



Northern Virginia Association of Rocketry



Free Press



January – February 2003

NOVAAR EVENT CALANDER

4 March 2003 – NOVAAR Meeting, 7 PM.
Tom Concannon discusses his team's Team America rocket.

8 & 9 March 2003 – Sport Launch and
Team America Flights at Great Meadow;
10 AM – 2 PM

16 March 2003 – Building Session at Kings
Park Community Center; 1-5 PM – ¼ A
Boost Gliders – Robert Edmonds

18 March 2003 NOVAAR Meeting 7PM;
Discussion: Roger Hillson will do a
preflight demonstration of his X-Cam TV
camera rocket

1 April 2003 - NOVAAR Meeting 7PM;
Discussion: Radio Control Rocket Gliders
– Dan Winings

5 April 2003 –

- Sport Launch at Great Meadow;
9 AM - 5 PM
- Science Olympiad – 8 AM – 12
PM at Sandburg Middle School

12 April 2003 - **OPOSSUM-7**
OPOSSUM-7 (Only Possible Open
Strategically Shackled Uproarious Meet)
will be an Open Meet at Middletown, MD..

NOVAAR will fly this contest as a club.

Events:

- ¼ A Boost Glider Duration
- A Helicopter Duration
- 1/4A Flex-Wing Glider Duration
- Open Spot Landing

15 April 2003 - NOVAAR Meeting 7PM;
Discussion: Supersonic Model Rocketry –
Greg Bock

(Continued on page 7)



Some NAR officers stopped by NOVAAR's February sport launch at Great Meadow. Pictured from left to right are NAR Trustee George Gassaway, NAR Secretary George Rachor, NAR President Mark Bundick, and NAR Vice President (and NOVAAR President) Trip Barber. There were almost 85 model rocket flights including five groups from Team America testing their egglofter models. See inside for more pictures. (Photo contributed by Roger Hillson)

**See President's Message on page 2 and find out
what you need to do to insure the future of hobby
rocketry!!!!**

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Fly Safe, Fly Fast, Fly High!

NOVAAR FREE PRESS

January – February 2003

Editor: Greg Bock

Contributors: Trip Barber, Greg Bock, Ellis Langford, Roger Hillson and Keith Wancowicz

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.

Send submissions to:

Ken Brown
7021 Forest View Drive
Springfield, VA 22150-3120

Submissions can also be sent electronically to:
gbock@erols.com

NOVAAR Officers

President: Trip Barber (ahbarber@alum.mit.edu)
Secretary: John Hochheimer
(john.hochheimer@verizon.net)
Treasurer: Roger Hillson (hillson@erols.com)
Senior Advisor: Ken Brown (brown007@bellatlantic.net)
Ken Brown
7021 Forest View Drive
Springfield, VA 22150-3120

Visit NOVAAR's Web site at:
<http://www.geocities.com/CapeCanaveral/8561>

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
Fairfax, VA 22032

Club members who wish to receive important announcements of launches, meetings and other club activities should send their E-mail address to Roger Hillson (hillson@erols.com)

Trip Barber, NAR 4322

I have recently contacted most of you by e-mail asking you to write to your U.S. senators supporting a proposal by SEN Enzi (R-UT) to introduce a bill exempting sport rocketry from explosives regulation. He is doing this because he is a rocketeer himself and has seen that our hobby is under direct threat of being legislated and regulated out of existence above the D engine power class as a result of a variety of recent federal actions, both the Homeland Security Act and the ongoing regulatory actions of BATFE. If you are not aware of all the particulars of what is going on or do not know how to put together a letter, please contact me.

Your letters will absolutely make a difference, but only if enough of us do it. Without this legislative relief, we will not be able to repeat having a Team America event next year and there will be almost no way to conduct sport rocketry above the Estes D12 power level. Please write, and do it now.

The last time that the rocketry community tried to influence legislation, we had less than 480 people respond between TRA and NAR, with combined memberships of over 8,000 (that's only 6%). We must do better than that this time. Even model rocketry is affected; it's not just about high power any more. The hobby is at extreme risk. Please help save our freedom to fly.

Editor's Ramblings

Greg Bock

This issue, which starts up the new year, contains some pictures of the our January and February sport launches; Ellis Langford's NARAM – 43 R&D project on optimum helicopter rotor design, and an article contributed by Nancy Leon from NASA's Education and Public Outreach Program. NASA is currently contacting notable rocket clubs to invite them to participate in their monthly Space Place column. From time to time I'll run items she sends to us that might be of interest to club members. This month's article is entitled Frisbees in Space, by NASA scientist, Dr. Tony Phillips and deals with nano-satellites. I'd like to thank Nancy for this contribution, encourage you to visit the NASA Space Place Web Site at <http://spaceplace.nasa.gov>. Special thanks goes to Keith Wancowicz for his assistance in turning the newsletter into web format.

Water Rockets

Volunteer to be a judge or to operate a NOVAAR information table at the Virginia Science Olympiad – 5 and 26 April 2003. *See page 4 for details.*

The Optimization of Rotor Design for the Helicopter Duration Event

By Ellis Langford

(This research received first place in B Division Research and Development at NARAM-43 held in Geneseo, NY during August 2001. --Editor)

Introduction: Helicopter Duration is now an international event as well as a NAR event. The goal of this project is to improve the state of the art of helicopter duration models, using a modern computer-based design tool for propellers and windmills. Helicopter models behave much like windmills.

I used a helicopter kit from Qualified Competition Rockets as a baseline model, analyzed the rotor performance, then designed, built and tested the improved rotor. Comparing it to the baseline QCR kit.

Drag and Decent Rate: The key to obtaining a high duration helicopter model is to achieve a low decent rate. Drag and velocity are related by the following relationship:

$$D = \frac{1}{2} \rho V^2 C_D A$$

where ρ is the air density, V is the velocity, C_D is the drag coefficient and A is the area of the blade.

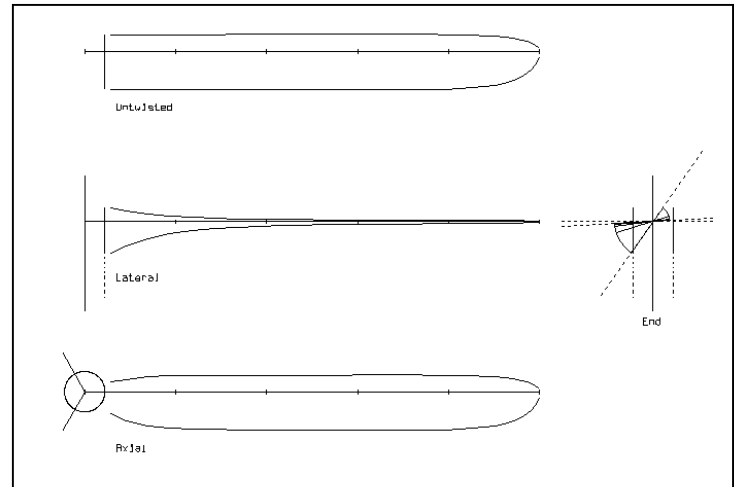
Solving this expression for V gives,

$$V = \sqrt{\frac{2D}{\rho \cdot C_D \cdot A}}$$

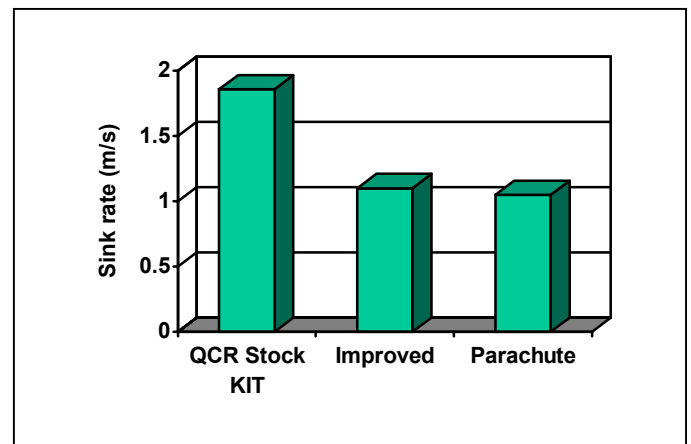
This expression indicates that to achieve low velocity you would like to lower weight, and increase the rotor blade area and drag coefficient. You also want a highly efficient rotor where the net rotor power for autorotation vertical decent is zero.

XROTOR Design Tool: The computer design tool I used was XROTOR. XROTOR is an interactive program for the design and analysis of ducted and free-tip propellers and windmills. The program was developed by Prof. Mark Drela at MIT and uses "lifting line theory" to design "minimum induced loss" rotors. Minimum induced loss rotors are the helicopter equivalent of an elliptical wing.

Using the QCR stock kit as a starting point the XROTOR program was used to obtain an improved blade design, one with higher thrust, blade efficiency and torque (torque in the opposite direction.) The drawing shows the improved blade design.



Test #	Improved (s)	QCR kit (s)	Parachute (36")
1	5.7	3.2	5.4
2	4.6	2.8	4.5
3	5.9	3.5	5.2
4	4.6	3.1	
5	5.5	2.9	
6	5.5	3.1	
7	6.1	2.9	
8	4.4	3.2	
9	5.1	3.3	
Averages			
time (s)	5.27	3.11	5.03
velocity (m/s)	1.10	1.86	1.05



Conclusions: Considerable performance increases are possible in helicopter performance. Current helicopter designs do not perform as well as they could-- most of inboard part of the rotor blade is stalled, while most of the rotor tips provide force in the wrong direction! On the first try, I nearly doubled performance over the existing kit. Optimized rotors can approach or even exceed performance of an equivalent-sized parachute. In some of my tests the rotor almost equaled the performance of a 36-inch diameter parachute. (Helicopter theory says rotors can have drag coefficient of well over 1)

I molded my blades from sheet balsa over a simple form, but high performance rotors will require improved construction techniques. High-performance rotors will be much tougher to package. Boost altitude must be considered in total design optimization, but lower sink rate can catch smaller (more numerous) thermals, even at lower altitudes.

The search for optimum helicopter duration models is by no means complete. Areas for future investigation include the use of data from this report to further redesign blades with Xrotor; Make rotor with composite materials; Improve Hub design; Experiment with various pitch angles; Improve packaging and model design.

I would like to thank Jean-Charles Ledé of Aurora Flight Sciences for his assistance in running the XROTOR computer software.

References

1. Wayne Johnson, Helicopter Theory, Princeton University Press, 1980
2. E. E. Larrabee, "The Screw Propeller", Scientific American
3. Martin Simons, Model Aircraft Aerodynamics, Nexus Press, 1996



Launch Equipment Trailer Painting Party

Aurora Flight Sciences hosted NOVAAR's January building session. No rockets or boost gliders at this session, only sanding, painting and refurbishment of NOVAAR's BATFE orange, weather beaten launch equipment trailer. Club members sanded, caulked and painted the trailer to get it ready for the upcoming launch season. (pictured left to right are: (front row) Tom Concannon, and club treasurer Roger Hillson; (back row) club secretary John Hochheimer, club president Trip Barber, Greg Bock and Joe Woodford. Not pictured are Ted Phipps and John Langford.)

Thanks to all – especially to John Langford who not only supplied the space, but also the great pizzas.

VOLUNTEERS NEEDED

VIRGINIA STATE SCIENCE OLYMPIAD

Organizers for the 2nd Annual Virginia State Science Olympiad competition have asked if NOVAAR is interested in assisting as judges in their "bottle rocket" competition that will be held in Fairfax County during April 2003. NOVAAR has also been invited to set up an information booth at the event. The organizers anticipate having over 600 students at the 2 days of competition. The "bottle rockets" that they fly are 2-liter soda bottles with water and pressurized air. This is a new arena of sport rocketry that is about to be recognized by the NAR with approval of the activity's first Safety Code. NOVAAR would need three people for each day from about 9AM – 1 PM

The middle school events will be held Saturday, April 5, 2003 at the Sandburg Middle School, 8428 Fort Hunt Rd., Alexandria, VA.

The high school events will be held Saturday, April 26, 2003 at Oakton High School, 2900 Sutton Rd., Vienna, VA 22181.

Contact Greg Bock at (703) 430-6959 or gbock@erols.com if you would like to volunteer for this effort. To find out more about the science Olympiad visit <http://www.fcps.edu/DIS/sciengfair/olympiad/index.htm>

Frisbees in Space

by Dr. Tony Phillips

When Pete Rossoni was a kid he loved to throw Frisbees. Most kids do-it's pure fun. But in Pete's case it was serious business. He didn't know it, but he was practicing for his future career in space exploration.

Grown-up Pete Rossoni is now an engineer at NASA's Goddard Space Flight Center. His main project there is figuring out how to hurl spacecraft into orbit Frisbee-style.

The spacecraft are small-about the size of birthday cakes. "This wouldn't work with big satellites or heavy space ships like the shuttle," notes Rossoni. But a cake-sized "nanosatellite" is just right.

Nanosatellites-nanosats for short--are an exciting new idea in space exploration. Ordinary satellites tend to be heavy and expensive to launch. The cost alone is a deterrent to space research. Nanosats, on the other hand, can travel on a budget. For example, a Delta 4 rocket delivering a communications satellite to orbit could also carry a few nanosats piggyback-style with little extra effort or expense.

"Once the nanosats reach space, however, they have to separate from their ride," says Rossoni. And that's where Frisbee tossing comes in".

Rossoni has designed a device that can fling a nanosat off the back of its host rocket. "It's a lot like throwing a Frisbee," he explains. "The basic mechanics are the same. You need to impart the spin and release it cleanly-all in about a tenth of a second." (The spinning motion is important because it allows the science magnetometer to measure the surrounding field and lets sunlight to play across all of the nanosat's solar panels.)

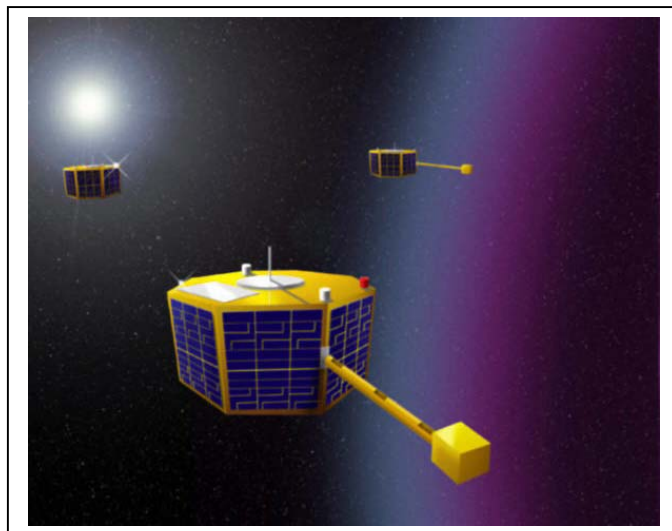
The ST5 nanosats are designed to study Earth's magnetosphere-a magnetic bubble that surrounds our planet and protects us from the solar wind. But their primary goal, notes Rossoni, is to test the technology of miniature satellites.

"We haven't done anything like this before," says Rossoni. Soon, however, the concept will be tested. A trio of nanosats is slated for launch in 2004 on the back of a rocket yet to be determined. The name of the mission, which is managed by JPL's New Millennium Program, is Space Technology 5 (ST5).

Can groups of nanosats maintain formation as they fly through space? Will their internal systems-miniaturized versions of full-sized satellite components-satisfy the demands of both the harsh space environment and critical science measurements? Is Frisbee-tossing as much fun in orbit as it is on Earth?

ST5 will provide the answers. Read about ST5 at

<http://nmp.nasa.gov/st5>. Budding young astronomers can learn more at http://spaceplace.nasa.gov/st5/st5_tortillas1.htm



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.

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.

The NASA Space Place program has two Web sites aimed at children but equally as fun and educational for adults. NASA invites you to explore this web site at

<http://spaceplace.nasa.gov>

From time to time I plan to include items that would be of interest to our club members--Editor.

FEBRUARY SPORT LAUNCH

As Jim Brower towed NOVAAR's equipment trailer into Great Meadow he found a lot of snow—but not as much as the 28 inches he would have if the launch had been held a week later. While NOVAAR's February sport launch was not as cold as January's -- 20 vs. 5 degrees -- the snow on the ground made range assembly a challenge. Trip Barber, enlisting the help of the four NAR Board members who were in town for their annual meeting and stopped by the launch, cleared out a rangehead and launch area. John and Andrew Hochheimer ran the checkins and the range. Here are some highlights from the launch

The day was a success!! Over a period of 4 hours, we had almost 85 flights, including a spectacular launch on an I 90-hybrid motor by Ivan Gaylash that decided to evade the snow and land in a tree. Six Team America groups came by to test their designs. The teams were from Wakefield, Oakton (3), Mt Vernon and Lake Braddock. (I hope I didn't leave anyone out.)



Mt Vernon High School readies one of their Team America test models. – photo by Greg Bock



One of three teams from Oakton High School preps their rocket. – photo by Greg Bock



As Jim Brower towed NOVAAR's equipment trailer into Great Meadow he found a lot of snow. – photo by Roger Hillson



Wakefield High School's "Warrior" Model in red, white and blue. . – photo by Greg Bock



Oakton High School . – photo by Greg Bock

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 1-½ hours. 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 flies at Great Meadow - Travel on I-66 to The Plains Exit #31; proceed south on Old Tavern Rd. (Rt. 245) to enter the gate

26 April 2003 - Science Olympiad – 8 AM – 12 PM at Oakton High School

27 April 2003 – Building Session at Kings Park Community Center: 1-5 PM, D Helicopter – Ken Brown

6 May 2003 - NOVAAR Meeting 7PM; Final Planning Meeting for Team America Fly-offs

10 May 2003 – Team America National Championship Flyoff at Great Meadow 9 AM – 5 PM

ECRM-30 - May 17 – 18 2003

ECRM-30 will be held as a Regional Meet on May 17-18, 2003 (9AM – 4PM) at Middletown, MD. **NOVAAR will fly this contest as a club.** Events are:

- Peanut Sport Scale
- 1/4A Boost Glider Duration
- A Helicopter Duration
- Set Altitude (150 meters)
- Random Altitude (must be flown before Set Altitude)
- Open Spot Landing
- No electronics may be used for deployment on the altitude events. Altitude will be measured to ejection.

Contestant fees: \$10 for A/B Division, \$15 for C Division, \$20 per team for T Division

20 May 2003 – Club Meeting

May 24 – 26 2003 - NATIONAL SPORT LAUNCH –
Clarks Summit, PA

3 June 2003 – Club Meeting and Discussion

June 21 2003 (Rain Date 22 June 2003) MARS 29 MARS-29 will be held as a Regional Meet at Great Meadow, (9 AM – 5 PM) **NOVAAR will fly this contest as a club.**

Events are:

- ¼ A Boost Glider Duration
- A Altitude
- D Helicopter Duration
- C Egg Loft Altitude
- ¼ A Parachute Duration (multi-round)

Contest Director – Jim Brower (jbrower721@earthlink.net)

4 July 2003 – July 4th Airshow at Great Meadow – NOVAAR High Power Rocketry Demonstration

19 July 2003 - Sport Launch at Great Meadow; 9AM – 5 PM

August 2 – 8 2003 NARAM 45

Evansville Indiana, Contest Director: Lila Schmaker (see www.naram45.org for hotel information.)

Events:

- 1/4A Boost Glider Duration
- A Helicopter Duration
- A Altitude
- B Parachute Duration (Multi-Round)
- C Super-Roc Altitude
- E Streamer Duration
- F Dual Egg Loft Duration
- Open Spot Landing
- Peanut Sport Scale
- Plastic Model Conversion

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john.hochheimer@verizon.net

Attend NOVAAR'S Building Sessions and Learn from the Experts!!!

¼ A Boost Gliders

**Sunday, 16 March 2003 1-5 PM the Kings
Park Community Center**

**Hosted by Robert Edmonds of
*Edmonds Aerospace***



D Helicopters

**Sunday, 27 April 2003 1-5 PM the Kings
Park Community Center**

**Hosted by Ken Brown
*Qualified Competition Rockets (QCR)***



**Bring your own construction tools - X-acto knife, sandpaper, CA and wood glue,
and sandpaper**

Get ready for this year's flying season.

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)

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*In memory of the STS 107 crew
and their loved ones.*