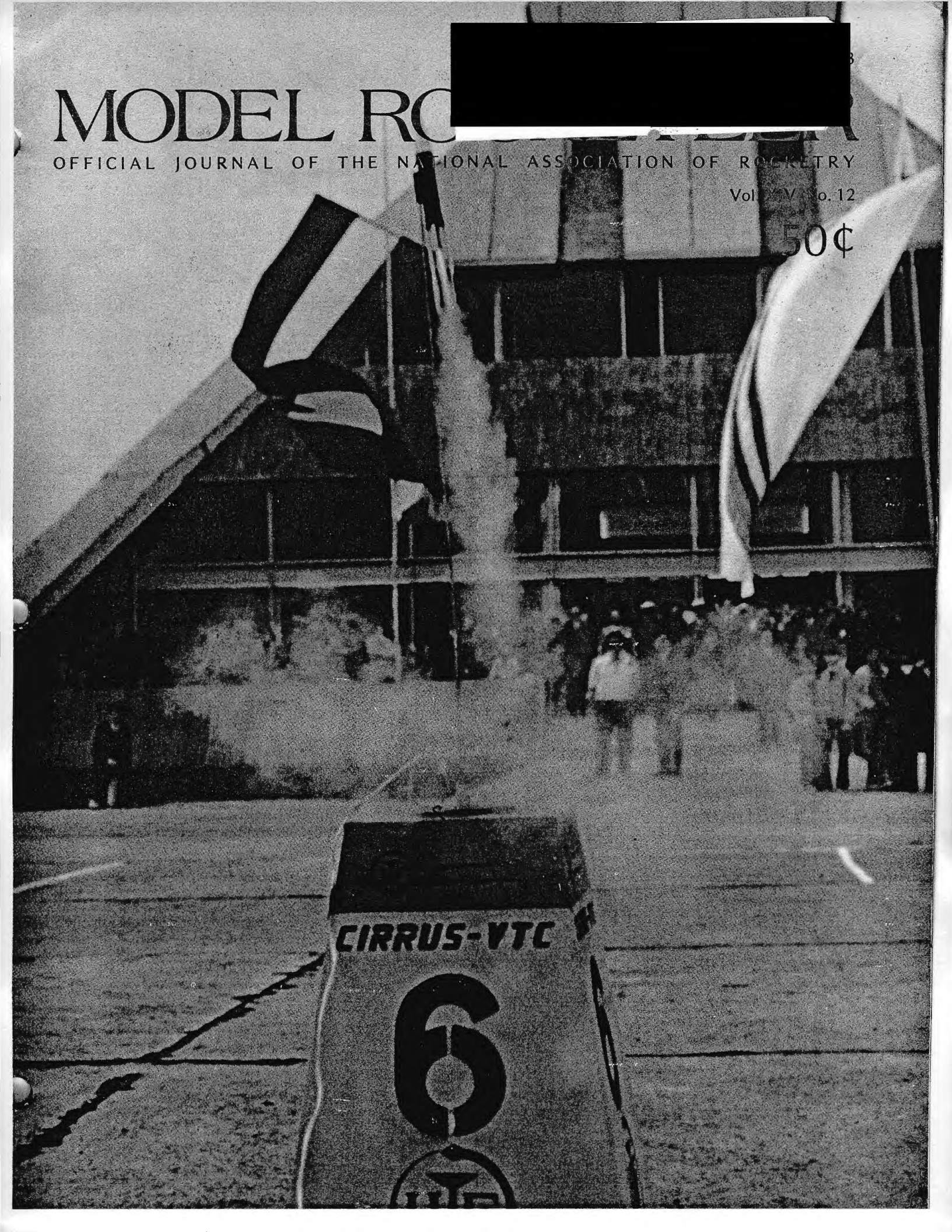

MODEL ROCKETRY

OFFICIAL JOURNAL OF THE NATIONAL ASSOCIATION OF ROCKETRY

Vol. V, No. 12

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3-0516	B6-4	1.20		
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JANUARY 1973

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CONTENTS

COVER PHOTO

At the opening ceremonies of the first World Championships of Space Modeling a replica of the first model rocket lifts off. The Vrsac aerodrome control tower is in the background. For the whole story of the World Champs, see page 6. (Photo by Mark Sheibenberger)

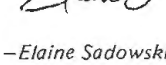
EDITOR'S NOOK

Several NAR members have told us about interesting happenings, which we would like to pass on to you. First, Steve Conners of the Steel City Section in Pittsburgh found an article by G. Harry Stine, NAR #2, in the November, 1972 issue of *Analog.* The article is entitled "Pollution Probe", and it describes the use of specially instrumented rockets, quite similar to the model rockets that we use, to take measurements in inversion layers, the weather condition that traps pollution over an area, keeping it from dissipating the way it normally does. Most pollution crises arise when inversions are over cities. So, if you're interested in this sort of thing, read the article.

Members of the Shawnee Rocket Association in Rosiclare, Illinois made political party jewelry to raise money for their club. The jewelry contains fluorspar crystals (about 90% of the fluorspar in the country comes from the area around Rosiclare, Ill.). After raising over $200 for the club treasury, one of the members thought it would be a nice idea to send the President of the United States a souvenir. The Shawnee group sent President Nixon a blue elephant key chain. President Nixon sent a very nice, personally signed letter to the members of the club, thanking them for their thoughtfulness and expressing his interest in educational projects, like model rocket activities, that the young people of the country undertake. We thank Joe Hamon, the club's sponsor, for the samples of their product and for telling the *Model Rocketeer* about the club's activity.

(And while I'm thanking people, I'd like to thank the NAR's Board of Trustees for voting me a lifelong membership in the NAR. I am most grateful for this honor.)

Happy New Year everybody!



—Elaine Sadowski

STAFF

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Send questions, ideas and gripes about NAR (don't forget about the "Loudly from a Broken Soapbox" and "If I Wrote the Pink Book" columns!) to:
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We cannot accept responsibility for unsolicited manuscripts or artwork. Any material submitted must include return postage. When writing the editor, address letter: ELAINE SADOWSKI, 1824 Wharton Street, Pittsburgh, Pa. 15203.

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NAR IN ACTION

MALFUNCTIONING ENGINE STATISTICAL SURVEY REPORT
April 1, - September 30, 1972

MESS REPORT

The first MESS report was published in the July Model Rocketeer. *This is a summary of engine failures since that time. We would like to point out that the number of failures is not necessarily indicative of the quality of a certain manufacturer's engines. Engines that are used more commonly can be expected to have more reported failures than those used less frequently or widely.*

MESS forms should be sent to:
Mike Wolfe, MESS Ass't Chairman
2798 Woodcroft Road
Columbus, Ohio 43204

CENTURI ENGINEERING COMPANY

NAR	ENGINE MALFUNCTION			DELAY/EJECTION MALFUNCTION				SUMMARY
ENGINE TYPE	NOZZLE BLOW OUT	BLOW 'THROUGH'	CATASTROPHIC	ENGINE FAILURES	DELAY 'MALFUNCTION'	NO EJECTION	DELAY TRAIN FAILURES	TOTAL FAILURES
½A6-2	0	2	0	2	2	2	4	6
A5-4	1	1	0	2	2	0	2	4
A8-0	0	1	0	1	0	0	0	1
A8-3	0	1	0	1	4	5	9	10
B6-4	0	1	0	1	1	0	1	2
B6-6	0	0	0	0	1	0	1	1
C6-0	1	0	0	1	0	0	0	1
C6-3	2	3	0	5	1	0	1	6
C6-5	0	1	0	1	0	3	3	4
C6-7	0	1	0	1	0	0	0	1
F52-5	0	0	0	0	0	1	1	1
F67-6	0	0	0	0	0	1	1	1
SUMMARY TOTAL FAILURES	4	11	0	15	11	12	23	38

L. M. COX MANUFACTURING COMPANY

A6-4	0	0	0	0	0	1	1	1
B6-4	0	2	0	2	0	0	0	2
C6-4	0	1	0	1	0	0	0	1
D8-3	0	2	2	4	0	0	0	4
SUMMARY TOTAL FAILURES	0	5	2	7	0	1	1	8

ESTES INDUSTRIES

NAR	ENGINE MALFUNCTION			DELAY/EJECTION MALFUNCTION				SUMMARY
ENGINE TYPE	NOZZLE BLOW OUT	BLOW 'THROUGH'	CATASTROPHIC	ENGINE FAILURES	DELAY 'MALFUNCTION'	NO EJECTION	DELAY TRAIN FAILURES	TOTAL FAILURES
½A6-2	0	0	0	0	0	4	4	4
A5-2	0	0	0	0	1	4	5	5
A5-4	0	0	0	0	0	3	3	3
A8-0	1	0	0	1	0	0	0	1
A8-5	1	0	0	1	0	0	0	1
B4-2	0	0	2	2	0	0	0	2
B6-2	1	0	0	1	0	0	0	1
B6-4	1	0	1	2	1	5	6	8
B6-6	0	0	0	0	0	1	1	1
B14-0	0	0	0	0	0	1	1	1
B14-5	0	1	0	1	0	1	1	2
B14-6	0	0	0	0	0	2	2	2
C6-3	4	0	4	8	1	4	5	13
C6-5	5	3	10	18	2	2	4	22
C6-7	2	4	1	7	0	8	8	15
D12-3	1	0	0	1	0	2	2	3
D12-5	1	2	0	3	1	4	5	8
D12-7	1	0	0	1	1	5	6	7
½A6-2s	0	0	0	0	1	1	2	2
A5-2s	0	0	0	0	2	1	3	3
½A3-2s	0	0	0	0	0	1	1	1
½A3-4s	0	0	0	0	0	1	1	1
½A3-2t	1	0	0	1	1	3	4	5
½A3-4t	0	0	0	0	0	2	2	2
A3-2t	0	4	3	7	0	4	4	11
A3-4t	5	11	5	21	0	2	2	23
A3-6t	0	0	0	0	0	1	1	1
A-3	0	0	0	0	1	0	1	1
B-2	0	2	0	2	0	1	1	3
SUMMARY TOTAL FAILURES	24	27	26	37	12	63	75	152

FLIGHT SYSTEMS INCORPORATED

B3-4	0	1	0	1	0	1	1	2
D18-6	0	0	2	2	0	0	0	2
E5-2	0	1	0	1	0	0	0	1
E5-6	0	1	1	2	0	0	0	2
F100-0	0	1	0	1	0	0	0	1
F100-8	0	1	0	1	0	0	0	1
SUMMARY TOTAL FAILURES	0	5	3	8	0	1	1	9

MODEL PRODUCTS CORPORATION

NAR	ENGINE MALFUNCTION			DELAY/EJECTION MALFUNCTION				SUMMARY
ENGINE TYPE	NOZZLE BLOW OUT	BLOW 'THROUGH'	CATASTROPHIC	ENGINE FAILURES	DELAY 'MALFUNCTION'	NO EJECTION	DELAY TRAIN FAILURES	TOTAL FAILURES
B6-4	0	2	0	2	0	0	0	2
C6-4	12	2	1	15	1	0	1	16
C6-6	1	0	0	1	0	0	0	1
A3-4m	0	1	0	1	0	0	0	1
A3-6m	0	0	0	0	0	1	1	1
B3-0m	0	0	1	1	0	0	0	1
B3-5m	3	1	1	5	0	0	0	5
B3-7m	6	3	0	9	0	0	0	9
SUMMARY TOTAL FAILURES	22	9	3	34	1	1	2	36

TOTAL FAILURES ALL MANUFACTURERS
April 1, - September 30, 1972

NAR	% ENGINE FAILURES			% DELAY TRAIN FAILURES				SUMMARY
ENGINE TYPE	NOZZLE BLOW OUT	BLOW 'THROUGH'	CATASTROPHIC	ENGINE FAILURES	DELAY 'MALFUNCTION'	NO EJECTION	DELAY TRAIN FAILURES	TOTAL FAILURES
NUMBER	50	57	34	141	24	78	102	243
% OF TOTAL FAILURES	20.5%	23.5%	14%	58%	10%	32%	42%	100%

TOTAL FAILURES ALL MANUFACTURERS
January 1, - September 30, 1972

NUMBER	68	88	52	208	37	115	152	360
% OF TOTAL FAILURES	18.9%	24.4%	14.5%	57.8%	10.8%	31.9%	42.2%	100%

FIRST WORLD MODEL ROCKET CHAMPIONSHIPS—VRSAC '72

by Ed Pearson *photos by Mark Sheibenberger*

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JAMES F KUKOWSKI TEAM MANAGER UNITED STATES SPACE MODEL TEAM
CARE AERONAUTICAL UNION OF YUGOSLAVIA
PZUN MIRKOVA 411 1000

PLEASE CONVEY MY BEST WISHES FOR SUCCESS TO ALL OUR TEAM MEMBERS
AS THEY ENTER THE WORLD SPACE MODEL COMPETITION SINCERELY
SPIRO T AGNEW

COLL 411 1000

Vrsac is a sleepy Yugoslavian town, eight miles from the Rumanian border, and chiefly known for its fine white wine and air academy. It was at the academy's airfield on September 22-25 that the Yugoslavian aeroclub hosted model rocketry's first world championship meet.

Nine different countries competed, with two additional countries sending observers. The competitors included Bulgaria, Canada, Czechoslovakia, Egypt, Great Britain, Poland, Rumania, the United States, and Yugoslavia. The non-participants were France and the Soviet Union.

Three events comprised the contest—Class II Parachute Duration, Class II Boost Glider, and Open Scale. Representing the USA were six team members: Bernard Biales (flying B/G), Howard Kuhn (B/G and Scale), Al (Scale) and Shirley (P.D.) Lindgren, Jon Randolph (P.D. and Scale), Ellie Stine (P.D.), Jim Worthen (B/G), and one team manager, Casey Kukowski.

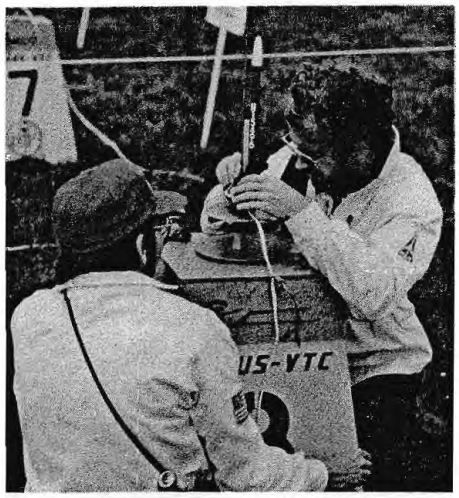
Here's how the meet went: Friday the 22nd was a test launch day, and while team members tested their B/Gs and P.D.'s, others battled Yugoslavian customs officials for the eventual release of 28 boxes of assorted AVI, Centuri, Cox, and Estes model rocket goodies, as well as the Estes static thrust stand seen at NARAMs 11 and 12. That night the stand was set up and engines from Europe and America were sampled and sealed in bags for use the next day.

Saturday arrived with an opening ceremony complete with a parade of the countries, flying balloons, girls with flowers, and speeches.

The flying field itself was superb—an approximate one mile square of short grass. The weather, however, threatened rain, and wind gusts and mild temperature (65°) insured low times for the two scheduled duration events.

In the center of the field, nine thirty-foot-long firing lanes (misfire alleys) were marked off—one for each participating country. At one end of every lane lay single rail launch pads atop two foot high pylons. At the other ends were tables to which two timing judges were assigned with bags of sealed engines, stop watches, rubber stamps (first flight birds were marked for return and second flight identification), and firing boxes (on/off switch affairs containing four D size batteries). Behind the tables, ropes held off the few spectators, and behind the spectators nine small walk-in trailers were provided as team prep areas. To the side lay a refreshment stand with cafe tables, and in the middle blared a public address speaker. Unlike those at US contests, the stand sold beer and cognac along with the lemonade, and the P.A. was used primarily to broadcast rock and roll or Eastern European folk music rather than range safety pronouncements. In fact, countdowns were rarely heard. Modelers would scurry between vans and alleys launching rockets rapidly. All this lent a relaxed mood to the meet.

The events were held separately and in one hour rounds, i.e., the three team members for each event from each country were given one hour to fly all their first flights after which the next round started for the same models' second flights. Individual winners of each duration event were determined from the best of the two flight times, and team winners were found by adding together each team member's best score and comparing each country's resulting figure. In scale, the models were static judged on Saturday and the flight judged in rounds on Sunday. Five international judges were used with each model's high and low scores dropped from consideration to insure judging impartially. The other three scores were then averaged. This new "mean" score was compared with other entries' marks; the model with the highest mean was declared winner. As in the duration events, the country with the combined best entry scores won the team event trophy.



U.S. PD team member Jon Randolph prepares to launch his model, with a little help from Jim Kukowski.

The US team fared well by taking first in Parachute Duration and third in Scale. Sadly, however, we ended up seventh in B/G after all three of our best combined flights netted a low 120 seconds.

Individually, Ellie Stine and Jon Randolph tied for third place in P.D. with 295 second flights. Shirley Lindgren was not far behind taking sixth place overall in a field of 25 contestants.

In B/G the best we were able to muster individually was J. C. Worthen's fifth place with 96 seconds. Howard Kuhn pulled in 18th place after an abortive first round attempt, and a cracked pod gave his Stingray a 21 second flight. Bernard Biales' one flight of three seconds (an arch crash) put him twenty places behind Mohamed Orfy's (Egypt) winning flight of 165 seconds.

In Scale, honors went to Howard Kuhn, whose Javelin gave him a third place behind two Czechs—Otakar Saffek and Karel Urban—who modeled Saturn Vs. Al Lindgren pulled fifth place with a beautiful flying Air Force Falcon, but Jon Randolph's efforts were thwarted by two parachute failures—one resulting in a first stage prang, the other causing a second stage death dive.

Observations on the European Rockets, Quality of Workmanship and Engines.

Other than German, English, and American plastic models, premanufactured European kits and parts are scarce if existing at all. Body tubes are hand rolled and nose cones are shop or club lathed. Launch lugs are tin-snipped from scraps of metal, and parachutes are obtained by separating the heavy plastic laminar from European wrapping paper. But don't be folled by the materials; the work is highly sanded and then doused in talc for competitive light and minimal drag flights. B/G wings are often carved out and then stretched over with silk span. Scale models show very high quality workmanship. Saffek's Saturn V was the finest scale model Jim Barrowman (the US Scale judge representative) says he has ever seen. Blueprints and plans are scarce, however, and photo reduction and measuring from plastic kits are widespread.

The European engines at the meet were of Yugoslavian, Polish, and Czechoslovakian manufacture. Yugoslavian engines are made in small groups when an aeroclub contracts a shop. Some batches are good, but other lots have been known to explode upon ignition. Consequently the Yugoslavs don't trust their

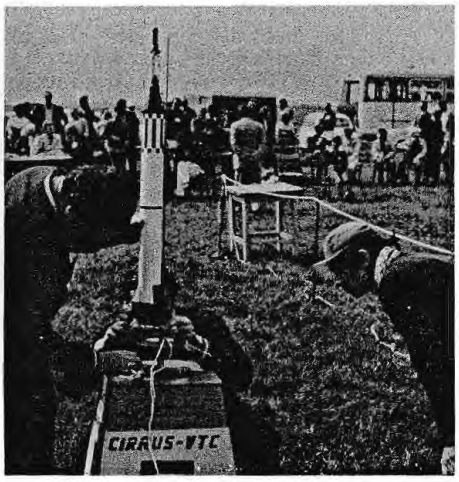
own engines for contest use, and other engines were tested and flown. Likewise, no Polish engines were used—one exploded on the test stand and two others exceeded the 5 Nt/sec total impulse maximum—which suggests the Poles also have difficulty with batches. The most reliable European engines tested were the Czech Adast brand motors. Cased in red pasteboard, Adast come most commonly in 5 or 10 Nt/sec. total impulse categories. However larger engines marked 20 Nt/sec. and called "widowmakers" are available. Adast seems the popular European engine.

Concerning the Meet--Organization and Preparation

At Sunday's ceremonial banquet, the president of the Yugoslavian aerounion thanked the participants for making the contest run so smoothly and apologized if the officials did anything contrary to anyone's principles or sense of right.

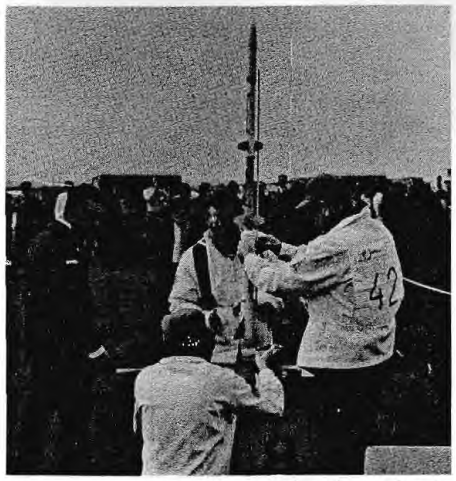
To this writer, his speech and subsequent praise of the generated international good will was appropriate and necessary. His tone was that of the meet itself—relaxed, and in the spirit of friendship. This was appropriate and needed, because at times there were questions about the rules governing the meet.

The points of contention were mostly minor, e.g., instructing judges to time birds after they leave the rail instead of at first motion, using as the official chronometers one stem stopwatches, and specifying exactly when

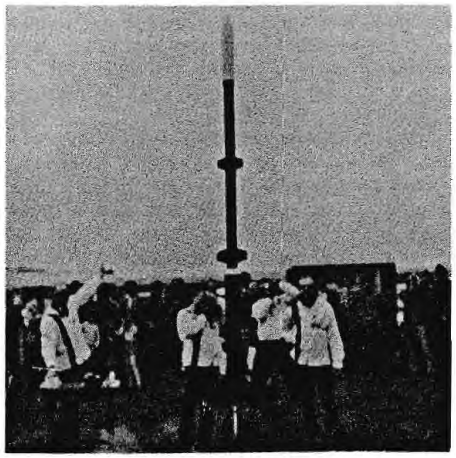


Dusan Madzarac and other members of the Czech team check on Madzarac's Mercury-Redstone.

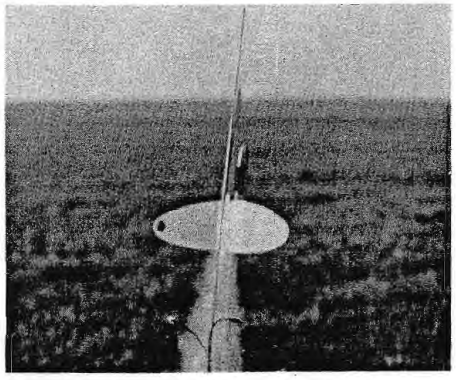
At the opening ceremonies, members of the Egyptian team prepare their demo flight.



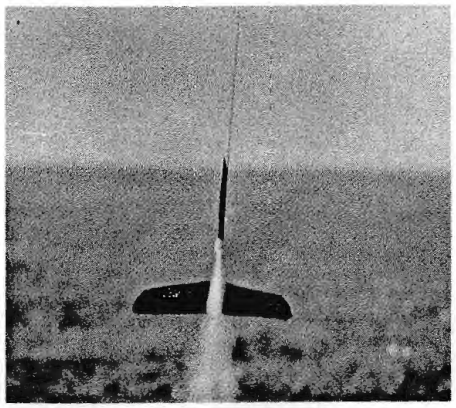
Howard Kuhn gets his scale Javelin ready. Assisting him are Al Lindgren and Jim Kukowski.



Jim Kukowski, Howard Kuhn, and Jon Randolph watch Randolph's Javelin take off. Parachute failures kept this bird from placing.



Bernard Biales tests his ill-fated glider.



Jim Worthen's B/G lifts off in a test flight.

a round ends (when the bird is on the pad, at the judges table, or in the air when the signal sounds), the only real fuss being over allowing scale models to be flown with unjudged last minute flight fittings (clear plastic fins and launch lugs). All of these misunderstandings could have been avoided with a little preparation.

Site selection, location of launch pads, housing and board accommodations, and the effort to translate notices into English were excellent. A result board was centrally located with up-to-date times continually being posted. It seemed as though the Yugoslavians put a good deal of consideration into the physical arrangement which would be required. There was some griping about the placement of the US van in relation to the firing lane and the use of four D cell batteries to ignite an American igniter thirty feet away, but contestants were given one hour to launch three rockets, and by Sunday a 12 volt battery had been found to assist in launching Scale.

The word's first championships of space modelers accomplished three major items: (1) insured model rocketry's place as an international aeromodeling sport within the FAI, (2) exchanged ideas and modeling techniques across geographic borders, and (3) fostered a real sense of good will among the participating modelers of the world.

(Small post-script is needed: Jim "Casey" Kukowski did a bang-up job in organizing the USA contingent, both with travel arrangements and as team manager. For those who went, much gratitude is given.)

Great Britain's John Wheddon tests his tenth-place PD bird.

Otakar Saffek of Czechoslovakia poses with his Saturn V, his trophy, and an "Enerjet" model.

(Continued on page 14)

The Effects of Delayed Staging on a Multi-Staged Model Rocket's Performance

by Tom Kuechler, NAR 13562
NAR Gateway Arch Section

The following article summarizes the effects of allowing a multistage rocket to coast for some amount of time after booster engine cut-off and before reignition of the upper stage. This "delayed staging" effect is shown to be beneficial for attaining higher altitudes for some rockets. In addition, a means of quantitatively calculating the extent of this effect is given.

The current philosophy when flying a multi-stage rocket is to use immediate ignition of the upper stages. The rationale has been that this will give the highest burnout velocity, which gives the highest altitude. For cases in which drag is not significant this is correct, but drag is a major force during the flight of a model rocket and because of drag there are exceptions to this rule.

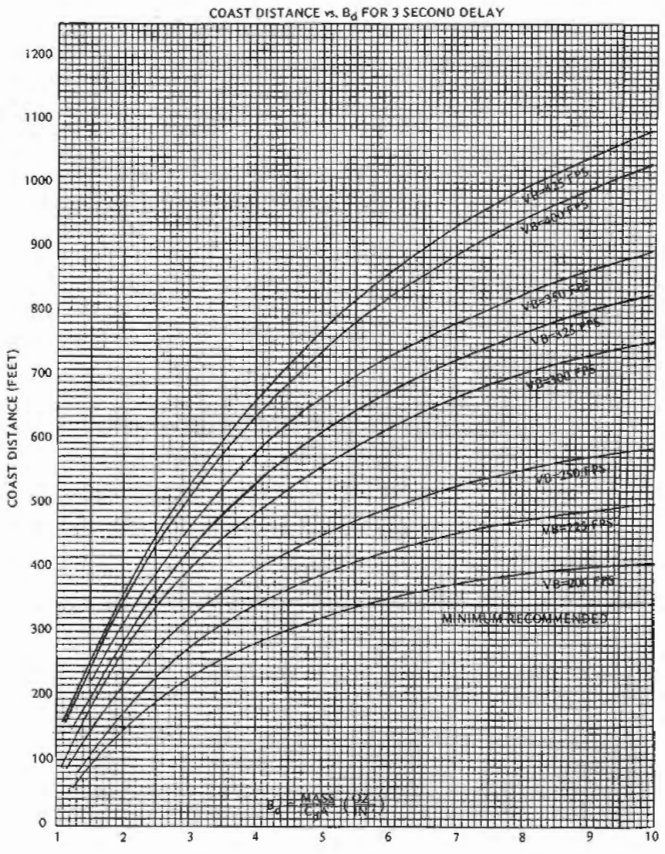
Consider the case of a two-stage D13-D13. With no payload a typical single stage D13 might go to 2150 feet, but the typical two-stage would go to only 3000 feet. Why doesn't the two-stage rocket go twice as high? Although the two-stage has twice the power and burns twice as long, the burnout velocity is only slightly higher than that for the single stage, 800 fps as compared with 780 fps. Hence, the two models coast for essentially the same distance. With the D13 a velocity is reached where a large portion of the thrust is wasted to combat air drag.

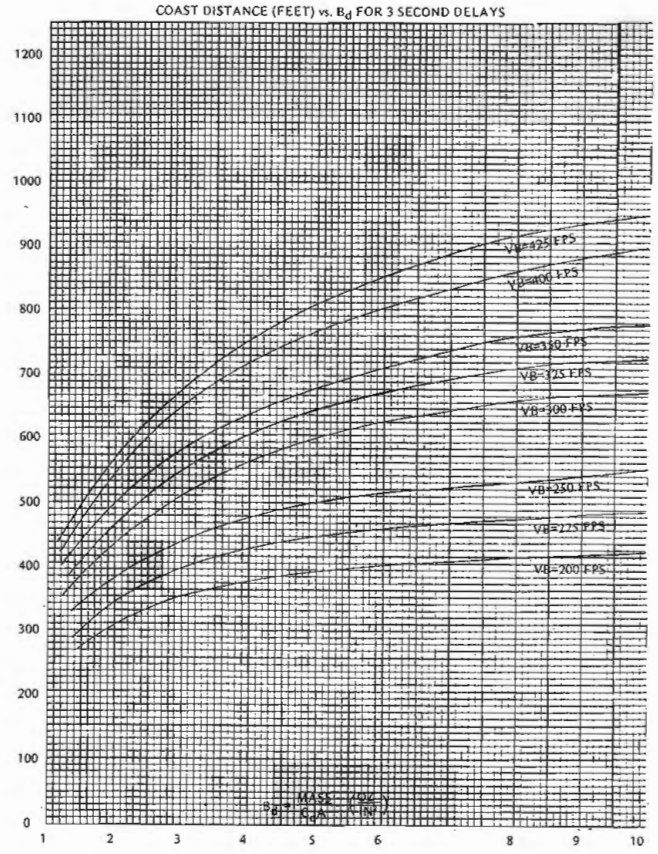
Therefore a class for which delayed staging would be beneficial exists, and it is made up of those rockets which are generally overpowered and lightweight. Our studies have shown that the technique of delayed staging can give sizeable increases in altitude. Obviously, for some rockets, particularly overweight ones, drag does not play a large role since the velocity never gets very high. For these rockets delayed staging would not be helpful.

How much of a delay and how much of an effect are we talking about? In the *Handbook of Model Rocketry* G. Harry Stine mentions the delayed staging effect and says that a slight delay in the upper-stage engine, under the proper conditions, may bring increased altitude. He emphasizes that this increase is slight and that the delay should be slight. I am not sure what he means by a slight delay, but I imagine under a second. My results are quite different; the optimum delay can go as high as five or six seconds, and the increase in altitude corresponding to this delay can be as large as 30%, with many increases of about 20%. In addition, for many rockets which are not normally considered overpowered, delayed staging can help, although the optimum delay is around one second and the improvements are small.

The optimum delays for many rockets are on the order of the lengths of many delay charges currently available. This infers that many multi-stage rockets could be flown with a normal engine with delay charge as the booster, not only safely, but with actual increases in performance over the same rocket without delayed staging. Engines such as the C6-3, D12-3, D8-3, E24-4 are prime candidates for use as delayed staging boosters. Using the ejection charge to ignite the upper stage is fairly reliable. I know of no other method for obtaining good upper stage ignition with a reliable time delay between stages. The perfection of new techniques could extend the use of delayed staging to the B-14 and F100 and make the other engines more versatile.

Up to this point the impression might be that delayed staging can be used with almost any rocket. This is *not* true. For most rockets any delay over one second can be dangerous. Flying your Robin Egglofter with a





B14-5—B14-5 combination will give you scrambled eggs for sure and can be very dangerous. Most delays should not be over three seconds. This eliminates most engines from use as delayed staging boosters. Optimum delays run anywhere from 0 to 6 seconds and are necessarily dependent on all of the characteristics of the rocket. Finding the correct delay will be discussed later.

There are some limitations and disadvantages to the use of this technique. It is obvious that any wind will cause a model with delayed staging to arc more than one without it and therefore increase the chance of losing the model. Obtaining a delay charge close to the optimum delay can be a problem. The chief disadvantage would be the increased likelihood of losing the booster stage. With delayed staging the booster might be dropped off at 500 feet instead of 150 feet. In addition, some people might not want to do the calculations necessary to insure that the model flies safely. These calculations should be done for each rocket and each engine combination.

How can you do the calculations? The problem is essentially one of altitude prediction, a subject which has received a lot of attention. Delayed staging, however, is a new wrinkle, the effect of which has not been completely treated. What are needed are equations describing the coast phase between stages, giving altitude gained and reignition velocity as functions of delay time and the parameters of the rocket. Happily, these equations can be found in the appendix of Estes TR-10 by Doug Malewicki. With some rearrangement, they are:

$$\text{velocity at reignition} = \sqrt{B_d}\ \tan\left[\tan^{-1}\frac{VB}{\sqrt{B_d}} - \frac{g\,t_d}{\sqrt{B_d}}\right]$$

$$\text{altitude gained during delay} = \frac{B_d}{g}\ln\left[\sqrt{1+\frac{VB^2}{B_d}}\cos\left(\tan^{-1}\frac{VB}{\sqrt{B_d}} - \frac{g\,t_d}{\sqrt{B_d}}\right)\right]$$

where:

VB is the burnout velocity of the first stage;

g is the acceleration of gravity;

t_d is the delay time;

B_d is the ballistic coefficient for the delayed staging phase and equals $\frac{m\,g}{\frac{1}{2}\rho\,C_d A}$ (m is the mass of the rocket during coast phase, C_d the drag coefficient, ρ the density of air in units of mass/volume, and A is the frontal area of the rocket, i.e., the cross-sectional area of the body tube).

To simplify the calculations, the graphs appearing on the opposite page have been prepared using the above equations. These graphs are to be used in conjunction with Estes TR-10. The graphs apply to the coast period between stages and are valid for only one delay time—3 seconds. If you are interested in investigating other time delays, you will have to resort to the above equations.

To use the graphs, first use TR-10 to find the burnout altitude and the velocity of the first stage. Use the burnout velocity and the rocket parameters with the graphs presented here to find the reignition velocity and altitude gained during the coasting period between stages. Add the altitudes to find the reignition altitude. Then use the equations in TR-10 for the rest of the flight as you would for a normal two-stage rocket. Check to see if your rocket will fly higher with a delay than without one. For a safe flight it is recommended that the reignition velocity always be over 65 feet/second (20 meters/second), which is approximately the velocity that many models have when they leave the launch rod. As a guideline, the optimum delay is generally that delay which results in a reignition velocity from 80 to 130 feet/second (24-40 meters/second) depending on the mass of the rocket.

Delayed staging effects can also be calculated using a successive iteration type computer program. Anyone having such a program should realize that only simple changes in the logic and the input of the delay time are necessary to modify the program to take delayed staging.

To get a good idea of what kind of effects we can get with delayed staging, the results of some calculations are summarized in Table 1. This table was prepared by using a computer program designed to find the optimum delay by a systematic trial and error process using Malewicki's equations. Results were checked and confirmed by a successive iteration program. Wind effects mentioned previously were studied by the use of this program.

Table 1: Summary of calculations for delayed staging effect.

engine type	masses (grams)	C_d	diameter (cm)	altitude w/o delay (meters)	altitude w/ delay (meters)	difference (meters)	optimum delay (sec)	reignition vel. for opt. delay (meters/sec)
D13	175 120	0.75 0.70	2.5	814	936	122	4.73	27.0
D13	195 140	0.75 0.70	2.5	800	874	74	3.73	34.3
D13	215 160	0.75 0.70	2.5	773	811	38	2.70	41.7
D13	120 70	0.75 0.70	2.5	779	1048	269	6.60	11.6
B14	80 60	0.60 0.50	2.5	363	386	23	2.13	29.5
B14	80 60	0.40 0.35	2.5	438	452	14	1.71	37.6
C6	100 70	0.80 0.80	1.9	690	768	78	3.80	28.2
C6	110 80	0.80 0.80	1.9	670	716	46	2.92	34.2
D8	175 125	0.75 0.75	2.5	632	663	31	2.39	35.3
D8	140 90	0.75 0.75	2.5	672	778	106	4.35	21.9

In Table 1 we can notice several trends. First, as the mass of the rocket increases, the optimum delay for the rocket decreases and the reignition velocity increases, and consequently the net effect decreases. Therefore to get the most from this technique the rocket should be as light as possible. At the same time, there are still beneficial results for fairly heavy rockets. The 215 gram D13 model has an optimum delay near three seconds; the recommended maximum liftoff weight for a D13 is 370 grams.

The results of this work led to the following conclusions:

1) The technique of delayed staging is not only safe *if used correctly*, but it can be beneficial to a rocket's performance. In some cases this benefit is quite large. In general the best effects are seen with lightweight, overpowered rockets.

2) This technique can be dangerous if used incorrectly. Care must be taken to insure a safe flight. The reignition velocity should always be at least 20 meters/second.

3) The optimum delay for many rockets is in the 1 to 5 second range, making the use of some regular engines with delay charges as booster engines possible.

4) Wind can severely affect the performance of a rocket using delayed staging. This technique should be used only in calm weather.

5) The optimum delay and the net effect increase as the mass of the rocket decreases and as the C_d of the rocket goes up. The effects due to changes in mass are quite large, while those due to changes in C_d are small.

6) Some new engine types should be produced to allow more versatility in picking engines and delay times for use with delayed staging. These engines should include types such as B14-1, C6-2, F100-1, 2, or 3.

With cooperation from the NARGAS section in St. Louis, the theory of this paper has been checked to a small extent. A couple of rockets have been flown using a delayed staging and tracked for altitude. Results seem to indicate that delayed staging is beneficial over no delay for certain rockets. We hope to do a more complete experimental verification of the theory and will make the data available as soon as possible.

BIOGRAPHICAL SKETCH

Tom Kuechler is a senior chemistry student at the University of Missouri at St. Louis. He plans to pursue chemistry in graduate school. Among his other interests are computer programming and astronomy. Tom is engaged and will be married in February.

The opinions expressed in this column are those of the author alone, and they do not necessarily reflect those of the Model Rocketeer *or the NAR.*

YOUR NEWSLETTER CAN BE EFFECTIVE
By David M. Scott, NAR 14875

One of the most important tools of a section is its newsletter. Not only should it keep the section members informed about meeting dates, contest events, general news, etc., but also it should form a means of communications with others outside the section.

Recently there have been complaints that *Model Rocketeer* is not big enough and does not give enough news about NAR sections. I do not believe that section news should be the prime purpose of *Model Rocketeer*. I think that *Model Rocketeer* should involve itself primarily with NAR news and secondly with big events of the sections (i.e. large contests, important demonstrations, achievements). Section news should be covered in the sections' newsletters.

The NAR needs a better system of communications among its sections. This should not be established by the NAR, but the sections themselves.

Earlier this year my section, Apollo/NASA, began a newsletter exchange program in an effort to find out what was going on elsewhere in the country and how our newsletter rated against other sections' newsletters. In short, a two-way system of communications, since a one-way system is expensive and a wasted effort.

We mailed out a copy of FREE FALL to every chartered NAR section we could find an address for and set up a permanent list for clubs, sections and organizations within the Southwest. In each newsletter we mailed out, we printed a note saying that if that section would send us a periodic newsletter or even a letter telling about its activities, we would put them on our mailing list and they would receive our newsletter monthly. Out of all the NAR sections, we received only four replies.

Okay, you say that a newsletter is expensive, and that maybe only one guy in the other section will read it. I say at least someone hears about it and a good section ought to bring the newsletter it receives to its meetings so that the section can read about others. And yes, a newsletter is not all that rich. With printing costing about 2¢ a page front and back, and postage at 8¢ a shot, it can run 14¢ or more per copy.

I suggest finding the most economical printing process for your newsletter that still keeps the quality up so it can be read, and if it becomes economical for your section to pay the fee, send your newsletter 3rd class. Apollo/NASA will consider this for next year. A section newsletter has a short lag time which can make the news "New" news, and length is limited only by cost.

Apollo/NASA not only mails its newsletter to its members, clubs and sections, but we also place the newsletter, along with other section and NAR propaganda, in local model and hobby shops which carry model rockets. This propaganda is neatly placed in a folder so that it takes up little space and interested people can easily turn inside and find information. This has been an effective source of publicity. But one word of caution, make sure that it is okay with the store owner and make your display neat and attractive as well as your newsletter and propaganda.

Start an exchange program on your own. The Apollo/NASA section's offer is still open, our mailing address is: Apollo/NASA Publications, 12111 Broken Arrow Drive, Houston, Texas 77024. We will welcome your newsletter and send you ours promptly.

WHY NOT LET THE MEMBERS CHOOSE THE NARAM EVENTS?
By Alan Bland, NAR 21790

In the April issue of the *Model Rocketeer*, Pat Griffith spoke out against the selection of NARAM sites. In the May issue, Jim Barrowman responded, stating that a NARAM site must have the necessary facilities for such an event. He says this is why members do not choose the NARAM site.

All of this is fine with me. A successful NARAM can't be run unless the site meets the

(Continued on page 13)

CONTEST calendar

SEND EARLY FOR CALENDAR!

Please submit all items for the *Model Rocketeer* "Contest Calendar" at least two months in advance! Contest Calendar items should be typed and sent directly to Elaine Sadowski, Editor, *Model Rocketeer* at 1824 Wharton Street, Pittsburgh, Pa. 15203.

The following are contests that have been *sanctioned* by the National Association of Rocketry. Points earned at these contests are credited toward national standings.

December 29-31, 1972—Phillipsburg, New Jersey. Name: Tannenbaum-2. Events: Official: Condor Boost/Glide and Rocket Glider, Class I Parachute Duration and Streamer Duration, Hornet Boost/Glide and Rocket Glider, Sparrow Boost/Glide and Rocket Glider, Class III Parachute and Streamer Duration, and Open Spot Landing. Unofficial: Scale Christmas Tree, Ornamental Ping Pong Spot Landing, Class II Garland Duration, Dragon Boost/Glide, Class VI Parachute Duration and Streamer Duration, and "C" Engine Feather Boost/Glide. For more information contact: David Klouser, 383 Warren St., Stewartsville, N.J. 08886.

February 11, 1973—Bridgewater, Mass. Name: MITSEC-4. Host: MITMRS 134. Events: Design Efficiency, Class 00 Altitude, Ostrich Eggloft, Class 1 Drag Efficiency, Peewee Payload, Robin Eggloft. Contact: Trip Barber, MITMRS, MIT Branch, P.O. Box 110, Cambridge, MA 02139. Phone (617) 253-3161.

March 9, 1973—Bridgewater, Mass. Name: MITSEC-5. Host: MITMRS 134. Events: Hornet Boost/Glide, Hawk Rocket Glider, Sparrow Boost/Glide, Class 1 Streamer Duration, Class 2 Streamer Duration, Class 0 Parachute Duration, Eagle Rocket Glider. Contact: Trip Barber, MITMRS, MIT Branch, P.O. Box 110, Cambridge, Mass. 02139. Telephone (617) 253-3161.

April 13, 14, 15, 1973—Camp A.P. Hill, Virginia. Name: East Coast Regional Meet VII (ECRM-VII). Host: NARHAMS 139. Events: Scale, Ostrich Egg Loft, Hawk Boost/Glide, Hawk Rocket Glider, Class 0 Parachute Duration, Class 0 Streamer Duration. Contact: Judith A. Barrowman, 6809 97th Place, Seabrook, Maryland 20801. Phone (301) 459-5261.

Date To Be Announced—Highland Park, Illinois. Name: ERT2, Evanston Tiros Regional. Events: Hornet Boost/Glide, Condor Boost/Glide, Eagle Rocket Glider, Design Efficiency, Class II Streamer Duration, Class 0 Parachute Duration, Pee Wee Payload, Robin Eggloft, Research and Development. Contact: Bob Finch, 415 Lambert Tree, Highland Park, Illinois. Phone (312) 432-8986.

CONVENTIONS, SYMPOSIUMS, ETC.

Washington's Birthday Weekend 1973—New York, N.Y. New York Star Trek Convention, Commodore Hotel. Contact: Mr. Al Schuster, Box 95, Old Chelsea Station, New York, N.Y.

March 16-17-18, 1973. Pittsburgh, Pennsylvania. 8th Pittsburgh Spring Model Rocketry Convention. Discussion groups on clubs, competition, electronics, tracking and many other topics. Movies, lectures, banquet, and a special seminar for teachers. Contact: Elaine Sadowski, 1824 Wharton Street, Pittsburgh, Pennsylvania 15203. Telephone: (412) 431-5139.

March 30-April 1, 1973—Cambridge, Mass. Name: 1973 MIT Technical Convention. Host: MIT Model Rocket Society. Events: R&D contest, Plastic Model contest, Boost/Glide and Rocket Glider contests, Photo contest; discussion groups on R&D Techniques, Propulsion, Boost/Glide Construction, Plastic Modeling, and many other topics; demo launch, banquet and three other meals; manufacturer displays. Contact: Owen Knox, MITMRS, MIT Branch Post Office, Box 110, Cambridge, Mass. 02139.

June 29 -July 1, 1973—1973 Canadian Model Rocket Conference. Conference open to all model rocketeers in Canada and America. Events: Discussion groups, films, R&D, etc. Contact: Canadian Conference 1973, c/o ARRA, P.O. 1455 Place Bonaventure, Montreal 114, Quebec, Canada.

NAR NEWS

ELAINE SADOWSKI RECEIVES LIFE MEMBERSHIP

For the first time in over six years, the NAR Board of Trustees has awarded an honorary life membership in the NAR. In awarding this rare honor to Miss Elaine Sadowski, editor of *The Model Rocketeer*, the Board recognizes her for the continuous personal effort and sacrifices she has made on behalf of the NAR and model rocketry.

Miss Sadowski's most obvious contribution has been as editor of *The Model Rocketeer* for the past year. The expansion of *The Rocketeer* from 6 pages in MRm to its current 16 pages could not have been accomplished without her. Soliciting material; establishing and maintaining an editorial staff; sifting through supplied material and writing and editing enough copy to fill nearly 16 pages every month adds up to a full time job. Miss Sadowski has accomplished this every month on her own time at her own expense. Only those who have edited a monthly magazine can fully appreciate the intense constant work it takes to meet your deadlines on time month after month.

Miss Sadowski's commitment to rocketeer communications was apparent long before she started editing *The Rocketeer*. As a member of the LAC and its secretary for two years she established and ran the LAC newsletter award for the best section newsletter. The award provides encouragement to excellence to newsletter editors throughout the country.

Her efforts include not only written, but also personal communication. She was one of the early organizers of the Pittsburgh Spring Convention and has been the Chairman of this annual event for the last year. Not only has the convention been a center of communication for rocketeers in the East and Midwest, it has been a model and encouragement for similar conventions throughout the country.

It was for the major and numerous contributions that the Trustees rewarded Miss Sadowski.

James S. Barrowman
NAR President

MID-AMERICA PERSONNEL CHANGES

Mid-America Regional Manager, Manning Butterworth, reports personnel changes among State Department Heads for Section Activities. Both Dennis Okesson who served in Illinois and Harold Mayes who served in Kansas have been unable to continue in their posts due to time conflicts with their jobs. Many thanks to both for their past services. Only the sections in Illinois and Kansas can really appreciate the efforts expended by these two workers in promoting section activities.

A new man, Tom Spilker, from the Midwest Rocket Research Association in Kansas City has stepped in to fill the Kansas vacancy. In addition to his experience working with MRRA, Tom has an inside acquaintance with the FAA, having worked for that agency this summer. Presently he is a student at the university in Manhattan, and his address there is

913 Pierre Street
Manhattan, Kansas 66502.

Welcome aboard, Tom, and good luck.

Illinois is without a State Department head at the moment.

—Manning Butterworth

NOMINATING COMMITTEE APPOINTED

The following people have been named to the Nominating Committee: Jay Apt (Chairman), Manning Butterworth, and Norm Ward. Their duty is to prepare a slate of nominees for the upcoming Board of Trustees election.

NEW LAC ADVISOR NAMED

Dr. Gerald Gregorek has been appointed as the advisor for this year's Leader Administrative Council. Dr. Gregorek is the Chairman of the NAR's Standards and Testing Committee.

CHANGES OF ADDRESS

Dr. Gerald Gregorek has just moved into a new house in Worthington, Ohio. His address is: 1095 Beechview Drive, Worthington, Ohio 43085.

Charles Russell, MESS Chairman and LAC member, and his new bride Bonnie (Congratulations to them both!) are now at 253 W. Dayton-Yellow Springs Rd., Apt. 114, Fairborn, Ohio 45324.

RECORD FILINGS

Robin Egg Loft: A Division—Michael McBride, NAR 21461, 244 m., 16 Aug. 1972; B Division—Jeff Kobs, NAR 19391, 214 m., 15 Oct. 1972; D Division—Micci/Grossman, T167, 381 m., 15 Oct. 1972. *Pigeon Egg Loft:* A Division—Wayne Gerhart, NAR 19894, 458 m., 9 Aug., 1972; D Division—George F. Coleman, Jr., NAR 22274, 453 m., 9 Aug. 1972. *Class 0 Parachute Duration* D Division—James H. Pommert, NAR 16908, 131 sec., 22 Oct. 1972. *Class 2 Streamer Duration:* C Division—Greg Stewart, NAR 19494, 162 sec., 14 Oct. 1972. *Sparrow Rocket Glider:* B Division—Marc Nagasawa, NAR 19714, 124 sec., 22 Oct. 1972. *Swift Rocket Glider:* A Division—Wayne Gerhart, NAR 19894, 149 sec., 22 Oct. 1972. *Eagle Rocket Glider:* D Division—James H. Pommert, NAR 16908, 207 sec., 22 Oct. 1972. *Hornet Boost/Glide:* B Division—Kevin Gordon, NAR 21416, 31 sec., 15 Oct. 1972; C Division—Don Beadle, NAR 17970, 150 sec., 22 Oct. 1972. *Sparrow Boost/Glide:* A Division—Margaret Pommert, NAR Pend., 188 sec., 22 Oct. 1972; C Division—Bruce Kimball, NAR 19388, 226 sec., 22 Oct. 1972. *Eagle Boost/Glide:* D Division—James H. Pommert, NAR 16908, 350 sec., 22 Oct. 1972. *Condor Boost/Glide:* C Division—Glenn Ronke, NAR 21708, 76 sec., 15 Oct. 1972.

NEW ENGINE CERTIFICATION
Effective 15 Sept. 1972

AVI ¼A3-1
AVI A3-2
AVI B3-3

TRUSTEE MEETING SUMMARY

Note: In order to free space in the *Model Rocketeer* for items of more general interest, the Secretary and the Editor have decided to publish only summaries of Board meetings. The full minutes are available at 50¢ copy from: Jay Apt. 15 Line Street, Cambridge, MA 02138.

MEETING BOARD OF TRUSTEES
NOVEMBER 4, 1972

The meeting was held in the Goddard Spaceflight Center, Greenbelt, Maryland. Present were: Jay Apt, Secretary; Lindsay Audin, James S. Barrowman, President; Howard Galloway; Gerald Gregorek; Al Lindgren, Treasurer; Jess Medina.

As the newly-amended By-Laws incorporate the NAR Geographic Regions in Trustee voting, the Board, under a motion by Gregorek, voted to assume the authority for setting the region boundaries. An independent committee will report to the Board after evaluating the present regions, coordinating with the Contest Board and the Section Activities Committee.

Ed Pearson, Chairman of the Education Committee, presented a plan for NAR educational group memberships. Under the plan, which is to be voted on by the Board in the spring, school groups would be allowed to join the NAR on a restricted 9-month basis for $5 to $10 per group plus $1 per member. No competition privileges would be given, and the group would receive a single copy of the *Model Rocketeer* per month, along with a teacher's guide to be prepared by the Education Committee. The program would be aimed primarily at 5th through 9th grades, and would go into effect next September on a trial basis in three states.

The Board passed the final version of a policy regarding the membership of model rocket company employees on the NAR Board of Trustees and committees. This policy will be published in a future issue of the *Model Rocketeer*.

The Treasurer presented his report for the first nine months of 1972, showing that the Association had been very successful in reversing the trend to lose money that had appeared in 1970 and 1971. Near financial stability has been reached, versus a loss of $7500 in 1971. Membership stands at 3700. 1973 should be financially a good year, with money available for committee work and membership acquisition programs. A savings account will be established to take advantage of the large cash flow in January and February. A discussion of Manning Butterworth's exhaustive membership analysis resulted in a consensus that the majority of the Association's allocatable resources should be directed towards membership acquisition programs. A report on these programs will appear after the essentials of the membership drive are finalized.

In appreciation for her many and varied contributions to the Association, the Board voted Elaine Carol Sadowski lifetime membership in the NAR.

Lindsay Audin presented the address that he had given at PACT-2 on July 1, 1972. After discussing the observations and suggestions made in the address the Board adjourned.

(Continued on page 14)

unearthly—MARS VII

aberdeen proving ground
maryland
october 14-15, 1972

by Elisa Diller, NAR 18677

While most of the world was sighing with relief as Friday, October 13, 1972 passed into oblivion, the 142 people from seven states who converged that day upon Aberdeen, Maryland were obviously of another accord. It was the beginning of the unearthly MARS, the seventh annual regional meet sponsored by the Star Spangled Banner Section of Severna Park, Maryland.

Because the name MARS has become synonymous in recent years with the word marsh, plans had been made several weeks before the meet to help insure good weather. Much to the surprise of all, and the relief of many, no action was necessary, for the weather remained clear, and all rumors that S.S.B. President Dave Pearce was to be sacrificed in return for the good weather were dispelled.

Saturday, October 14, dawned very clear, but cold. Four events were scheduled to be flown—Class 0 Streamer Duration, Class 1 Parachute Duration, Robin Egg Loft, and Design Efficiency. At 8:15, after a few words of welcome from our host, the U.S. Army at Aberdeen Proving Ground, the first demos were fired, and MARS VII officially opened.

It had been decided while MARS was in the planning stage that an attempt would be made to fly all the Saturday events simultaneously. Surprisingly enough, this worked with only one exception. Because all events were flown at once, the safety check-in lines were seldom empty and the launch rails were constantly in use. Unfortunately, this schedule resulted in an unusually long day for the trackers, who worked hard in the face of invisible Design Efficiency birds and no tracking powder.

One of the highlights of the regional was Saturday afternoon's trip to see APG's live V-2, which is stored in a restricted area. As contestants boarded buses provided by the Army, they were warned that any pictures taken on the way to the area would result in confiscation of the photographer's film. They were assured, however, that when they reached their destination they would be free to photograph, as well as to measure, the V-2 and any other rockets stored in the same building.

After the V-2 trip and lunch, firing resumed. There were few, if any, earthshaking times recorded at MARS VII, and tracking resulted in an overall close of 20%. The low close was due mainly to a low cloud cover and the fact that there was almost no one willing to track. Throughout the day, the same people did the work, and they should be congratulated for their fine job in the face of all the obstacles.

Although the number of problems at MARS was minimal, there were two rulings made that might set precedents for similar incidents at other meets. Because of his interpretation of an NAR Pink Book rule, R.S.O. Jim Barrowman DQed the flight of a Streamer Duration bird whose streamer was attached to the rocket by the bridling method (the method whereby the shock cord is attached in two places to the rocket, and the bird is able to drift to earth sideways). Also, due to a recent NAR Contest Board decision, one contestant was refused his points because he was not in possession of his NAR license.

Around 4:00 p.m. the range was closed, and contestants returned to the motel, where a game of Frisbee ensued. Later, most contestants tried to find their way to APG's theater for a discussion session with members of the recently returned U.S. international team. Besides slides of the World Championships, contestants were entertained with the infamous Steel City rocketry films.

Sunday morning dawned clear and cold. Unfortunately, it also dawned rather breezy, with winds starting out at 15 mph and gusting up to 30 near the end of the day. Needless to say, it was not good glider weather.

Besides Hawk Boost/Glide and Hornet RG, scale models were also scheduled to be flown. Originally Super Scale was scheduled, but due to lack of entries (one to be exact) the event had to be scratched.

It seemed that the Gemini Model Rocketry Society of Wilmington, Delaware stepped on any other competition in Scale. Not only did they take first place in the combined A-B division, but they took the first three places in C, and another third in D.

By 2:00 p.m. Sunday, all birds had been flown, and the MARS VII range was permanently closed. The awards banquet was scheduled for later in the afternoon at the NCO Club, so most contestants headed back to the motel to change, pack their gear, and collapse from exhaustion.

After the major attraction of the banquet (dinner), there was only one thing left to take care of—the presentation of awards. There probably should have been some type of special award for Mark Hopkins who took places in all six events (four first places) and with 393 points helped GMRS tie for first place with the NOVAAR Section of Virginia.

There was also a new awarded instituted this year at MARS—an Outstanding Service Award for those in the A, B, and C divisions who worked so hard to make MARS a success. They went to Tracey Cosby (A), Rajah Chacko (B), and Matt Johnson (C). There was also a standing ovation for Sgt. Major Barber, the man who provided the back-up support for NARAM-13 as well as MARS VI and VII.

When speaking of service, it wouldn't be fair not to mention SSB senior advisor Howard Galloway and his wife, Dottie, for without them there would not be a Mid-Atlantic Regional Shoot.

As the contestants headed for home, it was duly noted that at 6:00 p.m. the sky was still clear with no rain in sight. MARS VII was over, and in the opinion of the contestants it had not only proved itself unearthly, but really out of this world!

FIRST PLACE WINNERS

Class O Streamer Duration: A. Eric Sommer, 41 sec.; B. Irving Girschman, 36 sec.; C. Carroll Yung, 46 sec.; D. Michael Burzynski, 46 sec.

Design Efficiency: A. Kenneth Poorman, 80 m/Ns; B. Mike Turtora, 120 m/Ns; C. Rick Ferris, 144 m/Ns; D. Michael Burzynski, 190 m/Ns.

Class 1 Parachute Duration: A. Eric Sommer, 84 sec.; B. James LeCroy, 160 sec.; C. Robert Michel, 180 sec.; D. John Nowakowski, 98 sec.

Robin Egg Loft: A. Wayne Windsor, 122 m.; B. Mark Hopkins, 169 m.; C. Rick Ferris, 219 m.; D. Ruth Norman, 196 m.

Hornet Rocket Glider: A. Eric Sommer, 35 sec.; B. Mark Hopkins, 30 sec.; C. David Shucavage, 39 sec.; D. George Meese, Sr., 28 sec.;

Hawk Boost/Glide: A. Kenneth Poorman, 71 sec.; B. Scott Pearce and Mark Hopkins (tie), 77 sec.; C. Steve Hudson, 116 sec.; D. Terry Lee, 97 sec.

Scale: A-B. Mark Hopkins, 552 pts.; C. Jim McGraw, 712 pts.; D. Philmon Team, 686 pts.

Division Winners: A.: 1. Kenneth Poorman, 162 pts.; 2. Eric Sommer, 150 pts. B.: 1. Mark Hopkins, 393 pts.; 2. Mike Turtora, 144 pts.; C: 1. Rick Ferris, 135 pts.; 2. Jim McGraw, 120 pts. D: 1. Terry Lee, 186 pts.; 2. Mike Burzynski, 180 pts.

Team Winner: Philmon Team, 238 pts.

Section Winners: NOVAAR and Gemini, 804 pts.

BIOGRAPHY

Elisa Diller has been a member of the NAR and the Star-Spangled Banner Section for 2½ years. She is also a member of a rather unique team which consists of one Maryland member and one New York member (Karen Celentano), which was formed Friday, August 13, 1971, at NARAM 13.

NEW
FROM THE MANUFACTURERS

PRODUCT EVALUATION:
"Foxmitter 3" Transmitter,
Competition Model Rockets, $13.95

The Foxmitter 3 is a model rocket transmitter which features an integrated circuit, transistors, capacitors, and other electronic parts. It is easily built, even by the novice, and its plug-in sensors make a wide range of research possible.

To be frank, when I first decided to build the Foxmitter 3 I was skeptical. I had built the Foxmitter 2 and had a great deal of trouble assembling it, and I had never really had a successful flight; something was always going wrong. But, Howard Kuhn, who now handles all Foxmitters through Competition Model Rockets, convinced me to give it a try, so, with solder gun in hand, I began. The first thing I noticed were the instructions; the Foxmitter 2's instructions were not clear and very confusing, but these were excellent—clear, concise directions with drawings that even I could understand. (There was one mistake on them which should be corrected by the time you read this, but in case it isn't, if the placement of resistors R1 and R2 differs between the instruction sheet and circuit board, obey the circuit board!) It is most important that you follow the instructions carefully; if you do you should have no trouble at all. Here are a few hints which may help you. First, go through the instruction sheet and identify each part; then tape the part to a piece of paper and write its number beside it. This avoids confusion and speeds construction. Use a low wattage soldering iron (a soldering pencil is best) to lessen the likelihood of burning out a delicate part. Don't use big gobs of solder if small ones will do.

When the time comes to fly your Foxmitter 3 you will need some extra equipment—a walkie-talkie or other such receiver. These range in price from $5.00 to well over a hundred. Unless you intend to do research for NASA, do not spend over $20.00. (I have a $15.00 receiver, and it works very well.) Buy your receiver first so that when your Foxmitter arrives you will know which channel crystal to use. Also needed is a tape recorder, and any one will do.

When you are flying your transmitter, again, follow directions; a lot of thought went into them, so please read them. I test flew my Foxmitter twice, once with the beacon tone module, and once with the temperature sensor. When the beacon tone was flown with a C6-3, the signal was loud and strong through the entire flight. The temperature was about 30°F on the day the test flights took place, and at this temperature the sensitivity of the temperature sensor is decreased, so the change in tone was not substantial. The temperature sensor makes a great thermal hunter, but if it does find one, you may have to hunt for your sensor! It also makes a fair thermometer if you place it under your armpit. You can compare the tone you get with the one produced if you stick it under a "normal" friend's to see whether or not you have a fever! Don't expect an endorsement of the Foxmitter by the AMA in the near future, though. I used a C to carry the transmitter, but one or two D's will work well also, and there is no better project for the photographer than wiring a Cineroc with the sound sensor. There are other sensors which measure roll rate and acceleration, and a photo cell which can measure the breathing rate of a mouse. A complete list may be obtained from CMR.

So, the Foxmitter 3, with an integrated circuit which more than halves the size, a range of at least one mile in the air, and many other features would seem to be perfection, and it is very close to it—but to every silver lining there is a cloud. First, the price of the sensors has been raised slightly, but the improved directions from CMR are well worth that; second, the cost of support equipment is rather steep; and finally, if you lose it in a rocket-eating tree, well . . .

All things considered, though, the Foxmitter 3 is a good buy for the modeler who wishes to do research, or for the modeler who just wants to see how research is done. By the way, the Foxmitter 37 will be coming out in July, 1997. It will weigh one milligram, fit into BT-1, and handle twelve sensors at once. I can hardly wait!

—Robert Lieber

SOAPBOX *(Cont. from page 10)*

necessary requirements. But I can't see why the members can't select the events. We are the contestants, so we should pick what we want to fly.

As soon as the NARAM site has been selected, questionnaires should be sent to all NAR members. It should state the size of the field (not necessarily the place) and it should list all of the possible events based on the size of the field. Members should be instructed to select one parachute duration event, one B/G event, etc. Based on these questionnaires, the events can be selected. Those events with the most preference would be chosen.

Why not try this system to select NARAM-15's events? I think it would be worthwhile to do this. It would increase the activeness of the members by letting them participate in something that they want.

POINTS FOR R & D?
By Edmund Hack, NAR 12256

In recent years, there has risen a tradition of either eliminating the contest points awarded for R&D at NARAM, or, as was done at NARAM-14, reducing the points given for it.

I see no reason for not giving full credit at all contests for R&D. I asked why this was done at NARAM-12, where I was a contestant and was told that it was done to discourage junk projects from being entered by persons only interested in points. I agree with this idea, but feel that since the revision of the rules does not grant flight points, the full credit for this event should be given.

Research & Development is perhaps the single most important event in the current rules since there is a chance given for scientific ability to be rewarded, not just luck as many of the events involve. For an interest in this aspect of our hobby to be encouraged, I believe that full credit should be given for this event.

MODEL ROCKET TIPS

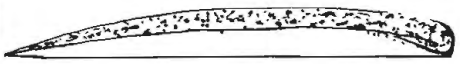
To get under-camber on a solid balsa wing the easy way, do the following:

1. Begin with your wing stock.

2. Shape the upper surface as you normally do.

3. Turn the wing upside-down and secure it in place with a piece of scrap balsa and a pin. Press on the trailing edge and force the bottom surface of the wing (now on top) to bow upward. While you have the bend established, sand it flat.

4. Flip the wing over and the natural spring in the wood will cause the wing to take on the shape shown.



To use this technique with foam wings, bend the preformed foam wing as shown above and tape the edges down to create a bulge. Using a hot wire foam cutter, slice off the bulge; the wing will spring back to shape when you remove the tape.

—David Newill

Share your modeling techniques! Send your ideas (with step-by-step drawings if possible) to:

Model Rocket Tips
David Newill
313 Mitchell Blvd.
Lubbock, Texas 79416

WORLD CHAMPIONSHIP RESULTS

(Continued from page 7)

PARACHUTE DURATION

Individual

Place	*Name*	*Country*	*Best Time*
1.	Ion Radu	Rumania	415
2.	Elena Ballo	Rumania	411
3.	Ellie Stine	USA	295
3.	Jon Randolph	USA	295

BOOST/GLIDE

Individual

Place	*Name*	*Country*	*Best Time*
1.	Mohamed Orfy	Egypt	165
2.	Peter Fribey	England	130
3.	Zoran Milicic	Yugoslavia	105
4.	Magdy Gabrial	Egypt	99

INDIVIDUAL SCALE

Individual

Place	*Name*	*Model*	*Country*	*Points*
1.	Otakar Saffek	Saturn V	CSSR	2945
2.	Karel Urban	Saturn V	CSSR	2776
3.	Howard Kuhn	Javelin	USA	2575
4.	Jaroslav Divis	Saturn IB	CSSR	2574

Poland's Julius Jaroncyk, along with other members of the Polish team, place a scale Diamant-B on the launch pad.

(Continued on page 15)

NAR NEWS *(Cont. from page 11)*

CHANGE OF ADDRESS

After January 1, 1973 all correspondence for Jay Apt, NAR Secretary and Chairman of the Nominating Committee, should be sent to him at 370 Concord Avenue, Cambridge, Massachusetts 02138.

LITTLE KNOWN FACTS

Did you know that NAR is the only model rocketry organization in the United States that provides its members with a $300,000.00 liability insurance policy and offers the opportunity to establish *official* National and international records.

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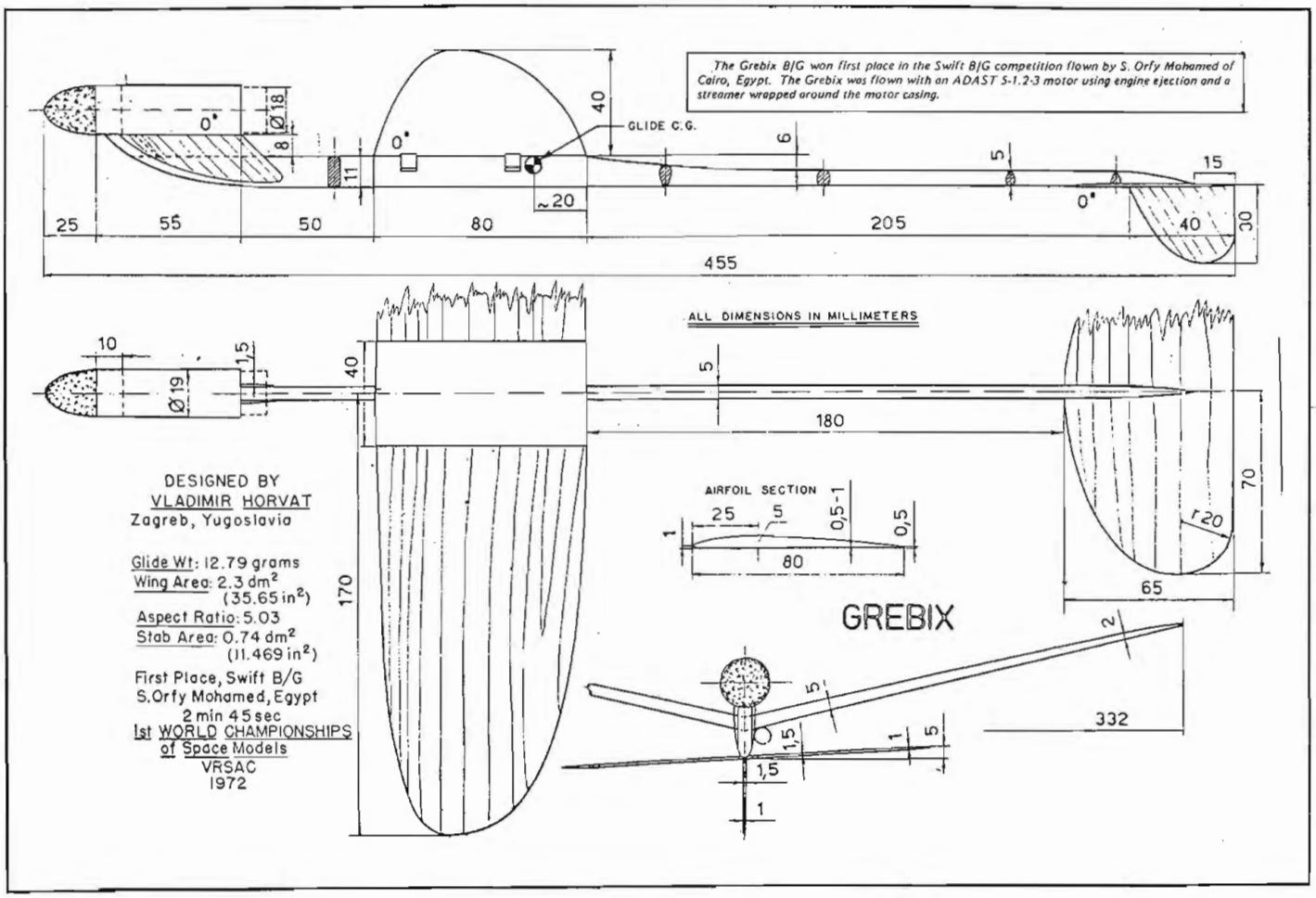
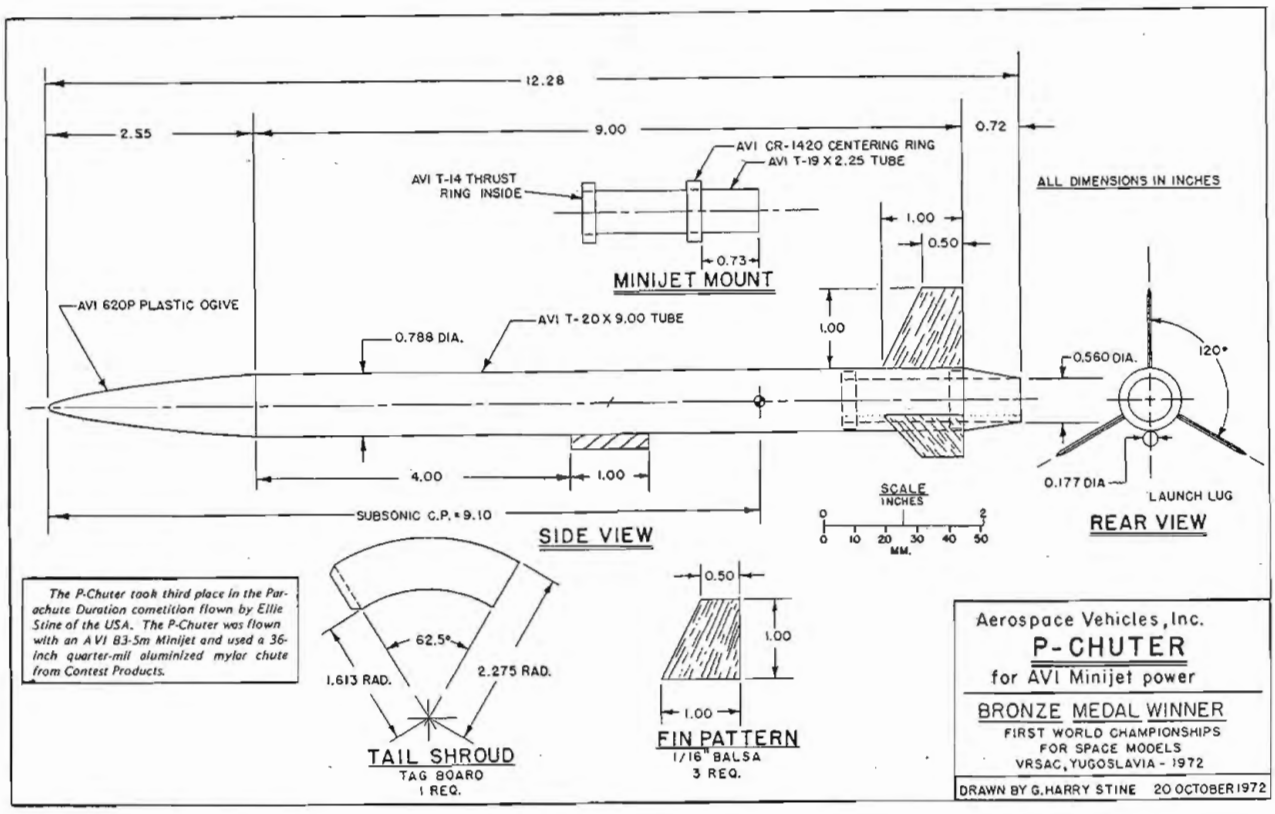
A BONUS FROM -- AND EXCLUSIVE TO -- **MODEL ROCKETEER.**

PLANS OF TWO WORLD CHAMPIONSHIP AWARD WINNING MODELS

(Continued from page 14)





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