Northern Virginia Association of Rocketry

Free Press

January – February 2004

This winter's cold weather didn't hamper the turnout at NOVAAR's monthly launches. See NOVAAR's Winter Launch Summary on page 8. Pictures are clockwise from the upper left – (1) Launch Control with NOVAAR's new banner (courtesy of Carl Curling); (2) a Fliskit *Duces Wild* model takes off at December's launch; (3) Trip Barber's EZI 65; (4) Joe Woodford discusses the flight of Oakton HS TARC Team's rocket (Photos by Mitch Guess and Greg Bock)

NOVAAR FREE PRESS

January – February 2004

Editor: Greg Bock

Contributors: Trip Barber, Mitch Guess, Bart Merkley, Chip Randall, and Joe Woodford

The **NOVAAR *Free Press*** is the official newsletter of the Northern Virginia Association of Rocketry, NAR Section 205. Subscriptions are included as part of the membership dues.

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Visit NOVAAR's Web site at:
http://www.novaar.org

Or better yet….

ATTEND NOVAAR MEETINGS!

NOVAAR holds meetings twice a month. We meet the first and third Tuesday from 7:00 PM to 8:30 at the Kings Park Community Center in the Kings Park Shopping Center. The shopping center is in North Springfield, two miles outside the Beltway (I495) at the intersection of Braddock and Burke Lake Road.

Dues are $5.00 per year for ages 13 or younger, $8.00 per year for ages 14-18, and $10.00 per year for age 19 or older. The maximum yearly membership fee for a family is $20. Make checks payable to "NOVAAR" and send to the Treasurer at:

Roger Hillson
ATTN: NOVAAR RENEWAL
4317 Selkirk Drive
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Members who wish to receive important announcements of launches, meetings and other club activities should send their e-mail addresses to John Hochheimer (john.hochheimer@verizon.net)

President's Corner

By Trip Barber

It's working. Over the last two years, NOVAAR has put a great deal of time and energy into popularizing model rocketry and publicizing NOVAAR in Northern Virginia. Many of our members have given presentations, manned displays, mentored Team America teams, visited hobby shops -- you name it and they have done it. We are now seeing the results of that effort at our rocket launches. Our February sport launch had 70 cars at the peak, with probably 150 people present (and mostly flying) at one point or another during the three hours we were flying in the bitter cold out at Great Meadow.

We didn't used to fly in the winter because of lack of demand, and our normal fair-weather sport launches attracted maybe 25 people. Thanks to the hard work of our dedicated "core" members, we have clearly taken rocketry to a whole new level in our area, and when we get access to the closer-in new public rocket flying site at Laurel Hill (formerly Lorton Prison), we can expect to see yet another step up in our participation.

The expansion of NOVAAR's size is great for the club and the hobby, but it comes at a cost. We have needed more range equipment to support the flight volume, and Greg Bock and Mitch Guess have stepped up and obtained it or made it. We now need two people running the range at all times when we fly, and these people have to give up their own flying for part of the time out on the field to do this. Joe Woodford, John Hochheimer, and Greg Bock have been particularly generous about serving as range crew. It takes a core of dedicated people who are willing to put out their own time to support other people's flying to make a rocket club great, and NOVAAR is very fortunate to have a few such people. We could use a few more so these volunteers don't burn out, so please "pay forward" and volunteer to help NOVAAR run our range for an hour or so the next time you come out to fly with us.

Fiberglassing Airframes for Mid and High Power Rockets

By Bart Merkley

Anyone who has spent the time and money to put together a mid or high power rocket likely has experienced the zipper effect, the dreaded "shred", or a hard landing that breaks a fin. One way to enhance the durability and longevity of rockets in the mid-to high power range is to use composite building materials and techniques. However, selecting appropriate materials for the job and employing the right techniques requires a bit of research and practice.

Dave Triano of *Shadow Composites, Inc.* [1]offers several training videos covering basic and advanced instructions in how to use composite materials in rocket construction. I have used his first video, *"Advanced Composite Techniques for High Power Rocketry,"* with great success. Much of what I know and present in this article, I learned from this instructional video. This article focuses on how to reinforce or cover a kraft or cardboard tube with fiberglass, and is in the form of a rough check list rather than a long narrative.

Safety Note!!

Make sure you are working in a well ventilated area and use latex or vinyl gloves while handling epoxies and composite fibers like fiberglass, Kevlar cloth and carbon fiber cloth.

The goal of the process described below is to cover a basic craft tube with fiberglass to strengthen it, and to make it a more durable rocket airframe. Specifically, you want two complete wraps plus a little additional overlap of approximately ¼ to ½ inch so that you end up with an equal ratio of fiberglass to epoxy by weight. This will result in the strongest composite system, and yet still be light enough to be useful in most mid-to high power rocket applications.

- Prepare the tube by sanding with rough sand paper (80-100 grit).
    - Sand the tube enough to ensure good saturation by epoxy.
- Draw a straight guide line down the length of the tube. (A length of angle aluminum from the hardware store makes a good straight-edge.)
- Place the tube on a "turning jig" such as the one in photo 1.
    - Prepare plugs or couplers for each end.
    - Wrap wax paper around plugs or coupler tubes before inserting them into the ends of the body tube. Fasten the wax paper with Scotch tape if needed.
    - Leave several inches of the plug or coupler extending outside the end of the body tube.
    - Insert wooden dowel (¾ to 1 inch in diameter) through prepared plugs / couplers.
- Select E or S glass (5 to 7 oz weight).
    - E glass is a less expensive standard weave.
    - S glass is more expensive, but it creates a stronger composite structure
    - Either E or S glass will be sufficient for all but the most extreme high power rocket projects.
- Measure the length of the tube.
- Measure the circumference of tube.
- Multiply by 2 and add an extra ¼ to ½ inch to the total.
- Lay out fiberglass on a clean flat surface.
    - Mark measurements derived above on the fiberglass cloth using a felt tip pen and metal straight edge.
    - Cut fiberglass using a single edged safety razor or new *Xacto* blade.

[1] Shadow Composites is now called Shadow Aero, and the web site is http://www.shadowaero.com/

- Use a metal straight-edge as a guide for the blade as you cut.
- A sharp, high-quality pair of scissors may also be used.

- Measure and mix the epoxy in a small paper or plastic cup.
  - Use a high quality epoxy. (I use West System Epoxies. *Aeropoxy* offered by ShadowAero is also excellent.)
  - Use slow, rather that fast cure, epoxy.
- Carefully lay the cut piece of fiberglass on a table located next to the prepared body tube.
- Apply epoxy completely around the body tube with a natural bristle brush.
  - Use a brush 1 to 3 inches in width – use a larger brush for larger tubes.
- Place the tube length end of fiberglass along the guide line so that when you rotate the body tube assembly away from you, the fiberglass will be pulled around the tube.
  - Pat down the fiberglass with rolling motions from the middle of the brush. (Do Not Use Brushing Strokes! Carefully lift the brush after each rolling motion so as not to pull or separate individual threads of fiberglass.)
  - Saturate the fiberglass with epoxy as you continue to roll the glass onto the body tube away from you. *(Try not to add more epoxy than needed, but the fiberglass on the tube should have a wet appearance. In fact, this process is also called "wetting out" the fiberglass.)*
  - When done, the fiberglass should form two complete wraps plus an extra ¼ to ½ inch around the body tube.
  - To ensure the final edge of the fiberglass stays down completely, you will likely need to make extra rolling motions with the brush along this edge.
- Roll heat tape around the glassed tube in a tight spiral motion.
  - Affix one end of heat tape to the far edge of the plug or coupler with masking tape.
  - Roll tape in a spiral motion in the same direction as the fiberglass was rolled on the body tube so that the tape barely overlaps—by approximately 1/8 inch.
  - By rolling the heat tape in the spiral motion some wet epoxy will be squeezed out of the fiberglass.
  - Continue to roll the heat tape down the length of the body tube then over the edge of the tube to the far end of the plug or coupler tube; attach this end of the tape with masking tape.
- Place the tape-wrapped glassed tube in a curing oven. See photo 2.
  - Bake in curing oven at approximately 175 degrees for 20 to 45 minutes.
    - Curing time depends on size of tube.
    - The heat tape shrinks tightly around the tube in the curing oven and squeezes out all excess epoxy and helps to ensure it is evenly distributed. It also helps to eliminate any air pockets.
    - Curing process is completed when the beads of epoxy oozing out from under the heat tape are hard, and are not tacky to the touch.
- Peal the heat tape off the body tube.
- Sand the tube with 100—200 grit sand paper.

- Apply "epoxy friendly" filler to surface of body tube. "Super Fill" is available from Shadow Aero, and other similar products are available from Mr. Fiberglass on the Internet

- Sand tube with medium and fine sand paper.

- The tube is now ready for assembly and / or painting.

The overall process does not take a lot of time. Once the wrapping process begins, it should take between 5 and 20 minutes to put on the fiberglass and wrap it with the heat shrink tape--depending on the size of the tube. The lay out and cutting of the fiberglass takes about 5 to 10 minutes. Precision in the cutting process helps greatly with producing a good fitting wrap.

Preparing the fins and affixing them to the body tube is another important step that can be greatly enhanced by using composite materials. I'll cover this in a future article.

Photo 1 – Airframe tube on turning jig. (photo taken by Bart Merkley)

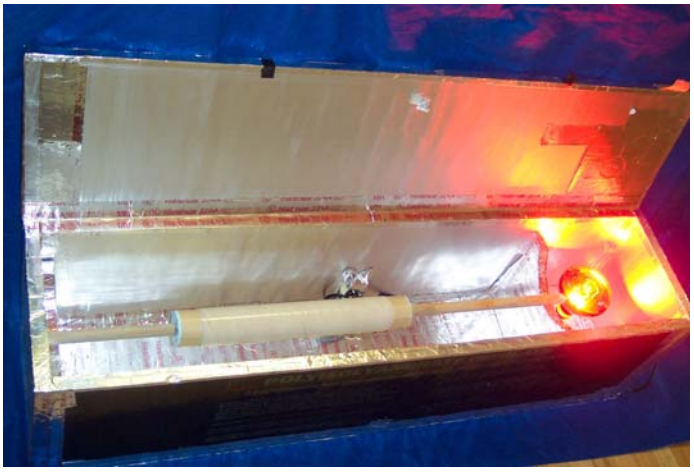


Photo 2 – Airframe tube shown in heat oven. Plans for this heat oven design are available from Shadow Aero. (photo taken by Bart Merkley)

Club Members Refurbish NOVAAR's Launch Equipment Trailer

On a cold January Saturday, and under the hospitality (and hanger) of John Langford at Aurora Flight Sciences, Inc. several NOVAAR members refurbished the orange equipment trailer to get it ready for the upcoming flying season.

This year the trailer needed a lot more work than just the simple painting it got last year. We replaced the trailer's roof with marine grade plywood, sealed all the cracks, sanded and applied two coats of international orange marine grade paint. The trailer also received a new pair of brake and signal lamps.

Thanks to Trip Barber, Greg Bock, Jim Brower, John Hochheimer, Jonathan Rains and Joe Woodford for their effort. Special thanks go to NOVAAR member John Langford for hosting this 2nd annual trailer party in the WARM Aurora Flight Sciences hanger, and providing the "trailer refurbishers" with a great pizza lunch.

UPCOMING EVENTS

- 21 March 2004 – Building Session
  B Payload and B Eggloft Altitude
  Session will be led by NOVAAR's Senior Advisor Ken Brown. Ken will have QCR Kits for these models available for purchase.

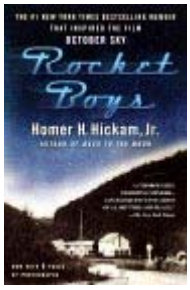
- April 3-4 2004 - Section Meet and Sport Launch

- May 6 2004 – Space Day at the Steven F. Udvar-Hazy Center

HOMER HICKAM COMES TO THOMAS JEFFERSON

By Chip Randall

All 1600+ Thomas Jefferson High School students, including entering freshman, as well as teachers and administrators were required to read "Rocket Boys/October Sky", a book about Homer Hickam's life as a young boy growing up in Coalwood, WV and aspiring to be a rocket scientist.



Themes on the book were incorporated into curriculum elements in all subject areas throughout the 2003/04 school year. The freshmen in my *Technology Education* class were given the challenge of designing a rocket that could loft one medium egg at least 200 feet and return it to earth safely. All rocket parts had to be student made except for the motors which were limited to C impulse Estes motors up to 18mm in diameter. All NAR rules were reviewed and adhered to. A site license of the latest RockSim software was made available for all school computers. Launch day turned into something of a school celebration. The Principal, Vice Principals, visiting dignitaries, parents and even some custodians and office staff came to the sports field to see the launches. Other teachers stopped classes, and led their students outside to witness this exciting event. And exciting it was.

Most of the rockets performed beautifully. The pride on the faces of the successful rocketeers was truly rewarding. Some rockets failed to deploy recovery devices properly, and became "lawn darts". Others zoomed off horizontally shortly after leaving the launch rod. These errant missiles brought disappointment to their engineers, but elicited raucous responses from the spectators.

Without a doubt, rockets will fly over TJ again next year, and this launch has every sign of becoming an annual event.

Students from Thomas Jefferson High School display their egg-lofter rockets after a successful launch. (photo submitted by Chip Randall)

Students ready their rockets for launch. (photo submitted by Chip Randall)

Deep Space Network 2-for-1 Sale!

By Patrick L. Barry

Call it a "buy one, get one free" sale for astronomers: Build a network of radio dishes for communicating with solar-system probes, get a world-class radio telescope with a resolution nearly as good as a telescope the size of Earth!

That's the incidental bonus that NASA's Deep Space Network (DSN) offers the astronomy community. Designed to maintain contact with distant spacecraft in spite of the Earth's rotation, the large, widely spaced dishes of the DSN are ideal for performing a form of radio astronomy called "very long baseline interferometry" (VLBI). VLBI produces very high resolution images of the cosmos by combining the output from two or more telescopes. The result is like having a giant "virtual" telescope as large as the distance between the real dishes! Since bigger telescopes can produce higher resolution images than smaller ones, astronomers need to use dishes that are as far apart as possible. That need dovetails nicely with the DSN's design. To maintain continuous contact with deep space missions, the DSN has tracking stations placed in California, Spain, and Australia. These locations are roughly equally spaced around the Earth, each about 120 degrees of longitude from the others-that way at least one dish can always communicate with a probe regardless of Earth's rotation. That also means, though, that the straight-line distance between any two of the stations is roughly 85 percent of Earth's diameter-or about 6,700 miles. That's almost as far apart as land-based telescopes can be.

"We often collaborate with other VLBI groups around the world, combining our dishes with theirs to produce even better images," says Michael J. Klein, manager of the DSN Science Office at NASA's Jet Propulsion Laboratory. "Since our 70-meter dish in Canberra, Australia is the largest dish in the southern hemisphere, adding that dish in particular makes a huge difference in the quality of a VLBI observation."

Even though only about 1 percent of the DSN's schedule is typically spared from probe-tracking duty and scheduled for radio astronomy, it manages to make some important contributions to radio astronomy. For example, the DSN is currently helping image the expanding remnant of supernova 1987A, and Dr. Lincoln Greenhill of the Smithsonian Astrophysical Observatory is using the DSN dishes to explore a new way to measure the distances and velocities of galaxies.

And all this comes as a "bonus" from the dishes of the DSN. To introduce kids to multi-wavelength astronomy, NASA's website for kids, The Space Place, has just added the interactive demo, "Cosmic Colors," at spaceplace.nasa.gov/cosmic.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration

NASA'S Space Place

Nancy Leon from NASA's Education and Public Outreach Program contributed the article above. NASA created the Space Place program to give the public the opportunity to explore the space program's technological advancements and delve into its discoveries. NASA invites you to explore this web site at

http://spaceplace.nasa.gov

A component of that outreach, the Space Place column is offered to select venues like rocket clubs. The column includes varied topics from all of the areas within NASA -- planetary exploration, of course, but also observing earth from space, and even spin-offs from space.

NOVAAR'S Launches: Winter 2003 – 2004

(*Compiled by Joe Woodford*)

It has been a busy winter for NOVAAR! The club hosted sport launches during the months of November through February, and by the time you read this we will have completed our March launch. NOVAAR typically does not launch during the winter, but started doing so last year to support the area schools that have entered Team America Rocketry Challenge (TARC). Of course, other club members participated in the flying as well.

NOVAAR's November sport launch was one of the biggest in the club's history with close to 200 launches. The large crowd was attributed to the airing of a three hour special on rocketry by the Discovery channel in early November and December.

Many of the TARC teams from area schools practiced their eggloft flights at the monthly launches NOVAAR hosted during the winter. The wide range of flying conditions offered the TARC teams an excellent opportunity to optimize their designs. School teams represented at the launches included:

Thomas Jefferson High School – Teams #1 and #2
Lake Braddock High School – Teams #1 and #2
George Mason High School
Oakton High School – Teams #1, #2 and #3
Washington International School
West Springfield High School – Teams #1 and #2
George Marshall High School – Teams #1 and #2

	15-Nov-03	13-Dec-03	24-Jan-04	21-Feb-04
	50 F - Partly Sunny	35 F Overcast	30 F Snow Clearing	45 F Partly Cloudy
	WNW 5-7 MPH	N 6-12 MPH	NW 7-10 mph	W 15 - 20 mph
Motor Class	Number of Launches	Number of Launches	Number of Launches	Number of Launches
A	44	10	8	9
B	33	15	9	6
C	64	12	8	25
D	19	5	6	12
E	16	10	6	8
F	10	3	3	1
G	6	4	2	0
High Power	No Launches	J,I	I	No Launches
Team America Rocketry Challenge	5	10	14	10
Total	197	69	56	71

A Two Axis Launch Rod Alignment Tool

By Greg Bock

Want to make sure you are launching your rocket straight up? Then here is a device that will help you. It's made from commercially available parts, and is easily constructed. We used it at last year's Team America Fly-Offs to provide the contestants a vertically mounted 6 foot long, ¼ inch diameter launch rod.

The device consists of a plastic fence post level (available at Home Depot), and a 6 inch long, ¼" diameter launch lug (available from LOC Precision). The launch lug is epoxied to the inside corner of the fence post level. The total cost is under $2.00.

To use the device simply slip the launch lug over the launch rod, and adjust the position of the rod until both horizontal bubble levels are centered, indicating the launch rod is vertical. The vertical mounted level located at the center is not used.

The Fence Post leveler has two horizontal and one vertical mounted bubble levels.

Here is the inside view showing the brown 6 inch launch lug. For more durability substitute an equivalent diameter brass or aluminum tube (available at most hobby shops) for the launch lug.

LEARN AND BUILD WITH THE BEST!!

Attend the club building session on 21 March 2004

Ken Brown, NOVAAR's Senior Advisor and president of Qualified Competition Rockets will lead the session. We will be building B Eggloft Duration and B Payload models. These events will be flown at the club's Section Meet on 3 and 4 April, at ECRM 31 (B Payload) on 5-6 June, and at NARAM 46 in August. Get an early start on the contest year and come to the Kings Park Community Center from 1-5 PM. Bring your building material, Xacto knife, glue and sandpaper. The kits will be available for purchase.

UPCOMING EVENTS

NOVAAR meets the 1st and 3rd Tuesday of each month at the Kings Park Community Center. Meetings begin promptly at 7 pm and usually last 1½hours. The Community Center is located in the King's Park Shopping Center, Braddock Rd. and Burke Lake Rd. — two miles outside the Beltway in Springfield. NOVAAR flys at Great Meadow - Travel on I-66 to The Plains Exit #31; proceed south on Old Tavern Rd. (Rt. 245) to enter the gate.

2 March 2004 - Club Meeting at King's Park Community Center at 7 PM;

- Ivan Galysh – *"Cubesat Satellites"*

6 March 2004 – NARAM 46 Planning Session 1:30-5PM at Jonathan Rains house.

13 March 2004 (14 March-Rain/Snow Backup Date) - Sport Launch at Great Meadow 12 Noon - 3 PM

- Team America Practice Flights
- Sport Launch

16 March 2004 - Club Meeting at King's Park Community Center at 7 PM;

- Chris Kidwell – *"Altimeters"*

21 March 2004 – Building Session – 1 - 5 PM at Kings Park Community Center. Ken Brown from QCR will supply kits for B Payload and B Egg Lofter Models. Bring your building supplies and money to purchase kits.

3 – 4 April 2004 (Both Days) - NOVAAR Section Meet /Sport Launch at Great Meadow 9 AM – 5 PM

- Team America Practice Flights
- Sport Launch
- Section Meet (April 3rd)

  Events:
  - B Payload
  - B Eggloft Duration
  - ½ A Streamer Duration

6 April 2004 - Club Meeting at King's Park Community Center at 7 PM;

- Randy Repcheck – *"Observing a Sea Launch Satellite Launch"*

10 April 2004 – OPOSSUM 8 Open Meet; Middletown, MD; 10 AM – 4 PM. Events: ½ A BG, ½ A RG, ¼ A Flex Wing, Drag Race. Details; www.narhams.org

20 April 2004 - Club Meeting at King's Park Community Center at 7 PM;

- Roger Hillson – *"Mini-Cam TV Flights"*

30 April, 1-2 May 2004- Battle Park 2004, Culpepper, VA; 10 AM – 5 PM; www.colonialvirginiahpr.org

6 May 2004 – 10 AM – 2 PM; Space Day at Uvar-Hazy Air & Space Museum; NOVAAR Members will host a NAR booth. Northern Virginia High School students will display their Team America Contest Rockets.

15 May 2004 – Sport Launch at Great Meadow; 9 AM – 5 PM

- CANSAT
- YMCA
- Boy Scouts

22-23 May 2004 Team America Flyoff (23 May is a back-up day) at Great Meadow (NOTE!! – Changed Dates)

June 5 – 6 2004 - ECRM at Middletown, MD, hosted by NARHAMS (www.narhams.org)

Events:

- Plastic Model Conversion
- A Rocket Glider Duration
- B Payload
- 1/2A Helicopter Duration

12 June 2004 - Sport Launch at Great Meadow 9 AM – 5 PM

June 26 – 27 2004 - Regional at Carlisle, PA hosted by SPAAR (www.spaar.org)

Events:

- ½ A Streamer Duration
- ½ A Helicopter Duration
- ½ A Rocket Glider Duration
- ½ A Parachute Duration (multiround)
- B Eggloft Altitude

4 July 2004 - July 4th High Power Rocket Demonstration at Great Meadow

31 July – 6 August 2004 NARAM 46 at Great Meadow 9 AM- 5 PM

28 August 2004 - Sport Launch at Great Meadow 9 AM – 5 PM

18 September 2004 - Sport Launch at Great Meadow 9 AM – 5 PM

6 November 2004 (Backup day -7 November) - Sport Launch at Great Meadow 9 AM – 5 PM

11 December 2004 - Sport Launch at Great Meadow 10 AM – 3 PM

NOVAAR MEMBERSHIP APPLICATION

Dues are $5.00 per year for ages 13 or younger, $8.00 per year for ages 14-18, and $10.00 per year for age 19 or older. The maximum yearly membership fee for a family is $20.00. Make checks payable to "NOVAAR" and send to the Treasurer at:

Roger Hillson
ATTN: NOVAAR RENEWAL
4317 Selkirk Drive
Fairfax, VA 22032

Roger can also be reached by email (hillson@erols.com) and telephone (703-978-6957 evenings). Be sure and put "NOVAAR RENEWAL" somewhere on the outside of the envelope, and enclose a copy of the renewal application.

Date _____Please check one: ___ New Member ___ Renewal

NAME:_____

DATE OF BIRTH _____

STREET:_____

CITY:_____STATE:_____ZIP:_____

HOME PHONE:_____

NAR membership number, if a member: _____

EMAIL ADDRESS
(Optional)_____

I heard about NOVAAR from:
_____

Dues are for one year of NOVAAR membership and do not include optional NAR Membership.

Please check one category based on your age as of the previous July 1st:
One: __ Age 13 or younger ($5) __ Ages 14-18 ($8) __ Age 19 or older ($10)

NOVAAR FREE PRESS
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