



# AEROPAC Winter “Bonus” 2016 Newsletter

Photo by Phoenix 4, courtesy of Curt Von Delius

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## AEROPAC Year End Party

Are you all having rocket withdrawal symptoms now that AeroPac's rocket season is over?

Well.....there is one way to help with that and that is show and tell with our friends and lots of food.

AEROPAC's year end party will be held on December 4th from 11-3 pm at Pizza Orgasmica and Brewing Company located at 812 Fourth Street in San Rafael (parking on Fifth street).

There is a HUGE room in the back of the restaurant that will hold us and our new projects for next season we are all working on. Come share good times with friends, lots of pizza, salads and sodas and just have a great afternoon. However, if you want beer (which I'm sure many of you will) you will have to go out to the full bar and order some of their delicious freshly brewed beer and pay for those yourself.

There will be a BOD meeting from 11 to 12 and everyone is welcome to join that as well. If not, start showing up at noon and the food will probably start coming around 12:30 or 1.

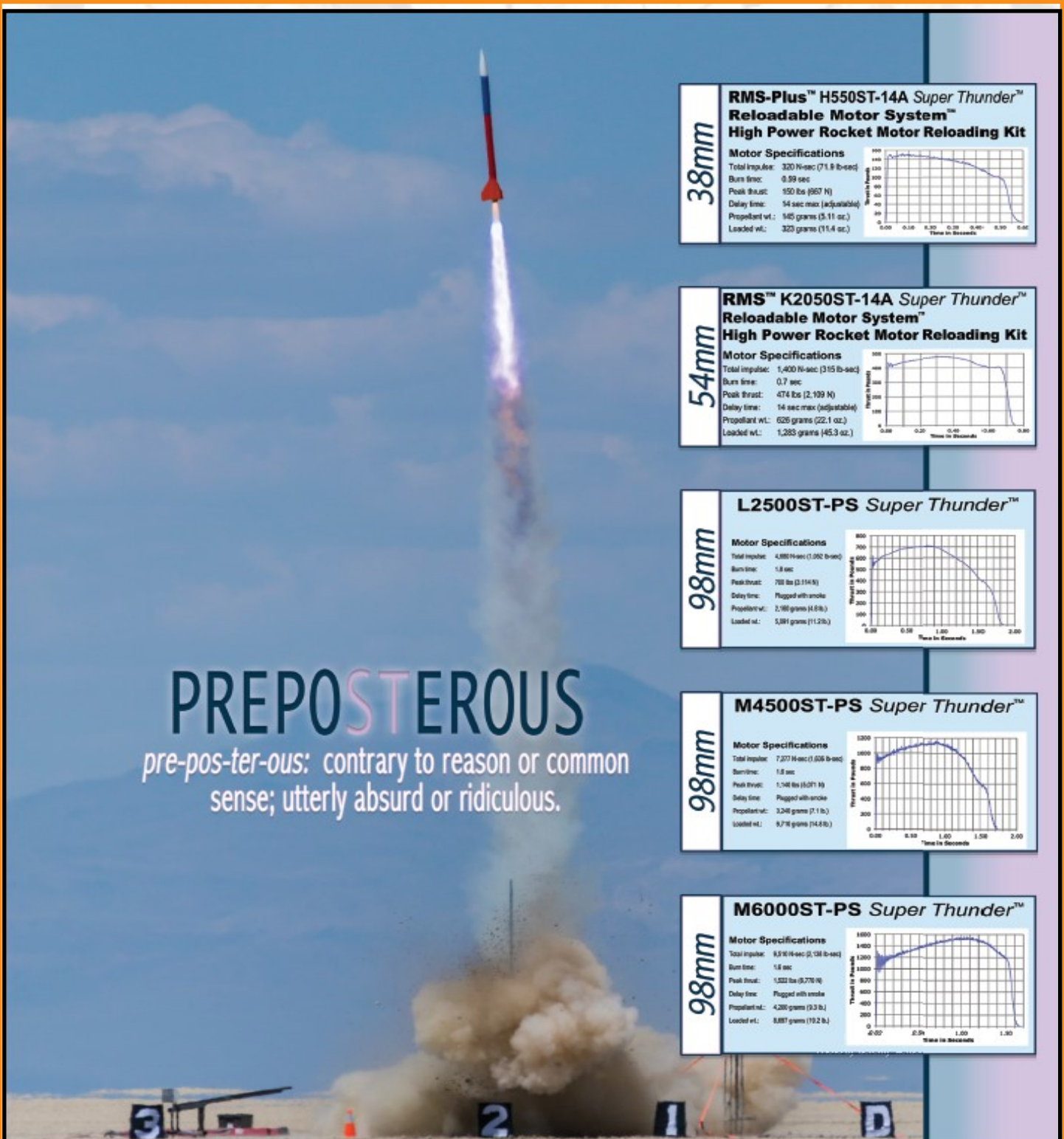
Look forward to seeing many of you at the party. Don't forget to bring extra money for your raffle tickets. There will be lots of good prizes. If you don't buy tickets....don't be mad if I win something....LOL.

Please email me off line at [apfueled@yahoo.com](mailto:apfueled@yahoo.com) to RSVP.

Becky Green







**PREPOSTEROUS**  
pre-pos-ter-ous: contrary to reason or common sense; utterly absurd or ridiculous.

**38mm**

**RMS-Plus™ H550ST-14A Super Thunder™ Reloadable Motor System™ High Power Rocket Motor Reloading Kit**

**Motor Specifications**

- Total impulse: 320 N-sec (71.9 lb-sec)
- Burn time: 0.59 sec
- Peak thrust: 150 lbf (667 N)
- Delay time: 14 sec max (adjustable)
- Propellant wt.: 545 grams (5.11 oz.)
- Loaded wt.: 323 grams (11.4 oz.)

**54mm**

**RMS™ K2050ST-14A Super Thunder™ Reloadable Motor System™ High Power Rocket Motor Reloading Kit**

**Motor Specifications**

- Total impulse: 1,400 N-sec (315 lb-sec)
- Burn time: 0.7 sec
- Peak thrust: 474 lbf (2,109 N)
- Delay time: 14 sec max (adjustable)
- Propellant wt.: 626 grams (22.1 oz.)
- Loaded wt.: 1,283 grams (45.3 oz.)

**98mm**

**L2500ST-PS Super Thunder™**

**Motor Specifications**

- Total impulse: 4,880 N-sec (1,092 lb-sec)
- Burn time: 1.8 sec
- Peak thrust: 700 lbf (3,114 N)
- Delay time: Plugged with anode
- Propellant wt.: 2,766 grams (9.8 lb)
- Loaded wt.: 5,881 grams (12.9 lb)

**98mm**

**M4500ST-PS Super Thunder™**

**Motor Specifications**

- Total impulse: 7,277 N-sec (1,628 lb-sec)
- Burn time: 1.8 sec
- Peak thrust: 1,146 lbf (5,071 N)
- Delay time: Plugged with anode
- Propellant wt.: 3,246 grams (11.4 lb)
- Loaded wt.: 8,716 grams (19.0 lb)

**98mm**

**M6000ST-PS Super Thunder™**

**Motor Specifications**

- Total impulse: 8,516 N-sec (1,918 lb-sec)
- Burn time: 1.8 sec
- Peak thrust: 1,532 lbf (6,776 N)
- Delay time: Plugged with anode
- Propellant wt.: 4,265 grams (15.3 lb)
- Loaded wt.: 8,887 grams (19.6 lb)



**Technical by Design.**

[www.aerotech-rocketry.com](http://www.aerotech-rocketry.com)

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## First Impressions of Black Rock

John Hochheimer

President, National Association of Rocketry

I have traveled many parts of our great country and have seen many of its unique features close up. But, as we turned the corner at Gerlach, I started to see the vastness that I would experience for the next 5 days on the playa. As we veered onto Rt 34 the anticipation grew. It has been a while since I have had to rely on navigation using directional equipment. My travelling companion and I changed our conversation from rocketry, universities, and other life experiences to navigation when we got to 12-mile gate. Since Burning Man was still in the clean-up phase, there was still some activity and a snow fence that served as a point of reference. Sure there were the hills to the left but we knew they were far away. I guess technology helped a bunch, because I was able to track our progress on the iPad and compare to the way-points programmed into the maps app. Then, we spotted the vehicles and tents ahead. At that point, I knew “lost” would not be the first thing remembered about the trip.

Stepping out of the vehicle, my first impression was this place is really dusty. (I know, big revelation.) The range was taking shape and I was impressed with the distances from campsite to the pads. A little perspective here. I live on the East Coast, just outside of Washington, DC. HPR that I have experienced paled in comparison. There were only a few flights that day for me to witness, a taste of more to come. The first flight I witnessed probably used more N-s than the total of all my flights to date. The rest of the afternoon was spent meeting many new acquaintances, unpacking and setting up my playa bedroom for the week, and getting used to the incredible vastness of the playa. I also helped to set up the large, away pad in anticipation of a 100K flight the following day.

The afternoon ticked away and dusk transitioned into night. I was not prepared for the dramatic temperature change. I think that first night, I had on all of the layers that I packed to stay warm. I was staying with good friend and fellow NAR board member John Lyngdal and new friend Joe Bevier. They know how to host a campsite; great food, awesome wine, and lots of stories. Coming from the East Coast, I had a long day and was ready to sleep after a hearty meal and a few glasses of wine.

My internal clock stays on the eastern time zone, so I was up early to witness sunrise. Oh, yeah, the sunset of the previous evening was spectacular too. The gathering of rocketeers slowly woke up and got the day going. The first big thing was a 100K launch. My recollection was lots of preparations, nervous energy and sighs of relief when the two-stage rocket lifted off. Good news from the flight was everything came back; bad news was the second stage failed to power up. I was impressed by the post mortem and rigor put into determining the failure mode. Also quite impressed by the safety features used to ensure safe recovery.







## First Impressions of Black Rock

**John Hochheimer**

**President National Association of Rocketry**

I heeded all of the warnings to stay hydrated, use sunscreen, and bring sunglasses. Sunset and a clear night brought more spectacular views. As I look at the pictures I took, I wish there was a way to capture how peaceful the playa was in the evening and early morning.

I witnessed many more flights during the week. I also served as ground crew for Joe's launch; a new altitude record for him. There was so much to learn and so many colleagues who shared their knowledge as they prepped rockets, built motors, and used amazing technologies to control various aspects of a flight or track its progress during flight. A shout out also goes to Becky Green. She worked with a group of students to build airframes for L1 and L2 certifications. I think all built their rockets and certified over the course of 3 days. Pretty impressive!

I came to Black Rock to experience the ARLISS project. In a nutshell, the project challenges students to design payloads and miniature satellites that are launched in a standard airframe with a standard motor. The National Association of Rocketry recently began supporting ARLISS and its small satellites program. This year, we increased our participation by building ARLISS airframes. Unfortunately, our build time was too compressed to allow us to complete the airframes in time for this year's launches. In addition to my many new experiences at Black Rock, witnessing the ARLISS project brought a new perspective of the talent and imagination of engineering students around the world. I could write many more words about my thoughts on the really amazing projects that I witnessed, but I'll save that for perhaps another time.

Leaving Black Rock was hard. Sure I was going to a hotel where I could take a long, hot shower to get some of the dust off of me. However, I was leaving a spectacular part of our country's natural beauty, many newly made friends, and a much slower pace than the work environment that I had waiting for me. I have already marked my calendar for next year and planning what I can fly. My dusty shoes remind me of a place I want to return.

One ironic last fact. I grew up on my family's farm which is located in Black Rock, PA. Just as serene, but very different.



**John Hochheimer**





## Bay Area Rocketry's Truck Bursts Into Flames!

As Mike Gentile was returning from BALLS back in September, cruising along Highway 99 near Elk Grove, his engine compartment began belching smoke. After pulling over a couple of off duty firemen stopped and managed to get the fire put out. However, the starter motor was cranking, would not shut off and the hood would not open! This created the potential for yet another fire.



The Bay Area Rocketry sign on the truck led to an obvious question - "What do you have in the bed of the truck?" Answer: "1.4!" Reply from the now assisting CHP officer: "Open this thing up now!"

Hammers, axes and a "Jaws of Life" appear and any hope of saving Mike's 2016 Chevy Silverado HD truck with only 28,000 miles on it disappears.



The Good Samaritan crew went to work and prevented a total disaster. Just imagine a truck bed full of AP cooking off along Hwy 99. Definitely not good.

The apparent cause was a problem with fuse location of an add-on accessory but insurance paid up and Mike has a new truck. Mike figured this is his 17th new Chevy going back to when he was 17.



**Mike's un-accessorized new Chevy.**



**More bad news! A drum sheared off his trailer and lost the wheel. He never made it to TCC's November Launch.**



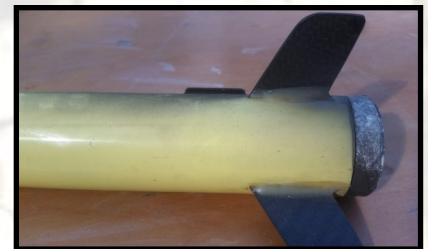


## Richard Hagen's Rocket - "Mostly Motor!"

Tony Alcocer

While at XPRS, Seth Wallace pulled out one of the rockets Richard Hagen had given him. Some of us had seen this rocket in the past. It was a 38mm min dia rocket named 'Mostly Motor!'. It had extremely small fins with a fin span smaller than the diameter of the rocket. I'm sure I was not the only one to tell Richard the fins were way too small to work.

I explained the "one caliber fin span rule" to Richard. Richard wanted to see "that rule" in writing some where. I can remember looking for days, for a link or source on fin span requirements. I was unable to find any info about it and heard about it many times from Richard!



The rocket, now known as "that rocket of Richard's with the really small fins", was "ready to fly and just needed a motor". So, Seth, Ken Adams and I looked at each other and figured it would be fitting to fly it...for Richard! So we have a rocket named Mostly Motor, we're at XPRS, we've got a billion foot waiver...what motor should we fly it on? Well, none of us wanted to lose a reload case, so we scrounged up an Aerotech DMS I140. That should be good enough for a test flight!

So we...OK, mostly me, started prepping the rocket. Richard had an elaborate shock cord attachment system that we could not use. The chute was a super tight fit so we went with a smaller chute. The rocket had electronics and deployment charges already.



Upon arming the electronics, there was no beeping or anything. Upon opening up the electronics bay housed in the nose cone. Richard had a stack of coin batteries for the power source. I checked them and one was dead. We found a replacement and still nothing. Upon taking a closer look at things, it appears "someone" had wired the altimeter wrong! Negative to positive sort of thing. I wonder if this was done on purpose to see if anyone could figure it out. Once I rewired it all was good and it was beeping out the correct beep sequence!

The rocket had no rail buttons on it and was meant to be launched from a tower. We went and looked at the tower and figured it would be easier and quicker to add some rail buttons too it. I'm not sure Richard would have approved of our rail "button" choice or our attachment method either. But it did work!







## Richard Hagen's Rocket - "Mostly Motor!"

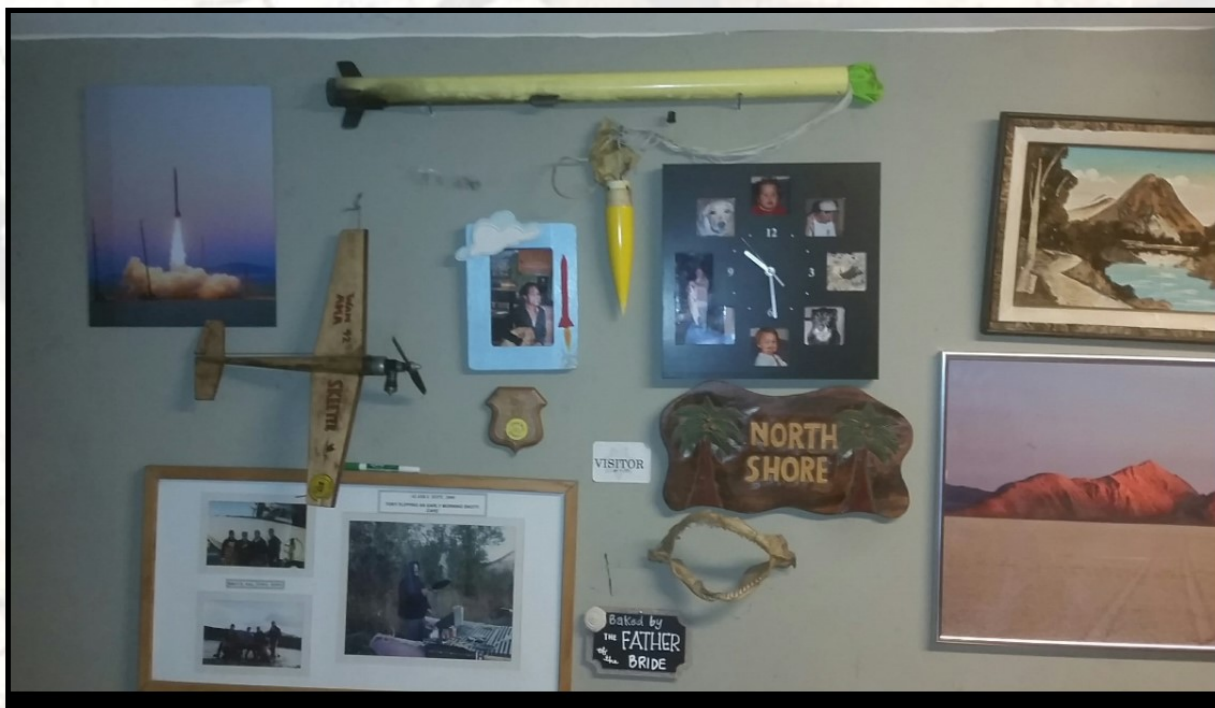
Tony Alcocer

So off we go to the far pads. Load up the rocket, take a photo and retreat back to the flight line. As the LCO read from the flight card, I could hear he too had a lump in his throat as I did. At zero the motor lit and the rocket took off .....as straight as an arrow! None of us could believe how straight it flew! We did not see or hear an apogee event and figure Richard must have grabbed it on its way by!

A short time later Kevin McGrath calls us on the radio and asks if we want him to bring in that little yellow rocket we had just flown. It had landed near him out at the away cells. We get the rocket back and that "smaller chute" that we (me) had put in it did not deploy all the way and the rocket came in fast. One of those little itty bitty fins had cracked a fillet.

So yes Richard, it did fly straight, just like you said it would! And yes, Ken, Seth and I did find your crossed wires and dead battery! And yes, Richard we did glue Acme rail guides to your 38mm min diameter rocket! Wish you were there to see it fly! It's now hanging on my shop wall until you stop by to get it!

Take care friend!







## High Powered Young Rocketeers

The last couple of years have seen a number of under 18 year olds take advantage of NAR and TRIPOLI programs to build and fly high powered rockets.

NAR's "Jr. HPR Participation Program is offered to Junior/Leader members ages 14 through 17 so that they may fly H and I class motors. The Level 1 Junior/Leader HPR participation program will follow the same basic procedure used for the HPR certification for Senior NAR members. However due to legal restrictions pertaining to the purchase and possession of high power rocket motors, ejection charges and related items, there are additional requirements...." . See <http://www.nar.org/high-power-rocketry-info/formal-participation-procedure/>

"The Tripoli Mentoring Program (TMP) allows Tripoli Junior members to learn the skills of high power rocket construction and launching in an environment that is both safe and consistent with all high power rocketry safety codes and legal restrictions.

With TMP, Junior flyers can design and build high power rockets, and launch their own rockets under the direct supervision of a Senior flyer, or Mentor. The Mentor will handle all aspects of the launch that, due to legal restrictions, require flyers to be over the age of 18 and certified for high power motor usage."

See: <http://www.tripoli.org/TMP>

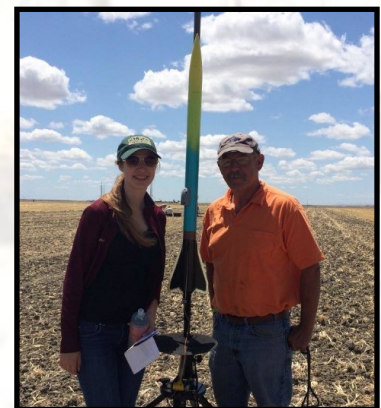
TRA Mentor Tony Alcocer:

As a past AEROPAC prefect I had the honor of giving "the test" to a few kids out on the playa. In addition to this I've also had the opportunity to actually mentor a few kids. Whether they were part of the Sonoma State University S4 program, or local high schools that I've have been working with. Mentoring has kept me busy and on my toes for the past three years. I learned very fast that kids now days sure have a lot of questions! A few times I'd have to do some research myself to find out the answers to the questions (keeping me on my toes).

Some of my mentoring was simple and went along with the S4 program and building the S4 rockets. The S4 rockets were simple 3" rockets that I had kitted up and provided to the high schools. I did a series construction videos on how to build and fly them with the S4 payloads. While other mentoring was one on one with specific goals or small groups with STEM goals in mind.

I asked a couple of students for feed back for this newsletter. You can see their replies below.

"My name is Nicole Gregorio, and I am lucky enough to call Tony Alcocer my rocketry mentor. I began my interest in rocketry blindly, simply hearing that there was a program called S4 that targeted high school students.



**Nicole Gregorio with Tony at Dairyaire 2015**



## High Powered Young Rocketeers

I had never built a rocket before, but I was up for the challenge. I completed my first rocket using a video tutorial that Tony had made for the S4 program. When came time for flight, Tony personally met my small rocketry group in Fresno and taught us about rocket motors, centers of pressure and gravity, and the delicate balance that must be met for a successful flight.

Unfortunately, my rocket exploded just shortly after it left the launch pad, and was incapable of a second flight. My experience left me unsatisfied and to be honest, disappointed, but I was determined to move on. I chose to begin a project in high-powered rocketry, and asked Tony if he would mentor me personally. Like I mentioned previously, I had very little knowledge about rocketry, and with my end goal being to scratch build a rocket that would travel at Mach 1 and reach an altitude of at least one mile while carrying a camera, I was highly unprepared. Luckily, I had the best mentor I could have asked for. Tony helped me step through the processes of designing and building a successful rocket, and taught me everything from how to use tools to the science behind each component. After a couple rainouts, my rocket had two successful launches with video to show for it.

But Tony's mentorship meant so much more than the success of my flights can show. His guidance helped me gain confidence in my knowledge of rocketry and my ability to reach any goals I set. Tony became a role model for me and someone I knew I could always look to when I had questions or needed advice. I learned from him that you don't need fancy tools to build awe-inspiring rockets. All you need is imagination, resourcefulness, and determination to find tools in places you never would have seen them before.

The most important knowledge I gained through my rocketry adventures is that support from a mentor can change your life. Great things happen when knowledge and passion is passed on. A mentor could change your life like mine did."

Nicole (Nicole is currently enjoying her first year at Cal Poly...Tony)

\*\*\*\*\*

Jeremy,

A couple things I remember from Mr Jaguar...(Mr. Jaguar is the name of Jeremy's rocket....Tony)

Before we had our first 'work' day you asked me to research epoxy sensitivity and prevention, and report what I had learned when we met. The project required a lot of epoxy, so this was good to start out with. I thought this was a really good way to go about the mentoring process. Listening to someone talk is good, but there's some cases where doing your own research is beneficial as well. I think there is a balance that can be struck between the two- I thought the little 'homework' assignments every now and then were good for me. Looking back, I think having more wouldn't have hurt- I think we did a couple in the beginning and that was about it.





## High Powered Young Rocketeers

I don't think I have much input in terms of the process required to join Tripoli and do the TMP. Everything went smoothly in that regard.

The actual project itself was pretty advanced- mach 2 and 20,000 feet, with a research motor, is not a beginner project, yet there I was with no high power experience. I fully understood from the beginning that this was not a flight that I would be repeating on my own without experience and time. In other words, I learned where I was in terms of flying experience, and what kinds of flights I was capable of (and what I was not ready for quite yet). I think that this was one of the most important things I learned. I have tried applied this to my flying since then, which has been worth it. The point is, mentors should make sure their students are aware of the importance of experience, so that when they move beyond their TMP they don't try some crazy project without working through the stepping stones to get there first.

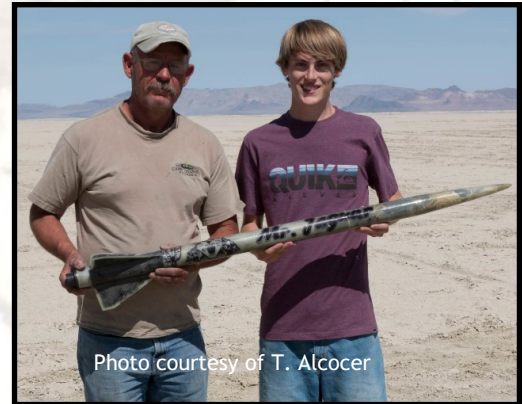


Photo courtesy of T. Alcocer

Mr Jaguar's maiden flight used a research motor we made. I helped, but wasn't really too involved. Looking back now that I have started doing my own research motors, I thought this was a good thing. Mr Jaguar was scratch built from homemade components, and learning to do both of those was plenty. TMP students should be more focused on learning how to build and how to have a safe flight. I think limited research motor involvement is fine, but it shouldn't be the focus of the project. I felt that my involvement with the Mr Jaguar motor was perfect- enough to learn something new and enjoy it, but without all the gritty details that are better left for later.

Something else I learned was that there aren't really any dumb questions. It's best to find answers instead of assuming something. You really encouraged my question-asking, and I thought that was important.

-So, here's a summary of what I thought was important to a successful mentoring experience:

- Small homework assignments requiring a little research can enrich the learning process.
- Students should learn the importance of gaining experience and to always keep in mind what their capabilities are, so that L1 and L2 aren't viewed as roadblocks to "finally being able to fly big stuff".
- Students shouldn't get too involved with research motors until later on.
- Mentors should really encourage curiosity and questions.

(Jeremy is currently in his second year at Southern Utah University and competed in the 2016 Intercollegiate Rocket Engineering Competition <http://www.soundingrocket.org/what-is-irec.html> Jeremy has also gotten his Grandfather John back into rocketry along with his dad Robert too!....Tony)

See the video at: <https://www.youtube.com/watch?v=ZBVhbt9VYMc>





## High Powered Young Rocketeers

16 year old Juniper Slouber took his TMP test at Tripoli Central California's Dairyaire in May and then successfully flew his 2.6" Madcow ARCAS twice on the AT H148R.

His next rocket was a 3" MAC Performance ARCAS featuring a canvas phenolic airframe.

Juni did a very nice carbon fiber tip to tip layup over the fin can.

At MUDROCK he flew the ARCAS on an AT J415W and then an AT K185W to over 7k'. Both were perfect dual deploy flights with a Raven and Stratologger CF.

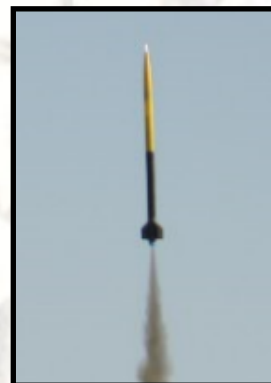
Check out the on-board video of the K185 flight: <https://www.youtube.com/watch?v=8v2WmAkrfOQ>

His next flight was at XPRS with a CTI L265. While this is a pretty mellow motor the canvas phenolic airframe did not survive MAX Q.

Juni has plans to build a 4" fiberglass kit rocket and is also designing a high performance 54mm minimum diameter bird.

Juni lives in Roseville, CA, attends Granite Bay High School and plans to attend CalPoly.

His TMP mentor is his maternal grandfather, Jonathan DuBose.







## AEROPAC's 100k Team Spectacular Thursday Morning Flight at ARLISS





## Dick and Diane Jackson's Night Launch Rocket

Jonathan DuBose

One of the special treats at ARLISS / XPRS the last few years has been Dick Jackson's night launch rocket. Okay, technically it belongs to his wife Diane, but she lets him bring it along to dazzle the crowd in the desert.

The origins of this rocket go back several years when the Jackson's discovered adhesive backed, battery powered strip LEDs at HobbyTown, USA in Roseville, CA. It was obvious that they were invented to adorn a night launch rocket. Soon the Polecat Aerospace Thumper Jr residing at the Jackson's abode sported a couple of hundred LEDs in patriotic red, white and blue.

The rocket was a spectacular sight flying at night especially when powered by a "sparky" motor and descending under a bright "Paralite" lit canopy. This, of course, generated both a sense of competition fueled by a large dose of envy from this writer. Soon that resulted in a little competition for the night skies: A "stretched" Polecat 5.5 Fatboy with 500 bright white LEDs.

I revealed this comet to Dick at October Skies by making him close his eyes while I set it the camp table and fired it up. Dick's first reaction was to look away - this thing WILL burn holes in your retinas if you look directly at it. But the reaction also generated a few choice words which can't be repeated here but can be loosely translated to: "You dirty dog."

I tried to explain that "imitation is the most sincere form of flattery" but got only a deep growl and a "I can't believe you did that." Apparently, Dick enjoyed being the brightest light in the night sky.



Diane Jackson with night launch rocket, version 1



Version 1 Lifts off at MUDROCK 2014





## Dick Jackson's Night Launch Rocket

Instant Karma however was on Dick's side. The first launch of my rocket, while definitely getting a higher applause decibel rating than Dick's launched only moments before, after a spectacular ascent on a CTI J295 Skidmark, landed in the field that had been flood irrigated that afternoon. Amazingly, all the LEDs were still on after it's "baptism". Dick's rocket had danced daintily over the watery field to a nice dry landing.

Dick returned to camp in a somewhat subdued mood only to be greatly consoled as he watched me trying to clean the muck off my rocket. It was also clear that the competitive juices had begun to flow and that the last had not been heard from Mr. Jackson on this subject.

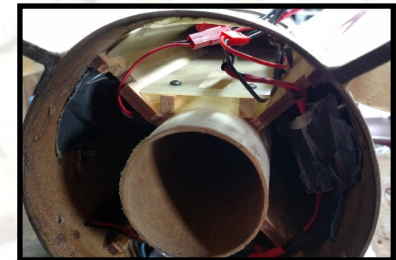
Although things were quiet for a while in the night rocket LED race I knew Dick must have plans to regain the lead in the "LED Gap".

After an unfortunate event resulted in a severe scorching of Diane's (now Dick's) rocket I heard vague references, but nothing specific, on the subject. It was also during this period that Dick launched his now famous "Dr. of BBQ" label and seemed as interested in this business as re-building the night launch rocket. When he designed and constructed an amazing smoker on wheels and began catering events far and wide, rockets and LEDs seemed to have taken 2nd place to culinary pursuits.

Suddenly, however, Night Rocket Version 2 made its spectacular appearance at ARLISS 2016. Diane and Dick had obviously been spending some time building a stretched out Polecat Thumper 2. It sports a beautiful paint job and 720 LEDs in the same red, white and blue scheme. See photos to the right.

The gap in the LED night rocket race had been regained by the Jacksons and this bright beauty made 3 spectacular flights, by popular request, during ARLISS / XPRS.

But how long will this advantage last? Stay tuned.







## SSU Program Trains Community College Physics Teachers to Build Drones and Rockets Lynn Cominsky

Rising Data is SSU's new rocketry and drone program. Following on the NASA-funded S4 (Small Satellites for Secondary Students) program which targeted high schools and middle schools, Aeropac member and SSU Professor Lynn Cominsky aimed this new program at community college students. Similar hardware is also used by SSU's Learning by Making project in Mendocino County. "The hardware platforms developed through these earlier programs, and for SSU's first CubeSat (T-LogoQube), were adapted for this new program," says Cominsky.

Four community college instructors received hands-on training in July 2016, building the payloads, rockets and drones that will ultimately form the basis of a one-semester course for 10 Hispanic-serving community colleges in California.

Funded by NASA's Minority University Research and Education Program (MUREP), the Principal Investigator is Prof. Erin Quealy (Napa Valley College), and the other co-investigators are instructor Lauren Novatne (Reedley College) and Prof. Greg Kriehn (CSU Fresno). Quealy, Novatne and Alex Wong (San Mateo), and Jayesh Bhakta (Los Angeles) comprised the inaugural cohort.

Kriehn, whose group develops sophisticated unmanned aerial vehicles to help monitor crops near Fresno, provided flying lessons on the F450 Unmanned Aerial Vehicles. The rocket launches and rocket design modifications were overseen by former Aeropac president Tony Alcocer. All launches were successful, but due to the small size of SSU's Commencement lawn, which is ringed by lakes and tall trees, only three of the four rockets were retrieved.



**Tony Alcocer explains rocket safety to the community college teachers while SSU's Kevin John listens in. L to R: Fresno state students, Lauren Novatne, Kevin John, Alex Wong and Tony.**



**Students help get an F450 drone ready to fly**





# Fruity Chutes

## Custom Parachutes

### Aerospace Recovery Solutions

Chutes for low power - mid power - high power - uav





**Fruity Chutes feature:**

- Lightweight 1.1oz Mil-spec Ripstop
- Sizes from 12" up to 16'
- Low, Mid and Hi Power Designs
- Heavy duty bridle and swivel
- Your choice of colors and pattern
- All seams are double stitched
- Hi Power feature 550lb shroud lines
- Iris Ultra with a Cd of 2.2
- Choose the options you want

**Fluorescent Colors**

 <small>Lemon</small>	 <small>Tangerine</small>	 <small>Lime</small>	 <small>Purple</small>
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**Standard Colors**

 <small>Coconut</small>	 <small>Blackberry</small>	 <small>Cherry</small>	 <small>Blueberry</small>
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**extreme rocketry**

Reviewed Nov, 2008 Issue!

[www.fruitychutes.com](http://www.fruitychutes.com) - [fruitysales@fruitychutes.com](mailto:fruitysales@fruitychutes.com)  
408-499-9050

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**February 9, 2015 - James Flenner, FAA licensed Senior Parachute Rigger, former member US Parachute Team, TRA L3**



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## 2015 to Present XPRS Altitude Records!

Darryl Paris

We had some of last year's record holders get bumped this year!

**H Motor: Joe Bevier**

**10,538'**

**I Motor: Kurt Gugisberg**

**8,352'**

**J Motor: Kurt Gugisberg**

**12,103'**

**K Motor: John Sifling**

**19,953'**

**L Motor: Greg Clark**

**16,229**

**M Motor: Gene Engelgau**

**32,011'**

**N Motor No entries**

**O Motor No entries**

**Two Stage: Curt Von Delius**

**95,786'**



Trophies last year—playa darts this year...go figure!



The playa darted booster—all that was recovered from Jonathan DuBose's 90,349 ft. ill fated flight





## My Level 3 - Congratulations Greg!

Gregory Ruhf

I am proud to report that I obtained my Level 3 certification on Sept 16, 2016 during the XPRS launch.

Many thanks to David Raimondi for serving as my level 3 advisor and graciously lending his motor hardware. For the L3 project, I built a minimum diameter Rocketry Warehouse Mongoose 75 and flew it on an Aerotech M1297, reaching a max velocity of Mach 1.7 and max altitude of 19k ft AGL. Liftoff weight (including motor) was 21 pounds. Fins were glassed using a single layer of 8 oz fiberglass cloth and Adtech 820 epoxy. The rocket left the rail at a slight angle and was quickly out of sight. Without the Big Red Bee GPS I would have had no clue where it landed. All charges and chutes deployed according to plan with the Fruity Chutes 48" Iris main at 1600' AGL. Recovery was approximately 1.7 miles northeast of the flight line. The playa gets much softer quickly in that direction!

2016 was my 4th year as an AEROPAC member and it has been quite an exciting journey. I began flying model rockets at age 12 and rediscovered the joy of rocketry as an adult in 2011. Level 2 certification was 2013, and in 2014 after seeing all the fun that Tony Alcocer was having, I became hooked on mixing research motors.







## A Year in the Life of Rocketry

Becky Green

At first I wasn't going to write this article since I covered a little bit of what I did this year in the ARLISS article....but after sleeping on it a few nights I decided I had a lot more to add for this year's rocket activities.

This year has been an incredible year for Jim and me. We had the best opportunities to do rocketry related projects well above and beyond previous years. There were times when we didn't think we would be able to do it all....but we reached deep down and managed to complete everything sometimes literally hours before having to leave.

It actually started last year just shortly after the rocket camp in Costa Rica. At the camp, there was such a great turnout that they decided to do it again this year. I'm sure most of you read my article from last year (if not it's in the fall 2015 newsletter). Jim and I enjoyed it so much that we didn't hesitate to say yes when they approached us again for this year's rocket camp. We didn't want to build same kit as last year so I started looking for a different rocket kit for them to build.



Photo by Becky Green

Well....as it turns out....it was in front of me for almost 15 years and I just didn't think about it. I was cleaning out stuff under our pool table one day and there in our daughter's old Little Mermaid sleeping bag were the 14 Crayon coin banks that I started to do a project with a group of kids back in early 2000. I could have Costa Rica scratch build their own kit this year. I quickly called Andres Mora to come spend the weekend with us and have him build the prototype kit. He designed it with OpenRocket and Jim made all the centering rings, bulk heads and fins for this one kit. Andres built the rocket but I put together a payload section (in case Costa Rica had a payload like last year).

We even hand made the parachute thanks to Tony Alcocer who showed me his design. We didn't need a very big parachute but when you are needing 14 parachutes that would have cost as much or possibly even more than each kit and they didn't even have a budget yet. The rocket was completed that weekend and we met at Snow Ranch in December, 2015.



Photo by Becky Green





## A Year in the Life of Rocketry

Becky Green

There were special guests at that launch too....Andres's parents were here visiting from Costa Rica so they were able to come too. Everything worked perfect and we knew they would work in Costa Rica with a G80 which is the biggest motor they can fly at this time. Now it's just a matter of how do I get 13 (Andres kept his rocket here) kits to Costa Rica. We were hoping we could get the freight forwarded to donate the shipping again like last year....but it was going to cost them \$2,500 to send the box of kits so I kept thinking of ways while I started working on the other big projects that were brewing.

I received a phone call from my brother's really good friend Mark in early February. We had a brief discussion a year ago about the Costa Rica camp we did in July of 2015 and he wanted to know if there would be a possibility of doing a rocket camp at the Maritime Academy in Vallejo with a group of Sea Cadets ranging in age of 14-18. Of course, how could I say no? It is a perfect STEM project.

I reached out to Ken Biba who has been creating the new S4 payload and thought this would be perfect for these students to build during the camp along with the rocket. I also reached out to Andres Mora who had experience teaching at rocket camps in Costa Rica. I had a dinner meeting with Ken and Mark in SF to jump start this project. Oh yeah....of course it's a go. We all left there feeling really good this would be a perfect project. The good news it was not until the last week in June so I had time to do my next two projects before having to kit (12) S4 rocket kits together.



Photo by Becky Green

BTW....this is the kit that Tony Alcocer designed for the original S4 payload. I made a few changes to the kit so it would fit the new S4 payload.

## S4 Payload and test launch

The next opportunity Jim and I got to do was not actually building any rockets. It was an opportunity to work with Prof. Jacob Hudson from the University of Hawaii and Pacific International Space Center for Exploration Systems (PISCES). PISCES was doing an emulation of a Mars Vertical Lift off and Vertical Landing pad in association with NASA and Honeybee Robotics. PISCES needed us to test the sturdiness of the pavers that were built by them at the University of Hawaii – Hilo campus made from basalt rock that was mined from a nearby quarry in Hilo. This basalt is nearly identical to the Mars rock. They had a robot put the interlocking pavers together and made a 10' by 10' pad. The PISCES team made a 3 legged gantry



Photo by Becky Green





## A Year in the Life of Rocketry

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to hold the motor in place. This gantry would withstand over 2000 lbs. of thrust and they only required a motor that had about 1,000 lbs. of thrust. Well of course we jumped at the chance to work with them on such a cool project. After doing some research, we chose the N3300R. I worked with the vendor in making sure everything arrived on time and Jake sent his motor case to the Big Island. Jim and I had used this excuse (of course none was needed) to take a vacation to Hawaii. We stayed with Jake about a week before all of us traveled to the Big Island.

Wow....this felt like we were at a NASA event. We arrived at the quarry and were escorted to the pad area with our safety gear on. We set up all our gear and did a dry run but only lit the igniter to test all our equipment. That day went off without a hitch and we were now ready for the final event.

The next morning they started the countdown at I think T minus 2 hours. We all knew our positions and the clock was ticking. As normal we had rain that morning.....but it was not raining during the event....but the humidity was terrible.

Jim and Jake got to stay near the motor because they had to insert the igniter at T minus 10 minutes and actually push the button to light the motor. They were all ready and behind the blast plate several hundred feet away and I was at the observation tower listening to the countdown. We were at T minus 30 seconds which was the last contact we had with the launch team and the countdown continued to 0 but nothing happened. What could it be? Everything was perfect in our trial run. Turns out the radio they used for communicating the countdown accidentally got switched to a different channel and the launch team didn't hear the final 30 second countdown. Once we got everyone back in communication, we started from T minus 5 minutes. This time at 0 the igniter lit and the entire pad area was covered with one big plume of smoke....wait for it....the motor came up to pressure with the huge roar that we all expected. We couldn't wait to go see how the pad looked after the burn.

Finally we were allowed to go into the area and saw what the N3300 did to the basalt pad. The initial thrust pushed the paver that was directly below the flame and started peeling back all the other pavers.



Photo by Becky Green

**Jake putting motor in the gantry just before steel cover was bolted on**





## A Year in the Life of Rocketry

Even though that happened....it was a great test and now the engineers have lots of data they are analyzing. We all went for beer after because our job was done....we successfully lit an N3300 and tested their pad.

Well....one beer turned into two that turned into three. I kept saying we have to get to the airport....nah....it's Hilo we have time. Well....Jake made it through security just in time and Jim would have....but my ticket had some type of problem.

Turns out there is a cut off time on the kiosks and I was too late so I had to wait for an attendant. The attendant got me to a ticket window...but by then I was told I missed the plane and would have to wait several hours for the next flight. I got a boarding pass for the much later flight but while we were in the security line someone made an announcement that if there was anyone for the flight leaving in 5 minutes in the line to please step forward. Jim and I grabbed our bags and got through security. We didn't bother putting our shoes back on. We just grabbed everything out of the trays and ran to our gate just to be greeted by the wonderful staff that shouted "are you the Green's". Yes, that's us and they handed us our new boarding passes and said they even managed to get us seats together in the back of the plane. The moment we got through the doors they locked them behind us and we got buckled in our seats and the plane backed away from the gate. Wow....that was the closest I had ever come to missing a plane. Next time no more beer until we get to the airport....LOL.

A couple weeks after returning from the PISCES project, it was time to pack up and head to Huntsville, AL to the NASA SLP event. Tony Alcocer met us at our house at 2 am and we headed to the airport for an early flight. We got to the airport at 3 am....just to find out TSA and all the ticket booths weren't open until 4 am. We could have left an hour later if we only knew. Oh well....we will be able to sleep on the plane. Well....that was partially true. I slept while it taxied away from the gate just to wake up back at the same gate we left from about 30 minutes earlier. Yep.....there was a mechanical issue which they were able to fix but that meant we missed our connecting flight in Denver. They re-routed us all to Chicago and then into Huntsville....but many hours later than expected. Good thing we left a day early.

Once again the event was great. We started inspecting all the rockets and made the punch list of things for the teams to fix. It turns out I had 2 of the same teams as I did last year. Wow....what a difference a

## Becky Green



**The pad after the motor burn**





## A Year in the Life of Rocketry

Becky Green

year makes. Their punch lists went from about a page long to only a couple minor items this year. The teams all had the rocket fair day (really nice seeing all the teams together in one place). We went out to the Briggs ranch to set up the range and made it back just in time for all the teams to start returning for their final inspection. We were all keeping a close eye on the weather as there was a big storm heading our way and we were possibly not going to be able to fly on the date assigned and thought we might have to fly on our back up date.

Well....we arrived just before 6 am and had the most beautiful sunrise.

The storm had just passed over us and was a beautiful day to fly by the time everything was set up and rockets on the pads. We managed to get all the rockets launched by 2 in the afternoon and with all the help we tore everything down and were back for dinner early. We had the next day off so Jim and I hopped in Tony's car along with John DeMar and took off for a wonderful sightseeing day in Huntsville.



Photo by Becky Green

### Sunrise at Braggs farm

After a couple stops, we all decided to head to Fayetteville, TN for lunch. We were so busy talking and not really paying attention to where we were....we didn't even realize we had driven into TN until we started seeing all the places had Fayetteville in the name of their companies. I was tasked with picking the place to eat so I found one that had the biggest parking lot filled with cars and figured it had to be good. Oh yeah....it was buffet style so no one left there hungry. Later that day, we took John to the airport and decided to get our boarding passes while we were there. Turns out the airline had cancelled Jim and my return flights. We were told we'd be put on standby at first but they told us to get to the airport early the next day....to see if they were able to get us on the full flight. Turns out this was the time when all of Houston was underwater from all the storms and they were cancelling many flights.

I was waiting at the gate for the person to announce our flight when they cancelled the flight that was just about to start boarding. I kept waiting to see if another gate would open up and sure enough one did. I followed the lady to the gate counter and I was the first to be helped. Sure enough....I finally got a boarding pass with a seat assignment. Phew....we were going to make it home at the same time as Tony.





## A Year in the Life of Rocketry

Becky Green

When we finally returned from all these trips, we had about 2 1/2 months before the Sea Cadet rocket camp and Costa Rica rocket camp. That may seem like a lot of time, but we still had to buy all the parts for the Sea Cadets 12 rockets and the 13 rockets for Costa Rica. I immediately started buying all the parts and pieces for the Sea Cadets. At first I thought I'd have Jim make all the centering rings, bulk heads, baffle pieces and the fins....but that was way too many to make so I had Evan Curtis from FXCutting make all those since he had made them for Tony back when Tony was putting together the S4 kits. I had him make a lot of extra S4 stuff because I heard there might be 7 students coming from Costa Rica to build Level 1 and Level 2 rockets. Everything turned out really nice and all I had to do is bevel the fins with the fin jig Jim made from Tony's design.

While we were waiting on parts to come in, Jim and I started making all the fiberglass payload sections and couplers for the Crayon rockets since they weren't standard size tubes. Each piece of fiberglass was 13 1/2' long and 28-32" in width depending on what we were making. We had to get the perfect days to make these since they took a while for each tube. We were lucky some days and the weather allowed us to make two before the wind came up. Then of course once these were all dried I had to sand them all on the lathe outside.

During this time, we also had 2 launches to go to. So the van kept getting loaded and unloaded since we always needed things at the launch and at home to continue building.

But now after Mud Rock I had to really start concentrating on the Sea Cadet stuff since that event was just a week away. They had a much larger turn out for this class so we decided to get 12 Alpha and 12 Alpha III educational kits so each of the students could build and fly. It turns out I finished everything literally the night before camp started. I brought lots of stuff for show and tell and of course all the parts and pieces for the 12 kits so the Denali was packed full.

Andres was not able to attend the camp but he allowed us to use his presentations from his rocketry camp in Costa Rica. Mark did this part of the class and I just watched and listened. Very interesting stuff. I helped when it came time to build the rockets. Also, part of the presentations was how to use Open-Rocket. I was nervous about teaching that part so I got Peter Clay to come over after work one afternoon



Sunrise at Braggs farm





## A Year in the Life of Rocketry

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to teach that part.

He brought his fleet of Black Brant rockets and wowed the students. After dinner that evening and Peter headed home, I went back to the class and continued teaching OpenRocket. The two of us were able to teach them enough that the next chance they got, they were building two stage dream rockets flying at Mach 2 and above.

Ken was unable to attend the class to do the S4 payload in person (just had hip surgery) but we did it via Skype. After all the training and building rockets....it turns out we were not going to have enough time for the students to build the S4 payload so Mark built one while they were busy building rockets.

The Alpha's were all complete by Tuesday night. When I got home Jim and I had loaded the Mean Green Rocket Launching Machine controller and the 14' 10 launch pad rail that I borrowed from Bay Area Rocketry into our truck. Jim was driving the truck that morning to the launch site and I was going to meet him there but I lost him at one of the lights just before the freeway. I slowed way down and was trying to let him catch up. How long does it take him? I called and he didn't answer the phone....ok something's wrong. I pulled over and waited and he finally called back and said the transmission is going out on the truck and it's not shifting so he was having to go really slow. All I could think of is "we had to get to the launch site for those kids". We couldn't let them down. Finally the truck shifted and he was able to make it to the launch site. The launch went really well except for the bit of wind that took a few of the rockets into the Napa River but it didn't seem to matter to them.

Luckily the wind wasn't too bad....it was just that we were that close to the river after the city moved us from our original location much further away. We managed to get 21 launches quickly that morning.







## A Year in the Life of Rocketry

The funniest part though was after everything was loaded back in the truck everywhere Jim drove it he had to make sure he didn't have to use reverse. That gear was completely gone. He circled the parking lot several times when we got to the Maritime Academy before he could actually park it. We managed to get the truck home that night under its own power but it wouldn't even go the extra few inches needed so it was left hanging over the sidewalk for months....until we had time to deal with the problem.

After the launch Jim stayed and helped me teach the students how to build the S4 kits. We decided to only build 5 of the 12 kits. There were 4 on a team and they were so excited they were now going to be building something much larger and fly it on a G80 after just building and flying the Alpha's on B6-4. Jim came back the next day too and helped with teaching them to build the S4 and also, we had them make their own parachutes. Heck....I even brought paint to the classroom and as they finished their rockets (Alpha's included) they went out on the hill and painted them. They just had so much fun.

The morning we were going to fly their S4 rockets....the weather was still windy. At the last minute before leaving the house I grabbed the Crayon rocket Andres had built and the new heavy fiberglass payload section I added. This was a much heavier rocket than the S4 so the chance of it drifting into the river was very low compared to the certain water landing the S4 would have. We flew the Crayon first without their payload just in case my prediction was wrong. The rocket was retrieved and reloaded with their payload so they had some data to analyze upon returning to class. Once we returned to the classroom and they were starting to analyze the data....I knew that was my cue to leave and head home.

Now that the Sea Cadets class was over, I only have about a week before our trip to Costa Rica for their rocket camp. The good news was Jim and I were able to complete most of the Crayon kits while working on the Sea Cadet S4 rocket kits. I pretty much only had to put everything in a box because we could kit them all when we got to Costa Rica. After a lot of research, I found out there really wasn't a cheap way to ship these kits to Costa Rica....but I finally figured it out....why even ship them? I could bring them as

## Becky Green







## A Year in the Life of Rocketry

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checked on bags. I boxed as much into one box but still had a few more items to pack so I got another big piece of luggage out and packed the rest in it. Jim and I both had a check on bag so it only cost us \$50 to get everything there. Wow...what a difference between that and our first quote of \$2,500. I will have to remember this for the future.

Now the motors were the biggest problem last year so this year I made it much easier by having the University of Costa Rica deal directly with AeroTech and let them deal with the shipping since they are used to doing it. The budget Leonora was able to receive this year was \$1,000. That was just enough to get some motors and pay for the outrageous price of \$660 to ship a box weighing about 10 lbs. Good thing I found those kits under the pool table and could donate them.

We arrived in Costa Rica and was greeted by Leonora who was beginning to think we missed our flight because she was waiting forever for us. We were the last ones out of the terminal. We waited and waited and waited on the rocket kit box I so cleverly used as a check on bag....it was not arriving. Could there have been a problem with TSA? There shouldn't have been since it was only cardboard/fiberglass tubes, plywood fins etc. but you just never know what might trigger TSA to look. Turns out it just happened to be the last box off the plane....or at least it was the last box that went up the conveyor belt. I grabbed the box and we made our way through customs.

We arrived a few days ahead of the camp so we could put the kits together. We met Leonora's staff (they were students most of whom we had met before) at the workshop of the University the next morning and started finishing all the kits. We needed to make all the fin slots which normally we use a Dremel....but we had 13 kits to do and they couldn't get access to the Dremel at that time. They did however start using a jig saw but that was going to take forever.

Since we had access to almost every tool possible in the shop, they set up the mill and we had the mill do all the work. There was a little bit of clean up to do on the slots but that didn't take too long. We also had to do some sanding on the lids that were made for the coupler/av bays so someone used the lathe to do that. There were other things to do so we all pitched in and got it done. I totally forgot about needing metal clips for the motor retention so Jim and the staff looked around and found big metal cutter and benders to help make them. I think by the time we were finished we used almost every big tool in the shop. Nice place....wished we had access to that here. We managed to get all the kits ready just before the class



Photo by Becky Green





## A Year in the Life of Rocketry

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started.

We had two separate classrooms this year with 25 students each. We didn't have enough tools for each team so there was a bit of running back and forth to the classrooms....but that was actually a good thing so we could see where each class was in the build process. Turns out it was very close....but I think Jim's class finished just before mine....but they were the last ones to clean up....LOL.

The next morning we all arrived at the university around 7 am and got on big busses to take us to another satellite campus about 1 1/2 hour drive from San Jose. We arrived at the launch site and all the media was already there, the tents and chairs and sound system was already set up so we had to quickly set up the range. We started having each team come over to get their motor and igniter and assigned a pad. The crowd was so excited to watch the flights as were the teams. These were all new students....none from last year. After some brief announcements it was time to start launching. The countdown....5, 4, 3, 2, 1 button pushed and the igniter lit but the motor didn't. Wow....just like last year. A quick igniter change and the next count down and the crowd roared watching that Crayon soar through the skies. It was perfect. We were able to get all 10 rockets in the air, the scratch built fiberglass rocket the staff built and an Estes Crayon on a B6-4 just before the waiver closed. We all noticed the sky was getting darker by the minute so after taking a bunch of pictures everyone started helping tear everything down and bring it all back to the busses. Just as we arrived at the busses it started to pour. Now I call that excellent timing.

Jim and I stayed another 5 or 6 days after the camp this year and got to do lots of things we hadn't done there before. Roberto took us to 2 volcanoes Irazu and (Turrialba which was active with ash). We didn't get to go all the way to it....but Roberto took back roads and got us close enough to see all the damage from the ash. We stayed with his family that night and got to go with him to a family birthday party at an extreme adventure park the next day. Wow....that was incredible. We felt like family by the time we left that day. We had other adventures that day too but had to get to Jose's house where Leonora was waiting for us. We were going on about a 20 mile white water rafting trip down one of the most beautiful rivers in the world early the next morning.



Photo by Becky Green





## A Year in the Life of Rocketry

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We were on 2-4+ rapids that day....the most we had done before were 1's so this was totally exciting and best birthday adventure of a lifetime.

It was a bummer though....our trip was coming to an end. We had one more day in San Jose with some of the staff. They took us to see downtown San Jose and learn a lot of the history....what a great end to a fabulous trip.

Leonora did everything for us on this trip....she was incredible....the best hostess ever. She arranged our

tickets there, had us stay at her house, cooked, worked, ran the camp, made sure we had food if she was at meetings, booked the rafting trip, arranged the staff to take us on the tour of the city etc. This was a five star rating the entire trip.

But now we did have to hurry back home to make it to Aeronaut and to start getting the 7 rocket kits ready for her staff that she was sending to ARLISS to get their Level 1 and Level 2 certifications (see details in ARLISS 2016 article and Costa Rican Teams article).

The last big rocketry event of the year is going to be a NASA launch. Sandra Cauffman a friend we met in Costa Rica in 2013 works for NASA Goddard and is the Deputy Director of the GOES-R weather satellite. While we were in Costa Rica this year she invited us to go with others to see her satellite launch. When we got the invitation Jim and I jumped at the chance to go see a big launch. We have our tickets, room and official invitation but our dreams may be delayed slightly. Hurricane Matthew hit the coast of Florida and they are currently assessing all the damage done at the Cape. At least all personnel are fine but some damage to the launch system may not be able to be repaired in time for the original date of November 4th.



Photo by Adrenalina Adventures





## A Year in the Life of Rocketry

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We received the invitation for the new launch date of November so we went on line to change our tickets and for whatever reason it wouldn't let us change to the flight we wanted (yes Jim watched me do it so it wasn't just me). Finally we gave up and I called United and talked with a real person. Turns out that was a very wise decision. United was going to charge us \$250 each for the change and re-issue fee. After explaining the delay was due to Hurricane Matthew and we had to wait until NASA gave us the new date, the person explained they no longer had the code in their system to waive the fee but she made a one-time exception. We of course now had to reschedule our room in Cape Canaveral which unfortunately now was only available from November 15-19 and we weren't leaving Florida until November 22nd. We decided we'd travel around Florida those last few days and stay in different places so we booked it. Well, just after booking it there was another delay this time due to fires in California that delayed a launch out of Vandenberg. ULA personnel of course couldn't be in 2 places at once. Good thing we planned on being in Florida for a week. The new launch date was set for November 19th with a back-up of November 20th or November 21st. Well the great news was we didn't have to change our flight but we did have to find a place nearby in case it didn't launch on November 19th. Jim remembered we had a free (for the low price of \$300) week left we could book anywhere thru Interval International before the end of this year. It just happened that he found a week in a beautiful Orlando resort and booked it even though we couldn't use the whole week. We were all set now and crossed our fingers there would not be any more delays. Things were just falling into place.

We arrived around 5:30 pm on November 15th and were all settled into our condo at Cape Canaveral by 7 pm and found a great sea food restaurant for dinner. The condo was the perfect size for 2 but we had a friend drive down from Atlanta, Georgia and stay with us a couple nights. Good thing he brought his sleeping bag....we

had to use the cushions from the love seat and put him on the floor. When they say there is a couch in the ad....don't always believe it.



Photo by Becky Green





## A Year in the Life of Rocketry

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We were a block and a half from the beach so we got to walk to the Cocoa Beach Pier a couple times (about 3 mile round trip) once to watch the sunset. Nothing like a beautiful sunset at the beach even if it was behind us.

On Wednesday we were informed we could sign up as standby for a special launch pad tour. OMG....we were keeping our fingers crossed and hoped we could actually do this tour on Friday (day before the launch). We checked in a bit before the 12:30 pm check-in and were number 5 and 6 on the stand-by list. They had us return at 2 pm but when we arrived back at 1:30 pm they were already calling the stand-by so we checked and they had passes for us. Several people couldn't make it because the tour was delayed a couple hours due to delays getting the rocket to the pad that day. Sorry for them....but happy for us. The picture shows how close we got to the rocket.

The rocket was an Atlas V 541 rocket which was the same rocket type of rocket that launched the Curiosity to Mars. This rocket is 62.2 meters just over 204 feet in height. Here is a link to all the details of the rocket: <http://spaceflight101.com/spacerockets/atlas-v-541/>



The GOES-R satellite is impressive in size. It weighs 6,299 lbs. dry and 11,446 lbs. fueled. Here's a link to all the details: <http://www.goes-r.gov/spacesegment/spacecraft.html>

We went to the "Mission Briefing" on the morning of the launch which was held at Kennedy Space Complex (KSC). After the briefing we had time to tour KSC before having to load onto busses to be taken to the Banana Creek view site which also had another museum that we toured while waiting for the launch. If you haven't been to KSC before, I suggest going....and don't miss the Atlantis Exhibit like Jim did....no drinks allowed in the exhibit. It brought tears to many I was standing near....and of course myself. It was so well done.

While we were all wandering around waiting on the launch, we were entertained by wildlife that was in the wildlife refuge between us and the launch pad. We were visited by several dolphins, 2 alligators, so many fish jumping completely out of the water and so many different birds.





## A Year in the Life of Rocketry

Becky Green

Now the countdown is at T-30 minutes and people are starting to settle in their seats....we chose the grass so there were absolutely no obstructions. At T-10 minutes everyone really quieted down and we could really hear the countdown. Unfortunately somewhere before T-4 minutes there was a problem with the launch vehicle so they put it into the T-4 minute hold. The entire crowd let out a big groan. They kept us up to date and added in 5 minute increments until the problem was resolved and gave us the new time of launch which was the 5 minutes plus the T-4 remaining count down. Several times went by and of course each time it made everyone even more nervous because there was only a 1 hour launch window and if it didn't go off many people were returning home the next day and would miss the launch. I think everyone there was crossing their fingers and hoping for the best. The problem was finally resolved and they said it was a go. I don't remember exactly the time but I do know the crowd erupted in cheers. Turns out it was a false positive reading on a valve. Just after we were told it was a go more chatter came across the speakers and it was put on hold again. This time there was an issue on the range. Once again big groans of disappointment. Still with all our fingers crossed we still had a few more times they could delay by 5 minutes but still get the rocket off the pad. Finally the announcement came that they resolved and they continued with the launch. The crowd once again erupted in cheers. Turns out though that was the absolute last minute it could have possibly been.....the new launch time was scheduled for 6:42pm. If there were any more problems during the countdown they would have missed the window. They continued the countdown and all the teams were a go. Then the crowd rose to their feet as the national anthem was sang. Then shortly after that it was down to T-1 minute.

Then the crowd counted down from 10...9...8...7...6...5...4...3...2...1....LAUNCH and the rocket roared to the skies.

It was an absolute perfect night for viewing. Not a cloud in the sky and the winds were absolutely dead calm. I even saw the external boosters separate (just the last of the motor burnout) on the first two but didn't see the second two separate. Oh and if you were all wondering what a rocket like that sounds when taking off.....the initial sound of course was much louder than ours....but since we were a few miles away....it didn't hit us until it was well up in the skies. That was when it hit us....literally it was incredibly loud and you could feel it. It was the most amazing sound ever. I thought Jim's M sparky motors were raspy loud....that wasn't even close to this one of



Photo by Becky Green





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We watched for a long time until the fairings separated and exposed the GOES-R. We went back to Sandra's place for a party and watched on NASA TV until the Centaur had done all its burns, coasts, separated the GOES-R and the solar panels started to deploy which was about 11 pm. We returned to our resort in Orlando with Todd and Leonora arriving about 12 am.

We had a great breakfast Sunday morning and then drove to Kissimmee and went on an airboat ride. That was so much fun doing donuts on only about 1" of water and stopping almost on a dime. We saw a lot of wildlife including alligators.



After we got off the ride....they had an area where we could dress up and have some crazy props and they took our picture. Unfortunately the week was coming to end for them and we had to hurry back to drop Todd off at his car and Leonora at the airport.

Jim and I had one last full day that was just spent wandering around our resort (about a mile long) going to the 7 pools that was on the property and enjoying another beautiful sunset.



BTW.....here is the time line of the launch. The GOES-R Geosynchronous Orbit won't be obtained until the 14th day. The GOES-R now called GOES 16 will replace (GOES 13) that is in the East and will not go live for one year. It will work side by side with the existing weather satellite so NASA/NOAA can do extensive testing to make sure it and all 3 new ground stations are working perfect. If you are interested in seeing more details about the continued progress of the GOES-R....go on line and search for GOES-R.





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Don't get me wrong.....I still love all the launches we do, what we have accomplished and we will continue to keep rocketry education going as long as possible.....but I am really hooked on these big launches.

Not sure why I never went to a big launch before (possibly timing) but I will definitely go back for more.

What an incredible year it has been. We can't wait to see what's in store for next year.

Activity/Event	Time (Nominal) (Hours:Minutes:Seconds)
Final Power-Up (driven by ULA activities and last access to fairing)	L -76:00:00
Begin Roll-Out from Vertical Integration Facility (VIF) to Launch Pad	L -32:40:00
Launch Team Call to Stations	L -04:00:00
Begin T-2 Hour Hold	L -02:40:00
Mission Phase to "Launch," Load/Start Boost Block	L -01:45:00
Final Spacecraft Configuration Commanding	L -00:30:00
T-4 Minute Hold to Verify Terminal Count	L -00:19:00
Final Poll for Launch	L -00:13:00
Spacecraft Switch to Internal Power	L -00:10:00
Exit T-4 Minute Hold	L -00:04:00
Launch Hold Restriction (hold can be called only by computer)	L -00:00:15
Booster Engine Ignition	L -00:00:03
Liftoff	L -00:00:00
Solid Rocket Booster Jettison	L + 00:01:50
Payload Fairing Jettison	L + 00:03:29
Upper Stage Separation	L + 00:04:27
Main Engine Start #1	L + 00:04:37
Ground Station Acquisition	L + 01:01:40
Main Engine Cutoff - Final (MECO-3)	L + 03:29:05
Spacecraft Separation	L + 03:31:55
Solar Array Deployment - Stage 1	L + 03:39:36
Uplink Command and Communications Acquired	L + 03:51:00
Rocket Engine Assemblies Checkout Completed	L + 14:34:10
Initiate Orbit Raising Operations	Days 2 - 8
Solar Array Deployment - Stage 2	Day 9
Continue Orbit Raising Operations	Days 10 - 14
Geosynchronous Orbit Obtained	Day 14



Graphic from: <http://www.goes-r.gov/mission/mission.html>





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