206-43

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IN THIS ISSUE: ***Saturn V Celebration, Antares Launch, EL Lighting, Carl McLawhorn Contest Report, More Power For Your Rockets, and more...***

Zog-43
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Official NARHAMS Newsletter
Editor: Don Carson

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

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

If you have any questions about ZOG-43, NARHAMS, subscriptions, or if you have any comment(s), correspondence, or if you'd like to submit an article, send them to:

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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 - 'Tis The Season To Be Building!

Don Carson, NAR #11069

For those of us facing Winter's cold weather and short days, build season is upon us. We have a couple of interesting build related articles in this issue and local professional rocketry coverage.

Alex and Alan both attended a pre-launch roll out of the Cygnus payload as well as the launch, as members of the press. In this issue, we have Alan's take on the roll out and Alex's view of the Antares launch. In the next issue, they swap subjects. Either way, there are lots of great pictures.

We are short on launch coverage - the two November sport launches were cancelled for lack of a Launch Manager and the calendar allowed us to get the October Goddard VC launch into the last issue.

We also have a look into my favorite shop ever, see if it gives you any ideas.

As always, thanks to all of you who contribute to our club newsletter. You make it happen.

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 parnoid about that sort of thing.

Front Cover: Alex Mankevich's beautiful photo of the recent Antares launch that he and Alan William covered.
Photo: A. Mankevich

Back cover: We had five beautiful models of the venerable Saturn V rocket at the celebration held at the Goddard Visitors Center of the very first launch of the biggest rocket ever.
That launch occured on November 9, 1967
Photo: M. Anderson

ZOG ROYAL COURT
(NARHAMS OFFICERS)

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November 2017 Goddard Launch Report: An Epic Day at the Goddard Visitor Center: The Saturn V 50th Anniversary Celebration

By Alex Mankevich, President – NARHAMS

By all accounts the first Sunday in November 2017 will long be regarded as an epic and heroic effort by several members of NARHAMS and our extended NARHAMS family. NARHAMS offered a special 50th anniversary celebration of the first 'full up' Saturn V rocket launch. The celebration ran concurrent with the usual first Sunday rocket launch at the Goddard Visitor Center on November 5th.

This adventure's humble beginning began during the AG Center launch back in August 2017. Bill Boublitz and Alex Mankevich were lounging in their lawn chairs watching the other rocketeers put their rockets into the corn field. Inspiration struck like an inbound ballistic missile, and before long the nucleus of the Saturn V celebration was in place. Naturally, there were to be Saturn V models on display, a Saturn V model launch and a Powerpoint presentation. Jim Miers was also at this launch, and a subtle inquiry revealed that his wife Jan had indeed witnessed a Saturn V launch. Jan was immediately penciled in as a presenter who could relate her launch experience. Great minds were at work when we also planned to have an outline of the 33 foot diameter of the Saturn V first stage outlined against Goddard's white Delta B rocket.

Bill got to work on assembling a paper of the Saturn V and Apollo mission facts and figures. Alex got to work searching for the recollections of Saturn V launches recorded by journalists and astronauts. He also ramped up publicity for the Saturn V celebration by issuing press releases. Alex then made Mike Cochran an offer he could not refuse. Mike was to print up posters of the whole series of 13 launches made by the Saturn V from 1967 to 1973.

More plans gelled together as the November date grew closer. Bill assembled his fact-gathering into a 50th anniversary commemorative booklet which the Goddard Visitor Center was willing to print in color. Bruce Mitchell was leaned on and readily agreed to present a modeler's perspective of building a Saturn V model. Back channel contacts were pursued and Alan Williams' brother Craig was offered an opportunity to present his recollections of witnessing both the Apollo 17 and Saturn

Lift off of Bill Boublitz's Saturn V demo model on a powerful D12 motor.
Photo: M. Anderson

Continued next page

Saturn V Anniversary Launch,

V/Skylab launch. Craig was encouraged to present the photos he took during both of these launches.

The Visitor Center personnel also got involved in the preparation as well. Julie Saba suggested that Apollo/Saturn V-themed coloring pages be printed for the kids to enjoy at the Visitor Center's crayon station. She also suggested that we create a flyer that could be posted as an announcement for the celebration. DJ Emmanuel saw to the printing of a couple hundred of the commemorative booklets. DJ also used his contacts to procure a 1/90th scale model of a Saturn V to go along with the 1/100th scale models already being lined up.

Whereas we didn't specifically set out to achieve the largest display of Saturn V models ever assembled, we certainly wanted more just a couple of models on display. Club members known to have a Saturn V were contacted. Soon commitments were secured from modelers Bruce Mitchell, Jim Filler, John McCoy, Tom Jackson and Chris Greco. Contact was made with the Gibson family that brought out a Saturn V to the June 2017 Goddard launch. They eagerly agreed to bring along their model and partake in the celebration. Not wanting to be left out of this distinguished lineup, Bill decided to hastily build his own Saturn V in time for this event. Bill's rocket was later designated as the event's official demo flight model.

Above: The presenters: Bill Boublitz (left), Bruce Mitchell, Jan Derry and Craig Williams (top to bottom).
Photo: E. Pearson

Alex, Bill and Bruce spent the weeks leading up to the event polishing up the Powerpoint presentation. It was frustrating that the computers could not talk to each other, so emails were used to share photos and text. This process went down to the wire, but eventually on presentation day it all came together.

Alex and Mike spent the preceding Saturday at the Visitor Center to transform the auditorium into a Saturn V spectacle. Mike's Saturn V launch posters were assembled into a framed tabletop display that was colorful and way too cool. Two display bases were set up for the Saturn V models that were due to arrive the following day. The 1/90th scale model was given its place of honor. A table was dedicated for a display of various Saturn V/Apollo memorabilia, books, magazines and models. Another table was set up along the side wall for the seating of our presenters. DJ made sure that we had microphones for our presenters.

Right: Mike Cochran prepared twelve posters of Saturn V rocket launches.
Photo: E. Pearson

On Sunday November 5th, just four days shy of the actual 50th anniversary, the celebration got underway. We planned all along to conduct the normal First Sunday Goddard launch and not to have it be superseded by the anniversary celebration. This ambitious goal meant that the Goddard range crew would be

Continued next page

Saturn V Anniversary Launch,

tasked with ‘double duty’, since Alex, Bill and Ole Ed would be peeled off to attend to the celebration duties. Complicating measures were that a few groups had advised us in advance that they had plans to attend this launch with dozens in their party. A couple of scout groups showed up in addition to the expected Bulgarian delegation lead by Demitri and Stoil Avramov. The Commander’s mom had previously informed us that her daughter Kristi was bringing along several of her friends.

Sarah and Ed Jackson along with Mike Cochran shouldered the additional burden like true NARHAMSters. The launch rack was set up on the concrete near the Delta B rocket due to the damp conditions. The range crew was joined by Demitri and Stoil who served as pad assistants and igniter wire replacement specialists. Mark Anderson had brought along his photography equipment to record the day’s highlights. The check-in line practically wrapped around the Delta B rocket. The whole range crew soldiered on bravely despite the large crowd and the generally chilly and damp day delivered by Mother Nature.

The Saturn V model rocket demo launch was scheduled for 2:00 pm. Ed Jackson handed over the microphone to Bill who gave a short narration of the importance of the iconic Saturn V and dedicated the demo flight to the men and women who made the rocket possible. A video of Bill’s rocket flight was later posted on Twitter by Conor Nixon. You can view this video by searching #saturnv on Twitter. An excerpt of Bill’s remarks is as follows:

"This is a demonstration launch to commemorate the flight of the very first Saturn V which lifted off from the Kennedy Space Center on November 9th, 1967. With this launch, we salute the vehicle, the Apollo 4 mission, and all of those individuals who made it possible."

Inside the auditorium, Jim Miers and Bruce Mitchell circulated among the visitors and offered insights into the Saturn V. The official presentation began at 2:30 pm. Ole Ed delivered the welcome address and said a few words about NARHAMS. He then introduced Bill. Bill did the bulk of the presentation outlining the Saturn V, its three stages and its technical specifications. Bill then moved on to the assembly of the Saturn V for its first flight and detailed the Apollo 4 flight profile.

Bruce Mitchell came on to explain the tasks involved in undertaking a

The crowd for the safety check-in line wrapped around the Delta B rocket.
Photo: E. Pearson

Jim Miers explained the Saturn V to visitors prior to the start of the presentation.
Photo: E. Pearson

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Saturn V Anniversary Launch,

Saturn V build. Bruce immediately established his 'street cred' as a modeler of airplanes, and talked knowledgeably throughout his presentation. His presentation included several photos of a Saturn V build in progress, such as filing in the creases, masking prior to painting, sanding, touch-up painting, applying the decals, etc.

Bill came back on to present the recollections of journalists and astronauts in regards to experiencing a Saturn V launch. This portion preceded the introduction of our own Saturn V launch witnesses - Jan and Craig. Jan delivered a very warm and personalized account of her viewing of the Apollo 16 launch. She set up her whole story with background on how she got passes to view the launch and gave particulars about the group with which she travelled with down to Florida. As someone who lived through the 1960s decade, I enjoyed her recollection of what it was like to travel to a distant destination back in the day. Craig followed Jan and presented his take on both the Apollo 17 and Skylab launches. Craig explained that Apollo 17 was the only night launch of a Saturn V and that the Skylab launch quickly went into the clouds. His presentation of the photos which he took lent a sense of presence for the audience members. Craig is a seasoned performer and his presentation was highly entertaining in addition to being informative.

All the participants received warm rounds of applause from the audience. After the conclusion of the presentation, several audience members came forward to discuss the Saturn V further with our presenters. Bill shared the following account from the audience members:

"There was a special treat at the end. You [Ole Ed] had already left. Soon after, a younger couple came up to me and introduced (her) father, a ripe 92 year old who was an engineer on the Saturn V project. They had made other plans for the day, but with the inclement weather decided to come, by chance, to Goddard. Fate at work. He was beaming! He was an IBM guy, who developed the guidance package aboard the instrument unit. He worked in upstate New York, but would travel to Huntsville every other month. On odd months, the Huntsville crew came up north. He met von Braun several times. His daughter took me aside and told me, "When that photo of the instrument unit appeared, he lit up like a Christmas Tree." The gentleman called the program the 'John F. Kennedy welfare program for engineers,' and said those were the best days of his life. It was a thrill to meet him."

The Visitor Center parking lot was overflowing and cars were parked on the access road. Julie Saba reported that the Visitor Center logged in 230 visitors, but she feels that the actual count exceeded 260. She and Shirley Ramos actually ran out of First Time Flyer certificates to award to the modelers.

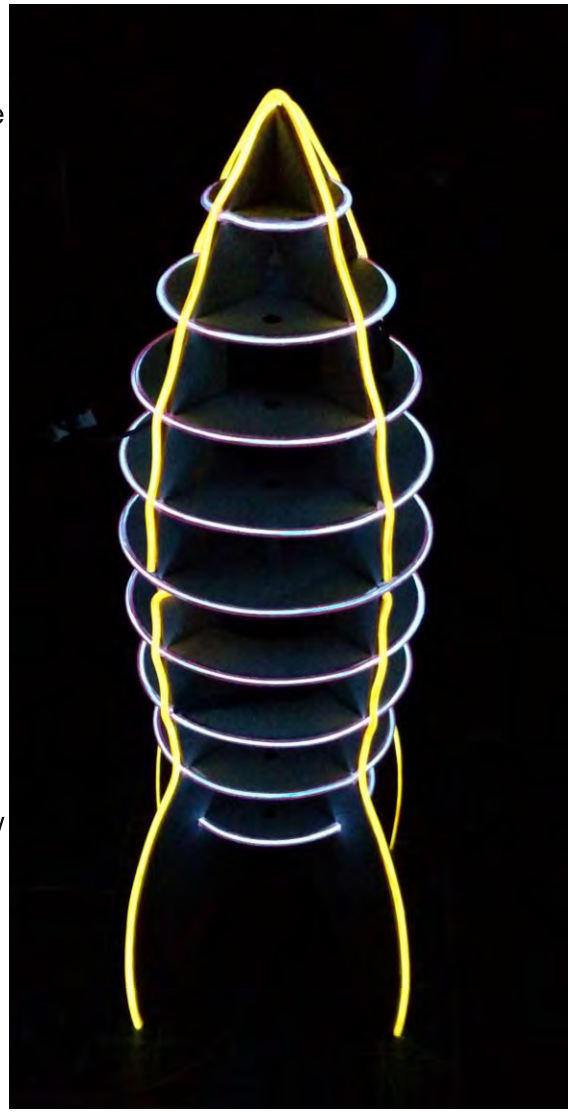
Left: Bill Boublitz and Mike Cochran prepare the Saturn V model for launch.
Photo: M. Anderson

Left: Alex and Bill ponder the significance of the upcoming Saturn V model demo launch.
Photo: M. Anderson

Rocket Illumination With EL Wire

Photos and Instructions by Ed Jackson

I was asked to write an article describing my experience using EL (Electric Luminescent) wire to illuminate rockets for night launches. While this is not an exhaustive study of EL wire in rockets, it should serve well as a starting point. If you want to further explore the use of EL wire, I highly recommend doing additional research, and I've listed some useful websites at the end of this article.

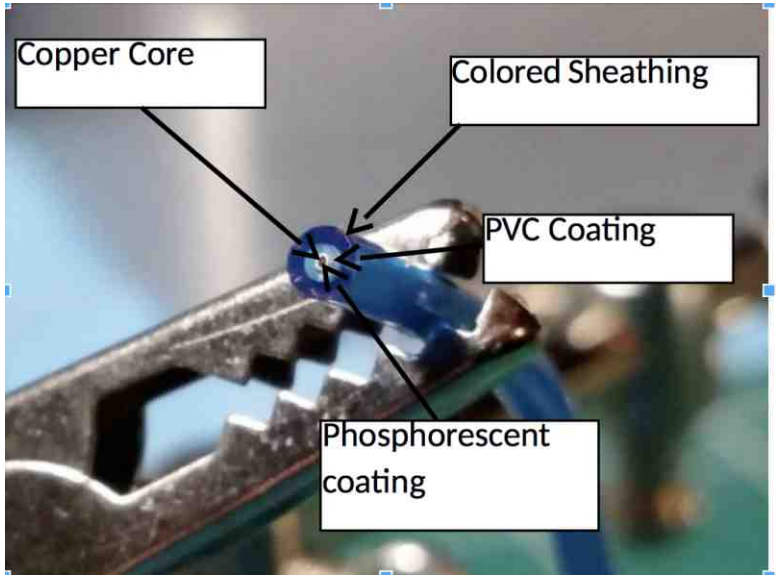


Retro Rebel in Yellow and Purple EL wire.

EL wire is a flexible, low level, light source about 1/8" in diameter that lets you create lighted lines and curves, similar to what is seen in the Disney movie Tron or old neon signs. EL wire can be used by itself or with other lighting devices to highlight rocket features, outline edges or draw unique neon like shapes. Using EL wire on a rocket with bold edges, like Rocketarium's Retro Rebel, creates a dramatic looking night rocket.

EL wire does come with some limitations. First, it's not as bright as conventional LEDs so using EL wire as the only light source is not recommended on mid or higher powered rockets. EL wire also requires a transformer to operate, so space and weight will become an issue when you design your lighting. While EL wire is flexible, too much flexing, or bending the wire too tightly, can cause dark spots or a break in the core. The wire is also high voltage so beware of the exposed end of the wire to avoid shocking yourself.

EL wire works using a concept similar to fluorescent and neon lights. A copper core is coated with a phosphorescent material which is then wrapped with hair thin (angel) wire(s). The wires are then coated with clear PVC to protect them from the elements, followed by a sheathing which is added to give the wire its color. When high voltage is applied between the core and the angel wire, the phosphorescent layer is excited and EL wire glows bright. EL wire does not need to be a closed circuit which means the wire can be cut to any length without a termination.



Before starting on any rocket lighting project, make sure you plan ahead on how the EL wire, the transformer and the battery will affect the overall performance of your rocket. Weight and its distribution within your rocket needs to be evaluated. Without going down the rabbit hole of rocket stability, I will say that when doing your lighting and wiring, symmetry is your friend.

Continued next page

EL Lights, Continued

There are three components that you will need to in order to add EL wire to a model rocket. The first is the EL wire itself, which is sold in many colors and diameters. The most common is 2.3mm in diameter which is the wire that the transformer ratings are nominally sized to. The next component is an EL wire transformer. The transformer, also called an inverter or driver, comes in a number of sizes and is usually rated in the linear feet of EL wire that it can drive. The last thing you will need, like all rocket lighting projects, is a power source. Some small EL wire drivers are coupled with two AA batteries making this a popular option. For the two EL wire projects that I did, I chose the Sparkfun 3V EL wire inverter powered by a 400mAh Lithium Ion Battery which gave me a transformer/battery combo that could power 10-15 feet of EL wire, weighed 2 ounces, and could fit into a BT55 body tube.

The easiest way to execute an EL wire installation is to buy a kit that includes the wire, driver, and battery pack. These types of inverters can be found on Amazon for as low as $10 and include 16' of a wire of a single color.

Start by selecting a place for the battery/transformer, typically in a compartment towards the top of the rocket. Make sure the battery compartment is easy to access but secure enough to survive launch and recovery. Next install the EL wire by gluing it to the rocket surface using CA. I use a gel type CA that is slower setting and glued the wire in 6" section, using small pieces of masking tape to hold the wire in place until the glues sets.

You might find you need more than a single unbroken length of EL wire which means having to cut and splice the EL wire. Below are the steps I used to splice EL wire. Also refer to the video on That's Cool Wire site for further instructions.

http://www.thatscoolwire.com/articleDetail.asp?articleID=16

hint I find it better to wait until you install the wire onto the rocket before trimming the EL wire to length. The soldering of the EL wire can be tricky so don't be discouraged if you find that you need to cut off the section you are trying to splice and start over.

1) Lightly score the outer colored sheathing about ¾" from the end and pull the sheathing off. If you cut too deeply you could accidently cut the angel wire. (Figure 1 and 2)

Fig. 1: Scoring the Sheathing.

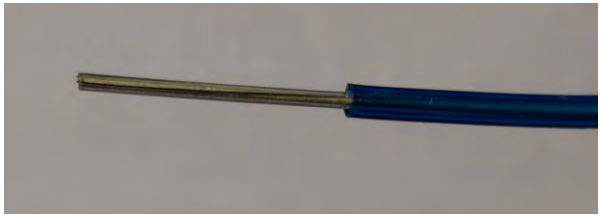


Fig. 2: Sheathing Removed.

2) The next thing to do is expose the angel and copper core. This next step should be done in a well ventilated space. The best way I found to expose the wire is to burn off the protective PVC coating using a soldering iron. After burning off a portion of the coating, the angel wires become accessible. Here, I find grabbing the wire by the tip and gently pulling the wire with tweezers while applying heat directly to the wire will get the wire to cut through the coating. (Figure 3 and 4)

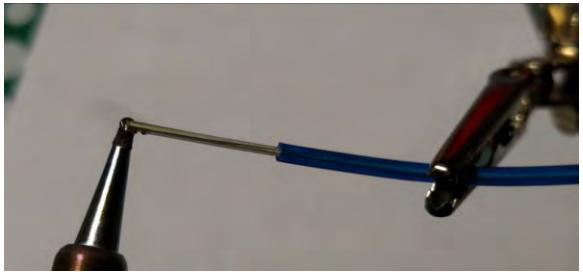


Fig. 3: Burning off the PVC coating.

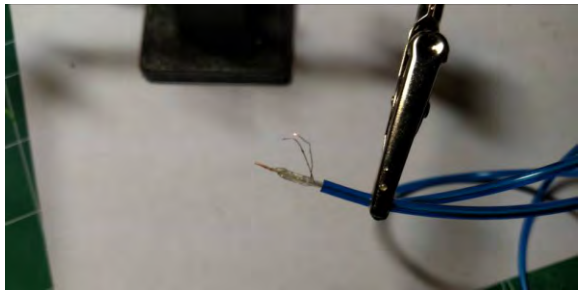


Fig. 4: Angel wires exposed.

3) Next use a hobby knife to remove the insulation from about 3/8" of the wire end. At this point you should see the white phosphorescent coating on the copper core; this will need to be scraped off so the core is bare copper. (Figure 5)

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EL Lights, Continued

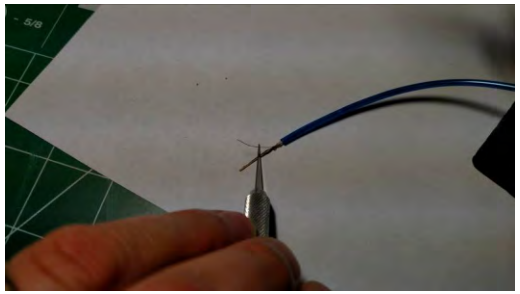

Fig. 5: Scrape off the insulation and phosphorescent coating.

4) To complete the splice, the inner core wire will be soldered to one side of the inverter output and the angel wire will go to the other. Solder the core wire first then use heat shrink to insulate it. Next solder the angel wire to the other side and insulate the entire termination with shrink wrap. (Figures 6 through 9)

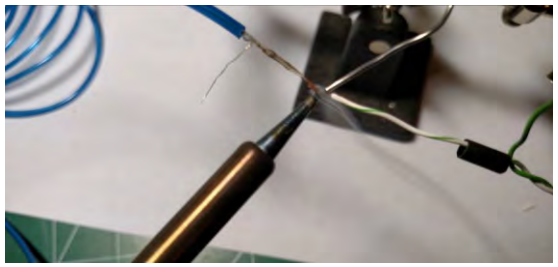

Fig. 6: Solder the core wire.

Fig. 7: Heat shrink the core solder joint.

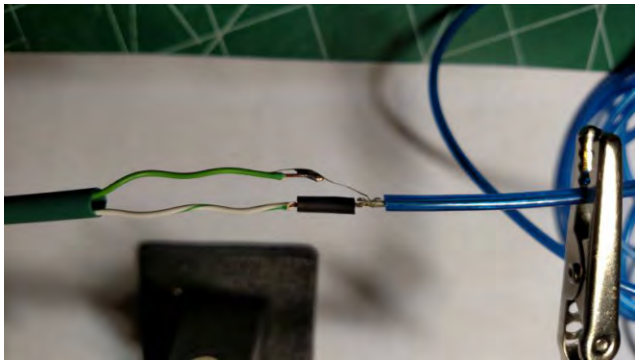

Fig. 8: Solder the angel wire.

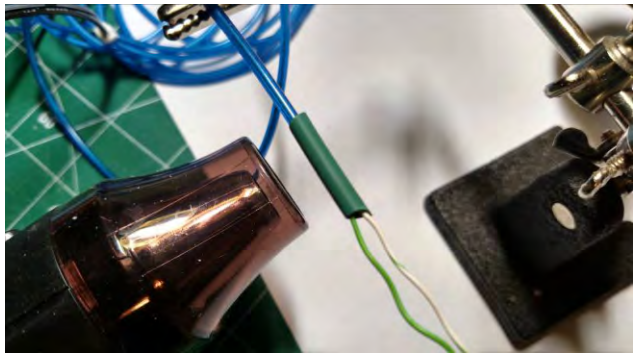

Fig. 9: Heat shrink the splice

5) Test the termination with the battery and driver. If it lights up, you are good to go. (Figure 10)

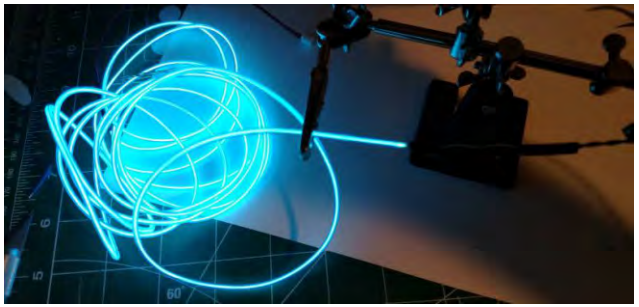

Fig. 10: Testing the termination.

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6) Finally, install the EL wire and trim to length. (Figure 11)

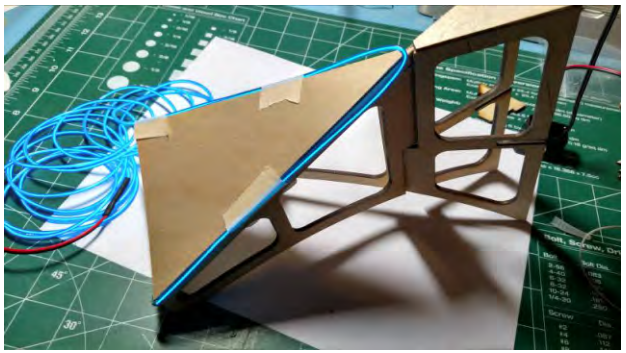
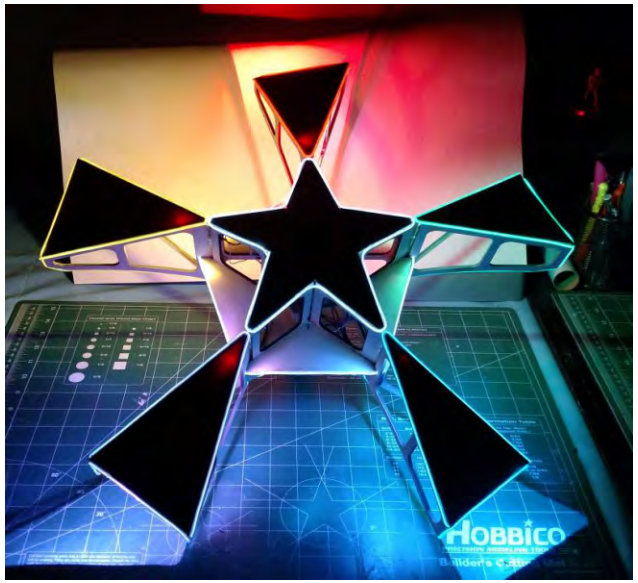


Fig. 11: Installing the EL wire.

Multiple lengths of EL wire can be connected in parallel to a single driver so long as the total length of the wire does not exceed the rated length for the driver.



EL Lights, Continued

This Quinta-Superstar uses following:

(All parts from Sparkfun)

Circuit 1: Arms

4' Blue EL wire (pn: COM-10195)

4' Orange EL wire (pn: COM-10193)

4' Purple EL wire (pn: COM-10196)

4' Red EL wire (pn: COM-10191)

4' Green EL wire (pn: COM-10194)

3v EL inverter (pn: COM-10201)

400mAh Lion Battery (pn: PRT-13851)

Circuit 2: Inner

10' White EL wire (pn: COM-10197)

3v EL inverter (pn: COM-10201)

400mAh Lion Battery (pn: PRT-13851)

5 – Super Bright White LEDs (pn: COM-0053) *Color was added to these LEDs by gluing the discarded EL wire sheathing to the LED so that the each LED matched the color of the EL wire of the arm it was mounted on.

Below are sites for additional information on EL wire:
https://learn.adafruit.com/el-wire/using-el-wire
http://www.thatscoolwire.com
https://www.sparkfun.com/categories/226

US Team Selections
Congrats All!

Senior 2018 US Team

	S1B	S2/P	S3A	S4A	S5C	S6A	S7	S8E/P	S9A
Barber, Trip	X		X						
Berk, Matthew								X	
Carson, Donald				X					
Duffy, James					X				
Flanigan, Chris							X		
Humphrey, Steve									X
Kreutz, Robert	X								
Kristal, Emma	X					X			
Kristal, Steve		X							
Kuczek, Kevin				X					
Marsh, Jay					X	X			
McReynolds, Marc							X		
Nowak, Mike							X		
O'Bryan, David								X	
Rivieccio, Nick			X						
Steele, Matt		X			X				
Stenberg, Jon									X
Vinyard, Keith				X					X
Von Kiparski, Wolfram		X							
Willard, Terrill			X			X			
Woebkenberg, Ryan								X	

Junior 2018 US Team

	S1A	S2/P	S3A	S4A	S5B	S6A	S7	S8D	S9A
Avramov, Stoil		X		X		X		X	
Harrison, Trevor	X		X		X				
Leggette, Trevor			X			X			X
Van Milligan, Allison	X	X		X*		X*			X
Van Milligan, Ashley	X	X		X*		X*			X
Stenberg, Ryan								X	
Stenberg, Zackary				X				X	
Houston, Charis			X*		X				
Stephens, Bryce			X*		X				

* Allison and Ashley VanMilligan will decide by March 31 which one will do S4A and which will do S6A. Charis and Bryce will do a local flyoff run by the Junior Team Manager Kevin Johnson by March 31 to determine which of them will be the third member of the S3A team.

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

By Alex Mankevich

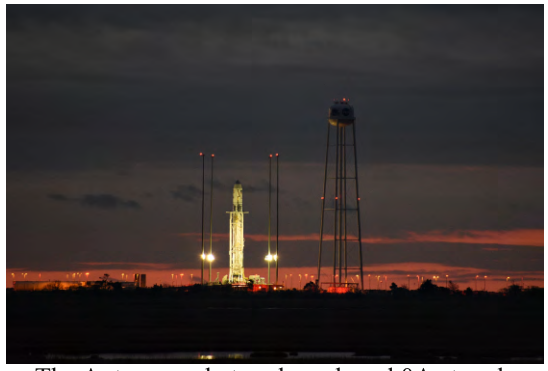
Blamed for aborting a NASA launch
on a cold November morn,
Little JetBlue wishes
it was never born.

November 12, 2017
MARS - Wallops Island

At daybreak on a freezing November morning on Virginia's Eastern Shore the Orbital ATK Antares rocket awaited liftoff to resupply the International Space Station (ISS). The slender white rocket had stood patiently on the Mid-Atlantic Regional Spaceport's (MARS) launch pad 0A since it was rolled out of the Wallops Flight Facility's Horizontal Integration Facility during the early morning hours of November the 9th.

The OA-8 mission was slated to carry the heaviest ISS resupply cargo payload thus far using an Antares rocket. The OA-8 mission was the second MARS Antares launch since the failed OA-3 mission in October 2104 and the second mission utilizing the combination of the newer RD-181 engines along with the upgraded Castor 30XL second stage motor. Orbital ATK ran the OA-5 launch to its delta velocity threshold in order to determine just how much increased lift capability was generated by switching to this upgraded engine/motor combination.

Close up of the Antares rocket on launch pad 0A two days before the launch.
Photo: A. Mankevich



The Antares rocket on launch pad 0A at early dawn on launch day November 11th.
Photo: A. Mankevich

Table 1: Comparison of Antares Rocket Versions				
Antares v.120 – ORB-2			**Antares v.230 – OA-8**	
Rocket Height	40 m/131.5 ft.		Rocket Height	42.5m/139 ft.
Gross Lift Off Weight	281,300 kg		Gross Lift Off Weight	292, 000 kg
Cargo Delivered	1,657 kg		Cargo Delivered	3,350 kg
LOX tank	178, 000 kg		LOX tank	175, 000 kg
RP tank	65, 000 kg		RP tank	65, 000 kg
Castor 30B motor thrust	303 kN		Castor 30XL motor thrust	464 kN
AJ26 engine thrust	3, 265 kN		RD-181 engine thrust	3,844 kN

Your intrepid ZOG-43 photojournalists braved the overbooked hotel rooms and freezing temperatures to report on this launch. The 7:37 am launch time on November the 11th required a 4:00 am wakeup to be at the bus staging area by 5:30 am. The sun was just beginning to sow daylight as the media-filled busses were pulling up to the radar site which served as the media/photographers' site. Fingers frozen raw by the cold, biting wind were coaxed into setting up the tripods and cameras.

A PA system was announcing all the countdown milestones and communications between the various launch control officers. The launch appeared to be progressing nominally despite a few minor issues that were corrected by the Range Control Center. The photojournalists sprang into action when the PA announced the T-2 minutes mark. At T-90 seconds the voices on the PA system announced a hold due to an aircraft violating the restricted airspace around the WFF. Consequently, the launch was aborted.

A media member aboard the bus ride from the radar range availed himself to a website that tracks the flight path of airlines en route to their destinations. The internet search disclosed that a JetBlue flight appeared to be the intruding culprit that triggered the launch abort. The media member asked a JetBlue representative for comment on the incident. The JetBlue rep advised that the company would be looking into the incident.

At the 10:00 am press briefing to recap the launch abort, Bill Wrobel, Directory of the Wallops Flight Facility (WFF), disclosed that the WFF Range Control Center had already determined that the intruding aircraft was in fact not a commercial jetliner. Instead, a general aviation aircraft flying about 5 miles offshore was responsible. Its low flight altitude of around 500 feet was responsible for the late detection by the Range Control Center of the

Continued next page

Antares Launch, continued

aircraft's intrusion into restricted airspace. Poor JetBlue came under a villainous attack as the presumed intruder responsible for the day's launch abort.

The launch was at T-90 seconds when the hold was called due to the violation of airspace. The countdown was in its three minute auto-sequence terminal countdown mode at the time of abort. There simply wasn't enough time to re-cycle the automated countdown to launch within Saturday's five minute launch window. NASA had promptly rescheduled the launch for the following day at 7:14 am, again with a five minute launch window.

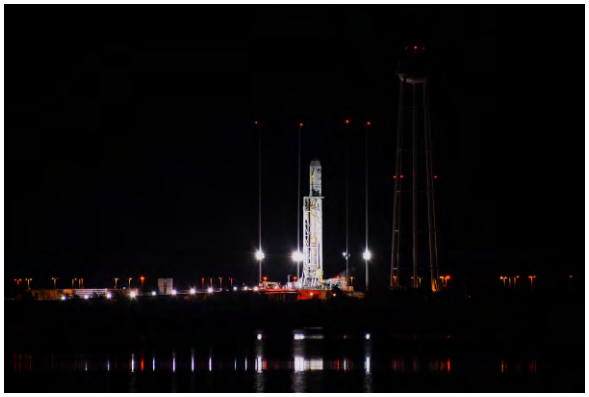
Your sleepy ZOG-43 photojournalists again boarded the media busses early the following morning for the trip to the radar site. Whereas the skies for the previous day's launch attempt were generally clear, this day's skies were cloudy. The temperature was slightly warmer and winds were calm. However, the low cloud ceiling meant that there would be little contrast between the rocket and its background skies. Another disappointment was that the flight of the Antares would be obscured shortly after liftoff.

Once again, concerns for another aborted launch surfaced as the PA system announced around the T-10 minute mark that Range Control was tracking two boats and a single aircraft in the restricted zone. Fortunately, this time the intruders were warded off in time for launch.

Launch of the Antares OA-8 mission to resupply the International Space Station.
Photo: A. Mankevich

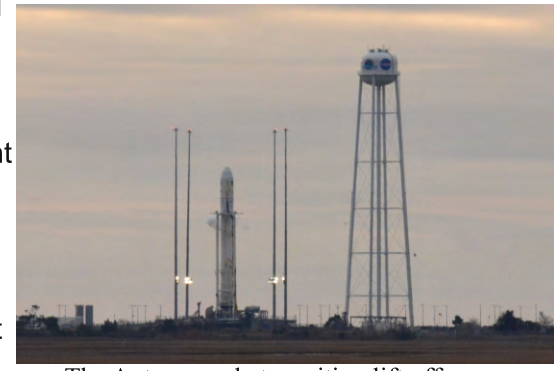
Kurt Eberly, Orbital ATK's deputy program manager for the Antares rocket, reported at the post-launch press conference that this flight still exhibited some over-performance that resulted in a higher orbit than was expected. Orbital ATK will do some further assessment to determine how this excess margin can be applied to future Antares flights. This bonus lift capacity could result in heavier cargo loads within the Cygnus spacecraft.

The next Antares flight from the Wallops Flight Facility is listed as No Earlier Than May 2018.



The Antares rocket at night time on November 9th after being transported from the Horizontal Integration Facility.
Photo: A. Mankevich

The cloudy conditions enhanced the flames of the twin RD-181 engines as they sprang to life. 3.7 seconds elapsed before the hold-down bolts released the rocket. It took an agonizing eight seconds until the Antares cleared its umbilical support structure. Then, finally the full roar of the engines reached the press site about 12 seconds after ignition. By then the rocket was well clear of the 307 foot water tower adjacent to the launch pad. Since the rocket quickly disappeared into the low lying clouds, the full-throttled roar of the engine noise became perhaps the most satisfying aspect of the launch.



The Antares rocket awaiting lift off on an overcast day.
Photo: A. Mankevich

(L to R) Tabatha Thompson, Dan Hartman, Kurt Eberly and Frank DeMauro at the Antares mission OA-8 post launch news conference.
Photo: A. Mankevich

Zog-43 Gains Access to Cygnus Spacecraft Ahead of Next Space Station Mission

By Alan Williams

We started our coverage of the OA-8 Antares Space Station resupply flight dark and early at 6 AM, when we began the three hour journey to Wallops Flight Facility for a visit to check out the payload. On arrival, we badged up then caravanned over to Bldg. H-100 on the west end of the airport grounds. Around 15 people from broadcast media, print, and science blog type operations took part in the viewing. Gowning up (overcoats, booties, and hairnets) took about ten minutes. We all emerged into the clean-room environment looking like we were about to take showers. We joined an almost equal number of Orbital management reps and technical personnel in the facility's white room.

Silvery-sided Cygnus-8 stood in the center of the facility's west side. We all stood on the other side of the room's centerline. Because of stacked hardware crowding us together, moving around took a certain care and awareness of others. Alex kept taking pops from a local TV reporter's elbow. Good fun. My big fear was face-planting on the slick floor while wearing the none-too-grabby booties. Also good fun.

We received an extremely thorough briefing on the upcoming flight, Antares launch operations and such. One special thrill was ex-astronaut Rick Mastrachio announcing that Cygnus would fly as the "S.S. Gene Cernan", in honor of the recently deceased Apollo 17 Astronaut.

Cygnus-8 resupply module.
Photo: A. Williams

The press briefing was held in the cleanroom.
Photo: A. Williams

The 20 ft. tall Cygnus was comprised of a pressurized cargo compartment holding 7,385 lbs. of food, supplies, experiments, and "stuff", and a smaller service module providing solar arrays for power, attitude controls, and orbital maneuvering guidance and thrust. This also mounts the grapple fixture used to dock with the International Space Station (ISS). Finally, for this flight it would mount a launch rack for 14 "Cubesat" micro spacecraft to be released after leaving the ISS' orbit.

King Zog taking notes.
Photo: A. Williams

After our event, Cygnus "Cernan" would be moved down to a remote facility on the Island for hydrazine monopropellant loading, then mated to the OA-8 (pronounced "Oh-Aee-8") vehicle in the Horizontal

Continued next page

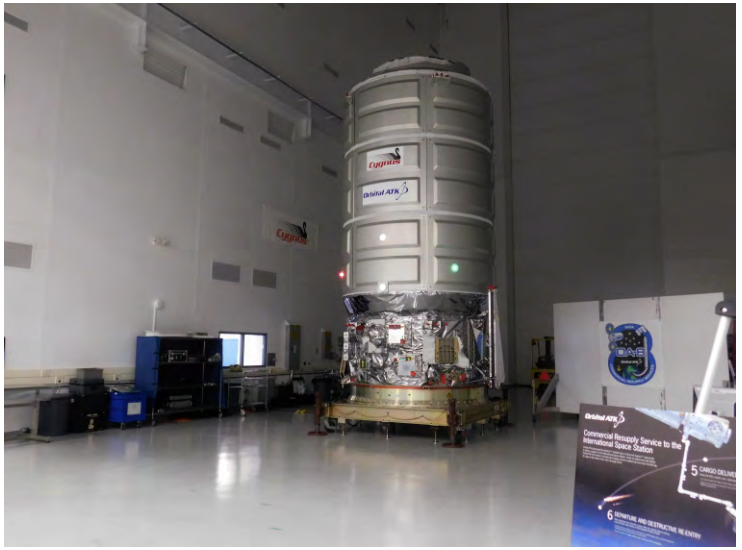
Cygnus-08, continued

Integration Facility. Transfer of the completed rocket south to Pad 0-A (pronounced “Zero-Aee”) completed preflight phase operations very early on Thursday, Nov.9th.

A second press event was a look at the newly remodeled Launch Control Center. Located at remodeled dormitory buildings near the center of the Wallops airport grounds, all vehicle flights regardless of size are directed from here. It’s a far cry from the old days when everything was run by analog switches in the blockhouses, and tracking was via surplus Nike vacuum pen-plot boards in an old Navy hanger. The former decades-old systems have all been replaced with the most advanced timing computers, touchscreen graphics, and video systems available. Things like setting launchers to firing positions are still controlled by the island blockhouses, but most important preflight operations are now run from the main base. The new systems now equal any space launch facility in America.

Astronaut Rick Mastrachio announcing the Cygnus OA-8 christening to honor Gene Cernan.
Photo: A. Williams

Wallops new state of the art Launch Control Center. Alex can be seen on the far left and Alan on the far right.
Photo: S. Hammer



Room lighting dimmed so the Cygnus Cernan running lights are visible.
Photo: A. Williams

ZOG-43'S SHOP SPOTLIGHT

Holiday Wish List

By Don Carson

Photos: D. Carson

Whether you have been naughty or nice, here is a check list for that new shop you'd like:

- ☐ Good natural light
- ☐ High ceilings
- ☐ Plenty of shelving for storage
- ☐ Dedicated workstations for your reloadable motors
- ☐ A place to store those fragile glider wings
- ☐ Year round climate control
- ☐ A comfortable chair/stool
- ☐ And, for the love of all that is good in this life, one table that doesn't have stuff all over it.

You can check it out at the National Air and Space Museum's Udvar-Hazy Center Restoration Hanger.

October 2017 Mt Airy Sport Launch Report

By Alex Mankevich – NARHAMS President

The benevolent character of NARHAMS shone on a bright, sunny and nearly perfect autumn day. John Stalnaker had arranged with NARHAMS to have this launch be prepared to accommodate several scout flyers. To this end, Mr. Stalnaker teamed up with Section Advisor John McCoy, Mary McCoy and Secretary Sarah Jackson to guide the scouts through the rocket assembly and flight preparation at one of the park's pavilions. Mr. McCoy's forward thinking included having the scouts complete their flight cards and the park's waiver form while at the pavilion. Thanks to these preparatory measures the safety checks and pad assignments out on the launch range went smoothly.

A blanket of rockets.
Photo: A. Mankevich

Our launch hours reverted back to an earlier start time due to the waning amount of available daylight. The Jacksons, Mike Kelley and Alex Mankevich arrived at the storage unit around 9:15, so that the launch range could be up and running by the 10:00 o'clock start time for NARHAMS members. We had set up both the 6-position launch racks and three away pads. Ed Jackson took on the firing officer duties. Alex handled the safety

A boost at the pad.
Photo: A. Mankevich

Mike Kelly's Crayon on a G76-4G with invisble clear plastic fins.
Photo: J. Filler

Continued next page

October Sport Launch, Continued

checks and pad assignments.

The scouts were flying Gnomes on ¼A motors. All the Gnomes climbed to impressive altitudes thanks to the very light winds, and thankfully drifted very little downrange. Only one shock cord separation was witnessed and one flight in which the streamer stayed jammed inside the body tube. All the remaining Gnome flights were nominal.

Ed and Sarah Jackson both got in a couple of flights around their scout-related duties. Soccer activity during the early morning hours kept the away pads quiet at the beginning of the launch. After the soccer activity concluded, the usual away pad suspect (Mike Kelley) sprung into action. The later part of the launch saw Grace and Joy Thomas fly their rockets multiple times each, including a Mosquito that was actually recovered despite its small size.

All eyes skyward.
Photo: A. Mankevich

NARHAMSters in the mix of launches included Dick Stafford who recorded the most launches at twelve flights (A10 motors up to F59), and Mike Kelley who flew from his staged Estes Savage to his RP Crayon on a G76 motor. Other NARHAMSters keeping the blast deflectors warm were Brad Lowekamp, Stephen Darnell, Bill Boublitz and Jim Filler. Rocketeers who got in several flights included Peyton Brandenburg with 10 flights on his Crossfire, Black Diamond and Amazon and Blue Ninja rockets, the Thomas sisters Grace and Joy flying their Alpha III, Flying Colors, Baby Bertha and Big Daddy models, and John Petrie rocketing his Loc Nano-Megg and Phoenix Bird models.

Sarah Jackson pitches in with the scouts.
Photo: A. Mankevich

John McCoy helps the scouts prep.
Photo: A. Mankevich

Once the smoke had cleared and the blast deflectors cooled down we took a tally of the flights. One hundred and thirty eight flights went down into the record books.

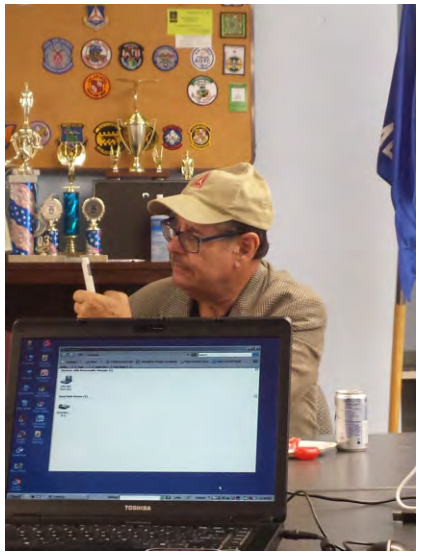
Meeting Highlights

Outside--The Moon is full and bright as street lamps.
Photo: E. Pearson

Inside we meet and work on models (Ed Jackson shown here working on a FlisKit Herc-5--assembled model at bottom).
Photo: E. Pearson

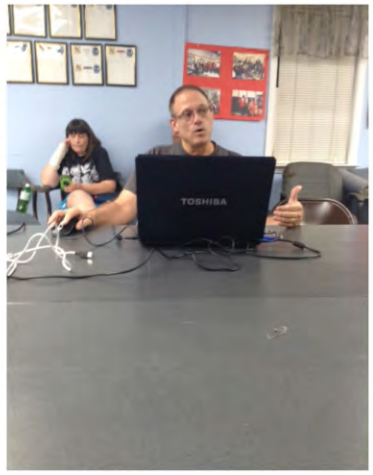
November

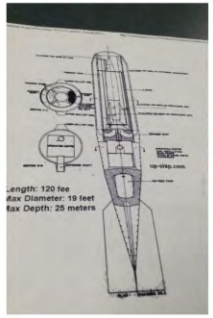
Zog prez Alex Mankevich models a parachute Marty Brown graciously donated to the club (November section mtg).
Photo: E. Pearson

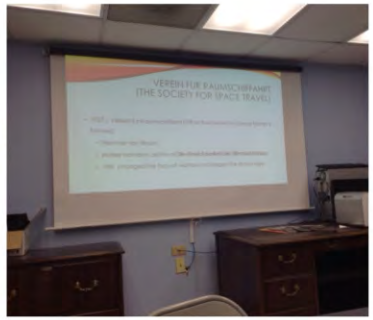


The official narhams newsletter photographer furiously photographing the action at the October meeting.
Photo: J. Fineran

October







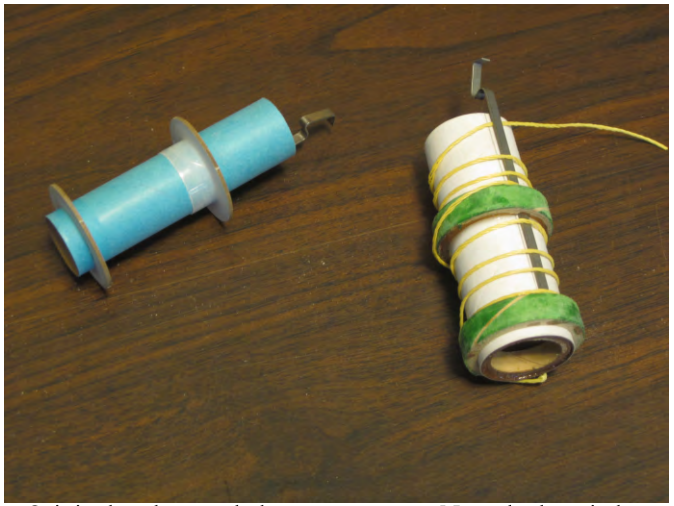
Chris Greco delighted the members with a talk on German rockets. Chris' talk included a book review (Von Braun by Michael Neufeld--Smithsonian Press), photos, models, and a PowerPoint presentation on the V-1, V-2, water-towed V-2, Rheintochter, Rheinbote, HS 293, Schmetterling, Enzian, and more! A real treat. The Zog (Alex Mankevich) brought refreshments of German food to go with the theme.
Photo: E. Pearson

Motor Upgrades (A Primer)

By: Jim Miers, NAR 60876

Some modelers find it amusing to fly kits with motors not originally intended by the manufacturer. Often these changes upgrade the motor to a higher impulse than the model was designed to accommodate.

Any such upgrade in motor impulse will require two primary considerations from the modeler; structural integrity and aerodynamic stability. Even upgrades that involve nothing more than flying with a higher impulse motor than recommended by the manufacturer, for example flying a low power model with an 18mm D composite will call for extra care in construction and possibly the need to make structural changes to components.

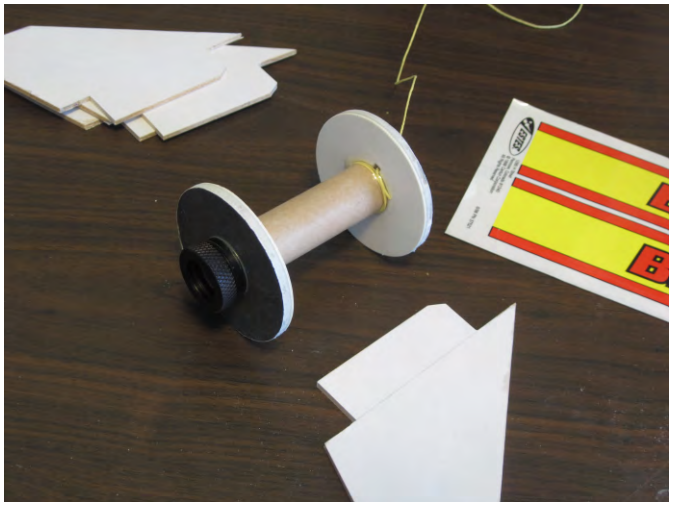


Original and upgraded motor mounts. Note the heavied up centering rings and Kevlar shock cord mount. I ground the top end of the retaining hook down flush with the inside surface of the motor block to ensure a correct fit for single use composites, although in this case their use is highly unlikely.
Photo: J. Miers

<u>Structural Integrity:</u>

Increase in the motor impulse will place stresses on the model beyond what the manufacturer intended. Within limits, this poses no real problem since most model kits are over-engineered; nonetheless the modeler should take extra care in construction; make sure all parts are sound and undamaged, glue joints are well constructed and reinforced, and fins are aligned properly.

Increase in motor diameter or length means a new motor mount. The combinations and permutations of body and motor diameters, impulse and average thrust make a thorough discussion of this re-design problem impossible (not that I'd attempt it in any case) but keep in mind, regardless of the new motor's physical dimensions, a motor with significantly higher thrust or impulse may require significant changes to the motor mount, for example replacing punched card-paper type rings with heavier spiral wrapped or aircraft plywood, especially if the design or upgrade does not include internal fin tabs.



Upgraded motor mount for an Estes Big Daddy with screw-on retainer. I made a fin alignment guide for this model out of foam-core board, and as the cut-outs were the right size for centering rings, I trimmed them down and glued them to the paper card rings as added reinforcement. The kit instructions call for attaching the shock cord directly to the upper centering ring, but this is a poor design whatever motor is used since it puts the elastic cord in direct contact with ejection gasses, so I replaced it with a leader of 200# Kevlar braid. The centering rings were now much thicker than those supplied with the kit, so the final assembly required trimming the fin tabs to fit. Note also the paper reinforcing added to strengthen the balsa fins.
Photo: J. Miers

Fins and joints need to be carefully constructed. In general, the highest stress on fins is aerodynamic, accordingly motor impulse is a significant factor, since problems are more likely to arise due to high terminal velocity. Fin to body joints need be as strong as possible. Use aliphatic resin or epoxy adhesives (I'm not a big fan of CA, but that's personal), and build up the fillet to increase the contact area and lessen vibration at the joint. Joint strength should be increased by sanding the glassine finish from the body tube and pin-punching through the body tube under the joint to form "glue rivets." Also consider through-the-wall fin mounting if the kit doesn't already use that feature, also upgrading

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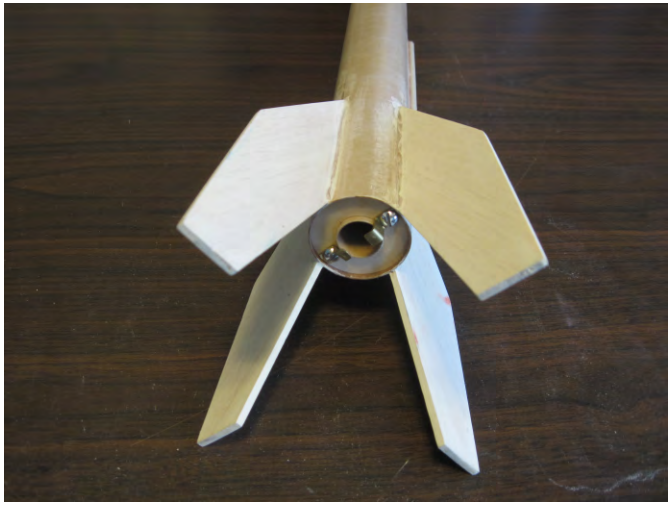
Motor Upgrade, Continued

balsa fins to basswood or plywood. Through the wall fin mounting will increase the strength not only of the fin attachment but the motor mount as well.



A Big Bertha upgraded to handle an 18mm D composite. The motor mount is the same size as supplied by the manufacturer, and will fly with the same motors, but the centering rings were replaced with 3/32 aircraft ply, and Kaplov clip retainers installed.
Photo: J. Miers

I often replace the included spring retainer hook with a more robust method (screw on end cap, Kaplov clips) since larger motors often carry a more energetic ejection charge which can force the hook aside and blow the motor right past (this is especially true when flying with composites). If you decide to keep the included spring hook, be sure a substantial motor block is properly installed if the kit does not already include one. In addition, if you are intending to fly with composite motors which sometimes have complex shapes, pre-test the motor mount assembly before gluing anything to ensure the block, retainer hook and other hardware will not interfere with intended motors. If you decide to keep the included retainer hook, plan on wrapping tape around the motor, hook, and motor mount for added security against the motor being ejected.

Heavier ejection charges can also cause shock cord failure, so plan on strong connections at both ends. This is especially true if you have added nose weight to re-stabilize the model. If the model includes a plastic nose, avoid using the flimsy attachment loop cast into the base; small holes drilled through the base flange (try not to drill through the seam) make a more secure attachment.

Manufacturers are sometimes parsimonious with their shock cords; you may want to replace it with a longer, heavier cord.

The possibility of structural failure in the body itself should be considered, especially with very long, thin designs. I cannot give any particularly useful advice here, other adding reinforcement by extending the stuffer as far up the body as feasible, with added centering rings placed along the way. Be aware that both accelerative and aerodynamic forces will be at work, so any high impulse motor, regardless of its average thrust, can potentially cause structural failure. In extreme cases, upgrades may be unworkable.

Along with other issues, you might want to upgrade the launch lug to a larger diameter, or replace it altogether with rail buttons.

Aerodynamic Stability:

Most motor upgrades lead to a heavier motor, motor mount, and fins, all of which will move the mass center closer to the rear of the model, potentially destabilizing the design. You should determine the pressure center of the design by whatever method works for you (silhouette method, Barrowman's, CAD software, etc) and adjust the mass center forward by adding nose weight if needed to re-balance. This is no different than for any scratch built model.

Balancing a pre-assembled model (suspending by a string would work as well). This model was pre-assembled exactly per manufacturer's instructions with parachute, shock cord, and recovery wadding inside, and a C6-5 motor installed in the original motor mount. The fins are held on with double sided tape. The balance point locates the mass center appropriate for stable flight.
Photo: J. Miers

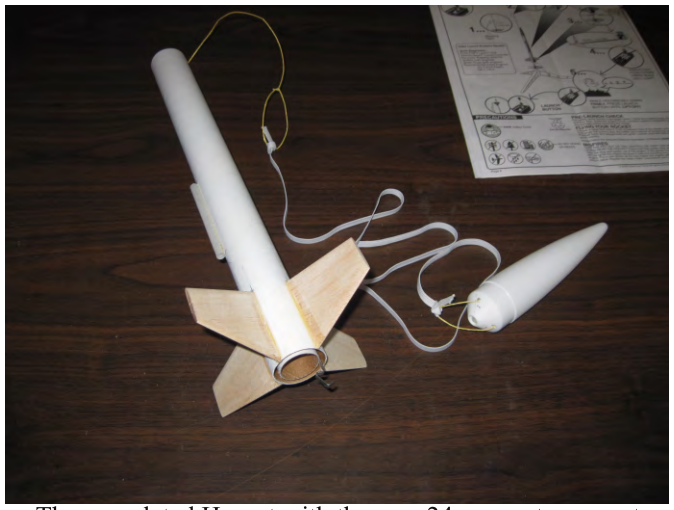
Another method I have used to ensure stability is to "pre-assemble" the model in full flight mode according to the manufacturer's instructions, but without gluing anything. Hold loose parts in place

Motor Upgrade, Continued

with a little tape judiciously applied. Include recovery and wadding and insert the heaviest motor recommended by the manufacturer.

In this condition the model cannot be flown, but the CG/CP relationship is appropriate for stable flight (assuming you can trust the manufacturer). Now, find and mark the balance point on the air-frame. This marks the lowest mass center know to be consistent with stable flight.

After completing assembly of the upgraded model, again with recovery device and wadding in place, insert the heaviest motor you now intend to fly. Then add sufficient mass to the nose to restore the balance point to the one earlier marked on the airframe. This method restores the CG/CP relationship with the new motor and any upgraded hardware to that originally determined by the manufacturer as being safe.



The completed Hornet with the new 24mm motor mount installed, 3/16" shock cord, and Kevlar leaders. I relocated the fins backward so they are now flush with the rear of the body, about a centimeter from the location called for in the instructions, a further concession for improved stability.
Photo: J. Miers

First time you fly it, alert the RSO this is a heads up flight, same as with any other untested design.

And one last thing to keep in mind. An upgraded model can attain altitudes well out of proportion to the increase in impulse[1]. If you are flying on a small field, or in unfavorable weather conditions, the higher impulse motor will substantially reduce the chance of successful recovery.

[1] – Stine's Handbook of Model Rocketry, Chapter 8, has an in-depth discussion of this issue.

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.

Bits and Pieces

Upcoming Meeting Presentation Topics:

December 2	Holiday Pot Luck Dinner
January 6	Open Build Session
February 3	Frog Award Nominations, Military Missiles

Upcoming Launches/Themes:

December 3	Goddard Visitor Center
December 16	Mt. Airy, Open Theme
January 7	Goddard Visitor Center
No January launch at Mt Airy, stay warm	
February 4	Goddard Visitor Center
February 17	Mt. Airy, Winter Frostbite Birds

Welcome New/Renewing Members

New Members

None

Renewals

Natalie Shafer, Rachel Shafer, Tamyra Shafer, John Shafer

Announcements

Urgent!
NARHAMS Needs Your Body

We need members to attend business meetings and we need volunteers to be launch managers.

There has not been enough members at the last two meeting to make a quorum. The club cannot conduct business without a quorum. We need your body, there are two requirements: your dues must be current and you must have a pulse.

Every Sport Launch we hold needs to have a Launch Manager. It is not a hard job, you get lots of help. You don't need a truck, you get lots of help. You don't even have to know how to do it, you get lots of help.

The two launches we had scheduled in November were cancelled because no one had volunteered to be the launch manager. We had the fields, we had the weather, but we couldn't launch rockets.

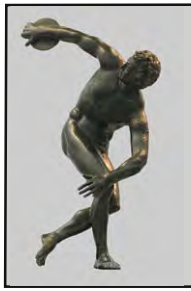
The annual calendar does not appear in this issue because we did not have enough people at the last meeting to plan the year's activities and volunteer to be launch managers.

We cannot rely on the same old regulars to do this all the time. That is how you burn people out and lose them.

Please consider attending some meetings and contribute your ideas (there will be food). Also, please consider volunteering to be a Launch Manager for just one launch. Contact Alex and let him know you what to help.

Thanks all,

Your Editor (who is getting great support from the club, thanks, and has volunteered to be a Launch Manager)



Competition Corner: BBQ and Contest Reports

Carl McLawhorn Memorial Fly-Off 5

by Jennifer Ash and Mark Wise

Not a lot of NARHAMSters were planning on making the trip north to fly at Pittsburgh for the fifth Carl McLawhorn Memorial Fly-Off (CMMF). This was also the first NRC that PSC would be flying, so it would be interesting to see how they would do the CMMF events. Jennifer decided the Wednesday before that she would attend. Mark had been planning on attending, and we were both taking more sport models than competition ones.

John Brohm of PSC and the Flying I-Beam Kids team had extended a nice invitation for those of us getting up there on Friday to come over to his house for a BBQ. Rod Schafer's mom made us three apple pies using apples from the Schafer family farm. John and his wife, Lori, have a lovely house, and John's workshop for rockets can be considered the gold standard! He keeps it spotless (part of his personality), and he even has a paint booth room inside. No wonder his scale models are flawless! Thanks to John and Lori for the hospitality, and thanks to Rod's mom for the excellent apple pies!

Rod and Steve Foster were using a different scoring system to determine the winner of the CMMF. Predicted Duration was a required flight, and the best score of your next two out of four events would determine the winner. This allowed you NOT to have to fly all the events. They also just made it one division, so teams and individuals would be competing at the same level.

PSC was also running the usual NRC events as well. Believe it or not, because of the less restrictive rules, it was a much more relaxed competition launch. That didn't stop Glenn Feveryear and Jim McGraw from launching a model for just about every NRC event, AND

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Barbeque Report
By John Brohm
Pittsburgh Space Command

I don't know if you have anyone writing up something about PSC's recent Carl McLawhorn Memorial Flyoff V event, but I've attached a photo of those hardy souls that showed up for the kick off barbecue at my place Friday night, the eve of the two-day competition event.

Nestled in the quiet suburbs of Mars PA, we enjoyed a nice evening, but with a hint of chill, and I'm of the opinion, based on the scarce leftovers, that everyone had a good time. Dinner was capped by some homemade apple pie, courtesy of the Schafers. Some great hobby conversation round the fire pit, and I think it fair to say that everyone left relaxed and ready for the competition.

Lori and I are already looking forward to CMMF VI, and the opportunity to host the visiting community at our next CMMF Eve's dinner.

The dinner guests, left to right:

Maria Schafer, Steve Foster, Jennifer Ash, Mark Wise, Laurie Foster, Lori Brohm, Bruce Canino, and Rod Schafer. Not shown: John Brohm – he's busy taking the photo.

Competition Corner, Continued

the CMMF events.

The weather in October can be rather iffy for flying, and we didn't know what to expect. We were incredibly lucky to be gifted with light winds, temperatures around 70 degrees, and clear skies most of the time. Mark picked up one last mild sunburn for the year, while Jennifer had the forethought to put on some sunscreen.

The CMMF is a launch to honor Carl McLawhorn, the founder of Semroc. PSC usually picks one event in which you are encouraged to fly a Semroc model. For this meet, that event was Predicted Duration. Jennifer flew her Launch Magazine model, which got team QFPB 3rd place overall. Mark flew his SLS Laser-X on a cluster of two D12-7s, but finished far back in the pack.

For the CMMF, the toughest event was E Streamer Duration, both as a modeler and as a timer. The corn fields made recovery interesting, and the models were tough to track. Jennifer decided to fly her Viper 4 on 2 D12-5s. It got 12 seconds, but she had a qualified flight.

Jennifer did a lot of flying on Saturday. On top of two competition flights, she flew eight sport models. Two were Semroc models, the Point and the Constellation. She also launched her Kitbash model, Full Moon, Totally Tubular by ASP and the Big Betty. She launched the Launch Magazine for fun and even launched her Graduator on an F23-4.

Mark split his flying evenly between Saturday and Sunday, flying his Lepton from Red River Rocketry on a B6-0 to an A8-5, which may have been the only staged flight of the meet. He flew the Interrogator-G on Saturday and the Eradicator on Sunday, both on F52-5s, and both of which are Sirius Rocketry kits that Mark has flown repeatedly at NARHAMS launches. Although not really an odd-roc enthusiast, he flew a Halloween candy dish that he'd converted into a saucer, based on a design by Bob Kaplow. Saturday's saucer flight was a heads-up affair because we weren't entirely sure that it would be stable, but it flew really well on an F50. He flew it again on Sunday in front of a larger crowd, and it turned in another good performance. Postflight inspection revealed a crack in the bottom of the dish, so Mark will retire saucer 1.0 and build an improved version in time for the October 2018 sport launch.

CMMF 5 was a fun, well-run meet, and the beautiful weather and pleasant company made for a memorable weekend. If you haven't been there, it's definitely worth adding to your 2018 launch calendar!

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

A Model For Each Decade
50 Years Since The First Launch Of A Saturn V

Modeler: Bill Boublitz.
Photo: M. Anderson

Modeler: Jim Filler.
Photo: M. Anderson

Modeler: John McCoy.
Photo: M. Anderson

Modeler: Saturn V_Oscar & Nelson Gibson.
Photo: M. Anderson

Modeler: Tom Jackson.
Photo: M. Anderson