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August 1969
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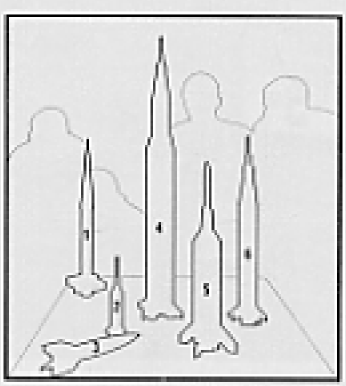

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Model Rocketry

Volume I, No. 10
August 1969

Editor and Publisher	George J. Flynn
Managing Editor	Gordon K. Mandell
Business Manager	George J. Caporaso
Distribution Manager	Thomas T. Milkie

Cover Photo

A model rocket climbs before a crowd of spectators at ceremonies opening the First Annual Aerospace Modeling Activities at the Smithsonian Institution on Saturday, June 7. The demonstration launching, with the capitol in the background, was prepared by the National Association of Rocketry. An article on this event begins on page 24. (Photo by George Flynn.)

From the Editor

This month **Model Rocketry** introduces a new dimension to the hobby–the radio controlled boost glider. There are several apparent advantages to radio control. First, it provides the ability to seek out the sometimes elusive "thermals" and thus increase flight durations. Second, the ability to circle a field and bring the glider to a landing literally at the feet of the modeler will make better performing gliders possible without increasing the risk of losing the glider because it flies outside of the field.

The radio controlled boost glider has been thought about for a long time. Several years ago Bernard Biales worked on such a glider. There are probably several radio controlled boost gliders, other than the one described by Doug Malewicki in this issue, flying right now. In the last few weeks, I've seen at least two in various stages of construction and heard talk of many others. The reader response to George Caporaso's mention of radio controlled rockets and boost gliders in his *Technical Notes* column indicated that the hobby is ready for this development.

What's to be done now? Radio controlled boost gliders are new. Like any new field, there's much to experiment with. As this aspect of the hobby develops, a new area for competition should emerge. Initially, duration contests could be held, as soon as two or three modelers in an area have built their RC boost gliders. However, spot landing competitions are also a possibility. Perhaps we can even have stunt flying

(Continued on page 47.)

Regular Features

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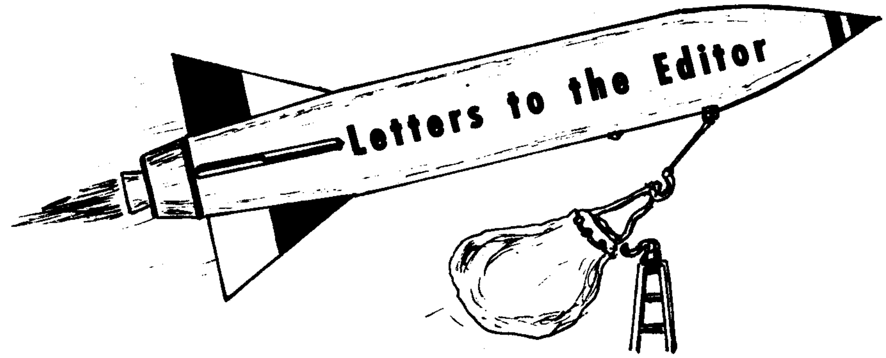


Metric Dimensions?

I would like to know why you do not put metric dimensions on the drawings and in the articles that accompany them. It seems as a step in that direction you are using the decimal inch. If you won't convert all to metric you could at least dual dimension. I do appreciate the dual scale that the articles by G. Harry Stine include. He also wrote some articles for **American Modeler** in which he had drawings of all metric. To put my money where my mouth is, as the expression goes, I have been buying my model kits from Flight Systems, Louisville, Colorado. They seem to be the furthest along in conversion, but I didn't see their ad in your magazine

Ralph Orsi
Prophetstown, Ill.

Our policy on dimensioning has been to allow the author to choose for himself whether to use the metric or English system of units. This allows an author to submit a design article for a rocket already constructed without converting the dimensions from one system to another. While the NAR has adopted the metric for engine specifications, most of the major model rocket manufacturers have retained the English system for specification of part sizes. Body tube diameters, nose cone lengths, and sheet balsa thicknesses are specified by the manufacturers in inches. Thus most modelers use inches in their rocket plans. Until the manufacturers adopt the metric system for parts dimensions, it will not come into universal use by modelers. If balsa wood is produced 1/32" thick, the modeler will more likely dimension his rocket as 1/32" rather than 0.94mm. However, if any modeler submits his drawings dimensioned in the metric system, you can be sure **Model Rocketry** *will publish them with metric dimensions.*

Hobby Shops

We have been selling your magazine since its release, and I am pleased to say that it's going extremely well.

In your current issue, May 1969, you have requested material for inclusion in your coming issues. I am pleased to say that I've shown this request to several of my more experienced customers and feel that eventually they will indeed be submitting material.

I hope you have much success in the publication of your well received magazine.

G. H. Malone
President
Craftown Hobby Shop
Reynoldsburg, Ohio

Enough of this Madness!

Many a model rocket enthusiast has sat down for hours with his many catalogs and 12 pieces of paper, trying to decide which parts he needs for the rocket he is designing. With the sophistication of model rocketry today, you would think there would be more uniformity!

For example, you are building a large payload rocket that will use an 'F' series engine to power it. In choosing the parts needed, starting with the engine, you find only one manufacturer makes NAR–

Movie Camera Designer

At the time of publication of the June 1969 issue of *Model Rocketry*, the identity of the designer of the movie camera mentioned in the editorial was unknown. However, we have received a recent communication from him and would like to take this opportunity to recognize his accomplishments.

The camera mentioned was designed by Michael K. Dorffler of Grand Island, Nebraska. He initiated the model rocket movie camera project over three years ago, in order to develop a camera which would not require an F class engine or a cluster. His project has been successful, and he has filmed such sequences as ignition, staging, parachute deployment and opening from a model rocket.

approved 'F' series engine, but he doesn't make large body tubes. So to the catalogs again. After finding the tubes, again to the catalogs for the adapters, and again for the engine mount. Finally, you end up with 20 different stock numbers from 4 or 5 different manufacurers. This can be very frustrating; especially when you stop to think that you have to wait 3 or 4 weeks before your entire orders arrive, just to *begin* building your rocket. After building several rockets in this manner, you are left with 50 pieces of body tubes of various sizes and no way to adapt them-the urge to burn them all surges up.

Well, I say, "Enough of this madness!", and ask this–'Why don't the manufacturers get together?' They could select several body tube diameters and make them standard, beginning with a tube to fit each of the various engines: one for the A-D engines and one for E and F engines. To these they could add 6 more sizes to fit several popular designs. In addition, each manufacturer would add specially-sized tubes to fit his particular rocket designs. And each could produce a variety of balsa and paper adapters for combini ng the tubes.

To this, a manufacturer might answer that his sales would drop-but would they? Wouldn't it be better to sell a greater quantity to fewer people than a small quantity to many people? Besides, the competition would be keener if he could offer a greater quantity of rocket designs and equipment. An enthusiast would buy his entire materials from one manufacturer instead of from 4 or 5. Naturally, the number of customers from each company would drop, but the volume of business would increase.

But my greatest concern is for the hobby itself. Wouldn't this uniformity and convenience tend to prolong the life of the sport of model rocketry? Wouldn't it prevent from happening the very thing that happened to slot cars? That sport died at the hands of the manufacturers, who overtrashed the stock of the tracks. If model rocketry is kept from this fate, both the manufacturer and the enthusiast would benefit and continue to enjoy the thrill, experience and knowledge gained from model rocketry.

Alan Bean
Attleboro Falls, Mass.

There's only one problem (aside from the problems it would cause the manufacturers) with your suggestion–scale modelers. It's hard enough now, with 16 different body tube sizes available, to scale a two stage model with two different body diameters. If the manufacturers were to produce only five or six standard sizes, the scale modeler would be forced to make his own body tubes. Furthermore, it would make it difficult for the manufacturers to offer good lines of scale kits themselves.

Technical Notes

I noticed that in George Caporaso's *Technical Notes* in the June issue he brought out the point that the general public's view of model rocketry is that it is just a toy that starts out with a bunch of kids and hangs on to a few adults. Since the press is the major contributor to public opinions, shouldn't it be the duty of clubs to impress upon their local newspaper that model rocketry is not only "fun and games" but has an increasing role in scientific research. In short I would suggest to any club with the proper equipment that it conduct a fairly conspicious series of tests relating to preplaned research project at a launch, contest, or demonstration meet at which the news media is present. But don't just do this and expect a reporter to write all about it. Have someone who can answer questions about the project tell an on-the-scene reporter what is going on.

In addition to getting a point across (assuming the reporter has made some mention of the project in his article) the public may take a better interest in model rocketery.

Please note: since you, Model Rocketry. Inc., are part of the news media I think (and probably you too) that the idea I have expressed in the last two paragraphs should be made known to your readers in order that, among other things, George Caporaso may be pleased.

I wrote to you a few months ago that I was planning which involved launching a gerbil and telemetering its bodily and altitude, acceleration, temperature, etc. to the ground. As yet the only source of information I have found on transmitters and sensors is you. I'm trying for the actual sound circuit from Heathkit and Lafayette, any more suggestions? You have recently in your May and June issues provided me with just the info I wanted but I would like to go along with my project faster than your printing press and monthly schedule.

If I wait for your press I might be able to have to have the project done by August 1970. If you would, please help me by sending me the circuit diagrams of sensors for humidity, altitude, acceleration, roll rate, and audio.

I also need a transmitter for pulses of about 75 millivolts (don't worry if you can't get this, I think I have another source). I should have the project finished by October or November and a report about it to you along with a circuit diagram for telemetry of staging time. I can't definitely guarantee this but if I clear the financial problem out of the way (understand I am not asking for money, you will have done more than your share for me by sending me the requested information) the show will go on the road at an increasingly faster rate.

I also have a specific question to ask about multi-data telemetry. The question is; is it possible to transmit and recieve over the same channel more than one type of data such as altitude and temperature simultaneously or practically so?

I have another specific question on the same subject. Can information telemetered on two or more different channels be recorded on the same tape (magnetic recording) simultaneously.

I may quite possibly get support of my project from the NAR Monroe Astronautical Rocket Society (MARS) of which I am a member.

Soon I will be sending you some pictures taken at a recent contest of MARS and an article in answer to your solicitation of material.

Thank you very much for Gordon Mandell's previous response to my questions about telemetry.

Robert Staehl
Rochester, New York

Technical Data

I wish to compliment you on your extremely fine publication. Please continue to make the hobby/sport of model rocketry an exacting science by continuing to provide readers with a well-balanced diet of technical/non-technical articles.

I disagree with the comments made by Mr. Orr that the technical aspects of the hobby make it so complicated the youngsters lose interest. The fact is that the technical side of the hobby promotes adult interest and the youngsters' interest in the non-technical aspects follows naturally. To keep fathers and sons together in a common interest you must satisfy both the child's and the adult's interest.

Let's see more articles on transmitter payloads. I am building the one in the May issue with great interest.

Ronald C. Lorenz
Willingboro, New Jersey

SOLICITATION OF MATERIAL

In order to broaden and diversify its coverage of the hobby, MODEL ROCKETRY is soliciting written material from the qualified modeling public. Articles of a technical nature, research reports, articles on constructing and flying sport and competition models, scale projects, and material relating to full-scale spaceflight will be considered for publication under the following terms:

1. Authors will be paid for material accepted for publication at the rate of two dollars ($2.00) per column inch, based on a column of eight-point type thirteen picas wide, for text, six dollars fifty cents ($6.50) for drawings, and two dollars ($2.00) for photographs accompanying text. Payment will be made at the time of publication.

2. Material submitted must be typewritten, double-spaced, on 8½ by 11 inch paper with reasonable margins. Drawings must be done in India ink and must be neat and legible. We cannot assume responsibility for material lost or damaged in processing; however our staff will exercise care in the handling of all submitted material. An author may have his manuscript returned after use by including a stamped, self-addressed envelope with his material.

3. Our staff reserves the right to edit material in order to improve grammar and composition. Payment for material will be based on the edited copy as it appears in print. Authors will be given full credit for published material. MODEL ROCKETRY will hold copyright on all material accepted for publication.

Those wishing to submit material should send it to:

Editor, Model Rocketry Magazine, Box 214, Boston, Mass. 02123

Now, the Ultimate in Model Rocketry...

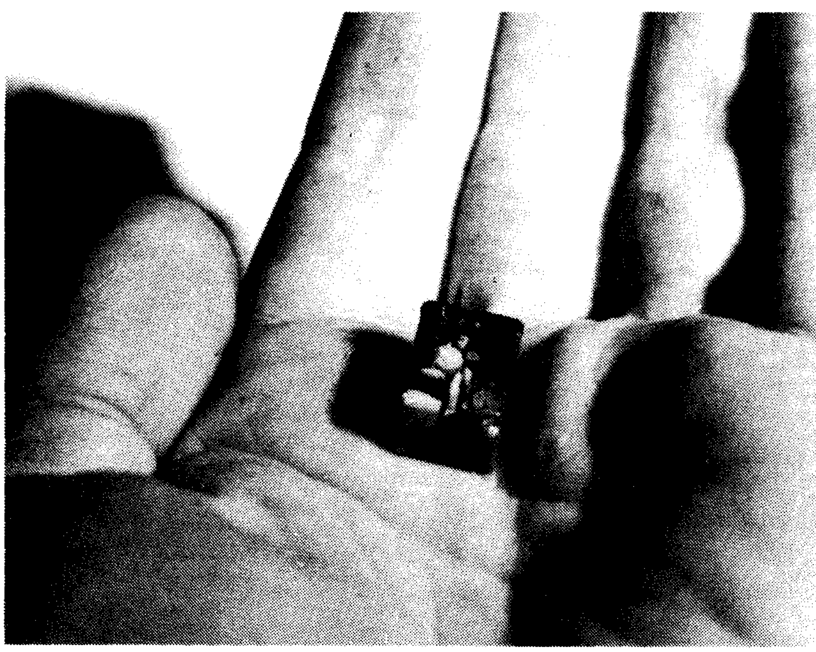
THE RADIO CONTROLLED BOOST/GLIDER

The first in a series on the art of rocket glider control by radio

by DOUGLAS MALEWICKI

In the past, success with radio controlled model rockets, and boost gliders in particular, has been severely limited by the weight of the electronic equipment. By utilizing available miniaturized components along with some new thoughts regarding the gliders themselves, the radio control concept has finally become a workable reality. The design presented here evolved gradually since my initial radio control boost glider experiments back in 1967. I now feel that it is in a relatively simple form which can be reliably duplicated by experienced rocketeers.

With this steerable glider, flight durations, using B4-2 engines, are consistently around one and a quarter minutes. While this is not exactly what one would call poor performance, neither could one expect to set any records with it. At present, the only record claim I have for the R/C glider is for "tying up the most money in a single model rocket". It costs about $100, with most of the money going for the radio equipment. When compared to the amounts that R/C model airplane enthusiasts pay for their multi-channel proportional radio gear, $100 is really not very expensive. However, when you are accustomed to spending only $1 or $2 total for rocket models which can be suitable for national competition events, $100 is indeed a large sum.



The miniature 0.17-ounce Bentert receiver.

The Radio Components

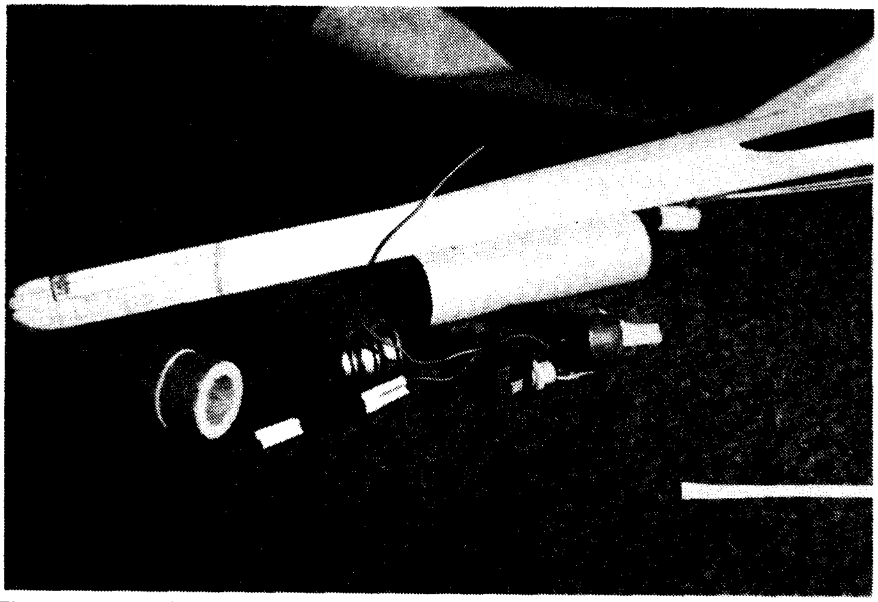
The key to the success of this project is the Bentert radio receiver shown below.

It weighs 0.17 ounce and its dimensions are approximately .4" X .4" X .55". The Bentert receiver is imported from Germany by Polks Hobbies in New York and it is just perfect for model rocketry applications *because* all the electrical components are permanently sealed in solid epoxy. As a result, it is virtually crash-proof and I personally don't even bother to cushion it in foam rubber as per standard model airplane receiver practice.

The Bentert receiver, its small companion actuator, and the rechargeable 50 milliamp-hour Nicad batteries all fit very nicely inside a Centuri No. 7 or Estes BT-20 body tube as can be seen from the following photo.

Pulse Proportional Steering

If you are one of the many model rocketeers unfamiliar with radio control (R/C) terminology, an explanation of pulse proportional is in order. Basically, the transmitter sends a pulsing rather than a continuous signal to the receiver. All a signal to the receiver does is switch on electricity to the electromagnet in the actuator. This, in



The complete radio control system is entirely contained in a standard 3/4-inch diameter body tube.

turn, *pulls* the actuator's torque rod from its position of rest to its maximum angular position. When the signal to the receiver stops, a spring in the actuator pulls the torque rod back to its rest position.

Now if the torque rod is hooked up to give full left rudder in its rest position and full right rudder in its maximum position, you can see that *sending* a signal to the receiver will cause a right turn and *not sending* a signal will result in a left turn. If you wanted to fly straight ahead, you could continuously alternate between steering to the right (signal on) for a short time and then steering to the left (signal off) for an equal amount of time. Also, if you spend slightly more time with the signal on (right rudder) than with the signal off (left rudder), you obtain a very gradual right turn.

In essence, this is exactly what the transmitter does for you but at a much faster rate of about 5 on-off periods each second (or 5 cycles per second). Thus, you can see naming it a *pulse* transmitter makes sense. Moving the control lever on the transmitter automatically varies the portion of the cycle time spent with the signal on, in relation to the time spent with the signal off.

The "proportional" part of the terminology means that you can obtain effective steering commands in exact proportion to the amount of turn you desire. The word merely distinguishes this more precise method of control from the more limited full left, full right, and neutral functions obtained with an escapement type system. With this background information, the following illustration should now make some sense.

As you can see, this is a lot of back and forth rudder wiggling. By now you might have already concluded that according to Newton's third law (action = reaction) a glider using such a system will be similarly wiggling its way across the sky. True—except that the aerodynamic forces generated by the deflected rudder are pretty small. You will find that during actual flights there is no visually detectable wiggle in the airplane's motion.

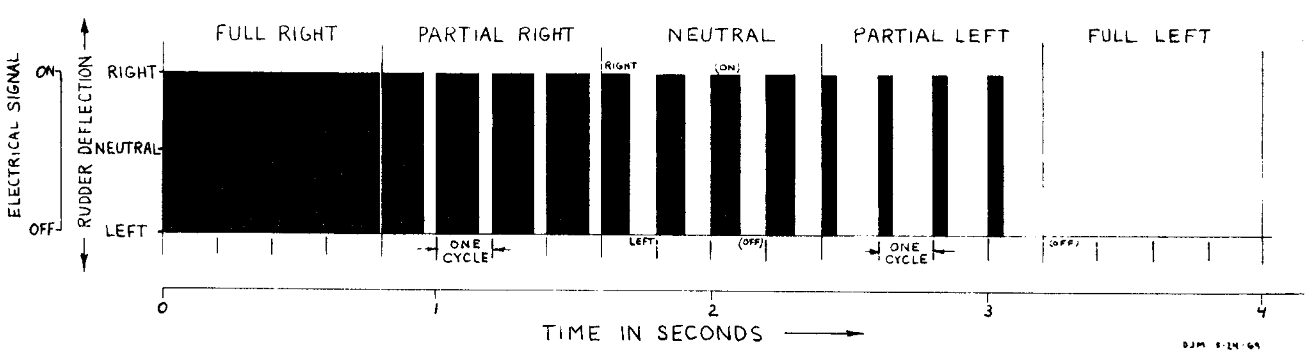
Flight Characteristics

In its existing form, the radio control boost glider can by no stretch of the imagination be considered a quick response stunt ship. The small available torque from the miniaturized actuator in combination with the limitations of the present rudder design means that effectively you are just re-trimming the plane to fly in a desired direction. Basically, this means that you can't steer it acurately enough to land it back in your hand after each flight which, of course, is the ultimate goal! Getting a lot more minds involved in R/C B/G development, however, should cure this.

Using an aerodynamically balanced and mass balanced rudder would result in a lot more steering control force for a given input torque. I haven't tried this as yet because I am concerned that flutter may occur during the high speed boost phase with unknown results, The same is true for the actuator moving a rudder *tab* rather than directly operating the entire rudder surface. Both ideas are top priorities for future experiments, though.

As is, even though radio controlled, you can expect to do a little chasing in strong winds. I have flown the present R/C B/G twice in gusty 15 MPH winds and both times I tried in vain to keep it headed upwind and directly above. The eventual landings were about 150 feet downwind from the launch pad. Now this is really not bad when one considers that the pop-pod landed *beyond* the glider in both cases by a good 50 feet. Note that this pod had a 12 inch chute with a 6 inch diameter hole in it

PULSE PROPORTIONAL STEERING COMMANDS



for minimum drift and it was *down* in about *20%* of the time the glider was airborne. If a neutral setting was kept on the glider throughout such flights, I think it would have landed some 500 to 1000 feet downwind.

On a nice, hot, calm day you can expect excellent flight results. It is not as near the mentally busy situation as flying in high winds–you can leisurely enjoy it and can get a better insight into turning response and overall flight characteristics. This is a long cry from the original R/C B/G (with its many assorted problems and reliability pecularities) that I took along to NARAM-9 back in 1967. Due to some pretty high winds, I passed up the pleasure of entering the spot landing event as intended. Nor was it entered in any of the boost glide events because its duration at that time was embarrassingly on par with a streamlined brick and, as such, even with B.8-2 power you could barely obtain two definite turns before she was back on the ground. Since then, the basic glider has been reduced in weight by 40%, strength has been greatly improved, and radio reliability upped to the point where it is of no concern whatsoever.

The glider in the photos weighs in at 1.7 ounces including the Bentert receiver, actuator, and batteries. Using B4-2's, flights generally average just over a minute in duration and if the transition-to-glide after pod separation is real smooth, the durations are closer to a minute and a half (times are for calm air non-thermal conditions).

Performance With Other Engines

Using the performance graphs in Centuri Engineering's TIR-100 report along with known lift-off weights and measured stop watch times to peak altitude, it appears that a C_DA (Drag Form Factor) of 4.0 is just about right for the boost configuration. Knowing this helps to explain why the present R/C B/G design must be restricted to B4-2 flights.

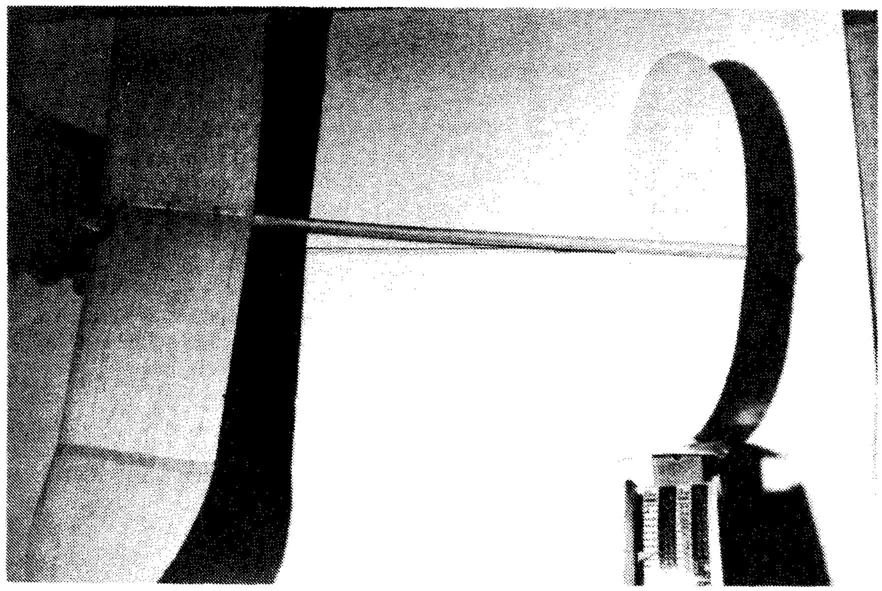
As you may already know from experience, high performance pop-pod gliders with 0^o incidence angle between wing and tail surfaces have one bad habit. They usually can't recover if ejection and pod separation occur *after* peak altitude has been passed and a dive back to earth has started. This phenomena is called a "death dive" by model rocketeers and is easily avoided by using only those engine delay times which insure ejection and pod separation before the peak altitude.

It turns out that even the fastest ejecting "A" engine (the A5-2) and the fastest ejecting "C" engine (the C6-5) cannot be used since in both cases the boost glider will have passed its peak by the time ejection finally occurs. (Dear Mr. Estes . . . the letter goes . . . How soon do you expect to be producing C6-3 engines? . . . Yours truly . . .). Anyway, a cluster powered pop-pod remains an alternative to obtaining more altitude without the death dive problem. However, that would be an interesting development program in itself which I probably won't undertake unless Mr. Estes persists in ignoring my bi-weekly mimeographed letters requesting that he *please* develop and make available C6-3's. I'd even be willing to name the R/C glider an Astron something-or-other in return.

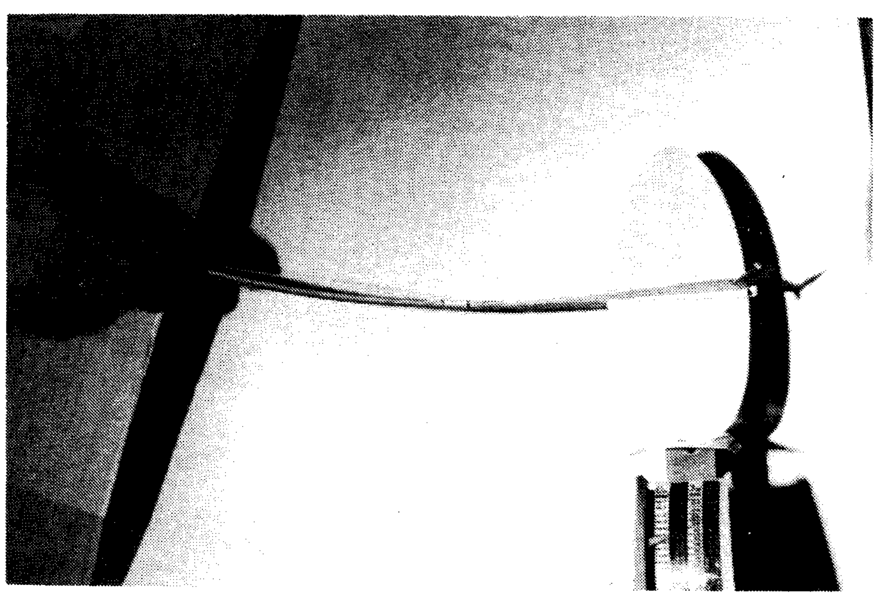
Design Innovations

Actually, this is not the real reason why the glider does not have a fancy space-age name in accordance with the usual practice. Instead, it is because each design evolution, each improvement, and all such other tremendous strides forward merely brought the appearance and construction of the resulting "super" glider that much closer and closer to existing HAND LAUNCH glider designs. The name if I was being honest, would have to be something like "ye olde H/L conglomeration".

Model rocket boost gliders have been in existence since 1961 when John Shutz luanched the first rear-engine B/G. In 1963 Larry Renger, an MIT aeronautical engineering graduate and hand launch glider record holder, invented the front-engine boost glider (Sky Slash II) and subsequently advanced the whole idea another step forward with his basic pop-pod concept back in 1965. Would you care to take a guess at how long the hand launch glider enthusiasts



The deflection of a 1/4-inch thick spruce body with an applied tail load of 7 ounces.



The deflection of a 1/8-inch thick spruce body with an applied tail load of 5 ounces.

have been optimizing their designs? I'd estimate it to be at least an order of magnitude longer than we rocketeers have been trying to to improve ours.

A reasonably well built hand launch glider is very light and extremely strong–with enough wing area to really float along and hook those thermals. My experiences over the last couple of years have me convinced that a successful boost glider must first be a successful hand launch glider. This means building it using hand launch glider methods and materials–then flying and trimming it as a hand launch glider.

The radio control boost glider for this article went through three major steps before finally becoming what it is. STEP 1–It started out life as a pure hand launch glider, including plywood finger rest for throwing. STEP 2–After many, many hand launch flights, it bacame a pop-pod B/G by merely drilling a hole in the body to accommodate the pop-pod. First and all subsequent rocket powered flights worked fine. This, I feel is due to all the time spent trimming the craft out as a hand launch glider. STEP-3–The underslung R/C POD, movable rudder, etc. were added and again consistent and successful flight characteristics were obtained.

Wing Loadings

In its pop-pod glider development phase, the glider weighed in at .75 ounces. This is pretty light especially when one considers that it has 56 square inches of wing area or a wing loading of 1/75 once per square inch. If you have been keeping up with boost glider progress, you are probably aware that recommended wing loadings lie between 1/30 ounce per square inch and 1/60 ounce per square inch.

This last figure is considered a "structural limitation" implying that gliders with lower wing loadings will necessarily be weak and structurally inadequate. My conclusion can only be that it is time to revise the wing loading criteria because this 1/75 ounce per square inch bird is among the strongest and most durable gliders I possess.

When I first started digging around for new ideas from old hand launch glider plans, I found that 1) just about everyone used skinny 1/8" thick spruce for the body, 2) most used a 1/4" thick four panel polyhedral wing with simple Clark Y airfoils, 3) some used composite wings of hard and soft balsa, 4) a few got carried away with exotic airfoils, and 5) most everyone had their own special technique for throwing and trimming their gliders.

The spruce body sounded like a good idea to try out first, but after feeling how flimsy the 1/8" thick material was at the local hobby shop I decided that 1/4" thick would be more suited to higher acceleration, higher speed model rocketry use. I found out that, yes, spruce was very much stronger than a balsa body and it even stood up fairly well against the death dive and its hand launching equivalent. I also found out that polyhedral wing gliders transition-to-gliding flight better than did equivalent two panel dihedral gliders. I learned later that the composite wing, which is actually more than 75% soft balsa, saved gobs of weight without really degrading the structural strength.

About a half a year ago I finally tried using the 1/8" thick spruce and to my surprise discovered why the experienced hand launch glider people keep using it. Flimsy was a misnomer for it. Springy and energy absorbing is more correct. Gliders made of 1/8" spruce survive bad hand launch crashes that would crack 1/4" spruce and would totally destroy a balsa body. The apparent flimsiness takes some getting used to before you can appreciate it.

As you can see from the photos, the glider body made of 1/4" thick spruce barely deflects with a load of 7 ounces, whereas the deflection of the 1/8" thick body is already very large even at a smaller load of 5 ounces. For a static loading such as shown in the above photos, it is true that the skinny member would fail first. A crash, however, is a dynamic situation and the more the structure can "give", the more impact load it is capable of absorbing. All this, plus we have eliminated half of the body weight at the same time.

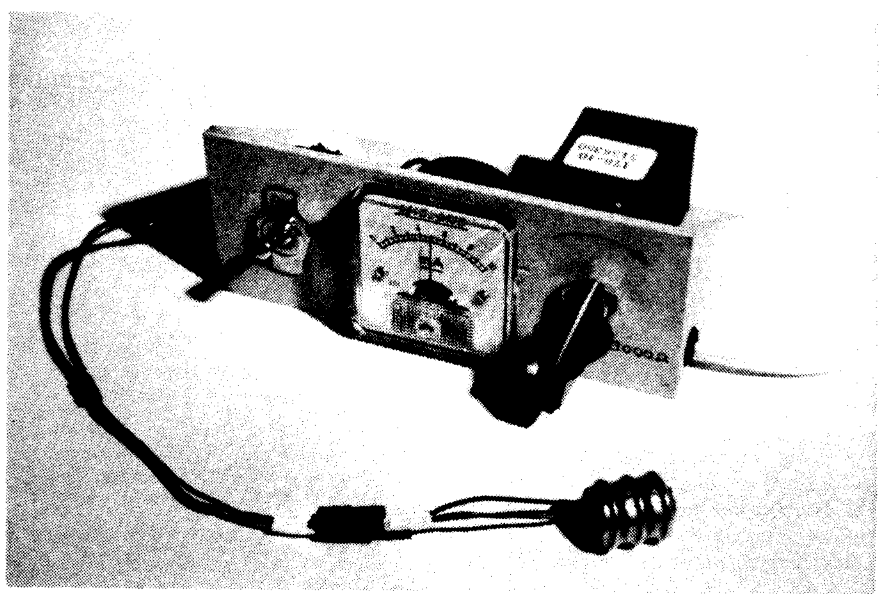
Before getting into the construction of the basic hand launch glider, we need to digress to mention a word about the control line cables and about building a low-current battery charger.

In order to eliminate most of the weight, friction and bulk of the usual torque rod to rudder installation, I went to control cables. These are made by unraveling a multi-strand ½A dacron U-control line into two main filaments and choosing one for use as the cable. The back and forth rocking motion of the actuator is converted to tension pulling forces on the rudder horn by simply passing the cable through an eyelet as shown on the R/C POD plans. Suitable hinges for the movable rudder surface are made by further unraveling the strands one more time.

Nicad batteries are usually recharged at an amperage level of 1/10th their rated capacity for a period of 12 to 14 hours. Thus, our 50 milliamp-hour rated battery will need a current no higher than 5 milliamps (.005 amp) for proper charging. A charger can be built as outlined in G. Harry Stine's May 1969 **Model Rocketry** article (page 17). Note that the ammeter used must be a 0 to 10 milliamp meter rether than the 0 to 1 amp meter required for the ignition cell recharging application. Also, the variable resistor will have to be 1500 ohms or above, instead of 50 ohms.

The 0 to 10 milliamp meter will burn out if you try to use it for the high current application of Stine's article. However, if you obtain a precision resistor with a value equal to 1/100th the stated catalog resistance of your 0 to 10 milliamp meter, you can convert it into a 0 to 1 amp ammeter. Installing the resistor in series with an additional on-off switch across the ammeter terminals essentially gives you a dual range meter useful for either application. Unfortunately, things don't work the other way around. If you already have a 0 to 1 amp meter, you will still have to get a 0 to 10 milliamp meter.

Next month **Model Rocketry** *will contain detailed plans for the glider itself.*



A homemade low-current nicad battery recharger (note the 50 milliamp-hour battery pack in the foreground).

RC Boost Glide Parts List

LIST OF REQUIRED EQUIPMENT AND SUPPLIES

A. Radio Control Equipment

Bentert Receiver
Small Bentert Actuator
Webra Picco Pulse Transmitter

Available at a package price of $89.95 from:

Polk Hobbies
314 Fifth Ave.
New York, New York 10001

B. Rechargeable Battery

3.6 Volt 50 Milliamp-hour Rated Nickel-Cadmium Button Cell Battery (Catalog No. 3.6V/50B)

Available at a price of $2.45 each C.O.D. from:

Gould-National Batteries, Inc.
931 North Vandalia St.
St. Paul, Minnesota 55114

C. Battery Charger Components

0 to 10 Milliamp Ammeter
On-Off Switch
0 to 3000 Ohm Variable Resistor

Available from your local electronic shop or by mail from Lafayette or Allied Radio

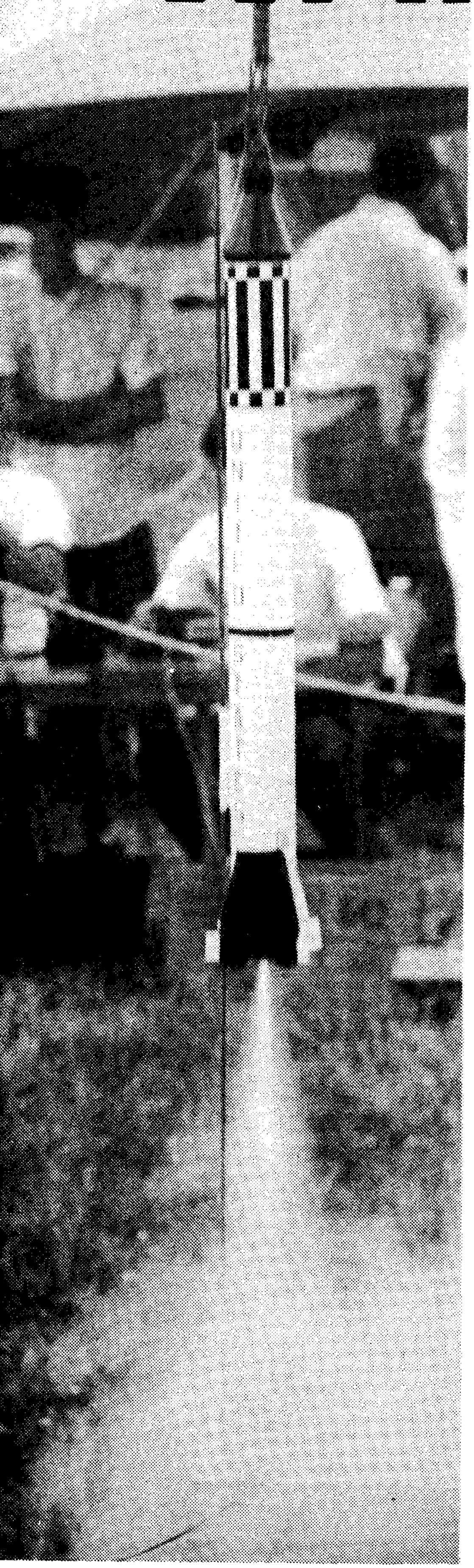
D. Other Supplies
Available at your local hobby shop.

1. Deans Pin Plug Connectors
2. R/C Hookup Wire in Assorted Colors
3. Titebond (or white glue) and Epoxy Glue
4. Dacron Thread (sold as control lines for ½A airplane models)
5. 4" X 8" X 1/32" thick sheet plywood
6. 3" X 36" X 1/4" thick soft balsa for wing
7. 1" X 36" X 1/4" thick hard balsa for wing
8. 3" X 36" X 1/16" thick medium balsa for tail surfaces
9. 36"X 1/2" X 1/8" thick Spruce for body (no warps or flaws–should be all lengthwise grain)
10. 1/16" diameter brass tube or solid rod
11. Package of eyelets
12. Modeling clay for ballast and trimming

E. Model Rocket Supplies

2 Body Tubes (Estes BT-20 or Centuri No. 7)
2 Nose Cones (Estes BNC-20B or Centuri BC-70)
1 Engine Holder
1 Thrust Ring
1 12" Diameter Parachute
1 Screw Eye
1 Shock Cord
1 Launch Lug

Results from WAMARVA-1



Despite the rain, the Washington-Maryland-Virginia regional model rocket competition drew big crowds of rocketeers for lots of action

WAMARVA-1, a regional competition for NAR members in the Maryland, Virginia, Deleware, Pennsylvania, and the District of Columbia, opened Saturday June 14. The weather report was for thunderstorms, but the sky was clear as the Star Spangled Banner Section's 15-star American flag was raised over the field. Over 100 rocketeers participated in the meet, sponsored by the MARS Section, and held at Andrews AFB, Maryland.

Col. Amend, representing the Andrews Base Commander, welcomed the participants and spectators, and then pressed the firing button launching the first rocket of the meet. After a series of demonstration flights, the competition, already delayed almost an hour and a half because of an early morning rainstorm, opened with the design efficiency event.

The object in design efficiency is to achieve the highest altitude per unit of total impulse. The tracked altitude is divided by the total impulse of the engine employed to give the design efficiency. Tracking was expected to be difficult because of the overcast white sky. However the tracking teams performed superbly, and very few tracks were "lost".

Tower launchers were used by several contestants in order to eliminate the drag due to the launching lug. Other rocketeers, particularly those from the Metropolitan Area Rocket Society (MARS), eliminated launch lug drag by employing the pop-off launch lug developed by Col. Howard Kuhn of Competition Model Rockets.

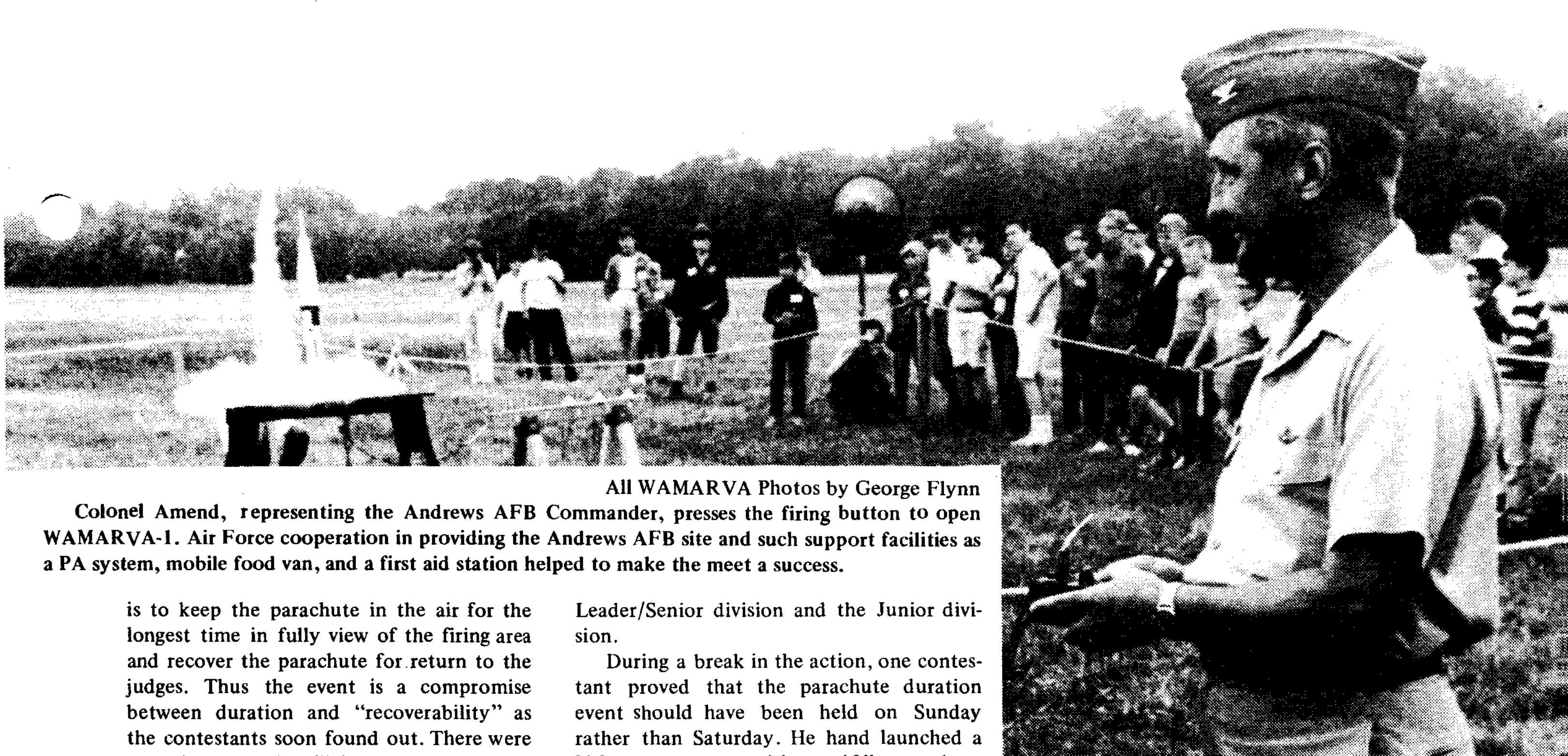
The Juniors proved their superiority in design efficiency when Jim Kenley turned in an 86.4 to take first place. Carl Guernsey placed second with a 78.4, and Craig Kuhn took third with a 70.4. The best leader performance was turned in by Jim Stevenson with a 60.0, while Jim Kukowski, an NAR trustee, took first place in the Senior division with a 72.8.

Eggloft, always a favorite event with the Juniors, followed. The MARS section was out in force with their ELO rockets and specially fitted egg-capsules from Competition Model Rockets. In the middle of the event, radio control model aircrafters who were set up about a quarter mile away discovered the field and put on a flying demonstration for the frustrated rocketeers. After Contest Director Richard Sipes threatened to name their site as the streamer spot landing target zone, Range Safety Officer Kukowski quickly convinced the aircrafters to cease violating our airspace.

As the eggloft was drawing to a close, Andy Elliot of the NARHAMS section ran in from the tracking site where he had been stationed for the event, and quickly prepared his rocket for flight. Minutes later he returned his rocket for the postflight check-in, and was awarded third place for a flight to 249 feet. Ken Tomasello and Tom McKimm beat him out with 329 feet and 310 feet respectively.

The third event of the afternoon was parachute duration. In this event, the object

Jim Stuart of Estes Industries and his wife displaying the new Estes scale kit for spectators and participants at WAMARVA. A number of the non-rocketeers who came out to Andrews AFB were attracted by the scale Saturns.



All WAMARVA Photos by George Flynn

Colonel Amend, representing the Andrews AFB Commander, presses the firing button to open WAMARVA-1. Air Force cooperation in providing the Andrews AFB site and such support facilities as a PA system, mobile food van, and a first aid station helped to make the meet a success.

is to keep the parachute in the air for the longest time in fully view of the firing area and recover the parachute for return to the judges. Thus the event is a compromise between duration and "recoverability" as the contestants soon found out. There were several spectacular flights, with the chutes still airborne as they cleared the trees downwind of the field. However, none of these rockets could be found by the contestants. Winning entries were those which fell just short of the trees and were more easily recovered. Several rocketeers were still in the woods searching for their birds when the time for return ended one-hour after the last flight of the day.

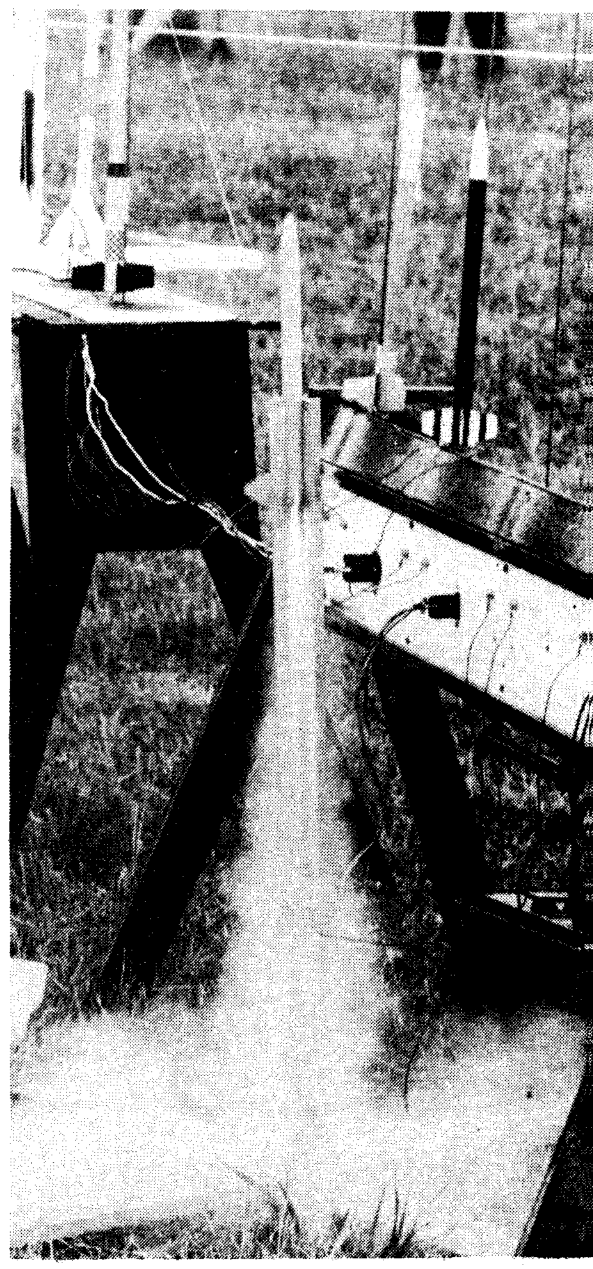
Sunday morning began with the Space Systems event in which D-Region Tomahawks emerged supreme. The MARS section has been collecting data on this rocket for some time, and all the dimensions were reduced to scale sizes on a computer. MARS entered their Tomahawks in force, and took firsts in both the combined Leader/Senior division and the Junior division.

During a break in the action, one contestant proved that the parachute duration event should have been held on Sunday rather than Saturday. He hand launched a V-2 nose cone with a 12" parachute attached. When last seen, his bird was still climbing, right over the Andrews radar facility.

In scale, the D-Region Tomahawks once again dominated though several other impressive models were entered. Sparrow Boost Glide was flown from another pad concurrent with the scale event. Everything seemed to be going fine until the event was interrupted by a sudden, though forecasted, rainstorm. Some rocketeers, such as the NARHAMS section which had pitched their tent in the field, were fully prepared for the rain. Most though had to just run to cars or seek out other shelter. A plastic sheet, which had been kept hidden to avoid

Mrs. Dottie Galloway of the Star Spangled Banner Section (Baltimore), records the tracking data as Elaine Sadowski, NAR Leader Administrative Council Secretary from the Steel City Section (Pittsburg), receives reports from both tracking stations on the field phone.

Launch towers, such as the one at right, appered in theDesign Efficiency event, to eliminate launch lug drag.



WAMARVA-I RESULTS

Design Efficiency

Senior	1st	Jim Kukowski	72.8
	2nd	'Ole Ed' Pearson	59.6
	3rd	Maj. Ken Lyon	57.6
Leader	1st	Jim Stevenson	60.0
	2nd	Mike Meerdter	36.4
Junior	1st	Jim Kerley	86.4
	2nd	Carl Guernsey	78.4
	3rd	Craig Kuhn	70.4

Eggloft

Senior	1st	Maj. Ken Lyon	285
	2nd	'Ole Ed' Pearson	139
Leader	1st	Jim Stevenson	278
	2nd	Art Chapman	77
Junior	1st	Ken Tomasello	329
	2nd	Tom McKimm	310
	3rd	Andy Elliott	249

Parachute Duration

Senior	1st	Jim Kukowski	1:58
	2nd	Col. Howard Kuhn	1:01
	3rd	Harry Cole, Sr.	0:52.8
Leader	1st	Art Chapman	2:22
	2nd	Mark Mercer	1:19
	3rd	Shiela Duck	0:20
Junior	1st	Guppy	1:51
	2nd	Andy Elliott	1:45
	3rd	Tom Burris	1:44.6

Space Systems

Senior/Leader	1st	Col. Howard Kuhn	D-Region Tomahawk
	2nd	Jim Stevenson	D-Region Tomahawk
	3rd	Mark Mercer	Javalin
Junior	1st	Tom Stevenson	D-Region Tomahawk
	2nd	Craig Kuhn	IQSY Tomahawk
	3rd	Allan Stolzenberg	Thor-Agena

Scale

Senior	1st	Col. Howard Kuhn	D-Region Tomahawk
	2nd	Barrowman Team	D-Region Tomahawk
	3rd	Sipes Team	D-Region Tomahawk
Leader	1st	Jim Stevenson	D-Region Tomahawk
	2nd	Shiela Duck	D-Region Tomahawk
	3rd	Mark Mercer	Javalin
Junior	1st	Guy Cavalos	Saturn V
	2nd	Tom Stevenson	Honest John
	3rd	Craig Kuhn	IQSY Tomahawk

Sparrow Boost Glide

Senior	1st	Maj. Ken Lyon	1:30
	2nd	Jim Kukowski	0:44.4
	3rd	Harry Cole, Sr.	0:12.9
Leader	1sr st	Jim Stevenson	1:18.4
	2nd	John McDermitt	0:48.4
	3rd	Bruce Blackistone	0:15.4
Junior	1st	Carl Guernsey	1:25.3
	2nd	Paul Day	1:09.9
	3rd	Bill Detes	1:03.0

Overall Points

Senior	1st	Col. Howard Kuhn	264
	2nd	Jim Kukowski	126
	3rd	Maj. Ken Lyon	120
Leader	1st	Jim Stevenson	321
	2nd	Mark Mercer	117
	3rd	Shiela Duck	69
Junior	1st	Tom Stevenson	222
	2nd	Craig Kuhn	168
	3rd	Carl Guernsey	102

A D-Region Tomahawk blasts off a scale launcher in the Space Systems Competition. The rocket, constucted by Col. Howard Kuhn, took first place in SR/LR space systems.

unnecessary pessimism, was brought out to cover the contest records. The rain stopped, and the boost glide event was quickly concluded. However, shortly after flights were resumed, the sky darkened again, and thunderstorms forced cancellation of the spot landing event which had been scheduled for the afternoon.

With the cooperation of Andrews authorities, an indoor site for presentation of the awards was located. After the event trophies were given out. Overall meet trophies, donated by local hobby shops, were presented for the overall high point totals. Tom Stevenson took first place in Junior division, while his brother Jim won in Leader, and Col. Kuhn was the victorious Senior. Trophies were donated by several local hobby shops: the Annandale Sports and Hobby Center, the Hobby House of Laural, ABC Hobbies, and Alexandria Arts and Crafts. Winners also received rocket kits donated by Estes, Centuri, and Model Rocket Industries. The top point scores in the overall meet, Jim Stevenson with 321 points was presented a Saturn V kit.

A special trophy, awarded to the WAMARVA: area section winning the highest total number of points was presented to the Metropolitan Area Rocket Society, with the NARHAMS section coming in second. A plaque of appreciation was presented to the Wing Commander of the 1001 Division, Andrews AFB for the excellent cooperation they extended to the meet.

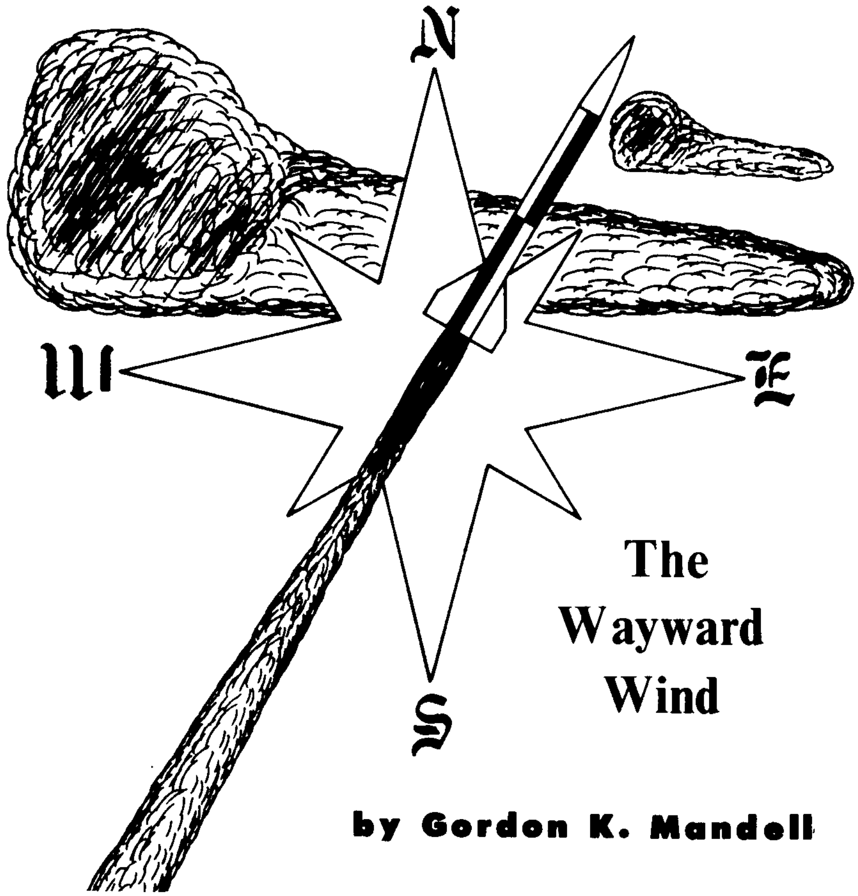
WAMARVA was not, however, solely designed as a competition. Spectators were invited, and a model rocket display area was provided to acquaint them with rocketry and with the NAR. Leroy Piester, president of Centuri Engineering, attended and provided a display featuring the line of scale rockets recently introduced by his company. Estes Industries, represented by Jim Stuart, displayed their new scale line including the new Mercury-Redstone. Both manufacturer's displays proved popular with the spectators and participants.

A sudden, but predicted, thunderstorm forced cancellation of the last event - Spot Landing - and sent contestants running for any available shelter.

Tom Stevenson receives the overall meet trophy for scoring the top mumber of total points in the Junior Division

Jim Stevenson (below) took first in the Leader Division by scoring more points the other contestants in the meet with his total of 321.

Col. Howard Kuhn (below), of Competition Model Rockets, took first in the Senior Division overall competition.



The Wayward Wind

by Gordon K. Mandell

RETROFIRE RECOVERY

It's beginning to look as if I couldn't possibly have been closer to dead center when, several months ago, I "zeroed in" on poor communications as a major impediment to the advancement of model rocketry. This month we have still another example of developmental duplication by numerous isolated enthusiasts, this one relating to a class of novel recovery systems relying on a principle to which I will give the broad classification "retrofire"–the use of a rocket engine to produce a thrust opposite in direction to the model's velocity. The most recent discovery of this concept was communicated to me by one Lewis Middaugh, Jr., of Massilon, Ohio, from whose letter I quote:

> I have thought about an idea which I call thrust recovery. It is a type of recovery system in which, after the coasting phase of flight, a timing device would ignite an engine. This engine would slow the model down until an altitude of about forty feet is reached, then the model will fall to the ground after the engine burns out. On the fall to the ground it could very well have a streamer or parachute slow it down more.

Lewis's idea is essentially a variation on a theme which has played a part in model rocket research and development at one time or another for at least five years. The manner in which he presents the concept and his variation from the basic system in the form of a "cutoff" altitude for the retrograde thrust, after which conventional recovery can be used, show that he is undoubtedly an independent inventor of the method. Nevertheless the method itself is not new and has been tried in a variety of forms by a number of independent researchers.

It doesn't date back to the inception of the hobby like some of the other concepts I have been discussing in these pages, though, and the reason for this seems to be that it took time for the *motivation* to develop the retrofire system to materialize. The earliest model rockets used ten-inch-square polyethylene "parasheets," streamers, or destabilization systems for recovery and were relatively heavy when compared with most present-day designs. While it would be an exaggeration to say that recovery was *no* problem, drifting was not generally severe and lost rockets were relatively rare. Throughout the early 1960's, however, designs became lighter, altitudes increased, and larger polygonal parasheets came into general use. While this made for softer landings, it also made for one's rocket winding up in the next county . . . so people started thinking about ways to bring their models down rapidly, yet gently.

The first thing that comes to mind in this connection is, why not just use a long-delay engine and let the model coast most of the way down before ejecting the recovery system? Well, in fact some builders tried just that. Unfortunately, delays just don't *come* that long for the high performance models. If your model was a bit on the heavier side you stood a chance of bracketing the right ejection altitude with available delay times, but you had to be extremely careful in your choice. Yea, verily, many were the rockets that bit the dust due to an overly-long delay train. Heavier rockets also tended to build up quite a bit of speed on the way down, and I saw several instances of parachutes becoming instant confetti upon deployment.

It was probably around this time that the idea of using a rocket engine, rather than a drag surface, for removing the velocity built up during the long fall from apex occurred to a number of researchers. Among the first to put it into practice was Lindsay Audin (then of the Pascack Valley NAR Section in New Jersey), who adopted a low-thrust retrofire system in an attempt to bring a model all the way down under controlled retrothrust from an ignition point "at altitude." Figure 1 shows the design he used as I have reconstructed it (somewhat imperfectly, no doubt) from memory. The engine used to provide the retrograde thrust was a Jetex 50B, a small metal-cased motor used for powering model aircraft. When fuelled with two pellets of guanadine nitrate solid propellant, this device will produce a steady thrust of 0.75 ounce for 12 to 14 seconds, depending on the ambient temperature and humidity and on the prior condition of the pellets. Jetex motors are ignited with a wick made of thin copper wire coated with guanadine nitrate compound which is passed through the tiny throat of the engine's convergent nozzle and coiled on the surface of the rearmost pellet. It was by regulating the length of this wick that Lindsay produced his timing device for the initiation of retrothrust.

At the instant of launch, one firing circuit was used to ignite the primary rocket engine while a second circuit was used to light the wick leading to the Jetex motor. A booster engine was used as the primary posigrade motor, with a bulkhead in front of it to contain the blow-through that would normally provide second stage ignition. The model was to reach its flight apex and fall about halfway back to Earth, at which time the wick would be consumed and would ignite the Jetex retrograde engine. When the system was tried out in the Research and Development competition at NARAM-6, (1964), however, an unfortunate operating characteristic of Jetex engines caused it to come to grief. The burning of Jetex wick leaves a gritty, black residue which clings to the thin copper wire at the core. This residue often causes the wick to stick, or jam, in the nozzle throat when ignition occurs. The model aviator is not troubled by this; he simply licks his thumb and forefinger and plucks the offending piece of wire from the gently hissing engine before hand-launching his plane. If the ignition occurs in a rocket which is several hundred feet in the air, though, there is no way to correct the situation. The pressure in the casing builds up until the emergency spring release of the engine permits the end cap to separate from the casing and releases all the exhaust gases from the joint thus unsealed. This is the relief system which makes Jetex engines acceptable under NAR safety certification standards. Unfortunately, it also reduces the thrust to zero–and this is precisely what happened to Lindsay Audin's retrorocket, which subsequently nosed in hard in a cloud of smoke. It really doesn't seem that Jetex, with its ignition-jamming problem, is the proper retrofire device to use for model rocket recovery.

The public demonstration of a retro-rocket, successful or not, was enough to send a half-dozen or so enthusiastic modelers to their drawing boards in an attempt to get a workable design. The team of Davis, Davis, Whitmyre and Whitmyre of the NAR's Steel City Section (Pittsburgh) showed up the next year at NARAM-7 with a retrorocket design of their own using standard 18 x 70-millimeter model rocket engines. This thing was a real monstrosity and I won't even try to draw it from memory–suffice it to say that it sort of "went ape" when the time for retrofire came. A number of other workers in the field attempted to perfect systems of retro-fire recovery without success, and after a year or so interest in the subject seemed to wane.

After all, the real practical justification for such a complicated device to perform a relatively simple function is tenuous at best. Whatever can be done by a retrorocket can be done just as well by any one of the numerous drag-brake systems in use, by fins which convert to helicopter blades, by a streamer released near the ground which acts as a drogue to deploy a parachute, or even by that old standby: destabilization. No, the only real motivation for the development of a practical recovery system seems to be the challenge of the problem itself . . . but, after all, that is all one needs in a hobby. This challenge led Dick Fox (then of the MIT Section of the NAR) to work on a unique retrorocket design of his own involving a system for shifting the fins from the tail of the rocket to its nose. After a long series of unsuccessful trials during 1967 and 1968–some of which, I can tell you, involved some of the most fantastic maneuvers I have ever seen performed by a model rocket–Dick got a successful flight and recovery by the spring of 1968. We'll have more about the Fox retrorocket, which he claims to be reliable, in a future issue of

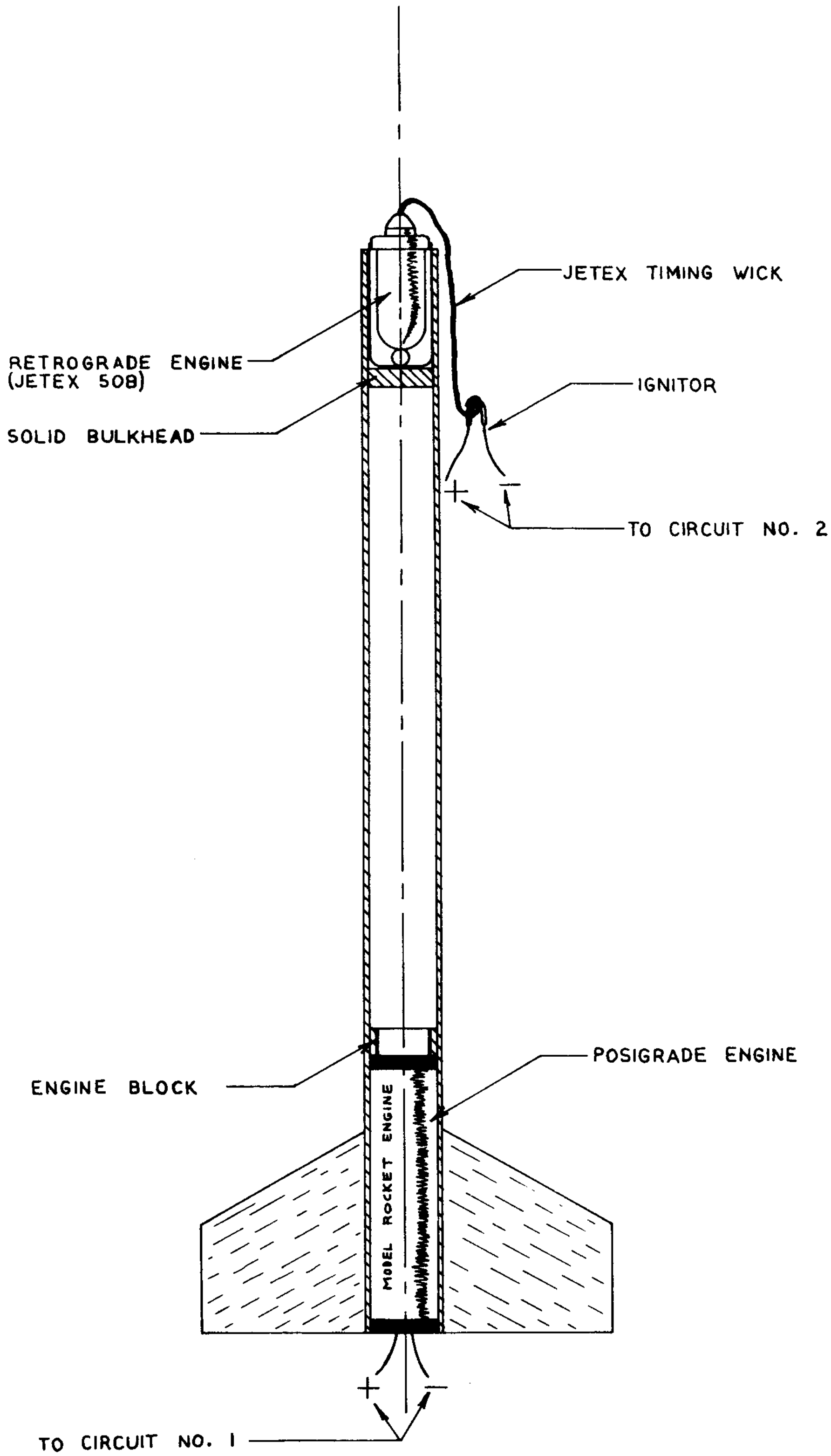


Figure 1. A retrorocket design of 1964, which used a Jetex 50B model aircraft reaction engine to provide the retrograde thrust. Drawn from memory, the diagram is intended to represent the test vehicle used by Lindsay Audin in his NARAM-6 Research and Development project. As my recollection of this design is at best sketchy, however, the drawing should be considered as representative only of the general principle of the rocket's operation; it is very probably highly inaccurate as regards the specific engineering details of its layout and construction. Nevertheless, it should give a good idea of one of the more outstanding retrofire concepts of the period.

Model Rocketry.

Now in all this I certianly do not wish to discourage my young correspondent or to belittle his efforts by reciting the list of prior contributions to the field. I *do* believe, and very strongly, that by being fully informed of the current state of the art Lewis Middaugh and others like him will be in a far better position to contribute to the further development of retrofire recovery. Perhaps something he has read here will start him thinking along lines that will result in his developing a novel, simple, practical, and effective means of model rocket recovery by retrograde thrust–in which case, of course, we'll want to hear all about it!

The above was just one of many examples of inventions, ideas, and concepts that have been rediscovered time and again throughout the history of model rocketry at a shameful waste of talent and brainpower–a waste that could have been avoided if an effective forum for the presentation of such developments had been available.

Model Rocketry *provides such a forum in* The Wayward Wind. . . *so why break your back duplicating somebody else's work? Send that pet theory, idea, design, gadget, etc., to me in care of* The Wayward Wind, **Model Rocketry**, *Box 214, Boston, Massachusetts 02123. If we don't know about it, you've got a clear go-ahead for further development. If we do, you'll avoid repeating something that's already been done and be able to pick up where the last man left off if development is not yet complete or go on to something else if it is. Don't be secretive, or the value of your work may be lost forever. . . or you may not get credit for it when it finally comes to light. Contribute something to your hobby; be a useful member of its R & D community. Let us hear from you.*

q & a

In your March issue of *Model Rocketry* concerning the article "How to Finish Model Rockets," the author Thomas Milkie mentioned nothing about the use of finishing wax on model rockets. I would like to have your opinion or reasons for using or not using finishing wax on model rockets.

H. Scott Krause
Cleveland, Ohio

The debate for and against finishing wax has been raging hot and heavy for at least six years now and has never yet been resolved one way or the other.

It is certain that the wax greatly improves the gloss of the rocket's finish, and hence improves its appearance. Wax also makes the rocket less prone to become waterlogged as a result of landing in wet grass, and helps to protect its fins against warping. In addition, waxing a rocket makes its surface smoother so that its boundary layer is more likely to remain laminar, thus reducing drag and increasing altitude.

Opponents of wax point out that it makes a rocket heavier, and that it tends to discolor some shades of dope, that it is messy, gets stuck between fins and body tubes, gets into launch lugs, is easily marred, etc. They also claim that the boundary layer will inevitably be tripped by the nose/body joint and by the launch lugs (if any), so that the wax cannot aid in maintaining a laminar

(continued on page 30)

Try the Dyna-Mite with silk covered fins

The article in the February issue of Model Rocketry provided the inspiration for this rocket. The Dyna-Mite uses built-up fin construction to make body and fin one and the same.

Construction begins with the installation of the engine block. Smear glue around the inside of the body tube about 2¾" from the end. Push the engine block into the tube with an engine casing until the engine is flush with the end of the tube.

Next, cut the fin braces from 3/32" or 1/16" balsa stock. Three of each item must be cut.

Sand a leading edge on all necessary pieces. The root edge of the middle braces should be shaped in the following manner. Wrap a piece of sandpaper around the body tube and, holding the brace at approximately the correct angle, sand until the root edge fits the tube.

Starting with the rear brace and working forward, the braces should be glued securely to the body tube. Use the drawing to align the braces at the correct angles. The fins should be spaced 120° apart.

Now take a screw-eye and two nose weights and install in the nose cone. Punch a small hole in the body tube and thread a 1-foot string leader through it. Knot the end at the body tube and apply glue to it. Attach the shock cord (I used heavy elastic thread) to the leader. Connect the shock cord and parachute or streamer to the nose cone.

When all the glue is dry the fins may be covered. Silk or tissue paper is used for this. (This material is available at your local hobby shop.) Cut out a piece of material that is larger than the fin. Dope the braces and the body tube and place the fin material on them. Repeat for the other five sides. A very light spray of water may be used to shrink the covering until it is tight, but the success of this depends on the material used. Trim off the excess material with a razor blade. Apply dope of your favorite color to the fins and body tube. Glue a launch lug right below the middle brace and you are finished.

(Note: This article was submitted without an author's name on it. The author should contact Model Rocketry *magazine in order to receive proper credit for the article. Authors, please put your name on the drawings and articles!)*

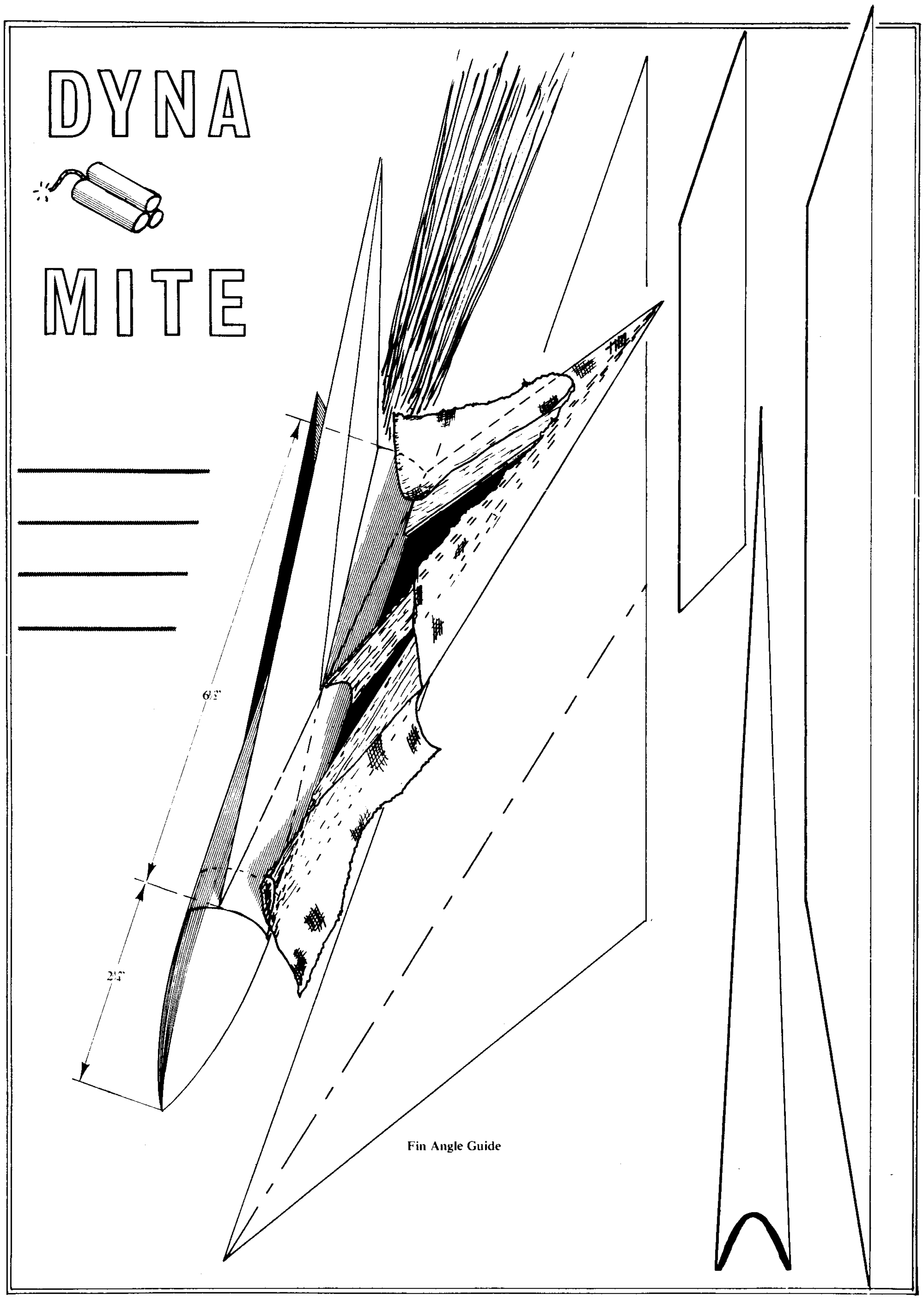
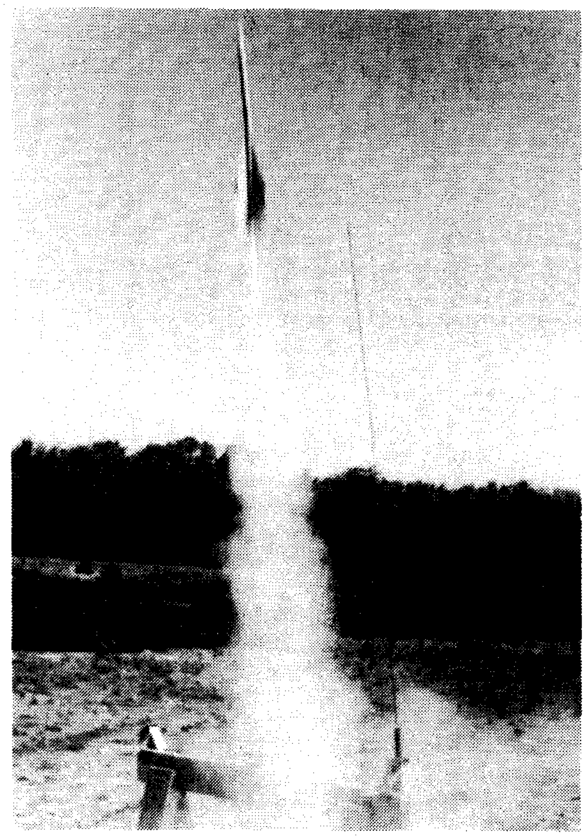

DYNA
MITE
6½"
2¼"
Fin Angle Guide

PHOTO GALLERY



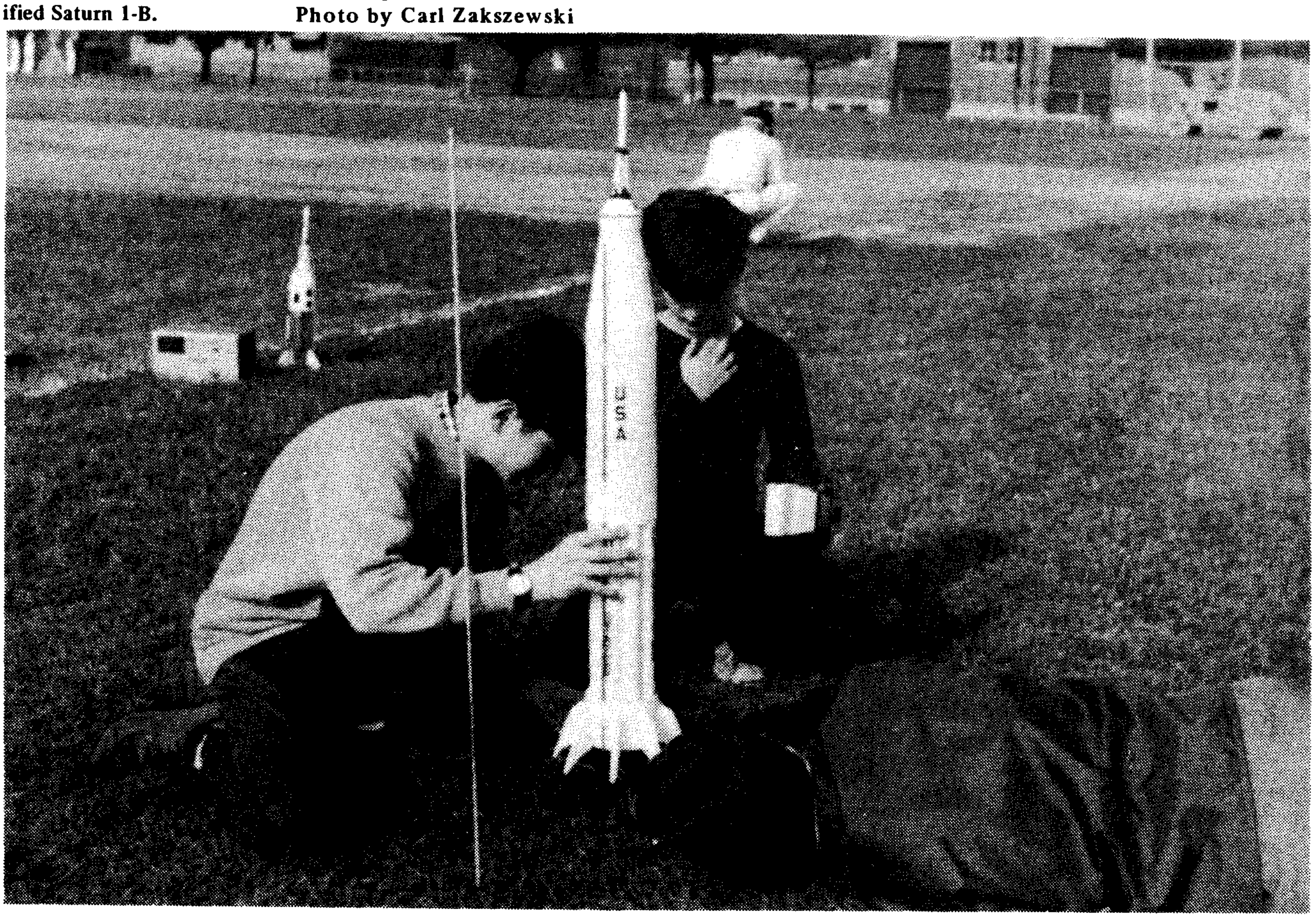
Readers are invited to submit photographs of their model rockets for publication on this page. Our staff will select those photographs having superior quality and composition for inclusion in the Model Rocketry *Photo Gallery. Send your photos to:*

Photo Gallery
Model Rocketry
Box 214
Boston, Mass. 02123

Last Month's Photo Gallery neglected to identify the subjects as a boost/glider competition at Prague, Czechoslovakia in March, 1968, and a semi-scale Aerobee launched in an October, 1967 contest in Vrchlabi, Czechoslovakia. Both photographs were taken by R. Mrazek.

Photo by George Vozeolas
Two-staged B-engine model in a winter launch.

Cambridge, Massachusetts club prepares to launch modified Saturn 1-B. Photo by Carl Zakszewski



An Accelerometer Module for Transmitter Applications

Fourth in a series on the Foxmitter and accessories for a variety of inputs...

by Richard Q. Fox

The instrumentation of model rockets with accelerometers is basic to research in model rocketry, but not much development has been done in this area. The accelerometer described is different from all other inexpensive accelerometers currently available because this accelerometer produces a continuous record of the acceleration of the rocket, and not just an indication of the maximum acceleration. The accelerometer data transmitted from the rocket can be used to determine not only the acceleration of the rocket, but also the velocity and the distance traveled, at each instant of flight.

The cost of the parts necessary to build the accelerometer module is about $3.00. The accelerometer-transmitter combination is about 9 inches long, and weighs 2.5 ounces. It is designed to work in conjunction with the transmitter described in the May 1969 issue of Model Rocketry.

Construction

A slight modification to the transmitter is necessary to use the accelerometer module. One leg of capacitor C2 must be disconnected from the negative bus and

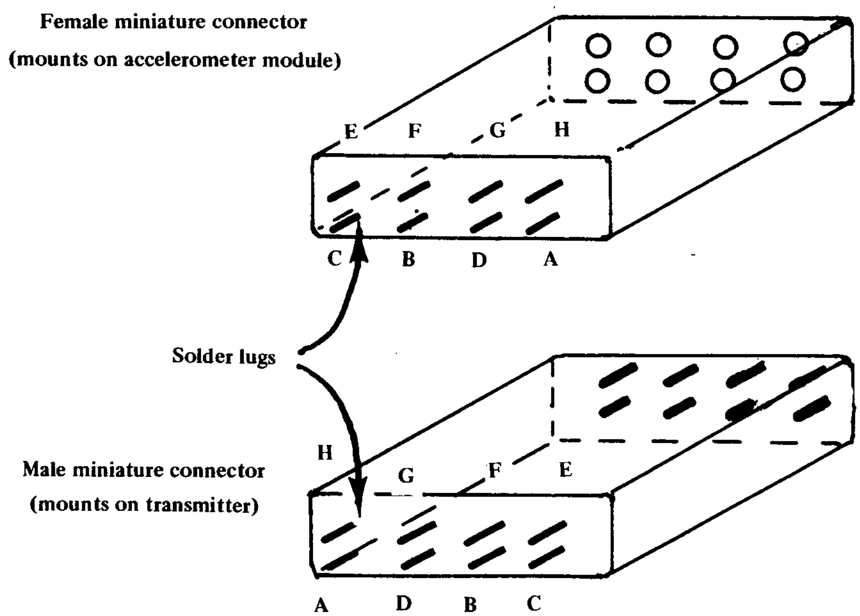


Figure 1

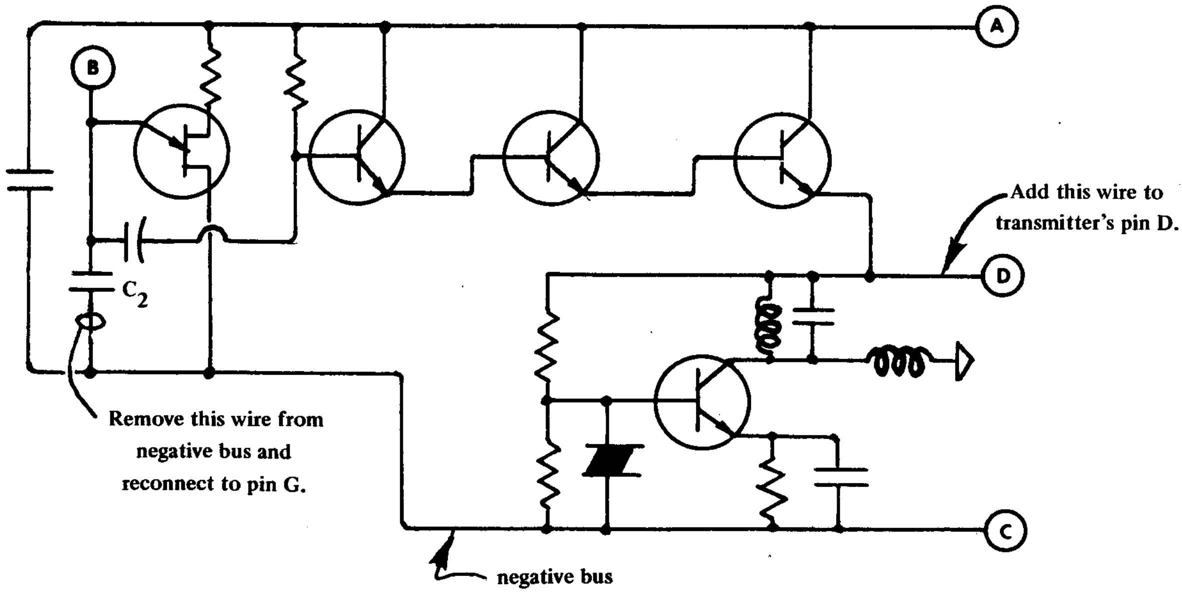


Figure 2
Modifications to Basic Transmitter

connected to pin G on the black plug as shown in Figure 2. In addition, a wire must be run from the emitter of Q4 to pin D on the black plug. The beacon tone module, the temperature sensing module, and the spin rate sensing module must be changed as shown in Figure 3 in order to remain compatible with the transmitter. These simple changes make the transmitter more versatile. Future modules will be designed with these changes in mind.

Construction of the accelerometer module itself is very simple. Mount the parts as shown in Figure 5 and keep all wires as short as possible. Do not make any substitutions in part values.

The acceleration sensitive inductor is constructed by using the Miller no. 9003 coil, a small washer, and a spring as shown in Figure 4. Remove the sheet metal nut from the end of the coil and discard it. Glue a small washer against the other end of the coil. Next, obtain a spring with a diameter of ¼ inch and a length of 1¼ inches. The spring should compress to a length of ¼ inch under 1 ounce of force. The most likely place to obtain such a spring is in a spring assortment package at a hardware store. The spring should be placed inside the coil, and the slug should be placed on top of the spring. With this arrangement, the slug will slide further into the coil when the coil is acted on by an accelerating force.

Flight Preparation

The accelerometer-transmitter should be flown in the vehicle described in a separate article next month. While the rocket is transmitting in flight, the signal should be received on the ground and tape recorded. The tape recorded signal can then be used to calculate the acceleration, velocity, and distance traveled in the flight.

Data Reduction

The signal sent from the accelerometer is a tone whose frequency is proportional to the acceleration of the rocket. Use the calibrator described in the June issue of **Model Rocketry** to convert the tape recording of the tones generated during the flight into a table of relative tone values versus time. This is done by matching the tones of the flight recording with tones generated by the calibrator described in the June issue. The settings of the calibrator necessary to match each tone of the flight recording are recorded on paper as the "relative values" of acceleration. The conversion of relative values to actual acceleration values is accomplished through the use of a conversion factor.

The conversion factor is determined as follows: Weigh the accelerometer coil slug on a sensitive balance. Then weigh a convenient large nail. Place the slug back in the accelerometer coil and turn the transmitter on. Be sure to position the transmitter so

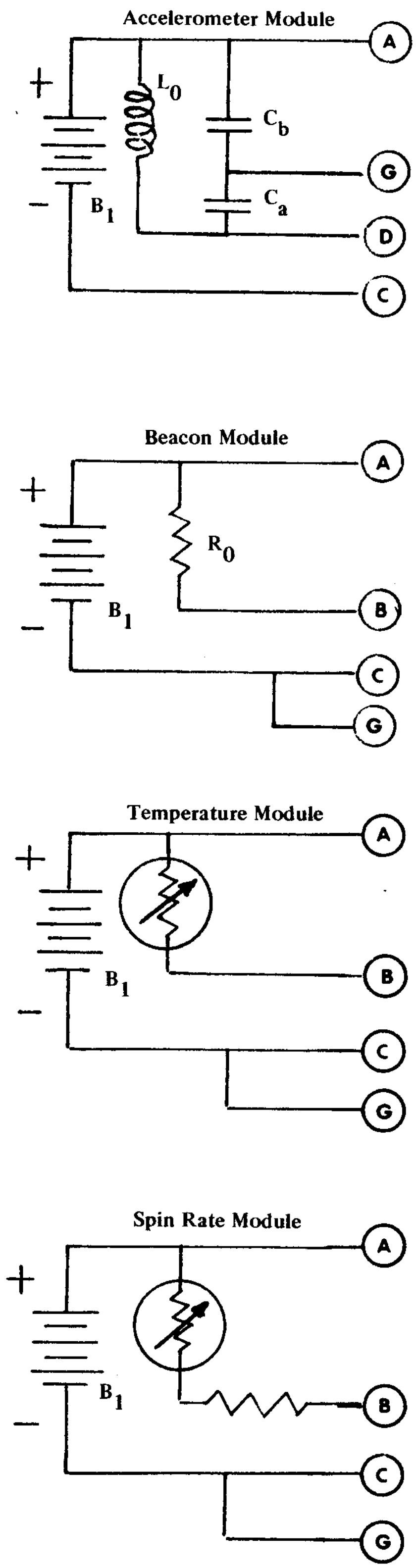


Figure 3

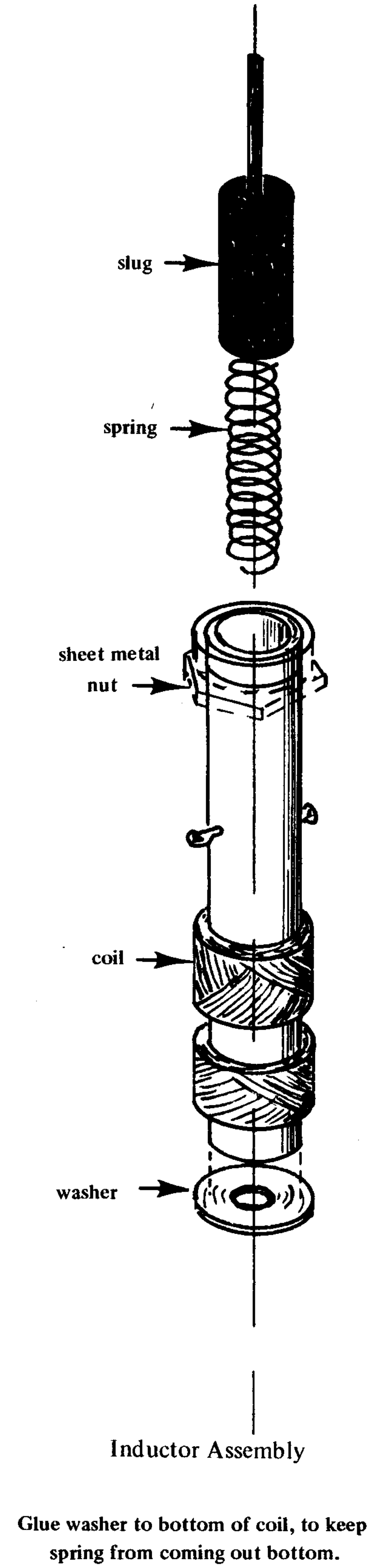


Figure 4

that gravity pulls the slug against the spring. Match the tone generated by the accelerometer with the calibrator tone and record the value. The matching tone that the calibrator generates has the relative value of one "g" of force. Now carefully place the nail on top of the threaded portion of the slug. The weight of the nail will simulate an acceleration force by pushing the slug further into the coil. This simulated value of acceleration can be calculated by dividing the weight of the nail by the weight of the slug, and adding one to the answer. $F_a = W_n/W_s + 1$ where F_a is the acceleration force being simulated, W_n is the weight of the nail, and W_s is the weight of the slug. With the nail on the slug, match the calibrator tone to the accelerometer tone and record the value. This simulation of acceleration force provides a second piece of information to help relate the relative values of the calibrator tones to the actual "g's" in flight. Additional data points are needed, and they can be obtained by placing other objects of known weight on top of the accelerometer coil slug and matching the tones produced with the calibrator. Once enough data has been obtained, the results can be plotted and saved as a permanent calibration of the accelerometer.

The calibration graph is then used to convert the relative values from any flight into a table of acceleration versus time. A plot of the acceleration versus time data should look similar to the thrust versus time curves shown in the manufacturers' catalogues.

The conversion of the acceleration data to velocity and distance data is done by integration. There are a number of methods of integrating the data, including the use of analogs and mathematical approximations, but they will not be presented at this time. Some model rocket manufacturers offer technical reports on the subject, and **Model Rocketry** magazine will cover the subject in a future issue.

Next month **Model Rocketry** *will carry the fifth in a series of articles on model rocket transmitters, dealing with a special payload carrier for the transmitter and its various sensors.*

For information on the basic transmitter circuit and other sensors refer to these back issues of **Model Rocketry***:*

May 1969 – *Building an Inexpensive Model Rocket Transmitter*

June 1969 – *A Temperature Sensor*

July 1969 – *Build a Spin Rate Sensor and Direction Finder*

All of the instrumentation described in this series is compatible with the May 1969 transmitter design.

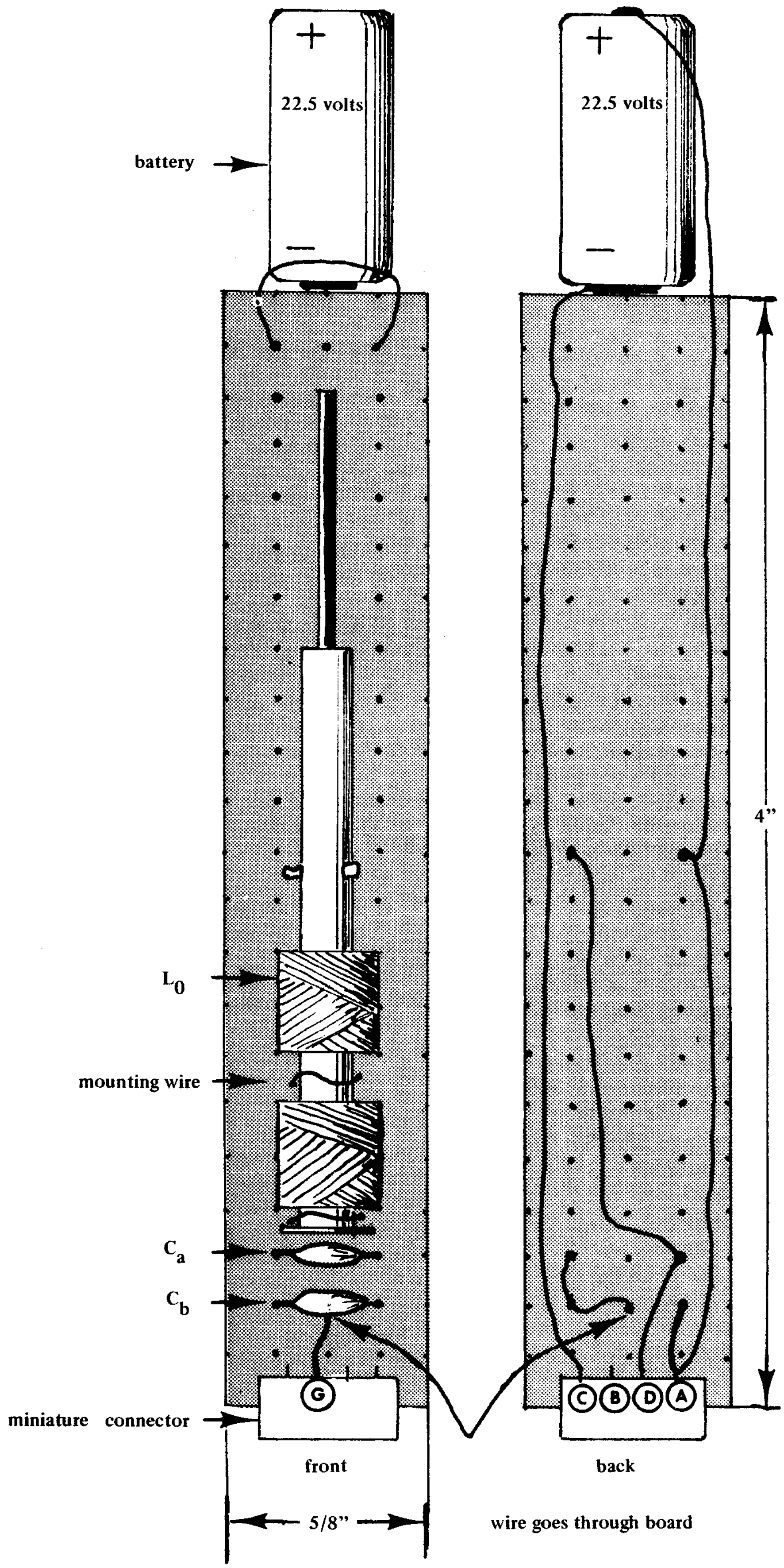


Figure 5 Wiring Diagram

Getting Started in Clustering

by Kevin Barkes, NAR 12335, Jr.

The exciting take-off of a clustered bird is an experience that every rocketeer should try...

After you have successfully built and flown both single stage and multi- stage rockets, the next logical step for the rocketeer is clustering. Clustering is having more than one engine (usually three) in the engine section of the rocket. Clustering should be used only after you have experience in the other forms of model rocketry. A cluster rocket can do mighty strange things in the air if it is sloppily constructed and used on a less than adaquate firing system. Structural failure, failure of all engines to ignite, or failure of the recovery system areall common mistakes to the novice.

The C-3 rocket (figure 1) is designed for the newcomer to the field of clustering. A cluster of three engines is used because of the ease of construction, and because of the equalization of thrust (unbalanced thrust can cause a rocket to do flip-flops at great speed).

To construct the rocket, first glue the nose block to the Bt-60 that is 7" long. Insert the screw eye, remove, squirt glue in the hole, and insert again. Set aside to dry. Cut two 3/4" slits one inch from the end of the 11" Bt-60. Insert the shock cord (1/4" is best, because of the high force of the ejection charge of all three engines) and push the slots even to the body wall. Glue, and set aside to dry.

While these parts are drying, assemble the recovery system. Use an 18" parachute if you are going to fly light payloads (under one ounce) and a 24" chute for larger payloads. If the payload weighs over three ounces, use two 18" or 24" chutes.

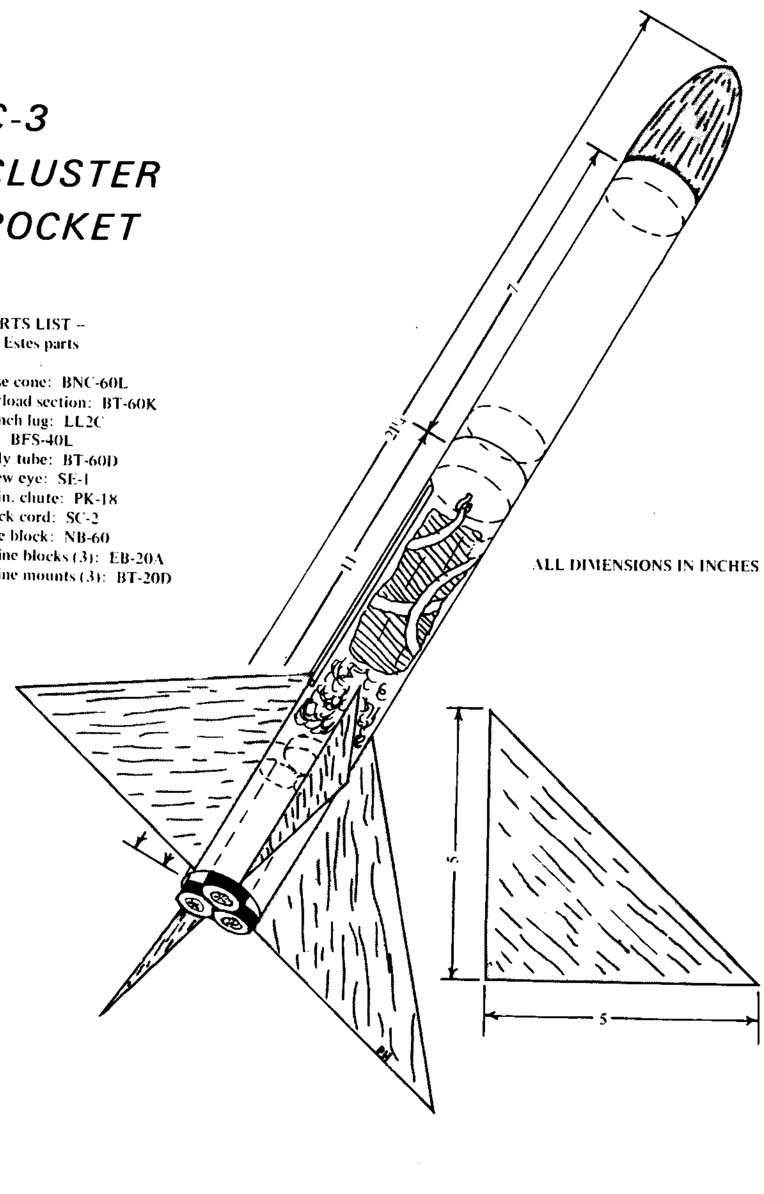
The propulsion system is easy to build but might seem a little tricky. Glue the engine blocks flush with the ends of the two 3/4" Bt-20. Then (figure 2), glue the two together on a flat surface with the ends of the tubes flush. *This is important* so that no unequal thrust will occur. Then glue the third tube onto the top of the other tube, making sure that all the tubes are flush. Set aside to dry throughly. Don't touch it while the glue is wet, or the joints will weaken, making the alignment incorrect.

The fins (four) should be cut out of 1/8" balsa. Cut them carefully and sand the

C-3 CLUSTER ROCKET

PARTS LIST --
for Estes parts

nose cone: BNC-60L
payload section: BT-60K
launch lug: LL2C
fin: BFS-40L
body tube: BT-60D
screw eye: SE-1
18-in. chute: PK-18
shock cord: SC-2
nose block: NB-60
engine blocks (3): EB-20A
engine mounts (3): BT-20D



ALL DIMENSIONS IN INCHES

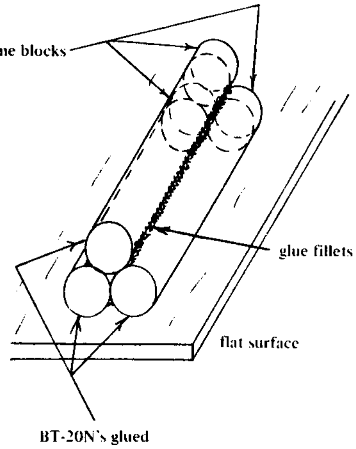


Figure 2

leading edge round. Taper the trailing edge so that the fin resembles an airfoil that is symmetrical. Sand all sides lightly.

By this time, the engine mounts should be dry. First slide the engine mounts in to see if they move freely in the larger tube (make sure that you have the right side of the BT-60; not the end with the shock cord). Mark the casings so that they protrude about 1/8" from the back. Spread glue along the inside of the tube, then insert the casings. *This must be done in one smooth motion, or the glue will set in the wrong place.* Use kleenex and white glue to form a sort of putty and fill up the openings between the casings. This must be done to insure proper deployment of the recovery system. Set aside to dry.

Mark the tube for four fins. Sand the root edges flat and glue the fins on. Allow to dry, and then put heavy glue fillets on to the fins. Don't set the rocket on its fins in any of the two preceding steps. Glue on the launch lug, and after drying, glue on fillets.

Attach the shock cord and the parachute(s). Insert the nose cone. Finish your rocket and paint it a fluorescent color (cerise and orange are good). Add any identifying markings and voila!–your first cluster bird.

Besides being easier to assemble than multi-stage rockets (with stage couplers, exact measurements, etc.) the C-3 has other advantages. With a three ounce payload, the rocket will not weathercock as much. It can have a higher lift-off weight, and can carry a payload to a high altitude. Its disadvantages are: the weight of the engines that are not jettisoned in flight, as in multi-stage, hard fin wear, and, most of all, getting all three (or more) engines to ignite at exactly the same moment. Let's tackle one problem at a time.

It is quite simple to modify your present launch system. Make two 4" clip-whips (figure 3) and merely clip your present micro-clips onto the ends of them. Any nichrome igniter will work. Just make sure the clips are clean, and that they do not touch the metal blast deflector or each other. Speaking of blast deflectors– use a bent coffee can or a heavy-duty deflector. A three-engined bird can put quite a dent in a deflector. This model can be flown with a standard 1/8" wide, 36" long rod. Clusters using more than three engines should use a 60" x 1/8" or a 36" x 3/16" rod.

If you have access to a good six or twelve volt car battery, ignition should be no problem. Just keep the wires running to the pad as short as possible. Remember, the longer the wires, the more the resistance. Each igniter should at least get six amperes of current. In G. Harry Stine's **Handbook of Model Rocketry**, Mr. Stine shows a system which uses a relay to keep resistance to a minimum. It costs only a few dollars, but is too lengthy to show here.

Safety and sense shows a great deal in clustering. Don't try to fly a seven- engine cluster rocket. The odds against ignition are too high, and with all that weight, even C engines begin to work against you. When installing the igniters, make sure that they touch the propellant grain so that all of them will ignite. Tamp in kleenex as you would an ordinary rocket. When attaching the clip-whip, make sure that the continuity key is in your pocket or in the hands of the safety officer. It's not a bad idea if the battery was disconnected also; not only is it safe, it gives you a good feeling knowing that those three C engines won't go off in your face.

Fly the C-3 with A8-3 engines the first time. Then fly a payload with a B6-4 or C6-5. Series two engines (B14-) can be flown if you have a securely fastened launcher and a mighty strong blast deflector. Twenty-one pounds of thrust, even for

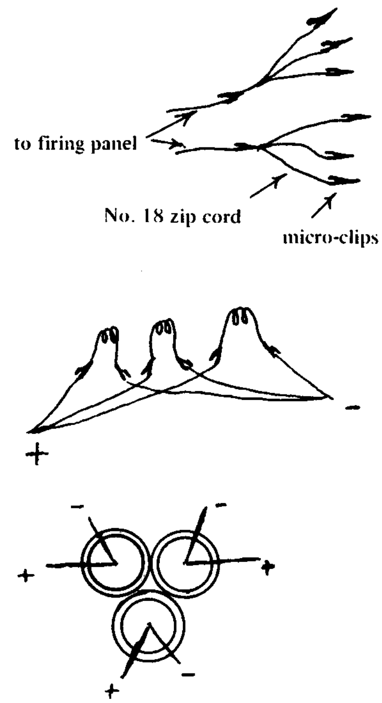
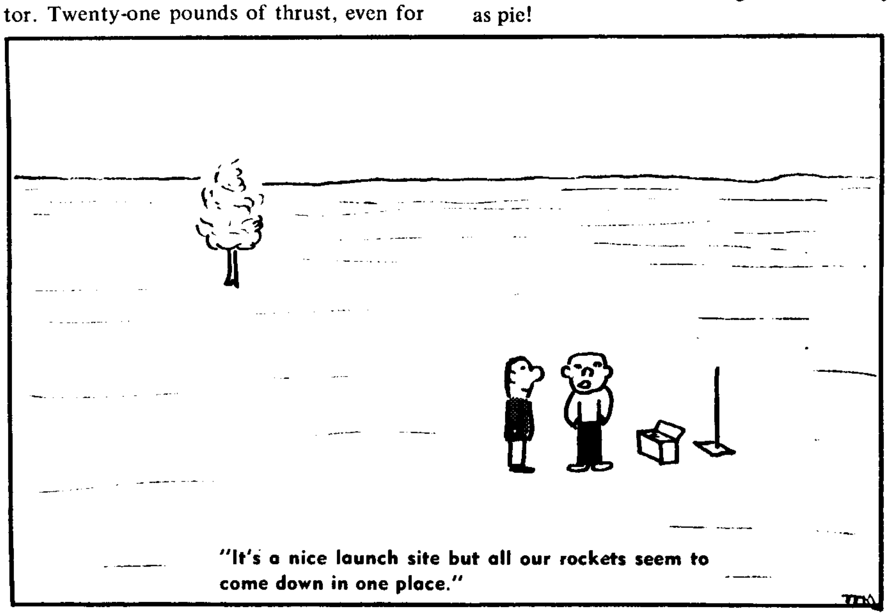


Figure 3

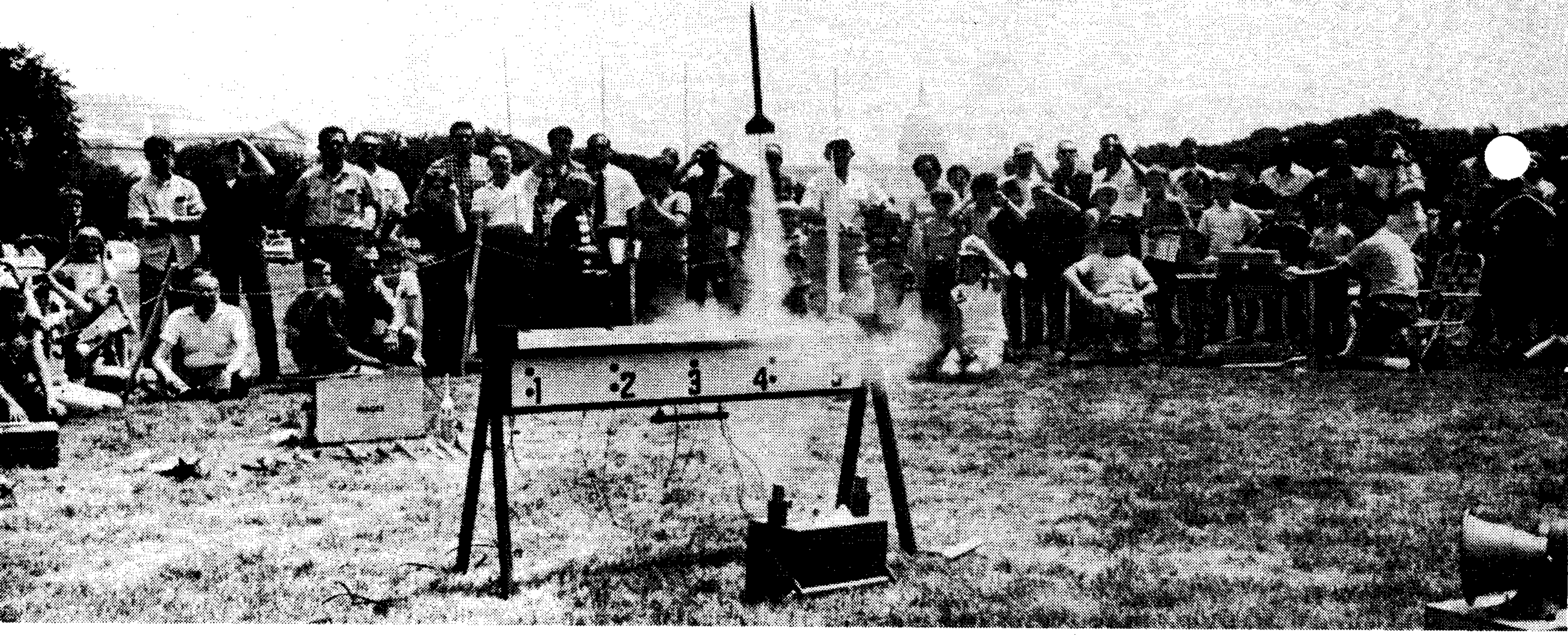
.35 of a second, ain't exactly somethin' to laugh at.

Keep your recovery crew and spectators at least forty feet away from the launcher, or for that matter, out of the immediate recovery range. An ape model with C engines is downright frightening.

Cluster rockets are a challenge, but real work-horses. I once flew a four-ounce transmitter and reached an altitude of 600 feet with C6-5 engines. I used this model, but with two eighteen inch chutes on the payload section. Fly this rocket with the same basic countdown prepartions as you would with any other bird. Just be a bit more careful–and clustering will be as easy as pie!



"It's a nice launch site but all our rockets seem to come down in one place."



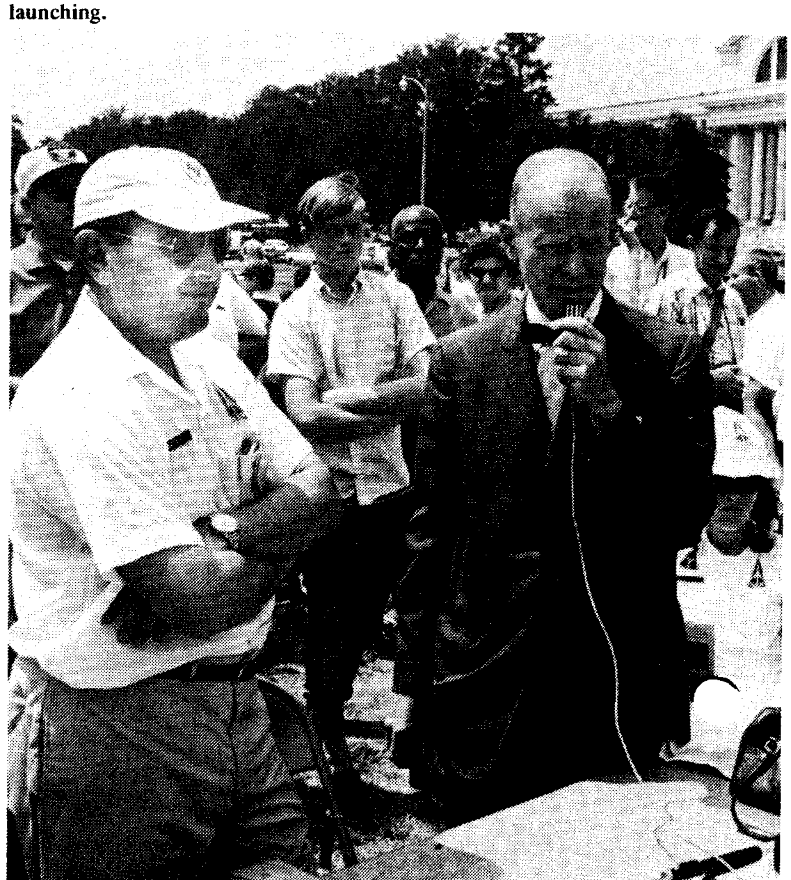
Photos by George Flynn

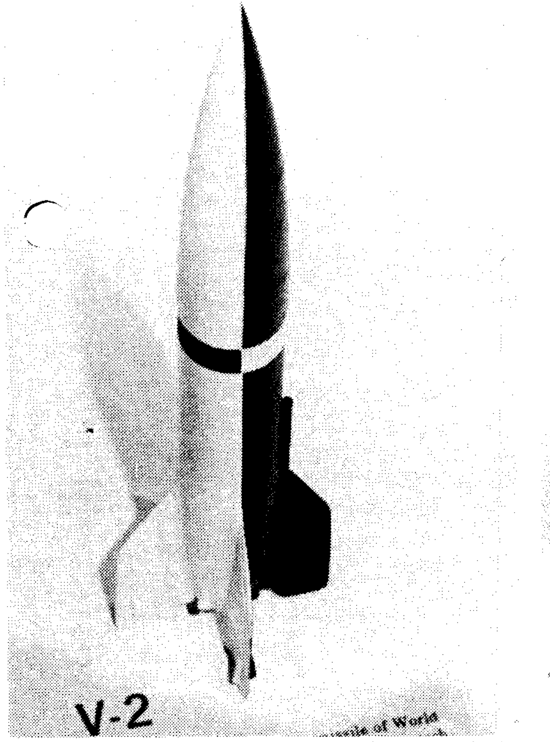
First Public Launch in Washington D.C...

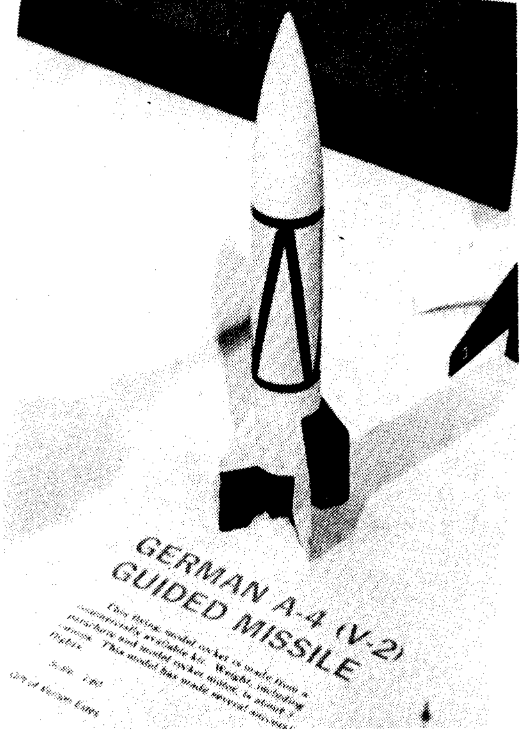
Smithsonian Sponsors Aerospace Modeling Activities

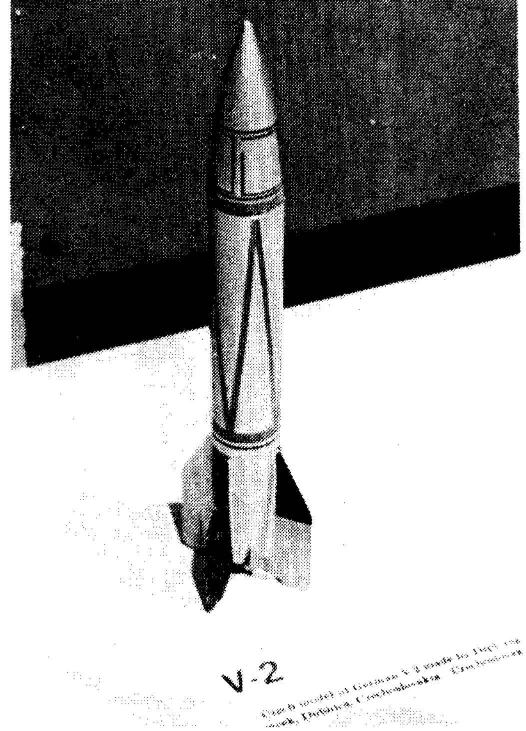
Andy Elliott(left) and Bob Singer (right), both of the NARHAMS section of the NAR, add a final coat of paint to the models prior to launching from the Smithsonian.

G. Harry Stine looks on as Fred Durant, Assistant Director of Astronautics for the Smithsonian, welcomes the modelers and spectators to the demonstration launching.









Among the models on display inside the Smithsonian are this collection of V-2 scale models. The first one (left) was constructed from a 1:40 scale Centuri Engineering Co. V-2 kit by modelers Keith Niskern and Bob Royal. The kit was donated to the Smithsonian by Centuri. The 1:60 scale Estes Industries V-2 (center) was given to the Smithsonian by Vern Estes. The 1:40 scale V-2 (right) was constructed by D. Haracek of Dubnica, Czechoslovakia. This V-2 model was donated to the Smithsonian by G. Harry Stine.

A model rocket launching conducted by Washington area NAR sections marked the beginning of the First Annual Aerospace Modeling Activities on June 7. The launching, on the mall between the Capitol and the Washington Monument was sponsored by the Smithsonian Institution to attract public attention to three months of aerospace modeling events to be featured at the Smithsonian.

The launchings began at shortly after 10 AM and continued hourly throughout the day. Though there was little advance publicity, passers-by stopped to watch the launchings. In all, several hundred people witnessed the launching of over 50 rockets from the mall. Many of them requested further information about the hobby of model rocketry.

Following the firings, three of the rockets flown were presented to Fredrick C. Durant III, Assistant Director of Astronautics, for exhibit at the Smithsonian. The presentation was made by NAR trustee Jim Barrowman.

Inside the Smithsonian, Washington area modelers took turns manning a model construction booth. Every third week during the summer, the booth will feature model rocket construction by members of the NAR. The Washington area NAR Sections have issued invitations to the interested visitors to Section launches and to meetings where the half-hour NAR documentary film is shown. In other weeks, modelers from the Academy of Model Aeronautics and the Plastic Model Association will run the booth. Each group will demonstrate the construction techniques of their hobby by building a complete model from a kit.

Washington area modelers Mark Servatius (left), Mark Crummet (center), and Rick Servatius (right) demonstrate model rocket constuction techniques to the visitors at the Smithsonian Institute. Local NAR members will man the booth for three weeks this summer participating in the Smithsonian Aerospace Modeling Activities.

Scale design...

The Rohini RH-75

INDIAN SOUNDING ROCKET

by Gordon Mandell

The Rohini RH-75 is the first rocket to be developed and flown by the Space Science and Technology Center (SSTC) of the Indian Thumba Rocket Range. The SSTC was recently set up at Veli Hill, India, for the purpose of developing sounding rockets and scientific payloads. To this end, the Rohini RH-75 test vehicle was developed by the center.

Rohini RH-75 flight model.

Project Objectives

The main objective of this first project was to design a 75mm diameter, solid propellant rocket to enable the Indian engineers to aquire experience in rocket design. Previously, only rockets of foreign design and manufacture had been flown from the Thumba range.

The project, under the direction of Project Leader Dr. Y. Janardana Rao, included the investigation of various methods to predict the performance characteristics of the vehicle and its components. To this end, internal ballistics of the rocket motor, trajectory calculations, stability, pressure distributions, drag and other factors were studied.

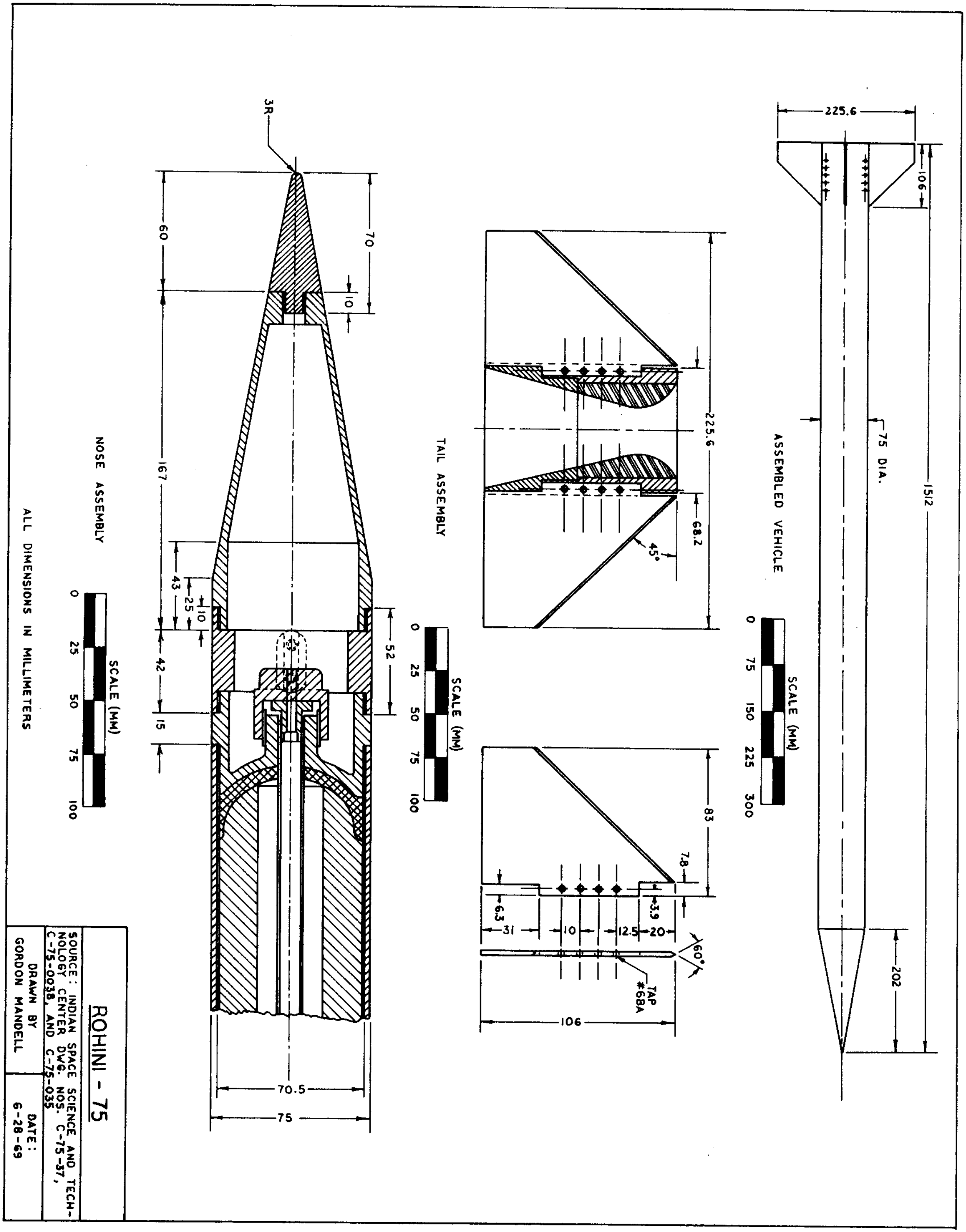
Motor Design

The first phase of the program was to design a rocket engine using the cordite propellant charge supplied by the Ordnance Factory. Static tests were conducted using various lengths of motor and different nozzle-throat diameters as well as different internal grain configurations. Initially, a number of stactic tests of half size (550mm long) motors were conducted in proof tubes. The first of these, on October 18, 1967, successfully proved the ignitor and propellant bonding techniques using a star-configuration, core-burning engine.

This was follwed by a series of full size (1100mm length motor) static tests. On October 4, 1967, in a test of the first full size motor the nozzle was ejected when a high internal pressure was built up. The grain was modified, and a successful test was concluded on October 14, 1967 when the pressure and thrust time variations of the modified grain were successfully measured.

Stability

Since the Rohini-75 was designed for engine flight-testing, only a 1 KG test payload was planned. A nozzle would simply be attached to the rear of the propellant grain, a nose cone to the forward end. Detailed weight analyses of various parts of


ROHINI - 75
SOURCE: INDIAN SPACE SCIENCE AND TECHNOLOGY CENTER DWG. NOS. C-75-37, C-75-0038, AND C-75-035
DRAWN BY GORDON MANDELL
DATE: 6-28-69
ASSEMBLED VEHICLE
75 DIA.
TAIL ASSEMBLY
NOSE ASSEMBLY
SCALE (MM)
ALL DIMENSIONS IN MILLIMETERS
TAP #6BA
3R

Flight Test Data

Date	Flight No.	Apogee (Km.)	Impact (Km.)	Impact time (Sec.)	Effective launch elevation (deg.)	Remarks
20-11-67	RH-75 C1-01	9.0	11.0	84.0	65	Uninstrumented. The first indigenously developed Indian Rohini-75 Rocket was successfully flight tested.
4-12-67	RH-75 C1-02	9.0	11.0	84.0	65	Radar tracked complete trajectory.
22-12-67	RH-75 C1-03	9.0	11.0	84.0	65	Flight was stable (Chairman witnessed this flight).
25-1-68	RH-75 C1-04	10.7	6.8	93.0	77	Flight was good and white streak of smoke was observed.
25-1-68	RH-75 C1-05	10.5	7.6	92.0	75	Radar tracked only at few points on the trajectory.
30-1-68	RH-75 C1-06	10.5	7.6	92.0	75	Radar tracked descending flight.
30-1-68	RH-75 C1-07	10.5	7.6	92.0	75	Failure. Nose cone was ejected due to failure of threads at the head-end joint.
2-2-68	RH-75 C1-08	10.0	8.8	90.0	72	Prime Minister Indira Gandhi witnessed this successful flight.

the vehicle were performed, and the position of the center of gravity for various payloads was determined analytically. the results compared very well with the experimental measurements. The variation of the center of gravity with respect to time was also calculated from a knowledge of the propellant mass flow rate.

Standard methods were used for the calculation of the center of pressure, and the static stability margin was determined for various flight conditions. It was determined that the rocket, as designed, would be stable under all anticipated flight conditions.

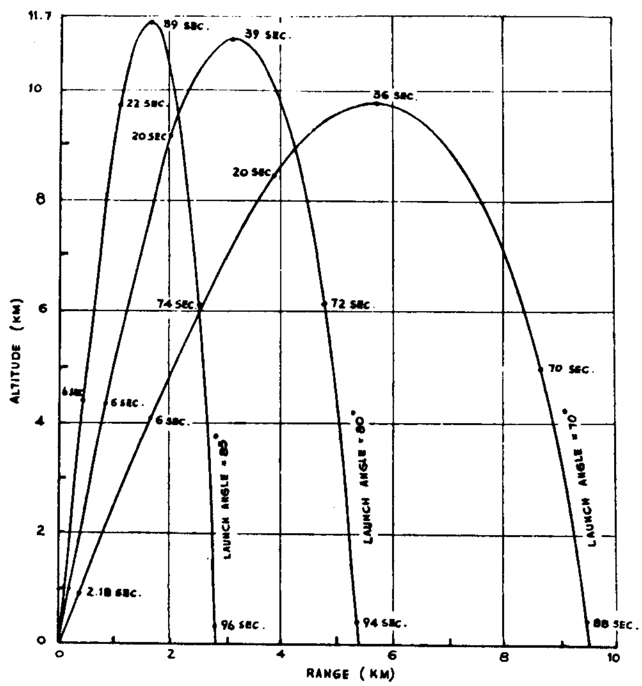
The first phase of the program was to design an engine using various grain configurations, with the results being used to optimize later Rohini vehicles.

Trajectory Calculations

Following the design of the engine a number of flight simulations were run on the Minsk 2 digital computer donated to the Center by the USSR. To estimate the performance of the RH-75, the program assumed that the rocket is a point mass moving in a vertical plane under the influence of a time varying thrust, a velocity dependent drag, and the force of gravity. The influence of the variation of the pressure, density and temperature in the atmosphere on the thrust and drag was also included in the calulations. Since the range of the RH-75 is only about 10km, a flat earth was assumed in all calculations.

Launcher Assembly

The Rohini launcher was designed for the 75mm diameter RH-75 rocket. It is a portable launcher of the ride-on beam type. Guidance for the rocket is effected by means of a pair of guide rails. The launcher has built in provisions for azimuth and elevation adjustments to an accuracy of 1°. It can be dismantled and easily packed or reassembled at any launch pad. No special foundation is required. Fabrication of the launcer was undertaken at SSTC.



RH-75 Trajectories for various launch angles.

Flight Testings

The first test flight of the Rohini RH-75 was successfully undertaken on November 20, 1967, from the Thumba Equatorial Rocket Launching Station. Since then, six other successful flights have been conducted (see table 1). On January 30, 1968, the only failure of the test program occurred when the nose cone was ejected due to a breakdown of threads at the head-end joint.

Paint Patterns

The overall color of the RH-75 airframe is red, with white lettering. The nozzle end and fins are painted green. The lettering down the side of the rocket reads 'ROHINI - 75 * SSTC INDIA'.

Future Programs

The successful testing of the Rohini RH-75 has provided the nessessary experiance for the Indian rocket engineers. It is planned to build a larger diameter version of the RH-75, with the present vehicle airframe modified to give optimum performance, and designed to carry a scientific payload. A two stage vehicle capable of carrying payloads to 180 miles is also in the design stages.

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Rao, Dr. Y. Janardana, Rohini-75 Project Report, SSTC–PR–1-68, Space Science and Technology Center, Trivandrum, India, February 1968.

Rao, Dr. Y. Janardana, Private correspondace, January 30, 1969.

Technical Notes

George Caporaso

This month's mad ramblings deal chiefly with the need for a scientific and technological organization within the hobby.

It is recognized by all that there is indeed a lunatic fringe of modelers who champion the insidious encroachment of science on the "hobby". This column is addressed to that small, but rapidly (I hope) growing segment of the modrocnuts.

Those of us who are depraved enough to introduce mathematics, physics, aerodynamics, and electronics into this field have a dire need for organization and communication. Since the proponents of this segment assert that it is in fact a science, it seems to me that we would benefit by adopting the generalized scientific approach .

We need model rocket theorists, experimentalists and combinations of the two. We need greatly increased publication in the technical aspects of the field. And we also need strictly technical gatherings.

In "professional" science there are many journals packed from cover to cover with all sorts of theoretical derivations and empirically measured goodies. There are many scientists who have specialized interests; they concentrate on theory or experiment in one area. A theorist working in a certain field publishes some of his work, then an experimentalist also interested in that area proceeds to devise and perform experiments that will test that theory. The results are rapidly published. The theorist then sees what aspects of his theory have held up under test and proceeds to revise the parts that didn't. An experimentalist then tests the new theory, etc., until convergence is attained.

The science of model rocketry suffers from several afflictions. First, there are pitifully few experimentalists. Second, results are rarely published and are not usually given wide circulation. Third, most of the current scientific "elite" in the hobby do not concentrate on one area.

Although there are many sides to altitude performance–oscillations, trajectory analysis, drag, etc.–I believe it is possible to unify the entire structure under a general theory. As is well known, many major segments of the hoped for theory already exist, but there are many gaps and a sore *lack of experimental data.*

So we need more theorists and many more experimentalists. We need rapid publication of theories and test results. Our theories are all *unverified.* Where do they break down? How good are they? Let's find out—NOW!

Next, we need many more gatherings of a technical nature. These need not be conventions and big affairs. They can be small regional meetings held solely for the purpose of having technical bull sessions and for the presentations of papers. Ideally, a weekend long meeting should boast no less than 15 papers delivered. We need these meetings on a regional and national level. Proceedings of each meeting should be published and circulated widely,perhaps in **Model Rocketry**. It is vital that this be done. Without this organization and structure of theorists, experimentalists, journals and meetings, the progress of the science will forever be slow.

There are perhaps enough theorists in the country to sustain the state of the science in rapid growth if only there were a commensurate number of experimenters. This column and this magazine are ready and willing to publish technical articles. We have found that, contrary to popular belief, the readership does like technical articles and projects. What we are trying to stress is the fact that model rocketry represents a vast panorama of opportunity for scientific development and research. *All the secrets of the field can be discovered by the model rocketeer.* He need not have a Ph.D in order to succeed; just a true interest in the field and the willingness to do a little reading, building and data taking.

If model rocketry is to survive and grow, it must become more technical (heh, heh!). The major manufacturers seem to recognize this fact as is evidenced by the increasing number of first rate technical reports that they offer.

At the same time, the continuous, unrelenting throat-ramming of science into progressively lower school grades is finally having its feared effect. Many younger modelers have been successfully brainwashed by their evil science teachers and now begin to actually manifest an interest in science (how terrible for those of the humane letters!).

Thus science in model rocketry is insidiously advancing on all fronts and unless a concerted attempt at eliminating the offenders is made now all mankind will doubtless suffer the consequences (the Vengeance Class rockets as an example).

As the spectre of science and technology slowly rises above our heads, we can realize that the actual technical development of the field will occur at some of our major universities. There are people of sufficient caliber at M.I.T., R.P.I., Cornell, Purdue, Ohio State, perhaps even at Harvard (ha!), and at many other institutions of higher learning. We desperately need academic leadership in California (perhaps from Caltech or Berkeley),the Southwest, Midwest and North. Academic clusters of modelers centered in the appropriate regions would form an effective set of "core locations" for the hoped for advancement. Once a sufficient number of "core centers" are established, nationwide technical meetings could be held once a year at a different center. Meanwhile, each core center would host a number of regional conferences throughout the year. If the proceedings of each meeting, regional and national, were then published, most of model rocketry's science headaches would be over.

Ten regional university core centers would probably suffice for the continental United States, each in turn hosting the yearly National Technical Congress on Model Rocketry. Sound fantastic? Maybe so, but I believe that there is enough in model rocketry to warrant such a savage title for such a meeting. In fact, I believe that the establishment of such regional centers is inevitable and hence feel that the organization of the science I have spoken of will surely follow. I invite comments on this column and the plan presented for the hobby's future development.

(Q & A continued from page 16)

boundary.

I myself believe that wax, when properly applied, will enhance the finish of any model rocket and that those who complain about wax on this score are simply shoddy craftsmen. Regarding performance, I think it is clear that, if wax were able to maintain a completely laminar boundary layer over the full length of the rocket, the advantage in drag reduction would always be greater than the penalty incurred in increased weight. On the other hand, I have no idea whether wax is capable of maintaining such a laminar boundary–for this, you will have to rely either on your own intuition or your own experiments.

Gordon Mandell

Any questions submitted to this column and accompanied by a self-addressed, stamped envelope will be personally answered. Questions of general interest will also be answered through this column. All questions should be submitted to:

Q and A
Model Rocketry *Magazine*
Box 214
Boston, Mass. 02123

For high altitude performance...

Build the EXCALIBUR

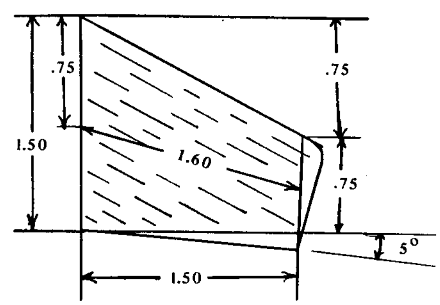
Employing Rearward Parachute Deployment

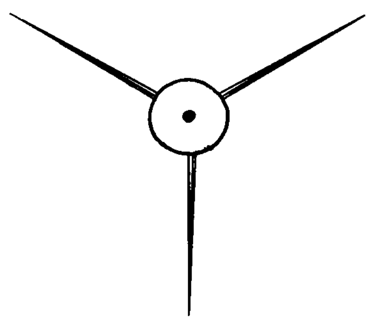
by Charles Andres

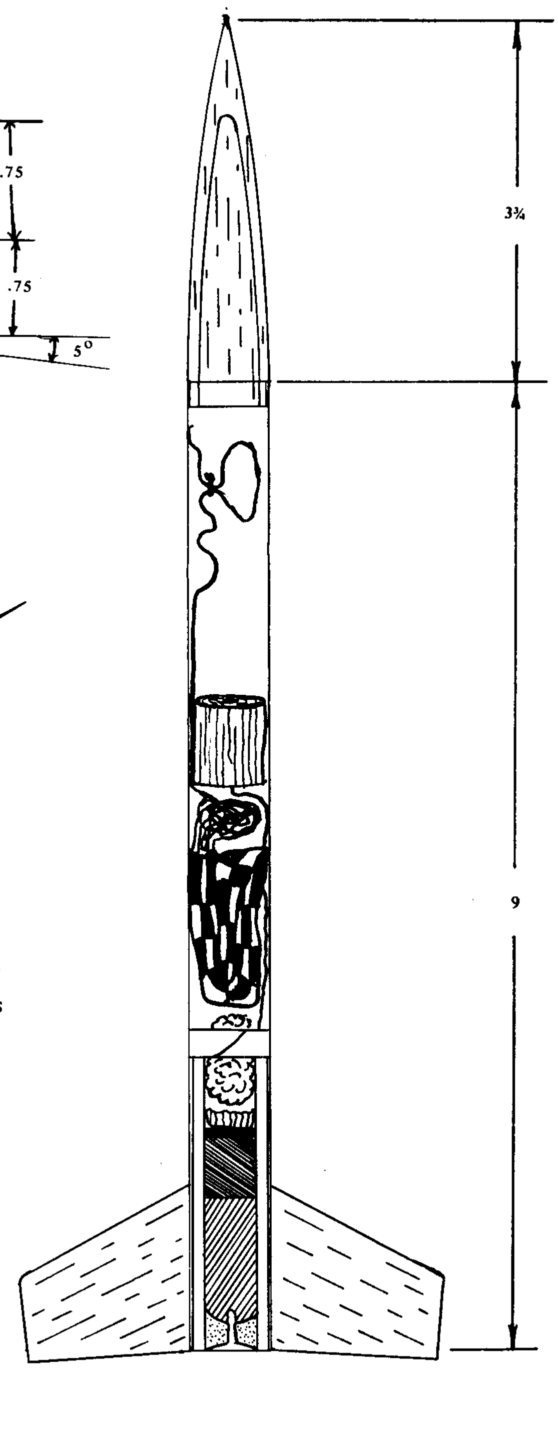
The Excalibur is a high performance model which was designed with altitude performance solely in mind. In keeping with this theme, the Excalibur incorporates several techniques to keep weight and drag at a minimum. The body tube is a Centuri ST–79 which is left at its 9.0" length. The nose cone is hollowed out and glued to the top of the body tube. The cone used on the original was a Centuri BC–74, incorporating a length to diameter ratio of 5:1. Because the nose is hollowed to save weight a rearward ejection system is used. This also eliminates the nose cone–body tube joint, which in turn reduces drag.

In the original model, two streamers are used, one for the expended engine and one for the rocket itself. A parachute could also be used for the body. The recovery system works as follows: When the ejection charge goes off, the engine casing is ejected backward, and pulls out its own streamer. However, because the streamer is ahead of the parachute, the parachute is pulled out as well. The parachute is attached to the forward end of the body by either a bungee strap or a shock cord. Recovery wadding is inserted at the rear of the engine on top of the retainer cap.

There are only three fins–for drag reduction–and each is a modified version of the standard Stine lo-drag design with a 5° swept trailing edge. The model incorporates standard building techniques, but should be finished in bright colors to aid in tracking. A coat of wax will help to make the surface as smooth as possible. In addition, the Excalibur should be launched from a tower to avoid parasite drag on a launching lug.







ALL DIMENSIONS ARE IN INCHES

FLIGHT HISTORY

This model was launched for the first time in the Spring of 1969, when it reached an altitude 717 feet with an A8–3. The second flight was flown at the 1969 MIT Model Rocket Convention with a B4–4. Even with streamer recovery, the model traveled as far as any other rocket launched that day that was recovered. The model has been predicted to be able to reach an altitude of 1650 feet with a C 6–5, and might travel farther under ideal conditions.

AD ASTRA PER ASPERA

DR.WILLY LEY
1906 - 1969

The man who founded the Verein fur Raumshiffart (German Rocket Society) in Berlin in 1927 with a dream of putting a man on the Moon missed seeing his lifelong dream come true by less than one orbit of the Moon around the Earth.

Dr. Willy Ley passed away of a heart attack on Tuesday, June 24, 1969.

He was born in Berlin in 1906 and studied at the Universities of Berlin and Konigsberg in physics, astronomy, and paleontology. Although he was one of the founders of the German Rocket Society, he was a paleontologist by profession.

In 1930, he introduced a young Prussian nobleman to the exciting world of rockets and space flight. That young student was Wernher von Braun.

When Adolph Hitler and the Nazi party came to power in Germany in 1933, Willy Ley prepared to leave Germany. He came to the United States in 1935, and subsequently became an American citizen.

He served in many posts as a science editor and a research engineer. But it was his pioneer book Rockets, published in May 1944, that gained him his place in the history he helped create. In October 1967, the fifth up-dated version of this book was published under the title **Rockets, Missiles, and Men in Space.** As Ley himself said in the Foreword to the 1967 edition, the first book was 60% historical and 40% prediction of what we could do in space. The 1967 edition is nearly all historical, because we accomplished what Ley said we could.

Or did we accomplish it because Willy Ley convinced us that we could accomplish it? Did he make a self-fulfilling prophecy? I believe he did.

I went without lunches in college to be able to purchase Ley's book, **The Conquest of Space**, illustrated by Chesley Bonestell. It changed my own personal life. When Willy Ley autographed it for me some 15 years later and I mentioned how it had altered the course of my own career, he remarked, "Oh, so I'm going to get blamed for that, too!"

When the National Association of Rocketry was formed as the Model Missile Association in 1958, Willy Ley was one of its first members and served continuously on the Board of Trustees until his untimely passing. As one of the early supporters of model rocketry – his real, honest, in-sequence NAR Number is and always will be NAR 14 – he stuck his neck out with confidence and faith in our nation's youth when many others were waiting to see if model rocketry would go up in a cloud of rocket propellant.

When asked, he gave unstintingly of himself to model rocketry and model rocketeers. He was on hand at NARAM-5, NARAM-6, and NARAM-10. He manned the firing panel. He autographed rockets. He talked with young rocketeers. He passed on to yet another generation the excitement, the emotion, and the desire to thrust beyond the sky into the Universe.

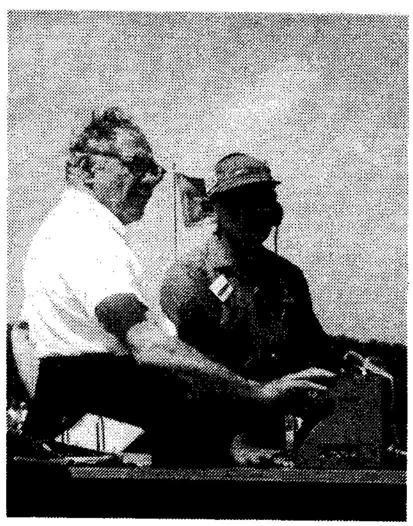


Photo by Vern Estes

Dr. Willy Ley mans the firing panel at NARAM-6 with G. Harry Stine to fire a scale model of the German V-2 rocket.

I spoke with Willy Ley the day before he passed on. We talked about being together at Cape Kennedy for the launch of Apollo-11 and of arrangements to be in New York for CBS News when man first set foot on the surface of another planet. When I asked Willey Ley if he would come to the CBS News studios for the landing, he replied, 'An Unqualified Yes!'

Dr. Willy Ley lived to see man conquer space. But he did not get to see the fulfilment of his lifelong dream, to watch a man set foot on Kepler's 'shining isle of Levania.'

He went on his own Long Trajectory first....

—G. Harry Stine

Recreation Dept Organizes Rocket Activities in Rutland, Vt.

The Rutland Vermont Recreation Department has invited local boys of junior high school age and older to join its model rocket club. The club will meet regularly at the Edwin W. Lawrence Recreation Center.

The Recreation Department reports that the club has permission from the Vermont Aeronautics Board to fire model rockets. Launches will be held once a month at a local firing range.

Ideas on construction and launching will be discussed at regular meetings. Alan Kousen, a Rutland High School chemistry teacher, originated the program with some of his students. Kousen serves as the club advisor. Jeffrey Wennburg is the club president.

News

Defiance Ohio Bans Model Rockets

The May 8, 1969 issue of the Defiance, Ohio Crescent-News reports that the Defiance Fire Department issued a warning to persons selling and firing model rockets. They cautioned that model rockets are classified as fireworks and are therefore prohibited under state laws.

Assistant Fire Chief Forest Hall said that the rockets are classified as Class C and fall directly under Ohio's Fireworks and Explosives Law.

Hall stated that these laws prohibit the sale, at wholesale and retail, of such devices and also prohibits the discharging, ignition or exploding of them.

"We feel that some of these explosives in unskilled hands could mean disaster for someone," Hall said. "We are asking the cooperation of the public in curbing the sale and use of these rockets."

Model Rocketry

Expands to 48 Pages

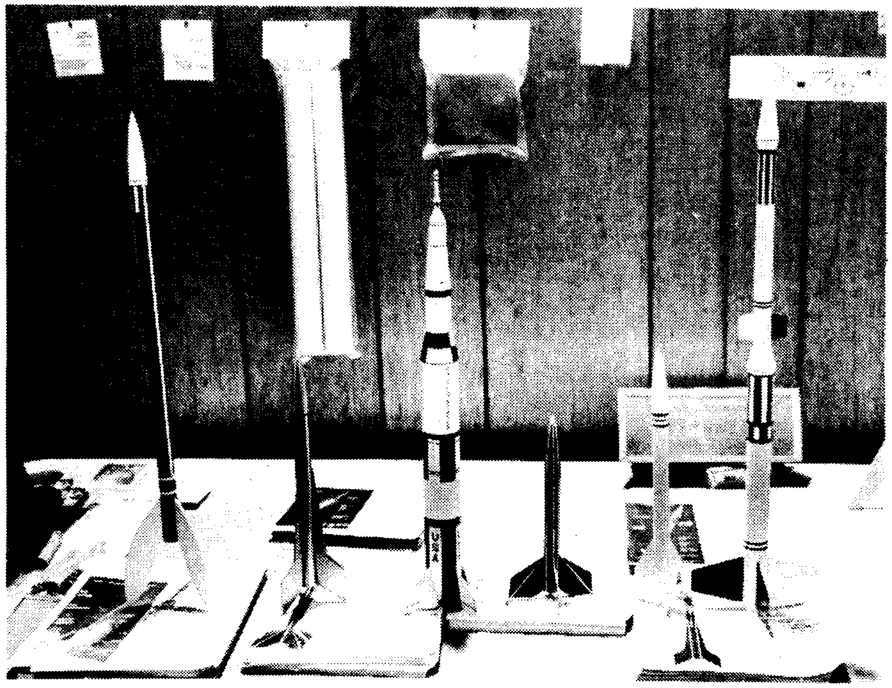
This month Model Rocketry magazine expands to include a 48-page issue length as part of its improved format. This move is undertaken as a part of our never ending effort to bring our readership the most complete, accurate, and up-to-date coverage of the field of model rocketry available anywhere in the world today. In keeping with this policy, a number of new features will be incorporated effective with our October First Anniversary Issue -- among them a beginner's column to provide aid and guidance to newcomers to our hobby and one or more international columns, written by on-the-scene foreign correspondents, to keep modelers around the world in intimate contact with one another.

Notes

HIAA To Assist With State Laws

Model Rocketeers in those states where the hobby is still illegal or restricted may now seek assistance from Tim Skinner of the Hobby Industry Association of America (HIAA). Rocketeers who have established contact with their state officials or legislators should write to Mr. Skinner, Chairman of the Rocketry Division of the HIAA, at 1930 Brandon Road, Norristown, Pennsylvania. He will offer guidelines on the content of legislation which has been successful in legalizing model rocketry in other states. Such legislation is generally based on the recent National Fire Protection Code, and Mr. Skinner would like to see uniform model rocket legislation in all states. He will also attempt to obtain a speaker to testify in favor of model rocketry before your state legislative committee when hearings on model rocket legislation are held. At the present time Mr. Skinner is working on a model rocket bill now before the legislature in his home state of Pennsylvania.

New Product Notes



The Space Age Industries rocket line, from left to right, the Judge, the Unicorn, a semi-scale Saturn V, the Skyhawk, the Tempus Fugit, and a semi-scale Nike-Deacon, is shown above.

A new line of model rocket products has been introduced by Space Age Industries. Led by the Judge, a 24½" long altitude rocket weighing 1¼ ounces and priced at \$2.50; the line also includes the Unicorn, a 13" sport rocket weighing ½ ounce for \$2.00; and a beginners kit, the 9½" Skyhawk, priced at 99 cents. This company also has available two semi-scale kits: the Saturn 5/Apollo 11 and the Nike-Deacon. The 21½" long Saturn 5, priced at \$3.50, employs slightly oversize fins to insure stability. The Nike-Deacon, 26" long, comes complete with 2 parachutes and weighs only 1½ ounces. This kit is priced at \$3.00. The Tempus Fugit, the rocket used by NAR trustee Bryant Thompson to establish an NAR record, is available in kit form for only \$1.50.

Space Age Industries will also introduce a complete line of body tubes (in metric dimensions), nose cones to fit, elastic shock cord material, aluminum launch lugs, and other model rocket supplies. A 6-part boost glider kit is coming soon. Space Age Industries products are available at your local hobby shops. If not available from your dealer, write to Space Age Industries, Dept. MR, 714 Raritan Avenue, Highland Park, N.J. 08904, including the name of your local hobby shop, and you will be sent a free catalog.

WHAT'S YOUR FAVORITE ARTICLE THIS MONTH?

Vote here for your favorite articles. List them in order - the most-liked first, etc.

1.__________
2.__________
3.__________
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Clip this section out or use a facsimile. Paste on a postcard or enclose it in an envelope and send to:

Reader Survey
Model Rocketry Magazine
Box 214
Boston, Mass. 02123

MODEL ROCKETRY magazine

The Journal of Miniature Astronautics

Box 214 Boston, Mass. 02123

Dear Model Rocketeer:

Model Rocketry is pleased to welcome the members of the National Association of Rocketry as readers of this magazine. We believe you will find "The Model Rocketeer" in its new, expanded form a valuable source of current information on NAR activities. Furthermore, we feel certain you will enjoy the 42 additional pages of model rocket news, designs, scale plans, technical features, etc., contained in every issue of **Model Rocketry**.

Your comments and opinions concerning the content of **Model Rocketry** are welcome. But, please, don't just tell us: "Publish more designs," or "How about a transmitter schematic?" Don't tell us this, and then expect that someone *else* will go out and design that contest-winning bird for you. Not, that is, unless *you're* willing to share some of *your* winning plans with *him*. LET'S SEE SOME OF YOUR DESIGNS, R & D WORK, OR PERHAPS JUST SOME OF YOUR SUGGESTIONS ON HOW TO GET STARTED IN MODEL ROCKETRY. If, and only if, you send in some of *your* material for publication can you expect other rocketeers to share their discoveries and their hard work with you.

We have a problem in this hobby -- COMMUNICATION. In the past there's been very little. That's why in this year of 1969 rocketeers are still wasting time trying designs that other rocketeers proved inferior in 1959. If model rocketry is to continue its growth, communication must be greatly improved.

You need not be a "professional writer" to submit an article for publication. As far as I know, none of the articles printed in **Model Rocketry** since our first issue last October (with the exception of G. Harry Stine's "Astroscale" and "The Old Rocketeer" series) have been written by "professional writers". What you *do* need, is a new idea, a new design, or perhaps an old idea that no one has ever taken the trouble to publish before. Write it down in something resembling coherent English, make us a rough sketch (or, if at all possible, a finished drawing) of any artwork necessary, and take a few photos, put the whole works in an envelope and send it in. Then you will have some grounds for complaint if no one sends in an article on that topic you're desparate for information about. This hobby will grow only through the effective dissemination of ideas. **Model Rocketry** can provide a forum for this vital dialog -- but only if you, the rocketeer, choose to communicate these ideas to your fellow hobbyists.

Very truly yours,

George J. Flynn

George J. Flynn

THE MODEL ROCKETEER

FROM COLORADO TO COLORADO - THE STORY OF THE NARAM

NARAMs have always been the highlight of each year in NAR's history and NARAM-11 will be no exception in that respect. Every year rocketeers gather from all over the country to compete, wrangle, talk, work, laugh and generally exhaust themselves (and NAR officials) for four days. Many friendhips are made, thoughts traded and things learned during this time, much of it completely unrelated to the contest. NARAMs are a time of communication as well as competition.

As an institution, the NARAM reaches all the way back to NAR's first year with NARAM-1 held in August, 1959. It was hosted by the first chartered section, Mile-Hi of Denver, which became the first championship section as well. At that time there were no age divisions so there was only one champ, Norman Mains, NAR no. 61. There were also no weighting factors or competition factors, so Norm won with a grand total of 26 contest points. A number of other notable things occurred at the first NARAM, not the least of which was the appearance of some strange people: a white bearded fellow who claimed to be the original Ole Rocketeer, and a sword swinging Soviet with a seven engined bird named Ivan. G. Harry Stine acted as CD over the flights at the Hogback Range, a 600 acre field perfect for model rockets.

NARAM-2 was again held in Colorado, this time at the Peak City Range in Colorado Springs. Again Mile-Hi walked off with the pennant as William S. Roe, NARAM-11 CD, presided. NAR was still small and competition was mild with most models large and not as sleek as today's birds.

The third NARAM was held at Hogback under the eyes of Del Hitch and Mile-Hi but something new was seen. Budding scientists and engineers put their brains to the test and came up with a camera rocket, underwater launches and the first boost glider; R&D had come into vogue. Peak City captured the pennant after a pitched battle with Mile-Hi.

NARAM-4 was hosted by the Air Force Academy Section, Rampart Range, with help from Peak City. Capt. Vernon Van Vonderon was CD (see photo) and NAR had grown to the point that the Captain had to restrict entries to the first 100 applicants.

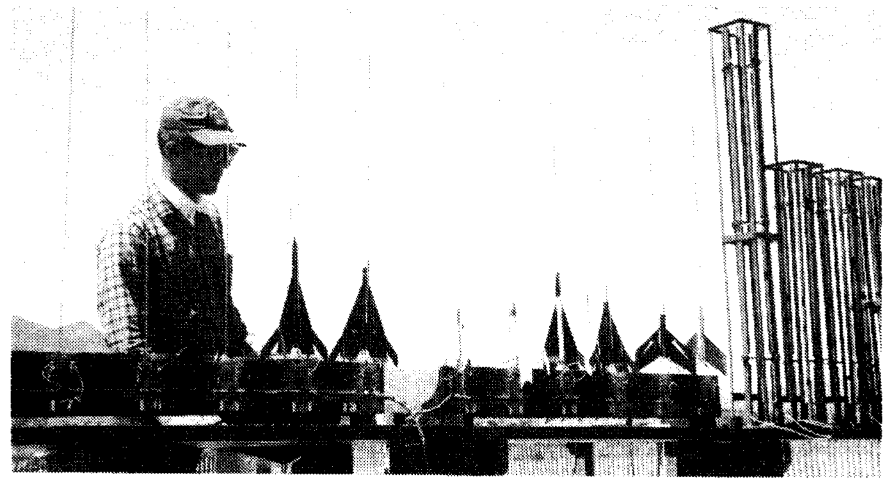


Photo courtesy G. H. Stine

Captain Vernon Vanvonderon, Contest Director of NARAM-4 at the USAF Academy in 1962, inspects a launch rack of boost-glider entries prior to lift-off. Seen on launchers are Estes Space Plane and old Centuri Aero-Bats.

Many national records were set including Vern Estes' B/G record. Time? one minute 22 seconds. More interesting R&D showed up, including a motion picture camera. For the first time division championships were given. Peak City held its previously won pennant.

NARAM-5 was the first Nationals to be held outside of Colorado and was hosted by Fairchester, North Shore and Pascack Valley sections at Hanscom Field, outside of Boston. For most of the 55 contestants it was their first NARAM since they were from the Eastern Seaboard. Marshall Wilder, NAR no. 39, was Contest Director and innovated the meet by opening R&D to all members who could attend, a tradition that has been maintained ever since. Everyone was surprised to see the Westerners take the pennant 2000 miles back home as Mile-Hi was the champion. Old rocketeers John Essman, Wes Wada and Greg McBride sold lightbulbs to earn their passage and demonstrated that anybody can get to a NARAM and win. R&D was big again and 4 out of 8 R&D winners were involved with gliders. The B/G event was a major hassle as the winds were gusting up to 35 miles per hour. Johny Belkewitch Jr. won B/G with a Space Plane with tabs trimmed up all the way and a NAR payload as a nose cone weight!

NASA hosted NARAM-6 with Dr. W. B. Rich presiding at Wallops Island, an ideal spot. Those who arrived early were treated to a full scale Scout launch and accomodations were ideal. NAR members were even treated to a clambake by the Chincoteague Chamber of Commerce. It was at NARAM-6 that ole rocketeer Gordon Mandell was initiated into the Neptune Society by being dumped into the purifying Atlantic. R&D abounded again, but perfect scale models began to appear in quantity. Some of the best modelers came from the first Eastern champs, Fairchester section, who grabbed the pennant and were to hold it for four years.

NASA engineer Howard Galloway was director of the Seventh Nationals, held at Aberdeen Proving Grounds in Maryland. An all around good meet, highlights included a record setting 4 minute, 15 second B/G flight by Talley Guill and a strange looking retro rocket built by a 4 man team.

NARAM-8 went to Clinton County AFB in Ohio and was sponsored by nearby Ohio Valley section. Steel City and Ashland lent a hand at the first NARAM to utilize the misfire alley system (each rocketeer launches his bird off of an individual launcher). G. Harry Stine came to the rescue as CD when NAR CD Bill Barnitz was called

(NARAM Continued.)

by the USAF at the last minute. Misfire alley took some time to get used to, but it was fun to launch your own entry. Several outstanding flights occurred including a 30 minute B/G flight by Gary Spriggs. Unfortunately, Gary lost the bird in a cornfield and had to be disqualified.

Zenith section hosted NARAM-9 in Minnesota with now-NAR President Beetch as CD. A tightly run meet, the ninth Nationals featured changes in NAR with elections of trustees and officers and provisional approval LAC. R&D again was notable with much professional investigation apparent in the projects. It was the first NARAM held on a college and the Mid-west location made the contestant roster read like an all-American directory.

Last year's NARAM celebrated NAR's tenth year. Jim Barrowman and NARHAMS ran the show, again at Wallops, and it was an all around fun meet. Jim innovated with new data systems and the new egg lofting event was held with multi-colored eggs to liven up the show. It was a really great contest with many new faces showing up in the competition and a new section champ, YMCA Space Pioneers. The meet was flown in the afternoon due to NASA runway tests and the morning was taken up with lectures and field trips.

And now the NARAM returns to Colorado, not as merely the eleventh National meet but as a nation-travelling tradition. NARAM-11 begins the next ten years of NAR growth as the indicator of model rocketry's advancement from a localized hobby to a national youth interest in the space sciences.

Editor's Nook

This is the first issue of *The Model Rocketeer*. It's new in that it's longer, with more news, features and tech material than ever before. It's new in that it's distributed by a magazine devoted completely to model rocketry. It's especially new in that it is a cooperative effort with a staff numbering more than one. Working together are: yours truly, Lindsay Audin, chief editor; Chuck Gordon, section news editor; Carl Kratzer, technical features editor; and Bob Forbes, illustrations editor. Several other people will be tapped for labor once our system is intact. As a matter of fact, a dozen other people have already been notified that they will be given the privilege of contributing their effort to the *The Model Rocketeer* in coming months. Another dozen letters are in the mill in the hope that the excellent cooperation I've received so far will continue. Will a little luck (and a lot of sweat) we hope to bring you a tech report or plan in every issue.

We'd like to include other features in future issues such as a question and answer column on NAR and rocketry in general and a letters-to-the-editor column to give me material for the Editor's Nook column. Got an idea, or a beef or a useful random thought? Send it to me. One matter I've noticed over the past years was a lack of communication concerning R&D work; often two rocketeers are duplicating effort on one project whereas they could simplify (or expand) their work if they were aware of each others' endeavors. Thus, any news news of what you or your friends are doing is especially welcome.

Any completed technical material you wish to submit is appreciated and will be returned intact. Copy and drawings will be prepared for printing by our staff but figures must be clearly sketched when submitted. Similarly, plans for any competition or scale birds should clearly indicate such detail as CP, CG and exact fin pattern. Send all such material to *The Model Rocketeer*, c/o, NAR HQ.

Any section or group news should be sent directly to the Section News Editor , Chuck Gordon, at 192 Charolette Drive, Laurel, Md.20810 to guarantee earliest publication. This includes notification of contests, meets, demonstrations, etc. and should be predated two months in advance to insure timeliness when published.

In each issue we hope to include a major feature article on a general topic in NAR. Presently lined up are items covering: section groupings, membership surveys, computerization in model rocketry and the battle for legalisation. Future articles will cover convention planning and professional use of model rockets.

SECTION NEWS

E.C.R.M. RENAMED

As many rocketeers on the East Coast know, each year the NARHAMS section sponsers the East Coast Regional Meet (ECRM) at Camp A.P. Hill, Virginia. As usual, the meet was held in the spring, but this time there was a slight change, namely a temporary alteration of the name. In April 1969, the Carl Kratzer Invitational III was held instead. The members of the NARHAMS decided to honor Carl, an old time rocketeer and member of the section, and now a student of Cornell University, for his outstanding work in organizing the first two ECRM meets and for the great example he set in arranging all types of contests for the section. Congratulations Carl.

SCOUTS BECOMING INTERESTED IN MODEL ROCKETRY

Denver area Boy Scout Troop 274 has recently expressed its interest in Model Rocketry by opening a booth at the 1969 Scouting Exposition. The booth was supplied with information in the form of NAR fliers, rocket models and engines for display provided by the Metro-Denver Rocket Association, along with their newsletter the Misfire, and technical reports supplied by Estes Industries.

On May 11, the NAR Capital Area Section (NARCAS) of Camp Hill, Pa. put on a demonstration at the Pathfinders Regional Camporee at Blue Mountain Academy in Pa. The Pathfinders were so favorably impressed by the demonstration, where every ignition was perfect, that they have expressed their desire to develop a merit badge for Model Rocketry.

In June, the NARCAS members also presented a program on Model Rocketry to Explorer Scouts in the Camp Hill area.

Considerable interest in Model Rocketry seems to be developing in Scouting through the continuing activities of Model Rocketeers throughout the country.

COSMOTARIANS BUSY

On the West Coast, the COSMOTARIANS section of Gladstone, Oregon is expanding tremendously. Chartered on March 14, 1969, the section has over 56 members, including 6 seniors, all official members of the NAR. It is possible that they are the largest section in the country.

Each week, as weather permits, the COSMOTARIANS hold a regular range launch where members have the chance to fly all types of models and to train in the operation of a rocket range and tracking equipment.

Funds for various projects, including a planned wind tunnel, are raised through paper drives, car washes, and other similar activities. These funds are also used to provide each member with an NAR patch and to buy engines for sale at the firing range.

Presenting civic programs upon request, close work with the police and fire authorities, along with regular model flying, are a basic part of the COSMOTARIANS' plans to become one of the best sections in the NAR.

MODEL ROCKETS - INTELLIGENT??

By now, I am sure many modelers have tried out that new event, Egg Lofting, and have also seen what can happen if the bird is not flown with proper care, and what weird looking rockets are sometimes flown.

At the Kratzer Invitational (ECRM III) one bird knew exactly where it really belonged. After a normal flight, the egg capsule was coming down right into the launch and recovery area, when it slowly drifted into the trash can for destroyed rockets, parachute and all.

Is a model rocket intelligent? Right now I don't know. Do you?

FROM THE SECTION COMMITTEE

To assist Section Director Atwood in organizing section activities, the nation has been broken up into six districts with the following members as local directors:

Division	Name	Address
Northeast	Jay Apt	40 Woodland Rd. Pittsburgh, Pa. 15232
Southland	Richard Sipes	5427 85th Ave., Apt. 101 New Carrollton, Md.
Mid-America	Manning Butterworth	Rt. 1 Eagle Lake, Minn. 56024
Southwest	James Poindexter	Spacemobile Opn. AP4 Manned Spacecraft Center Houston, Texas 77058
Mountain	Mel Severe	8361 Chase Way Arvada, Colorado 80002
Pacific	Dane Boles	1444 W. Garvey W. Covina, Calif. 91790

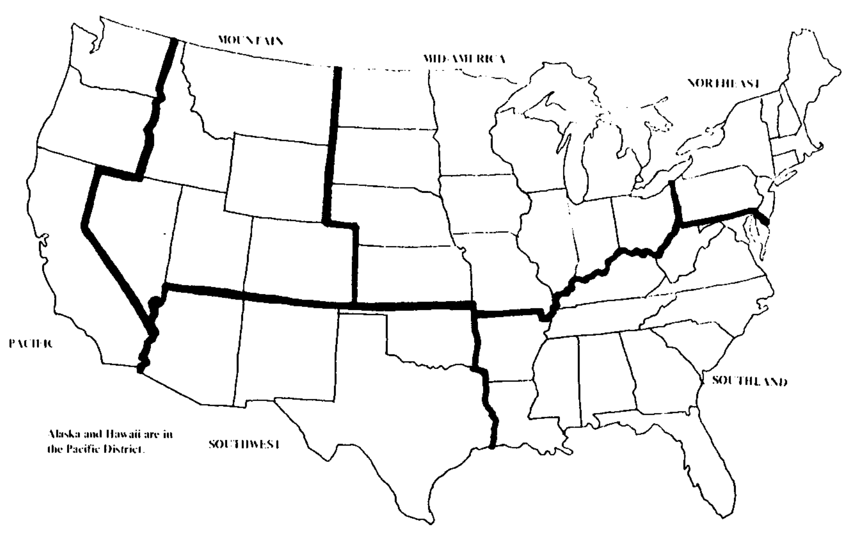
See the map below for boundaries of districts.

Purpose of the districting plan is to coordinate activities among sections (such as conventions, regionals, etc.), aid the formation of new sections, solve major local problems (such as legal difficulties), and ease the burden on NAR officials. Mr. Atwood plans to supplement the director positions with department heads for each state and eventually urban chiefs for major population concentrations.

An interesting sidelight of the districting plan is the breakdown of membership distribution. A little thought shows where effort is needed to bring NAR membership up to par with overall population distribution.

Division	NAR members (%)	sections (%)	1960 census (%)
Northeast	34	38	25
Southland	22	26	24
Mid-America	22	20	28
Southwest	7	2	8
Mountain	3	2	3
Pacific	12	12	12

If you have an idea for an activity of a regional nature and would like to help implement it, contact your local section director. There is much potential in this system an all directors are able and ready to help.



Leader Administrative Council

The primary thrust of this year's LAC projects has been toward improving benefits for the general NAR member; and many of the main efforts are well along toward completion. John Belkewitch is collecting plans of winning NARAM-10 rockets, as well as winning R&D reports; and Bob Forbes, Carl Kratzer, and Jim Barrowman's publications committee will prepare them for distribution through NAR Technical Services (NARTS). R&D report forms have already been prepared for NARAM-11 and all 1969 Section and Regional contests, so that good R&D reports can become available to the membership, both through the NAR Model Rocketeer and NARTS.

Bob Mullane is arranging a summer field trip for NAR members in the Northeast to the Grumman Aircraft plant on Long Island, where the Apollo Landing Module is made. Meanwhile, for Association members living in Western Pennsylvania, Ohio, and West Virginia, Elaine Sadowski has set up a similar summer excursion to the NASA Lewis Research Center in Cleveland.

Pat Stakem has established a computer altitude prediction service for all NAR members: given the essential characteristics of a model and the engine used, a computer at Carnegie-Mellon University used by the NAR will predict the rocket's altitude. Bob Mullane is collecting a list of all NASA films, books, and other material available for public distribution, so that members will be able to order from NASA directly.

Using a computer program developed for the LAC by Manning Butterworth, Jay Apt is conducting an analysis of the geographic distribution of NAR members to determine areas where new sections can get together. He then contacts all the NAR members living in such a locality and helps them in any way he and the LAC can, to form new Sections. So far, Jay has identified 35 such areas, 12 of which meet the requirements of Section formation (10 members, at least one leader and one senior). Contact will be made with these groups through NAR division managers.

To make forming a new Section easier, and running an established one more enjoyable for all Section members, Joe Persio is adding new chapters to the NAR Section Guide published by last year's LAC. These will include chapters on how to form a Section (including all the details of setting up a range), what to do at business meetings, how to run a contest, and non-rocketry Section activities. The present edition of the manual is available from Elaine Sadowski, and the second edition will appear in August.

This year, the LAC is also helping to better some of the mechanical functions of the NAR. Talley Guill is developing a systematic procedure for the selection of U.S. representatives to international championships, the next being in Yugoslavia in 1970. Bob Mullane and the members of the Pascack Valley Section of the NAR are helping the NAR Contest Committee to evaluate new NAR National Records.

In an effort to find out from the members what they want the NAR to do for them, and how they think it can be improved, Jay Apt is conducting a series of NAR evaluation seminars at conventions and regional meets. Similarly, Pat Stakem and Ed Pearson are preparing an evaluation questionnaire to go out to all NAR members in the 1970 renewal packets.

Elaine Sadowski is supervising the awarding of a new prize at NARAM: a trophy for the best Section newsletter published during the contest year. Elaine has received 10 newsletters and competition appears to be keen. Judging criteria will include originality and promotion of Section growth. If your group hasn't sent in its newsletter yet, do so now. Send to:

Elaine Sadowski
LAC Secretary
1824 Wharton St.
Pittsburgh, Pa. 12520

If I Wrote the Pink Book...

Often it is heard on the field (usually after a ruling is made) that "things ought to be done differently". This column is a place to discuss how things could be done differently, if you wrote the Pink Book. It is a place to discuss rulings by local CD's as well as suggestions for new events and changes in old ones.

This month's column covers Quadrathon and comes from a talk with Jim Barrowman, NARAM-10 CD and NARHAMS senior advisor. Comments are based upon experience with the event at ECRM-3, a regional meet.

The first impression of the event is the high pressure. Because four flights are required (and thus four safety checks) running time is very critical - it is conceivable that the one event could eat up an entire flying day. Furthermore, tracking becomes paramount in importance as a lost track almost invariably relegates the contestant into the non-placing category before he finishes his four flights. He is still required to enter the other three sub-events if he wishes to obtain flights points. For this and other reasons, there is sentiment for returning the weighting factor to 5 (from 10).

The experience of the WAMARVA sections should prove useful to other groups planning Quadrathon. Several tips are especially notable:

1. events should be flown in order of greatest to least loss possibilities to simplify record keeping and reduce the total number of flights; i.e., Parachute Duration, Altitude, PeeWee Payload, and Spot Landing.

2. disqualification from any three sub-events or spot landing alone constitutes disqualification from the whole event. The premium was placed on Spot Landing since it is the one event whose result reduces the quadrathon score and disqualification from it would help, not hinder, the contestant.

3. a running total should be kept (or at least a total should be made of the first three events) before the Spot Landing flights begin to ease pressure on distance measuring. Another Barrowman ruling was that, if the distance from the spot appeared to make the quadrathon score negative, the exact distance should not be measured to save time. Similarly, rulings could be made that distances beyond 300 or 500 feet be left unmeasured for the same reason.

4. since there are few meter measuring tapes available, a set form should be decided upon for conversion of feet to meters. At ECRM-3, distances were measured to the nearest foot and then converted to meters.

5. all quadrathon rockets should be marked distinctly by the safety checker to avoid switching rockets.

6. definite limits should be set up on allowable repair work.

7. the consensus of the WAMARVA group was that each sub-event be flown as a separate event and then the results be combined to equal quadrathon. This would necessitate a change in rule 9.1 (no entry can fly in two events simultaneously) but would allow easier competition and fairness in case of loss before all four events were completed.

Other groups are planning Quadrathon and their comments would be appreciated. This event is good for beginners who would like to experience keen competition with the limited difficulty involved in a simple quadrathon bird. The general view of those that have tried it is that, with some advance planning, Quadrathon is one of the best events in the Pink Book for the average rocketeer.

Notice to Members

The NAR Board of Trustees at a special meeting on March 29 in Pittsburgh approved a transfer of the NAR official publication from American Aircraft Modeler magazine to Model Rocketry. In the transfer a one month overlap has resulted and NAR members were sent the August issues of both AAM and MR as a bonus, to initiate the transfer as soon as possible and to provide an additional membership benefit.

The August issue of AAM was the last to be provided via membership dues - from now through the rest of the year **Model Rocketry** will be sent instead of AAM. The NAR Board consensus is that this action meets the desires of a very large majority of members.

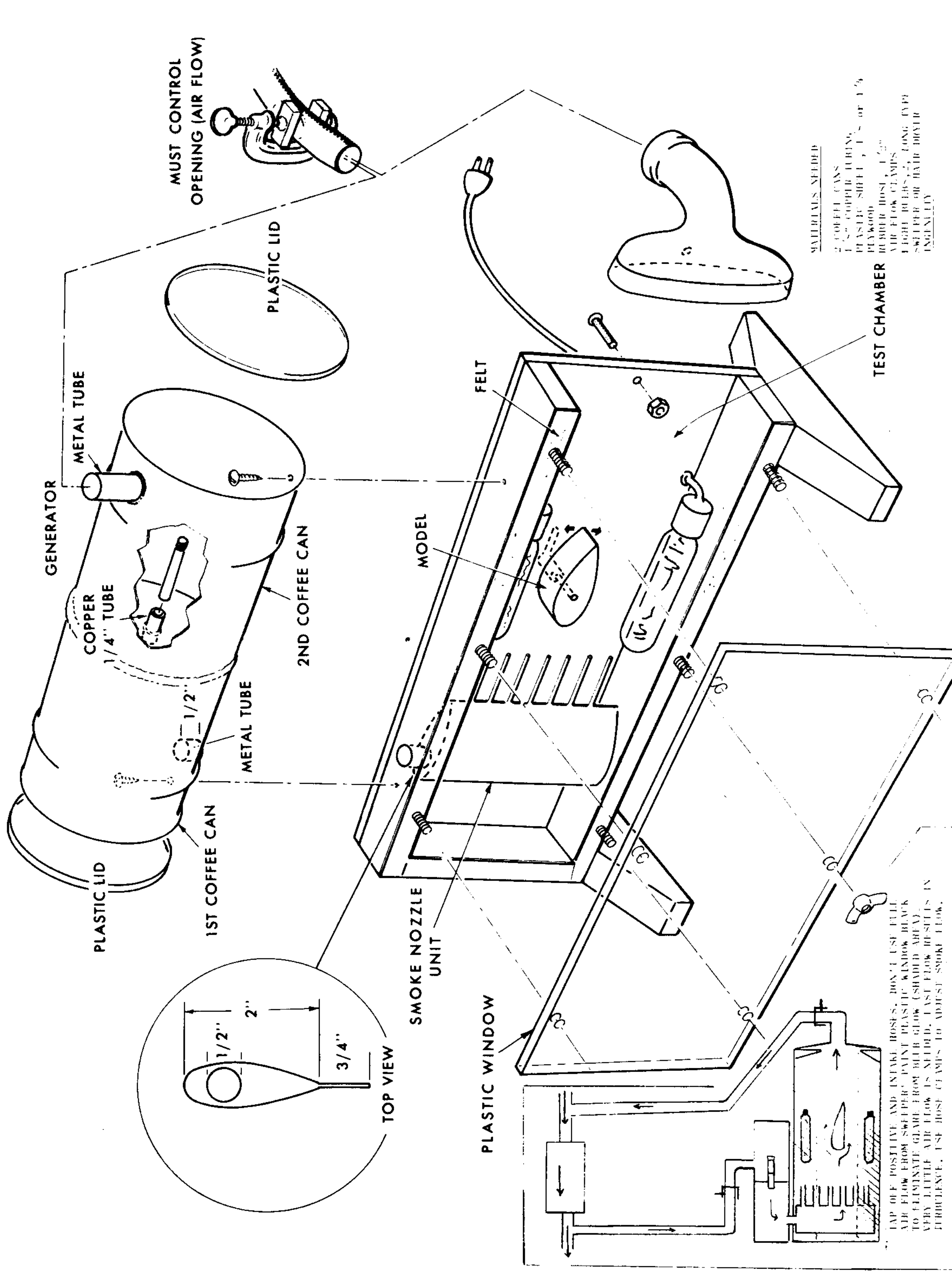
It is acknowledged, however, that for some members who are already MR subscribers a problem of duplication exists. This can be remedied in 1970 when credit for subscriptions can be applied to reduce the cost of membership renewal, but it is too complicated, impractical and costly to apply credit for 1969 duplication. The NAR went to considerable expense to make the magazine transfer for the ultimate benefit of its membership and the duplication problem is unavoidable in order to accomplish what most members have asked for.

To those receiveing duplicate issues in 1969, two courses of action are recommended: 1. Give your extra issue to someone who is not a member or a subscriber, as a personal gesture to promote interest in model rocketry and the NAR. Or: 2. Provide an effective contribution to help NAR save money by advising HQ that you already are a subscriber to **Model Rocketry** magazine and would prefer that the NAR copy be discontinued until your subscription ex pires. In either case you will be helping the cause and acknowledging support for the NAR Board's decision to offer members a magazine with more coverage of model rocketry news and information.

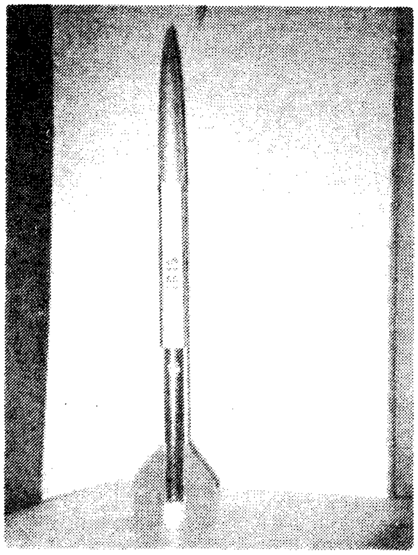
SMOKE TUNNEL

A low velocity smoke tunnel can be made with the aid of the sketch below. Source of air is from a vacuum cleaner or hair dryer. Use ½" soft rubber hose for air input and outflow. A cigarette is the smoke source. The smoke nozzle unit is a symmetric airfoil of balsa or metal and uses 1/8" brass tubes protruding from the trailing edge. Airframe models are mounted on dowels so they may be rotated. *Tap only a portion* of the in and out flow. Slow air movement is the secret to good operation. Adjustment is made with the hose clamps.

To get the most out of such a simple tunnel, further research is suggested. Most technical libraries (e.g., college libraries) contain texts on wind tunnel use. Presently in print is a series of Dover books entitled **Aerodynamic Theory** in six volumes. Go to volume four, wade past the differential equations and find the section on wind tunnels; it should prove useful for those interested in delving deeply into this interesting aspect of rocketry.


MUST CONTROL OPENING (AIR FLOW)
PLASTIC LID
METAL TUBE
GENERATOR
COPPER 1/4" TUBE
2ND COFFEE CAN
1/2"
METAL TUBE
1ST COFFEE CAN
PLASTIC LID
MODEL
FELT
TEST CHAMBER
SMOKE NOZZLE UNIT
PLASTIC WINDOW
TOP VIEW
1/2"
2"
3/4"

Scale Plan of the Month



NAR
Technical
Services
Offers one plan
Each Month to
NON-NAR Members
$ .75

●●●●●●●●●●●●●●●●

N A R Members can obtain this and many other plans at a reduced rate by ordering on the regular Technical Services Order Blank in the Membership Packet.

●●●

Send 75 cents for the IRIS No. 108 Plans to:

NAR Technical Services
Slot & Wing Hobbies Dept. F.
511 So. Century
Rantoul, Illinois 61866

FROM THE CONTEST BOARD

Top 10 section standings:

Section	Points
Apollo - NASA	3293
Pascack Valley	1730
Southland Assoc. of Rocketry	1181
MARS	1035
Fairchester	746
NARHAMS	669
Cheshire	408
Columbus Soc. for Advan. of Rocketry	396
YMCA Space Pioneers	332
Annapolis Assoc. of Rocketry	303

It would appear that Apollo-NASA is pushing for the pennant; perhaps they will have cinched it by the time you read this. NARAMS being what they are, though, we expect many old faces to soon emerge from the dust left by Apollo-NASA's active contest season.

In other news from the Contest Board, there were several rule changes Director Kirchner wished repeated or made known. They are:
add to rule 13.4A:
The number of events for the following meets must be held on one calender day.
Section meets and Area meets cannot have more than six (6) events.
The number of events for a Regional meet must not exceed eight (8) events and must be flown withing two (2) consecutive calendar days.
change 28.11 to make weighting factor of Quadrathon 10 instead of 5.
add to 26.1:
large egg 2 to 2.25 ounces.

Keep in mind that all contest results must be in two weeks prior to NARAM so it's past time to send everything to contest headquarters.

Good luck to all sections and contestants at NARAM-11!

Larry Loos

It would be a major oversight if special attention were not paid to former *Model Rocketeer* editor, Larry Loos. TSgt. Loos came into the center of the NAR fold as our European Liaison and representative in the overseas USAF. When transferred back to the U.S. he took the reins of *The Model Rocketeer* and faithfully delivered copy for the past year, even after being transferred to Thailand! It is such dedication and continuity that will make NAR a strong and ongoing organization. Our thanks to Mr. Loos for his efforts and aid to NAR communication.

Join the NAR

Want to join the NAR? It's easy; next issue will include an application for membership. Just clip it and send it in with the appropriate amount. NAR gives insurance, access to a large library of technical material and plans, participation in contests and now includes Model Rocketry magazine as one of its benefits. Why not join now? NAR is expanding and benefits are ever-increasing; so get in on the fun now!

Coming next month.....

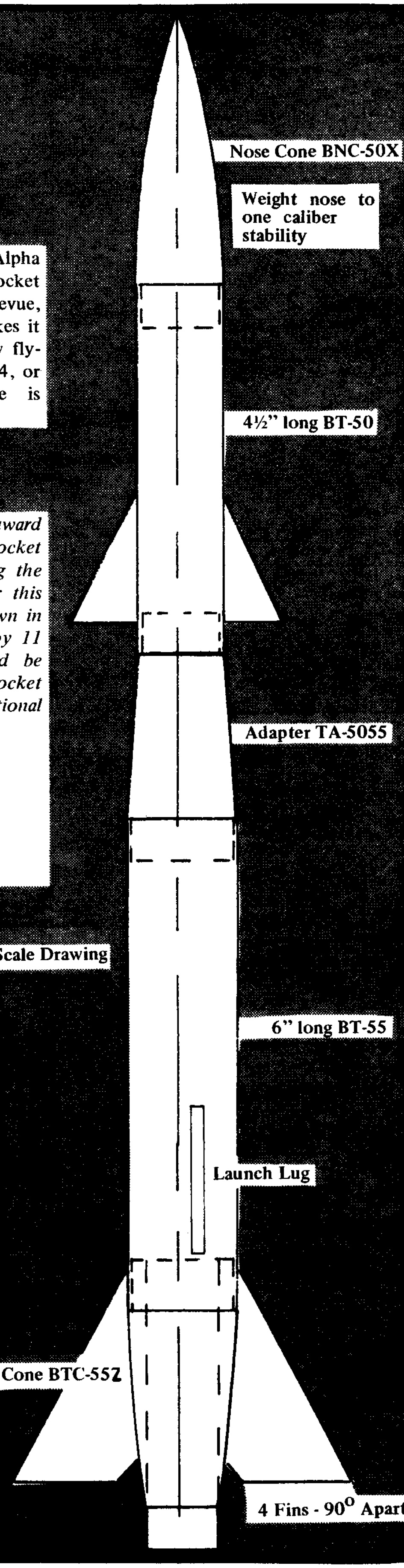
Little Joe II Plans
Section Regionalization
Technical Feature
What is Streamer Duration?

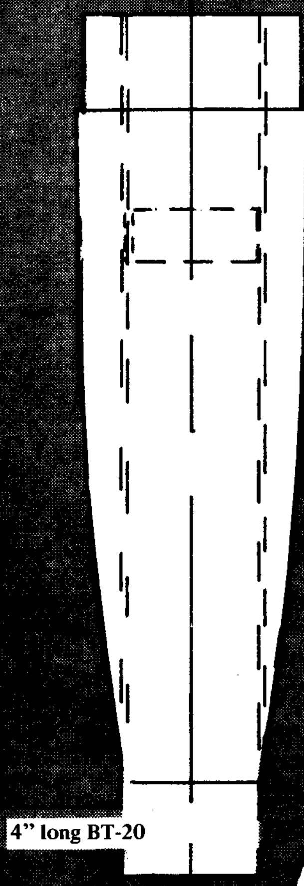
Reader Design Page

This month's Reader Design, the Alpha Delta 400, is a one-stage sport rocket submitted by Alan Dayton of Bellevue, Washington. It's futuristic design makes it attractive for demonstration and show flying. It can be flown with A8-3, B6-4, or C6-5 engines. A 12" parachute is recommended.

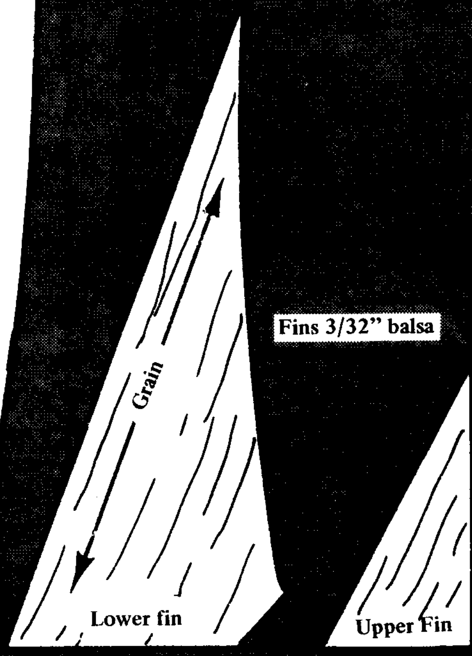
Each month **Model Rocketry** *will award a $5.00 prize for the best original rocket design submitted by a reader during the preceeding month. To be eligible for this prize, entries should be carefully drawn in black ink on a single sheet of 8½ by 11 paper. Sufficient information should be contained 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

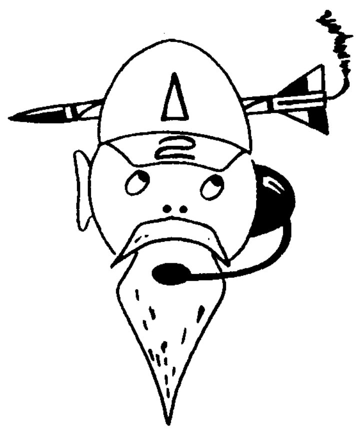




Full Size Tail Cone



Full Size Fin Patterns



The Old Rocketeer

by G. Harry Stine NAR#2

The "FlatCat" was specifically designed as a boost/glider that could be easily and quickly built by beginners while at the same time being suitable for competition and improved performance with only minor modifications. It can also be used as a "test bed" for checking various boost/glider design theories because it is possible to modify it extensively from the proven basic design.

Since its introduction in the YMCA Space Pioneers Section of the NAR in 1967, FlatCat has undergone only minor changes to improve its flight characteristics and to make it easier to build and fly. Three years of research preceeded its original design. It has been flown successfully by hundreds of model rocketeers, both young and old, with varying amounts of experience. It will accept both Type A and Type B motors. It has been flown in national competition and has won numerous ribbons and trophies.

FLAT CAT

BOOST GLIDE MODEL ROCKET

NAR Swift & Sparrow Classes

Construction Tips

Before tackling the FlatCat, you should have built and successfully flown several model rockets with streamer and parachute recovery so you are familiar with general construction techniques and model rocket safety and launching operations. FlatCat is strong and robust, but you must build it correctly. You must be able to make a good, strong glue joint. You must be able to put FlatCat together with the pieces properly aligned. It won't take you long to construct the FlatCat even if you are an inexperienced modeler, so don't get in a rush and do a sloppy job. A FlatCat built in a sloppy manner will fly in a sloppy manner. The design is very "forgiving," but there's a limit to it.

Tools Required

You will need the following tools and equipment to properly assemble the FlatCat:

1. A sharp modelling knife.
2. A ruler.
3. A pencil or ball-point pen.
4. Glue for wood -- model airplane glue, Elmer's Glue-All, Franklin Tite-Bond,etc., and NOT plastic model cement.
5. A sheet of waxed paper about standard letter size.
6. Sandpaper.

Bill of Materials

You will need the following materials for FlatCat:

3/32" x 3" x 14" sheet balsa for wings.
1/16" x 3" x 8" sheet balsa for stab, rudders and body sides.
1/4" x 1/2" x 12" hard, straight balsa for fuselage.
1/4" x 1/2" x 4" balsa for fuselage nose.
1/4" x 1/2" x 4" balsa for power pod pylon.
MRI T-20 body tube 6" long (MRI catalog No. 32015).
MRI T-19 tube insert (MRI catalog No. 31906).
MRI No. 620A balsa nose cone.
Wire motor holder.
Launch Lug, MRI No. 107.
Screw Eye, MRI No. 111.
Crepe paper or plastic streamer 18" long x 1" wide (MRI No. 114).
Aluminized mylar adhesive film or silver paint.
Cotton Line 8" long for shock cord.

Step By-Step Construction

You may be a red-hot model builder, but if you don't read and follow these instructions and if your FlatCat doesn't work, it's your fault! Remember: If at first yo don't succeed, try reading the instructions.

1. Cut wings from 3/32" sheet balsa. Bevel root chord edges with sandpaper and glue wing panels together at wing root with each tip elevated 2" to give wing dihedral. Set wing on waxed paper to do this so that wing does not get glued to work table. Use double glue joint. Let dry thoroughly and completely...fora a couple of hours or over night, in other words, and NOT just for ten minutes! (If this glue joint is not strong, the wings will leave the model on takeoff, which is embarassing.) This wing dihedral angle stabilizes the glider in the rolling direction so that it stays right-side-up in flight or so that it will roll-out to right-side-up position in case it is on its back when the power pod ejects.

2. Cut stab and rudders from the 1/16" sheet balsa. Mark center line on both sides of the stab. Glue rudders *on top* of the tips of the stab, making sure that the stab tips are cut square and that the rudders are lined up and standing up at right angles to the stab. Let them dry thoroughly. If you don't get them lined up, your FlatCat will tend to turn sharply or will have such a tight built-turn that it will always spiral into the ground.

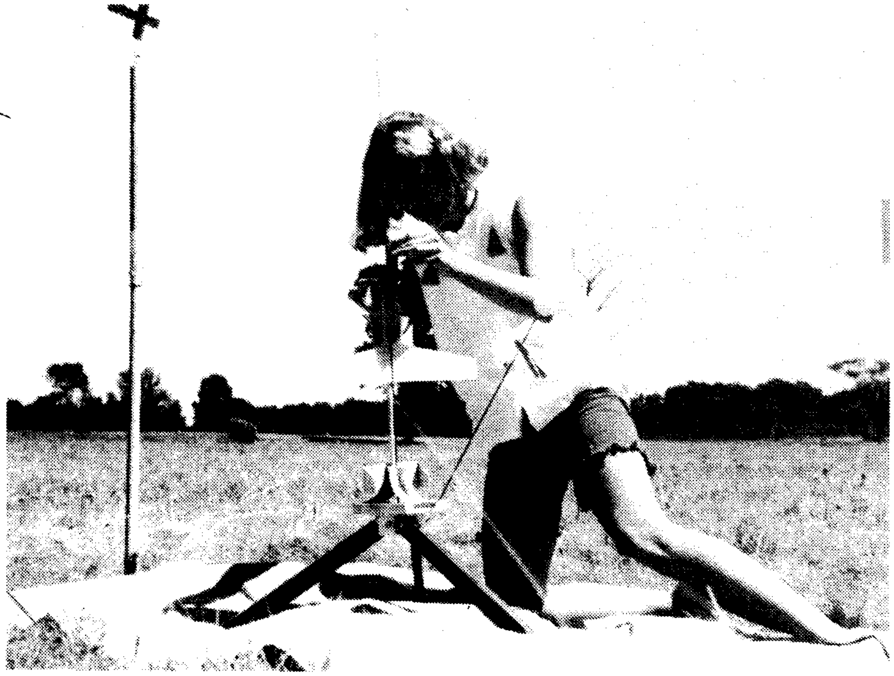


Photo by Stine

Ellie Stine, NAR no. 1955 of the YMCA Space Pioneers, helped test and prove the FlatCat B/G. The Design has been flown in two national meets with good results.

3. Mark two lines down opposite sides of the T-20 x 6" body tube as if you were going to put two fins on it. Insert the T-19 tube into one end of the tube and glue the wire motor holder into *THE SAME END* ,which is the rear end. Install the cotton shock cord. Put screw eye into base of the 620B nose cone and glue the screw eye in so that it can't pull out. Assemble the nose cone, shock cord, streamer, and power pod tube just as if it were a regular model rocket body.

4. Make the Power Pod Pylon from one piece of 1/4"x 1/2" x 4"balsa. Cut both ends to 45-degrees as shown in drawing. Sand the front end round and taper the back end with sandpaper so that the pylon has a streamlined cross-section; this is not really necessary if you are in a big, fat hurry, but it will reduce the air drag qn the pylon and help prevent if from possibly coming off during boost phase of flight. Glue the pylon to the pod tube on the opposite side from the motor holder, making sure that the pylon is precisely in line with the tube just like a model rocket fin should be. Glue the launching lug on the side of the pylon as shown, making sure that no glue gets inside the launching lug. Put the entire assembly aside to dry.

5. Take the 1/4" x 1/2" x 12' fuselage piece and mark a center line down both 1/4"wide faces of this balsa piece using the pencil. Measure the location of the wing 1' back from the front of this fuselage piece. Mark the location of the stab on the *OTHER END* and on the *OPPOSITE* 1/4" face of the piece. Taper the fuselage piece from the wing trailing edge location rearward to the tail as shown; removing this extra balsa does not weaken the fuselage but does remove unvanted weight from the tail of the model. Sand the rail of the fueslage to a point as shown.

6. Take the remaining 1/4" x 1/2" x 4" balsa piece which is the fuselage nose. Carefully measure the location and shape of 'Piece X' which you will cut out of the nose. Cut out Piece X cutting directly across the nose piece. Using a good double-glue joint, cement Piece X to the bottom of the power pod pylon in the location shown.

7. Cut the forward part of the fuselage nose piece away as shown in the drawing so that it will later have a hollow space so that you can add weight for glide trim without adding to the drag.

8. Using balsa pieces left over from cutting the stab and rudders from the 1/16" sheet balsa to 1/2"wide and 6" long. Glue one of these strips to the side of the fuselage nose piece. Then carefully glue these two pieces to the fromt of the fuselage, making sure everything is exactly lined up as it is in the drawing so that thte fuselage is extended by the addition of these pieces. When everything is lined up, glue the remaining 1/16" x 1/2"x 6"strip of balsa to the opposite side of the nose. This creates a super- strong laminated nose section on the FlatCat that is sesigned to bring the center of gravity forward, align the power pod when installed, and be strong enouth to withstand an accidental crash dive if it happens. Let everything dry thoroughly.

9. Using a double- glue joint, attach the stab-and-rudders tail assembly to the *BOTTOM* of the fuselage tail in the proper location. Make sure that the center line drawn on the stab is precisely lined up and matching with the center line drawn down the fuselage. If the tail section is not lined up carefully, the FlatCat will have a permanent turn built into it.

10. *MOST IMPORTANT STEP* Attach the wings to the top of the fuselage. But first sand a flat portion on the bottom of the wing root joint so that the wings will fit flat to the fuselage top and so that there is plenty of glue area in the joint. Make a GOOD glue joint. If you don't, the wings won't stay on. Make sure the wings are carefully lined up. The line of the wing root dihedral joint should line up with the center line drqwn along the fuselage. When you look at the model from the front or rear, both the wings should have the same dihedral an angle with the fuselage as shown in the rear-view drawing of the model.

11. Peel the paper backing from the aluminized mylar adhesive film and apply the film to the top of the wing over the root where it joins the fuselage. This will prevent the balsa of the wing from becoming scorched by the infra-red radiation from the jet of the model rocket motor. The silver aluminized layer will reflect the infra-red radiation and will not melt. The wing can also be painted with aluminum enamel or dpe instead. With out this film or paint coating, the balsa begins to darken from the heat of the jet, and this causes even more radiation to be absorbed, creating an even worse situation.

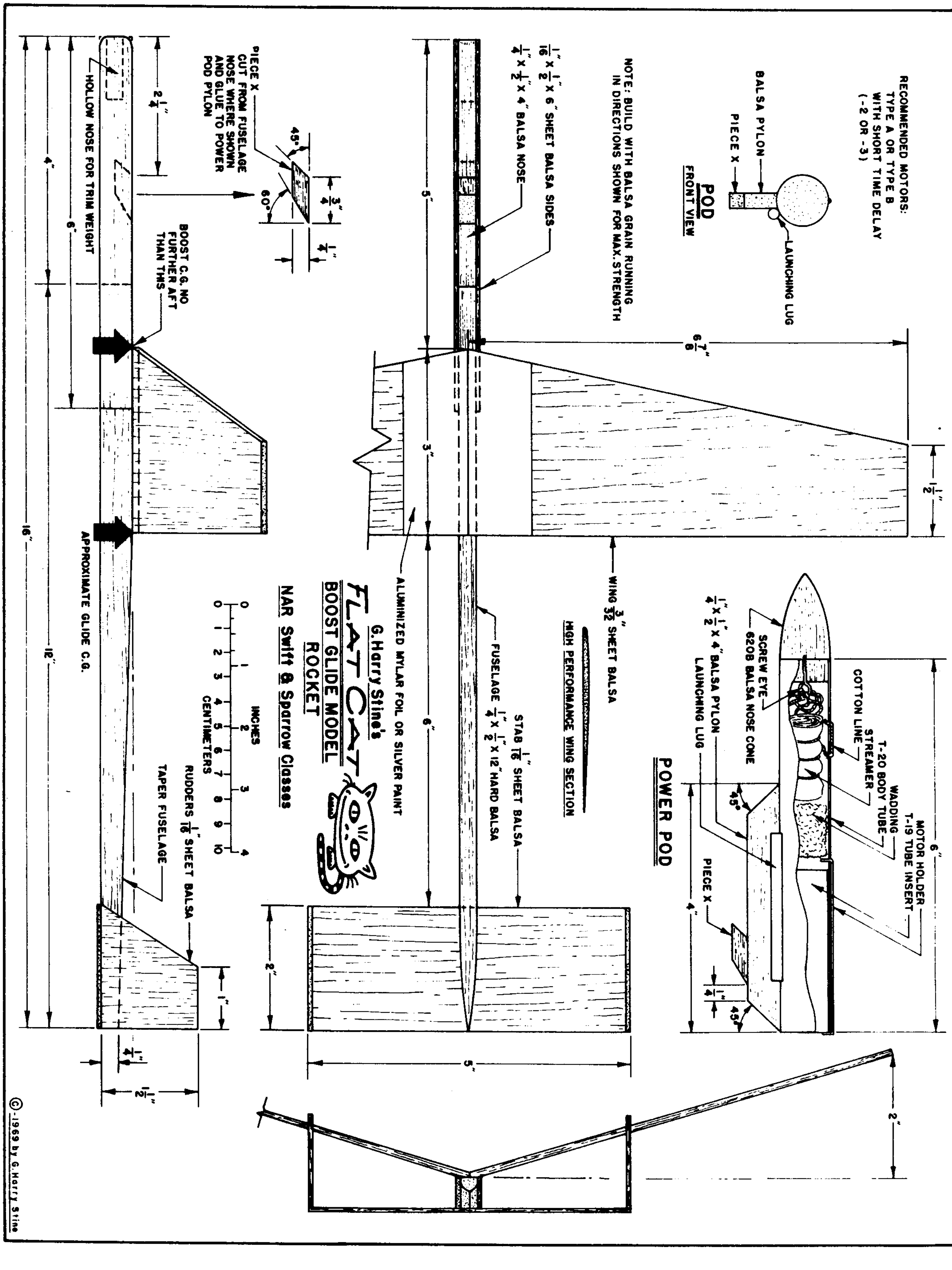
12. Sand the nose section of the body round as shown in the drawing.

Your FlatCat is now ready for pre-flight balancing.

TRIMMING

You must do this. Otherwise, your FlatCat may not fly. Since FlatCat must operate as a rocket during ascent and as a glider during descent, it's very important to have the model balanced properly for both boost and glide phases of the flight.

1. Glide Trim: With the pod *off* and with just the glider portion, hand-launch the glider by grasping it under the wings and tossing it gently with an overhand motion into a flight path just slightly below horizontal. Do this several times because there is a knack to it that sometimes does not come easily. If the model pulls up into a stall, add weight to the nose with plasticene clay in the portion, If the model dives into


RECOMMENDED MOTORS: TYPE A OR TYPE B WITH SHORT TIME DELAY (-2 OR -3)
BALSA PYLON
PIECE X
LAUNCHING LUG
POD
FRONT VIEW
NOTE: BUILD WITH BALSA GRAIN RUNNING IN DIRECTIONS SHOWN FOR MAX. STRENGTH
1/16" x 1/2" x 6" SHEET BALSA SIDES
1/4" x 1/2" x 4" BALSA NOSE
PIECE X CUT FROM FUSELAGE NOSE WHERE SHOWN AND GLUE TO POWER POD PYLON
HOLLOW NOSE FOR TRIM WEIGHT
BOOST C.G. NO FURTHER AFT THAN THIS
APPROXIMATE GLIDE C.G.
WING 3/32" SHEET BALSA
HIGH PERFORMANCE WING SECTION
ALUMINIZED MYLAR FOIL OR SILVER PAINT
FUSELAGE 1/4" x 1/2" x 12" HARD BALSA
STAB 1/16" SHEET BALSA
G. Harry Stine's
FLAT CAT
BOOST GLIDE MODEL ROCKET
NAR Swift & Sparrow Classes
INCHES
CENTIMETERS
RUDDERS 1/16" SHEET BALSA
TAPER FUSELAGE
POWER POD
SCREW EYE
620B BALSA NOSE CONE
COTTON LINE
T-20 BODY TUBE
STREAMER
WADDING
T-19 TUBE INSERT
MOTOR HOLDER
1/4" x 1/2" x 4" BALSA PYLON
LAUNCHING LUG
PIECE X
©-1969 by G. Harry Stine

the ground consistently (not just on one toss because you may have tossed it wrong), add plasticene clay to the tip of the fuselage tail If the glider turns left or right, add a bit of plasticene clay to the high wing tip, the wing tip that is on the outside of the turn, When you have the FlatCat trimmed for glide, it should sail away from your hand in a gentle glide, perhaps stalling just slightly, and turning slightly to the right. If you do not set the FlatCat for a gentle turn, it may turn downwind in actual flight and fly straight into the next county!

2. Boost Trim: With a Type A motor installed in the power pod, check for balance or trim during boost flight. The model should balance *NO FURTHER AFT* than the leading edge at the wing root (the wing-fuselage joint). If it balances further aft than this point, add an MRI No.115 Trim Weight to the base of the power pod nose cone, and *NOT* to the glider portion. Remember, your glider is already trimmed for glide, so any weight changes for boost flight should be make to the pod when separates before glide can begin. If the balance point is further forward than the point indicated, you should not have trouble with the FlatCat during boost flight.

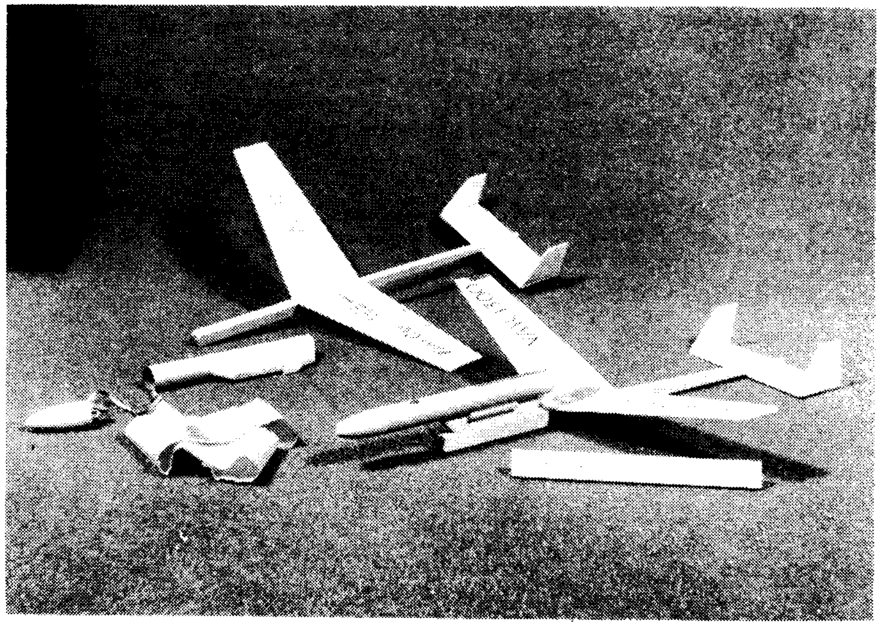


Photo by Stine

Two of the original FlatCat boost-gliders, still flying! FlatCat at rear shows glide configuration with power pod uncoupled. Front is in the boost configuration.

Flying the FlatCat

The FlatCat is launched in the same manner and with the same electrical launching equipment as a regular model rocket.

Make certain that the power pod fits *loosely* onto the fuselage with Piece X fitting into the hole from which it was cut, The power pod can be extremely loose and the model will still perform correctly during boost; this is because the model rocket motor in the power pod pulls the glider into the air. If the power pod fits too tightly, sand down the *sides* and *back* of Piece X until the power pod fits loosely,

The mechanism that causes the power pod to separate from the glider is the reaction force created by the sudden ejection of the wadding, streamer and nose cone by the motor ejection charge. This reaction force thrusts the power pod to the rear, disengaging Piece X from its slot in the fuselage. The motor holder wire prevents the rocket motor from being ejected when this occurs because a large reaction force is required.

It is therefore necessary to pack the wadding rather tightly into the power pod when preparing the model for flight.

If the pod does not come off, or if the glider entangles itself with the steamer – causing a 'Red Baron' spiral – it means that you have not packed the wadding tightly enough.

First flights should be make with Type A motors. Use the shortest possible time delay (but not a -0 booster motor) because the FlatCat, and most boost- gliders, has high drag in the boost configuration and because you want the pod to separate while the model still has forward and upward airspeed; otherwise the glider will stall excessively.

The FlatCat is strong enough to survive most dives due to improper trim. It has been designed this way because a glider of this particular configuration without airfoiled wings is often very tricky to trim for glide. In addition, the glider may also be airspeed-sensitive so that if the power pod separates while the model is in a dive, the glider will continue in the dive.

This is a basic shortcoming of this type of front-engined boost-glider and is a consequence of aerodynamics.

Improving the FlatCat

FlatCat can be improved for high-performance competition work with very little difficulty.

The flat wings may be shaped into a flat-bottomed airfoil by rounding the leading edge and tapering the trailing edge as shown in the drawing. This will change the glide trim of the model.

The stab and rudders may be streamlined by rounding their leading edges and tapering their trailing edges into symmetircal airfoils like model rocket fins. This should not alter the glide trim.

The fuselage may be made lighter and more streamlined round off the bottom and tapering the top only behing the wings – the top of the fuselage forward of the wings must be left flat so that the power pod can mount properly. Streamlining the fuselage into this teardrop shape will change the center of gravity location, and it will be necesssary to remove some trim weight from the nose.

Almost 25% of the FlatCat's weight may be elimated by streamlining.

FlatCat will fly well in completely unpainted condition, but this leaves the balsa wood susceptible to warping and swelling due to changes in atmospheric humidity. There is great controversy among boost-glider experts regarding whether or not a glider should be painted and have a smooth finish. FlatCat doesn't seem to care. It flies anyway.

However, once you have rounded off and streamlined your glider, the FlatCat becomes the Round Hound...

For those of you who would rather get the whole works at one fell swoop, arrangements have just been made for the issuance of the FlatCat as a complete kit by Model Rocket Industries. The kit form of FlatCat is scheduled for September release to hobby stores throughout the United States.

(Club Notes continued)

Committee, to produce a newsletter; the Recovery Committee, to set up three recovery teams; the Inspection Committee, to inspect the rockets before firing ; the Tracking Committee, to time the flights and compute altitudes; and the Mission Control Committee, to set up a launch check list. The Rocket Club at Greater Plains Elementary School also used model rockets in conjunction with their recent study of the Apollo 10 mission.

The Medford Area Model Rocket Association (MAMRA) has been organized in the Medford and Stetsonville, Wisconsin area. Club officers are Charles Hoffman,president; Steve LaBerge, vice-president; Kurt Peche, secretary-treasurer; and Greg Bockin, range officer.

Evan Koenig of Madison, Wisconsin would like to start an NAR section in the Madison area. Interested rocketeers should write to Evan Koenig, 2748 Kendall Ave., Madison, Wis. 53705.

Chris Regan of Wayzata, Minnesota wishes to start a Minneapolis area Rocket Club. He wishes to start an official NAR sanction. This will be the first NAR section in the Twin Cities Area. Contact Chris Regan--15805 Holdridge Rd. Wayzata, Minn. 55391--Phone GR3-6165.

The Queen City Model Astronauts Association, a model rocket club in the Buffalo, New York, meets on the second and fourth Tuesdays of each month at 7PM in the Fronczak Branch Library, 1080 Broadway. For further information on the club, call Justin Copera at 893-3116.

Students at the Jackson School, Janesville, Wisconsin, have been studying about rocketry all year under the direction of Dean Held, advisor to the school rocket club. The year's study was climaxed recently when the entire student body assembled on the playground to view the club's last launch of the school year.

Dennis Okesson of Crystal Lake, Illinois is searching for prospective members of the newly-formed model rocket club in the Crystal Lake area. Okesson was in the grocery store with his wife one day when he spotted a notice on the bulletin board: "Wanted--those interested in forming a model rocket club." He called the number listed and discovered a group of teenagers who needed a minimum of 10 members in their club to form an NAR section. Okesson volunteered to be a section advisor. Al Banker, a chemistry teacher at Crystal Lake High School, will become a second senior advisor in the fall.

Five boys, 14 to 15 years old, have so far joined in the meetings at Okesson's home. Chip Downey, a freshman at Crystal Lake High School, has been chosen as chairman of the group. Prospective members should contact Downey at 459-1376 after 6 PM.

The Metro Denver Rocket Association has presented a plaque to George Roose in appreciation of the services he has provided for the club. Roos is president of Flight Systems, a model rocket manufacturer and supplier in Louisville, Colorado.

A large crowd of onlookers came to Lincoln Field, Hartford, Wisconsin on April 25th to watch a model rocket launching. Sponsored by the Central School, the launching was designed to attract public attention to model rocketry.

The Kokomo Indiana YMCA sponsored a series of classes on model rocketry beginning in January. The program includes design, construction and launching of model rockets. The Wallace School yard in Kokomo serves as a launching field for the group.

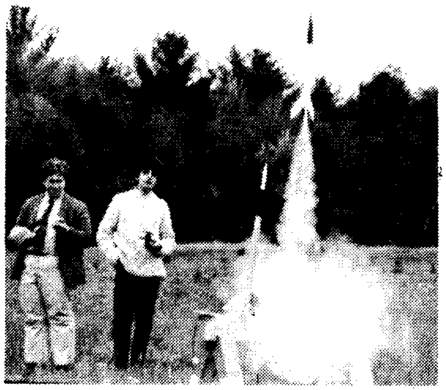
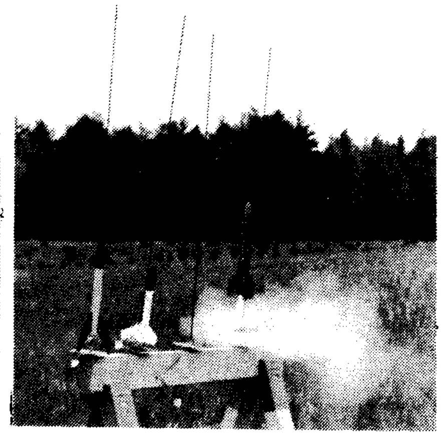
The McMillan Junior High School Rocket Club held a launch April 30 from the school athletic practice field. Highlighting the event was the launching of an Estes Ranger rocket carrying Dick the minnow. Dick was recoverd uninjured after the flight. The club, under the direction of science teacher Michael Malstead, put on the demonstration for other watching students.

Under the direction of science teacher Paul Crumrin, model rocketry has been introduced into the curriculum of Elida Junior High School, Elida, Ohio. "There are two ways to approach a subject – one is to talk about it and the other is to participate in it," Crumrine told the Lima News. The eighth grade model rocket program began last December when each class was divided into eight groups with a project manager and three launch crew members. The crews constructed models from kits, and prepared 41 rockets for firing. Only two had to be classed as failures.

Senior physics students at the Marist Preparatory School, Penndal, Pennsylvania have been pursuing model rocketry as an educational project for three years. Under the direction of Rev. Edward M. Jackson SM, a science teacher at Marist Preparatory School, the students have fired three stage Camroc carrying rockets, and a single stage payload carrying a white mouse.

Photos by Tom Muller

Two 14 year old boys from Hudson, New Hampshire have organized a model rocket club in that area. Dennis Tanguay (left) and Walter Raudonis (right), both members of the NAR, have been experimenting with their rockets from the Raudonis farm. Recent club activities have included a model rocket display in the window of the Nashua Federal Savings and Loan Association, in order to stir local interest in forming an NAR Section.

Photos by Gary Bernstein

The Berwick Academy Rocket Society has been in existence since the fall of 1966, and has been an affiliated section of the NAR since the fall of 1968. Since that time, they have increased their membership to twenty, and expect another membership boost in September. The Society had to start nearly from scratch this year, as theft of the club's old launcher and power supply over the summer of 1968 made it mandatory that the first project would be to replace these items. At the present time, the club has built a launching system capable of firing up to five rockets simultaneously, and owns two tracking theldolites. In the future, the Society has two objectives: first to find a larger launching field, and second, to purchase two walkie-talkies for aid in tracking models.

The Society held its first officially sanctioned meet in May, and participated in an area meet with the Greater Boston Model Rocket Society in July.

Two club projects which have been underway for a long time are presently near completion. Alex Monnel and Mike MacDonald are building a rocket designed to carry a movie camera which is powered by Centuri F engines. The other project is being done by Charles Andres. It consists of reducing such mathematical equations as those in the Barrowman CP report, the Malewicki calculations, and others to computer programs so that rocket data is available rapidly and with little effort. This project may eventually result as a service open to all model rocketeers. If and when this becomes a reality, any rocketeer will merely submit his rocket's dimensions and receive any of the following information: center of gravity, center of pressure, dynamic parameters, drag coefficient, and altitude with any engine.

Many of the members have been bitten by the scale bug, and one member is working on a super scale model of the German Viper Jet. Other projects under consideration for the fall include radio transmitters, acclereometers, and aerial reconnaissance.

The Wolverine Rocketeers of Detroit, a newly formed club, has had a very successful rocket range meet. During the summer, these meets may be planned for every two weeks. For information write Howard E. Neely, 19171 Manor, Detroit, Michigan 48221 (or call (313) 345-6636 5:00 P.M. to 9:00 P.M.)

The Aeronautics Research Society of Navato, California organization at Hill Junior High School recently held a rocket construction contest. Entries were judged on workmanship and originality. The winners were Jerry Walkup, first; Brian Womack, second; and Carol Donohue,third.

A model rocket demonstration sponsored by two local newspapers, *The Warrenton Clipper* and the *Gibson Record and Guide*, was held on April 19 at the Warrington, Georgia football field. The demonstration, presented by J. W. Seamon and students from the Glascock County High School, was designed to acquaint the local residents with the hobby of model rocketry.

A group of five 6th graders at J.J. Finley Elementary School, Gainsville, Florida had their first club launching on Saturday, May 17th. Club president Bill Green and Keith Conner started the club in mid-April and the school science teacher, Robert Bacheller, agreed to advise the group.

"I decided to help them because I thought they should have some supervision with the rockets," Bacheller told the Gainsville Sun. "The fuel they use is not dangerous, but it's best if they have some adult supervision when they fire the rockets." The boys decided to name their group the Estes Rocket Club after the model rocket manufacturing firm.

The Frost Junior High School Rocket Club held a launching on May 8. The launch was hampered by high winds, but at least 20 rockets were successfully lofted. The club is under the direction of Robert Maten, a math teacher at the school.

Torrington High School students were special guests at the 4th Annual Science Exhibition at the Torrington Branch of the University of Connecticut on May 9. Bill DeMichiel, Davied Bognan, and J. Fenton Williams, Torrington students, participated in a model rocket launch on the U Conn campus.

The Starblazer Rocket Club of Broadalbin, New York held its second public launching on Saturday May 3rd, from the Broadalbin High School field. The launching was under the direction of club president David Christopher and faculty advisor Charles Frisina.

The Queen City Model Rocket Club in Ohio has been launching recently from Roselawn Park. Just a short time after the Apollo 10 launching on May 18, club members gathered at the park to witness Allen Holub's launching of a scale model Saturn.

A new rocket club is being formed in Amarillo, Texas. Interested modelers should contact Larry Gray, 5105 Shield Drive, Amarillo, Texas 79110.

On Monday, May 12, the field outside Memorial Junior High School, Willingboro, New Jersey became a model rocket launching field. Members of the Willingboro Science Club launched 51 rockets, almost all of them successful. The club's activities are directed by William Mansfield, a science teacher, and Michael Skelly, the club president. The launching received almost a full page of coverage in the Willingboro Times.

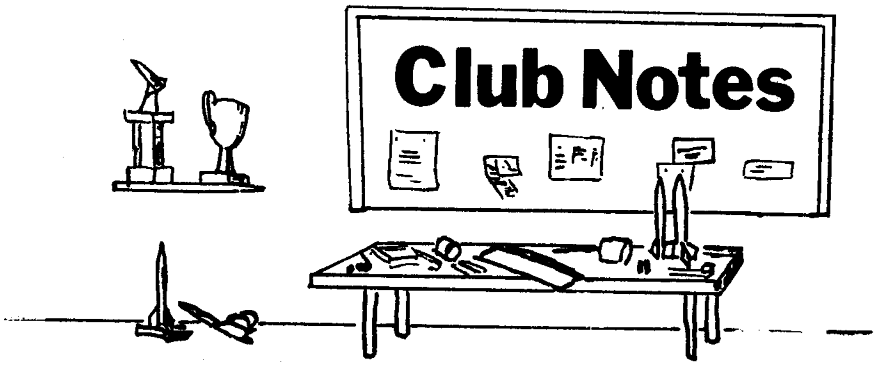
Members of the aerospace class at Salina High School, Salina, Kansas studied the behavior of model rockets during the course. Aerospace instructor Gary Regehr introduced model rocketry into the curriculum so that "the students can get a good understanding of aerodynamics and balance."

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
Boston, Mass. 02123

(From the Editor continued)
competitions introduced into the hobby.

However, let's learn from the mistake of our aircraft modeling friends. Let's allow radio control to grow as *one aspect* of the hobby. If we should reach the stage where the *ultimate* achievement in model rocketry is the construction of an RC model, as the aircrafters almost did a few years ago, we will have priced the youngsters out of the hobby. We would make growth impossible, and eventually see the death of the sport. Let's enjoy this *new area* of potential competition, and allow RC boost gliders to contribute to the growth of the hobby. Perhaps some of the airplane modellers will now be attracted to our hobby.



Twelve students at the Hillsborough Junior High School, Hillsborough, New Jersey, have recently formed a Model Rocket Club. Under the direction of Mrs. Janet James, ninth-grade science teacher and advisor to the group, club launchings are held every Thursday morning during the activity period from an open field behind the school. The club control panel was built by vice-president Joe Neale and his father.

Eighth and ninth graders at Brownsville Junior High School, Brownsville, Florida went on a field trip to Cape Kennedy recently and became so fascinated with rockets that they decided to build and launch their own model rockets. The first launching, from the schoolyard, was reported in The Miami Herald.

The Carolina Rocketry Association was recently formed for rocketeers in the Rock Hill, South Carolina area. The club has presented two demonstration launches and attracted over 10 new members. The Carolina Rocketry Association meets on the third Friday of every month at 7:30 PM in the Rock Hill YMCA. The club soon plans to apply for an NAR section charter. Officers are: R. Vance Butts (NAR 12319 Jr), President; Freddy Ivey, Secretary-Treasurer; and John London, Vice-president. Local rocketeers who are interested in joining should call 328-2726.

The Belair Association of Model Rocketry (BAMR), Belair, Maryland sponsored a model rocket program on May 9 in the Bowie Library meeting room. Model rockets and equipment were on display. An NAR model rocket movie was also shown.

Future activities of the BAMR include trips to several local aerospace companies, participation in competitions with other clubs in the area, and several club meetings during the summer.

Further information on the BAMR is available from Robert Seufert at 491-1090.

Sixth grade students in Mr. Chet Hagel's science class in Kodiak, Alaska held a demonstration launching on Wednesday, May 14. The science class has recently been studying spacecraft and rockets. They ordered a number of commercial kits and constructed them as a class project. Each student built his own rocket, and Mr. Hagel offered a prize for the best constructed and decorated rocket.

The 35 member Rocket Club at Greater Plains School, Oneonta, New York has been operating under the supervision of Science Teacher James Matthews. The club was first started when several of the sixth grade boys ordered rocket kits from Estes Industries. For their recent launch, the club was divided into eight committees with various functions: the Range Committee, to set up the firing range; the Spectator Control Committee, to set up rules governing spectators; the Communications Committee, to arrange for the PA system; the Publicity

(Continued on page 46.)

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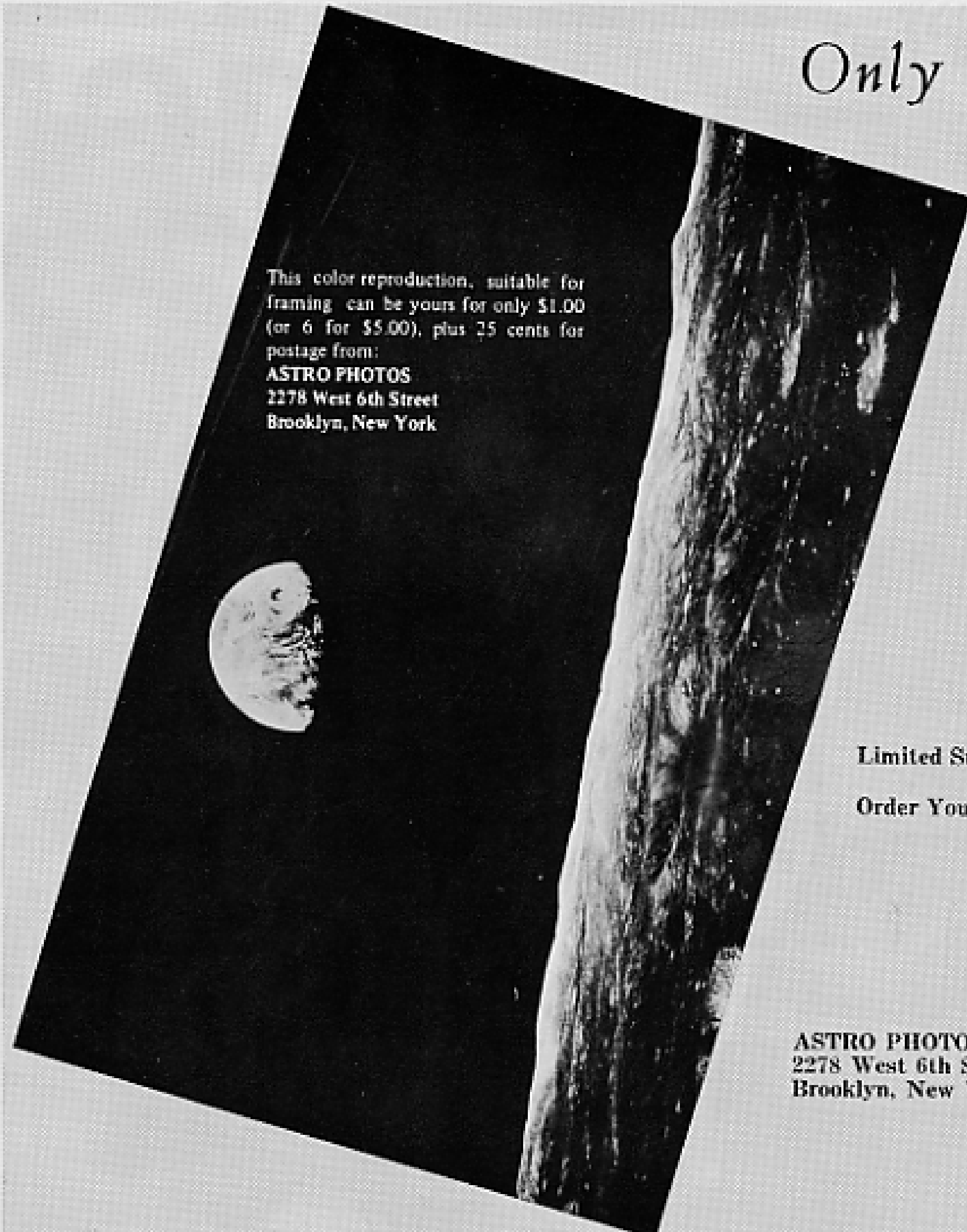

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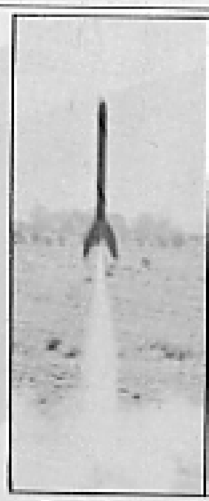

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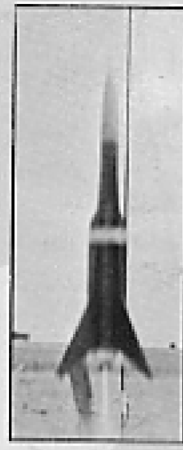

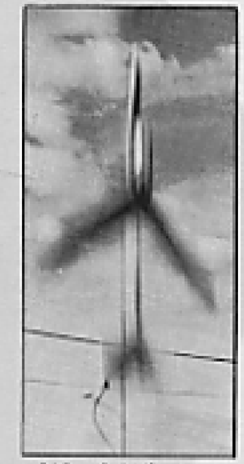

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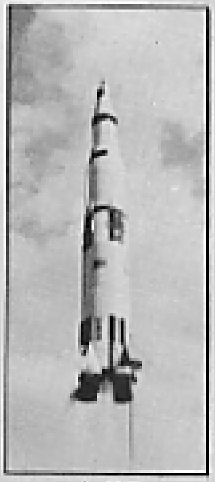

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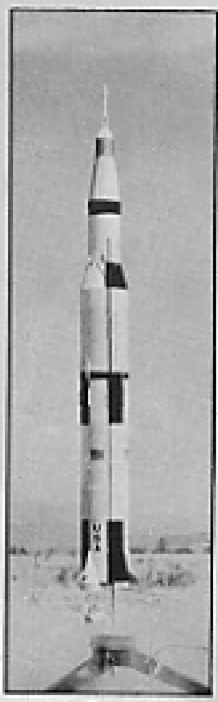

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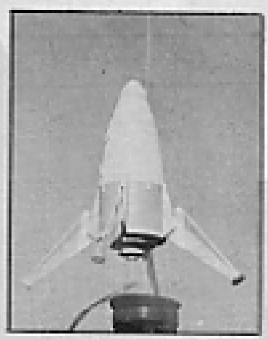
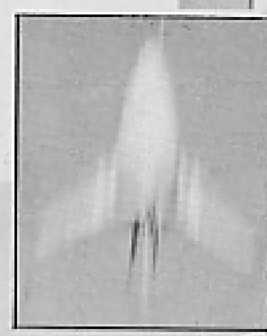
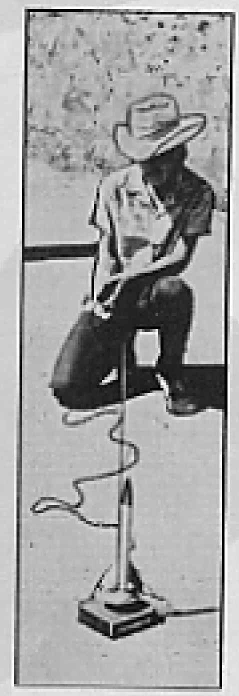


Will she go?



You bet!



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