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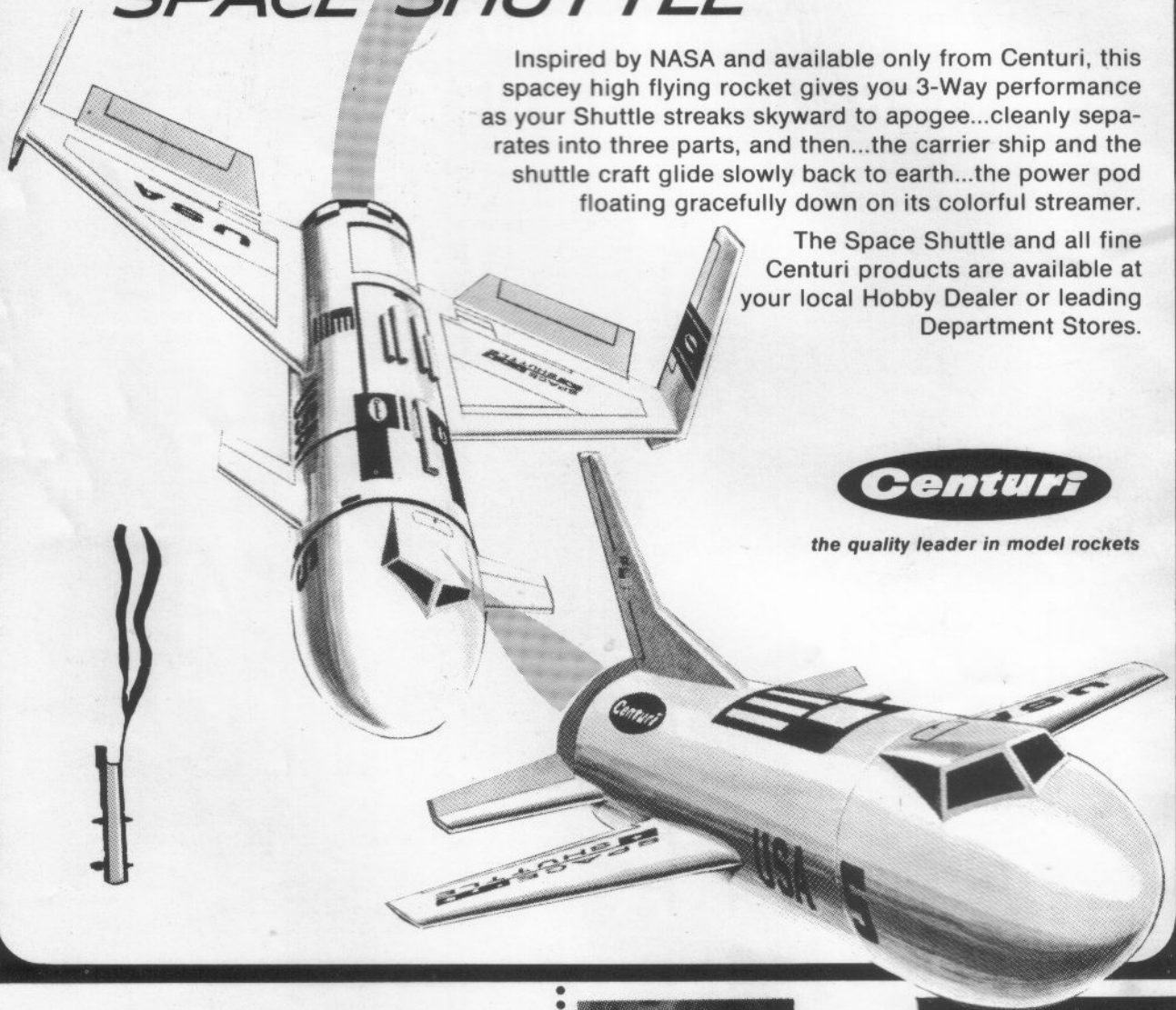

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Model Rocketry

Volume III, No. 2
November 1971

From the Editor

For several years we have believed that in order to promote the growth of model rocketry as a competition sport it would be necessary to have an organized contest structure allowing flight performances from across the country and around the world to be meaningfully compared. Most important however, in order to encourage the *maximum participation* in such contests there should be no sanctioning fees or record filing fees. Such fees only tend to discourage younger modelers from getting involved in rocket competition.

Unfortunately, there didn't seem to be any way to sanction contests or certify records without incurring expenses and, of necessity, charging fees. Even a volunteer organization like the National Association of Rocketry finds it necessary to charge several dollars in yearly dues as well as a 20 cent per participant contest sanctioning fee. In addition the NAR charges a $5.00 fee to apply for a World record. Much of this money, however, goes not to pay for the services involved, but to pay for postage on and printing of the numerous pieces of paper necessary to sanction and run a contest.

Looking at this operation, we believe that **Model Rocketry** has, after 2 years of searching, "discovered" a way to sanction contests and certify World Model Rocket Performance Records with *no sanction fees* and *no record filing fees!* Such an arrangement should allow even the smallest club to sponsor its own contests, and encourage young modelers to get involved in modroc competition.

The sanctioning procedure will be quite simple. The Contest Director, any adult over 18 years old, merely sends in a stamped self-addressed envelope and a contest sanctioning form will be mailed back to him. He fills in the contest date, events, site, etc. and mails the form back. If the form is received more than 90 days before the contest, it will be included in our Modroc Calendar listing. Contests can, however, be sanctioned up till 7 days before the meet.

Events will be chosen from a "Contest Code", now being written, which will include all the standard events as well as quite a few new and challenging contests. There will be at least one event for radio controlled B/G's, a multiple Boost/Glide event, a Micro-Scale event limited to models weighing less than 2 ounces (based on the "Peanut Scale" model airplane event), and many other exciting events. Availability of copies of the Contest Code will be announced next month.

In addition, **Model Rocketry** will act as a clearinghouse for certification of World Mo-

(Continued on page 46)

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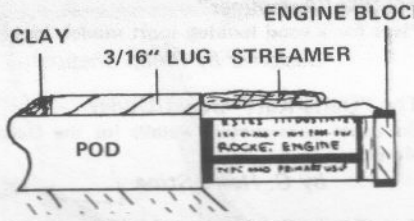
New B/G Pod

It is frequently said that a fixed pod is more difficult to build than a pop-pod because of the requirement for housing the streamer in the fixed pod. I have a new system that requires no cutting of the fixed pod for the streamer and no taping of the streamer to each engine.

A 3/16" diameter soda straw about 2" long is glued to the top of the fixed pod. A little clay in front of the straw provides for smooth air flow. Glue a piece of string to the outside of a 3/16" length of BT-20, and attach the streamer to the other end. Wrap a piece of tape around the rear



of the engine until the BT-20 ring is a tight fit, and slip the ring onto the engine. The streamer is rolled up to fit inside the straw.

Using this system my B/G took first in Swift at MMRR-71 with 102 seconds.

Mark Wladecki
Elyria, Ohio

Flight Test

I really like the new *Flight Test* column, and was wishing for one like it for the past year. Since I already have **Above and Beyond: Space Encyclopedia** your comments on it were even more interesting. You are right about what you said about the photos. This book only cost me about $39 instead of the $50 you mentioned. I bought it over a period of 8 months on my measley $1.00 a week allowance.

In future issues could you possibly evaluate the Centuri Enerjets?

Tom Cave
Sedalina, Mo.

Centuri is presently expanding the Enerjet line to include a series of five or six rockets as well as the high-performance E and F engines. A new catalog listing these products will be released in the near future. As soon as the entire Enerjet line of kits and engines is available for "flight testing" you can be sure that "Flight Test" will feature an article on these products.

Recovery Systems

Help! I live in Hawaii where we can fly rockets the year 'round. However, we have a very difficult problem here. We have practically the year around tradewinds (which blow between 15 and 20 miles per hour). This makes it very difficult to use any effective recovery system and not lose your rocket. Parachute recovery is all but impossible, and even streamer recovery is difficult since the winds blow our models out into the ocean.

I offer this as a challenge to rocketeers everywhere, to see if they can devise a recovery system for Hawaii.

Dennis Bishop
1545-1210 Linapuni St.
Honolulu, Hawaii

Predicted Altitude

In September '71 **MRm** George Flynn mentioned my 0% error predicted altitude flight at MMRR-71. I would like to elaborate a bit on that, and possibly convince some skeptics that it was not all luck.

A week or so before the contest, I took a tracker and several birds to the local field for testing. I was able to get three tracks on a Goblin, all being several meters different. I was only able to get one track on the Big Bertha. I expected to average the three tracks on the Goblin and use it for the predicted altitude contest. However, when I got home I compared my tracked altitudes with those calculated by using the Malewicki altitude tables (Centuri TIR-100) and found that my one track on the Big Bertha was on the nose!! Hence, that was what I used at MMRR-71.

I had originally calculated and planned to use 124 meters for my prediction, but the morning was very humid — "but by morning only a low cloud ceiling remained to remind contestants of the downpour" — so I deducted .5 meters to compensate — result, 0% error!!

Yours truly,
Bob Starks
Brecksville, Ohio

Renwal Nike Conversion

I have converted the Renwal plastic Nike-Ajax rocket for Minijet or Mini-Brute engine power. The procedure is quite simple. Since the booster is slightly too small to hold a mini-engine, the rear section of the Nike booster is replaced with a BT-5 tube.

To convert the model, first cut off 1½" of the rear plastic booster tube and glue both halves of the remaining section together. Plastic glue is applied to the lower ¼"of the top of the booster and a 2" length of BT-5 is slipped ¼" onto the booster (see diagram). The plastic ridge inside serves as an engine block.

A small screw eye is heated over a gas stove (Hold on to it with pliers!), and quickly screwed into the upper stage body. The upper stage is assembled as shown in the kit instructions, except that all fins are glued in place so that they cannot be moved.

The lower stage fins are epoxied to the BT-5 tube. A small chute, 6" to 8",is all you will be able to fit into the rocket.

Chris Michielssen
Watsonville, Calif.

Lone Rocketeer

I have been flying model rockets for some time. I am interested in getting into contest flying, but being a "one man club" makes it hard to get the information I need in order to qualify. If it is possible, would you send me a list of places and dates for contest flying in or around the city of Detroit.

Earl Giles
2132 McLean
Detroit, Mich. 48212

How about it Detroit area rocketeers, any contests on the schedule?

Modroc Tracking Beacon

I live in an area where visual tracking is, to say the least, difficult. The solution is obvious – a transmitter A range of ½ to 1 mile is a necessity. I would hope that someone at **MRm** knows where I can buy, how I can build, or any place I can steal a transmitter. Also, what about tracking antennas? Your prompt attention would be appreciated, I'm losing rockets too fast!

Jon G. Klasen
Royalton, Minnesota

Plans for the "Minimitter", a model rocket homing beacon were published in the October '70 issue of **Model Rocketry.** *This article also contains information on modifying a standard walkie-talkie to a direction finder. The October '70 issue is no longer available from our back issues department, however we can send you xerox copies for 25 cents per page (50 cents for the two page article).*

A complete parts kit for the Minimitter, having an air range of almost a mile, is available from Astro Communications, 3 Coleridge Place, Pittsburgh, Pa. 15201 for $10.95. You can also obtain their catalog listing the transmitter and sensor modules for 25 cents from the same address.

Swing-Wing B/G Info

Since I began reading **Model Rocketry** several months ago I have become fascinated by swing-wing boost/gliders. I have been unable to find much information on this subject. I am sure other rocketeers have the same problem as me. I was wondering if you could tell me where I could find some information on the subject, or if you might run an article on it.

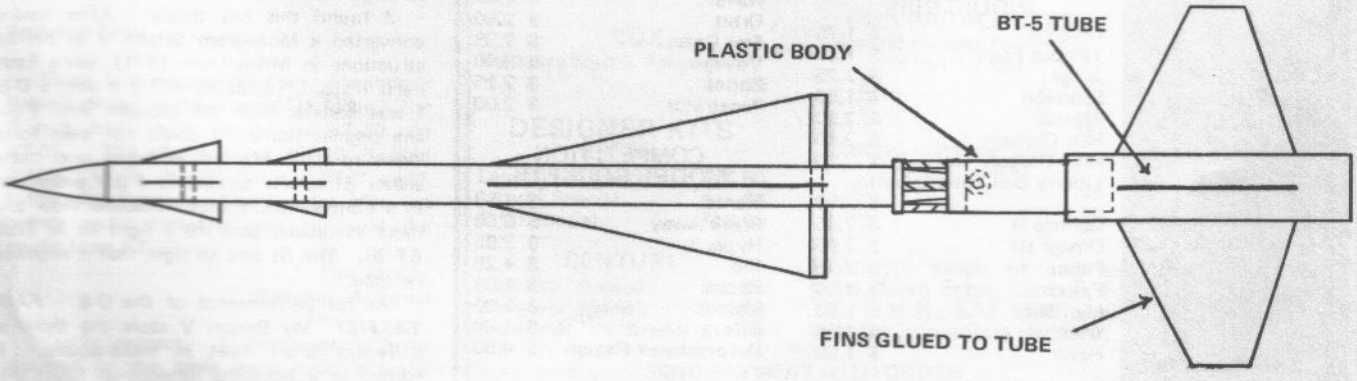
Joseph Macy
Old Westbury, NY

We hope you enjoyed the plans for Jon Robbins' swing-wing rocket/glider presented in the September '71 issue of **MRm.** *The techniques described apply equally well to the swing-wing boost/glider. As other high-performance swing-wings are developed, you can be sure that* **Model Rocketry** *will present plans for them.*

Gnat B/G Record

It gives me great pleasure to announce the setting of what is probably a world record that will stand for a long time. It was set yesterday at the Canadian Rocket Society B/G Trials. The record was in Gnat Boost/-Glide.

The record time of 1 minute 46 seconds was set by Eric Johnson, from the Kenmore-Tonawanda Rocket Society in New York state. The model was a standard pop-pod configuration, powered by a ¼A mini-engine. I boosted to about 100 feet and immediately went into a perfectly trimmed glide, catching the edge of a small thermal and ris-



Renwall Nike-Ajax Conversion.

ing an additional 20 feet. The B/G was very small, only about 4 or 5 inches long.

Paul Shindman
Canadian Rocket Society
Toronto, Canada

Since no other organization is ready to assume responsibility for certification of Gnat B/G records, **Model Rocketry** *will be glad to keep such records. All we ask is that any contestant anywhere in the world who sets a Gnat B/G record at a contest or record trials forward to us within 30 days a letter signed by the contest director and two timers and indicating the duration of the flight. A photo and brief description of the record setting model must also be included.*

Underwater Launching

I have become interested in trying some underwater launches. However, I do not have a copy of your October '70 issue and according to the September '71 issue, there are no back copies of the October '70 issue. I was wondering if you might be able to send me a reprint of the underwater launching article.

Alan Adelman
Philadelphia, Pa.

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.

Flight Test Comment

I just finished reading "Flight Test" in the September **Model Rocketry**. It was a very fine article, and showed much insight into the mind of the rocketeer. I have found one thing which you did not mention. I think that this is a common problem since many rocketeers I know have had the same problem.

The problem is this: Even though the casing of a Cox D-8 is supposed to be 18mm X 70mm, it will not fit in some of the standard engine mounts. The Cox engine must be larger than 18mm.

I found this out thusly: After having converted a Monogram Saturn V as per instructions in **MRm** (July 1971), using Estes parts instead, I decided to fly it with a D-8. I was ecstatic with the thought until I got the engines home. I could not even force them to fit! After three hours and many sheets of course sandpaper I got a tight fit in a Centuri No. 7 tube. Another hour and more sandpaper gave me a tight fit in Estes BT-20. The fit was so tight that it required no tape.

As for performance of the D-8 – *FANTASTIC!* My Saturn V stole the show at a recent sport meet in Indianapolis. It turned in a beautiful straight-up flight and the 'chute was ejected just at apex. (Inci-

dentally, I have found a C6-3 to have too long a delay. Cox has a C6-2, which should work better.)

I am looking forward to your column in future issues.

Gary Bannister
Muncie, Indiana

Doug Malewicki of Cox informs us that early production versions of the Cox D8 engines, as well as other Cox engines, were manufactured in an 18 mm outer diameter tube. Adding the paper wrapper made it impossible to fit the engine into a BT-20 or Centuri No. 7 tube, though there was no problem fitting it into a Cox model. To eliminate this problem, and make Cox engines fit all available standard size rocket kits, Cox is now manufacturing engines which measure 18 mm including the paper wrapper. Unless your hobby shop has very old engines on display, you should have no problem with fit on any engines you purchase today. Incidentally, Doug reports that he flew many models at NARAM-13 using Cox engines in BT-20 tubes, and he encountered no difficulty with the fit.

Cox is presently changing the tooling to allow completely automated production of the D8-0 and D8-3 engines. As a result, these engines may not be available in some stores until early in February. At that time, however, the automated equipment will allow high-speed production to meet the large demand for this engine.

Technical Articles

You can add my name to the long list of people who have praised your fine magazine. It is truly an accomplishment for you to publish a monthly magazine with the little advertising that is in it.

I think that the balance between technical and beginner's articles is a little lopsided. How about some more technical aritcles for us more advanced rocketeers. What ever happened to your monthly *Technical Notes* column?

My favorite types of articles are scale, boost/gliders, and F-powered birds.

Norman E. Heyes
East Grand Forks, MN

The "Technical Notes" column was discontinued when the author, George Caporaso, enlisted in the Navy. Right now an R & D oriented column is in the works, and we hope to get it started by January.

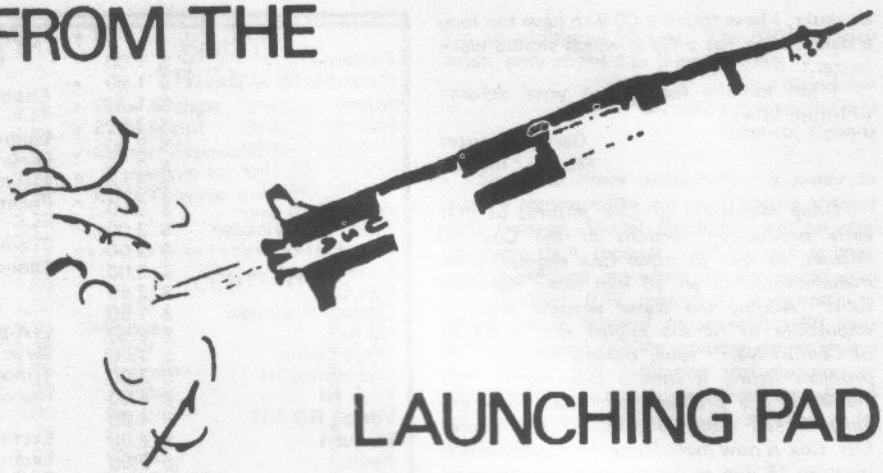
Egglofter Error

There is a mistake in Larry Shenosky's Eggloft design in the August '71 **MRm.** The 9 inch body tube should be BT-50 not BT-20. The diameter of BT-20 is only 0.710", while the BT-50 is 0.976" wide. I thought someone should point this out before some rocketeer trys to build the model from BT-20.

Tim Money
Gadsden, Alabama

You're correct. A typographical error resulted in the main body tube, actually a BT-50, being called a BT-20.

FROM THE LAUNCHING PAD

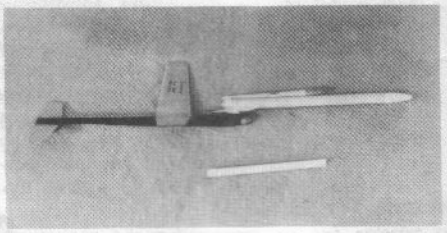


Regular readers will recall our interest in small field events, particularly the ¼A powered Gnat B/G event. Several months ago we reported on the Biales-Feshkins Team's 48 second Gnat flight using an ejectable flexwing. That 48 second duration seemed quite impressive and looked like a hard record to beat, but Gnat B/G has come a long way in the last two months.

Two very impressive Gnat flights have recently been reported. The first, which was made at the Toronto B/G Trials, was a 100.6 second duration turned in by Eric Johnson. This was a standard, fixed-wing model built from balsa. We have no details on the design, but it had to be something around the size of a Bumble Bee or Wasp, or perhaps even smaller, in order to boost high enough to turn in this duration.

But even Eric Johnson's flight of 100.6 seconds was quickly exceeded. At GERM-1, a NARCAS sponsored Regional meet in Gettysburg, Pennsylvania, Jon Robbins really did something spectacular with a Gnat. *He lost it!* Jon's model, this time not a swing-wing Groundhog, caught a good thermal on a rainy morning and turned in a duration of 156 seconds before he and the timers both lost sight of the glider. He was flying a small, elliptical winged B/G, weighing about 4 grams in glide configuration. Four other rocketeers at GERM managed Gnat flights of over 30 seconds, indicating that this event really can be flown successfully!

In the high-powered B/G field Bob Parks just turned in a rather spectacular flight with what he calls his "low performance Condor." This standard configuration B/G has a 22" wingspan and weighs only 2 ounces minus engines and pod. Boost power is provided by an F7 and a D18. Flying the model in Florida, Bob reports that it was set up to do an axial roll during boost, the two revolutions per second roll rate insuring a straight-up flight path, to an altitude of about 1200



feet. The model was timed for over 6 minutes before it went out of sight. Using binoculars Bob followed the bird for 14½ minutes before it disappeared into a cloud some 3 miles downrange. This 14½ minute flight should provide something for other Condor minded rocketeers to aim at.

Modelers interested in flight conversions of plastic kits should never pass up the opportunity to search through the shelves of old hobby shops looking for long discontinued kits. You never can tell what you're going to find. While in Gettysburg for GERM-1 most contestants stopped off at Gilbert's Hobby Shop which was right across the street from the motel. Most everyone went in to get a few parts for a hastily constructed contest model, but those who searched through the plastic model shelves were in for a few real surprises. Rich Brandon was the first to discover a stack of seven Revell Regulus II missile kits dating back to 1958. He also found a single Revell Thor missile with launcher, another kit discontinued over a decade ago. By the end of the day all these old missile kits had been bought as relics of another age – an age when modelers had a selection of almost 50 different plastic

ESTES ANNOUNCES INCREASES

Estes Industries has announced a series of price increases on kits, engines, and parts to take effect November 13th, 1971. The increases, contained in catalog No. 712, range from 10 cents on an 8" parachute, bring the price to 35 cents from 25 cents, to $3.00 on the Saturn V, now costing $16.50 up from $13.50.

Prices on all engines are up by an average of 10% to 15%. Increases on Series I engines range for 10 cents on a package of 3 ¼A engines (now 80 cents up from 70 cents), to 15 cents on a package of 3 C engines (now $1.35 up from $1.20). The Series II, B14 engines, have been increased 20 cents (now $1.30 up from $1.10). Series III short engines have now been raised to higher prices than the equivalent Series I engines with a 15 cent increase on all types. The highest increase, 25 cents on each package of 3 engines, is on the Series IV D-engines raised to $2.25 from $2.00.

Most of the Estes scale kits show significant price increases. Led by the $3.00 increase, from $13.50 to $16.50, on the Saturn-V kit, many other scale models are up by as as much 35%. The semi-scale Saturn-V was increased by 65 cents, to $3.50 from $2.85. The V-2 kit is up 75 cents, to $2.75 from $2.00. The Thor Agena B kit has been increased by 50 cents, to $3.75 from $3.25.

The largest increase in the sport model line is $1.75 on the Mars Lander, up to $7.75 from $6.00. The Orbital Transport price was increased 50 cents, from $3.25 to $3.75. The Sprint kit is up 75 cents, now $2.50 instead of $1.75. The Omega was also increased 75 cents to $5.75. Twenty-five cent increases were announced for the Cherokee D (now $3.00), and the Alpha III (now $1.75).

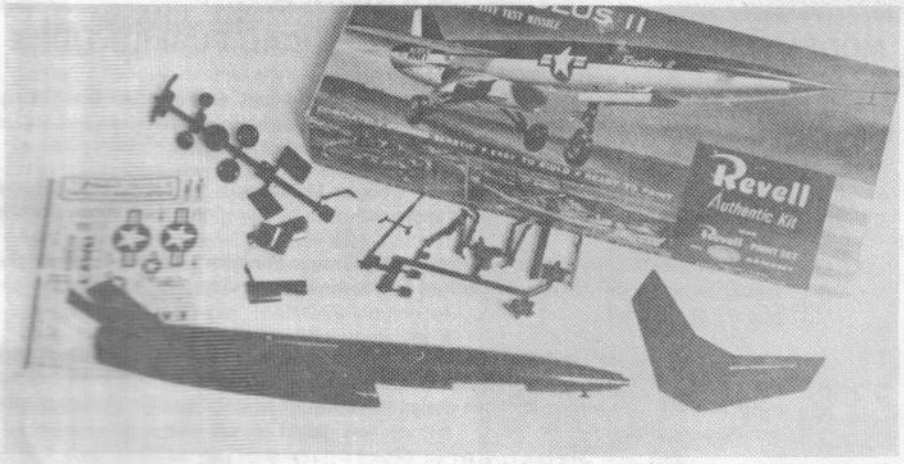
All Estes launching equipment is up 75 cents, raising the price of the Porta-Pad to $3.25, the Electro-Launch to $5.25, and the Tilt-A-Pad to $3.75. The Altiscope is up from $3.00 to $3.95. The price of several technical reports is also up. The Altitude Prediction Charts have been raised from 50 cents to $1.00, and the Drag Report has gone up 300% from 25 cents to $1.00.

Rocketeers can obtain a copy of Catalog No. 712 by writing Estes Industries, Dept. 31-M, Penrose, Colorado 81240.

missile kits by a variety of manufacturers. Most of these kits are now discontinued, and many of the manufacturers are now out of business, but a search of the hobby shop shelves may well turn up something interesting.

With the increased interest in night flying evidenced by a night Streamer Duration contest at NART-2 and the night launch at this year's Canadian Convention, some B/G builders might be interested in the rules for a recent night flown model airplane contest. The "Modesto Flying Cirucs 1971 Night Fly In" was scheduled for Saturday, October 2nd. Flown from dusk to midnight, all powered models were required to have "navigation lights" – a red light on the left wing, a green light on the right wing, and a white light on the tail. Gliders were required to have a single white light somewhere on the model. Any model whose light went out during the flight was disqualified. As a reminder to forgetful contestants, the contest announcement concluded: "Note: Don't Forget to Bring a Flashlight."

Displaying a single position light should be enough to allow timing of small gliders. This sounds like it could be an interesting



The Revell Regulus II missile kit, discontinued in 1959, was purchased only two months ago at Gilbert's Hobby Shop in Gettysburg, Pennsylvania.

contest event – Night Launched Swift B/G. Thus far I've only heard of two night flying B/G's. The first was submitted to **MRm** several years ago by a model rocketeer in Australia. The other was Ferenc Roka's "Ruptured Duck" flown at this year's Canadian Convention.

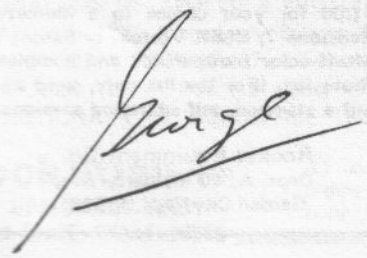
Look for big things from Canada in the upcoming year. Model rocket enthusiasm in Canada is growing quickly. Thus far we've received no announcements from U.S. clubs sponsoring contests for 1972, but already the announcement is in for the 1972 Toronto Regional. Other Canadian clubs are also planning major activities for 1972. Watch next month's *Update Canada* for a rundown of the planned events.

For a while it looked like the "Purple Book" of strange model rocket events would go unchallenged as the standard for unusual sport events at modroc contests. The Purple Book developed by the Monroe Astronautical Rocket Society of Rochester, NY, lists quite a few unusual events, indluding the LeMans Start event flown at the 1971 Canadian Model Rocket Convention.

However the Phillipsburg Area Rocket Club of Phillipsburg, New Jersey has devised a series of wild events for their Christmas contest – Tannenbaum 1. Leading off their schedule is "Scale Christmas Tree", an event for flying Christmas trees. Next up is "Garland Duration", an event similar to Streamer Duration but limited to entries using Christmas garlands as the recovery device. "Ping-Pong Ornamental Spot Landing", derived from the "Purple Book" Ping-Pong Spot Landing event, will also be flown at the Christmas meet. NAR members interested in participating in Tannenbaum-1 should contact David Klouser, 383 Warren St., Stewartsville, NJ 08886.

A letter in today's mail starts out with the words "Fly Groundhog", so it must be from Jon Robbins who created that contest winning swing-wing design. Jon reports that he has now developed a "light-weight" Groundhog series. The Gnat version weighs only 5 grams and has an 18 sq. in. wing area. The 24 sq. in. wing area Hornet weighs only 8 grams. He plans on testing out these new Groundhogs at the Evanston-Tiros Regional in early October, and we'll look forward to a report on how they perform.

For those rocketeers who found the wing deployment and pivot mechanism of the Groundhog a little hard to understand in the plans presented last September, this issue includes a series of close-up photos of both mechanisms. Turn to that article for more info and, as Jon would say, "Fly Groundhogs!"



FLOP-1 – Nov. 6, 1971. Sponsored by the Pueblo (Colorado) Model Rocket Club, and open to all rocketeers. Events: Sparrow B/G, Class 0 Alt., Class 2 SD, and Robin Eggloft. Site: Pueblo, Colo. Advance registration before Nov. 1 required. Overnight lodging available with club members. Contact: Larry Clark, 39 Normandy Cr., Pueblo, Colo. 81001.

NERFAM-II – November 7, 1971. Area meet sponsored by the New England Rocketry Federation. Events: Condor B/G, Class 0 PD, Sparrow B/G, and Class 3 Streamer Duration. Contact: Patrick Griffith, Legion St., Milford, Mass. 01757.

NETS-2 – November 13 1971. North East Technical Symposium sponsored by the Pascack Valley NAR Section. Site: Bloomfield, New Jersey Public Library. Tentative topics: Scale, B/G, Making Your Own Decals. Contact: Brian Skelding, 9 Appleton Rd., Glen Ridge, New Jersey 07028.

Oklahoma Area Meet – November 14, 1971. Contest sponsored by the Oklahoma Model Rocket Society, open to all modelers from the state of Oklahoma. Events: Class 1 PD, Sparrow B/G, and Class 1 Streamer Duration. For information contact Mike Clay, 4609 N.W. 35th St., Oklahoma Cith, Oklahoma 73122.

Tannenbaum-1 – December 28-30, 1971. Open to all NAR members, sponsored by the Phillipsburg Area Rocket Club, Events: Condor B/G, Condor R/G, Sparrow B/G, Sparrow R/G, Robin Eggloft, Roc Eggloft, Class 2 PD, Class 2 SD, and the following "unofficial" events "Scale Christmas Tree", "Class 5 PD", "Ping Pong Ornamental Spot Landing", "B-Engine Multiple B/G", "D-Engine Feather B/G", and "Garland Duration." Contact: David Klouser, 383 Warren St., Stewartsville, NJ 08886.

XMC-1 – January 15, 1971. Mini-convention featuring 4 discussion groups, possible R&D contest, NASA films, etc. Contact: Paul Porzio, 245 Windsor Pl., Brooklyn, NT 11215.

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.

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.

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

A RECORD-SHATTERING 156 SECOND GNAT BOOST/GLIDE FLIGHT AT...

GERM-1

by George Flynn

"From the same people who brought you NART-1 and NART-2" read the contest announcement for the first Gettysburg Regional Meet, and rocketeers from all over know that GERM-1 would not be an *ordinary* rocket contest. Never has Pennsylvania's NARCAS Section sponsored an *ordinary contest.* The club must have a special committee to search for little known and never flown events. At NART-1 they flew Condor B/G for the first time at a major meet, and NART-2 introduced the Condor R/G and Hornet R/G events. For GERM the contest committee selected Gnat B/G — that's B/G with a ¼A engine — for those rocketeers who like *small* events, and Roc Eggloft — 80 nt-sec power — for those rocketeers who enjoy building high-powered models that don't stand a chance of getting tracked.

At the contestants briefing on Friday night Contest Coordinator Doug Plummer described the GERM field to the 35 contestants. "It's more designed for Pigeon Eggloft than Roc," Doug explained, since the launch site was to be a small section of county owned land adjacent to the federal Gettysburg historical area. Just across the road was a used car lot, and Doug indicated that an "if you break it you bought it" rule would apply. To discourage rocketeers from aiming their models in the other direction, he reminded everyone that "it is a federal offense to damage any of the monuments in the park."

Though permission had been obtained from county officials to use the 1000 ft on a side GERM launch field, the federal Park Rangers were less than enthusiastic about having anyone trample their grass. In fact they insisted that the tracking scopes be set up on county land, giving slightly less than a 300 meter baseline. They also warned that rocketeers should not go into the park to recover their lost models.

It was raining lightly at the scheduled 7:00 AM starting time, and not even Contest Coordinator Doug Plummer arrived at the site before 8:00 AM. The first event on the schedule was a special NARCAS version of Class 2 Streamer Duration. All entrants were required to fly a fixed size streamer measuring 2" by 2". The moist weather caused a problem however, since the crepe paper streamers stretched during flight, and no one was sure whether to measure the length before or after flight.

Just about everything from minirockets to Alpha's were flown in the SD event, but MPC's Minijets proved supreme capturing the three top positions. Terry Lee turned in the best performance, a 71 second duration, using a B3-7m powered MPC "Super Star." A crepe paper streamer was attached to the kit at the CG position so that the rocket descended in a level attitude, thus increasing the drag.

Trailing by only one second, Jon Robbins turned in a 70 second duration also flying a B3-7m powered model. Jon's home-design featured a mid-ejection system, the separation point being just forward of the fins. He used a high-gloss finish to decrease drag on the way up, and a crepe paper streamer to provide high-drag during descent.

The only other flight of more than a minute was David Shucavage's 61 second duration. Dave's model was built around a BT-5 tube and was powered by a B3-5m Minijet. He also used a crepe paper streamer.

There were seven other SD flights in the 50 second range, but overall the performance was somewhat disappointing. Quite a large number of SD models were unstable and went "pinwheeling" across the sky. At least one model went unstable on its first flight, and the rocketeer didn't even bother to add some nose weight before its second, and predictably unstable, flight. Other rocketeers were DQ'ed when their streamers separated from the model at ejection.

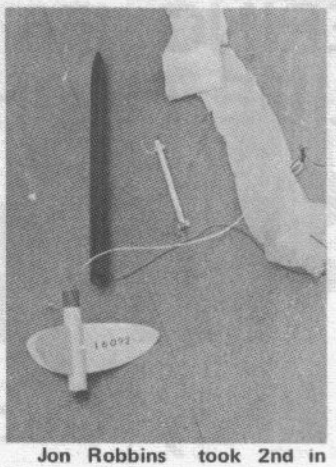
In Roc Eggloft, that's Eggloft in the 40 to 80 nt-sec range, the weather caused serious problems. The cloudy, sometimes rainy, sky hampered tracking in this event where good flights were expected to exceed 2,000 feet. Actually, Roc Eggloft was something of a catastrophy — or more accurately a succession of "catastrophic failures." Many of the entries were three-stage, Estes D-powered models. Since 30% of the Estes D's flown at GERM exploded, the only question on a 3-stage D-model was which stage would be the one to blow up. By unofficial count, fifteen Estes D engines exploded in this event. After one D powered model made it to apex, Bob Otloski remarked: "Oh gee, it spoiled a perfect record."

The best of the Egglofters were lost in the cloud layer. Enerjets, F100's, etc. all sent their payloads out of sight. The winning model showed no attempt at streamlining, in fact it was an Estes Omega with a CMR egg capsule shoved in the top. This three stage, D-powered model worked perfectly, staying low enough (550 meters) to be tracked. Only three other eggloft models were tracked — to 489 meters, 261 meters, and 75 meters.

The last of these eggloft flights, to 75 meters, was most spectacular. Jon Robbins flew a nicely finished 2-stage model topped by a CMR capusle. The D13 in the first stage exploded, but it ignited the E in the

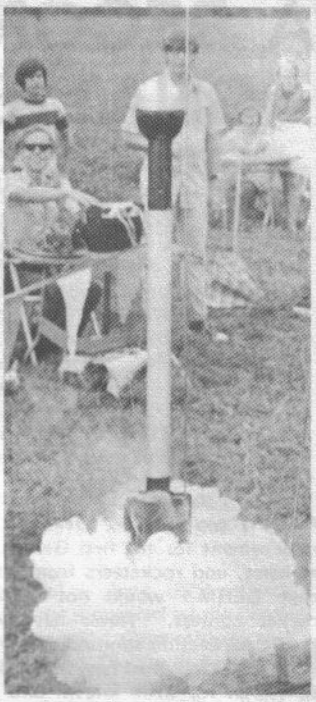
The rain didn't do much good for the unpainted models, but it certainly did hold down the length of the processing lines.

Terry Lee took first place in B-engine Streamer Duration using this MPC "Super-Star" with a crepe paper streamer.



Jon Robbins took 2nd in Streamer with 70 seconds using this mid-ejection model.

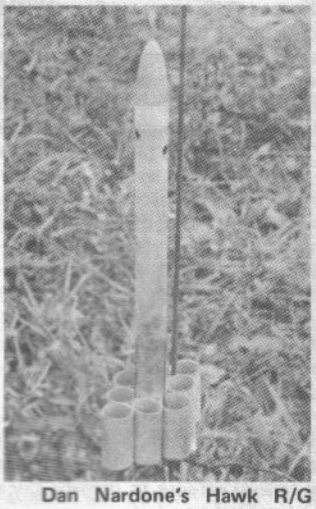
David Shucavage placed third in Streamer with a B3-5m powered mini-model.



Aaron Insinga's loop stabilized Egglofter used a stocking capsule to hold the egg.

Jon Robbins' egglofter was beautifully finished and would have turned in a good performance had not the first stage D13 engine exploded.

The simplest and most difficult of the Plastic Models were the Suplee-Yaeger team's MPC "Vostok" and Jeff Spear's MPC "Pilgrim Observer."



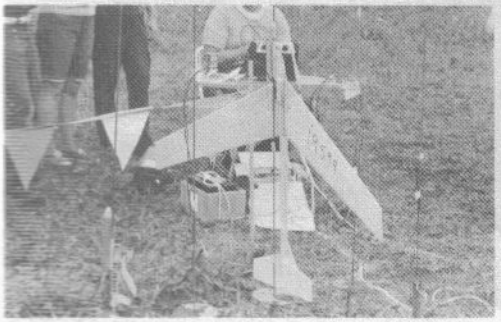
Dan Nardone's Hawk R/G entry was a loop stabilized model using the CG shift technique.

Bob Lieber used a 3-stage Omega with a CMR capsule on top for eggloft.

Doug Plummer's Gnat entry was typical of the light weight, elliptical wing models flown.

The Kennedy-Gibbs egglofter was a 3-stager built from scrap rockets left around the house.

Jon Robbins' Hawk Corporal Plastic Model took first by a good margin.



Hurley Gill's Hawk R/G used the "moving engine" technique to shift the CG position.

Jimmy Ash attempted to cant the engine pod on this large styrofoam B/G. Too much angle caused this Hawk R/G to loop.

stage sending the model on its rather low, but qualified, flight.

Results in the Dual Payload event were equally disappointing, with the good flights going untracked into the clouds, and many of the multi-stage D13-powered models exploding in flight. The best of the tracked flights was a 388 meter altitude turned in by the Yeager-Supplee Team. A 344 meter flight by Dan Nardone, and a 158 meter flight by the Thomson-Meyer Team complete the list of "closed tracks."

It rained all Saturday night and into Sunday morning. The field was muddy, and it took about 15 rocketeers to push Howard Kuhn's car and trailer "range store" out of the swamp. Speaking of the weather Peter Obst observed: "This is worse than NART!", and Howard Galloway was quick to pick up the bullhorn and reassure everyone: "It's important at a time like this that you remember *Model Rocketry is Fun!*"

With the rain coming down intermittently, many rocketeers put their models on the pad and held an umbrella over top until T-2 seconds. Nonetheless, quite a few impressive durations were turned in.

Gnat boost/glide, B/G powered by a ¼A engine, had never been flown at a major contest before GERM. The only durations available were from two MIT Model Rocket Society Section Meets – with the best flight being a 48 second duration turned in by Bernard Biales' ejectable flexwing (see *From the Launching Pad,* **MRm August '71**), and most others averaging 10 to 20 seconds. These rather dismal performances didn't stop GERM contestants from trying, and in many cases *succeeding.* When Hornet B/G was flown at NART-2 the top times were 100 seconds, 68, seconds, 54 seconds, and 51 seconds. With 109 rocketeers in attendance at NART only two managed Hornet durations of over one minute. What chance did GERM's 35 contestants have of coming close to this with ¼A's? Surprisingly, in the Gnat event, there was one flight of over a minute, two of over 50 seconds, and four of over 40 seconds. And that with only 35 contestants at the meet. The rather spectacular Gnat flights marked the single most impressive achievement at the contest.

Most of the Gnat's were flown during a break in the rain in the late morning. The

GERM-1 Results

Class 2 Streamer Duration

A/B Division			
1st	Jimmy Ash	58 sec.	
2nd	Mark Hopkins	53 sec.	
3rd	Tommy Hench	44 sec.	
C Division			
1st	David Shucavage	61 sec.	
2nd	Thomson-Meyer Team	55 sec.	
3rd	Yeagle-Supplee Team	52 sec.	
3rd	Bennett-Griffith Team	52 sec.	
D Division			
1st	Terry Lee	71 sec.	
2nd	Jon Robbins	70 sec.	
3rd	Kennedy-Gibbs Team	52 sec.	

Roc Eggloft

A/B Division		
	(no qualified flights)	
C Division		
1st	Robert Lieber	550 m.
2nd	Rich Brandon	489 m.
3rd	Aron Insinga	261 m.
D Division		
1st	Jon Robbins	75 m.
	(no other qualified flights)	

Dual Payload

A/B Division		
	(no qualified flights)	
C Division		
1st	Yaeger-Supplee Team	388 m.
2nd	Dan Nardone	344 m.
3rd	Thomson-Meyer Team	158 m.
D Division		
	(no qualified flights)	

Gnat B/G

A/B Division		
1st	Tony Shearin	49 sec.
2nd	Jimmy Ash	19 sec.
3rd	Jon Javitch	2 sec.
C Division		
1st	George Purcell	54 sec.
2nd	Dave Shucavage	38 sec.
3rd	Hurley Gill	31 sec.
D Division		
1st	Jon Robbins	131 sec.
2nd	George Flynn	41 sec.
3rd	Severn-Gardenghi Team	33 sec.

Hawk R/G

A/B Division		
	(no qualified flights)	
C Division		
1st	Thomson-Meyer Team	60 sec.
2nd	Dave Shucavage	12 sec.
3rd	Hurley Gill	11 sec.
D Division		
1st	Severn-Gardenghi Team	91 sec.
2nd	Jon Robbins	38 sec.

Swift B/G

A/B Division		
1st	Dave Insinga	56 sec.
2nd	Mark Hopkins	19 sec.
3rd	Jon Javitch	2 sec.
C Division		
1st	George Purcell	158 sec.
2nd	Robert Lieber	82 sec.
3rd	Rich Brandon	79 sec.
D Division		
1st	Jon Robbins	131 sec.
2nd	Severn-Gardenghi Team	86 sec.
3rd	Kennedy-Gibbs Team	77 sec.

Plastic Model

A/B Division		
1st	Dave Insinga	380 pts.
2nd	Tommy Hench	220 pts.
	(no other qualified flights)	
C Division		
	(no qualified flights)	
D Division		
1st	Jon Robbins	640 pts.
2nd	Kennedy-Gibbs Team	585 pts.
3rd	Ronald Gabeler	365 pts.

OVERALL

A/B Division	Dave Insinga	135 pts.
C Division	George Purcell	186 pts.
D Division	Jon Robbins	372 pts.

first Gnat off the pad was Lisa Diller's Falcon, a little heavy for a ¼A, which climbed only to the top of the rod, arced over at 5 feet, and attacked the boom of Peter Obst's B/G on the next pad. Many rocketeers thought this flight would be typical of the day's durations, but Jon Robbins quickly brought his Gnat model to the pad.

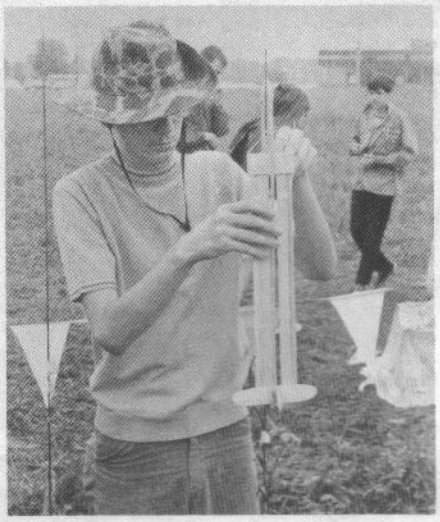
Jon's model was a small, fixed elliptical winged model with a 6" span, and weighing 4 grams in glide configuration. What caused Jon to not use a Groundhog in Gnat isn't known, but whatever the motivation for this *it worked!* The boost, on a ¼A mini-engine, was better than 30 feet, and the model went into a circling glide. Then it caught a *thermal,* and climbed,... and climbed,...and climbed. Drifting slowly downwind, Jon tried to chase the model. The timers lost it at *131 seconds,* and shortly therafter Jon gave up the chase, making him the first person ever to lose a Gnat B/G in contest flying.

In relatively calm air, the Gnats were to an average of 25 to 50 feet. There were many different designs, mostly however full size and scaled down Wasps, Bumble Bees, and Falcons were being flown. Though there were five more 30 second plus durations, none of the other contestants managed to catch that elusive thermal Jon's model discovered.

The results in Swift B/G were somewhat less spectacular. In fact the winning A-flight, a small model by George Purcell, only beat Jon Robbins Gnat duration by 2 seconds. Jon Robbins Groundhog Swift B/G took second place with 131 seconds. By this time the slow drizzling rain had started again, and many of the B/G's were warping on the pad or during flight. There was one rather unusual flight as a Sparrow model apparently warped unsymmetrically and went into a spiral dive.

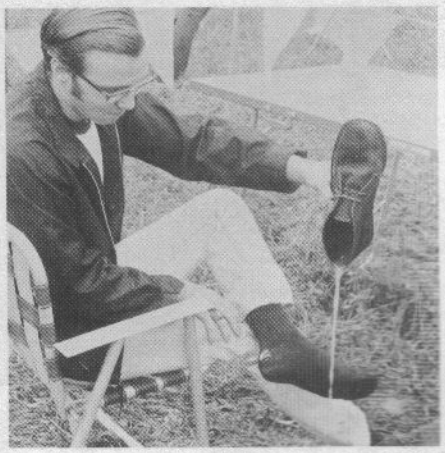
As the afternoon went on, the rain got worse and rocketeers be came more reluctant to bring their models to the pad. Launch officer Bob Lieber tried to speed up the contest with the "encouraging" announcement "All right, let's go now! Let's get some rockets on these pads. It looks like this rain isn't going to let up all day, and you're going to have to fly in it one way or another." And fly the contestants did, but only the early morning Gnat B/Gflights were anything spectacular. Unpainted balsa wood just dosn't stand up to the rain.

Andy Bennett holds an umbrella over Jon Robbins' Groundhog Hawk R/G just before its 38 second flight.

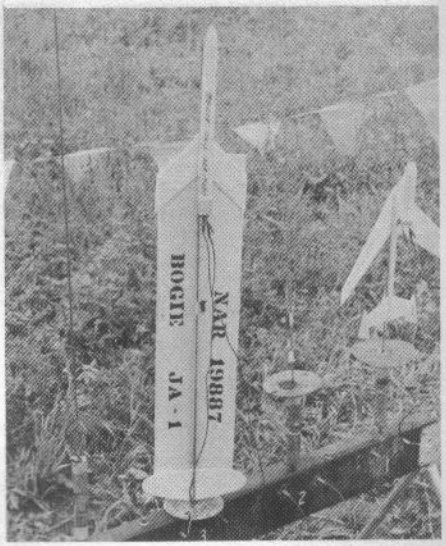


Swing-wings were "in" for Hawk R/G with Bob Otloski's Minotaur V which DQ'ed when it shreaded....

The plastic models stood a better chance of success, but many contestants experienced difficulties with their recovery systems. Entries ranged from the MPC Vostok flying kit, to the simple Hawk Corporal conversion, to a spectacular three-engine cluster MPC Pilgrim Observer. Plastic Model judging rules divide points about equally between difficulty of conversion and quality of workmanship. Thus a poorly done difficult model can score the same as an impressively finished easy conversion. Therewereonly two models which scored very high in difficulty of conversion — an MPC Pilgrim Observer and a Hasegawa F-106. Jeff Spear's Pilgrim Observer was powered by a cluster of three C-engines whose ejection charges were ducted through the body to deploy the three side panels and eject a chute through the nose. The model never left the pad, misfiring twice when the weakening range battery proved incapable of igniting more than two engines of the cluster at once. Mark Hopkins F-106, complete with missiles and landing gear, was DQ'ed when it made an unstable flight.



Greg Kennedy empties the accumulated water from his shoe on the muddy GERM field.



....and Peter Obst's 40" span swing wing which was broken by a wild Gnat glider.

The remainder of the plastic models were rather standard kits — Hawk Corporals, MPC Vostoks, and an Airfix Lunar Module — all relatively easy conversions. Jon Robbins' Corporal was the best finished model of the meet, with all the seams well filled and eliminated, and the flat white paint covering showing no traces of brush strokes, fingerprints, or smears. The model scored very high on workmanship and turned in a perfect flight to net 640 points in the event. Second with 585 points was the Kennedy-Gibbs team with an Arifix LM. The model was also well finished, but several of the smaller parts had broken off and some quick glueing was evident. Greg Kennedy indicated that the model had been "eaten" by his cat the night before, necessitating a quick repair. This model also turned in a good flight, edging out the third place model by over 200 points.

Overall GERM was a victory for Jon Robbins, who made the 10 hour car trip from Ohio for the contest. Jon, in his first meet of the 1971-72 Contest Year, went home with 372 points for his work: in C Division George Purcell topped the field with 186 points, and Dave Insinga placed first in A/B Division with 135 points.

The Vikings Section made a special presentation to Contest Coordinator Doug Plummer. In recognition of his efforts to run the meet with no cooperation from the uncontrollable elements, they awarded him the "GERM-1 Capsule" containing: *"Particles of an egg, whose lofter exploded.... Part of Terry Lee's Estes 3-D payloader that exploded....Part of Roland Gabeler's FSI F7-6 powered egglofter that shattered in an aerial bombardment....Pieces of clay that trimmed a disintegrated glider....A part of George Purcell's rocket/glider that pranged to destruction.....A rain-soaked streamer (doner unknown)....A flower....A weed....Six blaes of grass trampled and run over by a Pinto stuck in the mud....A blade of grass colored red by powder from an exploded streamer duration model....Ground swamp water....Rain water from the check-in table ....And mud from damn near everywhere!"*

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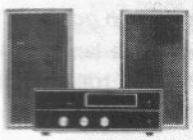

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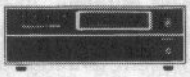

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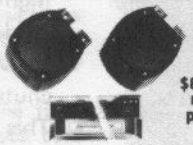

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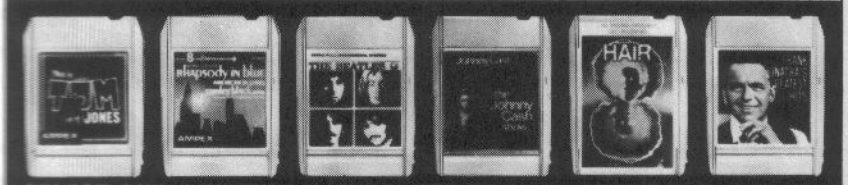

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JUPITER, ATLAS, TITAN
Three-in-One Plastic Conversion

by George Flynn

The new MPC Minijet engines open up a whole new area of plastic model kit conversions. Many kits whose conversion was impossible, simply because the standard 18 mm diameter engine would not fit in the model, can now be flown. Among these previously unconvertible kits are several missiles from the Monogram "U.S. Space Missiles" kit.

The "Space Missiles" kit is a collection of 36 plastic scale missile models and a display stand. First introduced by Monogram about 10 years ago as the "Missile Arsenal" the kit was redesigned to include newer missiles and reintroduced a couple of years ago.

The current "Space Missiles" kit includes plastic models of the: Atlas, Sidwinder, Rat, Pershing, Tarter, Bullpup, Titan II, Minuteman II, Asroc, Spartan, Hawk, Nike-Ajax, Lacrosse, Phoenix, Sparrow, Genie, Lance, Little John, Subroc, Rascal, Posidon, Hound Dog, Bomarc, Talos, Terrier, Nike-Hercules, Falcon, Dart, Redstone, Jupiter, Corporal, Honest John, Sergeant, Thor, Petrel, and Polaris.

All the missiles are modeled in 1:128 scale, making most of them too small to convert – even to Minijet power. However the Titan II, Atlas, and Jupiter are large enough to allow easy conversion. In addition, enterprising rocketeers should be able to convert the Thor and Minuteman models without too much difficulty.

Since the thin plastic casing of the Minijets get quite hot, it is necessary to use a paper engine holding tube inside the plastic missile. Failure to do this results in the engine heat being transferred to the plastic airframe causing it to distort. However, a T-15 engine tube inside the missile provides sufficient insulation to eliminate such problems.

All three of the models converted in this issue of MRm are finless, so clear plastic fins must be added to insure static stability. In addition the nose section of each model is filled with trimming clay to move the C.G. forward. (This clay is available from most art supply stores, and is priced at about 50 cents per pound.)

Monogram "Space Missiles" kit.

The trim clay makes these models quite heavy, so flight with the ½A Minijet is *not* recommended. All three models will turn in good flights, however, when powered by the A3-4 or B3-5 Minijet. In all cases, use the largest parachute which you can reasonably fit into the rocket body. This will help prevent landing damage, allowing many flights.

Finishing is the most important step resulting in a good looking model. The body halves on the Titan and Atlas fit together poorly, necessitating a filling process similar to that used on balsa wood. For plastic seams the filler material to use is Testors "Contour Putty for Plastic Models", available for 19 cents per tube at most hobby shops. Fill the seam with Contour Putty, allow it to dry, then sand flat with extra fine sandpaper.

After filling all the seams the models are ready for painting. *Don't use dope or other paints commonly used for balsa models!* If you don't own an airbrush, the best finishes can be obtained with a good spray paint designed for hobby kits. Testors "Spray Pla Enamel" was used to finish these kits because it goes on thin enough to allow the fine detailing to show through. The coarser spray from household paints will fill in the detailing that Monogram's moldmakers have gone to much pain to provide. Testors spray paints also come in the flat colors which more accurately resemble the paint used on the real missiles.

A base coat of white was applied to all three missiles. Then the areas to be painted other colors were masked off and sprayed. After final painting the paint *must* be scraped away from the fin attachment lines, and the fins glued in place with Liquid Plastic Cement. After these joints have dried, they should be filleted with tube type plastic cement.

The Monogram "Space Missiles" kit, priced at only $3.00, contains three models capable of simple flight conversion. Each is an attractive model strong enough to survive many flights when converted according to the plans on the following pages. The ambitious rocketeer will probably be able to flight convert a few more missiles included with this kit, though the conversions will be harder and the available room for a recovery chute will be minimal.

Rocketeers having difficulty locating the Monogram Space Missiles plastic kit can order it by mail from Spacemaster Enterprises (Dept. MR, Box 424, Willoughby, Ohio 44094) at $3.00 plus 60 cents postage. Testors Contour Putty is also available from Spacemaster Enterprises.

JUPITER

The Jupiter is the simplest of the "Space Missiles" series to flight convert. The two halves of the rocket (parts 20 and 21) are glued together using Liquid Plastic Cement. When this is dry, use an X-Acto razor saw to cut off the nozzle section flush with the rear of the missile.

Mark a 0.580" diameter circle centered on the forward and rear bulkheads of the missile body. Use a Dremel Moto Tool to cut away the marked areas of the bulkheads.

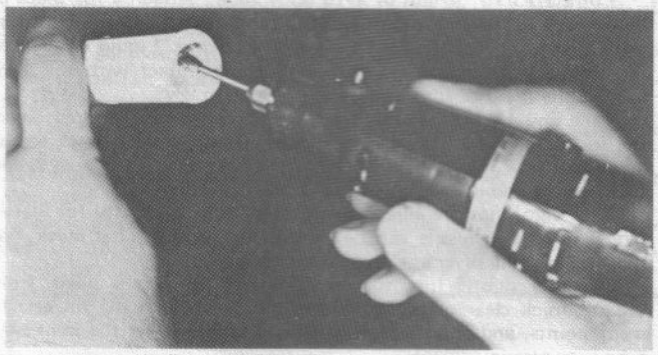
Cut a 4¼" length of T-15 body tube, and insert it into the Jupiter body to check the fit. Apply Ambroid Liquid Cement inside both bulkheads, and insert the T-15 tube into place. The tube should be flush with the rear of the missile.

Fill the nose cone to within ¼" of the rear with clay trim weight. Cut a 0.700" diameter disk from thin cardboard. Glue the disk into place in the rear of the nose cone. Make a nose block by cutting the shoulder from any T-15 size nose cone. Glue the nose block into place so that the nose cone will be properly aligned on the rocket body.

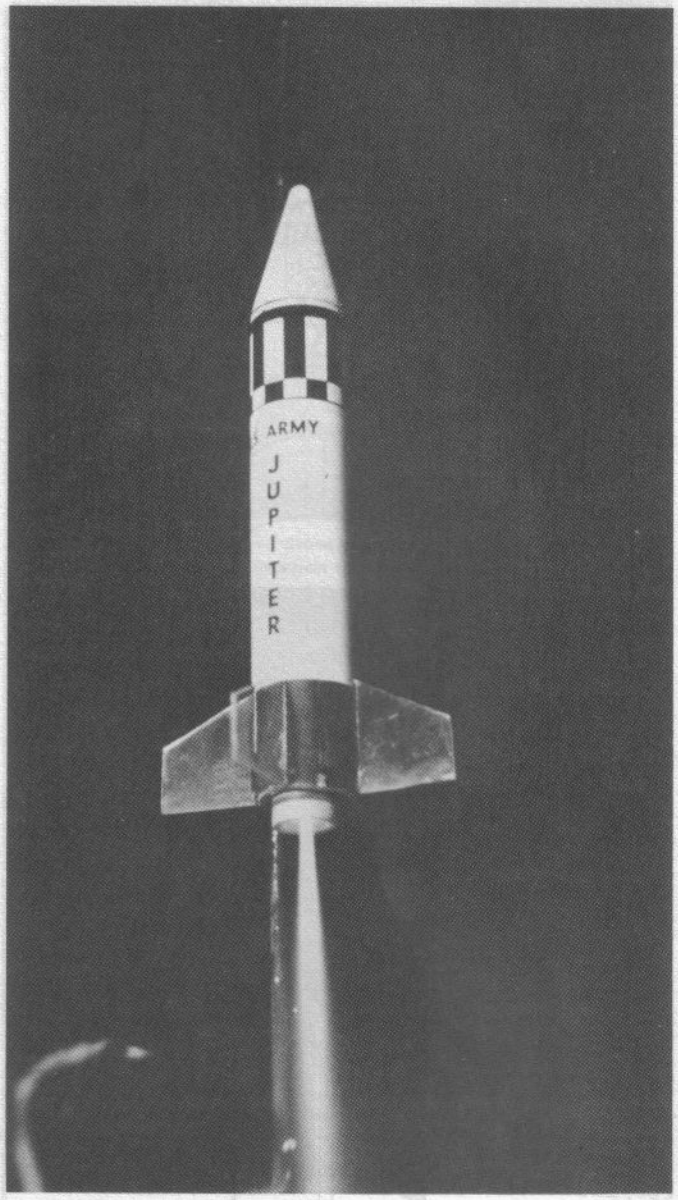
Glue an engine block to the front of the T-15 engine tube. Add a screw eye to the nose block, and fasten a 10" shock cord from the missile body to the nose cone.

Use the template given in the plans to cut four fins from 0.030" thick clear plastic. Glue the fins in place on the missile body using liquid plastic cement. Then lightly fillet the body/fin joint with tube type plastic cement.

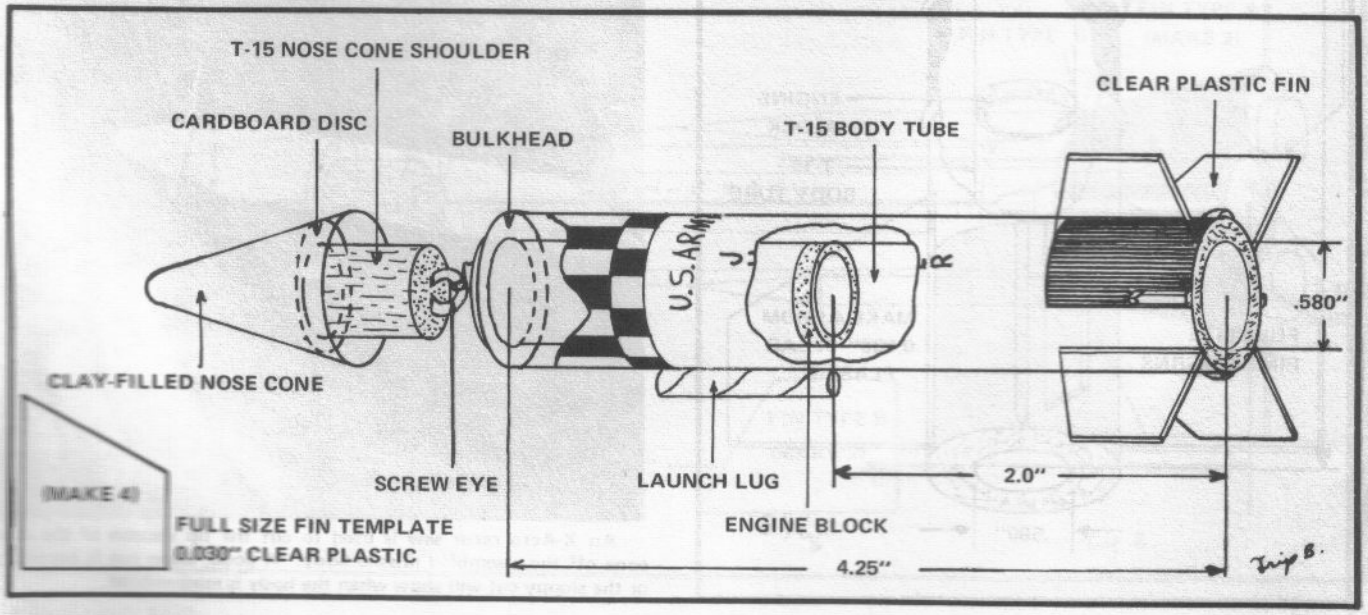
An 8" diameter chute is sufficient for safe recovery of this model. The Jupiter can be flown with an A3-4 or B3-5 Minijet.



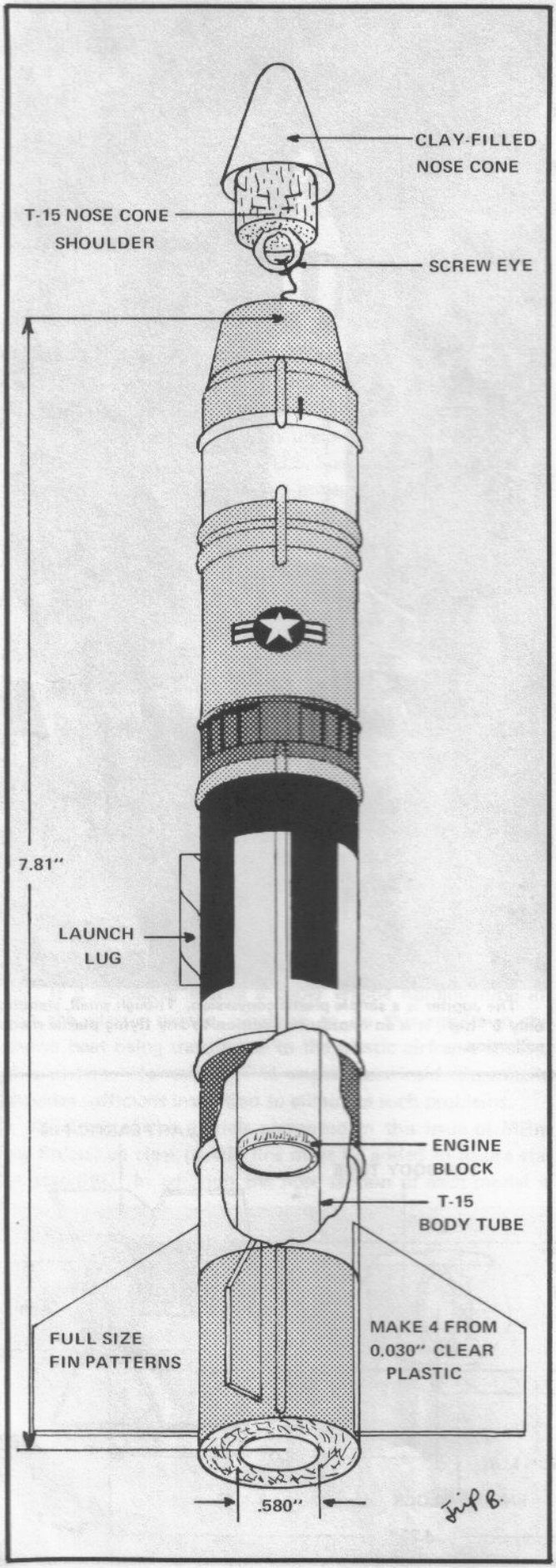
A Dremel Moto-Tool is used to remove a disk from the rear bulkhead. A T-15 body tube is fitted through the hole, and mounted in place.



The Jupiter is a simple plastic conversion. Though small, standing only 5" high, it is an impressive addition to any flying plastic model collection.



TITAN-II



The Titan II is the largest of the missiles in the Monogram kit. It could easily be converted to standard size engines, but the Minijet B is powerful enough to put it almost out of sight, so resist the temptation to convert it for something bigger. The use of a light-weight mini-engine also allows the plastic fin size to be reduced while maintaining a good stability margin.

MPC's T-15 body tube is a perfect fit for the nose section of the Titan missile, making this a simple conversion. First the two body halves (Parts 14 and 15) are glued together using Liquid plastic cement. Brush cement over the contact edges, and press the halves together continuing pressure until the glue has dried.

Use an X-Acto razor saw to cut the nozzles off flush with the rear of the missile. Mark an "X" across the rear of the missile to locate the exact center of the rear. Then draw a 0.600" diameter section from the rear of the missile. Try to slip an MPC T-15 tube into the hole, and use Dremel tool to enlarge the hole until this tube just fits into place.

Using the X-Acto razor saw, cut the nose section from the missile body. Be careful to make a clean, sharp cut. Any sloppiness here will show up on the final model. Use 400 grit sandpaper to clean the edges after cutting.

Fill the nose cone with trimming clay to serve as noseweight. Cut a 0.560" diameter disk from cardboard. Insert the disk into the cone. Use Ambroid Liquid Cement to glue the disk into the nose cone, and set the entire assembly aside to dry.

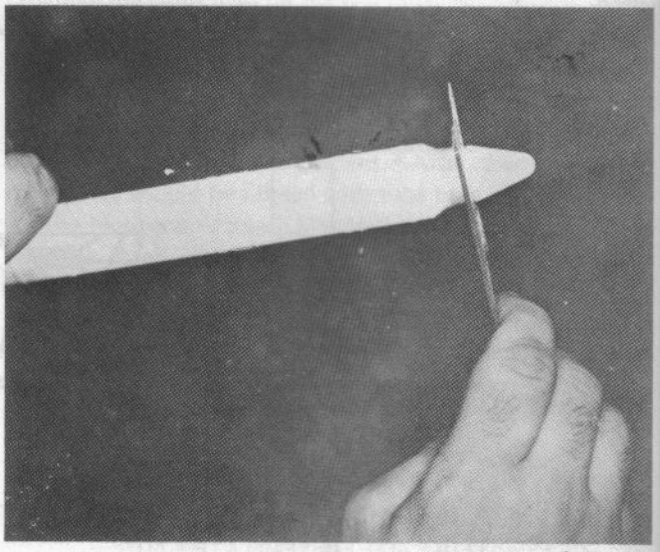
Cut a 7-13/16" length of T-15 body tube. Attach a 10" piece of shock cord to the forward end of the tube. Insert the tube into the missile shell, and check for fit. Apply Ambroid Liquid Cement to the walls of the missile at both points of contact with the T-20 tube. Slide the tube into place, and set aside to dry.

Take any MPC nose cone for the T-15 series tube, and cut away the top to give a ½" long nose block. Glue the nose block to the cardboard disk in the base of the nose cone. Add a screw eye, and tie the other end of the shock cord to the nose section.

The seam lines are filled with Testors Contour Putty for Plastic Models, and the missile can be painted in flat white, flat black, flat red, and metallic silver as shown in the kit plans.

Cut four plastic fins, to the pattern shown in the plans, from 0.020" thick clear plastic. Remove the paint from the fin attachment points, and glue the fins in place. Lightly fillet the joint with tube-type plastic cement.

A 12" or larger plastic parachute will assure soft recovery. The Titan II can be flown with A3-4m or B3-5m Minijet engines.



An X-Acto razor saw is used to cut the tip section of the nose cone off the assembled missile body. A good, clean cut is necessary or the sloppy cut will show when the body is reassembled.

ATLAS

The Atlas is the most difficult of the three Monogram conversions, since the body tube must be "built-up" to the correct diameter, and the scale nozzles must be modified to accept an engine. First the mounting pins are cut away from the bottom of the booster nozzles using a sharp X-Acto knife.

Using a Dremel Moto Tool and cutting tool remove the entire rear bulkhead from both halves of the Atlas shell (parts 9 and 10). A round file can then be used to touch up the edges of the cut.

The distance between the two booster nozzles is slightly smaller than the diameter of the Minijet, so a file must be used to remove part of the plastic of the nozzle cone. Continue filing away the plastic until the engine just slip fits between the nozzles.

Cut a 4½" length of T-15 body tube. Since the Atlas body is larger in diameter than the T-15 tube, two tube mounting rings should be built-up from T-20 tube. Cut a T-20 ring approximately 3/8" in length. Remove a segment from the tube so that it is just long enough to wrap around the T-15 tube. Position the front edge of this support ring ½" from the forward end of the tube, and glue in place. Glue a second support ring in place flush with the rear of the tube.

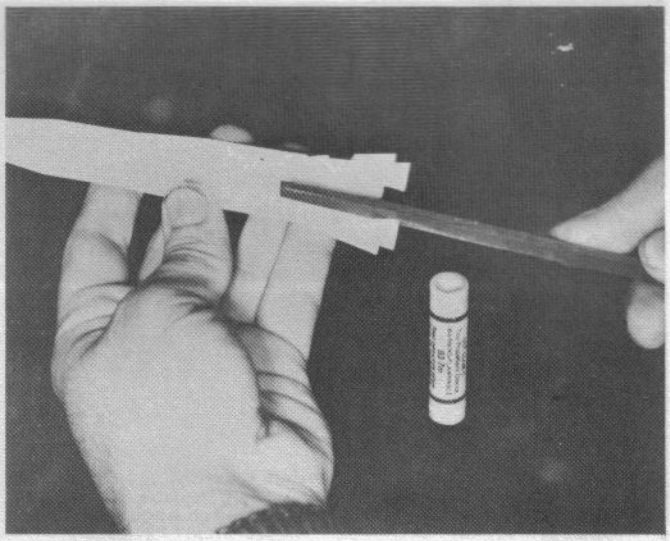
Tie a 10" length of shock cord to the MPC engine block, and glue the block into place in the 14mm diameter engine tube. Apply glue to the inside of the 4½" length of T-15, and insert the engine tube into the rear of the T-15. *Be sure to glue the engine tube into the T-15 before glueing the T-15 into the missile body!*

Using Ambroid Liquid Cement applied to both support rings, glue the engine tube into place in one half of the Atlas body. Liquid Plastic Cement is applied along the seams, and both halves of the Atlas are glued together.

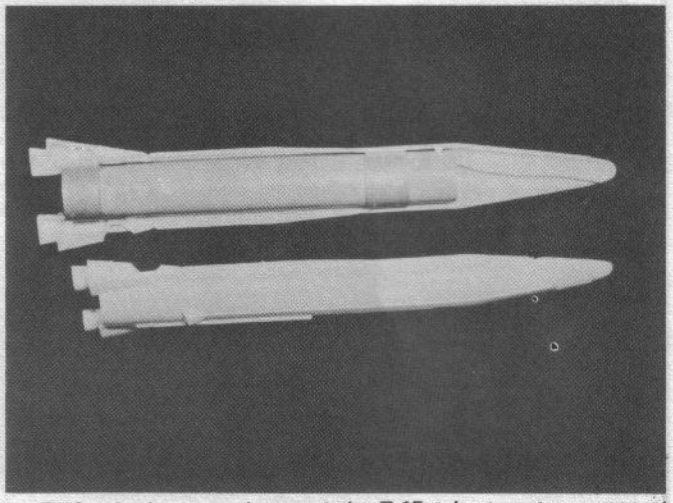
Using an X-Acto razor saw, the nose section is cut off along the scribed line just to the rear of the tapered conical section. Be careful, any mistakes will show up on the finished model.

The nose cone is filled to within ¼" of the rear with clay trim weight to cut down on the needed fin size. Cut a 0.670" diameter disk from light cardboard, and glue it in place in the rear of the nose cone.

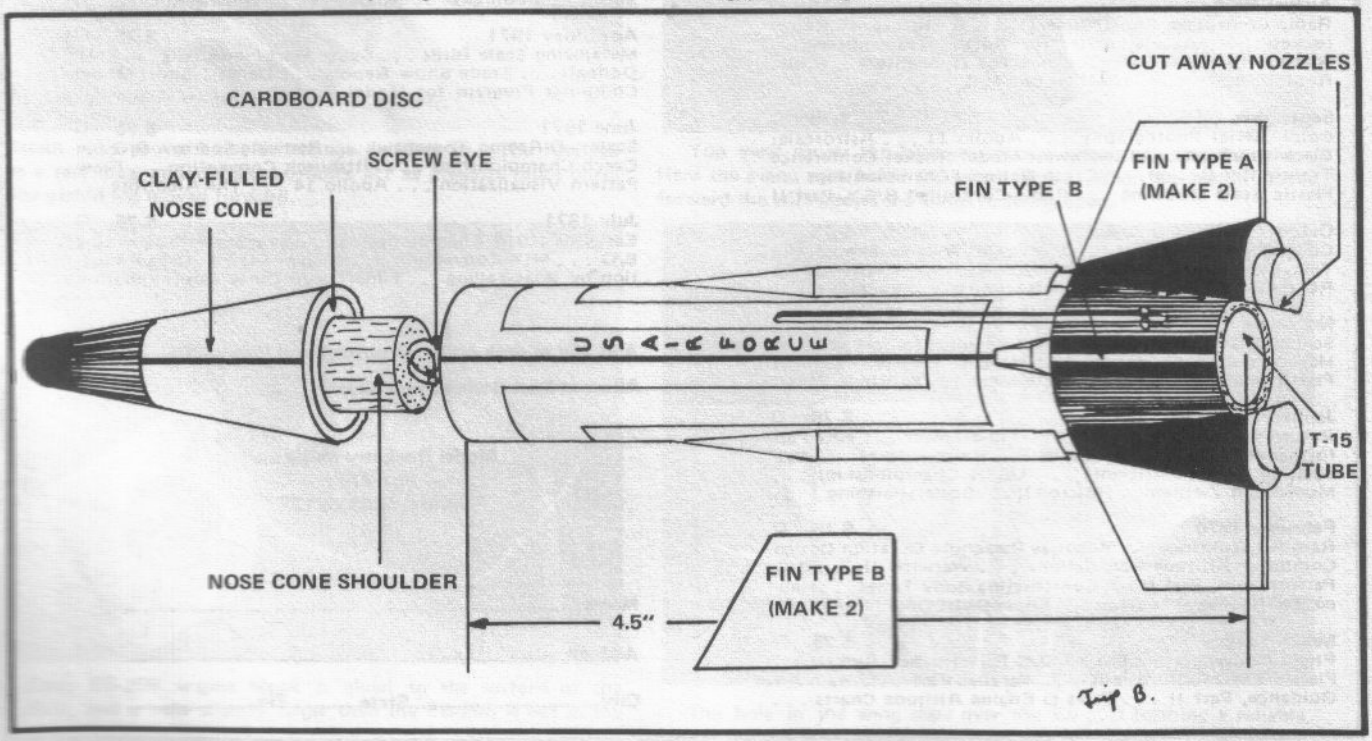
Clear plastic fins are glued to the missile body as shown in the plans. An 8" diameter chute is sufficient for recovery. Flights should be made with A3-4 or B3-5 Minijet engines.



A file is used to remove those portions of the Atlas nozzles which would interfere with the insertion of a Minijet engine.



T-20 tube is wrapped around the T-15 tube to act as a support ring, positioning the T-15 tube inside the Atlas body.



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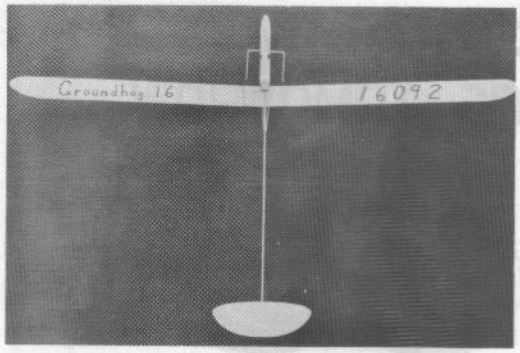
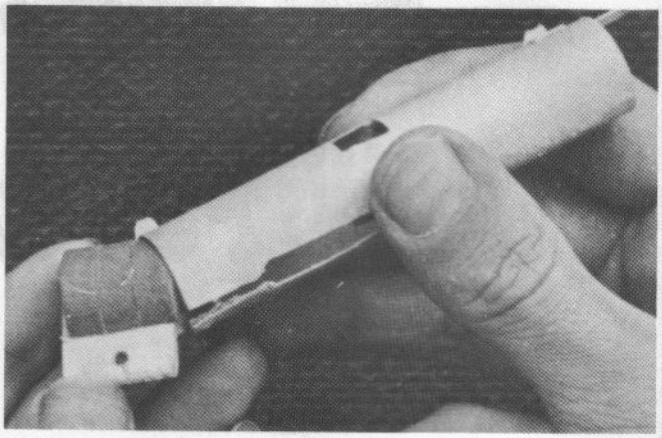


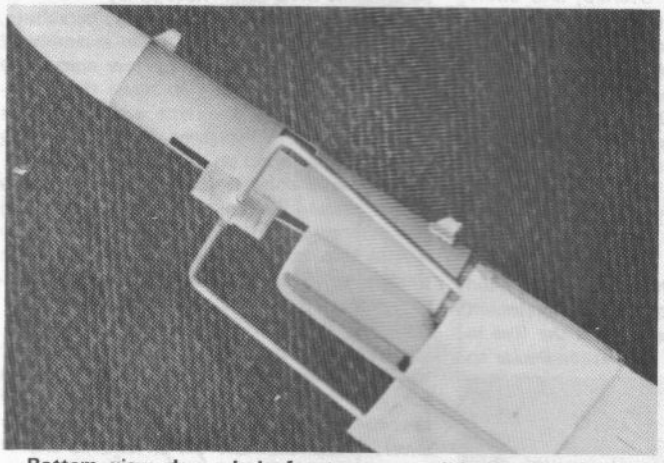
Hinge and Pod Detail
Ground Hog-16
By Jon Robbins

Since September, when plans for the Groundhog-16 Sparrow Rocket/Glider were published in **Model Rocketry**, many rocketeers have asked for more details about the hinge and pod systems. Since these systems are useful on all swing-wing R/G's these step-by-step construction photos were taken. They are designed to assist rocketeers in construction of the Groundhog and other swing-wings.

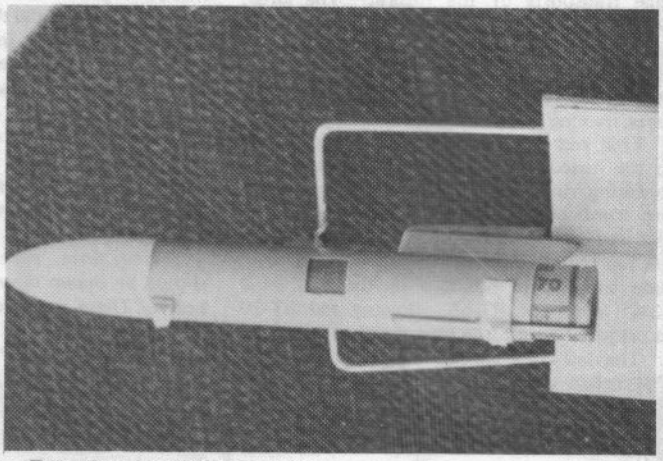
The pod is basically a Centuri No. 7 body tube slit halfway up its length, and a JT-20C paper tube coupler to which a spruce piston tounge has been attached. A bent wire hook, attached to the tounge, holds the wing folded. The Groundhog 16 pivot assembly is merely an Estes EB-20B engine block pivoting inside the circular hole cut in the wing.



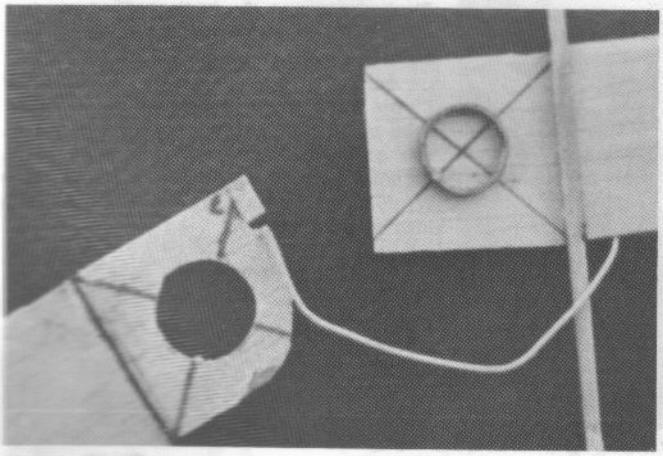
A spruce tounge, cut to the size shown in the September '71 issue, is glued to an Estes JT-20C coupler. A section is removed from the No. 7 tube to allow the tounge to slide freely forward and back.



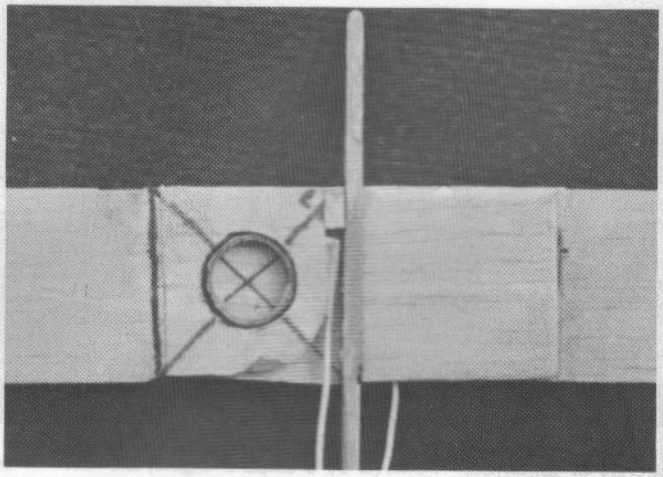
Bottom view shows hole for tounge to slide in. The fuselage acts as a rear stop and the square holes act as pressure relief ports after the piston has moved forward.



Top view shows the bent piano wire which actuates the wings. Here the piano wire holds the wings closed. When the piston moves forward the wire allows the wings to swing open.



A Estes EB-20B engine block is glued to the surface of the pivot plate, and a hole slightly larger than the EB-20B is cut in the wing.



The hole in the wing slips over the EB-20B forming a reliable, easy to build pivot assembly.

A HIGH-FLYING SPORT MODEL WITH THE LOOK OF A TRANSPORT AIRCRAFT OF TOMORROW....

FG-303 'ASTROLINER'

Designed by Philip Sheppard

The *FG-303 Astroliner* is a sport model simulating the appearance of high-performance transports of the future. The large, swept back fins and small forward canards give it the impression of speed, and make the *Astroliner* an attractive sport model. It can be easily assembled from only a few parts, making it a good model for beginners.

First put together the EH-2055 according to the instructions supplied. One cardboard centering ring should be located flush with the front of the BT-20 engine tube. The second ring should be glued in place 1" from the rear of the tube. When dry, the engine tube should be mounted in the rear of a 13½" length of BT-55, allowing the BT-20 to project 1" from the rear of the tube.

The tail cone shroud should be cut from light cardboard, such as an index card, using the template given in the plans. Glue the shroud together on the overlap, and allow to dry. Then slide the shroud onto the engine holder and glue in place.

The fins and canards are all cut from 1/16" thick sheet balsa. They should be sanded smooth with 400 grit sandpaper, and all edges except the edges which will be attached to the body or the fin units should be rounded (see plans). The "T-fins" should be glued in place on the main fins and allowed to dry.

Three lines, spaced 120 degrees apart, should be drawn down the length of the main body. These serve to locate the attachment points for the main fins. Glue the fins in place, making sure they are perpendicular to the body, and again let the unit dry. The canards should also be glued, 120 degrees apart, to the BNC-55AA nose cone.

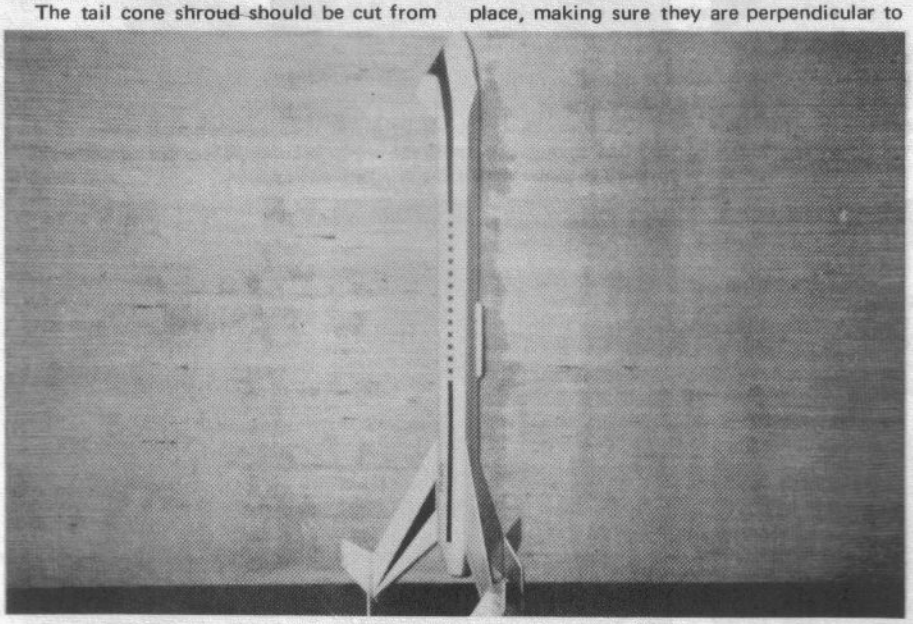
Add a screw eye, shock cord, parachute and a launch lug, and the basic assembly of the *Astroliner* is complete. Now comes the hard part — *finishing!* To make the *Astroliner* look like the futuristic aerial transport it is supposed to represent, it needs a paint job like those found on commercial airliners.

The basic color is flat white. The entire rocket should be sprayed flat white, using either spray cans of paint or an airbrush. Use several thin coats of paint rather than one thick one. This will improve the overall appearance.

When the white paint is completely dry, use masking tape to mask off the bottom of the *Astroliner* for its silver paint job. One fin, and the entire underside of the rocket between the other two fins should be painted silver. Near the nose the silver area should taper to a point (as shown in the photograph).

A flat red stripe down the length of the body increases the "airliner" appearance. Black squares on the fuselage simulate windows. Red triangular stripes on both sides of the two white fins complete the paint job.

An 18" chute should be used for recovery of the *Astroliner.* It can be flown with any type of 18 mm engine from ½A through C. For good performances use an A8-3, B4-4, or C6-5 engine. But don't use that C on windy days or your Astroliner will go drifting into the next county.



The FG-303 "Astroliner" is a sport model designed to look like the supersonic transport aircraft of tomorrow. Powered by a single C-engine, the "Astroliner" will reach altitudes in excess of 500 feet. The striped paint pattern and simulated windows help create the appearance of an airliner.

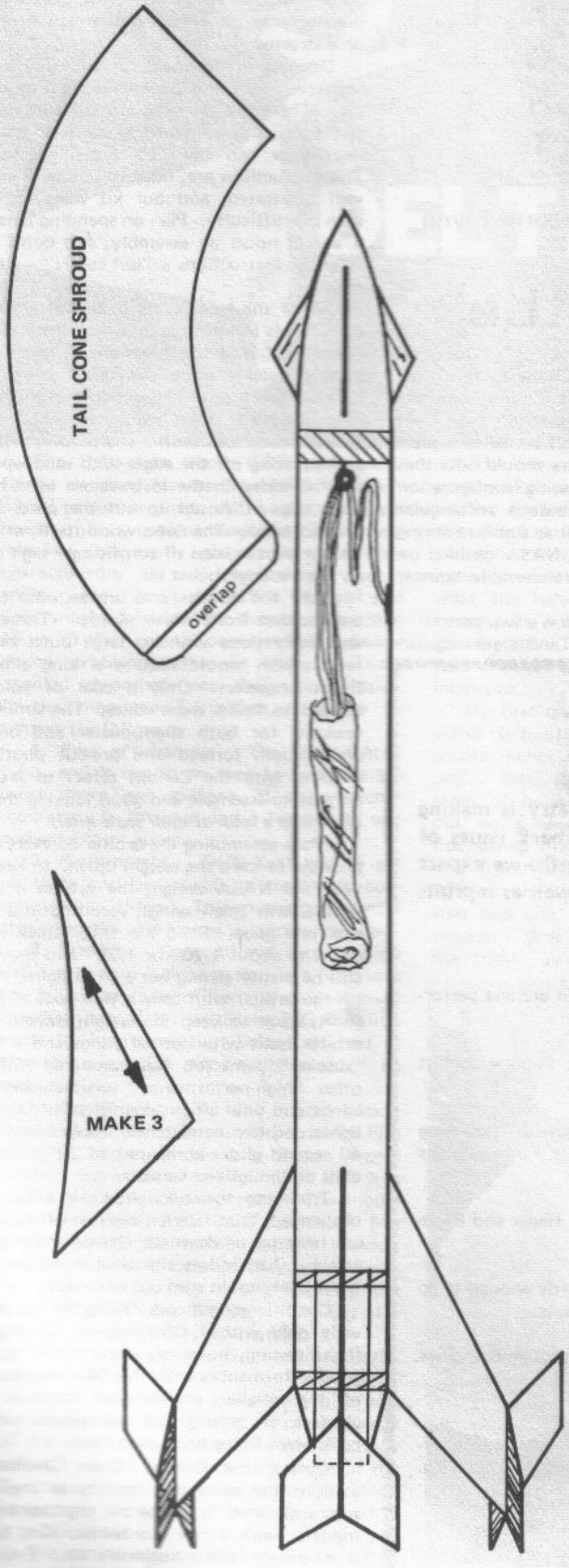
Parts List

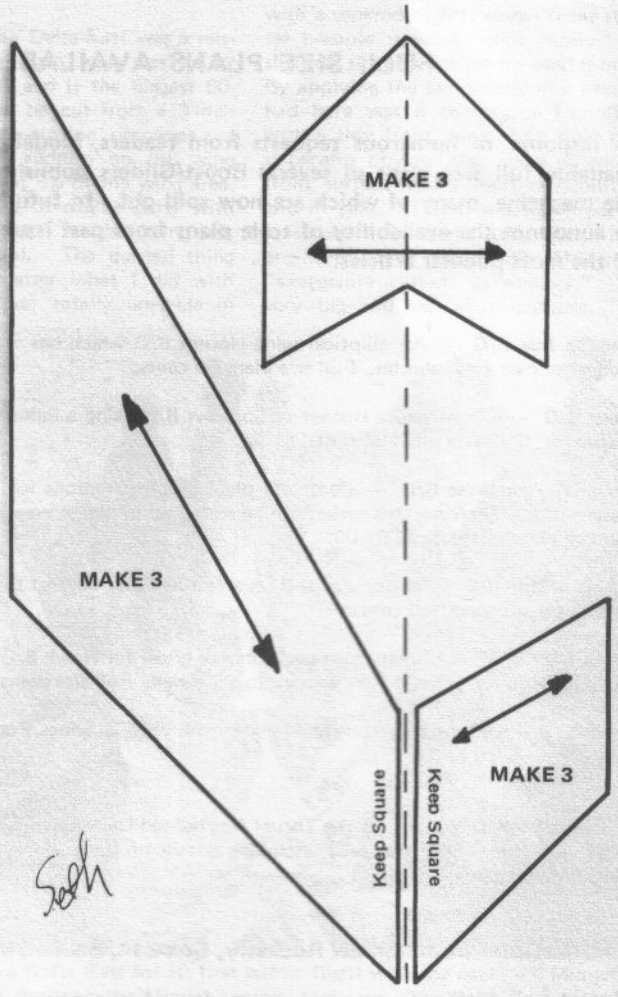
Body Tube (13½")	BT-55V
Nose Cone	BNC-55AA
Fin Stock	BFS-20L
Shock Cord	SC-1
Screw Eye	SE-1
Engine Holder	EH-2055
Parachute	PK-18
Launch Lug	LL-2B

(All Parts Available From Estes)

FG-303

Astroliner





FLIGHT TEST

by George Flynn

Centuri "Space Shuttle"

The Space Shuttle is the exciting new kit featured on the back cover of the current Centuri catalog. The kit makes use of several different types of materials to give an easy-to-assemble, good-looking model. Five years ago the only materials expected in a model rocket kit were balsa wood, and paper tube. The Space Shuttle makes use of vacuum formed plastic cockpits as well as molded plastic nose cones on both sections to supplement the balsa and paper parts.

The Space Shuttle was designed by Larry Brown, of the Centuri R & D Department, who used the several different contractor proposals for NASA's Space Shuttle as the basis for this model. Since NASA hasn't yet finalized the design, it can't be called a scale model. However rocketeers should note that Larry selected the delta wing configuration for Centuri's shuttle because a rectangular wing booster was "difficult to stabilize during boost," and months later NASA decided on the delta wing for their recoverable booster for the same reason!

Centuri's Space Shuttle is a two part kit — a delta-winged "booster" and a rectangular-winged "orbiter." Both sections employ [illegible] gliding recovery, as do the NASA prototypes. Unlike the real Space Shuttle, the engine [illegible] mounted in the orbiter, which lifts the booster into the sky. At ejection the model separates into three parts — the orbiter, the booster, and an engine pod which descends on a streamer.

Opening the box will convince any model rocketeer that the Shuttle is no beginner's kit. There are 41 separate steps in the instructions, and even a rocketeer with a year's experience will find this a challenging kit. The instructions are, however, quite clear and well illustrated, and our kit went together with no difficulty. Plan on spending between 4 and 8 hours on assembly, and don't consider the instructions a "last resort" — *follow them!*

All of the balsa parts in the kit are "die-cut." This is a process by which the parts are "punched" into the balsa sheet, making assembly quicker since you don't spend time cutting them out. However the edges are more "ragged" than would be obtained if you cut them out with a sharp X-Acto knife, and squaring off the edges with sandpaper as recommended in the instructions takes more time than it would to cut the parts from printed balsa. The balsa wood itself, at least on our shuttle, was of surprisingly high quality for a model rocket kit.

Both the booster and orbiter nose cones are molded from white plastic. The cones are nicely done with no large butts or defects which would require a long time to finish properly. Only a coat of paint is needed to finish these cones. The simulated cockpits for both the booster and orbiter are vacuum formed and pre-cut plastic in keeping with the Centuri effort to provide an easy-to-assemble and good looking model. *(Just take a look at their scale kits!)*

When assembling the orbiter do everything possible to keep the weight down. In keeping with the NASA design, the orbiter is a big model with small wings, resulting in a high sink rate glide. Sand the 1/16" thick wings down to about 1/20" or 1/25" and they will still be plenty strong but a little lighter. Finish the orbiter with only a thin coat of spray paint, again to keep the weight down. One orbiter built with normal wings and a thick "display" paint job was compared with another "high-performance" version using thin wings and only a light coat of paint, and the lighter orbiter consistently turned in 30 to 40 second glides compared to 20 to 25 seconds on the heavier version.

Trimming the two gliders is a bit of a challenge. Trim tabs on the rear of the wings are bent up or down to change the angle of attack. Just follow the clear directions, and the model should trim out with ease.

Centuri recommends flying the Space Shuttle only with a C6-3 engine. During our flight testing, however, it turned in equally good performances with the B4-2 engine. Use of the smaller engine also increases the chances of getting the lightweight orbiter back when flying on a small field.

Overall the Centuri Space Shuttle kit exhibits the same high quality as their Saturn scale line. It can be put together by any modeler with a few kits behind him, but it is definitely *not* a beginners kit. Even the experienced modeler will find this one fun to assemble and fly.

FULL SIZE PLANS AVAILABLE

In response to numerous requests from readers, Model Rocketry is making available full size plans of several Boost/Gliders published in back issues of the magazine, many of which are now sold out. In future months we expect to announce the availability of scale plans from past issues, as well as reprints of the most popular articles.

Bumble Bee B/G - An elliptical wing Hornet B/G which has turned in contest performances of over two minutes. Full size plans 50 cents.

Wasp B/G - A lightweight Hornet or Sparrow B/G using a balsa boom. Popular contest performer. Full size plans 50 cents.

Dove III Flop-Wing B/G - Complete plans and instructions for the Dove III flop-wing Designed as a Sparrow, this rocket can be scaled up to higher power events. Full size plans and complete instructions $1.00.

Thunder-Bird B/G - A popular and reliable fixed-pod contest bird for Hawk and Eagle B/G. Full size plans 50 cents.

Space Dart B/G - A small, high-performance glider for Hawk B/G. Sturdy enough to go for high altitudes, yet still light enough to glide well. Full size plans 50 cents.

Bat B/G - An attention-getting sport glider with unusual wings. For ½A through B engines. Full size plans 50 cents.

TAD Scale Plans - Plans for the Thrust Augmented Delta satellite launch vehicle (a Thor-Delta with three solid strap-ons), including details on dimensions, lettering, and coloring. Plans only 50 cents.

Order from: Model Rocketry, Box 214, Boston, MA 02123

CANARD B/G FOR 1/2A

DELTA-KATT

By G. Harry Stine

The Delta-Katt Boost Glider was specifically designed for the new MPC "minijet" model rocket engines. Although these small model rocket engines have the same total impulse and nearly the same thrust-time characteristics as the larger model rocket engines, their small size (13 x 57 mm) and light weight (about 45% that of a standard 18 x 70 mm engine) pose certain technical design problems while at the same time opening up entirely new design possibilities. In designing the Delta-Katt, I strove to achieve the following:

1. *Ease of assembly.* The Delta-Katt is a kit, and it has to be easy to assemble because there are millions of balsa-butcher modrocers in America and a fraction of one percent expert purists.

2. *Performance.* Delta-Katt had to get up there and be capable of turning in contest-winning times. This meant good boost characteristics and low wing-loading for glide.

3. *Stability.* Conventional configuration B/G's with zero-incidence stabs are notorious for failing to recover from dives and make excellent entries for the Stuka B/G Duration event in funny meets. Delta-Katt had to have built-in glide stability because of its small size.

4. *Appearance.* As any model rocket manufacturer will tell you, if you catch him with his finger off his sales figures, front-engined conventional-configuration B/G kits simply do not sell very well. The model rocketeers think they look too much like airplanes, and the model airplane builders won't touch them because they are rockets. Delta-Katt had to look "like a rocket ought to look" or at least like something out of a NASA future projects presentation.

The answer was the *front-engined delta-winged canard.*

Aerodynamically, a delta wing planform is not very sensitive to trim. It can go nearly all the way up to 45 degrees angle of attack before it stalls. Of course, the slope of the C_l curve isn't as steep as for a long, high aspect-ratio wing. But it is pretty insensitive as to CG location.

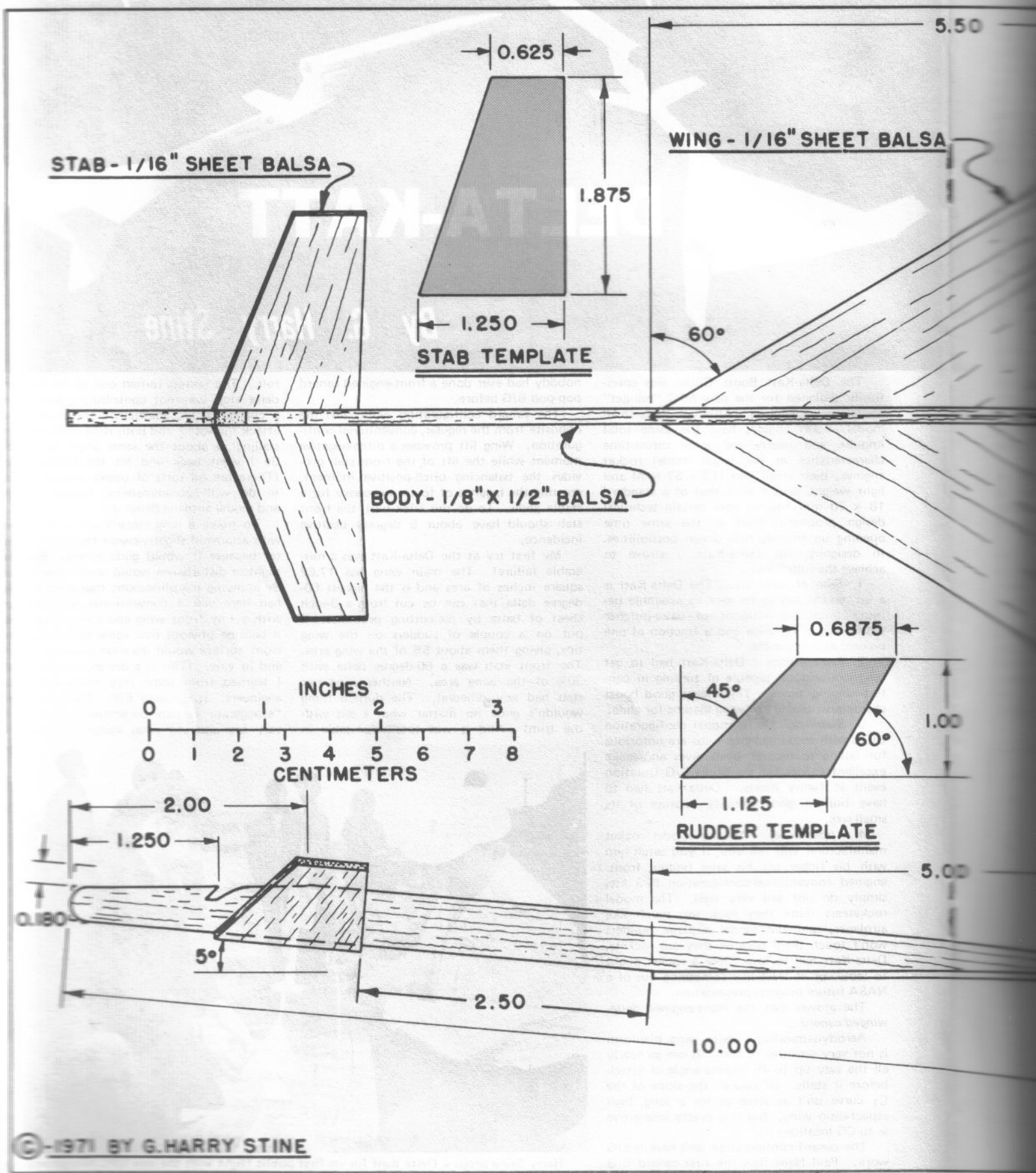
The canard configuration isn't new in B/G work. Paull Hans flew the first canard B/G back in 1962, and Centuri had a rear-engined canard B/G kit about 6 years ago. But nobody had ever done a front-engined canard pop-pod B/G before.

The canard configuration works just the opposite from the regular, conventional configuration. Wing lift provides a pitch-negative moment while the lift of the front stab provides the balancing pitch-positive moment, creating the balance of forces necessary for a stable glide. To do this trick best, the front stab should have about 5 degrees positive incidence.

My first try at the Delta-Katt was a miserable failure! The main wing has 17.62 square inches of area and is the biggest 60-degree delta that can be cut from a 3-inch sheet of balsa by die-cutting processes. I put on a couple of rudders on the wing tips, giving them about 5% of the wing area. The front stab was a 60-degree delta with 30% of the wing area. Neither wing nor stab had any dihedral. The durned thing wouldn't glide no matter what I did with the trim! And it was totally unstable in roll. The reason turned out to be that the delta stab was not contributing enough of a change in lift coefficient as the angle of attack increased, and both wing and stab were stalling at about the same angle of attack. So I went back and hit the books again. (There are all sorts of books around having to do with aerodynamics, aircraft design, and model airplane design.)

To make a long story short, I ended up with a tapered slightly-swept front stab. Better because it would glide nicely. But the slightest disturbance would send it into a roll. By applying the philosophy that what I really had here was a conventional configuration with a tiny front wing and a huge rear stab, it became obvious that some dihedral in the front surface would improve stability in roll and in yaw. (This is a design process which I learned from some very sharp industrial engineers. It is called ESP. That stands for "exaggerate system parameters." Make it very big and see what happens. Make it

Harry Stine preps a Delta Katt for its first public flight with the new MPC Minijet engines. Mike Bergenske, who designed the Minijet engines, looks on. The Delta Katt turned in a 35 second flight on an A engine on this launch at the MIT Convention.


0.625
1.875
1.250
STAB TEMPLATE
5.50
WING - 1/16" SHEET BALSA
STAB - 1/16" SHEET BALSA
60°
BODY - 1/8" X 1/2" BALSA
0.6875
45°
60°
1.00
1.125
RUDDER TEMPLATE
INCHES
0 1 2 3
0 1 2 3 4 5 6 7 8
CENTIMETERS
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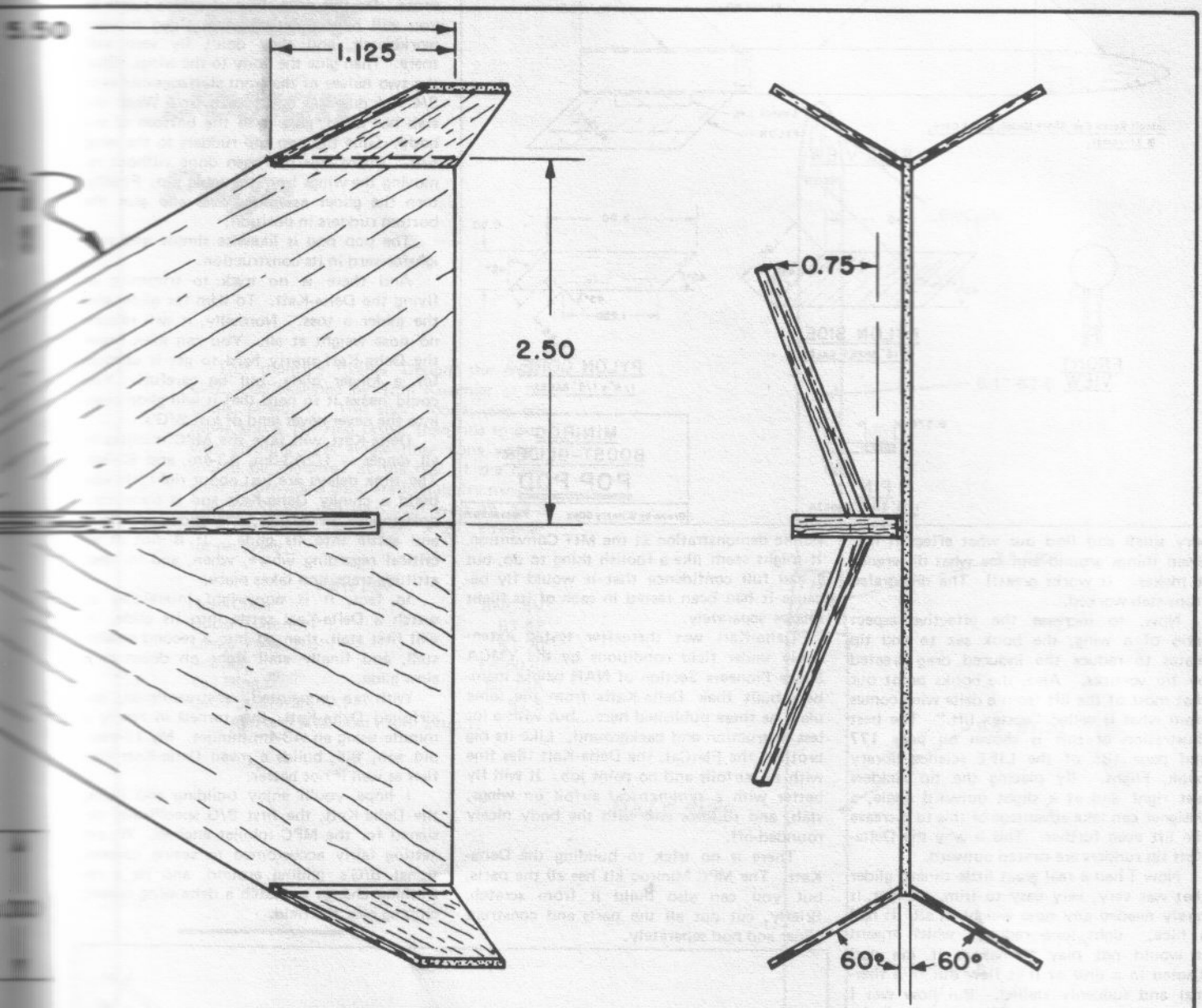
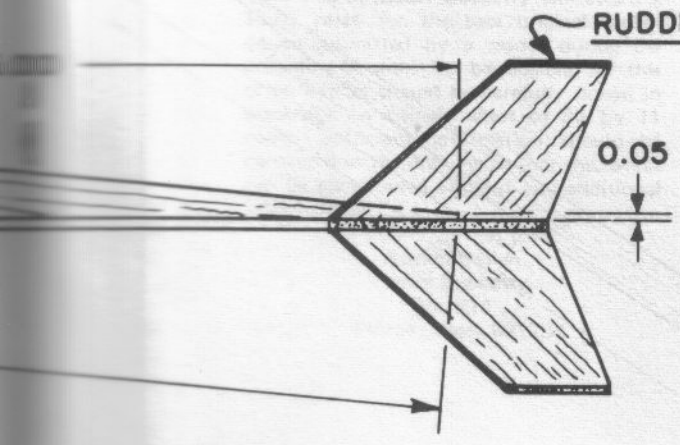
© 1971 BY G. HARRY STINE



ALL DIMENSIONS IN INCHES

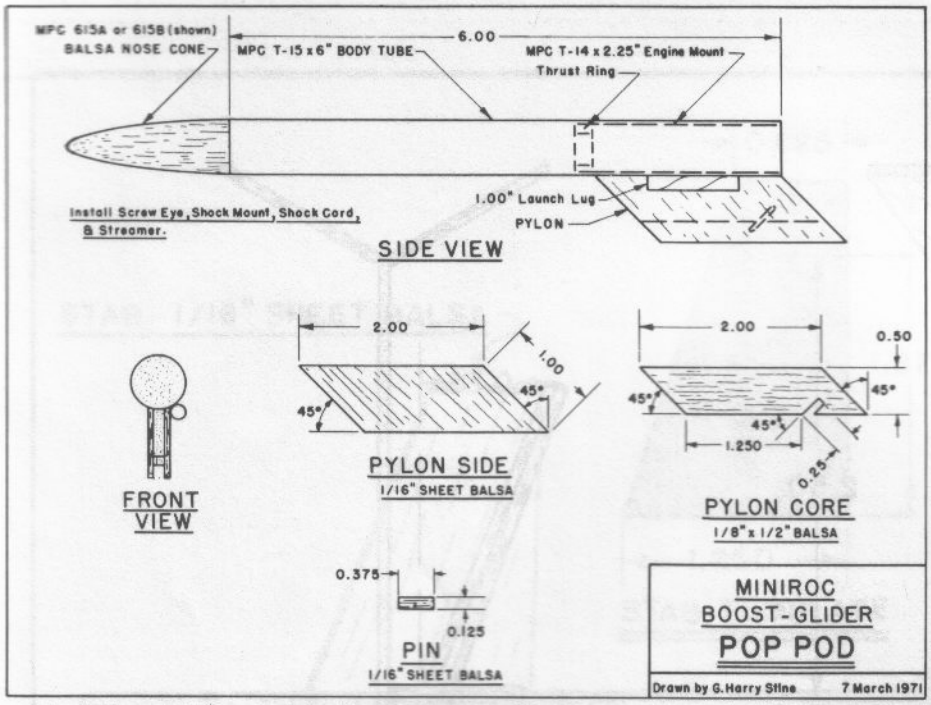


DELTA - KATT

BOOST - GLIDER

GLIDER PORTION

DRAWN BY G. HARRY STINE 6 MARCH 1971



very small and find out what effect it has. Swap things around and see what difference it makes. It works great!) The dihedraled front stab worked.

Now, to increase the effective aspect ratio of a wing, the book sez to add tip plates to reduce the induced drag created by tip vortices. Also, the books point out that most of the lift from a delta wing comes from what is called "vortex lift." The best illustration of this is shown on page 177 and page 185 of the LIFE science library book, **Flight**. By placing the tip rudders just right and at a slight outward angle, a designer can take advantage of this to increase the lift even further. This is why the Delta-Katt tip rudders are canted outward.

Now I had a real great little canard glider that was very, very easy to trim. In fact, it rarely needed any nose weight at all. It had a nice, tight loop radius, which meant it would not play Kamakaze if the pod ejected in a dive or if it flew out of a thermal and suddenly stalled. But how was I going to get a straight boost out of the bloody thing with the 5-degree incidence in the front stab?

Answer: (which did not come by study but from a sudden creative inspiration) put the pop pod at the same incidence as the wing and put the boost CG right over or near to the center of lift of the front stab. This would give the stab a short or non-existent pitching moment during boost, and any looping tendency of the stab would be very small.

The result looked weird. But would it work? The only MPC minijet engines I had were early prototypes without delays, essentially dash-zero boosters. I could at least check the boost phase stability (the glide phase was already tested) and could hopefully assume from past experience that coast phase stability would be pretty much the same as boost phase. So I tried it. WHOOSH-POP! Yup, it worked. And the glider did a couple of quick little loops as it settled down into a stable glide.

The first time Delta-Katt was tried full-bore was with a Type A3-4m minijet in a public demonstration at the MIT Convention. It might seem like a foolish thing to do, but I had full confidence that it would fly because it had been tested in each of its flight phases separately.

Delta-Katt was thereafter tested extensively under field conditions by the YMCA Space Pioneers Section of NAR whose members built their Delta-Katts from the same plans as these published here....but with a lot less instruction and background. Like its big brother, the FlatCat, the Delta-Katt flies fine with no airfoils and no paint job. It will fly better with a *symmetrical* airfoil on wings, stab, and rudders and with the body nicely rounded-off.

There is no trick to building the Delta-Katt. The MPC Miniroc kit has all the parts, but you can also build it from scratch. Briefly, cut out all the parts and construct glider and pod separately.

Glue the two wing panels together at the roots. Do this on a sheet of waxed paper or you will have a set of wings glued to your workbench, and they don't fly very well there. Then glue the body to the wings. Glue the two halves of the front stab together with 3/4" of dihedral under each tip. When the stab has dried, glue it to the bottom of the body. Glue the two top rudders to the wing tips. All of this has been done without removing the wings from the table top. Finally, turn the glider assembly over and glue the bottom rudders in position.

The pop pod is likewise simple and straightforward in its construction.

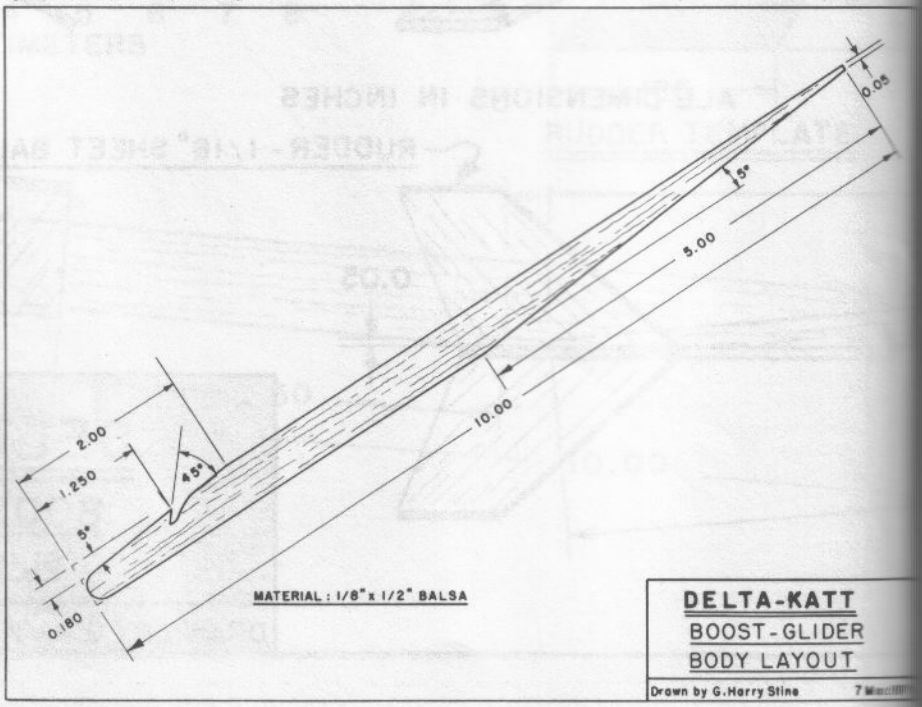
And there is no trick to trimming or flying the Delta-Katt. To trim for glide, give the glider a toss. Normally, it will require no nose weight at all. You can even heave the Delta-Katt pretty hard to get it upstairs for a longer glide, but be careful! You could heave it so hard that it will glide away into the never-never land of lost B/G's.

Delta-Katt will take the MPC minijets in all ranges — 1/2A3-3m, A3-4m, and B3-5m. The time delays are just about right. If you build a clunky Delta-Katt and it transitions post-apogee in a dive, the glider will loop and settle into its glide. It is not at all critical regarding where, when, and in what attitude transition takes place.

In fact, it is downright interesting to watch a Delta-Katt settle into its glide. It will first stall, then go into a second smaller stall, and finally stall right on down to a slow glide.

With an unpainted, unstreamlined, unairfoiled Delta-Katt, I've turned in nearly a minute using an A3-4m minijet. My 11-year-old son, Bill, builds a mean Delta-Katt that flies as well if not better.

I hope you'll enjoy building and flying the Delta-Katt, the first B/G specifically designed for the MPC minijet engines. We are getting fairly accustomed to seeing conventional B/G's gliding around, and its a refreshing change to watch a delta-wing canard circling over the field.



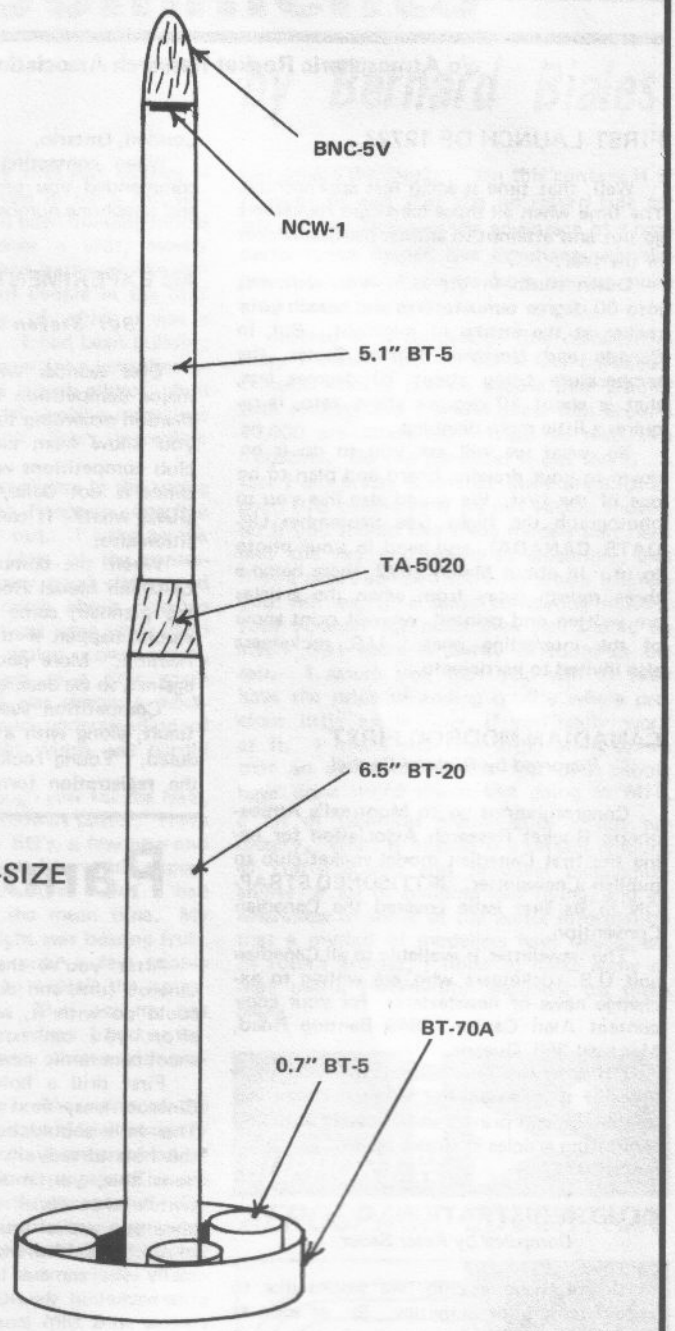
Reader Design Page

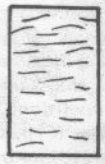
This month's Reader Design, the *NERGAL*, was designed by Tom Kuechler of St. Louis, Missouri. This sport model uses tail tubes and a tail ring rather than fins to provide stability. A single nose cone weight should be mounted at the rear of the nose cone to provide a good static stability margin. The *NERGAL* can be flown with an A8-3 or B6-4 engine, using a 2" x 20" streamer for recovery.

Parts List

Nose Cone	BNC-5V
Upper Tube (5.1")	BT-5P
Lower Tube (6.5")	BT-20
Adapter	TA-5020
Tail Ring	BT-70A
Loop Stabilizers (0.7")	BT-5

(All Parts Available From Estes.)





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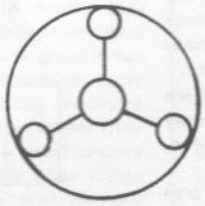


REAR VIEW

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

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

UPDATE CANADA

c/o Atmospheric Rocket Research Association, 7800 des Erables Ave., Montreal, 329, Quebec

FIRST LAUNCH OF 1972?

Well, that time is again fast approaching. The time when all those hard-core rocketeers go out and attempt to launch the first rocket of the year.

Down south in the U.S., you walk out into 80 degree temperatures and launch your rocket at the stroke of midnight. But, in Canada and Northern United States, the temperature being about 70 degrees less, that is about 10 degrees above zero, it requires a little more planning.

So, what we will ask you to do is go down to your drawing board and plan to be one of the first. We would also like you to photograph the flight (see September UPDATE CANADA), and send in your photo to us. In about March 1972, there being a three month delay from when the articles are written and printed, we will print some of the interesting ones. U.S. rocketeers also invited to participate.

CANADIAN MODROC FIRST

Reported by Richard Carmel

Congratulations go to Montreal's Atmospheric Rocket Research Association for being the first Canadian model rocket club to publish a newsletter. JETTISONED STRAP-ON in its first issue covered the Canadian Convention.

The newsletter is available to all Canadian and U.S. rocketeers who are willing to exchange news or newsletters. For your copy contact Alan Cantor, 6849 Banting Road, Montreal 269, Quebec.

Other clubs are invited to send us a copy of their newsletter when it comes out so that we can print a short review of it, and interesting articles in future issues.

CLUB REGISTRATION

Compiled by Peter Sauer

If you have a club, we would like to know about your activities. So, as soon as possible send us the name of your club and tell us what you've been doing.

We are a model rocket club that is interested in coming in contact with other high school clubs in the Montreal area for the purpose of competition. Interested clubs may contact the JFK High School Aerospace Club, 3030 Villeray, Montreal 453, Quebec.

Rocketeers in the Ottawa area who are interested in becoming part of a club may write: S.O.A.R., c/o Mr. Bruce Bourne, 1936 Haig Drive, Ottawa, Ontario.

Rocketeers in the London, Ontario area interested in a club may contact the Canadian Progressive Rocketry Association, c/o Mr. David Schenck, 304 Beachwood Avenue, London, Ontario.

When contacting these people, it is recommended you send your name, address, and telephone number.

AN EXPERIMENT

By: Steven J. Kushneryk

Ever wonder what would happen at a major competition if there were no classification according to age. Of course a lot of you know from experience, at your own club competitions where classification sometimes is not done, that it can work well. Guess what? It can work at major competition also.

When the competition for the Second Canadian Model Rocket Convention was being planned, some people wondered what would happen if there were no age classification. More people were in favor than against, so we decided to give it a try.

Competition events from simple to difficult, along with a funny event, were scheduled. Young rocketeers were warned on the registration form to build one or two good models rather than half a dozen losers. None of the younger rocketeers heeded our warnings, and brought along suitcases filled with rockets.

During safety inspection the night before competition, it was noticed that almost all rockets were of good quality.

Then, during the competition, to our amazement and contrary to common belief the young rocketeers gave the older ones a good run for the money and even beat them out in some events. Most Americans reading this article would say this is because of the poor caliber of Canadian competitors. Bite your tongues! Don Larson, NAR D Division, and Rod Simons, NAR A Division, were both third in NAR point standings at the time of the convention, and were both at the competition up from Virginia.

They were both given good competition, and in some cases were beat out by younger Canadian and American rocketeers.

The whole idea, besides being an interesting experiment, was a lot of fun. We would recommend that other organizations try this idea at some of their events. It will help younger rocketeers to grow out of their age groups a little faster. They will not

Panoramic View Cineroc

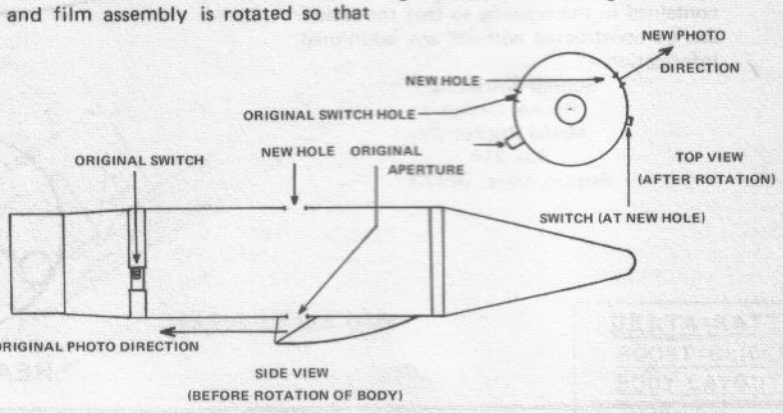
by Steven J. Kushneryk

After you've shot hundreds of feet of Cineroc film, and done all the research you could do with it, what then? With a little effort you can convert your Cineroc to shoot panoramic views of the horizon.

First drill a hole, the same size as the Cineroc lens, next to the mirror housing. This hole should be at the same height as the hole already in the tube. Once you've done this, you must cut a notch for the switch that turns the on Cineroc. This gives you a dual prupose Cineroc. When the motor and film assembly is inserted normally the camera looks down the side of the rocket in the normal manner. When the motor and film assembly is rotated so that it "looks" out the new hole in the side of the body the camera will shoot a panoramic view of the horizon.

Although this conversion requires precise measurements and careful skill, the end product, a panoramic horizon view Cineroc, is an excellent reward.

I have shot films showing the launch crew, the person turning on the camera and running away, and a beautiful overall view of the horizon. With some film splicing one can make a fantastic film out of several lights, depicting the flight of Cineroc from two different views. You might even add ground shot film of flights into the film.



always win the events they enter, but it will make them try harder. It perhaps will bring up the standard of the young competitor.

I realize clubs in the United States may have trouble with this, because it is not done in NAR sanctioned events. But, in Canada our national model rocketry organization CAR is so backward that it does not sanction or support competitions. In a way it made our experiment easier. To Canadian rocketeers, it shows you that you can still make a go of it. So, GET UP AND GO!

CRS B/G TRIALS

Toronto's Canadian Rocket Society sponsored a Boost/Glide Trials on Sunday, August 22nd with 200 contestants and spectators from Canada and New York State in attendance. The first issue of *CRS mitter*, the new CRS newsletter, provides the following account:

"Thanks to a half page article in the Toronto *Star*, a huge crowd turned up to witness the meet. Also in attendance were rocketeers from the Kenmore-Tonawanda Rocket Society (Buffalo, NY) and the Monroe Astros (Rochester, NY).

"The first event witnessed the setting of a possible new world record in Gnat boost/-glide. The boggling flight of 140.6 seconds on a ¼A was turned in by Eric Johnson of the KTRS. Using a new ¼A mini-engine, he was able to get an extremely small glider high into the sky.

"After only a few racks of flying, a storm front moved towards the field. All of a sudden the wind picked up scattering papers, and lifted a tent out of the ground. The site was evacuated just before the lightning and rain came, and the meet was rescheduled to Sunday, August 29th.

"For the first time in Canada the high-powered Eagle and Condor B/G events were flown. Only two Condors left the pad, and both were DQ'ed. Fritz Gnass' three-stage Thunderbird disintegrated just after staging, though he did bring back some of the bigger pieces. Arny Sokoloff's Condor was a swing-wing which lost a wing on the way up and pinwheeled into the ground.

"Eagle was won by Paul Shindman. He flew an ejected swing-wing with a flop stab and rudder. The timers lost it after 68 seconds, and Paul gave up looking for it after half an hour."

The Canadian Rocket Society has an active competition schedule planned for the upcoming year. Interested rocketeers can contact the CRS at PO Box 396, Adelaide St. Post Office, Toronto 1, Ontario, Canada.

ARTICLES NEEDED

Since UPDATE CANADA started in June we have had almost next to no articles submitted. Most of the ones you have seen have been written by the UPDATE CANADA staff.

If you think you have anything interesting, we would like to hear about it. Send your articles to:

UPDATE CANADA
7800 des Erables Avenue
Montreal 329, Quebec

Current Comments

by Bernard Biales

When I went to my first real contest — the '66 Nationals — I was in for a real surprise. At the time, I had been building model rockets for a little over a year, mostly boost-gliders. I had seen some of the impressive workmanship of people in the MIT Tech Model Aircrafters, of which I was a fairly inactive member. I had been building very simple model airplanes for a long time — mostly plastics and had launch gliders. And I had read a lot of model airplane magazines and poured over Frank Zaic's incredible yearbooks.

I started flying boost-gliders in the spring of '65, about the time Renger's superfine *FlaminGo* design came out. I went to the Nationals and wow! Most of the contestants weren't making very good gliders and didn't know all that much about how to fly them. Obsolete designs were used; hand launch techniques of design, construction, and trim were unknown at a time when the best design around was simply a modification of the HLG; and understanding of the rich behavior of the winds was hardly to be found.

'66 was kind of a rough year for the Nats, and NARAM-9 was somewhat better. There were more Renger-type BG's, a few new and promising faces, and some interesting experimental radio-controlled BG's. But I had learned quite a bit in the mean time. My fanaticism for light weight was bearing fruit, and I felt there were only a few people exploiting or working to exploit the potential of the B/G event. That was my last NARAM until this year, where I had an opportunity to compare past designs with current trends.

Where are we today? The status of the sport has improved. We have **Model Rocketry** magazine. The names of a number of bright glider experts appear on its pages. The old clumsy designs have mostly disappeared. Big, high energy designs that sometimes even work are being launched. The Rocket/Glider event provides a new twist. New varieties of engines are available. Design has entered a period of creative ferment. Yet, if we are not quite in a state of complete paupery, where is our wealth? I couldn't come up with the names of a dozen really hot experts competing today — there was maybe half that number at NARAM. Out of nearly 200 Eagle BG's maybe 10% were better than mediocre — there was only *one* good time. There even seems to be a pernicious cycle involving good modellers building mediocre gliders. I believe that one of the reasons they do this is because they have a good chance of placing with mediocre gliders when flying against weak competition — and perhaps have time left over for other activities. This can further mislead younger modellers and can debase the sport. (In this context it is relevent to add that the no return rule for BG actually increases the advantage of a high performance model, but simultaneously discourages some modellers from putting much effort into their B/G's.)

Instead of a handful of fine competitive flier, I would like to see a few hundred. Consider that a million people *play around* with rockets and I would guess that around 40,000 are interested enough to read this magazine. So the potential is out there. In fact I am pretty sure that there are a lot of good B/G people who are not widely known. So if you should like these models that flash into the sky and return so gracefully, and if you desire competition with others (though you will be, in a sense competing mostly with yourself for now) then you should be aware that there is plenty of room at the top. I assure you that you will at least have the pride of adding quality where precious little exists now, if you really work at it. I might add that although it seems that an awful lot of the top B/G people have done weird things like going to MIT, a lot of technical mathematics is not necessary. What is needed is a certain amount of craftsmanship and practical mechanical ability, a lot of building and flying, and an awareness of some of the useful information that a myriad of modellers have developed. In future articles, I hope to make some of that useful information available on these pages.

TECHNICAL REPORT

A Free-Flight Technique For Boost Glide Analysis

by Dr. Gerald Gregorek

Boost/Gliders offer the most difficult aerodynamic challenge in model rocketry. The gliders are rocketed to high altitudes at speeds approaching 200 ft/sec, then descend (hopefully) in a slow steady glide. This wide speed range causes the aerodynamic loads to change rapidly throughout the flight profile, making correct trim and high overall performance difficult to attain.

In order to cope with these flight control requirements, which often include a sizable weight change if the rocket engine is ejected, several boost/glider configurations have evolved in the past decade. Typical glider designs have included delta wing concepts, flying wing models, canard and conventional configuration. Each glider design has its advocates who build a specific type because of some past success, or because of a long series of practical aerodynamic developments, or just possibly because of a personal prejudice. Rarely is the choice of glider configuration based upon an enginnering evaluation which proves a particular design to be best. This is not to fault model rocketeers — neither the technical skills nor the experimental equipment to perform their evaluations are readily accessible to young model rocketeers. In fact, if any group could be charged with dereliction of duty it would be model airplane enthusiasts who have been building gliders for more than 50 years and still do not have a good technical base from which to design hand-launched gliders.

The purpose of this paper is to alert model rocketeers to a free flight technique which can be used to judge particular glider designs. It is a method which lends itself to direct quantitative evaluation, giving the flight speed, glide slope, lift to drag ratio, and lift and drag coefficients of the glider design being tested. Further, just two pieces of apparatus are necessary, a camera and a bright light pulsing at a known frequency. Both pieces of equipment are available to high school physics labs; for that matter, many high school dance bands use strobe lights for special lighting effects which could serve as an adequate light source. Cameras, likewise, are usually available to most rocketeers.

Another attractive feature of free flight methods is the potential for improved accuracy of force measurement. A boost/glider with a 20 square inch wing flying at 15 ft/sec has a drag less than 2 grams; lift for the glider would be about 10 grams. Even in a wind tunnel, under controlled conditions, these small forces, due to the small size and low flight speeds, would be difficult to measure.

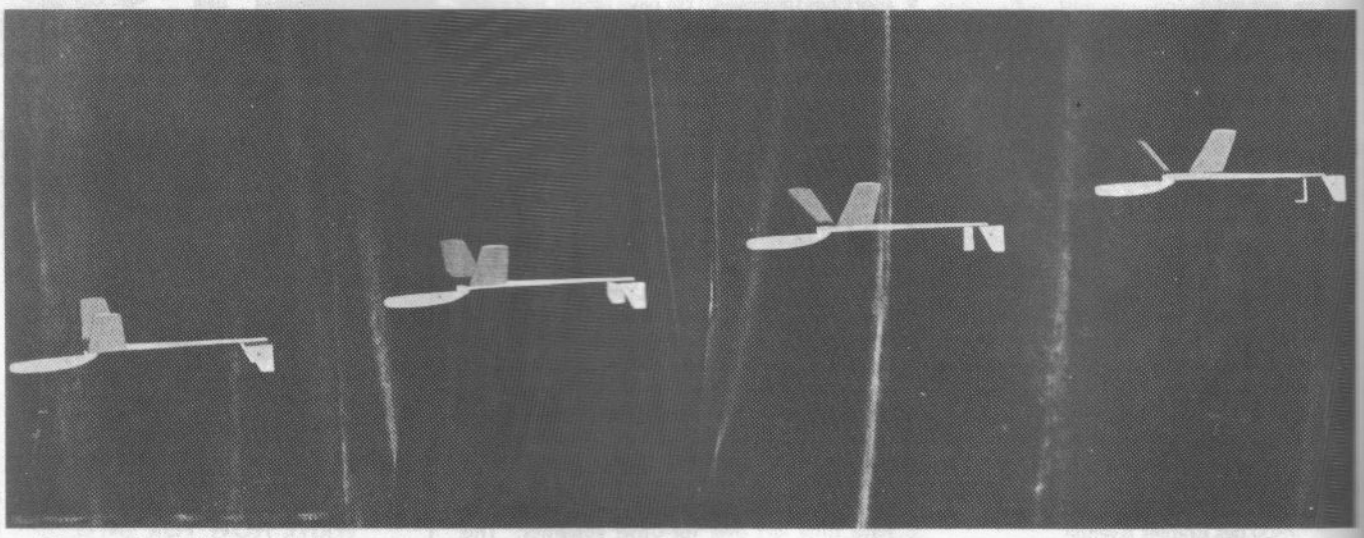
In spite of these favorable characteristics of a simple and economical apparatus and improved precision of measurement, questions quite naturally arise about the use of free flight techniques. For example, how accurately can the model be flown along the proposed flight path and what is the effect of deviations from this path? What is the required precision of measurement of time and distance flown? Will launch errors be difficult to account for? These and other practical questions — such as the type of film to be used and the correct camera exposure settings — must be answered for an evaluation of the free flight technique. And it is to these questions that the experimental program was addressed.

The test program was conducted in three phases. The first phase dealt with the operational problems of camera and lighting techniques. Once correct procedures were established, the free flight performance of three gliders with equal wing areas but different aspect ratio was compared. Finally, a single glider equipped with a moveable weight was flown to examine the flight speeds and glide slopes of the glider as the center of gravity was varied.

EXPERIMENTAL PROGRAM

Test Equipment and Procedures

Just two pieces of equipment were required to conduct the test: a Strobotac to provide a light source pulsed at a known frequency, and a 35 min single lens reflex camera. In order to prevent wind currents from affecting the results, the tests were conducted indoors.



Photos of B/G's during glide taken using the "free flight strobe photography" technique allow accurate measurement of the glider velocity and angle of attack. Simple reduction of this data allows the significant parameters to be determined.

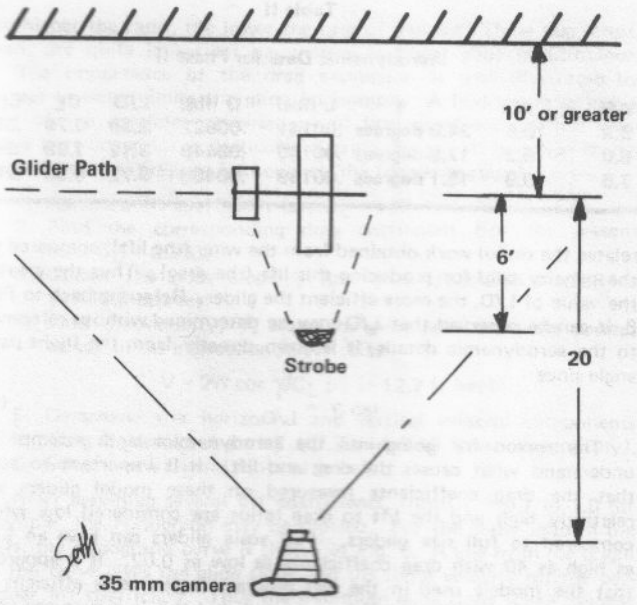


FIGURE 1: This arrangement of the strobe unit, camera, and glider was found to be the most successful during testing.

This also allowed the room to be blacked out so the tests could be conducted during daylight hours. (Alternatively, the tests could be conducted on a calm night outdoors). The black out requirement is necessary because the shutter to the camera is opened for 1 to 2 seconds while the light is pulsed to illuminate the glider along its flight path. If done in daylight, this long duration would, of course, overexpose the entire film.

Several different arrangements of the camera, strobe unit and glide flight path were examined. The most successful scheme is shown in Figure 1. The camera was fixed on a tripod 15 to 20 feet from the plane of the flight path, and the Strobotac was hand held about 6 feet from the flight path. When possible, the flight path was located more than 10 feet from the nearest wall to reduce the reflection from the strobe light. A larger room like a school gym or auditorium would have been more desirable and is recommended for any further use of the free flight technique. The large room will reduce reflected light and also allow more time for any launch transients to damp out.

The procedure followed for each test was to launch the model in a darkened room after a short count-down to synchronize the launch and camera shutter opening. As the glider flew across the view of the camera it was kept in the beam of the strobe light by a member of the experimental team. The tracking of the glider by a team member was the real "breakthrough" in the development of the technique. The strobe unit available did not have sufficient intensity to expose the High Speed Ektachrome film without using the parabolic reflector on the light source. However, when the reflector was used and the strobe unit was fixed in place, the beam was so narrow that only a few images of the glider were recorded on the film. By tracking the glider, it was possible to move the camera with a lens set at f/1.4, to 20 feet and keep sufficient light intensity on the glider to record the images. The increased distance produced more than 10 images on each slide to allow good data analysis.

Test Program

The first phase of the test program developed the procedures just related. At the end of this phase, it was concluded that the mechanical aspects – i.e. the strobe intensity, film selection (High Speed Ektachrome color, or Tri-X black and white), camera shutter settings (f/1.4 and 1 to 2 sec), strobe and camera placement – were adequate to allow the technique to be used for aerodynamic testing.

The second phase, then, proceded with a series of small models all built in a similar fashion with 20 square inch wing area but with different aspect ratios. Figure 2 is a typical configuration; weight of the models were 7 grams + 0.1 gram. These models were balanced and each flown several times to obtain flight records. The objective of this program was to determine the flight speeds and and glide slopes of boost gliders as a function of aspect ratio. With the known weight, flight speed, and glide slope, the lift and drag coefficients and the lift to drag ratio could be determined.

Table I

Flight Data From Phase II Slides

AR	V	γ	V_H	V_V
3.2	10.6 ft/sec	24.0 degrees	9.6 ft/sec	4.3 ft/sec
5.0	9.2 ft/sec	17.8 degrees	8.8 ft/sec	2.8 ft/sec
7.5	9.9 ft/sec	15.1 degrees	9.6 ft/sec	2.6 ft/sec

The third phase of the program was initiated to study boost glider aerodynamics in more detail. The lift and drag of a glider depends upon its angle of attack, which must be set, in turn, by the trim angle of attack. This trim angle depends upon the center of gravity location and the angles of incidence (angles relative to the glider longitudinal axis) of the wing and stabilizer. Therefore, a larger glider, with an area of 45 square inches and an aspect ratio of 5 was built which had an adjustable wing and provision for shifting the center of gravity. The 28 gram model had a weight to allow the CG to vary from the leading edge to the trailing edge.

This model was flown with the CG located at the leading edge, 1/4 chord, 1/2 chord, 3/4 chord, and trailing edge positions. As the CG was shifted it was necessary to retrim the model so that the pitching moment would remain zero. The incidence angle of the wing was decreased as the CG moved aft. Unfortunately, roughly a 10 degree change was required as the CG moved from the leading edge to the trailing edge. This large variation did produce several difficulties as will be shown presently.

Data Reduction

Reduction of the data was quite simple. After processing, the 35 mm slides were projected on a screen, the length, "l", of the model was measured and the distance, "d", between corresponding points along the flight path recorded. The true distance was then the ratio d/e times the actual length of the glider in feet. By dividing by the time between images – 0.1 seconds since the strobe unit was pulsed at 10 flashes per second – the glider velocity between the points was found.

The glide slope and glider angle of attack were measured directly from the photographs.

RESULTS AND DISCUSSION

Phase II Program

The sequence of slides obtained during the tests with varying aspect ratio gliders was examined and the one slide for each aspect ratio configuration that indicated the most *stable* and *steady* flight path was analyzed in detail. This procedure eliminated all photographs which showed the models to be banking, stalling, or diving. As several slides were taken of each aspect ratio, a "good" photograph was obtained for models with the three different wings.

Flight data recorded for the three cases are presented in Table I.

The effect of aspect ratio is clearly indicated on the glide slope, γ, decreasing from 24 degrees to 15 degrees as the aspect ratio of the wing increases to 7.5 from 3.2. Of importance in glider performance is the combination of flight speed and glide slope to give the

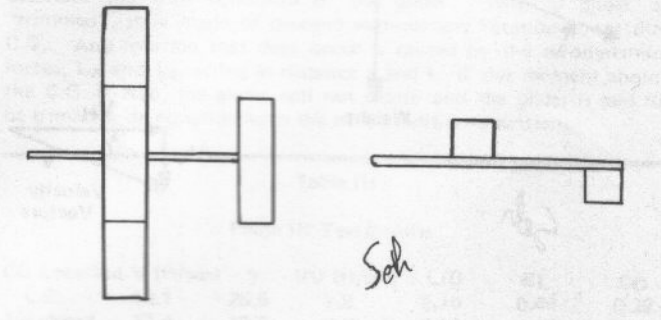


FIGURE 2: Typical configuration of the rectangular winged Basic Boost Glider design used in the flight tests.

horizontal speed, V_H, and the descent rate, V_V. The horizontal speed can yield the range (or distance along the ground covered by a glider) in a certain time, while the descent rate will determine how long a glider will remain in the air for a steady glide from a given altitude. These speeds are obtained from the flight speed and glide slope by the trigonometric expressions below:

$$V_H = \cos \gamma \quad (1)$$

$$V_V = \sin \gamma \quad (2)$$

Since duration is important in boost/glider performance, consider the AR = 3.2 to be in steady flight from 200 ft, then the time to reach the ground is 46.5 seconds. This duration is obtained from the fundamental relation:

$$\text{Duration in seconds} = \frac{\text{height in ft}}{\text{descent rate in ft/sec}} \quad (3)$$

The distance covered during the descent of this glider would be 446 ft, given by another fundamental relation:

$$\text{Range in feet} = \text{horizontal speed} \times \text{Duration} \quad (4)$$

Corresponding duration and range for the AR = 7.5 glider are 77.5 seconds and 745 feet; again a clear indication of the superiority of of the high aspect ratio wing.

Flight performance is not the only type of data that may be gleaned from the slides – aerodynamic information is also available. In a steady descent (or equilibrium glide) the aerodynamic and gravitational forces are balanced. As shown in Fig. 3, when the glider is pulled to earth by gravity, the lift of the wing and drag of the glider oppose the fall, producing a specific glide slope. It is possible, therefore, to determine the aerodynamic forces acting on the glider models by working with the weight of the glider and the glide slope. In fact, the lift and drag, L and D, are given simply by

$$L = W \cos \gamma \quad (5)$$

$$D = W \sin \gamma \quad (6)$$

It is often convenient to eliminate the effect of air density and velocity upon the lift and drag force by representing this lift and drag in a non-dimensional manner. A coefficient (or pure number without units) is obtained for the lift and drag by the equations below:

$$C_L = 2W \cos \gamma / \rho V^2 S \quad (7)$$

$$C_D = 2W \sin \gamma / \rho V^2 S \quad (8)$$

where ρ is the air density (about 0.0023 slugs/ ft^3) V is the velocity in ft/sec, S is the wing area in ft^2 (equal, in the present case, to 144 = .139 ft^2) and W is the glider weight in pounds 7/454 = 0.0154 lbs). These data are presented for the three models in Table II.

Included in this data is the lift to drag ratio, L/D. This term is often referred to as an aerodynamic efficiency factor, because it relates the useful work obtained from the wing (the lift), compared to the penalty paid for producing this lift (the drag). Thus the greater the value of L/D, the more efficient the glider. Referring back to Fig. 3, it can be observed that L/D may be determined without reference to the aerodynamic details, it is given directly from the flight path angle since

$$\tan \gamma = \frac{1}{L/D} \quad (9)$$

The reason for going into the aerodynamics is to attempt to understand what causes the drag and lift. It is important to note that the drag coefficients measured on these model gliders are relatively high and the lift to drag ratios are considered low when compared to full size gliders. Full scale gliders can have an L/D as high as 40 with drag coefficients as low as 0.02. It is apparent that the models used in the test program were not as efficient as could be hoped. Whether it is suspected that this is due to the very low speed and size – a Reynolds number effect – similar to the drag of a sphere which is quite large at low Reynolds number and decreases when the Reynolds number is increased.

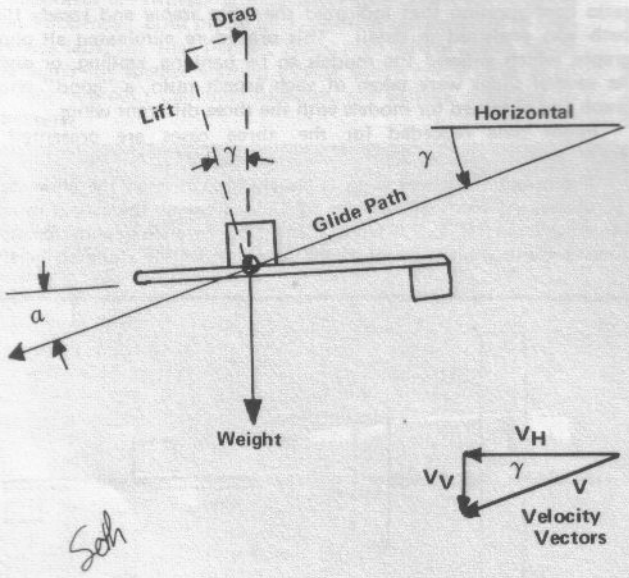


FIGURE 3: The forces acting on a boost/glider include gravity, lift, and drag. These forces come into equilibrium at one glide slope.

Table II

Aerodynamic Data for Phase II

AR	V	γ	L (lbs)	D (lbs)	L/D	C_L	C_D
3.2	10.6	24.0 degrees	.00141	.00627	2.35	0.79	.35
5.0	9.2	17.8 degrees	.00140	.00448	3.12	1.09	.35
7.5	9.9	15.1 degrees	.00149	.00400	3.72	0.95	.26

Phase III Program

With the Phase II tests, it was possible to determine the lift and drag coefficient from a single flight. However, sufficient data was not obtained to determine any other aerodynamic data. The effect of C.G. location was studied in the Phase III tests on a single glider; this did allow some very interesting observations. First though, the results of the tests are shown in Table III.

The model used for this program sequence had a 45 square inch wing and was heavier than the first set of models. It required a greater distance to reach an equilibrium glide; in fact data from both the leading and trailing edge CG locations must be rejected because the models were accelerating, and not in steady flight. When the slides are examined carefully only the 1/2 chord and 3/4 chord locations merit further study. It is evident that obtaining an equilibrium condition is one of the drawbacks of this freeflight method. For this reason, a large room is recommended for further test programs.

On the other hand, it is instructive to proceed to see what other data may be obtained with the two good photographs.

The basis of most subsonic aircraft performance is based upon a lift to drag relation given by:

$$C_D = C_{De} + C_L^2 / \pi ARe \quad (10)$$

where C_{De} is the "parasite drag" and the other combination of terms is called the "induced drag" or drag due to the generation of lift (note the C_L term). Since we have two data points giving C_D and C_L at two different CG locations, it is possible to solve for the unknowns C_{De} and e in this equation:

At 1/2 chord:

$$C_D = C_{De} + C_L^2 / \pi ARe$$

gives $0.109 = C_{De} + (.49)^2 / \pi(5)e$

while at 1/4 chord we have:

$$0.170 = C_{De} + (.73)^2 / \pi(5)e.$$

Subtracting and solving for e, called the glider aerodynamic efficiency factor, we find e = 0.32. Hence C_{De} = 0.06, and the drag of the glider is represented by:

$$C_D = C_{De} + C_L^2 / \pi ARe = 0.06 + C_L^2 / \pi(5)e$$

or

$$C_D = 0.06 + 0.197\, C_L^2$$

This equation is plotted in Fig. 5 to show how the drag varies with lift coefficient. Also shown on this plot is the lift to drag ratio and the ratio of $C_L^{3/2} / C_D$ when this equation is taken to represent the drag characteristics of the glider. The lift to drag ratio, recall, determines the glide slope; the higher the ratio, the more shallow the glide. The second ratio determines the rate of descent,

the higher the ratio, the lower the rate of descent. These two ratios, then, are quite important parameters in boost glide performance.

The importance of the drag expression is best illustrated by its use in determining the glide hodograph. A hodograph is just a plot of the possible combinations of horizontal and vertical velocities that occur for a particular aircraft design. It is drawn easily, once the drag expression is known by the following steps:

1. Assume a lift coefficient (say $C_L = 1.0$)
2. Find the corresponding drag coefficient (for the present case, $C_D = 0.258$)
3. Obtain the glide slope γ (tan γ = 1/1.0/.258 = .258 or γ = 14.5 degrees
4. Find the velocity, V, along the glide path using the correct values in the expression for velocity

$$V = 2W \cos \gamma / C_L \rho S \ (= 12.7 \text{ ft/sec})$$

5. Determine the horizontal and vertical velocity components using Equations 1 and 2 (12.3 and 3.18 ft/sec respectively).
6. Select a new C_L and proceed as before.

After assuming several lift coefficients, from C_L = 0.1 to 1.0 for example, the hodograph may be plotted. For the glider used in the tests, the hodograph curve is shown in Fig. 6. A line from the origin to the curve gives the glide slope and the flight velocity for the particular lift coefficient. Thus the minimum glide slope is the tangent

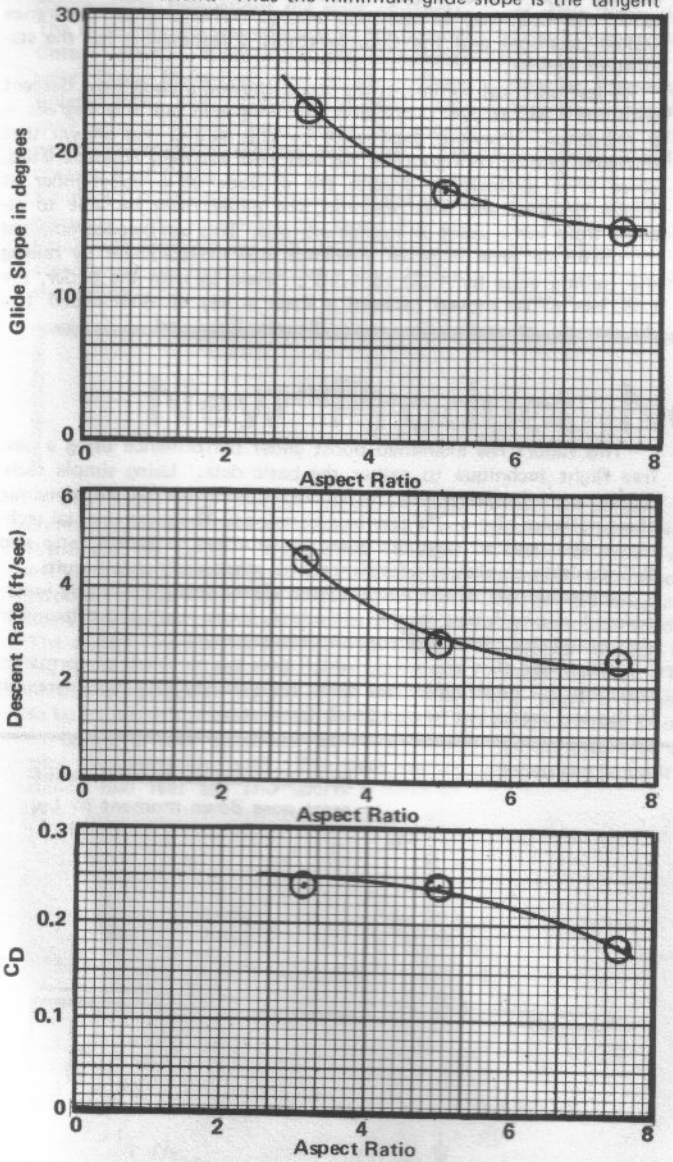


FIGURE 4: Influence of Aspect Ratio on Glider Performance. The above graphs show the data taken in the Phase II program of a series of gliders weighing 7 grams and having 20 sq. in. wing area. By varying the Aspect Ratio, the change in Glide Slope, Descent Rate, and C_D were found.

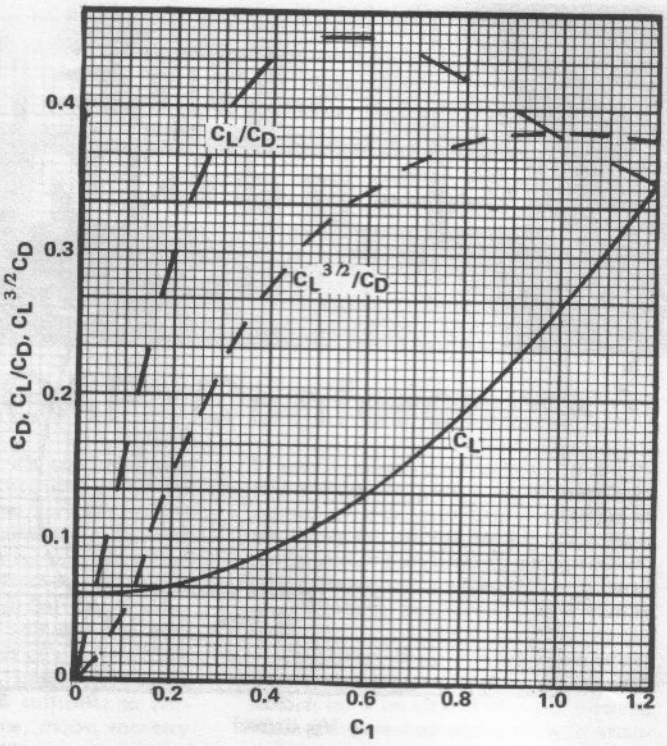


FIGURE 5: Aerodynamic Characteristics of the Glider. The Free Flight Technique was used to evaluate the variation of C_D, $C_L^{3/2}/C_D$, and C_L/C_D with C_L.

to the curve – shown to be 12.4 degrees for this glider and noted to be at the peak C_L/C_D from the aerodynamic characteristics of Fig. 5. The minimum descent rate is shown to be less than 3.2 ft/sec, and this occurs at the peak value of $C_L^{3/2}/C_D$.

Recall that this is the same glider, just made to fly at different lift coefficients and different air speeds by changing the CG location. Certainly CG location must be chosen with care. From the test data it would appear that the 3/4 chord location is best, since it allows the aircraft to fly at the minimum rate of descent. Practically, the reason for the better performance is that the tail starts to contribute to the lift of the wing. If the CG is too far forward, the stabilizer can actually "lift" downward, an inefficient way to fly.

This C.G. location is so important, that further comment is necessary. Back in Fig. 3, the lift was shown to be concentrated at the center-of-gravity. That was a simplification, since lift really comes from both "flying" surfaces, the wing and the horizontal stabilizer. A more precise picture is shown in Fig. 7. The lift of the two surfaces assumed to be concentrated at the greater chord. The total lift is simply the sum of the two components:

$$L = L_w + L_t \qquad (11)$$

A question arises, however, as to the *distribution* of the lift. How much lift comes from the wing and what portion is contributed by the tail? The answer depends upon the C.G. location. To find the solution, another fundamental equation must be introduced, one that describes the trim condition of the glider. When a glider is "trimmed", it is made to descend without any rotation about the C.G. Any rotation that does occur is caused by the aerodynamic forces, L_w and L_t, acting at distance x and l. If this moment about the C.G. is zero, the glider will not rotate and the glider is said to be trimmed. In equation form the trim condition is written:

Table III

Phase III Test Results

CG Location	V (ft/sec)	γ	VV (ft/sec)	L/D	C_L	C_D
L.E.	18.1	25.5	7.8	2.10	0.46	0.22
1/4 chord	17.4	19.0	5.7	2.90	0.52	0.18
1/2 chord	18.1	12.5	3.9	4.51	0.49	0.11
3/4 chord	14.8	13.0	3.3	4.33	0.73	0.17
T.E.	20.0	12.0	4.1	4.70	0.41	0.09

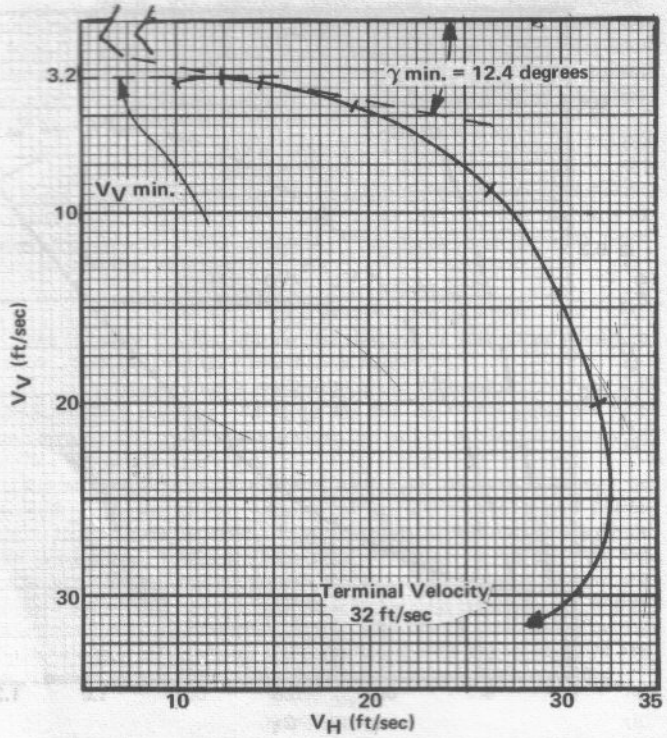


FIGURE 6: The Glide Hodograph. This plot shows the possible combinations of horizontal and vertical velocity for the test glider. The minimum glide slope is the tangent to the curve which passes through the origin — 12.4 degrees.

$$\text{Moment}_{CG} = L_W x = L_t l = 0 \qquad (12)$$

Equation (12) shows that as the C.G. approaches the quarter chord of the wing, then the distance x decreases and the moment required to stabilize the glider is decreased. In fact, if the C.G. is moved ahead of the wing quarter chord, the tail lift must decrease so much, as shown in Fig. 8, that it becomes *negative*. At the same time, if L_t is negative, the wing lift must be increased according to Eq. 11 to support the weight. This is why the statement was made earlier about forward C.G. locations being an inefficient way to trim a glider.

Now if the C.G. is moved aft, the x of Eq. 12 gets larger, the nose up moment increases and must be balanced by an increase in the tail lift. Then with the tail carrying more of the load, the wing lift can be decreased to maintain a constant value for L in Eq. 11. With this reduced lift requirement, the glider can fly at a lower angle of attack and the induced drag will be cut down. This is a more efficient way to fly.

But is there any limit to how far back the C.G. may go? There certainly is. The farther back the C.G. moves, the less *stable* the glider becomes. A stable glider will return to its trim condition if it is upset or disturbed by a gust. An unstable glider will not. Hence an efficient glider that has a good tail load can tend to be unstable — as is usually the case, some type of compromise is necessary.

At this point a few more comments may be made based on the photographs taken during the free flight study. The equilibrium glide condition occurs when the glider flies at the trim angle of attack — that is, when the moment about the C.G. is zero. From the photographs for the two C.G. locations, this trim angle was measured at 7.0 degrees and 8.0 degrees for the mid-chord and 3/4 chord C.G. locations. These values are consistent with the rest of the data obtained as the lower angle of attack would cause the glider to fly faster to obtain the same lift, as was noted in Table III. However, the change in lift coefficient for these two cases (0.24) appears excessive; indicating again that an *equilibrium glide* was not completely established.

One point has yet to be made, how is the glider trimmed at each C.G. position? This is accomplished by altering either the angle between the tail and the body or the angle between the wing and the body — these angles are called incidence angles. For a particular glider configuration which has the wing and tail glued at a certain angle — say 0 degrees for the wing and 0 degrees for the tail, there is only one C.G. location which will produce trimmed flight. In the present test program, the tail angle was increased from 0 degrees when the C.G. was at the 3/4 chord to about 3 degrees when the C.G. was at the mid chord. This angular difference (called decalage) and the C.G. locations is responsible for the stability of a glider.

A last practical comment, the study showed a good slow descent with the C.G. at 3/4 chord and the wing and tail at 0 degrees — 0 incidence. Previous experience by this author has shown that this good gliding configuration has very poor recovery characteristics. Since it is difficult to predict the attitude of a boost-glider at rocket burnout and pod rejection, the glider must be able to recover from some upset or strange attitude. This can be accomplished by putting a little negative incidence into the stabilizer by raising the trailing edge by 1/32 to 1/16". Then to trim the glider, the C.G. has to be moved forward a little — say to 60% chord, but the recovery characteristics are significantly improved.

SUMMARY

This report has examined boost glider performance using a new free flight technique to gather the basic data. Using simple techniques and relatively easy to secure equipment, the aerodynamic characteristics of a glider may be ascertained. The experimental technique was used to find the quantitative effect of aspect ratio and C.G. position on glider performance with moderately good results.

Improvements in the experimental method that should be incorporated in any future studies include a larger room and a launcher that would give consistent launch speeds and angle.

It is hoped that this report which gives the pertinent performance equations for boost glider free flight analysis will spur more research in this low speed, but fundamental flight range.

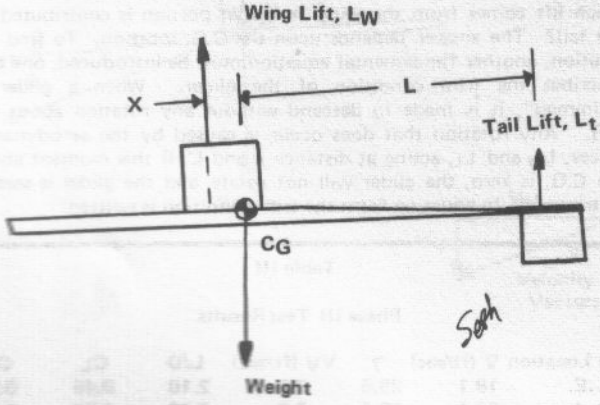


FIGURE 7: Distribution of Lift on a Glider with Aft Center of Gravity.

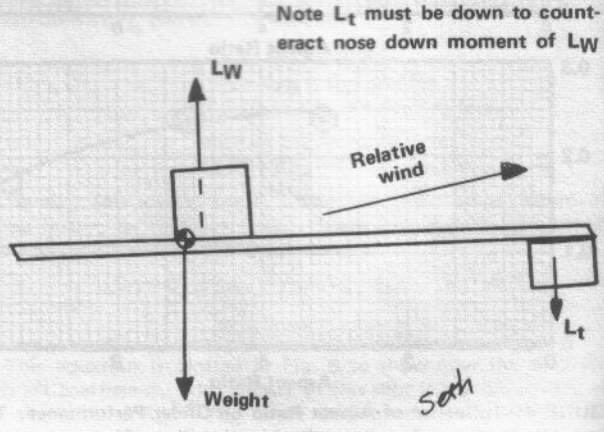


FIGURE 8: Distribution of Lift on a Glider with Forward Center of Gravity.

NEWS NOTES

Texas Modroc Demonstration

At the invitation of the Texas State Firemen's and Fire Marshals' Association, meeting in Dallas, Texas June 7 through 9th, model rocket manufacturers had an opportunity to discuss the hobby and provide a demonstration launching. Tim Skinner, chairman of the Model Rocket Division of the Hobby Industry Association of America, addressed the 1200 member organization of fire officials. Stressing theacceptance of rocketry on the state level, he detailed the technical aspects of the hobby and presented a suggested set of guidelines for officials to follow in order to promote safe rocketry.

Following the discussion, a demonstration firing was held for officials representing 180 communities throughout the state of Texas. The launching site was adjacent to the famous Cotton Bowl. Conducting the launchings were Doug Malewicki of L.M. Cox, Dane Boles of Estes, and Gil Lutz of MPC. Despite strong winds, the rockets performed well and spectator interest was high. TV channel 8 of Dallas covered the "Model Cape Kennedy" proceedings on their 6:00 PM news program. The meeting with Texas fire officials was arranged by MPC to promote the acceptance of model rocketry throughout the nation.

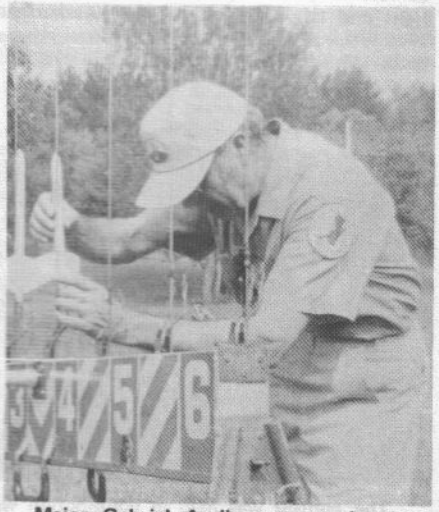
NY CAP Conference

In striving to provide continued growth in its special opportunities within the cadet program, the New York Wing of the Civil Air Patrol is developing its first major state-wide cadet conference on Model Rocketry. Model Rocketry is not new to New York Wing as Col Jess Strauss, Wing Commander, introduced this activity in the 60's as part of the New York Soaring Program, but today the current interest in the Wing is sufficient to warrant for the first time, model rocketry as a single special activity.

In early May, Col. Strauss sought the guidance of the Estes Industries Inc. and with their cooperation established the Wing's first instructors workshop in Model Rocketry from June 11-13 at the Ithaca Speech Camp in Danby, New York. The Senior members, accompanied by a limited number of invited cadets were submerged in a program that was aimed at saturating this core of model rocket leadership with a host of basic details such as: safety, organization, programs, equipment, literature, and construction techniques.

On Sunday the participants had ample time to question the instructors, as well as each other on various points of interest. When the workshop ended those in attendance had volunteered to establish programs in their own squadrons and in addition, assist the Wing in planning a Wing Convention in 1972. This convention would be open to all interested cadets and a tentative date of May 28-30 was set. Lt. David Gray and Cadet Patrick Connolly of the Lindenhurst Flight, Long Island Group will publish a Newsletter that will provide direction and assistance to all of the Wing Squadrons in Model Rocketry. Major Gabriel Audin and Richard Nelson, both of the Orangeburg Cadet Squadron and well experienced in model rocketry, were the instructors for the workshop.

Lt. Col. Albert Field, New York Wing's Deputy for Aerospace Education and representing Col. Strauss, considered the weekend workshop to have been highly professional and beneficial to the continued growth of the Cadet Aerospace Program in the New York Wing.



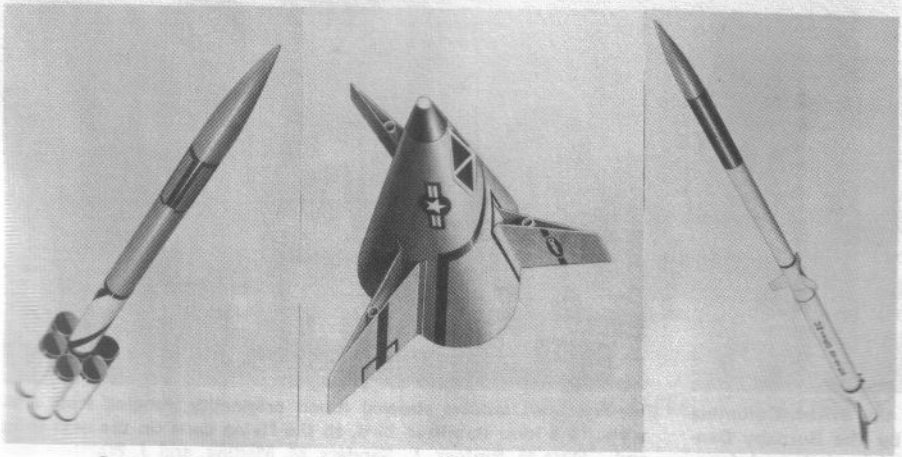
Major Gabrial Audin sets up the demo birds for the Civil Air Patrol state wide conference.

New Product Notes

The X-24 "Bug", model rocketry's first commercially available lifting body, has been introduced by Centuri Engineering. It blasts off trailing a wierd contrail. Then the ejection charge ejects the engine; the X-24 leaps forward then stabilizes in a glide. The stubby fins provide platforms for mounting trim fins. Try this one out! Its unique construction makes it an easy one to build, and it's priced at only $1.00.

Centuri's new Excalibur makes a beautiful demonstration bird. The sleek rocket stands two feet tall and sports a band of reflective chrome for easier tracking. Again a very agreeable price, only $1.85.

The Groove Tube is based on the "Infinite Loop" concept familiar to the readers of the magazine. It is a good flier and easy to build. Refer your beginning rocketeer friends to this one. Built from Tough Centuri ST-10 Tubes, it stands tall and takes a lot of abuse. Priced at only $1.75, this is one of several kits in a Centuri effort to see how many interesting models can be built for less than $2.00.



Groove Tube **X-24 Bug** **Excalibur**

British Columbia Centennial Meet

by David Soul

June 25 and 26 saw one of the largest rocket meets held in the Pacific Northwest and the largest competition ever held in Canada. The British Columbia Centennial Rocket Meet, sponsored by the Burnaby Model Rocket Club, was attended by rocketeers from three Provinces and six American States. On the schedule for the two day contest were Class O Altitude, Sparrow B/G Open Spot Landing, Open Eggloft, and Class O Parachute Duration.

The weather caused a lot of anxiety right up to the day of the meet as the Vancouver area was hit by weather that "never happens." For two weeks prior to the competition there was steady rain — records for most rainfall, least sunshine, coldest temperature, etc. were being broken right and left. Of course, the weatherman predicted sunshine for the two days of the meet, but he had done this before and the credibility gap was just too great for us to believe him. When the big day finally came there wasn't a cloud in the sky. Our unbelievably good luck was not to last, however, as by the time the test launchings were over clouds filled the sky and needless to say severely hampered tracking.

The first two events, Class O Altitude and Open Eggloft, were run simultaneously. Roughly 60% of the tracks closed, which wasn't bad considering the weather. One thing noticeable about this meet was that there were almost no kit built rockets present (not even by juniors). Although the rockets were home-designed, there were no stability problems. In fact, the only rocket disqualified for an unstable flight was a B/G. Unfortunately some of the contestants seemed to lose all sense of competition stradegy. In Eggloft "power-madness" seemed to rule the minds of some rocketeers as many two staged E & F models were flown. Not only did these rockets go too high to be tracked in the prevailing weather conditions, but due to the wind there was no chance of recovery. Some rocketeers blamed the loss of their rockets on a small field, but this just wasn't the case — a little thought on their part would have saved their grief.

At lunch time the rocketeers took a break and thoroughly enjoyed the flight demonstrations by Cox and Estes. The complete line of Cox rockets were shown for the first time in Canada. Powered by a wide range of engines from the Cox B for the Honest John to the new Cox D (in a standard casing) for the Saturn V, the models were all very impressive both as scale models and as flight models. Estes also provided an impressive display with several of their newer kits being flown. The highlights of Estes' display were the flights of the Cineroc and Transroc.

After lunch the contestants quickly got back to the business at hand and proceeded with Spot Landing. The spot was placed in an "impossible location" — about 400 feet from the launcher with the wind blowing at a 45 degree angle between the pad and the spot. This, added to the fact that the wind was gusty, ranging from almost zero to as much as ten mph in a few seconds accounted for the fact that there was only one close flight. Ken Bennett (Junior, NORC) was closest with a distance of 27 feet 10 inches.

That evening the banquet was held in a hall just across the road from the field. After dinner several speakers discussed topics of interest. David Roger of the Vancouver Planetarium presented a talk on the future of space exploration. He was followed by Dane Boles of Estes who showed a film of NARAM 11. Included in this film was a strip of CINEROC film. This was the first time that most of the competitors had seen film from the CINEROC and everyone present was extremely impressed. Doug Malewicki then gave an interesting and amusing account of Evel Knievels exploits. Doug then described the planning that he is doing in preparation for Evel's planned attempt to jump the Grand Canyon on a motorcycle.

The contest was held in conjunction with the British Columbia Centennial celebrations, and was sanctioned by the Burnaby Centennial '71 Committee. Here contestants check-in their egglofters. The event was won by Alan Dayton with a flight to 1715 feet.

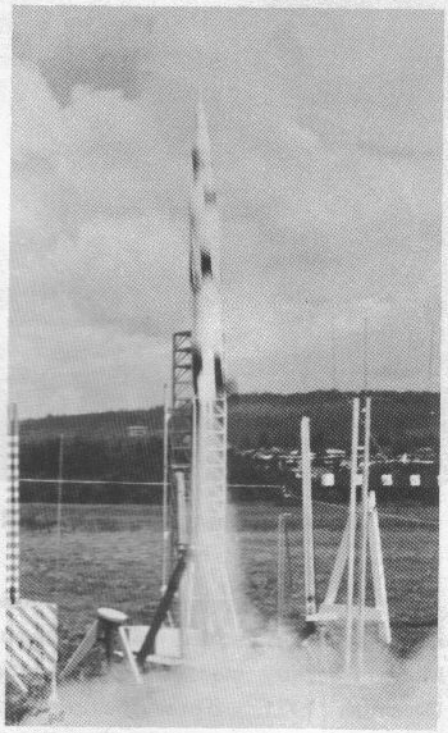
The Spot landers showed much originality, ranging from a V-2 scale, to a loop stabilized bird, to the flying cone on the next to last rod. Here M. Pintosz, L. Sanders, M. Medina, and J. Worthen make final adjustments on their models.

The BCCRM-71 awards presentation was held outdoors after dark on Sunday night. All 1st place winners received trophies as well as kits donated by Cox and Estes.

Saturday night the weather took a turn for the worse. By early morning the rain was pouring down. Luckily, it stopped before the range opened at nine. The excessive humidity, needless to say, caused many problems with chute deployment. Once again all the competitors were assured by the CD that British Columbia never has weather like this — it must be a figment of the imagination of the rocketeers. The weather played havoc with chute deployment, and it soon became evident that the way to win was with a small chute. Third place senior was taken with an extremely small chute — only 12 inches. Of the first ten flights eight suffered from some kind of failure in chute deployment. The only exception to the rule to think small was Jess Medina (SSRS) who managed to open a thirty inch chute turning in a time of 282 seconds — an extremely good time for no-thermal flying.

The Sparrow B/G event was in slightly better shape, but due to the lack of thermals no fantastic times were turned in. The durations were still much better than the times reported from many meets to the south however. The statement by MRm that "B/G's haven't caught on in Canada yet" was proven false for this region of the country. Ed Melvin's (BMRC) flopwing was one of the best performing flopwings that anyone had ever seen. Unfortunately a burning piece of wadding caught on his wing, burning through the Solar Film (similar to Monocote but stronger and lighter) and destroying the trim. This resulted in a poorer than usual flight but it was still good for 3rd place senior with a time of 46 seconds.

At the close of the meet, Jess Medina was declared senior champion and the Medina team, of Mike and Tony, junior champions. Besides the mountains of trophies the Medina's won a CINEROC and TRANSROC for their efforts. The Burnably Invitational was a tremendous success and should help to increase the already fantastic rate at which model rocketry is growing in Canada. Special thanks go to Cox and Estes for the prizes they donated, and to their representatives Doug Malewicki and Dane Boles for the fine demonstrations and talks they presented. Thanks are also due to the Brentwood Merchants Association sponsors of the meet. Most of the credit belongs to Laurie Sanders, contest director and firing supervisor of the Burnaby Model Rocket Club, for his fantastic job of orgainizing and running this meet and generally making it the success it was.



A Cox demo Saturn-V lifts off from the BCCRM-71 launch site. Both Cox and Estes were represented at the contest, and Doug Malewicki and Dane Boles flew many products previously unseen in Canada.

BCCRM-'71 Results

ALTITUDE (Class O)

Junior	
Medina team (SSRS)	567 ft
Mike Stephen (BMRC)	506
Randy Thomson (BMRC)	455
Senior	
Ken Tucker (BMRC)	705 ft
Jess Medina (SSRS)	618
James Worthen (SSRS)	523

SPOT LANDING

Junior	
Ken Bennet (NORC)	27 ft 10 in
Randy Thomson (BMRC)	66 5
James Jakeman (SSRS)	66 7
Senior	
Arnald Dayton (SSRS)	65 0
Art Soul (BMRC)	78 4
Ed Melvin (BMRC)	87 11

OPEN EGGLOFT

Junior	
Alan Dayton (SSRS)	1715 ft
Don Beadle (SSRS)	1270
Mark Antosz (DAWSON CREEK)	693
Senior	
Lynn Hurd (NOVA III)	1708 ft
Jess Medina (SSRS)	1656
Dave Swartos (GGRC)	1388

PD (Class O)

Junior	
Medina Team (SSRS)	106.0 secs
Mark Sanders (BMRC)	84.5
Alan Dayton (SSRS)	44.0
Senior	
Jess Medina (SSRS)	282.0 secs
Ken Tucker (BMRC)	70.5
Art Soul (BMRC)	60.0

SPARROW B/G

Junior	
Ken Bennet (SSRS)	71.0 secs
Mike Soul (BMRC)	63.0
David Jones (BMRC)	41.0
Senior	
James Worthen (SSRS)	74.5 secs
Jess Medina (SSRS)	59.0
Ed Melvin (BMRC)	46.0

Coming Next Month in MRm:

PVARM-3 CONTEST REPORT

Notice to

NAR Members

We have been advised by NAR President James Barrowman that he has decided that NAR members will **not** receive **Model Rocketry** magazine as a membership benefit after December 1971. Those members now receiving **Model Rocketry** will have to subscribe directly in order to continue receiving the magazine each month. **Model Rocketry** is making a special offer to all current NAR members, allowing you to renew your subscriptions to **MRm** at the same renewal rates offered normal subscribers. Your subscription will begin with the issue after the last issue received through your NAR membership, and you will save 50 cents off the normal subscription rate. Act today, however, since the special 50 cent reduction is valid only on orders received before December 15th, 1971.

Remember, receiving **Model Rocketry** magazine each month is the *only* way to keep up-to-date on the latest developments in model rocketry. Contest reports, scale plans, technical reports, new designs, telemetry plans, and new product information all appear first in **Model Rocketry** magazine. Don't miss an issue! Send your subscription form in today.

Don't count on buying these issues of Model Rocketry at newsstands or hobby shops. With 5000 other NAR members also looking for these issues, the small newsstand and hobby shop supply will quickly be exhausted. The *only* way you can be *assured* of receiving each and every information packed issue of **Model Rocketry** is to send in your subscription for it today.

In the past, many NAR members have reported problems in receiving their copies of **Model Rocketry**. The mailing labels for NAR members' copies of **MRm** were being processed by NAR Headquarters. There was no way we at **Model Rocketry** could assist you in making corrections. All changes of address and correction of errors had to be done by NAR HQ at the time the labels were prepared. Now, by subscribing directly to **Model Rocketry** our own office staff can solve those *few* problems which inevitably occurr. And these difficulties can be corrected quickly!

ACT TODAY! DON'T MISS AN ISSUE OF **MODEL ROCKETRY!**

Mail To: MRm, Box 214, Astor Station, Boston, MA 02123

Please enter my special rate subscription to Model Rocketry:

( ) 1 year	$ 7.00	$ 6.50
( ) 2 years	$13.50	$12.50
( ) 3 years	$19.50	$18.00

NAME: _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP:** _____

I am a:

( ) NAR member, start subscription in January

( ) current, subscriber, renewal

( ) new subscriber

SPECIAL RATES EXPIRE DECEMBER 15th, 1971.

THE MODEL ROCKETEER

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

Major Changes in the NAR

From the NAR President Jim Barrowman;

I wish to announce, starting with the 1972 membership year, the following changes in NAR membership activities:

1. The removal of the Model Rocketeer from **Model Rocketry** Magazine.
2. The expansion of the Model Rocketeer to 12 pages.
3. The replacement of **Model Rocketry** Magazine with The Model Rocketeer as the regular publication received by the membership.
4. The replacement of our calendar year membership plan with a 12 month membership plan whereby each member receives a full 12 months of membership and renews in the month he first joined or last renewed.
5. The establishment of a family membership plan. Once one senior member in a family joins at full dues, the members of his immediate family have the option to not take the Model Rocketeer and pay appropriately lower dues.

In leaving **Model Rocketry** magazine we sacrifice some obvious benefits that go with a commercial magazine. However, the increased cost of the magazine coupled with our own increased costs would have made a substantial dues increase absolutely necessary. President Nixon has challenged all Americans to fight rising costs even if it means some sacrifice. We in the NAR have accepted that challenge and have found our course of action outlined above contains both sacrifice and new benefits. All NAR members will benefit because we will directly control the publishing and distribution of our own newsletter. We can thus provide rapid dissemination of news as well as quick and positive rectification of any distribution problems. Members joining throughout the year will benefit since they will get a full 12 months of NAR membership for their money. Families will benefit because the total family cost for NAR membership will actually go down.

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.

MINUTES
NATIONAL ASSOCIATION OF ROCKETRY
BOARD OF TRUSTEES
AUGUST 10, 1971

The meeting of the Board of Trustees of the National Association of Rocketry was called to order by President James S. Barrowman at 8:25 PM, August 10, 1971, in the theater at Aberdeen Proving Ground, Aberdeen, Mary-

The Secretary was directed to call the role. The following NAR Trustees were present:

Jay Apt
Robert Atwood
Lindsay Audin
James S. Barrowman
Howard Galloway
Gerald Gregorek
Alfred Lindgren
Richard Sipes

The Chair announced that a quorum was present.

The Chair announced the nomination of Mr. Manning Butterworth to fill the Trustee seat left vacant by the resignation of Dr. Ellsworth Beetch. Atwood seconded the nomination; Apt called the question. NOMINATION ACCEPTED UNANIMOUSLY. Manning Butterworth was present and was seated as a Trustee.

Atwood moved to waive the reading of the minutes of the May 1, 1971 Board meeting; Lindgren seconded Passed unanimously.

The Treasurer's Financial Report is attached. Worth must resign from his position as NAR Treasurer and as a member of the NAR Executive Committee due to AMA business. He projects a $1170 net loss for the NAR in 1971, based upon adherence to the MAY budget.

The report of the Standards and Testing committee is attached. Gregorek verbally added that he has received much aid from NAR members Chas Russel, Doug Ball, George Pantalos, and Craig Street.

Sipes verbally reported on the activities of the Contest Board. He reported a $400 surplus in CB activities, due largely to sending materials via 4th class mail rather than via 1st class. 1040 individuals and 57 teams competed in this year, from 88 Sections. Divisional Contest Boards become effective September 15. Point awards sheets and sanction forms will come 1st class from the Divisional Boards to Sections, with all other materials being purchased bulk rate at any time during the year from the National CB, allowing greater Section flexibility and faster turnaround time.

No report was received from the Liaison Committee.

The report of the Section Activities Committee is attached.

The report of the Education Committee is attached. Apt asked in reference to Paragraph 2, section (b) of the report if Golobic has ever attended a Convention, Symposium, or Workshop. Barrowman replied that he believed not. Apt suggested that Golobic make every effort to familiarize himself with the current Symposia and Workshops, and contact the chairmen of past ones. He also said he had the notes from the discussion group on holding conventions he had set up after the 1971 MIT convention. In response to a querry from Barrowman, LAC Chairman Bob Mullane said that the LAC had received no replies to the R&D form similar to the one attached to the EducComm report that the LAC has distributed for the last 2 years.

Barrowman announced that Carl Kratzer, chairman of the Public Affairs Committee has resigned; he is searching for a replacement.

The report of the Publications Committee is attached. Audin announced the following appointments to the Committee: Bob Mullane, Wanda Boggs, and Chas Russell. He thanked the following people for the conception and execution of the Technical Slide sets: Arnold Pittler, Jay Apt, Bob Mullane, and Rosemary Krauss. The Technical Slide Sets will be marketed through NARTS. Col. Howard Kuhn asked from the floor whether the LAC Scale Pack would be complete data; Audin replied yes. Gregorek therefore suggested that the provision against the use of NAR plans as the sole scale data for a scale model be dropped in the new PB.

The NARTS report is attached.

Chairman Manning Butterworth reported that the By-Laws Revision Committee had no report at this time, but expected to hold a forum at NARAM-13.

The LAC Report and the LAC Advisor's Report are attached. Audin urged a careful reading of the report, and said that the report indicated that the LAC has been of great value to the NAR. Apt commended LAC Secretary Elaine Sadowski on the completeness of the report.

Al Lindgren verbally reported on the activities of the Special Fire Prevention Standards Committee. He has canvassed a sample of modelers on the East and West coasts for suggestions, finding divers views. He will canvass many more members in an effort to establish a good code.

The meeting moved to Old Business from the Minutes. The 3-man Committee to set selection criteria for the selection of the US International Championship team has been appointed: James Barrowman, Jim Sparks, and Jess Medina. They will report by August 31, 1971. The selection committee, whose members will be eligible to serve on the team, will be composed of the 3 top point winners from C and D divisions, plus the NAR President, the LAC Chairman, the NAR Contest Board Chairman, and the FAI Liaison Committee NAR Member. This committee will make a decision on the basis of the objective criteria determined by the 3-man committee, and will select by a vote of at least 7-3 for all team members.

Barrowman is discussing NAR manufacturer dues and the Trustee qualification proceedure with manufacturers at NARAM-13. Audin commented that he would like to see a report at the earliest possible date, since the policy should be applied to interim appointees as well as to

elected Trustees.

Due to the time restriction placed by the US Army upon the use of the hall, NAR President James S. Barrowman adjourned the meeting at 9:30 PM.

Respectfully Submitted,
Jay Apt
NAR Secretary

(Editor's Note: Due to the length of the attached committee reports, they have been omitted from the minutes printed here. Persons interested in reading the complete reports should write to NAR Secretary Jay Apt, 15 Line Street, Cambridge, Massachusetts 02138.)

TREASURER'S FINANCIAL REPORT
AUG. 1970

The mid-year financial statement is submitted with reservations. Some of the figures have not been verified due to some confusion concerning actual or projected expenses. Basically, the statement seems to give a fair picture of NAR's financial status for the period.

A general problem has existed since the practice was initiated this year of having Headquarters maintain the financial records with the Treasurer acting more as a monitor than as a bookkeeper. The problem is that the previous Treasurer's accounting has not been followed exactly so that there are differences in interpreting where various amounts should be credited or charged.

The headquarters records for the first half of the year also include various expense amounts listed as allocations rather than as actual expenses for a particular department. The attached mid-year financial statement attempts to show the actual departmental expenses rather than the allocations.

Furthermore the HQ records are confused by the inclusion figures involving the Contest Board, NARTS, and NARAM. These need to be more clearly separated. For example, income is shown for the Contest Board, but no expenses. The true status of Contest Board operations is not obvious from HQ records.

Improvement is needed in the financial record-keeping of NAR. Missing at present is a close and regular working relationship between the Treasurer and the HQ operation. Guidance is needed from the Treasurer to better organize the HQ financial records and to provide assistance in bookkeeping. Unfortunately, I find this impossible to do as a result of excessive workload from my position at AMA -- my responsibilities have increased greatly as a result of a tremendous expansion of AMA activities.

Accordingly, I must resign from the position of NAR Treasurer, effective immediately. I will try to assist any new appointee in taking over the position but cannot promise to continue monitoring the HQ operation in the meantime except on a sporadic basis. Similarly, I must resign from the NAR Executive Committee due to lack of time to serve. Hopefully, I may be able to continue as a Trustee and desire to do so at least through this year.

I apologize for the apparent suddeness of these decisions. The situation is simply that I have taken on more responsibility directly related to my basic job and there is little or no spare time left for anything else.

Meanwhile I note with concern that NAR's previous membership growth rate has declined. In fact it is unlikely that this year's membership total will equal that of 1970 (currently 4800 vs 5655 for last year). At the same time expenses are up considerably. The situation looks ominous and suggests that tight expense control must be exercised in the second half of 1971 in order to avoid a serious loss for the year.

Our March budget was based on a potential income from increased membership (estimated at 6,500). Since the potential is not being realized some basic budget rethinking is necessary for the rest of the year. Unless funds are available from the Contest Board, NARAM or NARTS, NAR's income for the year has essentially ceased. Yet substantial obligations (magazines, insurance, HQ services) remain.

Although the current problem is serious, the real concern should be for the future. NAR needs a basic change in balance between income and expenses for the years ahead. My recommendation is that all planning from this point be concerned with establishing a better relationship between membership benefits and dues structure.

A dues increase appears inevitable. Yet any membership decrease which might result need not be received negatively. NAR might well be a healthier organization serving 3,000 ten dollar members rather than 5,000 six dollar members. Considerable cost reduction could result and better service may be possible with fewer people involved.

Sincerely,
John Worth

N.A.R. FINANCIAL STATEMENT
JAN. – JUNE 1971
HQ OPERATIONS

A. INCOME		
Bal. FWD from 1970	$ 5,105.00	
Dues – '71, 4,701 Members	24,167.05	
Fees – '71, 117 Sections	620.00	
Contest Board	382.60	
Contributions	320.32	
FAI Stamps	116.00	
Advertising	130.48	
Miscellaneous	229.95	
Credit Coupons, Refunds	(398.00)	
Total Income thru 6/30:		$30,673.40
B. EXPENSES		
HQ Services	$ 4,125.00	
Telephone	449.53	
Postage (Gen.)	653.04	
Office Supplies	278.34	
Membership Supplies	34.94	
Membership Insurance (1st Qtr. only)	1,502.00	
Model Rocketry (6 Issues)	6,317.04	
NARAM 13 – Advances	623.12	
NARAM 12 – (Paid in '71)	850.00	
Reproduction	426.98	
Petty Cash	409.30	
Miscellaneous	115.00	
NAA Affil. Fee	73.75	
Contributors Exp.	250.00	
Total Expenses thru 6/31:	10.00	
Balance Available for 2nd Half – 1971		$16,118.04 $14,555.36
C. PROJECTED EXPENSES – 2nd HALF 1971		
1. 6 Issues Model Rocketry		
a)4500 Members x .25 x 6 =	$ 6,500.00	
b)Postage – 27,000 @ 2.5¢ =	675.00	
2. 6 Months HQ Services @ $750 =	4,500.00	
3. Insurance – 1800 Members @ .50 =	900.00	
4. NARAM 13 PR Services	750.00	
5. Pink Book Reprinting	500.00	
6. Committee/Magazine expenses	500.00	
7. Telephone	400.00	
8. Postage, General	500.00	
9. Supplies	500.00	
		$15,725.00

Note: Membership as of mid–August. Any increase afterward should balance between income involved and services rendered.

Section Activity Personel Listed

Mr. Robert Atwood, the NAR's Friendly Director of Section Activities, has given the *Model Rocketeer* a list of State Department Heads (as of 1 August 1971). These people work with the Regional Managers to aid existing sections and to help in the organization of new sections. Persons living in the listed states who wish to obtain aid or a list of other NAR members in their areas should contact these people. Regional Managers are listed every month at the beginning of the *Model Rocketeer.*

NORTHEAST

Connecticut
Mrs Josephine Shay
5 Vineyard Lane
Westport, Conn 06880

Maine
Charles Andres
RFD 2
North Berwick, Maine 03906

Massachusetts
Trip Barber
Box 121
MIT Branch P.O.
Cambridge, Mass 02139

New Jersey
Floyd Beebe
1 Oak St
Wharton, New Jersey 07885

Pennsylvania
Elaine Sadowski
1824 Wharton Street
Pittsburgh, Pa 15203

SOUTHLAND

Asst. Regional Manager
Mrs. Janice Toner
5012 Valley Stream Road
Charlotte, NC 28209

Florida
Lynn Fletcher
1551 S.W. 38th Ave
Fort Lauderdale, Fla

Georgia
Richard Malecki
Georgia Tech Box 33698
Atlanta, Georgia 30332

MID-AMERICA

Illinois
Dennis Okesson
531 Lake Street
Crystal Lake, Ill 60014

Kansas and Missouri
Lawernce L. Loos
CMR Box 711
Richards Gebaur AFB, Mo 64030

Ohio
Robert Hagedorn
1976 Farmingdale Road
Mansfield, Ohio 44905

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1709 N. 19th Street
Boise, Idaho 83702

Nevada
Dr. Edna Hinman
1271 S. 7th Street
Las Vegas, Nevada 89100

PACIFIC

Alaska
Robert Westmoreland
2418 E. 20th Street
Anchorage, Alaska 99502

California
Mike Poss
7855 Naylor Avenue
Los Angeles, Calif 90045

Hawaii
Donald Van Ausdeln
Box 538
Waimea, Kauai
Hawaii 96796

Oregon
William Boggs
730 East Dartmouth Street
Gladstone, Oregon 97027

Washington
J.C. Worthen
402 Barberry Court, 5
Seattle, Washington 98108

NARAM-13 Results

This listing includes fourth place event winners, national champions, and special award winners. For first, second and third place event winners, please refer to last month's **Model Rocketry** *NARAM coverage. The DLBF listings indicate the Dead Last But Flown awards presented to the worst flight in each event by the LAC.*

Eagle Boost Glide

A Div. 4. Mike Turtera	20655	44 sec.
B Div. 4. Andy Judkis	12508	70 sec.
C Div. 4. Randy Thompson	16310	118 sec.
D Div. 4. G. Harry Stine	002	88 sec.
DLBF-Harry Weznitski, (B Div.)	13817	3 sec.

Robin Egg Lefting

A Div. 4. Mike Turtera	20655	162 m.
B Div. 4. Gary Jacobsen	12862	184 m.
C Div. 4. Jim Pommert	16908	210 m.
D Div. 4. Shirley Lindgren	13685	164 m.
DLBF-Sanchez-Yurfest Team, (C Div.)	T017	47 m.

Predicted Altitude

A Div. 4. Rusty Lindgren	13089	3.2 %
B Div. 4. Thomas Burris	12650	6.2 %
C Div. 4. Ed LaCroix II	11248	2.0 %
D Div. 4. Jess Medina	14147	.5 %
DLBF-Butterworth Team (D Div.)	T041	68.5 %

Sparrow Rocket Glider

A Div. 4. Mark Hopkins	16577	8 sec.
B Div. 4. James Kerley	12091	44 sec.
C Div. 4. William Chilcoat	13485	47 sec.
D Div. 4. Greg Scinto	5589	62 sec.
DLBF-Blackistone-Smith Team (D Div.)	T034	5 sec.

Class III Streamer Duration

A Div. 4. Susan Zucchi	16891	59 sec.
Jon Gerber	17655	59 sec.
B Div. 4. Carroll Yung	6319	82 sec.
C Div. 4. William McKinnen	20670	95 sec.
D Div. 4. Harry Maurer	19593	87 sec.
DLBF-Ricky Lindgren (C Div.)	11774	5 sec.

Class I Parachute Duration

A Div. 4. Mike Turtera	20655	59 se
B Div. 4. John Massey	17544	116 sec.
C Div. 4. John Lane	12298	192 sec.

D Div. 4. Jon Randolph	15496	135 sec.
DLBF-Kevin Flanagan (B Div.)	15013	10 sec.

Pee Wee Payload

A Div. 4. Leslie Lindgren	15237	166 m.
B Div. 4. Michael Mames	17144	166 m.
C Div. 4. Craig Streett	11943	200 m.
D Div. 4. James Worthen	7095	195 m.
Michael Dillion	17035	195 m.
DLBF-Blackstone-Smith Team (D Div.)	T034	35 m.

Super Scale

A Div. 4. none		
B Div. 4. Bart Hunter	12174	1120 pts.
C Div. 4. Craig Streett	11943	999 pts.
D Div. 4. Englund Team	T022	1527 pts.
DLBF-Mark Newfield (C Div.)	17719	658 pts.

Scale

A Div. 4. Kerry Mechtly	16799	430 pts.
B Div. 4. Gary Jacobsen	12862	618 pts.
C Div. 4. Rick Grosberg	17105	582 pts.
D Div. 4. George Meese Sr.	12973	788 pts.
DLBF-Alan Malizia (D Div.)	4740	196 pts.

Research and Development

C Div. 4. Jeff Chandler
D Div. 4. Karl Feldman

National Champions

A Division	
Champion: Jeff Gordon	1369 pts.
Reserve: Kerry Mechtly	1272 pts.
B Division	
Champion: Charles Krallman	1242 pts.
Reserve: Mark Wargo	1211 pts.
C Division	
Champion: Gary Lindgren	1355 pts.
Reserve: Bruce Shay	1007 pts.
D Division	
Champion: Jon Randolph	1791 pts.
Reserve: G. Harry Stine	1208 pts.
Team	
Champion: Stine Team (T014)	1111 pts.
Reserve: Kuhn Team (T063)	1069 pts.
Section	
Champion: YMCA Space Pioneers	10788 pts.
Reserve: NOVAAR	

Sportsmanship Award

David Thurber

Distinguished Service Award

Larry Loos

Thurber, Loos Win Special Awards

The NARAM-13 Sportsmanship Award was presented to David Thurber of the North Royalton Rocket Society for coming to the meet not to compete but to track! Dave stood out in the broiling sun for hours and hours, and he tracked with approximately 80% closure.

Larry Loos, who has been doing public relations work at NARAMs for years, and who is currently engaged in Section Activities work in Kansas and Missouri, was presented with the Distinguished Service Award at NARAM-13. Larry spends most of his time at national meets typing up press releases, arranging interviews, etc.

The *Model Rocketeer* would like to congratulate both of these winners. They have contributed much to the NAR.

Final 1970-71 Point Standings

A Division

1. Jeff Gordon	NAR	11386	Sec. 113	1369 pts.
2. Kerry Mechtly		16799	113	1272
3. Leslie Lindgren		15237	265	858
4. James Starks		17691	180	571
5. Walter Page		19068	221	536
6. Mike Turtera		20655	205	531
7. John Kennedy		18526	166	515
8. Christopher Wurster		18525	166	510
9. Tam Joines		17998	102	484
10. George "Billy" Stine		0024	--	483

B Division

1. Charles Krallman	15118	113	1242
2. Mark Warge	10371	103	1211
3. Gary Jacobsen	12862	166	1131
4. Bart Hunter	12174	162	1087
5. Gregory Lindgren	10677	265	1015
6. Michael Scarborough	18524	166	739
7. Tony Mendel	12339	265	635
8. Steve Setzer	16903	130	593
9. Steven Hudson	18487	205	499
10. Harry Weznitski	13827	115	477

C Division

1. Gary Lindgren	10678	265	1355
2. Bruce Shay	12117	115	1007
3. Brian Dolezal	11017	180	932
4. Craig Streett	11943	113	931
5. John Drake	7515	166	805
6. William Chilcoat	13485	130	721
7. Alan Dayton	17367	176	597
8. Russell Rasmussen	16334	162	561
9. Brad Cline 17114	17114	215	506
10. Kevin Clark	10085	142	499

D Division

1. Jon Randolph	15496	180	1826
2. G. Harry Stine	002	166	1208
3. Alfred Lindgren	11501	265	926
4. Shirley Lindgren	13685	265	921
5. Arnold Jacobsen	12863	166	885
6. James Worthen	7095	176	753
7. Terry White	11184	193	703
8. Howard Kuhn	11628	205	601
9. Jon Robbins	16092	180	572
10. Jess Medina	14147	176	566

Teams

1. Connie Stine	Team	T014	166	1111
2. Craig Kuhn		T063	205	1069
3. Laura Englund		T022	166	1111
4. Dennis Okesson		T070	169	724

5. Chris Pearson	T036	180	720
6. Mike Burzynski	T067	205	717
7. Tony Medina	T064	176	670
8. Richard Sipes	T003	130	586
9. Alan Stelzenberg	T065	157	580
10. Greg Kennedy	T025	139	477

Sections

1. YMCA Space Pioneers	Sec. 166	10876 pts.
2. NOVAAR	205	7282
3. CSAR	113	6400
4. N. Royalton Rocket Soc.	180	5707
5. South Seattle Rec. Soc.	176	5068
6. Pascack Valley	143	5065
7. Fanwood Rocket Club	265	4327
8. Metro. Area Rocket Soc.	130	3933
9. Fairchester	115	3207
10. West Covina	162	2839

By Charles Gordon

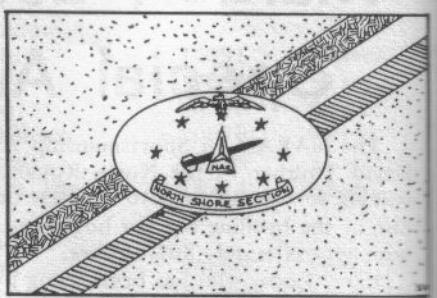
During the Easter holiday, four members of the APOLLO/NASA section (Houston, Texas) worked on creating a new club launch panel based on the ESCARIS system used at past NARAMs. Those working on the project were Talley Guill, Gary King, Bob de Leon, and Ben Russell.

The project took several days to complete. The system is equipped with 12 pads in modules of 4. Each pad has its own continuity light which flashes when the contestant is ready to go. A five second countdown automatically starts, and a hold switch gives the operator a safety control. Also, the panel has a PA system built into it. It was decided to name the panel HAL, which stands for *Heck of A Launcher.*

The Model Rocketeer includes sketches of NAR Section flags. Three or four flags will be included each month, selected randomly. The flags were all redrawn by Steve Fentress of North Hollywood, California. The NARHAMs flag has a black field with white lettering and design. The Tri-City Cosmotarians flag is white, with a yellow, white and light blue earth design, and a yellow and red symbol. The North Shore Section flag has a yellow background with red, white, and dark blue stripes diagonally, and black emblems on the center white area.

NARHAMs Section

Tri-City Cosmotarians



North Shore Section

(Club Notes, cont.)

tlen, secretary. Rocketeers interested in joining this club should contact Gary Craig, 2507 19th Street, Alamogordo, N.M. 88310.

A new club is being organized in the Schnectady, New York area. Interested rocketeers should contact David Gannon, 1 Seneca Ct., Apt. 31, Schnectady, N.Y. 12305.

A new club is being organized in Xenia, Ohio. Interested rocketeers can contact Steven Rue, 1052 N. Detroit, Xenia, Ohio.

Rocketeers interested in forming a rocket club in the New Castle, Delaware area should write to Charlie Galoway, 42 Onanay Place, Garfield Park, New Castle, Delaware 19720.

Rocketeers interested in forming a club on the island of Oahu in Hawaii are invited to contact Dennis Bishop at 1545-1210 Linapuni St., Honolulu, Hawaii.

On August 18 the Pennsylvania Aeronautics and Research Organization held their third annual Summer Launch Day. The traditional launch of an Alpha (in this case it was an Alpha III) started the afternoon. Next came an Honest John drag race with Ed Mroz's defeating Mike Kulas', both using A8-3 engines. Ed Mroz also had a streamer duration winner as his Stinger, powered by an A5-4 engine, stayed aloft for 46.4 seconds. Dave Szewczak's Little Joe II won the scale competition by recording 22 pts. and Mark Szewczak's Redstone Quasar drifted for an even 130 seconds for victory in B-engine parachute duration. Henry Mroz's Black & Gold rocket had a good flight in design efficiency, while despite an entanglement between the glider and the pod section, the Flat Cat, launched by Charles Kauffman, managed a 15 second flight with an A5-2 engine. The afternoon was climaxed by the launching of two D engine rockets, the Cherokee D and the Goblin, both performed excellently. A small crowd of about 20 witnessed the exhibition which was held at Keller Field in North Wales, Pa. Rocketeers can contact this group through David Szewczak, 413 East Montgomery Ave., North Wales, Pa. 19454.

The Eau Claire Rocket Club in Eau Claire, Wisconsin, was organized in March 1971 and recently held its first "Launch-In." Interested rocketeers should contact the club through vice-president Ed Nicholson at 832-1177.

Rocketeers interested in forming a club in the area of Kewanee, Illinois are asked to contact Frank Schlindwein, 809 West Prospect St, Kewanee, Ill. 61443.

* * * * * *

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

MPC 'Minijets' Top Ohio International Meet

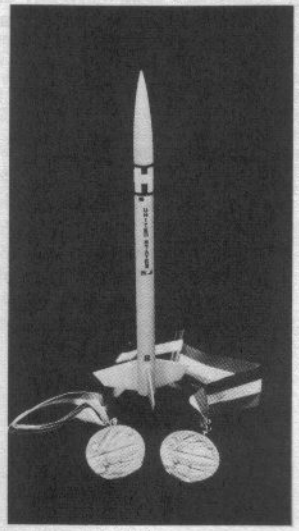
Thirteen out of the 24 gold, silver and bronze medals awarded at the 1979 Buckeye International Rocket Competition, held in Columbus, Ohio, went to rockets using MPC's new "Minijets."

The miniature rocket engines, developed by MPC for its line of "Minirocs", garnered six out of eight first place gold medals, four out of eight silver medals and 3 out of 8 bronze medals. This was the first international rocketry meet in which the "Minijets" were used.

The competition, which brought together model rocketeers from the United States, Canada, Czechoslovakia and Japan, included individual and team events in parachute duration, boost/glider duration and streamer duration. In addition, an individual event in scale building was held.

In a gesture of international cooperation, the contestant representing Czechoslovakia, Joseph Krasnec, was sponsored by MPC. To show his appreciation, Mr. Krasnec proceeded to win first prize in the team streamer duration event....using a rocket powered by an MPC "Minijet."

The rocketry meet, held July 17 and 18, was sanctioned by the National Association of Rocketry as a "record trials" and met all requirements for an international competition under rules established by the Federation Aeronautique Internationale (FAI).



An MPC Super-star, part of the new Miniroc line, took a first place gold medal in Streamer Duration at the Buckeye Internationals.

DEALER DIRECTORY

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

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(From the Editor, cont.)
del Rocket Performance Records. Again, the procedure will be *simple* and *free.* Records can be set only at sanctioned contests, and only in events which have been listed on the sanction form. The record applicant will be required to submit a drawing, photo and brief construction description of the record setting model. (Those models which are significant advances to the state-of-the-art will be published in Model Rocketry.) All record holders will receive certificates certifying their accomplishment.

The complete details on contest sanctioning and record certification will be announced next month in **Model Rocketry.** Watch for it, and start planning now for an active 1972 Contest Year.

SOLICITATION OF MATERIAL

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

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

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

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

Those wishing to submit material should send it to:

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

Club Spotlight:

South Seattle Contest

By Doug Frost and Tony Medina

Under the shadow of the Boeing Space Center, the Kent Kondors, just three months out of their nest as a new NAR Section, met the old battle-scarred South Seattle Rocket Society for a two-day competition. The events chosen for this encounter would truly flex the Kondor's Wings!! By a fantastic stroke of luck, the sun made it's appearance and performed for us.

SAMEE was going to open the contest with his cameo appearance, but he heard of a two stage F engined rocket, and was struck to his bones with stage fright, so Contest Director Jim Worthen took his place. He opened the meet with those immortal words, "Gentlemen, prep your engines!!"

The tracking wasn't expected to be very good for the first event, Predicted Altitude, judging from past performances by the trackers in similar conditions. They surprised everyone with only three tracks that didn't close out of twenty six flights. The Kondors had prepared for this event and thus took first in B Division and second, third and fourth in D. Tracking their models the weekend before, their predictions weren't too far off. The best flight of the event was Alan Dayton's 1.5% miss on his prediction for C Division, while Jim Worthen's prediction was only 1.6% off in D Division.

Robin Eggloft was flown next, and the tracking was just as good. There were a few broken eggs, but the individuals made it up on their second flights. In C Division the winners used three different models of CMR's egg capsules. It seems strange that Jim Pommert won with the oldest model capsule, while the Medina Team placed second with a newer model, and Alan Dayton placed third with the newest model. Typical of the East Coast's last minute construction techniques was the mad chick by "The Ole NARHAM", Doug Frost. The egg capsule was made from 1/6 of the bottom of an egg carton, with a nose cone on top. It was put together in the last minutes of the tracking events with lots of tape.

Pee Wee Payload was flown at the same time. Performances were excellent, with two flights over 200 meters and only .6 meters seperating 1st and 2nd in D Division.

Climaxing the first day's events were two flights not to be oft repeated. Jess Medina came within seconds of regaining his world 'Chute Duration supremacy, with a casual 17 minute 48 second flight. The model was nonchalantly hovering directly over a Space Center building constantly climbing and dropping from about 300 to 500 feet. Maybe the rocket was over the building air conditioning vents. Jess ran out of things to do so he walked back to the launch area to plot how to bring it down. It was rumored that he told Alan Dayton to set up the chess board------for a long game! One of the Boeing Guards actually asked Jess if he had a hot air machine in the rocket to keep it up there. It looked like first place was all stitched up, but the show had just begun!

Less than an hour later Jim Worthen's parachute entry caught a thermal, and headed in the opposite direction, away from the Space Center. All Jim could do was take to his car for the long chase. It stayed within sight of the timers for 21 minutes 6.9 seconds, and it looks like a new World's Record for Jim Worthen. Jim, in his chase car, had to turn around as his model headed back to within sight of the launch area. Jim's stopwatch read 48 minutes when his rocket finally came back to earth. Jess was somewhat disappointed to place only second after his tremendous 17 minute 48 second flight. Jess used the standard length engine while Jim used the short series III A engine. That explains the duration differences, or does it?

On Sunday the events scheduled were Sparrow Rocket-Glide, Eagle Boost-Glide, Swift Boost-Glide, and a finale of 'Chute Spot Landing. The Rocket/Gliders reflected many variations in the ingenuity of their builders. Alan Dayton has swung to the swing wings, Jim Pommert used movable ailerons, Jim Worthen flew a complicated flex-wing, the Medina Team used a movable casing over the wing, while Jess Medina flew his design with a movable casing under the wing. It was, "Back To The Drawing Boards" for all of the complicated models while the movable casing models took 1st in two divisions.

Jim Worthen's ingenious flex-wing unfortunately had problems in boost and in glide, but with his parachute duration world record flight Saturday, he didn't feel that he had any real complaints.

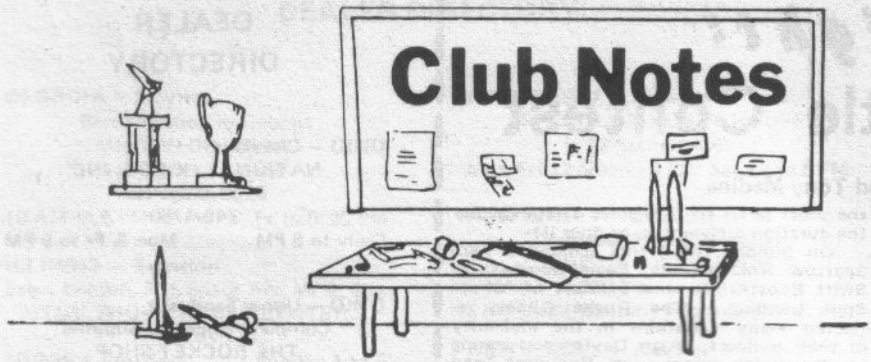
Jess Medina's thing had double extended wires to stop and hold the burnt crispy casing. The boost was straight up with a beautiful transition into a 30.56 second flight for 1st place in D Division. We didn't have the mini-engines yet so all the rocket gliders used the old standard diameter casing.

Eagle B/G is quite a challenge with the high acceleration, high altitude problems that tax even the best B/G fanatics' skills. Steve Bainbridge met the challenge with a greatly enlarged Centuri swift that was built like a brick and very colorful — mostly yellow and orange. It had a humongous wing of over three feet span which were reinforced with, would you believe, blue jean denim!! With a D-engine it zig-zagged its way upward as the wings vibrated wildly, and very visibly. It then went into a very impressive glide for such a huge monster. With 1 minute 19.6 seconds it was the best flight of the day in that event.

Doug Frost entered Eagle B/G with one of his infamous tandem engine combinations. The C6-0 and A5-2 epoxied end to end to operate as a single engine, was just into the Eagle category. A premature seperation by the glider ended the flight early, but the two hour old glider held together.

'Chute spot landing brought "SAMEE the FIRST" to a close, and marked the fall of the Kondors by the Seattle Society. The final score was Seattle 1850 points, Kent 202 points. However, the six-man (actually, five men, and one woman) team from Kent should be congratulated for putting up such a good showing at their first meet against the 16 man team from Seattle.

Jess Medina (left) and Jim Worthen display their PD models after flights of 17:48 and 21:07 respectively.



Results of NIMBUS I, an Area Meet held July 18th in Rochester, New York, are reported in the latest issue of *The Full Blast.* Five events were flown in the competition between the Monroe Astronautical Rocket Society, the Kenmore Rocket Society, and the Syracuse Rocketeers. In Open Spot Landing R. Clemens took first with a distance of 12'10" from the mark. J. Flygare topped the field in Class 1 PD with a time of 92.2 seconds. In Class 1 SD R. Smith took first with 49.7 seconds, while P. Johnson topped the Hornet B/G field with 69.3 seconds. Class 00 Altitude was won by R. Staehle with 170.7 meters. Overall the Monroe Astros finished first with 462 points, while the Kenmore Rocket Society had 346 points.

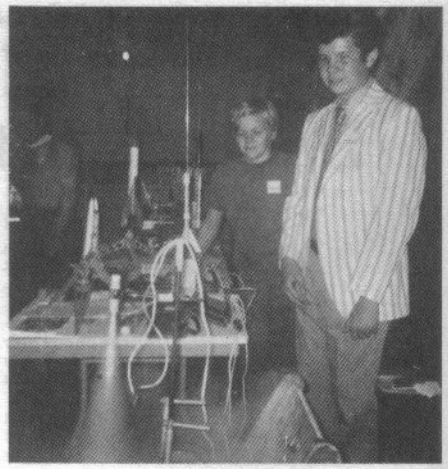
A new club is being organized in the Schenectady, NY area. All interested rocketeers should contact David Gannon, 1 Seneca Ct., Apt. 31, Schenectady, NY 12305.

Alan Laica is starting a rocket club in the north-west Detroit area. Interested rocketeers should contact him at 19509 Braile, Detroit, Mich. 48219.

The Pittsburgh Suburban Rocketry Club (Pittsburgh, Pennsylvania) held a demonstration launch at the Churchill Valley High School on Sunday, September 12th. About 60 spectators witnessed the launchings, despite a slight drizzle. A printed program, which described each rocket flown, allowed the spectators to identify the V-2, Wac Corporal, Honest John, and other models flown. This was the second demonstration launch for the club, which has been in existance for about a year.

The Goldsboro Starlancer Section of the NAR has scheduled the first North Carolina Regional Meet for December 11th and 12th, 1971. The contest, CRRM-1, will be open to NAR members from Maryland, Virginia, District of Columbia, North Carolina, and Georgia. Events to be flown include Roc Eggloft, Quadrathon, Sparrow B/G, Scale, Pigeon Eggloft, Open Spot Landing plus night launched contests in Single Payload, Class 2 SD, and Swift R/G. Rocketeers should contact Rod Wright, CMR 3271, SJAFB, Goldsboro, NC 27530.

The Lee Hills Rocket Club (Leesville, Louisiana) held a "get together meet" on August 1, 1971. The purpose was to introduce new members to the older club membership. The launch site is a motorcycle race field in Leesville, Louisiana. A total of 60 models, including Alpha IIIs, Mercury Redstones, a Jupiter-C, Saturn-V, and a Little Joe, were flown during the day. The club uses a mult-position pad built by David Montgomery. Rocketeers within a 50 mile radius of Leesville interested in joining should contact Richard Fessler, Jr., 2005 Allison Ave., Leesville, La. 71457.



The Coughlin Model Rocket Society organized at the Coughlin High School in Wilkes-Barre, Pennsylvania held Wyoming Valley's first Model Rocket Seminar on August 28, 1971. Participating in the seminar were Mr. Bernard Chandler, a science and math teacher at the high school, Mr. Robert Lada and a group from the Wyoming Valley Model Rocketry Society, and members of the CMRS. More than 50 model rockets were on display along with the club's multiple position launch pad, and several R&D projects. Highlighting the day's activities, which lasted from 11:00 AM to 7:30 PM, were three static engine tests and the Wyoming Valley Model Rocket Club's CINEROC films.

The ARS Rocketry Club in Sedalina, Missouri has published the first issue of their newsletter, *CAPCOM,* and reported on the election of club officers. The president is Tom Cave; vice-president, Craig Pirtle; and senior advisor, Tom Cave, Sr. The club is presently designing a multiple position launcher, and plans a contest for later this year. Rocketeers in the Sedalia or Pettis County area can contact Tom Cave, Box 1411, Sedalia, Missouri 65301.

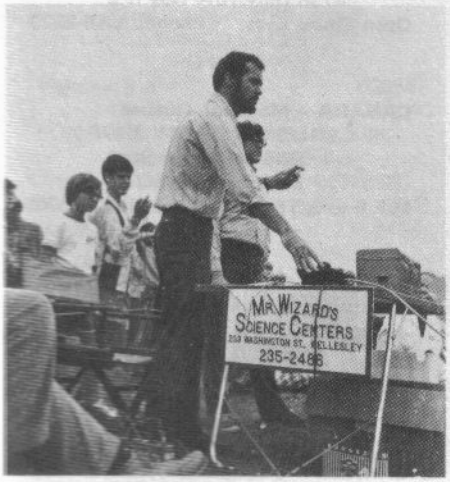
The Canadian Rocket Society has tentatively scheduled the second Toronto Regional Meet for June 1972. No events have yet been selected, but CRS indicates that rocketry seminars will also be held in conjunction with the contest. Interested rocketeers should contact the Canadian Rocket Society, Adelaide St. P.O. Box 396, Toronto 1, Ontario, Canada.

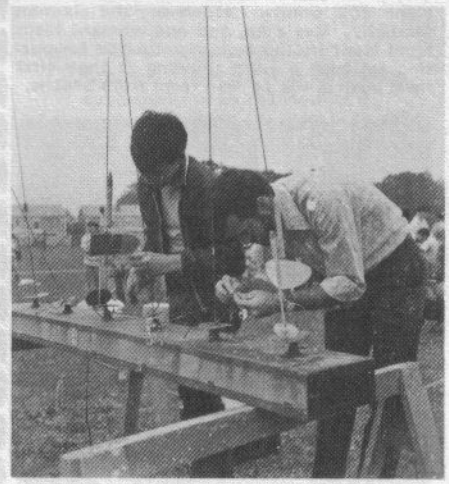
A model rocket club is being organized in the Odessa-Midland area of Western Texas. Interested rocketeers should contact Tony Kalenak, 1315 N. Kelly, Odessa, Tex. 79760.

The White Sands Rocket Association has been formed in Alamogordo, New Mexico area. The club was organized August 14, 1971, and currently has 18 members. Officers elected include Gary Craig, president; Charles Diehl, vice-president; and Brian Met-

(Continued on page 45)

Mr. Wizard's Launch





Dave Hammond supervises a monthly model rocket launching at Mr. Wizard's Science Center. The store, with the largest stock of model rocket supplies in New England, is located at 239 Washington St., Wellesley Hills, Mass 02181.

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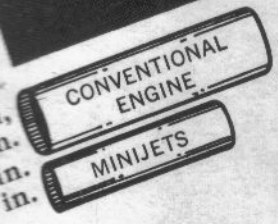

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