



206-43



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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

It has been a busy second half of the summer between contests, club launches and outreach activities. We had members attend NARAM-57, the selection flyoffs for the US Spacemodelling Team that will represent the country at the next international championships, the Capitol Cup, and RAMTEC-18! Back home, we kept up the pace with 3 sport launches and 2 outreach launches at NASA's Goddard Space Flight Center, finishing up with our annual Night Launch. We have coverage of it all, right here.

There is also the final point standings for individuals and teams in the club, check out how we ranked nationally. The details for 2 upcoming contests have been announced: the 3rd Annual Carl McLawhorn Memorial Flyoff (October 10-11) and NARAM-58 (July 23-29, 2016). Both have some great events, so check them out!

In addition, you will find the final installment of Ole Ed's reminiscences of the early years of the club and an inside look at the Wallops Flight Facility Sounding Rocket labs.

Thanks to all who submitted articles and photos, without you, I'd quit my job here.

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

For questions, answers, opinions, files, photos, and more NARHAMS, join the [NARHAMS Yahoo group](#). You have to get yourself a yahoo e-mail address (but you don't have to use it for anything else), it is free, painless, no ads, and may just be the cure for the common cold. Also: [Facebook](#) if you are not paranoid about that sort of thing.

Front cover: Jim Filler flies his S8E glider at the Capitol Cup. Steve Foster keeps the time while John Hochheimer and Keith Vinyard make sure they don't touch anything. Photo by Craig Beyers.

Back cover: Dave Fuller's shot from the September Sport launch in Mt Airy, MD.

ZOG ROYAL COURT
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(Treasurer) Maria Ha

KEEPER OF THE HOLY WORDS (Secretary)
Vacant, need a fulfilling role?

COURT JESTER (Section Advisor) Mark Wise

NARAM-57

By Chris Kidwell

All photos: Naramlive.com



NARAM-57 was held July 25-31 at the TIMPA R/C facility outside of Tucson, AZ. Steve Lubliner managed the sport range, while Ed LaCroix handled the contest. NARHAMS had a good contingent in attendance, including Jennifer Ash-Poole, the Avramov family, Jim Filler, Tom Ha, Steve Humphrey, Kevin Johnson, Mark Wise, and myself. The weekend consisted of sport flying, and qualification flights for the 2016 US Spacemodeling Team.

Monday - PRA and C RG

Predicted Altitude was the usual crap-shoot. Lots of people had it dialed in pretty well and got less than 5% error, but you needed better than that to place. Bob Alway set the standard on the second flight of the day with a perfect score. Jim Filler was waffling between 239 and 243 meters for his prediction. He chose to go with 239, but should have just stuck with the average, since his flight was 241 meters, good enough for 3rd place. Jennifer Ash-Poole made her one contest flight for NARAM and got a qualified flight. Reports were that pool and beverages followed shortly afterward.

C Rocket Glider saw a mix of designs, including lots of slide wings, one scissor wing, a few with no moving parts, and about 15 people doing various sizes of radio-controlled models. There was a lot of cloud cover early in the morning, with a few drops of actual rain, so most of the best flights took place after that cleared.

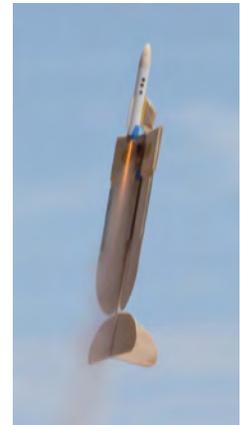


Beautiful built up swing wing RG



The range!

Large R/C models dominated every age division, setting new R/C records as well in each division. Keith Vinyard tested the endurance of his timing team with a 29 minute flight, stopping only due to low battery voltage and a stiff neck. George Gassaway also turned in a 20-minute flight in team division. Having an R/C model wasn't a guaranteed win, however. In C Division, 2nd through 4th places were all free-flight models, beating out Jim's R/C model in 5th place.



A swing wing RG under boost

At the NAR Town Hall, Ted Cochran noted that the NAR membership continues to grow. We have over 6000 members, yet competition rocketry is still a very minor component. In an effort to address that issue, the NAR Board of Trustees made several changes to the Pink Book, effective immediately after NARAM. First, R&D reports need to be submitted to the NAR web site in PDF format 2 weeks before the start of the meet. Second, a new event has been created to encourage mentoring of new



Stoil and his RC RG

Continued on page 4

NARAM-57 Continued

All photos: Naramlive.com

competitors. Lastly, John Hochheimer has been charged with leading a special committee to recommend ways of changing national events to reinvigorate competition rocketry.

Tuesday - FAI A SD and B HD

Weather played a big part in flights on day 2 as some really huge thermals came through the range. In the morning, there was one period where the temperature went from 97F to 115F, and stayed that way for 10 to 15 minutes. I got into it early with a streamer flight that easily hit the 3 minute maximum time. Tim Van Milligan and The Flying I-Beam Kids also got helicopter flights off, and got times of 7 minutes and 10 minutes, respectively. Thermals continued throughout the day, but none as big as that one. It was also fun watching the dirt devils that were getting stirred up with all the hot air, taking out one canopy in the parking area at one point. I ended up in 2nd place behind Tim in B Helicopter Duration. Jim Filler also piggybacked off my thermal picking and finished 4th. In FAI A Streamer Duration, I was in 1st place until the very end of the day, when Keith Vinyard knocked me down to 2nd. Jim and Steve Humphrey also had consistently good flights and finished 3rd and 4th.



External folding blade Helicopter

The evening activity was the Cannon Auction. There weren't many vintage motors, but several items did get high bids. Lee James' wife created a huge quilt with patches for the NAR and NARAM logos, and other sections inspired by the Arizona state flag. Several items from Lee Piester's estate were also donated, including a display model from his store, and a box of balsa sheets. Estes also made the usual donation of multiple mystery boxes. Overall, \$4465 was collected for the Cannon Fund.

Wednesday - E ELA

Weather was a factor again on day 3, but this time due to rain. At the start of the day, there was a rain cell to the south of the range, and radar loops showed it headed our way. We battened down the hatches and shut down the range for 1 hour, which of course caused the rain to skirt to the north of the range. Flights resumed for E Eggloft Altitude after the rain delay. I got a great flight on an E20, and spent the next 1.5 hours searching for the model. Thanks



A nice Eggloft launch

to the GPS line, I was able to find the model and return it for 760 meters. That score stood in 1st place until people started returning E6 flights, eventually bumping me down to 5th place. Jim Filler had a good first flight on an E18 but was unable to locate it after searching



Eggloft uh oh

for an hour. After a bit of rest (and a DQ flight on an E6), Jim headed out for another hour and finally found the model. The extra time was well spent, with the 810 meter altitude good for 4th place.

C and Team divisions presented their Research and Development projects in the evening. The quality of projects was substantially lower than in prior years, and there weren't any noteworthy projects.

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NARAM-57 Continued

All photos: Naramlive.com

Thursday - B ALT, 1/2A PD MR

For B Altitude, the field was split between those doing a single-stage B6-6, versus those opting for two-stage models using A10-0 staged to A3-4. The single-stage models maxed out at about 300 meters, while the two-stage models got 400 meters or more. My single-stage flight was only good enough for 10th place. Jim went the two-stage route, and got consistent flights of 436 and 441 meters to finish in 3rd place. Top flights in C and Team divisions reached 481 and 521 meters, respectively.



Check out this chute

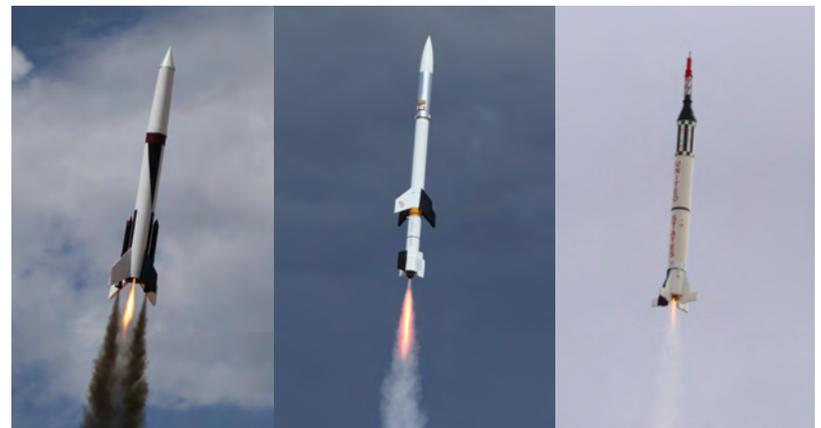
Many people chose to go with minimum diameter tubes for 1/2A Parachute Duration to get the highest altitude for deployment to give a better chance of catching a passing thermal. Jim and I went with larger diameter tubes to allow much larger chutes to be used. Jim had a 30mm model with a 24-inch chute, while I went with a standard 40mm FAI model and a 36-inch chute. With a 2-minute maximum time, we were expecting to have multiple people getting 3 maxes, but only the G-Force team was able to accomplish that. Jim got 2 maxes, but lost both models and was unable to fly a third time. He finished in 5th place, tied with two others in the same situation. I maxed my first two flights, and was able to recover both models. On the third flight, some of the shroud lines wrapped around the chute, so it didn't fully deploy. The model was so light that it was still able to get a respectable time of 88 seconds. Since no one in C Division got 3 maxes, I was able to hold on to 1st place.

The evening activity was R&D presentations from A and B divisions. Stoil Avramov gave his presentation on the development of a claw mounted on a drone for helping with drop testing models.

Friday - SpSc

Friday was Sport Scale day. After a short rain delay in the morning due to a passing thunderstorm, flights went off with a very good success rate. I was 3rd in static with my Black Brant IIIB, and had a perfect flight on a D12-5. But with no mission points on my flight, Tim VanMilligan was able to jump ahead with his clustered Astrobee 1500, pushing me down to 4th place. Jim flew his Black Brant 7 successfully on a B4-4, finishing in 7th place. There were only a few crashes. Jon Stenberg landed his Javelin on the runway and knocked off all 12 fins. Jonathan Dunbar failed to secure his motors, sending the core F39 sailing across the range, and earning him the Best Midwest Qualified Flight award in the process.

Overall, NARAM-57 went very well. Altimeter checkin was a bit slow at times, but people seemed to put up with the extra steps without complaint. Flights went off so quickly that we never even used the queue manager board. The weather was not ridiculously hot, and the organizers provided free water to ensure everyone stayed well hydrated. There was plenty of good food at the banquet, and the awards ceremony took less than 3 hours to complete. As a new twist this year, cash prizes (\$25 for 1st place, down to \$5 for 4th) were given for the event winners instead of trophies or medals. Thanks to the expert guidance of Co-Contest Directors Steve Lubliner and Ed LaCroix, I can definitely say a good time was had by all.



A gallery of Scale models

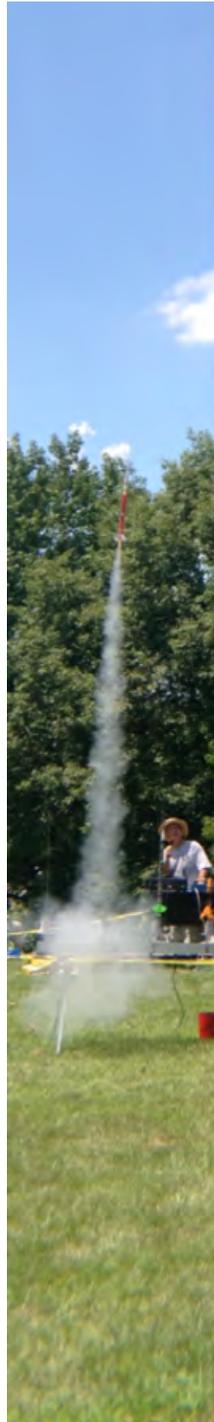


Outreach: GSFC Visitors Center August 2015 Launch

By Ed Pearson

The monthly NASA launch at GSFC conducted by NARHAMS for August (8/2) lasted 100 minutes; 98 launches were recorded. Visitor Center personnel gave out almost 50 first time flyer certificates. Two Cub Scout packs predominated--303 from Rosedale (Baltimore suburb) and 1010 of Springfield, Va--but there were plenty of enthusiastic families too. About 200 to watch or fly. Alex Mankevich MC'ed, Richard Crisco safety checked, and Mike and Ian Cochran pursued/tree recovered. Temperature was in low 90s.

All photos by Ed Pearson



US Spacemodelling Team Flyoffs at NARAM-57

By Kevin Johnson

Photos: Naramlive.com

Every 2 years the FAI holds the World Spacemodelling Championship (WSMC) to see who the best spacemodellers in the world are. Typically the same events are flown at every WSMC so competitors can practice and hone their skills for the meet. The US team is selected by a competitive flyoff that is held in conjunction with the odd numbered NARAM the year before the event.

This year the flyoffs were held on Saturday and Sunday opening the flying at NARAM. We use the contest range which gives the organizers a chance to



Its just hanging there!

make sure everything is working before the main NARAM meet, and keeps us out of the sport flier's hair so they don't have to wait to fly.

The events that people were flying for included S1 (altitude), S3 (parachute duration), S4 (rocket glider duration), S5 (scale altitude), S6 (streamer duration), S7 (scale), S8 (RC rocket glider), and S9



(helicopter duration). Most of these events were flown using A power, and that usually meant that a lot of Estes A3-4 were burned.

Several NARHAMS members were trying out for the team- Jim Filler, Steve Humphrey, Chris Kidwell, Stoil Avramov, James Duffy, Dave O'Bryan, and myself.



Jim Filler watches another perfect launch

I tried out for 4 events (S3,S6,S8, and S9), Jim battled for a spot on 5 teams (S3, S5, S6, S7, S8), Steve flew in 3, (S3, S6, S9), James also flew 3 events (S3, S5, S7) , Dave attempted 5 events (S3, S4, S6, S8, S9) and Chris tried out for 3 teams (S3, S6, S9).

The rules for the flyoff are a little different than the WSMC events in that we were allowed to fly one model in each of the 3 rounds, instead of using 2 models for the 3 rounds. This is a nod to the fact that individuals may not be able

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Spacemodelling Flyoffs, Continued



Chris: You gonna let me slide?
Trip: Nope!

to fly and recover in the short time we had to get all of the events flown in 2 days. At the WSMC not only do we have a team to help with recovery, but we typically fly the same number of events over 6 days.

The weather for the flyoff was great considering it was July in Tucson, Arizona! Highs during the day were in the upper 90's, with light breezes. There were good thermals to be found, especially since we were flying at Tucson International Modelplex an RC field with a blacktop runway. Recovery was challenging because of several fences, and lots of scrub oak, and cacti. An interesting tidbit of information, is that it takes about 70 years for a saguaro cactus to get big enough to grow an arm.

Even though the fliers are competing for the same spots of the teams, everyone was happy to help out if someone needed some help. I saw lots of sharing of supplies and tools, as well as people volunteering to time after they made their flights. Even more than a NARAM, it is important that the FAI fliers help run the range to make the contest happen.

Below is a list of the flyoff results, but keep in mind that we have until October 1st until we hear the official team roster. This is because the WSMC is in the Ukraine next summer, and some fliers are not sure if they are going. This means that there will be some shuffling of places as the top 3 pilots in each event make their decisions.

All photos: Naramlive.com



Kevin Johnson and Esther Roura head to check-in table with Mr. Alway hot on their heels



Jim Filler prepping and staying hydrated



Rachel Nowak's model clearing the tower

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Spacemodelling Flyoffs, Continued

2016 US Team Selection Standings

<u>S3A Parachute Duration</u>	<u>S4A Boost/Glide Duration</u>	<u>S9A Gyrocopter Duration</u>	<u>S6A Streamer Duration</u>
Junior Division 1 Van Milligan Allison 2 Avramov Stoil 3 Duffy Campbell 4 Nowak Rachel 5 Van Milligan Ashley Senior Division 1 Willard Terrill 2 Humphrey Steve 3 Barber Trip 4 Filler Jim 5 Duffy James 6 Johnson Kevin 7 Kidwell Christopher 8 O'Bryan David 9 Roara Esther 10 Nowak Nicholas 11 Nowak Mike 12 Alway Robert 13 Ringner Randy 14 Steele Matt Kristal Steve	Junior Division 1 Avramov Stoil 2 Stenberg Zackary 3 Stenberg Alyssa 4 Van Milligan Allison 5 Van Milligan Ashley Senior Division 1 Ringner Randy 2 O'Bryan David 3 Barber Trip 4 Flanigan Chris Steele Matt	Junior Division 1 Van Milligan Ashley 2 Stenberg Alyssa 3 Stenberg Zackary 4 Avramov Stoil 5 Van Milligan Allison Senior Division 1 Gassaway George 2 Barber Trip 3 Kidwell Christopher 4 Johnson Kevin 5 O'Bryan David 6 Humphrey Steve 7 Filler Jim 8 Steele Matt	Junior Division 1 Van Milligan Allison 2 Avramov Stoil 3 Van Milligan Ashley 4 Nowak Rachel Senior Division 1 Kuczek Kevin 2 Barber Trip 2 O'Bryan David 3 Kristal Steve 4 Marsh Jay 5 Roara Esther 6 Ringner Randy 7 Kidwell Christopher 8 Nowak Mike 9 Flanigan Chris 10 Humphrey Steve 11 Filler Jim 12 Steele Matt
<u>S8E/P R/C Rocket Glider</u>	<u>S1B Altitude</u>	<u>S5C Scale Altitude</u>	<u>S7 Scale</u>
Senior Division 1 Vinyard Keith 2 Berk Matthew 3 Johnson Kevin 4 Gassaway George 5 Filler Jim 6 O'Bryan David 7 Langford Ellis Guzek Brian S8D Rocket Glider Duration Junior Division 1 Avramov Stoil 2 Stenberg Zackary 3 Stenberg Alyssa	Junior Division 1 Van Milligan Ashley Van Milligan Allison Senior Division 1 Kristal Steve 2 Kreutz Bob 3 Steele Matt 4 Alway Robert Barber Trip Reynolds Gib	Junior Division 1 Duffy Campbell 2 Nowak Rachel Senior Division 1 Steele Matt 2 Kreutz Bob 3 Filler Jim 4 Duffy James 5 Kristal Steve Campbell Thomas Reynolds Tony	Senior Division 1 Flanigan Chris 2 Nowak Mike 3 Steele Matt 4 Duffy James 5 Alway Robert 6 Kristal Steve 7 Reynolds Tony Campbell Thomas Filler Jim

Meeting Highlights

August



Tom Ha gave a presentation on night rockets. Zog Alex and Alan Williams added to the discussion. Tom also summarized NAR Board actions and told of his NARAM-57 experience.

September



John McCoy talks about making models look good. In the foreground is a NARHAMS Gold. One can be pardoned for mistaking the kit for a trophy instead.



August 2015 Ag Center Sport Launch Report

By Mark Wise, Launch Manager

Photos by Ed Pearson

August in Maryland. Hot, hazy, and humid, right? Well, the weather was definitely a pleasant surprise for the August launch at the Carroll County Agriculture Center. Barely a cloud in the sky, great visibility, warm but not hot, low humidity, and light winds. It was hard to believe it was August, and it definitely beat the conditions at the previous Ag Center launch. (The wind chill was 17 degrees for the March launch.)

I arrived at the field at about 9:15 AM, way too early for a noon launch. Alex Mankevich had all the launch gear, so I walked up to the main buildings while I waited for Alex to arrive. I bought some produce and spices, then walked back down to the launch area. In the space of about 45 minutes, Alex had arrived and set up the range. We must have just missed each other – sorry about that, Alex!

The corn was going to be a problem, no doubt about it. There wasn't much wind, but it was a safe bet that it would carry at least one rocket into the eight-foot-high jungle.

Richard Crisco, our section Scouting Coordinator, joined Alex and me before the range opened. He didn't bring anything to fly, and we didn't expect any Scout groups, but it was nice to see him, as always.

The launch didn't officially begin until noon, but we were ready long before that, and it seemed silly to wait around. Alex launched his Shiney, an original design, on a C6-3 at 11:45. It weathercocked a bit, but it drifted back toward the pads. A good beginning to the day.

We don't see enough of Kevin Knebel, but he came up to the Ag Center that day. The second flight of the day was his, a Li'l Ivan on an A8-3. Mike Kelley followed Kevin with an Estes STM-012 on a D12-5, for another nice flight.

I've been picking away at the NARTREK Silver level for a while now, so I figured I'd get my payload requirement out of the way. I flew a Custom Rockets Elite on a B6-2, with an egg in the payload capsule. It wouldn't have rated more than flight points in any competition (11.4 seconds, against Chad Ring's U.S. record of 316 seconds), but the egg was undamaged and I completed the requirement successfully. Now, to get the scale and glider flights out of the way....

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Club member Kevin Knebel's (Bel Air, Md) Semroc tube-finned model. Kevin is left in the left photo.



Bill Boublitz came out to watch. Bill is from Hanover, Pa and hasn't flown in more than 30 years.

We did have a few mishaps during the day. Alex's Cosmic Cobra never deployed its rotor blades. Mike Kelley lost a rocket in the corn, and Kevin Smith's Cruiser drifted behind the trees. Kevin Knebel's Estes Heatseeker headed straight for the corn, which must have been a source of heat or something. The rocket separated, unfortunately, but both sections landed just short of the corn. After losing his Cruiser, Kevin Smith had two more unfortunate flights, neither of which appeared to be his fault. First, the delay in his Big Daddy Bee turned out to be a bit longer than the five seconds stamped on the motor, which led to one of those impact-before-ejection events we all dread. The second mishap was even stranger. He flew an Estes Leviathan on a single-use F20-7, but the motor burned through as though the forward closure on a reload had failed. The burnthrough came early in the boost, but the Leviathan continued to climb while black smoke poured out both ends of the rocket. The shock cord was burned through, of course, but the rocket appeared to be salvageable. Some days are like that, Kevin.



The Collins family watch their Baby Bertha lift off.

The Starvaggi family came by a bit later: Mom, Dad, and three kids with rockets to fly. Gianna, Andrew, and Peter all flew Alpha III's on B6-4's, and Andrew followed up with his Voyager 8, also on a B6-4. Thanks to Richard for helping them with prep and hookup!

Nora Collins, who we've seen at previous launches, arrived with her dad. She made five successful flights with various kits, although her final flight, an Athena on an A8-3, suffered a hard landing on the gravel.

Alex flew a Fat Boy on a C6-3 for the final flight of the day, shortly after 3:00. We waited awhile to see if any last-minute flyers would show up, but none came. Alex, Richard, and I had the range taken down and packed up shortly after 4:00.



We made 35 flights in just over three hours. That's not exactly a busy range, but it made for a nice, relaxed pace through the day. The corn was a bit of a problem, as we've come to expect with the August Ag Center launch, but the weather and the camaraderie more than made up for it.

See you in November. The corn will be down by then!

Number of flights by motor class:

1/2A, 3 (all Alex); A, 6; B, 11; C, 8 (including 4 C11's); D, 3; E, 1; F, 3



The Zog's model launches and Alex recovers



Capitol Cup 2015 – A Magic Moment

Text and photos by Ed Pearson

There are rocket contests and rocket contests, but the Capitol Cup, September 18-20, The Plains, Va, was a multifaceted, rarely experienced, Event—with a capital E. Nominally an FAI World Cup and Open International spacemodeling contest, CapCup was also an NAR regional contest, a team practice for the next world championships (2016, Ukraine), a chance to fly NAR's Postal G-engine Altitude Contest, sports launch, and opportunity for rocketeers to get together, exchange ideas, share methods and bond in camaraderie.

Trip Barber was organizer with help from more than a dozen NOVAAR and other volunteers who flew not but enabled the contests. Notable amongst the others were NARHAMSters Tom and Maria Ha who did 99% of the check-ins, returns, and results.



On Sunday, Taras Tataryn of Canada, exchanged his FAI judge hat to fly as a competitor in the egg contest. Peter Cook (R) of Canada judged the event. Taras won second.

U.S. contestants dominated with a small representation from Bulgaria and Canada. Events included helicopter, parachute, rocket glider, and streamer durations with A motors plus a TARC-like egg lofting event, and a precision (time and landing) E-powered rocket-glider performance event. Results are not included here—this is more of a photo journey giving you the Event's flavor (and one could say all who attended who flew or helped won) but medals were given out Saturday night at Aurora Flight Sciences at a dinner hosted by Dr. John Langford and on the field Sunday afternoon. Saturday's night dinner included a trip presentation by Matt Steele with help from Mike Nowak and James Duffy on the 2015 European Championships in Ukraine, previewing next year's world championships.

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Matt Steele of AZ and his winning egg-carrying rocket. The objective--fly an egg to 300 meters and bring it back, uncracked, in 60 seconds. Oh, and do this to the same egg three times!



Dmitre Avramov flew for Bulgaria; his son Stoil (R) flew as a U.S. competitor.

Capitol Cup - continued



Dr Bob Kreutz of NJ practicing his piston technique and altitude model.



Chris Flanigan of CA and his S2/P egg carrying rocket.



(Clockwise from top left) Kevin Johnson prepares his E-powered RC glider, the model launches, Kevin all a glow controls it, and US team mgr Dr John Langford measures its landing performance.



Keith Vinyard of MO won the RC glider event after four flights. L-R top: the model lifts off, Keith (R) guides it standing next to his helper, NAR Vice President Dr John Hockheimer. L-R bottom: Timers AMA VP Jay Marsh and Roger Hinson watch Keith's model, and Jay takes the landing measurement.



Jim Filler came in second in the RC glider event (S8E/P). He prepares the model, it lifts off and comes in for landing at the target tape.



James Duffy of TX won a place in parachute duration and served as the RSO for the helicopter and egg events.

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Capitol Cup - continued

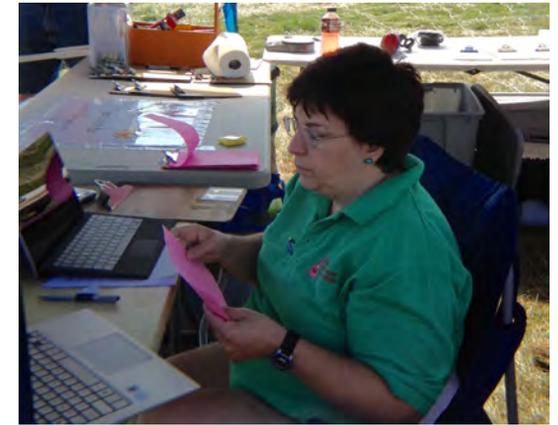


Sav Prato of Canada traveled 10 hours to the contest with wife Lucy to compete. Here he prepares a glider for flight.

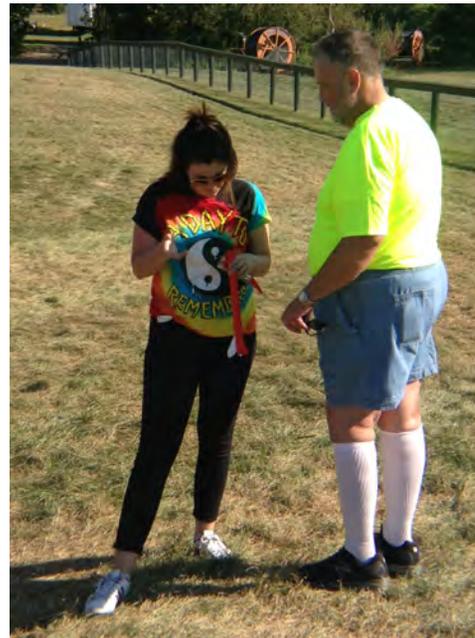


Dr John Langford and Tom Ha check in Dmitre Avramov's helicopter model.

Right: Maria Ha learned how to check models in Friday. She spent Sat and Sun at the contest doing results on two computers--for NAR and FAI contests! Talk of tireless effort, but she wasn't alone.



An outstanding range crew from NOVAAR and others officiated. Here are three, clockwise from left: Caleb Boe, Adam Martin, and Jonathan Rains.



Rachel and Mike Nowak used Capitol Cup as an opportunity to practice their scale altitude event with a Black.



Dr. Chris Kidwell of Florida strolls to retrieve his parachute model Sat morning--the wind was negligible. He won S3 (parachute) and S4 (small glider).

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Capitol Cup - continued



Steve Foster of PA flew in the NAR contest. Here he is by a wind speed monitor.



Left: Steve Humphrey of NJ and his S2/P egg rocket. (Second photo) NOVAAR President Joe Woodford launches Steve's model. Steve had a chance of medalling in the event but couldn't find/return it after the third flight. (Third photo) Steve, soaked in sweat and marsh water, and covered with brambles, burrs and insects returns to the contest empty handed but spirits high.



Trip Barber's second flight cracked his egg in the S2/P contest. Here Trip watches his model (third photo) sail off.



Trevor Leggette, a sixth grader from the Hampton Roads area of Va, was the youngest contestant. He is shown here with CD Trip Barber checking his models in.



There were sport flights too at the contest, practices, and here was a Trip Barber entry into the NAR postal contest of G altitude.



FROM THE ZOG: Much to be Thankful For

By Alex Mankevich
NARHAMS President



I first want to thank the NARHAMS members for allowing me to continue as your President. During the past year I was thrilled to have a front row seat as our members put together the 50th Anniversary gala, the NARHAMS Gold model rocket, the commemorate 50th Anniversary patch and the special, commemorative launch at the Goddard Visitor Center. I can proudly boast that I know members such as Tom and Maria Ha and our NARHAMS contestants competing at the World Space Modeling Championships who have literally traveled the world as they pursue their model rocketry endeavors. I'm also pleased that along with Richard Crisco, Ed Pearson, Mike and Ian Cochran we've continued to conduct the first Sunday of the Month launches at the Goddard Visitor Center. I would have enjoyed being a part of all these activities simply as a dues-paying section member. However, I've been able to squeeze out even more pride and satisfaction being your President since I've been given an insider's perspective as I've witnessed these pursuits progress from planning, to development, and finally to fruition.

I'm thankful for the accomplished members who have been elected to serve as your officers for the next year. Folks like Maria Ha, Mark Wise and Alan Williams are long-time members who have stayed involved and informed with the various dealings in the world of model rocketry. NARHAMS benefits from their service because of the depth of knowledge and insight they bring to bear as we address topics that come about during the course of conducting NARHAMS business.

I want to give to shout out to a couple members who have really stepped

up just when we needed them to shine. Kevin Johnson who took over as Secretary upon the departure of Chris Kidwell did a good, accurate and hi-tech job. I was cool to have our distant members connected via Skype during our business meetings. Don Carson continues to strive for accomplishment and improvement in delivering our ZOG-43. He never seems to run out of ideas and a desire to make our newsletter outstanding. Richard Crisco has single handedly re-wrote the definition of what a scouting czar should be. He has been a constant presence at all our launch venues. He has creatively put together an array of his own stuff to provide a station for scout groups to do their rocket build and launch preparation while on the launch range. Richard has also graciously offered a lot of his own rocket stuff to the scouting groups so they could fully enjoy their launch experiences with NARHAMS.

The Ha family (Tom, Maria and Chris) had stepped up to conduct launches at Old National Pike Park when needed to fill in for launch manager who've had to cancel for various reasons. Like Richard Crisco, the Tom and Maria are generous in giving away their own personal store of rockets and parts so that youngsters can enjoy their launch experience and even take away a prized possession afterwards.

Jim Filler deserves a special thank you for untiringly spearheading our major events during the past year. Maybe Jim actually does this stuff in his sleep, but his dedication and willingness has made possible the 50th anniversary gala and this year's ECRM. Jim makes his NARHAMS contributions while maintaining a world class competency in competition flying. Our members shouldn't feel unworthy because of what Jim can accomplish. After all, there can be only one Jim Filler.

A final thank you goes to Ole Ed Pearson. I've been lucky to see a lot of Ed this past year. I like it when I can sit at the feet of the master and let his wisdom and insight rub off on me.



Outreach: NARHAMS Launches at Explore@NASAGoddard

By Alex Mankevich, NARHAMS President

The gates were opened on Saturday September 26th to the public at NASA's Goddard Space Flight Center in Greenbelt for the first time in four years in celebration of Hubble's 25th anniversary. Visitors participated in more than 130 science, engineering and technology activities. Goddard arranged for at least 25 presentations, 13 facility tours and much more.

Goddard asked NARHAMS to conduct two rocket launches at the Visitor Center (VC) at 12:30 PM and at 3:00 PM. We were required to submit our activity title and description by mid-August and to submit the complete list of NARHAMS volunteers by mid September. Additional logistical details such as security and parking details were emailed to us during the week of the event. We were required to be set up by 10:30 a.m. and to breakdown the launch range at 5 p.m. We asked for and received permission for NARHAMS to have five cars parked in the VC lot. Amy E. Grigg of the Public Engagement and Outreach Team Lead and Deanna M. Trask were our NASA contacts. Deanna gallantly introduced herself to us as we were setting up the launch range.

The VC was one of several facilities that were opened to the public. The Visitor Center hosted activities as diverse as exploring the moon with the lunar reconnaissance orbiter, constructing a light-up NASA badge, a STEM scavenger hunt, presentations in the



The display rack was a natural gathering point to discuss model rockets and NARHAMS. Narhamsters Alex Mankevich and Michael Cochran

Science on a Sphere room, tours of the Astrobiology Walk, and pop-up rockets. An intergalactic flavor was provided by Star Wars costumed characters who mingled with the crowd and posted for photos. The 2nd floor of the VC was set up as a hospitality room at which we were able to score a bagged lunch of Subway sandwiches, a cookie and bottled water.

Participating in the launches for NARHAMS were Alex Mankevich, Ed Pearson, Richard Crisco and Michael and Ian Cochran. We

began our day around 9:00 a.m. by carting out all the launch equipment onto the usual launch area for the Goddard Sunday launches. Alex set up a weather station to monitor the wind speed and for any possible rain. A rope line similar to that used during the Goddard Sunday launches was set on the grass in front of the Astrobiology walk and extended northwards towards the fence line along the north side of the Gift Shop. We then extended the perimeter line southwards towards the sidewalk going down from the Apollo capsule. We then set up a perimeter line along the side walk that meanders up from the parking lot across from building #14. We were pleased with this set-up, since we never had to content with visitors walking across the launch range during the launches.

Our goal was to launch model rockets that spanned the scope and variety of model

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The launch of the AIM-9 Sidewinder in front of the Visitor Center crowd



Ian Cochran fishes a rocket out of a tree to the delight of the kids

Explore@NASAGoddard, continued

rocketry. Differing model rockets of pre-selected engine power, recovery devices, design and function were gathered. NARHAMS members Tom and Maria Ha, John McCoy, Ed Pearson, Alex Mankevich, Richard Crisco and Michael Cochran provided an array of rockets that provided the scope and diversity that we desired.



Admiral Motti stands by to launch the Death Star at the start of PM launch

Our launch strategy was that during each demonstration the rockets would be flown in two rounds of 6 launches using a single 6-rail system. The rockets were carefully prepped for flight prior to each round. The launch of each rocket was preceded by a short narration over our usual Goddard Sunday PA system. We also set up a table of rockets mounted on a 10-position display rack near the Astrobiology Walk. This gave visitors the opportunity to view an assortment of model rockets in between our launches. This table became a natural gathering point for visitors to ask questions about model rockets and about NARHAMS.



Darth Ed (in blue) - practitioner of the Dark Side of the Force is joined by his minions

The categories for launches were Tumble Recovery (Estes Snitch), Increasing Motor Power (Alpha IIIs on 1/2A, A8 and B4), Egg Lofter and Helicopter Recovery for the first rack. The second launch rack categories were Whimsical Design (Crayon and No. 2 Estes Skywriter), Space Exploration Heritage (Gemini Titan, Nike Smoke and Atlas V) and Military Heritage (Honest John and AIM-9 Sidewinder). At least six

stand-by rockets were prepped for each round just in case some rockets misfired, ended up in trees or flew onto the VC roof.

An opportunity presented itself thanks to the Star Wars costumed characters mingling with the guests at the Visitor Center. One of the costumed characters was none other than Admiral Motti - Imperial Officer and second in command of the first Death Star who was choked by Darth Vader. He graciously agreed to launch Mike Cochran's Death Star model for the start of the 3:00 pm demonstration. Admiral Motti competently pressed the launch button right on cue. Unlike Darth Vader, we found no reason to deem his "lack of faith disturbing".



Sorry Richard, we are looking for Imperial Scouts

We estimated that at least 300 visitors witnessed our 12:30 launch and that about 700 witnessed the 3:00 launch. For the later launch the line of visitors stretched 2 or 3 deep from the Iris rocket on the north side to the sidewalk on the south side. All our flights were near perfect! We had not one misfire for 24 launches and all recovery devices fully deployed (including Ole Ed's helicopter model which twice rotated just as Alex had promised during the narration). We did suffer some losses, though. Two of Ole Ed's Alpha IIIs never returned and Alex's Honest John and Egg Lofter were lost to the trees.

The Monday after the event, Chris Scolese the Director of the NASA Goddard Space Flight Center, declared that the Open House was immense success, and that the official visitor count was 20,010. All the event participants were commended for "hanging in there when the crowds grew very large and for staying flexible". NASA Goddard had posted numerous photos of this event on its facebook page <https://www.facebook.com/events/637959623004301/>



The History of NARHAMS, Part 5 - Remembering Folks and the Grand Wrap Up

By Ole Ed Pearson

With the club away from a single high school, or two, or three; the space program's progress regularly in the news; regular club meetings and NASA-location launches; and both an accepting and fun culture, NARHAMS rapidly grew—and so did other Washington and Baltimore clubs.

My memory is fuzzy when it comes to the chronology but we had these clubs around that I can remember: AAR, Belair Area Model Rocketeers—BAMR (Paul Gross, Alan & Craig Williams, et al.) Eisenhower Jr. High/later Laurel Senior High (led by Herb Desind—he also joined us), LARC, MARS (led by Dick Sipes), NARHAMS, NOVA then NOVAAR, Robert Goddard Model Rocket Research Society (led by Don Carson), Rock Creek Section (Washington—led by Marge Townsend), Seabrook Rocketeers (led by Ed Saylor and only about three blocks from my house!), SSB, UFO (started/led by Jim Kukowski) and Wheaton Association of Rocketry (led by many NARHAMS alums plus Steve Honnecker, Mike and Sally Loman).

This doesn't do justice to NARHAMS but I remember some old time folks who joined the club after the NMRC and before the memory of most current NARHAMSters (this

excludes aforementioned names): Bob Austin, Phil and Steve Barnes, Don Carson (he joined us after leaving Robert Goddard), Ted Coughlin, Paul Croarkin, Mark Crummet and his dad, Bobby Diamond, Herb Desind, Sheila Duck, Andy Elliot and his father, Chuck Gordon, Peter Helt, Paul Hoernig, Matt Dickstein, Steve Kranish, Dennis Kryway, Alan Lane, Larry Larson, Tom Lyon, Danny O'Steen, John O'Machel, Ron Jewell, Robbie Jackson, Dave Lewis, Mike Pine, Scott Rheem, Russell Sheets, Joe Shue, Bob Singer, Bob Sclater, Rick Todd, and Jim Wilkerson. It's hard to compile such a list and leave out people still here and yet have been in the club for more than 30 years. ..people such as Roger Allen, Dick Moran, and Alan Williams (coming to us after BAMR) come immediately to mind. Probably Jef Fineran, Jim Miers, and John/Mary/Katheleen McCoy also belong there. Jim Filler has been around forever....have you been with NARHAMS for more than 30 years? Omitted too are the current NARHAMSters—you know each other, and some others...folks around the 20-25 year mark I think who you may know or see occasionally—but worth citing anyway—Tom Anderson, Khim Bittle, Don Brown, (Cumberland) Ed Gugiano, Richard Hickok, Alan Holmes, Paul Miller and son, David O'Byran, Hartley Saunders and Vince

Sempronio. I tried, I just can't remember that well anymore. Jennifer Ash-Poole, a long-time member herself, has the best collection of Zogs that undoubtedly can double or triple this list and make me both go aha and feel chagrined. I suggest you write ZOG-43 with your own memories and fill in some gaps.

A singular re-mention is earned for Bruce Blackistone whose songs of NARHAMS were famous at local meets, conventions, and NARAMS. In loving rocketry, life and having fun, Bruce embodied the spirit of NARHAMS. He stayed with NARHAMS until a singular event: marriage.

Speaking of songs, did you know the club has a song? It only consists of six words (one's a contraction, so you can argue seven). It is sung to the tune of an old tire ad jingle and goes, "Sooner or later, you'll join NARHAMS." If you think of some people cited previously, you can see why the words are apropos.

I mentioned marriage. Spousal participation in the NAR runs the whole gambit. On one end of the continuum there are model rocket widows, and I'm afraid model rocketry has been used as a reason for marriage breakups. On the other end of the scale, two rocketeers get together and get married. The rest us marrieds' lie somewhere between, from occasional show-ups,

Continued on page 20

History, Part 5 Continued

to tagalongs, to a few who are at contests to keep their strong-minded mates in-check, to those who help recover models at launches, and so on. There are a very few who don't fly rockets or recover, yet make a big difference in their circles. Going back in time, I can think of five that come to mind: first and foremost there is Barbara Stine who helped Harry with everything. I also think of Janet Rose helping Art run contests and Ann Marie Sykos doing the same with Charlie. But they were out west or up north. That leaves two and they are Judy Barrowman and Dottie Galloway who made possible great meets in this area.

The two ran all the registrations, all the hotel assignments (we used to book a hotel for a contest and then assign as many four kids to a room for as many as 300 participants per meet), and all the data reductions to determine winners, points and score sheets sent to the NAR for the October MARS contests (SSB led annual regionals) and ECRMs (NARHAMS annual then-April biggie—it slipped to June years later). They paired to help each other, no matter whose contest it was. They also did this for the smaller section and area meets SSB and we would hold. If there was a goof, there would be embarrassment, and erroneously awarded trophies would have to change hands...so Judy and Dottie would run a meet where this rarely happened. It made our big meets possible and run seamlessly

instead of being a messed up nightmare or even a long wait for the results, e.g., “What’s taking them so long? I’ve got to get going.”

Dottie was particularly amazing. I remember one ECRM at Ft. AP Hill near Chris Kidwell’s old stomping grounds. It must have been around 1973 or 74 (this isn’t exactly when the club started stuff, but it is early club history). I stopped into the room where they were doing data reduction to see how they were doing. Dottie and Judy were discussing the efficacy of handheld electronic calculators—they were just becoming widely available. Dottie didn’t use them nor do I think did Judy. So they ran a contest—Judy would tabulate the sum of a column of numbers by a hand-held and Dottie would do it by hand. Who would finish first and who would be accurate? It wasn’t a case of showing off skills, but honestly seeing if hand-helds were fast and accurate enough to do the job. The result of this competition? If there were about 20 or less small (2-3 digit) numbers Dottie was as fast and accurate as Judy doing the same by calculator. If there were say forty numbers to add up, Judy would get the sum first. Dottie would lag, but would come up with the same result. This proved to Dottie, that the things worked, and for lots of numbers faster than by hand. After that they started using calculators more. I left the room, however, impressed with Dottie’s skill—who do you know who is that good today?, and in reflection now am startled in the realization that we (finished??)

sending men to the Moon before the advent of commercial hand held calculators.

What are some observations and lessons learned from NARHAMS? That’s a challenge, i.e., recounting obviously subjective life lessons. So, please, since this article is about history for a long-lived club, let’s leave with one reminder: for an organism to have longevity, it has to grow. Conversely, if it stops growing, it starts to die out. If we want the club to continue, let’s build on our foundations that made the club a powerhouse—and isn’t that why we study and remember history? Past is prologue...it cuts towards either for growth or sometimes just remembrances of the long ago.

In this ZOG-43 article, for the bestest ever club newsletter, the story was told of how NARHAMS was founded, why the name was made, how we became NARHAMSters, how we grew, identified some earlier older members, talked about spousal help and reminded one on what makes for longevity. I hope you found this interesting and insightful.

Endnote: Doug Frost left NARHAMS in 1966 or 1967. He joined the Air Force and later moved to California. He writes that, “(a)fter about 49 years on the West Coast, I will moving to the East Coast.” He plans to set down in Charlotte, NC by May of this year (2015)...watch out Don Carson and Jay Marsh. Doug says he plans to be a regular at NARHAMS contests and sport events. And the beat goes on.



September 2015 Mt. Airy Sport and Night Launch

By Jim Miers, Launch Manager

All photos by D. Fuller except as noted

The September Sport Launch and annual Night Launch was held at the Old National Pike Park on September 26, 2015, having been delayed two weeks on account of adverse weather.

Launch activities opened a few minutes after noon, and continued until nine that



The Berg family Rainbow Rockets Flight
Photo: J. Miers

evening, with an hour's break between six and seven to set up for the night launch.

There were sixteen club members flying (and several who showed up just to observe), in addition we welcomed fifteen friends and guests. In all, one hundred fifteen successful flights were logged for the day (not counting two that hung on the launch rails), seventy eight during the daytime, and thirty seven at night.

Field conditions were generally favorable, despite the easterly winds. By mid-afternoon the ball games all cleared out and the empty lower fields provided an excellent recovery area. Temperatures were mild, and while overcast, the cloud cover was well over our ceiling.



Continued on page 22

Sept. Launch, Continued

Particular thanks to Mike Kelley who showed up early and stayed late and helped with setting up and knocking down afterward; similarly to John McCoy (and Mary, too) who also stayed the whole day, and ran the night launch check-in; to Tom Ha who spotted me on range manager's duties for an hour or two so I could get up a couple of flights on my own; and to Alex Mankevich along with everybody else who stayed after to tear down the range and get it all packed away. And of course to Dave Fuller for all the awesome pictures.



Miss Shafer with a model called
Black Lightning
Photo: J. Miers



All Photos by D. Fuller except as noted





Competition Corner: NARHAMS Final Standings 2014-2015 Competition Year

Congrats to all our NARHAMS competitors. Here are the point totals for the year, including NARAM participation. We had 18 individual/team participants in contests over the year. That's a pretty good showing.

A detailed analysis of the data reveals that we did not have many A and B Division folks competing, although our only one, Stoil Avramov, is one of the tops in the country.

I am proud to point out that I placed 43rd nationwide. I only wished I could have planned that.

Don Carson



Jim Filler starts off the new contest year at RAMTEC-18 Overall C Division Champ!

Photo: Kevin Johnson

National Ranking	<u>A Division</u>	
6	Avramov, Stoil	3501
	<u>B Division - None</u>	
	<u>C Division</u>	
13	Filler, Jim	5469
25	Kidwell, Chris	3464
41	Grant, Bradley	1452
43	Carson, Donald	1202
52	Giugliano, Ed	858
109	Humphrey, Steve	192
131	Ash-Poole, Jennifer	64
136	Crisco, Richard	54
136	Mankevich, Alex	54
136	Pearson, Ed	54
136	Williams, Alan	54
141	Krohn, Matthew	36
143	Fineran, Jeff	30
143	Pena, Raul	30
151	Ha, Thomas	0
151	Wise, Mark	0
	<u>Team Division</u>	
16	Murphy's Lawyers	2622
	<u>Section</u>	
8	NARHAMS	18728

3rd Annual Carl McLawhorn Memorial Flyoff

A Alitude
B Eggloft Duration
C Boost Glide
F Flex Wing Duration
Predicted Duration (using any SEMROC kit**)

October 10-11, 2015 in
Location: Grove City, PA
Sponsored by Pittsburgh Space Command
For more info see: www.psc473.org

NARAM-58 Competition and Sport Launch Announced!

Plastic Model Conversion
E Scale Altitude (altimeter)
G Streamer Duration
D Rocket Glider Multi-Round (no radio control in this event)
C Parachute Duration Multi-Round
A Helicopter Duration
½ A Super-Roc Altitude (altimeter)
Open Spot Landing
Research & Development

July 23 to Friday July 29, 2016 in
Location: Walnut Grove, MO

For more info, go to www.naram.org

A NARHAMster Runs Loose at the Wallops Flight Facility Open House

Text and photos by Alex Mankevich, NARHAMS President

The NASA Wallops Flight Facility (WFF) welcomed the public (that's me) to its Open House on Saturday June 27, 2015. This date was intentionally selected since it was exactly 70 years earlier that the facility conducted its first rocket launch in 1945. Wallops is now NASA's leader for suborbital programs including sounding rockets, airborne science and scientific ballooning.

Good fortune was on Wallop's side as the weather that day was predicted to have torrential rains kicked up by 25+ mph winds. The ominous forecast cancelled that day's plans to deploy a gigantic weather balloon. The day stayed partially sunny, hot and humid, but several visitors were carrying umbrellas and rain gear just in case.



Navigation Payload

The festivities kicked off with an opening ceremony at which WFF Director Bill Wrobel served as host. Chris Scolese, Director of the Goddard Space Flight Center also made some welcoming remarks. Three Virginia politicians addressed the crowd, each of which promised to pass a bill for funding the needed repairs to the Wallops launch pad destroyed in the ill-fated Antares launch in October 2014. The peanut gallery applauded loudly to encourage the politicians to fully fund the needed repairs. WFF employees were outfitted with fluorescent "Staff" T-shirts and they

were very helpful in directing visitors to the various buildings and displays

Facilities which were opened to the public included several of the hangers, the sounding rocket, scientific balloon, engineering and mission planning buildings. The Range Control Center was also opened for tours, but you had to brave the longest line of the Open House to get inside. On top on my list was a visit to the sounding rocket building. I also was keen to hear some of the presentations from both past and present WFF personnel as well as to 'clean up' all the goodies offered at the exhibitor displays.

The tour of the sounding rockets building started at the machine shop that trimmed the tubes of raw aluminum weighting several hundred pounds down into segments for the rocket bodies weighting just a few pounds. Next on the tour was a stop at the navigation and communication area which displayed several rocket sections that were slated for future missions in Alaska, New Mexico and Sweden. We were given an instructive lecture on how on-board magnetometers use the Earth's magnetosphere for navigation. I didn't know that the rocket scientists were able to recycle some of the navigation and control units. In fact, some units on display already had three or four flights to their credit. Next up was a tour of the



Inside the Sounding Rocket Building

Continued on page 25

Wallops Open House, Continued



Sounding Rocket Shop payload build up spin/deploy testing station. A room enclosed by heavy-duty curtains is used to catch the deployed sections as they separate during testing. This area also has spinning platforms to test the balance of rocket sections and to detect and correct any inherent wobble.

I attended the lecture by retired NACA and NASA employee Costen Gladding who presented his “Memories from a NACA/NASA Career”. He talked about setting up and testing the various radar installations and building the causeway to the launch pads. Next I heard from Jim Mason-Foley who discussed his job of “Launch Range Photography”. Jim talked about how he uses sound and motion detection devices to trigger his cameras once the rocket gets underway. He showed us several of his aerial photos of rockets both on the pad and in flight, and yes, he also gave us the background about the famous “Astro Frog” who photo-bombed the LADEE launch.

My favorite presentation however was given in the mission planning building in which a presentation and video were given on Low Density Supersonic Decelerators. This is the now-famous NASA flying saucer that was recently tested off Hawaii in June 2015. The

objective of this project is to allow NASA to safely land heavier space craft on Mars, up from the weight of the Curiosity Rover which weighs in at around 2200 pounds. If NASA can land a heavier rover on Mars, then the rover can be packed with more instruments allowing more science to be gleaned from the mission.



Transition - raw to finished

I greedily pounced on the exhibitor display tents, a skill which I have perfected at multiple TARC launches. Since most exhibitors were too slow to remove their wares from their table as I approached, I easily scored a GOES-R poster, several color bookmarks featuring missions including the future James Webb Space Telescope, the current DAWN mission to the asteroids Vesta and Ceres, and the POES mission. I’ve gotten my mitts on numerous NASA ‘meatball’ decals, a handful of “Virginia is for Launchers” bumper stickers, and brochures and a nifty lined notepad from Orbital ATK.

There was much more to see and do at the Open House. I wasn’t able to take in any of the numerous aircraft on display, I missed out on seeing the Range Control Center, I wasn’t able to book a tour out to the launch pad and I had no time to drop by the Visitor Center. I kind of needed an Alex clone for this day.



The author beside an all-up payload



Narhams Gold - 50th Anniversary
 Kit# 133. 700uc0Sa:
 Front View Decaled Complete.
 Payload section extended 1-1/4"
 to fit Altimeter Sled.
 Dia: 1.637"
 OA Length: 21.5"
 Fin Span: 5.26"
 Recovery: 16" Chute.
 Ewt: 72.7g
 Ewt w/ Sled & FireFly: 84.1g
 Motors: B6-4, C6-5
 08-27-15

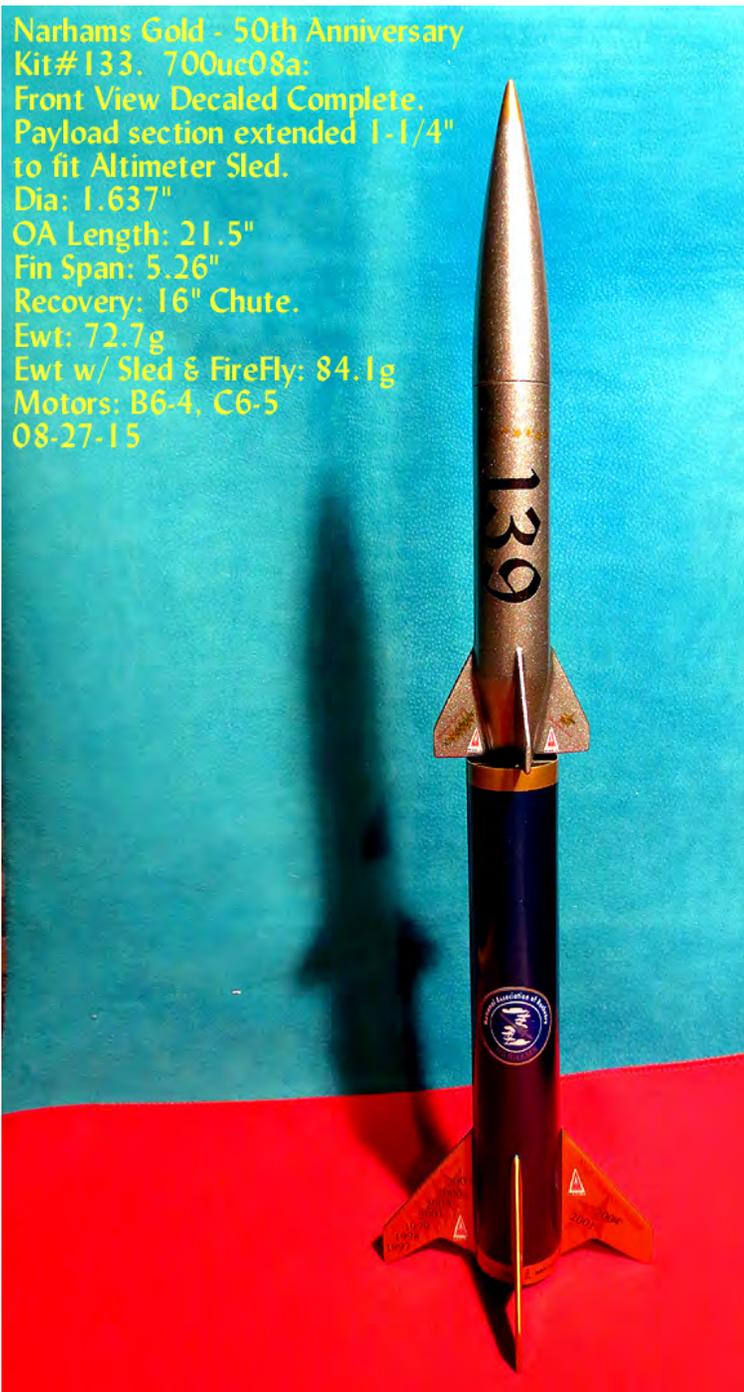
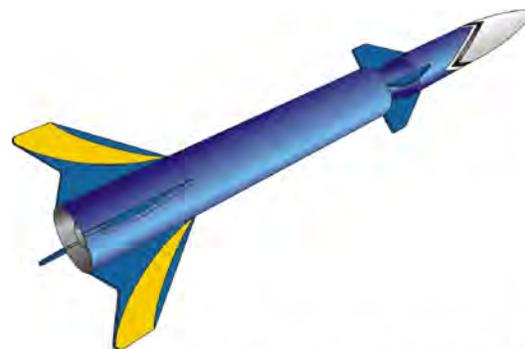


Photo: J. McCoy



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!*

