

206-43



Jan/Feb 2018
Vol 40 No 1

IN THIS ISSUE: 2017 Holiday Party, Aleda-R Kit Review, Building for ECRM, Passings of Prof Radu & John Young, 2018 Calendar, Antares Launch, Club Launches, and more...

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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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 - 2017 Zog-43 Statistics

Don Carson, NAR #11069

I always go on about how the Zog-43 is a group effort, how it is your newsletter. Well here are the numbers that back that up.

Every year I do a quick assessment of where the content for the Zog-43 comes from. I count up the number of submissions - articles, photos (just 1 or a whole launch counted as 1 submission), tips, news, etc - and who submits them. It is not exacting science, but it will give you the idea.

The results for 2017 (6 issues) are similar to previous years. We had approximately 185 submissions from 28 people! Of those submissions, 174 came from club members and 11 from outside the club. A total of 17 club members generated 174 submissions. We received contributions from another 11 folks from outside the club, each submitting one item.

As always, my thanks go out to everyone who contributes to make this a such an outstanding newsletter - the credit goes to you.

If this issue creates a sense of deja vu for you, it may be because we have more coverage of the latest Antares launch and payload viewing. Last issue, Alex covered the launch and Alan did the payload unveiling. This issue, those roles are reversed.

Lastly, it should be noted that our front and rear covers are both from distinguished Presidents - Elon Musk and Alex Mankevich!

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

For questions, answers, opinions, files, photos, and more NARHAMS, join the [NARHAMS Yahoo group](#). 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: Antares RD-181 - A rear view of the Orbital ATK Antares Stage One structure seen inside the Wallops Flight Facility's Horizontal Integration Facility. The twin Energomash RD-181 engines dominate the business end of this rocket which re-supplies the International Space Station.

Photo: A. Mankevich

Back cover: From Elon Musk's twitter feed comes this spectacular view of the aft end of the Falcon Heavy launch vehicle, with, count 'em, 27 Merlin engines.

Photo: E. Musk/SpaceX

ZOG ROYAL COURT (NARHAMS OFFICERS)

ZOG (President) Alex Mankevich

VICE ZOG (Vice-President) Alan Williams

COLLECTOR OF THE ROYAL TAXES
(Treasurer) Ed Jackson

KEEPER OF THE HOLY WORDS (Secretary)
Sarah Jackson

COURT JESTER (Section Advisor) John McCoy

2017 Holiday Pot Luck Dinner



Models people brought.
Photo: E. Pearson

The Rockets!



Jim brought some great give aways.
Photo: D. Carson



Outside display model, courtesy of Jim Miers.
Photo: E. Pearson



John brought some great tiny things.
Photo: D. Carson



You say this goes here?
Photo: D. Carson



This does not go there.
Photo: D. Carson

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Holiday Party, Continued



The buffet was fabulous.
Photo: D. Carson



Sweets!
Photo: E. Pearson



Left: The annual making of the punch.
Photo: D. Carson

The Food!

Continued next page

Holiday Party, Continued



DJ, Ed and Diane.
Photo: A. Mankevich



Rob Edmonds and the McCoy's.
Photo: A. Mankevich



Mark's not buying it.
Photo: D. Carson



Left: Ward, they are not buying it either.
Photo: D. Carson

The Comaraderie!



The Shafers enjoy the fare.
Photo: D. Carson



Rob and DJ discuss the finer points of...
Photo: D. Carson



A couple of surprised FROG recipeints.
Photo: D. Carson



The Jacksons know to decorate a table.
Photo: D. Carson

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The Prizes from HobbyWorks!



Alex awards the RC Electric Glider.
Photo: D. Carson



Looks like another RC pilot on the way.
Photo: D. Carson

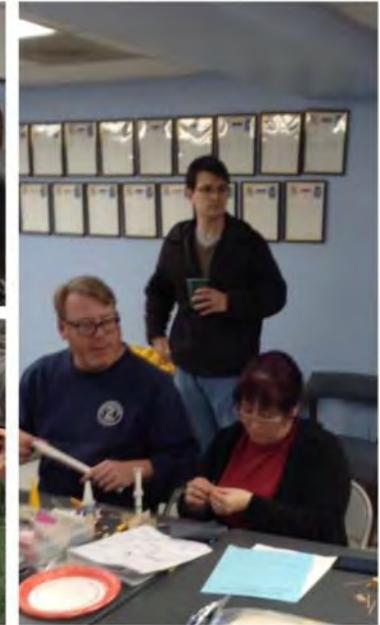
Meeting Highlights

January

The January 6 College Park Airport meeting featured multitasking.

A business quorum was met and we discussed submission of a proposed constitutional amendment for increasing voting privileges to family members. Thanks to all who attended!

Meeting theme: Bring and Build Your Rocket.
Photo: E. Pearson



Got milk?--ha! Got phone?
Photos: E. Pearson



NARHAMS Awards FROG Awards to Esther Roura and Don Carson



The NARHAMS award
For Rocketeers of Greatness
Is presented to
Esther Roura Johnson

Already establishing herself as a principle in European Spacemodeling – witness her leadership in the Spanish spacemodeling community and organizing/directing the 2008 World Space Modeling Championships - Esther made the life-changing move from the Old World to America, marry and continue in spacemodeling. The FROG Award is annually presented to pioneers who make significant contributions. Esther's bold move contributes to and enriches all Spacemodeling. An appreciative section recognizes her accomplishments, her daring spirit, and wishes her and her family the best of success in the future.

Presented 2017 by a grateful club,
NAR Section #139



The NARHAMS award
For Rocketeers of Greatness
Is presented to
Donald Carson

in recognition of his innovation, leadership and outstanding effectiveness as ZOG-43 editor. During his tenure, Don moved the club newsletter form print to electronic media format; distributed ZOG-43 free (and in color!) to all members instead of a paid-subscriber basis; more than doubled newsletter content; made use of external links to additional resources, content and photographs; and produced substantial production cost-savings to the section. Don successfully advocated to the NAR Board that submissions for consideration for the annual newsletter award be made electronically and thus produced more cost and time savings. As a result of his stewardship, diligence and committing to quality, ZOG-43 won the NAR newsletter award for an unprecedented tenth time.

Presented 2017 by a grateful club,
NAR Section #139



January Goddard Launch Report: Goddard Launches Kick Off for 2018



By Alex Mankevich, President – NARHAMS

NARHAMS proudly announces the start of another year of model rocket launches at the NASA Goddard Visitor Center in Greenbelt, MD. This auspicious start continues our streak of the oldest, continuously-conducted public model rocket launches in the nation. Fittingly, the conditions on launch day exemplified the determination of the range crew to keep our proud tradition alive and well.

As the images included in this article will attest, launch day was a frozen affair with temperatures hovering in the low 20s. Your humble reporter was in full winter gear (as were most of the flyers). Boots, wool socks, heavy winter coat, wool hat, thick gloves and layers of clothing (including thermal ‘unmentionables’) were the de rigueur fashion of the day. This ensemble was accessorized by hand warmers and ear muffs.

We weren’t sure about actually conducting a launch that day due to temperature considerations, so we had a reserve plan to perform a ‘show and tell’ in case the outdoors conditions were too brutal. Alex had his Basic Rocketry PowerPoint in reserve. Ed and Sarah Jackson brought along a number of their models for display. Ed’s Quinta-SuperStar model outlined with electric luminescent (EL) wire which was featured in September’s Night Launch (see the video at <http://www.facebook.com/NARHAMS>) was one of the display models.

The rocketeers started filing in and the range crew took consideration upon the comfort and well-being of the flyers. We had agreed to set up a ‘minimized’ launch rack and launch control in our winter mode near the base of the Delta B rocket. Our plan was to perform the rocket safety checks and pad assignments inside the Visitor Center, then to lead the groups of six flyers each out the launch rack. Once that round of flyers collected their rockets, they were to return indoors, and we were to escort the following group outside.



Sarah Jackson and Alex Mankevich assisted the Laurel Brownies troop to prepare their Alpha III models for flight. Note the abundance of cold weather gear.

Photo: E. Pearson

Continued next page

January Goddard Launch, Continued

Launch day offered good flying conditions of high clouds and little winds despite the freezing temperature. Whereas spotty pockets of snow coated the ground, the concrete walkways were clear.

The main group of flyers was Ms. Roche's Brownie troop based in Laurel, Maryland launching as part of the Girl Scouts' new engineering badges. Alex had lead them in a build session during their meeting back in November. Ole Ed Pearson, Sarah Jackson, Alex Mankevich and Michael Cochran helped the girls in the auditorium with model preparation and igniter wire installation. The girls brought their Alpha III models and intrepidly planned to launch them on C6-5 motors. All their rockets launched to impressive heights and mercifully the light wind didn't drift the inbound rockets too far afield. The girls' impressive flights were witnessed by a group of Asian visitors who were being escorted on an official tour of the NASA Goddard grounds.

Goddard launch veteran John Bonk kept true to form by once again launching a themed Mosquito for the occasion. John designed a 'frozen winter wasteland' themed rocket – meaning the Mosquito was painted entirely white. He intentionally launched his diminutive white-colored rocket against a light-gray sky and purposefully planned a tumble recovery unto the snow-spotted ground. Despite my determined effort to track his Mosquito from launch to landing, I humbly admit that I lost track of his model somewhere up in the sky.



A bundled-up Ed Jackson prepares a rack of Alpha III models brought by the Laurel Brownies troop to qualify for the Girl Scouts' new engineering badge.

Photo: A. Mankevich



Left: Michael Cochran loads an Estes Crayon model onto the launch rack. Careful bending that launch rod, Mike!

Photo: E. Pearson



Ed Jackson's Quinta-SuperStar was among the models brought by Sarah and Ed for display in the auditorium.

Photo: A. Mankevich



Shirley Ramos prepares the First Time Flyer certificates.

Photo: E. Pearson



Product Review: The Aleda-R Boost-Glider by J&H Aerospace

Photos and Review by Bradley Grant, NAR 85261

One of the interesting parts about our hobby is that Model Rocketry can sometimes lead into other hobbies. In my case I started enjoying building Balsa Model Planes (Guillows). After joining a balsa airplane group on Facebook, I noticed something from J&H Aerospace come across my Facebook feed. It was a notification about a boost glider that the company was going to be selling to the public. I was fascinated by the glider design because it reminded me of The Edmonds Micro-Vee boost gliders. When it became available to the public I purchased two of them and have built one. I found the build to be as easy as the company says it is and while the weather has been less than hospitable for rocket flying, I have every confidence that this will be a glider that will do well in competition events. As soon as I get my next paycheck I will be ordering two more.

About the Company

J&H Aerospace (<http://jhaerospace.com/>) was founded in March of 2015 by Josh and Hope Finn. The company provides a wide range of balsa gliders to build and have fun with. They also offer a swing-wing rocket glider and the Aleda-R boost glider. Both are 13mm black powder rocket kits. On their website they have a lot of pictures of their products in actual use and you can get a good idea about the company. When I ordered my two gliders the service was extremely prompt and the gliders came well packaged to prevent any damage in shipping the product.



The Build

I decided to build the first glider on a very cold Saturday. I inventoried all the parts to make sure I had everything. While doing this I noticed the balsa used was of a very high quality and the laser cutting of the balsa was such that it was very easy to remove the wings and other parts from the balsa sheets. The directions for the build are not in the package but are provided to you via a YouTube hyperlink. While I was not used to the directions being given to me in this format, I quickly found them quite useful and as a side bonus, Joshua was providing some tips in the video that helped with the build and just in glider construction in general. The glider came together pretty much as he mentioned in his advertising for the product. For me the only challenges were inserting the balsa tongue into the pylon (watch the video!!!)

One thing I did not do is trim the glider when he instructed. Normally I like to trim my gliders after I finish building them so that I can correct any construction errors that might cause glide issues. The very pleasant surprise in my opinion about the glider was once that it was assembled and I was tossing it about the house, it did not appear to need any trim. The final test is when I



Figure 1 Taking Inventory of the parts.

Continued next page

Aldea Boost-Glider, Continued

take it outside to toss it from my deck. To me, this little test has given me a lot of confidence that the glider will perform well in competition.

Assembling the boost section was very simple. The most challenging part is making sure the pylon fits correctly into the glider. If it doesn't, this will impact the performance of the glider at separation. In the set of pictures below, I have tried showing the process of how the pylon needs to be assembled. What is not being shown and is important is not to forget that the tongue that needs to be glued in the middle piece. The video does a much better job in explaining this. One thing to do that I did not, is make sure you test fit the parts before actually gluing them together. It is a good practice and something that I did not do.



Figure 2 The parts for the pylon assembly (missing the tongue).



Figure 3 Showing the order which the parts need to be glued.



Figure 4 Finished pylon assembly.



Figure 5 Boost pod with pylon attached.



Figure 6 Finished Product.

Conclusion

Since the weather has been a bit cold to do any flying. I will fly the rocket glider when we get some nice weather and provide a follow-up article as to its performance. So while it has been too cold to actually fly the glider, given the ease of construction, the fantastic quality of the parts and the instruction, I think this little glider is going to allow me to be competitive at meets. The price for a glider is \$12.00 which is a fantastic deal for everything you get. I would encourage anyone who is interested in flying rocket or boost gliders to visit Josh and Hope's website and order a kit.

Editor's Note: This is a good model for flying at ECRM and in the new National Rocket Competition (NRC) that is being flown all around the country.



December 2017 Goddard Launch Report: Closing Out The Year



Photos and Captions By Ed Pearson



Poster outside the visitor center entrance citing the 40+ year old model rocket launches. Nice.



A regular at the launches for several months now is the Commander.



We flew for two hours and put up quite a few models.

In addition to regulars (eg, the Commander) we had scout groups from Columbia and Baltimore and a synagogue group. Pretty long checkin lines.



December Goddard Launch, Continued



Ed Jackson was firing officer and narrator.



The pointers/spotters.



Also helping was Alex Mankevich, when he wasn't getting rockets out of the trees.



Winds were light; models landed nearby--unless modelers used big engines.



Before the launch Sarah Jackson and Bill Boublitz helped people get their rockets ready in the visitor center. When the launch started, they did safety checks, rail assignments and repairs at the range.



Last flight of the day was by DJ Emmanuel and Sally Cook.



Prof. Ioan Radu, A Truly Great Figure In Spacemodelling Passed This Fall At 82 Obituary By Srdjan Pelagic (Forwarded by Ed Pearson)

Date: November 6, 2017

Dear Spacemodellers,

Here is a sad news of passing away of our good friend and one of the pioneers of spacemodelling from Romania Prof. IOAN N. RADU (82), the first ever SM World Champion in S3 from the 1st WSMCH held in Vrsac (ex-YUG, now SRB). In addition to that, Prof. Radu set six SM World records in classes S1B, S1C, S3B, S6D and S8C. He also was the winner of many national and international competitions. After completion of his sporting career he served as the scale judge in classes S5C and S7 in EuSMChs and WSMChs.

Prof. Radu was also very popular for his publication skills. He was the editor of the magazine ASTRONAUTICA for popularization of spacemodelling, rocketry and astronautics, which was published many decades. He was also the author of several books on spacemodelling and astronautics and also of books on Romanian and World Spacemodelling history. So, he was the only SM historian in the world so far.

On the occasion of the 50th Anniversary of Space Models in the FAI, his book "Half a Century of World Spacemodelling", the first comprehensive history of spacemodelling, was promoted at the CIAM Plenary Meeting in April 2012 in Lausanne (SUI).



Prof. Ioan N. Radu was awarded with the FAI Paul Tissandier Diploma for many years of service to spacemodelling in 2002.

Prof. Radu was born in Tirgoviste (Romania) in 1935 where he completed his elementary and high school education and later he graduated from University in Timisoara in Mathematics and Physics. He spent almost his whole professional activity in his native city, but thanks to his intensive activity in spacemodelling,

rocketry and astronautics he was very popular in the whole world.

Prof. Radu was a very good friend of mine for many years and I was deeply honoured when he invited me to write forewords for two of his books.

Prof. Radu was a nice and friendly man always ready to help and teach especially younger enthusiasts. We shall all miss him very much.

May Lord rest him in peace.

Srdjan D. Pelagic, dipl.ing.
NAC SRB Delegate to CIAM and
CIAM Space Models SC Chairman, 1996 - 2016

From the ZOG: Ten Joys of Serving as a NARHAMS Launch Manager

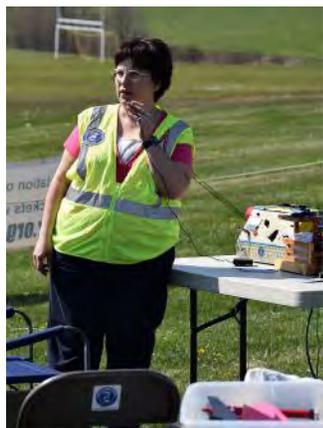
By: Alex Mankevich, NARHAMS President



I'll bet that you think I'm going to say that pushing the launch button is one of the joys of serving as a launch manager. Yes, having the power in your fingertip to make smoke happen is a perk to the job. Remember, with awesome power comes awesome responsibility. What I really want to share is that being a launch manager is more than just noise and pyrotechnics.

Life in the Great Outdoors

The health care community is always telling us to get more exercise. An active day in the glorious Maryland sunshine benefits both our minds and bodies. What better way to experience the changing seasons than to be at the control panel of an outdoors model rocket launch range?



Become a Weather Prognosticator

When your turn as launch manager comes up, you'll have to tune into the weather forecast around mid-week and follow it through launch day. You'll get to assemble your own, personalized network of websites, TV newscasts and radio stations that you'll rely upon to announce the 'Go/No Go' decision to launch.



Learn How the Mechanical World Works

Setting up the range head is a sure way to appreciate how cool stuff comes together. NARHAMS has launch racks that are cleverly self-contained, and away pads that fold together. All our range equipment is stored in cleverly-designed containers.



Do a Mic Drop

You'll be announcing the countdowns over the PA system. Assembling the PA system of speakers, microphone and amplifier gives you a means to channel your inner 'rock band roadie'. You'll get to educate the crowd by explaining the anticipated flight events of cool launches such as multi-staged flights or Jolly Logic delayed recovery deployments,



Continued next page

From the Zog, continued



Everybody Knows your Name

As launch manager you'll get to review all the flight cards completed by the flyers. This is a great way to put the names and faces together. Frequent flyers become recognized and remembered through their frequent flight cards. You'll get to become the 'face' of NARHAMS because folks will remember your face and name.

Name that Model

Until you serve as launch manager, you can't appreciate how much history is in the models that make it to the launch rack. The Jackson brothers, Ed and Tom, are famous for checking-in classic models that have decades of flights behind them. John McCoy will write on his flight card the precise number of flights his model has already flown. Jim Filler's flight card will advise you that he is testing his latest world-class competition model.

Sharpen Your Situational Awareness Skills

As launch manager your situational awareness skills will eventually rival those of a Jedi Master. You will 'use the Force' to stay aware of aircraft in the sky, flyers recovering their models, inbound flights and adverse hourly changes in the weather.

Promote Your Favorite Launch Themes

You'll get to use the PA system to announce the theme for each month's launch. You'll get to do some important 'PR' work for the club by promoting both NARHAMS and NAR upcoming events.

Get a Visit from Ole Ed

Sometime after lunch you're likely to get a visit from Ole Ed who frequently serves as event photographer. He is always gracious in thanking you for serving the club. Ole Ed will share with you nuggets of information that he's learned from the peanut gallery assembled behind you. Having Ole Ed greet you at the range head is as good as a visit from Old Saint Nick.

Go On Record

After the smoke clears and the blast deflectors cool down, you'll get to share your favorite launch memories in a report to the ZOG-43. Your report is a means for you to offer suggestions and other reflections as to how we can make our launches even better.



Pioneering Astronaut John Young Dies at 87

By Alan Williams, NARHAMS VP

The January 6th NARHAMS meeting turned somber with news of moonwalker John Young's death. He had succumbed the previous day at his Houston home to complications of pneumonia. According to various sources Young was the longest active career American space explorer.

Born September 24, 1930 in San Francisco, Young grew up on a cattle and citrus farm near Orlando, Florida. Starting in the mid 1950's, he was a naval aviator and test pilot. He was selected in 1962 for NASA's second class of astronauts. He shared the first manned Gemini Program mission with Virgil (Gus) Grissom. GT-3 is perhaps best remembered for a little revolt against the remarkably awful "space food" that NASA inflicted upon the crew. Young smuggled a corned beef sandwich from a favorite Cocoa Beach joint aboard inside his pressure suit. Grissom had it instead of "zero-G-safe" jellied beef cubes and other culinary horrors they were supplied with. Engineers and nutritionists howled, but the spacecraft did not oblige the doubters by blowing up. Young later commanded Gemini 10 with Mike Collins and helped explore the challenges of orbital rendezvous and space walking.

May 1972's Apollo 10 was the first of his two lunar flights. He ran the CSM as Gene Cernan and Tom Stafford rehearsed the flight plan for the July landing attempt. In 1972 he and Charles Duke landed for the second to last lunar survey. They scouted across a total of 16 miles via the electric "Lunar Rover" vehicle.

In the late '70's he became the head of the JSC Astronaut Office.



Young posing with models of the three spacecraft he flew.
Photo: NASA



John Young at age 34, when the pilot of Gemini 3.
Photo: NASA

In 1981 he and Robert Crippen inaugurated the Space Shuttle era with the April 12 flight of Columbia. He flew on Columbia a final time in 1983. I saw him a number of times while I covered the early flights for Model Rocketeer, the NAR's magazine at the time. He would often fly in with the crews of the upcoming mission, then perform weather survey support flights in the NASA Gulfstream jets. He was notable for his relaxed manner, plus a slight "cowboy roll" in his stride which I've always suspected was due to horse riding in his youth. He was remarkably well admired by members of the Astronaut corps and others in the spaceflight community.

In the wake of the 1986 Challenger explosion, he strenuously called out Reagan-era NASA managers who had kept known "O" ring seal issues from the flight crews. This was an attempt to keep them from stirring up trouble during a series of cuts to the system's hardware and maintenance budgets. Unfortunately, his and other voices were ignored as fiscal fashion held sway over national policy. He was shunted to a new flight safety office whose actual influence was debatable. Fifteen years later, shuttle Columbia broke up over Texas during return from a science mission. Some lessons refuse to be learned.

When he retired from NASA in 2004, he was the only astronaut who had missions in the Gemini, Apollo, and Space Shuttle programs. According to the Washington Post, for some time afterwards he retained his flight ratings against the chance he might be recalled.

This great loss means that only five of the twelve Apollo moon walkers are still with us.



Bits and Pieces

Upcoming Meeting
Presentation Topics:

February 3	Frog Award Nominations, Military Missiles
March 3	Tubular/Tumbler/Tipsy Overview
April 7	Winter Builds Show & Tell

Upcoming Launches/Themes:

February 4	Goddard Visitor Center
February 17	Mt. Airy, Winter Frost-Bitten Birds
March 4	Goddard Visitor Center
March 17	Mt. Airy, Tubular/Tumbler/Tipsy Green
April 1	Goddard Visitor Center
April 21	Mt Airy, Open theme

Welcome New/Renewing Members

New Members

Steve Lloyd

Renewals

Jim Filler, Karl Gulling

Announcements

Congratulations!

On September 28, Alexander Mitiuriev became a United States naturalized citizen. Alex is a world champion space modeler and first visited the U.S. to participate in the US/USSR Cultural Exchange and Spacemodeling Competition exactly 29 years earlier (in 1988) than his citizenship ceremony. He lives in Maryland. Congratulations Alexander!



Zog Sightings



Spotted Dec 17 in a Syracuse parking lot by Rich Holmes.
Photo: R. Holmes



Competition Corner: ECRM, SCST-18, CanAm Cup Announced, Tips and Plans for ECRM

East Coast Regional Meet(ECRM) - 45 Announced

1/2A Parachute Duration
1/2A Boost Glider
A Payload Altitude
A Helicopter Duration
Open Spot Landing
Sport Scale

This will be both a contest and an NRC sanctioned launch. It provides all participants the ability to fly any of the six NRC events. This event will award trophies for first place in all divisions for the specified ECRM events only.

NOTE: if you choose to fly eggloft for NRC, you must provide your own egg(s) as eggloft is not an ECRM event. Payloads will be available to borrow. Firefly altimeters will also be available to borrow.

All contest forms, launch equipment and stopwatches will be provided. If you choose to fly in the "ECRM" contest, there is a \$10 fee for A& B division entries, and a \$20 fee for C&D division entries.

There will also be a BBQ picnic to follow on Sunday afternoon. \$7 per person or \$25 per family of four or more.

See the following article for tips on building and flying these events.

Steel City Smoke Trail 18 – June 2nd & 3rd, 2018 Cedar Grove, PA

All 6 NRC events
1/2A Boost Glide
A Helicopter Duration
A Payload Alt. (18mm)
C Super- Roc Altitude w/altimeter – NARAM event

Meet champions will be determined from the last four events listed above

Contact: [Pittsburgh Space Command](http://www.psc473.org/)
(<http://www.psc473.org/>)

CanAm Cup 2018 Muskegon, MI June 8-10, 2018

World Cup events: S4A, S6A, S8E/P, S9A
Open International Events: S3A, S2/P

Contestants must have an FAI license to fly in the WorldCup.

Contact: Mike Nowak, 2349 Coventry Road,
Cleveland Heights, Ohio, (216) 337- 9537

ECRM, What's It All About? (A Primer)

By: Jim Filler, NAR 27862

What is an ECRM? The Forty Fifth East Coast Regional Meet is scheduled for June 16th & 17th 2018. NARHAMS has been hosting this NAR sanctioned contest for decades. I do not know much of the history before ECRM 17 which was the first one I attended as an adult in 1990. I have been the contest director for this event since ECRM 24 with the exception of ECRM 41. So if you look elsewhere in this copy of ZOG-43 you will find the list of events. 1/2A PD, 1/2A BG, A HD, A PLA (altimeter), SPSC, OSL So what exactly does this mess of numbers and letters mean? I am going to offer you some more detail on this and what some options are for you to participate in some or even all of these events. All events must use contest certified motors. The list is located here: <http://www.nar.org/standards-and-testing-committee/nar-certified-motors/>

You need to read the specific rules for every event to clarify details. The link to read the sporting code events is here: <http://www.nar.org/contest-flying/us-model-rocket-sporting-code/>

Altimeters you can use in an NAR contest can be found here: [NAR Altimeters](#)

1/2A PD The abbreviation stands for Parachute Duration using a 1/2A engine. This event can be one of the hardest events to win. There are kits available or you can fly a basic three fins and a nose cone model. If the later, you should use a 13 or 18 mm body with a 15"-24" parachute. The parachute can be made from a dry cleaner bag or my favorite, quarter mil mylar. You can get these parachutes from Aerospace Speciality Products here: [Mylar Parachutes](#) The key to this event in my opinion to build the lightest weight model you can, boost it as high as you can, and of course catch some thermal activity. PD models can be flown with a piston launcher to increase altitude. An Estes Gnome kit could be used with a competition parachute but it would be a heavy option. ASP sells a great kit you can get here: [13 MM Parachute Kit](#)



13mm Pracheute Kit from Aerospace Specialty Products.
Photo: ASP

1/2A BG The abbreviation stands for Boost Glider duration flown with a 1/2A contest certified motor. This is an event about flight duration: whose glider can stay up in the air the longest in a stable gliding flight after being launched vertically with a rocket motor of a specified total impulse. This event can be flown with a rocket glider or a boost glider. What is the difference? For rocket gliders, all parts of the rocket that boost must return together. Boost gliders are permitted to separate into multiple pieces allowing for the weight of the motor and its pod to be jettisoned at apogee, leaving a much lighter glider for duration. The gliding portion may not use flexible materials for its aerodynamic surfaces (if it did, it would belong in the "Flexwing" event) and the glider may not have an attached parachute or streamer. There are many plans available at the bottom of the NAR page at [boost glider-duration](#). There are also a few kits available as well. I have never built this one but it looks like a contender [Mini-Condor](#) by Apogee. Apogee provides video clips in the instructions to show how to build the model. A new model is now available from J&H Aerospace and can be seen here: [Aleda-R](#) I have not seen or heard anything about these models.



Aleda-R BG from J&HAerospace.
Photo: J&HAerospace

A HD The abbreviation stands for Helicopter Duration flown with a contest certified "A" engine. You can use any kit that recovers in one piece utilizing helicopter recovery. This is a very challenging event to build and fly. Plans and tips are available here: [helicopter-duration](#). The only kits I am aware of are sold by Apogee components here: [Helicopter-Rockets](#). Estes is getting into the fray with a new model due out anytime now, [see it here](#). Taken from the NAR webpage: "Weight is an important issue for helicopter models, regardless of design. The lighter, the better, as long as the blades (and the rest of the model) are

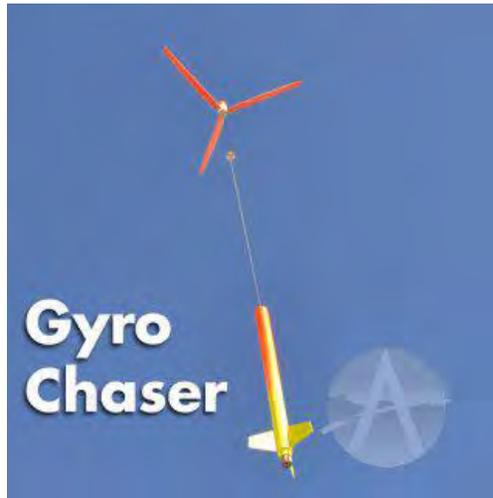
Continued next page

ECRM, Continued

physically strong enough. Try to find reasonably light balsa for the rotor blades, but without being so weak that the blades will bow outwards too easily when the blades are folded for boost.” Helicopter models can be flown with a piston launcher to increase altitude. Before you launch that HD model be sure your rubber bands are hooked up to deploy those blades !

A PLA (altimeter) The abbreviation stands for Payload altitude using a contest certified “A” engine, carrying a standard NAR payload and an altimeter for performance measure. From the NAR webpage: [payload-altitude](#). “The purpose of this event is to carry a standard-size payload to the highest possible on a specified amount of total impulse. The rocket may be single or multi-staged. The model has to be returned after flight. The payload needs to be completely enclosed in the model, and remain inside the model from launch to return. Nothing can be permanently attached (i.e. glued) to the payload. If your attending ECRM

I will have the new 17mm payloads (and the old 18mm payloads if you have an old model from the previous rules) available to borrow. I will also have Firefly altimeters available to borrow with the stipulation you lose it you pay for it. Apogee Components offers a new kit and payload making kits here: [Kits/Midge](#) For altimeters, the smallest lightest version contest approved is the [Adrel BMP](#). This one comes from Poland, NCR and Apogee are now carrying these here: [Adrel-Altimeter](#). Another good choice is the [Firefly](#) by Perfectflite. One last one that I will mention is the [MicroPeak](#) by Altus Metrum.



Gyro Chaser helicopter model, above, and Midge Payload model, below, from Apogee Components.

Photos: Apogee Components



SPSC The abbreviation stands for Sport Scale. Sport Scale is an event that emphasizes craftsmanship, and is judged on multiple categories including the actual flight. From the [NAR Sport Scale tips page](#): “Sport Scale is a somewhat “relaxed” version of the Scale event. In Sport Scale, dimensional accuracy is based on visual assessment of similarity of outline instead of direct measurement of dimensions. This can help speed static judging, thereby making Sport Scale a feasible event even at smaller contests. In addition, the data documentation package is simplified by not needing a dimensioned drawing. This expands the number of prototypes that can be modeled. Don’t forget you need to include a “data packet” with you entry. For the full rules for this event, please see the Sport Scale rules in the NAR Pink Book. For a large selection of sport scale kits, see the kits that Aerospace Speciality Products offers here: [ASP-Scale-Model-Rocket-Kits](#)



Kappa-9M, one of many cool Scale kits from Aerospace Specialty Products.

Photo: ASP

OSL The abbreviation stands for Open Spot Landing. This event can be flown with your favorite sport model. You only get one flight and your model has to come back in one piece, it cannot separate intentionally or unintentionally. Some flyers will use a saucer style model if the spot is close enough, some like to use a larger model with a minimum engine. Streamer recovery is usually the preferred method for a traditional style rocket. One of my favorites is the Estes Baby Bertha.

These events might seem overwhelming, but can be understood by reviewing the rules for each event in the sporting code referenced earlier in this article. I would encourage you to come fly at the contest even if you think it will be tough to win. Anyone coming out to the launch will be able to fly Open Spot Landing and Sport Scale and not pay any contestants fee if you are an NAR member. Come out and join the contest flyers and you might just surprise yourself. If you have questions let me know, I am always happy to answer questions about flying contest events. You can reach me at zog139@yahoo.com



Competition Corner, Continued

NARAM-60 Competition and Rocketry Festival

Events:

- 1/2A Parachute Duration*
- 1/2A Boost Glide Duration*
- A Streamer Duration*
- A Helicopter Duration*
- A Payload Altitude*
- C Eggloft Altitude*
- B Cluster Altitude
- C SuperRoc Altitude
- Classic Model
- Sport Scale
- Research & Development

August 4-10, 2018
Hudson Ranch
Pueblo, CO

Old Rocketeer Reunion on August 4
Keep tabs, new activities to be announced

For current info, go to
www.nar.org

Other Happenings

NARCON 2018 – February 23-25
Houston, TX

National Sport Launch
(NSL) 2018 – May 26-28
Geneseo, New York

NASA Goddard Visitor Center Model Rocket Contest



WHEN: Sunday, July 15, 2018 12 noon – 4pm
(no rain date)

FOR: All Area Model Rocketeers

WHERE: NASA/Goddard Visitor Center, Greenbelt, Maryland
(I-95 Exit 22A, Baltimore-Washington Parkway Exit for
Route 193 East; then follow signs to Visitor Center on ICE Sat Road)

EVENTS: "Lunar" Spot Landing

COST: Free

REGISTRATION: Register at the launch site on the day of the launch

SPONSORS: This contest hosted by the NASA Goddard Visitor Center and conducted by the National Association of Rocketry Headquarters Astro Modeling Section (NARHAMS). Assistance has been received from the Maryland Space Business Roundtable and model rocket companies.

AWARDS: First through fifth place trophies and model rocket kits for each event have been donated.

WHY: This event is to commemorate the 49th Anniversary of the Apollo 11 Moon Landing, and promote interest in Space Sciences among area students.

Contest Rules

1. The contest is open to all model rocketeers.
2. Contestants must follow the National Association of Rocketry (NAR) Safety Code
3. Modelers must provide their own model rockets, wadding, engines, igniters, and prepping tools. The Space Center will provide the launch equipment suitable for 1/8" and 3/16" diameter straws (launch lugs).
4. In each event, contestants may fly either as an individual or as part of one team. Entry into both team and individual competition is not permitted.
5. Model rockets must use a single (NAR classification and safety certified) engine for each flight. "D" class engines or greater are prohibited.
6. Total weight of the model rocket with engine must be less than four ounces.
7. Model rockets must pass a preflight safety, engine and weight inspection at the launch site prior to launch.
8. Model rockets must land safely and must use either streamers or parachutes or gyrocopter-type devices for their recovery.
9. Model rockets must not separate into two or more unattached parts during flight.

Contest Judging and Other Important Information

1. Modelers may launch their models one time.
2. A launch is a successful ignition of the engine. A flight is when the model rocket starts to move upward on the launch pad and until the model rocket finally stops its descent.
3. The object of the event is to determine whose flight comes closest to reaching the center of a circular 125'-diameter "Moon" marked on the ground.
4. If a model rocket lands on the "Moon," contestants must leave the model rocket undisturbed until the model rocket is measured.
5. Officials will measure all model rockets that land within the "Moon's" boundaries.
6. Measurement will be from the "Moon's" center to the tip of the model rocket's nosecone. The measurement becomes the contestant's score.
7. The person with the smallest measurement (i.e., closest to the "Moon" center) will be declared the winner. The next smallest score will be second place and so on.
8. The contest will be flown in two age divisions; one is for those 15 years and younger; the other is for those 16 years and older. Teams will be classified by the age of the oldest team members.
9. Decisions of the judges are final.
10. These contest Sundays have traditionally been some of the hottest days of the year, so be prepared. Also, please be prepared to have FUN!

Time Schedule

Visitor Center Hours for This Event	12 Noon to 4:00 p.m.
Contest Registration	12:00 p.m. to 2:30 p.m.
Opening Ceremonies	12:30 p.m. to 12:45 p.m.
Contest (Flying Period)	12:45 p.m. to 2:45 p.m.
Awards Ceremonies	3:30 p.m. to 4:00 p.m.

For further information, call the Goddard Visitor Center at (301) 286-8981, Tuesday through Friday, 10:00 a.m. to 4:00 p.m.

Unveiling the OA-8 Cygnus Spacecraft at NASA's Wallops Flight Facility

By Alex Mankevich,
NARHAMS President

NASA invited the media to view and photograph the Cygnus spacecraft as a prelude to its launch aboard an Orbital ATK Antares rocket from the Mid-Atlantic Regional Spaceport (MARS) near Wallops Island, Virginia. The Antares missions are flown in order to re-supply the International Space Station (ISS). Members of the media were met by Keith Koehler of the NASA Wallops Flight Facility Office of Communications at the Badging Office located outside the main gate. The schedule for the day was set for a brisk pace. Arrival and departure times, the interview sessions and the photo ops followed each other in rapid succession.

The media was escorted to the Payload Processing Facility and then directed to a vestibule area in which clean-room attire was to be donned over the street clothing. The clean-room attire included a hairnet, booties to cover your footwear and a disposable lab coat. Carrying cases and camera bags were to be left behind in the vestibule and not taken into the clean-room. No shorts, skirts or high heels were permitted. Anything small that may be dropped was not allowed inside the clean room.

The 6.39 meters tall Cygnus spacecraft consisting of a pressurized cargo module and an instrument-laden service module was poised vertically on a platform. Its solar arrays were in their retracted position. Accompanying the spacecraft was a rendering of the OA-8 mission patch designed for the pending flight. The clean-room is a high bay outfitted with high-pressure sodium lighting which facilitated the images



The Cygnus spacecraft was mounted vertically on a platform with its two solar arrays in their retracted position. The OA-8 mission patch is seen to the left.

Photo: A. Mankevich



Close up of some of the many thrusters attached to the Cygnus cargo module.

Photo: A. Mankevich

recorded by the photojournalists. The media was directed not to cross a line plainly visible on the floor, cancelling out any opportunity for a close-up, 360 degree walk around the spacecraft.

Vicki Cox, Director of Communications of Orbital ATK's Space Systems Group, introduced the representatives who were to address the media. The unenviable task of notifying the media that the Antares launch was already postponed for one day fell to Ms. Cox. The line-up of subject matter experts included NASA's Sam Scimemi, the director for the International Space Station at NASA Headquarters, who discussed the status of the ISS commercial re-supply program. Kurt Eberly, Orbital ATK's Antares Deputy Program Manager, discussed the status of the Antares launch vehicle. The particulars regarding the loading of payload aboard the Cygnus spacecraft were addressed by Rick Mastracchio, a former astronaut now a senior director of operations-commercial resupply services program at Orbital ATK. Each of



Kurt Eberly, vice president of Orbital ATK, discussed preparing the Antares rocket for the OA-8 mission with NARHAMS vice president Alan Williams.

Photo: A. Mankevich

these officials gave a 5 to 10 minute overview of their subject matter, and then stayed available for one-on-one interviews with the media.

The subject matter experts chosen by NASA and

Continued next page

Cygnus-08, continued

Orbital ATK are excellent ambassadors for their respective agencies. Each representative is personable, articulate, intelligent and dripping with desire to inform the media. All the representatives seemed at ease while under the intense questioning by the media, especially those pesky ZOG-43 reporters.

Two highlights of this media event are worth mentioning. Photojournalists were treated to a photo-op in which the high bay lighting was dimmed so that the Cygnus running lights became pronounced. The other main event was the unveiling of the name of the deceased astronaut for which the current Cygnus spacecraft was to be named. A poster board concealing the honoree's image and name was set upon an easel. At the high-drama point the cover was removed from the display and the identity of the honoree was disclosed as former Gemini and Apollo astronaut Eugene Cernan. Captain Cernan had been renowned as the 'last man on the moon'.

The spacecraft at this stage was about 75 percent filled with supplies, equipment and research to be delivered to the ISS. The numerous steering thrusters on this spacecraft are not fueled at that time. Technicians were to seal the 'late load' into the pressurized cargo module about two days before the spacecraft was to be transported to MARS launch pad 0A.

For the OA-8 mission, the ninth Cygnus spacecraft to visit the ISS, the pressurized cargo module was tasked to serve as an extension of the space station. This repurposed function was to accommodate an experiment featuring the TangoLab – which was designed for microgravity research. Prior to un-berthing from the ISS, the experiment was transferred out of Cygnus and back into the ISS. The freely orbiting Cygnus released a record number 14 Cubesats prior to its planned destructive re-entry into the atmosphere.



A close-up of the two TriDAR rendezvous and docking laser systems which provide automated, real-time visual guidance for navigation, rendezvous and docking.

Photo: A. Mankevich



“Do Not Remove” tags concerning consecutive items in the spacecraft processing sequence.

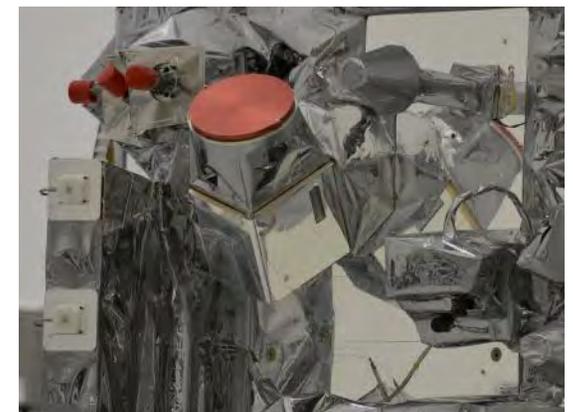
These are located towards the base of the Cygnus Service Module.

Photo: A. Mankevich



Vicki Cox - Director of Communications at Orbital ATK. To Vicki's left is the unveiled poster board announcing the designation of the Cygnus spacecraft as the 'S.S. Gene Cernan'.

Photo: A. Mankevich



Close up of the instruments and thrusters located on the Cygnus service module.

Photo: A. Mankevich

A Report on the Antares Mission OA-8 Mission to Resupply the International Space Station (ISS). Part 2

By Alan Williams

On Nov. 9 Alex and I checked in to the lovely “Lighthouse” Inn in Chincoteague. We were warmly welcomed by our hosts Lea and Chris, who could not have been more accommodating. Not so, the weather. A brutal arctic front swept that afternoon’s pleasant fall airs right into the Atlantic, where they died. In short order the air temps dropped by around 40 degrees. Frigid gusts slashed through near 35 mph, then relaxed to about 25 steady right out from north. Welcome to the Fimbulwinter.

After badging up Friday morning at the Wallops VC we attended a conference touching all major aspects of the mission. After ISS docking and cargo extraction, Cygnus Cernan would serve as a temporary extension laboratory. There was a strong mix of bioscience and technical projects aboard. Then, in early December the now refuse-filled Cygnus Module would translate to a higher orbit to release that record 14 Cubesats before its planned destructive reentry.

I joined Alex and two busloads of traditional and social media journalists for a trip down to the Island launch area and to view the completed OA-8 flight vehicle. Our single vantage this time was at the Y-15 Vehicle Assembly Shop parking lot. With us having to shoot right into the sun and the brutal cold wind, this was not last year’s photo cakewalk. I did document the nose art naming this Antares for founding Orbital executive J.R. Thompson. He had passed a few short weeks before the flight.

We then went north to the Horizontal Integration Facility where we saw most parts of the OA-9 vehicle laid out for assembly. That flight is on for May, 2018.

This time we had excellent close access down the entire length of the bird. Surprisingly, the 55,000lb. Castor30 XL second stage motor was already there on the assembly rails. We also saw installed RD-181 engines in the OA-9 bird’s tail. We returned to the VC a much more hopeful duo. When we were not gathering info, we both were busy explaining what the heck a “Zog-43” is to press and industry reps. Then an early dinner with members DJ



Close up of the Antares rocket two days before the launch.

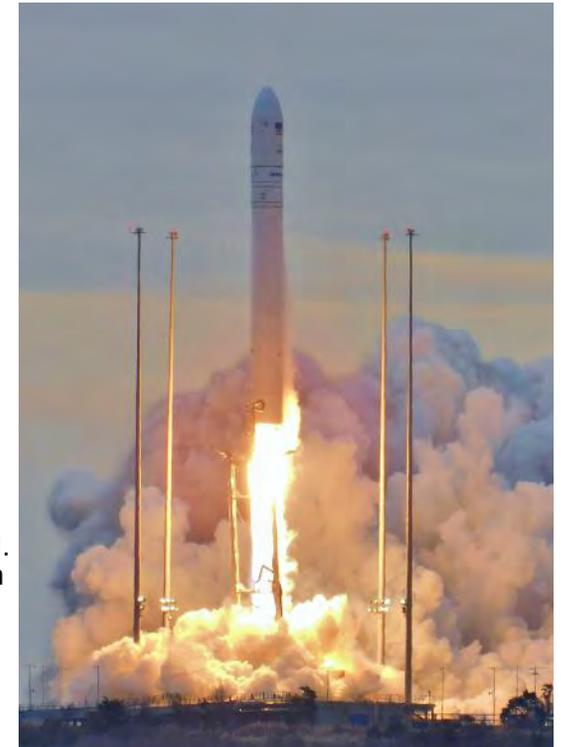
Photo: A. Williams

and Sally and back to the Lighthouse to await the alarm clock.

Saturday, 4 AM was...early...cold. 5:30 found us on the bus to the viewing site. Flight time was 7:37 AM, with a five minute launch window. Imagine two hours in a combination wind tunnel-meat locker. My hands felt like bags of ice. Alex was in full “lumberjack” gear mode. Good times, all. As the Old Norse folk saying has it, “a chill wind blows everybody’s nose”.

Mostly clear skies were balanced by that savage cold wind. The combination produced a surprising amount of optical turbulence. The rising sun did nothing to warm us. Did I mention the cold? Operationally, everything flowed very smoothly till about T-80 seconds. Then, a shocking “Red-Range Abort” warning call- a plane was suddenly reported inside the safety exclusion zone. Because there was no time to recycle in the short flight window, we were instantly done for the day. Even with gloves it took almost 10 minutes to pack up my two cameras.

Initially, internet tracking software fingered a nearby Jet Blue flight as the culprit. News persons had a merry time



Liftoff of the Antares rocket on launch pad 0A at early dawn on launch day November 11th.

Photo: A. Williams

Continued next page

Antares Launch, continued

politely harassing the airline's PR contacts, since even people who don't fly hate Jet Blue. By the time a 10:30 post-abort briefing was held the actual actor was revealed as an idiot private pilot sneaking around in the radar ground clutter offshore. There were a number of creative punishment suggestions from the press involved fines, jail, fire, and blood. All were diplomatically declined by officials. And the Jet Blue flight turned out to be innocent, in assigned airspace well clear of the range. Towards the end, I got to ask about how the newly refurbished Launch Control Center had functioned. (Except for a short and inconsequential 1st stage data dropout about 3/4 hour before T-0, the new room was praised by NASA, Orbital, and MARS representatives.) Also, our club's newsletter name was nowhere near the oddest sounding affiliation announced at the briefing.

Happily, the Sunday forecast was for much lower wind and air at least 12 degrees warmer at T-0. However, since orbital mechanics demanded an earlier 7:14 launch it was much closer to sunrise. 4 AM felt no friendlier the second time round. Layered cloud strata would also dominate the skies.

Somewhat smaller numbers of press and social media turned out. We were still cold, but had lots more heat, donuts, and coffee, courtesy of Orbital ATK. (Thank you, thank you!) Alex set up close by We Report Space (and NARHAMS) member Jared Hayworth. I was again near the U 80 tracking installation, finding more level ground there. The sunrise was mostly hidden by clouds, but soon we had enough light to shoot by. We did note less visual distortion across the marsh this time.

About 40 minutes before launch some boats made a run towards the impact areas offshore, but were chased away. One reporter (Ok, it was me) suggested to Orbital VP Barry Beneski that they install a solid flame wall on the ocean impact zone borders to send a message. He countered with the ATK division's access to literally millions of 20MM. cannon shells. A minor technical issue moved T-0 to the end of the window. As these things go, time seemed to crawl by. I actually remembered to start my backup video system.

Suddenly it was the last ten seconds. Then fire splashed out and lifted by over 860,000lbs. of thrust, Antares was on its way at 7:19: 51 AM. My still camera started cranking



Up and away on its mission to resupply the International Space Station.

Photo: A. Williams



About 30,000 gallons of water turned to steam in 20 seconds.

Photo: A. Williams

like a sewing machine. The rocket was visible in the climb for about a mile, then disappeared in the first of several cloud layers. Occasionally it played peek-a-boo through little holes as it rose. Again with the loud rasping crackle-roar thingy.

After the first volley my Nikon's memory and focus started misbehaving, so I got less coverage than anticipated. I was later pleased with one surprise good high altitude shot of Antares' flames through the clouds. I was so focused on the camera that I was convinced the rocket was much quieter than last year's flight. (I was wrong- friends in Bethany Beach, Delaware reported a jarring rumble over 50 miles north of us.) All Antares systems continued functioning right "on the money". Nine minutes after ignition, the "Cernan" Cygnus Cargo Module was announced to be flying free in orbit and on its way to the Space Station. (By Tuesday afternoon it had successfully docked with the Station.)

Much cheering occurred, then we broke down all the gear and were bussed back north as fast as possible. Alex and I had decided to check out of The Lighthouse in Chincoteague and then swing back to finish our expedition with the post flight briefing.

There it was revealed that the OA-8 vehicle had actually exceeded planned performance by a noticeable margin. (The vehicle already has a substantial performance surplus which is being reserved for future flight options.) Orbital executives praised the NASA Wallops and MARS teams for excellent and responsive support including the 24 hr. turnaround after Saturday's abort. Back at the VC press area I also saw my photo results for the first time. Low numbers, but some striking early images. Both NASA and Orbital folks praised how they looked in my camera's playback system. Alex's stuff was also quite striking.

So, in sum, Alex and I worked very hard to make this trip succeed. I hope you enjoy our results.



NARHAMS 2018 Calendar of Events

Date	Time	Event	Location
Jan 06	5:30 – 9 pm	Monthly Meeting Topic: Open Build Session Refreshments: Sarah & Ed Jackson	College Park, MD
Jan 07	1 - 2 pm	Goddard public launch	Greenbelt, MD
Feb 03	5:30 – 9 pm	Monthly Meeting Topic: Military Missiles – John McCoy Refreshments: McCoys	College Park, MD
Feb 04	1 - 2 pm	Goddard public launch	Greenbelt, MD
Feb 10	10am–5 pm	Full-STEAM Ahead Rocket Build Session Pax River NAS Museum Manager: Alex Mankevich	Lexington Park, MD
Feb 17	12 - 4 pm	Sport Launch Theme: Winter Frost-Bitten Birds Launch Manager: Alex Mankevich	Mt. Airy, MD
Feb 23 - 25		NARCON 2018	Houston, TX
Mar 02	5 - 9 pm	Wood Acres Elementary School Space Night Room Display by NARHAMS Manager: Alex Mankevich	Bethesda, MD.
Mar 03	5:30 – 9 pm	Monthly Meeting Topic: Tubular/Tumbler/Tipsy Overview Refreshments: Alex Mankevich	College Park, MD
Mar 04	1 - 2 pm	Goddard public launch	Greenbelt, MD
Mar 17	12 - 4 pm	Sport Launch Theme: Tubular/Tumbler/Tipsy Green Launch Manager: Alex Mankevich	Mt. Airy, MD
Mar 24	12 - 4 pm	Ag Center Launch Launch Manager: Mark Wise	Westminster, MD
April 01	1 – 2 pm	Goddard public launch – CANCELLED Due to Easter Holiday	Greenbelt, MD
April 07	5:30 – 9 pm	Monthly Meeting Topic: Winter Builds Show & Tell Refreshments: Ole Ed Pearson	College Park, MD
April 21	12 - 4 pm	Sport Launch Theme: open Launch Manager: open	Mt. Airy, MD
April 22	12 - 5 pm	Rockville Science Day Launch Manager: Alex Mankevich	Rockville, MD
May 05	5:30 – 9 pm	Monthly Meeting Topic: Laser Cutter – Open Build Refreshments: Sarah & Ed Jackson	College Park, MD
May 06	1 - 2 pm	Goddard public launch	Greenbelt, MD
May 12	8am – 5pm	TARC Finals	Great Meadows, VA
May 19	12 - 4 pm	Sport Launch Theme: NRC Contest / Ping Pong ball Launch Manager: Don Carson	Mt. Airy, MD
May 26 - 28		National Sport Launch (NSL)	Geneseo, NY
June 02	5:30 – 9 pm	Monthly Meeting Topic: Night Launch Lights - E.Jackson/J. McCoy Refreshments: Ole Ed Pearson	College Park, MD
June 03	1 - 2 pm	Goddard public launch	Greenbelt, MD
June 16 & 17	9 am - 5 pm	ECRM 45 - Events: 1/2A PD, 1/2A BG, A PL Alt, A HD, OSL, Sport Scale Contest Director: Jim Filler	Mt. Airy, MD
July 01	1 - 2 pm	Goddard public launch	Greenbelt, MD
July 02	9 – 9:45 pm	Camp Snyder Scout Night launch support Manager: John McCoy	Camp Synder, VA

July 03	2 - 4 pm	Camp Snyder Scout Day launch support Manager: John McCoy	Camp Synder, VA
July 07	5:30 – 9 pm	Monthly Meeting Topic: Summer Picnic Refreshments: Pot Luck	College Park, MD
July 11	11:30-12:30	SISTER launch support Goddard Visitor Center	Greenbelt, MD
July 15	12 – 4 pm	Apollo Contest Goddard Visitor Center Contest Director: Jim Filler	Greenbelt, MD
July 21	12 - 4 pm	Sport Launch Theme: Gliders Launch Manager: Ed & Sarah Jackson	Mt. Airy, MD
Aug 04 - 10		National Rocketry Competition C ELA(altimeter), APA(altimeter), AHD, ASD, 1/2A HD, A SD, 1/2A PD, 1/2A BGD, BCA, CSRA, CM, SS, RD	Pueblo, CO
Aug 04	5:30 – 9 pm	Monthly Meeting Topic: Open Build Session Refreshments: open	College Park, MD
Aug 05	1 - 2 pm	Goddard public launch	Greenbelt, MD
Aug 18	12 - 4 pm	Sport Launch Theme: Sounding Rockets Launch Manager: Alex Mankevich	Mt. Airy, MD
Aug 25	12 - 4 pm	Ag Center Launch Launch Manager: open	Westminster, MD
Sept 01	5:30 – 9 pm	Monthly Meeting Topic: Elections / NARAM Wrap-Up Refreshments: open	College Park, MD
Sept 02	1 - 2 pm	Goddard public launch	Greenbelt, MD
Sept 15	2 - 9 pm	Sport Launch Theme: Night Launch/Don Carson B'Day. Launch Manager: Jim Filler/John McCoy	Mt. Airy, MD
Oct 06	5:30 – 9 pm	Monthly Meeting Topic: WSMC Wrap-Up Refreshments: open	College Park, MD
Oct 07	1 - 2 pm	Goddard public launch	Greenbelt, MD
Oct 20	12 - 4 pm	Sport Launch Theme: Sci-Fi Rockets / Octoberfest Launch Manager: Ed & Sarah Jackson	Mt. Airy, MD
Nov 03	5:30 – 9 pm	Monthly Meeting Topic: Planning Refreshments: open	College Park, MD
Nov 04	1 - 2 pm	Goddard public launch	Greenbelt, MD
Nov 17	12 - 4 pm	Sport Launch Theme: open Launch Manager: open	Mt. Airy, MD
Nov 24	12 - 4 pm	Ag Center Launch Launch Manager: open	Westminster, MD
Dec 01	5 - 9 pm	Holiday pot luck dinner and raffle Greenbelt Community Church 1 Hillside Road, Greenbelt	Greenbelt, MD
Dec 02	1 - 2 pm	Goddard public launch	Greenbelt, MD
Dec 15	12 - 4 pm	Sport Launch Theme: Tannenbaums Take Flight Launch Manager: open	Mt. Airy, MD

