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MODEL ROCKETRY

THE JOURNAL OF MINIATURE ASTRONAUTICS

Sport Model
Giant 'Pipsqueak'

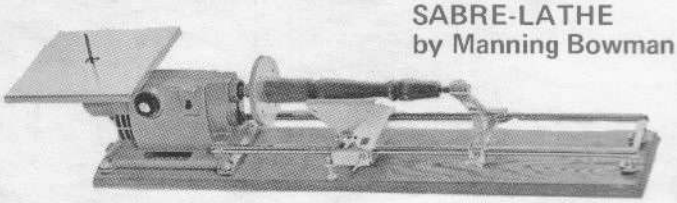
Mach-1
Sparrow B/G

Rocket Equipment Co.

Dept. MR, 10 Mulberry Ave., Garden City, N.Y. 11530

TOOLS —— WALKIE TALKIES —— STOPWATCHES —— MORE!

SABRE-LATHE
by Manning Bowman



Sabre-Lathe Home workshop ideal for turning nose cones, cutting fins, and for use as a finishing machine. This precision wood lathe, complete with a three-speed motor, is an entire rocketeer's workshop. Entire unit--sabre saw, lathe, and grinding attachment--comes mounted on a wooden base for easy portability and stability. Ideal for the club workshop. Wt. 18 pounds.
Cat. No. 4276-005K2994 $44.95

MOTO TOOL
by Dremel

The Dremel Moto Tool is invaluable for plastic conversions, hollowing nose cones, and super-detailing your scale models. The kit includes attachments for grinding, drilling, carving, sanding, engraving, and deburring. The motor produces 30,000 RPM. Wt. 3 pounds.
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BINOCULARS
by Selsi

All purpose 7 X 35 binoculars to keep those high flying models in sight. Seven power magnification, and a wide 351 ft. field at 1000 ft. range. Case included.
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Large 50 mm objective to gather more light. These 7 X 50 binoculars are ideal for night use.
Cat. No. 5884-003L2190 $41.00

STOPWATCH
by Chateux

Stopwatch with start-stop, and separate reset button for timing all contest duration events. Choice of 30 second or 60 second full sweep.
Cat. No. 9040-139X1297
(60 sec) $19.95
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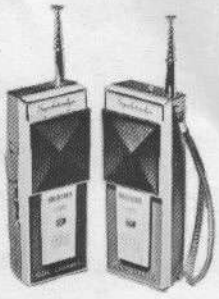
(30 sec) $19.95

SOLDERING GUN by Weller

Complete Weller soldering gun for wiring transmitters and other instrumentation. Kit includes gun, 3 tips, wrench soldering tool, brush, solder, and break proof case. Wt. 4 pounds.
Cat. No. 4322-001K780 $11.50

WALKIE-TALKIES by Midland



For on the range communications and to receive Foxmitter and Transroc signals, the "Saturn" walkie-talkies have 100 mw output to give 1¼ mile range. Has separate volume, push-to-talk, and call alert controls. Pair of walkie-talkies, complete with channel 11 crystals. Wt. 2 pounds.
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by General Electric

Handy cassette tape recorder for recording Foxmitter and Transroc telemetry. Operates on 4C batteries (not included). Wt. 4 pounds.
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3" Reels, 225 ft. tape each. Package of 3 reels (total 675 ft. tape).
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by Microtan

Operates on 2 D batteries for range use to record Foxmitter and Transroc telemetry. Records on 3" reels of tape (one included).
$16.95
Cat. No. 6830-009 R1099

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Mail to: Rocket Equipment Co.
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Name:
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Quantity	Cat. No.	Description	Price

Minimum Order $15.00

Model Rocketry

Volume IV, No. 4
January/February 1972

Cover Photo

This month's cover shows a Jetco "Thermic 18" hand launched glider converted to a Hornet/Sparrow class boost/glider. Flying with Minijet engines, this easy-to-build boost/glider will turn in creditable contest performances. Complete plans begin on page 19. (Cover photo by George Flynn.)

From the Editor

Not a week goes by that we don't get a letter from at least one rocketeer asking what the legal requirements are for flying model rockets in his locality. In some cases we can help him, by sending out a copy of his state law, and suggesting he contact his local police or fire department to learn of any special local regulations which apply. In some areas a call to the local Parks and Recreation department will bring information on public sites which have bben designated as model rocket launching sites.

Some states, such as Massachusetts, New Jersey, Pennsylvania, and California, have passed laws or regulations dealing specifically with model rockets. In these states there is little confusion, since the laws spell out the required field sizes, launching conditions, supervision required, and where to obtain permits (where special permits are necessary). Other states, such as New York, Missouri, and Illinois, have no laws specifically mentioning model rockets. In these states local or county officials are generally free to determine whether model rocket activities are restricted by other statutes. This leads to a situation in New York where the authorities in one county are prosecuting a hobby dealer for selling model rockets (presumably in violation of the state law prohibiting fireworks) while the Parks and Recreation department in the adjacent county has established a model rocket launching site on county park land.

The legal situation, in many states, is quite confusing. For the beginning rocketeer, it can be quite discouraging to write or call the police, fire, and parks officials and receive three different answers on the legality of model rockets. Discouraging enough, perhaps, to cause the beginner to seek out a new hobby.

The ideal situation would be to provide this beginner with written copies of the laws and regulations governing model rocket activity in his particular area. Copies of these laws and regulations from states where rocketry is permitted would also assist those rocke-

(Continued on page 39)

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Material submitted for publication should be accompanied by a self-addressed, stamped envelope if return is desired. Model Rocketry can assume no responsability for material lost or damaged, however care will be exercised in handling. Articles accepted for publication will be paid at the rates current at the time of publication. Letters, contest information, news, announcements, ect. are assumed to be submitted gratis.

Undeliverable copies, notices of change of address, subscriptions, and material submitted to Model Rocketry, Box 214, Astor Street Station, Boston, MA 02123.

Printed in USA

Ejectable Flexwing

After trying to build a B/G for D and larger motors and having the wings torn off during boost I decided to try something different. I sat down one afternoon after my classes were over for the day and built the folding wing glider shown in the first photo. The wings and tail are spring loaded so they can be folded back against the fuselage.

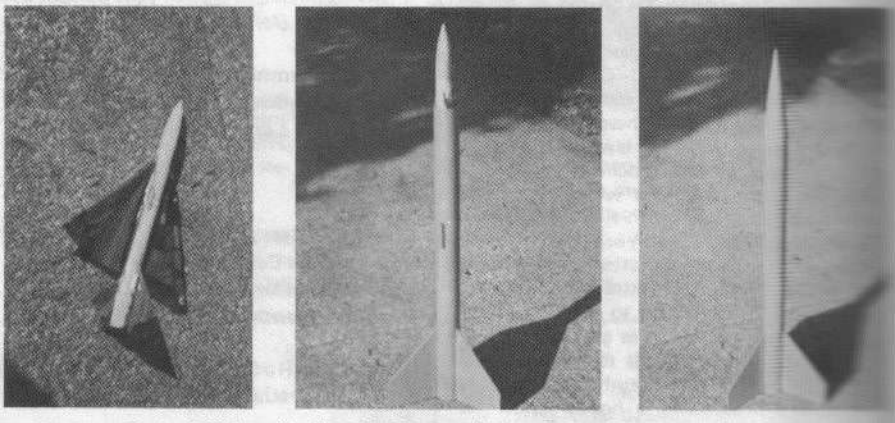
The glider is folded and slipped into the body of my D-powered Scorpion. (A parachute for the rocket body is inserted into Scorpion before the glider.) The completed assembly, shown in the far right photo, has no protruding wings to cause problems on boost.

When the ejection charge goes off the glider pops out and glides down while the Scorpion carrier returns by parachute. The first test flights have been fairly good, and I hope to send you complete plans when the testing is finished.

Stephen C. Gurley
Camp Hill, Pa.

The ejectable flexwing certainly does offer structural advantages during boost. A good discussion of this concept can be found in Gordon Mandell's article "Model Rocket Recovery by Extensible Flexwings" (MR, November '68) in which he discusses another variation on the flexwing idea. Copies of this issue are still available from our Back Issues Dept. (Box 214, Boston, MA. 02123) for 75 cents.

Bernard Biales has also been experimenting



Stephen Gurley's "ejectable flexwing" boost/glider, for D-engine power, is shown in extended glide configuration (left), folded and being inserted into the rocket (center), and ready (right).

DID YOU KNOW . . .

That the readership of Model Rocketry magazine has increased by over 200% in the last year.....

That 45,000 copies of Model Rocketry magazine were printed last month, and that an average of 2 people read each copy.....

That Model Rocketry magazine advertising is the most effective and economical way of promoting and selling model rocket kits and related hobby supplies throughout the USA and Canada.....

That full advertising information is available by writing to Advertising Department, Model Rocketry, Box 214, Boston, MA 02123.....

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ing with the ejectable flexwing concept, both for high-powered and for low-powered B/Gs. In fact, it was a ¼A ejectable flexwing which Bernard used in Gnat boost/glide last spring to turn in a 48 second duration, a record performance at that time.

Canadian Convention

I would like to make a correction to the caption on page 36 of your coverage of the Canadian Convention in October. That's not Alan Cantor, my good friend from Montreal, but me returning my egglofter.

Paul Shindman
Toronto, Ontario

Aero–Hi Kit?

I have seen in **Model Rocketry** magazine a rocket called the Aero-Hi. This model looks very impressive, and I would like to build a model like it. Could you send me the address of the company who sells this rocket as a kit.

Jack E. Cary, Jr.
Hughesville, PA.

The Aero-Hi has not been released in kit form by any manufacturer. All of the models you have seen in Model Rocketry were scratch-built. However, complete plans, to assist you in building your model, were published in the October 1971 issue of **MRm**.

B/G Strobe Experiments

I think I have a solution to Dr. Gregorek's light problems mentioned in the article on "A Free Flight Technique for Boost/Glide Performance (**MRm**, November '70). By using Tri-X film processed in Acufine developer an ASA index of 1200 can be obtained. Thus, 1/8th as much strobe light intensity will be required than is needed for the ASA 160 High Speed Ektachrome used in the experiments.

Acufine film developer can be bought at almost any camera shop, and the technique described above requires no changes from the standard developing procedures described in the instructions. The increased light sensitivity of the Tri-X/Acufine combination will allow the strobe and camera to be moved further away, increasing the field of view and allowing more data to be collected on each flight.

Gary Baxter
Tacoma, Washington

Dr. Gregorek was aware of the possibilities of using high-speed black & white film with the "Free-Flight" experiments. However he chose color film since it would make a more attractive presentation in the discus-

TAM-1 — January 22, 1972. Tucson Area Meet sponsored by the Sunnyside Organization for the Advancement of Rocketry, and open to all Tucson area rocketeers. Events: Hornet B/G, Class 0 Altitude, Class 1 Altitude, Open Spot Landing, Class 0 Parachute Duration, and Class 1 Streamer Duration. Contact: David Stribling, 926 Calle Aragon, Tucson, Arizona 85706.

TART-1 — March 4-5, 1972. Texas Area Rocket Tournament, open to all NAR members, sponsored by the Sulphur River Section. Site: Sulphur Springs, Texas. Events: Class 00 Altitude, Class 1 Streamer Duration, Single Payload, Class 1 Drag Efficiency, Class 1 Parachute Duration, Eagle B/G, Pigeon Eggloft, and Open Spot Landing. Contact: Danny Miller, 804 Gilmer St., Sulphur Springs, TX 75482.

MIT Convention – March 24-26, 1971. Technical convention held at MIT, Cambridge, Mass. Open to all rocketeers. Features: five discussion group periods, open R&D contest, banquet, modroc movies, and a launch. Contact: Chris Flanigan, MITMRS, MIT Branch PO Box 110, Cambridge, Mass. 02139.

PAR III — March 25-26, 1972. Pacific Area Regional meet sponsored by the South Seattle Rocket Society and open to all west coast rocketeers. Events: Super Scale, Scale, Eagle B/G, Hawk B/G, Sparrow R/G, Pigeon Eggloft, Plastic Model, Class 2 Streamer Duration, and Payload Boost/Glide. Contact: Jim Pommert, 524 South Butte Ave., Pacific, Wash. 98047.

ECRM VI – April 7-9, 1972. Regional Meet, sponsored by the NARHAMS NAR Section. Open to NAR members from Maryland, District of Columbia, Virginia, Pennsylvania, West Virginia, North Carolina, Delaware, EVENTS - R&D Scale, Hawk R/G, Swift B/G, Pigeon Egg Lofting. Pee Wee Payload, Class 0 P/D, Class 2 S/D. Application deadline Jan. 31, 1972. Contact Judith A. Barrowman, 6809 97th Place, Seabrook, Maryland 20801.

WART-1 – May 14, 1972. Record trials sponsored by NOVAAR section of Fairfax Va. Records in any class of timing event may be attempted. Competition events: Condor B/G, Swift R/G, Class O P/D and Class 2 S/D. Meet fee (to cover cost of ribbons & trophies) $2.50. For more info contact: Randy Thompson, 10814 First St., Fairfax, Va. 22030.

Toronto Regional – June 1972. Open meet and seminars sponsored by the Canadian Rocket Society. Competitions and presentation of the Diamond Award in Rocketry. Science teachers and their students especially invited. Contact: CRS, Adelaide St. P.O. Box 396, Toronto 1, Ontario, Canada.

TRRM-2 — June 17-18, 1972. Competition and seminars sponsored by Toronto area rocket clubs and open to all rocketeers. Events: Class O PD, Class 2 SD, Gnat B/G, Sparrow B/G, Hawk B/G, Predicted PD, Scale, R & D, Roc Eggloft, Plastic Model, Open Spot Landing, and a night launch. Contact: TRRM-2, 76 Shrewsbury Square, Agincourt, Ontario, Canada.

Third National Canadian Model Rocket Conference – July 7-9, 1971. Convention and competition open to all model rocketeers from Canada and the United States. Events: Discussion Groups, contests in Scale, Condor B/G, Sparrow B/G, Hawk R/G, Open Spot Landing, and Class O PD. Contact: Canadian Conference 1972, c/o Steven J. Kushneryk, 7800 des Erubles Ave., Montreal 329, Quebec, Canada.

HARM-2 – July 8-9, 1972. Hart of America Regional, sponsored by the Midwest Rocket Research Association, open to NAR members from the midwest area. Events: Roc Eggloft, Robin Eggloft, Scale, Sparrow B/G, Sparrow R/G, Pee-Wee Payload, Hawk B/G, and Cass 0 PD. Contact: Mark Pemberton, 10911 West 70 Terrace, Shawnee, Kansas 66203.

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

sion groups he has led on the technique. The average rocketeer planning to do experiments with this technique will probably find the Tri-X/Acufine combination less expensive and easier to use than color.

Ohio Contests

I need help! I don't know when or where rocket meets are going to be held in Ohio or the surrouding areas.

Mark Wladecki
Elyria, Ohio

We can't tell you if the Contest Directors don't tell us. Currently **MRm** *has no information on any Ohio contests planned for 1972. Contest Directors in Ohio, as well as the rest of the world, are invited to make use of a free listing in our* Modroc Calendar *to publicize their contests. Send all announcements, at least 90 days in advance, to Modroc Calendar,* **MRm,** *Box 214, Boston, MA 02123.*

South Miami Rocketeers

I am a rocketeer in South Miami, and there isn't a single hobby shop selling rockets in my area. Also I almost joined a club, but twice I went to their meetings and nobody was there. If there is any club around South Miami, I hope they will get in touch with me.

George Visco
13340 S.W. 99 Ct.
Miami, Fla. 33156

Infra-Red Tracking

I am presently engaged in a project which involves the use of infra-red light and infra-red conversion tubes for the tracking of model rockets. I would appreciate any information that you or your readers may have on this subject.

Kurt Deitrick
1020 Deepwood Ct.
Winston-Salem, N.C. 27104

Coupon Placement

I would like to say that you have a great magazine, but I do have one suggestion. I think that it would be a good idea if you would put cut-out coupons like the subscription renewal form on pages that have advertisements or something like that on the opposite side of the page. When I cut out the renewal form I also had to cut up the last part of the British Columbia Centennial Meet write up. Other than that, I think the magazine is great!

Mike Bame

But what would the advertiser think if we encouraged you to cut up his ad? Actually, for almost all magazines, it is the advertising that must pay the bills. Printing, mailing, etc. all costs money, and if you add it all up the production costs of a magazine generally exceed the cover price that the reader is charged for the issue. That's why most magazines are between 30% and 50% advertising.

Only when a magazine has more than

about 25% advertising can it break even. It is to the advantage of the readers of any magazine to encourage manufacturers to advertise. By doing so, the readers make it possible to keep subscription rates and cover price low. With less advertising the subscription rates and newsstand price must be raised.

It's not likely that an advertiser would be pleased to have another ad run on the back of his ad. Thus, it is necessary to put subscription forms and other order forms on the back of articles. However, as long as you copy all the information required on the form onto a sheet of paper, you need not cut up the issue to enclose the form with your order.

Vostok Colors?

Do you know where I can get some information on what colors I should use to paint my MPC Vostok and Sputnik authentically?

Michael Reeb
Madison, Wis.

The Vostok manned launch vehicle was painted in a green very similar to that used by the U.S. army for their combat weapons . An excellent color photograph of the Vostok can be found in Above and Beyond: The Encyclopedia of Aerospace. Copies of this book should be available at your library. In addition, Rocket Equipment Co. (10 Mulberry Ave., Garden City, NY 11530) has available a series of six 35 mm color slides of the Vostok for $5.00.

Great Bird

The November issue of **Model Rocketry** contained a letter about my ¼A Boost/Glider flight with a time of 1 minute 46 seconds. That is the time which the judges recorded, however one of our club members timed the glider at a different angle and saw it for 2 minutes 22 seconds. This seems to be a still unbeaten world record.

Eric Johnson
Kenmore, NY

Underwater Rockets

Recently I was looking through the September issue of **MRm** and came across a mention of underwater rockets. I have been working with model rockets for a few years and would like some information on underwater rockets. If there are any other rocketeers interested in this topic I would like to hear their ideas.

Bill Fritz
684 Wyleswood
Berea, Ohio

Due to the large demand for reprints of Bob Parks article on Underwater Launching, we have printed a two-page booklet, the first in a series of Model Rocket Project Suggestions, containing all the information including plans needed to assemble your own semi-scale Polaris for underwater launching. Send 25 cents and a stamped, self-addressed envelope to Model Rocketry, Box 214, Astor Station, Boston, Mass. 02123 for your copy of this report.

ROCKETEER MODELING TIPS

Each model rocketeer has his own ideas on model construction, finish and scale detailing. Many of these ideas would be helpful to other modelers, if only there was some way to pass them along. Such things as tips on how to simulate scale rivets, how to hollow out nose cones, etc. are not long enough for a full length article in Model Rocketry. However, to provide a way to pass on these construction tips, MRm is starting a new feature – "Rocketeer Modeling Tips."

If you believe you have a new or better method of contruction or finishing, pass it on to other modelers. Send the idea into Rocketeer Modeling Tips, c/o Model Rocketry, Box 214, Boston, MA 02123. Entries selected for publication will be awarded a $5.00 prize.

The entire technique or process must be fully explained clearly and completely. Text should be typewritten and doubled spaced. Photographs to illustrate the idea should be 4" X 5" or larger black & white prints, though we can make use of color prints or snapshots if you have nothing else available. Step-by-step diagrams are not necessary, but are often helpful expecially in explaining more difficult or complicated techniques. When drawing diagrams use black ink on white paper (not ball point pen or pencil sketches).

If you wish the return of material not accepted for publication, include a self-addressed, stamped envelope with your submission.

Let's get going, and pass on those modeling tips to other interested rocketeers.

FROM THE LAUNCHING PAD

At several recent contests where the Drag Efficiency event was being flown we had the opportunity to determine the drag coefficient of the winning model using the specified weight and size data and the information contained in *TIR-100*. The results were uniformly disappointing, with the best drag coefficient being in the neighborhood of 0.6 and the worst being well above 3.0. These numbers call into question the accepted drag coefficient of 0.75 for a standard rocket of "average" finish.

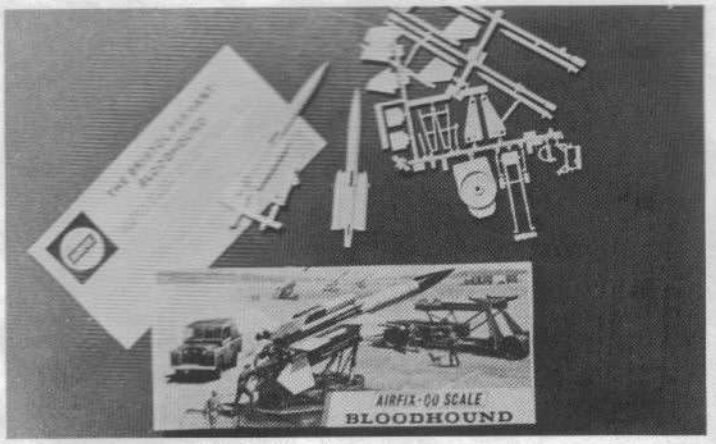
At a recent area meet sponsored by the MIT Model Rocket Society, we had the opportunity to collect additional data on drag coefficients. Again, the tracking data was obtained from the Class 0 (A-engine) Drag Efficiency event. Using the five closed tracks, all on model using standard size (19mm outer diameter) body tubes, the *TIR-100* tables were used to work out the drag coefficient. Two C_D valves were obtained, one for the minimum weight (35 grams) and the second for the maximum weight (40 grams). The model's actual C_D lies somewhere in the range between these two values. The results were as follows:

Tracked Alt.	C_D(35 gm.)	C_D(40 gm.)
146.4 m	0.66	0.44
131.8 m	0.88	0.55
128.4 m	0.93	0.66
124.3 m	0.99	0.76
107.4 m	1.25	1.10

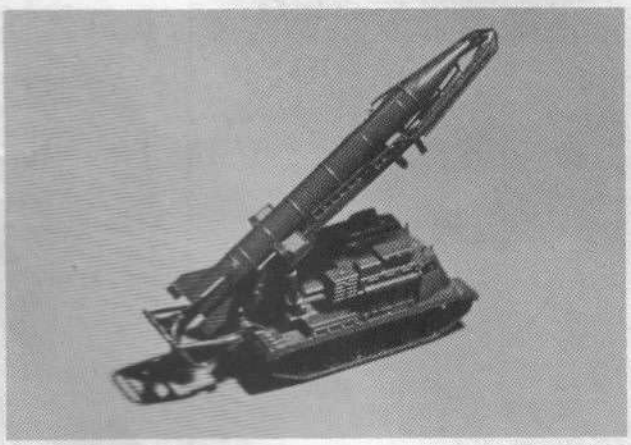
The best C_D obtained, in the 0.44 to 0.66 range, is much better than those reported in the other Drag Efficiency contests. However, since it is reasonable to assume that all contestants were flying the lightest rockets permitted (35 grams) because of the performance advantage gained, the results again indicate that the 0.75 assumed average C_D is a bit low. Quite a bit more research needs to be done into this area of actual, in-flight drag coefficients for model rockets.

Scale builders should take note of two booklets in the *Aero Series* by Aero Publishers (Dept. M, 329 Aviation Rd., Fallbrook, CA.). The first is titled *Kamikaze* and includes sections on the Japanese "Oka" piloted bomb, and the German "Natter" and F2G-76" manned bombs. All three vehicles were rocket powered, and the booklet includes basic dimensions, color data, and many photos. Each rocket powered aircraft has been thoroughly researched in preparation of the booklet. Many of the photos are close-ups of those rocket/aircraft captured at the close of World War II and placed in museums. These photos should be of great assistance in preparing a scale model.

The second booklet, titled *Messerschmitt 163* includes more than 40 pages on the "Komet" rocket-fighter introduced by the Germans just before the end of the war. Photos of the combat Me 163B as well as the Me 163B now on display in the "Deutsche Museum" in Munich are included. The book concludes with two photos of the experimental Northrop MX-324 rocket-fighter, de-



The Airfix re-release of the Bristol Bloudhound plastic kit is now available in the U.S.



ROCO Minitanks had introduced a scale model of the USSR "Scud" surface-to-surface rocket.

veloped in the U.S. during World War II, but no drawing of this vehicle is included. Both books are of value to scale builders contemplating models of WW II rocket powered aircraft.

Airfix, the British plastic kit manufacturer, has reintroduced their 1/72nd scale kit of the Bristol Bloodhound rocket. The kit is a highly detailed replica of the 25' 3" long anti-aircraft rocket which is boosted by four solid-propellant boosters and a ramjet sustainer. It includes the launcher assembly, transporting trailer, and launch crew. In 1/72nd scale the missile, only 4" long, is far too small to be flight converted, but it could be used as a prototype, and scaled up to flyable size.

Airfix kits, especially their missile kits, have been somewhat hard to find in the U.S. Many of the specialty hobby shops who handle the airplane kits have not picked up the missiles. Thus rocketeers might have to do some looking to come up with the Bristol Bloodhound kit. Mine came from Womrath's Book Shop, which has an excellent plastic kit department, in Hempstead, New York. If you happen to be in the neighborhood, you can stop off there and pick up the kit for $1.49. If not, check with your local hobby shop. He may be able to suggest a store which specializes in these hard-to-find imported kits.

Another new plastic model which scale builders will be interested in obtaining is the ROCO kit of the U.S.S.R. "Scud" surface-to-surface missile. This model, also too small for a flight conversion, is in HO scale (1 to 87). Manufactured in Austria, it is part of the ROCO Minitank line, and should be available in hobby stores emphasizing armor and tanks.

The Scud, also known as the B.B. 3, is a single-stage, liquid propellant rocket weighing 35 tons at liftoff and having a range of 90 miles. The ROCO model includes the missile and tracked launching vehicle. The model is highly detailed, and compares well to the photos of the Scud appearing in Janes. This model, which is priced at $1.20, will also be useful to rocketeers who want to use it as a reference to build a larger flying scale model. Two other military models by ROCO, the Honest John on truck launcher and LaCrosse on truck launcher, also in 1:87 scale might also be of interest to model rocketeers. Last we heard the ROCO Minitank series was being imported by AHM (3200 N. Boudinot St., Philadelphia, PA), who may be able to supply prices for mail order.

Frequently we receive letters from model rocketeers asking if the correct designation of NASA's moon rocket is the Saturn *V* or the Saturn *5*. A set of NASA "style rules" was

established in 1969 to clarify the numbering procedure not only for rockets but also numerically designated satellites. The rules are as follows:

Launch Vehicles or Rockets — Designated by name and Roman numeral (eg., Saturn V, Saturn IB, Titan III) including individual stages of multi-stage vehicles (eg., S IVB stage).

Manned and Unmanned Spacecraft — Manned craft are always designated with Arabic numerals, before and after launch (eg., Gemini 8, Apollo 15). Unmanned craft *before* launch are designated with capital letters (eg., Mariner F, Explorer G, Relay B), *After* launch unmanned craft carry an Arabic numeral (Mariner 6, Explorer 37). Prior to 1969 the after-launch designation of unmanned craft was Roman (Mariner IV, Explorer VII).

The latest issue of *Aerospace Facts,* a quarterly publication of Thiokol Chemical Corporation, contains coverage of NARAM-13. With the subtitle "Models of Thiokol Rockets Fly High at National Model Rocket Meet," the Thiokol magazine story focused on Brian Dolezal, a competitor from Cleveland, Ohio, and his model fo the D-Region Tomahawk. With an emphasis on the *safety* of the hobby, the Thiokol report presented a brief history of model rocketry as well as coverage of the championships. The entire article is reproduced below for those readers who wish to get out their magnifying glasses and find out what Thiokol thinks of the model rocket hobby.

Finally there is some news about an underwater launching project outside of the Florida area. The Lehigh Valley Section reports in their "Polaris Project." Under the direction of Glen Hendricks, the club is building a portable silo – a 30 gallon metal drum with a plexiglass window near the base. A length of tubing will be attached down the inside of the drum to house the ignition wires. Alex MacWilliams and Jeff Risberg are assisting on this project which the club hopes to complete during the winter.

Great Britain became the sixth nation, joining the U.S.S.R., U.S., France, China, and Japan, to launch an earth satellite with its own, nationally developed, booster rocket on October 28, 1971. The Black Arrow rocket, launched from the Woomera test range, placed the 145 pound "Prospero" satellite into orbit. This launching was the fourth, and last, test of the British designed and built Black Arrow vehicle.

The first test vehicle, a sub-orbital flight launched in1969, was deliberately destroyed following loss of control during launch. The second, also a sub-orbital test, was successful. On the third attempt, the first designed to launch a satellite, failed to reach orbit due to an early shut down of the second-stage. Last October's orbital flight, the fourth Black Arrow launch, successfully placed its satellite in a 334 by 990 mile elliptical orbit.

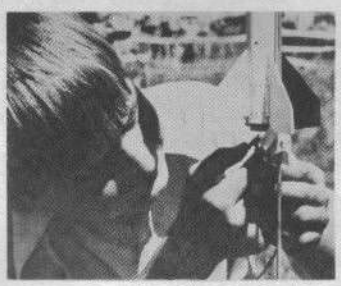
Last July the British government announced cancellation of the Black Arrow launcher development project. Future British satellites will be lofted using the less expensive U.S. Scout launching vehicle.

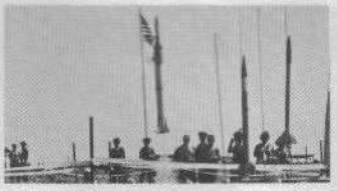
Model Rocketry has obtained blue prints and photos of the Black Arrow launch vehicle, and work is now proceeding on a scale article to be published later this year. Watch for it in a future issue of **MRm**!

N.A.R. members should note that this is the *last* issue of **Model Rocketry** which you will receive as an N.A.R. member. To continue receiving **MRm** each month, you must subscribe directly with **Model Rocketry**. A subscription form has been provided on this month's inside back cover for your convenience.

Miniature Cape Kennedy

Models of Thiokol rockets fly high at national model rocket meet.





The U.S. Army's Aberdeen Proving Ground in Maryland was transformed into a miniature Cape Kennedy for five days in mid-August as model rocket buffs ranging from eight years old to near 80 took part in the 13th National Model Rocket Championship Meet of the National Association of Rocketry. In all, 387 persons participated in the largest gathering of model rocketry enthusiasts ever assembled in the U.S. – possibly in the world.

One rocket after another lifted off the launch pads of the small range situated on the military reservation's spacious parade ground. Powered by small, highly efficient solid fuel rocket motors, an estimated 3,000 rockets hissed and whooshed into the sky. Some rockets carried small one ounce lead weights, others carried fresh hen's eggs, and most of them carried a prayer along with them. As in the professional rocketry business, there were some failures. Every flight had at least one pair of fingers crossed for it as a loudspeaker blared, "... five ... four ... three ... two ... one ... ignition ... lift off!"

Constructed of paper tubing, balsa wood and frangible plastics, the model rockets, particularly the scale models, were works of art. Each was built according to regulations devised by the National Association of Rocketry (NAR) and was required to perform flawlessly to qualify for competition points. A wide variety of rocket motors, built to rigid specifications, enabled the modelers to make their rockets perform just as desired.

Contestant Brian Dolezal, 16, of Maple Heights, Ohio, was typical of the youths who competed in the national championships. A rocketry enthusiast for many of his young years, Brian scored impressively in his specialty of scale construction. His D-Region Tomahawk models took a second place in Scale competition and Super Scale. Brian also won a first place award in his age division with a Parachute Duration flight of 305 seconds.

Brian couldn't recall how many hours he spent building his Thiokol D-Region Tomahawk. He started planning for the meet last fall and figured that he may have spent several hundred hours building the scale models.

Like many youths his age, Brian grew up with Mercury, Gemini, Titan, Vostok and Minuteman almost daily words in his vocabulary. Sounding rockets were already probing space with marked regularity and Sputnik was less than three years away when he was born.

Model rocketry had just gotten off the drawing board in 1954. A shoe salesman in Norfolk, Nebraska, Orville Carlisle, designed a small rocket vehicle that resembled a model airplane in construction ... light in weight, yet strong. He envisioned a safe, nonmetallic solid fuel motor to power it and rigged the rocket with a parachute to return it safely to the ground.

After numerous attempts Carlisle came up with a model that worked. Only a few cautious individuals showed an interest in the rocket. Amateur rocketry accidents were all too common in the U.S. and abroad. The model rocket was too similar to the common 4th of July skyrocket. But in October 1957, the space age dawned and the model rocket literally "took off" and hooked tens of thousands of nonprofessional rocketry enthusiasts.

After initial uneasiness, law enforcement agencies, fire and safety organizations, federal agencies and the accomodating fraternities accepted model rocketry as a safe and educational science hobby.

The National Model Rocket Championship Meets have been held since 1959 at such locations as NASA's Manned Spacecraft Center in Houston and Wallops Island, Virginia. The Air Force hosted meets at the Air Force Academy, and at air bases in Ohio and Massachusetts. This was the second time a meet was held at Aberdeen Proving Ground.

Intent on a career in engineering, Brian Dolezal is typical of the thousands of modelers who belong to the NAR. He likes cokes, girls, school and a good time. He also likes to spend hours, days, even weeks, building a perfect scale model of a rocket. Measurements are accurate down to 1/100th of an inch.

Even the distaff side is interested in model rocketry. Eleven-year-old Leslie Lindgren of Fanwood, New Jersey, is an excellent aeromodeler. Dolls don't interest Leslie. She likes to build rockets and she's good at it. Interestingly enough, she got her interest in rocketry from her mother, Mrs. Shirley Lindgren. Mrs. Lindgren was senior national champion in 1970 and placed high nationally this year. At Aberdeen, brother Gary won the Division C (ages 15-17) national championship trophy and brother Greg placed well in Division B (ages 13 and 14). Her father, Al, took two third place awards at the meet. It's safe to say that the Lindgren family is probably the world's leading model astronautics family.

Thanks to some excellent plans commercially available and the assistance of NASA and Thiokol personnel, the D-Region Tomahawk was the most popular launch vehicle at Aberdeen. A Tomahawk built by Jon Randolph, of suburban Cleveland, Ohio, was by far the most outstanding. Winner in the Scale competition with the D-Region Tomahawk, as well as the payload altitude event, Randolph added enough competition points to win the national championship of model rocketry.

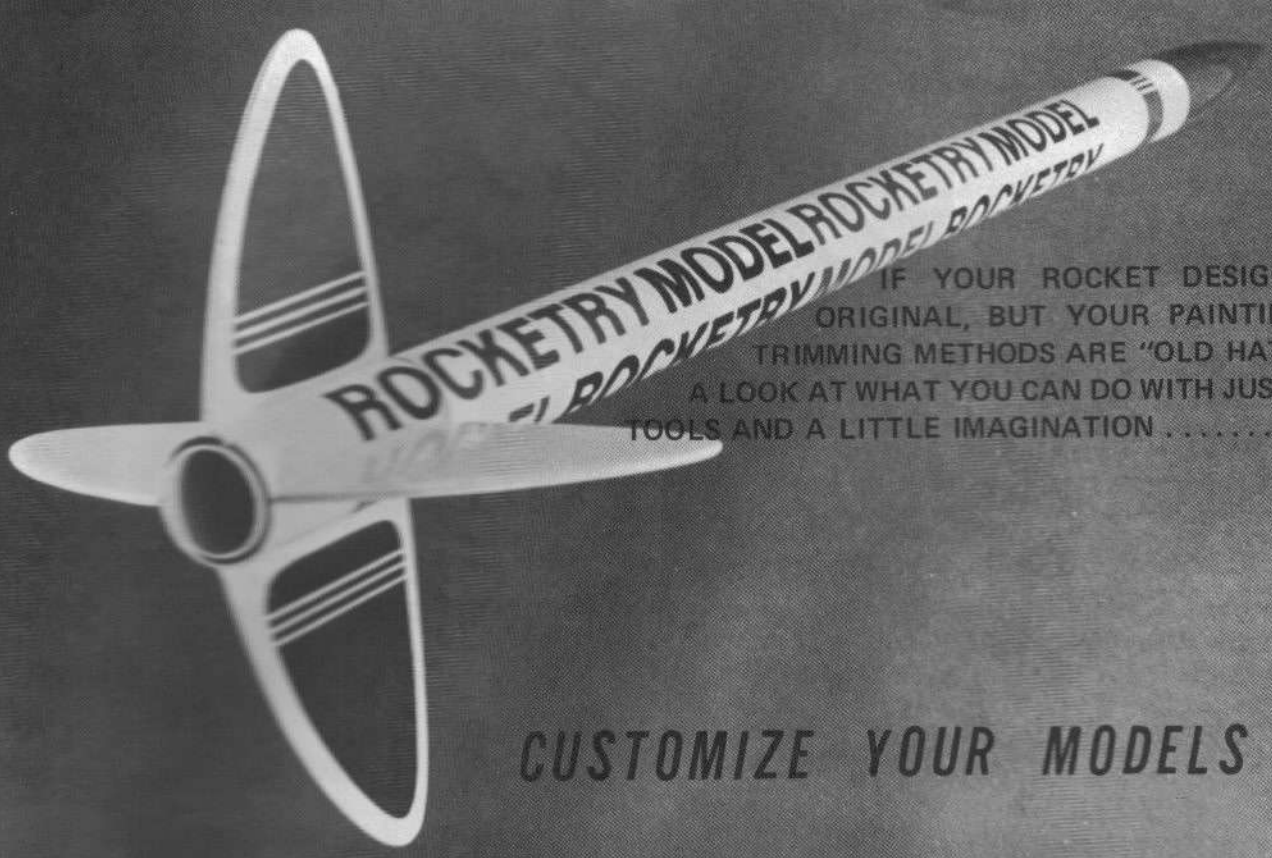
Also seen in large numbers were the Sandhawk and numerous Nike-Tomahawk sounding rockets.

The meet's youngest competitor, 8-year-old Ricky Fiscus, of Phoenix, Arizona, flew a Tomahawk and placed second in his division.

It wasn't all serious business at the meet, called NARAM-13 (National Association of Rocketry Annual Meet). The Egg Loft competition had its very light moments. There's something about a malfunctioning model rocket with a fresh egg in its payload section. Sometimes the rocket motor ejection charge failed or a parachute did not open. Down come the rocket ... "kersplash" ... scrambled egg.

The work and enthusiasm and the NAR and its members have made model rocketry a popular, engrossing – and safe – hobby of the space age.

Thiokol Chemical Corporation's coverage of NARAM-13, reprinted from "Aerospace Facts."

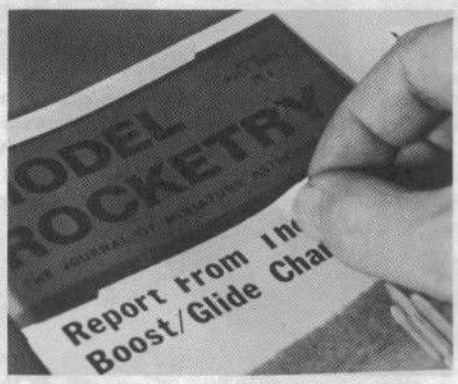


IF YOUR ROCKET DESIGNS ARE ORIGINAL, BUT YOUR PAINTING AND TRIMMING METHODS ARE "OLD HAT", TAKE A LOOK AT WHAT YOU CAN DO WITH JUST A FEW TOOLS AND A LITTLE IMAGINATION . . . . . .

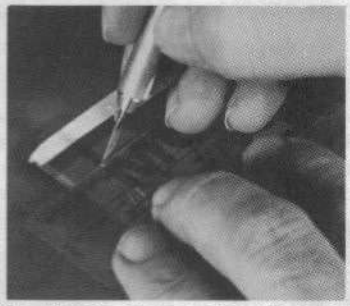
CUSTOMIZE YOUR MODELS

by John Frankosky

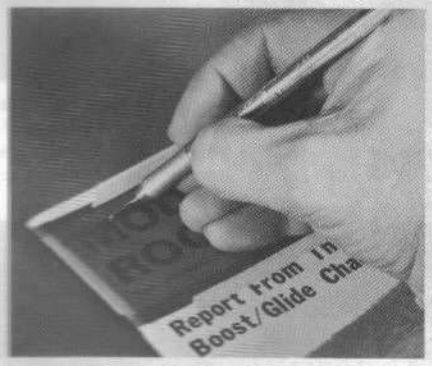
1. The materials needed to produce multiple decals to decorate your models are simple: a piece of Du-Cal Dupe, masking tape, a straight edge (cheap transparent ruler), a knife such as the Grifhold No. 24, and a Super Du-Cal Kit. (For prices and mail order form on Du-Cal materials, see page 12.)



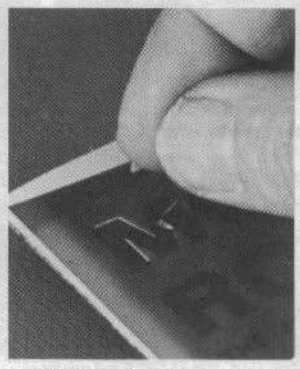
2. Position the Du-Cal Dupe sheet over the art work, lettering, club emblem, or design you wish to duplicate. Masking tape will keep it in place until you're finished. The dull side of the Du-Cal Dupe should be up.



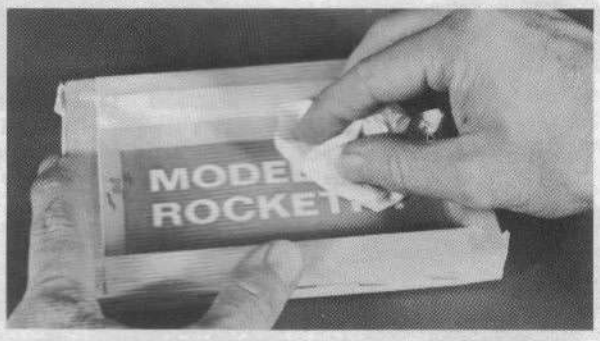
3. Using a sharp knife, cut along the edges of the design to be copied. Use just enough pressure to cut through the top colored film. Do not cut through the clear plastic base. When you get the feel of the material, you will be able to do the curved lines free-hand.



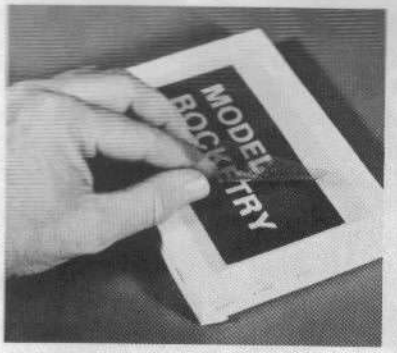
4. Use the sharp point of the knife to free the outside corners first. Lift the colored film from the clear plastic base. Don't hurry. Haste makes waste .... and sloppy rockets.



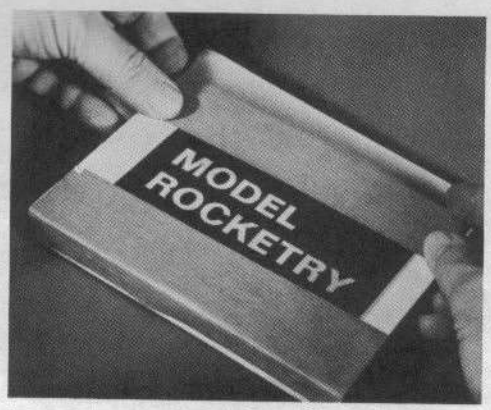
5. Use forceps or finger nails to lift away the unwanted film. Do this carefully to avoid tearing into the solid portions of your stencil.



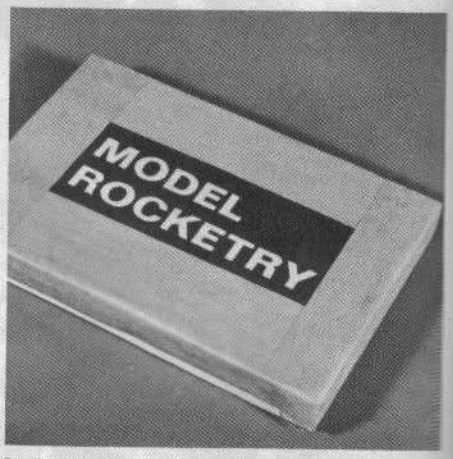
6. Place a thickness of cardboard under the Du-Cal Dupe stencil and position the Du-Cal Applicator (special fabric stretched over wood frame) over the stencil as shown. Use a wet cloth to adhere the Du-Cal Dupe stencil to the underside of the fabric. Too much water will distort the sharp edges of your stencil. Use too little water and it will not adhere.



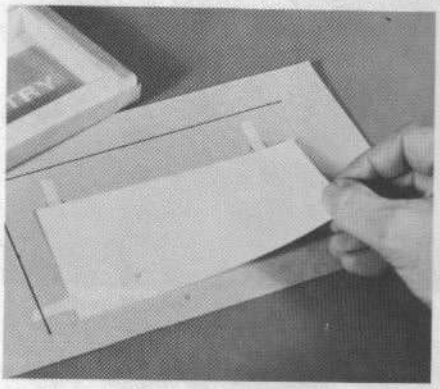
7. Allow the Du-Cal Dupe film to dry completely. It may take a few hours depending upon weather conditions. Start at one corner and lift away the plastic base. If the colored stencil tears, it isn't dry.



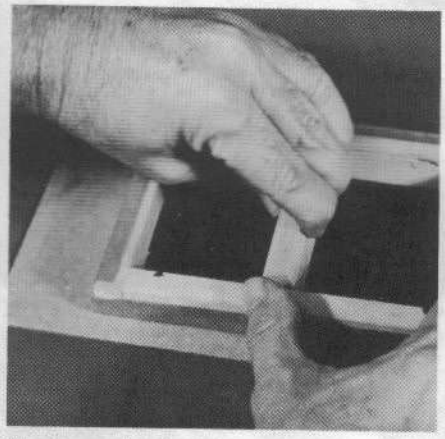
8. Water soluble gummed tape is good for masking the open area surrounding the stencil. Ordinary masking tape may be used if you don't plan to make more than a hundred copies.



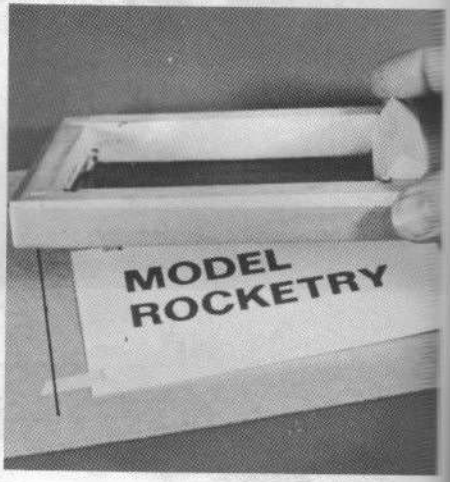
9. Make sure that the edges of the tape overlap sufficiently. Paint seepage is a nuisance.



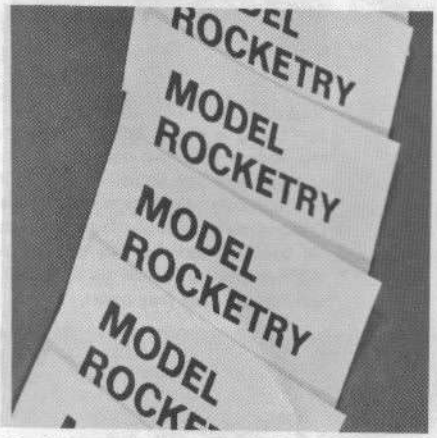
10. If you wish to make many copies or use more than one color, a guide marking the location of one corner of the frame is convenient. A simpler method is to tape several sheets of Du-Cal paper to your work surface, and just place the frame on top of the paper.



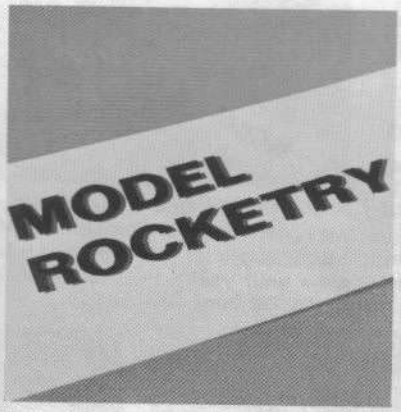
11. Pour a bead of paint along one edge of the frame and use the neoprene rubber squeegee to draw the paint firmly across the screen.



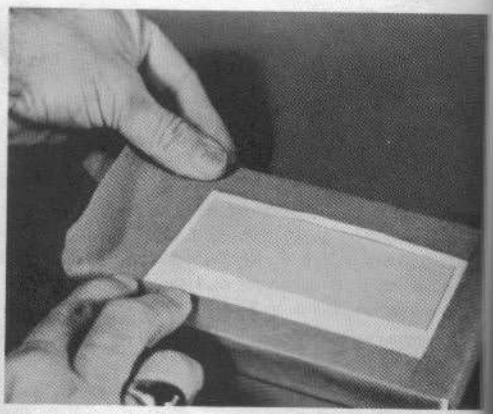
12. If all went well, you should have a perfect copy of your favorite design.



13. You may now proceed to make a few thousand copies. The Du-Cal Company and Model Rocketry magazine will be happy to supply all the paper you need.

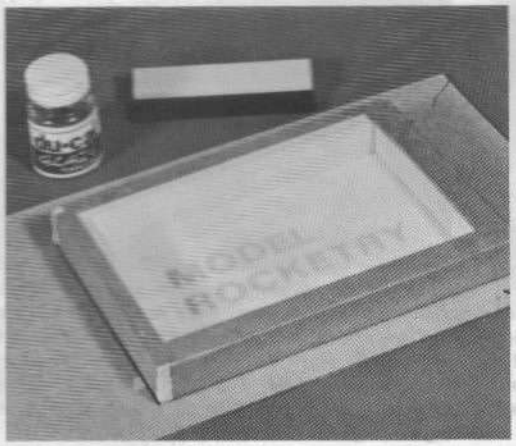


14. After the paint has dried, and you have cleaned the screen with the appropriate thinner, you may wish to print a second color slightly off register. This produces a shadow effect.



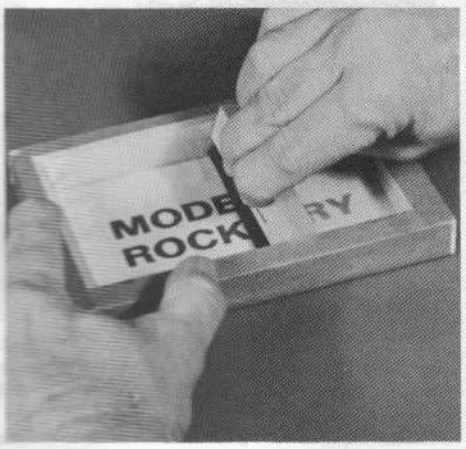
15. Your decal is not a decal until Du-Cal Glaze has been applied. Tape a paper cutout to the bottom of the screen as shown. The shape of the cut-out should correspond to the area of your design.

AS YOU BECOME FAMILIAR WITH THE DU-CAL SYSTEM, YOU WILL DISCOVER OTHER WAYS TO USE HAND CRAFTED DECALS ON YOUR ROCKETS. PLEASE SUBMIT YOUR IDEAS TO MODEL ROCKETRY MAGAZINE, AND PERHAPS THEY CAN BE PASSED ON IN FUTURE ISSUES.

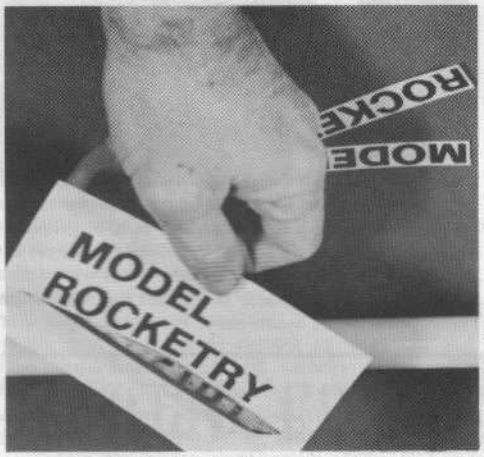


16. If you bothered to make the guide suggested earlier, you may use it to apply Du-Cal Glaze to your prepared Du-Cal paper. Otherwise, you must tape each sheet to your work surface.

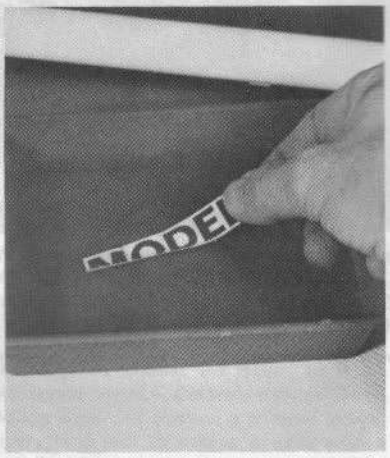
17. Pour a bead of Du-Cal Glaze along one edge of your applicator and zip it across with one firm stroke of the squeegee.



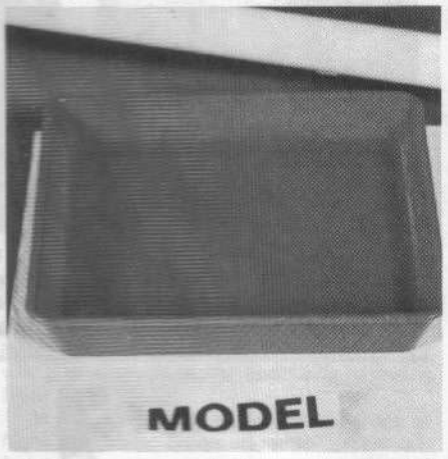
18. If a bit of color offsets to the bottom of the applicator, try to line it up with the next sheet. If it seems to be a problem, you may be working too slowly.



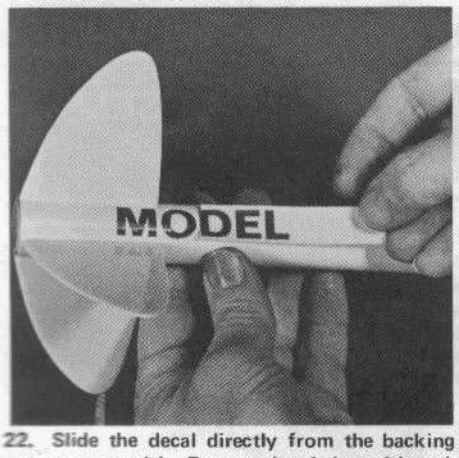
19. As soon as your decals are dry, they are ready to use. They should be trimmed from the sheet allowing a very slight clear margin.



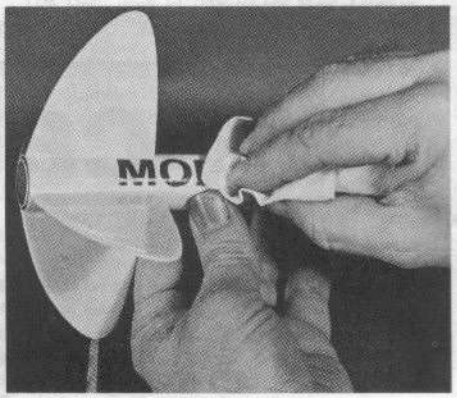
20. Place the decal in water for 10 SECONDS ONLY. Too much soaking washes away the glue.



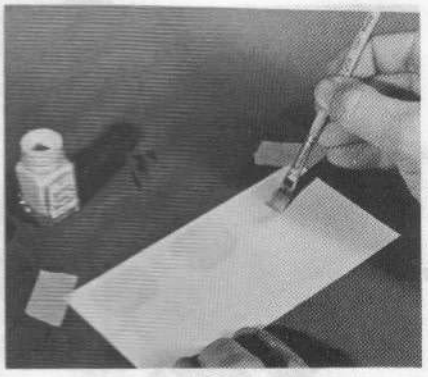
21. Allow the wet decal to rest for one full minute. It should then slide easily from the backing paper.



22. Slide the decal directly from the backing onto your model. Be sure that it is positioned correctly before blotting away excess water.



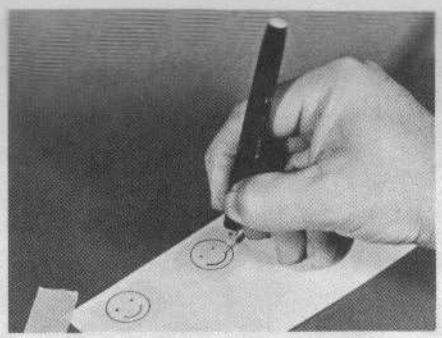
23. Gentle blotting and pressure will push out small air bubbles and excess moisture. Decals produced by this method are very thin and conform easily to most irregular surfaces.



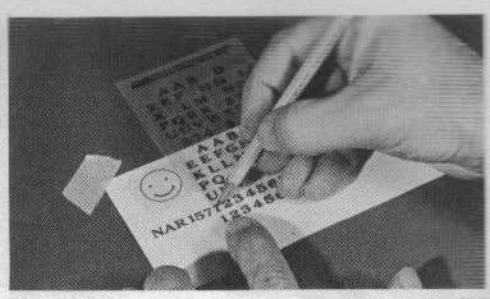
24. It is often easier to draw simple decals directly on the surface of Du-Cal paper. Testors Pla dries quickly and smoothly. Here a yellow background is being applied.

SEE PAGE 12 FOR DU-CAL ORDER BLANK. ALL MATERIALS NEEDED, INCLUDING REPLACEMENT SUPPLIES, WILL BE AVAILABLE THROUGH MODEL ROCKETRY. WATCH FUTURE ISSUES FOR MORE IDEAS!

25. Mechanical drawing instruments are valuable for drawing perfect lines. Properly thinned Testors Pla or WATERPROOF black drawing ink may be used.

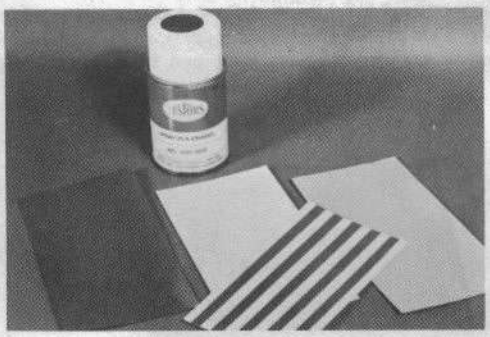


26. The Mars 700 pen or any other drafting pen is useful for detailed drawing. Points for different line widths are available. It should be used only with the proper waterproof inks.

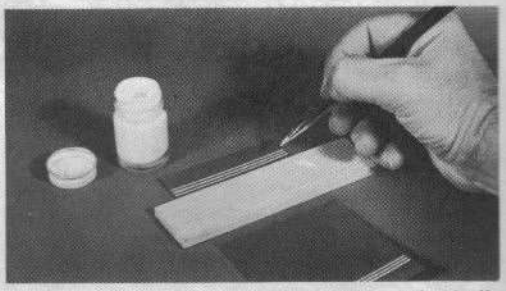


27. Rub-on lettering may be applied to Du-Cal paper. The advantage? It's easier to work on a flat surface, and it may be combined with other art work. Auto World, Dept. B, 701 N. Keyser Ave., Scranton, Pa. 18508, has a good selection of very small letters. 30 cents will get you their big catalog.

28. Du-Cal Glaze may be applied with a brush. The only secret is to apply a quick application with a wide brush.



29. Large colored panels may be prepared by spraying Testors Pla directly on Du-Cal paper. The Du-Cal Glaze Applicator should be used to coat these surfaces.



30. A ruling pen may be used to draw mechanically perfect lines. This technique was used to prepare the fin panels shown on the Model Rocketry Sport Flyer designed for this article. A pattern was traced on the paper side of the decal sheet, cut out with scissors and applied. It's much easier than masking.

SAVE $$$'s ON YOUR CINEROC FLYING BY LOADING AND PROCESSING YOUR FILM . . . .

Flying the CINEROC

by Richard Fox

The Estes Cineroc is an amazing device — a light weight, fast shutter speed, aerodynamically streamlined camera which, when used properly, will produce movies rivaling NASA's most spectacular. It would be impossible to modify any other movie camera to meet all these requirements and still remain within the Cineroc's $21.95 price. However the camera does have some faults. It requires warm weather, good lighting, careful preparation, and expensive film. Having flown many cassetts of Cineroc film, I would like to describe how Cineroc results can be improved by proper preparation, and how money can be saved by processing your own film.

An F100 powered Cineroc carrier will provide an impressive high-altitude flight. The one shown above was the first launch of a Cineroc in conjunction with a Foxmitter in an attempt to obtain sound movies from the flight.

Planning the Flight

The Cineroc should be flown *only* on bright, sunny days. Cineroc movies taken on cloudy days will contain a colored image, but everything will look blue or gray with a very dark image. When you're spending $6.75 per flight for film and processing it's best to wait for a good, sunny day.

The best time of day to fly your Cineroc is in mid-morning or mid-afternoon. At noontime it's plenty bright, but with the sun directly overhead there are no visible shadows. Shooting about three hours after sunrise or three hours before sunset the shadows are long but there is still plenty of light. The result is a colorful movie with plenty of depth.

Unlike other model rocket activities where the ideal launch site is a clear, isolated, empty field, you want to fly your Cineroc out of crowded areas. Movies of a field of weeds receeding into the background just aren't very interesting. On the other hand, pictures of a busy parking lot dropping away at several hundred miles per hour are spectacular. (Furthermore, if your chute fails, movies of a busy parking lot being *approached* at several hundred miles per hour are also quite spectacular!)

Movies of the bottom of your chute as the rocket descends to earth generally aren't very interesting either. If you attach the chute near the top of the Cineroc (see Figute 1) you will obtain pictures of the ground all the way down. No modification of the camera is required. A 12" chute is sufficient to bring the Cineroc down safely. Anything larger will only cause the camera to drift further away and hamper recovery.

The best launch vehicle is a two-stage rocket constructed from BT-60. You can use the Omega, or design your own bird; but with a two-stage model you obtain a beautiful film of staging.

An impressive alternate vehicle is a single-stage BT-60 rocket powered by a high-thrust F-engine. While not giving a movie of staging, this vehicle does eliminate the hazard of staging failure. Also the F-powered vehicle will give a much higher and faster climbing flight.

If you want to do an interesting study of flight dynamics on your model rocket airframe, try boat-tailing the Cineroc down to BT-50 size, and fly it on a two-stage BT-50

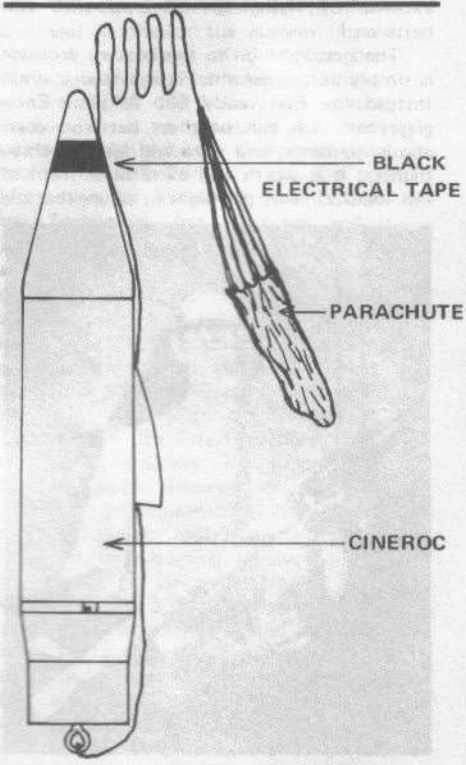


Figure 1. The parachute shroud line can be attached to the top end of the Cineroc in order to give impressive pictures of the ground during the descent.

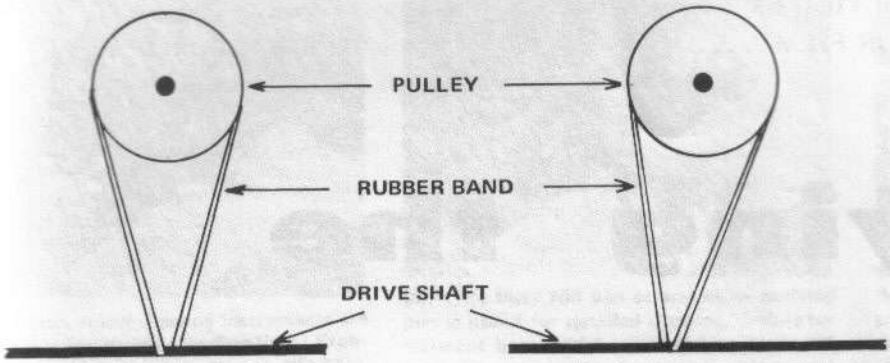


Figure 2. The rubber band must be put on the drive shaft and pully in the correct direction (illustration at left). If assembled incorrectly (at right) the film will not wind through the camera.

carrier. The movies will show some wild flexing and whipping of the rocket body during thrusting, though the flight will look perfectly normal from the ground.

The Batteries

The batteries which power the Cineroc's electric motor are a continual problem. Estes packs two fresh NEDA type 910 zinc-carbon cells with each film package. These batteries will provide good results for one cartridge of film on a warm day if they are not too old. Unfortunately these batteries have a shelf life of only three months, and you have no way of knowing how long they have been sitting on the dealer's shelf before you bought them. (Perhaps Estes should mark an *expiration date* on each film package to allow rocketeers to avoid the disappointment and expense of flying the Cineroc with bad batteries.)

The best solution to this battery problem is simply not to use the Estes batteries at all. Instead use Everyready E90 Alkaline Energizer cells. A pair of these batteries costs about 80 cents, and they will last for three flights. It is worth this extra investment of less than 30 cents per flight to assure that the expensive Cineroc film will be properly exposed. Futhermore, these batteries will work to much lower temperatures than the Estes ones, making it possible to shoot movies in any weather a reasonable rocketeer would be out in. (One word of caution, the Everyready E90 batteries have the opposite polarity of normal batteries. The plus side is on the bottom of the battery, not the top, and the batteries must be put in the Cineroc exactly opposite to the drawing in the instructions.)

Mike Dorffler, designer of the Cineroc, examines one of the early production versions. The Estes two-stage BT-60 Omega vehicle makes an ideal Cineroc carrier.

Rubber Band Drive

The Cineroc uses a rubber band and pully as a constant torque drive system for the take-up spool of the film cartridge. When there is only a small amount of film on the take-up side of the cartridge the spool will revolve quickly, however when the spool has a lot of film on it, towards the end of flight, the rubber band slips and the spool revolves more slowly.

When assembling the take-up system be sure to thread the rubber band so that the pully rotates counter-clockwise. If it is hooked up backwards (see Figure 2) the take up spool will rotate backwards, no film will be wound up, and the film cartridge will jam after about 5 seconds. Also be sure that the rubber band contains no twists and that the teflon washer is on the correct end of the drive shaft, or the rubber band will slip excessively and the film will jam.

Loading Your Own Film

Estes sells film and developing for the Cineroc at $6.75 per flight. This price pushes the upper limit of most rocketeers' budgets, and you can realize a substantial saving by loading and processing your own film, especially if you plan a large number of flights.

Fast processing of the exposed film is another reason for doing your own processing. At last year's Pittsburgh Spring Convention a Cineroc film from the sport launch was shown to participants only two hours after the flight. You can't get that kind of turn-around time from any commercial processor.

The first step in loading your own film is to obtain an *empty* Cineroc cartridge. Estes will not sell you empty cartridges nor will they return your cartridges to you after processing a roll of your film. (You can't expect them to sell you empty cartridges so you can save money by loading your own film, can you?) Thus, the only way to obtain an empty cartridge is to buy a roll of Estes Cineroc film and process it yourself (following the directions outlined in the next section of this article.)

The film used in the Cineroc is single-width Super 8 film which is available at all photo stores in 50 foot lengths. One 50 foot roll is enough film for *five* Cineroc flights. For black and white movies the film you want is Kodak Super 8 "Tri-X" which sells for about $2.65. That works out to about 53 cents per flight. For color movies use the new Kodak Super 8 "Ektachrome High Speed 50-105" (ASA 125), which sells for $3.75 per roll or about 75 cents per flight.

Transferring the film from the Kodak cassette to the Cineroc cartridge *must* be done in *total darkness*. Assemble the necessary materials – an empty Cineroc cartridge, a roll of Super 8 film, a 12" ruler, and a roll of scotch tape – in your darkroom (or closet) and you are ready to begin. Measure out a 10½ foot length of Super 8 film and roll it up into the tightest coil possible. The film should be rolled with the light sensitive side *in*. This is easy to do because the film coils naturally in this direction. Place the film on the supply side of the Cineroc cartridge (see Figure 3), and thread the end of the film out of the slot on the supply side of the cartridge.

Temporarily tape the cover back on the Cineroc cartridge, then turn on the lights. Check that the perforated holes of the film are on the bottom side of the cartridge and that the lighter colored side of the film is facing out. If the perforations are wrong the wrong end of the film is at the center of the coil. Try again!

Once the film is oriented properly in the cartridge a hole should be punched at the

Table One
Suggested Darkroom Supplies

Superior Powdered Black and White Reversal Chemicals, ½ Gallon Set	$ 3.25
Super 8 Daylight Tank (may be used in normal light)	$24.50
or	
Junior Deluxe Super 8 Tray (must be used in total darkness)	$12.95
Chemical Thermometer	$ 1.50
16 ounce beaker	$ .80
Stirring Rod	
5 half gallon plastic bottles	

The above are available from Superior Bulk Film Company
442-450 North Wells Street
Chicago, Illimois 60610

Write for their 64 page catalogue of home movie supplies.

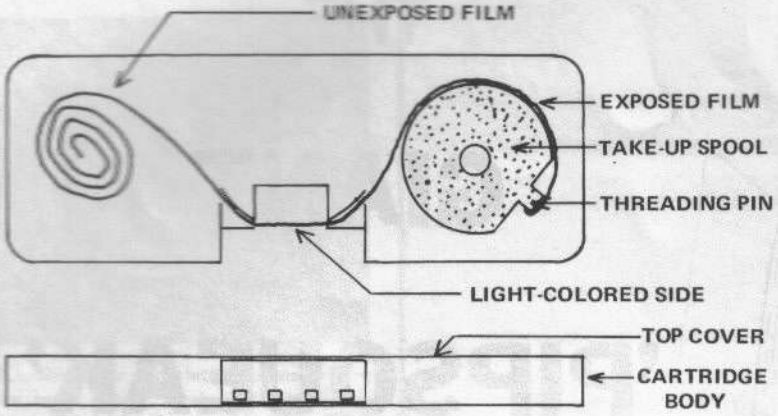


Figure 3. The film is wound into a coil and inserted into the left side of the cartridge. A hole is punched in the end of the film, and it is wound onto the take-up spool.

end of the film. The take-up spool, which should have been removed from the cartridge, has a pin on it. Place this pin through the hole in the film. The lighter colored side of the film should be flat against the spool.

Again in *total darkness* the film cartridge is opened, and the take-up spool should be seated in its grooves on the take-up side of the cartridge. Finally tape the cover back on the cartridge, and your Cineroc cartridge is ready to fly. Believe it or not, the whole loading procedure can be done in four or five minutes. In fact I've done it at the field inside an Estes changing bag.

Black & White Developing

Once you've shot the Cineroc film you must process it. No commercial processing is available for this non-standard film length, and Estes will not process it. You will need some special equipment to process movie film, but the initial investment of $15 makes possible significant savings (over $5.00 per flight) on your future Cineroc launchings.

The most inexpensive movie film processing kit available is the *Junior Home Processing Kit* (from ESO-S Pictures, Dept. M-8,

(continued on page 39)

Table Two
Typical Color Processing Sequence

Solution	Time	Total Minutes
(first four steps in total darkness)		
Prehardener	3 min.	3
Neutralizer	1	4
First Developer	7	11
First Stop Bath	2	13
(remaining steps may be carried out in dim light)		
Wash	4	17
Color Developer	9	26
Second Stop Bath	3	29
Wash	3	32
Bleach	5	37
Fixer	6	43
Wash	6	49
Stabilizer	1	50
Dry		

THREE NEW ROCKETRY BOOKLETS

Just off the presses at Estes Industries, Penrose, Colorado, are three new brochures which thoroughly cover all aspects of model rocketry as an educational tool and as an exciting club activity. The new brochures--**Aerospace Education and Model Rocketry, Space Age Technology,** and **Guide for Aero-Clubs**--were prepared and printed at the Estes plant in Penrose.

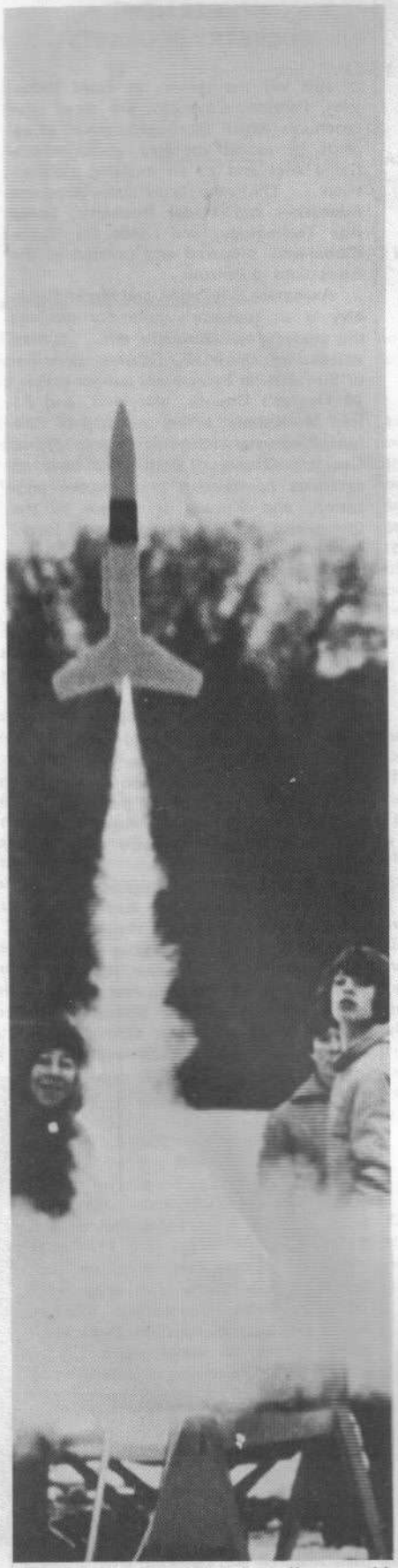
Aerospace Education and Model Rocketry is an educator's guide for teachers of grades four through ten. It was written by Daniel F. Saltrick, principal of Surrattsville Elementary School in Prince George's County, Maryland, and Alfred M. Kubota, acting principal of Chillum Elementary School, also in Prince George's County. Both men have an extensive background in aerospace education, and Kubota is advisor to the Cherokee Lane Elementary School Rocket Club. The 36-page 8½ x 5½ **Aerospace Education and Model Rocketry** booklet covers model rocketry, suggests further activities to explore our aerospace environment, and outlines continuing activities in the fields of aerodynamics, mathematics, space, and teamwork. Fully illustrated with photos and artwork, **Aerospace Education and Model Rocketry** is available separately (Cat. No. BK-18, price $1.00) or as part of the Estes Educator's Information Packet (Cat. No. 711-EP-2, price $2.50) designed specifically to show teachers how they can incorporate model rocketry into their curriculum.

A four-week unit designed to introduce and emphasize the current importance of technology of the space program, **Space Age Technology** is primarily directed at the junior high school. However, it is also suitable for many groups in high school. Science minded young men will find it interesting and informative for individual reading. **Space Age Technology** has 52 pages and is thoroughly illustrated. The 8½ x 5½ brochure has been divided into 11 chapters which cover such subjects as theory of flight, history of jets and rockets, power plants, rocket propulsion systems, guidance and controls, and model rockets. It is available from Estes Industries for $1.00 a copy. (Cat. No. 711-BK-14.)

The third new Estes Brochure, **Guide for Aerospace Clubs,** was prepared by Dane M. Boles, Director of the Estes Rocketeer Communications Department, and is written for individuals and groups interested in becoming involved in the development of a model rocket club. A 29-page, 8½ x 11 booklet illustrated with many photographs and drawings, **Guide for Aerospace Clubs** covers such topics as launch site operations, workshop activities, club funding, special equipment, aerospace presentations, competition, demonstrations, exhibits, field trips research and developments projects, sponsorships, and club advisors. It can be ordered from Estes Industries for $.50 a copy. (Cat. No. BK-19).

THE GIANT 'PIPSQUEAK'

by Len Fehskens



The Giant Pipsqueak lifts off at a mid-winter launch. Powered by an F100 this model is a real crowd pleaser, with lots of smoke on liftoff.

The Giant Pipsqueak is a 3.75:1 very-close-to-scale model of the MPC Pipsqueak, designed to be flown with D or larger engines. It is constructed mostly from Centuri large-scale parts, and is fairly easy to build. In addition to the usual model rocket building tools, the following parts will be necessary:

Centuri BC-225B nose cone
LT-225A body tube
LT-115A body tube
EM-225F engine mount
ST-56 body tube

2" long 3/16" launch lug
3" wide 1/4" hard balsa (about 21")
recovery system – 12" or larger chute, preferably heavy duty

To build the model procede as follows:

1) Cut the LT-225A to a length of 15".

2) Cut the LT-115A to a length of 10".

3) Mount the paper engine block from the EM-225F in the 10" length of LT-115, 7 1/4" from one end. Insert the engine block from the nozzle end so that the excess glue will not build up on the engine side of the block as it is pushed in.

4) Glue the two balsa engine mounts from the EM-225F flush with both ends of the LT-115. Set aside to dry.

5) Cut out and shape the three fins from the 1/4" hard balsa. The full size fin pattern is not quite scale to allow cutting the fins from 3" wide stock. If you can get 4" or wider stock, the fins can be made scale by extending the root chord 1/4". For the perfectionist, the fins can be tapered to 1/8" at the tips. Of course, do this before airfoiling the fins. Smooth sand and preliminarily seal the fins. The nose cone can be sealed at the same time, since the balsa parts require much more sealing than the rest of the airframe.

6) Glue the LT-115 engine mount assembly into the LT-225, recessed 1/2".

7) Mark the LT-225 body tube for the three fins and launch lug. The launch lug is aligned midway between two fins, halfway up the body.

8) Roughen the body tube at the launch lug bonding area with some fine sandpaper. Double glue the launch lug to the body.

9) Using the same procedure, glue the fins to the body.

10) Cut the ST-56 to 3 3/4". Slit it lengthwise.

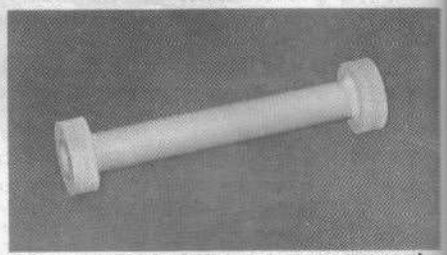
11) When the launch lug is quite dry, spread the slit ST-5 and slip it over the launch lug. The bottom edge should be 5 5/8" from the bottom of the body tube. Glue it into position.

12) Build up large glue fillets on the fin-body joints. This is a large, heavy model designed to be flown with the largest engines presently available and must be built to take a beating.

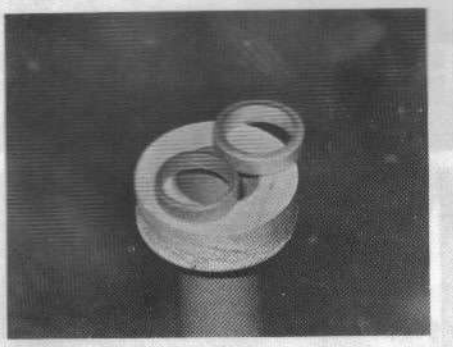
13) When the glue has completely dried, build up large nicely rounded fillets on the fins and launch lug. Hobbypoxy Stuff was used quite satisfactorily on the prototype.

14) Seal and sand the entire model (body tube, scale launch lug, fins, nose cone). Re-

Step 1. The necessary parts. Body tubes have all been cut to length.



Step 2. Glue the balsa engine mounts to the LT-115. Note the heavy glue fillet. The engine block has already been glued in.



Step 3. Glue the completed engine mount into the body tube. Again note the heavy glue fillet. This is the engine end.

peat until all surfaces are smootn.

15) Paint the model. The prototype was painted with Krylon Glowing Cerise and a black and white Monokote roll pattern was copied from the decal in the MPC kit.

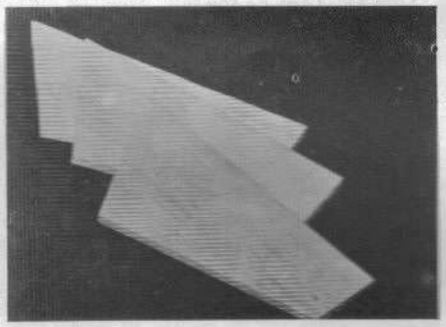
16) Assemble and install the recovery system of your choice.

Flying the Giant Pipsqueak

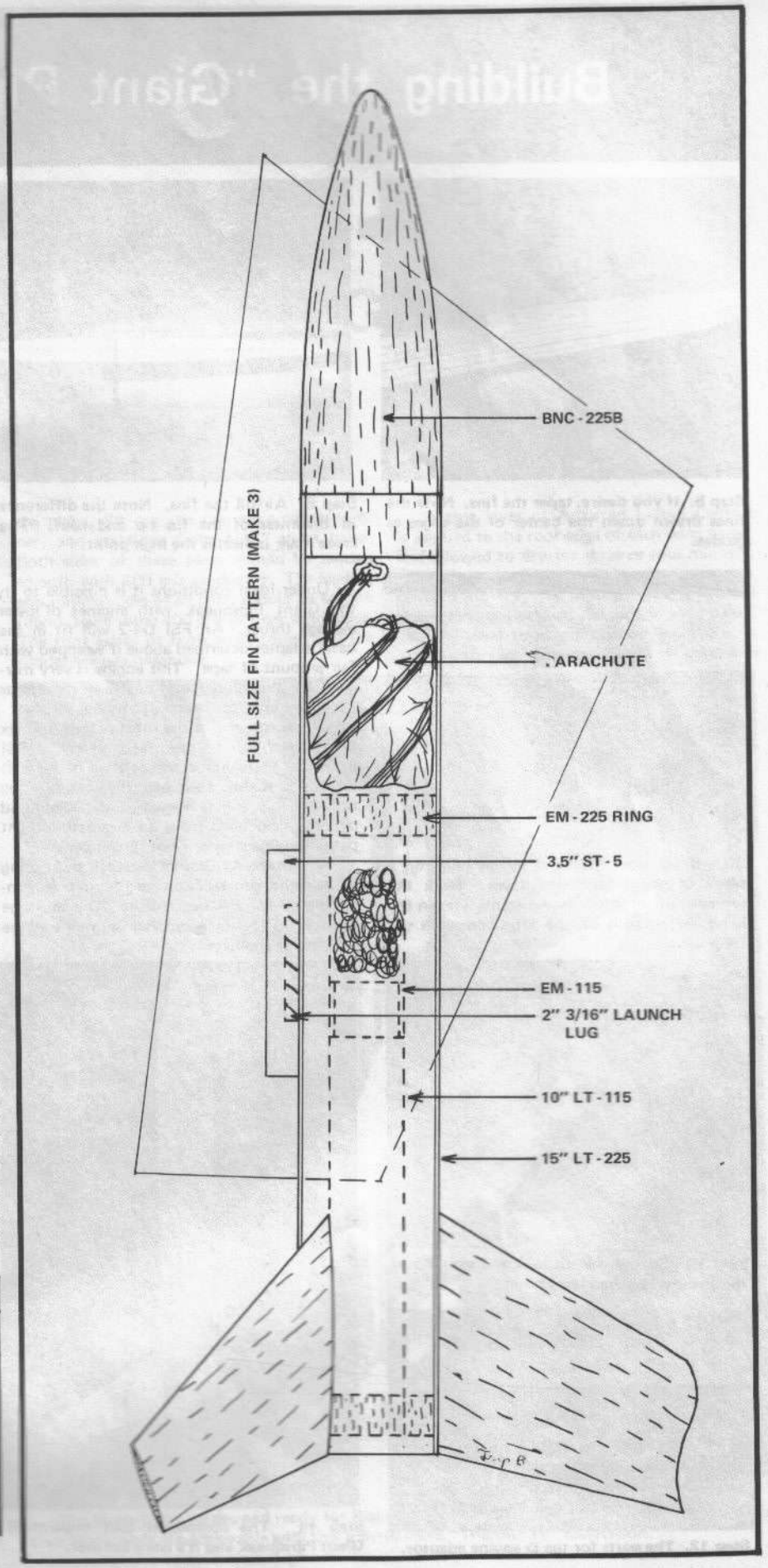
The prototype Giant Pipsqueak has been flown with FSI D4-2's and Estes D13-5's. The new Estes D12-3 is recommended as a good engine to start with. The Giant Pipsqueak is large and heavy, so exercise the proper precautions when flying it.

The engine mount is large enough to handle any existing engine. Engines which are too short can be used in conjunction with an adapter of the appropriate length. Centuri sells a series (EMA-1, EMA-2, EMA-3, EMA-4) of such adapters.

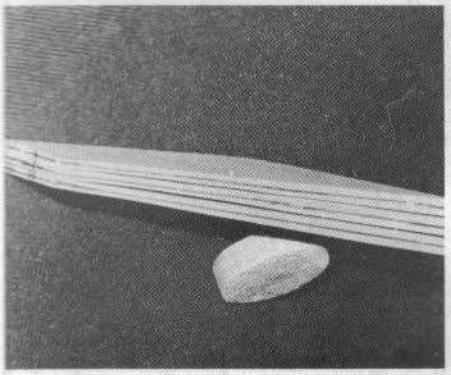
Engines which are too small in diameter can be liberally wrapped with tape (a procedure which is not recommended) or used in an adapter. A basic adapter is built from a 7¼" length of Estes BT-50. Peel two Estes AR-5055 adapter rings until they are small enough to slip snugly inside the LT-115 engine mount tube. Mount an Estes AR-2050 ring 2½" from one end of the BT-50. If desired, the engine block can be supplemented with an engine hook. Glue the stripped AR-5055's to the BT-50. one 1¼" from the engine end (over the engine hook if one is used), the other flush with the opposite end of the tube. This adapter can be used directly with the Estes D12-3, or with the Cox D8-3 or C6-2 in an Estes EM-2050 engine mount slipped into the basic adapter.



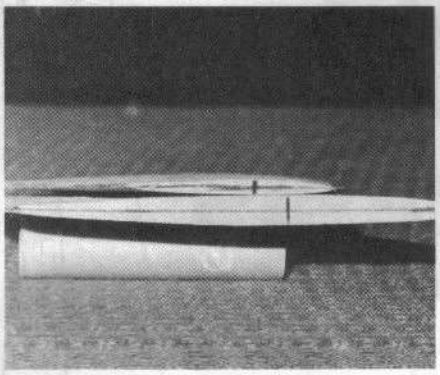
Step 4. Cut out the three fins.



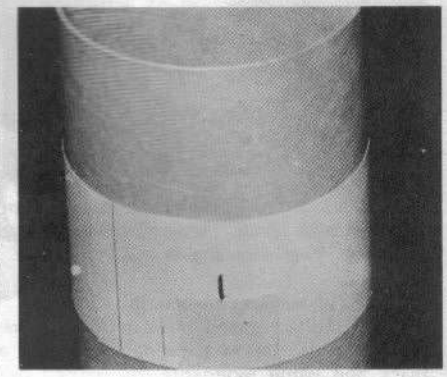
Building the "Giant Pipsqueak"



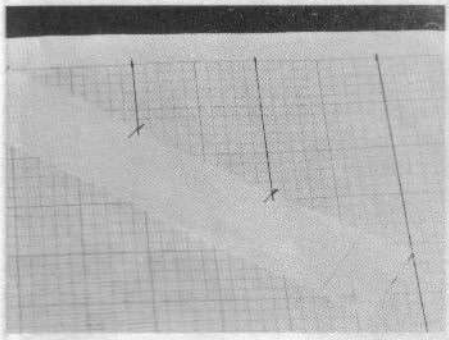
Step 5. If you desire, taper the fins. Note the lines drawn down the center of the edges as guides.



Step 6. Airfoil the fins. Note the difference in thickness of the fin tip and root. The cross mark indicates the high point.



Step 7. Mark the body tube for the fins. Do this by wrapping a paper band around the tube and marking the overlap.

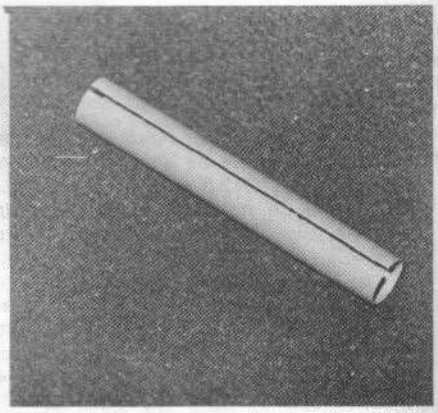


Step 8. Trisect the band by laying it on a piece of graph paper as shown. Mark the intersection of the 3 equidistant lines on the band. Rewrap it on the tube and mark the fin positions.

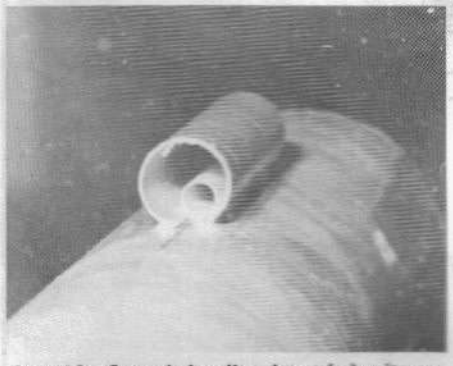
Under ideal conditions it is possible to fly the Giant Pipsqueak with engines of lower average thrust. An FSI D4-2 will fit in the basic adapter described above if wrapped with fair amount of tape. This engine is very marginal for this model, and probably represents the lower limit for successful flying.

Of course, any of the short delay Minimax or Enerjets can be used, as well as the FSI F100-8. Though the thrust level of the FSI F7-4 is probably adequate, the long burning time of this engine increases the likelihood of large deviations from an acceptable flight path, and this engine is not recommended.

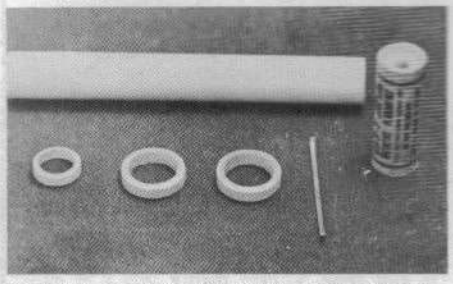
An "uprated" Giant Pipsqueak built using lightweight construction techniques is contemplated for the near future. It should be possible to fly such a model with all but the smallest of engines.



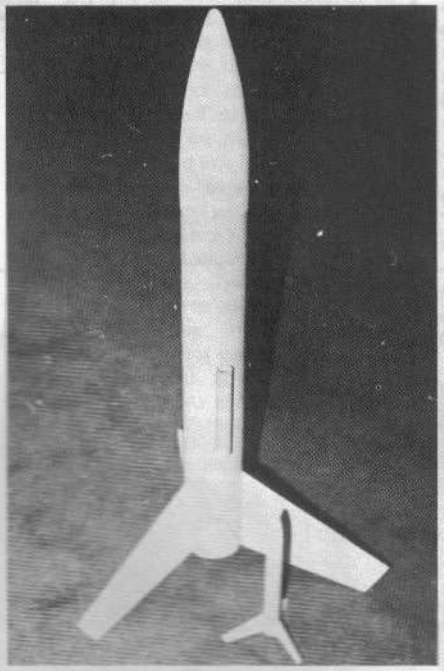
Step 9. Slit the ST-56 lengthwise as shown.



Step 10. Spread the slit tube and glue it over the already attached launch lug.



Step 12. The parts for the D engine adaptor.



Step 13. The completed (but unpainted) Giant Pipsqueak and it's baby brother.

Step 11. Glue on the fins. When all the glue has dried, fillet the fin and launch lug joints.

Step 14. The completed D engine adaptor and some engines the Giant Pipsqueak can be flown with.

An easy-to-do conversion of

JETCO's Thermic-18 glider.....

MACH-1

Sparrow Boost/Glider

by George Flynn

The *Mach 1* evolved from a series of discussions during which the "B/G experts" continously made comparisons between boost/glide techniques and those of model airplane hand launched gliders. Of course the question came up: "If the glider design techniques are so directly applicable to boost/gliders, why not just fly an HLG in boost/glide?"

Why not? At least it's worth a try! Somewhere in the history of the model aviation there must be a good design for use in the Sparrow B/G event. A quick look through the model airplane catalogs turned up a few promising looking kits. Though not many have been flown recently, the Jetco Thermic 20 was a popular B/G conversion for Sparrow and Swift up till about two years ago. But with its 18" span and 1/8" thick wings, the Thermic 20 is a little large and heavy to conform to the current winning ideas for boost/glide.

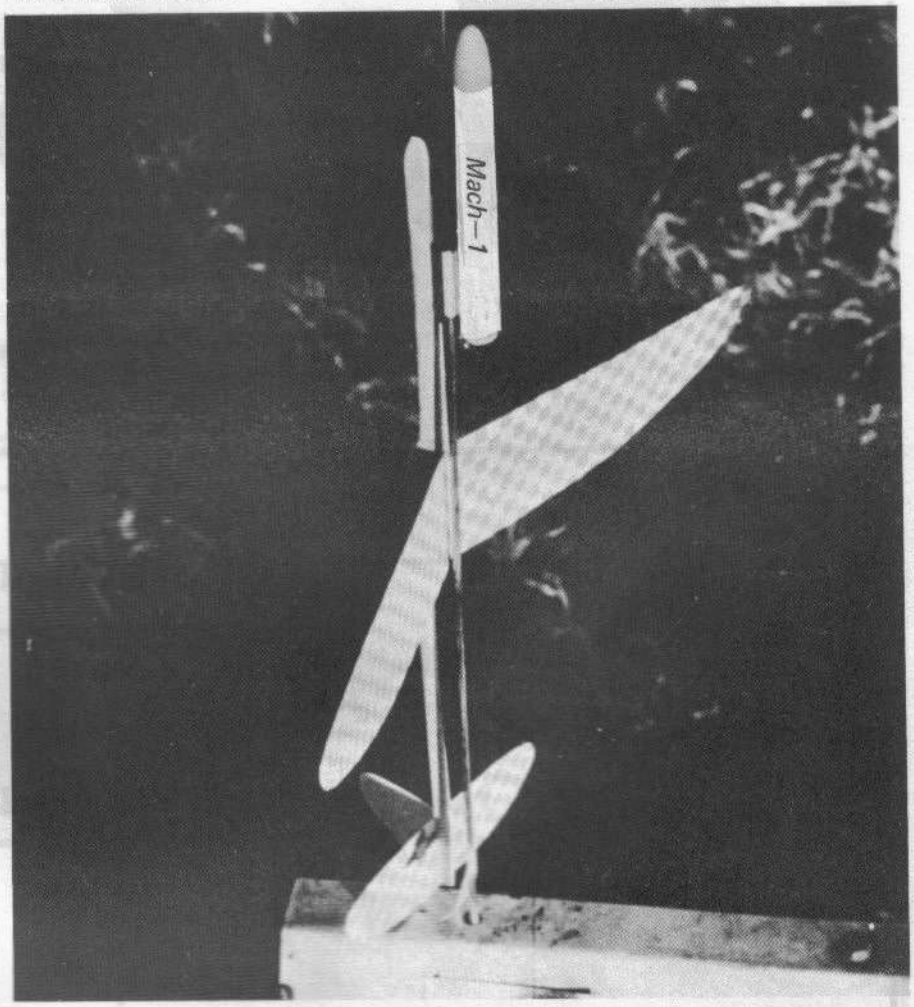
Its little brother the Thermic 18, however, looked just ideal for the job. This glider uses lightweight 1/16" thick balsa wings with a full span of 13 inches. The JETCO kit includes all the parts necessary for the B/G conversion except a T15 tube, and a nose cone for the pod. Best of all is the price, only 29 cents for the Thermic 18 which is available in most hobby shops.

Originally the objective was to select a glider kit which could be flown as a B/G by a beginner with little background in modroc construction. However, the *Mach 1*'s first flight proved that this little bird can turn in performances that most contest modelers would be proud of. The Thermic 18 starts out as a light glider with good thermal performance. When the pop-pod is added, its boost is straight and the transition is quick and clean. Putting all this together resulted in a duration of 71 seconds on the first try! A few more flights to get it into perfect trim and the *Mach 1* was giving consistent performances of better than a minute and a half, and there was no evidence of strong thermal activity.

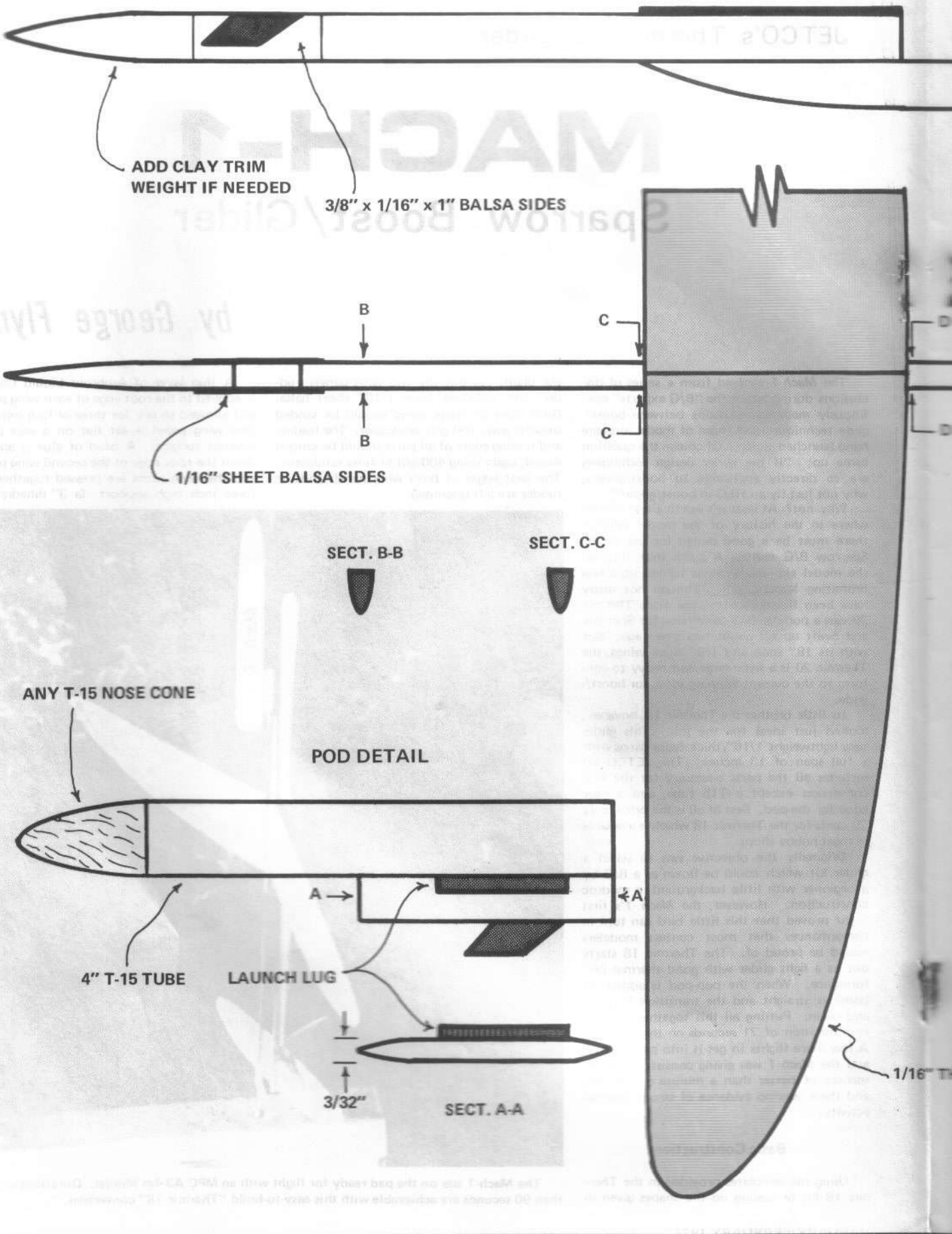
Basic Construction

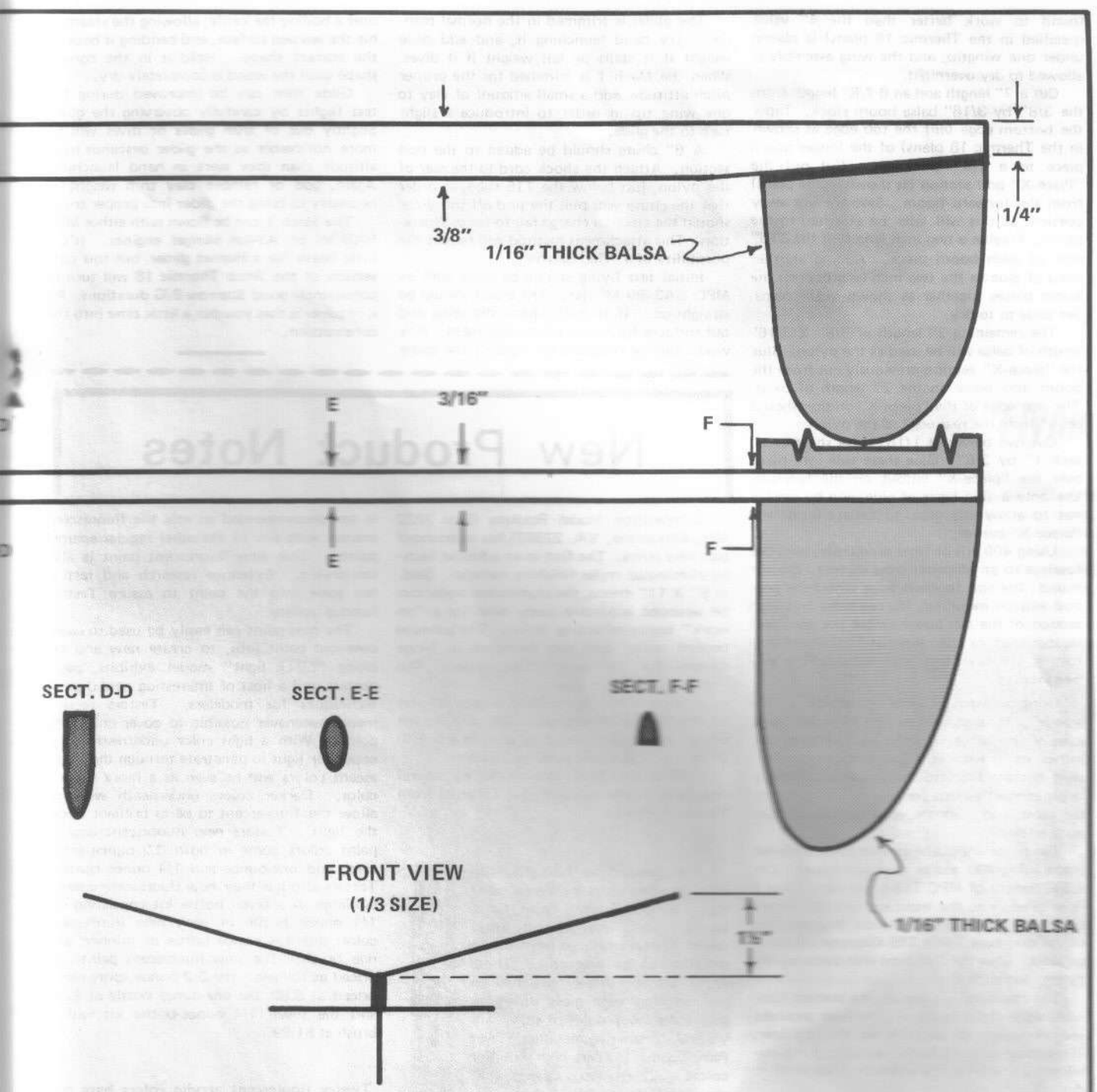
Using the templates provided in the Thermic 18 kit or scaling up the shapes given in the plans, cut out the two wing panels, rudder, and stabilizer from 1/16" sheet balsa. Both sides of these parts should be sanded smooth with 400 grit sandpaper. The leading and trailing edges of all parts should be sanded round, again using 400 grit or finer sandpaper. The root edges of both wing panels and the rudder are left unsanded.

A thin layer of Ambroid Liquid Cement is applied to the root edge of each wing panel, and allowed to dry for three or four minutes. One wing panel is set flat on a wax paper covered surface. A bead of glue is applied down the root edge of the second wing panel, and the wing roots are pressed together. A three inch high support (a 3" dihedral was



The Mach-1 sits on the pad ready for flight with an MPC A3-4m Minijet. Durations of more than 90 seconds are achievable with this easy-to-build "Thermic 18" conversion.


ADD CLAY TRIM
WEIGHT IF NEEDED
3/8" x 1/16" x 1" BALSA SIDES
B
B
C
C
1/16" SHEET BALSA SIDES
SECT. B-B
SECT. C-C
ANY T-15 NOSE CONE
POD DETAIL
A
A
4" T-15 TUBE
LAUNCH LUG
3/32"
SECT. A-A



FULL SIZE

MACH-1

(Thermic 18)

DRAWN BY G. FLYNN 11/29/71

found to work better than the 4" value specified in the Thermic 18 plans) is placed under one wingtip, and the wing assembly is allowed to dry overnight.

Cut a 7" length and an 8 7/8" length from the 3/8" by 3/16" balsa boom stock. Taper the bottom edge (*not* the top edge as shown in the Thermic 18 plans) of the longer boom piece to a 1/4" thickness. Cut out the "Piece-X" pod section (as shown in the plans) from the forward boom . Save the cut away portion, as this will later be attached to the pylon. Preglue a two inch length of the 3/16" side of each boom piece. Adding another bead of glue to the two inch length, press the boom pieces together as shown in the plans. Set aside to to dry.

The remaining 2" length of 3/8" X 3/16' length of balsa will be used as the pylon. Glue the "piece-X" section previously cut from the boom into place on the 2" length of balsa. The rear edge of the "piece-X" section should be ½" from the rear edge of the pylon.

Cut two pieces of 1/16" thick sheet balsa, each 1" by 3/8". Glue these side into place over the "piece-X" cutout on the fuselage. Use only a thin layer of glue, and be careful not to allow any glue to collect inside the "piece-X" cutout.

Using 400 grit or finer sandpaper, sand the fuselage to an elliptical cross-section. Do not round the top forward edge where the pop-pod will be mounted, the rearmost two inch section of the top boom where the wing will be mounted, or the rearmost 1½" of the bottom of the fuselage where the stabilizer will be mounted.

Using a sharp X-Acto knife, cut a "V-groove", to accomodate the dihedral root joint of the wings, into the top rearmost two inches of the upper fuselage section. The wing bottom fits into the groove providing a larger contact surface for glueing. Add glue to the joint, and press the wing into place. Set aside to dry.

The pylon should be sanded to an airfoiled shape using 400 grit or finer sandpaper. Cut a 3¾" length of MPC T15 body tube. Glue a nose block into the front end of a T14 engine tube, and glue the engine tube into the rear of the pod tube. Any T15 size nose cone can be used. Glue the T15 tube into place on the pylon. Set aside to dry.

The stabilizer is glued to the bottom (tapered) edge of the fuselage. The taper provides several degrees of decalage on the stabilizer. The rudder is glued to the bottom of the stabilizer, and the entire assembly is set aside to dry.

Finishing and Trimming

The surfaces sanded with 400 grit paper prior to assembly should be sufficiently smooth to reduce drag almost to a minimum. The fuselage needs no further finishing, however one or two light coats of clear dope on the wing surfaces could improve the performance. Sand with 400 grit or finer sandpaper between each coat.

To improve appearance, with little increase in weight, a large Sig decal can be used on the wing. These decals, available in multicolored checkerboard patterns (as shown on the cover), *must* be applied with care or else the wing may warp. Don't allow excess water to accumulate on the wings during decal application, or you may find a strange curve on the wings.

The glider is trimmed in the normal manner. Try hand launching it, and add nose weight if it stalls or tail weight if it dives. When the Mach 1 is trimmed for the proper pitch attitude, add a small amount of clay to one wing tip in order to introduce a slight turn to the glide.

A 6" chute should be added to the pod section. Attach the shock cord to the *rear* of the pylon, just below the T15 tube, in order that the chute will pull the pod off the glider should the ejection charge fail to cause separation. This attachment method will reduce the possibility of a "Red Barron".

Initial test flying should be done with an MPC ½A3-3m Minijet. The boost should be straight-up. If it isn't, check the wing and tail surfaces for warps or misalignment. Any warps can be removed by holding the glider over a boiling tea kettle, allowing the steam to hit the warped surface, and bending it back to the correct shape. Hold it in the correct shape until the wood is completely dry.

Glide trim can be improved during the test flights by carefully observing the glide. Slightly out of trim glides or dives will be more noticeable as the glider descends from altitude than they were in hand launching. Again, add or remove clay trim weight as necessary to bring the glider into proper trim.

The Mach 1 can be flown with either MPC ½A3-3m or A3-4m Minijet engines. It's a little heavy for a Hornet glider, but this conversion of the Jetco Thermic 18 will turn in consistently good Sparrow B/G durations. All it requires is that you put a little *time* into the construction.

New Product Notes

Competition Model Rockets (Box 7022 MR, Alexandria, VA. 22307) has announced two new items. The first in an adhesive backed aluminized mylar finishing material. Sold in 8" X 11" sheets, the aluminized mylar can be wrapped around a body tube for a "no work" highly-reflecting finish. The adhesive backed mylar can also be used as hinge material for "flop-wing" boost/gliders. The price is 50 cents per sheet.

A second item from CMR is their Minijet to RB-74 engine adaptor. The unit, which allows Minijet engines to be used in any RB-74 or BT-20 size tube, sells for 35 cents.

CMR's new 1972 catalog, listing several new kits, is now available for 25 cents from the above address.

The demand for high-gloss finishes has been met by a new paint from Illinois Bronze Paint Company. The new aerosols, aptly called "Wet Paint", go beyond the glossiness of regular enamels. These paints are specifically designed to give an ultra high gloss finish, to attain the "wet-look" of shiny vinyls and shimmering metallics. "Wet Paint" comes in vivid, high visibility colors — Green, Red, Orange, Purple, Pink, Light Blue, Dark Blue, Yellow, White, and Black — achieved through the use of the unique properties of pigments in a secret formulation. Quick to apply and quick to dry, the "Wet Paints" can be applied on wood, metal, plastics, (styrofoam as well as styrene), glass, and almost any other surface. Available in 10 vivid colors, "Wet Paint" enamels are available for $1.98 in 16 oz. aerosol cans in paint, hardware, and department stores throughout the United States.

Testors has just introduced a complete line of fluorescent enamel paints to make night-time model painting a bit more "glowing." This new fluorescent enamel paint comes in six luminous colors including: red, orange, yellow, green, pink and blue. Modelers will be happy to know that the colors can easily be mixed with each other. However, it is not recommended to mix the fluorescent enamel with any of the other regular enamel paints. This new fluorescent paint is also fast-drying. Extensive research and testing has gone into the paint to assure Testors famous quality.

The new paint can easily be used to cover over old paint jobs, to create new and exciting "black light" model exhibits, paint posters and a host of interesting new display techniques for modelers. Testors recommends whenever possible to cover only light colors. With a light color underneath, it is easier for light to penetrate through the fluorescent colors and be seen as a more intense color. Darker colors underneath will not allow the fluorescent to be as brilliant under the light. Testors new fluorescent enamel paint colors come in both 3.2 ounce spray cans, and one-ounce and 1/4 ounce bottles. Testors also has their new fluorescent enamel available in a seven bottle kit consisting of: 1/4 ounce bottle of each new fluorescent color; one 1/4 ounce bottle of thinner; and one brush. The new fluorescent paints are priced as follows: the 3.2 ounce spray can is priced at $.89; the one-ounce bottle at $.35; and the seven 1/4 ounce-bottle kit with a brush at $1.39.

Twelve flourescent acrylic colors have been developed by A.W. Faber-Castell Pencil Co., Inc., as an expansion of its line of Artone Designer Colors. The new paints can be used as a waterproof or an acrylic. Although they are waterproof and designed for indoor or outdoor use, they can be removed with soap or ammonia. The new Artglo colors fluoresce brilliantly under black light and glow in daylight, too. They are highly concentrated and flow freely, making them easy to work with. Their extensive coverage makes them economical to use. Artglo fluorescents are true colors. Included in the line are dark brilliant blue and violet, both highly unusual in fluorescent form. Also available are chartreuse, mixing white, blue, green, orange, red, cerise, yellow orange, white and magenta. All are available in 2 oz. bottles priced to retail at $10.80 per dozen.

UPDATE CANADA

Ottawa Regional Meet

On Saturday October 2nd, 1971 a model rocket regional hosted by the Ottawa Rocket Research Club was held in Ottawa. More than thirty rocketeers from Ottawa, Smith Falls, Montreal, Kingston, and Toronto converged at the National Museum of Science and Technology in the early morning to start the meet. ORRM-1 was, however, delayed for a while when it was discovered that the launcher wasn't working on the morning of the meet. A few fast repairs, soldered joints, and a jiggled wire got the launch system back into shape.

The rocketeers received an opening welcome from Barry Nicolle, Contest Director, and a launch briefing from Bill Bourne. This was followed by a short speech asking for Canadian support in model rocketry by Steven J.Kushneryk of Montreal's ARRA. Then, after a quick lunch, everyone piled into the cars and drove to the launch site twenty-five miles away. The long drive was necessary to reach a field which would conform to Canadian model rocket regulations.

The launch site, a farmer's field, was big enough for a good contest. Because of this no one expected to lose any rockets – but it didn't quite work out that way. A breeze was slowly picking up and blowing in the direction of a wooded area.

The first event was Hornet B/G. It was dominated by Wasps. Bill Bourne's standard Wasp, powered by a regular size engine, was given up for lost after drifting out of sight at over three minutes. It was still high in the air half mile downrange. At the beginning of the contest there were many good thermals, but they died down as the contest progressed. In fact most good flights were lost, and David Bourne's 51.7 seconds turned out to be the winning time.

Sparrow B/G followed on the schedule. Most thermal activity was now over, but occasionally a glider would catch one and turn in a good time. The designs were standard – a Redwing, Bumble Bee, and a Wasp or two. The only unusual glider entered in the contest was Alan Cantor's flop-wing. The glider used a 2 inch chord styrofoam wing cut out and built up with Jap tissue. The thirty-two square inch glider weighed a mere 8½ grams in glide condition, but it failed to turn in good times.

Class O Parachute Duration was next up the rod. It was dominated by clear plastic cleaner bag chutes ranging in size from 24 to 32 inches. All were stuffed into regular 7/10 inch body tubes. More than half the entries were DQ'ed because of improper packing resulting in failure of the chutes to deploy. Of course, most models drifted quite downrange. The best time, 110 seconds, was turned in by Fritz Gnass.

In Streamer Spot Landing the target was placed downwind....well almost downwind. Actually it was about 30 degrees to the side, making it a rather difficult target. Most contestants did not realize that many rockets will weathercock into the wind, rather than drifting with the wind. The event was *won* by Alan Cantor's ring stabilized "Skylump" with a distance of 24 *feet.*

The final event was a bit of nostalgia from the Canadian Convention last July – LeMans Start. In this event the contestant must run up to the pad with his prepped rocket, hook it up, run back to the launch director (who signals his rocket to be launched). He then must recover the rocket and return to the control table with it. The contestant with the shortest time wins. The oddest rocket was Steven J. Kushneryk's "Inverted Cup", but it was not good enough to place or beat out Bill Bourne's 19 seconds.

On site competition closed with a sport launch session. Fritz Gnass and Peter Cook flew some of their B/G's. Both had spectacular flights. Contest Director Barry Nicolle flew a plastic converted X-15 for another great flight demo. The Bourne family flew their special demo rocket, which was also flown at the Canadian Convention, painted in Canadian colors. Another crowd pleaser was Thomas Geiger's Sputnik-Too built from Estes plans. Many of the Ottawa rocketeer's had never seen a Cineroc flight, so the ARRA members present gave the insight by demoing one for them. That ended flying for the day. Everyone then gathers all their tubes and pieces of balsa and returned to the National Museum of Science of Technology.

Waiting for things to get started, some of the rocketeers took the opportunity to visit a full size Black Brant II that was on display. Some of them had to be politely escorted away after trying to obtain measurements for scale data.

The post competition activities included a slide show. The local clubs showed slides of their recent launches, and complete slides of the Second Canadian Convention were also shown. Barry Nicolle then announced the positions everyone had placed and thanked the contestants for coming.

Congratulations go to Barry Nicolle and friends for the almost perfect organization, and to the South Ottawa Association of Rocketry who provided a back up launch site after problems were run into with the one originally planned to be used. ORRM-2 is now being planned for Fall 1972.

ORRM-1 COMPETITION RESULTS

HORNET B/G

1st	David Bourne	51.7 seconds
2nd	Peter Cook	27.0
3rd	Fritz Gnass	22.0

SPARROW B/G

1st	Bill Bourne	65.0 seconds
2nd	David Bourne	60.0
3rd	Peter Cook	55.0

CLASS O PARACHUTE DURATION

1st	Fritz Gnass	110.0 seconds
2nd	John Rolph	87.0
3rd	Peter Cook	80.0

STREAMER SPOT LANDING

1st	Alan Cantor	24 feet
2nd	Bill Fretts	36
3rd	John Troope	42

LeMANS START

1st	Bill Bourne	19 seconds
2nd	David Bourne	21
3rd	Allen Mackie	22

ORRM-1

ORRM contestants (l to r) Fritz Gnass, Peter Cook, and Taras Tataryn prep their Sparrow B/G entries.

Alan Cantor makes a last minute adjustment on his flop-wing Sparrow B/G entry. The model weighed only 8½ grams in glide configuration.

CONTEST TECHNIQUES:
"Peeling" and "Super-Peeling" for Lightweight Body Tubes

by Bernard Biales

Many model rocketeers are familiar with the technique of hollowing out balsa nose cones to reduce weight. However, few are aware that it is possible to cut weight by peeling out body tubes. The common spiral wound body tubes are made of strips of paper glued together and covered with a layer of plastic. In order to increase strength, the spirals are not all wound in the same direction. Three plies of paper are widely used, giving the light but strong tubes. But these tubes are much stonger than necessary for a clean flight profile. So let's peel out some of those spirals for our light weight competition models. Typically you can save 40% of the tube weight, quite significant on a high-performance model.

The tool used in tube peeling, shown in Figure 1, is fairly easy to make. It was made from a piece of brass tubing 5/32" in diameter and 12" long, available under the K&S label at many hobby shops for about 25¢. A slot is cut about ½" deep through both sides at one end of the brass tube. This can be done by making a little nick with a pair of dikes or a file, then carefully sawing through with a razor saw. Spread the slot to almost 1/32" at the end of the tube so that it will fit easily over the paper. Mash the *other* end of the brass with a hammer or pliers for about 3/4" – this provides a place to grip the tube with pliers if your hand starts to slip. To help prevent your hand from slipping, wrap some tape around the grip area (the end opposite that with the slot cut in it).

Once you have made the "Peeler", just follow the steps shown in the photos. Figure 9 shows a number of peeled tubes and the stripped out paper from each. The tube standing at left is the one shown in the other figures. The spiral from it (actually two layers thick) sits on the scale, weighing in at 3.3 grams. To its right is a similar 18" tube which went from 14.7 to 9.0 grams after a single two layer peel. It was started with the Peeler, but this pulled out. I could have reattached, but instead I went to the needle nose pliers with unusually good results. Lying in front is another 9 X .9" tube which was peeled three times, starting at 7.8 g and going to 6.4g, then 4.5 g, finally a super peeled (and probably useless) 2.2 g. At the lower left is a 4" X .55" CMR tube which went from 1.45 g to .6 g using the special precautions mentioned below. In peeling a number of tubes, several helpful hints for avoiding some problem areas and, if you wish, to carry the method to extremes were experimented with.

Since the tube peeling method requires a bit of practice, I suggest that you start off with any damaged body tubes or short lengths you might not need. Once you get the hang of it, most peels go fairly easily, taking about a minute to do one tube. The tube must be handled carefully during peeling to avoid nicking the ends or bending the sides. It is easier to cut the tube to size *before* peeling. During finishing it is also necessary to be gentle. The usual kind of problem occurs at the seam where the paper meets itself. The tube tends to collapse just a wee bit under stress. This crease can serve to promote further collapse. And if you sand the crease while finishing it becomes even weaker. (This happened to the Fehskens-Biales Nationals payloader during construction. The model flew OK on the first try. On its second flight the parachute jammed while the ejection charge

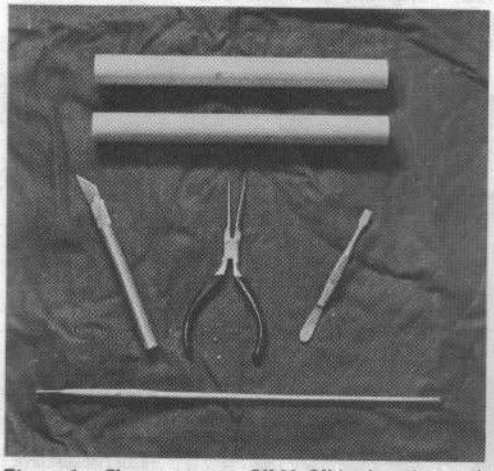


Figure 1. Shown are two 9" X .9" body tubes and the tools needed – knife, forceps, needle nose pliers (optional), and the Peeler. The latter three tools should be used in combination with imagination and flexibility.

Figure 2. Enlarged view shows the ½" deep slot cut in one end of a 12" length of 5/32" diameter brass tube. This "Peeler" is the secret to successful body tube peeling.

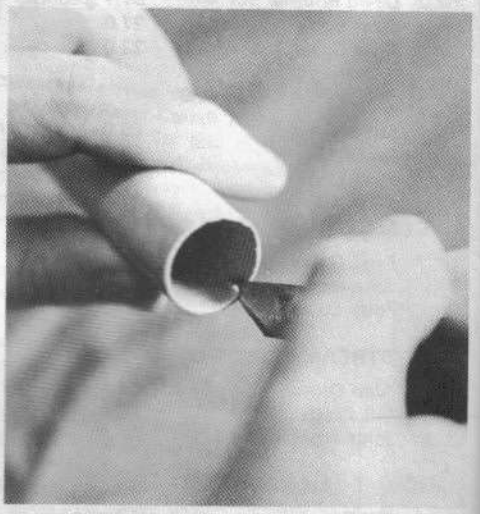


Figure 3. Start the "peel" by locating the inside seam and cutting the inside layer loose with a sharp knife where it meets the end of the tube.

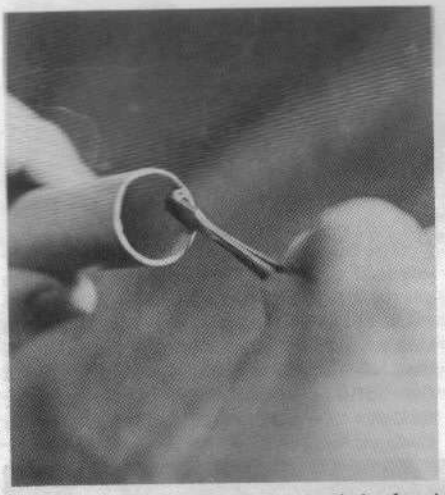


Figure 4. Use the forceps to peel the freed end of the spiral back a little more. Before going to the next step you must have the spiral coming off smoothly along the seam. Otherwise it will probably tear off.

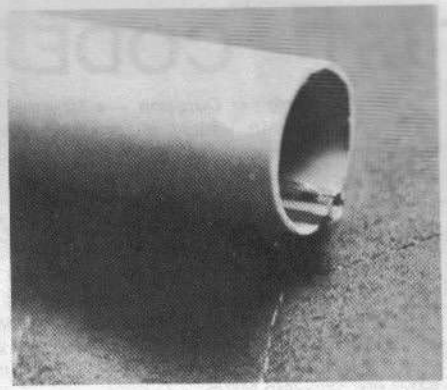


Figure 5. Insert the Peeler from the end opposite to the one you have started and slip the slot in the Peeler over the paper you have worked loose. The wider the section that starts off, the less likely it is to tear off the Peeler. (If the tube is over about 11" long, you will have to bring it in the other direction. After you get as far as you can, start from the other end.)

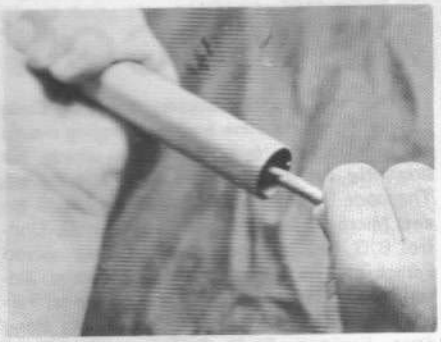


Figure 6. Holding the Peeler in the right hand (use a pliers to hold the flat end if it starts to slip), roll the tube using the left hand. Move the hand up the tube as it is peeled so that it is just ahead of the part that has just been peeled This helps to reduce the chances of damaging the tube, but see the instructions for super peeling. If the Peeler comes loose, stretch the spiral out to the end of the tube, push the Peeler down the center of the spiral and reattach. Start rolling again.

blew through the body tube along the crease line.) I do not recommend peeling tubes which are to be split down the middle, such as Howard Kuhn's (CMR) Breakaway or my own clamshell flexwing boosters.

The CMR tubes in the .55" to .9" range are already quite light. They use a very strong bonding agent which makes them somewhat difficult to peel. Still, with shorter lengths, it can be done. The standard tubes from MPC, Estes, and Centuri peel quite easily.

Jamming a taped engine into a peeled body tube is another area that requires special care. A special lightweight engine clip for peeled models is planned for the next issue of MRm.

Super Peel

"Super peeling" is my term for removing every layer of paper. Only the plastic coating, a layer of glue and a tiny bit of paper stuck to the glue remain. You can tell when you have reached super peel by the light passing into the interior of the tube and by the crease that generally develops in outside spiral line. Although such tubes are of limited use, the methods used for them are of some interest and sometimes valuable for not quite super peels. The problem is the peeler pulling the paper off also pulls the remaining wall inward and tends to collapse the tube. It helps to support the tube with your hand right where the peeling is happening. If it is a short tube, run your finger inside right behind the rolling Peeler to prevent the wall from caving in. On longer tubes, the medium metal X-Acto knife handle (without blade) can be dropped in to perform this function, but in this case the Peeler must stay on the bottom while the tube is rotated around it.

A different approach was used on the not quite super peeled CMR tube in the photo. It was completely wrapped with masking tape to help support it during peeling, then a puny (.5" diameter) engine casing was slipped inside to support the tube while the tape was removed. Results were quite good. An amusing sport model using a super peeled tube is in the works.

Thanks to Karl Biales for the suggestion to develop a peeler and to Len Fehskens for the sanding tube design. Proper use of the peeling technique can result in a 40 to 50% reduction in the tubing weight on your next competition model.

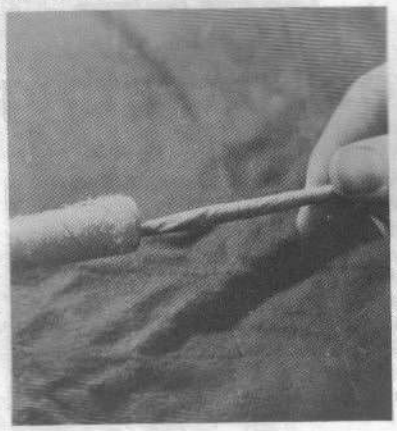


Figure 7. The Peeler is pulled out of the tube with the removed paper still attached to it. Go back to Figure 2 if you decide to peel out more.

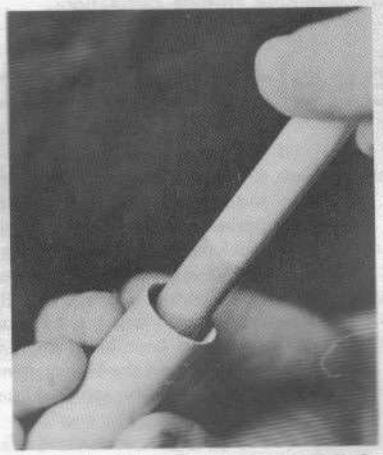


Figure 8. Clean up the inside a little with some fine sandpaper glued around a piece of narrower body tube.

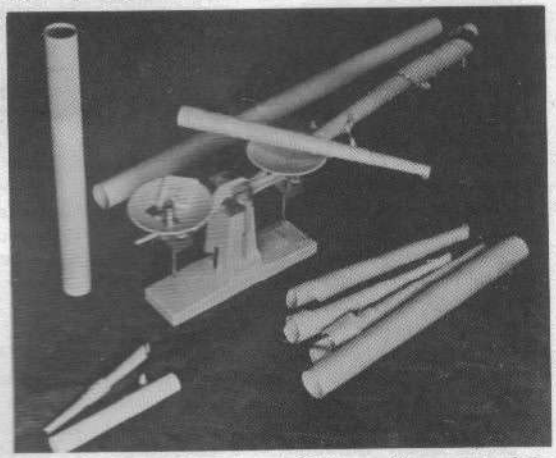


Figure 9. A number of peeled tubes. Proper use of the "peeling" technique allows reduction in tube weight by 40 to 50%.

NEW CONTEST CODE

The new **Model Rocketry Sporting Code** containing many new and challenging events as well as the favorite events which are presently being flown has now been issued. The code includes a Multiple Boost/Glide event, Micro-Scale, Aerial Mapping, Radio Control B/G, new high-powered and low-powered Parachute and Streamer Duration events, Advanced Boost/Glide, Telemetry Systems, Parasite Boost/Glide, LeMans Start, Ping Pong Spot Lanidng, Scale Craftsmanship, Night Launched Streamer Duration, Night Glider Duration, and Standard Streamer Duration. The new contest events have rules designed to provide a challenge for even the most advanced rocketeer:

Multiple B/G – a boost/glide competition for two gliders launched by the same carrier vehicle. Both models are timed, and the two durations added to determine the winner.

Micro-Scale – a scale event limited to models weighing less than 3.0 ounces in launch configuration, and judged as with normal scale.

Aerial Mapping – an event in which the model carries a camera which photographs a standard ground object, and the height above the ground is determined by photo-reduction. The model photographing the ground from the highest altitude wins.

Radio Control B/G – a boost/glide duration event limited to radio control models which must land in a designated area (to establish that the RC system is functioning.)

Parachute & Streamer Duration – new categories will be introduced for low power (¼A and ½A) and high-power (D,E, and F) engines.

Advanced Boost/Glide – a multiple flight B/G event in which the winner is the contestant with the highest *average duration* over a series of flights.

Telemetry Systems – an event open to model "sounding rockets" containing miniature telemetry systems to relay data back during flight.

Parasite Boost/Glide – a boost/glide duration event for those models using gliders lofted as parasites on (or inside) carrier vehicles.

LeMans Start – a duration event, adapted from the Rochester MARS club's "Purple Book", in which the modeler is timed from the instant he starts hooking up his model until it is recovered and returned to the processing table.

Ping Pong Spot Landing – a spot landing event in which a ping-pong ball free-falls from the carrier rocket, and the distance from a pre-selected spot is measured.

Scale Craftsmanship – a scale event where the C.D. supplies a "substantiation packet" for a selected rocket to all contestants (30 days in advance of the contest), and the resulting scale models are judged for adherence and workmanship.

Night Launched Streamer Duration – a night launched dutation event for models containing a tracking source allowing the duration to be measured.

Night Glider Duration – a boost/glide duration event open to models showing red and green wing-tip position lights (which must remain operative throughout the entire flight).

Standard Streamer Duration – a Streamer Duration event in which all models use streamers of the same standard length and material.

The new **Model Rocketry Contest Code** also includes details on contest sanctioning and establishment of *World Model Rocket Performance Records.* Sanctioning and record filing will be provided through **Model Rocketry.** Copies of the contest code are available for $1.00 each from:

Contest Code
c/o MRm
Box 214
Boston, MA 02123

NARAM–14 SCHEDULED FOR SEATTLE, WASH.

The South Seattle Rocket Society has announced that Seattle, Washington will be the site of NARAM-14. The announcement was made by SSRS President Jess Medina at the club's November 23rd meeting. He indicated that NAR headquarters had already accepted the SSRS proposal to host the contest, though no formal announcement has yet been made yb NAR HQ.

NEWS NOTES

1972 Southwestern Conference

Albuquerque, New Mexico

Albuquerque, New Mexico – the home of the Atomic Museum, the World's Largest Laser Lab, Sandia Corporation, and Kirtland AFB – will be the host for the 1972 Southwestern Model Rocketry Conference. The many activities (including housing and meals) will be on the campus of the University of New Mexico and will feature many new things to do.

At SWMRC-72 there will be more events in the day long flight competition plus on-the-spot computer tracking results. Light beam communicators from the launch pad to the trackers will be set up to guarantee interference free communicatoin. A 16-digit electronic calculator will be available to modelers to check the computer altitude calculations. There will also be special nite launchings with payloads loaded with transmitter, light flashers, gallium arsenide lasers, etc.

NASA will again support the activities with brand new displays featuring the manned space program. And schedule permitting, they have agreed to send another spacemobile complete with space foods, space suits, and space lecturer. Besides the R&D competition, discussion groups, manufacturers' displays and presentations – you can expect to find the best of model rocketry. If you happened to be interested, just write to:

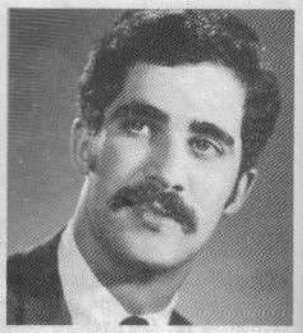
SWMRC-4
Physics Department
University of New Mexico
Albuquerque, New Mexico

ReeseHeadsEstesMarketing

S. Howard Reese, 27, has been appointed Director of Marketing for Estes Industries, Penrose, Colorado, a subsidiary of Damon Corporation. Estes is the world's largest manufacturer of model rockets and related supplies.

Prior to joining Estes, Reese directed the marketing effort for the Youth Recreation Product Division of The Leisure Group. In that capacity, he had made his headquarters first in Los Angeles, California, and later in Medina, Ohio. He previously had been a consultant in the Management Services Division of Touche Ross & Co., a Chicago CPA/management consulting firm.

A native of Cleveland, Ohio, Reese received a B.S. Degree with Distinction from Ohio State University, Columbus, and a Master's in Industrial Administration from Purdue University, Lafayette, Indiana.



S. Howard Reese

Current Comments

by Len Fehskens

Bernard Biales and I have long felt that best performance would be obtained by flying a model rocket at relatively *low velocities*, the reason being that, since drag forces increase as the square of the velocity but altitude only increases linearly, high velocities "waste" total impulse overcoming drag. Just how low the velocity should be and how significant the difference between optimal and typical performance would be remained a mystery.

To get some idea, I conceived a "thought-experiment" that went like this. We want to see the dependence of performance on velocity. To make things easy, suppose we boosted a model instantaneously to some velocity and maintained that velocity throughout the entire engine burn. The altitude at burnout could be easily computed, and the coast altitude read from a Malewicki chart, or computed from the Bernoulli equations or by an iterative simulation.

To keep things fair, some portion of the engine's total impulse would have to be expended to produce the velocity. What I proposed to do, then, was look at the performance as a function of that fraction of the total impulse, and thus indirectly as a function of velocity. The mathematics involved for the constant weight case are almost trivial, but since propellant mass typically represents 20-30% of a model rocket's mass, the results would be unacceptably awry. As an exercise in understanding the problem, you can try working out the constant-weight analysis yourself. Taking into account mass burnoff requires facility with calculus, so if you're not confident of your math ability you might want to skip ahead to the results. If you don't understand anything I've said so far (congratulations for hanging in there this long) you might as well skip ahead to the next article.

To begin, a list of the variables we will be working with:

I_t	the given total impulse, nt-sec
j	the fraction of total impulse burned off instantaneously
m_b	the burnout mass of the model, kg
m_p	the propellant mass of the model, kg
m(t)	the total mass of the model, as a function of time, kg
$\dot{m}(t)$	the propellant consumption rate, as a function of time, kg/sec
F(t)	the thrust as a function of time, nt
F_{av}	the average thrust during the sustainer phase, nt
V(t)	the velocity as a function of time, m/sec
V_b	the burnout velocity of the model. This is, of course, the velocity to which the model is instantaneously boosted. m/sec
k	drag factor. $k = \frac{1}{2}C_D\rho S$
C_D	drag coefficient
ρ	mass density of air, 1.293 kg/m^3
S	drag reference area, m^2
h_b	altitude at burnout, m
h_c	coast altitude, m
h_t	total altitude, $h_t = h_b + h_c$, m
I_{sp}	propellant specific impulse, $I_{sp} = I_t/m_p$, nt-sec/kg To convert to lb-sec/lb, divide by g.
g	acceleration due to gravity, 9.78 m/sec^2
t_b	the burning time of the sustainer phase, sec

If you're going to attempt to follow this, you should know by now that impulse (the time integral of a force) is equivalent to momentum (the product of velocity and mass). The hypothesis requires that we convert some fraction (j) of the engine's available total impulse (I_t) into momentum (mV_b). Then we will pick an F(t) such that $V(t) = V_b$ for the rest of the flight.

What shall we use for m? Clearly, a fraction j of the propellant mass m_p will be consumed in the instantaneous burn. We could decide on m by calculating velocities for sharper and higher thrust peaks (by letting the thrust grow without bound while the required burn time goes to zero) and seeing if in the limit (instantaneous burnoff) the velocity approaches that associated with the initial, final, average, or some other mass. The average mass seems like the most reasonable guess without doing the calculations (I'll do them one of these days).

So, the mass at the "beginning" of this burn is:

$$m_i = m_b + m_p \tag{1}$$

and the mass at the "end" is:

$$m_e = m_b + m_p - jm_p \tag{2}$$

Assuming the mass changes linearly (there are other functions that will work the same way) the average will be:

$$m = (m_i + m_e)/2 = m_b + (1 - \tfrac{1}{2}j)m_p \tag{3}$$

So we have:

$$jI_t = (m_b + (1 - \tfrac{1}{2}j)m_p)V_b \tag{4}$$

or,

$$V_b = jI_t/(m_b + (1 - \tfrac{1}{2}j)m_p) \tag{5}$$

Since we will force V(t) to be constant:

$$h_b = V_b t_b \tag{6}$$

So we must compute t_b. The only handle we have on t_b is that the time integral of F(t) must equal the impulse remaining, with F(t) such that $V(t) = V_b$ (i.e., constant) for the duration of the burn. t_b enters the picture as one of the limits of integration (the other is zero). Thus:

$$\int_0^{t_b} F(t)dt = I_t - jI_t \tag{7}$$

Thus we need to determine F(t).

To maintain constant velocity, the forces on the model must sum to zero. In other words, the thrust must exactly balance the drag and gravitational forces. Thus:

$$F(t) = kV(t)^2 + gm(t) \tag{8}$$

V(t) is no problem, it is simply V_b. However m(t) presents somewhat more of a challenge.

We can compute m(t) as:

$$m(t) = m_b + (1 - j)m_p - \int_0^t \dot{m}(t)dt \tag{9}$$

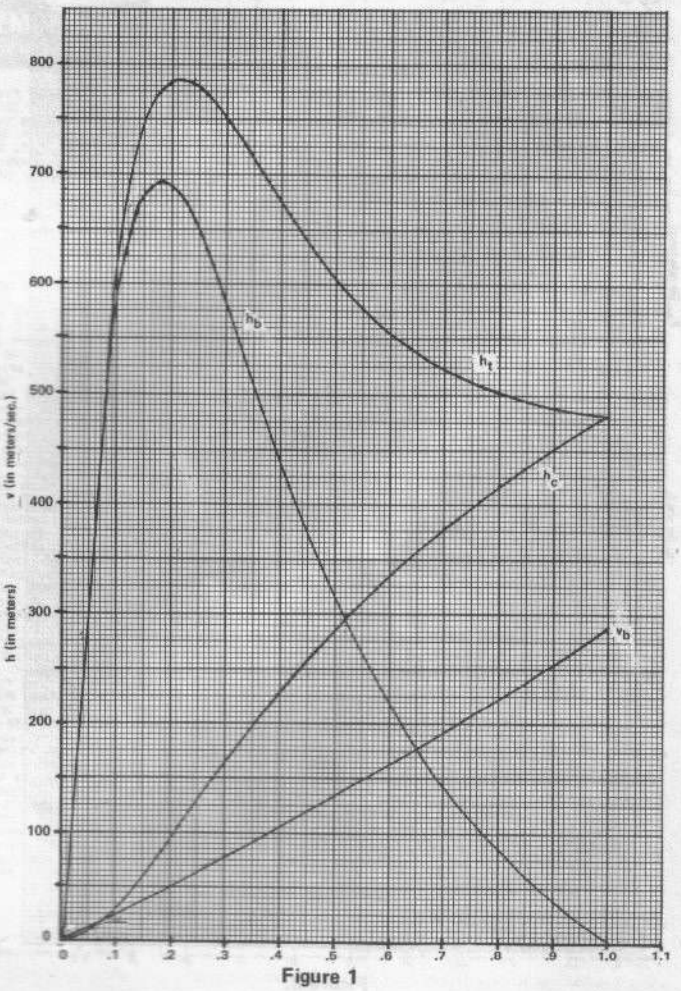


Figure 1

Let us make the not unreasonable assumption that $\dot{m}(t)$ is proportional to F(t) and determine the constant of proportionality. Actually, the thrust is proportional to the propellant consumption rate, given that a lot of other things in the engine are held constant; the proportionality constant is called the specific propellant consumption and is a characteristic of the propellant. Thus:

$$\dot{m}(t) = cF(t) \tag{10}$$

But:

$$\int_0^{t_b} \dot{m}(t)\,dt = (1 - j)m_p \tag{11}$$

That simply says that the amount of propellant burned off after the initial boost is just that which remains.

So:

$$(1 - j)m_p = \int_0^{t_b} cF(t)dt = c\int_0^{t_b} F(t)dt \tag{12}$$

The integral is of course the impulse consumed during the burn; see equation 7. So at last we get:

$$c = ((1 - j)m_p)/(I_t - jI_t) = m_p/I_t = 1/I_{sp} \tag{13}$$

Combining equations 8, 9, 10, and 13 appropriately, we have:

$$F(t) = kV_b^2 + gm_b + (1 - j)gm_p - (g/I_{sp})\int_0^t F(t)dt \tag{14}$$

Differentiating both sides with respect to t we get the differential equation:

$$dF(t)/dt = -(g/I_{sp})F(t) \tag{15}$$

The solution to such a differential equation is an exponential; we must satisfy the boundary conditions:

$$F(0) = kV_b^2 + gm_b + (1 - j)gm_p \tag{16}$$

and:

$$F(t_b) = kV_b^2 + gm_b \tag{17}$$

Equations 15, 16, and 17 are satisfied by:

$$F(t) = (kV_b^2 + g(m_b + (1 - j)m_p))e^{-(g/I_{sp})t} \tag{18}$$

We can get t_b by evaluating equation 18 at $t = t_b$ and using equation 17. The result is:

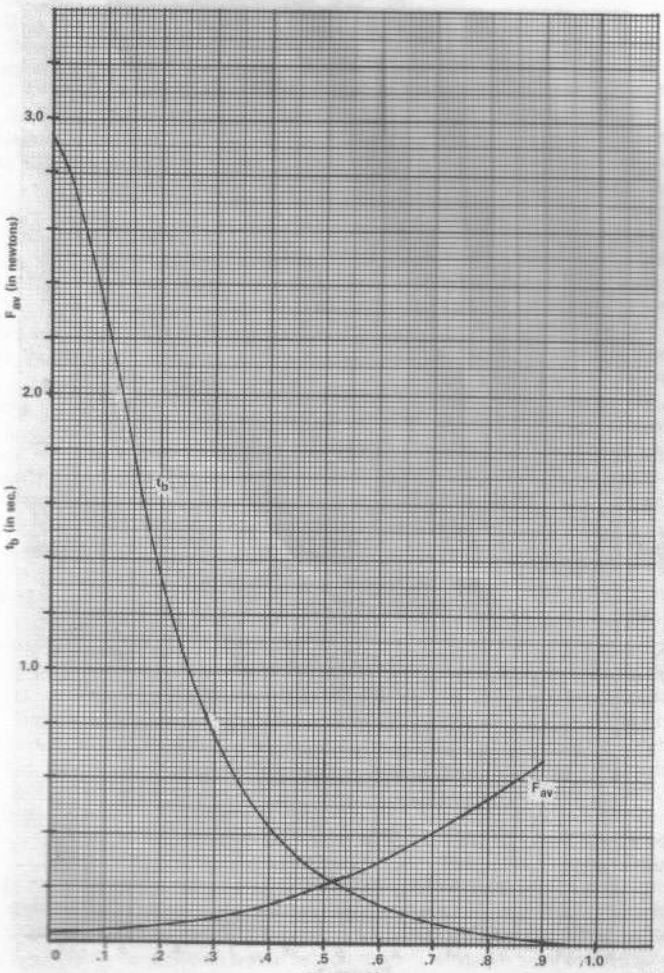


Figure 2.

$$t_b = (I_{sp}/g)\,ln\,((kV_b^2 + g(m_b + (1-j)m_p))/(kV_b^2 + gm_b)) \tag{19}$$

So that's it. We've got expressions for everything we need; *but what does it all mean?*

To find out, I considered a hypothetical model with the following characteristics:

I_t = 10 nt-sec
m_b = .03 kg = 1.06 oz.
m_p = .01 kg
k = .0001 (that's a C_D = .5, S = 3cm^2)

(The initial W/C_DA works out to 6.07 oz/in^2, the burnout W/C_DA to 4.56 oz/in^2. An area of 3cm^2 corresponds to a diameter of .77in.) These numbers were picked as reasonable and computationally convenient.

The results are tabulated in Table 1 and plotted in Figures 1 and 2. That there is a strong dependence on the thrust-time profile is strikingly obvious from the graph of the altitude data. For comparison, a standard C6 (an engine of the same total impulse, but slightly lower specific impulse, as the engine used for the calculations) at the burnout W/C_DA is read from the Malewicki chart as doing slightly better than 400 m. There is quite a difference between that and the best performance of this peculiar style of engine, that difference being somewhat more than 1000 ft.

Our conjecture seems to have been born out. Best performance in this case is obtained at a j of .22, with the corresponding V_b of about 190 ft/sec. The burn time is almost 12 seconds at an average thrust of .7 nt.

Strictly speaking these results are probably erroneous at the low and high extremes of j. At very low j's, the velocity, and thus Reynolds number, is very low, and the drag coefficient used is probably unrealistically low. Similarly at high j's the velocity is approaching the transonic drag rise. But in either case the effect is to sharpen the performance peak even more. Unfortunately, this information is not immediately applicable to real model rocket engines as there is no way of instantaneously boosting a model to some velocity.

Also, it remains to be seen how the location of the performance peak is affected by the drag and weight characteristics of the model. As a preliminary check, I ran a similar set of calculations for a 50nt-sec 200gram model, and got a peak of pretty much the same shape and location. Clearly more work needs to be done on this point.

The next step is to run some iterative simulations of engines with realizable thrust time profiles similar to the ones proposed above. At this point I would presuppose the following. The boost phase of the burn will now be of nonzero length, so the altitude at the end of the boost phase will now be nonzero. On the other hand, the burnout velocity will probably be slightly decreased, so the altitude increments during the sustainer and coast phases will decrease somewhat. How these effects will balance each other out remains to be seen, and I hope to discuss the results of such experiments next time.

TABLE I

j	F_{av} nt	t_b sec	V_b m/sec	H_b m	H_c m	H_t m
.00	.34	29.36	0	0	0	0
.02	.34	28.63	5	144	1	145
.04	.35	27.50	10	276	5	281
.06	.36	26.04	15	394	11	405
.08	.38	24.33	20	492	19	511
.10	.40	22.47	25	569	29	598
.12	.43	20.54	30	626	41	666
.14	.46	18.62	36	663	53	717
.16	.50	16.78	41	685	67	752
.18	.55	15.04	46	692	81	773
.20	.60	13.44	51	689	95	784
.22	.65	11.98	57	677	109	786
.24	.71	10.66	62	659	123	783
.30	.94	7.49	78	583	165	749
.40	1.43	4.19	105	441	230	671
.50	2.10	2.39	133	318	286	604
.60	2.94	1.36	162	220	335	555
.70	3.99	.75	192	144	378	522
.80	5.24	.38	222	85	417	501
.90	6.73	.15	254	38	451	489
1.00	.00	.00	286	0	482	482

Reader Design Page

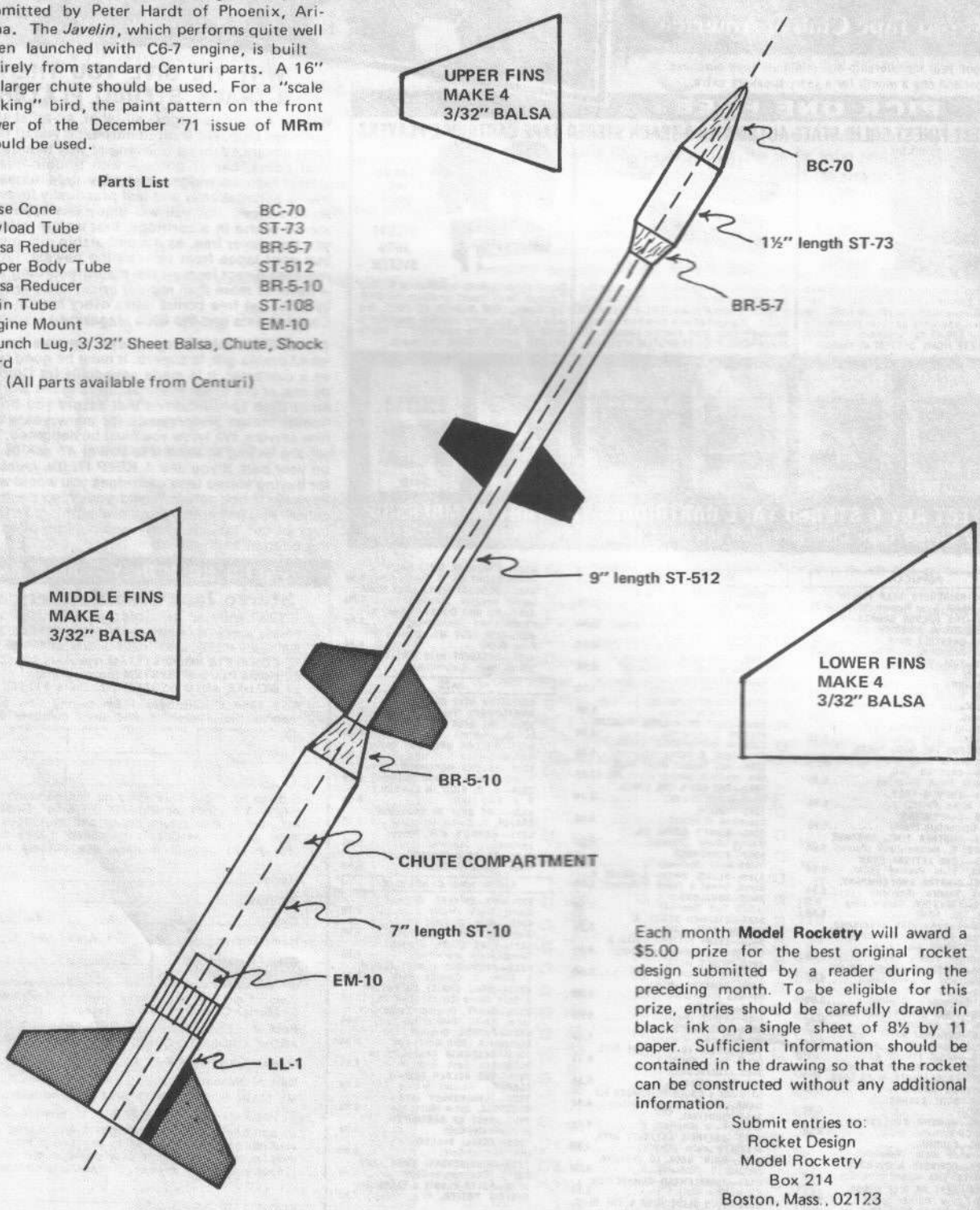
This month's Reader Design, a semi-scale model of the *Javelin* sounding rocket, was submitted by Peter Hardt of Phoenix, Arizona. The *Javelin*, which performs quite well when launched with C6-7 engine, is built entirely from standard Centuri parts. A 16" or larger chute should be used. For a "scale looking" bird, the paint pattern on the front cover of the December '71 issue of **MRm** should be used.

Parts List

Nose Cone	BC-70
Payload Tube	ST-73
Balsa Reducer	BR-5-7
Upper Body Tube	ST-512
Balsa Reducer	BR-5-10
Main Tube	ST-108
Engine Mount	EM-10

Launch Lug, 3/32" Sheet Balsa, Chute, Shock Cord

(All parts available from Centuri)



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

Submit entries to:
Rocket Design
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Boston, Mass., 02123

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

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

NAR Starts Survey of Engine Failures

The NAR Standards and Testing Committee is starting a continuous survey of model rocket engine failures. The survey, called Malfunctioning Engine Statistical Survey (MESS), will gather and analyze facts about failures around the nation. Modelers and manufacturers alike are concerned about engine malfunctions. MESS will help point out specific engine problems to the engine manufacturers and provide them with the evidence they need to eliminate them. In addition, the survey will help rocketeers be aware of problem engines or batches.

It is important that every modeler become involved in the survey. The information can come only from you. The results and effectiveness of MESS depend on you. If you have an engine failure, report it to Standards and Testing immediately. The MESS address is:

MESS
c/o Charles Russell
3480 Cemetery Road
Hilliard, Ohio 43026

An engine malfunction report form is given on the next page. Copy it and give all the requested information. Hand written copies are okay. Also, participation is not limited to NAR members.

MESS results will be published regularly in *The Model Rocketeer* starting as soon as adequate data has been received and analyzed. Of course, each engine manufacturer will be told how his engines are doing.

MALFUNCTIONING ENGINE STATISTICAL SURVEY

Return to: STANDARDS AND TESTING COMMITTEE
c/o Charles Russell, MESS Chairman
3480 Cemetery Road
Hilliard, Ohio 43026

ENGINE DATA

Manufacturer ______________________ NAR Engine Type ______________

Date of Manufacture ______________ Manufacturer's Engine Code ______________

Date Flown ______________

Location (Site or Meet) ______________________

TYPE OF MALFUNCTION

Nozzle Blow-out ______ Blow Through ______ Detonation (Split Casing) ______

Other Type Failure ______

Delay Malfunction. Delay was: Too short ______ Too long ______

No delay ______

No Ejection Charge (end cap retained) ______

COMMENTS ______________________

____

REPORTED BY

Name ______________________ NAR No. ______________

Address ______________________

____

Signature ______________________ Date Filed ______________

INSTRUCTIONS FOR FILING A MESS REPORT. File a report whenever an engine malfunction occurs. Examine the engine casing to determine the type of malfunction, the date of manufacture, and the manufacturer's engine code (numbers and letter stamped on the case giving additional information on the engine production process). Complete the form accurately and mail to the above address.

+ +

DO NOT WRITE IN THIS SPACE. FOR OFFICE USE ONLY.

Date Received ______________ Date Filed ______________ File No. ______________

Engine Certification. Safety: Yes ______ No ______ Rem. ______

Contest: Yes ______ No ______ Rem. ______

Comments ______________________

____

Executive Committee

by Ed Pearson

NAR's Executive Committee met on a rainy Sunday afternoon Sept. 12 at Goddard Space Center to discuss *Model Rocketeer* contract negotiations, NAR goals, and future NAR plans. Representing the Executive Committee (see NAR by-laws for function) were NAR President Barrowman and Section Activities Director Atwood (please note this new appointment – Bob Atwood replaces John Worth as member of the Executive Committee). The committee's third member, Howard Galloway, was out of town competing with his section in NARCAS's sponsored regional GERM-1. Trustees Sipes and Audin were also in attendance as well as a pocket of spectators such as Norm and Lou Ward (Lou is our gal at NAR HQ; Norm handled NARAM 13 publicity), Chuck Gordon (section news editor and graphic arts major at the U. of Md.), Bob Mullane (LAC retiree – read his column monthly in the mag.), and others who were allowed to freely participate in the discussions.

The meeting caught this reporter scurrying back and forth from his fiancee's bridal shower so much of the meeting's continuity was lost to him. However it seemed the meeting was held in a relaxed informal manner, though difficult and perplexing problems were handled candidly with a serious and frank attempt to assuage some of NAR's most pressing problems.

Model Rocketeer contract negotiations dominated the meeting as they appear to be one of the most sensitive issues in NAR's recent history.

Model Rocketry Magazine was asking for a 92% cost increase to cover carrying the *Rocketeer* (from 25 cents to 48 cents per member per issue), and although the belief was that this price could be whittled down to perhaps 31 to 35 cents per issue, the additional cost would either have to be absorbed by the NAR and new funds raised to cover this absorption, or NAR would have to raise its dues to cover magazine cost increases.

Audin felt the magazine was well worth the price increase (viewing the magazine as NAR's most visible tangible asset), and that manufacturers should be asked for donations. He requested to be empowered to negotiate with George Flynn on per issue costs. Atwood felt that higher cost is an economic fact of life, and that NAR members hsould be prepared for dues increases, although he was interested in an alternative method of distributing the *Rocketeer*.

The alternative method is removing the *Rocketeer* from the magazine, upgrading the NAR publication, and sending it directly to the membership. Norm Ward, on the request of Jim Barrowman, had prepared some cost estimates for this and gave a presentation on how much he'd charge to typeset, print and mail out the *Rocketeer* ($700 per month).

The idea of publishing the *Rocketeer* independent of the magazine won out. Bob Atwood recommended that other competitive bids be sought for cost comparisons (two additional ones were subsequently obtained but it looks like Norm will be our fellow).

In other happenings, the NAR decided to revert to yearly memberships based upon when a rocketeer joins to 365 days later instead of a calendar year membership. This may cause some housekeeping difficulties with our insurance company, but it was felt that our present membership set-up is inequitable to those who join in the year's later months.

Also, members will now receive their initial membership cards by 1st class mail instead of 4th class. (Remember how long it took to get your first card? That alone was enough to early discourage fine rocketeers).

Lastly, Norm Ward was announced as NAR's new public relations committee chairman. He takes on the post vacated by Carl Kratzer. Norm runs a small advertising/publishing firm and has extensive contacts with AMA model airplane personnel. Norm said his first task will be the issueing of (contest pending) press releases to sections' local news media. This would be in addition to any public relations effort individual sections provide, and extended as a NAR service.

As for goals, the only real feeling this reporter received was that new goals are to be sought – the old ones as stated in the By-Laws were set in model rocketry's dark ages long before there was a national model rocket magazine, big business manufacturers, and thousands upon thousands of model rocketeers. The impression left was that many of NAR's goals are being carried out presently by the model manufacturers, and in a more efficient manner than the NAR can afford to do with limited funds and volunteer help. The NAR is in need of new goals – yet unnamed.

With this somewhat somber note the Executive Committee meeting closed. As people left there was a mood of apprehension and anticipation, as the big news was the separation of the *Model Rocketeer* from the magazine. But there was also that feeling of eagerness present with the resolve of making the *Model Rocketeer* a better, more meaningful publication for NAR members than it is today. Plans call for it to be initially an 8 to 12 page, two color, variety article magazine. Elaine Sadowski will continue as our editor(ess).

Point Standings

Point Standings as of October 22, 1971

TOP TWENTY INDIVIDUALS AS OF 10/22/71

DIVISION A	NAME	NAR	SEC	PTS	WF
1. Arthur	Peters	19764	221	162	2
2. Chris	Clemens	12749	136	149	3
3. Brian	Clouse	11563	221	120	2
4. Nick	Stepanovsky	20143	221	120	2
5. James	Diamond	20221	215	102	2
6. Gordon	Clouse	20811	221	88	2
7. Doug	Bartling	15709	0	28	2
8. Kevin	Jenkins	20820	238	26	1
9. Ken	Miller	16222	C	18	3
10. Matthew	Loudis	19956	133	16	2
Stewart	Brown	21169	109	16	2
11. Jeffrey	Fisher	14223	241	12	2
Christopher	Pinder	20055	133	12	2
Sheldon	Linn	21113	0	12	2
John	Schiel	19995	133	12	2
12. Wayne	Gerhart	19894	176	11	1
13. Mark	Medina	13538	176	10	1
14. Anthony	Tripodi	20346	115	3	1

DIVISION B	NAME	NAR	SEC	PTS	WF
1. James	Gazur	19366	180	212	2
2. Kerry	Mechtly	16799	113	190	2
3. Edward	Jestes	15444	109	176	2
4. Jeremy	Raw	20092	238	171	4
5. James	Starks	17691	180	120	2
6. Larry	Rollins	18181	0	108	2
7. Eric	Johnson	20176	241	74	2
8. Dave	Insinga	19138	116	72	1

9. Mike Vertis	Finagon Upton	20847 13063	221 109	68 68	2 2
10. David	Shucavage	16208	133	64	2
11. Dennis David	Stauffer Mitson	19795 19977	133 249	60 60	2 2
12. Paul	Vogel	17163	238	60	4
13. Jeffrey	Risberg	20261	0	56	4
14. Gary	Bump	12321	179	54	1
15. Richard	Shivik	18833	136	54	3
16. James	Needham	20563	103	53	1
17. Rodney	Rivera	12550	116	50	1
18. Warren	Branch	12777	136	49	3
19. Ben	Raskin	17765	168	42	4
20. Steve Frederick	Klouser Yeagle	17653 19782	0 133	36 36	2 2

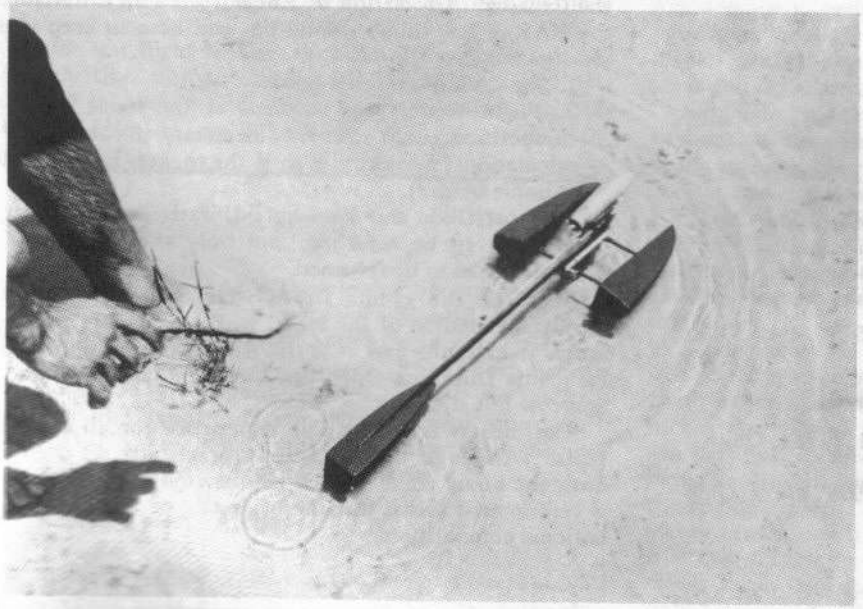
DIVISION C	NAME	NAR	SEC	PTS	WF
1. Gary	Raley	14803	238	243	3
2. Frank	Osborn	14406	108	170	2
3. Mike	McMasters	20826	215	164	2
4. Richard	LaBarre	15528	108	136	4
5. Randy	Picolet	13100	238	113	4
6. Gary	Cole	18962	168	108	4
7. James	Spilker	16006	168	102	4
8. Lytle	Norton	19892	168	102	4
8. Mark	Wargo	10371	103	97	1
9. Bill	Kenney	20235	168	97	4
10. Bruce	Shay	12117	115	94	1
11. Philip	Johnson	20175	241	94	2
12. Donald	Bingaman	16429	238	94	4
13. Wayne	Hazlip	9181	0	92	2
14. Mike	Bartling	12812	0	88	2
15. Andrew	Maisel	12536	179	84	1
16. James	Waurishuk	13706	115	77	1
17. Tony	Medina	13987	176	75	1
18. Robert	Staehle	10493	136	74	3
19. Mike	Howell	16973	136	72	3
20. Jeff Brad	Shafer Beebe	17950 14709	0 173	68 68	2 2

DIVISION D	NAME	NAR	SEC	PTS	WF
1. Thomas	Ackerman	15910	108	240	4
2. Jon	Robbins	16092	267	166	2
3. Harold	Mayes	15754	168	160	4
4. David	Hendricks	17743	0	146	2
5. Thomas	Spilker	16003	168	141	4
6. Thomas	Kuechler	13562	238	125	4
7. George	Pantalos	10620	113	124	2
8. John	Mechtly	16800	113	110	2
9. Philip	Slaymaker	6432	136	105	3
10. Dean	Davis	20509	113	104	2
11. Joseph	Ewing	20003	109	78	2
12. Jeffrey	Flygare	11164	241	98	2
13. James	Pommert	16908	176	94	1
14. Carl	Warner	9986	133	92	2
15. Thomas	Hills	1724	109	78	2
16. Edward	Hayes	13492	0	74	2
17. Lynn	Bobo	20926	173	72	2
18. James	Worthern	7095	176	61	1
19. Joseph	Osborn	19689	108	60	2
20. Stephen	Schulte	20834	238	58	1

TOP TWENTY SECTIONS AS OF 10/22/71

NAME	PTS	WF	SEC
1. Gateway Arch Section	1015	4	238
2. Midwestern Roc Res Assn	904	4	168
3. Monroe Astro Roc Soc	804	3	136
4. CSAR	722	2	113
5. Upper Arlington Roc Club	714	2	221
6. Birch Lane Rocket Society	596	2	109
7. Bethlehem Section	574	4	108

Rocket Powered Boat Tested



The first successful firing of a rocket powered boat took place on July 4, 1971. The Gold Coast Model Rocket Club conducted the project. The boat was designed by Jon Norcross, president of the club. The first time the boat was fired it was powered by a B.4-2 engine, which pulled the boat approximately 300 feet. So, with a determination to make the boat go farther, a D.18-4 was used. This turned the boat into a submarine, but by adding a little weight to the rear of the boat, a distance of approximately 900 feet was attained. With just a little care in building, this new adventure can be a very rewarding experience. For copies of the plans for the boat, write to Dan Lange, 6641 S.W. 64th St., Miami, Florida 33143.

8. South Seattle Roc Soc	546	1	176
9. Gemini	418	1	116
10. Ken'mr-Tonawanda Roc Soc	364	2	241
11. N Royalton Roc Soc	332	2	180
12. Missile Minders	316	4	133
13. Scioto Darby Rocket Club	304	2	215
14. Fairchester	303	1	115
15. Outa-Sight	242	1	115
16. Apollo-NASA	228	1	103
17. Kent Kondors	202	2	267
18. Hall of Fame Section	160	2	249
19. Delta-V NAR Section	140	2	173
20. Hawkeye Section	90	2	178

TOP TWENTY TEAMS AS OF 10/22/71

NAME		TEAM	SEC	PTS	WF
1. Doug	Ball	122	113	108	2
2. B. Scott	Paniccia	133	221	100	2
3. William	Arthur	114	136	65	3
4. Jonathan	Rains	98	0	60	2
5. Robert	Otlowski	93	0	24	2
6. Mark	Mulconry	125	116	22	1

REMAINING SLOTS IN TOP 20 NOT FILLED

Record Attempts

Swift Rocket Glider
Division B
Steven Bryson, NAR 16489, 10 Oct., 1971, Bryan, Ohio

Eagle Rocket Glider
Division C
Michael Micci, NAR 14613, 10 Oct., 1971, Bryan, Ohio

Hawk Boost/Glide
Division D
James Pommert, NAR 16908, 3 Oct. 1971, Kent, Wash

Eagle Boost/Glide
Division B
Steven Bryson, NAR 16489, 10 Oct., 1971, Bryan, Ohio
Division D
James Pommert, NAR 16908, 3 Oct., 1971, Kent, Wash

Class I Streamer Duration
Division B
Mickey Buehrer, NAR Pend., 9 Oct., 1971, Bryan, Ohio
Division D
Llewellyn Partee, NAR 21183, 10 Oct., 1971, Bryan, Ohio

Class II Streamer Duration
Division B
Mickey Buehrer, NAR Pend., 9 Oct., 1971, Bryan, Ohio
Division D
Llewellyn Partee, NAR 21183, 10 Oct., 1971, Bryan, Ohio

Class IV Altitude
Division C
Paul Giguere, NAR 8067, 25 Sept., 1971, Bridgewater, Mass

Class 0 Parachute Duration
Division D
Jim Worthen, NAR 7095, 3 Oct., 1971, Kent, Wash

Pigeon Egg Lofting
Division D
James Pommert, NAR 16908, 3 Oct. 1971, Kent, Wash

By Charles Gordon

Captain Larry Loos, NAR State Department Head for Kansas-Missouri, reports the appointment of Mr. Harold Mayes as Urban Area Coordinator for NAR Section/Individual Activities in the Greater Kansas City area. Any NAR members or sections in the Kansas City-Wichita-Salina area or any model rocketeers who would like help in joining or forming NAR sections should contact Mr. Mayes at 712 South Kansas, Olathe, Kansas 66061 or phone 913-764-2866.

The International Scene: the Burnaby Invitational

(From the South Seattle Rocket Society's "Modroc Flyer", Vol. 5, No. 6, June, 1971)

In June, seven members of the South Seattle Rocket Society (section No. 176) attended the Burnaby Invitational at the request of the Model Rocket Club of British Columbia. Along with their families, they crossed the Canadian border to fly in the first international meet west of the Rockies. Also representing the United States were two members of the NOVA-3 club of Spokane, Washington, and one contestant from Mt. Vernon, Washington.

The occasion was British Columbia's Centennial, and the meet was one of a year-long series of celebrations. Because the Canadian Association of Rocketry is a bit different from the NAR, a few things should be said here to keep matters clear:

1. The CAR has no rule book.
2. Flight testing was required at the range before the competition could start (not necessary if you had CP/CG calculations; necessary even if the rockets had been flown at home before).
3. Boost/Glide and Parachute Duration models were not required to be returned, and only the egg capsules in Eggloft had to be returned.

Some of the events flown were Spot Landing (flown during the middle of the meet, with a range of 100 meters, rather than at the end as is the American tradition), Class 1 Parachute Duration, Open Egg Lofting, Class 0 Altitude, and Sparrow Boost/Glide.

The meet was a very fine experience for all the contestants. Although the SSRS took practically all the events, both the home team and the visitors enjoyed the meet and is is certain that this is just the beginning of this type of international competition.

In New Jersey there are six sections north of Trenton, mid-way down the state, but none south of there. That's half the state without a section. Mark Orthner is trying to do something about this situation by forming a section in the South Jersey area. Any NAR members or other model rocketeers in the area interested in helping and joining should contact Mark at 103 Kitty Hawk Road, Cherry Hill, New Jersey, 08034, or call 428-1857.

BCMRA Demonstration

On September 25, 1971, members of the Broward County Model Rocketry Association (section No. 217) in Fort Lauderdale, Florida, put on a demonstration launch at the Kiwanis' Kids' Day activity in South Miami, Florida. From 1500 to 2000 spectators were on hand at the Kids' Day activities, and many of them came out to see the section's displays and story board.

Scrap Pays

The Broward County Model Rocketry Association has found a possible way of reducing dues and subsidizing the cost of competition, awards and trophies for the coming year. Section members collect aluminum cans and redeem them at 10 cents per pound at the Reynolds Aluminum recycling center in their area.

The Northern Virginia Association of Rocketry (NOVAAR) held its second annual public demonstration launch on Sunday, September 5, 1971, at Van Dyke Park in Fairfax, Virginia. Approximately 150 people showed up to see such spectacular flights as a two stage (D13 and F7) Camroc and a Gnat Boost/Glider which turned in a 44 second flight.

NOVAAR attracted 10 new members through this activity, and other sections could easily do as well, while at the same time promoting community acceptance, by holding such an event.

HARM-1

(From "NARGAS News", Vol. 1, No. 6)

The first Heart of America Regional Meet (HARM-1) was hosted by the Midwest Rocket Research Association on July 10 and 11 at the Olathe Naval Airbase. Fifty Contestants from four states and six NAR sections (MRRA, NARGAS, Hawkeye, Solar Missilers A.R.S., TIROS, and Group VII CAP) competed in eight events: Class II Parachute Duration, Hawk Boost/Glide, Dual Payload, Pigeon Eggloft, Open Spot Landing, Sparrow Boost/Glide, Swift Rocket/Glide, and Roc Eggloft.

With the last flight in Roc, the HARM-1 regional came to a close. MRRA won the meet with 627 points, and NARGAS came in second with 555. Other totals were Hawkeye—90, SMARS—51, and TIROS—18.

New Southland Regional Manager

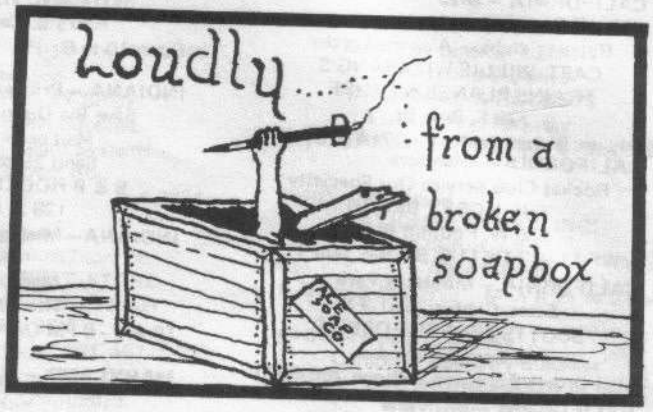
Bob Atwood, the NAR's Director of Section Activities, has announced the appointment of Richard Barnard as Regional Manager for Section Activities in the Southland Division. His address is 1107 Waverly Road, Fort Lauderdale, Florida 33312 (telephone 305-523-0818). He succeeds Dick Toner of Charlotte, North Carolina, who served for a little less than a year. We thank Dick Toner for a job well done and wish the best of luck to Dick Barnard.

International Team Patches

The members of the YMCA Space Pioneers Section have decided to contribute $1.00 per club member from the club treasury to the support of the US model rocket team. Every person contributing $1.00 to this cause receives a NAR International Team Supporter Patch. These are available from NARTS or your friendly neighborhood NAR official. Let's all follow the example that the Space Pioneers have set.

New NAR Sections Chartered

The NAR would like to welcome the following new sections: No. 271, Simi Valley Section, California; No. 272, Transportation City Section, Colorado; No. 273, Cloudbusters, New York; No. 274, Oklahoma Model Rocket Society, Oklahoma; No. 275, Goldsboro Starlancers, North Carolina; No. 276, Bryan Arrowspace Modelers, Ohio; No. 271, Riverside Rocket Center, California; No. 278, Point Place Model Rocket Club of Toledo, Ohio; No. 280, Society of Lodi Area Rocketeers, California.



(The following is a comment on the editorial which appeared in the October, 1971 *Model Rocketeer*.--Ed.)

Recently I attended my first NAR Section meeting (Steel City Section) and some of the reasons I was there back up your editorial.

I do not think the NAR should be exclusively competition any more than I think the National Aeronautics and Space Administration should be thought of as "those crazy people who spend too much money to go to the moon."

Being the possessor of one talent does not make an entire world, nor can one hope to continue an organization with only one person's ideas involved — it leaves no room for growth. We did not get to the moon in the earlier forms of our ancestors, and the people at NASA include scientific personnel, public relations experts, typists, craftsmen, technicians, and whoever else is needed to compose the loveliest ideas and dramatic productions I have witnessed.

Someone is going to point out a) NAR is not NASA, b) I am against contests. Neither statement is applicable to my human opinion.

The space program is an essential part of my life because I learned about hope for mankind, and dreams are not to be ridiculed at Cape Kennedy. NAR's role is obvious five or ten years from now when your trackers are involved in telemetry and the Werner Von Brauns among you are working for the original.

I don't know if I'm a competitive or non-competitive type as I've never even seen a contest. I am looking forward to changing that, although I do not see myself as a major threat to anyone because of my non-technical mind and "just for fun" attitude. I'm old enough to know that I am not now, never have been, and more than likely won't be a member of the engineer corps. However, NASA appreciates the tiny bit of my tax money it does get, and I think the Steel City Section might keep me around for laughs as well as some of the things I can contribute. I would not object to a proposed training program since I am inexperienced, just as I wouldn't object to going to night school to learn more about my trade.

I tend to avoid attending meetings of groups which do not interest me and try to make myself useful to groups about which I am concerned.

Jay Dana, NAR No. 19496

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

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(Club Notes, continued)

Goggin vice-president, Charles Butler treasurer, Mike Lynch recording secretary, and Terry Lee advisor. Interested Virginia area rocketeers can contact the club through Terry Lee, Box 121, Heathsville, VA 22473.

The Midwest Rocket Research Association held a section meet on Sunday, September 5th, 1971. Competition began at 9:00 AM with the Sparrow B/G event, which was won by Tom Spilker with a duration of 145 seconds. Robin Eggloft, limited to 10 nt-sec total impulse, was won by Mark Pemberton with an altitude of 635 feet. In the Swift R/G event there was only one qualified flight, a 21.5 second duration by Tom Spilker.

After lunch the contest resumed with single payload, won by Dean Troxel with 1257 feet. Harold Mayes took first place in Plastic Model with a "finely detailed but not too stable Space Clipper." The last event on the schedule was Ostrich Eggloft won by Mark Pemberton with 1245 feet.

Rocketeers interested in joining the MRRA should contact J.R. Pemberton, 10911 West 70th Terrace, Shawnee, Kansas 66203.

Plans for the Third Annual Alberta Regional Meet, to be held in Edmonton, Canada, have been announced. The contest, to be held May 20-22, 1972, will include: Class 0 Altitude, Class 1 Parachute Duration, Class 2 Streamer Duration, Class 2 Bio-Sim (10 nt/sec Eggloft), Hawk B/G, Swift B/G, Scale, and Open Spot Landing. Interested rocketeers from British Columbia, Alberta, Saskachawan, and Manitoba are invited to contact: AARM-3 Contest Processing, 13540-126 St., Edmonton 44, Alberta, Canada.

A new model rocket club is being organized in Somerset, New Jersey. Interested rocketeers should contact Leon Wojentko at (201) 249-8511 or Mark Furrier (201)246-0369.

On March 4-5, 1972, the Sulphur River Section of the NAR will host the Texas Model Rocketry State Championships in Sulphur Springs, Texas. The meet will be sanctioned by the NAR with Class 00 Altitude, Single Payload, Class I Streamer Duration, Class I Drag Efficiency, Class I Parachute Duration, Eagle Boost/Glide, Pigeon Eggloft, and Open Spot Landing being flown. First place winners in each event will be designated as State Champions. Interested rocketeers should contact Sulphur River Section, c/o Danny Miller, 804 Gilmer St., Sulphur Springs, Texas, 75482.

Rocketeers near the Whitmer High School in the northwest section of Toledo, Ohio interested in forming a rocket club should contact Terry Gomez, 2787 Lyceam, Toledo, Ohio 43613.

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

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

(From the Editor, cont.)

teers who are attempting to legalize the hobby in states or localities where rocketry is presently prohibited.

What is needed, however is a *written copy* of the state, county, or local law on model rocketry. A letter by a rocketeer, detailing his impressions of what the law says will do other rocketeers no good should local authorities raise questions about the legality of their activity.

To put together such a "legal handbook," we ask the assistance of all **MRm** readers. Who knows where to find a copy of the law in your state, county, or town better than you do – especially after you have spent days searching it out. Thus, we ask that all **MRm** readers send in a copy of the rules and regulations in your area. For our part, we will make this information available to other rocketeers, and to groups attempting to legalize model rocketry in those areas where it remains prohibited.

Only with the cooperation of our readers in all areas can we put together a *complete* listing of state and local model rocket laws. Please send in copies of the rules in your vicinity to:

"Legal Handbook"
c/o Model Rocketry magazine
Box 214
Boston, MA 02123

(Cineroc Photography, cont.)

47th and Holly, Kansas City, Mo. 64112) which sells for $10.95. It holds up to 32 feet of film, so you'll have no trouble with the 10½ foot Cineroc length.

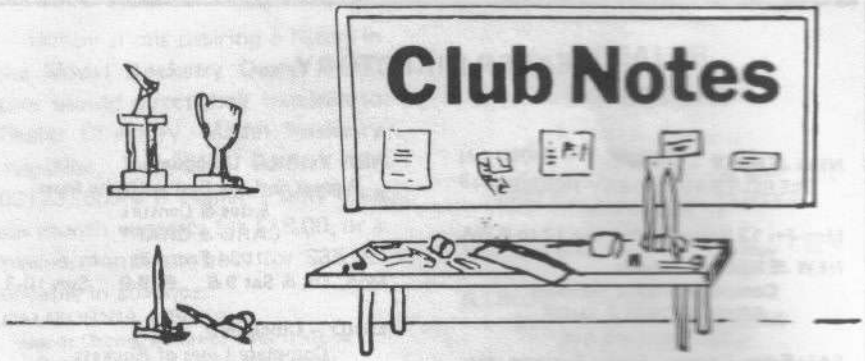
Chemicals for processing black and white *reversal* processing are available at many large camera stores. A half-gallon kit, sufficient for about 30 rolls of Cineroc film, is available from ESO-S Pictures for $3.45. Since each brand of chemicals will have slightly different processing times, follow the directions accompanying your kit. The entire black and white processing time will be about two hours.

Using black and white is advantageous because of its lower film and processing costs. Rocketeers planning R&D experiments should especially consider use of Tri-X film.

Color Processing

For spectacular Cineroc results, color is a must. The Estes film is a special Instrumentation Film made by Kodak. It can be processed in a Kodak E-4 Ektachrome Processing Kit (which sells for $12.00 in ½ gallon size). The same chemicals can be used to process the Kodak Ektachrome High Speed film. The processing instructions given in the Kodak kit should be followed exactly. Note especially the warnings about contact with some of the chemicals. A list of the processing steps is given in Table 2.

Developing your own Cineroc films is a practical and money saving way of persuing aerial photography. The major drawback is the initial investment in processing equipment. However once you have processed 10 or 12 rolls of film the cost per roll will be well below that of the Estes processing. The equipment and procedures described in this article will provide consistent and satisfactory results.



Results of the South Seattle Rocket Society's SEAMEE-8 section meet, their first contest since NARAM-13, are reported in the latest issue of the *Modroc Flyer.* A low ceiling hampered the tracking, but that didn't stop Jim Pommert from taking first place in Pigeon Eggloft with 373 meters. In Class O Drag Efficiency first place honors went to Jim Worthen with 184 meters. There were only two qualified flights in Swift Rocket/-Glider, with Mike Medina's 32.4 second duration capturing first place. The Hawk B/G event went to Jim Pommert with 166 seconds. In Eagle B/G Jim Pommert took first again, with a 232 second duration. Class O Parachute Duration went to Jim Worthen with 208 seconds, while Al Gerhart took first in Open Spot Landing with a 16'2" miss distance.

An NAR Section is being formed in the Pasco, Kennewick, and Richland, Washington area. Interested rocketeers should contact either Dave Moser, 1009 Rt. 34 North, Pasco, Washington 99301, or Richard Grantham, 2311 Boise, Richland, Washington 99352.

The Santa Barbara (California) Model Rocketry Club held its first meeting at the Goleta Boys' Club in October. Since then the club has grown to 28 members and has held a demonstration launch. This launching, on Sunday November 7th, included Cineroc and Camroc flights, several scale flights, etc. County officials supervised the first launchings, and the demonstration was covered by newspapers and local television. Interested rocketeers should contact Larry Evans, 45 Dearborne Pl., No. 39, Goleta, CA 93017.

The members of the Smoking Saturns Rocket Club of Fort Wayne, Indiana conducted a rocketry demonstration at the Glenbrook Mall the 4 and 5 of September. Several new members were attracted to the club. Just recently members of HARE and Smoking Saturns formed a new NAR section called Summit City Aerospace Modelers. Meetings of the Smoking Saturns Rocket Club are held on the third Saturday of every month. For more information write to Tom Hoelle, 2231 Charlotte, Ft. Wayne, Indiana 46805 or Greg Stewart, 1324 Fletcher Ave., Ft. Wayne, Indiana.

On Sunday November 14, 1971 David Summers, Andy and Rick Pozdol, Don Pecina, and Mr. Scott Gordon of the Glen Ellyn (Illinois) Rocket Society put on a model rocket demonstration during half-time of a Chicago Bears football game. The club frequently sponsors model Rocket demonstrations, including an annual Labor Day launching. Interested rocketeers in the Glen Ellyn area should contact David Summers, 383 Slow Lane, Wheaton, Ill. 60187.

Virginia's Vikings Rocketry Society sponsored their first sanctioned contest, CARM-1, on November 7th, 1971, at the Hanover Air Park north of Richmond, Virginia. Though the weather was excellent the day before the meet, Contest Director Terry Lee reports that the day of the meet was cold and windy, resulting in the performances being lower than anticipated. In Pigeon Eggloft Tom Marvin captured first place with 176 meters. First place in Class 2 Streamer Duration went to James Howard with a 75 second duration while Penn Goggin took first in Parachute Duration with 39 seconds. Hurley Gill had the only qualified Sparrow Rocket/Glider flight, with a 15 second duration, while Sparrow Boost/Glider went to Penn Goggin with 55 seconds. First place in Swift Boost/-Glide went to Contest Director Terry Lee with 88 seconds, while Mark Dugan took first place in Hornet Boost/Glide with 57 seconds.

The Vikings Rocketry Society also recently held their election for 197' officers. Tom Marvin was elected president, Penn

(Continued on page 38)

Club Spotlight:

Hawkeye Area Meet

by Glenn A. Scherer, Jr.

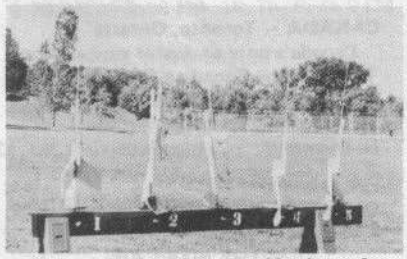
The Hawkeye Section of Davenport, Iowa hosted an Area meet at Garfield Park in Davenport on October 2-3, 1971. A total of nine events — Robin Eggloft, Class 0 Altitude, Design Efficiency, Open Spot Landing, Sparrow Rocket/Glider , Hornet Boost/Glider, Swift Boost/Glider, Class 0 Parachute Duration, and Class 1 Streamer Duration — were on the schedule.

All the altitude events were flown on Saturday, but the results were not accepted because of an error in setting up the trackers. Open Spot Landing and Sparrow R/G were also flown that day. In all, there were only three qualified Sparrow R/G flights, with Larry Hiemann's 28.1 second duration edging out Alan Jones' 24.2 seconds for first place. The Open Spot Landing event went to Tony Clark with a miss distance of 32'4", a full 30' better than Paul Thieses' 66'5" second place distance.

Sunday's events got off to a late start because of early morning rains which lasted till 11 AM. Quite a few of the entries were DQ'ed because of the weather, but Alan Jones turned in an excellent Hornet B/G duration of 78.2 seconds. In the Swift B/G event the Glenn & Carol Scherer Team took first with a 92.5 second duration on a styrofoam wing glider, beating Glen Maynard's second place Minibat which turned in 54.1 seconds.

In the Class 0 Chute Duration event Alan Jones took first place with a 78.2 second flight, giving him a 35 second margin over Jeff Mientus' second place duration. Jeff captured first in the Class 1 Streamer Duration event when his 28.0 second flight barely edged out Greg Genaschek's 27.3 second performance.

Overall, Alan Jones was the contest winner, accumulating 132 points and two first place awards. The Glen and Carol Scherer Team placed second, and Larry Hiemann took third. In the club competition, the hosting Hawkeye Section beat the Black hawk Section with the final total of 318 points to 244 points.



Boost/glider rack at the Hawkeye Area Meet showed a variety of designs.

Hornet B/G

1st	Alan Jones	78.2 sec.
2nd	Toney Clark	19.7 sec.
3rd	Glenn & Carol Scherer	17.1 sec.

Swift B/G

1st	Glenn & Carol Scherer	92.5 sec.
2nd	Gary Maynard	54.1 sec.
3rd	Paul Thiessle	30.1 sec.

Sparrow R/G

1st	Larry Hiemann	28.1 sec.
2nd	Alan Jones	24.2 sec.
3rd	Glenn & Carol Scherer	8.1 sec.

Class 1 Streamer Dur.

1st	Jeff Minties	28.0 sec.
2nd	Greg Genaschek	27.3 sec.
3rd	Gary Mayard	20.0 sec.

Open Spot Landing

1st	Tony Clark	32' 4"
2nd	Paul Thiesses	66' 5"
3rd	Alan Jones	73' 6"

Overall

1st	Alan Jones	132 pts.
2nd	Glenn & Carol Scherer	108 pts.
3rd	Larry Hiemann	72 pts.

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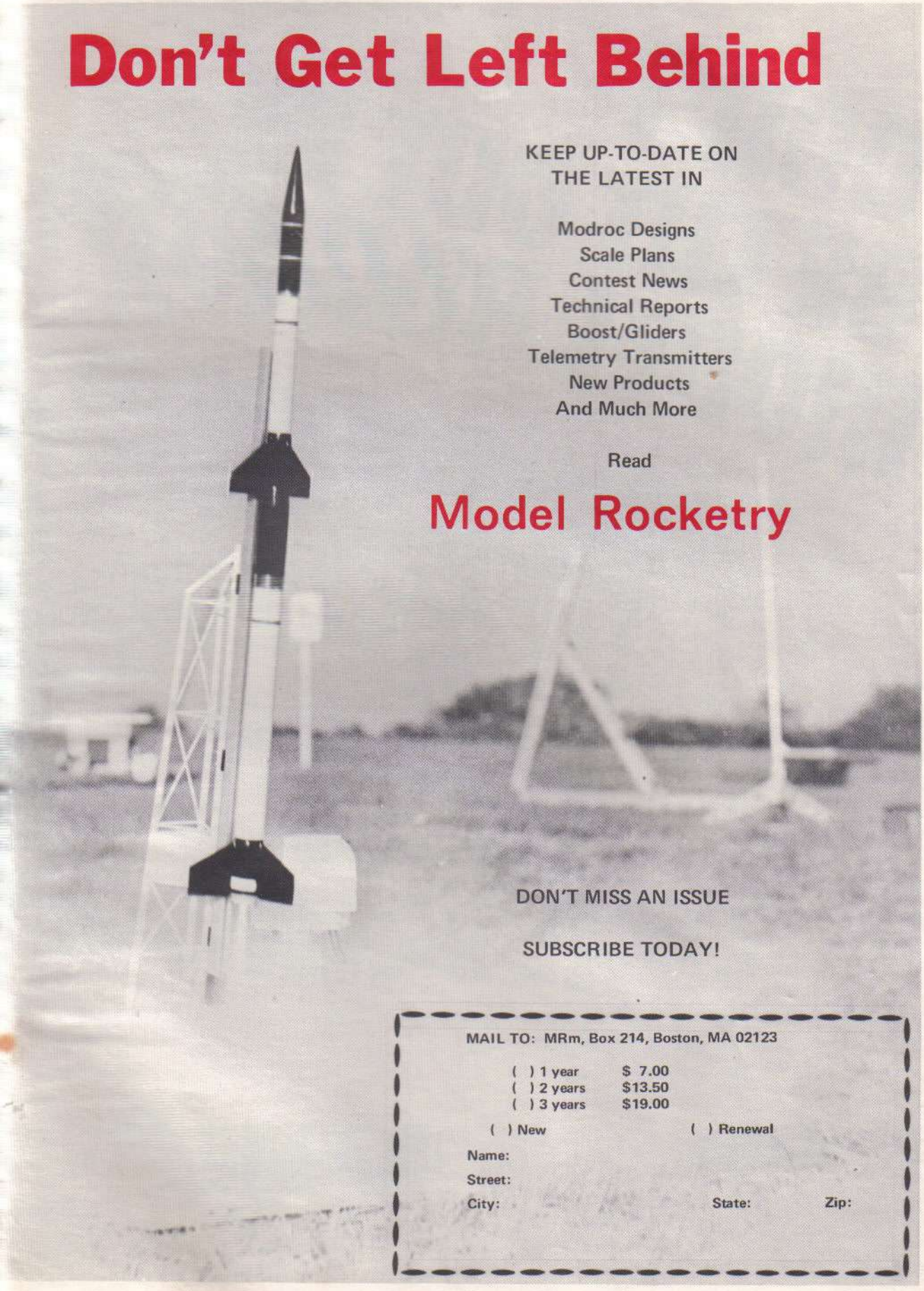

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