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Official NARHAMS Newsletter
Editor: Don Carson

ZOG-43 is dedicated to model rocketeers of all ages, abilities, and interest. We are committed to providing the most current, up-to-date information on model and real world rocketry, and to provide educational material, as well as, entertaining information.

ZOG-43 is published bi-monthly and is available to all paid up members of NARHAMS. Club membership is open to all, dues are 10 cent per week.

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ZOG-43
117 Coventry Ct.
Macon, NC 27551

Email us at: zog43editor@yahoo.com

About NARHAMS

The National Association of Rocketry Headquarters Astro Modeling Section, or NARHAMS, serves Baltimore, the state of Maryland., Washington, DC and the surrounding Metropolitan areas. The club is a section (#139) of the National Association of Rocketry (NAR).

We are the oldest continuously active model rocket club in the United States, first established as a high school club in 1963, changing our name to NARHAMS when chartered as a NAR section in 1965. NARHAMS is the only seven time winner of the NAR "Section of the Year" award (1997, 1998, 1999, 2001, 2004, 2006, and 2007).

NARHAMS members regularly fly their model rockets at NASA's Goddard Space Flight Center in Greenbelt Md, at Old National Regional park near Mt. Airy, Md. and at the Carroll County Agriculture Center, near Westminster, Md.

NARHAMS welcomes all to our monthly meetings and launches.

For details, dates and directions to our club, meetings and launches, go to: <http://narhams.org>

From the Editor

Don Carson, NAR #11069

Another big issue, thanks to all our contributors. The first thing you probably noticed is that we have gone to a landscape format! I hope this makes for easier reading on electronic devices. I suggest you switch your viewer to full screen for the best effect. It is still an 8.5 x 11 format so you can still print it out like usual, though you may have to set it to print landscape.

We continue with Ed's history of NARHAMS and a blockbuster article by Doug Frost about his battle with the NAR to accept bigger, higher powered rockets.

We have coverage of 3 contests - our own ECRM, Steel City Smoke Trail, and the NASA Goddard Apollo 11 Contest.

Our roving reporter and Senoir Advisor, Mark Wise, attended the National Sport Launch in Orangeburg, SC and has provided an entertaining account of his trip.

As always, we have reports on the monthly launches at Mt. Airy and the Goddard Visitors Center, as well as our outreach activities.

Wrapping up, we have, hot off the press, news of some big changes being made by the NAR concerning competition rocketry. We have summarized the news in the Competition Corner feature. There is also a link to the full presentation which is a good overall assessment of the State of the NAR.

Fly 'em high, bring 'em back, and be safe.

Welcome New Member

Edward Jackson

Welcome Back Renewing Members

Alan Williams, Geoffery Cook, Gerald Goodwin, Kevin Knebel, Tom Bagg, Kevin Smith, Dick Stafford, Robert Sclater, Sean and Noah Grantham, Richard Crooks

ZOG ROYAL COURT

(NARHAMS OFFICERS)

ZOG (President) Alex Mankevich

VICE ZOG (Vice-President) Alan Willaims

COLLECTOR OF THE ROYAL TAXES
(Treasurer) Maria Ha

KEEPER OF THE HOLY WORDS (Secretary)
Kevin Johnson

COURT JESTER (Section Advisor) Mark Wise

EAST COAST REGIONAL MEET - 42

By Jim Filler, Contest Director

Photos: D. Carson

The forty second rendition of the East Coast Regional Meet was held at Old National Pike Park near Mt. Airy Md. on June 20th and 21st. Weather seems to always find a way to creep into the event and this year was no exception. Saturday started cloudy, warm, and humid. The sun appeared early in the afternoon to turn the temperature up even higher. Did I mention it was humid? This year the acronym should have been ECRHM - East Coast Really Humid Meet! Thanks go out to Don Carson, Alex Mankevich and Bradley Grant for getting out early to help setup the range. We opened the range and most heeded my advice about the forecast showing rain later in the day and possibly most of Sunday, so lots of flights were made early and even though the humidity was really high, the wind was very calm. About 4pm on Saturday a thunderstorm cell could be heard approaching from the south, so we shut down the launch and asked everyone to exit the



field, secured the equipment, and headed home for the evening. Several contestants headed over to the Golden Corral for dinner on Saturday evening. Sunday morning yielded a wet field and breezy conditions after multiple storms came through Saturday night.



field. Several of us headed to McDonalds to enjoy a cold beverage and some air conditioning! We headed back to the

For contest flying, Random duration was the first event to be flown per the sporting code. With a one minute target, Chase Fitzgerald in A division missed by only 4 seconds, and Jess Feebach in "C" division only missed by 5 seconds! Predicted Altitude was flown using altimeters and overall the result was good in my opinion. Only a few track lost flights, meaning the altimeter didn't report. Glenn Feveryear had a meet best flight with only a 1.33% error in his prediction. 1/2A Parachute duration yielded several good flights. Stoil Avramov in "A" division had a meet best flight of 240 seconds. "C" engine rocket glider had 11 entries and of those 4 were RC. Don Carson took first overall with a combined time of 280 seconds for two flights. FAI Streamer duration was flown by

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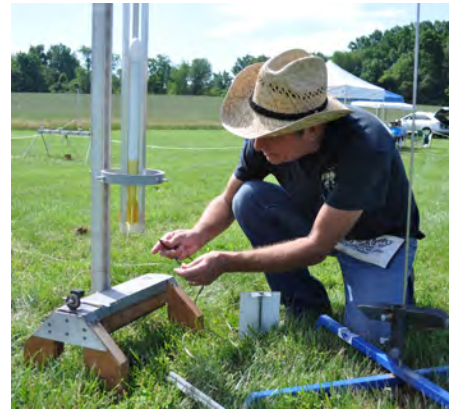
Stoil Avramov finishes his C Rocket Glide flight.



Ole Ed Competed in Predicted Altitude!



Glenn Feveryear and his swing wing C RG



Jess Feebach hooks up his A FAI SD bird



Jef Fineran and Raul Pena



15 entries and some good times were flown. Glenn Feveryear had the best combined duration of 179 seconds for the multi-round event which is three flights. Jim McGraw came in second only 7 seconds back with 172 total seconds. "B" Helicopter duration was the sixth event for the meet and there were several flights over 1 minute. The Flying I Beam Kids Team had a best single flight of 79 seconds and a meet best total of 153 seconds to win the event in team division.

Final results for the contest showed that Stoil Avramov racked up 1293 points to finish first in "A" division. Michala Alexander finished first in "B" division with 522 points. Glen Feveryear totaled 1575 points in "C" division.

The overall meet champion was The Flying I-Beam Kids team of Rod Schafer and Steve Foster from the Pittsburgh Space Command Section. We had 23 entries counting the three teams that entered in the contest. Five sections were represented with NARHAMS totaling 5361 contest points for the meet.



ECRM-42 was held concurrently with the monthly club sport launch. Several sport flyers and contest flyers took advantage of the opportunity. The motor usage is shown in the chart below for a total of 106 motors



Jim Filler guides his RC controlled RC RG



Sport Flying Family



Michala Alexander and her award from PSC



Greg Smith showing off



Jef rides and rests in style!

used for exactly 100 sport flights including four 2 stage models and one 3 motor cluster. Motor count was: A: 10; B: 29; C: 36; D: 10; E: 7; F: 8; G: 6.

Sunday afternoon the range was closed down at 2pm. Jennifer Ash Poole stepped up and organized the traditional post launch bbq/picnic. Thanks to Jennifer for organizing, Jef Fineran for manning the grill, Michelle Alexander and Rita Feveryear for bringing goodies for everyone to enjoy. Jennifer also processed the Saturday results for me in Contest Manager. Scott and Michala Alexander processed the Sunday flight results. So with the results done for me, I handed out trophies for first place winners and door prizes donated from my kit collection and from Andy Jackson who donated gift certificates for Aerospace Speciality Products. The last order of business for the event was to award the "Ole



Murphy's Lawyers



Stoil and coach

Ed dead last but finished roving trophy." This custom trophy was first introduced to encourage the NARHAMS adult competitor who finished with the lowest point total for the meet to come back and do better the following year. The winner got their name engraved on the trophy for the year they won. It was very fitting that this being the 50th year the club has been in existence and the last year to award the trophy to non-other than Ole Ed Pearson himself.

See page 26 for overall results.



Overall Meet Champions Flying I Beam Kids team



Ole Ed is the final winner of the Ole Ed Trophy!

NARHAMS History, Part 4 - Time For Some Adult Supervision

By Ole Ed Pearson

For a very short while after forming, NARHAMS had an adult member who we designated as our senior advisor. His name was Alex Vella, and he worked for Rabinow Electronics. Rabinow was on 70S (now I-270) and we flew there a couple times. (The location, now bustling with commerce, was empty then. If you took the 70S corridor towards Frederick, you went past Rockville, then Rabinow on the left, the National Bureau of Standards [now NIST] on the right, and then got to Frederick. There were not many notable landmarks between). But Vella dropped out and we needed an adult.

Doug told us of an engineer at Goddard who was willing to join the club, but only if we were serious about him in the senior advisor position. We agreed, and at the Hyattsville library's December 1965 meeting, we met Jim Barrowman and voted him in as advisor. Jim was to become the most famous and respected NARHAMster of all time. And although we didn't know it at the time, NARHAMS was going to excel/explode in growth.

Jim's first task was to administer us a written test on the NAR safety code and I think the Pink Book too. He wanted to see what we knew about rocketry/the NAR. He got us to flying at Goddard regularly at the Antenna Range and other venues on an ad hoc basis, e.g., Saturday demos for scouts at the Goddard Recreation Center, for visitors at annual Goddard open houses (at a lot across from Buildings 1 and 8) or at Sounding Rocket Division open houses (Glendale). Atwood,

Barrowman, Galloway, Honnecker, now Kukowski (he joined Goddard's education office), Marge Townsend and others favorable to what we were doing (e.g., Arnowitz, Bailey, Boyle, Crone, Lane, Phiphal, Suddeth, et al.) made a potent force for model rocketry at Goddard. (This was a decade before the Goddard Visitor Center launches—the latter now almost 40 years old).

Initially Jim would attend meetings and launches by himself, but later starting bringing Judy, his wife. I don't think he was ignoring her, but rather first trying to get a sense of who we were. I smile and can imagine what others might have told him about NARHAMS (remember hints I dropped about the Battle of Cumberland? Also, read on about NARAM-8).

When Jim and Judy moved from DC to Maryland (first to Hyattsville, then Bladensburg, then to Seabrook), NARHAMsters helped their moves. The door to their house in Seabrook seemed always open to the club, we spent countless building sessions and parties there and watched their daughters, Julie and Heather, grow up (and in turn babysit our kids...Diane and I moved across the street from them). Jim and Judy stayed in the club for about ten years and Jim rose to become NAR President.

Long before that, he attended his first NARAM. This was NARAM-8 (1966) held at Clinton County Air Force Base, in Ohio. That NARAM stands out to me for at least four reasons. One, whoever has heard of an air force base named after a county? Two, Jim proved he was a standup guy for NARHAMS. Some contest points NARHAMS earned that year were not in the final tally going into the national meet. We were concerned no one was going to count

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NARHAMS History Continued

them because of the immediate contest and a previous year's incident (ask me some time). Jim was getting what we thought was the runaround, but he cornered officials one night and kept/hounded them until we got those points recorded.

The third reason was Jim's prize-winning R&D report. Nationally, Jim may be best known for this milestone on algebraically approximating a rocket's center of pressure...used today by TARC hopefuls and others who have never heard of NARHAMS (it is okay, you have never heard of them either!). Back then, it was an unknown novelty that raised the skepticism of no less than G. Harry Stine, the NAR's founder. According to Jim's calculations, a model he brought to NARAM should be stable. According to Harry's cutout method, the model should flop, and Harry would not back down until he was shown. The model flew straight, Harry became an advocate to Jim's method, and today almost five decades later we have those guys we haven't heard of nor they us, still using the Barrowman method to determine a model's stability.

The fourth reason isn't as positive. Some NARHAMSters got arrested for stealing traffic signs^{3.43} (and one or two guys from other groups too). Kukowski got them released, called their parents, and sent them home on busses. (He then called some other adults together at NARAM to discuss the situation, and collectively, they disposed of confiscated liquor).

Back home, Jim, Jan and I hammered out the NARHAMS constitution. We had been using a boilerplate constitution suggested by the NAR and Jim thought we could do better. We did this over the course of a couple months coming together once a week over at Jim's apartment in Bladensburg. Main precepts of that new (our current) constitution were that as a NAR club, members should belong to the NAR. Club members should participate in the business of NARHAMS; not just come to our launches. Voting was thus reserved to those who were

in the NAR and had recently attended other business meetings.

Even after Jim left NARHAMS and resigned as NAR's president, he returned to help in major activities, e.g., was the RSO at the world championship in Lakehurst (NJ) in 1980, and again at the U.S./U.S.S.R exchange meet at Wallops in 1988, and timing chief and occasional RSO at almost all Team America finals.

Jim went up the ranks professionally and retired from Goddard as a deputy director, I believe. He has often said that the experience in working with volunteers, in coaxing, encouraging, and getting them to do NAR work, helped him succeed getting his NASA job done with paid employees. (He is a leader, which is more than an effective or efficient manager).

I think of Jim, first as a friend, and then as a foundation man. He has the uncanny sense to lay the bricks that will lead to future success, plus the acumen to identify those bricks. You need to look no further than our recounting to see examples: Jim would join NARHAMS only if assured we were serious; once in he tested us to make sure we weren't yahoos and to see what he was working with; he brought Judy into the group only after he was sure the environment was good; getting racks made for a national meet months ahead of the time needed; and hammering out a lasting club constitution. These are only a few examples, and they bespeak of foundation building before taking other steps.

^{3.43}Stealing stop signs is not a laughing matter. According to the Web, more than 50,000 people died on national highways in 1966 (the year of NARAM-8). This number approximated the total number of American fatalities fighting in Viet Nam. If I'm not mistaken, that's about the year that seatbelts became nationally mandated and the Department of Transportation formed.

Continued Next Issue With:

Part 5 - Remembering Folks and the Grand Wrap Up

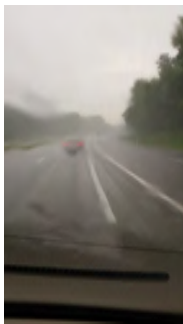
Steel City Smoke Trail 2015

The Non-Competitor's Take

By Jef Fineran

With Ellen out of town for the weekend, and nothing really constructive to do, one day while talking to Jim Filler, he suggested I go up to Grove City with him for the Steel City Smoke Trail contest this year. Being the competitive type that I am (not) I immediately asked if they had a good field. His response ? OOOH yes. He wasn't kidding either..

So, after a little further discussion with Jim, consultation with the Head Capo (Ellen), and a few doggie day care issues worked out, the leave slip went in for Friday the 5th, and before we knew it, we were on the road. On the ride up, we drove into more rain, as if we hadn't had enough already, and I remember thinking this was going to turn out to be another "just my luck" kind of trip. Thankfully, the rain stopped, we made it up alive (Jim doesn't drive THAT bad) and, we survived a trip through the local (VERY large) hobby store. Somehow, we managed to hold on to enough money to feed ourselves for the weekend, and before we knew it, we were checked into the hotel, and ready to go on Saturday morning.



I have to admit, whatever you like to fly, their field is great for any type rocketry activities. In addition to high power flights, it's amazing just how far some of the contest models can drift, and some of them did... Most of my flights stayed close to home. The most I had to walk was 150 yards or so.



Their High power waiver was good from 11-4 Saturday, and 11-2 Sunday. I started Saturday with a couple G64's to get the feel of things, and worked up to the H class, then on to the Aerotech I200 in my 4" Tomahawk, which is the biggest rocket, and the biggest motor I have used to date. The size of the farm they use is enormous - I would guess 1,000 acres, so I wasn't too worried about losing anything. When I flew the Tomahawk first time, the parachute didn't fully deploy, but it

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came down relatively slow and landed with no damage. The second flight on Sunday was flawless. I did have one CATO with an H128, which burned through the side of the casing, and ultimately the side of my tan camouflage rocket, sending into a tail spin and back to the ground after only making it 50 feet high or so. Like anything in life, you take the good with the bad...

This was also the first time I really used an altimeter to any extent, not for deployment or any sort of flight control, but my own curiosity as to how high my rockets were going. I was surprised that the highest flight I had for the weekend was 1186 feet. Many times I thought they went much higher than they really did ! With the cost of altimeters having come down so much, I bought one of the Estes ones for \$20, and I really like knowing "just how high" they really fly.

All in all, it was a fabulous trip. I got a total of 11 flights in over two days. 6 or 7 were high power, one CATO, and got to hang out with a good group of people, even if I wasn't there for the contest ! In addition to me and Jim, Brad Grant also made the trek up. Never know who you'll run into at these things..

I understand they do this twice a year. I think this is a road trip I would definitely be interested in making again!



We did some other running around up there, Wal-Mart, dinner out Friday and Saturday, and some Ice cream place on the way out Sunday that was really good. Jim I'm sure could tell you the name, my recollection skills for aren't always the best. See the photo - I think it's self explanatory.

NARHAMS Meeting Highlights



In June, John McCoy showed a few Plastic Model Conversions and custom cases including a Patriot missile and launcher.

Photos D. Carson



July meeting featured a cookout at the College Park Airport - oldest continuously operating airpark. 21 people attended.

Photo E. Pearson.

The \$10 Million Lawsuit: How and Why The NAR Had to Change, 1984-1987

By **Doug Frost (alias Frog Dust)**
NAR #3446, NARHAMS #2, TRA #1007

Photos: Doug Frost

Since its inception in the late 1950's, the NAR was locked into a one pound (16 oz.) maximum lift-off weight. The Safety Code was also worded as a "Pledge" for the members to sign that they would only fly their rockets within this weight limit. In later years, the availability of NAR insurance helped to lock this weight limit into legally binding insurance paperwork.

No one wanted to "rock the boat," as if to increase the weight limits might somehow cause the U.S. Government to shut down the NAR and stop all other civilian rocket programs. I want you to consider that the sport of rocketry in the U.S. was hi-jacked and stifled for decades by this limited and narrow view of how a "Safe" rocket program should be run. Don't misunderstand me. I am very grateful to all the pioneers that started the NAR and the great hobby and sport of model rocketry. The NAR type of safe rocketry, however, was on a future collision course with a safe program with bigger rockets that would be taught in colleges. There was an unavoidable chain of events that began in 1984 that brought changes.

I started building and flying my own home fueled rockets in 1957 after Sputnik was in orbit. The Soviets had launched the first artificial satellite



About half of the FORT-1 team, the rest skipped the photo for fear of losing their NAR membership

Oct. 4, 1957. I found the NAR in 1961 and signed up. In 1965, I helped start the NARHAMS club in Maryland. In 1973, I lived in California and helped start the BAYNAR Club near San Jose. In '89, I helped to start Aeropac, with the Tripoli Rocket Association. I believed in the NAR, the TRA, and clubs.

There were two developments in '84 that forced the NAR Board of Directors to re-

consider the one pound weight limit. They also had to re-think the Safety Code Pledge that limited the NAR member from flying heavier than one pound rockets. The NAR had to change!

One development in 1984 was the growth of the Tripoli Rocket Association (TRA). Many former NAR members were lured away by the legal ability to build and fly much larger rockets. The 2nd development was caused by the NAR

Continued on page 11

Lawsuit - continued

removing Doug Frost (me) from membership. I and the Foothill College Rocket Team (FORT) flew big rockets (260 lbs.) in Nevada, in '83 & '84. I was "kicked out" of the NAR because I flew rockets heavier than the one pound. This caused a lawsuit: Doug Frost Vs. the N.A.R. in May '85. The NAR had killed The Foothill College Rocket Team (FORT) with one "inflammatory" letter, in May '84, to the College President.

I met a Space-Age Attorney, William A. Jennings, in Sept. '84 at an airshow at NASA/

Moffett Field, Mt. View, CA. He was a space fan and bought six Laser Impact Photos & frames of NASA Photos from our L-5 Society table at the airshow. I told him about the NAR "killing" my rocket program at Foothill College. He saw a rocket law suit. We arranged to meet.

Mr. Jennings read the two letters from the NAR President, Pat Miller, an old friend. The first letter, from '83, agreed with me that we (FORT) had a safe program. Mr. Miller understood from my letter that the RRI, Rocket Research Institute, built the rocket engines, installed ignitors, and conducted the launch at a distance of one quarter mile and at a 10 degree away angle. He even agreed that we worked with a professional group, RRI, (started 1943) and wished us good results. Other elements of our safety approach were the Smoke Creek Desert, NV,

launch location, and the Bureau of Land Management approval for the land use. Also, the FAA, Federal Aviation Agency, was notified and their paperwork was processed before each launch date.

The second letter from Pat Miller was dated May 2, 1984 directly to the Foothill College President. This letter stated that there was a real possibility that students could be "injured or killed" by these rockets! Mr. Jennings' (the attorney) advice was easy due to the contrast between the two letters. Mr. Jennings, asked

me if these two letters were written by the same person? Both letters were on NAR letterhead, and both had been signed by Pat Miller, who I had considered to be a long time friend. Mr. Jennings took on my case for free (pro bono). He stated that my rights as a U.S. citizen had been trampled upon and I was due for compensation.

The fact that I had a paid position with Foothill College as an Instructor to conduct the rocket classes and projects was important. The NAR

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Doug and Colin Fisher prior to the launch of FORT-1

Lawsuit - continued

had also damaged my reputation. The blatant and amazing differences between the two letters were hard to understand. He decided we would sue the NAR for ten million dollars! He said we have to treat them like a donkey. We might have to hit them hard to get their attention, then they will learn. He said that they could not hold me to that "Pledge" that as a member I would only build rockets less than one pound. That would only work during NAR sanctioned events. He said we would definitely win this case! The San Jose Mercury News picked up on the Ten Million Dollar Lawsuit and ran an article. They called and arranged for an interview with me and Mr. Jennings. It was all very unusual and interesting.

I told Mr. Jennings that I did not want to financially harm the NAR. He explained we would probably settle out of court for a much smaller sum. The NAR, he explained, should not be allowed to treat their members this way, and that justice would be served.

Here's how this fiasco started: without going into all the details, let me say that I had a run-in with Harry Stine, another old friend, about April 1984. We were at the L-5 Society Convention, in San Francisco, CA. L-5 was a "Space-Age" group with clubs all over the World. Many of the lectures were by NASA people, sci-fi writers, space enthusiasts, and yes, myself, as the Foothill Rocket Team



FORT team poses during the filming of a TV news spot.

manager and spokesman. We had our 17 foot by 10 inch aluminum rocket on horizontal display with an Empty rocket engine casing. We had 3 foot poster photos of our 1983 flight sponsored by the L-5 Society, United Technologies, & Hotsy Bay Area (my employer).

The empty engine was a Korean War surplus, 52 in. by 5 in., 50 lb. (Empty) steel casing. It probably didn't help that our flyers stated

8,000 to 10,000 lbs. thrust for one second! The empty casing was bright red and had 4 inch tall black letters spelling: SAFETY ENGINE. I had to assume that our big rocket and engine display was what caused Harry to yell at me. I just introduced him to some of our team members. He yelled at me and left, not wanting to hear me explain. The five of us could not understand one word of what Harry had said. Looking back, I couldn't blame Harry

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Lawsuit - continued

for being mad at me. He thought he was protecting his “Baby”, the NAR.

About a week later, Pat Miller, NAR President, wrote the “infamous” letter to Foothill College which destroyed the (FORT), Foothill Rocket Team. I visited Stanford University and had decided to start a rocket program there. Their Astronautics Department in Palo Alto, Ca. was just a few miles north of our Foothill College location. The NAR, in their hurry to stop me, ruined the possibility that I could build up a Stanford University Rocket Program in 1984.

The FORT program ran from Jan. '82 through May '84. We flew model rockets every Saturday morning from the College parking lot, and held our college rocket classes next to the Observatory. Students had earned elective credits through this activity. We had the only college rocket class that we could locate in the U.S. at that time.

The “Big Rocket Trip” of '83 saw 32 students make the trip to Smoke Creek, NV, and in May '84, 43 students made that trip. The FORT Team flew FORT-1 (17ft. by 10 in.) to approx. 12,000 ft. in 1983. In '84, we flew FORT-2 (17ft. by 10 in.) to approx. 12,000 ft.

In May '84, we also flew FORT-3 (10.5 ft. by 5.6 in.) to a tracked altitude of 22,080 ft. or (4.18 miles)! We finally got a “track closed” (Trip Barber scopes) with 5 lbs. of desert dust!

FORT-3 held a Western States Altitude Record for over five years, from '84 to '89. The NAR letter forced the College to shut down our access to the Foothill Campus in May '84.

The lawsuit was settled out of court, October '87 and I was allowed to re-join the NAR. The agreed upon sum was mid “four figures”(not to be disclosed). Pat Miller later told me that the suit did not financially hurt the NAR. I believe that the NAR and rocketry were greatly helped and improved by the entire series of events. I hope you will enjoy flying “Big Rockets” while keeping your NAR membership. Now you know how it all happened. You have William A. Jennings and Doug Frost to thank for this outcome. After the lawsuit, NAR members were not kicked out for flying bigger and heavier rockets. The Pledge was changed. The NAR membership has grown partly because of these changes. You must “fight for the right to fly”.

In August 1989, I was invited to attend “The Old Rocketeers Re-union” at NARAM. Trip Barber assured me that it would be peaceful with “no problems with Harry Stine.” I had a great time and narrated my NARAMs 5 & 6 videos. Everyone got along like old times. Pat Miller, Harry Stine, and I renewed our friendship. After 30 years, I am writing this to clear up the mystery of “How and Why The NAR Had to Change.” I was a part of some interesting “unwritten history” and I wanted the real story to be written down and understood.

Special thanks to the FORT Team members, Chuck Piper & RRI, the L-5 Society, Ty Hall from Hotsy, Bill Wood, advisor and Westinghouse Engineer, and to Leroy Vadebonquer, advisor and Lockheed Engineer. Thanks to Bill Jennings, & the loyal opponents: Harry Stine, Pat Miller and the NAR. Thank you, for your kind attention to this history lesson.



Launch of FORT-2, 1984

GSFC Visitors Center June 2015 Launch

By Ed Pearson



For the second consecutive month the parking lot filled and hundreds came to watch or fly.

Thanks to Alex Mankevich and Richard Crisco, who ran the show. These public launches continue to amaze--even as they approach their 40th anniversary.

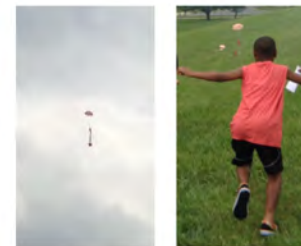
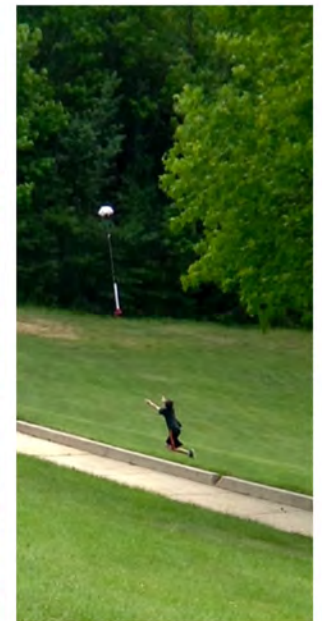
Photos by Ed Pearson



And fly they did.



The press corps (aka moms, dads, and rocketeers) recorded the activity.



Then it was off to the races to recover the models.



Several landed behind the security fence. Their fate--unknown.

National Sport Launch

By Mark Wise

Photos by M. Wise except as noted



The biggest sod farm I'd ever seen. Friendly hosts. Decent food on the field. Good weather. Not many bugs. All in all, Orangeburg, South Carolina was a pretty decent place to hold this year's National Sport Launch.

Friday, May 22nd. I loaded four rockets, two range boxes, a picnic chair, and a folding table into the car and headed south down I-95. I'd have taken more rockets, but you can only fit so much into a Ford Focus (something to remember the next time I buy a car!) The traffic was surprisingly good for the beginning of a holiday weekend – I guess it helps to leave town early.

After eight hours on the road, I pulled up to the official hotel, a Days Inn that had seen better days. Faded paint, peeling plaster, a faint aroma of decay not completely masked by disinfectant. Some of the veterans of international competition said it reminded them of Eastern Europe, not that it made them feel nostalgic. But the price was certainly right, and it could have been worse.

After breakfast at the hotel on Saturday morning, (Just like Mom used to make, when she was cooking at the women's prison...), I drove to the field. I found a parking space a hundred yards or so from the rangehead and headed over to pick up my badge. Registration got started a bit late, but I passed the time chatting with Pat McCarthy and Bob Koenn from Florida, and I had a chance to meet Lawrence Bercini, whose name I remembered reading in rocketry magazines when I first joined the NAR in the early 80's. Registration was followed by a range briefing: Check-in procedures, range safety, where we could and could not step, and



Not all flights are nominal!

other useful info.

I didn't fly on Saturday. I watched the action on the field, visited with other flyers, and made the rounds of the vendors. Some of them were old friends, like Andy Jackson of Aerospace Speciality Products, and Pat McCarthy, who was running the North Coast Rocketry booth. I figured to spend more than a few dollars over the three days of NSL, but I didn't feel like rushing into it. I did buy a pack of C11-5 motors for one of the rockets I'd be flying, along with a crayon rocket kit (the 29-millimeter conversion kit, not the Estes crayon).

I was impressed by the range layout. ROSCO, the host section, flies regularly from the field and knows all the ins and outs of setting up a safe, efficient range. Two low-power racks were set up near the LCO table. Six mid-power to Level 1 launchers stood in the middle distance. An equal number of launchers were set up at an appropriate distance for Level 2, and two away pads for Level 3 lay in the far distance. All would see much use. The morning brief included warnings about muddy patches to walk around rather than through, and a large, newly-

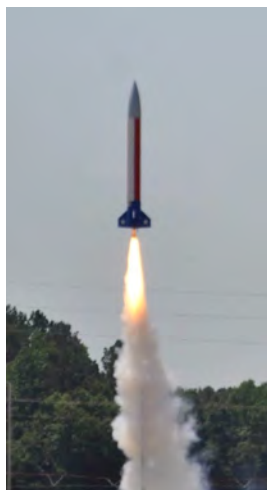
Continued on page 16

NSL continued

seeded area was to be avoided at all costs.

NSL is about rockets big and small, and everybody shared the range comfortably. Parents were pretty careful about monitoring small children, everyone knew better than to disturb someone else's rocket after landing, and people were willing to help each other out. Any stress at the field was due to off-nominal flights, not personalities. Now, that's my kind of rocketry event!

One memory stands out from Saturday. I wasn't doing anything at the moment, so I volunteered to walk out to the pads with Trip Barber and Ted Cochran to hook up Trip's star-spangled HPR bird.



The nose seemed just a bit loose, but Trip had successfully flown the rocket that way and elected to fly it as-is. When the time came to fly it, it boosted beautifully but drag-separated. No significant damage, thank goodness, but I just don't think of such things happening to Trip.

ROSCO had scheduled a night launch for Saturday, so a few of us decided to grab dinner between the day and night launches. I

tagged along with Trip, Ted, and John Hochheimer to a place called Duke's BBQ on the far side of town. In a group like that, the smart thing for me to do is say little and listen much. A bit out of character, I'll grant you, but I managed it. (It was easy, actually; I was stuffing my face with pulled pork and cole slaw.)

We didn't stay for much of the night launch. The insects were starting to come out, and it had been a long day.

On Sunday I finally did some flying. I'd bought a Li'l Devil kit from Bay Area Rocketry at NARCON. It's a short, stubby, dynamically-underdamped kind of thing, but it looks pretty cool with orange paint and a devil decal. With a Jolly Logic Altimeter Three in its nose and a C11-5 in its tail, I looked forward to a fun first flight and some good data. Unfortunately, I got so caught up in initializing the altimeter and making sure that it was talking to my phone that I forgot to hook up the igniter. Embarrassing, but harmless. Tried again, only to watch the igniter burn through. The third time was the charm, and it was a bit of a thrill to approach the rocket after it landed, look at my phone, and see that the altimeter was automatically dumping its data to my phone as soon as it was within Bluetooth range. Two hundred ninety-two feet at apogee, with a peak acceleration of 12g and an altitude of 65 feet at burnout.



I made one more flight that day, with my Eradicator from Sirius Rocketry. I'd flown it at a few NARHAMS launches, so I pretty much knew what to

Continued on page 17

NSL continued

expect. With winds just under 10 mph, the rocket boosted nicely on an Aerotech F62. A six-second delay meant that ejection was a couple of seconds after apogee (601 feet), and I didn't have to walk too far to retrieve it.

As I was rolling up the parachute to tuck into the body tube, I saw a good-sized high-powered rocket come down a couple of hundred yards away. It landed just fine, but the chute filled with air and began dragging the rocket toward a ditch. I ran after it (not an easy task in hiking boots) and grabbed hold of the recovery harness. Still jogging to keep up with the dragging rocket, I pulled myself along the recovery harness hand-over-hand and finally reached the shroud lines. I gathered them in and collapsed the chute. The rocketeer walked up just as I finished wrapping the shroud lines around his chute, and he thanked me for helping. He definitely did not mind my getting involved with the recovery.

The remaining exciting event of Sunday was watching Trip fly "Thumper," the rocket he'd used for his Level 3 certification. Painted olive-drab, decorated with ship's crests from the four Spruance-class destroyers he'd served on, Thumper was an impressive sight on the away pad. Its flight more than made up for the previous day's frustration, rising majestically – and loudly – on a M motor, with drogue deployment right at apogee and main deployment just a few hundred feet above the ground. A beautiful flight from liftoff to touchdown.

I finished up the day along Vendor Row, buying a streamer duration kit



Mark on Vendor Row, load 'em up!

Photo: R. Smith

and a couple of books from Andy Jackson, and a polo shirt from JonRocket.com. For dinner, I joined Al and Karen Gloer and Ray DiPaola, who'd all driven down from Connecticut for NSL, at a local Mexican restaurant. To my sorrow, I discovered that they couldn't sell beer on Sunday, but it wasn't the end of the world. The food was decent, and I enjoyed talking rockets with Ray and the Gloers.

There was considerably less flying on Monday, as people needed to start heading home. I flew my Eradicator again, this time to 1383 feet on a G64-7. Two hours later, I sent up my Interrogator-G, another Sirius Rocketry kit that I'd flown many times at NARHAMS sport launches and once or twice at NARAM. It's a heavy, draggy model, but even so, I was surprised to get an altitude reading of only 280 feet on an F62.

I also rode out to the away pads in the back of a pickup truck, helping Al Gloer transport his "Real Men Fly Pink Rockets" to the pad. Built as a tie-in to a breast cancer fundraiser in Connecticut, it was 12 feet tall and flew on an M. I helped him adjust the rail tilt and mount the rocket to the rail, then watched as he armed the electronics and hooked up the igniter. It flew beautifully, with a straight boost and both ejection events happening right on schedule. Unfortunately, it landed on the roof of a local business.

Ray DiPaola and I worked the final range shift, with him handling the PA duties and me running the launch panel. We weren't too busy, and we were able to close the range right on schedule at 4PM. A few of us non-locals stuck around to help pack up range, and everybody was off the field by 5:30.

I don't usually attend NSL, since I'm normally in Minnesota celebrating my mom's birthday over Memorial Day weekend. I'm glad I went, though. I saw a lot of spectacular rockets of all sizes, met some fascinating people, and did some flying of my own. I'd hoped to have more rockets ready, but I had fun with the rockets I brought, and you can't have everything. If you've never been to NSL, and if it isn't too far away, you really ought to go. Maybe I'll see you at NSL 2016!

Goddard Apollo XI Contest

By Ole Ed Pearson

The contest ran on Sunday, July 19, 2015, from 1-3 with awards after. It was held at the NASA Goddard Visitor Center in Greenbelt MD. Starting temperature was 91 degrees and it just got hotter. News started that night with the day's hypothermia alerts!

There were 91 contestants this year. The contest, held annually, dates back to 1981.

After check-in, people setup their rockets. We used two racks six rails each and we flew in two age divisions--15 or less and 16 and older. Contestants could fly models up to a D engine with various recovery methods. The objective was spot landing--our spot was the US flag.

Trophies and supplies made possible by the Maryland Space Business Roundtable in addition to kits from Estes.

Jim did an awesome job juggling this contest with all his other responsibilities and rocket activities. The club and public owe him thanks for picking up the ball and running with it.



Here's a liftoff from the target's perspective.



We started the contest off with the national anthem followed with a rack of scale models.



Here's the Saturn V liftoff synced to a taped broadcast of the real Apollo 11 launch.



People queued up for check-in. There were 91 contestants this year. The contest held annually dates back to 1981.

Apollo 11 Contest Continued



Here are pictured the junior winners.



Here are pictured the senior winners.



This is Vincent Hillkirk. He came out with Stoil and helped run cards. He also flew, won a kit donated by Estes, but was really proud of First Time Flyer certificate (provided by Alex and filled out by the helpful Visitor Center staff for any first timer).



Tom Ha and Richard Crisco did checkin and rail assignment.



Jim Filler provides the keynote address next to the table of trophies and awards.



Ian Cochran retrieved rockets, Maria Ha did results, and Mike Cochran was rack purser and misfire fixer.



Happy Overall Winner of the Apollo Contest.



A cameraman from WUSA (Washington Channel 9 TV) came out and filmed our contest. We also got publicity from a parents mag on kids activities. Credit goes to Alex for his promotion of the contest.

Richard Sipes, Passes July 8, 2015

From Alan Williams, NARHAMS Vice President

Those of us who flew '70's era NAR contests around Washington will fondly remember Dick Sipes of the New Carrollton-area MARS club. Recently I received the sad news that this old friend has passed away at the age of 73. He had been in frail health from multiple causes for several years. Services were held at a funeral home in Beltsville July 16th, with burial at Ft. Lincoln Cemetery following. During the event NASA coworkers, relatives, and friends shared about his rock-solid work ethic, personality, and passions. Most of the twenty or so mourners were from Dick's days at Goddard running the pioneering NIMBUS polar orbiting weather satellites. Dick's supervisor said he was the first person to figure out sending spacecraft flight commands via what we would think of as an early "desktop" computer. His friends had little info on his other life in space modeling. Ed and Diane Pearson and I were the NAR contingent so I gave them some insight into that world. At Ed's request, this is a slightly expanded version of my account of how we knew him.

I began with a little of my beginnings with the Bowie-based Belair Association of



Rocket Society. Being teens, we were big on the hated rivalry thing. We were convinced that all the other clubs were (a) snobs; (b) cheating because they knew the rules; (c) knew something 'cause their clubs had girls and we didn't, and (d) cheating because they won and we didn't. A lot was made of the MARS members all flying identical innovative rockets from Competition Model Rockets, run by this Army artillery officer named Howard Kuhn. (Hated NARHAMSTER Bruce Blackistone even wrote a snide little song about them.)

It turned out Dick Sipes was the brother-in-law of this Kuhn guy. "Foul, unfair advantage", we mumbled under our breaths. Eventually we got to know this bunch of jerks and found out they were a pretty nice group of people. (Including little Larry Hogan, who is currently Governor of the State of Maryland.) The Sipes family, (Dick, mom Peggy, and young Tammy) were particularly ready to help, loan, teach, and share.

Model Rocketry. This was a group of mostly teen rocket flyers, so we knew we were really hot stuff. We started attending contests with other clubs such as Wheaton, Star Spangled Banner, the hated Laurel Rocket Society, the hated NARHAMSTers, and the hated Metropolitan Area

We all bonded more strongly during the adventure of performing at the TRANSP0-72 Dulles air show. Every one of the twelve regional NAR sections had a hand in the challenging daily flight demonstration program. In hindsight, a big boost was the organization skills Dick lent to the enterprise.

Shortly after, he invited me to help demonstrate at a small air show at Ft. Belvoir. Another success! And it was the first time I ever rode in a Cadillac. That back seat was so big, I'm still sitting in it!

At about that time I started easing into the pay-forward part of the hobby. I didn't connect those dots until much later...

(Soon after, Dick was named National Contest Chair for the Association. That's where things went south. I don't remember the details, but a National Championships Meet ended up on fiscally shaky ground and Dick ended up holding the bag. MARS folded; Dick left the organization and I didn't see him again until Col. Kuhn's funeral in 2010. His health challenges were obvious and we all knew his long term prospects were poor. He became essentially house-bound. But he contacted Ed frequently via E-mail.)

I finished by saying that each of us gathered there had been enriched by knowing Dick, and that if we live the lessons we got from him a finer legacy could not be found in this life.

FROM THE ZOG:

A Magical Evening that Happens Each September

By Alex Mankevich
NARHAMS President



The presentation theme for the August 2015 business meeting is “Night Launch Prep” to be presented by Jim Filler. It is safe to say that Jim will be presenting night launch awesomeness. His presentation is just a prelude to an annual NARHAMS event that is arguably near the top of every rocketeer’s list of main events to attend each year.

I’ve said before that it was the advent of micro-sized electronics that got me back into model rocketry. The thought of flying cameras (video and still) as payloads then downloading the images into a laptop was the spark that got me to dust off some old rockets and get back into the game. You could imagine my excitement when I found out that NARHAMS conducts a night launch each September which features battery operated LEDs as the payload. Oh, joy! More payloads featuring electronic circuitry!

We will probably see Jim Filler display some flexible LED strips. In my opinion, this latest technology has allowed the night launch to leap frog ahead in terms of amazement. Rocketeers are no longer confined to assembling night launch payloads as single, bright LED mounted in the nose cone. These days we can wrap bright LEDs all around the body tube.

These days it’s easier to get hold of some miniaturized circuitry that’s already programmed to display multiple colors and flash sequences. This puts a major wow factor into the whole works. Who does not like seeing a rocket poised on the launch pad beating out a pulsating rhythm of multi-colored bright lights? It’s no wonder why we draw a respectfully sized “peanut gallery” for our night launches.



Photo Courtesy of NASA

So, why don’t we have a night launch every month, or for that matter every weekend? Well, you’ve probably heard that timing is everything. For starters, September typically has less humid air, allowing for better visibility of the night launch. Another prime factor is that dusk happens sooner in September than all the preceding summer months. We couldn’t do with a night launch that needs to start after 9 PM. Yes, it does get darker even sooner in November, but I’m not so sure we want to be shivering for the night launch. Another factor is the hours of operation as set by the Parks & Recreation. Starting October first, we would need to be out of the park sooner in the evening. Finally, trying to squeeze in a night launch during the early Spring months would be hectic given all the activities we already have on our plates during those months.

Remember, night launch rules require that any new model that you wish to fly during the night launch must first be qualified during the day. Also, please be certain to either inspect and/or replace your recovery system on your night launch models. Models that get separated or descend in a ballistic manner are more frightening in the darkness. Finally, I will once again bring my collection alien beings to view the night launch.

July 2015 Mt. Airy Sport Launch Report

By Christopher Ha, Launch Manager

Maria Ha and I arrived at storage facility at 11:20, were joined and assisted by Richard Crisco and Don Carson in loading and setup. Both racks were used along with the away pad setup. Both canopies were deployed and functioned well. I placed a Ping-Pong ball spot landing spot downrange, in the form of an orange flag.

Don Carson took first range duty. The first flight was Dick Stafford's Under Dawg, a 2-stage model on a D12-0 and C11-3. Richard Crisco put out the yard signs at the start of the public launch. There were multiple groups with children who came to the public launch. There were no organized soccer matches for the entire day, though some kids were observed kicking a ball around one of the goals for a time.

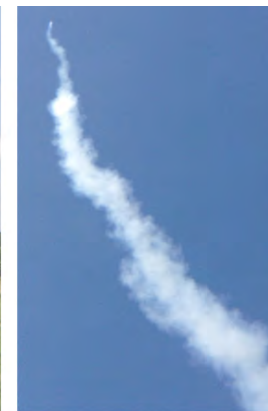
The pace of the launch in general was slow, but this was in part due to a number of the children wanting to press the button for their flights. This interrupted my flow as RSO/LCO, meaning a number of operator errors occurred, usually by way of not switching pads when we got a new kid up to press the button. All in all, the launch went well, though, and I think the children's enjoyment of participation outweighed any dissatisfaction with the inefficiencies.

We flew 62 total flights, only 2 of which were non-nominal (one second stage failed to ignite and one separated but came down safely). There were 7 flights by 4 participants in the Ping-Pong ball spot landing competition, and the final results are thus: Jim Filler, 50' 5"; Richard Crisco, 53' 5"; Maria Ha, 63' 7"; Fabrice Derullieux, 63' 8". Fabrice is of notable mention, because he did not know of the contest before the day and flew 3 times, improving his score each time.

A motor breakdown follows: Clusters: 0; Staged: 3; A: 10; B: 16; C: 22; D: 3; E: 1; F: 4; G: 3. Percentages, if necessary, are left as an exercise for the reader. The largest motor was a G74-6.

Mike Kelley, Fabrice Derullieux, Jim Filler, Richard Crisco, Maria Ha, and I cleaned and packed up the range at 6. Some range supplies went with Jim to Goddard for the Goddard Contest. Scott Gowing left his personal pad on the field; it was placed in the storage unit.

I received questions about both the summer launch hours and some way to give fliers a method of logging their own flights (one flier hoped to get their flight cards back). **More photos on page 23.**



Mike Kelly's Nike Orion
Photo: E. Pearson



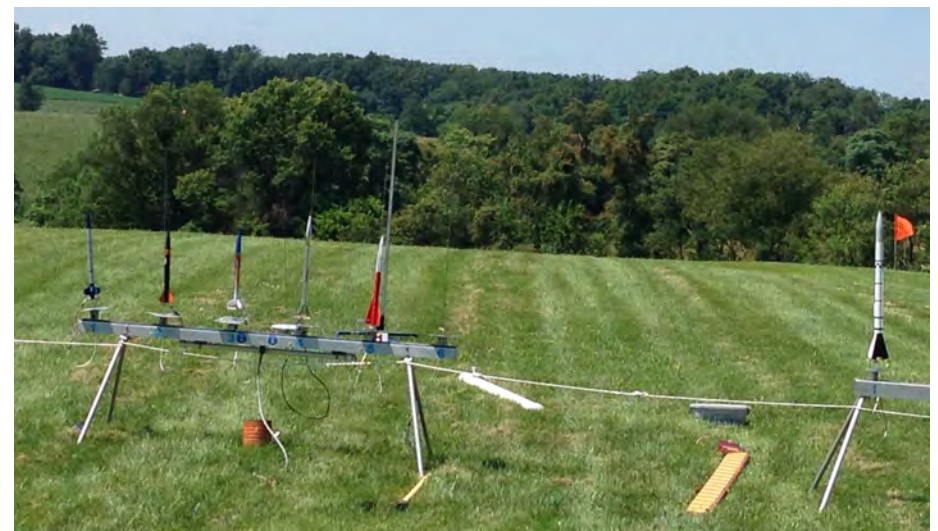
Young modelers watching a flight
Photo: M. Ha



Fabrice Derullieux
Photo: M. Ha



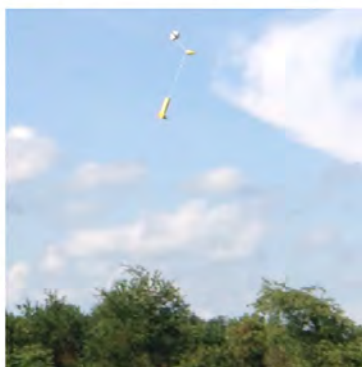
The O'Rourke boys
Photo: M. Ha



Models ready to fly. Photo: M. Ha



Maria Ha's Ping Pong Ball Spot landing attempt
Photo Collage E. Pearson



People
Photo: M. Ha



Flyers and thier Dads Photo: M. Ha



Ji Filler's NARHAMS 50
Photo: M. Ha



Jr. LCO!
Photo: M. Ha



Where is it?
Photo: M. Ha

OUTREACH: OPTIMUS PRIME Spinoff Launch

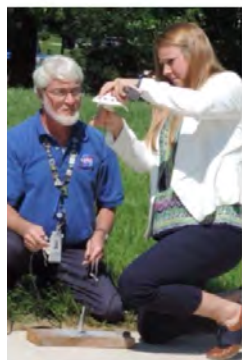
By Ole Ed Pearson

Tom Bagg gave a launch demo to winners of the OPTIMUS PRIME Spinoff Challenge and visitors at the Goddard Visitor Center, July 16.

The pictures below are from DJ Emanuel, VC Operations Manager, who also helped with the Goddard Apollo Contest.

The spinoff challenge was generated by NASA's Innovative Technology Partnership Office (technology utilization spinoffs), Tom's old office--he is currently working on the OSIRIS REx project. Tom recently helped in another NARHAMS VC launch--the SISTERS program, the day before. Good examples of public outreach using model rocketry. Great going guys.

Read about the spinoff challenge at <http://itpo.gsfc.nasa.gov/optimus/>



GSFC Visitors Center July 2015 Launch By Ed Pearson

We had a few dozen rocketeers show up, July 5, at the Goddard Visitor Center public launch. The launch lasted 1.5 hours. Sixty-six models were flown. Great job, gents.



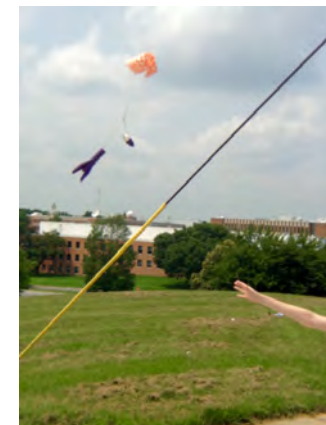
Ed Jackson chats with safety check-in Richard Crisco (right). Ed brought several vintage models (e.g., this Mars Snooper) and some new ones after a GSFC hiatus of about 30 years. He helped put away equipment too!



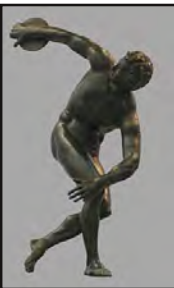
Alex Mankevich (left) did narrations while Jim Filler was launch officer.



Kids weren't the the only rocketeers flying this after-the-Fourth launch.



Where did this arm come from (nice Baby Bertha model)?



Competition Corner: Changes Just Announced at NARAM!

NAR Board of Trustees Announces Significant News

From Ted Cochran's [State of the NAR presentation](#) at NARAM comes major news regarding Competition Rocketry. Paraphrased from the presentation:

Board of Trustees has established a Special Committee for the Enhancement of National Events to recommend ways to attract more NAR members to the NAR's National Events and to reinvigorate all forms of rocketry competition. The committee will be chaired by NAR Vice President John Hochheimer. The Special Committee will have enhancing contest rocketry as part of its charter.

In addition, there were no bids to host NARAM in 2016, so the Special Committee will establish NARAM-58, which will likely be shorter in duration and significantly different in content from previous NARAMs. However, if a good "classic NARAM" bid is received by September 30, it will be accepted.

The Board of Trustees has voted to make three pink book changes to spur growth and enable change.

First, to increase flexibility of scheduling and judging of R&D, the written portion of R&D entries must be submitted as a .pdf file to the NAR website (nar.org/rd) no later than two weeks prior to the opening of the contest.

Second, limit teams to two or three members.

Third, to encourage mentorship the BoT created a new event: Mentorship. This event essentially awards points for being a mentor to a "new competitor." The more people you mentor the more points you get. The "new competitor" does have to show up and make a qualified flight in the contest.

RAMTEC-18 Events:

Events: Total Weighting Factors = 80
A FAI Streamer Duration Multi-round
1/4A Helicopter Duration Multi-round
B Rocket Glider Duration
1/2A Parachute Duration Multi-round
1/4A x2 Cluster Altitude (Optical Tracking to ejection)

Date: Sept. 5 & 6, 2015 (Labor Day Weekend)

Location: Fort Indiantown Gap, PA

CAPITOL CUP 2015

An FAI-Sanctioned World Cup Spacemodeling Competition

September 19-20, 2015

Great Meadow, The Plains, Manassas, VA

Sponsored by: NOVAAR

World Cup events: S4A, S6A, S8E/P, S9A

Open Int'l Events: S3A, S2/P

Capitol Cup is also sanctioned as an NAR regional meet for the S3A, S4A, S6A, and S9A events, flown as FAI-style multiround NAR events.

**Contact: Trip Barber, ahbarber@alum.mit.edu,
9306 Brian Run Lane,
Springfield, VA 22153
(703) 866-4710/cell (703) 474-7128**

Entry Fee: \$20, payable at registration.

ECRM-42 Meet Champions

Place	Contestant	NAR Number	Section	Total Points
A Division				
1	Avramov, Stoil	92988	139	1293
2	Fitzgerald, Chase	Pending	205	384
B Division				
1	Alexander, Michala	85196	473	522
C Division				
1	Feveryear, Glenn	24931	503	1575
2	Carson, Don	11069	139	1002
3	Giugliano, Ed	32456	139	858
4	Filler, Jim	27862	139	783
5	McGraw, Jim	18071	503	594
6	Feebach, Jess	16859	205	486
7	Bock, Greg	44161	205	261
8	Canino, Bruce	39989	593	252
9	Grant, Bradley	85261	139	243
10	Gearhart, James	25441	205	75
11	Crisco, Richard	51555	139	54
11	Mankevich, Alex	86018	139	54
11	Pearson, Ed	5694	139	54
11	Williams, Alan	14137	139	54
12	Krohn, Matthew	98112	139	36
13	Fineran, Jeff	90633	139	30
13	Pena, Raul	88644	139	30
T Division				
1	The Flying I-Beam Kids	T-473	473	2220
2	Duck	T-661	473	1368
3	Murphy's Lawyers	T-788	139	1140
Sections				
1	NARHAMS		139	5631
2	PSC		473	4110
3	SPAAR		503	2169
4	NOVAAR		205	1206
5	SOJARS		593	252



NARHAMS Gold

National Association of Rocketry Headquarters Astro-Modeling Society
(NARHAMS), NAR Section 139 presents:

**Limited Edition
50th Anniversary
Model Rocket Kit**

Only 139 numbered kits available!

Unique Ducted Booster
2-stage styling
Quality Kit Production
Decal sheet included

Length: 20"
Diameter: 1.34"

Suggested Motors:
B6-4 (first flight)
C6-3
C6-5

Per kit price: \$30; \$7.50 shipping up
to two kits, or free delivery at
NARAM.

Kits available NOW!

Send checks (payable to NARHAMS)
to Maria Ha, NARHAMS Treasurer,
512 Chestnut Street, Mount Holly
Springs, PA 17065

or
PayPal to rocketha@gmail.com

Please use the send money to friends
or family option when using PayPal!



Further details can be found on the [NARHAMS website](http://www.narhams.com).