MASA Planet

Volume 8, Issue 6 **Plans!** **November 2005**

Safety First!

An Energetic Discussion

...With a powerful conclusion

Ted Cochran
NAR 69921

Some of you may know that I got smacked with a separated fin can at NARAM. It barely left a mark, but it did start me wondering--what would it take to hurt?

It turns out that predicting injury from being struck by ballistic objects is not really a scientific endeavor. It's more of an art. Well, a black art. OK, more like black magic. Consider a baseball thrown at 100 mph. You probably wouldn't enjoy being struck by one, right? In fact, major league baseball players get struck all the time, and are usually none the worse for the experience. But not always--depending on where the ball hits, serious injury can result.

There are four things that matter in determining whether you'll be hurt by a falling object. First, the object has to hit you. The NAR safety codes are designed to reduce the chances that will happen. Second, there is the object's kinetic energy, which

Energy, continued on page 2

ALSO IN THIS ISSUE

Sport Flying

Kitbashing

For rocketeers who can't follow directions

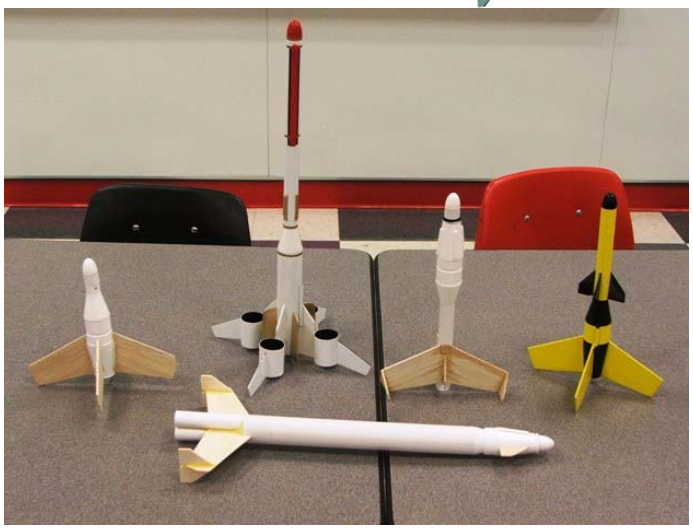
Alan Estenson

At the October meeting, Glen Overby organized a kit bash session using the Estes "GBU-24 Paveway III" kit. The goal, of course, is to build a rocket (other than a Paveway) using only parts that come in the kit.

The rules were:

- You can use everything that comes with the kit - including the plastic bag.
- You can substitute a shock cord & parachute of the builder's choice.
- You may substitute a 5" piece of bt-50 for one of the 5" pieces of bt-20 that come in the kit, but resulting rocket must then have a 24mm motor mount.

Twelve people elected to participate, and some of their designs are presented in various forms in this issue of the *Planet*.



Buzz McDermott

Original Paveway (above) and five MASA bashes.

Energy, continued from page 1

depends on its mass and its velocity. Third, there is the power that is imparted by the object when it hits you, which is a function of energy over time (where less time is worse). Finally, there is the ability of the part of your body that is struck to absorb that power. Obviously, if the Safety Codes work, the other factors don't matter. However, if it's a Very Bad Day, and the Safety Codes haven't prevented an impact, the next thing that matters is the energy of the rocket.

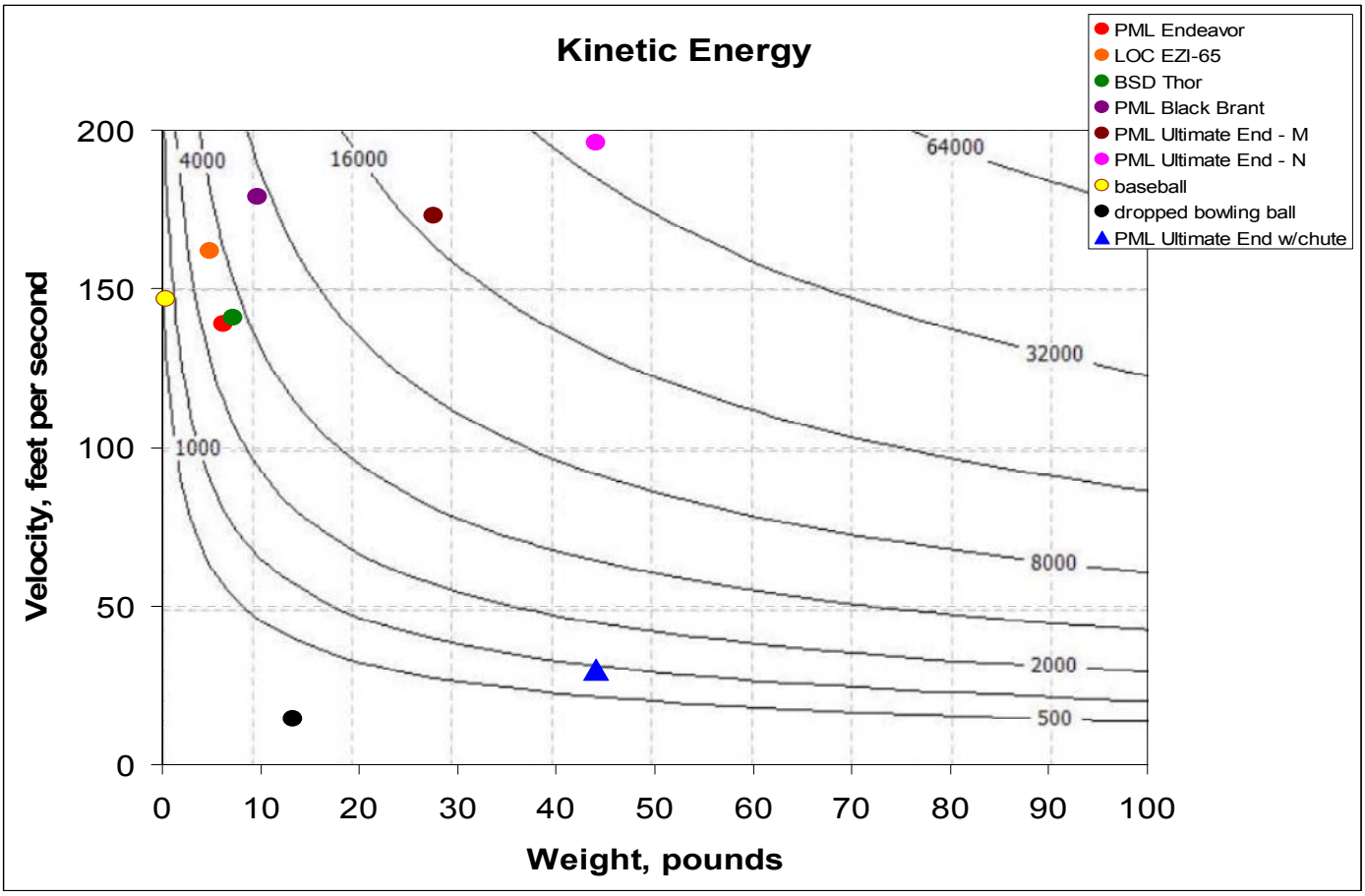
Kinetic Energy is measured in joules, and given by the equation $KE = 1/2\ m\ v^2$, where m is the mass of the object in kilograms and v is the velocity of the object in meters per second. So the energy of the baseball, which weighs 5.2 ounces or .147 kg, traveling at 100 mph or 44.7 meters per second, is about 147 joules. That's two and a half times as much as a 13+ pound bowling ball dropped on your foot (58 joules).

If you figure out the energy of various moving objects, you might be surprised. Fall out of a second story window? That's 3,776 joules at ground level. A .357 pistol round has about 450 to 750 Joules, depending on muzzle velocity and the weight of the bullet.

What about rockets? As you might suspect, a rocket coming in without a parachute has significant kinetic energy. A 6.2 pound PML *Endeavor* with a terminal velocity of 95 mph (139 feet per second) has a kinetic energy of 2524 joules. My *Quantum Leap*? It can have 32,300 joules! (It has a higher ballistic coefficient and comes down at over three times the velocity). What about model rockets? An Estes *Alpha* has a terminal velocity higher than the *Endeavor*, but it weighs next to nothing: KE is 55 joules. At its maximum (burnout) velocity of 448 feet per second, however, that same little *Alpha* represents 400 joules: way more than a baseball, and close to a .357--certainly not an event that I'm in a hurry to experience first hand.

The energy of moving objects can be plotted on a contour plot, and I've done that for some rockets (and other common examples) below. As you can see, big rockets under chute, and all rockets that are moving quickly, can have significant amounts of energy.

Next time I'll discuss how the NAR will use these data to improve safety, and I'll also discuss how kinetic energy relates to power and the odds of injury.



MEETING SCHEDULE

THURSDAY, NOVEMBER 3
Location: Science Museum of Minnesota
Time: 7 PM to 9 PM
Topic: Finishing Rockets (David Whitaker)

HOLIDAY PARTY!
SATURDAY, DECEMBER 10
Location: McDermott Residence
Time: 6 PM to 10 PM
Topic: Holiday Cheer!

THURSDAY, JANUARY 12 (ONE WEEK LATE!)
Location: Science Museum of Minnesota
Time: 7 PM to 9 PM
Topic: 2006 Plans, Elections, Badge Selection; Nominations for 2006 Officers

LAUNCH SCHEDULE

NOTE: TIMES AND LOCATIONS SUBJECT TO CHANGE! CHECK THE WEB SITE FOR UPDATES

SATURDAY, NOVEMBER 19 (ONE WEEK EARLY!)
Location: TBD
Time: 9 AM to 1 PM
Theme:

SATURDAY, JANUARY 28
Location: White Bear Lake
Time: 10 AM to 1 PM
Theme: TBD

Summer fun

Alan Estenson

John Carlson preps; sons critique during September launch.

President's Corner

Summer's End

We had a wonderful flying season this summer. We had lots of great launches at our new field near Nowthen, MN. Thanks to our first waiver, and the nice open space of the sod farm, we have been able to welcome back high power rockets at MASA launches. I will be finding out how to renew the waiver for next year.

After I get back from a trip to Iowa this weekend, I will be trying to set up our November launch at the VFW field. I also plan to see if we could have a second launch at the Rockford farm on the following day, Sunday November 20.

Last night's meeting went well. I would like to thank all of the current officers for agreeing to serve the club for another term. I would also like to thank the membership in attendance for voting unanimously to have the current officers serve another term. It means a lot to be appreciated; Thanks!

Remember the 2005 MASA Holiday Party will be on December 10, starting at 6 P.M. at the Buzz McDermott residence in Blaine. Watch the web site and the Yahoo email group for details.

Other than the Holiday Party, there are no launches or meetings in December. The January meeting is one week later than normal, on January 12, and the first launch of the year will be on January 28 in White Bear Lake.

Stay safe, have fun!

Mike Erpelding

NAR # 79922 HPR L2

MASA President

Plans

Red Varmint

"Yeah, it's got tubes instead o' balsa. Ya wanna make sumtin' of it?"

Design MH-07 by Alan Estenson, NAR 69539 SR

Length:	635 mm (25 in.)
Diameter:	25 mm (0.98 in.)
Weight:	66 grams (2.3 oz.)
Recommended engines:	A8-3, B4-4, B6-4, C6-5

Parts list

A. One (1) 864 mm (34 in.) piece of t-50 body tube.

B. One (1) 70 mm (2.75 in.) piece of t-20 tube

C. One (1) eb-20 engine block.

D. Two (2) 20/50 centering rings.

E. One (1) 1/8" launch lug, 60 mm (2.375 in.) long.

F. One (1) 102 mm (4 in.) ogive nosecone, plastic or balsa, to fit t-50 tubing.

G. One (1) 12" plastic or mylar parachute.

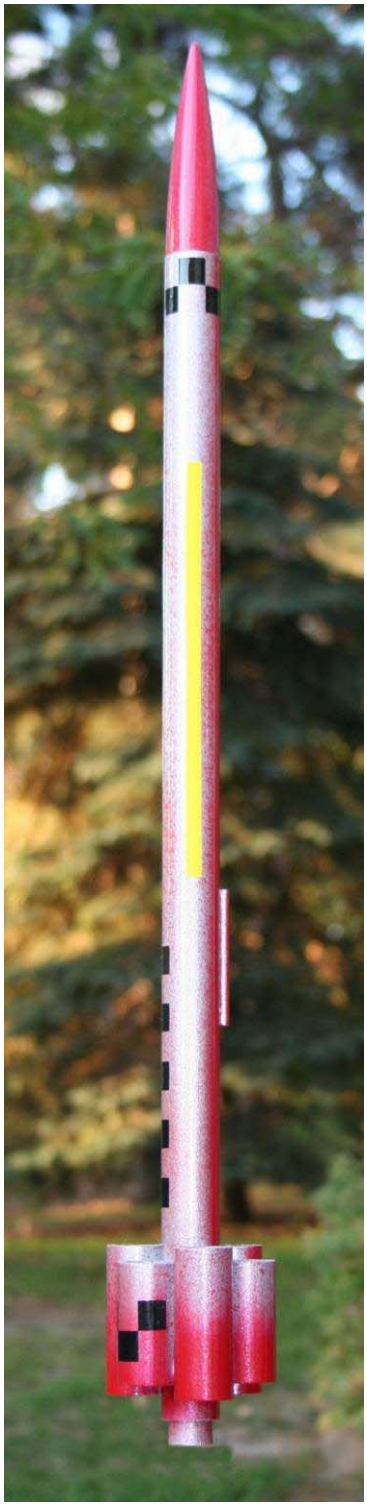
H. One (1) º " elastic shock cord ñ about 1220 mm (48 in.) long.

I. One (1) 560 mm (22 in.) length of Kevlar cord (optional).

Building Notes

1. Cut three 51 mm (2 in.) lengths and three 64 mm (2.5 in.) lengths of t-50 tubing.
2. Glue the tubes together into three pairs with one short and one long tube in each pair. Center the shorter tube on the longer one. The remaining piece of t-50 should be about 521 mm (20.5 in.) long. This will be the main body tube.
3. Glue the engine block 64 mm (2.5 in.) up inside one end of the short piece of t-20. Glue the two 20/50 centering rings onto this tube. One ring should be about 13 mm (0.5 in.) from the bottom end and the other about 6 mm (0.25 in.) from the top end (end with the engine block.) If you'd like, tie one end of the Kevlar cord around the upper centering ring to use as a shock cord mount.

4. Glue the completed motor mount inside one end of the main body tube. Leave about 13mm (0.5 in.) of the motor mount tube extending outside the main tube. If you didn't use a Kevlar shock cord mount, make a folded paper shock cord mount and glue it inside the opposite end of the main tube
5. Glue the pairs of tubular fins onto the main tube such that the long and short tubes alternate. The ends of the longer tube fins should be spaced about 10 mm (0.375 in.) up from the end of the main tube.
6. Glue the launch lug on the main tube about 165 mm (6.5 in.) up from the bottom end. Align the lug such that the launch rod will pass between two of the tube fins.



Plans

Diamond 'lil

"That 'lil, she's quite the looker."

Design MH-06 by Alan Estenson, NAR 69539 SR

Length:	556 mm (21.875 in.)
Diameter:	18.8 mm (0.74 in.)
Weight:	43 grams (1.5 oz.)
Recommended engines:	A8-3, B4-4, B6-4, B6-6, C6-5, C6-7

Parts list

A. One (1) 864 mm (34 in.) piece of t-20 body tube.

B. One (1) eb-20 engine block.

C. One (1) 1/8" launch lug, 60 mm (2.375 in.) long.

D. One (1) 73 mm (2.875 in.) ogive nosecone, plastic or balsa, to fit t-20 tubing.

E. One (1) 51 mm x 762 mm (2 in. x 30 in.) plastic streamer.

F. One (1) elastic shock cord ñ about 914 mm (36 in.) long.

G. One (1) 508 mm (20 in.) length of Kevlar cord (optional).

Building Notes

1. Cut three 51 mm (2 in.) lengths of t-20 tubing.
2. Cut three more lengths of t-20 tubing that have a 45 degree angle at both ends. The long side of each tube should be 89 mm (3.5 in.) The short side will be about 51 mm (2 in.)
3. Cut the end square on the remaining long piece of t-20 tubing. It should be about 483 mm (19 in.) long. This will be the main body tube of the rocket.
4. If you'd like to use a Kevlar shock cord mount, tie the Kevlar cord around the engine block, then glue the engine block 64 mm (2.5 in.) up inside one end of the main tube. If you prefer, make a folded paper shock cord mount and glue it inside the opposite end of the main tube.
5. Glue the tubular fins onto the main tube. Alternate between the square and angled tubes. The angled tubes should be positioned 13 mm (0.5 in.) up from the bottom of the main tube. The square tubes should be positioned 32 mm (1.25 in.) up from the bottom of the main tube. Make sure to align the long side of the angled tubes along the main body tube.
6. Glue the launch lug on the main tube about 140 mm (5.5 in.) up from the bottom end. Align the lug such that the launch rod will pass through one of the tube fins.

Plans

Bumblebee

It flies? Isn't that theoretically impossible?

Ted Cochran, NAR 69921

Length:	10.75 inches
Diameter:	1.325 inches
Weight:	3.5 ounces
Recommended engines:	B6-4 (single stage), B6-0 & A8-5 (two stage)

Parts list:

A. One Estes GBU-24 Paveway III Rocket Kit - 2053

B. Approx 1 ounce of nose weight

Introduction

This design is a product of the Second Annual MASA kitbash. This year, we started with the Estes GBU-24 Paveway III kit, a model of a 2000-pound laser guided bomb (the bomb, however, is unpowered).

Last year I converted a two stage Renegade into a massively clustered EnRaged, while keeping much of the appearance of the kit intact. This year I again chose to bash function over form, and converted the single stage kit into a one or two stage model (you can fly it either way), with significant, but not unrecognizable changes to the original model's appearance. Except that it now looks a bit like a bumblebee, which is appropriate, because it also looks like it ought not to be able to fly very well. Time will tell.

Building Notes

With the exception of the two-stage conversion, most of the building process is the same as for the kit. Because of the liklihood of losing the top stage in a two stage flight on all but the smallest of motors, I designed this model to fly either way. In a single stage flight, the model can be made to break either at the nose or the base of the sustainer, depending on where the single stage locking device (AKA masking tape) is applied. The shock cord is attached to the nose cone, and tied around the base of the booster motor and taped before the motor is friction fit into place.

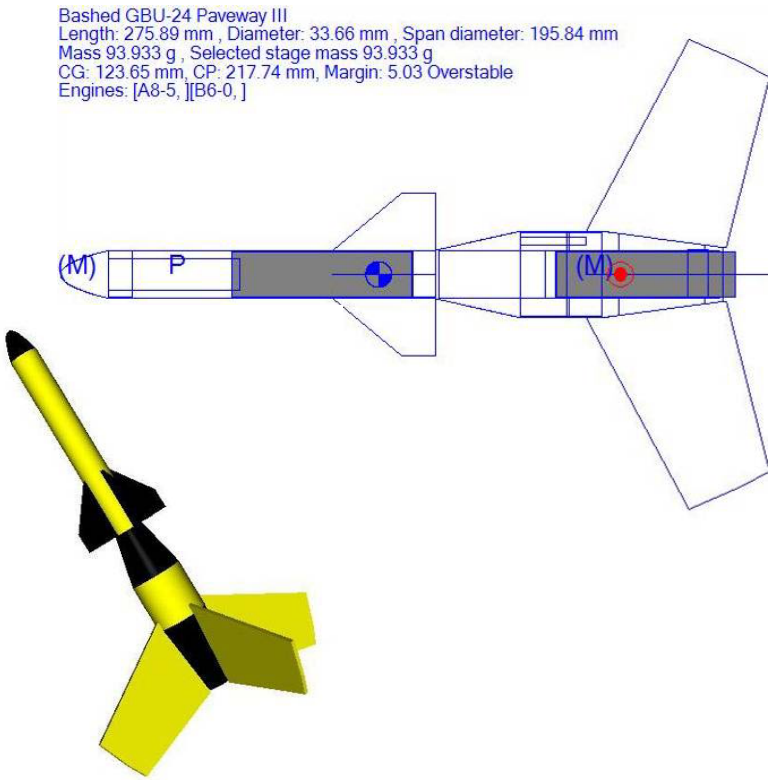
In two stage flight, the sustainer motor is recessed into the base just enough to permit the sustainer to fit over a shortened transistion. The shock cord is fastened to the base of the sustainer motor. The booster uses tumble recovery.

Build the rocket just like the instructions, except for the following points.

1. Shorten the large body tube to 1.25 inches, or just long enough to enable the transition and the boat tail to fit inside.
2. Cut 1/4" off of the top of the transition section to reduce the need for recessing the sustainer motor.
3. Cut down the motor tube so that it spans the booster from transistion to boat tail. Drill four 3/16" vent holes in the transition just below the shoulder, centered between the fins.
4. Trim that ugly angle off of the ends of the fins.
5. Use a piece of the yellow engine block insertion tube for an engine block in the sustainer. Insert it far enough so that the motor is recessed enough to enable the sustainer to fit onto the transition.
6. Add 1 oz. of nose weight, and at the same time epoxy an eyehook or kevlar loop at the base of the nose cone for shock cord attachment.
7. Make a streamer out of the parachute.

Reference

www.fas.org/man/dod-101/sys/smart/gbu-24.htm



Plans

United Spaceship Paveway

An interstellar kit bash

Buzz McDermott

The major changes I decided on were to (1) cut down the main body tube to get four tube fins, (2) lengthen the upper section of the rocket by using all of the supplied BT-20 as body tube rather than stuffer and (3) make it a fantasy design.

I cut off four roughly 1.5 inch sections of the main body tube for the tube fins. Second, I used all of the BT-20 supplied with the kit and glued that to the upper end of the transition. This, of course, left me without a motor tube so I cut out a 2.75" by 4.75" piece of the kit header card. I rolled that around a spent Estes 18mm motor (a total of two wraps) to make a new motor tube, using white glue.

Next, I carefully cut out the raised plastic over the four fin slots. I cut down the main fins and left about a 1.25 inch span. The span was based on the span of the upper fins. I squared off upper leading edge of the remaining fin and combined them with the upper fins. The tube fins were glued to the outer edges of the fins. The remains of the cut down fins were further cut down and added outside the tubes. I decided to use four of the fin braces and attached those halfway between the existing fins.

I chose to make the separation point for ejection at the top of the main tube. This pretty much finished the model. However, I thought it still needed a little more to really make it look different from the original kit. So, for detailing I used the four plastic covers left over from when the fin slots were cut out. I sanded them down and used plastic cement and cyano to attach them around the upper body tube, just above the transition. Finally, I cut out two .25 inch by 5 inch strips from the scrap balsa left over from the main fin sheets. I glued these together, sanded one side to match the upper body tube shape and rounded the other. I glued this near the top of the upper body tube.

Buzz McDermott

Completed USS Paveway

After a quick paint job (white Rustoleum) and hand painting some red, black and gold trim, my Paveway smart bomb had finished its transition to the SS Paveway deep space exploration vehicle. This was neither my best construction craftsmanship or my best paint job, but it sure was a lot of fun!

Alan Estenson

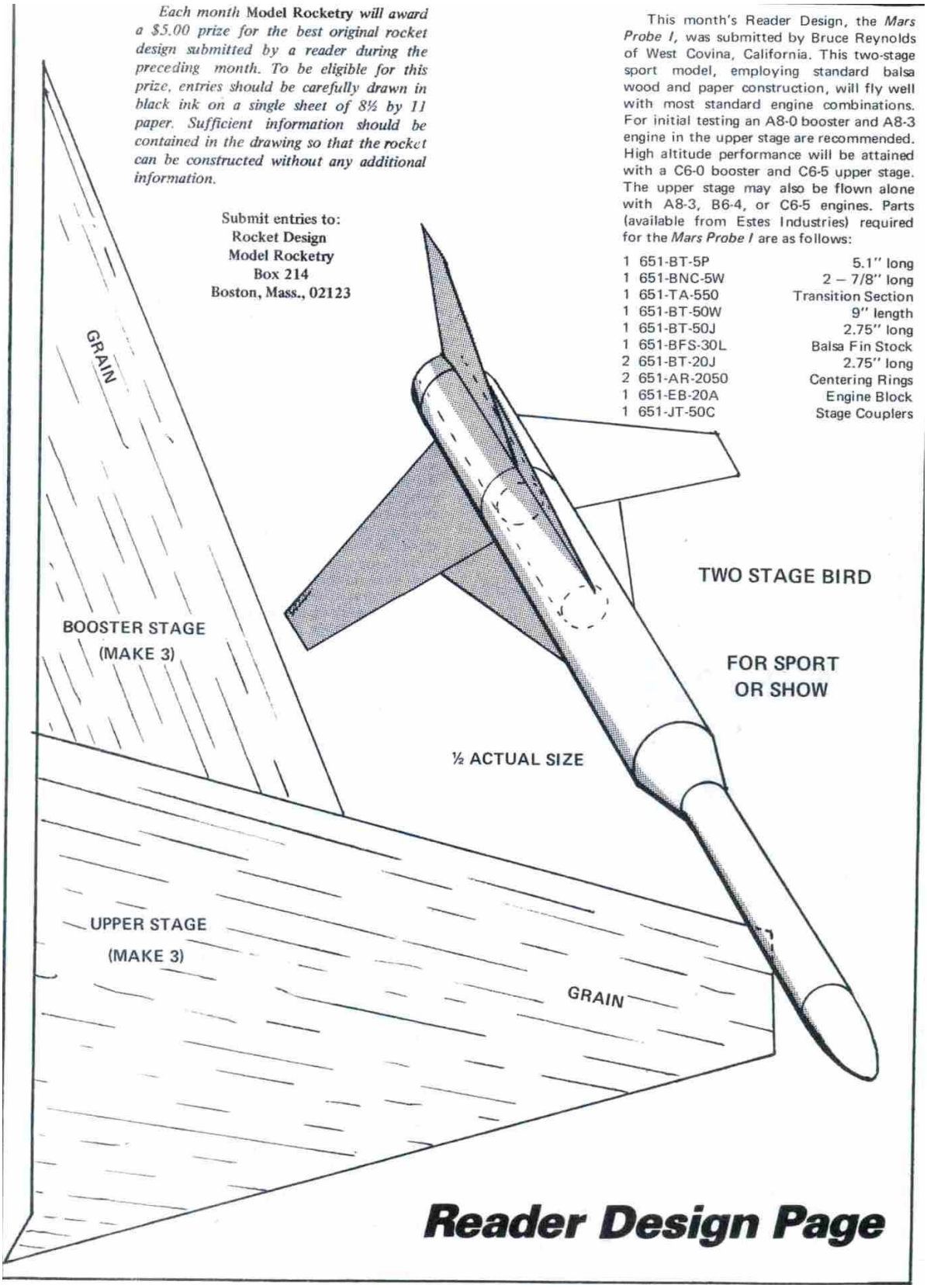
Dave Whitaker has LOTS of clips to hook up on his Mini Katana. (See page 10 for the outcome!)

Buzz McDermott

Seth Cochran shows off kit bash prize.

Blast from the Past

(Here's a plan from the April, 1970 edition of *Model Rocketry*, courtesy of Mark Thell. --Ed)



Full Scale

Farewell, Titan

Heavy Lifter flies for last time

The last Titan rocket was launched on October 19 from Vandenberg AFB, with a classified payload. The Titan launched all of the Gemini missions, the Viking Mars landers, the Voyager probes that toured the outer solar system, and the Cassini probe that is now orbiting Saturn. Silo-based Titans were also a mainstay of the nuclear deterrent from 1964 to 1987. Its role will now be served by Atlas 5 and Delta 4.

http://www.spaceflightnow.com/titan/b26/gallery4

The last of more than 500 Titans, a Titan4B, lifts off from Vandenberg AFB.

Full Scale

Welcome to Mars, Atlas

20" Telescope, 1.2 Gigapixel camera on the way

The Atlas 5 became an interplanetary probe launcher on August 12 with the successful launch of the Mars Reconnaissance Orbiter, which will spend the next seven months in transit to the Red Planet.

The 4800-pound orbiter will be doing some serious science, with the largest interplanetary camera ever launched, subsurface radar, and other instruments resulting in an expected 34 terabits transmitted over the life of the mission at a 5.6 mbps peak data rate.

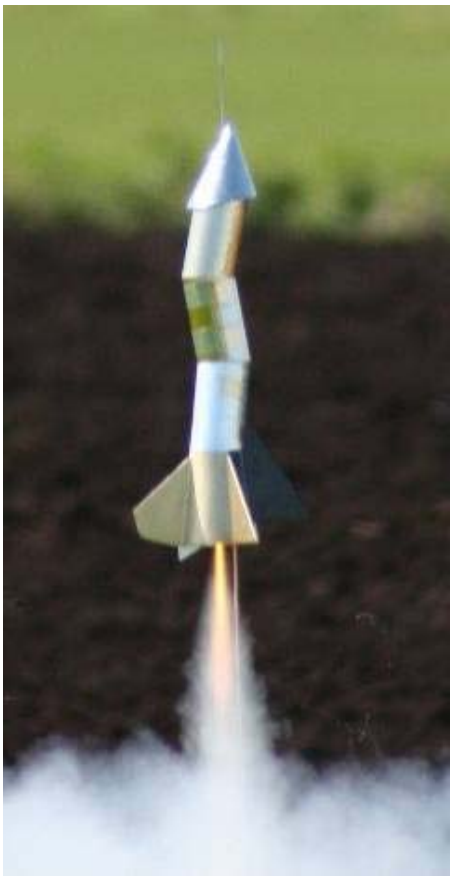
http://spaceflightnow.com/atlas/av007/gallery/01.html

MRO takes flight from Cape Canaveral's Complex 41.

September Launch Photos

Tom Lawell's *Graduator*

David Whitaker's *Mini Katana*



Ted Cochran's Fliskits Acme Spitfire

Photos by Alan Estenson

Four *Deuce's Wild*s and a *Tubes,c'est Wild* lift off nearly simultaneously.

(Extreme) Road Trips

MASA Goes to Antarctica, Part II!

Russ Durkee, weather guy

You may recall that MASA member Brenda Everitt spent the summer in Antarctica last winter. Not to be outdone, her husband, MASA Founding President Russ Durkee, is spending part of the summer there this winter. He left October 19, and he says he should be back in the Twin Cities in time for the January launch.

Russ is part of a five-person meteorology team at the south pole that provides hourly weather reports seven days a week. His adventures can be followed at his web site: http://home.earthlink.net/~russdurkee

Russ also stars this month in the Science Museum of Minnesota's Science Buzz pages. Check out the link:

http://www.smm.org/buzz/museum/ask/Durkee

(Above) Russ launches one of the twice-daily weather balloons. Check out that crisp blue sky!

(Right) Russ takes his own hero shot at the ceremonial South Pole, braving -60 degree temperatures and risking frostbite in the process.

Reflected in the globe is the new station.

Photos by Russ Durkee

The *MASA Planet* is the official newsletter of the Minnesota Amateur Spacemodeler Association, Section 576 of the National Association of Rocketry. It is published bimonthly as a service to its members. MASA authors and photographers retain rights to their submissions, which are used by permission. The *Planet* is available in ***color*** on MASA's web site:

http://www.mn-rocketry.net/masa/

Submissions may be made to the editor at: masa.planet@mn-rocketry.net. (Volunteer quickly, lest you be asked to write saucer certification rules.)

If your email address, U.S. Mail address, or phone number changes: Please send notice of your change to masa@mn-rocketry.net. Include your name, old email address, and new address. We depend on email for communicating important information. When an email address starts "bouncing", we lose contact with you.

Milestones

Welcome New MASA Members!

Jo Baecker and Nick, Zach, and Mari Johnson
Bruce Becker
Dan Keppel
Eric, Abby, Sharon, and Ray King
Marc, Christelle, Nada, and Walid Maalouli
Carol Marple and Tyler, Courtney, and Ben Ericksen
Buzz McDermott
Jamie and James Neild
Christopher, Ashley, Jamie, and Steve Santilli
Gene Stoneman
Jeff, Alyssa, and McKenna Taylor
Mark, Isaac, and Michelle Weis

New Level 1 Certifications

Lee Frisvold Public Enemy V2, Cesaroni I212

Other Starring Roles

MASA Vice President Stuart Lenz will have the title role in *The Nutcracker--Not the Ballet*. December 9 & 10, 16 &17. www.rosetownplayhouse.org

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