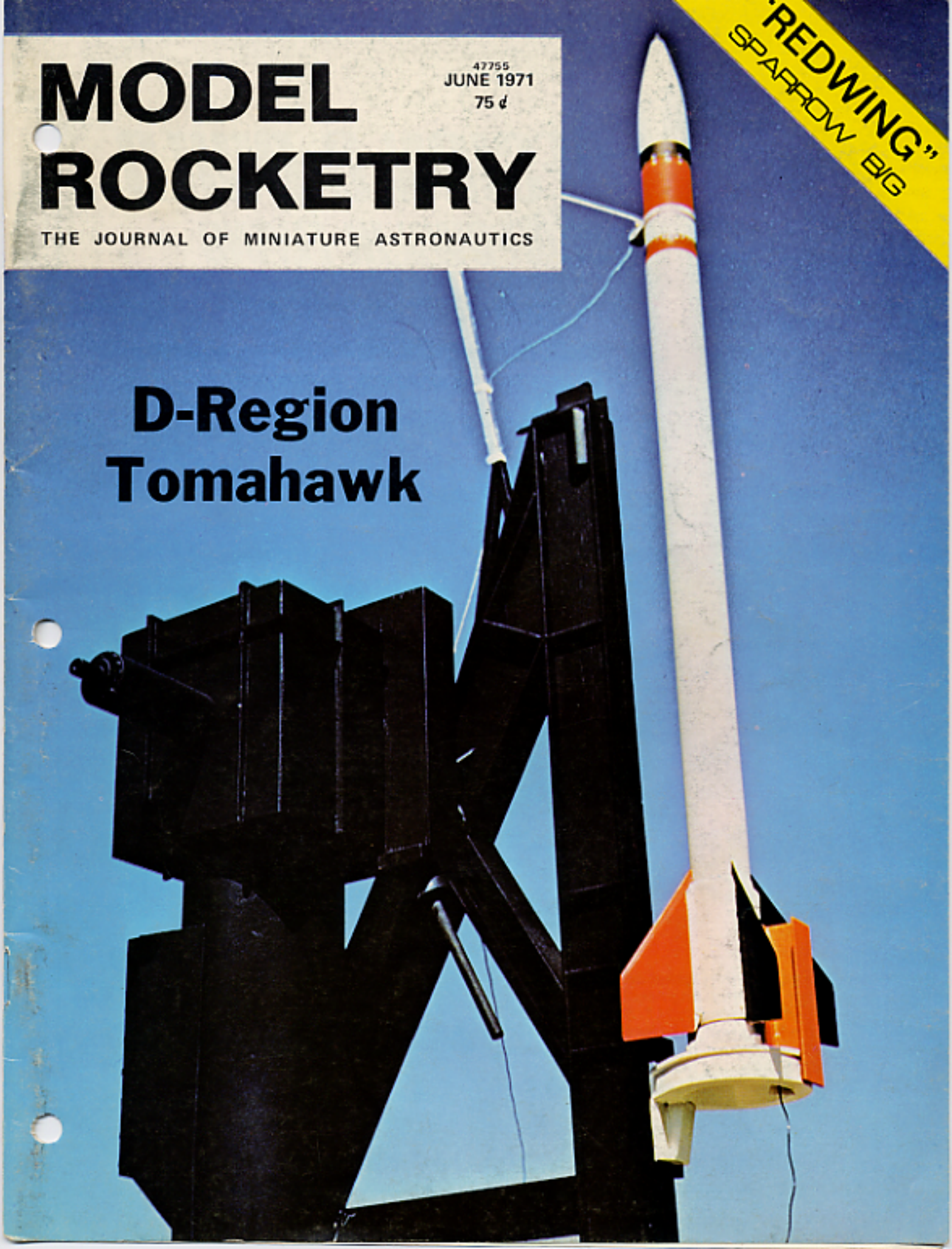

MODEL ROCKETRY

47755
JUNE 1971
75 ¢

THE JOURNAL OF MINIATURE ASTRONAUTICS

D-Region Tomahawk

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Model Rocketry

Volume III, No. 8
June 1971

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Cover Photo

This Month's cover shows a D-Region Tomahawk scale model built by Howard Kuln. Complete scale plans for the D-Region follow on page 10. (Photo by Howard Kuln.)

From the Editor

By now we hope you've noticed that **Model Rocketry** has expanded to 48 pages. By including eight more pages every month we will be able to include more designs, scale plans, contest reports, technical material, and other articles.

Unfortunately, increased postal rates as well as higher printing costs make necessary an increase in the price of **Model Rocketry**. Effective with this issue the cover price will be raised to 75 cents per issue. Beginning on June 1st the yearly subscription rate will be increased to $7.00 per year. (Get your renewals in before June 1st and the $6.00 rate will still apply.)

Along with the price increase comes an increase in the quality of **MRm**. First, the expansion to 48 pages will allow us to bring you more and varied articles in each issue. Second, beginning with this issue we will be using a new, and whiter paper for printing. This new paper will allow more details to be visible in photographs and provide a sharper, more easily readable type in **MRm**. Finally, by increasing the number of regular columns appearing monthly we hope to bring you more regular information on new products, competition, scale, and other aspects of the model rocket hobby.

We hope you will keep us informed, by your letters, of which of these new features you enjoy most. Your letters and opinions determine what material will be included in future issues of **Model Rocketry**.

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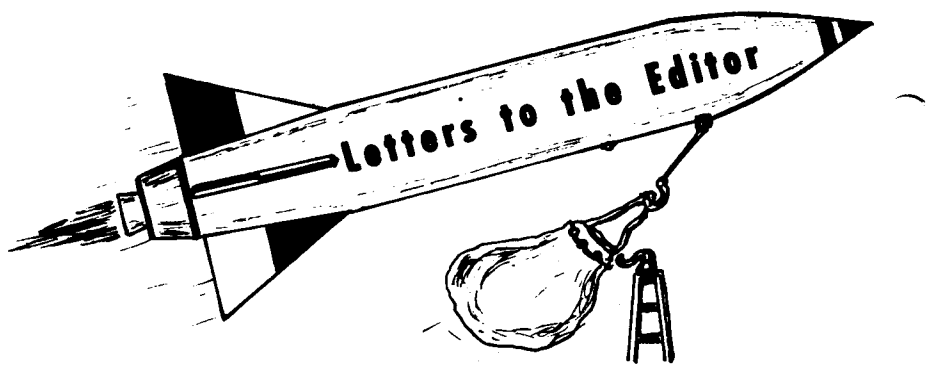
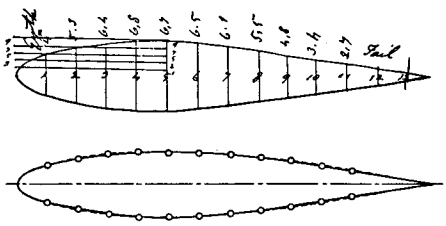


Fin Shape Analogy

In the December 1970 issue of **MRm**, Richard Trissel noted the efficiency of the fish shape for low aerodynamic drag. You might be surprised to learn that Sir George Cayley made a similar observation back in 1825. Cayley was an early observer of birds and experimenter with problems of flight. He measured the trout cross-section from a stream in England. The sketch below shows Cayley's original measurements. Below that sketch is another comparing the cross-section of the trout with a modern airfoil - - NACA 63A016. This comparison was made by Von Karmen in the paperback book "Aerodynamics" published by McGraw Hill, a good reference book for modelers.



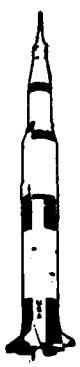
The drag of the fish shape and modern airfoils is almost entirely friction drag, coming from the air (or water) moving rapidly past the surface. That's why smooth finishes are so important for low drag on model rockets. Drag due to any pressure unbalance is just about negligable on this efficient shape (accounting for less than 10% of the total drag). The trouble is that as soon as you cut the tail to mount a rocket engine, a pressure unbalance does occur on the resulting blunt base and the drag goes up. The blunt base can account for as much as 30% of the model rocket drag. Boat-tailing the back end reduces this drag, but you might expect that anyway since fish are naturally "boat-tailed" all the way.

Dr. Gerald Gregorek
Ohio State University
Columbus, Ohio

Whistle Rockets

In the March 1971 issue I especially liked the atricle of whistle rockets. I have one suggestion to make regarding this type of rocket. As any wind instrument player will tell you, a flute or any toher pipe containing vibrating air will produce different notes depending on the velocity of the air through the mouthpiece.

Some enterprising modeler might want to try mounting a group of whistles on a rocket. By special selecting of these whistles



to produce a sequence of chords as the velocity of the rocket changes, and carefully selecting the boosters, parallel stages, ect., it might be possible to play a whole tune during the flight.

Anyway, it's nice to know that model rocketry has produced a true "sounding rocket."

Steve Fentress
North Hollywood, CA.

Leaving Rocketry?

I am 15 years old and, according to the statistics, I should be losing interest in model rocketry. I am ashamed to say that this was almost the case. Around the beginning of the year I had plans to buy a transmitter and possibly get started on an R&D project. But I slowly grew apathetic.

I took the money I had scraped together for the transmitter and prepared to buy a 35mm camera being sold by a friend. Over and over I told myself the reasons for dropping rocketry- - the rockets just go up and come down, its just too easy, my friends kid me for being a "space cadet."

But then I remembered the feeling I get when the bird I've been working on for three weeks ejects its chute and comes floating down, and I knew I would be on the bottom side of the deal if I quit rocketry. I called my friend and told him to keep the camera. After reading my old issues of **Model Rocketry** I know I've made the right choice.

Steve Hadlock
NAR 12302
Manchester, NH

Diamant Plans

In your January 1971 issue I noticed a plea for Diamant rocket plans. While I was looking in various books and magazines for Vostok pictures, I came across plans for the Diamant B rocket. These plans include dimensions for all major body diameters and lengths of the Diamant B vehicle used to launch the D-2 satellite. The plans can be found in the April 1968 issue of "Space Technology International," page 21.

An excellent set of Vostok photographs can be found in the same issue on pages 30 to 39.

Stephen Maire
Westwood, Mass.

Oddball Designs

Your magazine is very good. Get more articles on strange rockets such as the "Tall-Tail-10," the "Flying Bowling Pin," ect.

Mark Younglove
Riverside, California

Parachute Duration Record Attempt

On February 24th, 1971, our rocket club fired a Centuri "Starfire" on an incredible 1906 second flight. The model we used carried a 20" red and white parachute, and was powered by a B6-4 engine.

The rocket was launched a little after 1:20 PM and soon after liftoff the rocket streaked out of sight. Then we saw the ejection of the recovery system. We thought the rocket would return in about five minutes but the air current kept it up for a long time. We almost gave up on recovering the "Star fire," but it finally landed about a half-mile away.

The rocket was recovered undamaged. The parachute was fully deployed, and the engine was still in place. We believed that this 31 minute 46 second flight is one of the best achievements of our club.

Ted Nomura
Las Vegas, Nevada

Range Safety Idea

As an idea for greater range safety, mask off a 2" section at the top of each launch rod and spray it with a thin coat of white enamel. This makes the launch rod much more visible and may prevent possible injury to inquisitive spectators and carless model rocketeers. It dosen't add any drag, and only takes a few minutes to do.

D.W. Garrett
Houston, Texas

Whistle Rockets

I think that the NAR should ban whistle rockets like the one which appeared in the March issue because it is a possible safety

hazard. First of all the whistle, in substitution of a nose cone, would not equalize the center of pressure. Second, the horns or whistle added to the side of the rocket or whistles added to the side of the rocket would cause a certain amount of drag depending in its parabolic shape. Of course, it might be a good table centerpiece.

Marty Coghlan
Philadelphia, PA

Rest assured that the "whistle Rocket" described in March was thoroughly tested before publication. It exhibits no problems with stability during the boost, and flys quite straight. We suggest you give one a try to alleviate any safety fears you might have.

Underwater Launching

With respect to your comments on "underwater launching," we have done a total of four underwater launchings. Two of the four were successful. All of the launches were recorded on movie film and slides, but these have not yet been developed.

The rockets used were christened Aquaroc 1 and 2. They were constructed out of MPC parts using a regular streamer ejection system. The balsa parts were sealed with epoxy, to make them hard, waterproof, and smooth. Both rockets were completely assembled with epoxy, then coated with waterproof glue. They were painted, and a clear coat added for waterproofing.

Michael Roeder and
Richard Bianchi
Flushing, New York

Styfofoam Fin Material

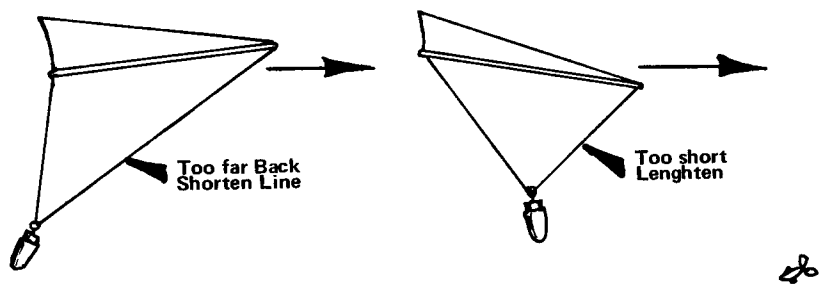
I have been learning a lot about the use of styrofoam as a material for B/G's. With a little adaption of the D–B Industries wing section it might be possible to use the D–B material for competition fins. The styrofoam, which is lighter and tougher than balsa, should make good fin material.

Jim Dickson
Toronto, Canada

Parawing Recovery

I have read many issues of **MRm**, and you always have somthing worth trying. In Volume II No. 4 I noticed an article about **Parawing Recovery.** I tried making one, and the preliminary tests show it to work. To adjust for a good glide Iv'e found a good method for trimming. Start with the middle guideline very long. Adjudt the trim by decreasing the length of the line until a good glide is obtained. (Don't cut the line between each test, just retie the knot till you hit the right position.)

Dave Mancalester
West Chester, PA



The parawing Recovery systems, described in a letter above, decreases the length of the center guideline in order to trim the glider.

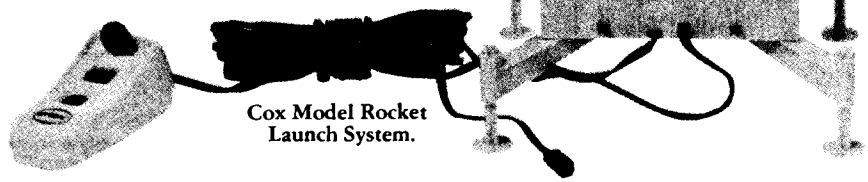
Be nice to your scratch-built rocket.

You've invested a lot of time and energy in your beautiful bird, not to mention some pretty tedious work. If you want it to perform to match your craftsmanship, you won't try to fly it with second-rate engines and accessories. You'll use the best: the Cox family of model rocketry components. See them and our line of fine, beautifully detailed, ready-to-launch model rockets at your favorite store.

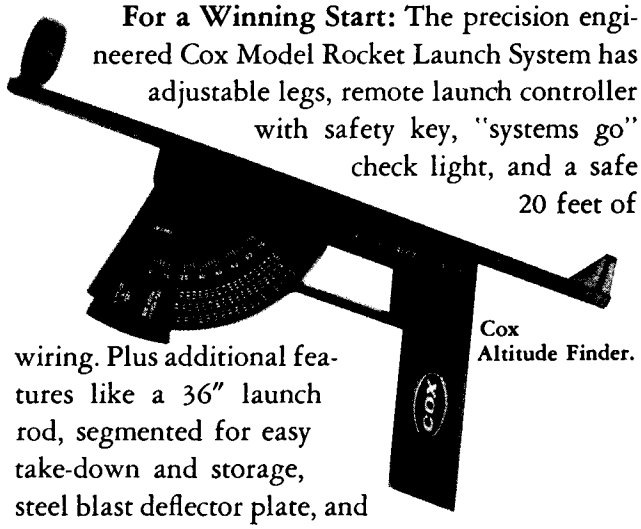
Cox Solid Fuel Engine and Cox Safety Igniter.

Premium Fuel: It may be rated in newton-seconds instead of octanes, but it's still the best. Why? Because Cox Solid Fuel Engines provide a better power-to-weight ratio in the standard .69″ x 2.75″ casing than any other manufacturer's. Which means that you get more usable power out of a lighter package. And this year, Cox is introducing the most potent member of the line: the D8. The D8 produces 50% more power than was previously available in standard .69″ x 2.75″ casing. All Cox engines feature dense, highly visible tracking smoke.

Positive Ignition: Cox Safety Igniters* provide fail-safe arming because the igniter is plugged into the electrical circuit prior to insertion into the engine. No "micro clips" or groping around the base of an armed rocket required.


Cox Model Rocket Launch System.

For a Winning Start: The precision engineered Cox Model Rocket Launch System has adjustable legs, remote launch controller with safety key, "systems go" check light, and a safe 20 feet of wiring. Plus additional features like a 36″ launch rod, segmented for easy take-down and storage, steel blast deflector plate, and the launch base holds 8 "D" cells (not included) for dependable single engine ignition time after time.



Cox Altitude Finder.

High Performance Requires Fast Tracking: Cox's ready-to-use Altitude Finder is a quick, easy way to pinpoint the angle and height of your rocket's apogee. As the rocket reaches maximum height, the Altitude Finder's trigger is released, locking the direct readout gauge in position. The rocket's altitude is read directly in feet with no immediate calculations or trigonometry tables required.

Power Brakes: Cox Parachutes come pre-cut with shroud lines and snap-swivels attached. An elastic shock cord is included to guarantee that your favorite bird won't do a pancake landing from 800 meters. In 12″, 16″ and 20″ diameters.

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*pat. pend.

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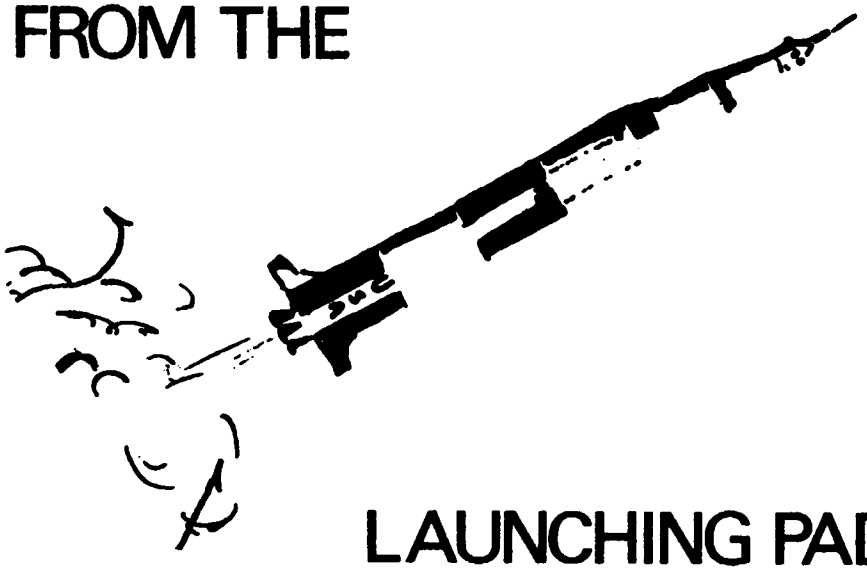
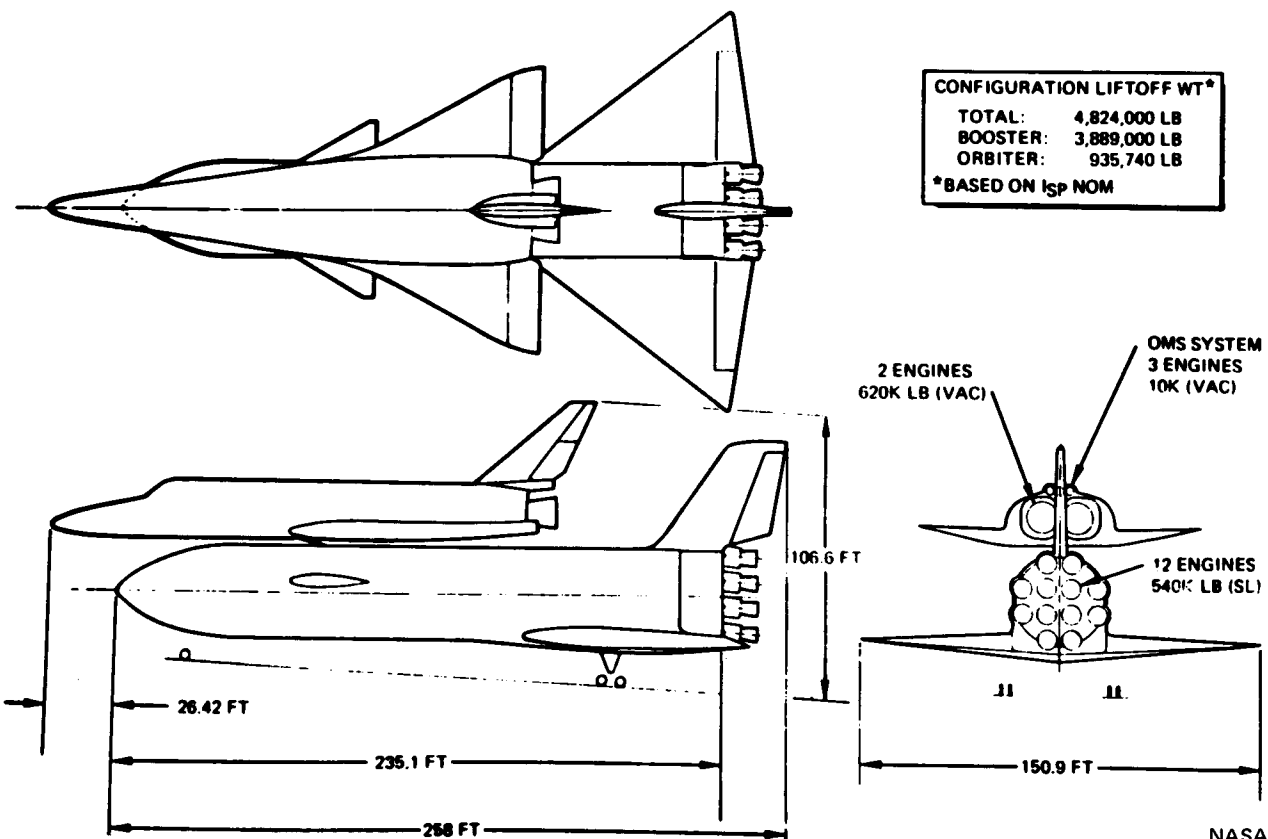


LAUNCHING PAD

Work is now underway on the revised Foxmitter 3. This new transmitter uses an integrated circuit to reduce the overall weight by one-third. A description of the February 21st test flight was given in Steel City's Starburst:

"This was only the second test flight for the device, which had a temperature sensor attached.,,, When the rocket was a hundred feet above the ground on the way up, however, the signal from the transmitter faded out, reappearing again when the rocket had come down to the same altitude. Richard Fox decided later that the cold temperature of the air at launch time had affected the performance of the integrated circuit. You can now find the new Foxmitter 3 inside Richard's refrigerator, as he tests it out."

NASA's "Space Shuttle" vehicle, designed to transport men and equipment to low earth orbit late in this decade, will prove a problem for serious scale modelers. One of the hardest items to detail properly, especially on small models, is the nozzle section, and the Space Shuttle will have **twelve** of them in its first stage. NASA research teams, assisted by engineers from Aerojet General, Pratt & Whitney, and North



NASA Photo

This engineering drawing of the North American version of NASA's Space Shuttle illustrates the Delta wing Concept currently under consideration. The Booster employs 12 engines while the Shuttle uses two. The overall vehicle, to be launched vertically, will stand 284 feet tall, almost the height of a Saturn V.

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Most catalogue items available, order by part number.

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Lectronix

FM Rocket Transmitter	7.95
Tracking Light with Nose Cone	4.95

Engines

Estes: A,B,C,D's
Centuri: Enerjet E&F's
MPC: A,B, & C's
FSI: A,B,C,D,E, & F's
SAI: A,B,C, & D's
(All at Manuf. Prices)

Books

Hand Book of Model Rocketry	6.95
Model Rocketry Manual	1.50

Glue

Hobbypoxy Formula 1 Cures 1 hour	1.00
Hobbypoxy Formula 2 Cures 3 hours	3.00
Hobbypoxy Formula 4 Cures 15 minutes	2.00
Testers Wood Glue	.15
Ambroid	.25
Ambroid	.39
Elmers	.29
Elmers	.59

Paints

Testors Dope 1 oz.	.25
Testors Dope 4 oz.	.69
Testors Dope Thinner 1 oz.	.25
Testors Thinner 4 oz.	.60
Rubbing Compound	.85
Finishing Wax	.85

Balsa

3/32 by 3 by 12"	3 for .60
1/8 by 3 by 12"	3 for .70
1/16 by 3 by 12"	3 for .55
Fireproof streamers	.35

American Rockwell, are currently performing preliminary design of the Space Shuttle's engines while other teams are investigating other aspects of the vehicle.

If the current concept is approved, the reusable Space Shuttle will be a two-stage, winged vehicle. The "airplane-like" booster and orbiter stages would be launched vertically in a piggy-back arrangement. Each would land seperately in a horozontal attitude like an airplane.

The first stage would be powered by 12 engines of 550,000 pounds thrust each. Thus, the first stage's thrust of 6.6 million pounds would almost match the Saturn-V's 7.5 million pounds. The booster would lift the vehicle from earth to about 250,000 feet altitude and then the orbiter would separate. The booster would fly back to an "airport" landing area, while the orbiter would continue into orbit powered by two engines similar to those in the first stage.

The Space Shuttle is envisioned as having a capability of 100 or more flights into orbit. Its missions will include the deployment of unmanned spacecraft, satellite repair and retrieval, space rescue, short duration orbital science and applications missions, and eventually space station supply.

***

Model rocketry made the front page of The Nyack, New York *Journal-News* in March when one rocket launched by Grandview Elementary School students was reported missing. Under the headline "Monsey Students' Missile Lost in Space" the *Journal-News* reported the following story.

"One of three experimental rockets sent aloft Friday morning by science students at the Grandview Elementary School in North Monsey has gone astray, and the school has posted a $5.00 reward for its return. Principal Joel Elkind reported that the 18" long red missile had equipment aboard that the school is anxious to have returned. When last seen, its multi-colored parachute was floating eastward over Route 306. Anyone finding the rocket is asked to call us at the school."

Well, that's one way to get publicity for your club! Take a look at this month's *Club Corner* by Bob Mullane for some tips on how your club can make page one.

Payload Boost/Glide will be flown again, this time in Wisconsin at a contest sponsored by the Mariner Rocket Society. The event is scheduled for September 18th, and will be flown under a combination of NAR payload and B/G rules. The gliding portion of the entry must carry one standard NAR lead payload. Engine size will be unlimited. We hope to have a report on the success of this event after the contest.

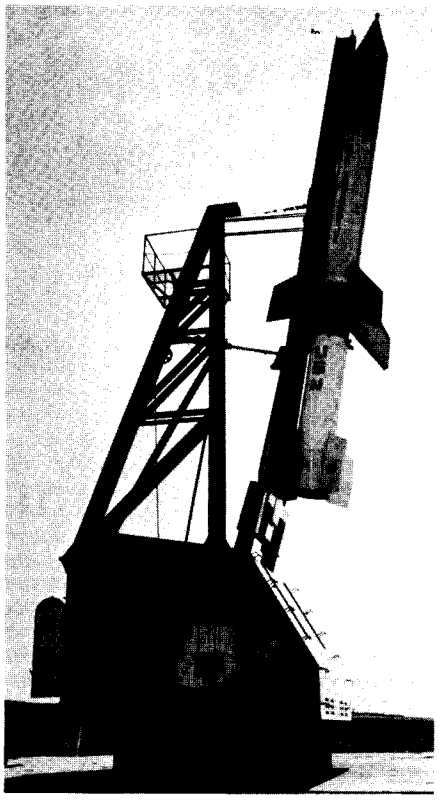
Scale modelers are in for a whole new "breed" of sounding rockets as the supply of Nike M-5 booster rockets is running short. For over a decade the seemingly inexhaustable supply of Nikes, originally manufactured as the lower stage missile of the 50's, was used as an inexpensive sounding rocket booster. Such common vehicles as the Aerobee, Tomahawk, Cajun, Apache, Asp, and Arcas were mated to "off the shelf" Nike boosters to increase their capability as high performance sounding rockets.

However, the Nike booster, manufactured by Thiokol, has been out of production for several years and the stockpile is running low. Experimenters are looking for new, low cost, booster vehicles to carry their experimental payload aloft.

The Nike became popular as a sounding rocket when the Nike-Ajax missile became obsolete, and the surplus became available for the sounding rocket program. Now, scientists and engineers are turning their attention to other surplus missiles available in quantity. The next few years will see quite a few new sounding rockets built from "off the shelf" Army, Navy, and Air Force missiles.

A team at the Naval Research Laboratory, seeking an inexpensive sounding rocket, has fabricated a new rocket called the Super Chief. The first successful launch of the Super Chief, carrying a 1225 pound payload, was conducted from the Pacific Missile Range San Nicholas Island last fall. The 40 feet Super Chief is a combination of a Talos first stage and a Sergeant second stage, NRL was able to obtain the Sergeant rocket from the Army and the Talos from the Navy. A surplus Navy gun mount was used as the launcher to lift the payload to an altitude of 130 miles.

The NRL Super Chief is characteristic



Official U.S. Navy Photo
U.S. Naval Research Laboratory

The new super chief sounding rocket, developed by the Naval Research Laboratory, uses a surplus Navy Talos as its first stage and a surplus Army Sergent upper stage. The launcher is a surplus Navy gun mount. The ingenuity of Naval Research Laboratory. scientists in using surplus rockets is expected to save the Navy thousands of dollars in space research costs.

of the new sounding rockets which will be fabricated over the next few years. Many solid propellent military rockets such as the Nike-Hercules, Sergent, Talos, Tarter, and Terrier will be available to NRL, NASA, and other scientific research organizations for use as sounding rockets.

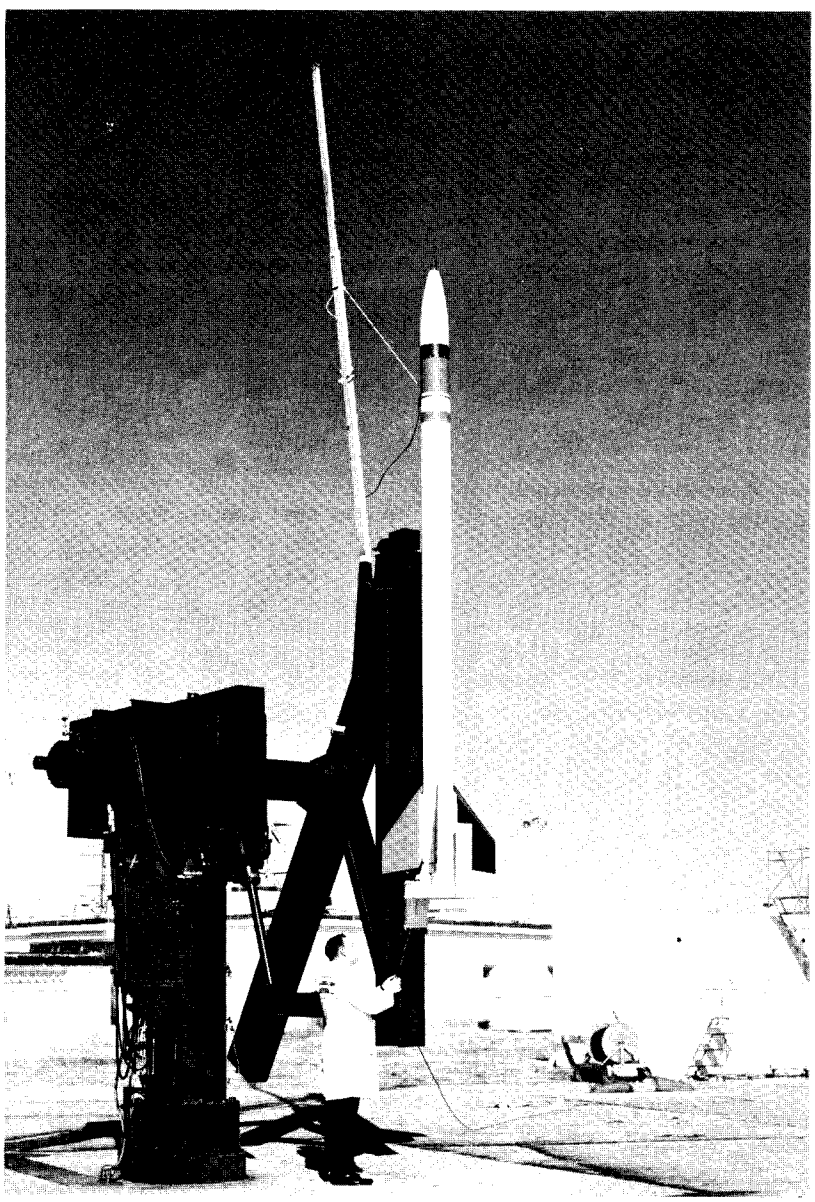
The March 18th issue of *Flight International* contains an article of interest to all scale modelers. The annual "World Missiles" directory, a 20 page summary of missiles and rockets on active military deployment or under development, includes silouette drawings and specifications on these missiles. Data such as length, maximum diameter, weight, range, and prime contractor are included. The information provided on French, British, Russian, and German missiles will prove particularly interesting to the scale modeler who wants to build something different. Copies of *Flight International* are available in the reference section of most good libraries.

George

DETAILED SCALE PLANS

D-REGION TOMAHAWK

by Howard Kuhn



Overall view of the D-Region Tomahawk, NASA Flight No. 12.08GT, on the launcher ready for flight. Note that the fin to the right is painted black while the the others are red. The D-Region carried no visible markings or insignia. (NASA Photo W68-34)

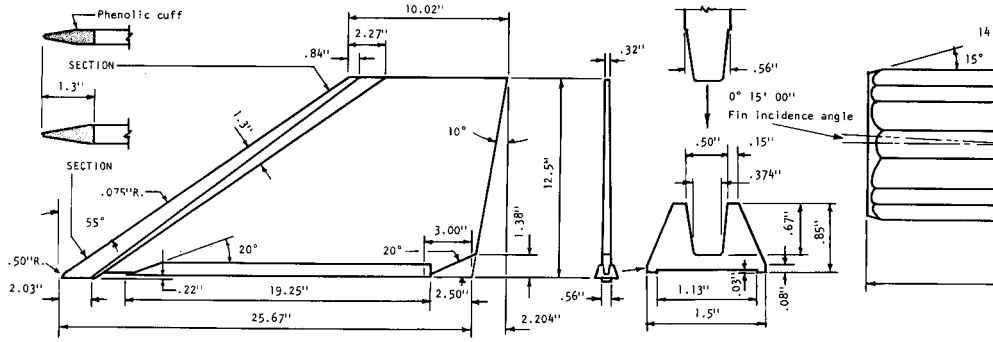
The "D" Region Tomahawk is a medium performance member of the Tomahawk Sounding Rocket family designed by Astro-Met of Thiokol Chemical Corporation. The single-stage Tomahawk is fin stabilized, uses the basic TE-M-416 Tomahawk solid propellant motor and attains its special performance characteristics through a controlled drag design. Normal trajectory data are based on a sea level launch at an initial launch angle of 80 degrees and a gross payload weight of 60 pounds.

The basic medium performance (MP) Tomahawk is designed for the specific capability of delivering an 80 pound gross payload to an apogee altitude of 110 kilometers. However, a simple configuration change from a 3:1 ogive nose cone to a low drag shape such as a 5:1 ogive nose cone would result in an altitude increase of approximately 70,000 feet, or conversly, would permit achieving the nominal apogee altitude with an increase in payload weight of 35 to 40 pounds, thus providing a significant payload growth capability for a 100 kilometer altitude range. A reduction in apogee altitude of approximately 1,800 feet will occur for each additional pound of system weight, and a 42,000 foot reduction in altitude will occur for each 10 percent increase in drag.

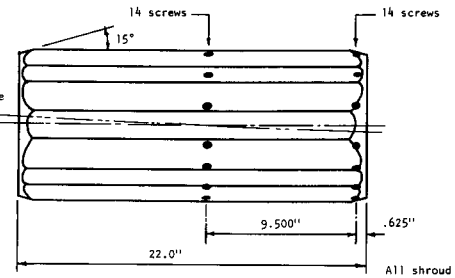
NASA D–REGION TOMAHAWK

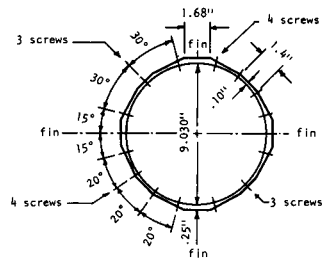
The "D" region Tomahawk, NASA Flight No. 12.08,GT, was primarily a test flight to demonstrate vehicle flight characteristics before acceptance by NASA as a standard NASA sounding rocket. The object of the test flight was to determine vehicle performance and establish the payload environment during flight. To accomplish these objectives, the payload carried three accelerometers, two vibration transducers, one stable platform to measure vehicle attitude, ten temperature transducers to measure temperature environment of the payload, one pressure transducer to measure chamber pressure on the TE-M-416 rocket motor, and associated electronics designed to transmit data to a ground station.

Vehicle No. 12.08 GT was launched from Wallop Island, Virginia, at 1900 Z 5 February 1968, and reached a peak altitude of 118.5 KM (389,927 feet) in 160.0 seconds. An altitude of 380,000 feet was predicted. Burnout accured 9.5 seconds after lift-off at an altitude of 27,456 feet and a velocity of 6,067 feet/second. Impact was 318,185 feet at an azimuth of 110 degrees from the launch site after a flight of 5 minutes and 27 seconds. The launcher was set at an effective angle of 116.30 degrees azimuth from true north and 80.48



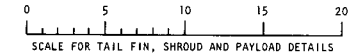
TAIL FIN



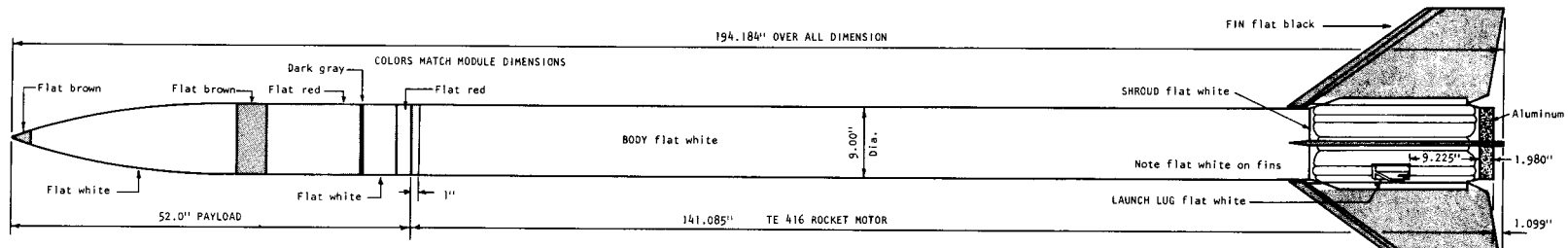


All shroud screws F.H.C.S. 100° Allen 1/4"x28NF flat white

SHROUD



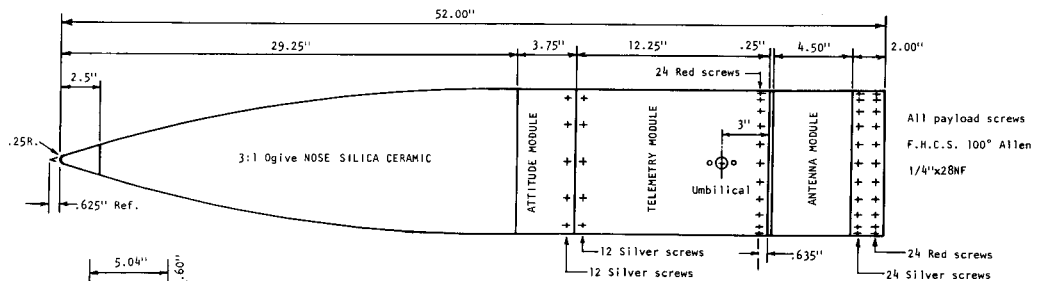
SCALE FOR TAIL FIN, SHROUD AND PAYLOAD DETAILS (Inches)



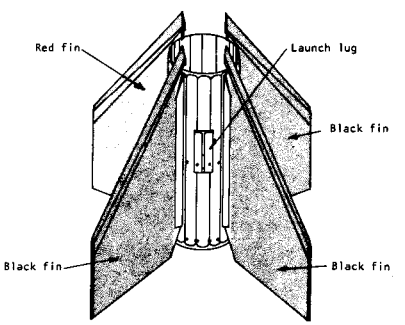
SIDE VIEW

DATA SOURCE: Thiokol Chemical Corporation Drawings:
D00763, D00764, D00765, D00788, R00528, R00529, R00548, R00790, C00746.
NASA Photographs:
Color: W68-18, W68-19, W68-20, W68-21, W68-22, W68-23, W68-24, W68-39, W68-40, W68-44, W68-45.
Black and White: W68-10, W68-11, W68-12, W68-13, W68-14, W68-15, W68-16, W68-17, W68-30, W68-31, W68-32, W68-33, W68-34, W68-35, W68-38.

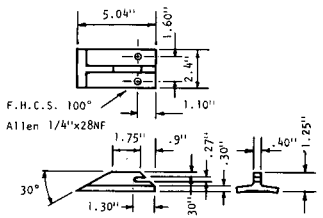
Scale for Side View (Inches)



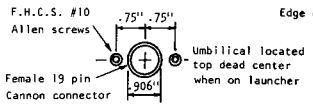
PAYLOAD



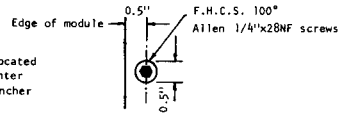
FIN ASSEMBLY



LAUNCH LUG



UMBILICAL

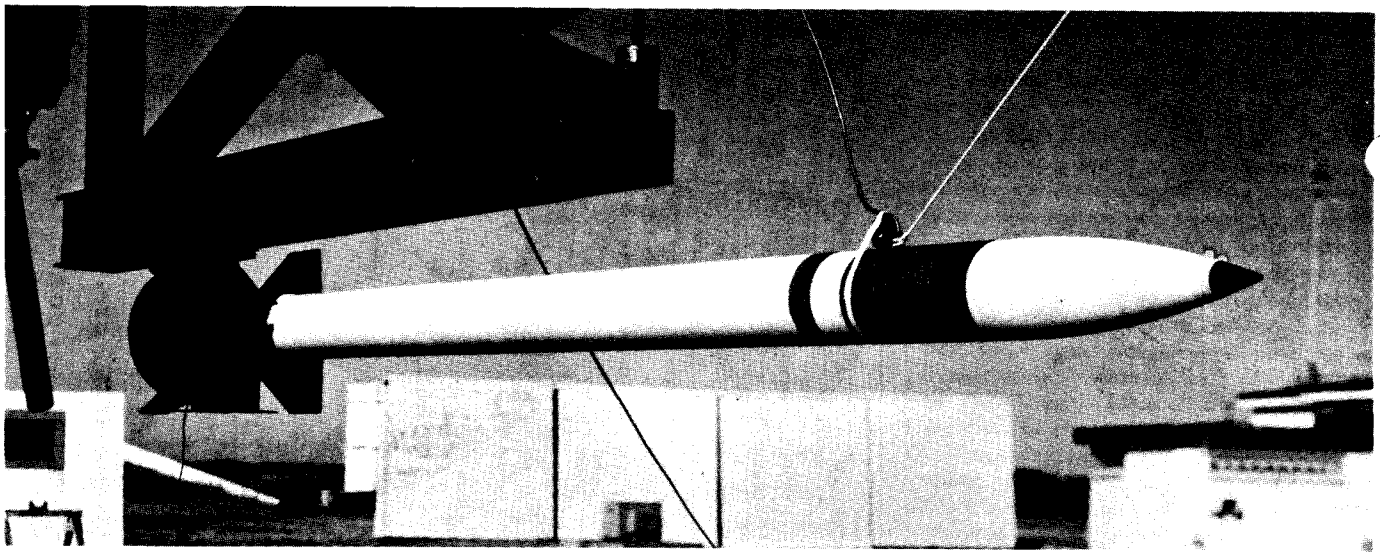


SCREW DETAIL

D-REGION TOMAHAWK

NASA FLIGHT No.12.08 GT Drawn by HRK

Thiokol CHEMICAL CORPORATION
ASTRO-MET DIVISION



Right side view of NASA Flight 12.08GT. Note that the screws on the payload section are unpainted. The dark cable from the payload is the umbilical, while the lighter colored line is a rope tied to the umbilical connector. (NASA Photo W68-32)

degrees elevation above horizontal. The vehicle performed as predicted with all instrumentation operating to impact. The rocket was recommended for acceptance in the NASA sounding rocket stable.

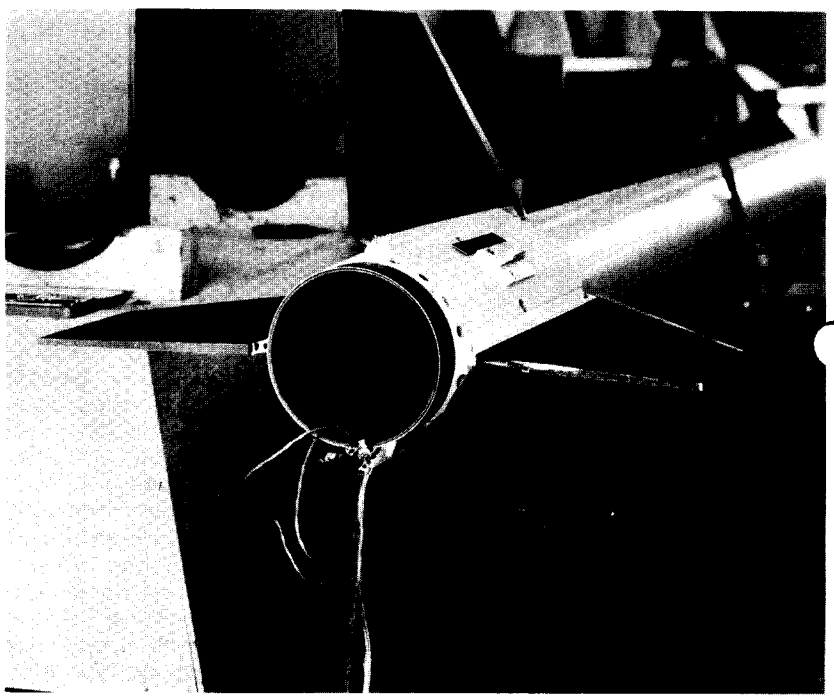
DESCRIPTION

The D-Region Tomahawk was a single-stage rocket based on the Thiokol Chemical Corporation TE-M-416 solid propellant rocket motor. Vehicle stabilization was provided by four fixed incidence fins each having an area of 222 square inches. The payload weighed 82.25 pounds and was an ogive-cylinder configuration. Both the motor and payload were 9 inches in diameter. The launch weight was 622.3 pounds. The weight after burnout was 223.1 pounds. The TE–M–416 motor utilized solid propellant with a sea level impulse of 93,840 pounds/second. It was ignited by two pyrogen-type igniter squibs located at the head of the motor. The ignition leads extended from the igniter through the perforated solid propellant grain and out the nozzle to the firing circuit in the blockhouse. These leads burn up after motor ignition.

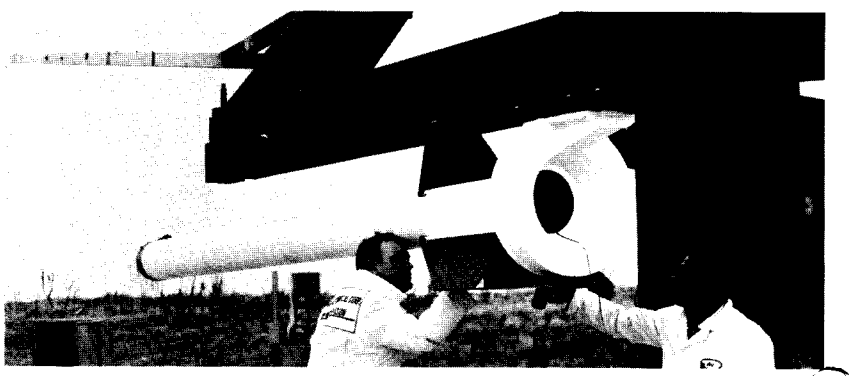
The tail fins were from 6061-T6 aluminum sheet. The fin structure was protected from high aerodynamic heating by an asbestos phenolic leading edge cuff and silicone rubber surface coating. The fins were retained to the support shroud over the entire fin root by a locking bracket and sixteen No. 10 bolts. The leading edge was swept 55 degrees and the fin had a total of 222 square inches.

The fin-to-motor attach shroud was a solid alluminum shell structure having a minimum wall thickness of .10 inch. The fins were attached, preset, to this unit at the factory. The shroud with fins attached was slipped over the motor at the nozzel end and was retained by twenty-eight ¼ inch flat head allen bolts.

The payload consisted of diagnostic instrumentation required to obtain data relative to acceleration, vibration, angular position and rate, motor pressure, and payload temperature. The total length was 52 inches with a maximum diameter of 9 inches. The overall configuration consisted of a 3:1 ogive which is attached to a cylindrical housing having a length of 24.50 inches. The nose had an asbestos phenolic nose tip epoxied to a S/C fuzed silica 3:1 ogive nose cone which in turn is epoxied to an asbestos phenolic atitude gyro cover. This assembly is attached to a splice ring on the telemetry housing by 12 ¼ inch flat head allen bolts.



Rear view of the partically assambled D-Region in the shop. The shape of the fin shroud is clearly shown. In this photo the shroud attachment bolts have not yet been painted. (NASA Photo W68-14)



Left side view of NASA Flight 12.08GT prior to installation of the payloa section. Note that the bolt heads on the fin shroud have been painted white. The color version of this photograph clearly shows that the trailing edge of each fin is painted red. (NASA Photo W 68-16)

This ring is then attached to the aluminum telemetry housing by 12 ¼ inch flat head allen bolts. This housing attaches directly to the forward part of the aluminum antenna housing with 12 ¼ inch flat head allen bolts. A special aluminum splice ring attaches the antenna housing to the rocket motor with two sets of 24 each ¼ inch flat head allen bolts.

The rocket motor was a Thiokol TE–M–416 solid propellant type PBAA with a total impulse of 93,846 pound/seconds. The nozzle was constructed of graphite and silica phenolic. The motor casing was made from 7075-T6 aluminum with a diameter of 9 inches and overall casing length of 141.085 inches.

The rocket was launched from a special zero length launcher attached to the beam of a standard Wallops Island launcher with 3/8 inch diameter bolts. Basically, the zero length launcher consists of a ring with mounting flanges on one side and an I beam to support the rocket diametrically opposite on the other side. The rear of the motor casing slips into an opening in the ring at the same time the launch lug on the rocket shroud slips into an attachment on the I beam. This supports the entire rocket from the rear. To insure a good fit into the ring the rocket motor casing from the rear of the shroud is unpainted. The exhaust gasses blow through the opening in the launch ring upon ignition to minimize damage to the launcher.

FLIGHT INFORMATION SUMMARY
NASA FLIGHT NO. 12.08 GT

Weights:

Launch Weight:	**622.3 lbs.**
Payload Weight:	**82.25 lbs.**
Burnout Weight:	**223.1 lbs.**

Performance:

Burnout Alitiude:	**27,456 ft.**
Burnout Velocity:	**6,067 ft/sec.**
Burnout Time:	**9.5 sec.**
Apogee Altitude:	**387,927 ft.**
Apogee Time:	**160.0 sec.**
Impact Range:	**318,185 ft.**
Impact Time:	**337 sec.**

Color Data:

Nose Tip: Flat Phenolic Brown
Nose Cone: Flat White
Attitude Gyro Cover: Flat Phenolic Brown
Telemetry Housing: Flat Bright Red
Small Ring: Natural Aluminum
Anetnna Housing Cover: Flat White
Rocket Motor:
1" from top: Flat Bright Red
Body: Flat White
Rear of Shroud: Natural Aluminum
Shroud and Launch Lug: Flat White
Fin Locking Bracket: Flat White
3 Fins: Flat Black
1 Fin: Flat Bright Red
Rear of Fins: Flat Bright Red

DATA SOURCE

Thiokol Chemical Corporation, Contract No. NAS5-10444
NASA Flight requirements Plan,NASA 12.08 GT
NASA Sounding Rocket Post Flight Summary, NASA 12.08 GT
NASA report of Sounding Rocket Launching, Vehicle No. 12.08 GT
NASA Photographs: Color: W68-18, W68-19 W68-20, W68-21, W68-22, W68-23, W68-24, W68-39, W68-40, W68-44, W68-45.
Black and White: W68-10, W68-11, W68-12, W68-13, W68-14, W68-15, W68-16, W68-17, W68-30, W68-31, W68-32, W68-33, W68-34, W68-35, W68-38.
Thiokol Chemical Corporation Drawings: D00763, D00764, D00765, D00788, R00528, R00529, R00548, R00790, C00746.

NOTE TO MODELERS

An exact scale kit containing all parts. including a screw head forming tool, for construction of the D-Region Tomahawk is available from Competition Model Rockets, Box 7022D, Alexandria, Virginia. The kit sells for $4.50 plus 25 cents for postage and handling. The kit includes complete, detailed instructions for construction of the fin shroud payload section, and screw heads.

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A complete scale data substantiation packet for the D-Region Tomahawk is available from Rocket Equipment Company, Dept. MR, 10 Mulberry Ave., Garden City, NY 11530. The packet includes a 16 page booklet, drawing, two black and white and one color photographs, and additional information for $5.00 post paid. A list of additional D-Region photographs is also available.

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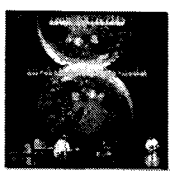
42745 WOODSTOCK—Soundtrack (3 records) **Cotil** LP

15113 MAHLER—Sym. No. 3 (2 records) **Vangu** LP

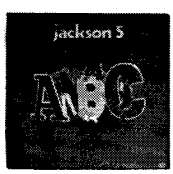
33077 JOAN BAEZ—One Day At A Time **Vangu** LP, 8TR, CASS

31799 THREE DOG NIGHT—It Ain't Easy **Dunhi** LP, 8TR, CASS



33443 IRON BUTTERFLY In-A-Gadda-Da-Vida **Atco** LP, 8TR, CASS

48782 APPLAUSE—Original Cast **ABC** LP, 8TR, CASS



30615 JACKSON FIVE—ABC **Motow** LP, 8TR, CASS

16759 TCHAIKOVSKY 1812 Overture **Mercu** LP, 8TR, CASS

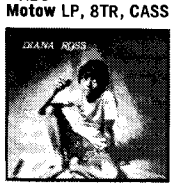
42715 BEST OF MJQ **Atlan** LP, 8TR, CASS

44378 PAUL MAURIAT Gone Is Love **Phili** LP, 8TR, CASS

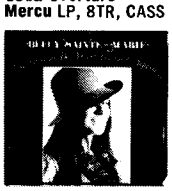
66671 RARE EARTH—Ecology **RarEa** LP, 8TR, CASS

43839 ERIC CLAPTON & YARDBIRDS—Live **Mercu** LP, 8TR, CASS

65775 VERY BEST OF LOVIN' SPOONFUL **KamSu** LP

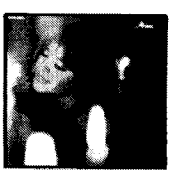


30618 DIANA ROSS **Motow** LP, 8TR, CASS



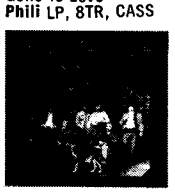
33029 BUFFY SAINTE-MARIE—Gonna Be A Country Girl **Vangu** LP, 8TR, CASS

44369 MYSTIC MOODS ORCH.—Stormy Weekend **Phili** LP, 8TR, CASS



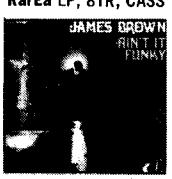
65779 MELANIE—Candles in the Rain **Budda** LP

33065 JOAN BAEZ—David's Album **Vangu** LP, 8TR, CASS



42704 CROSBY, STILLS, NASH & YOUNG—Deja Vu **Atlan** LP, 8TR, CASS

43793 SPANKY & GANG Greatest Hits **Mercu** LP, 8TR, CASS



66556 JAMES BROWN Ain't It Funky **King** LP

49706 B B KING—Completely Well **Blues** LP, 8TR, CASS

48786 JAMES GANG—Rides Again **ABC** LP, 8TR, CASS

33083 COUNTRY JOE & FISH—C J Fish **Vangu** LP, 8TR, CASS

66530 BOBBY SHERMAN **Metro** LP

42665 CROSBY, STILLS & NASH **Atlan** LP, 8TR, CASS

34525 HELLO DOLLY—Soundtrack **TweCe** LP

67503 SMITH—Minus-Plus **Dunhi** LP, 8TR, CASS

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AT LAST A RECORD AND TAPE CLUB WITH NO "OBLIGATIONS"—ONLY BENEFITS!

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City _____ State _____ Zip _____

2—679—4— 20339

PRANG-II — May 1-2, 1971. Regional meet sponsored by Pittsburgh's Steel City NAR Section. Events: Super Scale, Scale, Sparrow R/G, Sparrow B/G,Robin Eggloft, Cl. 0 Drag Eff., Design Eff., Cl. 0 PD, and Open Spot Landing. Contact: Alan Stolzenberg, 5002 Somerville St., Pittsburgh, PA.

Boston Area Rocket Meet — May 8, 1971. Area meet open to NAR members from Maine, New Hampshire, Rhode Island and Connecticut (east of Hartford). Events: Quadrathon, Swift B/G, Contact: MIT Model Rocket Society, MIT Br. PO Box 110, Cambridge, MA 02139.

SIAM-71 — May 22-23, 1971. Area meet sponsored by the Hilliard, Ohio NAR Section. Events: Class 1 Scale Altitude, Sparrow B/G, Hornet B/G, Robin Eggloft, Plastic Model, Cl. 1 PD, Cl. 2 Streamer Dur. Contact: Fred Long, 256 Bigelow Dr., Hilliard, Ohio 43206.

New England Rocketry Federation Section Meet — May 22, 1971. Section meet open to all NAR members in the Boston area. Events: Class 00 Altitude, Class 0 PD, Class 1 Streamer Dur. Contact: Patrick Griffith, Legion St., Milford, MA.

Card and Craft Hobby Shop Contest— May 23, 1971. Contest for Long Island, New York area rocketeers sponsored by the card and craft Hobby Shop Site: Mitchell Field, NY. Contact: Card and Craft Shop, 1004 Front St., Uniondale NY. (Advance registration required.)

GCMRA Area Meet — May 30, 1971. Area meet open to NAR members in the Southern States. Events: Class 1 Altitude, Single Payload, Streamer Spot Landing, Class 2 PD, Class 3 Streamer Dur., Scale, Swift R/G, and Hawk B/G. Site: Tamiami Regional Park. Contact: Lynn Fletcher, (305) 633-2522.

Toronto Regional — June 1971. Open meet for rocketeers from the Ontario, Canada area. Sponsored by the Canadian Rocket Society. Science teachers and their students are especially invited. Contact: CRS, Adelaide St., PO Box 396, Toronto, Ontario, Canada.

Tri-State Competition — June 1971. An open meet for rocketeers in the Amarillo Texas and neighboring states area. Contact: Amarillo Modelers Society, 4219 Summit, Amarillo, TX 79109.

Texas Wing Meet II — June 12, 1971. Open model rocket competition, sponsored by the National Aerospace Program Sherman-Denison Squadron, for rocketeers from the five state area adjoining Texas. Events: Parachute Duration, Stremer Duration, Boost/Glide, Eggloft, and Payload. Contact: Oscar R. James, 403 W. Burton, Sherman, TX 75090.

Phillipsburg Annual Convention & Record Trials — June 18-20, 1971. Convention open to all rocketeers. Events: Discussion Groups, Manufacturers Displays, Lectures, Films, and Banquet. Record Trial Events (limited to NAR members): Hawk R/G, Condor B/G, Eagle R/G, Cl. 0 and Cl. 3 Streamer Dur., Hornet B/G, and Hornet R/G. Contact: David Klouser, 383 Warren St., Stewartsville, NJ 08886.

North Georgia Regional Meet — June 18-19, 1971. Regional meet, sponsored by the Metro-Atlanta Society for Educational Rocketry, open to rocketeers from the Southeast. Events: Eggloft, B/G in Sparrow through Hawk catagories. Site: near Atlanta, Georgia. Contact: Richard Wallace, 4676 Kingsdown Road, Dunwoody, GA 30338.

Blackhawk Regional II — June 19, 1971. Regional competition sponsored by the Blackhawk NAR Section of Rock Island, Illinois. Open to NAR members from Indiana, Ohio, Illinois, Iowa, Wisconsin, and Minnesota. (Advance registration before April 10, 1971 is required.) Events: Drag Race, Sparrow B/G, Hornet B/G, Cl. 2 PD, Cl. 1 Streamer Dur., and Pigeon Eggloft. Contact: Glenn Scherer, 1427 Seventh Ave., Rock Island, Ill.

Burnaby Invitational — June 26-27, 1971. Contest in Burnaby, British Columbia, open to both Canadian and US rocketeers. Events: Class 0 Altitude, Open Spot Landing, Sparrow B/G, Class 1 PD, and Robin Eggloft. Features: Guest Speakers, Manufacturers Displays, Planetarium Visit, Banquet, Trophies, etc. Contact: BCC-RM Contest Director, 6714 Hersham Av., Burnaby, British Columbia, Canada.

MMRR-71 — June 26-27, 1971. Regional meet in Columbus, Ohio, open to NAR members from the Midwest. Events: Scale, Swift B/G, Hornet B/G, Sparrow Rocket/Glider, Robin Eggloft, Predicted Altitude, Plastic Model, Class 0 PD, and Class 2 Streamer Dur. (Advance registration required.) Contact: MMRR-71, 1191 Shanley Dr., Columbus, Ohio 43229.

Texarea II — June 26-27, 1971. Area meet sponsored by the Apollo-NASA Section and open to NAR members from the state of Texas. Site: Manned Spacecraft Center, Houston. Contact: Gary King, 13903 Barryknoll Lane, Houston, Texas 77024,

Canadian Convention — July 2-4, 1971. Second National Canadian Model Rocket Convention, sponsored by Montreal's ARRA club, and open to all rocketeers. Discussion groups, films, speakers, competition, and a banquet. Full information from: ARRA, 7248 2nd Ave., Montreal 329, Quebec, Canada.

SRAM-2 — July 3-4, 1971. Section meet sponsored by the Sulpher River NAR Section, Sulpher River, Texas. NAR members in East Texas may compete. Events: Class I PD, Sparrow B/G, Class 0 Drag Efficiency, Open Spot Landing, Class 00 Altitude, and Class 2 Streamer Duration, Contact Danny Miller, 804 Glimer St., Sulpher Springs, Texas 75 482.

NSSR—71 — July 17, 1971. Regional Meet sponsored by the North Shore Section of the NAR, open to all NAR members from the New York, New Jersey and Connecticut area. Events: Scale, Eagle B/G, Sparrow B/G, Streamer Duration Class 1, Open Spot Landing Class 0 PD. Registration Deadline: May 22, 1971. Contact: Kevin Clark, 167 Dorchester Rd., Garden City, New York 11530.

Southwestern Model Rocketry Conference — July 20-23, 1971. Third annual convention for rocketeers in the Southwestern US. Featuring: flight competition, discussion groups, speakers, films, and banquet. Sponsored by the ARC-Polaris Rocket Club, Portales, New Mexico. Write for information: ARC-Polaris, Arawer 89, Portales, N. Mex. 88130.

Montreal Eggloft '71 — September 18, 1971. Regional Egglofting competition in Montreal, Canada. Site: Maisonneuve Park complex,, Montreal. For rules and information write: ARRA, 7800 des Erables Ave., Montreal 329, Quebec.

Wisconsin Area Meet — September 18, 1971. Contest, sponsored by the Mariner Rocket Society, open to all NAR members from the state of Wisconsin. Events: Class 0 PD, PeeWee Payload, Robin Eggloft, Hornet B/G, and a non-sanctioned Payload Boost/Glide event. Contact: Russ Schmunk, 118 Highland St., Whitewater, Wisconsin 53190.

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

ON THE SCENE REPORT:

1971 Pittsburgh Spring Convention

by George Flynn

This year's Pittsburgh Spring Convention, sponsored by the Steel City Section, got underway on the evening of March 19th. Traditionally this convention marks the end of winter hibernation for northern rocketeers. In past years it has always been cold and windy for the Convention, and 1971 proved to be no exception. The weather was cold, though slightly above freezing, the ground was muddy, and the forcast was for snow for the scheduled Saturday launch.

Over 160 rocketeers from the Pittsburgh area, the northeast, and the midwest gathered to participate in the discussion groups and lectures. About 30% came from the Pittsburgh vicinity, while others came from as far away as Illinois, Maryland, and even Canada. Almost 80% of these rocketeers were attending their first convention.

In his opening Keynote Jay Apt, former SCS President and originator of the Convention, described the purpose of the meeting. Initally the Convention was organized to raise the general level of modeling skill in the hobby by exposing the inexperienced rocketeers to the modeling techniques used by the "experts." Basic construction methods and elementary contest modeling were emphasized. The Convention also provides an opportunity for experienced modelers to exchange ideas in their areas of special interest, and to get acquainted with each other in an atmosphere away from the pressures of competition.

Convention Co-Chairmen Alan Stolzenberg and Marvin Lieberman came up with a program designed to appeal to all levels of rocketeers. Sessions on almost a dozen topics were on the schedule for the 2½ day meeting. On Friday night Dr. Gerald Gregorek and Bob Parks led a session on the general topic of Boost/Gliders, but the new Rocket/Glider competition was a major area of interest. Unlike the B/G event, where pod ejection causes a CG shift which results in transition from boost glide trim, the Rocket/Glider can not eject its engine. Alternative methods of shifting the CG or CP were the topic of discussion. The general opinion was that variable geometry concepts such as the swing-wing and flop-wing offer much promise in this event, Bill Werre drew on his club experience to suggest that the ejection charge alone can not reliably actuate the variable surface. They use rubber bands to fully deploy the surface after the ejection charge activates the deployment system.

The Scale group, led by G. Harry Stine and Bob Hagedorn, spent some time on the basic finishing techniques nesessary to produce a good model. George Dibos described his simple fin finishing method — — simply dust the entire surface with "Parachute Powder," spread sanding sealer over the top, allow to dry, and sand flat (using fine sandpaper). After two coats he gets a "glossy" finish on the fin. The use of Rub and Buff for realistic looking silver and gold finishes was also recommended. Jon Randolph suggested that many rocketeers who complain of the lack of scale model data, overlook

Howard Kuhn of CMR demonstrates the construction method for making scale paper fins for missiles such as the Nike.

Bob Parks and Jerry Gregorek lead the B/G Techniques group. Much of the discussion centered on variable geometry gliders and the new Rocket/Glider competition.

the data which is available in good public libraries. In fact, all the data for Jon's first place NARAM–12 Asp model came from the Cleveland Public Library. On the subject of judging the only concensus was that "there are many different ways to judge scale."

Members of the NAR Leader Administrative Council conducted a small group on Clubs, The emphasis was on promoting the growth of small clubs, and the key to this is publicity. Several methods were suggested– asking the local hobby shop to display a poster listing the club's name and meeting or launch time and site, static window displays of the club's most impressive models in stores, banks, ect., and static or flight displays in conjunction with model airplane meets and other hobby activities.

The group on Research Photography led by Goerge Flynn discussed several areas where inexpensive photographic techniques can by used to gather data. Use of a continually operating flashlight bulb in the payload and a rotating "strobe disk" on the camera provides an accurate method of determining position, velocity, and acceleration throughout the trajectory. As an alternative, the exhaust flame can be used as a light source (requiring no instrumentation on the rocket) and a strobe disk employed to determine position, velocity, and acceleration during engine burn. This latter method should prove particularly useful with "sound barrier" rockets.

Friday night ended with a home movie session and films on the Condor boost/glider event at NART–1 and MARS–V.

Saturday morning was the scheduled launch time ... but ... it didn't look too promising. It snowed all night and into the morning, and there was a high wind. An exploratory team, led by Launch Officer Dave Crafton, was sent out to the site with an MPC launcher to evaluate the possibilities. The temperature had risen to 35 degrees and the winds were up to 30+ mph. A group of about 30 spectators watched from the motel window as Crafton's launch team readied a d–13 powered Estes Omega for the test flight, "Hey, you better launch it fast, the launcher is blowing over," shouted one freezing member of the launch crew. But the countdown ended a T=O, and the rocket sat on the pad. The launch battery seemed to be suffering from frostbite. The launch crew waited while one member ran to the motel for a new battery ... and they waited, ... and they waited. Finally, after ten minutes in the cold, Crafton and his accomplises gave up asd made their way back to the motel. It turned out that the launch had been cancelled while they were out at the site.

With snow again coming down outside, discussion groups continued in the motel. A seminar on construction techniques was led by Howard Kuln of CMR and Tag Powell of SAI. The discussion was quite varied, with both manufacturers answering questions from the floor on how they build their models. For neat and precise lettering Kuln suggested the use of "rub on" or "transfer" lettering available in sizes from ¼" to 3" at most large stationary stores. On competition glider finishing Kuln indicated that he balances the need for a clean finish and low weight by using a single coat of clear dope, sanded with fine paper, on his B/G's. He also described a simple method of making built-up paper fins for scale models such as the Nike. (A complete discussion of this technique will be featured in next month's **Model Rocketry**.)

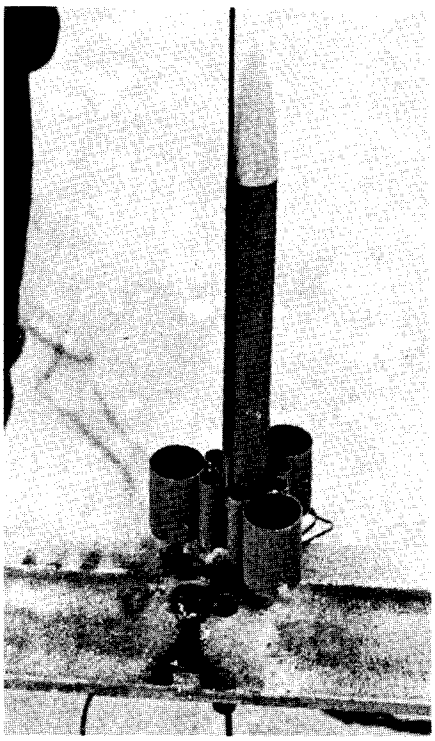
Dick Fox's discussion group on Model Rocket Electronics again proved to be the best attended at the Convention. He discussed the latest improvements in the "Foxmitter" model rocket transmitter. The new Foxmitter 3, still in testing features an integrated circuit in order to decrease the weight while maintaining the same performance as the Foxmitter 2. (Plans for the Foxmitter 3 will be published in **Model Rocketry** as soon as the design is finalized.) Dick also explained the multiplexer he is developing. This device allows as many as three sensors to be used with a single Fox-

Steve Eisley readies his "flop-wing" B/G for flight. The B/G used a Tatone dethermilizer timer to "pop-up" the tail and bring the glider down to avoid loss.

Dane Boles of Estes Industries demonstrates the new Estes "Transroc" model rocket transmitter. This version of the "Transroc" transmits a beacon signal to allow easy recovery of the model. The signal to allow recovery of the model. The launching rocket is an Estes Alpha III using the new plastic fin unit and nose cone.

Tag Powell of SAI displays the "King-Kong," SAI's newest kit. This sport model is expected to be on sale in early summer.

Larry Brown of Centuri Engineering preps the Centuri Little Joe II. An enerjet E engine was used to power this model.



This "Double Infinite Loop" is characteristic of the many oddball designs flown at this years' Convention.

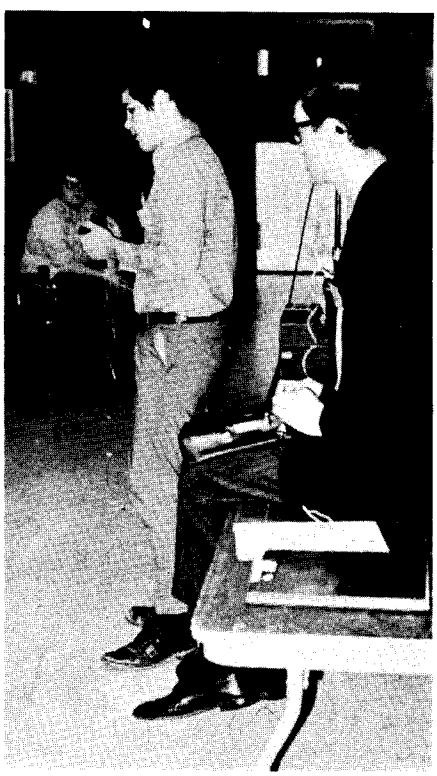
MPC provided one of their new Prgasus Kits to each Convention participant, and some of the results indicated quite a bit of creativity. Swept back body tubes were used instead of fins on the four foot tall model at left. The center model used two forward mounted engines, a reversed fin unit, and a plastic tail cone. At right is a highly decorated tall model powered by a cluster of three engines. The Pegasus Kit certainly is versitile.

mitter, allowing multi-channel data telemetry.

Saturday morning's discussion groups were followed by a lecture on "The NASA Space Shuttle" by Lawrence Brown of Centuri Engineering. Since he has designed the Centuri Space Shuttles, he has been in close contact with the proposals for the actual Shuttle. He discussed the various designs which have been submitted to NASA as well as the proposed missions for the Shuttle would serve not only as a manned launch vehicle but also as the booster for medium size scientific payloads and geological survey satellites.

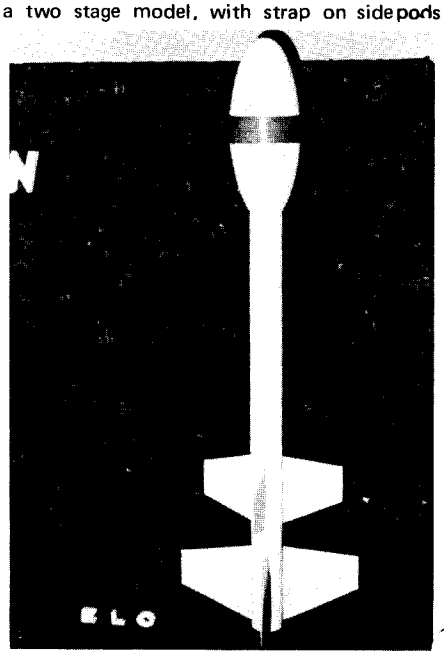
After dinner Dr. Gerald Gregorek of Ohio State University discussed "Propulsion — From Models to Mars," in which he describes many of the various types of propellant in use today or planned for the future. At the bottom of the scale was the rather unsophisticated "black powder" used in most model rocket engines, then came the liquid propellants, and finally the ion drive.

On Saturday night many of the rocketeers spent their free time assembling the Pegasus kits which MPC had provided for all the participants. The Pegasus is a kit which MPC says the modeler can use to build "two single stage models each 12" tall, or one two stage model 24" tall, or... "Well, with 160 Conventioneers, each with their own Pegasus kit, MPC discovered a few new things you can put together. For example with one Pegasus kit you can build a two stage model, with strap on sidepods



Rich Brandon of Three Rivers explains the operation of the Sound-Cineroc system as Dick Fox looks on.

Howard Kuln examines his Manta Rocket/Glider just before its 35 second flight on an A engine.



CMR's new Elo Egglofter features a longer nose cone designed for better performance. The new cone is now available from CMR.

standing over three feet tall. With four Pegasus kits you can build a four foot tall model using swept back body tubes instead of fins for stability. And it continued! As rocketeers wandered from room to room, they thought "I can build one more interesting than that" and rushed off to find another half dozen Pegasus kits. With the postponed launch only hours away, the RSO was reported to be considering leaving the country, or at least the state.

Sunday morning, with an inch of snow an the ground, 10 mph winds, and a temperature of around 30 degrees, the decision was made to at least try the launch. By the scheduled 8:30 AM starting time about 25 rocketeers arrived at the site—an overpass of an as yet unfinished highway just behind the motel. Five racks were available for launching, and with only 25 rocketeers up and standing in the cold that gave each one his own launch rod.

The first rocket off the pad was a Mars Lander which got caught in a strong gust of wind and impacted under power. By 9:00 AM only eight rockets had been launched and 60 of the Convention's 160 participants had walked the ¼ mile to the launch site.

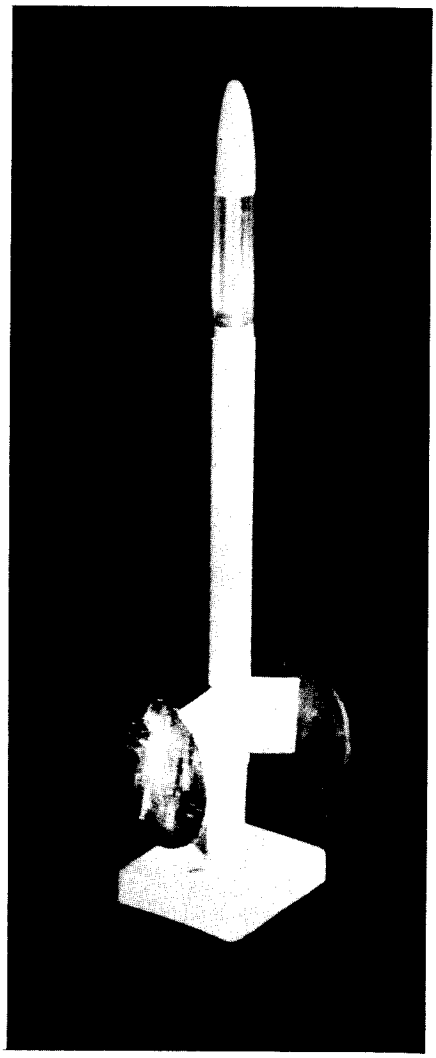
A number of interesting models, aside from the variations on the MPC Pegasus, were flown. A flight converted AMT plastic Saturn 1B turned in a beautiful flight. Steve Eisley demonstrated a Flop-wing B/G which used a Tatone dethermilizer timer, set for 45 seconds, to assure recovery.

The manufacturers also flew birds. Dave Boles of Estes Industries flew their new Transroc on an Alpha III, the new Alpha using a plastic fin section. The signal was heard over the PA system throughout the entire 300 ft. flight of the Transroc, thus demonstrating the range of the device. Larry Brown flew the new Centuri Ener-jet E in a Little Joe II and demonstrated several Space Shuttle vehicles. On one of the Shuttles the ejection charge failed, however the model glided in to a safe recovery. That makes Centuri the first company out with a kit for the new Rocket/Glider event. MPC's demo flight was their new Starhawk high performance flyer. They put an A3-2 in it, and it developed on the way up. Even with a A3-2 it might have still been going up at ejection. The last of the manufacturers demo flights was CMR's new Rocket/Glider, of course a Manta. Howard Kuln predicted 30 seconds on an A, and got a good glide of 33 seconds before the model flew behind a building and out of sight.

The Convention concluded with a discussion by Howard Galloway of NASA's Goddard Space Flight Center titled "Behind the Scenes in Aerospace." He explained the operation and purpose of the sounding rocket program, and the launching of a Black Brant from Natal, Brazil. Then, just to prove that not everything always goes as planned, he showed films of a Nike-Arcas launch from Wallops Island. The Nike hung up on the pad, and the Arcas took wildly (it's unstable below a certain velocity). As a result, this wild Arcas flew into the ocean and back out, and over the Wallops beach, past the monitering truck, ... ect. until the engine burned out. It looked just like the Condor films from Friday night, only the rocket was bigger, and the motor burned longer.

FOR SPORT FLYING

Build the "Albatross"



The Albatross

BY STEVEN KAWECKI — The Albatross is a unique, circular finned, payload model which will attract quite a bit of attention at your next launch. Employing standard construction techniques, the Albatross can be assembled in about an hour. With a fancy red, white, and blue paint job, this will be one of the most attractive and unusual models in your "fleet" . . . . . .

The Albatross is a sport model designed to look different. Everyone uses rectangular or trapezoidal, or delta, or perhaps even elliptical fins on thier models. But when was the last time you saw a model using *circular* fins. Well the Albatross, which is quite an attention getter on any rocket range, does just that.

Actually, construction of the Albatross is rather simple. An 8" section of BT-20 tube is filled, and finished in the normal manner. A clear plastic payload section (PS-20J) is employed and a BNC-20N nose cone is used. The nose block (NB-20) is glued half-way into the center tube. Be sure to use a cement, such as Ambroid Liquid Cement, which will adhere to plastic. Body tube assembly and finishing is done first. An engine block (EB-20A) is glued into place 2¾" from the rear of the body tube. Two inches of launch lug is added to the main tube.

The Albatross' fins are the big difference! Two parallelogram support fins are cut from 3/32" thick balsa sheet. Be sure the grain runs in the direction indicated in the plans. Sand these fins using 400 grit sandpaper. The surface should be sanded smooth, while the leading edge is rounded and the trailing edge is slightly tapered. These fins are glued to the main tube, flush with the rear, and 180 degrees apart. Set aside to dry.

Two 3" diameter circular fins are also cut from 3/32" sheet balsa. Again using 400 grit sandpaper, the disks are sanded smooth, and the entire circumference edge is rounded. The circular fins are glued to the tips of the parallelogram fins. Be careful to make sure that the grain direction on the circular fins is perpendicular to the main body of the rocket.

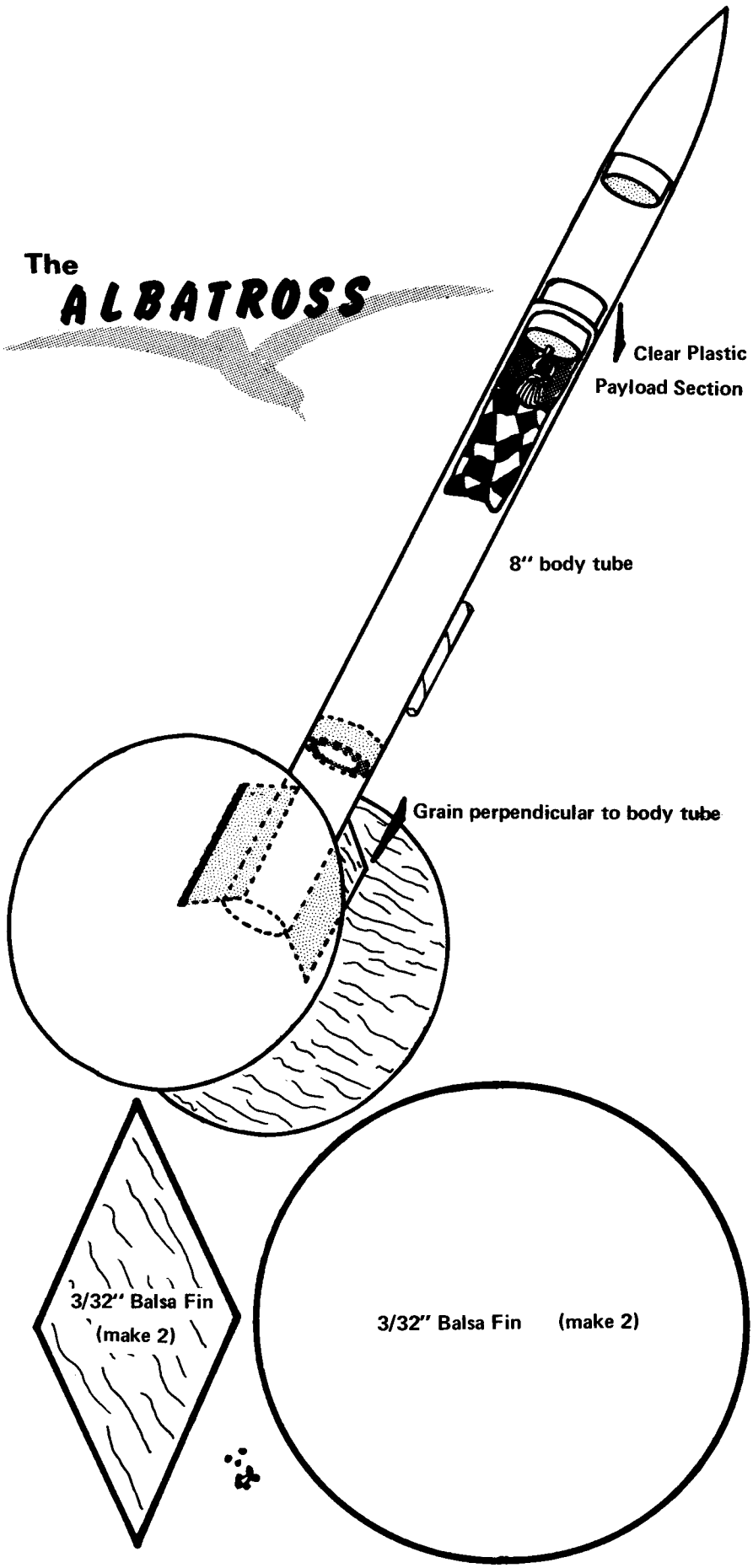
Just about any color combination will make the Albatross an attractive model. However the red, white, and blue scheme used on this model is particularly attention getting. The main tube is painted white, the nose cone and circular fins blue, and the parallelogram fins red. A white star is added to each fin.

A 12" chute is recommended for the Albatross. However, in windy weather, an 8" chute will give a better chance of recovery.

Power can be provided by an A8-3, B4-4, or C6-5 engine. With the A8-3 engine and a well finished model you can expect an altitude of about 400 feet, quite sufficient for any demo flight. But id you really want to thrill the crowds, use a C6-5 engine for a flight to over 1000 feet!

Parts List

Nose Cone	**BNC-20N**
Body Tube (8")	**BT-20B**
Payload Tube (2¾")	**PST-20J**
Shock Cord	**SC-1**
Launch Lug	**LL-2B**
Parachute Kit	**PK-12**
Engine Block	**EB-20A**
Screw Eye	**SE-2**
Nose Block	**NB-20**
Fin Stock	**BFS-30L**



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****

Full-color copies of the photograph, which is reproduced in black and white above, may be obtained by sending 50¢, or $1.00 for 3, to:

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A NEW SPARROW B/G DESIGNED FOR HIGH–PERFORMANCE COMPETITION FLIGHTS. THIS MODEL USES THE "JEDALSKY" WING CONSTRUCTION TECHNIQUE FOR HIGH LIFT DURING GLIDE WHILE MAINTAINING EASE OF CONSTRUCTION.

The Redwing

Sparrow Boost/Glider

by Richard Hyman

The *Redwing* is a high-performance boost-glider designed primarily for Sparrow B/G competition. It was designed with light weight, and a lot of wing area in mind. The special wing construction is the heart of the glider—it is light but strong and has plenty of lift. While the *Redwing* was designed for powered flights, many enjoyable hours can be spent hand launching this glider. This is also profitable in trimming for longer flight durations.

The *Redwing* was developed from a hand launched design of the same dimensions, but using a 1/8" thick solid wing. With almost forty square inches of wing area, this is larger than most boost-gliders of the Sparrow class. Results of the initial flights with the first glider were very encouraging, so the *Redwing* was constructed using built-up wing construction.

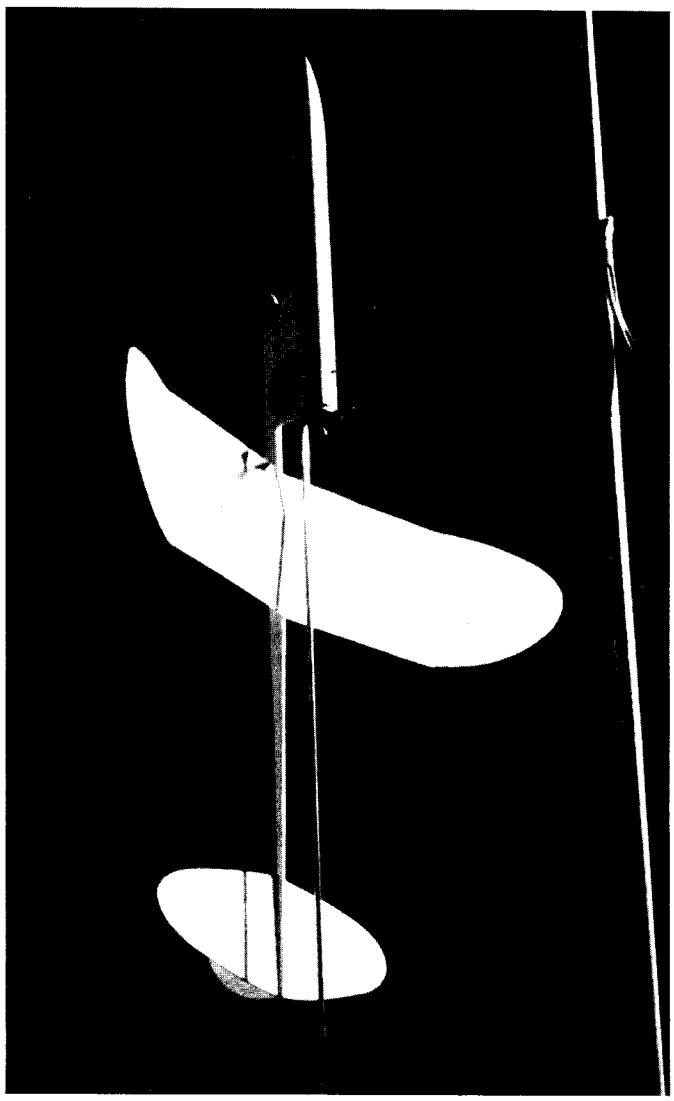
The built-up wing, called Jedelsky construction, is a modeling technique used most commonly with large gliders, such as towline gliders. Jedelsky construction allows you to build a thick, undercambered airfoil from just a thin sheet of balsa and ribs. The sheet balsa is simply curved over the airfoil shaped ribs. Thus, it is possible to save weight and increase lift all at the same time. It is possible to build the *Redwing* so that it weighs less than one-half ounce by using 1/16" balsa for the wing. Unfortunately, the undercambered airfoil also increases drag slightly—most noticeable during the boost.

The use of Jedelsky construction has been proven many times. Most notiable were flights of this glider during record trails held by the Monroe Astronautical Rocket Society (Victor, N.Y.) on May 23, 1970. The first flight of the *Redwing* lasted 96 seconds, with even better times as the day progressed. By mid-afternoon the glider had recorded a 159 second flight. For the flights of this day the *Redwing* averaged more than 130 seconds, using A5-2 engines.

In the fall of 1970 at a freak meet hald by MARS, I was having trouble while trying to trim a *Redwing,* because of a stiff breeze. However even with a slight stall, the *Redwing* averaged almost a half, during three official flights.

Another addition to the *Redwing* is the use of negative incidence in the stabilizer. Negative incidence means that the stabilizer is offset at an angle so that the leading edge is lower than the trailing edge. Negative incidence in the stab brings the nose of the glider up, increasing the angle of attack and consequently the lift. Therefore, to be properly trimmed more weight must be added to the nose of the glider to quickly transition into the glide from the boost phase. The incidence also prevents any long dives which would mean a great loss in altitude and duration.

Using negative incidence in the stabilizer breaks a long tradition of maintaining a zero to zero degree relationship between the stab and the wing. This tradition has been maintained because it has been felt that negative incidence could cause a glider to arc onto its back during the high velocity boost phase. I prefer using a small amount of negative incidence rather than accidentally having positive



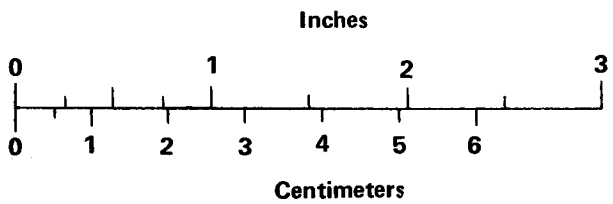
The redwing uses a wood dowel as an umbilical tower to keep the clips from tangling the boosting glider. Flying in the Sparrow class, this glider has turned in almost 2 minute flights.

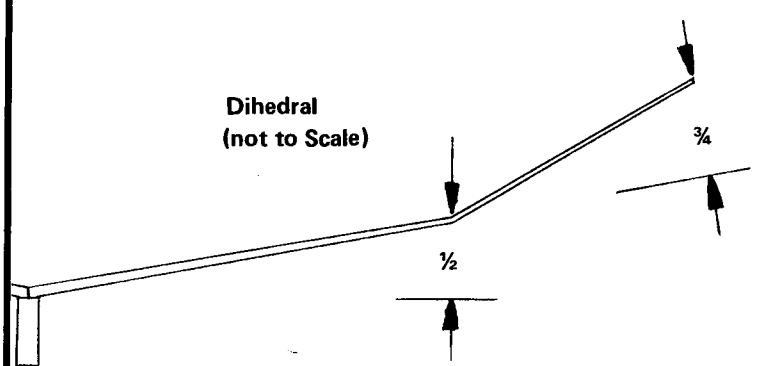
REDWING

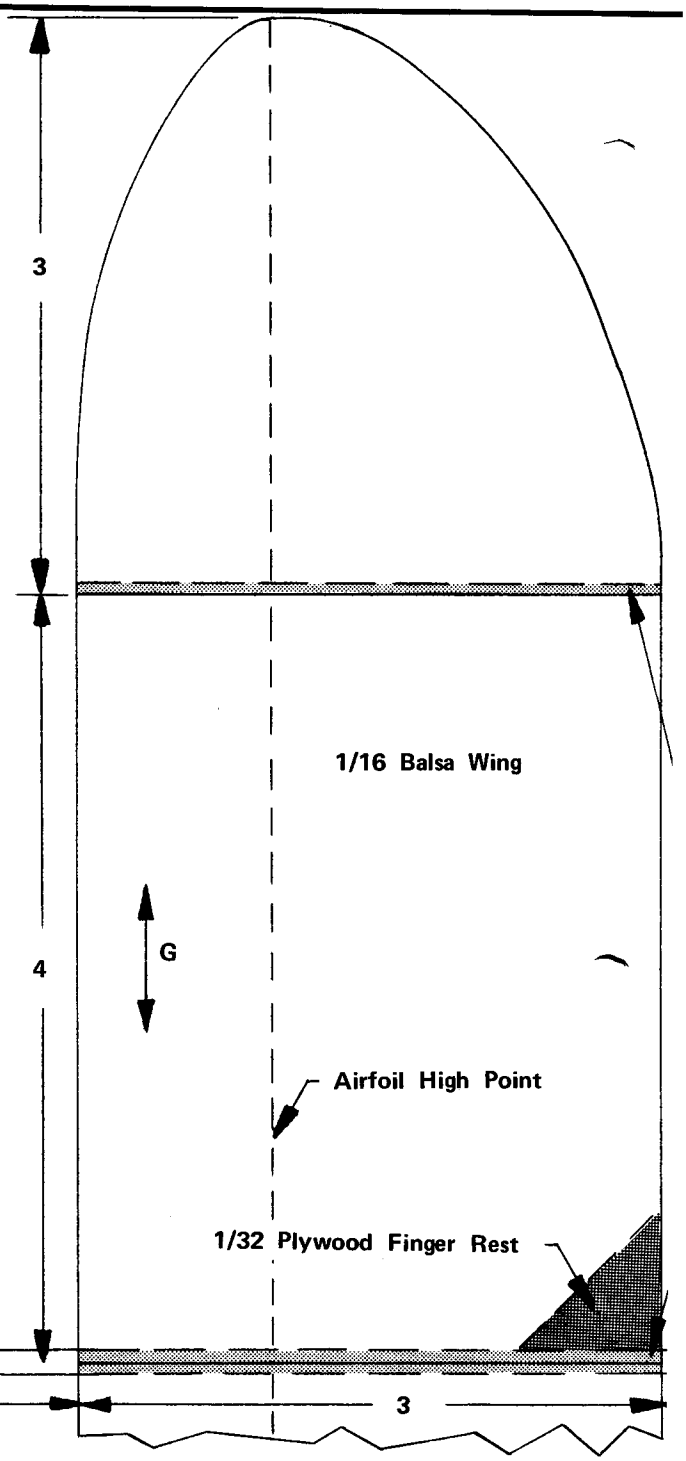
G Indicates Grain Direction

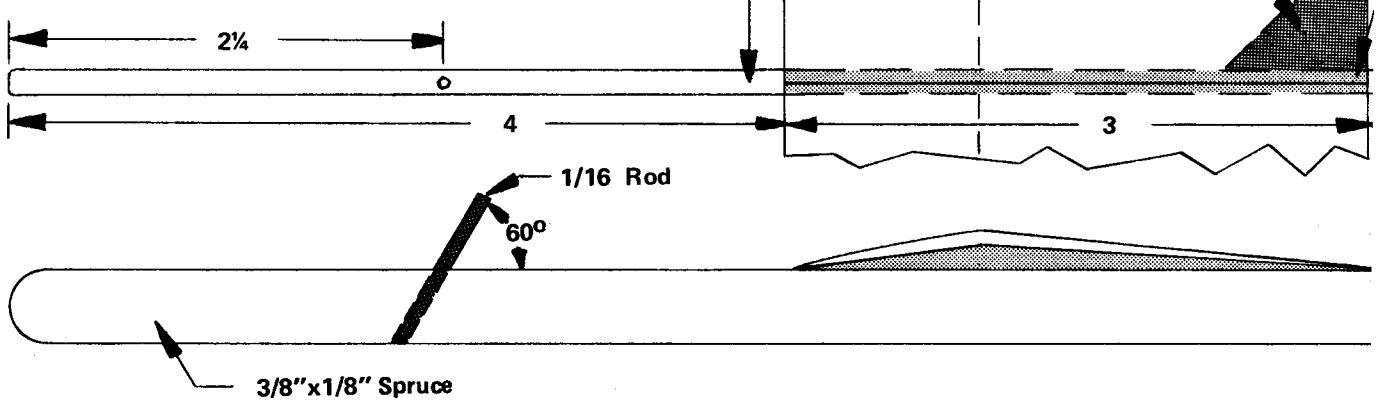
Designed and drawn by Richard Hyman

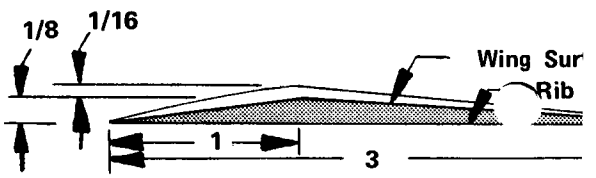
Scale:





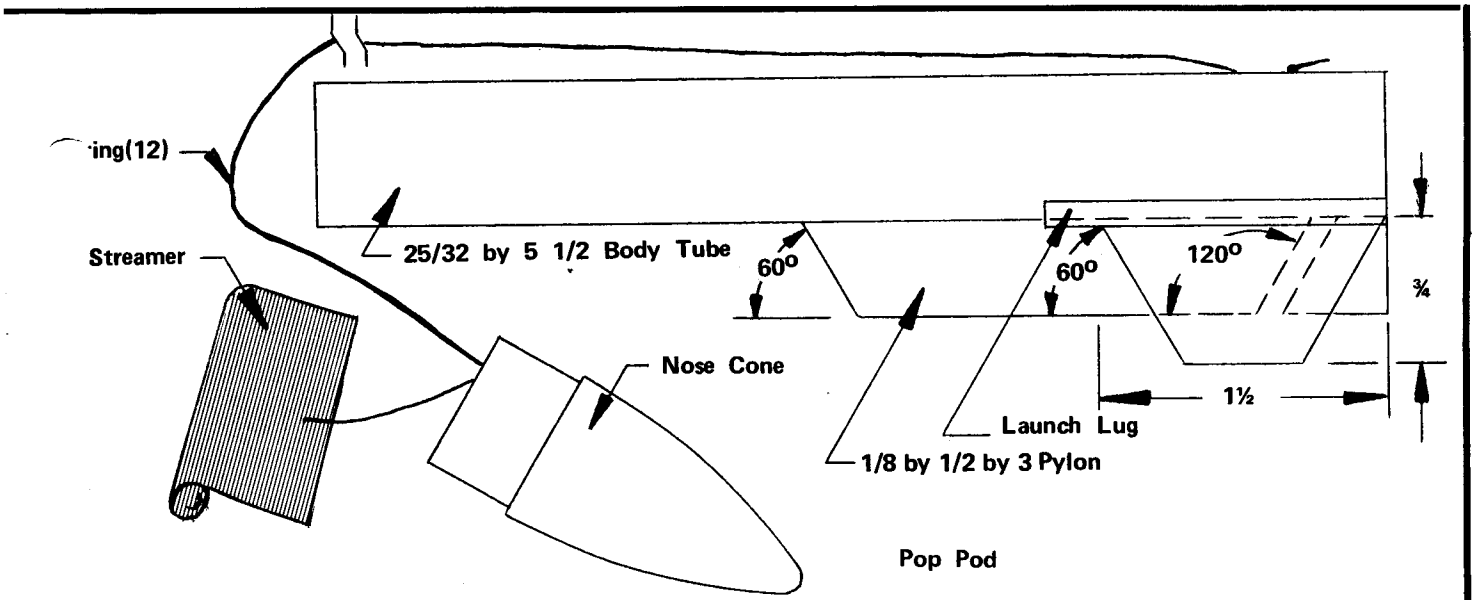


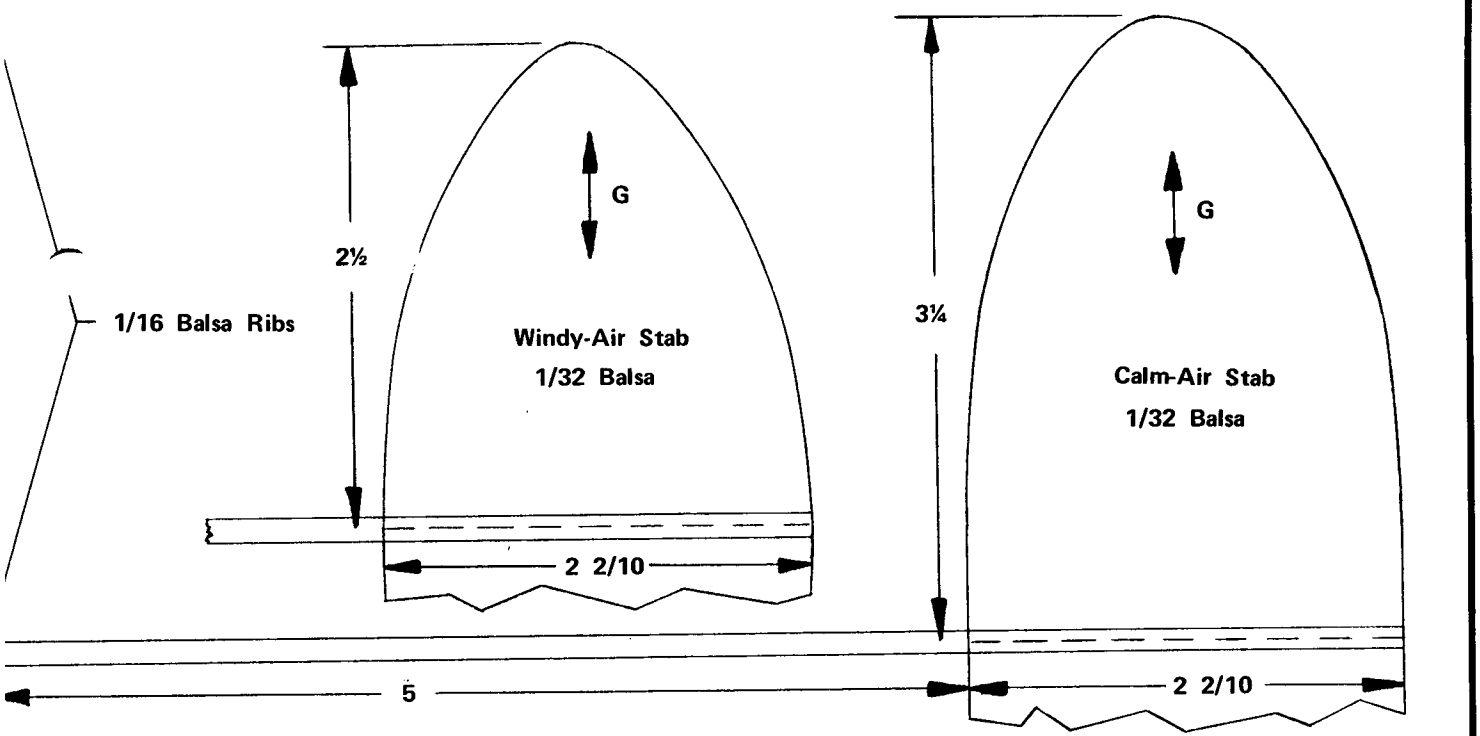


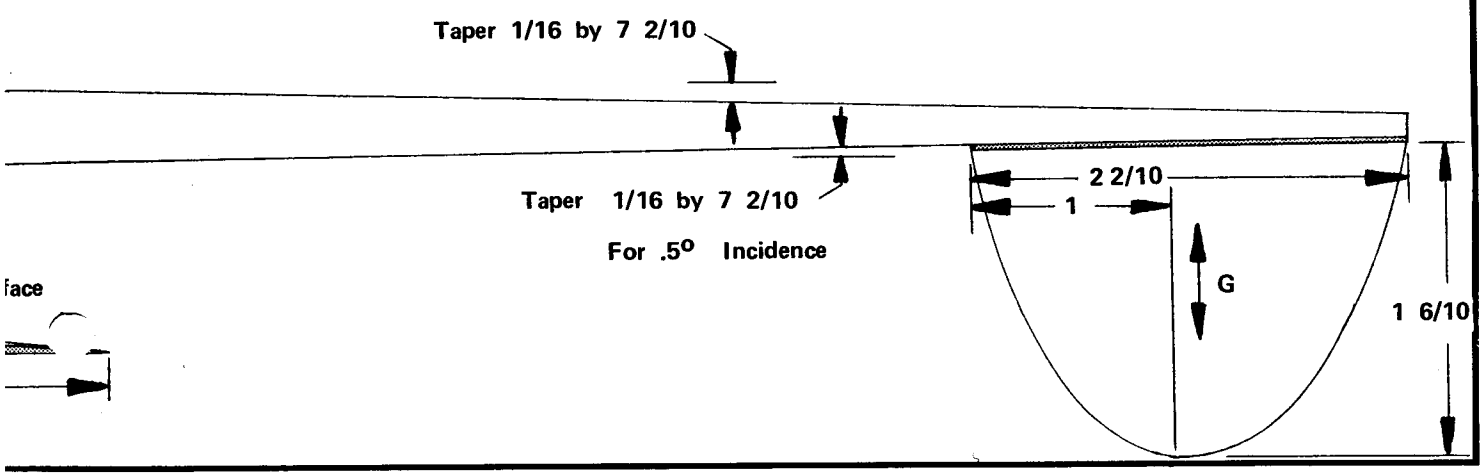


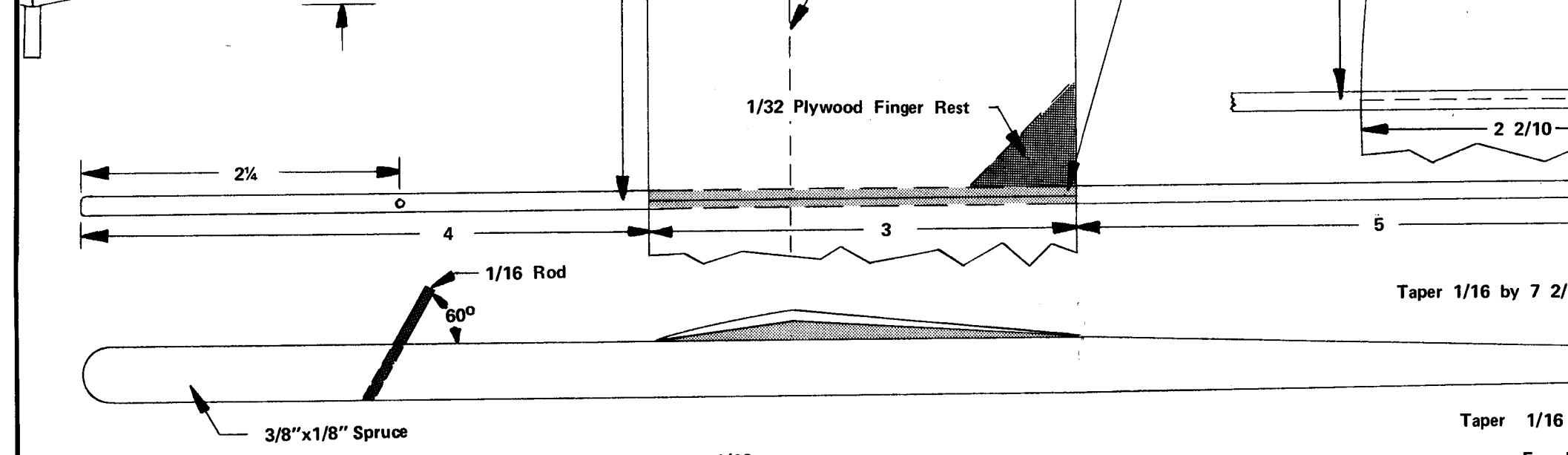
Typical Rib Section

All dimensions in inches


ing(12)
Streamer
25/32 by 5 1/2 Body Tube
60°
60°
120°
¾
Nose Cone
1½
Launch Lug
1/8 by 1/2 by 3 Pylon
Pop Pod


2½
G
1/16 Balsa Ribs
Windy-Air Stab
1/32 Balsa
2 2/10
3¼
G
Calm-Air Stab
1/32 Balsa
5
2 2/10


Taper 1/16 by 7 2/10
Taper 1/16 by 7 2/10
For .5° Incidence
2 2/10
1
G
1 6/10
face



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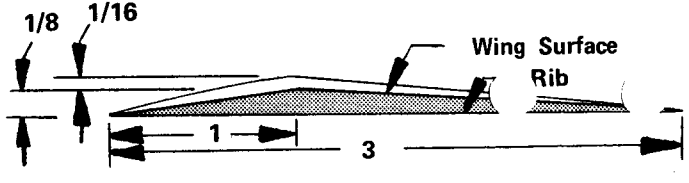
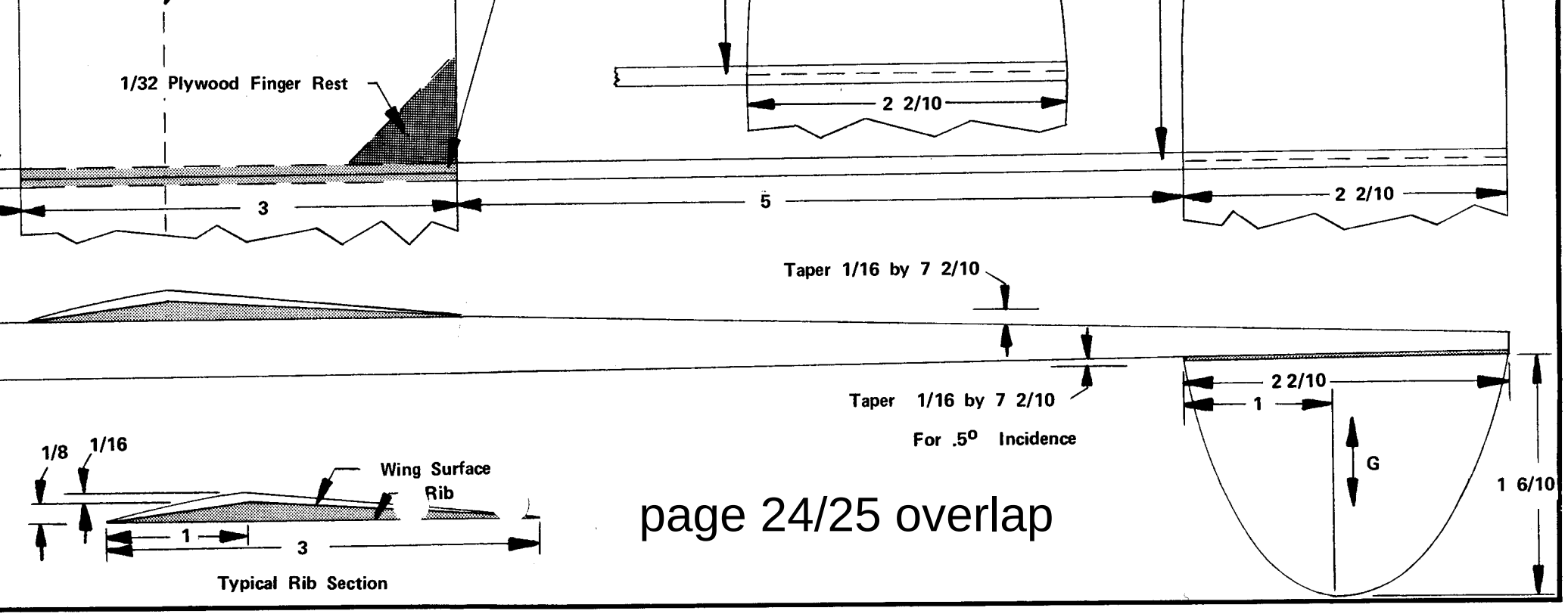
All dimensions in inches



Typical Rib Section



page 24/25 overlap

incidence (the leading edge of the stab is higher than the trailing edge) which would cause an immediate dive out of which a glider would not come. The *Redwing* does have a good boost trajectory, and no problems have ever been caused when using negative incidence.

The few critical dimensions of this glider lie in the prepatation of the fuselage. Most other dimensions are not critical and can be modified. The plans are full size, for use during construction.

Start construction with the wing. A piece of C-grain 1/16" balsa must be chosen for the wing and the wing ribs. The wing is cut out of the 1/16" balsa to the shape shown in the plans. The grain should run parallel with the leading edge. The high point of the airfoil can be drawn on the wood to aid in sanding, and the dihedral break lines can be drawn on the bottom side with a pencil for later use. The wing is then sanded down to an airfoil shape as with any wing—be careful to maintain this shape all along the wing. A sanding block is almost indespensable, because it does a faster and better job. Such a thin airfoil is difficult to sand, but don't settle for half a job. Every extra minute spent sanding will result in a better glider.

When the sanding is completed, four ribs must be cut out of the 1/16" balsa. With the grain running lengthwise. the ribs are cut to the size measuring 3" in length with a 1/8" high point 1" from the leading edge. The ribs should be held together and sanded in unison so that each rib is an exact copy of the other.

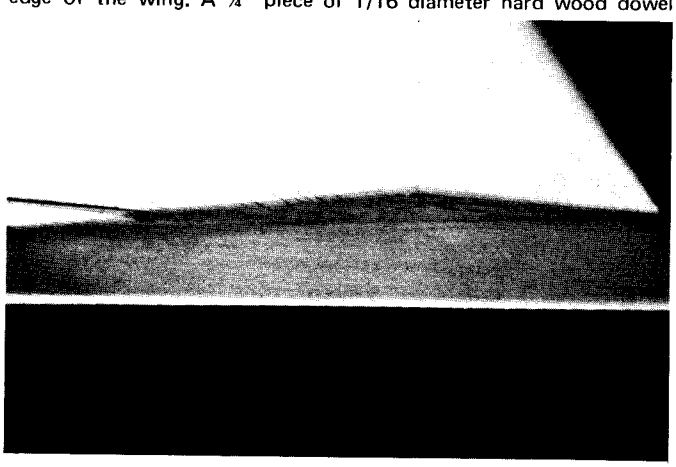
After completing the ribs, carefully cut the wing into four panels at the dihedral break line. Each panel is then split,with the grain, along the high point of the airfoil, so that the wing may be rejoined with undercambered resulting.

Before the panels are rejoined, the edges of the high point are slightly beveled at an angle, with the sanding block. The two sections of each panel are preglued once along the edge. and then glued together at an angle so that a slight amount of undercamber results. Undercamber is such that the bottom surface of the wing isn't flat but is slightly concave, taking on an airfoil shape. The four ribs are then glued in place; one to a wing at the inside edge of each of the four panels. The ribs, which give the wing strength will support the panels as they dry.

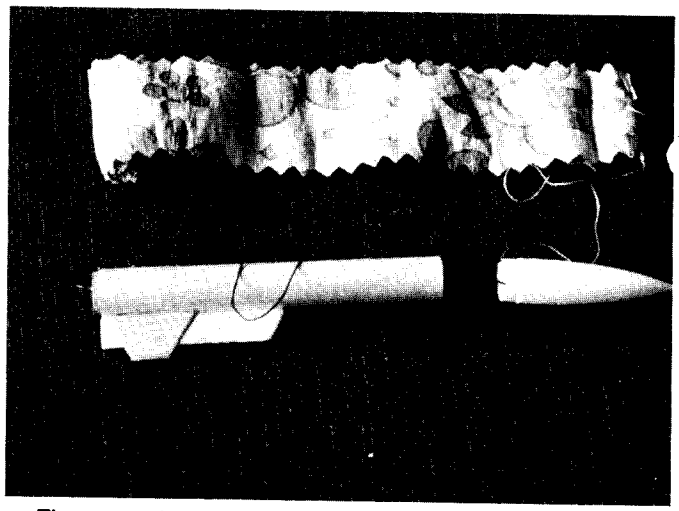
When these assemblies are dry, the panels are ready to be joined at the dihedral break lines. Each panel must first be beveled at the edge where the ribs are located. With the center panels held down on a flat surface, the tip panels are glued to the corresponding center panels, with their tips propped up ¾". When these two assemblies are thoroughly dry, they are glued together with both of the center panels propped up ½".

The fuselage is constructed of 1/8" spruce. Spruce, which most commonly comes in pieces measuring 1/8" by 1/2" by 36" is used because it is much stronger than balsa. The shape should be drawn on the spruce exactly as it is on the plans. Note that 7.2" of the bottom of the fuselage from the trailing edge of the wing to the tail, tapers upward 1/16". Be sure to transfer this correctly as it is this taper that gives the stab negative incidence. When cutting out the fuselage do so very carefully and slowly because spruce is much more difficult to cut than balsa.

When the fuselage has been cut out, a 1/16" hole must be drilled at a 60 degree angle approximately 1—¾" in front of the leading edge of the wing. A ¾" piece of 1/16 diameter hard wood dowel



The undercambered wing and ribs of the Redwing are constructed of 1/16" balsa. By cutting the wing at the "high-point" and gluing it to the rib, an efficient, high-lift air-foil is constructed.



The pop-pod uses a streamer recovery system. The streamer is attached to the rear of the pod to decrease the possibility of the pod hanging up on the glider.

of 1/16" diameter wire is then glued into this hole. This dowel is the pin which holds the pop-pod in place. The dowel is glued onto the glider and not the pod so that there isn't any hole in the glider to weaken the fuselage. When the pin has been glued in place, the edges along the bottom of the fuselage, and the top of the fuselage behind the wing location, would be rounded off with sand paper.

The stabilizer and rudder are next cut from balsa wood. C-grain 1/32" wood is best, but 1/16" wood may be substituted if it is carefully tapered. The shapes for the stab and rudder can be traced from the plans onto the wood, with the grain running in the proper direction.

You will note that two types of stabilizers are shown on the plans. The calm-air stab with the greater area, places the center of gravity at a point little more than two inches from the leading edge of the wing. This aft center of gravity location gives the *Redwing* a slow glide speed, which in turn increases lift and decreases drag slightly. The windy-air stab requires a shift of the center of gravity to a point just behind the airfoil highpoint. With this forward location of the center of gravity, the glider penetrates wind more easily. It would be nice if you could build two *Redwings*-one with each kind of stabilizer so that you can be prepared for any wind conditions. However, if you must choose between them, it might be better to use the windy air atab.

When assembling the glider, it is easiest to first glue the stab to the bottom of the fuselage. Preglue this joint, and be sure that the stab is perpendicular to the fuselage. When this has dried the wing can be glued on. The two ribs at the center of the wing provide a flat surface that the fuselage can be glued to. However, if the wing dosen't lie perpendicular to the fuselage the bottoms of the ribs will have to be sanded a little. When this joint has dried the glider is turned over and the rudder glued on. Again, alignment is important. To protect the rudder and stabilizer from being scraped up, a piece thread can be glued to the edges. A triangular finger rest, used for hand launching, is made of 1/32" plywood, and can be glued to the bottom of the right wing as shown on the plans.

For the pop-pod I prefer Centuri ST-7 body tube because it is strong enough to withstand constant use with more than one glider. What ever type of tube is used, you will need to cut a piece 5-½" to 6" in length. An engine block is glued in place so that the engine sticks out about 1/8". While this is drying, the pylon can be cut from 1/8" thick balsa or from the spruce used for the fuselage. The pylon should measure ½" high and 3" long with leading edge tapered at a 60 degree angle. A hole should be drilled to match the pin in the glider fuselage. However, an aesier and faster way of doing this is by cutting through the pylon at a 60 degree angle and moving the pieces apart slightly to form a square hole. The pylon sides are then glued on to brace the pieces of the pylon, forming the sides of the square hole. Care should be taken to keep the pieces of the pylon properly aligned. The sides, made of 1/32" plywood extend down ¼" from the pylon to keep the pod aligned on th glider during flight. These sides measure 1-1½" tapering to 5/8" and are ¾" high.

When the pylon is dry it can be glued onto the rear of the body

tube. The recovery system is then installed. It consists of about 12" of string tied to a nose cone which may be hollowed out for lighter weight. The string is attached to the rear of the pod on top, opposite the pylon. Two small holes can be made with a compass or pin. The string is then threaded through these holes, knotted, and a drop of glue is added to keep it in place. To the nose a crepe paper streamer can be attached through a screw-eye or U shaped paper clip glued in place. Attaching the streamer ot the back of the pod improves the pod separation reliability. After completing the recovery system a couple of inches of launch lug is glued to the pop-pod in a corner between the body tube and pylon.

Once construction is complete the glider can be finished. However, I agree with those modelers who believe that the many coats of balsa filler needed to obtain a smooth finish add too much weight to a glider. Of course, a bright color could be added to the wings to increase visibility. However there is a way to give the wings a fairly smooth finish, add color, and add strength all at once without adding much weight. The way that is done is by applying Japanese tissue to the wings (see October 1970 **MRm.** p. 12). Jap tissue, used on most airplanes, is a specially treated paper that comes in colors, and shrinks when water is applied to it. It is available at hobby shops in 18" by 20" sheets for less than a dime.

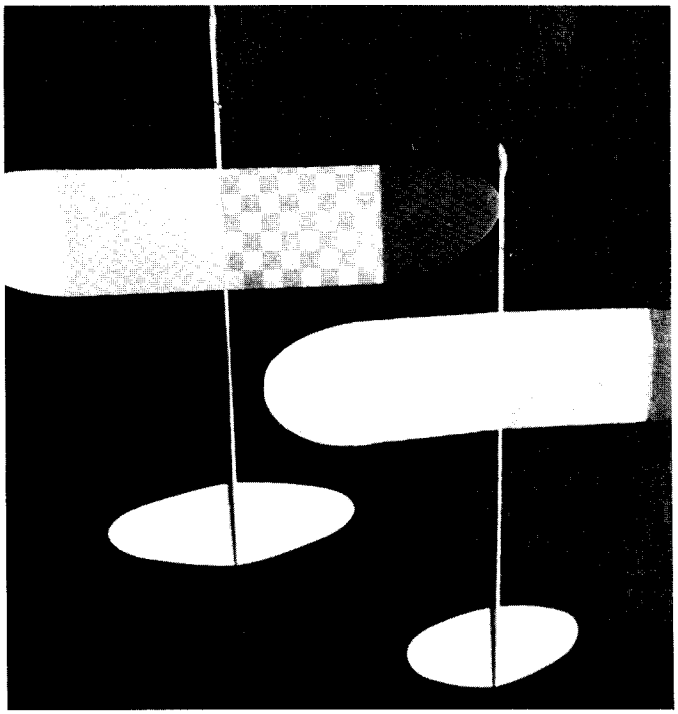
The usual method of applying this tissue to models is to first apply a coat of clear dope to the model frame, spray the tissue with water, and then cover the frame with the tissue smoothing out the wrinkles. The dope will dry first adhering the tissue to the frame, and the tissue will then dry, shrinking as it does to form a smooth surface. Additional coats of clear dope are then added.

In applying tissue to the *Redwing* it is easier to just tissue the upper surface of the wing. Four separate pieces of tissue must be used because of the polyhedral breaks. It's a good idea to iron the tissue to get rid of most wrinkles. A thinned coat of clear dope is put on the wing surface to which tissue is being applied. The tissue isn't wetted, and thinned dope is used to prevent warping. When the tissue has dried another coat of thinned clear dope can be applied to the entire glider to keep the wood from absorbing moisture and dirt. The pod should be checked for fit on the glider. It shouldn't wobble, but it should be loose enough so that when the glider is held up vertically the pod should fall off by itself. If there is a tight fit the fuselage sides can be sanded until the proper fit is obtained.

Clay is added to the nose of the glider (without the pop-pod of course) until the glider balances at the center of gravity location mentioned earlier. This is meant to be a starting point for trimming your glider. On a calm day you can go outdoors and further the trimming process. The glider is gently thrown level with the ground to obtain a smooth glide. Stalls can be corrected by adding a little clay to the nose and dives can be corrected by subtracting a little clay. Don't just do this once, because one throw is not conclusive as to the proper center of gravity.

Once the glider has been trimmed out fairly well, turn can be added. This can be done during construction with a slight misalignment of just about any part of the glider. One designer of a hand launch glider suggested bending the rudder for left turn, warping down the trail edge of the left wing panel slightly, and warping up the left side of the stab to prevent tail spins . . . or something like that. But by far the easiest method to induce a turn is by merely adding a little weight to one of the wing tips.

The glider can now be advanced to hand launches. The glider should be thrown so that it leaves your hand about a 45 degree bank to the right and with about 30 degrees elevation. This will cause the glider to climb with a spiral turn to the right to gain thirty of forty feet of altitude. As airspeed is lost the glider will transcend into a smooth glide. Again, correct any stalls or dives which occur. On breezy or windy days you will probably have to add a little clay to the nose. Spend as much time as possible hand launching your glider because it will not only save rocket engines but you will get longer flight durations when you do power the glider.



The Redwing can be built with two differint stabs. The smaller stab is suitable for windy weather, while the normal stab turns in its best performances in calm air.

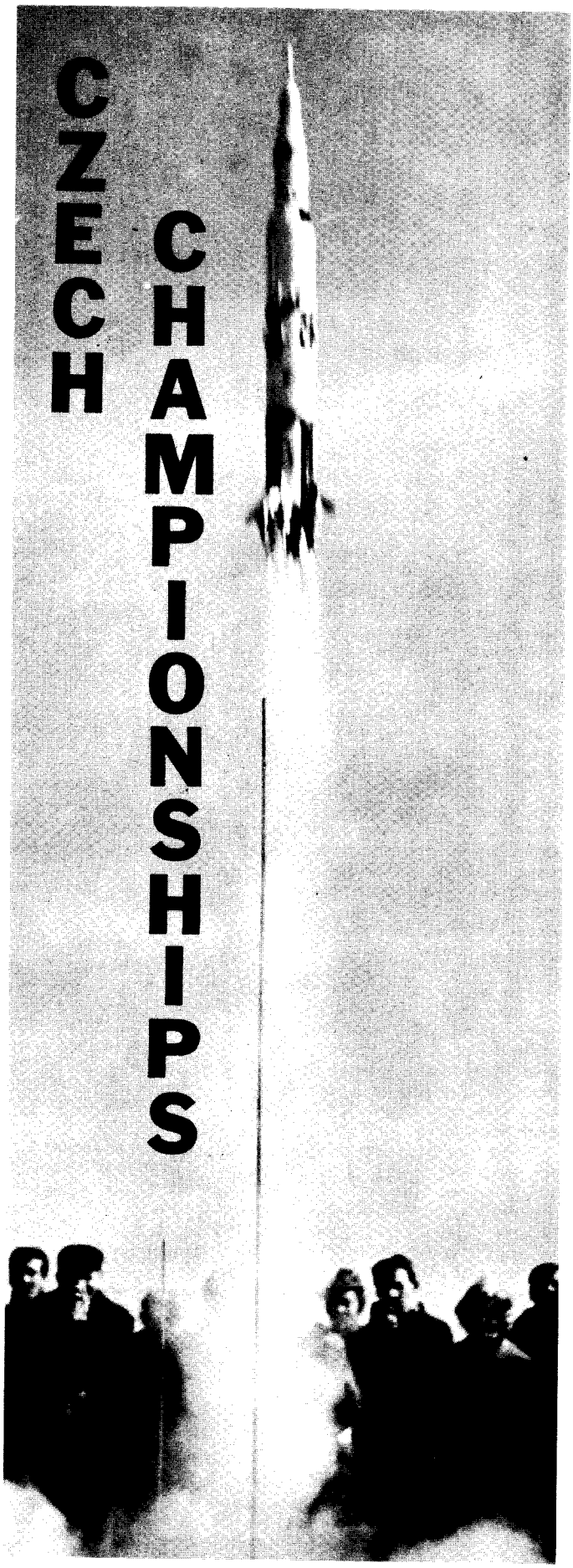
Your first powered flight tests can be made with ½A6-2 engines. The recovery system is packed into the pod as with any other model. The nose cone will have a snug fit because of the recovery system string, but it shouldn't be too tight. Tape the engine firmly into place. Put a piece of masking tape on the launch rod about a foot from the base to support the model. If you don't need the masking tape, your pod is too tight! Attach the micro clips and launch the *Redwing* as you would any other model.

Some modelers find that micro clips will catch on some portion of a glider, and the glider will pull the ignition lines up with it, or it will sit on the pad with the engine blasting away. This problem can be taken care of by using a "umbilical tower", which is a dowel rod of about ¼" diameter set in its own hole in the pad about six inches from the rod. The ignition lines can be taped to this tower about a foot above the pad. Six to eight inches of line can be extended from this tower to the rocket engine. Upon ignition the lines will swing down and away from the glider so that the micro clips won't catch.

After advancing your flights to A5-2 engines you will find that the exact center of gravity location will constantly shift around. This is caused by slight warping and other factors. The only way to solve this problem is to hand launch the glider to keep it trimmed, whenever you fly your *Redwing*. A carefully constructed and trimmed *Redwing* will turn in a good duration at any Sparrow contest you enter.

COMING NEXT MONTH IN MRm:

East Coast B/G Championships Report
Technical Report on "Boattailing"
AMT Saturn–V Plastic Conversion
and much more . . . . .



By Otakar Saffek

The 6th Czechoslovakian National Model Rocket Championships were held on October 16th to 18th at the airport in Vyskov, Czechoslovakia. Rocketeers from the clubs throughout the country gathered at the airport for the major national contest of the year. From Tranva in the South, Ostrava in the North, Usti in the East, and the capital Prague, as well as other cities, the best events to determine the champions.

The first event was a Streamer Duration competition flown under the Czech National rules. These rules specify the size of the streamer (50 by 500 mm). In the 5nt-sec catagory anything over a minute is excellent, and Otakar Saffek topped the field with 90 seconds. In the Junior Devision a 78 second flight by 16 year old Iro Jelinek of Dubinca was first.

Two Boost/Glide events, both flown under the FAI rules which required return on the glider for a qualified flight, were on the schedule. In the 2.5 nt-sec catagory P. Kynel of Prague turned in the best time with 145 seconds. I. Pazour of Dubinca recorded a 138 second flight for Junior first place. Most of the designs flown were quite standard, employing a fixed pod and normal HLG design, however V. Cerny came up with an unusual twin-boom model. In the 5nt-sec B/G competition S. Makran of Tranva took first in the Senior Devision with 175 seconds, while M. Horvath of Pezinok won in the Junior Devision with 145 seconds.

Scale Parachute Duration, flown under the Chech National Rules which assign points for adherance to scale and duration, was also flown in two catagories — 10 nt-sec and 40 nt-sec total impulse. In the 10 nt-sec catogory V. Rylko of Ostrava won the Junior championship, while O. Statzke of Belina took the Senior title. In the 40 nt-sec catagory M. Cerny on Belina won in the Junior competition, while J. Cerny of Usti took first place in the Senior event.

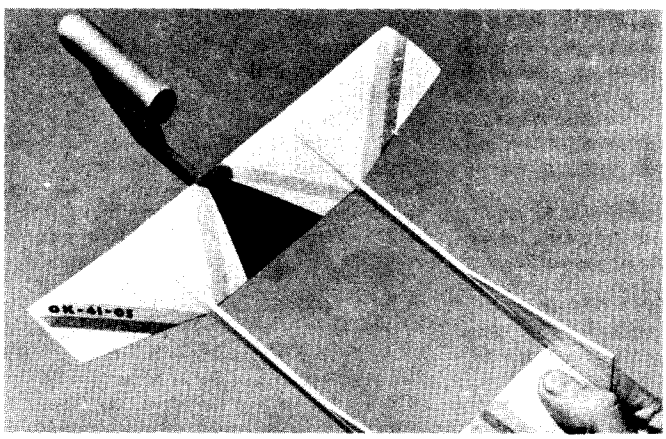
The Scale competition saw quite a number af beautiful models. Otakar Saffek tood first place in the Senior competition with his Saturn V in approximately 1/100 scale. This model is powered by five 10 nt-sec engines, one in each of the scale engine nozzels. Flown under the FAI Scale rules, Saffek's model scored 950 points out of a possible 1,000. V. Taborsky of Prague topped the Junior Division with a total of 856 points.

Karel Verabeck of Usti displays his scale model Manika three stage sounding rocket. The first stage is powered by a cluster of four 10 nt-sec engines, while the second and third stages each employ a single 5 nt-sec engine.

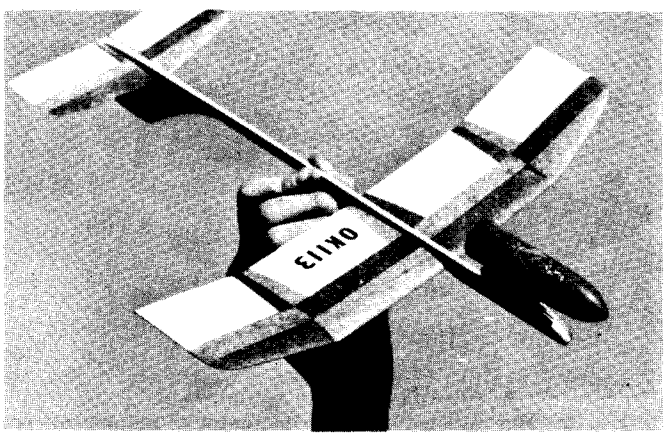
Otkar Saffek prepares his impressive Saturn V scale model for flight. This model powered by a five engine cluster, placed 1st in the CSSR Championships.

Anton Repa's beautiful model of Mercury Atlas 109-D flys with three 10 nt-sec engines. Small plastic fins are used to insure stability.

Vera Urban of Prague displays the Saturn V scale model built by her brother Karel Urban. Note that unlike US models, this Saturn employs scale engines, with engines inserted in the nozzels.



J. Cerny prepares his unusual twin-boom boost/glider for flight The model was entered in the 2.5 nt-sec FAI catagory. This model uses a fixed pod.



Dana Michalkova prepares her 5.0 nt-sec boost/glider. The trihedral design is typical of hand launched gliders. As with most European B/G's, a fixed pod is used.

6th Czechoslovakian Model Rocket Championships

October 16-18, 1970

STREAMER DURATION (5 nt-sec)

Senior	1st	O. Saffek (Praha)	90 sec.
Junior	1st	I. Jelinek (Dubnica)	78 sec.

PARACHUTE DURATION (10 nt-sec)

Senior	1st	P. Kynol (Praha)	510 sec.
Junior	1st	I. Jelinek (Dubnica)	421 sec.

BOOST/GLIDER DURATION (2.5 nt-sec)

Senior	1st	P. Kyncl (Praha)	145 sec.
Junior	1st	I. Pazour (Dubnica)	138 sec.

BOOST/GLIDER DURATION (5 nt-sec)

Senior	1st	S. Mokran (Trnava)	175 sec.
Junior	1st	M. Horvath (Pezinok)	145 sec.

SCALE PARACHUTE DURATION (10 nt-sec)

Senior	1st	O. Satzke (Bilina)	844 pts.
Junior	1st	V. Rylko (Ostrava)	1003 pts.

SCALE PARACHUTE DURATION (40 nt-sec)

Senior 1	1st	J. Cerny (Usti n.L.)	864 pts.
Junior	1st	M. Cerny (Bilina)	902 pts.

SCALE

Senior	1st	O. Saffek (Praha)	950 pts.
Junior	1st	J. Taborsky (Praha)	856 pts.

OVERALL

Sr. National Champion	Otakar Saffek	Rocket Club Praha
Sr. Reserve Champion	Premysl Kyncl	Rocket Club Praha
Jr. National Champion	Ivo Jelinek	Rocket Club Dubnica
Jr. Reserve Champion	Vlado Hadac	Rocket Club Praha

TECHNICAL REPORT

FLOW VISUALIZATION

by Lonnie Kroo

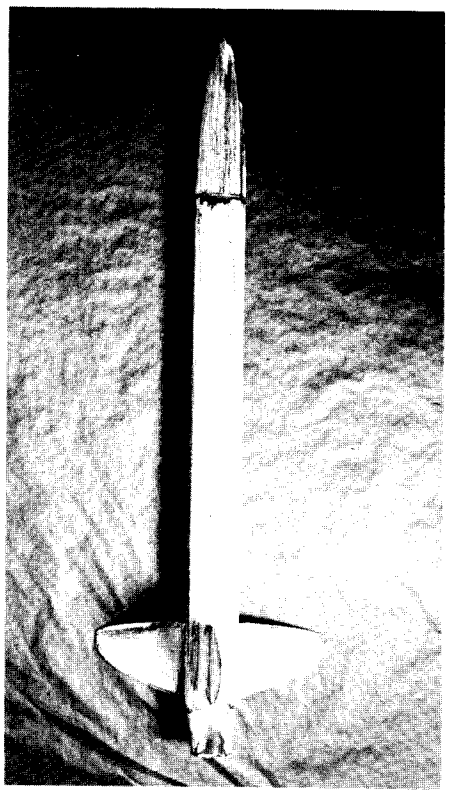


Figure 1: Flow patterns over a model rocket may be made visible using the technique described. This "high-performance" model actually experiences flow separation at the nose-body joint and on the boattail. More careful design and better finishing would result in a better performing model.

Many factors must be taken into account in designing model rockets. Among these are drag, stability, and structural strength. All of these factors are influenced by the air flow over the rocket's surface. This flow is usually highly irregular and cannot be determined using a set of equations. (Mathematical models of simple air flow do exist, but even these are quite complex and difficult to solve.) In order to obtain an accurate idea of what this flow looks like, we must make it *visible*. This can be useful in determining what shape of fins to use, whether to boattail or use a larger payload section for a quadrathon model, or in determining the optimal design of nose cones.

There is a very simple method by which these flow patterns can be observed. A mixture of fine clay and kerosene is used to cover the model. The model is placed in a wind tunnel (a simple tunnel will do). The kerosene evaporates when exposed to air, leaving the fine white clay on the rocket in the shape of the flow pattern.

To prepare the mixture add approximately one gram of kaolin (aluminum silicate) to every 12 ml of kerosene. (Kaolin is available in white powder form in some drug stores and most places which sell chemicals.) The mixture should be thin enough to be applied with a paint brush.

The rocket being tested should be painted black or dark in color since the kaolin powder is white. Paint the surface of the rocket with the mixture. This must be done fairly quickly because the kerosene is constantly evaporating. The mixture should be applied generously so that it will flow over the rocket with the air flow.

Place the coated rocket in a wind tunnel, and start the tunnel. (If a tunnel is not available, the exhaust from a powerful vacuum cleaner may be used.) When positioning the model in the air flow, make sure that it is mounted on a sting which projects from the rear of the rocket. This minimizes interference between the mount and the airflow. A simple sting may be made by gluing a ¼" dowel into an expended engine casing. The model must, of course, be fastened to the tunnel very securely, since any vibration of the model will upset the laminar flow over the rocket.

The rocket should be exposed to a flow of at least 30 m.p.h. for five to fifteen minutes. (The exact time you will have to leave the model in the tunnel depends on the concentration of the solution and the air speed. This time should be determined by experiment, however, five to fifteen minutes is a good starting point.) When removed from the tunnel, the rocket should appear mostly white but with black showing through in some areas. It will take a few tries to obtain the correct exposure time.

Remove the model from the tunnel holding it by the sting. Be careful not to touch the surface of the rocket or you will smear the flow patterns.

The patterns can now be analyzed and/or photographed for future reference. It will remain on the model, essentially undisturbed, for an hour or two. The pattern may be wiped off the model with a soft cloth. The model can then be flown or tested again in the tunnel.

Reading the Flow Patterns

Analyzing the results is the most difficult part of this flow pattern visualization method. In using kaolin and kerosene, dark areas on

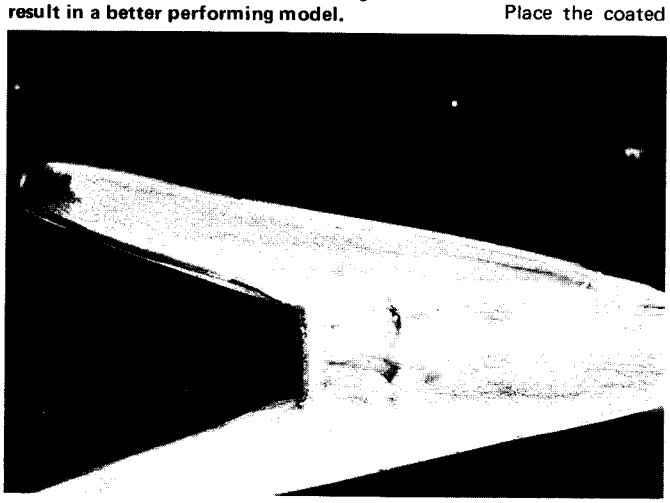


Figure 2: Flow patterns over various fin shapes can be analyzed (Top) The swept back fin design shows separation along the trailing edge (black line) and evidence of a tip vortex (black area at tip). A good body/fin fillet is indicated by the lack of a shock wave originating at the attachment point of the leading edge.

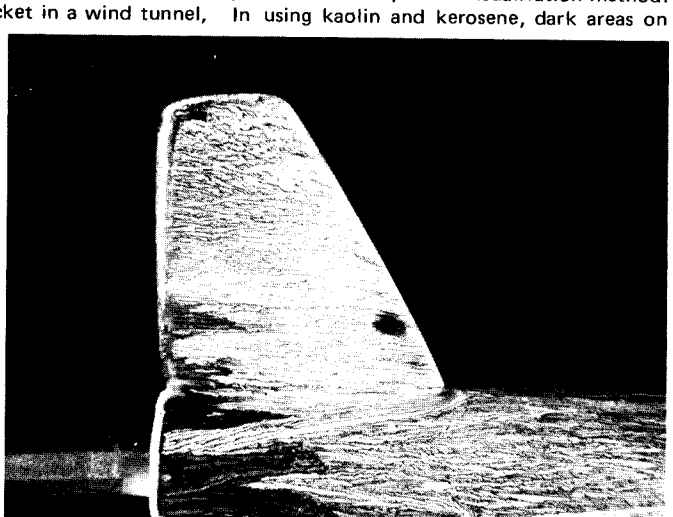


Figure 3: This high-performance fin design shows less evidence of a tip vortex. However the "shock wavw" over the body tube, originating at the leading edge of the fin, indicates that the fillet is not effective. Additional filleting is necessary for good flow.

the rocket (places where the kerosene has not completely evaporated) and curved lines of kaolin both indicate areas of relatively slow moving air or places where separation and/or turbulence occurs.

When testing fins, the presence of tip vortices can also be determined. If the fin exhibits a large tip vortex, the kaolin will be removed from the fin tip and it will appear black. The size of the black area at the fin tip is an indication of the strength of the tip vortex.

Separation of the flow from the trailing edge of the fin will be indicated by the absence of kaolin on the rear edge. Try a fin with no trailing edge airfoil, and you will see that the rear edge comes out black. Now airfoil the same fin and, if you do it carefully, you should be able to maintain a laminar flow over the entire fin.

Separation of the flow at the leading edge will cause the entire fin to be black.

Perhaps the most interesting phenomonen which can be observed by this method is the "shock wave" produced by the leading root edge of the fin. This "shock wave" directs the flow away from the fin, thus increasing the drag. (See Figure 3.)

Turbulance and/or flow separation on a boattail or conical transition section will be visible by either a complete lack of kaolin on the surface (indicating separation) or circular streaks on the surface (indicating turbulance.

Some parctice is necessary in order to correctly analyze the flow patterns, but after a while it is quite easy.

Using the Flow Visualization Technique

Those rocketeers interested in using this method in further airflow studies should study the following photographs of experiments already conducted. They indicate the types of flow which can be investigated, and the flow patterns you would observe.

FIN SHAPES

What type of fin is best? To answer this this question a number of factors must be taken into account. Among them are lift capability, drag, and air flow over the fin. Flow visualization techniques allow the simple investigation of the latter factor. Figures 2 and 3 show flow patterns on rockets with two different "high performance" fin shapes. The flow over the elliptical fin shape can be seen in figure 1.

The elliptical fin shape in figure 1 shows a slightly darkened leading edge. This darkening indicates that an inconsistent airfoil has been sanded into the fin. Improvement of the airfoil will result in a smoother flow. A small dark spot at the tip of each fin indicates the presence of a tip vortex. Separation of the flow from the trailing edge may also be seen on this fin.

In figure 2 the model uses swept fins. The presence of large tip vortices is indicated by the large black areas at the fin tips. Separation of the flow from the trailing edge of this non-airfoiled fin can also be seen.

Figure 3 shows a rocket using Harry Stine's "low drag fin design." The black line along the trailing edge and a change in the flow pattern near the tip indicate that both tip vortices and separation at the trailing edge exist.

In all three of the fin photographs, a white line curves from the leading edge of the fin down the surface of the body tube. This is the "shock wave" which was mentioned earlier. It is caused by interference between the flow over the body tube and the flow over the fins. Notice that the area between the "shock front" and the fin root edge is dark in color, indicating the presence of slow moving air or turbulence. This results in increased drag.

Elimination of these "shock waves" will result in increased performance if all other factors are kept constant. Large glue fillets along the fin/body tube joint will reduce the interference effect. However, such fillets also increase the weight of the rocket. (The model shown in figure 2 has very large fillets, and the interference effect is barely noticable.

An alternate way to decrease the interference effect is shown in figure 4. Scratches are cut in the body tube parallel to the fin root edge. These scratches are not deep enough to increase the drag, but they seem to "direct" the air flow straight down the body.

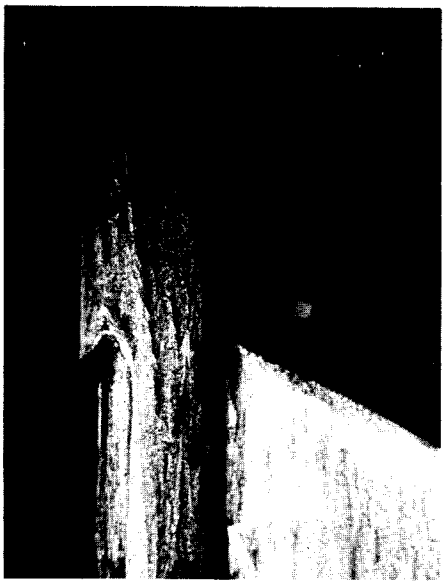


Figure 4: Scratches parallel to the fin root and equally spaced around the body seem to direct the flow and minimize the "shock wave" resulting from the body/fin joint.

NOSE/BODY JOINT

Figure 5 shows the type of flow at the nose cone/body tube joint on typical model rockets. The dark area just behind the joint indicates the flow separation which results from this type of joint. On the rear-ejection model shown in the same photograph this separation is not indicated.

BOATTAILS

Undoubtedly the boattail is the device used most often on competition models to reduce the drag. However, some boattails can do more harm than good by causing separation at the transition joint. If the joint is not carefully finished, separation similar to that at the nose/body joint can occur.

In addition, if the angle of the boattail

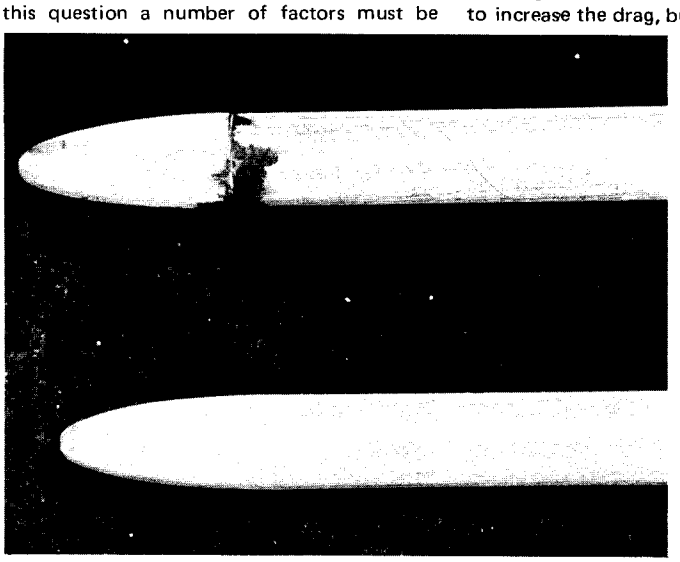


Figure 5: A little effort on the nose/body joint dramatically changes the flow. The top model, a standard rocket, shows flow separation at the joint. The lower model, a rear ejected bird, has had the nose/body joint carefully finished. There is no indication of flow seperation on this model.

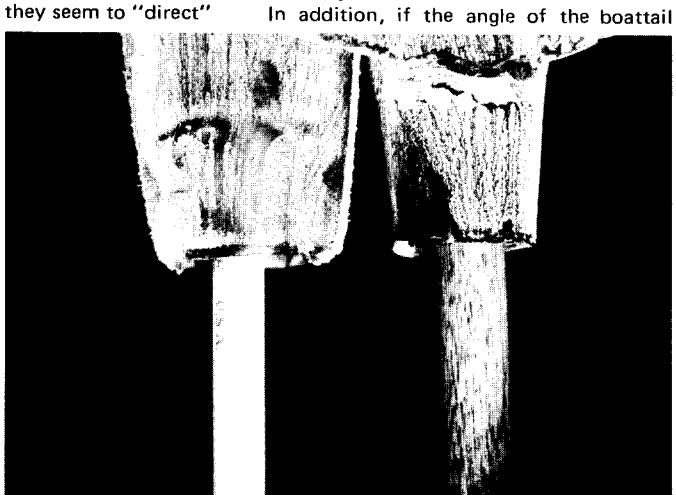


Figure 6: The flow patterns on these two boattails, a 20 degree boattail (left) and a 15 degree boattail (right), are drastically different. On the 15 degree boattail the flow is smooth and laminar, except in the wake of each fin where there is turbulance. The 20 degree boattail shows the rotational flow characteristic of turbulance. The 15 degree boattail is effective in "directing" the flow, while the flow cannot "follow" the 20 degree boattail so laminar flow is disrupted.

exceeds the 'optimal angle' separation will occur at the joint and the boattail will be totally ineffective in reducing the drag. Figure 6 shows the patterns from two boattails with angles of 15° and 20°. The dark area on the 15° boattail is caused by turbulent flow behind the fin. The large accumulation of kaolin at the transition of the boattail is caused by the joint between the body tube and the boattail.

On the main area of the 15° boattail, unlike the 20° one, the flow is fairly smooth and laminar. The optimal angle is probably somewhere between these two boattails. Of course this angle varies with body diameter, and should be determined for each individual rocket. By means of this flow visualization technique the angle may be found for any model.

Other Methods

Kaolin and kerosene seems to be the mixture best suited for tests on model rockets. Other substances are either hard on the paint or show different types of flow. Among these are oil of wintergreen (methyl salicylate) which destroys normal paints but functions much like kaolin and kerosene; and lamp black and oil, which when painted on foward surfaces produces patterns indicating a different set of flow chacteristics. This mixture may be useful in observing tip vortices, but it is difficult to work with.

To properly analyze the flow patterns, a basic understanding of what turbulence, separation, and tip vortices look like is essential. **Shape and Flow** by A. Shapiro, and **Aerodynamics** by T. VonKarmen are excellent references on the basic principles of flow. Flow visualization techniques similar to this one are discussed briefly in **Low Speed Wind Tunnel Testing** by Pope and Harper (p. 105f).

This method of flow visualization should prove valuable to those rocketeers who are trying to design the 'perfect' altitude model and may add a bit more challange to the next competition. The model can be built, tested, slightly modified, tested again, etc. until the final flight design is selected. Perhaps a similar method will work for boost/gliders.

MPC "Vostok" Presented to FAI

Although the Federation Aeronautique Internationale, located in Paris, is the 51-national organization that offically certified the first manned spaceflight, made by Russia's Yuri Gagarin in 1961, it never had a photo or a model of the history making rocket and space capsule used by the Russians — until now.

G. Harry Stine,space consultant for Model Products Corporation and chairman of the FAI's Subcommittee for Space Models, presented an MPC RD-107 Vostok model to Mr. Charles Hennccart, Director General of FAI, during a recent trip to Paris.

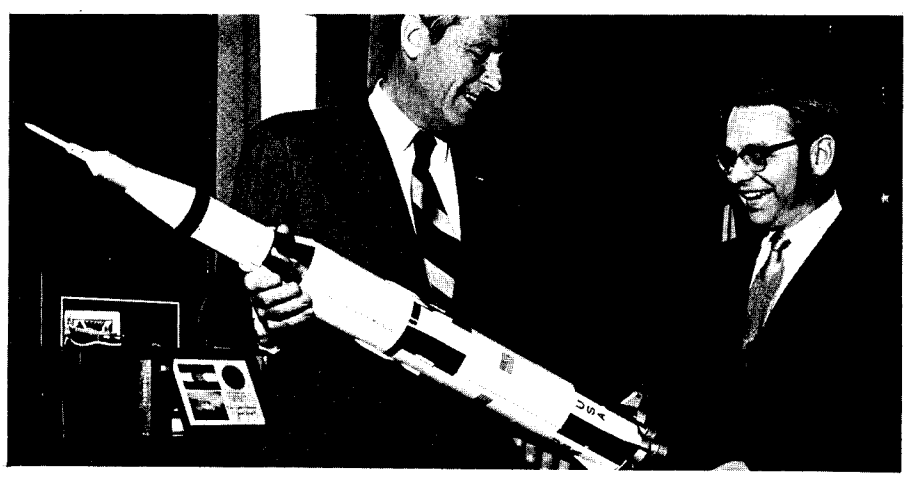
According to Mr. Stine, the Central Aero Club of the Soviet Union had to file with the FAI a series of documents proving that Gagarin made the flight in 1961. These documents give data such as times, altitudes, orbital inclination, radar data and certification of Central Aero Club witnesses to the flight. However, nothing in the international rules requires that photographs of the spacecraft or launch rocket be included, although the United States has always filed photos and drawings of its space vehicles.

The model rocket presented by MPC is an exact 1/100 scale replica of the rocke used by Yuri Gagarin. The model, when built, stands over 15 inches high and may be used for flying or display. The RD-107 Vostok is constructed of strong, durable plastic and may be built either as the Sputnik version with a clear nose cone with "chrome" satellite inside, or the Vostok version with a clear nose cone with re-entry capsule and cosmonaut figure inside.

Charles Hennecart, FAI Director General inspects the MPC model of the USSR "Vostok."

NEWS NOTES

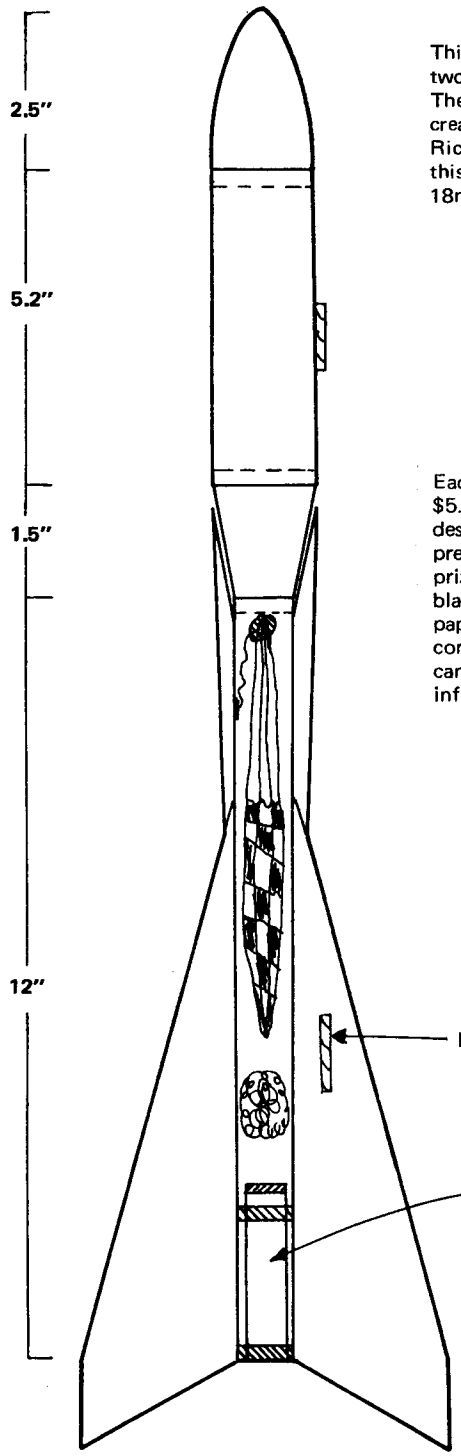
GOV. RECEIVES SATURN-V



By executive order of Governor John A. Love, March 16 was offically proclaimed "Rocketry Day" in Colorado. To celebrate the occasion, Vernon Estes (right) president of Estes Industries, Penrose Colorado, presented the Govorner with a flying scale model of the Saturn V. "moon rocket". A subsidary of Damon Corporation, Estes Industries is the worlds' largest manufacturer of model rockets and supplies.

Rocketry Day in Colorado honored the memory of Dr. Robert H. Goddard (1882-1945), distinguished American scientist and engineer, who, on March 16, 1926, ushered in the Space Age when he launched the worlds' first liquid fuel rocket—which he had designed himself—at Auburn, Massachusettes.

Reader Design Page



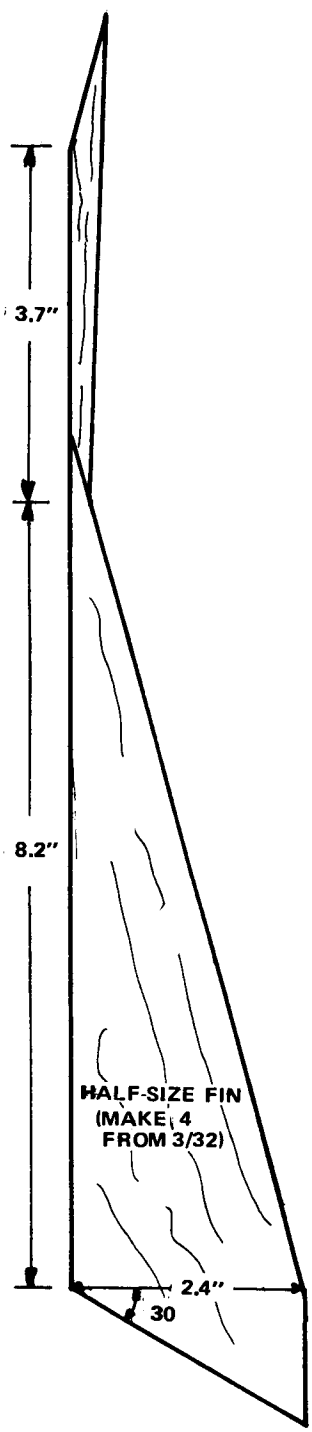
This month's Reader Design, the RD-1, is a two foot tall payload for large payloads. The model uses its fins as a "fairing" to create an interesting profile. Designed by Richard Marchant of New Hyde Park, N.Y., this bird may use a C or D engine in the 18mm diameter.

Parts List

1 ST-165 Body Tube
1 ST-811 Body Tube
1 BR-8-16 Balsa Adapter
1 BC-160 Nose Cone
1 EM-8 Engine Mount

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



AN ON THE SCENE REPORT FROM THE KENNEDY SPACE CENTER, DETAILING NASA'S PLANS FOR THE–POST APOLLO PROGRAMS –– SKYLAB, SPACE SHUTTLE, AND AFTERWARDS

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Apollo 14 and Afterwards

by Charles Andres

Apollo 14, man's latest trip to the moon, was launched from Cape Kennedy at 4:03 p.m. on January 31. It was observed by more people than any other launch in history, and was covered by the second largest press contingency. Among the 1900 members of the press were at least a few model rocketeers including myself, who never having seen a Saturn V launch, was determined to see at least one before NASA depleted its stock. In what was one of the most unique positions of any newsman, I got a view of Cape Kennedy and the aura of a launch which I had not expected. In addition to this and being thrown amid the confusion of a pre-launch preparation, the atmosphere resulting from the post Apollo-11 slump was vary prevalent and although an outer layer of optimism was displayed, a deeper feeling of worry over future cutbacks was very apparent at the Cape during this launch.

I started thinking about going to Florida about the time the launch vehicle was rolled out to the pad in November. As it turned out, I got a ride from Ithaca, NY to Miami with four other people squashed in a Volkswagen beetle. Fifteen hundred miles in 32 hours straight through – cost per person, $6.00. Although not a very comfortable way to travel, you can't beat the price.

After broiling myself alive on the beaches of Southern Florida, I headed north to Cape Kennedy on the Wednesday before launch. Arriving in Cocoa at dusk, I was amazed to find the town almost permanently deserted.

I got a ride to Cocoa Beach and immediately hit the Apollo News Center to get press accreditiation. I can only imagine what the receptionist thought when she saw a sun-broiled, long-haired kid in a winter coat, knapsack, and sleeping bag walk through the tinted glass doors of the plush NASA Apollo News Center, and present valid accreditation papers to enter the world of men in dark suits rushing around in their rented Cadillacs. That orange badge opened more doors for me in the next few days than almost any credential has.

About this time, I began to worry about finding a room for the coming nights – which was about two months too late to start worrying about it. Although Cocoa Beach is filled with motels, a launch is the one time when they are all filled, and the prices are triple the standard rates.

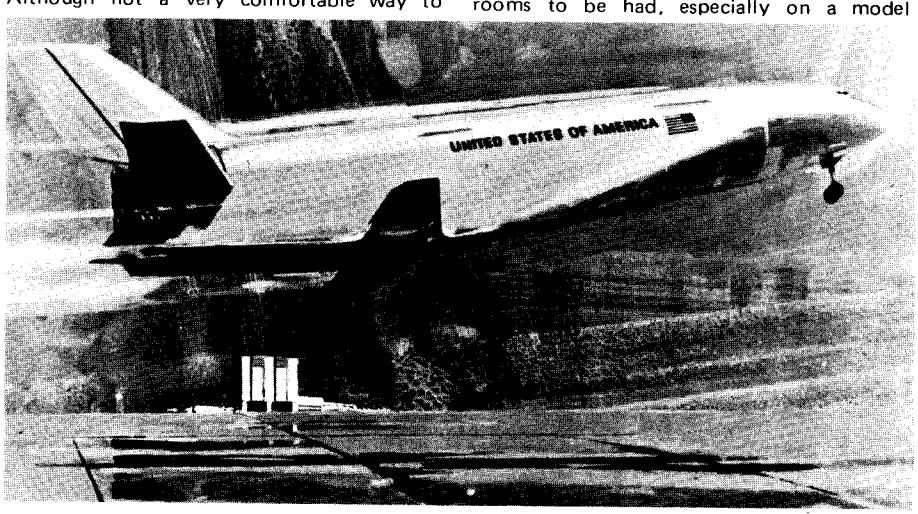
I had been getting used to the idea of living a nomadic existence during the previous week, so when I realized that there were no rooms to be had, especially on a model rocketeer's budget, I began looking for a nice grove off the beach. The accomodations I finally wound up with were excellent – within easy walking distance of the Apollo News Center, a beautiful view of the ocean, a reasonable skylight, adequate but uncontrolled air conditioning, sufficient furnishings (an abandoned lawn chair), and the facilities were private. (Fortunately mosquitos, scorpions, snakes, etc. hibernate in January.) My situation was vaguely reminescent of a WW II South Sea spy. In addition to keeping my position secret from the surrounding natives, I had to dodge searchlights from the beach patrols. (Here I was surviving in a style little better than a savage in the shadow of man's greatest technological innovation, living off wild IGA oranges and coffee and doughnuts courtes of North American Rockwell.

In the nights during the Apollo 14 launch preparation, the Apollo contractors and other groups held several cocktail parties for the press corps. I gained easy access to these, by wearing my badge. Otherwise, I'm sure I would have been royally escorted to the door. I could then at will transfer back and forth from my primitive campsite living (virtually free of cost) to the glittering elite world of the press – highlighted by such people as Jules Bergman, Merril Mueller, John Chancellor, and others. I doubt any other press member covered the launch in a situation of such striking contrast.

On the days prior to the Apollo 14 launch, NASA conducted several tours and briefings to keep the press men busy. The basic tour of the Cape, which covered some 70 miles in about four hours, starts at the East Coast Air Force Test Range where all of the early flights took place, and culminates with a visit to the Saturn Vehicle Assembly Building and launch pads.

On taking the tour three times, it was amazing to see the progression of advances at the Cape. The Air Force had been in the habit of building their pads in a line working their way up the coast as each new missile came along. Thus the tour, which started at the South tip of Cape Kennedy Air Force Station and worked its way North past all of the launch pads, closely followed the chronological order of US missile development.

Models, and in many cases actual prototypes, of many of the rockets launched in the past were on display at the Air Force Museum.



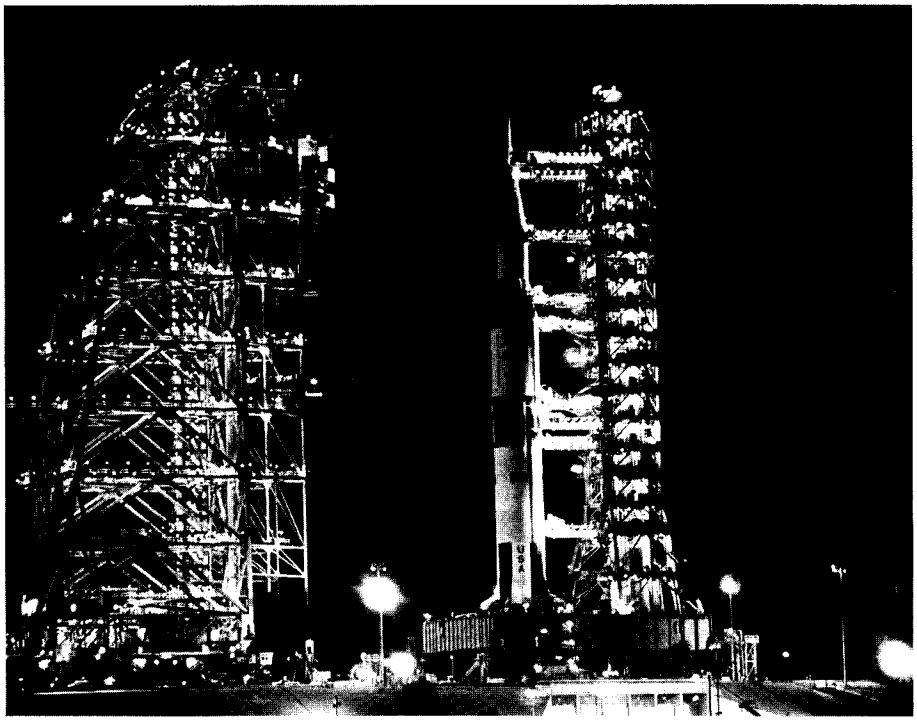
NASA Photo

After Apollo, NASA plans call for the winged "Space Shuttle" to carry men and satellites into orbit. The Booster will take off vertically with the Orbiter mounted on the side. The booster (shown above) will then land in the same manner as conventional aircraft. Initial test flights are planned for 1977-78.

The full size missiles on display here can provide a wealth of knowledge for the scale modeler. Vehicles such as the Redstone, Minuteman, Firebee, Atlas, Polaris, and even a German V-1 can be seen, measured, and photographed from close-up — a scale modelers dream.

One could also see the progression in gantry technology — the early ones were built on the principle of the oil derrick, which they resemble. The very latest ones, for the Saturn V and Titan III pads, are built on the mobile launcher concept. Going through the launch control centers one gets an idea of the complexity yet primitiveness of the space program. Equipment complex beyond comprehension, built with a reliability approaching 100%, makes possible the undertaking of such a seemingly impossible task as a flight to the moon. However, Wernher Von Braun was right when he said that the basic vehicle hasn't changed much in 30 years. The Saturn is basicly an outgrowth of the V-2, and somehow, despite its massive size and six million parts, it seems extremely primitive when it takes off with its great amount of of flame, noise, and smoke.

We toured onward, through mile after mile of desolate brush and wilderness. Cape Kennedy is one of the few places in the world designed to make man and nature compatible so that both may survive. Aside from serving as the Apollo launch facility, Cape Kennedy serves as a federally established wildlife refuge. One cannot help but notice the orange groves, the large variety of trees, fish, and game which are spread out over nearly all of the Cape. We even saw a wild pig roaming within three miles of the Saturn.



NASA Photo

The night before launch the 410 foot high Mobile Service Structure was moved back from the rocket. Flood lights on the pad produced an erie display visible from 30 or more miles away.

Only when you are actually inside the Vehicle Assembly Building is the enormous size of the Saturn evident. Here Apollo 14's first stage is raised into position in the VAB. Indicative of the delays in the space program, the first stage was raised into place on January 14, 1970, over a year before the Apollo 14 launching.

From a distance, the Kennedy Space Center lives up to its advance publicity. The VAB and the pad with Apollo 14 on it were visible from twenty miles away. As I got closer and closer, these constructions got bigger and bigger. The immense size of the Saturn V and the KSC launch equipment has been extoled countless times before. Being previously prepared, it seemed to me that they were not as big as they had been billed. But when you get inside the VAB and look up the side of Apollo 15's first stage rising up and up through the building, the really immense size becomes impossible to imagine or describe.

Of the several pre-launch news conferences those on the future NASA budgets and the pre-launch briefing were the most interesting. NASA does not expect to get as much money in the future as it has received during the peak years of the Apollo project. The contractor manpower chart indicated that the low should be reached in mid-1972, when employment should level off at 108,700 men (down 20,300 from the start of this year). The projected yearly expenditure for 1971-72 is about 3 billion dollars, just about the same as it was for 1962 before Apollo got into full gear. This money is expected to be distributed more evenly between manned and unmanned projects. Apollo will be cutback by 1/3 in 1972 and terminated in 1973. The Skylab and Space Shuttle projects will absorb some of the cutback, but basically the cuts will be from the manned program. Many of the project leaders fear that these cutbacks are beginning to reach disasterous proportions. One aerospace engineer suggested that if the engineering and launch teams built up over the last decade and a half are dismissed, it will require many years to reassemble such a team.

The most talked about topic at the Cape, even more than the Apollo 14 flight, was the upcoming Skylab and Space Shuttle programs. North American Rockwell, McDonnell Douglas, and others displayed mock-ups and plans for both projects since every major aerospace contractor needs at least one good contract to maintain their production capability in the space field. Although the Skylab project has been just about finalized, the Shuttle, which is the first step towards inexpensive space flight and a permanent space station, is still tentative. The lead time on a project of this complexity makes it mandatory that a major committment be made this year or next if the Shuttle is to fly by 1980.

As the contractors must compete for the Shuttle design and construction contracts, so must the Cape fight just to retain launching and landing responsibility over the early Shuttle flights. Cape personnel are pushing for launch responsibility to keep KSC active after Apollo. Vandenberg AFB and White Sands Proving Grounds are also under consideration as Shuttle launching sites. However, KSC's launch operations are built around the "mobile launcher" concept which gives the Cape an advantage in the site selection.

Already in preparation for Skylab is one of the most amazing mobile launchers ever imagined. The idea is to cut costs by launching the Skylab Saturn 1B from a Saturn V pad and launcher. Since the Apollo capsule must be located at the same level in the tower, the base of the Saturn 1B must be mounted about 100 feet higher than the normal base level on the mobile transporter. If you can imagine a crawler/transporter equipped with a milk-stool, with a Saturn 1B balanced on top, you have some idea of what the configuration is supposed to look like when completed.

(continued on page 47.)

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UPDATE CANADA

Update Canada . . .

Beginning this month, *Update Canada* will appear as a regular monthly feature in **Model Rocketry** magazine. The purpose of this "news page" is to encourage communication among Canadian rocketeers and to bring Canadian modroc accomplishments to the attention of the rest of our readers.

Support Needed . . . .

People said it couldn't be done in Canada. But, we did do it. The First Canadian Model Rocket Convention and the Alberta Regional were held, and were initial successes.

This year why don't you insure the future development of model rocketry in Canada? Why don't you get out there and support events in your area of the country. Even though you have to travel hundreds of miles to some events, try to make it. And I don't mind mentioning that there are almost as many Americans as Canadians that attend Canadian events. This does show disunity and a lack of support in Canadian model rocketry.

Now that you are possibly "sold" on attending some Canadian event this summer, here's a run-down on what's happening.

In Montreal, the Second Canadian Model Rocket Convention Will be held on the second third, and fourth of July. This event is sponsored by the Atmospheric Rocket Research Association, and information can be obtained by writing to 7248 2nd Avenue, Montreal 453, Quebec.

In Alberta, the AARM-2 will be held sometime this summer. This event is sponsored by Edmonton Rocketry Club, and last year was held near the town of Morinville. For details and dates one can write 13540 126th Street, Edmonton, Alberta.

A third major event has been added this year. Its the B.C. Centennial Invitational sponsored by the Burnaby Model Rocket Club in Burnaby, British Columbia. The competition is scheduled for the 26th and 27th of June and information can be obtained by writing: 6714 Hershan Ave., Burnaby, British Columbia.

And, this may be also worth mentioning. If you cannot attend any of these three events this summer, try thinking of having one of your own in your locality and keep us informed of your results, we would be interested in them and possobly could print them in a year end wrap up.

Its Up to You!

We will try to write stories of general interest to everyone. But, we would like to make the format of the majority of articles come directly from you the readers. We invite you to send in comments, pictures, scale plans, R&D projects, and almost anything else you have for inclusion to:

UPDATE CANADA,
Articles,
7800 Des Erables Avenue,
Montreal 329, Quebec.

Note that if you would like your article returned include a stamped self-addressed envelope. We hope to hear from you soon.

Club Registration

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.

Apollo 5 - Saturn 1B

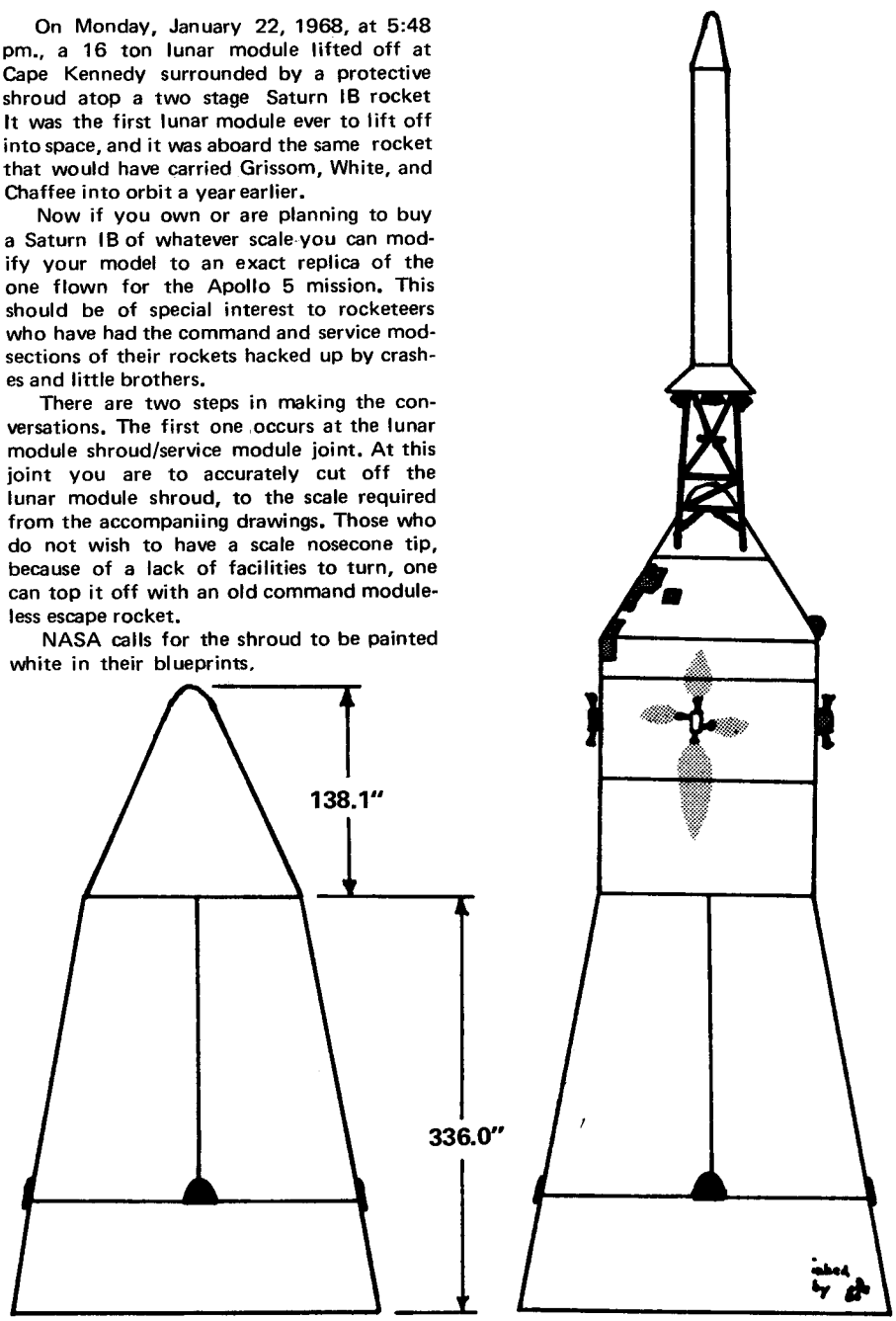
by Steven J. Kushneryk

On Monday, January 22, 1968, at 5:48 pm., a 16 ton lunar module lifted off at Cape Kennedy surrounded by a protective shroud atop a two stage Saturn IB rocket It was the first lunar module ever to lift off into space, and it was aboard the same rocket that would have carried Grissom, White, and Chaffee into orbit a year earlier.

Now if you own or are planning to buy a Saturn IB of whatever scale you can modify your model to an exact replica of the one flown for the Apollo 5 mission. This should be of special interest to rocketeers who have had the command and service mod-sections of their rockets hacked up by crashes and little brothers.

There are two steps in making the conversations. The first one occurs at the lunar module shroud/service module joint. At this joint you are to accurately cut off the lunar module shroud, to the scale required from the accompaniing drawings. Those who do not wish to have a scale nosecone tip, because of a lack of facilities to turn, one can top it off with an old command module-less escape rocket.

NASA calls for the shroud to be painted white in their blueprints.



CLUB CORNER

by Bob Mullane NAR 4157

OBTAINING PUBLICITY FOR YOUR CLUB

For a club to grow and obtain community support, a well planned program of publicity is almost essential. Good publicity introduces new people to the hobby (some of them may even become model rocketeers), let others rocketeers in the area know that your club exists (so they can join), and it lets people know that model rocketry is a good thing.

Hobby shops, school newspapers, newsletters of local science-oriented associations (like planetariums), and **MRm** provide an easily used means of contacting local rocketeers and potential rocketeers. If you have been keeping in contact with your hobby shop, the owner will probably let you keep a poster in his store giving information on your club. School newspapers will usually print almost anything, so contact the editor and see if he'll run a story on model rocketry. (BEWARE: Be prepared to write the story yourself.) The same holds true of the newsletters issued by local museums, planetariums, ect. Every month many clubs run a notice in "club notes" in this magazine asking rocketeers in their area to contact them. Why haven't you used this means of contacting rocketeers?

By their nature, all of these means of publicity are easy to use and aimed at rocketeers or potential rocketeers. Reaching the general public is a little more difficult.

Before reaching out for the mass media (newspaper, radio, TV), your club should appoint a publicity officer to organize and run the public relations effort. He should be articulate and well versed in model rocketry. If possible, this position should be held by an adult since most reporters and editors are adults, they seem to listen to an adult more readily than to "just some kid."

Where to begin? If there has been no press coverage of model rocketry in your area, start with long "feature" articles in newspapers and brief news reports on local television news broadcasts. Once this has been accomplished, continue to send press releases to the papers, and attempt to get members of your club on TV and radio interview shows and feature length TV news reports. Sit down now and plan out exactly what you intend to do.

Once you know what you want to do, how do you do it? Search the local papers and watch the local TV news and find out who the Science Reporters, Feature Reporters, and Roving Reporters are. (Make sure you have the names of local reporters, not syndicated or wireservice reporters who may be a thousand miles away.) Have your publicity officer phone these reporters about three weeks before a big event (a meet or a special demonstration) and explain briefly what model rocketry is, what your club is, and what event you are planning. If they seem interested in covering the story, your publicity officer should make an appointment to visit the reporters to explain more about the club. Offer to hold a special demonstration for each reporter (so you can devote full time to him) and find out when he could come for such a demo. If your publicity officer goes to see the reporter, he should bring along a few rockets and some literature to demonstrate what model rocketry is. Don't wait until the last minute to plan your demonstration. Well before the day of the demo, plan exactly what you intend to fly (make sure you have pre-tested everything). I'll speak about organizing and running a demonstration next month.

On the day of the demo or meet, have a packet of information ready for and a club member (again, an adult if possible) to talk to each reporter present (if you have more than one coming.) The packet of information should include information about your club (a copy of your newsletter if you have one), about model rocketry in general, the NAR (if you are a section), and safety. The member guiding each reporter should explain as fully a possible the basics of model rocketry, your range operations, tracking, ect. He should be ready to answer any questions which the reporter may have. If this is being done at a meet, offer to call the reporter that night with the results of the meet.

Don't stop after the first splash of publicity. Keep a listing of the reporters who covered the meet or demo, and send them press releases when you are going to have a meet or other big event. A brief release may be sent a few weeks before the meet explaining what will be going on and when and where it will be held. A release should also be sent immediately after the event explaining what went on at it. From time to time (maybe twice a year), invite the reporters to attend a meet and report on it.

Now, you might try to contact the producers of local radio and TV talk shows and any special (scientific of educational) local shows. Instead of asking if they'll cover an event, now you ask if they would like to have a club member come on the show to be interviewed. Follow the same procedures as with the reporters of explaining model rocketry, your club, ect. If granted an interview be sure to send a neat, articulate member. If the person you send isn't able to talk well, DON'T SEND HIM! He should bring along a few good looking models of various types (scale, B/G, payload, ect.), some engines, and parts (body tubes, nose cones,ect.) to show what model rockets are like. Even if the interview is on the radio, these props will help keep the discussion going. The interviewer should be given a general information sheet ahead of time in order to prepare intelligent questions. Be sure to mention how people can contact you, and when and where you'll be holding your next launch.

After all this, continue sending release to the papers. Make them short and on a specific topic. These releases should cover any important members you have in your club, special events you are running, club members going to a NARAM, and your own big meets. They should be fairly short and contain information on how people can contact the club and about when a launch will be held which they can attend. The information on time and place should also be sent to the "Community Calendar" of the papers, radio, and TV. When sending it to the TV stations, include a color slide of a rocket taking off to be shown on the screen while the announcement is read.

In all your contacts with the press, try not to use up too much of the reporter's time. If anyone in the club has a personal con- with someone on the newspaper, TV, or radio be sure to use that contact. *Always stress the safety of model rocketry.*

As of this writing, NASA is planning to launch the Apollo 15 next month (July 25 to be exact). This Sunday launch might provide an excellent opportunity to set up a demonstration for the press. Why not start one now? Next month, I'll go into some details on how to run a demonstration. Let me know what you are doing and what subjects you'd like to see covered here.

New Product Notes

ESTES "CITATION" LINE

The CITATION line, a deluxe section of five brand new model rockets, marks the entry of Estes Industries in the mass merchandising market. A subsidary of Damon Corporation, Estes is the worlds largest manufacturer of model rockets and supplies. Until now, Estes has sold its products only by direct mail or through hobby shops. "By making our model rockets and related supplies also available through mass merchandising outlets in the United States," says President Vernon Estes," we hope to introduce hundreds of thousands more young Americans to model rocketry, America's fastest growing and most exciting hobby. We feel that this exposure to quality model will add substancially to the future of the hobby," It is estimated that there are now about one million model rocketeers in the United States.

The five new models in the CITATION line are the Quasar, Red Max, Patriot, Starship Vega, and Bomarc. All were designed by Estes Research and Development staff.

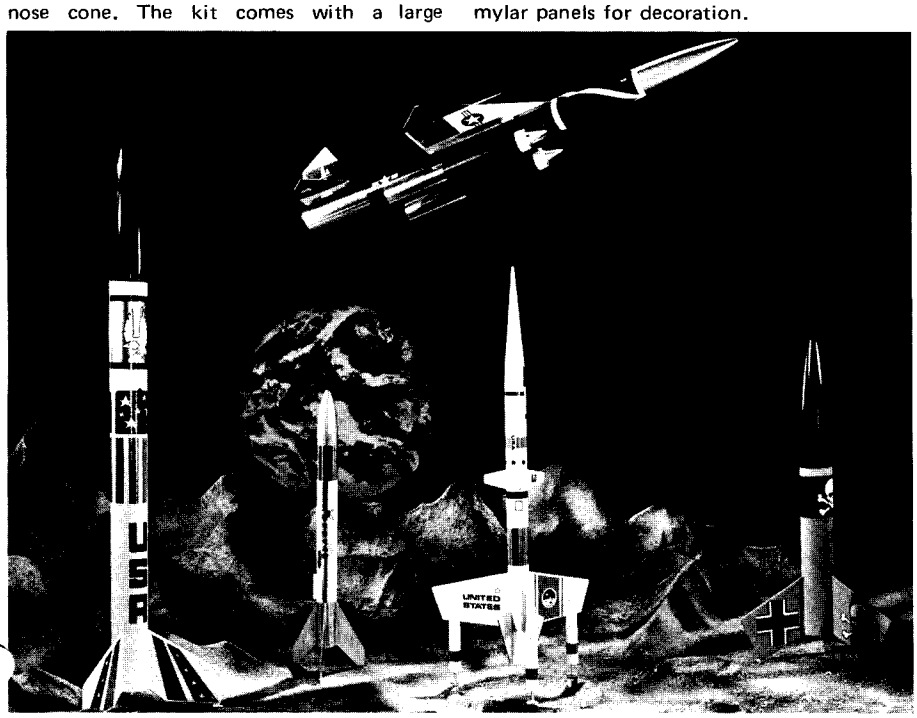
With its all-plastic fin and nose cone assemblies, the Quasar is easy to build and will be particularly attractive to the beginner, since it requires no painting. The fin and nose cone assemblies come already brightly metalized, and the kit is supplied with metalized and pre-printed body tube wrap-on decorations.

Designed with fun in mind, but also well suited to sport flying, the Red Max is a big, attractive model with a large diameter body tube, die-cut balsa fins, and molded plastic nose cone. The kit comes with a large "kookie custom" decal sheet that's easy to apply over a simple spray paint job requiring no masking.

An impressive model over 25 inches tall the Patriot is also equally suited to sport of fun flying. A molded plastic nose cone and die-cut balsa fins make for fast, easy construction of this large diameter model. Big, five-color decal sheets in "All-American" red, white and blue are furnished with the kit for application over spray paint. As with the Red Max, no masking is necessary when painting the Patriot.

The 20" tall Starship Vega is a futuristic vehicle designed mainly for sport flying. This deep space model has a balsa nose cone and die-cut balsa fins, and is supplied with a three-color decal sheet that is applied once the model has been spray-painted. In-flight tracking and recovery are made easy by the bright wrap-on foil trim that reflects the sun's light to make the model highly visible in the sky. Landing legs on the rear fins add to the Starship Vega's realistic appearance as an inter-planetary exploration vehicle.

With the Bomarc, a striking 23" long scale version of the USAF surface-to-air interceptor missile, Estes Industries is introducing the first scale boost glider ever on the market. In this model, which performs to please even the most demanding rocketeers, the engine pod is ejected at maximum altitude and returns to earth by parachute, while the Bomroc glides back in a gentle, flat pattern. The kit features die-cut balsa parts, molded plastic nose cone, and big, authentic-looking mylar panels for decoration.



The new Estes "Citation" line.

Centuri's new Space Shuttle boosts vertically then separates into two gliding sections just like the proposed NASA vehicle.

The "Space Shuttle" is Centuri Engineering's simulation of the current proposals now under study by NASA as an orbiting payload shuttle for future space flights. The Shuttle's three-way performance should be fascinating for every rocketeer. As the Shuttle is launched it ascends vertically, then the shuttle craft separates and begins to glide slowly back to earth, the power-pod containing the expended engine returns via streamer, and the carrier ship also glides back to earth. The Space Shuttle's carrier ship is 15" long, with a body diameter of 1.64", and weighs 1.93 ounces. The shuttle craft is 8.9" long, uses a 1.34" diameter tube, and weighs 0.67 ounces. The Space Shuttle, Kit KC-6, retails for $3.50.

Astro Communications (3 Coleridge Place, Pittsburgh, PA 15201) has introduced their new 1971 catalog. The catalog lists the Minimitter and Foxmitter model rocket kits as well as several sensor modules for the Foxmitter. Send 25 cents for the catalog.

Plastruct has issued their new 1971 catalog. The latest edition, printed with an orange cover, includes a variety of new items. Among these is a larger section of ABS plastic tubing in 19 additional sizes ranging from 1½" diameter to 6" diameter. Clear butyrate sheet stock is also a new item.

Most Plastruct materials are made from ABS plastics to assure high quality. To the modeler this means easier working - - it cuts clean, either with a blade of fine-toothed cutting saw. It cements easily, particularly with Plastruct's Plastic Weld cement, The materials are extremely strong and hold together well. In addition, Plastruct may be finished with any type of paint, including lacquer.

The new Plastruct catalog, featuring many structural shapes ideal for scale launchers, is available for 50 cents from: Plastruct, Dept. MR, 1621 N. Indiana St., Los Angeles, CA 90063.

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

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

MINUTES
BOARD OF TRUSTEES
January 30, 1971

The meeting of the Board of Trustees of the National Association of Rocketry was called to order by Vice President B.A. Thompson, acting for President E.B. Beetch *in abstentia*, at 7:21 P.M., January 30, 1971 in the Gold Coast Room, Sherman House, Chicago, Illinois.

G. H. Stine was appointed Secretary pro-tem and directed to call the roll. The following newly-elected Trustees of the NAR were present:

Robert Atwood
James Barrowman
Gerald Gregorek
Harry Stine
Bryant Thompson
John Worth

The chair announced that a quorem was present.

It was moved and seconded that the Minutes of the meetings of the Board of Trustees held on August 17 and August 19, 1970 be accepted and that reading of said minutes be dispensed with. The motion was ammended and seconded that the minutes of the meeting of August 19, 1970 be changed so that Line 3 of Page 2 reads as follows: ..."of Section Activities. There ensued a questioning session..." Passed. The motion as ammended passed.

There was no report from the President, no report from the Vice President, and no report from the Secretary. The Secretary *pro-tem* of the January 17, 1971 meeting of the Association, James Barrowman, reported that the minutes of said meeting had been mailed to all trustees and that the ballots for the election of Trustees had been burned.

The report of the Treasurer was submitted. It was moved and seconded to table discussion and vote on acceptance. Passed.

There was no report from the Membership Committee.

The Standards & Testing Committee reported that a number of model rocket engine types from various manufacturers were under test for certification, that the MPC Type A3-2 was running high and had therefore been de-certified from Contest Certification. A random sampling plan and program was under way with assistance from the LAC. In all respects, the Standards and Testing Committee is operating well. It was moved and sec-

onded that the report be accepted. Passed.

The report from the Contest and Records Committee was delivered by Barrowman from Sipes. A proposal for regional akdown of the Contest and Records Committee was present- , and materials that are sent to each Contest Director were displayed and passed around for review. An s.o.p. for records procedures was passed out. It was further reported that financial accounting methods had been instituted by the Committee. It was moved and seconded that the report be accepted. Passed.

The Liaison Committee reported that the minutes of the C.I.A.M. Subcommittee for Space Models had been sent to all Trustees.

Business moved back to the report of the Contest & Records Committee. Barrowman displayed for review by those present a computer print-out for the contest year to date.

The Section Activities Committee presented the names of all existing and new Regional Managers. There were 104 Sections chartered in 1970, and the membership for 1970 reached 5665. Thus far in 1971, 24 Sections have re-chartered thus far. The renewal and rechartering rate is slow, but the pattern is normal. Atwood felt that the Association would have 150 Sections by NARAM-13. Moved and seconded that the report be accepted. Passed.

There was no report from the Public Affairs Committee save that Barrowman reported that Kukowski had accepted the responsibility for obtaining trophies and awards for NARAM-13.

There was no report from the Publications Committee.

The Technical Services Committee reported funds on hand and that a 2-year supply of lapel pins was on hand.

The report of the Audit Committee, a Special Committee created by the Board at their meeting in August, 1970, was presented by John Worth, Chairman. He reported that the Committee had audited the funds of the Association itself, of the Technical Services Committee, of the Contest and Records nmittee, and or the NARAM-12. The books, funds, and accounting procedures of the General Fund and of Technical Services were found to be in order, although a detailed audit of Technical Services had not been made since all documents appeared to be in good order. This could not be said for the Contest and Records Committee and for NARAM-12 because there was no set of books and loosely-accounted-for expenditures, some from General Fund advances. The Committee submitted its report along with a list of recommendations. It was moved and seconded that the Association concur with the contention of Forrest McDowell that the range store operation at NARAM-12 was a private venture by McDowell and was not an obligation of the Association. Passed. It was moved and seconded that an expense voucher in the amount of $417.38 from McDowell, previously under withheld-payment status pending resolution of the range store status, be paid by the Association. Passed.

Worth moved that the finances of the Contest and Records Committee be administered by NAR Headquarters and controlled by the NAR Treasurer. Seconded. Passed.

It was moved and seconded that the Special Committee on NAR Audit be commended by the Association for a splendid job. Passed.

Stine moved and Barrowman seconded that the first 3 pages of the report of the Audit Committee be published in *The Model Rocketeer*. This motion was ammended and seconded that the report be published with deletions of references to personalities. The ammendment passed. The motion as ammended passed.

It was moved and seconded that the Treasurer's report be untabled and brought to the floor. Passed. It was moved and seconded that the report of the Treasurer be accepted and that first page be published in *The Model Rocketeer*. Passed.

Business was returned to the report of the Section Activities Committee. It was moved and seconded that funds in the amount at least equal to the amount received from Section charter fees be allocated to the Section Activities Committee for their use. After discussion, the motion was not passed,

It was moved and seconded that Mrs. Lou Ward be given a commendation and special award for her excellent services at NAR Headquarters. Passed.

It was moved and seconded that Leslie H. Butterworth be appointed an Honorary Trustee for life in recognition of his outstanding services on the Board of Trustees. Passed.

Business passed to the election of officers.

The Chair entertained nominations for President. Robert Atwood nominated and John Worth seconded James S. Barrowman. There were no further nominations. James S. Barrowman was elected President by unanimous acclimation. Thompson forthwith yielded the chair to the new President.

The Chair entertained nominations for Vice President. Atwood nominated and Worth seconded the name of Dr. Gerald Gregorek. The nomination was declined by Gregorek. Barrowman passed the gavel to Thompson and nominated Howard Galloway, seconded by Atwood. Stine nominated and Gregorek seconded the name of Bryant A. Thompson. There being no further nominations, the nominations were closed. A secret ballot was held. The Chair requested that the Secretary pro-tem study the proxy ballots and to enter the votes of those proxies who were for a nominee for Vice President. Leslie H. Butterworth acted as scrutineer of the ballots, and he announced that Bryant A. Thompson had received the largest number of votes and had been elected Vice-President.

At 9:05 P.M., the Chair called for a 14-minute recess and reconvened the meeting at 9:20 P.M.

Atwood nominated and Stine seconded the name of Jerome Apt III for Secretary of the Association. There being no further nominations, Jay Apt was unanimously elected Secretary.

Stine nominated and Thompson seconded the name of John Worth for Treasurer of the Association. There being no further nominations, John Worth was unanimously elected Treasurer.

The meeting was then opened for Old Business.

Thompson reported that the FAI Team Selection Committee had not yet met in pursuance to the direction of the Board, and that there was not yet a report from this Special Committee.

Thompson queried the Chair regarding the By-Laws Committee, established by the vote of the membership in August 1970. The Chair replied that the By-Laws Committee would be appointed within the next few weeks to begin review and revision of the By-Laws of the Association.

The meeting was then opened for New Business.

Worth moved and Stine seconded that the Association policy on late memberships be revised and that membership dues for new members joining between August 1 and October 30 of any year be one-half of the regular full-year membership. Passed.

Worth asked for guidance from the officers on materials which could be sent to members on their request. There had been some problems with some members asking for excessive quantities of NAR literature. The Chair replied that this would be treated as an administrative matter and that the Chair would contact NAR Headquarters to establish guidelines.

Stine moved and Worth seconded the formation of a Special Committee to revise and re-issue the U.S. Model Rocket Sporting Code, the "pink book." Discussion revealed that A.W. Guill Sven W. Englund, and other members in southern Connecticut felt that it would be possible to review the current rules, get comments from others, obtain advertising, print, bind, and deliver to NAR Headquarters for mailing a new pink book on or about June 1, 1971. Worth moved and Gregorek seconded an ammendment to the motion requiring that the text of the proposed new rules be mailed to the Board for their review, that a maximum of two weeks be deemed a reasonable time for said review by the Board, and that approval of the President be obtained before a committment to the printer was made. The ammendment passed. The motion as ammended passed.

Stine moved and Atwood seconded that the Executive Committee submit an operating budget for the Association for 1971 to the Board. Worth moved and Gregorek seconded that the motion be ammended to require the Treasurer carry out this duty and present the budget to the Board for approval. The ammendment passed. The motion as ammended passed.

The Chair presented for the advice and consent of the Board the following list of Chairmen of Standing and Special Committees:

Executive Committee: Barrowman, Worth, and Galloway
Standards and Testing Committee: Gregorek
Contest & Records Committee: Sipes
Liaison Committee: Stine
Section Affairs Committee: Atwood
Publications Committee: Audin
Technical Services Committee: Thompson
Public Relations Committee: Carl Kratzer
LAC Advisor: Audin

There were no Presidential appointments for the Membership or Education Committees.

Worth moved acceptance, and Atwood seconded. The discussion that followed centered around the appointment of the Chairman of the Contest & Records Committee. The President replied that he was well aware of the problems of the past year, that he had discussed the matters fully with the C&R Chairman, and that he was confident that the Chairman would handle his duties in a satisfactory manner. The motion was passed by a vote of 3 to 2.

The meeting was then opened to Remarks, and the Chair announced that the Board would be pleased to hear any comments from the observers and spectators in the room as well.

Tag Powell asked that the Board please request that the NARAM-12 Contest Director return the field telephones lent for the meet.

Thompson remarked that the Contest & Records Committee should begin a compilation of the NARAM Contest Director's manual and that the NAR should develop an S.O.P. manual for its activities.

Vernon D. Estes asked if the minutes of prior meetings were available, if copies of the Treasurer's Report and the Audit Committee's Report were available, and if the books of the Association were open to perusal by the membership. The President replied from the Chair that the answer to all these questions was yes.

There being no further business to come before the Board of Trustees, Atwood moved and Thompson seconded that the meeting stand adjourned *sine die*. Passed. Meeting adjourned at 10:42 P.M., January 30, 1971.

Respectfully submitted,
G. Harry Stine
Secretary pro-tem

NAR 1970
AUDIT COMMITTEE REPORT

The NAR Audit Committee met twice in December, 1970. At the first meeting two basic jobs of auditing were performed. All the 1970 daily worksheets and accompanying bank deposit records were checked. These worksheets were produced by NAR Headquarters as a record of all money received by HQ. They indicated when money was received, from whom, and for what. Each worksheet had a bank deposit form attached, showing that the money received had been deposited to the NAR account.

Expenditures for the year were also checked. These expenditures were made by NAR check, co-signed by the HQ administrator and the NAR treasurer. All expenditures were accompanied by invoices, expense statements, bills, or other documents which verified the nature and amount of the expenditures.

All the checking done at this first meeting indicated that a very high standard of accuracy and description of transactions had been maintained by HQ and the treasurer. Only a very minor error of several dollars (out of thousands) was noted in the worksheet examination and only a designation of one wr catagory of expense was noted in the expenditure record.

At the second meeting the effort concentrated mostly on auditing the Contest Board activity and partially on the NAR Technical Services accounting. The latter appeared to be well accounted for and in sufficient detail as to provide confidence in the figures presented. No further verification was considered necessary. The Contest Board activity, however, was considered to be in need of detailed examination because of substantial expenses paid out from general NAR funds.

Both NARTS and the Contest Board activities have been expected to be self-sufficient. Each has its own income sources and these are supposed to cover expenses without need for support from general NAR funds. The financial statement from NARTS showed that this operation was doing better than holding its own. It actually showed an operating surplus. In contrast, the Contest Board operation showed major advances from general NAR funds without any evidence that these would be replaced. The committee decided, therefore, to concentrate its effort on auditing this operation.

The committee had considerable difficulty determining the nature of expenditures by check. Most checks were not identifiable to a specific bill or expense. Also, there were many bank charges for overdrawn checks. Confusing this picture were a number of expenditures apparently made by commercial money order, rather than by check, and without receipts for some such expenditures. Also examined were various forms of evidence of expenditure such as cash register receipts, bills, etc. – but the collection was incomplete. There was insufficient documentation to verify the Contest Board statement concerning NARAM-12 expenses and no documentation concerning basic meet income (such as entry fees).

Due to the overdrawn state of the Contest Board bank account (a separate account from that of NAR HQ and in a different bank), plus the fact that additional checks were still outstanding, the Audit Committee agreed that this account should be closed as soon as possible and that all future expenditures should be via NAR HQ. The account was closed and the Contest Board Chairman was instructed to clear any future expenditures via NAR HQ.

Meanwhile, the committee consensus was that the only way that an accounting could be made of Contest Board finances was to accept items which were unverified. This seemed practical under the circumstances. In brief, the committee could not disprove the accounting so it had little choice but to accept it.

The committee acknowledges that the Contest Board had little or nothing in the way of instructions concerning the nature of its job and the financial obligations involved. It is disturbed, however, that not even the fundamentals of elementary accounting were observed: the documentation or daily recording of how much was spent, with whom, and for what.

Beyond the accounting problem, however, is a greater one of judgement involved in many Contest Board transactions. Even if the bookkeeping had been perfect, there is considerable doubt about the propriety and wisdom of many expenditures. Here too, the committee grants much benefit of doubt because of the lack of instructions or guidelines concerning what could or could not be charged to the NAR, but the evidence suggests that better judgement should have prevailed.

Also attached to this report are the committee's recommendations concerning future NAR accounting procedures.

–John Worth, Chairman
Audit Committee, 1/27/71

TREASURERS REPORT – 1970

Balance - January 1, 1970 (included '70 members received in '69)			$9,090.09
INCOME			
Memberships - Individual	$22,977.00		
Section Charter & Insurance Fees	598.50		
Received for NARTS (orders)	6.95		
NARAM 11 (from Contest Director)	344.86		
Donations for World Championship Meet	600.00		
* NARAM 12 - trophy donations	900.00		
Misc. (pink book sales, overpayments, etc.)	119.01		$25,546.32
Total income - 1970			$34,636.41
EXPENDITURES			
Administrative Services Contract (Mrs. Ward)		$7,500.00	
Insurance premiums (membership insurance)		2,566.50	
Magazine: Model Rocketry, Inc. (incl. postage)	$12,520.62		
Editorial Expense	324.44		
Mailing tapes (AMA)	331.95	$13,177.01	
Office Supplies & Expense (Postage: $1,173.39)		2,844.77	
Printing		4,947.27	
* NARAM 12 (Advances and expense)		1,936.10	
NARTS		93.72	
Refunds (incls. $500 Int. Meet donation refund)		628.00	
NAA Dues		500.00	
FAI Entry fee		18.58	
** Contest Board Expense		581.10	
Contest Board sanction fee transfer		4.00	
Trustees Expenses		39.32	
Committee Expense: Section		136.27	
Elections		201.42	
Publications		127.76	
Liaison		8.16	
LAC		105.11	
Total Expenditures - 1970		$35,415.09	
Less "old" checks still outstanding		(33.86)	$35,381.23
			$(744.82)

RECAP:	Bank Statement - 12/31/70	$3,742.65	
	Less current checks outstanding	1,534.39	
	Bank Balance	$2,208.26	(Includes 1971 mem. income)
UPDATE:	Expenditures - 1970	$32,428.15	
	Expenditures - 1971 ***	2,953.08	
	Total 1970 Expenditures	$35,381.23	
	Income - 1970	25,546.32	
	Excess Expenditures over income - 1970	$ 9,834.91	

CONTEST BOARD FINANCIAL REPORT

Jan. 1, 1970 - Jan. 25, 1971

PAID IN -	99 Section Meets		$263.90
	44 Area Meets		$209.20
	12 Regional Meets		$147.00
	9 Record Trials		$ 56.00
	TOTAL		$676.10
PAID OUT -	Postage		$463.38
	Printing		$ 75.56
	Office Supplies		$113.58
	Bank Charges		$ 85.00
	TOTAL		$737.52
	Paid In		$676.10
	Paid Out		$737.52
	Balance		$(61.42)

* Naram 12: Figure shows only expenses from NAR general funds - does not include Contest Director expenses. Income does not include entry, motel or banquet fees - these received by Contest Director.

** Contest Board: This is the first year in which the Contest Board has required substantial funds from general NAR treasury. Contest Board has in the past operated within its own income (santion and record fees).

NAR TECHNICAL SERVICES

Financial Report January 1, 1970 to November 30, 1970

Cash on hand January 1, 1970		$812.88
Income		
January Sales	$221.02	
February	203.05	
March	148.90	
April	182.40	
May	130.70	
June	190.40	
July	128.30	
August	195.15	
September	90.15	
October	163.20	
November	105.00	
Total Income	$1756.27	$1756.27
		$2569.15
Expenses		
Postage	$82.85	
Office Supplies	53.76	
Clerical	250.78	
Printing	229.35	
Patches	379.23	
Refunds	20.35	
Office equipment	153.95	
Freight on above	14.15	
Typewriter repair	11.00	
Telephone charges	4.10	
Member fees to Hdq.	17.00	
Misc. labor	2.00	
Donation for World Champ. expense fund	100.00	
Total expenses	$1328.52	$1328.52
		1240.63
Transferred to savings account		500.00
Balance on hand		$ 740.63

Office equipment owned by NARTS
- 1 metal desk
- 1 Remington typewriter
- 2 metal 4-drawer file cabinets

NARAM 12 – CONSOLIDATED FINANCIAL SUMMARY

by John Worth, Chairman NAR Audit Committee

Receipts			
a) Received by NAR HQ	$ 900.00		
Sponsors			
b) Received by Contest Director			
Event Fees	1,317.00		
Motel Fees	4,145.00		
Banquet Fees	494.00		
Range Store	- - - - *		
			$6,856.00
Expenditures			
a) Contest Director			
Motel Fees	$4,466.00		
Banquet	592.00		
Telephone	387.44		
Auto Rental	237.67		
Typewriter Rental	52.00		
Printing	59.05		
Postage	51.21		
Photocopying	32.25		
PR Services (Loos)	100.00		
F. McDowell, Equip. & Supplies	767.17		
Keypunching	70.00		
Contest Director Meals	40.56		
Jan. exp. at Houston (Sipes, Kukowski)	84.72		
Scale Judging equip. purchased	22.35		
Miscellaneous	91.52		
		$6,915.16	
b) General NAR Funds			
Advances to Sipes (3)	$ 650.00		
Air Fares (D.C. to Houston – Sipes, Kukowski)	462.60		
Trophies	800.00		
Postage–HQ	23.50		
		1,936.10	
			$8,851.26
		Loss	($1,955.26)

*No range store income for NAR–local section operation.

Additional notes:

Total expenses claimed by Contest Director		$6,497.97
Total income claimed by Contest Director		5,956.00
	Deficit	541.97
NAR General Fund Advances to Contest Director		650.00
	Shortage	($ 108.03)

At the Board of Trustees meeting in Chicago, an Ad-Hoc committee was appointed to revise the NAR Sporting Code, often called the "Pink Book." The committee is chaired by Dr. Sven Englund and contains other NAR members in the Southern Connecticut area. The committee has promised to complete the new pink book and have it in the mail to NAR members on or before July 1, 1971. The deadline for receipt of comments on rules changes was thus set to April 1. Due to this short notice it was not possible to notify the general membership of the upcoming rules revision. Fortunately, all NAR chartered Sections have been notified by the NARlett Section Newsletter and comments are being solicited from the sections. If you did not have an opportunity to comment on the pink book, don't give up. You may continue to send your suggestions to the NAR Contest Board since pink book revisions can and have been made at any time of the year. I presume that the new pink book will not take effect until after NARAM-13.

In mid-February Bob Atwood, Director of Section Activities, and the six NAR Regional Managers met in Penrose, Colorado. The seven discussed matters relating to section activities and plans for increasing NAR membership and sections. Atwood hopes to have over 150 sections before the NARAM! The affair was hosted by Estes Industries. Atwood requests that all NAR Sections appoint an NAR Liason Officer and communicate his name to the appropriate Regional Manager.

Further details on NARAM-13 are expected next month as are point standings of the top NAR competitors.

—Carl Kratzer

INTERNATIONAL SYMPOSIUM

G. Harry Stine, Chairman of the NAR Liason Committee, reports that a CIAM Space Model Symposium has been tentatively scheduled to follow the World Championships for Radio Controlled Model Aircraft at Buck's County Airport, Doylestown, Pennsylvania on September 20, 1971. The symposium is being organized to provide an opportunity for members of National Aero Clubs in many countries to be introduced or become better acquainted with model rocketry. The R/C Championships will permit European representatives to fly to the United States by inexpensive charter flight.

In a further effort to advance model rocketry in other nations the European CIAM Space Model Secretariats are organizing flight demonstrations for various Aero Clubs. Two US model rocket manufacturers — Estes Industries, Incorporated and Model Products Corporation — have donated large amounts of equipment to be used in these demonstrations.

TWO RECORD ATTEMPTS FILED

Howard Galloway, NAR Records Subcommittee Chairman, has announced the filing of two NAR Model Rocket Record Attempts. Thomas Milkie of Cambridge, Massachusetts filed a Hornet Boost/Glide record in the D age catagory with a 196 second duration. Bernard Biales of Brookline, Massachusetts filed an Eagle Boost/Glide (D catagory) record of 249 seconds.

SPECIAL CONTEST BOARD RULING

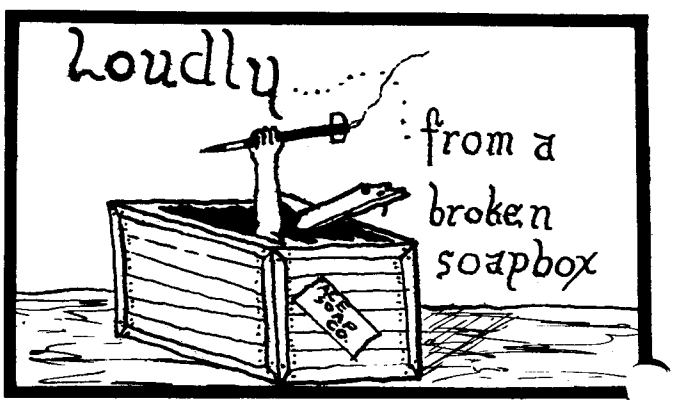
Here is the Contest Board's latest ruling and explanation:

It has come to the attention of the Contest Board, through section newsletters and direct correspondence, that a num of members are concerned that the way to win National Chan ionships is to compete only in twelve section meets for the entire year. The possibility of this practice was recognized at the time the USMRSC Supplement was written. However, it was felt that the NAR members' good sportsmanship and sense of fair play would prevent this practice.

Although we feel the members' sportsmanship and fair play has not deminished, the concern expressed across the country about this apparent loophole in the rules has prompted the Contest Board to make the following ruling:

Effective as of this publication, no individual, team, or section may compete in more than six (6) section meets per contest year.

This ruling is made to help assure that the NAR National Championships are won on the basis of more than limited local competition.



In the January 1971 "Loudly From a Broken Soapbox" Robert Mullane questioned the present system used in determining the national champion. He noted that point totals for a club or individual could reach unapproachable heights before the NARAM. As a recommendation, he said that regional eliminations could be held to select the NARAM participants. This solution would only cause a slack in other competition since points collected throughout the year would be of no value.

As my solution, I would like to suggest a point average system such as that used in basketball. Averages could be determined by dividing the rocketeer's total points by the total number of events he has flown. A minimum number of events would have to be entered to qualify for NARAM.

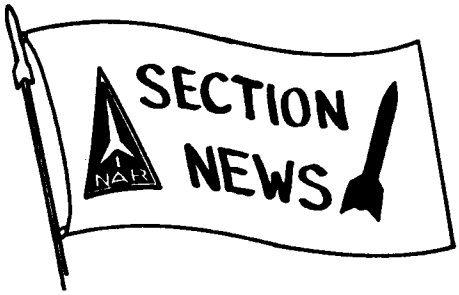
Invitations to NARAM could be extended to a certain number of the top rocketeers in each age catagory. It would even be possible to keep averages in the particular events to be flown at that year's NARAM and determine single-event champions.

One other item I'd like to bring up is that of an independant rocketeer's chances of participating at meets. I imagine that every NAR member would like to join a section, but due to various reasons often cannot. These "unattached" rocketeers would still like to compete in many meets so I would like to suggest the following:

a) All contest organizers submit to their Division Manager announcements of all upcoming meets. The Division Manager would compile these, mimeograph the lists giving location and events, and mail them on a monthly basis to all members in that division.

b) These lists would include section and area meets. A section must let any NAR member, even though not a section mer , compete in section meets if he lives within the area said to be the boundaries for members of that section.

—Larry Durst, NAR 17402



By Charles Gordon

In January, the Model Rocketeers of Lodi, a New Jersey Section, held a demonstration launch for the Bergen County Park Commission to demonstrate the safety of model rocketry. Until this time, the Commissioners would not allow park facilities to be used for model rocket flights.

The reaction to the demonstration was so good that the Commissioners have approved a large park facility for use by the Section, greater in size than the original location requested.

*****

A section is being organized in the Johnstown, Pennsylvania area. Interested members should contact George Dibert, 1439 Emmett Drive, Johnstown, PA 15905.

*****

A few sections have undergone internal reorganization in the past few months, including name changes as follows:

The Mamaroneck (NY)-Larchmont Section reports that it has reorganized itself and will henceforth be called the Leading Edge Rocketry Club Section.

The old Virginia Rocket Center Section (Richmond, Va.) is now the Viking Rocket Society Section.

Good luck to both of these "new" sections.

*****

The Wheaton (Maryland) Rocket Association, through some special feat of Public Relations magic all their own and some extra effort by member Dick Brown, was able to present a full scale model of the Atlantic Research Corporation ARCAS sounding rocket at their January 20 meeting.

Instead of being similar to those presently put out by model rocket manufacturers, which were scaled to the first and smallest of the Arcas series, this model was of the SPARROW H'V ARCAS, a 12½ foot, two-stage "monster" that put in it's latest appearance at the Paris Air Show last year.

Along with the SHV Arcas, the A.R.C. people gave the Section a variety of literature, several small cutaway thruster motors, several large diagrams, and 2 films to show.

*****

For those of you who live in Ontario, there is a Canadian Rocket Society which offers its services to all interested rocketeers. For more information contact:

Canadian Rocket Society
Hillel Diamond
Adelaide Street, PO Box 396
Toronto 1, Canada

*****

The Memphis (Tennessee) University School Model Rocket Society has made the following plea:

"Up until now, none of the regional meets have been open to rocketeers from Tennessee. We are too small to sponsor our own. We would like some of the larger sections in the vicinity to consider opening some of their large meets to us. When we are larger, perhaps we can reciprocate. Please contact: MUSMRS, c/o Morris Jones, 4288 Charleswood Road, Memphis, Tennessee 38117."

*****

The Annapolis (Maryland) Association of Rocketry reports of its newest acquisition, a trailer, to be used for hauling range equipment and the section store to all meets. This will enable the section to carry more store items and supplies with less effort and fewer individual autos. The trailer can also be used for permanent storage — no more loading and unloading for each contest.

*****

Congratulations to the NARGAS Section (St. Louis, Missouri) on the publication of Issue Number One of the *NARGAS NEWS.* Compliments also to the North Royalton Rocket Society Section (Cleveland, Ohio) on publication of Volume 1, Number 1 of the *Royal Rocketeer Magazine.*

*****

In February, the Randallstown (Maryland) Rocket Society held their annual family-night meeting where section members brought members of their family to the meeting.

After the introduction of officers and advisors, members explained different activities of the section. Talks on such things as how an engine is ignited, why youngsters should join the section, what the photography group does and how, a poem called "Flight of a Rocket," and many others were given. Two members also talked about engines and their functions, the center of gravity and the center of pressure, and different types of recovery systems such as B/G, parachute, streamer, and helicopter recovery.

*****

The NARHAMS Section (Seabrook, Maryland) reports of the formation of an Eclipse Committee. The purpose of the committee at present, is to plan for a possible trip by chartered bus to Maine or Canada in 1972 for observation of the scheduled solar eclipse, and to plan possible scientific experiments (some using model rockets) during the eclipse.

*****

NAR Section News would like to thank the following sections for submitting news of their section activities for this issue although none was used this time: APOLLO-NASA, FAIRCHESTER, ROCKVILLE ROCKETEERS, HORNET'S NEST, C.S.A.R., BROWARD COUNTY SECTION, STAR SPANGLED BANNER, NARCAS, MIDWEST ROCKET RESEARCH ASSN.

*****

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

NAR SECTION NEWS EDITOR
Charles M. Gordon
192 Charolette Drive, Apt. 2
Laurel, Maryland 20910

(Club Notes, continued)
retary; Jon Javitch, Treasurer; and Doug Plummer, Newsletter Editor.

A model rocket club has been organized in Wayne, New Jersey. Interested rocketeers should contact Carl Berry, 42 Clifford Dr., Wayne, New Jersey.

Floyd Dillman is attempting to organize a model rocket club in the Niles and Park Ridge, Illinois area. Interested rocketeers can contact him at 8272 N. Wisner, Niles, Illinois 60648.

In commemeration of the Apollo 14 launching, Robert Fisch and Terry Dunn of North Brunswick, New Jersey launched six rockets within hours of the Apollo liftoff. The demonstration launching, sponsored by the Rutgers Prep Rocket Club was reported in the East Brunswick *Spokesman.*

The sixth grade science class at A.D. Owens school in Newport, Ohio recieved instructions in rocketry during February. Under the direction of teacher Pat Ingram the class voted to raise money to purchase model rocket kits. The students built, painted, and tested their own rockets. The program "helps them socially, makes them part of a team, and bolsters their grasp of mathematics," Ingram said in explaining why she encouraged the program.

The results of South Seattle's latest section meet, Seamee VI, are reported in the *Modroc Flyer.* Overall the best Hornet B/G time was an impressive 83.3 seconds turned in by James Pommert. The Medina Tean topped The Hawk B/G competition with 207.5 seconds. In Class 1 PD Jim Worthen topped the field with 216.4 seconds. Jess Medina took first in Pee Wee Payload with an altitude of 203.5 meters. In the Eggloft event, Alan Dayton placed first with 364 meters.

A model rocket club is being organized in the northeast Philadelphia area. Interested rocketeers should contact Steve Ashton, 3816 Pearson Ave., Philladelphia, PA 19114.

Seventh and eighth grade students at the Perry Elementary School in Mt. Moris, West Virginia have recieved model rocket instruction from science teacher Bruce Lemley. The entire student body turned out recently for the successful launching of six models. Working from instruction booklets prepared at West Virginia University the models are completely home biult, with the body tubes hand rolled from parcel post tape wrapped around a pole form. The Program has been well received, and is being extended to the fifth and sixth grades.

On January 3rd the Warminster Rocket Research Club held its January "Launch-In." Ten rockets were flown and recovered successfully. The cold weather prevented some of the chutes from opening, but 6" of snow on the ground cushioned the landings. Rocketeers in the Warminster, Pennsylvania area are invite to contact Mike McGurrin, 326 Hopwood Dr., Warminster, PA for more information about the club.

An NAR Section has been formed in the Fairfield County area of Ohio. Interested rocketeers should contact Don Shaffer, 6027 Pickerington Rd., NW, Box 40, Carroll, Ohio 43112.

The Kenmore-Tonawanda Rocket Society in upper New York state has scheduled two contests for the summer. The first one, to be sponsored jointly by the KTRS and the town Boys Club, will be held in Sheridan Park on June 5, 1971. The contest will be open to all model rocketeers with the following events scheduled: A Parachute Duration, B Altitude, B Streamer Duration, and D Eggloft. The second contest will be flown in August. Interested rocketeers should contact the KTRS, 3049 Delaware Ave., Kenmore, NY 14217.

* * * * * * *

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

* * * * * * *

Apollo 14 and Afterwards, Continued from page 35.

On the night before the launch there was a tour out to the pad — actually about 2,500 feet from the missile, since that's the closest the Cape's equivalent to an RSO will allow non-essential personnel to approach a partially fueled bird. The sun set behind the VAB and the moon hung in the sky just above the Apollo. As it grew darker, big xenon spotlights illuminated the mobile service structure, the launcher, and the rocket itself. Activity around Apollo 14 was quite intensive as the last minute launch preparations were being made.

There was a delay in moving the service structure back, since a paint scratch on the bird had to be touched up and checked. The press busses weren't going to wait for the structure to move, since we had been out in the cold for more than three hours. However one of the buses couldn't get its headlights working, and our departure was delayed more than the gantry's.

As they finally rolled back the service structure, the maze of girders, pipes, and fittings opened to reveal the rocket. The resulting view was almost more impressive than the liftoff. Standing in gleaming white against the black sky, every detail of its magnificance was etched in the sharp contrast cast by the xenon lights which shone on the rocket all night. It was a sight out of the imagination of Jules Verne, H. G. Wells, and every other man who has ever dreamed of man's first voyage to the moon.

Launch day finally dawned, and all was perfect except the weather. There had been clear blue skies for a week, but today there was a solid overcast. By noon it was only "partly cloudy," with some patches of clear sky, and some hope for a liftoff.

After watching the astronauts ingress into the truck which carried them to the launch site, we traveled to the VIP site located on on the opposite side of the VAB from the press site This site is wall to wall people — with some 12,000 "VIP's" scheduled to view this launch. I scanned about 5,000 of them without seeing one well-known face. One VIP remarked that he didn't know that there were this many important people in the world.

I definitely didn't want to stay here for the liftoff — the atmosphere was reminiscent a country fairgrounds. I finally caught one of the last press buses back to the press site and breathed a sigh of relief. There were fewer people here, and the frequent announcements from Launch Control made it easier to follow what was happening.

I watched the rocket through a telescope for a while, then realized that this was the equivalent to watching it on television. The only way to get an idea of the size and reality of the event is to watch it with the naked eye.

Right on schedule the clouds came in. At the scheduled launch time, 3:23 PM, there was a 100% overcast and the threat of rain. We hoped for a long delay, since the launch window continued until 7:00 PM, and a night launch would have been fantastic. As it turned out, however, the delay lasted only long enough to upset the TV schedules. As word came from the weather forecasters that clear skies would arrive soon, the count was resumed.

At T minus 5 minutes it began to rain at the press site. However the rain lasted only a minute or two.

T minus 3 minutes . . . can I get a better view from closer up? I ran down to the edge of the water which separates the pad from the press site. I found out that you couldn't hear the PA countdown from there, and rushed back to the bleachers.

T minus 60 seconds . . . everyone is making final adjustments on their equipment, knowing they have only one chance to catch this thing.

T minus 20 seconds . . . this is it! . . . this is really it!

T minus 15 seconds . . . guidance is internal.

T minus 10 . . . 9 . . . 8 . . . flames appear at the base of the rocket marking the start of the ignition sequence. The smoke is building, as thousands of gallons of water poured over the launcher to minimize damage are immediately vaporized.

. . . 3 . . . 2 . . . 1 . . . launch commit . . .

Liftoff. The view from the Press Site is tremendous as NASA's Saturn V lifts off the pad.

LIFTOFF! The flame is bright, although not blinding, but there is no sound, no vibration. Apollo 14 is rising, but the lack of any sound makes it seem unreal. Just as it clears the tower, we hear the first sound — sound of the engines at ignition. 18 long seconds ago.

The exhaust is over 1,000 feet long, three times the length of the rocket. As it goes into a cloud we hear an even louder roar of the engines.

The rocket quickly disappears, and then the flame is swallowed up by the cloud. The noise gradually dies out, and we are aware that it is gone. The rest of the ascent had to be viewed on a TV monitor, but the pad was in the background to remind everyone that it really did happen.

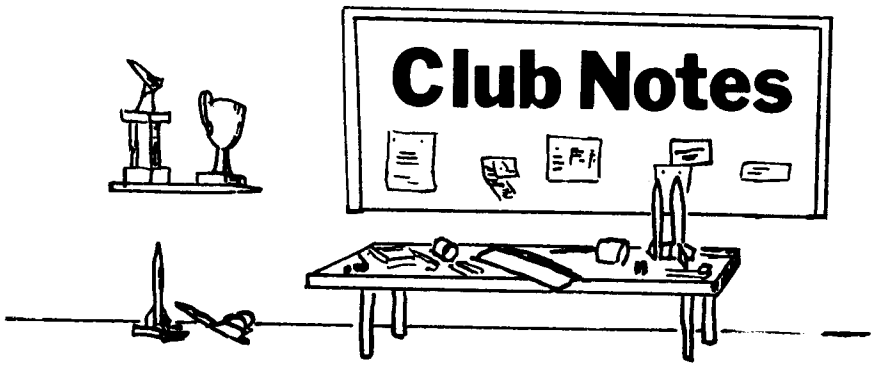
After the launch I began to realize how much this event paralleled a solar eclipse, or any other scientific happening which attracts spectators from all over the country. The spectators who massed on the Florida beaches to witness this launch were the same type of "space nuts" who will go to any extremes to see a historical event.

Among others, I met Doug Pratt (NAR 17870) of Seneca Falls, New York, and Don Cameron, a Canadian rocketeer. I'm sure there were many other model rocketeers among the million people who watched Apollo 14 lift off.

Later that night, at the press site, we got word about the docking failure. Of course, the immediate reaction was that this mission was going to be another Apollo 13. When the docking was finally achieved, however, the contrast between the two missions stood out sharply in my mind.

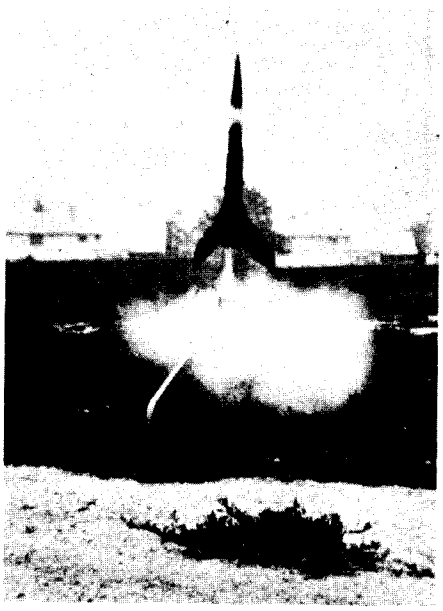
If Apollo 13 served, as some have claimed, to indicate why man should not be sent into space; then Apollo 14 proved the necessity for manned space flight. Besides pioneering the way for the astronomers, scientists, and future space explorers, the Apollo 14 astronauts repaired or solved difficulties leading to the docking failure, the battery failure, and the LM on-board radar failure. Any one of these problems would have caused the failure of a completely automated mission. The man, on board the spacecraft, demonstrates his usefullness in space most dramatically not when the mission goes off as planned, but when those little problems, which can only be corrected by the man on board, crop up.

When Apollo 14 lifted off from Cape Kennedy on January 31, the world it left behind was strikingly different than when Apollo 11 departed for the moon in 1969. The massive effort to explore space peaked with Apollo 11 and now the entire program is just continuing on the momentum built up in the '60's. Activity at the Cape is now only a fraction of what it was at the peak. Popular support for the space program has declined, and projects such as Skylab and the Space Shuttle are encountering funding problems. Concern is high among engineers and scientists that political pressures may delay the future explorations of space.



A new model rocket club is being formed in the Charlestown, Indiana area. Interested rocketeers should contact Joe Marsh, Lot 15, Witten Trailer Court, Charlestown, Ind. 47111

The Boward County Model Rocket Association in Florida had two very busy months in January and February. To start off the year, the club had a "fly for fun" meet on January 10th. This launch, a time for test flying new designs, featured two CINEROC movie camera flights. At the club's January 19th meeting films from the CINEROC flight were shown. On January 23rd, the BCMRA sponsored a window display in the Gulfstream Camera and Sound store. The display, timed to coincide with the Apollo 14 flight, included model rockets and slides of BCMRA launches. On February 7th the club participated in a competition in Miami, and returned home victorious with 9 trophies. At the February 16th club meeting the NASA Apollo 12 film was shown and the club discussed plans for their upcoming competition. The February activity concluded on February 21st with the BCMRA "Winter Competition" featuring: Swift B/G, Streamer Spot Landing, Scale, Design Efficiency, Predicted Altitude, Rocket Glider, and an Engineering Event open to unusual and R&D designs. Rocketeers interested in joining the BCMRA should contact Robert Thurlow, Technical Advisor, 2130 Northwest 64th Ave. Fort Lauderdale, Fla. 33313.



Steve Alcuri's Saturnian lifts off from Burilli Field in Plainview, New York. Model rocket activity is on the increase in the Long Island area, with at least two major events in the schedule. Card & Craft Hobby Shop is sponsoring a major competition on May 23, 1971 featuring Predicted Altitude, Spot Landing, Egg Lofting, Saturn Competition, and Rocket Glider Duration. Information on the contest is available from the store at 1004 Front Street, Uniondale. Long Island's North Shore Section is also planning a competition —— an NAR Regional —— set for July 24, 1971. Information on this contest is available from the North Shore Section, c/o R. Mendyke, 23 Hilldale Road Albertson, NY 11507. (Photo by Gary Hobish, shot with a Kodak Instamatic 104 and "an unbelivable amount of luck" to catch the rocket just at ignition.)

A new rocket club is being formed in Toronto, Canada. Interested rocketeers are invited to contact the Don Valley Rocketry Association, 141 Sweeney Drive, Toronto 375 Ontario, Canada.

The Commack Cosmics rocket club in Commack, New York held its first meeting in February. The club is seeking additional members in the Commack area. Interested rocketeers can contact the club through Steve Cohen, 8 Pinewood Drive, Commack, New York 11725.

The Vincent Massey Collegiate Model Rocketry Club was formed in Winnipeg, Manitoba last April. VIMMROC is affiliated with the Canadian Association of Rocketry. A Firing Supervisor's permit has been obtained by Mr. R. Flower, a science teacher at Vincent Massey, who will serve as advisor The club now operates a rocket range just outside Winnipeg, and plans several launches in the near future. Other rocketeers in the Metro Winnipeg area can contact the club through Doug Cook, 152 Marshall Crescent, Winnipeg 19, Mannitoba, or call 453-4908.

The latest issue of *Missile Epistle,* newsletter of the Harrisburg, Pennsylvania, NAR CAS NAR section, reports on that section's plans to host the NART-2 Record Trials in May, 1971. The events to be scheduled are: Hornet B/G , Hornet R/G, Class 1 PD, Class 3 PD' Class 3 Streamer Duration, Condor B/G, and Condor R/G. The site will be the Indiantown Gap Military Reservation. Dates not yet announced.

The Elkins park Orbiters is forming ar NAR Section in the southeastern Pennsylvania area, Interested Rocketeers should contact Stephen D. Streiker, 20 Holly Hill Rd., Richboro, PA. 18954.

The Mariner Rocket Society of Whitewater, Wisconsin will hold a contest for NAR members in the state of Wisconsin on July 17, 1971. The events will be: Class O Parachute Duration, Pee Wee Payload, Robin Egglofting, Hornet B/G, and a non-sanctioned Boost/Glide Payload event. Further information can be obtained from Russ Schmunk, 1118 Highland St., Whitewater, Wisconsin 53190.

The Alpha Centrui Model Rocket Club of Las Vegas, Nevada was organized in Sept. 1970 at the Garside Jr. High School. By early March 1971 the club has launched more than 103 rockets including some large models such as the Centuri Little Joe II and the Estes Saturn V. Just recently the club received a grant of $100 from the Clark County School District. Currently the club has 34 members.

Tom Sloan and Richard Williams are forming a rocket club in Thornton, Colorado. Interested rocketeers should contact Tom Sloan, 2081 Hoyt Dr., Thornton, Colorado 80229.

On February 6th Houston's Apollo-NASA NAR Section conducted a demonstration launching in the Neiman-Marcus Department Store parking lot. With the assistance of Dane Boles from Estes Industries, Apollo-NASA members Forrest McDowell, David Barr led off the demonstration with a Saturn V. During the public launching an Interceptor and an Alpha III were also flown.

A new model rocket club is being formed in Camillus, New York. Rocketeers interested in joining "The Model Rocketeer Society" should contact Dana Peters, 109 Heather Lane, Camillus, NY 13031.

The Northern Indiana Rocket Association (NIRA) meets weekly at the Benton Central School in Fowler, Indiana. Currently the club is conducting an Extreme High Altitude Photography project, involving the launching of a two stage F-powered Camroc vehicle. Both stages are powered by F-100 engines. On its first flight, at a February launch, Dwight Booth's model performed perfectly until second stage ignition ... it didn't. According to the *NIRA News* "This resulted in a splash-down in a field of mud." Indiana rocketeers can contact NIRA through Robert Furr II, 201 South Park, Fowler, Indiana 47944.

The latest issue of *Missile Epistle* reports the results of the elections of NARCAS, the NAR section in Harrisburg, Pennsylvania Elected were: Randy Black, President; Dan Nardone, Vice-President; Mark Hopkins, Sec-

(Continued on page 46.)

BULLETIN:

NEW MPC MINIROCS SHATTER RECORDS IN FIRST APPEARANCE AT NAR SANCTIONED MEET!

Now . . . model rocketry is a whole new thing! So is the model rocketry records book . . . as witnessed by the latest gathering of the pros in a NAR sanctioned meet. Out went a whole batch of 1/2A, A, and B engine records. In are the new Miniroc records. Minirocs have just changed the name of the game in rocketry. Miniroc rockets . . . Minijet engines . . . both are the result of a major technical breakthrough. Minijet engines are up to 46% lighter while packing the same power! This means the Miniroc rockets can be lighter, slimmer, and have less drag than ever before. So whether you're going for the championships . . . or just wanting to start off in rocketry with championship equipment, you're Miniroc material.

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