

Altitude!



South Jersey Area Rocketry Society Official Newsletter

NAR Section #593

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MAY/JUNE 2000

HAPPY 1st BIRTHDAY SoJARS!

President's Corner

By Art Treiman

Well, here I sit writing my report (late, as I occasionally am, with apologies to Joe), debating what to write about. We are getting underway for our spring and summer launch season (April wind-out aside), and generally doing the things that rocket clubs do. Oh, yeah... it is also the one-year anniversary of our formation! Looking back, it has been a busy and fast year since we started. I remember my wife thinking I was nuts as I generated the form letter and mailed it out to 20 names on a list. Well, I should be in sales because over half those people ended up coming to our first meeting and forming our group! I guess it is just the smell of black powder that keeps us coming back for more.

Anyway, I won't waste too much "bandwidth" with my column this month. The first anniversary of our group is a nice milestone, but I don't want to dwell on the past. We all see the future unfolding together every month at our launches and meetings, so I don't need to tell you all about it. I hope SoJARS will continue to be as enjoyable and rewarding for all its members as it is for me. One of our group recently said to me that "we've got a good group of people and a good thing going here" with SoJARS. I most definitely agree! Thanks to all of our members who have helped turn this club into "South Jersey's Rocket Club."

Finally, congratulations to Nancy and Darren on their Level II Certifications.

See you all out on the field!

Editorial

By Joe Libby

Our one-year anniversary is upon us, so in honor of this historic moment I thought I'd reprint our first minutes as scribed by John Coles from that groundbreaking meeting. I also reprinted our first launch report. Additionally, I compiled a listing of

the Rocket of the Month Contest winners for the past year. And don't forget at our May 21 launch we plan to take a group photo for the occasion.

Speaking of upcoming launches, Art forwarded many of us an email from Stephen E. Flynn concerning a new NAR Sanctioned Open Meet in Newton, NJ. See the Calendar and the new Letters to the Editor section for details.

Though our April 30 launch was waived off due to high winds, a reporter was on site and took notes from (and a photo of) many of us.

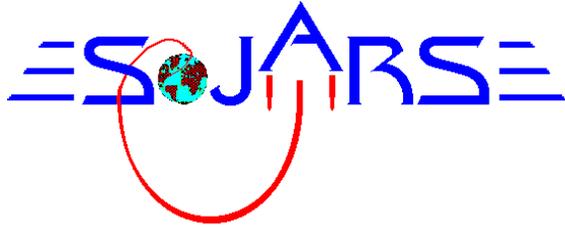
Finally, RATS IX took to the skies from April 28th to the 30th with many SoJARians in attendance. Congratulations to Nancy who flew a successful Level 2 certification with her Quilrocket.



Congratulations also to Mike Rossbach who successfully certified Level One on Saturday April 29 at RATS. He launched a PML Ariel on an H-73J.

Thanks to all who responded to my request for RATS stories. Thanks also to Darren Wright whose story reminds us that there are other cool high power venues nearby. See Members Forum and Letters to the Editor for stories and photos.

As usual, thanks go to Pat for keeping our website updated. Back in March he had added a local chat forum to our site, so if you haven't been recently you should check it out.



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Calendar of Events

SoJARS Meetings

Unless otherwise specified, all meetings take place at the Cherry Hill Public Library, 1100 North Kings Highway, Cherry Hill, NJ. (856) 667-0300. Directions are available on our web site. For the year 2000, all meetings will be held on the 4th Tuesday of each month from 7 till 9:00pm in Room A.

Tuesday, May 23.
Presentations: Rock(et) Videos - Steve Childs

Tuesday, June 27.
Presentations: Trip to KSC - Joe Libby

SoJARS Launch Dates

Unless otherwise specified, our launch area is at the Gloucester County College. Directions are available on our web site.

Sunday, May 21, 12:00pm to 4pm.
Raindate: None.
Theme: None.
Funtest: 1/2A Streamer Duration.
Vendor: M & G Hobbies, Delran, NJ, 856-461-3553

Sunday, June 11, 12:00pm to 4pm.
Raindate: 18
Theme: Sci-Fi.
Funtest: None.

Sunday, July 9, 12:00pm to 4pm.
Raindate: 16.
Theme: Moon & Mars.
Funtest: None.

Whitehall Fair Launch

SoJARS is doing a rocketry demonstration and launch on Wednesday, May 31st, at the Whitehall Elementary School, 10am - 3pm and 5pm - 9pm. Anyone interested should Email Pat Flanagan.

Spring Challenge in Newton, NJ

Saturday, June 3, 9:30am to 5:30pm
Sunday June 4, 2000, 1:30pm to 5:30pm

Altitude! Deadlines

Submissions for publication are accepted continuously by the editor. The Deadline for the July/August issue will be July 7.

Launch Reports

In honor of our First Anniversary, I'm reprinting our first launch report...

July 18th, 1999

By Pat Flanagan

On the 18th of July, SoJARS had its first Launch! We had a wonderful turnout and a great day. The weather for the day was hot and dry with the temperature over 100°F. In spite of the blazing sun, we got in lots of flying and had tons of fun. The day started with set-up. Tony Romano and family brought a canopy, and the Rowley's brought a table and other equipment. Other equipment brought to the event included buckets of cellulose recovery wadding, three Mantis pads, several Estes and Quest pads, a PVC pad and controllers of various makes.

After set-up, Club President Art Trieman attempted the first launch, which failed to ignite. After some tinkering it still wouldn't fire and it was determined his controller had low batteries. After Art's attempt, Pat Flanagan tried an Estes X-wing with a C6-3. His first attempt ended like Art's, but with a new controller from Tom Mitchell the rocket took off in a nice flight.

More excellent launches followed, including Art Trieman's Javelin, and several of John Coles' unique creations, most of which were making maiden flights. Other good flights were Pat Flanagan's Saturn V, Bob Ross's Sidewinder, and a Rocket Drag Race of three Comets.

By days end over 40 launches were logged. On leaving the field we kept with our word to the Sports Director at the college and made sure the place looked like we were never there.

Good flying all!

March 19, 2000

By Barry Berman

Sunday, March 19, 2000, was another great day for rockets! Twenty-four participants took part in the day's festivities: President Art Treiman and his daughter Sydney, Steve Bastow with son Steven and nephew C.J. Ennis, Jim Beck, Kali Bradshaw, Steve Childs, John Coles, Billy Commander, Peter Commander, Jr., Jim and Kathleen Duffy, Patrick Flanagan, Brian Freeman, John Grammick, Joe Libby, Bob Matts, Tom Mitchell, Bob Ross, Mike Rossbach, Steven Wilson, Darren Wright, and myself. In addition, several visitors/spectators were

also present, and we hope some will be back next month with their own models to fly. Special thanks to our "vendor", George Tiger from TNT Hobbies, who came all the way from Baltimore to provide us with those all-important missing or broken items so we could continue flying. Thanks also to those members who made George's trip up here worthwhile by making purchases. We hope this will keep him coming to our flights.

Silver Comet Drag Race: Let's face it, we just have to do this. No getting out of it I suppose, even if we wanted to, which we don't. This installment was probably the most spectacular of all with five and a half participants: Steve Bastow, John Coles, Joe Libby, Tom Mitchell, and myself taking part. The other "half" participant was Mike Rossbach who had a little trouble getting his off the pad, taking to the sky a few minutes later.

A Couple of "Firsts": Sydney Treiman flew her first rocket, which she built and painted herself (using fingerpaints - a new finishing technique!) and named "Jamie". Jim Beck flew his Alpha III on an A8-3 to earn his merit badge! Congratulations, Jim!

"Back to the Drawing Board": The most painful moment of the afternoon was Pat Flanagan's Saturn V flight. Engine failure (D12-3) caused it to come off the launch rail with a fraction of the expected speed. Consequently it did not achieve anything near its expected altitude and landed HARD on the turf. Good news - Pat says it's repairable. Bad news - he wasn't through there. His Comanche-3 (D12-0, C6-0, C6-7) experienced total recovery system failure (sounds medical, doesn't it?), describing a beautiful swan dive, drifting well downrange, and creating a DSE (detectable seismic event) by shattering on the asphalt of the parking lot. Ouch! Steve Childs had his share of the afternoon's woes with two separate recovery-system problems, however both times the rockets made what appeared to be relatively soft landings on the turf, and were not badly damaged. It's hard to damage them with all that fiberglass! A list of failed flights could not be complete without mention of the unluckiest rocket in the club, my cloned-from-club-plans Maxi Mosquito. Having learned my lesson chasing long-streamered rockets, I shortened the streamer, and replaced the motor mount (damaged in LAST month's launch!) with an 18mm mount. After a nice launch on a C6-5, the nosecone failed to open (damaging the new motor mount) and causing the much-cursed thing to lawn-dart a mere 3 inches from the edge of the asphalt parking lot. Unfortunately, I recovered it. This brings me to Darren Wright who attempted twice, both times unsuccessfully, to LOSE his Estes Mongoose (he says its old and falling apart) using C6-0 to C6-7 both times. Unlike those who DON'T want to lose their

rockets, he recovered it unharmed both times. Another potentially serious moment was Tom Mitchell's Nike-Ajax fire. The model caught fire, and landed close to the pad, never achieving any serious altitude. With some heads-up attention, the fire was quickly put out without any collateral damage. Failure analysis suggests that only one of the three clustered engines ignited at launch, causing one or both of the others to be ignited from the TOP end by the single functioning motor. Suggested fix: longer motor tubes to prevent the ejected material from reaching the other motors. For me the high-point AND the low-point of the afternoon was Art's launch of his new-improved Pretty-in-Plaid (Space) Barbie... "now sporting an improved rocket pack with heat-resistant shielding and a flame-proof helmet"!!! Unfortunately, the official result as recorded by the RSO was "Spin, Burn, Crash". Oh Well... Back to the drawing board.

Other interesting flights included Darren Wright's 3 x C6-7 clustered Astron Ranger, Bob Matts' Astrocam, the great-looking sci-fi/retro custom fins on Tom Mitchell's Silver Comet, John Gramick's Strongarm (E30-4T), Jim and Kathleen Duffy's father-daughter launch of their Big Mosquito which flew great on a C6-5, and Tom Mitchell's Orbital Transport clone (chute-recovery booster with parasite glider).

Lavoisier Award: Once again the Antoine-Laurent Lavoisier award for the most flights goes to Steve Bastow with eight. Honorable mention to Joe Libby with seven and Tom Mitchell with six. As always, a great time was had by all. Hope you can join us next time: Sunday April 30th from noon to four.

April 30, 2000

By Joe Libby

This is a brief but disappointing report to write. "Canceled due to excessive wind." Blah! We actually did have a great turnout, so quite a few bummed-out rocketeers had to sigh and turn away. We did, however, get to share our excitement over our hobby (addiction for some of us) with a freelance reporter who came and will be publishing a story about us (including a group photo) in an upcoming issue of *The Washington Township Reporter*. Since she missed out on actual launches, she'll be back for the May 21 launch. That launch marks our First Anniversary so we should all try our best to be there.

Members' Forum

My RATS Adventure

By Joe Libby

By now I'm sure everyone knows that Roar at the Shore IX, canceled this fall, was held this Spring on April 28 - 30, 2000. Friday was for experimental rockets and motors, so I doubt any SoJARS members went on the 28th. The other two days were open to all certified motors through "N" class with waivers to 15,000 feet all three days. I went on Saturday with Steve Childs.

I had a great time at RATS! This was my first time there, and I'm so glad I went. It was especially fun going with Steve and seeing so many friends there.

Steve & I headed out bright and early hitting the road before 8. Well, that was the plan anyway. I think we actually got rolling a little after 8, but the drive was easy, just over about an hour. We arrived to find a good parking spot where I opened my hatch & hung out my SoJARS Blanket as a "banner."

Before breaking out our supplies, we walked around to orient ourselves. The Tripoli Staff were very organized. They called together everyone for a brief orientation/ground-rules review about 9:30am. They not only had a PA system but even broadcast over FM 100.1 all announcements. The very large field was divided into three sections. A dirt road lead from the Parking Lot/Vending Area to the Launch Control Area. Along the road were first the Registration Desk, then the RSO table, then Igniter Prep tables, then, behind caution tape, the Launch Control Station. To the left and right of the road were a total of 29 Pads, 1 - 17 on one side, 18 - 29 on the other, each at least 100 yards from Launch Control. Also, a separate "Estes Rack" with about 12 rods was close to Launch Control. Finally, at the end of the dirt road, about 500 yards from the Launch Control Area, was the distant Level 3 Pad (facility is more like it).

Again, I can't emphasize enough how organized they were. There had to be a couple hundred rocketeers there, but I never had to wait long to get a pad assignment. Everyone prepped their rockets at their cars, withholding igniter insertion until cleared by the RSO. The RSO weighed & inspected each rocket, then you moved on to a Pad Manager who assigned you a pad. While the left side of the field loaded pads, the right side launched, and vice versa. All launches were executed by a single Tripoli Staff Member/Announcer. Even though I didn't "push the button," it was still very exciting to hear your name announced & see your creation shoot into the sky.

Especially exciting to me was seeing & hearing, and FEELING, the larger rockets thunder off the ground. I believe the largest motors flown were several "M" motors, all launched from the distant Level 3 Pad. Also amazing to me were how close back to the launch site some of these very high flying missiles would return. Sadly though, a few great flights ended up in the trees, in spite of the fact that they were a good half-mile downrange. One was an otherwise outstanding "M" flight, and another was our own Steve Wilson's Level 2 (I think) rocket. I have no idea if or how they'll get them back.

Speaking of Steve and high power flights, he was prepared to fly his North Coast Archer on an "H" for Level 1 certification. Would you believe he couldn't proceed because no one had the proper NAR paperwork!? Nonetheless Steve managed to get the Archer off the ground with a G, but just barely. It was clearly underpowered as it struggled to climb a couple hundred feet. At least he didn't have any trouble finding it. Not so for his North Coast Patriot. This meticulously crafted scale model thundered way up into the clear afternoon sky on a beautiful G powered flight. Unfortunately it took Steve over half an hour to find it as someone else apparently found it first and "kindly" brought it to the Launch Control Station!

Next, Steve flew his Launch Pad Falcon, which has had a few less-than-ideal flights at our SoJARS launches. Flying on a cluster of two E15-4s, it shot off horizontally and on ejection lost its nosecone. Back to the drawing board, I guess.

On a positive note, Steve got to meet several rocketeers from the Pennsylvania group, PARA. He tells me they are a very cool group.

The trip was as educational and inspirational as it was fun for me, too. Everyone was friendly and happy to tell me about their rockets, what special features they had, what tips they had to share, etc. Our own Steve Wilson gave me a mini-lecture on altimeter drogue and main 'chute deployment, without which I don't think I would nearly have appreciated some of the incredible high-altitude flight recoveries I witnessed. In the end, I was extremely motivated and inspired. I'm already starting my first scratch built model!

Another neat feature of the Roar At The Shore experience for me was seeing all the cool goodies the several vendors brought. Steve Childs especially was like a kid in a candy shop! I myself picked up an E15-7 and an E30-7 after launching my reinforced-fin Silver Comet on an E15-4 proved too short of a delay. I'm truly only guessing, but I'll bet I got to over 2000 feet with the Silver Comet on the E30-7. I didn't even mind the 20-minute walk to recover her, especially since I initially thought she ended up in the

trees, but actually turned out to be about 100 yards short of them.

For those of you who couldn't make it, try your best to go to the next one, scheduled for sometime in October. I know I'll be there!

Letters to the editor

I sent out a request for RATS stories and many of you obliged. I added headlines for effect but otherwise these are your stories in your words.

Two Days at RATS

By Bob Ross

I too had a great time at RATS. It was a long time coming. Last year (1999) was a total blowout. In the spring, the farmer decided to plant lettuce, which was an early crop and couldn't be trampled by hundreds of "rocket scientists". In the fall, the weather was horrible.

However, last weekend was pretty good even though the high winds canceled the last half of the day on Sunday. I was fortunate to have the "honor" of sending off the last rocket of the meet. It was my Aerotech Initiator on an F20-7W. Even though I launched it into the wind and used a 30" X type chute, the drift was still enough to send it clear across the field, but luckily short of the dreaded trees. While I was out there I video taped the three large rockets that still dangled from the treetops. Unfortunately one of them belonged to Steve [Wilson]. Hopefully he got it back.

Saturday was a great day. The weather was sunny and warm even though the winds were a little more than we would have liked. I started off the day with my favorite V-2 on a D12-5. After a good recovery I followed it with the metallic-red Fat Boy on another D12-5. It too came back in great shape. Raising the power ante, I put an Aerotech E15-4W into the Launch Pad Bullpup. It had a great liftoff; however, the recovery was a bit rough. During its decent, it drifted past the grass field and into the dirt field. After touchdown, the wind caught the chute and dragged the missile across the field until it got hung-up on a sprinkler head. There was quite a bit of paint damage and two of the forward fins came loose. Not sure how I will fix the paint, but at least the decals were not touched.

The next launch was my new custom design. At the last SoJARS meet where the dealer from Baltimore was selling things, I purchased a 36" long 2.5" tube. I had been wanting to build a larger version of my son's tubular fin rocket, and this was to be the body. AAA Hobbies in Magnolia was able to

supply me with a Phoenix nosecone and 2 packs of BT-60 tubes. To make a long story short, I angled both ends of each tubular fin (7 total), filled in the interior and outside grooves, and painted the insides red to match the nosecone. The body and the outside of the fins were then painted Rust-Oleum Chrome, which when dry, looks like stainless steel. The overall effect was just what I wanted and the rocket glistened in the sun both on the pad and in the air. The launch was a surprise -- literally. The rocket was set up on pad 24, which was the first one in the green group. All eyes were on the first pad in the red group, which was the rocket that the LCO was reading about and expecting to launch. When he pressed the button, everyone was shocked to see my rocket lift off instead of the other one. Apparently a switch was thrown in the opposite position. Regardless, it went up on an Aerotech F20-7W which sent it pretty high (the rocket is quite light for its size). Recovery went well, although it took me about a half an hour to find it in the tall grass. I had to keep playing back the videotape to see where it came down.

The final launch for me on Saturday was my Phoenix on an Aerotech E15-7W. It had a great flight and landed in a field of high clover across the road. It was like landing on a pillow and was the first time in many flights that none of the fins broke off.

The rest of the day with all the other rockets flying was absolutely terrific. There were hundreds of flights from A size through M. The continual roar of the composites going up is phenomenal. The best part of all was watching our own Nancy get her Level 2 certification -- that was really special !!!!

Congratulations to Mike Rossbach on his Level 1 Certification Flight.

Level One Cert with Ariel

By Mike Rossbach

I certified level one successfully on Saturday [April 29]. I was a little worried when I saw a level one cert. flight go off before me with the same rocket and motor combination (PML Ariel and H-73J) hit the street nose first. But after waiting for a 3/8 pad for over an hour the Ariel left the pad and safely landed between the rangehead and the pad. I walked maybe 25 feet to retrieve my rocket. The parachute had some damage and had to be replaced but my Ariel will fly again.

Nancy Knits a Nice Level 2

Photos By Bill Rowley

Congratulations also to Nancy Rowley for a nice Level 2 Certification Flight. Sometimes pictures are worth a thousand words...



Nancy's Quiltrocket waiting for her launch command on Pad 10.



Bill Rowley's EZ-I65 rocket stands ready while another rocketeer loads his own creation in the distance.

Finally, as most of you already know, RATS isn't the only High Power venue in the area. Darren Wright sent me this story...

MD/DE High Power Trip

By Darren Wright

No... I didn't attend RATS. I was in Tampa on business. Actually, I try to stay away from RATS.

Once you fly with the MD/DE guys everything else seems way too crowded.

Where: Rhodesdale, MD

When: 6th May [2000]

Who: DE/MD Tripoli Prefects. Actually it is one group now. The MD/DE Tripoli groups had launch areas so close to each other that they decided to combine and purchase their own insurance. It allows us to fly whatever we want. Since most of the launches are not Tripoli sanctioned, we do not have to adhere to the "certified only" policy. You will regularly see Kosdon, USR, APS propellants being used. There is also a lot more leeway with rocket building. It allows us to have much more interesting rockets flying. (And some pretty hairy CATOs and shreds.) It also allows sharing of RSO and LCO duties over 2 groups of guys. There are 3 major fields flown out of: Rhodesdale, MD, Bridgeville, DE, and Price, MD. All 3 are some of the largest fields on the East Coast - way bigger than RATS. Allows us to fly to 15k windows - and still come down in the field. They are a great group of guys, very helpful, not a stuck up one in the bunch.

I flew on Saturday, May 6, 2000:

1. A Mach Buster on G55. Gone. Gone. Gone.
2. The Transonic on an I435T. (Still level 1, although a heck of a Level 1 engine). Broke Mach with quite a crack, and was thought lost until a young lady found it about 1.5 miles down range. Go figure.
3. A custom 4" 9.5' tall 6lb rocket with three (3) 38mm cluster. Thanks to RockSim, I decided to go small and load 3 G80-10T's. Whew, did that thing move. This one will probably be the one on display at the Allied hobbies thing.
4. Well, by 2:00 I still hadn't gone level 2, and the track record was not good. One of the other members had a spectacular level 3 failure on an Aerotech M2400 blue thunder, and there was another level 2 that came in ballistic. I had both my THOY Falcon, and my PML Eclipse. The Falcon is a regular motor ejection, while the Eclipse is a full dual recovery system using an ALTS2 altimeter. With some pushing from my spectators and the other rocketeers, I prepped the Eclipse for flight. Between the heat and nerves, my hands were shaking pretty bad wiring up the ejection charges. But, I got it altogether, bought my 54mm casing, and loaded the J180T Moon Burner. So I had 3 new adventures going!
 1. First J level flight
 2. First altimeter flight
 3. First 54mm flight



Needless to say I felt as nervous as my first date. So I put her on the pad, Joe counted down, and off she went. 6.0 second Blue Thunder... the most spectacular engine I have used yet. Burned forever. I had a nominal drogue ejection, but it seemed too be descending too slowly. It turns out that my main had popped a little early. So, other than having to walk

quite far for the rocket, everything turned out OK. The altimeter was beeping 4700ft. Not bad for a 9lb 8.5' tall rocket.

5. Re-flew the cluster rocket on G125T's. Again a great flight...



Above is a picture of a few of my high powered rockets.

(Left to right)

Thoy Falcon, 54mm mount, 4.5lbs

PML Eclipse, 54mm mount, 9.0lbs

Dual chute recovery LOC Hi-Tech, 38mm mount, 1.5lbs

Custom Cluster rocket, three (3) 38mm mounts

Presentations

Fiberglassing Techniques

February 22 & March 28, 2000

By Steven Childs

Since the beginning of my rebirth back into model rocketry, I have always strived to learn new ways to preserve the models that I was constructing. Many times in the beginning I had become very frustrated with this hobby because even if I had a successful launch and recovery, the very launch itself would produce damage, sometimes unfixable.

One of the very best techniques I came across was fiberglass lamination. Not only was “glassing” incredibly strong and light, but it could also give the rocket a perfectly smooth surface resembling, what else, but glass. Here are some of the methods I’ve learned or developed in the lamination process of a model rocket.

To begin with, the laminate choices are extremely important and can range anywhere from light to heavy cloth depending on certain conditions. Of course, the heavier cloth is much stronger, but can build up the diameter of say, your airframe so much that it would become larger than the diameter of your nose cone or the overall length of wrap-around decals. Heavy cloth also has a more pronounced “weft” or weave that must be filled with either microballons, another layer of light cloth or some other means. It also cannot be wrapped around sharper angles such as fins, especially if an airfoil is present. My choice has always been medium cloth or the overall best in my opinion; multi-layers of fine cloth.

Now as far as resins are concerned, this choice is equally as demanding. The cloth must be saturated with some type of medium that will turn the cloth from a fabric into a solid mass and adhere that mass onto the surface you are strengthening. I have used both types of resins that are commonly used for this type of application: Polyester resins and epoxies resins. The former is used quite extensively in automotive applications and has the advantage of being easily sanded and applied. It is similar in viscosity to pancake syrup. The problem with this medium is that it does not adhere to surfaces as well as epoxy resins. Polyester especially does not adhere well to plastics and even though the majority of the strength with fiberglass is found in the cloth, keeping the cloth together as a whole is very important, and epoxy resins are the best choice in this area as well.

So now with our cloth and resin choices out of the way, let’s begin with the lamination process. I usually begin with the airframe without any fins or surface detailing in place. The reasons are somewhat obvious, as the lamination and sanding process is greatly reduced when it’s completed. I begin by assembling my kit in the same manner as I would without the lamination. After all, not many kits come with the fins already attached.

Begin with a thorough sanding job of your airframe, roughing up the surface enough to promote a good saturation of your resin into the fibers of the cardboard or phenolic airframes. As with fin attachments, adhesive epoxies need something to grip on to, as do our lamination epoxies. Mix your epoxies with it’s hardener according to the instructions given on the package, making sure you

are as precise as possible. Too much hardener will give an overly rapid catalyst effect, which can greatly reduce its strength. Too little may result in a mixture that may never fully cure. The two components can be mixed in a non-waxed bathroom cup, using craft-type popsicle sticks to mix them together.

Now with a cheap, throw-away bristle brush, lay down a thin “tack line” across the length of your airframe, about 1” in diameter. You will now lay the edge of your pre-cut cloth onto the tack line. This will give the cloth a little hold so you can begin the 1st wrap. It must be noted that I am of the opinion that the cloth must be laid down one layer at a time. To do multiple wraps may develop air pockets between the layers, which in turn will greatly reduce laminate strength. Also, when cutting your cloth, try your best not to pull or snag the fibers at the edge of your cloth. It will make your job a thousand times harder. It may also be best to support your airframe in some type of mandrill to free up your hands. A length of PVC pipe attached between two tube couplers works well. Make sure you place wax paper between the coupler and airframe, as to give yourself a good friction fit and assure that you can remove the couplers after your laminate is dry.

Now with our cloth attached to the tack line, begin turning the airframe while applying your resin across the length of the surface. You will not want to “paint” or wipe the resin across the cloth, as it will pull it off of the surface. The best approach is to “stimple” the resin into the cloth. This is more like a dabbing type of effect and actually forces the resin into the cloth. As you tap the brush down onto the surface, add a slight roll with your wrist. After the cloth is completely saturated, use some type of squeegee to wipe the excess resin off of the surface. This has a two-fold necessity. First there will be much less resin to sand afterwards and when you master this technique you will find that the surface can already look quite good. The second and most important reason is that too much resin will cause the fabric to float over the surface and again, air pockets can easily form. You must have just enough resin on the surface to fill the cloth. You want that cloth to be the strength on your airframe, not the very brittle, thin layer of resin between the airframe and cloth. When you squeegee the surface, you are also trying to smooth out any wrinkles that occur. You may also accidentally add some wrinkles or even pull the cloth around too much. With epoxy resins, you have about an hour to play around with it before it begins to cure. So be patient and take your time. The better job you do at this point, the less sanding and re-layering you’ll have to do later.

After your laminate dries, you may notice some areas that have air bubbles under it. These need to be

cut out with an exacto knife and a small piece of glass can be laid over the exposed hole. Make sure the cloth is at least a ½ inch bigger than the diameter of the hole. This is also true of the lap joint of your cloth as it goes around the surface of the airframe. Have the layer overlap itself at least a ½ inch to assure an overall strong surface. The very ends of the airframe will show the most discrepancies as far as wrinkles and air bubbles are concerned. One way of avoiding the problems is to cut your cloth long enough so that it drapes past the ends and onto your mandrill. If you still wind up with problems, don’t worry, you can always cut out the area and reapply a smaller piece over it.

With correct sanding and filling, it will never be noticed, not even by you. With fin lamination, a slightly different approach must be taken to lay your glass onto both sides and edges of the fin. Most of the time, I choose to lay the root edges down first and after the laminate is cured, I lay down one flat side at a time. It is much harder to get a wrap-around the entire fin without having serious air pockets forming near the edges. There will almost always be areas where the cloth will not be laying flat. The reason I choose to lay the edges first with small strips is to avoid a thicker edge that would possibly appear from lying over top of the plane surface. Although it would be somewhat unnoticeable, there would still be a fatter edge rather than the thinner streamlined edge needed. You don’t necessarily have to wait for the plane surface to dry before applying the underside. Simply squeegee the surface, turn it over, lay it on top of wax paper and begin to laminate the new surface. If or when you decide that additional layers need to be applied to either the airframe or fins, remember to sand the surfaces as thoroughly as possible without of course, sanding into your fibers. The next layer will not adhere well to an unsanded surface.

Another important consideration is to stagger the weft of your cloth in order to get the maximum strength from the lamination. Set the second layer at 45 degrees from the first and if a third layer is chosen, set it at 45 degrees in the opposite direction. You may then start a 4th layer back at 0 degrees. When you finally set your fins on your airframe, make sure you sand the area where the fin lays flush. Heavy or medium cloth may then be used as a fin fillet to keep the fins on strong. One to two inches will be fine. After all your finishing is done, the fillet will again not be noticeable. If you have a very prominent airfoil sanded into your fins, such as the *Estes Phoenix*, the airfoil must be resanded back onto the fin between each layer. If you wait until the end to resand, you will actually have to sand through the layers to achieve what you had in the beginning.

This process takes considerable time, but the results are worth it!

If time is a factor with your project, you may want to use your glass only on areas of extreme importance, such as the top of your rocket where zippering may occur, fin root attachment, launch lug attachment, etc. Fiberglass can also come in handy on other rocketry applications. Sometimes with transitions, there is not enough of a shoulder to secure within the airframe or transition itself. Even some secured nose cones, such as the *Estes Honest John*, suffer from this problem. A transition or boattail can be surfaced mounted without a good shoulder or even one at all, and have a layer of medium to heavy cloth placed on the inside covering both surfaces. This would act as a strong, perfectly fitted shoulder connecting the two halves. Laying fiberglass on the inside of your rocket may be a possibility overall and would not require extensive finishing of the glass. Of course, you still have the spirals to fill and wood grain to smooth out, which an outer layer of glass would completely eliminate.

Another interesting usage of fiberglass is found in the construction of super strong, super light centering rings. An ordinary cardboard or balsa-centering ring laminated with heavy cloth would be a quick method of making rings without the labor of cutting them out of plywood. Both sides could be laminated and no finishing would be required. After all parts are attached and the surface is sanded fairly clean, a layer of resin mixed with micro-balloons can be printed over top. Micro-balloons are small spherical glass balls that thicken up your resin and give it structural support. Resin on its own is very brittle, but the micro-balloons turn it into a flexible, plastic-like coating. Paint a thin layer first and wait for the coating to become tacky. Then you can lay a thick layer over top, which will stick to it extremely well. This will cover those imperfections left on the surface. Afterwards, give it a light sanding and spray the entire model with white, sandable primer. Next, apply red "spot putty" over the surface and sand this down until a desirable surface remains. Reapply another coat of primer and check for imperfections (primer really makes them stick out). Repeat the spot putty process over and over again until you reach perfection. Remember that if you want a great surface, it has to look great in its primer color, your final coat will not hide imperfections that remain. If it looks great with primer, only then will it look great with the final coat of paint. Also remember to use the spot putty over top of primer only. Each new layer of spot putty must be laid over the primer or it won't stick well.

One major advantage of fiberglassing that I should mention, is the ability to use wet sandpaper.

With wet sand, you are able to clean the paper, removing excess material that gets trapped on the grit surface. When you get down to 1,500 grit, this means a lot. If you have small bits of sanded off material left in the paper, it is no longer a fine grit because you are scratching that material overtop of your rocket's surface. The wetness also acts as a lubricant, aiding in the constant back and forth sweeps required in sanding.

I hope that this article aids you in your rocket building and leaves you with a model that is truer to aerospace engineering and can last a lifetime of launches.

Rocket Stability

April 25, 2000

By John Coles

Unfortunately, I don't have an actual write-up from John summarizing his excellent presentation, but what follows is right from the April 25th Meeting Minutes. - JL

John Coles gave a lecture on rocket stability, particularly as it pertains to the relationship between the Center-of-Gravity (CG) and Center-of-Pressure (CP) of a rocket. After defining the terms he would be using throughout the talk, John went into how to determine, both mathematically and empirically, the location of the CG and CP. He also talked in some detail about the relationship between the two and how that affects both static and dynamic stability. John was able to provide reprints of two technical reports as reference material: Estes TR-1, Rocket Stability, by Vern Estes and Centuri TIR-30, Stability of a Model Rocket in Flight, by Jim Barrowman. TIR-30 is of particular interest, as it provides drawings of easy-to-comprehend analogies to what could otherwise be pretty dry technical material.

Rocket of the Month Contest

This is your basic "bragging rights" contest held at each monthly meeting. Steve Childs originally proposed the idea at our July 19, 1999, meeting. The original idea was to have two categories - Adult and Youth. First prize would be bragging rights, and perhaps a photo on our web site. The contest was to be limited to models that are legal to fly on our field only.

We had no contest in August so our first contest was held at the September 28, 1999, meeting. There were four entries: a Tan-Sam missile, a SideWinder

missile, a Big Bertha and an Orion. The Tan-Sam won with 7 votes, the SideWinder had 3, the Bertha and Orion received 1 vote each. Congratulations to Tony Romano for winning our first "Rocket of the Month" contest!

For the October 26, 1999, contest we again had four entries: a Nike-Ajax, an SM-2 missile, a Phoenix, and an Astrobee D. The Nike-Ajax and Phoenix tied for first with 3 votes each.

November 15, 1999, had five entries: an Estes Black Brant, an Apogee Components helicopter duration model, a Sandhawk, a Quest Gemini DCY, and a Silver Comet. The Sandhawk took the honors with 7 of the 12 total votes. Congratulations to Steven Wilson!

December 13, 1999, had quite a few entries. The Estes F-14 Tomcat won with 6 votes. The Space Shuttle and Astron Barbie tied for second with one vote apiece. Congratulations to John Coles and his veteran of 2 sorties!

There was no January contest as the meeting was canceled due to snow.

In the February 22, 2000, contest. John Coles won again with his Tango Papa 1.6x Mars Lander. Second place was the V-2.

At the March 28, 2000 meeting the only entry was Darren Wright's high-power Hawk Mountain 'Transonic'. Though the contest is supposed to be just for rockets that are legal to fly at our field, we gave the honors to Darren anyway.

At the April 25, 2000 meeting we had two entries and Steve Childs won with his SA-14 Archer. Congratulations Steve!

Book Review

By Joe Libby

"**The Challenger Launch Decision**" by Diane Vaughan, University of Chicago Press, © 1996 University of Chicago, 575 pp.

For anyone interested in rocketry, January 28, 1986, must be etched in their minds. Like so many of my friends, I know exactly where I was that tragic day. Sure Shuttle launches were still exciting, full of suspense and danger, but by then so many of us also had the feeling that they were routine. No one expected a disaster. Heck, they had a school teacher on board! And how many of us were wishing we were on board that morning? How could this have happened?

Well, a Presidential Commission was rapidly assembled and intensely investigated, interviewed, and probed all documents and persons involved in the decision to launch the Challenger that cold January

day. Their premise, paralleling a belief widely held in this country, was basically that, for something to go wrong, someone had to be to blame. So their conclusion, and the one still generally accepted, implicated competition, scarce financial resources, and production pressures permeating the NASA organization, culminating in trade-offs of design safety for schedule and cost pressures. The night before launch a managerial decision was made, in the eyes of the commission, in violation of safety requirements, risking lives to maintain costs & launch schedule. Managerial wrongdoing, therefore, has become the conventional explanation for the Challenger disaster.

Diane Vaughan, however, goes way beyond the night-before decision making process. She delves into the culture of the engineers, the entire NASA culture for that matter, to get a deeper understanding of what went really happened.

As a sociologist, she actually thought she understood what went wrong before she even began her own investigation. She expected to find evidence of a well know organizational problem known as "amoral calculation." That is, managers weigh risks and benefits and do what needs to be done to meet organizational goals, even if safety, or laws for that matter, is compromised, unless legal penalties exceed anticipated profits by the violation. Sounds like good fodder for conspiracy theorists, or a movie maybe, but this is not what she found at all.

As she got into the culture of rocket scientists in general, and NASA specifically, she made an interesting discovery. Rather than a night-before, high pressure, "amoral calculation," she found that over many years the engineers evolved a system of "normalization of deviance." She reveals a steady progression of genuine safety tests that repeatedly supported the engineers' belief that the Solid Rocket Booster field joints & O-rings were doing the job adequately, if not ideally, and most importantly that it was safe to fly. In fact, every time there was any concern about the safety of the joints, more tests were conducted and in some cases adjustments made to ensure safety. This culminated in a confidence in the joint that was reinforced with each successful shuttle flight. On every launch there was always risk, from many components as well as the Solid Rocket Booster joints. The night before the fateful Challenger launch, risk was assessed, deviance normalized, and risk accepted - with very unfortunate consequences. There was no managerial wrongdoing, no "amoral calculation," no conspiracy.

To me, this is an even more disturbing conclusion. Considering the incredible complexity of a machine like the Space Shuttle, the engineers and managers did everything they could to prevent

disaster, yet disaster struck anyway. One is left relieved that there was no wrongdoing, yet dismayed with a feeling of "what else could have been done?"

This book is a must read for anyone interested in rocketry in general, but especially those who are still haunted by the image of the Challenger explosion and the aching questions it raised.

Meeting Minutes

Our one-year anniversary is upon us, so in honor of this historic moment, as editor I thought I'd reprint the minutes scribed by John Coles from that first meeting...

5/26/99 Meeting:

The meeting was called to order at 7:10 p.m. in Meeting Room A of the Cherry Hill Public Library. There were 16 people in attendance (13 adults, 3 children). In attendance were: Pat Flanagan, Steve Childs, Bob Ross, Joseph Libby, Bill Rowley, Nancy Rowley (a.k.a. Joe ;-), R. Scott Scalf, Benjamin Scalf, Robert Romano, Anthony Romano, Steve Wilson, Tom Mitchell, John Coles, Larry Zupnyk, and Art Treiman. Art Treiman welcomed all and then we went around the room as everyone introduced themselves. We each discussed a little about ourselves and our rocketry interests. Most of the adults classified themselves as BAR's (Born Again Rocketeers), with a few new to the hobby. We then reviewed the agenda and discussed naming of the club. South Jersey Area Rocketry Society (SoJARS) was decided on as the name. Our "vision" of the club was discussed. We all seemed to agree that we would be flying mostly low to mid power rocketry due to space constraints, but did not rule out high power if a site presented itself in the future. Discussion was also entertained about being sure families and children would be able to be actively involved in the club. The proposed Bylaws were reviewed. A suggested change in Article III, paragraph d was made to make Junior members 13 or younger, and Leader members 14-17. This corresponds to age at which minors can purchase motors themselves. Dues and Finances were discussed, in the context of needing ~\$55 to Charter, get insurance for the section and one site plus additional to purchase basic equipment. After some debate, it was agreed that Annual dues for 1999 will be \$12 for Adults, \$5 for Leader members, and free for Junior members. Families can join for \$25 for the entire family. Launch fees were discussed, and it was decided that we will charge no fees for members or

non-members to fly with us. Initially, we will all bring our own launch supplies, with plans in the future to build club ground support equipment and other supplies. A 10-minute break was taken at 8 p.m. The meeting resumed with a vote to accept the Bylaws. They passed unanimously. The document was circulated for the chartering members to sign. Officers were nominated and elected unanimously: President - Art Treiman; Vice President - Steve Childs; Secretary/Treasurer - John Coles; Director of Range Operations and Safety - Nancy Rowley. Committees were discussed and decided on. There will be two committees: Operations Committee - responsible for running the range as well as keeping records of contests and flight records - chaired by Nancy Rowley, (I missed the committee members); and Activities and Public Relations Committee - responsible for newsletter, web page, planning activities, promotions, etc. - chaired by Pat Flanagan, committee members Tom Mitchell & Scott Scalf. We had a discussion on potential launch field locations. Various ideas were surfaced, mainly centered on various high school athletic fields. A public (?) field in Hainesport looked to be the most promising, and is being looked into by ?? (Sorry, it's going to take me a little time w/ all the names). We decided that once a field was located, launches would be held once a month, on a Sunday afternoon. Also, we discussed having informative discussions, lectures, training sessions, etc. at our monthly meetings once the organizational stuff has died down. We ran out of time and had to adjourn at 9:00 p.m. The next meeting is scheduled for Monday, June 14 in Meeting Room A at the Cherry Hill Public Library from 7 - 9 p.m. Dues will be collected from charter members.

March 28, 2000

By John Coles

Present: Art Treiman, Bob Jonas, Nancy Rowley, Pat Flanagan, Tom Mitchell, John Coles, Steve Bastow, Barry Berman, Darren Wright, Joe Libby, Steve Childs, Ron Will.

Art opened the meeting at 7:07 pm, with an announcement that we would now be running through all new and old business in the first hour of the meeting, reserving the second hour for the lectures and demonstrations. Committee issues not involving all club members, which were previously discussed to death during the meetings, will now be taken offline.

Old Business:

February minutes were reviewed. Motion to approve by Barry Berman, second by Tom Mitchell, unanimously approved.

The treasurer reported that having finally reimbursed Art for 2000 NAR fees and launch fees since last December, \$225.00 remained in the cash box at the start of the meeting.

Upcoming launches:

<u>Date</u>	<u>Theme</u>	<u>Funtest</u>
30 April	Man in Space	None
21 May	None	1/2A Strmr Dur
?? June	Sci-Fi	None
?? July	Moon & Mars	None
?? August	OddRocs	None

There are no rain dates available for the April and May launch dates. The Man in Space theme commemorates both Yuri Gagarin's flight and the first launch of the Space Shuttle. Sci-Fi in June marks the anniversary of Kenneth Arnold's report of the first UFO on 6/24/47 and the term "flying saucers" being coined. Moon & Mars relates to anniversaries of the 7/20/69 Apollo 11 moon landing and the 7/4/97 Mars Pathfinder landing.

As of the meeting date, our NAR insurance was still due to expire on 5 April, and threatened our April launch date. [This has since been OBE. New NAR insurance went into effect on 5 April, with no break in coverage! - JC] It was also noted that our 30 April launch date was during RATS weekend. [For those who don't know, Roar At The Shore is a Tripoli-sponsored high-power launch nominally held twice a year in South Jersey - JC] NAR members are welcome to fly.

The Range Operations report opened with a discussion of our March launch. We had a significant number of launches, despite the high winds (which threatened to shut us down as they gusted over 20 mph). Steve Bastow had since gone to Edmund Scientific and picked up a wind gauge for the club. The organization of the launch was great, although we still had a lack of volunteers for RSO duty. We may need to adopt stricter rules on this, and not open the range until all 1/2 hour time slots are filled (preferably by different people). We had a hobby shop, TNT Hobbies, come up from Delaware to support the club.

We also discussed a new item on the agenda: launch failure debriefings. This was a discussion idea prompted by Steve Childs to debrief the club on the cause(s) of rocket failures from the previous launches. We talked about Steve's Patriot, Tom's Nike-Ajax cluster, and other potentially hazardous flights from the March launch. [This was an unstructured discussion, so my notes are incomplete-JC]

Next came a discussion of our club newsletter, Altitude!. We're not likely to continue pursuing selling advertising. Other clubs that Art has contacted have shown little support for the idea. Plus, we're in good shape financially, and may not want to show favoritism by advertising one shop when many support our club activities.

The PR committee came next. SoJARS will be hosting a table at Allied Hobbies in the Echelon Mall on 9-10 June. Steve Childs and Pat Flanagan are coordinating the effort. Anyone else who can volunteer to spend some time would be appreciated. Also, anyone willing to donate particularly large or eye-catching rockets to attract attention to our table, please do so.

Next we talked about club T-shirts and hats. Joe Libby handed out order forms in order to determine the quantities and sizes needed. Any interested parties who are not able to attend meetings or launches, contact a club member for an order form. The T-shirts are \$15 for adult sizes (M, L, XL), \$12 for kid's sizes (S, M, L) and hats are \$10. There is a volume discount structure in place, so order one of each and save money! Of course, we'd like to get the orders in as soon as possible.

We were then going to hold our "Rocket of the Month" voting. The problem was, only Darren Wright brought a rocket to show off! So Darren won by default with his high-power Hawk Mountain 'Transonic'. Way to go!

At the April meeting John Coles will talk on the CG/CP relationship as it pertains to stability, and Joe Libby will discuss his February trip to the Kennedy Space Center. We're still looking for more ideas on topics to be taught, as well as volunteers to teach them.

The business meeting was adjourned at 8:05pm!
Lecture: Steve Childs finished up his presentation on fiberglassing techniques. Steve was going to cover a BT-20 body tube as a demonstration, but forgot to bring rubber gloves and brushes. He answered a lot of questions on particulars, especially regarding details on finishing fin edges and fillets.

The meeting adjourned at 9:00 pm.

April 25, 2000

By John Coles

Present: Art Treiman, Pat Flanagan, Darren Wright, Lisa Paullin, Tom Mitchell, Steve Childs, John Coles, Barry Berman, Joe Libby, Randy DePasquale, Steve DePasquale, Jay Garnier, Rob Morace, Colin Morace, Cindy Morace. Welcome to our new members: Darren Wright (belated), Lisa

Paullin, Randy DePasquale, and Rob & Colin Morace.

We opened the meeting basically on time, sticking with our plan to conduct all business in the first hour, vote for "model of the month" during the break, and hold the lecture during the second hour.

Orders of Business:

March minutes were reviewed. Motion to approve by Barry Berman, second by Art Treiman, unanimously approved.

Treasury report: The treasurer reported that having finally reimbursed Art for 2000 NAR fees and launch fees since last December, \$225.00 remained in the cash box at the start of the meeting. Raffle tickets for the Launch Pad 'Anubis' kit are still on sale, with the drawing scheduled for our club meeting on 23 May. You don't have to be present to win - but you'll never win if you don't buy at least one ticket!

Range Ops report: Upcoming launches:

<u>Date</u>	<u>Theme</u>	<u>Funtest</u>
30 April	Man in Space	None
21 May	None	1/2A Str Duration
?? June	Sci-Fi	None
?? July	Moon & Mars	None
?? August	OddRocs	None

There are no rain dates available at GCC for the April and May launch dates. The Man in Space theme commemorates both Yuri Gagarin's flight and the first launch of the Space Shuttle. Sci-Fi in June marks the anniversary of Kenneth Arnold's report of the first UFO on 6/24/47. The term "flying saucers" was coined. Moon & Mars relates to anniversaries of the 7/20/69 Apollo 11 moon landing and the 7/4/97 Mars Pathfinder landing.

John Coles reported on the possible use of Mill Creek Park in Willingboro as an alternate flying field. The park runs about 1400' by 1800' in total size, but this is "divided" into five areas. Area 'A' has a large pond in it, and Area 'E' houses multiple tennis courts. There are a number of informal soccer fields between these two areas, making up the western half of the park. Areas 'B', 'C' & 'D' make up the eastern side, with a total area of about 1400' by 1000' and maybe a dozen trees scattered throughout. There are no real physical barriers dividing the different areas with the exception of the tennis courts in Area 'E', which are within the typical high fence. Some major pluses to this park are the available restroom facilities on site and the fast food, small restaurants, and other amenities in the nearby area. It is yet unknown how crowded this park might get on a nice Sunday afternoon in the summer, or if there would be any fees or restrictions associated with flying there.

Art reported that the new NAR insurance went into effect on 5 April, with no break in coverage! This allows us to hold our club launches as planned.

A short discussion on the new insurance followed, where it was mentioned that all NAR members are automatically insured for this year whether they had purchased NAR insurance at the beginning of the year or not. The good news is that the new insurance is less expensive than the old policy; the bad news is that since insurance is no longer optional (and is now included in the price of NAR membership) the basic NAR membership fees have increased.

Our April launch will be a bit shy on club regulars, as some will be at RATS and others will be unavailable. However, we are expecting quite a few new members and spectators this month, so everyone must be willing to volunteer time to help run the launch. John Coles will be running this launch, and is the point of contact for cancellation information. Also, Pat Flanagan will be keeping the launch status up to date on our web site (<http://www.sojars.org>). Let it be known that if we don't get sufficient volunteers to help out with the RSO, fire control and cleanup duties once on site, the launch will be scrubbed!

A vote was held on the revised launch fee structure that was broached at last month's meeting. Art motioned to adopt the fee structure, Tom Mitchell seconded, and the resolution was passed. The new launch fee structure is now: \$5 - per Adult, \$2 - per Leader (14 - 17 years old) flying solo, Free for all Junior members and Leaders flying with a paying Adult. Visitors still fly for free their first time out.

PR Committee report: Joe Libby talked a bit about our club newsletter, Altitude!. The submission deadline for the next issue is 6 May. He could also use some more material for this issue (plans, articles, news, etc.). We discussed the idea of making one of our upcoming launches a public event by notifying local papers and TV news bureaus, and posting flyers publicly. It was decided by general consensus that the 21 May launch would be the best one to publicize, as the weather should be good and we won't be competing with summer vacations. [Since the meeting, I've also learned that a freelance reporter for a South Jersey weekly paper may be at our 30 April launch. - JC.] A reminder that SoJARS will be hosting a table at Allied Hobbies in the Echelon Mall on 9 - 10 June. Steve Childs and Pat Flanagan are coordinating the effort. Anyone else who can volunteer to spend some time would be appreciated. Also, anyone willing to donate particularly large or eye-catching rockets to attract attention to our table, please do so.

Joe Libby began collecting orders for T-shirts and hats. The T-shirts are \$15 for adult sizes (M, L, XL), \$12 for kid's sizes (S, M, L) and hats are \$10. Joe will also look into availability of XXL size T-shirts. The deadline for ordering is mid May. If

we're close to making the minimum order by that time, the club treasury will subsidize the remainder of the order.

Next month for our lecture series, we'll watch some of the launch video that Steve Childs has been shooting over the last several months. In June (?) Joe Libby will discuss his February trip to the Kennedy Space Center. We're still looking for more ideas on topics to be taught, as well as volunteers to teach them. Darren Wright has an idea for giving a discussion on flight electronics, especially as they pertain to high-power staging and recovery deployment. Barry Berman is considering a session on the history of the Soviet space program.

In the area of outreach programs, Art mentioned that there will be a Cub Scout troop at our May launch. Also, we have volunteered to give a demo at the Whitehall Elementary School in Williamstown on 31 May. Rain date is 1 June. There will be two launch sessions, the first from 10 - 2 and the second in the evening from 5 - 9. The field is about 450' x 500', and we will be limited to blackpowder engines only. Pat Flanagan and Steve Childs are coordinating this effort.

Art talked a little bit about capital equipment. We are looking to pick up a battery/inverter combination capable of powering a 150W PA system for the 4-6 hours of a launch. There was some discussion about what is available on the market, but as the treasury funds will be subsidizing T-shirts in the near term, the discussion was tabled until a future meeting.

The last order of business was on-site vendors. We had TNT Hobbies of Wilmington, DE, just show up at our March launch, where he made some sales of mid- to high-power stuff. We have also talked to M&G Hobbies of Delran, NJ, to come support our launches on alternate months. M&G sells more of the model rocket and mid-power supplies that our field is capable of handling. Yet another area hobby shop, D&K Hobbies in Cherry Hill, has expressed an interest in working with our club in the future.

The business meeting was adjourned about 7:50pm!

We held our "Rocket of the Month" voting during the break. We had two entries this month, and Steve Childs won with his SA-14 Archer. Congratulations, Steve!

Lecture: John Coles gave a lecture on rocket stability, particularly as it pertains to the relationship between the Center-of-Gravity (CG) and Center-of-Pressure (CP) of a rocket. After defining the terms he would be using throughout the talk, John went into how to determine, both mathematically and empirically, the location of the CG and CP. He also talked in some detail about the relationship between

the two and how that affects both static and dynamic stability. John was able to provide reprints of two technical reports as reference material: Estes TR-1, Rocket Stability, by Vern Estes and Centuri TIR-30, Stability of a Model Rocket in Flight, by Jim Barrowman. TIR-30 is of particular interest, as it provides drawings of easy-to-comprehend analogies to what could otherwise be pretty dry technical material.