MASA Planet

Volume 6, Issue 3 **Outreach Edition** **May 2003**

Safety First!

A Battery of Issues

Think 12 volts is "perfectly safe"? Think again!

Ted Cochran, NAR 69921

Sometimes the biggest hazards lie in things we take for granted. Consider, for example, the 12-volt battery. We may only notice it when it's too drained to launch our rockets reliably. But did you know that a 12-volt car battery contains more potential energy than the largest rocket motor you're ever likely to use? Let's look at some of the safety issues involved with batteries. There are a variety of battery technologies available, each with its strengths and weaknesses. The ground support equipment I've seen for launching APCP-powered rockets typically uses rechargeable lead-acid or NiCd batteries. There are three issues with them:

- The materials in the batteries are hazardous;
- The energy in the batteries is hazardous, and
- The use and recharging of the batteries can create explosive gases.

Lead acid batteries contain sulfuric acid, and NiCd batteries contain potassium hydroxide, both of which can blind you, to say nothing of ruining your clothes. Take care to treat NiCd and sealed lead acid batteries with respect. Don't drop them, and don't let them rattle around in a toolbox. Be extremely cautious in dealing

Safety, concluded on page 2

ALSO IN THIS ISSUE

Outreach

Team America!

MASA mentors potential NASA recruits

Art Gibbens, Ted Cochran, Ken Corey-Edstrom, Glen Overby, and Mike Erpelding

The Team America Rocket Challenge is the largest rocketry competition ever held. Nearly 900 teams, from 36 states and the District of Columbia, signed up to attempt to fly two eggs in a two stage rocket to exactly 1500 feet AGL, and return them unharmed. Of these teams, about a third were able to successfully qualify in one of two allotted attempts. The 100 teams with the highest scores from these qualification flights will compete in the National fly-offs on May 10 in The Plains, VA.

Ten Minnesota teams signed up, and six of these completed qualifying flights. Three of the teams (Apple Valley High School, North Branch High School, and St. Anthony Village Senior High School) have been invited to the finals, and one (Brainerd Senior High School) is on the reserve list.

All of the finalist teams had mentors from MASA or TRA. This story describes some of the fun that MASA members had in mentoring two of these teams and in supporting launches for all of the others.

Team America, continued on page 7

Safety, continued from page 1

with leaky batteries, and dispose of them in an environmentally sensitive way.

Electrolytes can blind you, to say nothing of ruining your clothes

While 12-volt batteries won't shock you, the energy they contain should be treated with respect. A dead short on a 12-volt battery will draw thousands of watts, capable of, for example, turning a wrench red-hot in a matter of seconds. I have heard of at least one battery for launch equipment causing a fire on the way home from a launch because it was shorted. Design and construct your ground support equipment to minimize the chance of accidental shorts, and use an insulated cap on (at least) the positive terminal of unconnected batteries.

Lead acid battery explosions are no fun!

The third issue to understand with respect to batteries is that they generate explosive hydrogen gas during use. This is particularly true during recharging, and especially when the recharging voltage is too high. Make sure the charger you use is designed for your battery, and always use heavy-duty battery chargers outside!

Batteries can also explode when asked to deliver significant amounts of current after periods without use, and this is an issue of concern to rocketeers. As a lead-acid battery ages, the corrosion layer on battery plates increases in thickness, causing the distance between the plates to narrow and the potential for cell degradation to increase. The battery voltage drop causes the charger to produce more current to normalize the voltage as a cell degrades. The increased current could boil off electrolyte in the cell, causing the

NiCad Battery explosions are no fun, either!

top of the plates to be exposed, providing an air gap that can allow for arcing. This is not good when hydrogen is present!

So, before you charge your battery for the first time after a period of storage, check that the cells are full of electrolyte. After charging, check the cells again--a dry cell is probably a bad cell.

[By the way, if you're tempted to use newer technologies such as lithium or nickel metal-hydride batteries, don't! They aren't able to withstand the abuse that rocket launching entails. When lithium batteries are shorted, for example, the flammable electrolyte boils and vents, sometimes at temperatures above its flash point, producing an exciting flame-thrower effect.]

References

http://www.formulasun.org/asc/teams/conference/talks/batteries.ppt

http://pergatory.mit.edu/2.007/handouts/batteries/battery-info-sheet.pdf

http://www.solareco.com/articles/article.cfm?id=37

Outreach

Westwood pupils chant flight durations. A typical winning flight for a generic E2X on an A8-3 is about 30 Mississippis. *See page 11.*

MEETING SCHEDULE

THURSDAY, MAY 1 (NOTE CHANGE)
Location: Science Museum of Minnesota, St. Paul
Time: 7 PM to 8:45 PM
Topic: LCO/RSO Training session

THURSDAY, JUNE 12 (NOTE CHANGE)
Location: Science Museum of Minnesota, St. Paul
Time: 7 PM to 8:45 PM
Topic: Super-roc building session

SATURDAY, JULY 19
FIFTH ANNUAL SUMMER PICNIC!
Location: Elk River
Time: TBD
Topic: Eat, Drink, and Launch Rockets!

LAUNCH SCHEDULE

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

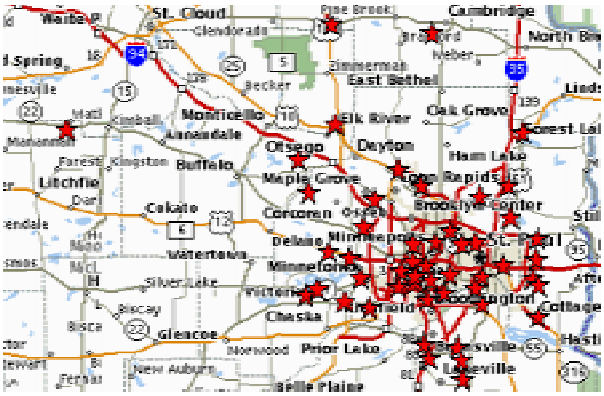
SATURDAY, MAY 10
TEAM AMERICA ROCKETRY CHALLENGE LAUNCH
The Plains, VA

SATURDAY, MAY 24
LAUREL CLARK MEMORIAL LAUNCH
Location: Blaine
Time: 9 AM - 4 PM

MAY 24 THROUGH 26
National Sport Launch
Clarks Summit, PA
See http://www.nepra.com/nsl/

SATURDAY, JUNE 28
RICK HUSBAND MEMORIAL LAUNCH
Location: Blaine
Time: 9 AM - 4 PM

SATURDAY, JULY 26
WILLIAM MCCOOL MEMORIAL LAUNCH
Location: Blaine
Time: 9 AM - 4 PM
Fifth Annual MASA Scale Event



MASA member pin map (some stars overlap)

President's Corner

Challenges

Glen Overby

This year has brought many challenges to the rocketry community, from regulations at the national level that restrict the shipping and possession of rocket motors, to the loss of our premier field at the local level.

For those of you who haven't heard the news, a developer is building a planned community on top of our Blaine launch site. Steve Fricke, the owner of the sod farm, has been bought out along with many of his neighbors. The land changes ownership in May.

I have a few leads for fields that I've started following up on. While I continue to explore those, I'd like help from all members. If you know someone who has land and might be willing to let us use it as a flying field, please tell them about your rocketry hobby and ask if we can conduct our insured launches on their site.

At the national level, there are several regulatory activities affecting our hobby: First, our lawsuit against the ATF is still awaiting a ruling by the court. Second, the Safe Explosives Act has imposed new requirements on those that ship model rocket motors and on those that fly high-powered rockets. We have an opportunity for legislative relief in a bill introduced by U.S. Senator Mike Enzi (R-WY), and cosponsored by Senator Coleman. This bill is awaiting consideration by the Senate Judiciary Committee.

Third, the BATF has issued a Notice of Proposed Rulemaking and an interim rule for implementing the Safe Explosives Act, both of which are open to public comment. The proposed rules clearly regulate rocket motors with more than 62.5 grams of propellant, and impose other changes affecting rocketry. I am concerned that once the BATF has regulated high power motors, they will move to regulate smaller motors. I think everyone--even those of you who don't fly high power rockets--need to be aware of this legislation. I hope many of you will participate in the comment process for these rules.

More information on these issues can be found at:
http://www.space-rockets.com/arsanews.html
http://www.atf.treas.gov/explarson/notices/notice_968.pdf
http://www.atf.treas.gov/regulations/final-interim/atf_1.pdf
and other rocketry news web sites.

Glen Overby, MASA President

Outreach

Rocket League Returns

Twenty-five teams to Measure Mars

Ted Cochran

Innovations in Science and Technology Education (INSciTE) is once again sponsoring Rocket League this spring. About 80 students in 25 teams are participating. This year's competition is loosely coordinated with the upcoming launch of NASA's Mars missions.

The competition is open to students in grades four through nine. Students get to choose how challenging their competition will be, and they will earn ribbons based on how well they complete that challenge. In addition, the best teams in each competition division will receive trophies.

Rocket League students will have to design, build, and fly a model rocket that contains a probe designed to make up to twenty separate measurements of their landing area. They can measure temperature, wind, solar radiation, or anything else they wish. The teams can build a simulated TV camera, or even fly a real camera if they have the ability to do so. They'll also be attempting to land the probe exactly 50 meters from their launch site.

Teams will first have to develop alternative designs in support of the mission, document their research, and submit the designs for review.

Once the review team has completed a safety check of the design, the team will build the rocket and make initial test flights to qualify for the competition flights.

Finally, the team will fly competition flights. They'll be awarded up to five points for each successful measurement taken, depending on the precision and accuracy of the measurement. Additional points will be awarded for landing the probe near the target distance from the launch site.

INSciTE™
Innovations in Science and Technology Education
Rocket League

This year, a large number of GEMS (Girls in Engineering, Math, and Science) students are participating. These students, from Olson, Green, and Field schools in Minneapolis, spent a week at Space Camp in Huntsville, Alabama during their spring break, and have come back to Minneapolis with a lot of knowledge and motivation to be applied to Rocket League!

Other teams are being mentored by MASA members, and we may see a few at the field during MASA spring launches.

Rocket League will conduct a final launch on the afternoon of **May 29** at Bryn Mawr Meadows park in Minneapolis, near the I-394 intersection with I-94. We expect to see many of the teams fly competition or demonstration flights that day, and MASA members are welcome to come out and help!

Contact Ted Cochran for additional information about Rocket League, particularly if you are interested in spending an afternoon or two mentoring one of the GEMS teams.

Building

Turn Your Own Nose Cones on a Lathe!

Third and final part in a series

Jon and Katie Hayman

Now that we are experts at turning out a nose cone from a full-scale drawing like the M100b nosecone from Part 2, it is time to discuss creating technical nose cones like the Von Karman shape. All of the turning techniques and issues described in the last Planet apply here with just a few differences.

STA	Diameter
1	2.219
2	2.219
3	2.219
4	2.219
5	2.218
6	2.202
7	2.173
8	2.136
9	2.093
10	2.044
11	1.989
12	1.930
13	1.867
14	1.798
15	1.726
16	1.649
17	1.568
18	1.483
19	1.393
20	1.298
21	1.198
22	1.093
23	0.981
24	0.862
25	0.734
26	0.596
27	0.443
28	0.265
29	0

Instead of working with a full-scale drawing of a nose cone to set our calipers to each station, we can just use our programmable calculator or computer software to generate a table of stations and the diameter at each station. Do this by plugging in the Haack equation (where C=0 for Von Karman shape) shown in Part 1 (last December's issue).

To create a 14" long Von Karman nose cone for an airframe with an inside diameter of 2.133", we generated the accompanying table of data in which the stations are one-half inch apart.

The first step in making this nose cone is to use the procedure described in the last article to rough out the wood stock and get the first station cut to the 2.219" depth. Then form the shoulder to the left at 2.133".

Now for a word about precision when cutting to the depths listed in the above table. Wood workers making fine furniture usually never try for accuracy greater than 1/64". If you turn metal stock on a metal lathe, you might try for the 1000ths of an inch specified in the above data using a dial or digital calipers. Because of the nature of wood, wood fibers "stand up" and contract/expand, so trying to measure to 1/100 or 1/1000ths of an inch would be meaningless. At best, your accuracy will be somewhere between a tenth and a hundredth of an inch after you finish profiling and sanding. If you don't have digital calipers, you could convert the above figures to the nearest 1/64 of an inch and set your lathe calipers to that dimension using a ruler with 1/64" markings. If you have digital calipers, you can follow a quicker method that we describe below.

For each station in the chart, open your digital calipers until you get the reading of the station to 1/1000ths of an inch (even though you don't really need this accuracy). Now, set your lathe caliper opening the

Figure 1. Setting the calipers

same as or slightly larger than the digital caliper opening (Figure 1). Use the lathe calipers to get the stock down to the initial depth of the station while the stock is in motion on the lathe. Also, the digital

Figure 2. Precision depth measurement.

Figure 3. Sixteen stations cut and marked.

Figure 4. Seven more have been cut.

Figure 5. The work continues.

Figure 6. Almost done.

calipers are wider than the lathe calipers and need more space to fit down into the slot. When you cut the stations with the parting tool, you will need to cut them at about twice the width (to the right of the station mark) as you did for the nose cone in the last article.

When you get close to the needed depth, stop the lathe and check the slot depth with the digital calipers Figure 2). We have plastic digital calipers and we would quickly ruin the jaws if we tried to place them in the slot when the stock was in motion! Keep cutting the slot a little deeper, and stop the lathe to check the depth until the digital caliper jaws just slide over the work. As you cut each station, check the station off on the above table so that you don't repeat it by mistake.

Work the stations left to right (thickest to thinnest), profiling with the skew chisel / sanding block, and fine sanding as you go along. See Figure 3 with stations 1 to 16 cut and marked with arrows.

Figures 4 to 6 show the progression of cutting, and Figure 7 shows the nose cone chucked on the drill press so that the tip can be finished with a sanding block. We don't recommend this method of finishing nose cone tips, as mentioned in the March issue. A lot of instability and wobbling is introduced to the stock in motion by turning a narrow-enough spindle to the left of the

Figure 7. Sanding the tip using a drill press.

shoulder. Also, the stock wobbled in the drill press and it took a lot of hand pressure (with heat build-up!) to steady the stock enough to form the tip. We feel that it is best to finish the tip as described in the last article.

You should now have all the info you need to get started with turning your own unique nose cones! Figure 8 shows a few of the nose cones turned by the authors with a golf ball as a reference for size. The Von Karman shape is second from left. A few recent lathe books that we found helpful are listed in the references.

Happy turning!

Figure 8. Anyone got any mahogany airframes?

References

Conover, Ernie, *The Lathe Book*, The Taunton Press, 2001 (great general reference for everything about the lathe)

Spielman, Patrick, *The Art of the Lathe*, Sterling Publishing Company, Inc., 1996 (see pp. 29 - 31 for a shop-built steady rest and a home-made "spigot chuck" which could be used in place of the expensive lathe chuck for forming nose cone tips)

Photo credits

Thanks to Katie Hayman for photos in this article!

Team America, continued from page 1

Several MASA members, including Mike Erpelding, Alan Estenson, and Ted Cochran had signed up for the mentor's list last fall when NAR first sought volunteers, and were listed on the TARC web site as contacts. We also sent regular emails to all of the Minnesota teams describing launch schedules and ways to get advice. But, as anyone who mentors schools on a regular basis would expect, some teams asked for help right away; others waited until they needed help to contact us, and still others waited until the qualification deadline. Ted's experience with Apple Valley was a bit different from Art's experience with St. Anthony Park.

Apple Valley High School's AP Chemistry teacher, Katie Koch-Laveen, is a Minnesota Teacher of the Year award winner and Science Olympiad coordinator. When her students became interested in participating in Team America, she looked Ted up on Team America's web site and sent him an email asking for mentoring help. Ted's motto in these situations is simple: Given a choice, play with rockets, don't stay at work[1]!

Play with rockets, don't stay at work!

Ted needed to determine how many students wanted to participate, but they all didn't have a good idea of what would be involved. So, he first met with all of the students in Katie's two AP Chemistry classes, and gave an overview of TARC and model rocketry. About 20 students expressed interest, and a meeting was scheduled the following week to provide additional

Apple Valley TARC team

[1] Play With Rockets, Don't Stay At Work is abbreviated PWRDSAW, as in, "Boss, I'll go get the powered saw...."

Brainerd TARC Team

information. Some of the students wanted to see some launches of AP motors (none of them had ever seen one before), so Ted set up a demonstration/practice launch at the school's field on a Wednesday afternoon in late November. MASA members Stuart Lenz, Glen Overby, and David Whitaker were happy to help[2].

Brainerd qualifies!

AVHS ended up with a team of seven students. One of the members had read Homer Hickam's *Rocket Boys* as a sophomore, gotten interested in aerospace engineering, and had written to him. He sent her an encouraging letter in return. TARC was a natural fit for her. Other team members were not as excited initially, but they got more focused as the plans took shape.

The team got an Estes Designer's Special and a commercial payload capsule, and Ted led them through a trade-off analysis. They decided not to use AP motors (to avoid the learning curve associated with electronic staging). They also decided to use clustered motors in the sustainer (to avoid lawn darting when a single motor fails to light) and to gap stage the sustainer to improve the chances that all of the sustainer motors would light even if one of the booster motors did not. They further decided to make a rocket that was as small and light as possible. RockSim indicated that three C motors staging to three more C motors had potential, and the backup plan was to add two strap-on pods to the booster if necessary.

The initial design work was finished in mid January, and construction of the first rocket was completed by the February MASA launch, which was (not coincidentally) at the AVHS field. The rocket weather cocked and didn't clear 900 feet. On to Plan B: The team added the strap on pods.

Meanwhile, Art had been in contact with Paul Lulai, the teacher of the St. Anthony Park Honors Physics class. Art set up an initial meeting and found out that none of the students had ever built a rocket from scratch, though a number had built "almost ready to fly" kits from Estes. During Art's initial presentation, he went over basic parameters of the contest and what needed to be accomplished and suggested a timeline with intermediate goals. Art also brought a couple of his rockets to show them some basic building techniques and to give them some ideas of what they needed to accomplish.

St. Anthony Park decided to use the KISS principle - Keep It Simple Stupid. They decided to keep the diameter of the rocket the same along its entire length and to incorporate kits as much as possible. They used two Fat Boys and also purchased an additional body tube of the same diameter. They used one of the nose cones as a coupler. They used all six pre-cut fins from the kits. They modified the centering rings to accept three BT-50 motor tubes. One Fat Boy body tube

Champlin Park TARC Team

[2] ibid.

became the booster, cut just long enough to accommodate D12 or C11 motors. They also opted to use the sure fire staging system of cellophane tape between the booster and sustainer stages.

Champlin Park qualifies (barely!)

For the egg holding portion of the payload section, they encapsulated two hard-boiled eggs in "foam in a can" inside one of the extra body tubes from one of the Fat Boys. Then they cut the cylinder in half, scooped out the egg and were then able to secure the raw hen's eggs very snuggly by taping the foam cylinder back together. They did an initial drop of 30 feet to test the durability and broke no eggs. [They were actually testing their first design parachute and it failed to open.]

They built the sustainer to accept up to three E9's boosted by three D12's, but that put them way over on the propellant weight limit. After much trial and error using Rocksim, they were able to determine that three D12-0's to a D11-P and an E9-8 was the most propellant they could "stuff into it". They simply plugged the third sustainer hole. This arrangement gave them a lot of flexibility with their design, especially with the new Estes C11 motors.

Ted received permission from AVHS to coordinate regional qualifying launches there three weeks in a row prior to the deadline. On the first such launch, Brainerd and Apple Valley were the only teams ready. It was Apple Valley's first flight with strap on boosters (the rocket now staged five C motors to 3 C motors), but they decided to make this an official qualification flight anyway (no guts, no glory). One booster motor didn't light (until staging, then it burned from the top down) but the rocket still managed 1155 feet. That same day, Brainerd flew an official qualification flight to 1256 feet on a large rocket with a G35 in each stage. Alas, a second rocket flown for practice CATOed, and the first rocket's second official flight drifted out of sight.

Since Apple Valley had an official qualification flight made, they decided to focus on reliability improvement before making a second official flight. The team repaired their slightly toasted booster section, and launched the following Wednesday. Unfortunately, a side pod motor didn't light, and the resulting spiraling flight limited altitude to 1050 feet.

Three days later, in between a blizzard that ended at 10:00 AM and a gale that started at 2:00 PM, we hosted another regional qualification launch. Apple Valley flew a perfect practice flight to 1590 feet. It was filmed by Channel 11 and appeared on the 6:00 PM news.

Apple Valley wasn't the only team silly enough to fly in the -15 degree wind chill. Champlin Park flew "Mel," a modified Big Daddy staging a D12 to an E9, but the E9 CATOed. Nevertheless, one of the eggs survived, and they turned in an official qualification altitude of zero feet.

St. Anthony Park's rocket, now dubbed "666", flew beautifully to apogee. We heard the ejection charge and some saw it afterwards, but the students learned something about parachutes that day: Don't make them out of clear plastic! All of us lost sight of it as it drifted in the gray background from the clouds. So off went the team, trekking through the snowdrifts. While walking the lee side of one of the hills Art slipped and did a somersault, much to the amusement of the team. Finally, one of the students that had run ahead called and said he had it in sight. The rocket had drifted well over half a mile. It was beeping out 1335 feet, giving St. Anthony Park a score of 165 if there were no broken eggs.

They got inside out of the wind and cold and opened the payload section in front of the NAR referree who verified that the eggs were unbroken. Much hooping and hollering was had by all--they were top dogs in the

St. Anthony Park TARC team

state until Apple Valley a few days later. This flight went about 30 feet higher than Rocksim had predicted. St. Anthony Park lightened the rocket, but was unable to fly a second flight later that day due to ground support equipment problems.

Four days later, on March 12, Apple Valley decided they were ready for their second qualification attempt. To improve clustering reliability, they were using igniters with long leads, and were paying special attention to igniter preparation. Ted asked the team what they'd done to reduce the performance of the rocket to keep it from flying to 1590 feet again, and one of the team members told him that they'd "told the rocket not to fly so high." It worked at least a little bit, because the flight went perfectly, and the altimeter read out 1570 feet with both eggs returned intact.

After building for four months and flying five flights in the depths of a Minnesota winter, AVHS had reached their goal, and looked to be a lock for the finals. That obviously resulted in extremely excited and happy team members, whose members began raising travel money and planning for the finals.

Ted and Art also witnessed flights on Friday March 14 at the huge North Branch sod farm, which was a welcome relief from Apple Valley's barely-legal field surrounded by rocket eating trees.

A perfect recovery!

North St. Paul High School, which had joined MASA for a meeting in October (only to be scared silly by our junk yard rockets building session <grin>) flew a 2.6" booster with 2 D12s staging to a 4" modified Big Daddy sustainer with 2 E9s. The rocket weighed a hair over 2 pounds. It went rather ballistic, but was retrieved from the cornfield about 1/4 mile upwind with two eggs intact and 555' on the altimeter for a qualified flight. However, they couldn't do a second flight because of damage to their motor mount.

St. Anthony flew their second qualifying flight, but one of the three D12's in the booster did not light, which meant that the D11-P in the sustainer did not light, which means the rocket achieved an altitude of just 430 feet. There was still plenty of daylight left and they had more engines, so they did another trial flight and this time all five engines lit and they got an altitude of 1385 feet. Unfortunately, the parachute got melted together and the rocket hit with enough impact to crack a fin and break an egg. Also, they forgot to unplug the holes to their altimeter portion of their payload and suspect that they actually went higher than that.

Apple Valley qualifies!

St. Anthony had to wait to make sure that the 165 score was low enough to qualify for the Finals. It was! So they too are off to the National Competition May 10th and are way excited.

Also on Friday, North Branch Senior High flew a 2.6" rocket staging a G80 to and F23. Their first flight weather cocked significantly during the two second coast programmed into the timer, but was recovered about 1/4 mile away with eggs intact after a flight to 895 feet.

During preparation for a second qualification flight there was an, um, unplanned ignition of the sustainer motor, which resulted in a spectacular land shark. Luckily, the team was observing safety precautions and was neither behind nor in front of the errant rocket, but they were out of time to qualify for that day.

That same day, MASA member Ken Corey-Edstrom witnessed Champlin Park's second qualification attempt in Champlin, Minnesota. Champlin Park's team was extremely eager but inexperienced, and had only been working on the challenge for a few weeks. There were 15 enthusiastic team members, and all of the proceedings were being videotaped.

The team's highly taped and repaired rocket weighed 568 grams with eggs and motors. They had prepackaged their motors by taping them tightly into the upper and lower stages before Ken got there. They were attempting to stage a D12 to an F50, and given the approaching deadline, there was nothing that could be done to increase their chances for success. After

launch pad problems, battery problems, and controller problems, they managed to get the flight off the ground. Alas, the results were predictable. The badly weather-cocked rocket went up painfully slowly to about 100 feet, failed to stage, and suffered a harsh landing in the quickly softening mud. The motor mount had disengaged from the bottom of the tube and was jammed against the parachute. The eggs were well packed into the nose cone, but both were broken. The altimeter did not register an altitude but the flight was disqualified in any event. Given the enthusiasm of the team, though, we'll have to make a special effort to get them a knowledgeable mentor next year!

Glen Overby agreed to witness North Branch's second qualification attempt over the weekend. After a mad scramble to get an FAA notification in place, Glen was able to witness their attempt on Sunday--the last possible qualification date. Glen watched as the team prepped their rocket (with revised ground handling procedures :-) and launched it around noon. The rocket staged properly and both booster and sustainer deployed parachutes. They used a huge 48" parachute to make sure that the eggs would be intact on landing, and it worked. The flight went to 1415'--an excellent result that qualified for the national fly-offs on the last possible date.

A beautiful day for a launch! OK, a decent day. No, really, a pretty fair day. Well, at least the wind is legal.Ö

Ted Cochran and Mike Erpelding are volunteering at the finals--expect to hear all about it next issue!

Still More PWRDSAW[3] Opportunities

Camporee Launch

300 scouts and 300 rockets in eight hours!

On **May 17** at the Metro Lakes District Camporee there will be a large rocket launch. The Boy Scouts hope to launch up to 300 rockets between 9:30 a.m. and 5:00 p.m. Many of the rockets will be built ahead of time, but they are also planning to have at least some scouts build the rockets that day. The camporee will be held at Streans Scout Camp near Annandale and Clearwater, MN. Experienced rocketeers are needed to help older scouts and adults. Contact Mike Erpelding to volunteer.

St. Croix Academy Rocket Camp

Two weeks of rocket fun!

St. Croix Academy's summer rocket class will be **Monday July 7 to Friday July 11 and Monday July 14 to Friday July 18**. The class will be for six- to ten-year-olds, and will be held from 9 A.M. to noon each day. Mike Erpelding is coordinating MASA volunteers to teach during the session, and to help launch rockets each Friday. Contact Mike Erpelding to volunteer!

Westwood Elementary School

Build and fly for 90 fourth graders

For the sixth straight year, MASA will be helping Westwood Elementary School's fourth graders build and fly rockets. This year we'll be working with 78 students in three classes. Teams of three kids will construct their rockets in a building session on **Friday May 2, 2003**. They'll fly all 26 of them **on Friday, May 23, 2003**. We will also conduct a demonstration launch or two at the end of the day.

Every year we have a duration contest, with the kids doing the timing using their well-calibrated ONE-Mississippi counting system. This is yet another great opportunity to get kids interested in the hobby. If you're interested in helping, contact Ted Cochran.

[3] Ibid.

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 alleviate the impact of urban development on rocket flying!)

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.

Welcome New MASA Members!

Kevin Cox

Steve Handeland and family

Ferrell Wheeler

Sheehan Wheeler

Caislin Wheeler

Parting Shot: The aerodynamics of flying cones

Ted Cochran

John Cipolla's Sprint demonstrates the effect of velocity on base drag as it accelerates from lift off through burn out on its magnificent maiden flight at a Minnesota Tripoli launch in June, 1999.

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