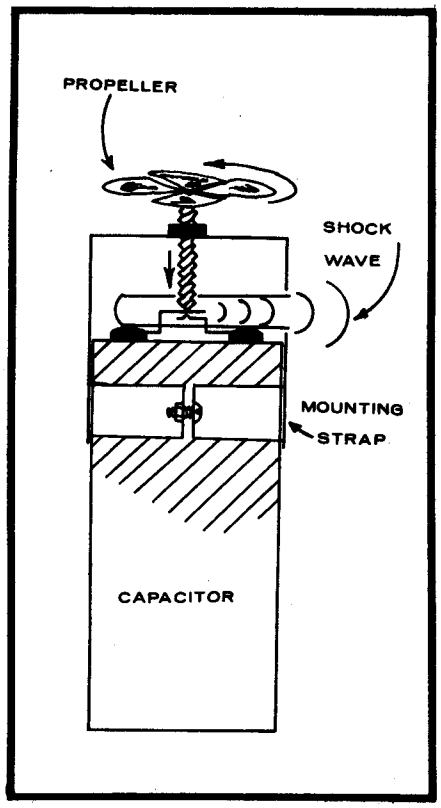


Figure 1

Those readers who are familiar with elementary electronics are probably aware of the sharp, loud report caused by the rapid discharge of a capacitor which has been charged to a high voltage. A very large capacitor will produce a sound not unlike that produced by a fire cracker when rapidly discharged. It was theorized that the acoustical shock wave of such a discharge would be capable of performing work. Following some rough calculations to support this premise, Capacitor Discharge Control Rocket No. 1 was designed and constructed.

The project's major engineering problem was applying the acoustical shock wave at a given point in the flight of the rocket. As the objective of the experiment was to determine the feasibility of capacitor discharge control, the exact time of discharge must be known. As originally conceived, the rocket would be capable of producing several acoustic discharges. Unfortunately, it is not possible to lift in a model rocket the necessary high voltage, fast recycle charging apparatus for such an endeavor. Therefore, a one-shot acoustic pulse from a capacitor charged to a high voltage before rocket liftoff was decided upon. The problem of applying the acoustic shocks at a given moment was somewhat alleviated, as only a single shock would be available.

Several approaches for discharging the capacitor were considered, and experimentation showed mechanical discharge to be the most reliable. But placing the necessary apparatus with which to discharge a large capacitor in a model rocket is not a trivial problem. The main limitation was weight, as the capacitor alone weighed 110 grams. A radio control receiver and actuator used in another model rocketry project were modified to permit mechanical discharge of the capacitor on command from the ground. But as the radio control apparatus exceeded the available weight limit, the approach was abandoned. After considering and rejecting a miniature spring-driven timer, a solution to the problem was found. The principle is similar to that used in a simple type of bomb arming mechanism: an air driven propeller mounted on a threaded shaft. In the case of the bomb arming mechanism, a preset number of turns of the shaft engages and arms the impact or proximity fusing device. In the case of the capacitor discharge rocket, rotation of the propeller causes a vertical displacement of the threaded shaft and mechanical contact across the capacitor terminals. In both cases, the impetus for propeller rotation is provided by air rushing past the projectile. As in the bomb arming mechanism, the discharge device was capable of being preset by merely rotating the propeller in one direction or the other as desired. The farther out the shaft, the longer the delay before capacitor discharge.

The air driven capacitor discharge device was constructed and mounted firmly to the

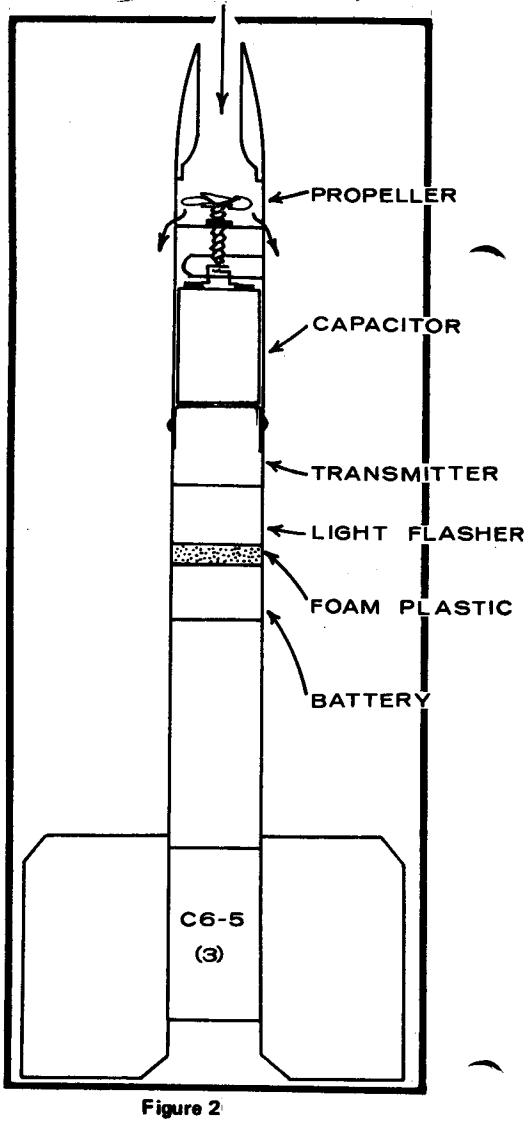


Figure 2

business end of the capacitor as shown in Figure 1. The assembled unit was tested by mounting it from the side of a moving automobile. The propeller blade rotated properly and engaged the discharge terminals of the capacitor as planned. The entire assembly was then mounted in the nose section of the model rocket as shown in Figure 2. Air was permitted to enter a forward facing port in the nose cone and exit from flits just aft of the propeller. The capacitor generated acoustical shock wave was directed through a short plastic tube to the outside of the rocket.

In order to determine time of capacitor discharge, a small radio transmitter was designed and constructed. The transmitter was mounted just aft of the capacitor. The resultant proximity caused the transmitter to interrupt its transmitted tone with a sharp crack or pop when the capacitor was discharged. A ground system consisting of a radio receiver and tape recorder detected and stored the transmitted signals for later interpretation.

In order to very accurately determine any course changes in the flight of the model rocket, I decided to use a favorite technique and launch the rocket at night. Time exposure photography would record the complete flight path of the rocket and would permit accurate determination of course changes. In order to provide a light source for recording on the photographic film after engine burnout (the engine exhaust provides a brilliant light source), I installed a miniature transistorized light flasher. (For more details on night launched model rockets, see Wysgalla, Peter, "Staged vs Cluster Model Rocket Performance," **Model Rocketry**, May 1969, p. 27 and Mims, Forrest, "Transistorized Tracking Light for Night Launched Model Rockets," **Model Rocketry**, September 1969, p. 9. You may order back issues of these magazines from **Model Rocketry**, Box 214, Boston, Massachusetts 02123. Enclose 75¢ for each magazine ordered.)

The completed rocket, specifications of which are shown in Figure 2 contained a control experiment, an air driven timer, a radio transmitter, and a light flasher. Assisted by Ford David, then president of the Albuquerque, New Mexico Model Rocketry Club, I set up launcher, camera, radio receiver, tape recorder, and rocket on top of a large earthern dam on the vast expanse of treeless land just north of Albuquerque. Before launch, the rocket's capacitor was carefully charged to 600 volts by a pair of 300 volt dry batteries. Two sturdy leads mounted on the side of the payload section permitted easy charging.

The rocket was launched just before midnight on August 8, 1969. All three C6-5 engines successfully ignited and the rocket rode a spectacular fiery tail to an altitude of about 100 meters. Since the earthern dam launch site is about 10 meters higher than the surrounding terrain, Ford and I had no trouble tracking the rocket visibly until the tracking light disappeared about 300 meters away. We at first through that the flasher had ceased flashing at impact. But a radio track on the still operating transmitter led us to the top of a nearby hill from which we could see the light flasher blinking away about 30 meters distant. Both 30 centimeter parachutes had properly deployed, the 2 meter antenna was intact, and the rocket itself was undamaged. In order to determine whether or not the capacitor had discharged, I carefully touched an insulated jumper wire to the exposed charging terminals. A loud crack indicated that for some reason the capacitor had failed to be discharged. A playback of the tape recording revealed no changes in the transmitted signal and confirmed no discharge had occurred.

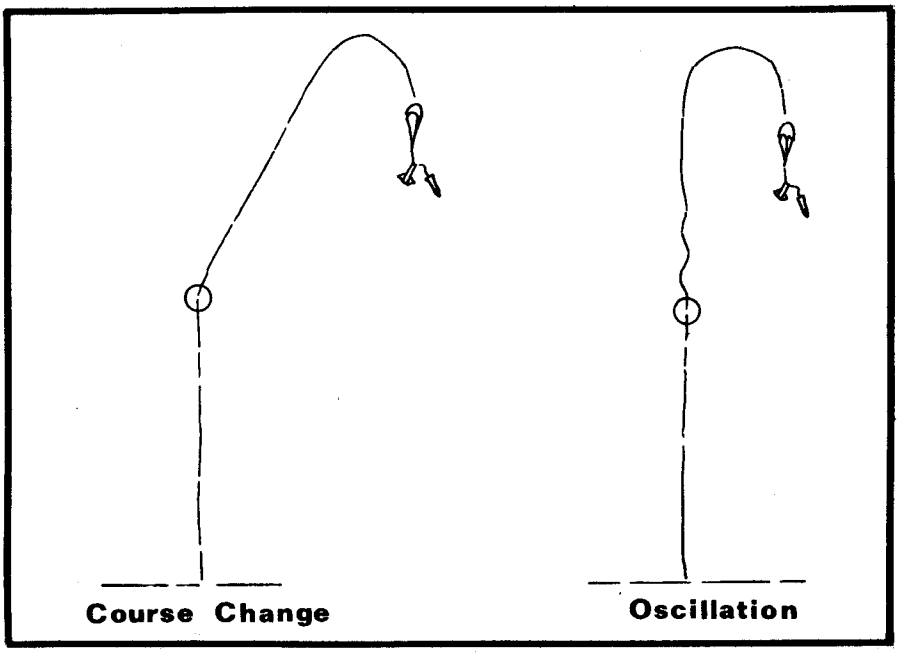


Figure 3

Back at my home office recording the launch details into my notebook, it occurred that a single acoustical pulse would probably not even cause a discernible course change in the flight of the rocket. More probably, the pulse would initiate oscillations, which, assuming a fairly stable rocket, would be quickly damped out. The oscillations might even be so small so as not to be noticeable on a photograph of the flight. A series of pulses might indeed provide a course change, but only if so rapidly sequenced so as to provide positive rather than negative reinforcement. That is, acoustic shock waves spaced too far apart might tend to cancel or reduce any resultant moment about the center of gravity by occurring during an oscillatory back swing of the rocket.

For these reasons, I decided to forego further experimentation with capacitor discharge control. Development of a fast recycle charging circuit was not possible as the required weight could not even be lifted in a model rocket. And as explained above, a single acoustic pulse would do little more than cause minor oscillations in the rocket flight path.

But though the experiment was unsuccessful, there were several interesting spinoffs I had perfected and flight tested a miniature radio transmitter weighing under 9 grams, flight tested an air driven timer (which has now been perfected), and radio tracked a lost rocket at night.

More on Infrared Tracking

In the February 1970 edition of **Model Rocketry**, a letter from Mark A. Lytle suggested that it may be possible to track model rockets by using an infrared sniperscope.

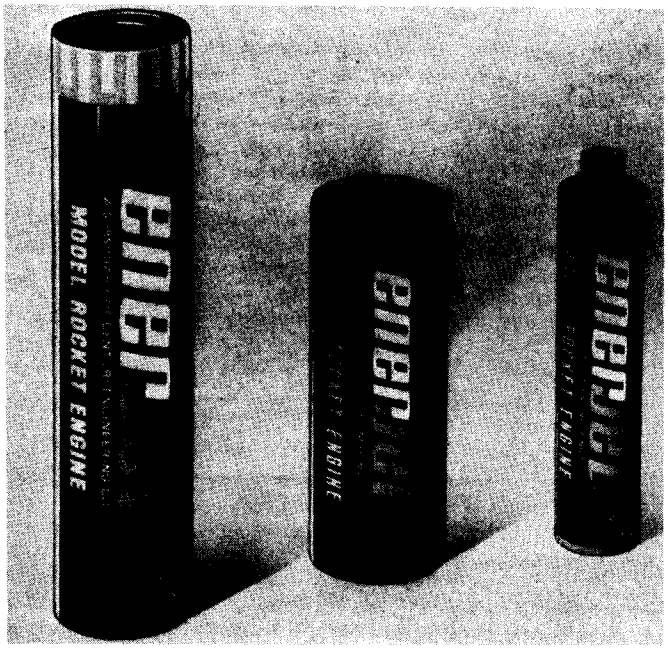
The sniperscope makes use of an image conversion tube which converts invisible near infrared to a visible green image. Recent developments in multi-section image converters provide the heart of the well known starlight scope, a device which makes possible vision at night with nothing more than starlight.

Thanks to a manufacturer of image converter tubes, I have had use of a "sniperscope" for about four years. The unit is worth over $500 so it would be out of financial range for most model rocketeers. I use the unit for many experiments with infrared. At a recent launch conducted by the Alburquerque, New Mexico Model Rocketry Club, I tracked a dozen or so rockets using the "sniperscope." The scope did make more visible the rocket flame trails but only for several meters after launch. The flight of each rocket was quickly lost as the bright skylight oblitereated the faint rocket shape. The scope has much poorer resolution than the human eye and is rapidly saturated by bright skylight. Also, while a rocket flame trail does emit large quantities of infrared, the rocket body itself emits infrared at wavelengths far beyond the sensitivity region of all but very specialized image conversion devices.

The conclusion to all this is that an effective model rocket tracking technique is still in need of development.

That concludes this edition of The Experimenter's Notebook. Future editions will describe construction and use of a simple water table, the first laser launched in a model rocket, and simple construction of low cost strain gauges for use in car mounted and other wind tunnels.

Centuri 'ENERJETS'



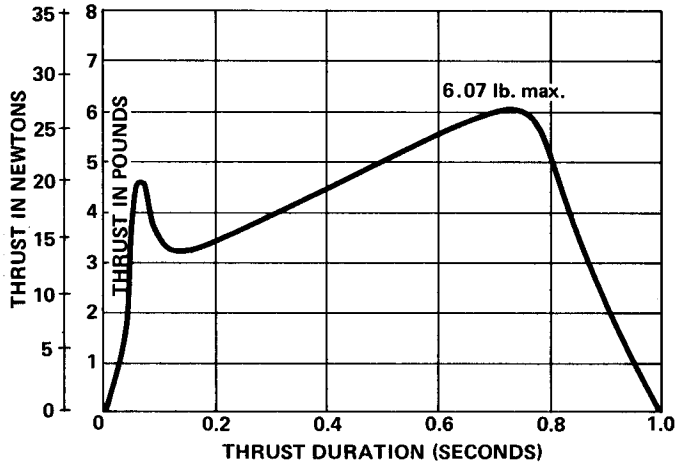
High-Impulse D, E, F Engines

A new series of model rocket engines, employing a high specific impulse propellant, are now available. The Centuri Enerjet D, E, and F, engines, especially designed for competition and payload lofting use, employ a composite propellant similar to the type used in professional sounding rockets.

In the E and F engines the propellant is case bonded to a glass filament wound, epoxy impregnated casing. The machined graphite expansion nozzle and delay charge housing are epoxy bonded to the engine casing. Available in E24, F52, and F67, types the Enerjets are the same diameter as the Centuri Mini-Max engines, allowing their use in all rockets designed for Mini-Max power.

The D-engine, a 20 nt-sec total impulse engine weighing only 1.12 ounces (only 20% more than a standard C engine), is in a 18 mm OD casing allowing use in standard model rockets. Delivering a specific impulse of 187, the D also uses a composite propellant. The engine casing is formed of a newly developed, temperature resistant, plastic compound.

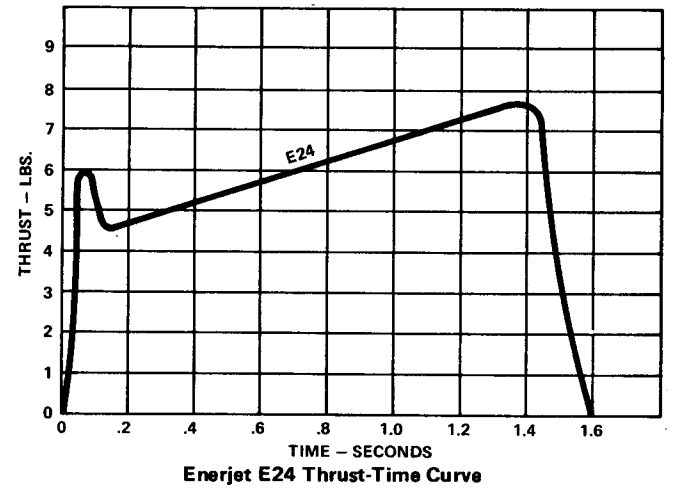
Complete details on the new Centuri Enerjets are available in the new 1971 catalog from Centuri Engineering, Box 1988R, Phoenix, Arizona 85001.



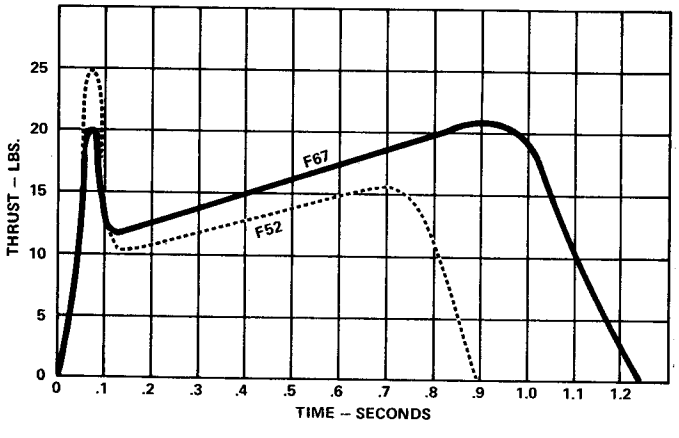
Enerjet D21 Thrust-Time Curve

CENTURI ENERJET SPECIFICATIONS

	D 21	E 24	F 52	F 67
Total Impulse	20 nt-sec	40 nt-sec	46 nt-sec	80 nt-sec
Thrust Duration	0.95 sec	1.60 sec	0.90 sec	1.20 sec
Initial Weigth	1.12 oz	2.5 oz	3.4 oz	4.0 oz
Propellant Weight	10.9 gram	21.8 grams	24.9 gram	43.0 grams
Size: Diameter	0.695"	1.125"	1.125"	1.125"
Length	3.36"	3.0"	5.0"	5.0
Time Delays	4, 7, 10 sec	4, 7, 10 sec	5, 8, 12 sec	6, 9, 14 sec



Enerjet E24 Thrust-Time Curve



Enerjet F52 and F67 Thrust-Time Curves

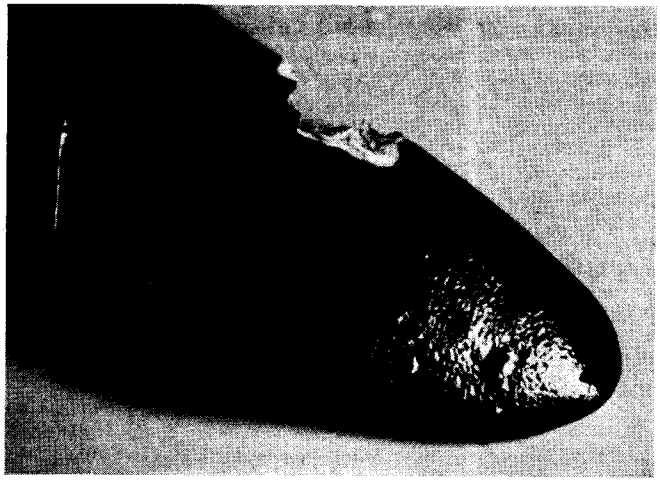
Fix on-the-Field Damage

'INSTANT' FIN REPAIR

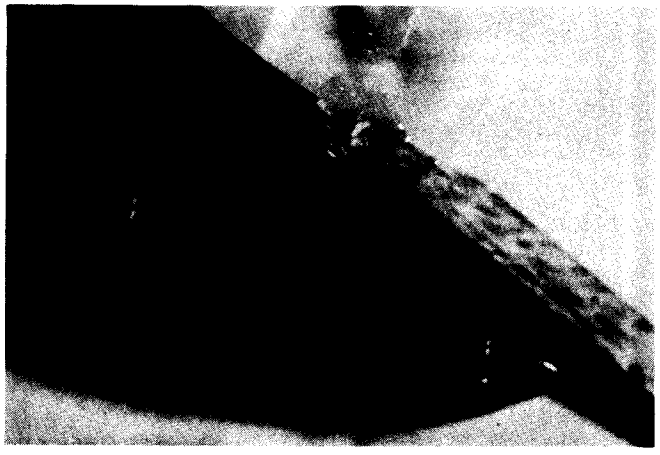
by BOB PARKS

In the last few years more emphasis has been placed on low drag design than ever before. Consequently, many rocketeers have been trying to obtain the "perfect" finish. However, what leaves the workbench dosen't necessarily get into the air, at least not in the same condition. I was lucky (?) enough to find this out after traveling 1800 miles to NARAM 12. Shipping had caused a dent about 3/16" deep in the leading edge of one of the fins on my Design Efficiency rocket. The method shown here was used to repair the fin. Only a few minutes of work were involved. The fin was in perfect condition after only a light sanding. After a coat of paint was applied, it was impossible to locate the original dent.

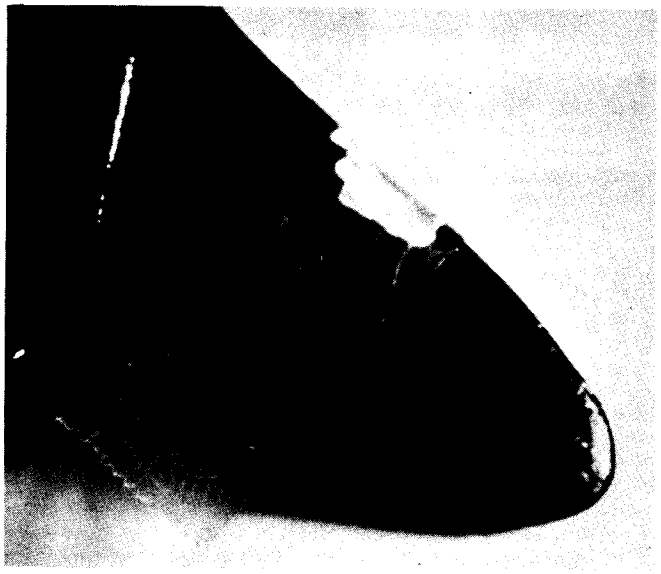
Epoxy must be used in this type of repair method. This is because it can harden quickly in thick layers and it does not shrink as it hardens. Any quick curing epoxy will work.



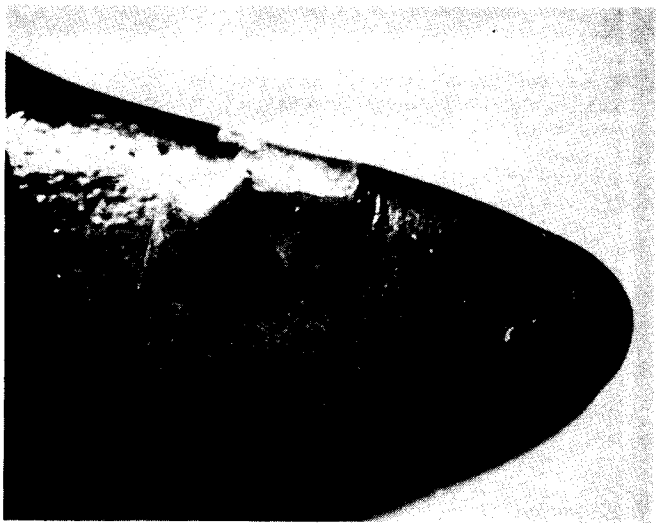
1. Since balsa is lighter than epoxy, try to reposition any small fragments of the fin and reshape it as much as possible.



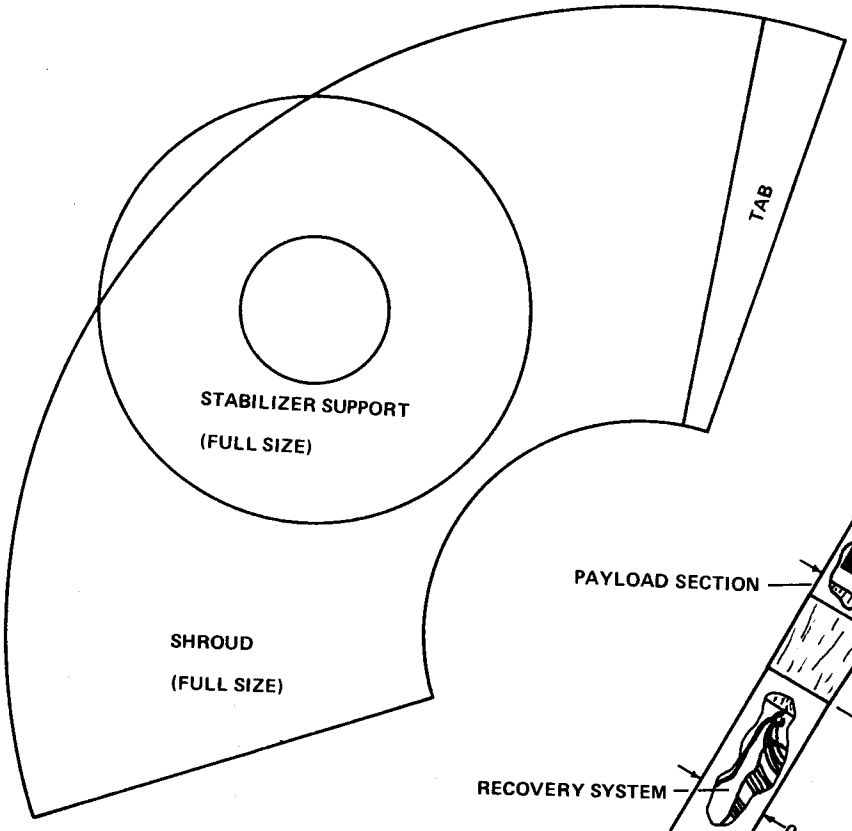
2. Apply a piece of cellophane tape to one side of the fin. Mix the epoxy, and apply enough to fill the damaged area. It is better to have a little too much epoxy than not enough.



3. Now wrap the tape around the leading edge of the fin. This serves as a mold to form the epoxy to the fin airfoil. Try to avoid wrinkling the tape.



4. After the epoxy cures, remove the tape. A small amount of sanding with medium-fine and then fine sandpaper will finish the job. This method can also be used on nose cones and adapters. A coat of paint over the repaired area will completely hide the damage.



Parts List

Body Tube	**ST-712 (cut to 9.5")**
Body Tube	**ST-83 (cut to 1.5")**
Nose Cone	**BC-83**
Balsa Reducer	**BR-7-8**
Launch Lug	**LL-2**
Thrust Ring	**TR-7**

12" Chute, Shock Cord, Screw Eye, Balsa, etc.

(All parts available from Centuri)

LAUNCH LUG STANDOFF

(FULL SIZE)

1/8" THICK BALSA

SAND TO AIRFOIL

For Sport Flying

Build the CANDLESTICK

by Jeff Chandler

For quite some time now, in fact, since the invention of the model rocket, designers have been working with basically one type of rocket – the finned rocket. Although there has been some experimentation with models without fins, most of these have resulted in failures.

In order for a rocket to produce a stable flight, the center of gravity must be located in front of the center of pressure. To locate the center of gravity (CG) in front of the center of pressure (CP), one of two things can be done to the rocket before flight. Either fin area can be added at the rear or a weight can be added to the nose end.

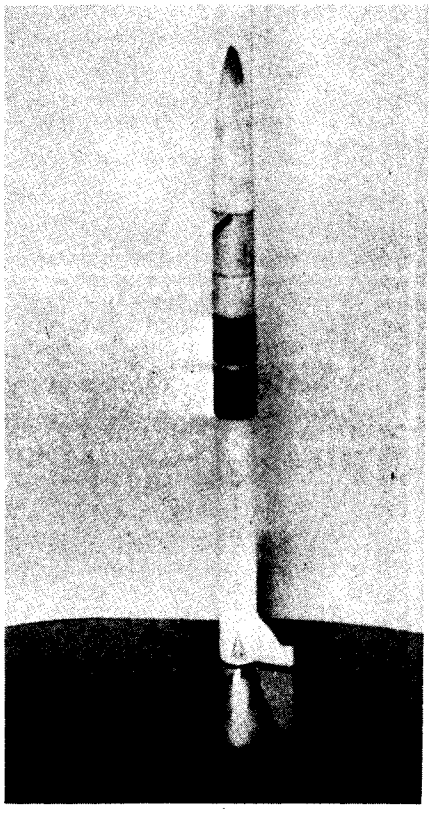
The first finless model which I constructed was actually just a body tube with a payload section in which I placed a FAI-NAR standard lead payload weight. Like most finless rockets, though it was statically stable (GC forward of CP), it lacked dynamic stability. Thus it "coned" on the way up. Although this was an oversimplified finless model, it lead to the present design of the CANDLESTICK – a finless rocket with good dynamic as well as static stability.

To begin construction of the CANDLESTICK, cut the shroud from light cardboard. A large index card, available in any stationary store, will work fine. Glue the tab underneath the opposite end and clamp with hair clips, then set aside to dry. In the meantime cut the shroud, support from heavy cardboard, such as shirt cardboard, and glue it to the aft end of your (9.5) inch body tube. Be careful to brace it so that when dry it will be perpendicular to the tube. At this point you can assemble the parachute, and glue the screw eye in the nose cone. Now cut out a shock cord holder and fold over with the cord inside, gluing as you fold. When dry, glue the shock cord holder one inch from the forward end of the body tube. After this has dried, slide the shroud over the front end of the body tube wide end first. Slip it towards the rear of the rocket until it fits snugly against the shroud support. Glue the two parts together and fillet the shroud and body tube. Now you can insert the engine block in the body tube. It should be placed 2.50 inches from the rear end so that when dry an engine can be inserted and held in place with enough of the nozzle showing for you to be able to remove it after flight. Now cement the launch lug to the lug support stand-off and then cement that assemblage to the shroud as shown in the drawing. Connect the loose end of the shock cord to the screw eye in the reduction fitting and anchor with a dab of glue and a tape strip. Cut the payload section body to the desired length and assemble the payload section. The CANDLESTICK is now ready for finishing.

First apply a base coat of sanding sealer to all balsa parts. Then sand it smooth with #400 sandpaper. Two or three light coats of white should give a smooth background for the final color. This should be a high visibilitiy color such as floruescent red-orange, red, cerise, or yellow. Now add the lead weight, engine, igniter, and launch. Don't fly the CANDLESTICK without the one ounce payload weight or other similar payload.

The CANDLESTICK makes an excellent payload model for competition in Pee-Wee Payload. It can also be used for Spot Landing. It can be instrumented just as long as the telemetry weights around one ounce to insure stability of the rocket. (It may be necessary to lengthen the payload section to do this)

If you plan to experiment with rockets of this type, remember to have at least one ounce up front to insure stability. It also helps to have at least ten inches between the payload section and stabilizer. Of course as the diameter of the body is increased, both factors probably change. But with the numberous possibilities, there is no telling what you will come up with!



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August 17-21 Houston NARAM-12

A large field at NASA's Manned Spacecraft Center in Houston, Texas, served as the site for the 12th National Model Rocket Championships during the third week of August. The contest, attracting 188 rocketeers from 30 states, saw, according to one count, 1,919 launchings in the competition. The firing range, selected by the host Apollo-NASA Section, was an open field extending almost a mile on each of two sides, bounded by a road and another field on a third side, and by MSC on the fourth side. Anything lost on this large range was to be the fault of the modeler for giving up the chase or loosing sight of the rocket, rather than his running into a forest, swamp, or other natural hazard which has characterized other NARAM fields.

By Saturday morning, two days before the opening ceremonies, much of the range had been set up. The NARAM-11 "Misfire Alley" launch system, including the ESCARLS panel supplied by Estes Industries, was in use again. Saturday's weather, only a slight wind and temperatures in the mid-90's, was better than expected, and the early arriving competitors hoped it would stay that way for the week. The five day forecast indicated only a 20% chance of rain each day of the week.

Vern Estes ran a final check of the launch system on Sunday morning and found it working better than at NARAM-11. With the 15 pad areas located in a "C" rather than the straight line at NARAM-11, more pads were located close enough to the range battery to allow reliable cluster ignition – and clusters there would be with Eggloft on the schedule as the first event on Monday morning.

Towards the afternoon, however, the temperature went up past 100 degrees. That's the temperature in the *shade,* but there's very little shade on a NARAM field. It soon became evident that special modeling techniques were necessary in building for this environment when one contestant complained that the clay trim weight on his B/G had melted!

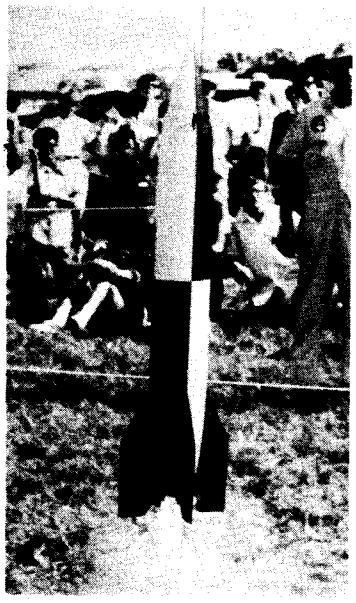
The contestants briefing was held at 8PM on Sunday next to the swimming pool at the Sheraton Kings Inn just across from MSC. Contest Coordinator Forrest McDowell and National Contest Director Richard Sipes had a few announcements to make the meet run more smoothly. Both events would be flown simultaneously each day, to allow the contestants more time to prepare for each event. The range would be closed from noon till 3 PM each day, to allow contestants to return to the motel air-conditioning for a few hours. It would remain open each evening at least until 6PM to take care of second flights.

The briefing was followed by a partial eclipse of the moon. "It's a good sign," one of the rocketeers observed, "this means its going to be a good NARAM." But from the smell of paint, glue, and balsa dust, around the motel, whether or not it was going to be a good NARAM for some contestants would depend on if they could complete their egglofters in the 12 hours remaining before the event began.

The opening ceremonies got started just a little before 9AM with the traditional raising of the flags of all the NAR Sections participating in the Championships. This was followed by a series of demonstration launches. The first rocket off the pad was an FSI Mach 2, a two-stage F100 powered vehicle. Centuri followed with a Little Joe II powered by their new Enerjet E24 engine. The Enerjet performed superbly, as the Little Joe disappeared into the sky. Estes Industries flew their new Cineroc model rocket movie camera on the specially designed Omega carrier vehicle. Forrest McDowell, NARAM Contest Coordinator, closed out the demonstration flights with the launching of a Little Joe II carrying a

There is quite a bit of work in getting a NARAM field ready for the competition. But under the direction of the host Apollo-NASA Section and with the help of those rocketeers who arrived early and a group from Estes Industries, everything was set to go on time for the opening ceremonies.

Scott Layne hooks up his 1/30th scale Little Joe II. The model, in 1/30 scale, was completely hand made with a balsa body tube and tower section fabricated from hardwood dowels. A perfect flight powered by an FSI F100 gave the model first in Junior Scale.

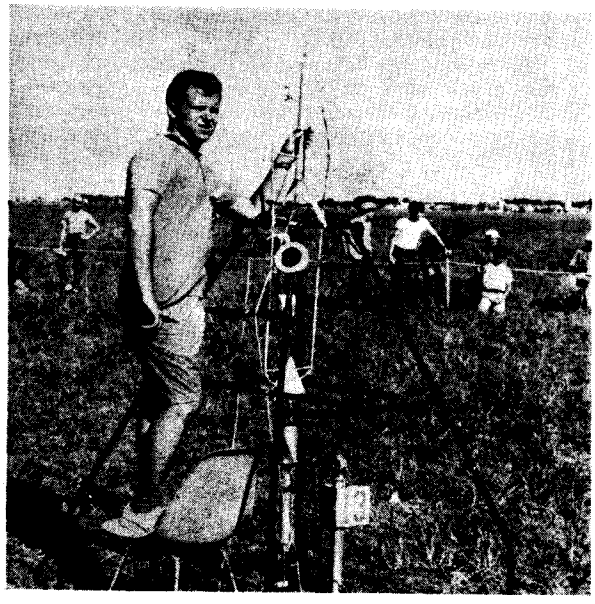


Powered by two Estes D-engines, Gary Lindren's three foot tall V-2 lifts off. The flight was perfect until ejection when the chute ripped from the shroud lines. The balsa body tube was almost undamaged.

Doug Malewicki prepares his RC B/G for launch. Using the RC glider he succeeded in taking second place in the Spot Landing event with a distance of only 13 feet. Powered by a B4-2 engine the liftoff weight was 2.8 ounces including Bentert receiver and actuator.

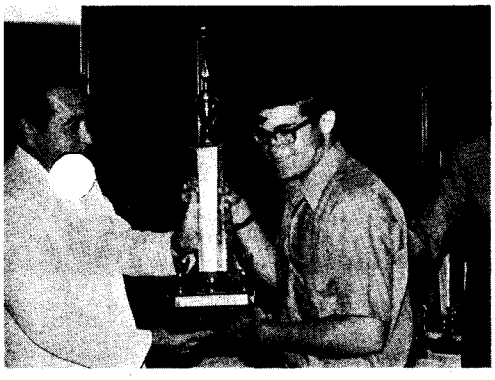
NARAM·12

Alan Stolzenberg tries to stabilize his 5.54:1 WAC-Corporal. The three foot launch rod just wasn't long enough for his four foot tall model. Powered by an FSI F 100, the model weighed in at one pound. After an hour of work on the pad the WAC took off on a beautiful straight flight.



Phil Gust prepares his 3/4 size scale model of the original Goddard liquid fuel rocket. Launched from a Goddard type pipe frame launcher, the model was entered in the Space Systems contest. Construction was from balsa wood dowels and cardboard tubes to conform to the safety code. Unfortunately high winds caused the Range Safety Officer to cancel the firing of this impressive scale model.

Jon Randolph displays his beautiful scale Asp rocketsonde. The model received so many static judging points that Jon took first in Space Systems though he flew without tracking and missed the target area. He took first in Scale with the same Estes D[illegible]ered model.



Junior National Champion Gary Lindgren of Pascack Valley receives his trophy.

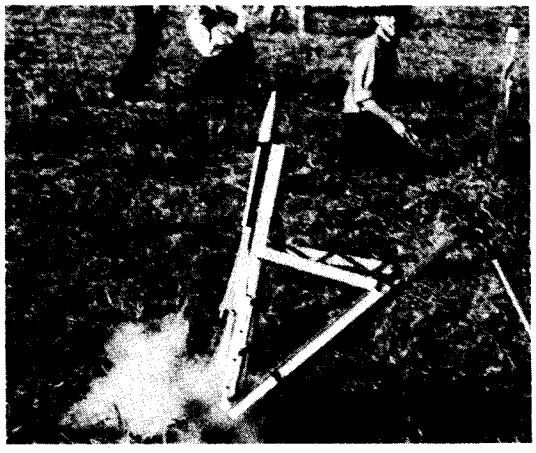
Leader National Champion Charles Russell of CSAR receives his trophy.

Senior National Champion Shirley Lindgren of Pascack Valley receives her trophy.

Pam Smith preps the Blackistone-Smith canard-wing Swift B/G. This "Valkyrie" B/G is the same one Bruce Blackistone flew to a forth place in Swift at NARAM-11. This year however, with Bruce absent from NARAM because of a "prior committment" to Marine Corps ROTC, the Valkyrie didn't do as well.

Lee Streett preps his Mini-Bat B/G for Swift. Recently Lee has been placing in almost all the Ohio area contests with two minute plus Mini-Bat flights. Unfortunately, his NARAM B/G broke apart under the B's thrust, depriving the NARAM contestants of the opportunity of seeing a well trimmed Mini-Bat fly.

Last year's National Champion Howard Kuhn inspects his Egglofter. He had not had an Egglofter tracked successfully in the 1969-70 Contest Year so, in desperation, he underpowered his NARAM Egglofter. Powered by only a D18 booster and B3-6 upper stage he had a beautiful tracked flight for first in Senior Egglofting.



Jon Randolph's Space Systems Asp lifts off. The m was launched from a metal scale pad propped to the 85° launch angle using a rod.

Chas Russell's IQSY Tomahawk leaves the pad to take first place in Leader Space Systems – the only Leader model to land in the target area.

Gary Lindgren prepares a scale Nike-Hercules for a demonstration flight. Gary flew the model two-staged, with a ducting system to carry the booster engine ejection charge to the upper stage nozzle. His experiments have indicated that the system can be used over distances to 10 inches.

baseball in the nose – the same rocket he had flown in the Astrodome to open the Houston Astros baseball season.

The first competition flight left the pad shortly after 9AM, with the Design Efficiency and Eggloft events, the only two tracking events at the meet, being flown simultaneously. With many of the contestants wanting to get their birds into the air before it got too hot, the processing lines were long and slow. At times, as many as fifty contestants were standing in line and one hour waits were not uncommon. Many good flights were turned in, but late in the afternoon came the disappointing news that the baseline had been incorrectly measured and all the reported altitudes were about 30% too high. Since the baseline was not accurately determined before the scopes were taken down, all altitudes were reduced using the standard 300 meter baseline. Thus the actual numbers are about 30% too high, though they do indicate the relative performance of the models.

With many two and three stage birds flying in the egglofting event, one of the disadvantages of the MSC field was quickly pointed out to the contestants. Though the firing area was freshly mowed, the remainder of the field was overgrown with weeds – causing some problems for those contestants who had chosen to combat the heat by wearing shorts.

This year was the first one where high thrust D's – the Estes D13 and the new FSI D18 – were available, so the egglofting strategy changed dramatically. Instead of the numerous cluster models seen at NARAM-11 and previous contests, the predominant NARAM-12 strategy was to multi-stage a D with a low thrust E or another D. Alan Stolzenberg went all the way to the 80 nt-sec limit with four D's – three in a cluster for the booster and a single D in the uppper stage. It was a monstrous rocket, but surprisingly it worked! CAP Cadet Fred Miller was not so lucky with his four-D-powered egglofter. Three D's ignited, but the ejection charge end of the fourth engine in the cluster was ignited by the ejection charges of the other three . . . ejecting it straight down into the pad area.

Dick Fox flew a "Minimitter" recovery beacon in his Egglofter "to ease the recovery." However its signal faded after landing, and the rocket had to be recovered without the aid of radio. Postflight inspection indicated that the transmitter failed when egg yoke, from the broken egg in the payload, dripped onto the circuit board.

Howard Kuhn, who hadn't had an egglofter tracked in more contests than he would care to remember, came up with a special Elo for NARAM egglofting. His secret, underpower the rocket and give the trackers a chance to see it. He went with an FSI D18 in the booster and a B3-6 in the upper stage. Even with that the rocket

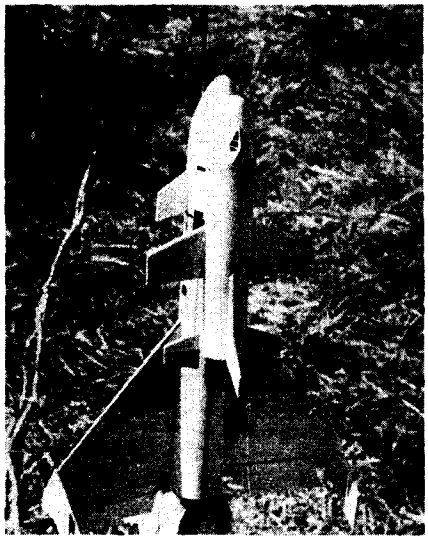
Manufacturers Display New Products

Seven manufacturers were represented at NARAM-12 to demonstrate and explain their new products to the rocketeers. Centuri, Cox, Competition, Estes, FSI, MPC, and SAI were all on hand to introduce new designs, and explain the additions to their product line.

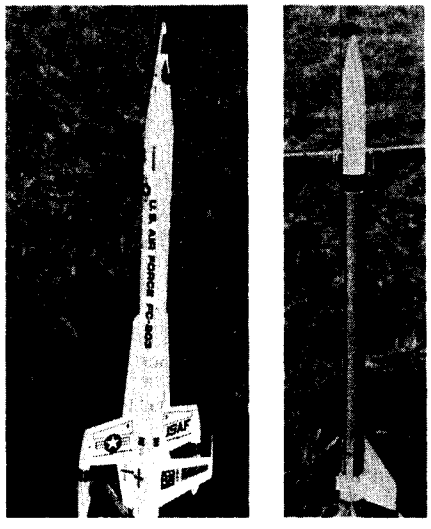
Centuri stole the show on the first day with the introduction of their new Enerjet D, E, and F engines. In the demonstration flights they consistently sent the models out of sight. (See page 00 for more information on the Enerjets.) This was a year of new ideas from Centuri – the Enerjets, a Baffle Ejection System, a unique Servo Launching System, and seven new kit designs highlighted their introductions. The Baffle Ejection System, featured in their new demonstration rocket the Centurion, eliminates the need for parchute wadding in large diameter rockets. These cylindrical baffles, available to fit #13, 16, and 20 body tubes, shield the chute from the hot particles of the ejection charge while allowing the ejection gases to pass freely.

Among the new kits introduced by Centuri is the Mach 10 Rocket Plane – an unusual model with an amazing flight path. The Mach 10 is a winged vehicle which ascends vertically, ejects a "Target Marker" at apex, does a few loops to reduce airspeed, and then goes into a glide for recovery. Another futuristic glider design from Centuri is the SST Shuttle I. The rocket blasts skyward with the Shuttle glider attached to the side. At ejection the rocket descends on a chute while the Shuttle goes into a slow, gentle glide.

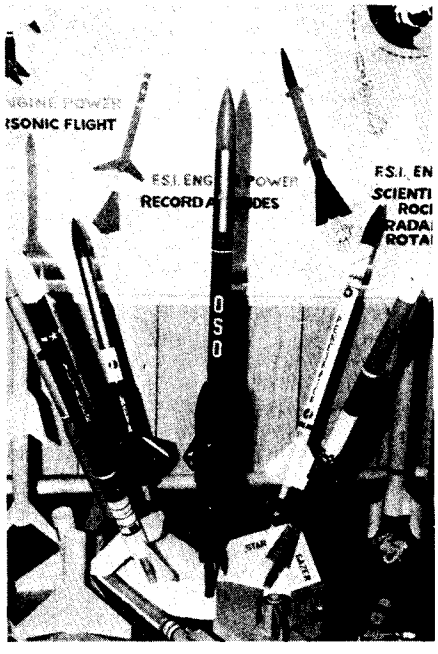
The Orion Interplanetary Vehicle, a single engine sport model, is loaded with details, all supplied in the form of plastic wrap-arounds similar to these used on the Centuri Saturns, The new Centuri Space Shuttle, a "semi-scale" version of the current orbital vehicle under study by NASA, also employs a carrier booster and a gliding strap-on vehicle. In this case, both the carrier ship and the shuttle descend by



From Centuri, one of the seven kits introduced at NARAM, comes the SST Shuttle. Both the "booster" and parasite SST glider return to earth in a gentle glide.



The newest in the Estes kit line (left) is the "Interceptor", a colorful, futuristic model almost covered with decals. (Right) Scheduled for release soon is the Sandhawk scale model.

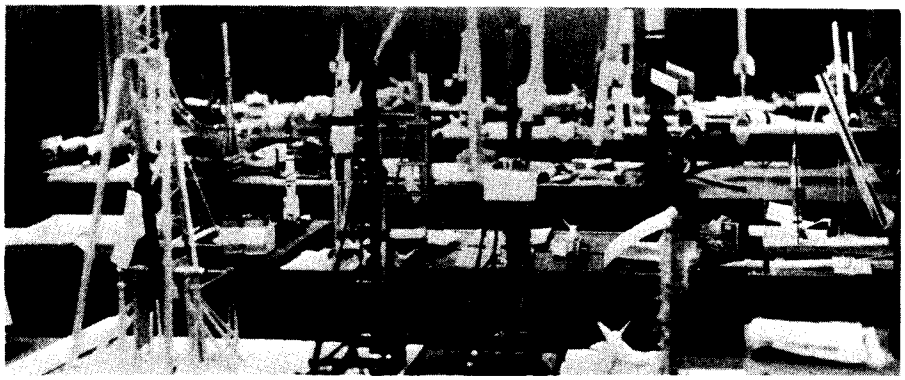


A view of the FSI display at NARAM. The new kits in the FSI line incorporate ring tubes for stabilization.

almost went out of sight! The track closed, however, and netted Howard a first place in Senior egglofting with an uncorrected altitude of 783 meters.

The Design Efficiency results provided the first clue that something was wrong with the baseline. When numbers like 203.2 m/nt-sec are being recorded something must be wrong – that's almost higher than the drag free altitude of the engine caseing alone. Even when you reduce Richard Rynearson's 203.2 m/nt-sec by the 30% correction required you get a quite respectable 120 m/nt-sec which gave him first place in the Leader Division. The Orbits Team took first in the Senior Division while Buddy Smith placed first in the Junior Division.

Monday evening was turn in time for the Scale and Space Systems models, and it was immediately evident that there were more and consistently better scale models than at NARAM-11. The models quickly filled all the available tables set aside for scale judging and a second room had to be obtained to accommodate the overflow of models. There were over 100 rockets submitted for static judging, and of these at least 30% showed exceptional effort on the part of the builder.



There was just about every type of missile to be seen in the Scale and Space Systems judging room. At least 30% of the models showed considerable building skill.

On Tuesday morning, with Swift B/G gliding while the engine returns on a streamer.

Centuri also announced two additional kits at NARAM. The Egg Crate, their first design for Egglofting competition, is a 20" tall model complete with two recovery systems. As an addition to their scale line, Centuri announced the Mercury Redstone, featuring a molded plastic capsule and tower. All the roll patterns will be pre-printed as decals, and the fins will be pre-printed on balsa stock. Both the Egg Crate and the Mercury Redstone are expected to be ready for delivery this month.

The new Centuri Servo Launcher was designed for reliable ignition on only two Photo-flash batteries. The firing switch, built into the launcher, is actuated by air pulsed through a 12' long plastic cable from a plunger firing button. All of the new designs from Centuri are described in their 1971 catalog, also introduced at NARAM, available for 25¢ from Centuri, Box 1988MR, Phoenix, Arizona, 85001.

The L. M. Cox demonstration consisted of the introduction of their newest ready-to-launch plastic rocket – an impressive scale Saturn 1B. The model flew straight with power supplied by two Cox C engines. All of their demonstration flights emphasized the dense white tracking smoke put out by the Cox A, B, and C engines.

From Estes Industries came the first public demonstrations of their two newest kits – the Interceptor and the Sandhawk. The Interceptor is a "futuristic" design almost covered with colorful decals (all supplied with the kit). The Sandhawk, newest design in the Estes scale line, features a molded plastic payload section complete with antenna detailing. The Sandhawk stands over 18 inches tall, and turned in a beautiful straight-up flight.

FSI took the opportunity to introduce their new D18 engine. This engine, in the same caseing as their E, has a full 20 nt-sec total impulse. It was designed with a sharp thrust spike just after ignition to assure stability with even heavy payload rockets and Egglofters. FSI also introduced a new kit line, completely described in a series of catalog sheets available for 25¢ from FSI, Box 145K, Louisville, CO 80027.

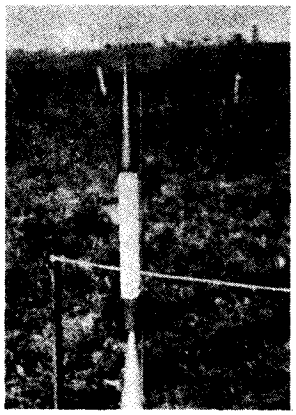
The latest from SAI is the Hen Grenade egglofter, now available in kit form and which comes with three alternative fin designs. Also new is a PD model, the American Eagle, which will be introduced in kit form early in 1971. The American Eagle, designed for SAI by Bryant Thompson, was optimized for B engine Patachute Duration.

Competition Model Rockets made the first successful public flight of his Maxi-Manta. Powered by a D engine, it turned in a 40 second flight. This is the same design which Howard Kuhn tried unsuccessfully to fly in the Condor B/G event at NART-1. For his "advance to the state of the art" in making the first successful Maxi-Manta flight, Howard was presented a special B/G award, a 2 foot long cardboard Bumble-Bee, by Bob Singer, CMR expects to introduce the Maxi-Manta early in 1971, with an optional RC pod to be available soon afterward.

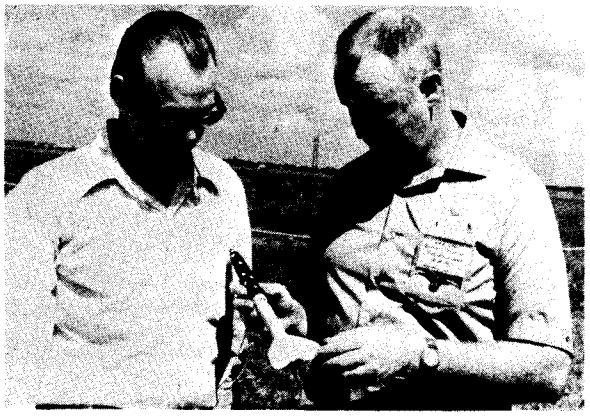
MPC took the opportunity to make the first public demonstration of the second in their line of plastic scale model rocket kits. The Titan IIIC, in 1/100 scale, made a perfect liftoff and proved its stability with only the small fins supplied with the kit. Also flown was a prototype C9 engine in a new Nike-Smoke kit.

The last rocket off the pad was a Vashon demonstration of the cold propellant Valkyrie 2 rocket.

Astronaut Robert Parker inspects the newest addition to the Cox ready-to-launch line – the Saturn V set up for power by a cluster of two B or C engines.



The new MPC Nike-Smoke lifts off. This model is powered by a prototype MPC C9 engine.



Bryant Thompson (right) explains his new design, the "American Eagle" competition PD model. to SAI president Tag Powell. The "American Eagle" is scheduled for introduction as an SAI kit this month.

The world's first "sound-Cineroc", an Estes Cineroc and Foxmitter microphone module lifts off from the NARAM field. Next month Model Rocketry will report the complete story, with plans for the sound-Cineroc system.

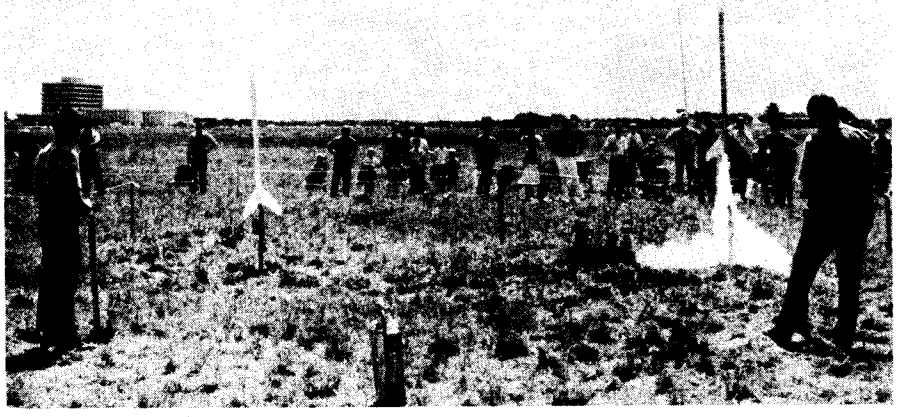
and Open Spot Landing on the schedule, many of the contestants were out on the field trimming B/G's by 7:30AM. There were, believe it or not, three Bumble-Bees being flown in the Swift event. Since Bob Singer had designed this glider (MRm, December 1969) for Hornet competition, he was quite surprised to see it flying in Swift. "They must be feeding them vitamins," Bob commented when he saw the McMullen-Kennedy Team Bumble Bee leave the pad and hold together. Actually it was a strengthened version of the Hornet Bumble Bee, and it proved the soundness of the design by turning in a 121.9 second flight – the only two minute plus flight during the morning flying. Charles Andres was also flying an Uprated Bumble Bee, with a slightly increased wing area and a 3/32" thick airfoiled wing. The pod hung up on its first flight, but it turned in a duration of over a minute on the second flight. Bob Singer managed to beat out all the Bumble Bees with a 158 second duration on the only "flap-wing" to work successfully in the Swift event.

Doug Malewicki was flying his old "Snoopy" B/G design in Swift, but he added a new engine mounting system. He used a "T" shaped balsa block which the forward end of the engine slipped onto. It provides no increase in frontal area and reduces the weight of the engine mount assembly.

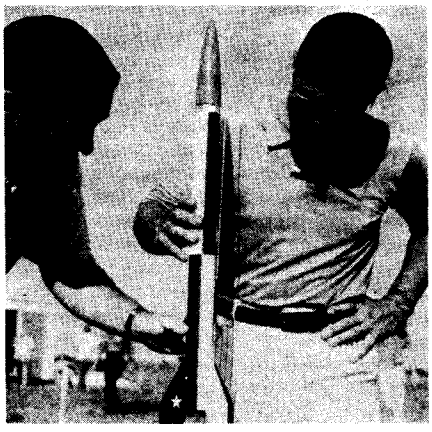
The best flight in the Swift event was a 390 second duration turned in by Greg Scinto for first place in the Leader Division. No one else even came close to this time, with Terry White's 165 second duration taking second in the Leader Division. David Rosenfeld captured first place in the Junior Division with a 173 second flight, while Forrest McDowell placed first in the Senior Division with a 134 second duration.

In the Spot Landing event the target was placed almost directly downwind from the pad area, making it an easy target to reach and a dull event. . . . Dull at least until Doug Malewicki did what he had been threatening to do for several years now. He brought out his radio controlled boost/glider, allowable under the Open Spot Landing rules, and tried to guide it to the target. Flying with a B4-2 engine the RC B/G weighted in at 2.8 ounces, just a little under the 3 ounce maximum weight for the event, fully equipped with a Bentert receiver and actuator. There was a bit of wind during the flight, but Doug managed to "guide" his B/G to a landing only 13 feet from the target. It was the closest flight up till that time, but while the judges were out measuring Doug's distance, Al Lindgren put his rocket within 12 feet 1 inch of the pole to take first place away from the RC B/G.

Steven Lehnhard took first in the Junior Division with a flight to within 10 feet 9 inches of the target, while Fred Miller III captured the Leader Division trophy with a 22 foot 9 inch distance.



During the demonstration flying Apollo-NASA came up with a contest to prove they do things big in Texas. A Drag Race with four foot models, one powered by an FSI F100 and the other by an Enerjet F67, was on the schedule. Unfortunately, iginition system problems kept Ben Russell's model on the pad.



Astronaut Robert Parker discusses the new Centuri Enerjet engines with Centuri president Leroy Piester.

Wednesday was the day for PD and Scale flights . . . and a special visitor to the launch site. Since the NARAM field was a mere 3/4 mile from the building housing NASA's 48 active astronauts, Scientist-Astronaut Dr. Robert Parker visited the field. During his half-hour visit he toured the range facilities, autographed contestants' models, and participated in the launching of a dozen models. There were several abortive attempts to get the first rocket off the pad, as Parker was asked to operate the ESCARLS launch system but no one explained to him which of the several buttons he was required to press to activate the system. The most spectacular flight was an FSI Mach I powered by an F100 in the first stage and a D18 in the upper stage. Staging was clearly visible, and the D18 had one of the clearest smoke delays at the meet. The rocket was seen through apex as a white trail extending almost straight up into the sky. He also had an opportunity to inspect the new Enerjet F67, and watch it power a Centuri Explorer to an estimated altitude of 5,000 feet. The new Estes Cineroc demonstrated to him the advanced level of instrumentation in the hobby. He showed interest in inspecting the MPC Vostok, and also participated in its launching.

There was little wind in the morning, good weather for the PD flights. By early afternoon, however, it picked up and 20 mph gusts were not uncommon. Some of the contestants had long walks bringing their models back. Considering the heat, there was not too much thermal activity. With over 150 contestants flying in the event, some taking two flights, there were only eight flights of over two minutes. There was no preferred type of chute employed with contestants flying, and winning, with polyethelyne, aluminized mylar, and clear mylar chutes. Again the trick was to get altitude, not to use a big chute. Howard Kuhn had the best flight of the meet with a duration of 382 seconds for undisputed first place in the Senior Division. The Sipes Team placed second with 249 seconds, while Jim Kukowski took third with 179 seconds.

In the Leader Division the McMullen-Kennedy Team captured first placed with 216 seconds, the only two

minute plus flight turned in in that Division. In the Junior Division Forrest McDowell III took first place with a 279 second duration. Scott Newton took second with 155 seconds, while Alan Stolzenberg and John Lane tied for third with 154 seconds.

In the Scale event several modelers are copying the European attitude of building the scale models *large.* In the Junior Division, Scott Layne flew a 1/30 scale Little Joe II which stood almost 36 inches high. He used a balsa body tube, and powered the beautifully detailed model by an F100 engine. It turned in an excellent flight, and took first place in the Junior Division.

Other large scale models were also in evidence. Alan Stolzenberg had a 1:5.5 model of the WAC-Corporal, while Gary Lindgren entered a V-2 standing almost 3 feet tall. After almost an hour in the pad area trying to find a satisfactory way of extending the 3 foot launch rod to a length acceptable for his four foot WAC-Corporal, Alan was ready to fly. It took a lot of nose weight to make the F100 powered WAC-Corporal stable, but it turned in a beautiful straight-up flight. Gary's V-2 was also going fine until chute ejection, when the polyethelyne parachute ripped away from the shroud lines allowing the model to free fall. Fortunately it was built strong enough to survive with only minor damage.

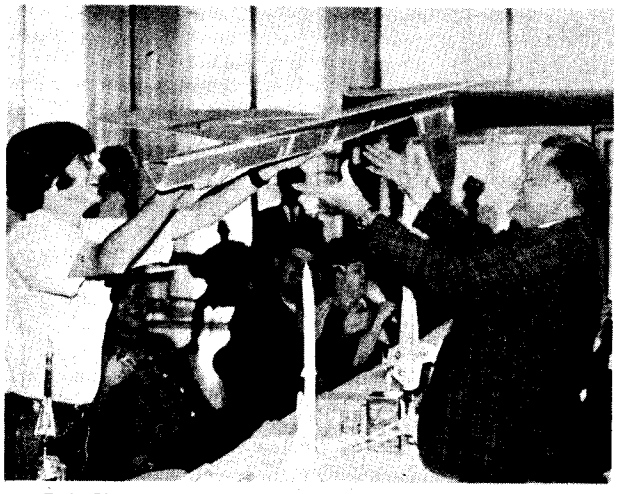
Norm Wood took first place in the Leader Division with his well done Javelin model. In the Senior Division Jon Randolph's scale Asp, which was accurate in every detail that the judges measured, took first edging out Howard Kuhn's Nike-Tomahawk.

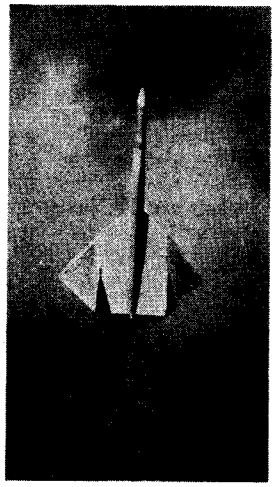
With 7:30AM set as the first launch time for Space Systems, there were few spectators or contestants on the range when it opened on Thursday morning. In the Space Systems event the contestant is required to launch his scale model from a scale launching pad during a three minute pre-assigned launch window. The event is judged on adherence to scale, altitude achieved, and landing in the specified target area. There were a number of well done models in this event. After the static judging the leaders were so close that the flight performance would decide the winners.

In the Senior Division Jon Randolph captured first place with the same D13 powered Asp model that had given him first in Scale. The model, slightly over two feet long, was flown from a well done, metal launcher. Jon launched it without tracking, since the scope had become misaligned minutes before the start of his launch window, but he took first place anyway since none of the Senior entrants succeeded in landing in the target area. By 8:30AM the wind had picked up, and hitting the target area was a process of luck.

Howard Kuhn took second place with his D-Region Tomahawk. It turned in a nice straight flight, but missed the target area by only 8 feet. A hit in the target area would have given him first place in the event, but a last minute aiming adjustment caused the miss.

The Ball-Hagedorn Team, flying an Astrobee 1500, used a simple RC unit to control the launch angle of their pad. Using this method, the angle could be changed right up to the moment of ignition. The rocket had a beautiful flight, but as with all the other Senior entries, it missed the target and a chance at first place.





Bob Singer awards the "giant Bumble-Bee" to Howard Kuhn for "advancement to the B/G state-of-the-art. The trophy was presented to Howard for successfully flying his Maxi-Manta in public after six consecutive failures. At right the Maxi-Manta lifts off.

In the Leader Division Charles Russell captured first place with an IQSY Tomahawk in 1:10 scale. He launched without tracking, since the scope team was not ready, but landed the Tomahawk right in the middle of the target area. The spot landing points gave him a 200 point edge over the next nearest competition.

Richard Sternbach, flying a model of the French LEX-20 sounding rocket, took second place in the event. Charles Duelfer, flying a very small Astrobee 1500 model, took third place with a very good flight.

In the Junior Division Sven Englund took first with a Nike-Smoke model in in 1:10 scale. Going from a well built launcher he built up a 100 point lead over the nearest competitor. Gary Lindgren took second with a Terrepin model, while Mark Wargo placed third with an Aeolus.

During much of the Space Systems event the other competitors were out in the field trimming their Sparrow boost/gliders. Styrofoam advocates were out in force in this event. They didn't do too bad either with the McMullen-Kennedy styrofoam Bumble Bee taking first in the Leader Division with a 100 second duration. Howard Kuhn, flying a styrofoam Manta, placed second in the Senior Division with an 86 second flight. Jerry Gregorek was flying a DB styrofoam wing section cut out and sanded to an elliptical shape.

"Flop-wings" were represented by Bob Parks, Guppy, and Bob Singer, none of whom could seem to finalize on a design until they were walking out to the launch pad. They used up plenty of five minute epoxy, and proved that with a design as complex as the "flop-wing" it must be test flown a few times before flying it in competition. Bob Singer was the only one in the group to turn in a non-DQ'ed flight. On his second attempt he had a good flight, which was still in the air several minutes later heading in the direction of the MSC buildings.

During the morning B/G flights there were only two above a minute – both with uprated Bumble Bees. Only the McMullen-Kennedy styrofoam Bumble Bee with its 100 second flight and Charles Andres balsa Bumble Bee, turning in 72 seconds, topped a minute on Thursday morning. During the afternoon session, however, ten more contestants turned in one minute plus flights. The best flight of the event, and the only two minute plus flight, was Steve Fentress' 130 second duration for the first place in the Junior Division.

In the Research and Development competition, which was not counted for contest points at NARAM-12, Dr. Gerald Gregorek topped the Seniors with a project investigating the use of multiple exposure strobe photography of B/G flight paths to determine the parameters of the glider. Andy Elliott, using this method which Dr. Gregorek had presented at the MIT Convention, analyzed the parameters of a Thermic B/G for third place in the Junior Division. Charles Andres took first in the Leader competition with an analysis of supersonic model rocket flight. Scott Layne took first place in the Junior competition with an experimental determination of the thrust time curves for most of the currently available model rocket engines.

In order to allow time for the points to be totaled, no competition flying was scheduled for Friday. The morning was free for manufacturers demonstration flights and sport flying. The awards banquet, closing NARAM-12, began at 3PM in the MSC cafeteria. Trophies and ribbons were presented to the winners (see list on page 35), and Estes Industries awarded Cineroc movie cameras to all the first place winners.

When the points were all totaled Gary Lindgren of New Jersey's Pascack Valley Section emerged as Junior National Champion, Charles Russell of Ohio's CSAR Section was the Leader National Champion, and Shirley Lindgren of Pascack Valley was named Senior National Chamption. The Ball-Hagedorn Team of Ohio's MASA Section emerged as National Championship Team, and the host Section, Apollo-NASA, took the Championship Section honors.

the Escape Tower

BY BOB PARKS

A PARASITE HORNET B/G

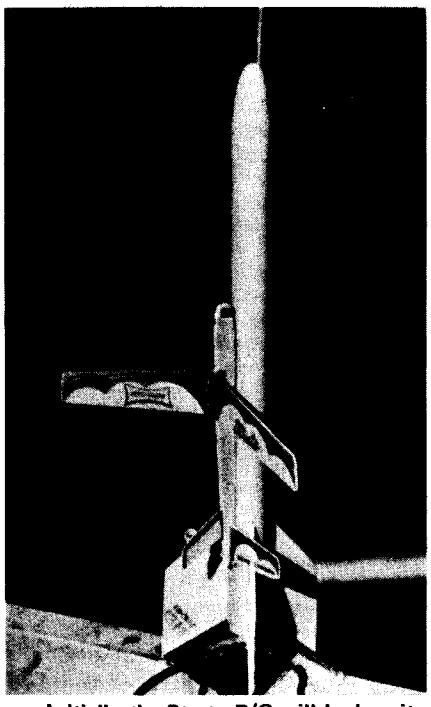
Five Cent North Pacific Glider For Contest Flying

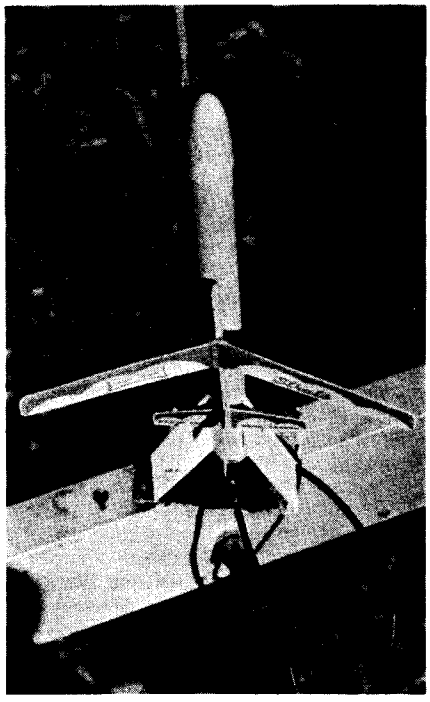
Parasite gliders are becoming very common now. The Lieberman-Crafton team won Condor B/G at NART-1 with a Micro-Manta hooked onto the side of their two stage egglofter. Howard Kuhn has been experimenting with the Mini-Manta lofted on the side of a booster for use in some of the small B/G events. All of the Vashon B/G's as well as the MPC Lunar Patrol B/G are based on the parasite principle. Estes and Centuri have also introduced parasite glider models.

Parasite gliders have generally been characterized by their simplicity of construction, and ease of glide-trimming. However, none can compare with this conversion of the North Pacific Strato toy glider. Its so simple the entire model can be constructed on the field. In fact, if you forget your B/G in the next Hornet Contest you can go to the local grocery store or five and dime store and buy your B/G. It flys strapped to the side of almost any rocket.

The idea for this B/G comes from John Langford of Atlanta, Georgia. The North Pacific Strato offers several advantages. First, at a cost of only 5¢ each, there should be no major problem with lost gliders. Just spend a few minutes assembling another glider and you're ready to go again! Also, almost any rocket can be converted for use as a booster in about the same amount of time it takes to assemble the glider.

The performance of the Strato B/G is rather good. John reports times of up to 47 seconds on a ½A. That's good enough to win most Hornet Contests! In fact the glider won first place in Hornet at the North Georgia Regional Meet. My particular version was turning in times of about 20 seconds with a ¼A and about 50 seconds on a ½A engine. I didn't try any larger engines because John said that he had several gliders rip apart on A engines. (Possibly a 10¢ glider will work in the Sparrow event.)





Initially the Strato B/G will look quite strange strapped to the side of your rocket. But, if you build it strong and take a few minutes to trim it, it will turn in surprisingly good performances as a B/G.

For sport flying, almost any rocket can be used as a booster. A small diameter, medium length rocket like the Centuri Javelin or Estes Beta would probably give the best performance of any of the kit models. However, for contest performance, a special lightweight booster should be built. John sent plans for the booster he used at NGRM, and this booster is shown in the drawing. I built a similar vehicle, only I made a few modifications in an attempt to reduce weight. A normal balsa nose cone can be hollowed, but I found that the Competition Model Rockets vacuum formed nose cones were just as light and did not require any work to obtain a good finish. I also used the CMR body tube. Use of a Series III engine can eliminate about a tenth of an ounce more weight. A good airfoil on the fins and some care in finishing will assure good performance on boost.

It is not really necessary to glue the glider together, but you can if you want to. If you do use glue, don't glue the plastic wing clip to the body! The glider is trimmed by moving the wing slightly forward or backward. The metal nose weight suppied with the glider should be removed. An attachment hook (shaped as shown) should be bent out of soft copper bell wire, and then attached to the nose of the glider with glue or tape.

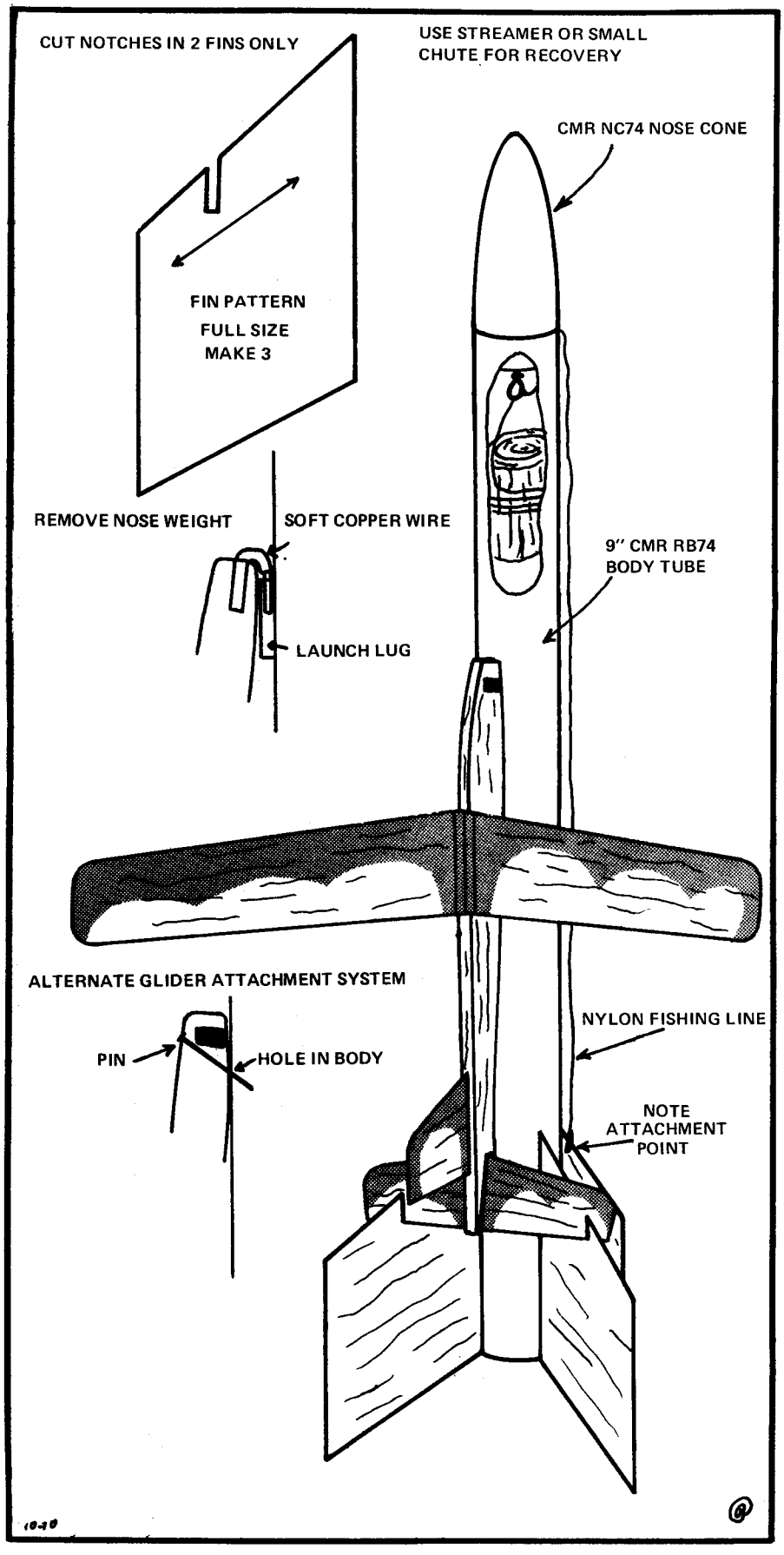
An even easier attachment method is to stick a straight pin through the fuselage of the glider at a 45° angle. Put the glider in place on the rocket body and stick the pin through the rocket body. Enlarge the pin-hole in the rocket body just slightly and check to see that the "pin-pod" fit is loose enough for deployment.

The booster is built by normal methods and should cause no problems. A short piece of launch lug should be glued to the side of the body in the position shown to receive the hook on the glider. Also, note the notches in two of the fins to hold the stabilizer of the glider. This keeps the glider from "flapping" on the way up and ripping itself apart during boost.

Make sure the slits in your fins are cut exactly in the location shown. This places the glider wings at a very slight negative angle-of-attack during boost, tending to hold the glider to the rocket body. If you put the glider at even a slight positive angle-of-attack, the wings will rip off during boost.

As with any other type of B/G it is necessary to glide test the glider to optimize performance. The booster is prepped like a standard rocket, and the glider is hung on the side just before launch.

For those of you who desire more of a challenge, you could devise a method to boost the 15¢ North Pacific skeeter rubber powered plane in such a way that the propeller is released at separation. (Note: this could not be used for contests because the wound rubber has power that does not come from the rocket engine.) For contest use, how about a strengthened Jetco Thermic 20 as a parasite on a two-stage D and E powered carrier rocket for the Condor event . . . .



Boles Joins Estes Ind.

Effective September 1, Dane Boles will become director of the Rocketeer Communications Department for Estes Industries, of Penrose, Colorado. For the past six years, Boles had been recreation leader for the Recreation and Parks Department in West Covina, California. He had also served as head recreation advisor for the West Covina Model Rocket Society since that organization was formed in March 1967.

In his new duties with Estes, Boles will report to Robert L. Cannon, executive director of the Communications Division. As director of Rocketeer Communications, he will supervise a staff whose main function is to answer a wide variety of letters covering the entire field of model rocketry. The department writes well over 100 letters a day. Boles will also work closely with model rocket clubs.

A 22-year old native of Altadena, California, Boles was graduated this year from the University of Southern California, with a double major in political science and in international relations. His official model rocket activities have included serving as Pacific Division Manager for the National Association of Rocketry; acting as consultant in advising many private groups and recreation departments in the development of model rocket programs; and officiating as contest director for the four largest model rocket meetings held in California. He has also authored "Community Model Rocket Program" for the National Recreation Association.

NEWS NOTES

Police Chief Endorses Rocketry

On September 8th the new Pennsylvania law permitting the use of model rockets went into effect. Commenting on the law Colonel Frank McKetta, Pennsylvania State Police Commissioner, said: "The new legislation is welcome since it removes much of the confusion that has existed among the rocket hobbiests. This new law outlines important, common sense safety standards that all rocketry buffs should welcome."

The new law, removing model rocketry from the General Fireworks Law, was passed by both houses of the Pennsylvania legislature and signed by Governor Raymond Shafer on July 8th. The law, House Bill 1319, establishes state wide safety standards for model rocketry. Prior to its passage, the sale and use of model rockets was sharply restricted under the 1939 Fireworks Law (Public Law 134).

The new regulations permit the use of model rockets weighing not more than 500 grams and employing not more than 4 ounces of propellant. All engines sold or used within the Commonwealth of Pennsylvania must have NAR safety certification.

While rocketry is now legal on a statewide basis, local ordinances in some towns may still prohibit model rocket activities. Rocketeers should check with the local police department to determine the status of rocketry in their town.

Borman Visits Cox

Retired Astronaut Frank Borman recently participated in a regulation countdown and launch of an authentic Saturn V model in Santa Ana, California. The launch was conducted on L.M. Cox Manufacturing Company's firing range, used to test fire the company's family of ready-to-fly models. Colonel Borman pushed the button on the Cox Launch Control System and watched the Saturn V model streak to an altitude of 1,200 feet. The model launch vehicle, with detailed command and service modules, is a miniature of the Saturn V system which took Borman 10 times around the moon and back to earth in 1968.

During his visit to Santa Ana, Colonel Borman, now a vice president of Eastern Airlines in Miami, met L.M. Cox President William Selzer and Executive Vice President of the parent Leisure Dynamics, Inc., M. Allen Hatfield. Colonel Borman toured the plant to watch manufacturing processes involved in the production of model gas engines and the molding of components for the many different airplanes, automobiles and rocket models manufactured by the firm. The company is a well-known manufacturer of all types of engine-powered air, land, sea and space models. At the close of the visit, Selzer presented Colonel Borman with a special trophy, L.M. Cox's model of the Apollo Saturn V, mounted and appropriately inscribed.

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N.Y. Hobby Shop Sponsors L.I. Contest

Card & Craft Meet

by Gary Hobish

On April 5, 1970, the Card & Craft Hobby Shop of 1004 Front Street, Uniondale, Long Island, sponsored a model rocket contest. This was the first major competition sponsored by a hobby shop. Though not an NAR sanctioned competition — it was open to all Long Island rocketeers — all NAR regulations were followed to the letter, except membership.

The prime purpose of the contest was to acquaint those not knowledgeable in rocketry with the model rocket hobby and to introduce them to the NAR. There is no doubt that this was accomplished.

At 9 A.M. the Contest Director announced the beginning of the final regulation checks. The purpose here was to ascertain that all rockets entered met with the regulations concerning weight and total impulse. The Registrar, Gene Ulrich, did a fine and thorough job. While this was going on, the Range Safety Officer, Gary Hobish, began the countdown for the first drag-race launches, which went off two at a time. In all, there were 22 entries in the drag-race event. According to NAR regulations, points were awarded as follows:

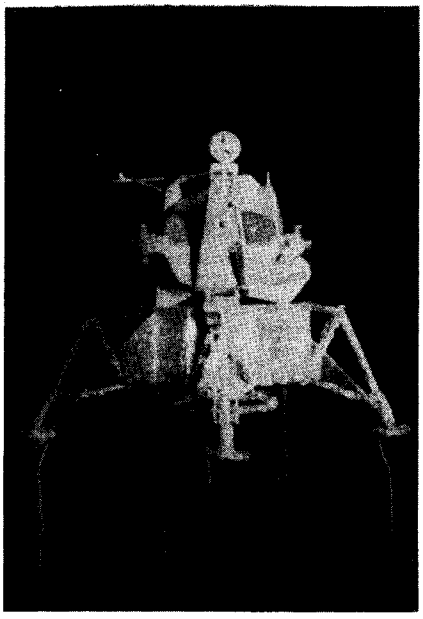
1 point for first off the pad,
1 point for lowest maximum altitude,
1 point for last to touch the ground.

First place was won by Mike Colucci with 5 points. Second place went to Brian Ulrich of Bethpage, while third place went to Mike Buckham, assistant RSO and member of the North Shore Section.

At about 11:15 the altitude competition got under way. As is generally known, the basic component of a good altitude event is well co-ordinated teamwork by the support crews.

Mike Heiberger of Uniondale took first place with an Estes Mark powered by a C 6-7. The amazing part is that the flight was tracked to an altitude of 2300 feet, then went off the Centuri Sky-Trak computer board. This means that the flight went to a minimum altitude of 2300 feet. It was, without a doubt, a record of some kind. Mike Disilvio took second place with a flight

Card and Craft owner Stanley Hobish presents first place trophy in Drag Race to Mike Colucci.



Chris Williams prepared a 1/48 scale Lunar Module to highlight the Card and Craft Meet.

of 1,478 feet, and Mike Colucci took third place with 1,180 feet. Fourth place went to 9 year old Leslie November of Massapequa with a flight by a rocket she designed herself. There certainly is no age limit in rocketry!

The third event of the day was spot landing. This type of event can be quite tricky. At Pascack Valley, this event was won by a young lady named Karen Celentiano of Farmingdale, and a member of the North Shore Section. Once again, Karen won first place honors using a Centuri Astro-1 equipped with streamer recovery. She came in at 6'7½". Of the 24 entries in this event, Kevin Clark of Garden City and the North Shore Section took second place with 54'5", and third place went to Glenn November of Massapequa with 67'8".

Under ordinary circumstances, this would have been the last event of the day, but for the first individually sponsored non-sanctioned meet, something special was needed. The fourth and final event of the day was called "Saturnia". Only the large scale Saturns were allowed to enter and they were judged on all-around good looks and performance. In this event there was only a first place prize. Out of two Saturn 1B entries and three Saturn V entries, first place was captured by Robert Colucci with a Centuri Saturn V. It was tracked to an estimated 250 feet. The ejection charge didn't blow until the Saturn was only 30 feet above the ground, but no damage was detectable. Bob almost gave up on entering this event when a launch lug broke off, but a quick repair job found him first place. There it was, a perfect day and a perfectly executed "first" meet of this type.

The first place winners all recieved trophies. The Saturnia event needed something special. This special trophy had a marbelized base on which an 8" winged victory was place holding a 2" rocket type medallion. Second place winners received gift certificates good for a Saturn 1B kit, a Saturn V kit and the large scale Little Joe II kit. I think they slept in front of the store Sunday night so that they could redeem the certificates bright and early Monday morning.

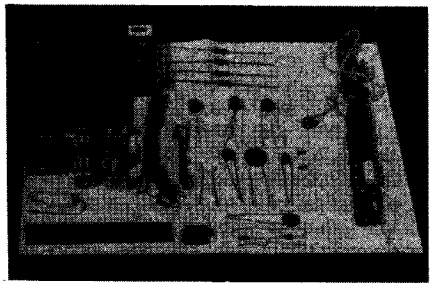
Honorable Mention Certificates were presented to the third place winners.

In between altitude and Saturnia events we instituted a special happening. Chris Williams, President of the North Shore Section, built a 1/48 scale Lunar Module. It's maiden launch took place at 3:10 P.M. The photograph gives you a pretty good idea of how well built it was. The launch was absolutely perfect. But trouble did develop on ejection. Although two shock cords were used, both of them tore. As a result, the descent stage was damaged on landing, but not beyond repair. Very shortly now the LM will fly again - this time with a "soft" landing.

In regard to advancing the popularity of the hobby and making people more "rocketry concious", the store is still receiving the most complimentary phone calls from people who just came to Mitchell Field "to have a look around" and ended up completely captivated, to the point where they spent the entire day.

New Product Notes

A complete kit of parts for the Foxmitter-2 model rocket telemetry transmitter has been introduced by Asto-Communications (3 Coleridge Place, Pitssburgh, PA 15201). Consisting of all the necessary electrical components, solder, and hook-up wire, the kit is priced at $14.95,



Foxmitter-2

including one 27 mHz crystal (specify channel). Kits for several sensor modules including a Breathing Rate Sensor ($2.75), Temperature Sensor ($3.00), and Accelerometer ($3.50) are also available.

Initial scientific findings of the Apollos 12 flight to the Moon last November are outlined in a new publication of the National Aeronautics and Space Administration. "Apollo 12: Preliminary Science Report," NASA SP-235, is a 227-page book with extensive black and white photographs and charts. Among the experiments discussed in separate chapters are: passive seismic, lunar surface magnetometer, solar-wind spectrometer, suprathermal ion detector, lunar atmosphere detector, solar wind composition and multispectral photography.

The precise landing capability of the Apollo 12 mission allowed the crew to accomplish a wide variety of tasks and paved the way for planning future mission to smaller, more selected landing areas with possibility of significant scientific returns. "Our second journey to the Moon opened the new age of extraterrestrial scientific exploration by man," Dr. Thomas O. Paine, Administrator of NASA, states in the foreword to the new publication. The book includes discussion of the preliminary examination of lunar samples and preliminary results from Sureyor 3 analysis. The report may be purchased from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151, for $3 a copy.

An inexpensive, but effective home spray booth that eliminates the hazards of indoor spraying has been introduced by the Rub 'n Buff Division of American Art Clay Company, Indianapolis. Aerosol users have complained that it is difficult to paint an object from all angles without staining nearby surfaces and with windows closed in winter, fumes are unpleasant, even dangerous.

This compact Rub 'n Buff booth puts an end to overspray mess. It can be set up in seconds, The user simply unfolds the booth, slips lock tabs into the outer carton which serves as a base. Turntable rotates easily at the touch. Baffle and vents at the back catch and siphon off fumes. Craft and hobby spraying need no longer disrupt family living areas in apartment or house. The Rub 'n Buff booth folds back into its box for minimal storage, can be used again and again. The booth will hold objects up to 10" in diameter and 12" in height. It retails at $2.49.

Several recent releases from the Government Printing Office should be of interest to rocketeers. Leading the list is **Apollo 13: "Houston We've Got a Problem"**, the story of the dramatic voyage of Apollo 13. This 25 page illustrated booklet, NAS 1.19:76, is available for 75¢. **The First Lunar Landing as Told by the Astronauts**, a full color booklet including the transcript of the Apollo 11 post-flight news conference by Astronauts Armstrong, Aldrin, and Collins, is also available from the GPO at 75¢ as publication NAS 1.19:73. Both publications are available from the US Goverment Printing Office, Division of Public Documents, Washington, DC 20402.

Aviation Photo Exchange, which has supplied aircraft photos to modelers for several years, has several items of interest to rocket modelers. Their latest catalog lists photos of the Bomarc, Regulus Terrier, Nike, Honest John, Thor, X-17, Polaris, X-15, Atlas, Snark, Viking, Vanguard, and other missiles. 3½ X 5 inch B&W photos are 10 for $1.45, while 8 X 10's are available at $1.00 each. Send 10¢ for a current catalog to Aviation Photo Exchange, Box 8233R, La Crescenta, CA. 91214.

Reader Design Page

Each month **Model Rocketry** will award a $5.00 prize for the best original rocket design submitted by a reader during the preceding month. To be eligible for this prize, entries should be carefully drawn in black ink on a single sheet of 8½ by 11 paper. Sufficient information should be contained in the drawing so that the rocket can be constructed without any additional information.

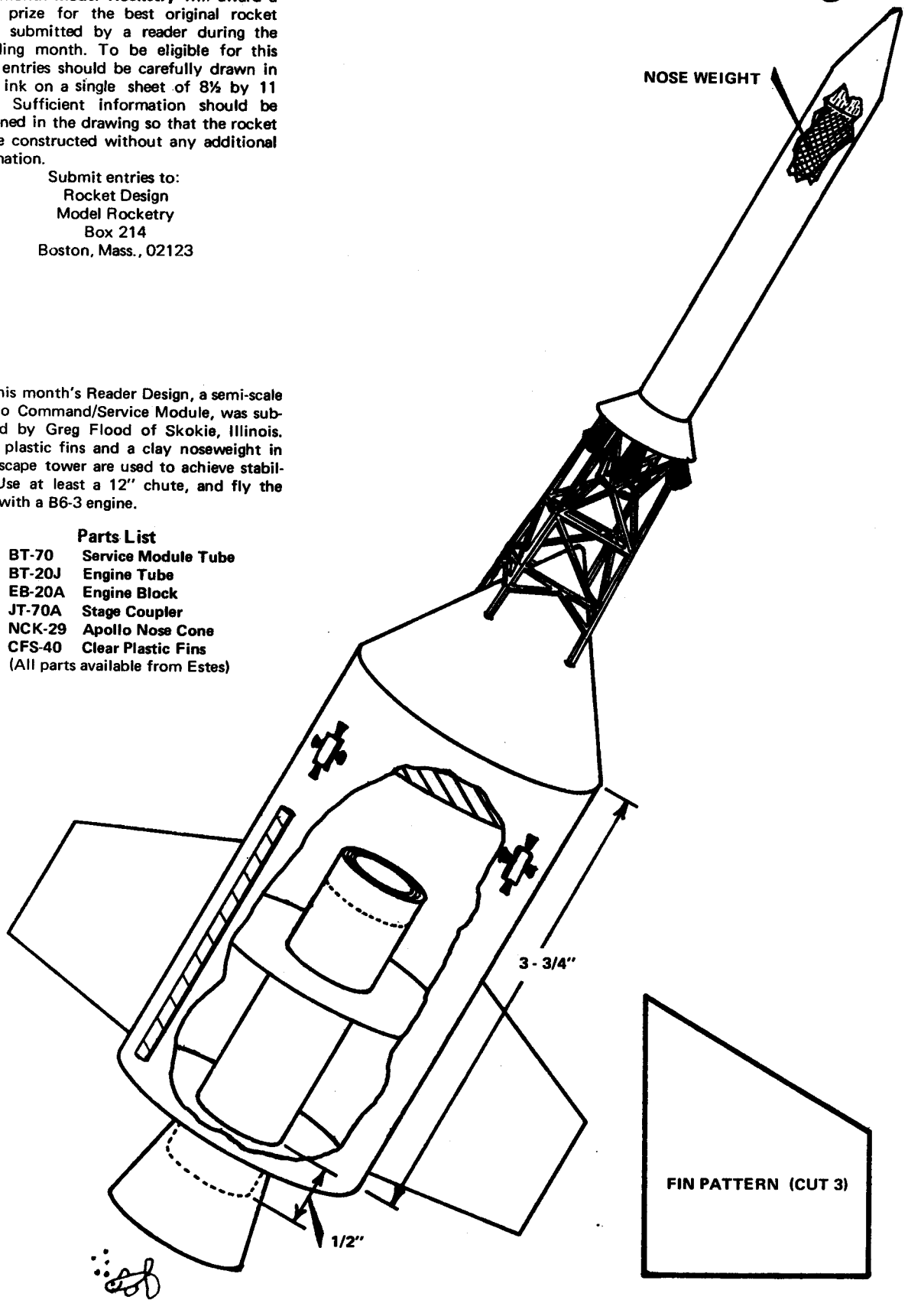
Submit entries to:
Rocket Design
Model Rocketry
Box 214
Boston, Mass., 02123

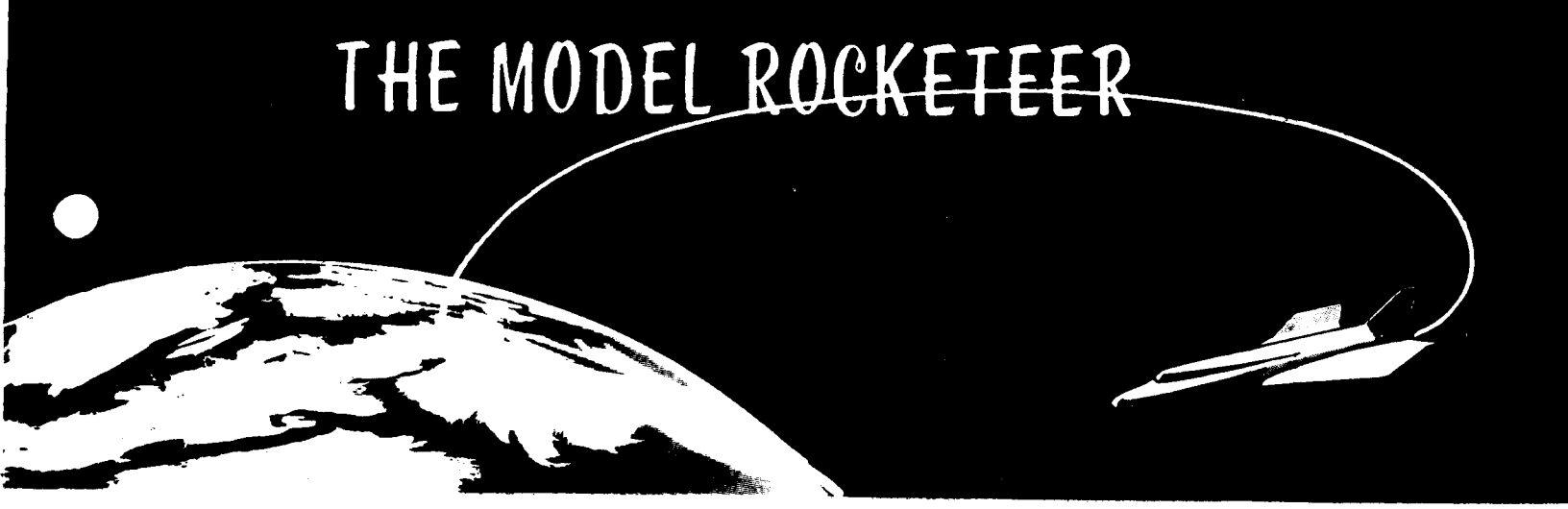
This month's Reader Design, a semi-scale Apollo Command/Service Module, was submitted by Greg Flood of Skokie, Illinois. Clear plastic fins and a clay noseweight in the escape tower are used to achieve stability. Use at least a 12" chute, and fly the CSM with a B6-3 engine.

Parts List

BT-70	**Service Module Tube**
BT-20J	**Engine Tube**
EB-20A	**Engine Block**
JT-70A	**Stage Coupler**
NCK-29	**Apollo Nose Cone**
CFS-40	**Clear Plastic Fins**

(All parts available from Estes)





NATIONAL ASSOCIATION OF ROCKETRY, Box 178, McLean, Virginia 22101

The Model Rocketeer is published monthly in **Model Rocketry** magazine by the National Association of Rocketry, Box 178, McLean, Virginia 22101. The National Association of Rocketry, a non-profit educational and charitable organization, is the nationally recognized association for model rocketry in the United States. **Model Rocketry** magazine is sent to all NAR members as a part of their membership privileges. NAR officers and trustees may be written in care of NAR Headquarters. All material intended for publication in *The Model Rocketeer* may be sent directly to the editor.

LAC Newsletter Award Presented

Dick Fox accepts the LAC Newsletter Trophy, sponsored by North American Rockwell, in the absence of Rick Baier of Three Rivers.

In judging conducted at NARAM-12, Pittsburgh's Three Rivers Section was awarded the annual LAC Newsletter Trophy for the most outstanding Section newsletter during 1969-70. The winning newsletter – "Contrails" – has been edited for the past year by TR member Richard Baier.

The Fairchester Section's "Igniter Current," edited by Richard Sternbach, was named runner-up. Third place was given to "The Modroc Flyer" from the South Seattle Model Rocket Society. Honorable Mentions were given to "Impulse" (Pascack Valley), "Xaverian Newsletter" (Xavarian H.S. Model Rocket Society), and "Tracking West" (Tri-City Cosmotarians).

The LAC Newsletter Award is presented annually to encourage better communications within and between NAR Sections.

TRUSTEES TO BE ELECTED BY MAIL VOTE

Leader and Senior members are going to have a thick renewal packet this year. It will include a ballot for the election of a new Board of Trustees. Resumes for all candidates, those nominated at the Tri-Annual Meeting from the floor as well as those nominated by the Nominating Committee, will be printed in *The Model Rocketeer* next month. Full details of the election will be contained in next month's issue.

LAC AMENDMENT PASSED

The Leader Adminstrative Council By-law Amendment was ratified at the Tri-annual meeting by a nearly unanimous vote. There was a great deal of discussion on the origin, structure, and accomplishments of the LAC. It was apparent from the discussion that not many members are aware of the LAC's activities and that the LAC needs to do more to involve Junior members.

DISTINGUISHED SERVICE AWARDS

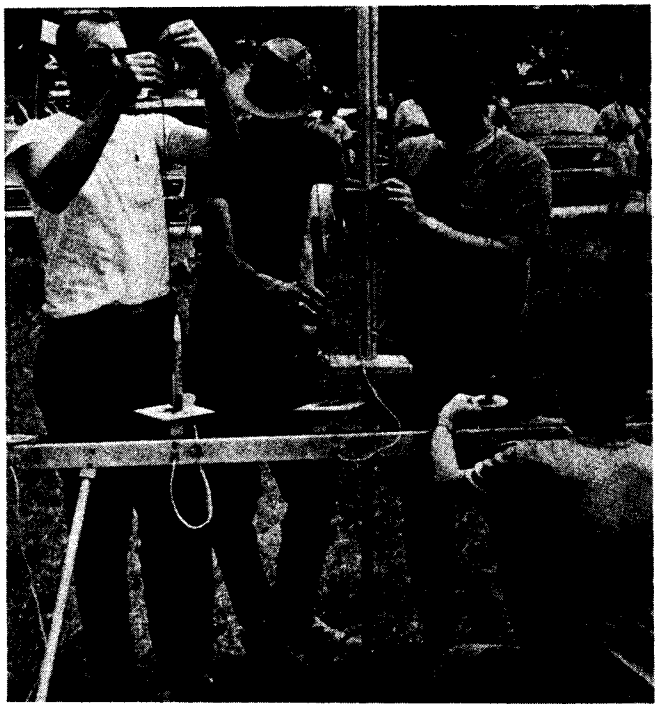
NAR Distinguished Service Awards have been given to the following two outstanding NAR members:

- Mr. John Worth for his dedicated service to the NAR in Headquarters management as well as his experienced advice on important decisions of the Board.
- Miss Elaine Sadowski for her leadership and effort in helping make the Leader Administrative Council a meaningful part of the NAR and, especially, her work with the LAC newsletter trophy.

WORKMANSHIP AWARD WITHHELD

The David Gregorek Memorial Junior Workmanship Award was not awarded this year at the NARAM. Not one of the Junior entries in Sparrow Boost/Glider, the chosen workmanship event, was of sufficient quality to warrent the award. Let's hope the juniors improve for NARAM-13.

Capital Area Regional Held



Four of the competitors at the First Capital Area Regional (CAR-1) load up their design efficiency birds. From left to right; Bill Werre, Bruce Blackistone, Jim Barrowman and Eric Max. Notice that Bruce and Jim are about to knock heads over who will launch with that one set of clips - both survived. Eight of the NAR sections in the Washington, D. C. area participated in the July meet as well as a number of independents. (Photo by Alan Williams of the Bowie Association of Model Rocketry.)

Point Awards Sheet - I would like to remind all contest directors that the point awards sheet is used as a keypunch form. Recently our keypunch fees were raised $10 per thousand because the point award sheets were so illegibly filled out. Please be sure the point awards sheet is filled out *carefully* and *legibly*.

Team Numbers - Team numbers are assigned by the contest board. When forming a team, write the contest board giving the names, birth date, and NAR number of each team member. Also, please include a postcard addressed to the team member with the lowest NAR number. The CB will send your team number in the return mail. When filling out a Contest Entry Form, use the name and NAR number of the team member with the lowest NAR number. Also include your team number and age of the oldest team member. Rockets flown by the team should have the *team number* on them - not all the team members' NAR numbers.

NARHAMS ANNOUNCE ECRM-5

The Fifth Annual East Coast Regional Meet (ECRM-5) will be held at Camp A. P. Hill, Va. on April 16, 17, 18, 1970. The events will be:

Scale
Sparrow Boost Glider
Swift Rocket Glider
Class I Parachute Duration
Class II Streamer Duration
Hawk Boost Glider
Parachute Spot Landing

ECRM-5 will be open to any NAR member in Maryland, Virginia, North Carolina, Delaware, West Virginia, and Pennsylvania. The entry fee will be $1.00 base fee plus 50¢ per event entered. NAR members interested in competing at ECRM-5 please send a postcard giving your Name, NAR#, and address to:

James S. Barrowman
6809 97th Place
Seabrook, Maryland 20801

no later than January 15, 1971.

International Meet Postponed

The Aeronautical Union of Yugoslavia has informed the NAR of the postponement of the World Championship Meet originally scheduled for September. The reason for the postponement was an insufficient number of applications for the Championships. Only four countries – Poland, Chzechoslovakia, USA, and Romania – applied. The Aeronautical Union of Yugoslavia has suggested that this Championship be held in 1972 in Yugoslavia.

A Yugoslavian National Meet has been scheduled for the 3 days originally scheduled for the World Championships. The USA as well as several other nations have been invited to compete to allow competitors to exhange their experience. It is expected that a US team will attend.

NARAM-12 RESULTS

Egg-Lofting

Junior		
1st	Richard Rasmussen	1,055 meters
2nd	James Hagedorn	934 meters
3rd	Gary Price	808 meters
Leader		
1st	Charles Russell	860 meters
2nd	Norman Wood	848 meters
3rd	Jay Harris	675 meters
Senior		
1st	Howard Kuhn	783 meters
2nd	Shirley Lindgren	680 meters
3rd	Robert Thayer	585 meters

Scale

Junior		
1st	Scott Layne	989 points
2nd	Robert Dunbar	905 points
3rd	Tom Roberts	882 points
Leader		
1st	Norman Wood	860 points
2nd	Greg Scinto	845 points
3rd	Charles Russell	773 points
Senior		
1st	Jon Randolph	877 points
2nd	Howard Kuhn	789 points
3rd	Shirley Lindgren	748 points

Parachute Duration

Junior		
1st	Forrest McDowell III	279 seconds
2nd	Scott Newton	155 seconds
3rd	John Layne	154 seconds
	Alan Stolzenberg	154 seconds
Leader		
1st	McMullen-Kennedy Team	216 seconds
2nd	Guppy	119 seconds
3rd	Mike Keyes	112 seconds
Senior		
1st	Howard Kuhn	382 seconds
2nd	Sipes Team	249 seconds
3rd	James Kukowski	179 seconds

Open Spot Landing

Junior		
1st	Steven Lehnhard	10 ft 9 in
2nd	Mark Crummett	27 ft 2 in
3rd	Alan Stolzenberg	27 ft 7 in
Leader		
1st	Fred Miller III	22 ft 9 in
2nd	Alan Malizia	26 ft 10 in
3rd	Michael Keys	32 ft 9 in
Senior		
1st	Al Lindgren	12 ft 1 in
2nd	Doug Malewicki	13 ft 0 in
3rd	Forrest McDowell	17 ft 9 in

Swift Boost/Glide

Junior		
1st	David Rosenfield	173 seconds
2nd	Steve Lehnhard	156 seconds
3rd	Becky Lundberg	135 seconds
Leader		
1st	Greg Scinto	390 seconds
2nd	Terry White	165 seconds
3rd	Robert Singer	158 seconds
1st	Forrest McDowell	134 seconds
2nd	Butterworth Team	123 seconds
3rd	Bill Fileccia	116 seconds

Design Efficiency

Junior		
1st	Buddy Smith	182.4 meters
2nd	Scott Newton	172.0 meters
3rd	James Philmon	166.8 meters
Leader		
1st	Richard Rynearson	203.2 meters
2nd	Robert DeLeon	170.8 meters
3rd	Edward LaCroix	157.2 meters
Senior		
1st	Orbits Team	164.0 meters
2nd	Shirley Lindgren	155.6 meters
3rd	Robert Thayer	149.2 meters

Due to an error in baseline measurement all NARAM-12 altitudes (as reported above) are about 30% higher than the actual achieved altitudes. The error only effects the reported numbers, the order of finish is correct. None of the altitude flights may be filed for U.S. or FAI records.

Space Systems

Junior		
1st	Sven Englund	1043 points
2nd	Gary Lindgren	927 points
3rd	Mark Wargo	805 points
Leader		
1st	Charles Russell	916 points
2nd	Richard Sternbach	696 points
3rd	Charles Duelfer	630 points
Senior		
1st	Jon Randolph	851 points
2nd	Howard Kuhn	795 points
3rd	Ball-Hagedorn Team	790 points

Sparrow Boost/Glide

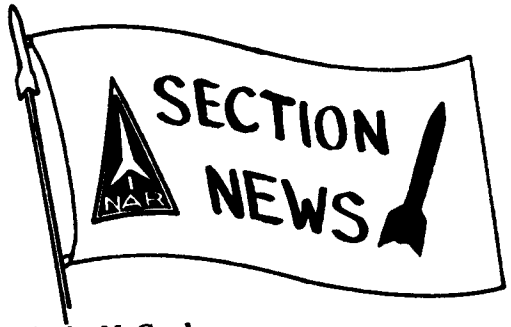
Junior		
1st	Steven Fentress	130 seconds
2nd	Andy Elliott	119 seconds
3rd	Carroll Yung	109 seconds
Leader		
1st	McMullen-Kennedy Team	100 seconds
2nd	Greg Scinto	81 seconds
3rd	Norm Wood	79 seconds
Senior		
1st	Donald Valkema	113 seconds
2nd	Howard Kuhn	86 seconds
3rd	Butterworth Team	73 seconds
	James Kukowski	73 seconds

Research & Development

Junior	
1st	Scott Layne
2nd	Gary Lindgren
3rd	Andy Elliott
Leader	
1st	Charles Andres
2nd	Christopher Williams
3rd	Norman Wood
Senior	
1st	Dr. Gerald Gregorek
2nd	Mr. & Mrs. Carl Guernsey
3rd	Richard Fox

OVERALL

Junior	
National Champion	**Gary Lindgren (Pascack Valley)**
Reserve Champion	**Sven Englund (Space Pioneers)**
Leader	
National Champion	**Charles Russell (CSAR)**
Reserve Champion	**Mark Evans (Apollo-NASA)**
Senior	
National Champion	**Shirley Lindgren (Pascack Valley)**
Reserve Champion	**Forrest McDowell (Apollo-NASA)**
Champion Team	**Ball-Hagedorn Team**
Champion Section	**Apollo-NASA, Houston, Texas**



By Charles M. Gordon

The following are the results of the "Quickie Survey" called for in the July '70 issue of Model Rocketeer. There were only the eleven sections below included in the results because they are the only ones (out of the over 100 now in the Association) who sent in their totals by August 15.

As of JULY 1, 1970 section memberships are:

SECTION NAME	City & State	# of Members
PASCACK VALLEY	Harrison, New Jersey	74
RANDALLSTOWN	Randallstown, Maryland	73
SANTA CLARA	Saratoga, California	54
ANNAPOLIS ASSN.	Annapolis, Maryland	49
TRI-CITY COSMOTARIANS	Gladstone, Oregon	48
AREVALOS	Santa Anna, California	40
THREE RIVERS	Pittsburgh, Pennsylvania	21
T.I.R.O.S.	Crystall Lake, Illinois	21
ROCKVILLE ROCKETEERS	Rockville, Maryland	17
BELAIR	Belair, Maryland	13
NORTHSIDE SECTION	Atlanta, Georgia	10

Hopefully, the next time a survey is taken there will be a better response from all the sections. Special thanks to the above mentioned sections for their cooperation.

* * * * * * *

On July 12, the Tri-City Cosmotarians (Gladstone, Oregon) gave a static display of Model Rocketry at the Mulino, Oregon Fly-In Air Show, at the special request of the Oregon Pilots' Association. The presentation included a description of range procedures, including launching, tracking, and data reduction.

* * * * * * *

The Northside Rocket Club Section (Atlanta, Georgia) has quite a few interesting R & D projects going. One is to send rockets up over a mile high with a camroc and radio transmitter both as the payload. Another is a "Soil Sampler" where the rocket lands, scoops up soil, and takes off again. A third has been termed "Cluster-Staging", where the engines are mounted atop each other, about a foot apart. They are ignited together. If all ignite, the effect is a cluster flight. If one fails, the rocket still flys straight. Work is going ahead on all projects.

* * * * * * *

The YMCA Space Pioneers (New Canaan, Connecticut) have a "Century Club", for those YMCASP section members who have 100

contest points or more for the current contest year.

* * * * * * *

The Steel City Section (Pittsburgh, Pennsylvania) has been working on a 5 minute sound and color film of the Section and its activities to be used as public relations material by the section. The film includes material from the 1970 convention and some clips from as far back as 1966. It is hoped by the time of this printing that the film has been completed. This is probably the first section film made including both color and sound.

* * * * * * *

To help hold member interest and attract new members the Northside Section (Atlanta, Georgia) will hold at least one club function each month. In November an all parent meeting is planned. In December a Falcons Game demonstration is planned if at all possible.

* * * * * * *

Congratulations to the Monroe Astronautical Rocket Society (Victor, New York) upon publication of Volume I Number 1 of their section newsletter "The Full Blast."

* * * * * * *

In June, members of the Zenith Section (Mankato, Minnesota) again gave model rocketry instructions to 22 teachers enrolled in the NASA workshop at Mankato, State College. All were very enthusiastic about the program and expressed their appreciation to the section for it's efforts.

* * * * * * *

The ZOG 43, newsletter of NARHAMS Section (Seabrook, Marlyand) reports that the first Capitol Area Regional was held on July 11-12, 1970 at Ft. George G. Mead, Maryland and that it ran very well. Due to the relatively small number of contestants (60-65) the atmosphere was relaxed. The NARHAMS, MARS, Rock Creek, Robert H. Goddard, Rockville Rocketeers, Wheaton Rocket Association, MARS, and SMART Sections participated in the competition.

* * * * * * *

On July 4, the TIROS Section (Crystal Lake, Illinois) participated with the Jaycees as part of the annual Independence Day program. There as a static display of various rocket kits built by section members, the club launch system, and two tracking scopes. There was also a demonstration launch held in the afternoon. It is estimated that over 5000 people saw the demonstration and display.

* * * * * * *

SPECIAL NOTE: If the official Section News reporter for your section has changed this past fall, please be sure and have the new name and address sent in to NARSN as soon as possible.

Thank You.

NAR Section News would also like to thank the following Section for submitting news or sending in correspondence for this issue. We hope you will all bear with us and keep sending in your monthly news.

PASCACK VALLEY SECTION * SOUTHERN MARYLAND AREA ROCKET TEAM * THREE RIVERS SECTION * TOFTOY SECTION * ARREVALOS ROCKET ASSOCIATION * N.O.V.A.R. SECTION * FAIRCHESTER SECTION * BELAIR ASSOCIATION OF MODEL ROCKETRY * MARS AREA ROCKETEERS * NORTH SHORE SECTION * SOUTH SEATTLE SECTION * RANDALLSTOWN ROCKET SOCIETY * ROCKVILLE ROCKETEERS SECTION.

To all of you we give a very big thanks.

NAR SECTION NEWS appears each month as a regular feature in *THE MODEL ROCKETEER*. Those sections wishing to have news and/or information of their section activities printed in this column should submit such material to:

NAR SECTION NEWS EDITOR
Charles M. Gordon
192 Charolette Drive, Apt. #2
Laurel, Maryland 20810

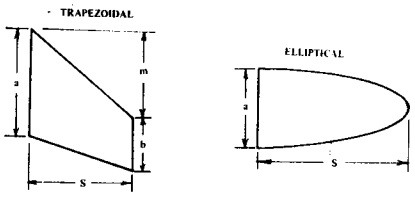
Elliptical Fin C.P. Equations

James S. Barrowman

In the last year or two, high performance model rockets have made use of elliptical planform fins. Elliptical fins are highly efficient because they produce a minimum of induced drag for a given amount of lift.

The fin normal force coefficient $(C_{N\alpha})_f$ and fin center of pressure $(\overline{X}_f)$ equations given in Centuri TR-33 "Calculating the Center of Pressure of a Model Rocket" are intended for a trapezoidal fin shape having the root and tip chords parallel. Trying to utilize the trapezoidal fin equations for elliptical fins is like trying to fit a round peg into a square hole.

Returning to the basic equations for generally shaped fins and applying them to the elliptical planform shape produces equations that are actually much simpler than those produced for trapezoidal fins. This occurs because the elliptical shape can be defined with half the number of dimensions required to define the trapezoidal shape.



Using the symbols from the Centuri report, the equations for elliptical fins are:

$$C_{N\alpha_f} = \frac{4n\left(\frac{s}{d}\right)^2}{1+\sqrt{1+1.623\left(\frac{s}{a}\right)^2}}$$

$$\overline{X}_f = X_f + 0.288\,a$$

The fin $(C_{N\alpha})_f$ chart given in Centuri TR-33 (Chart 4) can still be used to calculate the $(C_{N\alpha})_f$ of an elliptical fin. This is accomplished as follows:

Calculate $\frac{s}{d}$

Calculate $\frac{s}{a}$

Multiply $\frac{s}{a}$ by 0.638 to obtain an equivalent $\frac{1}{ab}$ values to Chart 4 in TR-33 to get the $(C_{N\alpha})_f$ for four fins.

As stated before, the elliptical fin equations were derived by applying the basic equation for a general shape to the elliptical shape. However, the elliptical fin $(CN\alpha)_f$ equation can be derived directly from the trapezoidal fin equation. How? Thats a brain teaser for the equation shufflers in the crowd.

CHANGE OF ADDRESS

NAR members, when you move, please send your change of address to NAR HEADQUARTERS - not to Model Rocketry Magazine.

DEALER

DIRECTORY

●●●●●●●●●●

Hobby shops desiring a listing in the **Model Rocketry** Dealer Directory should direct their inquiries to Dealer Directory, Model Rocketry magazine, Box 214, Boston, MA 02123. Space is available only on a six month contract for $18.00, or a twelve month contract for $35.00, payable in advance.

●●●●●●●●●●

CALIFORNIA – Mt. View
Model Rocket Supplies
SAN ANTONIO HOBBY
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Complete Selection
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CONNECTICUT – Bridgeport
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Mail Orders Ph: 654-5022

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(302) 994-0281
9:30 AM to 5:30 PMWed, Th, Fri to 9 PM

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7:30 - 6 Mon. to Sat. 813-677-6310

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9 AM - 5:30 PM Thursday to 8:30 PM

MASSACHUSETTS – Melrose
MIDDLESEX COIN, STAMP
& HOBBY SHOP
473 Main Street
02176 662-8319

MASSACHUSETTS – Walpole
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PO Box 244
Walpole, MA 02081

NEW JERSEY – Burlington
FREEDMAN'S GIFT & HOBBY SHOP
228 High Street
Thurs - Fri: 9-9
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NEW JERSEY – Edison
Complete Rocket Supplies
EDISON CYCLE SHOP
238 Plainfield Ave.
Estes, Centuri, MPC, Bo-Mar, SAI, etc.

NEW JERSEY – New Brunswick
STEVE VARGA'S HOBBY SHOP
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(201) 545-7616
Daily 10 AM - 7 PM Closed Sunday

NEW JERSEY – Princeton
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Rocketry is only one hobby section
Open Sundays 696-5170

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"World's Leading Hobby Store"
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Complete Line of Model Rockets
LARRY'S HOBBY SHOP, INC.
3018 Jerico Tpke.
Mon-Fri 12-9 PM Sat 10AM - 9 PM

(Club Notes cont.)

13 age group with a white and blue Astron Midget. Mark Hamblin took first in the 14 to 16 category with a pink Camroc Carrier. Kevin Coffey won in the 17 to 20 age division with a well done Saturn 1B. In the over 21 age group, David Metlock took first with an Astron Shrike.

The Wilkes-Barre Recreation Board sponsored a Moon Day to observe the first anniversary of the Apollo 11 moon landing. To highlight the ceremonies, Frank Walsh and David Rajchel launched a 44 inch tall Saturn V model rocket which they had constructed under the sponsorship of the Recreation Board.

The Oakdale Rocket Club in Royal Oak, Michigan staged a successful demonstration launching in Farwell Field near Detroit in late July. Under the direction of rocketeer Ken Jensen, the club launched a total of 14 rockets for the spectators.

Last summer saw a model rocket program taught by Karl Brierley featured as part of the summer school program at Mahwah High School in Ramsey, New Jersey. The model rocket activities were incorporated as part of the elementary science program offered at the school.

A new model rocket club is being formed in the Hampton, Virginia area. Interested rocketeers should contact Mike Conley at 99 Fort Worth, Hampton, VA 23369.

Send your club or section newsletters, contest announcements and results, and other news for this column to:

Club News Editor
Model Rocketry Magazine
P.O. Box 214
Astor St. Station
Boston, Mass. 02123

ARE YOU MOVING?

Every day we get a handful of address labels back from the post office with either a change of address on them or a note that the subscriber has moved and left no address. The magazines are thrown out and just the address label is returned.

Please don't expect us to send you another copy if you forget to notify us in advance of an address change. Remember, it takes about 6 weeks to process an address change, so send us notitification of your address change at least 6 weeks in advance.

Club Spotlight:
First Wisconsin Meet

by David Burrows NAR #13370

WMRM I, Wisconsin's first state model rocket meet, was held at Whitewater, Wisconsin, on June 13, 1970. The meet, hosted by the Mariner Rocket Society Section of the NAR, was open to all modelers in Wisconsin. Seventeen rocketeers from Madison, Richland Center, Grafton, and Whitewater participated. There were 60 entries and 86 flights during the day.

The meet opened at 9:30 A.M. with Parachute Duration. Although the field was rather small and the wind was moderate, most rockets were successfully recovered, even though many landed on the high school roof nearby or drifted over it.

Eggloft Duration, as is usual in Eggloft events, was quite exciting. Two cluster catastrophies were followed by several chute failures. Then there was a shock cord failure in which the egg capsule separated from the rocket and fell about 200 feet. Unbelievably, the egg wasn't even cracked! The climax of this event was an F-powered bird flown by Tom Roberts of Richland Center. Luckily there was a good smoke trail to follow, but it didn't help because the rocket disappeared into the clouds, which completely covered the sky. Just as the judges were about to give up on it, it was spotted about 100 feet up. As it came down, it smashed into a telephone pole, but the egg was O.K. and Tom won the event with a time of 2:09.5.

Boost-Glide turned out to be rather strange, too. Several gliders did strange loops or broke up in the air, and some tangled with the pod parachute lines. Most were trimmed rather badly, so it was obvious that a lot of work still needs to go into building B/Gs and instructing people how to trim them. One interesting thing was the popularity of several designs. There were six Bumblebees flown and three Mantas. The most unusual design was a canard bird, which everyone thought was gliding backwards at first.

Like several other contests, we had our problems with airplanes, which is ridiculous because there isn't an airfield around and none of the previous Whitewater launches have been bothered by airplanes. The contest had to be held three times because of airplanes, including one crop dusting biplane, flying at betweent 50 and 100 feet directly over the launch area.

The contest ended with the awarding of certificates and trophies by Dr. L.R. Stonecipher of the Physics department of Wisconsin State University-Whitewater. All in all, it was very successful, especially as it was the first in Wisconsin. The Mariner Rocket Society is looking forward to another next year, and the establishing of this contest as an annual event.

Contest Results

Parachute Duration (5.00 n-sec max.)

1.	Brad Atkinson	MRS	1:43.0
2.	Michael Pusch	Grafton	1:42.9
3.	Paul Peckham	RR	1:31.5

Eggloft Duration (Open)

1.	Tom Roberts	RR	2:09.5
2.	Jim Veloon	Grafton	1:36.8
3.	David Lien	MRS	1:04.4

Boost/Glide Duration (2.5 n-sec max.)

1.	Tom Roberts	RR	1:08.5
2.	Bernard Biales	Madison	1:03.0
3.	Jeff Laydon	Grafton	0:57.2

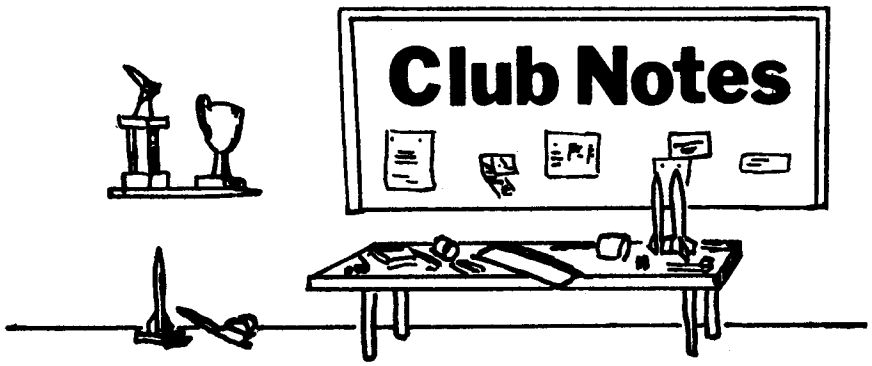
Streamer Duration (5.00 n-sec max.)

1.	Jeff Laydon	Grafton	0:49.6
2.	Michael Pusch	Grafton	0:46.2
3.	Paul Peckham	RR	0:42.6

Spot Landing (Open)

1.	David Lien	MRS	34' 1"
2.	Ed Roberts	RR	47' 1"
3.	Russell Schmunk	MRS	63' 8"

Tom Roberts receives a trophy from Dr. L. R. Stonecipher as Overall Champion at WMRM-1.



A new model rocket club, called the Legion of Aerospace Adventurers, is currently being formed in the Lynchburg, Virginia area. Model rocketeers over the age of 10 are invited to join. The club has access to extremely large flying fields, a library, and a workshop-lab. Other clubs in the area are also invited to contact the new group about the possibility of competitions. Rocketeers interested should contact Walter Haberer, Route 1, Box 452, Rustburg, VA 24588 or call 239-0073 between 5 and 6 PM any day.

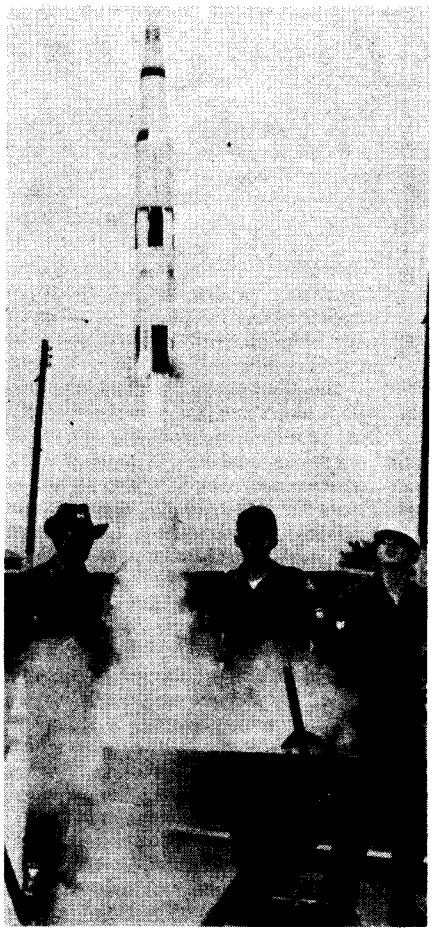
The first issue of *The Nova Rocketeer*, newsletter of the Spokane (Washington) Model Rocket Research Society, reports the results of the Northeast Washington Regional Championships. The Championships are a semi-annual event, with two events being flown each month over the six month period. Flown under WSMRA rules, the results were as follows: Bob Rile took First Class Altitude with 920 feet, Bill Geisler took Second Class Altitude with 1450 feet, and Bob Rile took Open Altitude with 2820 feet. In Craftsmanship Steve Rile won first place, while Bill Geisler took first in R&D with a project on fiberglass body tubes. In Set Altitude, with a target altitude of 500 feet, Bob Michner won with 460 feet. Bob Rile took first in the Spot Landing event with a distance of 189 feet from the target. In the B/G event Steve Rile took first with 64 seconds, and the Payload B/G was declared no contest since both entries failed. Overall, Steve Rile took first place, Bob Rile second, Bill Geisler third, Lynn Hurd forth, and Gary Brown fifth.

A new model rocket club is being formed in the Detroit, Michigan area. Rocketeers interested in joining are asked to contact Ed Zobeck, 19265 Tyrone, Harper Woods, Michigan 48225.

Mark Warchol would like to start a rocket club dealing with Vashon cold propellant rockets, boost/gliders, and jet planes. All interested rocketeers in the Portland, Oregon area are asked to contact Mark Warchol, 6425 N.E. 39th Ave., Portland, Ore. 97211 or call 281-2405.

Photo by Eric Max

On Sunday August 30th the Northern Virginia Association of Rocketry (NOVAR) held a public demonstration launching at a public park in Fairfax, Virginia. Lasting from 2 PM to 5 PM, about 100 flights were flown from NOVAR's new rack launchers. At one point about 200 spectators were counted. The crowd saw spectacular flights including several B/G's, a Camroc, and an Estes Saturn V. A cheer went up when the recovery system of the Saturn V finally deployed, just 15 feet above the ground. As a result of the launching NOVAR has gained a few new members, and the public in the area is better informed about the safety of the model rocket hobby.



CAP Photo by Capt. Larry Loos

An Estes Saturn V model clears the launcher on a successful demonstration flight during the recent Group I, Civil Air Patrol encampment, held at Northampton, Mass. Cadet squadrons of the Group held their first model rocket competition, featureing three events and trophy awards sponsored by the Chicopee Chapter of the Air Force Association. The meet was held according to the sporting code of the National Association of Rocketry.

A new club named the "Meteorites" is being organized in Chicago. Launchings will be held in Rainbow Park. Rocketeers interested in more information can contact Peter Flotz, 7124 Coles Ave., Chicago, Ill. 60649.

A model rocket club is being formed in the Donelson area of Nashville, Tennessee. Interested rocketeers should contact Charlie Siler, 2914 McGavock Pike, Nashville, Tenn. 37214.

Estes Big Bertha kits were awarded to four members of the Central Illinois Model Rocket Association in the club's first contest – a craftsmanship event. The entries were judged on the workmanship display by the painting, glueing, and overall appearance. Gary Hicks' won in the under

(Continued on page 38)

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