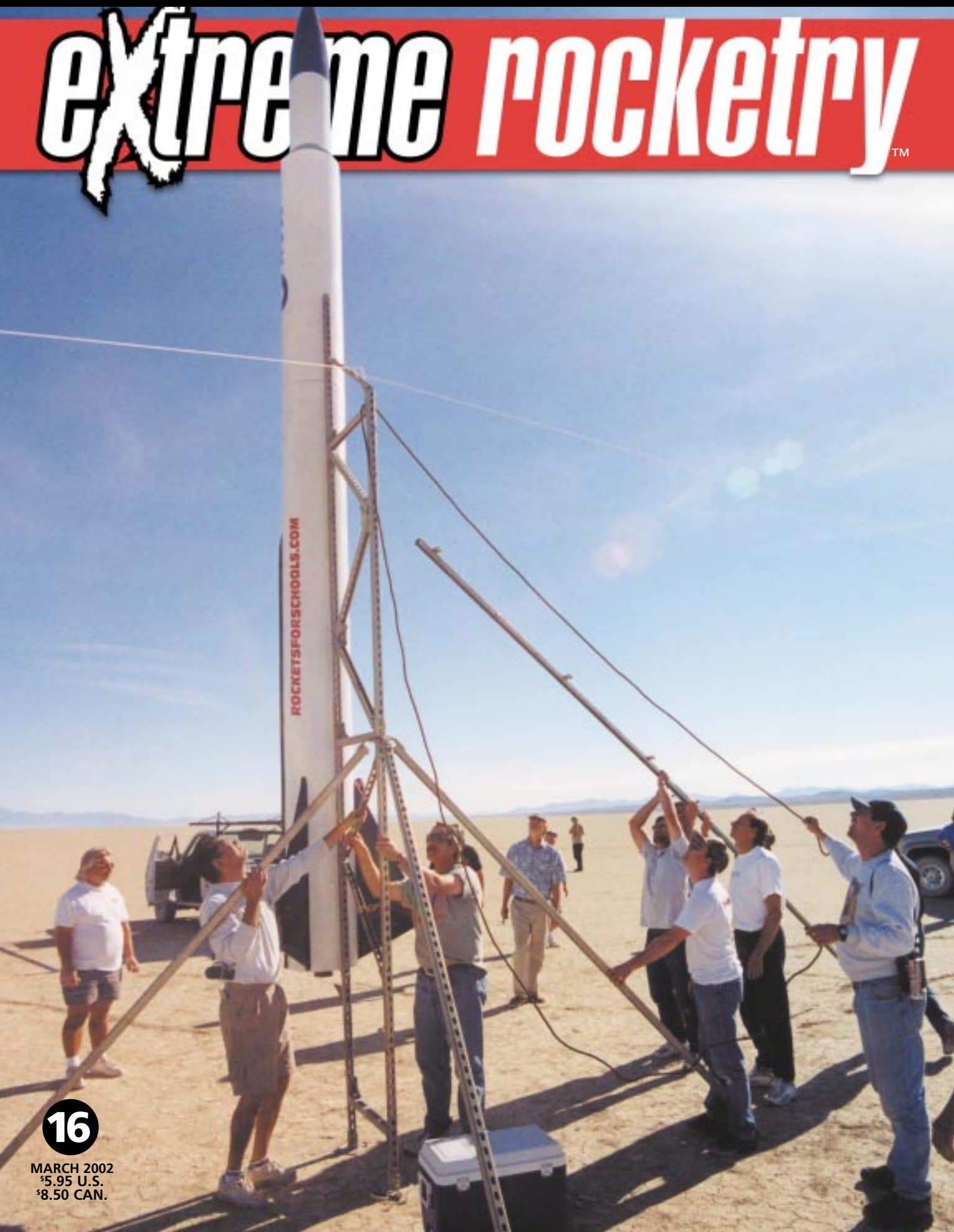
EXPERIMENTAL ROCKETRY • 1/50 SCALE APPOLO/SATURN 1B • DAVE TRIANO INTERVIEW

extreme rocketry™



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2002 RocketSilo Calendar

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MAGAZINE CONTENTS

[march 2002]

Features

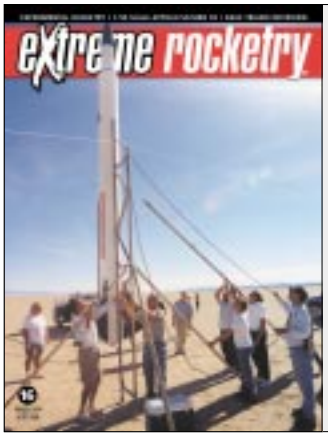
featured articles in this issue

MAGAZINE CONTENTS

[march 2002]

Departments

regular stuff that appears in each issue



About the Cover

One of the biggest experimental launches each year is held at the Black Rock Desert northwest of Reno, NV. The launch is know as Balls. The cover photo and centerfold this month is of the Max-Q project which flew at Balls 2000. This rocket was enormous as you can see. It took a big team to get the rocket ready to fly. Unfortunately the parachute stuck inside the rocket and didn't deploy. The result was a crushed rocket. Extreme Rocketry was given the nose cone which is now sitting in our offices.

Correction from Previous Issues

On p. 46 of the Jan issue we printed incorrect information about the PET2 timer. Missile Works informed us that "both timer channels can be set to either timing range."

No other typos or corrections were reported by our readers! Corrections should be emailed to info@extremerocketry.com or mailed to Extreme Rocketry, 109 E. Charleston, Ste. 101, Las Vegas, NV 89104.

extreme rocketry

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EDITOR'S NOTE

[by: brent mcneely]

I messed up!

centerfold controversy influences reconsideration

I admit it—I was wrong! Boy, was I wrong! I made many assumptions when we published our January 2002 issue of the magazine. Some of them were right on the money, but my one major mistake appears to have been the centerfold.

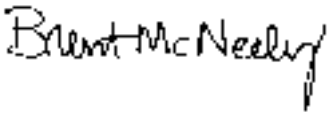
When I first started the magazine two years ago, I wanted to do something different from what the other magazines were doing. I wanted something that was timely and where you got the number of issues you paid for. I also wanted to publish better articles and add some interviews, so the average Joe could find out more about those who are shaping the future of rocketry. One of the ideas I considered early on was doing a swimsuit-type centerfold like those found in hot rod and sports magazines. I viewed rocketry primarily as a guy's hobby like the others. But, I didn't have the photos to use for the centerfold, and didn't want to spend the money to have a photographer take them for me. As a result, I ran the best photos of rockets I could find in the centerfold of each issue.

Then in late November 2001, we received the photo that we published for the centerfold of the January 2002 issue. The photo features a girlfriend of a rocket flier and his rocket. I thought the photo was clever and would bring a smile to the face of my readers. However, that was not what happened. What happened was the most reader feedback we've had to date. About half of the email was constructive criticism about why we should reconsider having bikini girls with rockets for our centerfolds, accompanied by a polite request that we reconsider publishing photos like this. Various reasons were given, many of which I had never considered before. At the other extreme, we received a good portion of email and letters that could best be described as "flame mail." This email was not at all constructive, but simply expressed the anger of the magazine reader and how they felt when they saw the photo. Some women wrote in, mostly with constructive input on the issue.

We finally decided to run a poll on our website to see how many people liked the new centerfold. We thought there was a chance that many of those who liked the new centerfold would fail to write in. However, the results of the poll confirmed that a good portion of our readership simply did not like the content. The final result of the poll was 58% were in favor, 9% undecided, and 33% opposed. Granted, the "majority" liked the centerfold, but it was nowhere near the percentage needed to make it a regular part of our magazine. If we had over 90% favoring the women and rockets centerfold theme, then we would continue to run it. But, with 33% opposed, it just wasn't wise.

One person wrote in stating that they believed we ran the centerfold just to create a media spin of debate about the centerfold to draw attention to the magazine. This is simply not true. The thought never entered my mind. I did it just for fun. I thought the guys would like something to hang in the garage or office.

In the end, I am repenting of my ways and begging for forgiveness. I'm sorry and feel really bad I've offended so many of my readers. I really do care what my readers think. I created the magazine to help rocketry grow and want to create content to that end. As you may have gathered by the text above, after reading the many emails and letters, reviewing the polls, and speaking with everyone on my magazine staff, I have decided to discontinue the women and rockets centerfold theme in favor of finding the best "G" rated rocket photos we can.



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READER'S LETTERS

[from: our readers]

Praise & Criticism

send us your comments via email at info@extremerockery.com

A Good Looking Lass

I opened my ER mag and when I got to the centerfold "Wow" is all I could say. My eyes bugged out, heart rate went to 300. Mercy! Goodness Gracious! Bodacious! After I popped my eyeballs back in their sockets it downed on me that some fool will write in and complain and threaten to cancel their subscription. If some one does just tell them to get over it and get a life. I am 56 years old. The day I don't appreciate a good looking lass will be the day you can't find a pulse on me!

--JR Currens

Educational Resource

Extreme Rocketry is an exceptional magazine that is used in my Exploring Technology class as a teaching tool. The tech pages are helpful and the articles help my students understand rocketry better. From clustering to using trigonometry for finding the altitude of a rocket, they have gained invaluable knowledge from your magazine. At our last launch, we had over one hundred rockets with "F" to "G" motors. There were approximately three hundred students and parents in attendance.

In your Jan-Feb 2002 periodical there was a centerfold that could not be shown to my students. From my standpoint this is a rocketry magazine not a pinup magazine. I am not trying to be prudish, but I am educating over one hundred-fifty students per semester in the science of rocketry. My library has all of the Extreme Rocketry magazines except #15. The purest rocket enthusiast does not care about Extreme Women of Rocketry. They care about Extreme Rocketry. If this magazine turns into a pinup magazine the school will not re-subscribe or will have to cancel the subscription. Please take this request under consideration.

--Jim Schaffer, Exploring Technology Teacher

You Made the Centerfold

I got this page over the intercom: "Larry Taylor line one". So I answer the phone. "Hey dude, you made the centerfold!" Those six words and man it was Christmas all over again! I can't believe it, and my girlfriend Stace freaked! This mag has kicked ass from day one, and now it does in a sexy way too! You guys ROCK....HARD.

--Larry Taylor

Equal Representation

In your latest issue you asked our opinion of your new centerfold. I find it detracts from the high quality of your magazine. However if this is to become a regular part of Extreme Rocketry, I feel that myself and other female rocketry enthusiasts should be given equal representation. I would hope that you would accept and print pictures of our boyfriends and husbands posing with our rockets also.

--Debra Koloms

Like the Centerfold

I really like the centerfold concept BUT Whoever is posing with THE rocket should be posing with THEIR rocket now focus on picking between the poser and the rocket.

--Bob Yanecek

Embarrassed and Dissapointed

I just wanted to say what a great job you guys have been doing with the magazine. Up until the January-February issue I didn't have any complaints or problems with ER. When my dad showed me the centerfold of the immodestly dressed woman beside the nicely build rocket I was pretty embarrassed and disappointed. I'm a 19 year-old young man... I just hope ER leaves the half-dressed women up to all the other magazines out there and keeps its publication clean and available to all age groups.

--James Grover

Keep It Kid Safe

While Larry's girlfriend (who is unnamed, I hope by her own request) makes a great centerfold, I think a better one exists in the same issue. See the V2 holder and dad on page 16. This is what the hobby is all about. Please don't go down the road that so many other magazines have. Keep it kid safe. I want to continue to be able to share the magazine with my son!

--Dave Morey

WRONG, WRONG, WRONG!!!!!!

The "most helpful criticism" and selection of the centerfold has just taken you guys down a terrific couple of notches times 1,000. You have really shot yourselves in the foot on this one... I strongly oppose the use of this type of suggestive direction in your magazine. Leave the scantily clad ladies to the many magazines that already sponsor this sort of sport; or leave them draped over Harley's and automotive mufflers in the speed shop rags; but don't put this sort of dribble in what was up until now my favorite magazine on rocketry.

--Koen O. Loeven, DVM

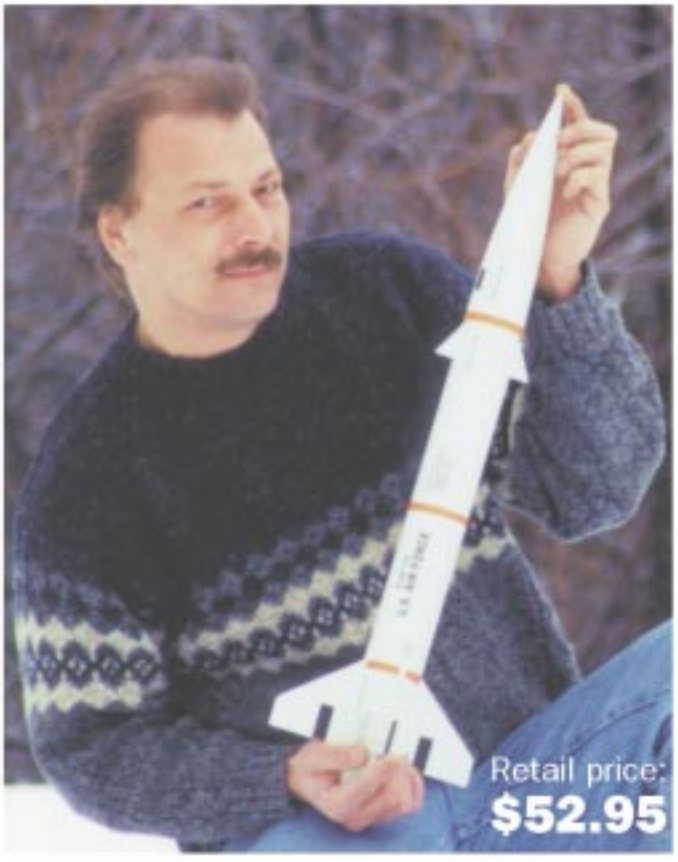
A Family Hobby

I have always enjoyed your magazine with the informative articles and impressive pictures... However, the latest issue had a disturbing quality about it. I did not feel that I could share this issue with my children due to the photo of the scantly dressed woman next to the rocket... If this is the course your magazine is now going to take, I am highly disappointed and will no longer purchase any further issues. I ...REFUSE to allow my children to be exposed to photos such as the one you published... I will not give up the hobby, but I will give up your magazine.

--Jennifer

Rocket Kit Data Sheet

BULL PUPPY 2.1



Based on the U.S. Navy Bull Pup missile, the Bull Puppy 2.1 is the latest addition to the Bull family of rocket kits. A great starter kit with excellent styling and performance. This puppy is perfect for pre-cert F and G flights and smaller fields. Comes complete with military style decals and a pre-slotted, plastic boattail.

Features Include:

- Flies great using F through H motors
- Pre-slotted boattail
- Quantum Tube airframe
- G-10 fiberglass fins
- Piston ejection system
- Multi-panel nylon parachute
- Plastic nosecone
- Thin-wall brass launch lug
- Decal sheet
- Explicit instruction

Dia.: 2.1" **Height:** 27.75" **Weight:** 19 oz. **MMT:** 29mm **Chute size:** 18" **Launch lug:** 1/4"

Recommended motors and predicted altitude chart

All motors shown are Aerotech. Information displayed as Altitude in Feet, Optimal Delay in Seconds

Re-load kit	G75J	H128W	H238T	H97J	H180W	H220T
Bullpuppy 2.1, 29	3445,11.85	4049,12.94	3584,12.63	3768,12.78	4922,14.06	4402,13.58

Re-load kit	F37W	F62T	G54W	G104T	F40W	F52T	G33J	G64W
Bullpuppy 2.1, 29	761,5.63	796,6.28	1520,8.12	1716,9.15	1606,8.41	1550,8.24	1971,8.28	2674,10.62

Single Use Motor	F20W	F25W	F50T	G38BM	G40W	G80T	H55W	H70W
Bullpuppy 2.1, 29	1319,6.51	1640,7.29	1802,8.79	1871,8.85	2695,9.73	2315,9.26	4667,12.16	4667,12.66

Other motors can also be used but some may require modifications to the kit.
Always refer to the Motor Recommendations Chart at www.publicmissiles.com for the latest information.

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Rocket News

Giant Leap Rocketry Releases Pre-sewn Shockcords

Giant Leap Rocketry, Inc. has released shockcords that come with pre-sewn loops at both ends. These come in both tubular Kevlar and tubular nylon. The pre-sewn ends of these cords have been pull-tested using equipment at a parachute manufacturer. "In all cases, results of the tests revealed that the sewn loops have a higher breaking strength than the cord itself", according to Ed Shihadeh of Giant Leap Rocketry. These pre-sewn shockcords, called SHOCK-LOOPS, come in a variety of lengths (12 to 25 feet) and widths from 9/16" to 1" wide. The Kevlar(TM) shockloops are pre-sewn with Nomex thread in order to preserve the fire resistance of the material.

Giant Leap also releases the SUPERLOOP. This is a pre-sewn shockcord based in 2" wide seat-belt webbing (red). This is intended for the very large projects. The advantage of such wide webbing, according to Ed, is not only its tremendous strength, but upon hard contact with the bodytube, its width distributes the load thus reducing the chances of a zipper. Ed further maintains that "similar pull tests reveal that the pre-sewn ends of the SUPERLOOPS outlast the webbing itself."

www.giantleaprocketry.com

Ye Olde Rocket Shoppe Re-Opens

Ye Olde Rocket Shoppe has re-opened at a brand new site. After sitting dormant for almost two years, YORS has been re-tooled from the ground up. Gone is the old auction system that was run manually by the webmaster. In its place is a new auction program that is fully automated. It has most of the features of main-stream auction sites such as eBay, but there is no cost to the sellers!

Along with the rocketry auctions, people can now get their own free yourname@rocket-shoppe.net WebMail address. The WebMail system is similar to another rocket related WebMail site that many people are familiar with.

www.rocketshoppe.com

READER PHOTOS

[from: reader photographers]

Level 3 Certification

We only had one reader photo this month (below). So, the photo to the right is of the editor-in-chief prior to his level three certification. Brent McNeely was the first individual to certify on an AeroTech 75mm M class motor. Certification took place at El Dorado Dry Lake Bed just south of Las Vegas several years ago.

Doug Gerard's Super Scale

Doug stands next to his super scale Estes Mars Snooper II. Doug informed us that his version is a scratch built 400% upscale rocket which he called the Mars Snooper III. The rocket is made entirely from G10 fiberglass tubing and fin stock. Doug's Snooper weighs 35 pounds and flew at Springfest 2001 on an L850.

SUBMIT YOUR PHOTOS!

Have a great rocketry photo? Each month we choose one photo for our centerfold, and we put a couple other ones in here. If you would like to see your photo published please send a good quality print of the actual photo as well as a description of each photo to 109 E. Charleston Blvd., Ste. 101, Las Vegas, NV 89104.

Rocket News

Mostly Missiles Grand Opening

Mostly Missiles, located in Oklahoma City, Oklahoma, is proud to announce its grand opening! The company produces experimental motor casings and parts, markets experimental propellant mix kits, and conducts propellant safety classes. Currently available are motor casings sized for motor mount tubes from 38mm to 76mm, with 98mm casings in development.

Current propellants available include low smoke types with flame colors of red, yellow, orange, and blue. Development is underway for a white smoke/bright flame propellant, and a black smoke/yellow flame propellant.

Attending a propellant safety class is mandatory to being able to purchase propellant mixes. A prerequisite to attending class is that you must be level 2 certified from Tripoli Rocketry Association.

www.mostlymissiles.com

Public Missiles Has Moved!

Public Missiles recently moved to a new address and has new contact information:

Public Missiles Ltd.
25140 Terra Industrial Dr.
Chesterfield Twp., MI 48051
Phone: 1-586-421-1422
Toll free: 1-888-PUBLIC-M (sales)
Fax: 1-586-421-1419

Ellis Mountain Rocket Works

Ellis Mountain Rocket Works announces that with recent licensing agreements it plans to provide tracking smoke and delay/ejection charge forward closures for its line of reloadable motors. A limited number of tracking charge forward closures for the 38mm line is now available and announcements will be made as further items come on line. Odyssey Productions, Trailing Edge Technologies and Magnum are current Distributors.

www.EllisMountain.com

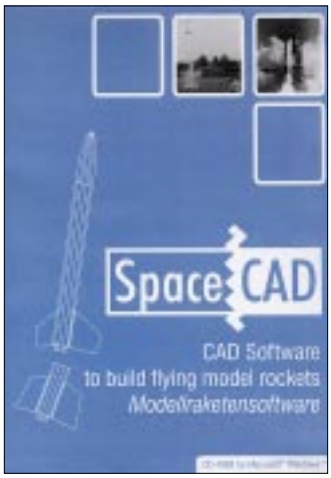
HAVE NEWS TO SUBMIT?
Send all submissions to that you would like to have posted to news@extremerocketry.com along with contact information.

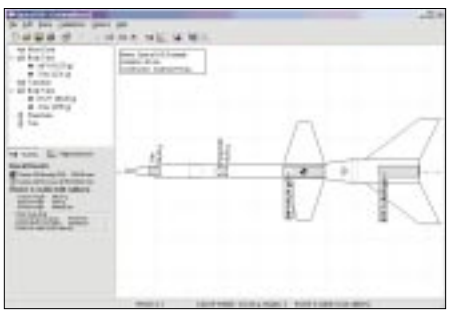
HOT PRODUCTS

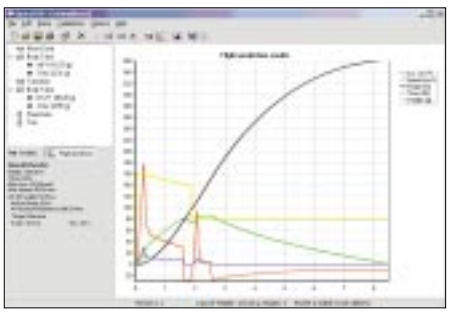
[new rocket stuff]

SpaceCAD software

SpaceCAD, with more than 3500 downloads worldwide, is the award-winning model rocket software for Microsoft Windows. SpaceCAD calculates the stability of model rockets by automatically determining the stability of model rockets (the center of gravity and center of pressure). It also predicts the flight of model rockets, to find out how high it will fly. SpaceCAD supports model rockets with multiple stages. It gives recommendations on parachute size and best delay times for self-built model rockets. SpaceCAD looks back on a successful history in Europe where it has been available since 1997. It soon became the market-leading software to design model rockets. SpaceCAD has been available internationally since December 2000 and has been rated five out of five cows by Tucows.com. Visit the website for more details at www.spacecad.com.







DG&A Defender Rocket

Defender rocket kit has three fins with a futuristic look (as well as a nozzle finned area). The rocket accepts motors ranging from 54mm to 38mm in diameter (with use of a 38mm adapter). The following motors are recommended: 38mm: I211W, I284W, J350W; 54mm: J275W, K185W, K550W.

Length: 87"
Diam.: 4"
Body tube: Kraft paper
Fins: 1/4" 5-ply birch (thru the wall fins)
Engine mount:54mm.
Launch lug 7/16"
Weight: 4-5 lb.
Recovery: 48" ripstop nylon chute
LIST PRICE: $140.00; SALE PRICE: $129.99

$12.00 S/H within the U.S. Call for info. on shipping international parcel post. See www.dgarockets.com for details.

Rocky Mountain Rocketry

http://www.RockyMountainRocketry.com 801-566-2965 801-808-0443

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How to figure shipping:
The shipping charge is shown in each box for each type of product. Your shipping charge will be the highest of those charges.
Utah residents must add 6.6% sales tax to their totals.

Rocky Mountain Rocketry is owned and operated by David Urbanek and Ron Weigel. We're rocket enthusiasts who want to bring you the very best of scratch building supplies.

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OD	3/32"	1/8"	3/16"	1/4"	3/8"	1/2"
1.14"	**$1.00**	$1.20	$1.20	$1.40	$1.70	$2.70
1.53"	$1.30	**$1.00**	$1.30	$1.50	$1.80	$2.80
2.15"	$1.40	**$1.10**	$1.40	$1.60	$1.90	$3.00
2.56"	$1.50	**$1.15**	$1.50	$1.60	$2.00	$3.10
3.00"	$1.60	$1.60	$1.60	**$1.30**	$2.20	$3.20
3.90"	$1.80	$1.85	$1.80	**$1.50**	$2.40	$3.50
5.38"	$2.40	$2.40	$2.40	$2.50	**$2.40**	$4.30
7.51"	$3.40	$3.40	$3.40	$3.60	$4.80	**$4.35**

Recommended sizes are ***indicated*** above.
Bulkheads, subtract $0.50 from the above price.
When ordering, tell us what type of tube the centering ring is intended for so we can properly size the.
Clusters: Add $2.00 per additional hole after first.
Shipping: $4.50

Body Tubes

Flexible Phenolic

Size	length	
1.14" (29mm)	36"	$5.25
1.53" (38mm)	36"	$6.25
2.15" (54mm)	36"	$6.75
2.56"	36"	$8.00
3.00"	36"	$8.50
3.90"	36"	$10.25
5.38"	48"	$22.75
7.51"	48"	$27.50

Kraft Paper

Size	length	
0.95" (24mm)	24"	$2.50
1.14" (29mm)	24"	$2.75
1.53" (38mm)	24"	$3.75
2.15" (54mm)	24"	$4.50
2.56"	30"	$3.75
3.00"	24"	$5.50
3.90"	24"	$6.50

Cutting: $1.00 per cut. Slotting: $2.00 per slot
Shipping:
Single or nested tubes to 3.00" $4.50
More than 1 tube or tubes over 3.00" $10.00
5.38" Tubes $15.00
7.51" Tubes (per tube) $8.00

Couplers

Flexible Phenolic

Size	length	
1.53" (38mm)	3"	$0.60
2.15" (54mm)	4"	$0.75
2.56"	5"	$1.25
3.00"	6"	$1.50
3.90"	8"	$2.75
5.38"	11"	$5.75
7.51"	15"	$9.75

Full length couplers in phenolic cost the same as a body tube of that size.

Kraft Paper

Size	length	
1.53" (38mm)	4"	$1.50
2.15" (54mm)	5.75"	$1.70
2.56"	6"	$2.10
3.00"	6"	$2.70
3.90"	6"	$3.30

Shipping:
Single or nested tubes to 3.00" $4.50
More than 1 tube or tubes over 3.00" $10.00
5.38" Couplers $15.00
7.51" Couplers (per 2 couplers) $8.00

Nose Cones

LOC/Precision

Size	length	
1.53"	8"	$8.25
2.15"	9.5"	$9.25
2.56"	9"	$9.30
3.00"	11.25"	$13.25
3.90"	12.75"	$15.00
5.38"	13"	$35.00
5.38"	21"	$45.00
7.51"	22"	$60.00

Public Missiles Ltd

Size	length	price
2.15"	9.5"	$9.50
2.56"	11.25"	$11.25
3.00"	13.25"	$14.25
3.90"	16.75"	$16.00

AeroTech

Size	length	
2.56"	12.5"	$10.75

Shipping: Up to, and including 4" nose cone.. $4.50
5.38" or larger $10.00

Shock Cords!

4mm Nylon Cord (light rockets)
Per foot $0.15

5/16" tubular nylon (average rockets)
Per foot $0.20
10' with 2 loops $4.00
20' with 2 loops $6.00
30' with 2 loops $8.00

3/4" tubular nylon (big rockets)
Per foot $0.30
20' with 2 loops $8.00
30' with 2 loops $11.00

1" tubular nylon (serious mondo rockets)
Per foot $0.40
20' with 2 loops $10.00
30' with 2 loops $14.00

Shipping $4.50

Motor Tubes

Flexible Phenolic

Size	length	
1.14" (29mm)	12"	$2.25
1.53" (38mm)	12"	$3.00
1.53" (38mm)	18"	$4.25
2.15" (54mm)	12"	$3.25
2.15" (54mm)	18"	$4.60
3.00" (75mm)	36"	$8.50
3.90" (98mm)	36"	$10.25

Kraft Paper

Size	length	
0.95" (24mm)	5.5"	$0.75
1.14" (29mm)	11"	$1.25
1.53" (38mm)	11"	$1.75
2.15" (54mm)	17"	$3.00

Shipping:
Single or nested tubes to 3.00" $4.50
More than 1 tube or tubes over 3.00" $10.00

Hardware

Motor Retainers
Small (24mm to 29mm) $1.50
Medium (38mm) $2.00
Large (54mm +) $3.00

Wire Eye Bolts
#10 ..... $0.50
1/4" $0.60

Forged Eye Bolts

1/4"	500 lb.	$3.75
5/16"	900 lb.	$4.00
3/8"	1300 lb.	$4.45

U-Bolts

1/4" x 1"	455 lb.	$1.10
5/16" x 1"	610 lb.	$1.50
3/8" x 1"	1090 lb.	$2.15
1/4" x 1 1/2"	455 lb.	$1.20
5/16" x 1 1/2"	610 lb.	$1.60
3/8" x 1 1/2"	1090 lb.	$2.45

Quick Links

1/8"	132 lb.	$1.10
5/32"	176 lb.	$1.20
3/16"	440 lb.	$1.35
1/4"	660 lb.	$1.50
5/16"	1540 lb.	$2.25

Fin Cans
38mm $25.00
54mm $25.00

Shipping: $4.50

Top Flight Parachutes

Round Chutes

Size	rocket weight	
9" (reg or thin)	1 oz.—2 oz.	$4.00
12" (reg or thin)	2 oz.—5 oz.	$4.95
15" (reg or thin)	3 oz.—5 oz.	$5.95
18" (reg or thin)	5 oz.—10 oz.	$6.90
24"	10 oz.—1 lb.	$8.75
30"	1 lb.—1.5 lb.	$12.30
36"	1.5 lb.—2 lb.	$15.15
45"	2 lb.—3.5 lb.	$18.95
50"	3.5 lb.—4.25 lb.	$21.80
58"	4.25 lb.—6.5 lb.	$25.60
70"	6.5 lb.—9 lb.	$35.10
84"	9 lb.—13 lb.	$56.95
95"	13 lb.—17 lb.	$66.45
120"	17 lb.—26 lb.	$75.95

X-Type Chutes

10" (reg or thin)	1 oz.—2 oz.	$8.15
18" (reg or thin)	3 oz.—7 oz.	$8.05
24"	6 oz.—12 oz.	$8.95
30"	10 oz.—1 lb.	$13.25
36"	1 lb.—1.75 lb.	$17.95
42"	1.25 lb.—2.25 lb.	$18.95
48"	1.5 lb.—3 lb.	$22.75
54"	2.25 lb.—3.75 lb.	$25.60
60"	2.5 lb.—4.75 lb.	$28.45
70"	3.25 lb.—6.5 lb.	$37.95
80"	4.25 lb.—8.5 lb.	$56.95
90"	5.25 lb.—10.5 lb.	$68.30

Colors: Orange, Pink, Black
Shipping $4.50

Electronics

Olsen Advanced Electronics
FCP/M2 ..... $150.00
Shipping $7.50
Express shipping $15.00

The M2 is a complete package. Everything you need is included: cables, mounting hardware, instructions and even a battery!

All the features you need:
* G Switch launch detect
* Altitude change launch detect
* Flight data recording
* Apogee deploy
* Main deploy (pick your altitude)
* Mach delay (pick your time)
* Simple menus to set up, uses LCD to configure)
* Visual and audible indicators for ready status.
* Maximum altitude displayed on LCD display.
The most versatile and easy to use altimeter on the market!

Chute and Shock Cord Protectors

Chute Protectors

Size	tube size	
3" x 3"	up to 1.5"	$2.80
9" x 9"	up to 3"	$4.75
12" x 12"	up to 4"	$5.65
18" x 18"	up to 6"	$8.55
24" x 24"	up to 8"	10.45"

Shock Cord Protectors

Length	
36"	$8.55
60"	$14.25
36" retro-fit	$11.35

Shipping $4.50

Launch Guides

ACME Conformal Lugs

Tube Size	Rod Size	
1.64" (38mm)	1/4"	$3.75
1.64" (38mm)	1/4" (standoff)	$3.75
2.26" (54mm)	1/4"	$3.75
2.26" (54mm)	5/8 (standoff)	$3.75
3.10"	3/8"	$4.75
3.10"	1/2"	$4.75
4.00"	1/2"	$4.75
4.00"	3/4"	$4.75
6.15"	3/4"	$4.75
7.67"	3/4"	$4.75

ACME Conformal Rail Guide

Tube Size	
1.64" (38mm)	$3.75
1.64" (38mm) standoff	$3.75
2.26" (54mm)	$3.75
2.26" (54mm) standoff	$3.75
3.10"	$4.75
4.00"	$4.75
6.15"	$4.75
7.67"	$4.75

Standard Size Rail Buttons
Nylon (pair with extra screws) $1.00
Delrin (pair with extra screws) $2.00

LOC/Precision Paper Lugs
1/4" (pair) $0.50
1/2" (pair) $1.00

Shipping $4.50

Dave and Ron wish you all, happy flying in 2002!!!

[by: tim quigg]

Words of Wisdom

addressing commonly asked questions in rocketry

"Gloving Up"

One of the first things I was told by my mentor upon my entry into high power rocketry was that I needed to wear some type of protective barrier on my hands when working with epoxy resins. For years now, I've been using those "one size fits all" exam gloves one can purchase by the box at their local drug store. So imagine my shock when I found out apparently there is a particular type of gloves one should use! Here for years I thought I had been protected. It would appear that this was not the case.

One should not wear latex gloves when working with epoxy. Latex is the widely accepted barrier used by emergency services personnel for protection from biological hazards. However, some of the hazardous chemicals in epoxy will diffuse right through latex. I learned long ago that barrier creams by themselves also do not provide adequate protection.

Here's what I just recently learned. Several years ago, a technical/safety expert at the Hexcel Corporation (makers of epoxy resins and laminate components) strongly recommended vinyl gloves. Vinyl exhibits sufficient resistance to the chemicals found in epoxy. Another factor often overlooked by beginning rocketeers is proper ventilation while using epoxy resins. Even though epoxy doesn't smell as bad as some other resins, some of the relatively odorless components can be hazardous in vapor form.

The bottom line folks is that EVERYONE will eventually develop an allergic reaction to epoxy, over time and with sufficient exposure. Some people have experienced this after only just a few exposures. With other folks, it may take years. The frequency and amount of each exposure seems to have a lot to do with it, and the effects are cumulative. So far, I have not developed any reactions to epoxy resins, perhaps I'm "living on borrowed time" as it were. Please folks, don't make the mistake I did. Make sure the next box of gloves you purchase are VINYL gloves, and that you use them every time you work with epoxy. We all want to see you enjoy this hobby for many years to come!

Fiberglassing Fins for Beginners

Stanley Plummer of Novato, CA sent me an e-mail back in January, asking for help on fiberglassing fins. As a beginner, he was having problems understanding the basic concepts. Well Stanley, let's see if I can help you and other beginners out there.

First of all, let me say there are many different fiberglassing techniques out there. I'm not saying the method I use is the best, just that it's the one that works best for me. The topic of fiberglassing can be the subject of a rather lengthy, in-depth article of itself, but I'll try to simplify it here. The technique you use to fiberglass fins depends upon the materials involved. I prefer G-10 as opposed to plywood, only because I'm inherently lazy and don't like sanding wooden fins! When dealing with G-10 fin material, I like to first rough up the fins and the body tube with at least 80-grit sandpaper. My own personal preference is to use 1.5 or 2-ounce cloth. I cut the cloth so that it will be wide enough to go up the side of each fin about one to two inches, down across the body tube and across the next fin to the same length. Mixing up a batch of 30-minute epoxy, I apply a thin, even layer of resin to this area with an old credit card, driver's license or similar tool. I then place the pre-cut and sized piece of fiberglass over this area, pushing down on it with a gloved hand ensuring all of it is wet. Again, taking the improvised resin tool, I "squeegee" as much excess resin as I can out of the fiberglass cloth. When this step is completed, I let this dry before moving on to the next set of fins. Unless you are pretty good with one of those little electric power sanders, I'd blend the seams to the fins and body tube by hand. Yes, it is time consuming, but if you aren't skilled with the power sander, you can ruin your rocket project in very short order. Once you are satisfied with the looks of the joint during sanding, you can prime, sand and paint as usual. That's it Stanley, a very simplified example of basic fiberglassing. If you need further help, you can always post a question on Rocketry Online's discussion forum at www.rocketryonline.com.

A "New" Power Source for the Range

When I first saw the Prestone "Jump It" come on the market, I knew I had found an alternate power source for the range. Over the past year, I've found a great many uses for this neat little portable power pack besides jump-starting cars. On a full charge, it can power our club's 12-volt PA system all day with no problem. It can also be adapted to power a launch control panel and pads. Got a laptop computer? This baby will power your laptop all day long at the range, allowing you to run computer simulations on site. The "Jump It" comes equipped with a built in high-intensity flashlight unit that really helps to light up the area when loading up the range equipment in the evenings. Recharging is accomplished via a wall-charging unit included with the system. The Prestone "Jump It" and other generic spin-offs sell for around $70.00, but I have seen them on sale in stores like Wal-Mart and K-Mart for as low as $59.00. If your club is in need of a good, inexpensive and reliable power source for its ground support equipment, you might want to consider one of these little gems.

[by: tim quigg]

Choosing A Level 1 Certification Rocket

part two of a multi-part series

In the first part of this two-part series, various aspects to consider in the choosing of your level one certification rocket were discussed. Why you should avoid kits with "bells and whistles", the concept of the multi-role rocket vehicle, and the pro's and con's of 29mm motor mounts compared to 38mm motor mounts were discussed. In this issue, let's take a look at several other topics of interest to consider.

Design Parameter Considerations

If you plan to take my advice and go with a multi-role rocket kit design for use with level one and later level two certification, here are a few design parameters that I recommend for your consideration. Try to choose a rocket kit that is four-inches in diameter. The reason for this is simply because body tubes of this diameter are easier to get adult size hands down into for maintenance, repair work and flight preparation. Secondly, try to find a kit that is an easily workable length. The flight stability of some short, stubby rockets currently on the market can often times be questionable. For this reason, I would avoid them for certification flights. Too long of a rocket can also complicate things, adding unnecessary weight, and they are also sometimes difficult to work with as well as transport to and from the launch site. For this reason, I recommend a happy medium between 48 to 60 inches in length, with a moderately sized payload section. You can fly such a rocket vehicle with an empty payload for your certification flight. Later, the payload section can be adapted to the electronics you will undoubtedly want to dabble with later on down the road. The question of three fins versus four fins is somewhat of a moot point in my opinion. Four fins add more stability, but also add increased weight and drag during flight. Three-finned rocket designs have proven they are more than stable, reduce the vehicle weight, and overall drag coefficient. Finally, as I recommended earlier, go with a 38mm motor mount and purchase an adapter so you can fly the rocket on a wide range of 29mm and 38mm H and I motors. Depending upon your construction techniques and skill, a rocket vehicle outfitted in the manner I have described here will also allow you to attempt level two certification with a 38mm J350. When completed, (and depending upon how light you build) such a rocket vehicle as I have outlined here will weigh in at approximately three pounds—well within the lifting capacity of the 29mm H128.

Range Safety Booth at LDRS 20 (2001)

Component Materials

Another point to consider is the type of materials the rocket kit is composed of. Some manufacturers kit components consist of Kraft cardboard airframe and motor tubing, aircraft grade plywood fins and centering rings and plastic nosecones. Others supply their kits with standard or flexible Phenolic tubing, fiberglass fins and nosecones. The most complex rocket kits consist of components made up entirely of fiberglass. Adhering to my philosophy of "keeping it simple," I recommend a kit consisting of Kraft cardboard airframe and motor tubing, with plywood fins, centering rings and an inexpensive plastic nosecone. Using standard construction techniques, I have seen many rockets built of these materials successfully and repeatedly handle a wide range of rocket motors from low end H impulse motors up through J350's, without the fiberglassing techniques so often considered a requirement by many. Standard Phenolic tubing tends to be brittle and will crack or fracture easily. In my opinion, flexible Phenolic tubing is a better choice. Most recently, Public Missiles, Ltd. introduced a new airframe tubing. Called "Quantum Tube," this gray, seamless plastic tubing is re-writing the book on rocketry materials. Time will tell if this new product will change the way in which rockets

have been traditionally constructed. Given the choice between aircraft plywood fins and fiberglass fin material, I will go with fiberglass every time. This is more out of my own laziness than anything else. There is very little sanding and preparation needed, and unlike plywood fins, there is no need to seal them with several coats of epoxy sealer.

Keep in mind that by using such materials as Phenolic tubing, fiberglass fins and nosecones, you will also be increasing the overall total weight of your vehicle. I tend to build light, but strong. These may appear to be a contradiction in terms at first. However, once you have a few high power rocket designs under your belt, you will begin to learn how much epoxy to use, and where to safely shave off weight without compromising stability or structural integrity. I consistently build anywhere from one-half to one pound less than the manufacturer's estimated finished weight of their rocket kits. In all instances however, before you begin to build any rocket kit, be sure to first read the manufacturer's supplied instructions completely. Make sure you understand each step in detail first. These instructions should also outline what construction materials you will need, including what cure of epoxy to use, and any other special tools or materials that will be required.

Motor Retention

I might also interject here that you strongly consider the introduction of some form of motor retention system into the design of your rocket. For years, high power rocketry enthusiasts have used nothing more than a few wraps of masking tape to friction fit rocket motors into the motor mount tube. This technique has served many people well for years. However, a simple motor retention system with a hard point built into the rocket vehicle will virtually ensure that you won't loose a motor casing at ejection. Such an event would spell a certain and decisive end to the life of your certification vehicle and flight. There are many different types and designs of motor retention out there. Some are commercially manufactured, some are hand made. Many of these techniques are available for study through the rocketry-based Internet website "INFOcentral" at http://www.info-central.org.

The typical price range for a rocket of the design and materials I have outlined here will be between $60.00 to $100.00. Depending upon how much time you wish to devote to construction, you can plan on spending as little as one week to upwards of one month for assembly.

Painting of your rocket vehicle can be accomplished with as little as a couple of coats of a good quality sandable primer, and a couple of coats of compatible spray paint. I use Krylon brand sandable primer and paints, but have also used the bargain brands with equally successful results.

Level one certification will open a whole world of possibilities in the rocketry hobby for you. The easiest way to open this door of opportunity for you is to keep it simple and easy. After you have achieved level one certification, the sky is the limit. However, getting that certification, and doing it safely and correctly the first time out should be the ultimate goal of every beginning rocketeer with HPR aspirations.

Experimenting in rocketry is what the pioneers of this hobby relied on. It was a necessary step in getting our hobby where it is today, and is still necessary to keep it growing. By Stan Hazlewood

PHOTOGRAPHY **BRENT McNEELY**

GETTING STARTED IN EXPERI

British Team prepares for altitude attempt at Balls 2000, Black Rock Nevada.

MENTAL ROCKETRY

NASSA team prepare experimental rocket & motor for flight at Balls 2000, Black Rock Nevada.

The word "experimental" is a term that when used in rocketry, projects an image of danger and the unknown. When you speak of experimental rocketry, you will get varied responses from those of us involved in the hobby. Some avoid even speaking of it. There are others who try to wish it away as a threat to our existence. Then there are those of us who, having taken the time to study and learn about experimental rocketry, are excited about the prospect of taking our hobby one-step further on a personal basis. There are valid reasons for all the above perceptions, but as in most things in life, the more you learn about a subject the less the terms "danger" and "unknown" apply. I hope the information I impart to you will enlighten you as to the advantages and disadvantages of recognizing the experimental phase of our hobby. It may not be for everyone, but I believe that it does deserve a place that receives recognition, and therefore a set of rules and regulations that govern the safe and enjoyable use of the technology that is now available to us.

I think the term "experimental rocketry" is a misnomer. While participation in this sector of the rocketry hobby does require a certain amount of experimenting, mixing your own propellant is far from being an "on the edge" venture. There are volumes of information on how to safely mix propellants that are equal to, in fact superior to, commercially made propellants. I think the first order of business in validating the enjoyable task of designing and mixing your own propellant is to change the descriptive terminology of this

The first rule of safety... ...is knowledge.

activity from "experimental," to another more acceptable title such as "Level Four Rocketry." This would, in my opinion, accurately describe the giant step from our current method of certification into a new, exciting level of enjoyment of our hobby. It also would have another effect. My history is one of being involved in the insurance industry and I can tell you firsthand that there is a definite perception on the insurance company's part in the descriptive terminology used in applications for coverage. I can practically guarantee you of a declination if the word "experimental" is used in any part of the application. However, if the terminology used in any application projects a higher level of knowledge and ability, it stands to reason that the coverage will be looked at in a more favorable light. Therefore, you will not see the word "experimental" used again in this article except to indicate activities that will in fact pertain to experimenting. Our subject is now: Level Four Rocketry!

It is ironic that Level Four Rocketry was the level that was first used by rocketry pioneers. They were the true experimenters, as they had no manuals to follow, and no trial and error experiences to call on. Each and every step the pioneers took was truly experimental, and I might add, dangerous. This correlation between Level Four Rocketry then and now is truly a paradox. Their vision and persistence is amazing, especially when you consider their activities were viewed by most scientists at the time to be frivolous and had no immediate practical application to the scientific community. We, in the hobby, owe much to these individuals, and carrying on the legacy they started by recognizing Level Four Rocketry as a viable and needed part of expanding our hobby is to be commended and encouraged. To illustrate the needed challenges offered by our hobby I will relate to you the term BAR (born again rocketeers). In most interviews I've read, a lot of the prominent individuals in our hobby today are BAR's. The reason they give is one of newly found discovery of technological advances that offered excitement, opportunities and challenges. With the proper recognition of Level Four Rocketry, I feel that I can guarantee you an increase in participation in our hobby. This is a very real and exciting probability. As our hobby grows, so grows our opportunities and perceived legitimacy.

Building rockets and safety

Building rockets with the ability to use self-made motors can be divided into two distinct categories:

1. Using standard rocket kits or scratch built projects that use the normal 24mm thru 98mm motor mounts.
2. Using rockets designed with the purpose of using motors constructed with PVC products.

The first category allows you the use of re-loadable motors made and sold by major manufacturers, but only with certain modifications that will be required for safety reasons. The second category using PVC products requires careful control of pressures in order to ensure stability and containment of the thrust generated by high power propellants.

This brings us to the exciting part of Level Four Rocketry, the actual designing and building of a motor. I hope that you will find this as fascinating as we who are already constructing rockets and motors do. You should realize that there are practically no limits as to what you can achieve when you have control over the pressures, thrust, and duration of burn of a motor. The first step of Level Four Rocketry is getting applicable material and learning all about the subject. Fortunately, there is an abundance of material available to you that you should read and study before embarking on this type of activity. The most dangerous part of the activity is not knowing what you are doing and what parameters you must stay within. Learning this is not difficult. I'm 61 years old and not especially smart, as I

have absolutely no background in any technical area. I've constructed many rocket motors and tested each successfully, although some have been more successful than others. I exercise great caution in working with materials that are required to produce that wonderful burst of thrust that propels our vehicles high in the sky. This caution is a requirement, as safety is a basic rule of all forms of model rocketry

The first rule of safety is knowledge. As I mentioned above, there are volumes of information available to you to introduce safe and effective propellant mixing activities. One of the best I've seen is the CP Technologies package, which includes a very comprehensive book along with software to assist in your successfulness of designing and mixing propellants. CP also includes a catalog of materials and chemicals that you will be using, as well as sources of where these may be acquired. As you already have realized, our hobby has some of the most unselfish people in any hobby. Information is freely shared among all in our hobby. You may find that some are reluctant to share their "pet" recipes since they have spent considerable time in arriving at the formula and mixing technique, but there are a lot formulas that are available if you will just use the effort to ask. I personally have stuck with one formula and have perfected it to my satisfaction. It is a very "hot" propellant and can be used as an "end burner" as well as a "core burner." I have friends however, who are always tinkering with formulas to achieve certain effects such as color or smoke, etc. This may be in my future also. That is one of the most fascinating aspects of Level Four Rocketry. There are practically no limitations as to what you can achieve. It is very important to point out that before I attempted my first propellant batch, I spent considerable time reading and studying the hows, whys, dos and don'ts of propellant mixing. I also sought out people who had experience in mixing and asked for their advice and assistance. I obtained a wealth of information and first mixed inert ingredients to become familiar with working with the equipment and chemicals before I attempted to mix the actual ingredients. This way I built confidence in procedures that I would need to use precisely. Read, learn and ask. It will pay off in safety and effectiveness.

Safety Procedures

Starting from the top down, the first things you should protect are your eyes. As with any activity that requires use of equipment or materials that could pose a threat to your eyes, you should wear eye protection. The use of a face shield is preferred, but at the least, you should wear safety goggles. Since you will be working with chemicals, it would be recommended that you wear a dust mask. Other safety material should include protective gloves. I make it a practice to wear a shop apron when I am constructing motors. This may sound like overkill, but each item mentioned has a purpose and it is always better to be prepared for an unlikely event than to leave you in potential harms way. Also, a fire extinguisher should be on hand with sufficient capacity and proper rating for effective use.

All activities involved with rocketry can be as safe or as dangerous as you will allow. This certainly includes constructing rocket motors. So, if you elect to mix your own propellant, stay on the safe side.

Equipment

The second requirement of mixing propellants is the availability and use of the proper equipment. I will list a few items that are necessary for the proper formulation of a good and safe propellant. The first item you will need is an accurate triple beam laboratory balance that measures in the tenths of grams. I found a good one on e-bay and won it in an auction at a reasonable price. Waxed paper cups are required as chemicals used in formulations can attack plastic ones. You will need a mixing bowl (glass or other material that will not be subject to chemical corrosion) and a stirring rod. I use a wooden rod that I coated with a few coats of polyurethane. I have seen a lot of things used for mixing including spatulas. Whatever you use, make sure it's strong. The propellant, in its latter stages of mixing, will be of a very coarse consistency. Always keep the equipment clean! Propellant can stick to anything and it remains highly flammable for its lifetime. Cleanliness in the work area is a necessity. A bucket filled with water nearby is advisable, but ONLY if magnesium is NOT used in your formula. All propellant must be accounted for, and while assembled motors may be difficult to ignite, the shavings and residue are extremely easy to ignite and are volatile. This of course means you must have a safe and secure place to put your tailings of propellant. A Ziploc bag is a good place to put the propellant bits and shavings you will encounter while mixing. The trash bin is not a good idea so save the tailings for proper disposal at intervals during the process. Plastic spoons and knives are helpful when packing your casting tube with propellant. You should have duct tape and masking tape on hand. A drill is sometimes used when no mandrel is inserted into the casting tube to form the core of the propellant. It is mandatory that this drill be capable of SLOW rpm's in order to not generate heat when the core is drilled. You can even use a hand drill for this purpose. I use my drill press but open the top of it and let my wife or friend hand turn the spindle to drill the cores. This should give you an idea of just how slowly the drill should be turned! A notebook with carefully planned instructions should be at your disposal. There are other types of supplies and material that can be used during the mixing process but only in more advanced mixing than we are going to talk about in this article.

Preparation

It is a requirement that adequate preparation should be made before the actual mixing process. I have a notebook that I write the entire process that I plan on following. I break the percentages of each chemical down and list them next to the chemical name. I list these in the order they will be added to the mixture and I also make notes as to mixing require-

ments, etc. and put this under the chemical to keep myself aware of any special procedures I need to take when adding that particular element to the mix. I take nothing for granted and I DO NOT rely on memory when mixing. If it isn't written down, I don't do it. Writing all names, amounts, and mixing instructions down eliminates all reference to memory and ensures proper steps will be taken on each ingredient that is to be used. I also make sure I am mixing near an item that I can ground myself to on a regular basis to eliminate static electricity. This step should not be discarded; especially in the winter but also in all other seasons. You don't want a spark to ignite the propellant mix until it is safely in a rocket on a launch pad. The mixture will become subject to ignition when fuel and oxidizer are mixed together. This will be a "wet" mix, but don't be fooled. It will burn with an intense flame.

Also in the preparation, you will need to have the casting tubes ready so you can pack them with the propellant. You should have made a decision as to whether you want to use a mandrel for the core and then cut the grains into the proper length later (not my favorite method). Or, you should have the casting tubes already cut and ready to pack so you can drill the core later after the mix has cured. If you use this latter method of casting propellant, there is one preparation to the tubes that should be made. A short length of duct tape should be placed and stretched over the bottom of each casting tube. This will allow you to pack the propellant and have it even with the bottom of the tube.

You should have the plastic spoons, knives, mixing container (cleaned, of course) and the mixing rod handy. In fact, the mixing container and stirring rod should be on the triple beam scale in order to determine the tare weight. The balance indicator should be on the neutral line of the indicator. All calculated weights should then be added to this number in order to add the proper amount. You will be using tenths of grams to determine the proper amounts to add so establishing the tare weight is mandatory for accuracy.

I make a list of all equipment in my notebook in order to be prepared to complete the mixing process from start to finish. I want to emphasize, there should be nothing left to memory or chance. You also should mix only when there will be no phone calls or distractions. You want nothing electrical in your hands or near the mixture.

The mention of all the above listed recommendations may make mixing seem potentially dangerous. You should know that it is potentially dangerous if you don't set and follow proper guidelines. If you prepare properly

All activities involved with rocketry can be as safe or as dangerous as you will allow.

Bottom: NASSA team fin can. Top: NASSA team loads rocket onto custom rail launcher at Balls 2000, Black Rock Nevada.

Jason Blatcheim prepares Tomahawk rocket for launch at Balls 2000, Black Rock, NV.

and follow your preset guidelines, you only have to be careful in your procedures. This is why I practiced with inert ingredients before embarking on the use of actual chemicals (a process I recommend for you also).

Chemicals

There are many chemicals that can be used in formulating high power propellants. I have stuck with one formula because I like to keep things simple. The two most popular oxidizers are Ammonium Nitrate (AN) and Ammonium Perchlorate (AP). Each will produce a very high power propellant. Ammonium Nitrate is the preferred choice of CP Technologies and it produces a very effective propellant. Its only drawback is the availability of powdered magnesium that is used in the mix. Since the events of the terror attack on the World Trade Center, magnesium, in a powdered form has been regulated by the BATF. I do not know if this is permanent or not. I am hoping that its use in model rocketry will be de-regulated soon. So, with this in mind, I chose to use Ammonium Perchlorate since the use of aluminum is used in conjunction with it instead of magnesium. Ammonium Perchlorate must be used with caution since it can, under certain conditions, auto-ignite. It is imperative that you not allow it to become a dust cloud. If and when the regulations governing magnesium are lifted, I would recommend Ammonium Nitrate as an oxidizer because of the simplicity of the formula in comparison to that required when you use Ammonium Perchlorate.

A good formula using Ammonium Nitrate only involves three ingredients: Ammonium Nitrate, powdered magnesium and a binder (HTPB R-45). The use of my formula with Ammonium Perchlorate requires several more ingredients. But, I believe my formula produces a greater amount of thrust based on comparisons made with my mixing buddies who use Ammonium Nitrate, although they may disagree. My formula requires that I use a binding

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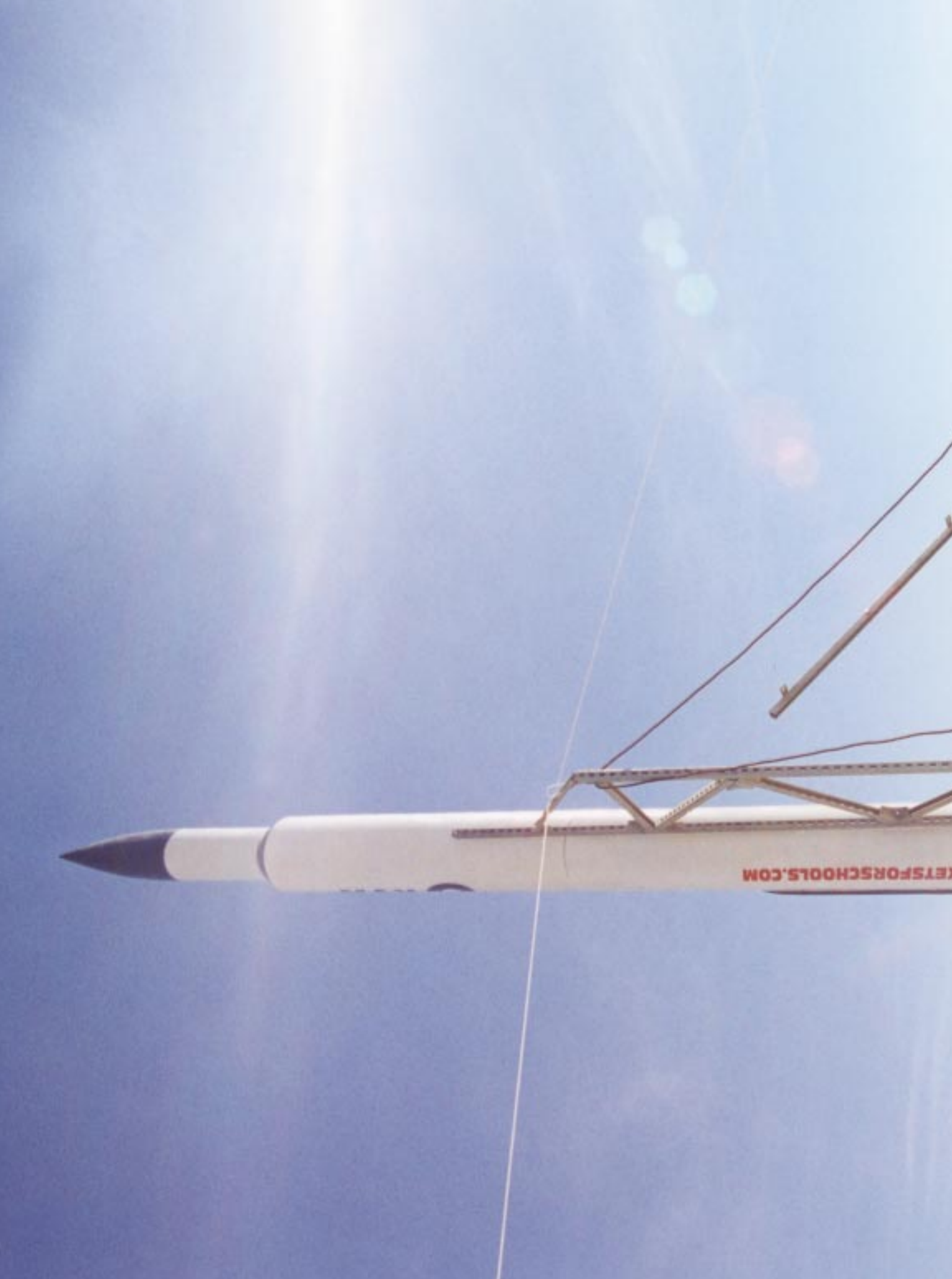
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extreme rocketry

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Win $100 for Rocket Photo Contest

We want more photos like this one to the left and we are willing to pay the big bucks for them (well $100 was the best we could do on our limited budget!). Take a photo of your rocket and send it to us at the address below. Make sure to follow our requirements listed here!

Requirements:

- Non-digital, color photo or slide (prints can be any size up to 8x10)
- Photos will not be returned
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About this Month's Centerfold

The Max-Q rocket featured in the centerfold was created by the Max-Q team of Mike Hobbs, Greg Davis, Brian Liggett, and Gary Silvers. This huge rocket stood over 24 feet tall and was 16 inches in diameter. The rocket weighed in at over 500 lbs on the pad. The big rocket was powered by a custom Q15,000 rocket motor with a nine second burn time. The motor by itself was six inches in diameter and almost eight feet long. The rocket performed perfectly with only one problem, the chutes did not fully deploy. As a result the rocket fell from apogee flat on its side. The rocket was unable to fly again.

Note: the Balls 2000 rocket launch was covered in Issue #7 of Extreme Rocketry (March 2001).

Write for Extreme Rocketry and Get Paid

Since the very first issue of Extreme Rocketry magazine we have paid for articles. Granted, what we pay isn't much, not like the big magazines out there. However, we feel the effort put in by the writer is worth something more than just a pat on the back.

Submission Guidelines

We publish a large percentage of the articles submitted, but not all of them. And, there may be significant delay before the article is actually printed—sometimes months may go by before an article is printed. Articles which are time sensitive like launch reports are included in the next issue or two or not at all. If there is a significant delay after a launch the article is never published. So, if you are writing a launch report or article get it in quickly along with some good photos or slides (no digital camera photos please!). If your local invitational launch has never been covered by Extreme Rocketry, chances are very good that if you write something that it will get published.

Construction articles, how-to guides, and other non-time sensitive articles are published as we can work them in. Typically we publish more of these kinds of articles in the winter when there are not so many launch reports.

Interviews are typically done by Brent McNeely. However, if you want to interview someone and type it up, we would love to have you send it in. If your submission is interesting and still contains a informal style it may be publishable.

Submissions should be sent in electronic form on disk, CD or by email. A hardcopy should also be mailed along with photos to 109 E. Charleston, Ste. 101, Las Vegas, NV 89104. Photo prints or slides are great, but please do not send digital camera photo files or prints from digital cameras (they will not be accepted).

Ideas for Articles

Have an idea for an article? Email us at info@extremerocketry.com with your idea and we'll help you get your submission headed in the right direction before we begin. Currently we are seeking launch reports for launches never before covered by the magazine, how-to articles, and technical pieces.

Payment

Currently Extreme Rocketry is paying 2.5¢ per word. Typically we can get about 800 words on a page with one or two smaller photos. For a single 800 word article we would pay $20 which is enough to buy a pizza or a rocket motor or two (well the smaller motors anyway!). Checks are cut after the magazine comes off the press. We typically send the writer a copy of the magazine containing the article along with payment based on the number of words written.

Questions?

The best way to contact us is by email at info@extremerocketry.com.

Author with Horizon 54 rocket

agent whose purpose is to bind the dry chemicals together. I also use a bonding agent to ensure that the propellant's ingredients do not separate from one another. My formula also requires a use of a plasticizer to thin the mixture so the viscosity is such that I can pack it into a casting tube. Finally, I use a curing agent whose purpose is to cure the propellant ideally into a rubbery texture after it is packed into the casting tubes. There are catalysts that can be used to increase burn rates and thrust and there are ingredients that can be used to produce colored flames. I would advise you to stick to the basics until you learn more about basic formulas. There are several companies who sell chemicals. Their primary business is the pyrotechnics industry, but several chemicals they market are used in model rocketry propellant formulas.

Testing

One of most enjoyable activities of making your own motors is that of testing. It is with testing that you perfect the delay times, the nozzle size, the chemical formulation and the burn times. It is helpful to use a video camera to record the tests as it will give you the burn time and allow you to see how long it takes from the first smoke you see to pressurize into an effective thrust. You can realistically put yourself in the shoes of Dr. Goddard when he was perfecting and testing his rocketry skills. You can identify any problems and apply remedies to the next batch. You can identify what improvements should or can be made. You can adjust burn times by using different core patterns to attain desired thrust curves. And yes, you can design propellants with superior performance to commercial products!

I have only been formulating propellants for a short time. I am thoroughly enjoying the experience. It has come in handy since the Aerotech accident. I plan on using commercially made motors for the most part but will continue my venture into "Level Four Rocketry" with excitement.

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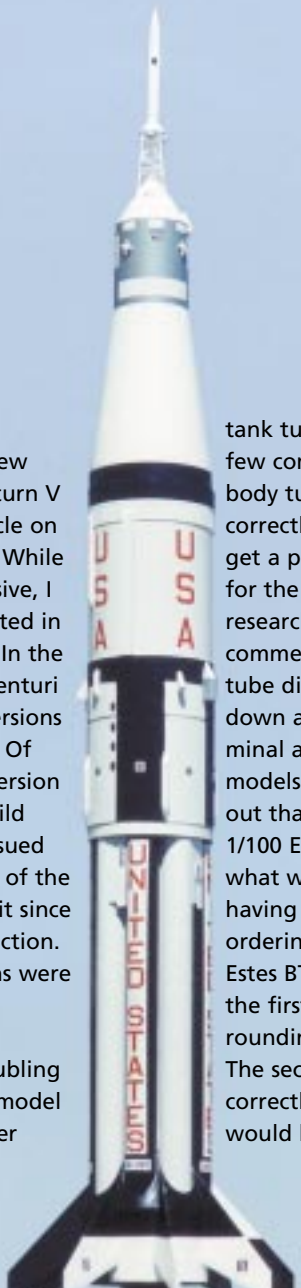
PO Box 461256 Leeds, UT 84746
435-879-6833
<stancy@infowest.com>

Part 1

building the

Apollo/Saturn 1b

1/50 scale



by: jeff brundt

Admittedly, I was inspired by Andrew Waddell's big Saturn V construction article on Rocketry Online. While the Saturn V is impressive, I am much more interested in the smaller Saturn 1b. In the past, both Estes and Centuri kitted model rocket versions of this NASA launcher. Of the two, the Centuri version was much easier to build and fly. Estes had re-issued Centuri's 1/100 version of the Saturn 1b in 1992 but it since has gone out of production. These two past versions were to be the basis for my upscale project.

One of the most troubling features in doing this model is the first stage booster tank tubes. There are very few commercially available body tubes that are sized correctly to evenly space and get a proper circumference for the first stage booster. I researched and listed all commercially available body tube diameters then sat down at the UniGraphics terminal and built some CAD models. I eventually found out that a 2x upscale of the 1/100 Estes kit would fit what was available without having to resort to custom ordering. I ended up using Estes BT-56 body tubes for the first stage tanks surrounding a 54mm core tube. The second stage or more correctly the SIV-B stage would be a LOC 5.68 diame-

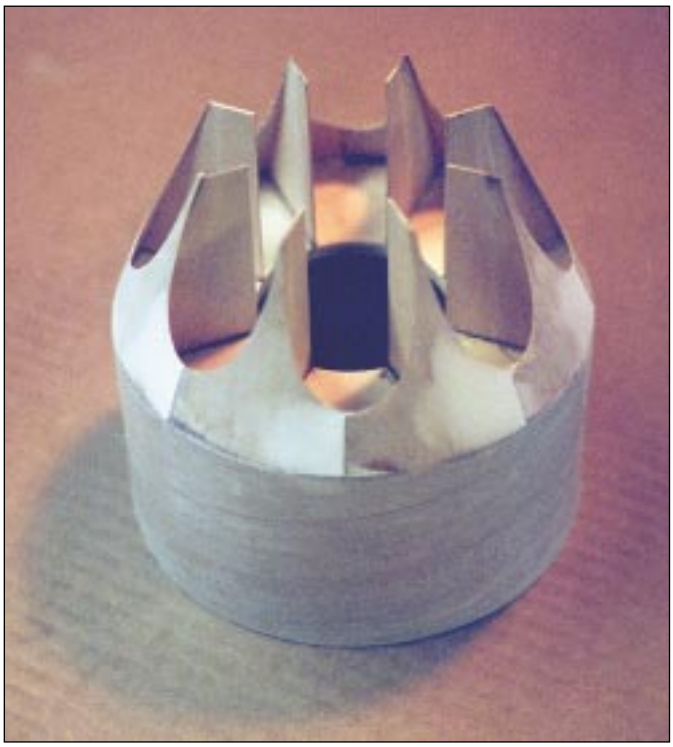
ter body tube cut down to 4.75". (a5a Andrews method for the Saturn V) The base of the first stage would be the stock diameter 5.68" body tube.

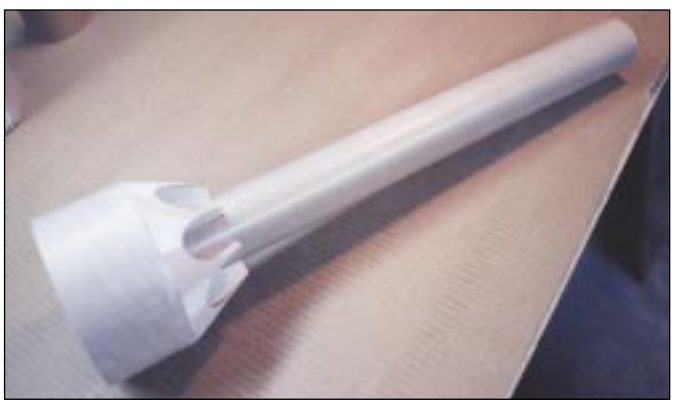
The hard part was now out of the way. I downloaded the plans for Estes 1/70 version of the Saturn 1b from JimZs web site. These plans were invaluable for making the command module capsule, LES (launch escape tower) and the fin assemblies. I plotted the shroud for the LEM on the UG and printed it out full size. The pattern was transferred to poster board and cut out. All of the parts I used to construct the Saturn 1b are available through any supplier of high power and model rocket components. (I ordered everything through Magnum.)

The kit was constructed very similarly to the Centuri/Estes version whereby the rocket is built-up and painted in various sub-assemblies, then final assembled, detailed, and decals applied. I will list each major component and the build process I used.

First Stage Fin/Tank Base:

For me, this was probably the second most complicated item to do. If you notice on the Saturn 1b, there is a shroud ring on the lower section of the first stage booster that surrounds the first stage fuel tanks. This shroud has scalloped cutouts to accommodate the booster tanks. I used the pattern from the Estes 1/70 plans and enlarged it to the size I thought I would need. I then made a poster board pattern and tried it out. It didn't work too well. The reason was the lower body tube of the first stage booster needed to be smaller in diameter than the 5.68" one I was using. Since I didn't want to cut this tube down and make more centering rings I needed to use something else. I finally hit on using thin 1/64" veneer ply. I cut out a single section needed to fair to the booster tank. I then split this in half, made a mirror pattern then glued a rib to the backside that would set the proper angle and setback from the core tube to the edge of the lower body tube. What I had now was one section of lower fairing that would go around one-half of a booster tank tube on either side. Now I had to make eight of these.



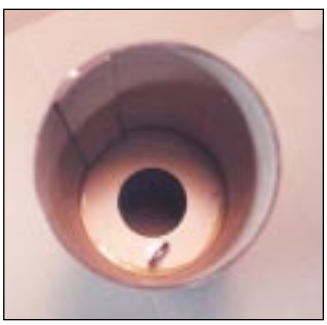


Veneer ply is very easy to work with and cut. You can use scissors or score with a knife and break it similar to sheet styrene. It is available at most hobby stores. Its a little pricey per sheet since it is so thin. I made my eight sections one at a time. First, I cut the lower body tube to the right length, glued in the centering rings, and marked out my eight equal sections. Then I started gluing the fairing pieces down using CA. I had little short sections of BT-56 left over from cutting the booster tubes to length and used these for spacing and fit checks. I did each section one at a time checking the fit and trimming where necessary. The total job took about two nights to do. But, it was well worth it.

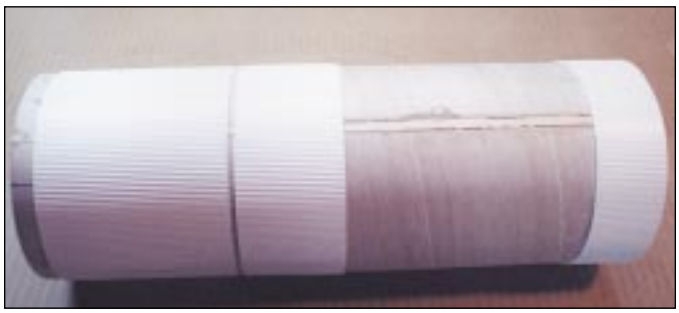
After the unit was filled and sanded, I glassed it using 3/4 oz glass cloth and epoxy finishing resin. The weave was then filled and sanded smooth.

Main Body Tube:

Next up was the main body tube. This started out as a 5.68" diameter LOC payload section. It was cut to length then run on a table saw lengthwise to remove enough material to reduce the diameter to 4.75". I saved the section I removed to use as a splice joiner later. To get the tube to hold a circular shape I took the LOC 5.68"/54mm centering rings and cut the diameter down to 4.75". I did this by taping the rings together, marking the new circumference and trimming them on the band saw. These centering rings are what were used to keep circularity and diameter on the tube. The centering rings were inserted and the splice was epoxied in place with 30-minute epoxy then taped and left to dry. After the splice joint cured, the centering rings were glued in place



joint, filled it, and then sanded smooth. From three feet away you cant even tell. Painting made it even less



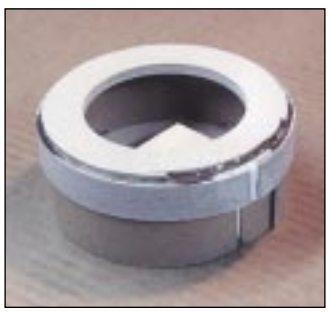
noticeable. The overall effect with the corrugations is well worth any minor cosmetic issues.

with 30-minute epoxy. There ended up being a gap between sides of the longitudinal cut in the tube. I filled this with scrap balsa and sanded it smooth. I then marked the upper end of the tube to trim off about a 1 section to be used as the base for the LEM Shroud/Command Module Stack.

Now it was time to apply the body wraps. I wanted to have the body corrugations on my model just like the full size Saturn 1b. I used Evergreen Styrene sheets with .10 ribbed spacing on them. These can be found in most hobby shops that sell model railroad supplies. There are many different sizes and styles. The sheets I bought were 6"x12" and come three to a pack. I used three packs for the body wraps. I measured off my 1/100 model and cut the sheets to strips of proper width. Since the sheets are only 6" wide, they needed to be put on in sections to do the entire circumference. The only drawback to this whole process was the need for a good seam between joints. It turned out rather well. I masked off three or four rib spacings on either side of a

LEM Shroud/Command Module Stack:

For this assembly I used the ring previously cut from the main body tube, a cut down 5.68" tube coupler, a 3" LOC body tube, a 1/8" thick ply 5.68"/3.00" centering ring



reduced to 4.75" diameter, a poster board LEM shroud, a paper nose cone and a 3" tube coupler as a nose cone base.

I epoxied the cut down centering ring into one end of the main body tube ring. I left about 1/8" exposed at the top for the LEM shroud to attach to. I then cut down the 5.68" tube coupler so it would fit in the main body tube. I left about an inch and a half shoulder to seat into the main body tube. The coupler also has a slot or keyway that fits the doubler in the main body tube. This feature prevents the nose section from rotating on the main body. After the couple tube is set and a good fit achieved, I epoxied a solid ply bulkhead at the bottom of the couple ring. The screw eye of the recovery system will pass through here and it makes a nice solid base.

Next, I epoxied in the service module body tube. Alignment was an important issue here so I took my time and made careful measurements. This was to make sure that the completed assembly wouldn't look crooked when the whole rocket was together. After the epoxy cured, I

installed the paper LEM shroud. I had drawn out and cut this pattern earlier then put it together using super tacky glue and an iron. Basically, you attach the glue tab to one edge of the seam, let it dry then apply the same glue to the other half of the tab and let it partially dry. Let your iron heat up while you do this, not too hot though, about 300 degrees should be fine (I use a Monokote iron for my model airplanes). You will also need a dowel of some sort to back up the joint when you iron it. I use a scrap piece of closet hanger dowel rod. Let the end of the dowel rod hang over the end of your workbench and support it so it will take some pressure when you iron. Then take your shroud, align and join at the seam, slip over the dowel rod and iron the seam. You won't have to hold the iron there long. Move it up and down the length of the seam for a few seconds. The glue will reactivate from the heat and produce a strong bond.

I then fit checked and aligned the shroud to the body tube and base. When everything was where it needed to be I epoxied the assembly together. To make the shroud more durable I glassed it with 3/4 oz. glass cloth and Z-Poxy finishing resin. After sanding to remove excess cloth, I filled the weave with lightweight spackle and sanded smooth.

The Command Module capsule came next. I had sized the paper pattern from the Estes 1/70 scale version so it would fit on the 3" body tube. I photocopied it onto cardstock. The pattern has panel lines and details

marked on it. Since my model will replicate an actual launch condition vehicle, these markings are not required. The boost protective shroud is all white. The pattern on the Estes sheet is basically an arc and if you cut it out as shown by the lines, you will get a conic section with no tip. That's because the Estes kit used a balsa turning for the top of the cone. I modified the cut by extending the seam edges up to the theoretical center of the arc lines. When the pattern was folded and ready for joining I had a cone. There was a small hole at the tip due to the nature of trying to make a paper cone. I'll tell how I dealt with this later. I overlapped and glued the seam with my super tacky glue and let it dry. I then cut a 3" tube coupler section to about 1" in length. This is the shoulder of the nose cone. Once again, I measured carefully to make sure everything was aligned then temporarily CAed the coupler in place. I then ran a bead of epoxy around the inside joint between the cone and coupler. A paper cone is a bit flimsy so it needed some reinforcing. I inverted the cone, mixed up a larger than normal amount of 15-minute epoxy and poured it into the inverted coned. This plugged up the small hole at the tip and added some nose weight. I used my heat gun for Monokote to get the epoxy to flow better. Heating epoxy has the added benefit of making it cure faster. After the epoxy cured, I sanded the tip to shape and was ready to glass it. I glassed the outside of the cone with 3/4 oz. glass cloth and Z-poxy finishing resin. I made sure to put tape around the coupler so I wouldn't mess that up. After the epoxy cured, I removed the excess cloth, filled the weave with lightweight spackle and sanded smooth.

I now needed to add some base pieces for the LES tower. These were 3/16" dowel sections cut with a matching angle to the capsule so the tops would be parallel to the ground plane. I held some sandpaper on the cone and sanded the mating surfaces of the LES bases to match the cones contour. After they were all shaped and correctly sized I CAed them in place. I filled any gaps with lightweight spackle and sanded smooth. Next, I located the centers on each dowel top and drilled a 1/16" hole for the support wire I was going to use to attach the LES tower to the nose cone. The basic LEM/Service Module/Command Module stack was now completed. There would be extra detailing to come later.

LES Assembly:

I wanted on this model a

scale and durable LES (launch escape system) tower. I had previously made one for my Boyce Aerospace Redstone and modified it for flight use. That one had suffered minor damage from time to time but I knew I could build a better one. I decided to use brass tubing. The Estes 1/70 version came to my aid again. The LES tower for that version used wood dowels glued together. I would substitute brass for wood and solder for glue. I scaled the Estes plans accordingly and built a jig. All the horizontal crosspieces fit into the vertical legs because I drilled holes to accept them. These would be stronger joints because the parts would physically interlock and be soldered. I built the basic tapered box shape adding

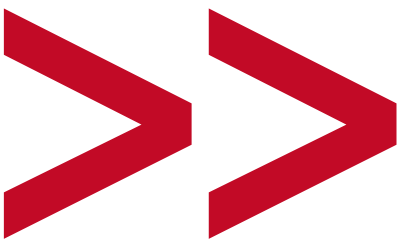
one side at a time. When I was done, I carefully heated the joints and aligned and straightened where needed. I then started to add all the little diagonal cross members. The central ring was formed around a 3/8" drill bit shank and the ends soldered together. The whole process was not that tedious and took me about two to three hours over two days. The end result was worth it.

For the top of the tower where it attaches to the rocket motor, I cut out a solid brass circle and soldered it to the top. To this circle would be attached the lower shroud of the rocket motor and the LES motor tube and nosecone. The shroud was laid out and drawn in Unigraphics. The LES rocket body is a BT-5 body tube cut to length with a balsa nose cone from my Estes Designers Special box. The pieces were all test fit and then put aside for assembly later.

Part two of this article will apear in next months issue.

DAVE TRIANO

David Triano is best known in rocketry as the founder of Shadow Composites, Inc., a rocket company specializing in composite material rocket kits, advanced materials, and components. He is an advocate of experimental rocketry. Dave's primary occupation is as an Industrial Designer of Automotive, Marine, and Aerospace products. He lives in the Lake Tahoe area of Northern California, only a couple of hours drive from Black Rock, Nevada. Interview by Brent McNeely.



Editors Note: The following rocket personality interview contains comments and opinions which some may find objectionable or controversial. The views, comments and opinions expressed in the following interview are solely those of the interviewee, and do no necessarily reflect the views and opinions of Extreme Rocketry Magazine, its editors or staff.

Where did you grow up?

We moved to Lake Tahoe when I was eight, and I spent most of my time growing up here. I'm currently living in South Lake Tahoe.

What was your first experience with rockets?

When I was eight years old, I sold greeting cards door-to-door in order to save enough money to get the Centuri Screaming Eagle Starter Kit. After I finally got the kit, I flew it until it fell to pieces. I got over twenty flights with that rocket. From that time on up until high school, I think I flew every Centuri rocket kit there was. I didn't like Estes products very much. I liked the Centuri and Flight Systems stuff, so I built those. Eventually I became involved in tennis and that ended up taking up all my time. So, that sort of took away from the rockets and I quit flying them about my sophomore year of high school.

What were your career aspirations after high school?

At that point, I had dabbled in professional tennis, but I soon realized I didn't have the commitment it took to be a professional tennis player. So, I fell back from the athletic pursuits to the more intellectual ones. I had a strong love for the ocean, so I went to study marine biology at Humboldt State University in Northern California. I studied there for awhile, but eventually became disillusioned with it because I learned the only jobs you could get with that degree were working for oil companies or writing textbooks. Neither of these jobs sounded very fun to me.

I got to know at a very young age how to work properly with advanced composite projects.

When did you start your snowboard company?

After I left school, I returned to Lake Tahoe and started my snowboard company called Shadow. This was in the early 80's, before snowboards were popular. I was involved in the evolution of that from the beginning. Back then, there were only a few very small groups of people involved in snowboarding. There was a small group in Canada, another in Colorado, one back east, and our group in Tahoe. There were very few people doing it. So, I started my own snowboard company making composite snowboards.

When did you start learning methods of composite work?

From age 12 or so, my father and I had built home-built aircraft. However, my father had developed epoxy sensitization early in the building process. Due to this, I became the official laminator for all our aircraft projects. I got to know at a very young age how to work properly with advanced composite projects.

When did you go back to school?

I went back to school at the Art Center College of Design in 1987 to study Transportation Design. We had a family friend who was actually a pretty famous car designer. He showed me what he did and I thought I could do that as well. Art

Dave at Delemar, NV

Center is one of the top two schools in the world for automotive design. I finished my degree there in a little over two years with no breaks. I got the highest GPA ever recorded there in a Bachelor's of Science, Engineering in Transportation Design degree.

Where did you work after completing school at Art Center?

I was hired right out of school by Toyota. I worked in their facility in Newport Beach called CALTY, which is an acronym for California Toyota, and is their advanced styling studio in Newport Beach. I worked there from 1990 to 1995. While I was there, I did a lot of futurist design for cars 10 and 20 years in the future. I also designed the 1998 Toyota Corolla, and was heavily involved with the Lexus RS300, and the Toyota Solara.

When did you start designing boats?

I moved out to Kansas in late 1995 to work for Cobalt Boats. They are known as the finest recreational boat company in the world. I worked for them as their chief designer for a couple of years. Eventually I got really tired of Kansas. It is a tough place for someone to live who grew up around mountains.

When did you start your own design company?

In 1997 I moved out to Big Bear Lake in California (near Lucerne) to start my own design studio. I had kept the Shadow name from earlier when I used it for my snowboard company. I reactivated the name, added "Composites" and used it for my marine and aerospace design company. In that capacity we've done a lot of work for companies like Regal Marine, Toyota Marine Sports, Kawasaki Watercraft, and Malibu Boats, We do all of the concept design work all the way up to the finished mold. It is a real turnkey operation, utilizing the most advanced CAD systems available.

When did you start the rocket company?

I started the rocket part of my company in 1998. I got involved in rocketry again because I was right across the hill from the Lucerne Test Range. I had heard about guys launching rockets out there, and they were bigger rockets than the little model rockets I remembered. So, I hopped over there and saw a couple of launches. At the time, I thought it was pretty interesting, but also thought I didn't really want

Dave Triano, Frank Kosdon, and Eugene Trubowitz at Delemar, NV.

Our credo is, "You are what you build."

to get into it because it was a very expensive pursuit. I finally decided to get the best kit out there, build it, and have a good time with it. I did my research and found what I thought was the best kit. It was all G10 fiberglass, which was reportedly the best material. I ordered it, got it, built it, and built it perfectly because I knew how to use these materials. I flew it a couple times and then the thing came down, hit the only little rock on the entire lakebed, and shattered to pieces. I was really disappointed with that. I thought to myself, "This is state of the art?"

When did you build your first advanced composite materials rocket?

It just so happened that I had a few small projects in the marine industry which used rather advanced materials like carbon/epoxy filament wound tubes. I had some overage on the parts production, which I decided to use to make a few rockets. I was basically trying to justify a little business thing in the hobby. A lot of guys do that. My first rocket was the Raven. This rocket, to my knowledge, was the first all carbon fiber kit offered to the high power hobby (I'm told that people have advertised them before, but I've never actually seen one). On my first run, I made 20 of the kits and hand tooled everything. I sold all of those and people really liked them. People were asking for more and more. I grew this little business slowly and let it progress as God wills it. Our credo is, "You are what you build." We are all about making a rocket as light, strong, and as high performance as possible. With the 40mm Raven EX and 54mm Shock, flyers now have two all carbon fiber extreme performance rockets to choose from that use real aerospace technology in every component.

What are your goals for Shadow Composites?

Right now its fine; it is pretty much where I see it. If God wills this business to become larger in the industry, then that's fine. I see the company just going where it naturally wants to go. I would like to further automate our order and record keeping abilities as time and capitol allows.

What are some of your other rocket business dealings?

I've teamed up with Dr. Frank Kosdon and the department chair of mathematics at a school called ETH in Zurich, Switzerland. That is the same school that Einstein taught at. His name is Dr. Eugene Trubowitz. We utilize my knowledge of composite engineering with Dr. Kosdon's obvious rocket motor credentials and Dr. Trubowitz' extreme simulations skills on a Cray supercomputer to create an ultra-low mass fraction rocket motor—a motor in which the casing is carbon fiber. In addition to carbon fiber in the casing, boron is also

used and other materials that make it very special. There are many other carbon-cased motors out there now, but they don't really optimize to the point we do.

What applications are carbon cased motors used for?

The Orbital Pegasus was the first all carbon fiber/epoxy rocket. Some of the Lockheed products like the GEM motor (which stands for Graphite-Epoxy Motor) are constructed of similar materials, but they are mainly used as low mass fraction expendable boosters (strap-ons) for heavy lift capability. We are aiming for the ultra-high speed research market. There have been some studies in hypersonic research that have recently taken a swim in the Pacific. One was on the nose of a Pegasus that went out of control. We want to offer a less expensive way to achieve those same high speeds for research purposes. We have been in an ongoing test program for the last year and a half in developing the motor design for this project In hobby rocketry terms, theses are about an O class of motor. These have carbon cases along with an awful lot of advanced extreme composite engineering going on internally as well. We have flown a few and static tested a few with good results (some success, some failure, as is normal in the rocket motor development cycle). We are aiming at selling these to educational institutions, and NASA of course is a big research customer. There are educational institutes all over the world that are

very interested in high-speed research. Our motor system can be configured in different ways and is capable of getting speeds of up to mach 8.5, the extreme hypersonic realm.

What are your thoughts of experimental rocketry's role in NAR and Tripoli?

My thoughts of experimental rocketry in both Tripoli and NAR come from my interest as a manufacturer in wanting to see the hobby continue at ANY level. Recently, there was a fellow back east who took it upon himself to send the ATF in Washington D.C. a letter to inquire about specifics about the "Easy Access" nature of rocket motors. As a result, the ATF is changing rules regarding "Easy Access" rocket motors. We all know that is coming. The unusual thing about this is how can one man mailing a letter to the ATF jeopardize our entire hobby or at least one aspect of the hobby? I believe what this shows is the current illusion of protectiveness created by both NAR and Tripoli is bogus. The certification process for motors and various levels of certification for rocket fliers is all a weak illusion. It is all a house of cards ready to fall over!

In your opinion, how must rocketry change in order to survive?

In the 21st century, our rocket hobby will have to be seriously reconfigured in order to advance even minimally in freedom. The current system used by Tripoli and NAR is so poorly managed and executed, that it is headed for a wall which has intentionally been built brick-by-brick, methodically over the years, by the TRA and NAR leadership. Over those years, they have defaulted freedom-after-freedom to more-and-more onerous regulation by the government authorities. What these organizations like NAR and Tripoli have brought on themselves, in my opinion, is completely unnecessary! I can only think of a few reasons for it. One is for the personal aggrandizement of people in this hobby that want to look like the big shots. These leaders have actually given over the hobby organizations and members of those organizations to increasing regulation in order to increase their status and feeling of importance in that organization. I think it is pathetic. It is not an idealistic rant to sit here and say these things—that freedom has been given away. I'm not saying this as an anarchist. I'm a manufacturer who wants to see the hobby continue to grow. If we observe the activities that have been done for the last 15 years and take it as a given that the current course of action is not working, and take it as a given that our freedoms are being chipped away one-by-one, due to this course of action, it is not too difficult to see why soon you are left flying only G motors and wondering "What happened?"

This is what is happening in the high power rocketry hobby today. So what bright spots can we see on the horizon? These bright spots are amateurs involved in experimental rocketry. There is a Tripoli group in Maryland who go out and get their own private land, they get their own private insurance, and they fly whatever they darn well please. They do it 100% legally, 100% covered by insurance and with no involvement with Tripoli except for having the name and a Prefecture, and they have a superior safety record. In my opinion, Tripoli should be only an organization to call people together in the camaraderie of flying rockets. Tripoli should not make up silly little rules they push down the member's throats, because it just doesn't work! The whole process of motor certification, which they say brings regulatory relief, is choking the hobby with regulatory involvement. It is done because the leaders of hobby rocketry organizations choose to have it that way. There is no one with enough intelligence, know-

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how, or street savvy to get out there and pursue another more effective direction. The organizations out there can't turn back the clock, but they can change. They can become social organizations to coordinate some aspects of rocket launches and advise as to safety standards for launching rockets. They should advise as to safe launch distances, equipment to be used, and other launch guidelines only.

Should a rocketry organization get involved in motor certification?

When an organization steps in and starts to 'regulate', and pretend they are a government organization, then the next step down the line is to get a governmental institution involved to validate their imaginary regulations. That is what has been done in the past. These organizations say, "Look we are so safe. See what we do? We even make up our own pretend rules!" I don't believe it works. Once you let the government in the door, they are going to want more and more. I think the notion of organizations providing insurance for members in order to help secure a place to fly (because of the wonderful motor certification process that is supposed to make the insurance company feel warm and fuzzy) is ridiculous. As a professional businessman, I have a million dollar liability insurance policy that covers all of my design and research activities. It is not very expensive, and it is not difficult to obtain. Groups like Tripoli Maryland have done just that. There are insurance companies that provide this kind of coverage regularly and you just go out and buy it. I guess it just comes down to: do the members want to participate at a local level, or do they want to send in an ever-increasing membership fee to an organization and trust that someone is doing it for them? I don't buy it. Regardless, when a rocket hits a car at a launch, the first insurance policy that counts is the individual flier's. The last one to pay off is the organizational policy. It is really a sham or illusion that organizational insurance like Tripoli and NAR trumpet so loudly means anything. It could be so much easier if you didn't need Tripoli or NAR insurance and could just go out and get your own. An organization could even publish guidelines on how to get your own. If you do that, it simplifies everything. If you do that, then you don't need motor certification. Regarding motor certification, every time it comes up, Tripoli brings up past history. They say one individual was going around selling motors that weren't up to spec. I'm tired of hearing about this one individual and the justifications for this entire nightmare of motor certification being pinned to his activities. It's all a matter of "Pay no attention to the man behind the curtains, I am the great Oz!"—a distraction technique. I'm all for the common sense approach. A customer can ask around and find out about which motors work and which don't. Let the customer decide what to buy through their own intelligent research. As long as the safe distances are followed, a rocket motor can't hurt you. It is a common sense thing. With motor certification, let the market dictate as it may. If the manufacturer is not obeying laws when he makes his motors, then let the legal system deal with it! Let the consumer put that company out of business, or keep him in business as they see fit. All the current activities that are going on regarding motor certification, the insurance issues, etc. are, in my opinion, 150% unnecessary and destructive.

In your opinion, do you feel LEUP's (Low Explosive Users Permit) are necessary?

For the average rocket hobbyists, LEUP's are a foolish thing to pursue. People think they have to get one because their fellow hobbyist has one, they get a LEUP and then the ATF has authorization to come bust down your door and inspect your magazine. You have to play with your local rules. You need to check with your local ordinances. The bottom line is that no hobbyists should have (or want) to store motors at their home. Buy them at the launch from a legally correct vendor who has to comply with the existing laws of the land. As a larg-

It's all a matter of "Pay no attention to the man behind the curtains, I am the great Oz!"—a distraction technique.

er issue, for those in the business the LEUP is an awful burden because AP propellant (Ammonium Perchlorate) is not a regulated low explosive by the ATF's own definition. Eventually, there will be someone who will have a test case. By chemical definition, AP (in the particle sizes used in our motors) is not an explosive, it is a Class 5.1 Oxidizer. Because it is not an explosive, the ATF has no authority to regulate AP propellant. But if you want to be legal and not have any question of it, how about not keeping these items in your house? If you want to learn about making your own propellant, the good team at the RRS (Reaction Research Society) will be glad to show you how to do it correctly, without keeping it in your home.

Editors Note: The ATF maintains that it does have regulatory powers over storage of AP propellant. The ATF does require LEUP permits for storage of various types of rocket motors. The statements above are Mr. Triano's opinions and do not necessarily reflect the views and opinions of this publication or its staff.

What do you see as the future of this hobby?

From a professional standpoint, I could not care less about Tripoli or NAR. They make absolutely no difference and have no effect on my activities. From a hobby standpoint, I'd like to see the hobby grow much like that of another organization I'm involved with. I've been a member of the Experimental Aircraft Association since I was 12. In that time, I've seen the organization grow from one that was fairly comparable to Tripoli or NAR in size to one that is vastly larger and more professional in its dealings with Washington. It is a good idea to pick a like organization and try to emulate it and make your hobby grow. They have managed to grow their membership exponentially while at the same time decreasing the regulatory involvement in their activities.

What do you like most about rocketry?

I like the calls I get every day from people who want to learn better ways to do things. They want to discover more efficient ways to make rockets go higher and faster, and I love to see their successes.

What do you hate most about rocketry?

First, I believe the regulations are ludicrous. Second, the group of people who don't want to know anything more about rockets or proper aerospace engineering and construction techniques—they are sure that they know it all and it can't be done any better.

What advice would you give someone starting into rocketry?

Do your research, determine the level of involvement you want to get into the hobby at, and take it slowly. Do it on a budget so that you don't affect your

[by: bob shultz]

Electronic Strobe Module (ESM)

bob shultz's LDRS 20 project

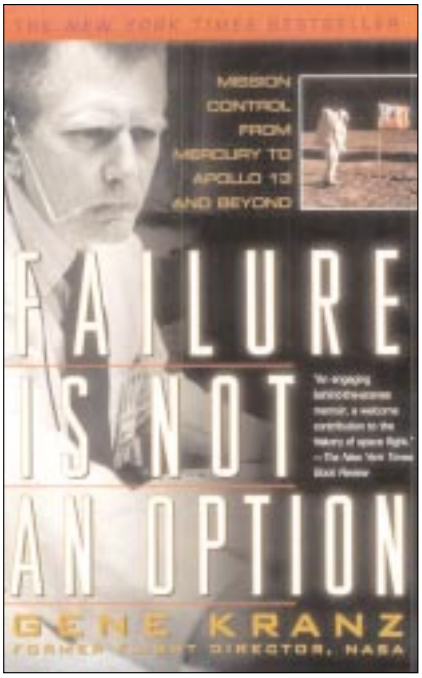
Bob Shultz and his wife holding a checklist stand next to the ESM (Electronic Strobe Module) at LDRS 20. The strobe is a 16 Joule strobe meant for use on emergency vehicles. The unit was disassembled, keeping the strobe element and electronics, etc. The finished ESM includes the element mounted in the clear nose, along with a 50-watt halogen "landing light" (meant for night flying) and a 1-watt cooling fan. The clear dome is a plastic 6" security camera housing (like you see in public buildings and airports). Bob cut the base off with a Dremel tool. He then epoxied the hemisphere to a short chunk of 6" body tube, which in turn bolts to the rest of the ESM. Sadly, the dome shattered on impact. The ESM weighs 8 pounds – 5.7 pounds more than the normal PML BullDog nose cone that it replaces – but some of that is due to building it tough.

PRODUCT REVIEW

[by: steve ainsworth]

Failure is Not an Option

a book written by gene kranz



This book is more than a book about spaceflight. It is a book about life. If you read only one book about spaceflight this year, read this one. Kranz talks about his childhood thrill of aircraft model construction and flying rockets. His high school thesis was entitled, "The Design and Possibilities of the Interplanetary Rocket." He explains how he looked into the eye of the tiger (fear) and overcame it in flight school. The tools learned early flying fighters proved invaluable at his job in mission control. He also tells us how he discovered "that for much of my life I had just been coasting along". The space program gave him direction as it did the entire country in the tumultuous 1960's.

NASA hired Gene Kranz in October of 1960 sight unseen. Working under Chris Kraft, he assembled a team of flight controllers and outlined a job that had never been done before. That team invented every aspect of the job they were to do. The early unmanned and manned flights demonstrated a need for knowledge of the complete rocket and spacecraft system, so Kranz had each member of the team learn the details on one area of technology used in a flight. Then they got together and taught what they had learned to each other. His crews were defining the roles they would each play in spaceflight. Kranz captures the rocketeers' spirit in his book, and I felt like I shared a common bond with them. In reading his book, I realized that rocketeers are cut from the same cloth.

The early US Space program was restricted by budgetary constraints and got off to a slow start. The first launch of a Redstone with a capsule on board flew to an altitude of four inches, shut down and fell back onto the launch cradle. With no umbilical lines attached and the booster shutdown, there was no telemetry on the rocket condition and controllers were confused as to what should be done. They had a fully fueled Redstone on the pad, loosely resting on its launch cradle but otherwise unsupported. Minutes later the events timer ejected the chute from the capsule. The chute was caught in the breeze and threatened to pull the rocket over. The rocket was not safe to approach, as it could tip over or just explode at any moment. Suggestions of what to do next included shooting holes in the propellant tanks with a rifle to de-pressurize them. No one had thought about what should be done if this happened. The German scientists in the blockhouse were stuck there until a solution was found. Cooler heads suggested that if the breeze did not pick up, the rocket was stable, and could be left overnight allowing the propellant to boil off and trip the pressure relief valves. Also, by morning, the batteries would be dead, and there would be no danger of a spurious command detonating the rocket.

Kranz often comments on the risk level that was accepted in the space program to get an American on the moon. He states that they were rolling the dice in a way that would not be allowed in today's space program (the first EVA was done without any training). The controllers fully expected to loose two astronauts in the Mercury program. Quite often they had to make decisions where there was no right decision to be made; nothing was black and white. He gives several detailed examples of the high-gain high-risk leadership at NASA in the 1960's without which the US would not have gone to the moon by the end of the decade. The human factor was the key to our success in Gemini and Apollo. Kranz states, "Suddenly and unexpectedly we may find ourselves in a role where our performance has ultimate consequences. Knowing what we didn't

Failure is Not an Option... Continued

a book written by gene kranz

know was how we kept people from getting killed."

And yet three were killed. Kranz takes us into the depths of the emotion surrounding the deaths of Grissom, White and Chaffee on the pad in Apollo 1. This accident changed the space program and changed the men who were Mission Control.

When Apollo 8 was launched on the first visit to the moon, Charles Lindbergh was present at Mission Control. The control team felt that his presence was, "Kind of laying on of hands for the mission, and a handover of the stick and rudder to the astronauts."

When Apollo 13 was in trouble, there were many questions to be answered, and a correct answer too late was worthless. "How cold can the thrusters get and still fire? How many amp hours are really in the battery beyond spec values? How critical is the reentry angle?" What material helped save the day for Apollo 13? Duct tape!

Conclusion

For space buffs (like me), it is a hard to put down book, and compliments the NASA Mission Reports for each mission by telling some of the same events (and much more) but from the Flight Controller's perspective. In addition, there are details of the unmanned Mercury, Gemini and Apollo missions.

Pro's

Gene Kranz captures the spirit that we all feel when we fly rockets. He has some great insight that we can learn from as amateur rocketry enters a new level. The lessons learned by the people that invented spaceflight can be invaluable to the new breed of amateur rocket scientists. This book offers us a glimpse at many of those lessons.

Con's

The book is about the personal experiences of Gene Kranz and as such does not provide details on flights for which he was not a controller.

Available at most bookstores.

LAUNCH CALENDAR

[march launches]

March 2-3
Three Oaks, MI
Sponsor: Tripoli Michiana (78)
Contact: Roger Coates
Phone: 616-657-2192
rscoates@earthlink.net
http://www.geocities.com/ruthieq99/tripolimichiana.html

March 3
Monroe, WA
Waiver: 5,000 ft AGL
Contacts: Prefect: Dave Davis
Phone: 206-933-0944
david.davis4@pss.boeing.com
www.northwestrocketry.com

March 3
Indianola Baloon Field
Just East of Indianola Iowa
Tim Covey
tcovey@uswest.net
http://www.isoar.org/

March 9
ROC Launch
Lucerne Valley Dry Lake, CA
Contact: Rick O'Neil
rroneil@earthlink.net
http://www.rocstock.org

March 9
Kansas City Association of Rocketry
Kansas City, MO
Sponsor: Kansas City Association of Rocketry
nar505@yahoo.com
www.angelfire.com/mo2/kcar

March 9
Blue Mountain Rocketeers NAR # 615
Dayton, Washington
Contact: Tim Quigg; Section Advisor
Phone: (509) 382-4176
tquigg@hscis.net
http://communities.msn.com/BlueMountainRocketeers

March 9
Tripoli Quad Cities Sport Launch
Van Orin, Illinois
Contact: Tim Lehr
http://www.tripoliquadcities.com

March 9
Swan Falls, ID
Contacts: Vern Knowles
Phone: 208-939-1076
vern_knowles@worldnet.att.net
www.tripoliidaho.org

March 9
Clegg Sod Farm
Bunnell Florida
Contact: Greg Peebles
gmrpeebles@earthlink.net
www.nefar.net

March 16
Space Port Cape Canaveral Range: SRA Rocket Ranch
Palm Bay Florida
Waiver: 10,000 ft AGL
Prefect: Kirk Baird
Phone: 321-453-8462
bairdkl@aol.com
http://home.cfl.rr.com/sra/

March 16
Thunder in the Desert
Alamogordo, New Mexico
Waiver: 10,000'
Contact: Bob Turner (TRA #647)
Phone: 1-877-333-6589
space-cur@zianet.com
www.alamorocketry.org

March 16-17
SPRINGFEST
Range: El Dorado Dry Lake Bed
Boulder City, NV
20 minutes from Las Vegas
Dave Pacheco
Phone: 702-432-9293
davepach@vegasnet.net
www.tripolivegas.com

March 16-17
Williams Farm
Midland, NC
Waiver: 5000 feet agl
Contact: Ralph Roberts
Phone: 704-568-1070
EROCCPREZ@prodigy.net
www.tripolicharlotte.org

March 17
JMRC in the field
Location: Gumbert's field in Jackson, MI
Sponsor: JMRC
Contact: Scott Miller
scott.miller@wmich.edu
www.jmrconline.org

March 17
ESAC St. Patrick's Day Blarney Rocket Launch
Daphne, AL
Contact: Chad Blair
cdb4003@bellsouth.net
www.zrocketwerkz.com/clubs/

March 23
Battle Park
Culpeper, Va
Sponsor: Tripoli Central & East Virginia
Contact: Ed Rowe
Phone: 757-566-8012
edrowe@whro.net
www.ColonialVirginiaHPR.org

March 23
Rainbow Valley, AZ
Waiver: 9500' MSL
Contacts: Mark Clark
Phone: 623-877-6814
markclark2@mindspring.com
www.ahpra.org

March 23
Rebel Field
Mercedes, Texas
Waiver: 9,900' AGL
Contact: Randy Ashley
Phone: 956-248-5268
rgvrc@email.com
www.geocities.com/rgvrc/

March 23
Swan Falls, ID
Contacts: Vern Knowles
Phone: 208-939-1076
vern_knowles@worldnet.att.net
www.tripoliidaho.org

March 24
CATO 58
Sterling, CT
Sponsor: CATO (NAR 581 / TRA 27)
Contact: Jay Calvert
jcalvert@ctol.net
www.catorockets.net

March 24
Tuscola Airport
Waiver: 10,000 ft AGL
Contacts:Don Reasor
Phone: 217-253-2586
Don.Reasor@netcare-il.com

March 30
West Palm Beach Site EX Launch
Range: Roth Farms
Bellglade, Fla
Waiver: 10,000 ft
Contacts: Bruce Kilby - Prefect
Phone: 561-746-4683
bkilby@bellsouth.net
community.gopbi.com/FSA-TWP

For more information and details on these launches, as well as active links to all the websites listed, please visit AeroTech's website and view the launch calendar page. www.aerotech-rocketry.com

AFT CLOSURE

[by: scott goebel]

Slow Down, Take It Easy

There is no need to do all three certification attempts in one day

If you have attended more than just a few high power events, you know that some certification attempts fail, and again many are successful. Preparing to advance to a higher level in the certification process can be as easy or as difficult as you make it. Some people simply take the test and fly a J-350 in the same bird they used for their successful level one certification. Others decide to do their homework, read, study, gain advice, use a computer design and simulation program, and then build a rocket to suit their goals. Using electronics to ensure a safe recovery is also an option many flyers add to their agenda when planning their level two attempt.

The three-step certification process does provide some measure of ensuring that flyers are competent to move up to using higher power motors. There is however, a large loophole that allows flyers the opportunity to advance certification levels faster than what could be termed prudent. There is no provision to measure the experience of the flyer between the certification levels. Flyers should be required to log an appropriate number of flights in their current certification level before being allowed to advance. The skills required to attempt a level two flight already make the project a difficult challenge. The simple requirement of perhaps ten flights before attempting that important flight would not discourage anyone from attempting to complete the task. I am positive that anyone considering their level two flight will agree that the additional experience gained by flying those ten birds will be an asset to their rocketry portfolio. You can read all the books, buy and project all the computer simulations, use all the fancy adhesives, epoxies, and composite construction techniques. When push comes to shove, experience will give you the confidence to plan a project that will succeed.

I received some advice just after my successful level two flight. My friend told me to be extra careful in my preparations for my second flight. It is easy to make a mistake on that next flight. It was good advice, there is always potential to forget something in your preparations. The knowledge to be gained in making future flights makes each ensuing one safer and more enjoyable.

I would also like to recommend adding a step to the certification system. You are not currently required to use electronics to achieve level two. I was surprised to learn this when I was planning my project. I learned by experience that motor delays are not going to provide the perfect timing for a successful deployment. You do need to know your electronic recovery devices backwards and forwards before undertaking any current level three attempt. This new third level would be ten flights on any bird using an electronic device for recovery. Mastery of this level would give you the confidence to plan, build your rocket, and attempt your level four flight.

Some people can be in too much of a hurry to move up the certification level ladder.

There is no race to see who can get to the top the fastest, and certainly no need to do all three certification attempts in one day. The satisfaction of achieving a goal is not the conquest of the feat, but in the journey. Enjoy the hobby, fly some rockets!

When push comes to shove, experience will give you the confidence to plan a project that will succeed.

About Scott Goebel

Scott got involved in rocketry when his son's Boy Scout troop built Estes Fat Boys and flew them at a Tripoli Wisconsin Association launch. When Scott saw that there were big rockets for big boys he was hooked. Scott enjoys the hobby almost as much as the friends he has made while involved in it. He enjoys camping and working on cars. Scott is a union construction electrician. Currently he is serving a term as President for WOOSH, NAR section #558.

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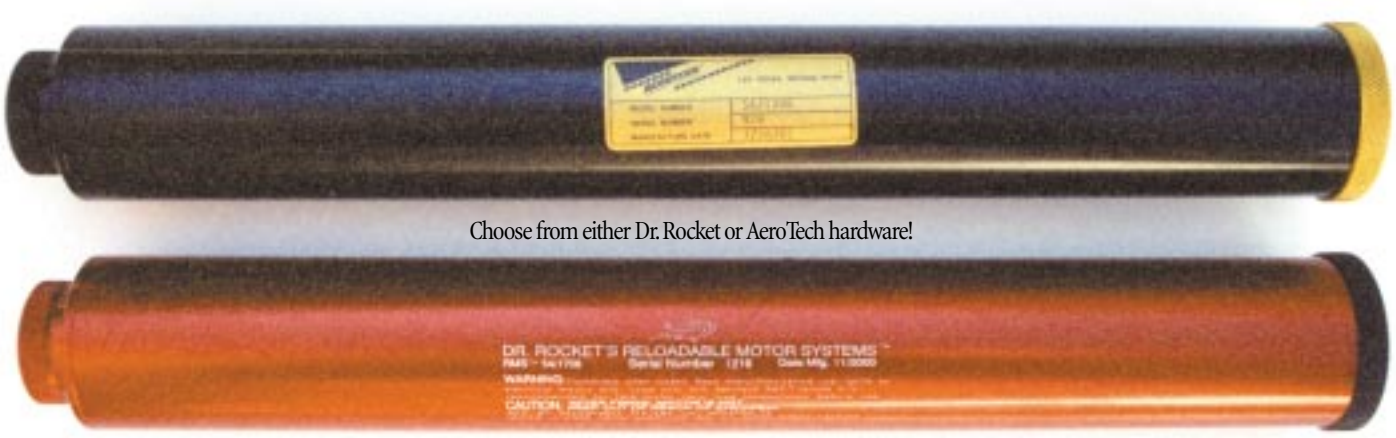

Choose from either Dr. Rocket or AeroTech hardware!

Buy 54mm Motor Hardware AND RECEIVE A DISCOUNT On 54mm RMS-Plus™ Motor Reloads

New for 2002: AeroTech™ has extended its RMS-Plus™ technology into the 54mm motor product line! The new RMS-Plus features increased reliability and accuracy in motor delay and ejection. For a limited time, AeroTech is giving a unheard of 10% discount on 54mm RMS-Plus motor reload kits when you purchase any AeroTech or Dr. Rocket™ 54mm motor hardware component. Hardware and motors may be purchased from any authorized AeroTech dealer listed on the AeroTech website.

NEW 54mm RMS-PLUS

IMPROVED RELIABILITY & PERFORMANCE

New for 2002, AeroTech has extended its now famous RMS-Plus™ technology which has been successful in 29mm and 38mm sizes to the popular 54mm diameter. The RMS-Plus™ system was developed to increase the accuracy of delay burn time, and makes assembly of the motor reload kit far easier.

RMS PLUS

54MM RMS-PLUS™ DISCOUNT COUPON

10% REBATE

Buy any AeroTech or Dr. Rocket 54mm hardware component and earn 10%* towards purchase of a 54mm reload kit.

- Offer good through July 1, 2002
- Contact your dealer for details

*10% off 54mm hardware purchase price will be credited towards purchase of 54mm RMS-Plus reload kit.