



# AEROPAC Fall 2016 Newsletter

Photo by Phoenix 4, courtesy of Curt Von Delius

## President's Pad Jim Green

### President's Pad

Greetings, fellow AEROPAC members.

Our new wireless launch system performed flawlessly after replacing our batteries and battery harnesses. That corrosive Black Rock dust likes to get into electronics and eat it away.

The next thing we need to replace is the PA system. A smaller lighter wireless system would be nice.

We moved our launch location this year to be closer to the FAA determined center point yet still stay on hard play and out of the scrub.

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## President's Pad

Jim Green

This gives us a daily 60,000' altitude with windows to 150,000'.

The guidelines that the FAA is using this year are as follows...

### **Black Rock Amateur Rocket Guidelines June 14, 2016**

**Background:** These Black Rock Amateur Rocket Guidelines are being provided to clarify procedures and expectations when applying for waivers/authorizations and operating amateur

Procedures and expectations when applying for waivers/authorizations and operating amateur rockets at Black Rock. This year has presented particular issues since access the playa has been problematic due to an unusually wet spring. Additionally, there has been some general confusion as to whether varied launch locations are available away from the launch points delineated in waiver/authorization applications. It is in everyone's best interest to follow these guidelines to ensure future access to the playa and the associated airspace. Two key items that drive some of the guidelines are the Victor Airway to the east and the Reno Military Operations Area (MOA) to the southwest. We must strike a balance of access to the playa, the DOD's missions in the MOA, and the need to have the airway access available to air traffic control.

#### **Definitions/Explanations:**

**Black Rock Operations Area:** The general area/s of the Black Rock Desert playa where rocket organizations/clubs/individual proponents have coordinated, with FAA, to launch and recover Class II and Class III Amateur Rockets.

**Authorized Launch Point:** The point on the surface of the earth at which, under normal circumstances, proponents are to launch all rockets after authorization is granted by the service center, all prior-coordination with affected facilities is accomplished, and launch approval by Air Traffic Control (ATC) is received.

**Black Rock Center Point/Coordinates:** Latitude 40°52'59.73"N, Longitude 119°02'04.73"W

**Black Rock Center Point/Fix Radial Distance (FRD):** The Lovelock (LLC) VORTAC magnetic 319° radial at 50 NM (LLC 319 050)

**Authorized Launch Area:** The area that is contained within the circumference of a circle having a one-half-mile radius (1/2 NM Radius) and is equally positioned, or centered, around the Authorized Launch Point. A proponent may, without prior approval/coordination, vary the actual launch location to any suitable location, provided it remains within a one-half-mile radius from the Authorized Launch Point.



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**Black Rock 7-mile (BR7) Hazard Area:** The area that is contained within the circumference of a circle having a 7-mile radius and is equally positioned, or centered, around the Black Rock Launch Point Coordinates and extending from the surface upward to infinity (or predetermined altitude that exceeds the maximum vertical capability of any Class II or Class III rocket operating under the current and applicable Certificate of Authorization or Waiver). The maximum altitude that may be authorized while operating area is **157,976 feet Mean Sea Level (MSL)**. This maximum altitude assumes launches are conducted from the Center Point and is calculated by subtracting the Center Point's Authorized Launch Area Radius of one-half (1/2) mile from the farthest protected range of 7 miles, resulting in 6 ½ miles, which is then multiplied by 4 (reverse calculation of one-quarter of the maximum expected altitude as specified in JO 7400.2, Part 6, Chapter 31, Section 2, paragraph 31-2-2.7.b.) and further multiplied by 6,076 (approximation of the predefined nautical mile of 6,076.12 feet), i.e.,  $(7 - .5) * 4 * 6,076 = 157,976'$  or  $157,976 * .25 / 6,076 + .5 = 7$  NM (aka. BR7). Note: This maximum altitude, however, is not guaranteed and may be reduced by the Office of Commercial Space Transportation after a thorough review/evaluation of submitted supplemental information as specified by eCFR Title 14, Part 101, Paragraph 101.29, Information Requirements. Operations contained within BR7 may be coordinated for 24/7 daily operations.

**Black Rock 15-mile (BR15) Hazard Area:** The area that is contained within the circumference of a circle having a 15-mile radius and is equally positioned, or centered, around the Black Rock Launch Point Coordinates and extending from the surface upward to infinity (or predetermined altitude that exceeds the maximum vertical capability of any Class II or Class III rocket operating under the current and applicable Certificate of Authorization or Waiver). The maximum altitude that may be authorized while operating within this hazard area is 352,408 feet MSL. This maximum altitude assumes launches are conducted from the Center Point and is calculated by subtracting the Center Point's Authorized Launch Area Radius of one-half (1/2) mile from the farthest protected range of 15 miles, resulting in 14 ½ miles, which is then multiplied by 4 (reverse calculation of one-quarter of the maximum expected altitude as specified in JO 7400.2, Part 6, Chapter 31, Section 2, paragraph 31-2-2.7.b.) and further multiplied by 6,076 (approximation of the predefined nautical mile of 6,076.12 feet), i.e.,  $(15 - .5) * 4 * 6,076 = 352,408'$  or  $352,408 * .25 / 6,076 + .5 = 15$  NM (aka. BR15). Note: This maximum altitude, however, is not guaranteed and may be reduced by the Office of Commercial Space Transportation after a thorough review/evaluation of submitted supplemental information as specified by eCFR Title 14, Part 101, Paragraph 101.29, Information Requirements. Operations exceeding BR7, but contained within BR15 may be coordinated for one two-hour period per day.

**Black Rock Revised Launch Area:** The area that is contained within the circumference of a circle having a 2-mile radius and is equally positioned, or centered, around the Black Rock Center Point. A proponent

**President's Pad****Jim Green**

may, with prior approval/coordination by/with ATC, vary the actual launch location to any suitable location, provided it remains within a 2-mile radius from the Black Rock Center Point. This Revised Launch Area may be requested when access to the Black Rock Center Point is limited or not possible. Note: When the Black Rock Revised Launch Area is activated, the maximum altitude shall be 100,000 feet MSL. This limitation is applicable to any operation/s that would have otherwise required activation of BR15.

**Off-Center Launch Point:** A point on the surface of the earth, not contained within the Black Rock Revised Lunch Area, at which proponents are requesting, via 7711-2, to launch all rockets after authorization is granted by the service center, all prior-coordination with affected facilities is accomplished, and launch approval by ATC is received. The maximum altitude applicable to launch operations conducted at an Off-Center Launch Point will vary based upon distance from the Black Rock Center Point (BRCP) and associated hazard areas calculated to remain within the predetermined boundaries of BR7 and BR15, i.e., the farther away from the BRCP, the lower the maximum altitude and/or time available for launch operations. Note: In the Off-Center Launch Point example noted on the illustrations on pages 3 and 4, the Off-center Launch Point is 2.3 NM from BR7. This position limits the standard/daily operations altitude to 43,747' MSL, because the maximum hazard area / radius calculation that remains within BR7 is 1.8 NM, i.e.,  $(2.3 - .5) * 4 * 6,076 = 43,747'$  or  $43,747' * .25 / 6,076 + .5 = 2.3$  NM. Any altitude higher than 43,474' MSL would require prior approval from the Service Center and "day of" coordination and approval by ATC to activate the BR15 Hazard Area, which may be available for a maximum of one two-hour period per day.

**In a nutshell:**

**Black Rock Center Point:** 40°52'59.73"N/119°02'04.73"W (LLC 319 050)

**Launch Area Variance:** 1/2-mile radius from Center Point / Off-center Launch Point

**Revised Launch Area:** From one-half mile up to 2-mile radius from center point (max altitude 100,000' MSL)

**Off-Center Launch Point:** Anywhere on the playa; however, hazard area calculations will align with/remain within BR7/BR15

**BR7 Hazard Area:** 7-mile radius from center point (standard operations, available 24/7 with prior coordination)

**BR15 Hazard Area:** 15-mile radius from center point (limited operations, may be available for one 2-hr period p/day)



President's Pad

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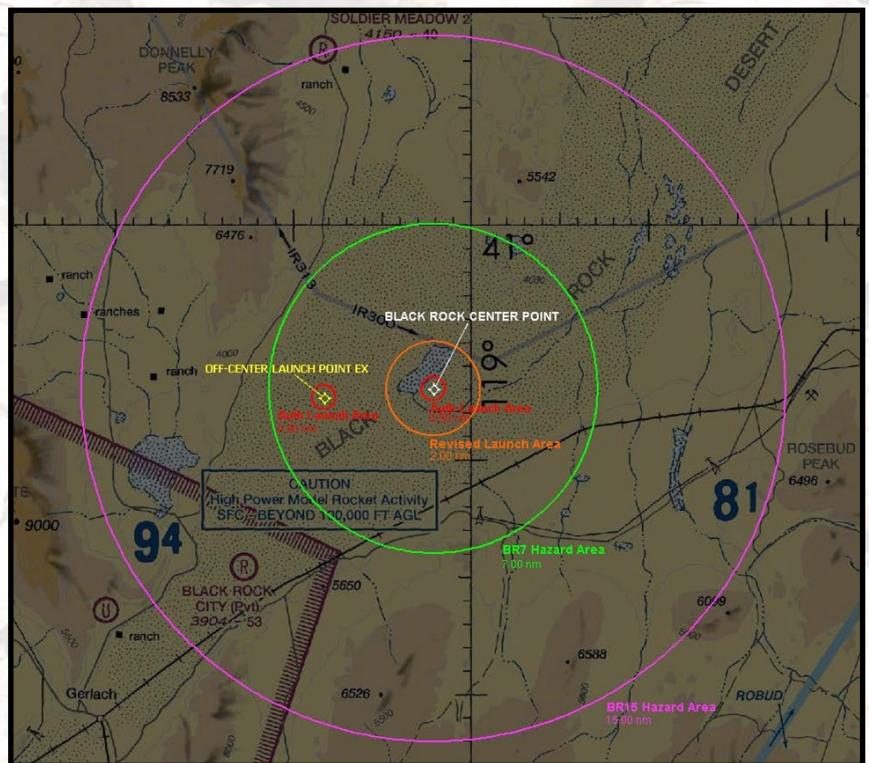
**Off-Center Launch Point distances from Center Point / Max Altitudes\* MSL (subtract 4000' for approx. AGL):**

<u>Up to:</u>	<u>BR7</u>	<u>BR15</u>
½ Mile:	157,976'	352,408'
1 Mile:	100,000'	TBD*
2 Miles:	100,000'	TBD*
3 Miles:	85,064'	TBD*
4 Miles:	60,760'	TBD*
5 Miles:	36,456'	TBD*
6 Miles:	12,152'	Not Authorized
7 Miles:	0	Not Authorized

\*BR15 Maximum altitudes for launches occurring outside of the Authorized Launch Area will be considered on a case-by-case basis and may or may not be authorized.

**Discussion:** All proponents are expected to use launch points designated in waiver/authorizations and may only vary from these launch points based on the details in the descriptions above that are appropriate for your particular waiver/authorization.

The FAA has no responsibility for scheduling of events at Black Rock and will not become involved in scheduling conflicts among proponents.





## 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 the new projects for next season that 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 that 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



Photo by J. DuBose



## AEROPAC Annual Membership Meeting

September 17, 2016

Subject to appropriate notice, President and Prefect Jim Green called the annual member meeting to order on Saturday, September 17, 2016.

Jim Green, President & Prefect; Gene Engelgau, Director & Launch Director; Eric Kleinschmidt, Director and CFO; Erica Bradley, Vice President; and William Kellermann, Secretary & Corporate Counsel: were the officers attending. Twelve members attended.

1. Jim Green discussed the new launch site location as a result of new waiver conditions imposed on AEROPAC by the FAA. The FAA, in negotiation with TRA, selected a zero-point and two general waiver conditions designated BR7 and



BR15. The primary reason for the new location is to avoid flights and recovery in the Reno Military Operations Area (MOA). The directors and officers are concerned that the zero-point is barely accessible and too close to the Quinn river sink. As such, much of the recovery area is inaccessible if rockets are launched from the zero point. The distance of our range head from the zero-point determines the maximum altitude and waiver cylinder for our launches. The current range head location was selected as a compromise between altitude, accessibility and extent of recovery area. The officers and directors are concerned that while the Reno MOA has been there for a long time, it has just now become a concern. Moreover, based on environmental impact reports and regulations, the hours when the military is authorized to fly do not impact our launches on Saturday or Sunday. Accordingly the board has authorized an initiative to monitor and participate in waiver setting discussions with TRA and the FAA. While there is some concern our current launch site may be problematic for Mudrock accessibility, the consensus was this was a good site and we could adjust for Mudrock if necessary.

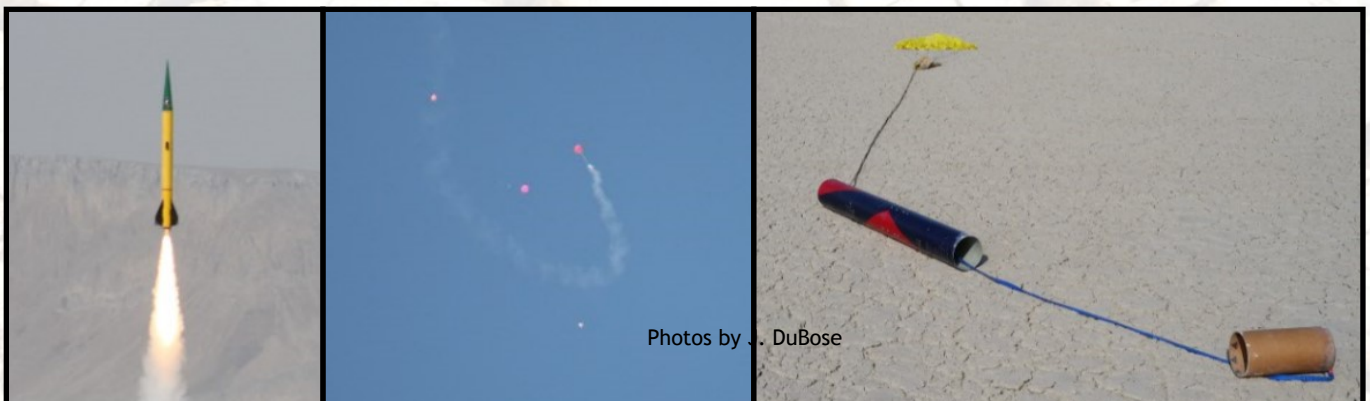


## AEROPAC Annual Membership Meeting

September 17, 2016

- Gene Engelgau addressed the ongoing effort to improve launch equipment. Jim and the members thanked Gene for his work to source and acquire the new wireless launch control system. Consensus of the members was that it was working very well and better than the old system. Gene discussed the need for a new public address system as well as a siren. He informed the members that the AEROPAC board re-authorized the ongoing initiative to improve launch equipment with the goal of replacing the public address system, warning siren and away-cell high power pads this off-season.
- Eric Kleinschmidt and William Kellermann reported about the accounting review. There were no issues with accounting or finances reported by the CPA. Aeropac is in good financial condition.
- Jim reported on the relationship with the BLM as a good one, however our longstanding ranger is retiring. The outreach team will continue to work to maintain good relations with the BLM directly.
- William Kellermann reported briefly on the board meeting and that our current slate of officers and directors remained the same. He called for additional volunteers for various positions, including equipment manager and to assist with other tasks at launches. Gene echoed the call for volunteers.
- There was no further business; the meeting was adjourned.

WTK (William Kellerman)



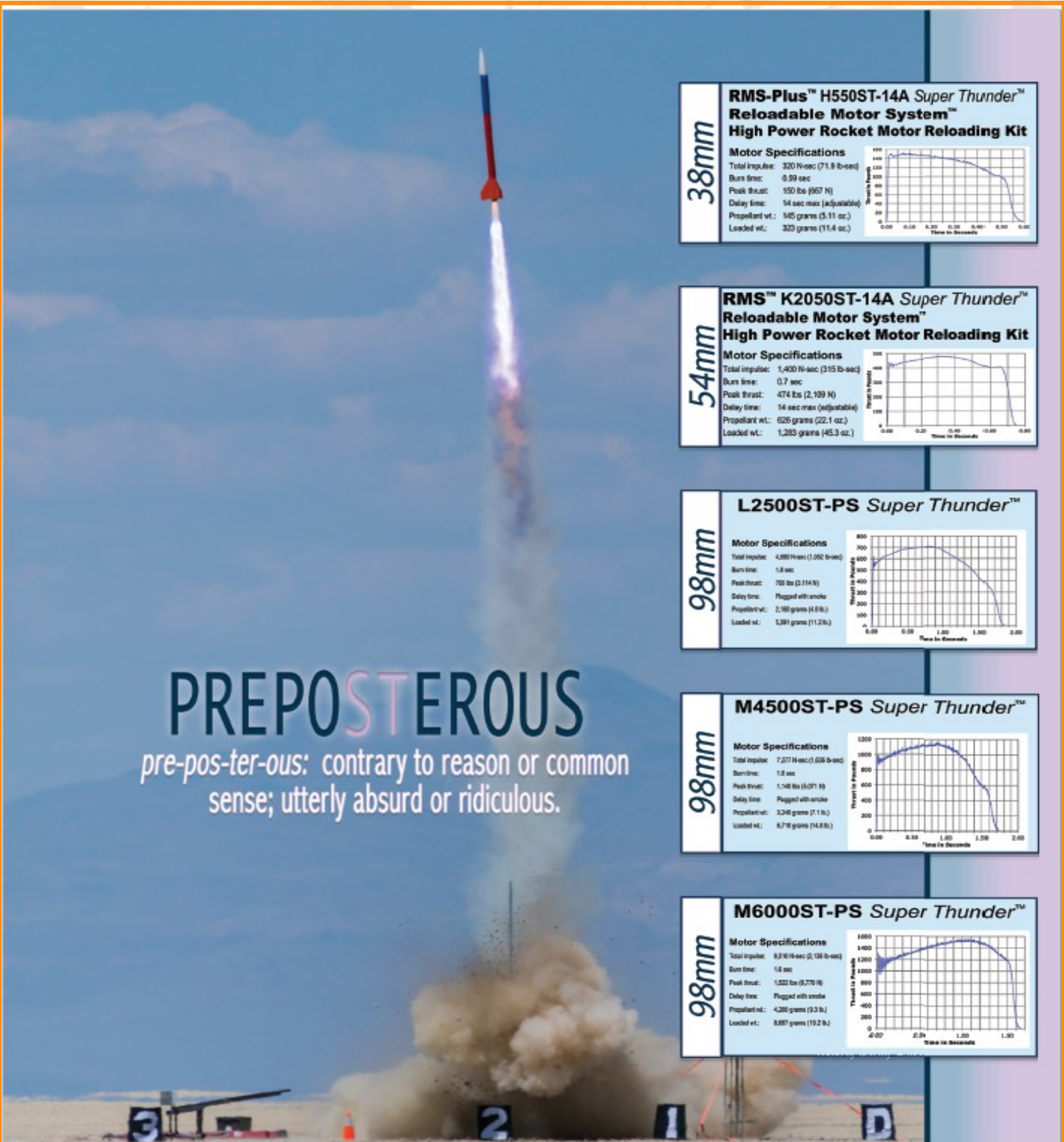
Photos by J. DuBose

**What every ARLISS flyer wants to see - A nice straight boost, 4 parachutes - nose cone, fin can, main body, and most importantly, the student payload.**

**And a nice, neat undamaged rocket laying on the playa.**







# 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 lbs (667 N)
- Delay time: 54 sec max (adjustable)
- Propellant wt.: 145 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 lbs (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 lbs (3,114 N)
- Delay time: Plugged with smoke
- Propellant wt.: 2,185 grams (78.0 lb.)
- Loaded wt.: 5,381 grams (11.2 lb.)

**98mm**

**M4500ST-PS Super Thunder™**

**Motor Specifications**

- Total impulse: 7,277 N-sec (1,636 lb-sec)
- Burn time: 1.8 sec
- Peak thrust: 1,146 lbs (5,071 N)
- Delay time: Plugged with smoke
- Propellant wt.: 3,246 grams (115 lb.)
- Loaded wt.: 8,718 grams (19.2 lb.)

**98mm**

**M6000ST-PS Super Thunder™**

**Motor Specifications**

- Total impulse: 9,516 N-sec (2,131 lb-sec)
- Burn time: 1.8 sec
- Peak thrust: 1,533 lbs (6,770 N)
- Delay time: Plugged with smoke
- Propellant wt.: 4,265 grams (151 lb.)
- Loaded wt.: 8,887 grams (19.6 lb.)



**Technical by Design.**  
www.aerotech-rocketry.com





## Flying the PrepoSTerous Aerotech M6000

William Walby

M6000 at XPRS: 9500 N-sec, 1.6 sec burn, 1500 lbs thrust-Preposterous!!!!

This started out as a project for me to build and fly a minimum diameter 98mm M750 to as high as I could. What I ended up doing was flying this rocket on a new AeroTech M6000 SuperThunder! I was contacted just after Aeronaut by Karl Baumann at AT and he asked me if I wanted to fly the M6000 as a demo flight at XPRS in a minimum diameter airframe and I jumped at the chance. I had the airframe mostly built for the long-burn M 750 but decided it needed to be reinforced a bit at the coupler to withstand the approximately 60 G thrust this rocket was going to experience once the motor was ignited. I laminated an extra piece of coupler tubing inside the existing coupler using West System resin. I was already using a Binder aluminum fin can so I thought the aft-end robust enough for for this motor. Karl brought me the built motor early in the week of ARLISS so I had plenty of time to appreciate the the gigantic nozzle opening and the serious nature of what I was going to do come Saturday of XPRS. Karl and I walked the 31 lb rocket out to the pads a little before noon and got it ready for launch. I have to admit that my heart was in my throat while awaiting the countdown and launch. I just kept repeating to myself "stay together and fly straight," over and over.

The countdown ended, there was a ball of flame and the rocket was gone!!! This was a 48 to 1 Thrust to weight. WOW, dead straight boost 1.6 sec burn, 20 sec coast to 22K ft, 57 G's - as the ad says "PREPOSTEROUS". Recovered intact 0.8 mi east of the flight-line. A bit of a hard landing as the chute deployment bag got tangled up with the shock-cord and the chute didn't deploy. A little zipper but fixable. All in all an awesome flight. Thanks go out to Gary and Karl of Aero-tech for their continued support of Aero-pac and all of hobby rocketry. You make absolutely bitchin' products. Next up, the new K2050 ST in my "in progress" 54 MD.

William Walby

TRA 2904, Aeropac 102

L3

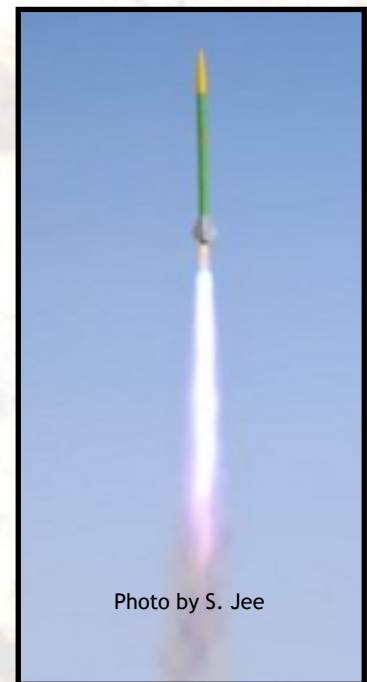




Photo by J. DuBose

At ARLISS / XPRS Karl Baumann and Gary Rosenfeld from Aerotech displayed some new and upcoming products—DMS™ Disposable Motor System™ motors including the O6000, a NASA inspired head end ignition system for 2 stage / airstarts and Floating Forward Closures for use with Reload Adapter System™ . Gary and Karl were busy all week answering questions and arranging demo motor flights. Gary, Karl — we truly appreciate your support!

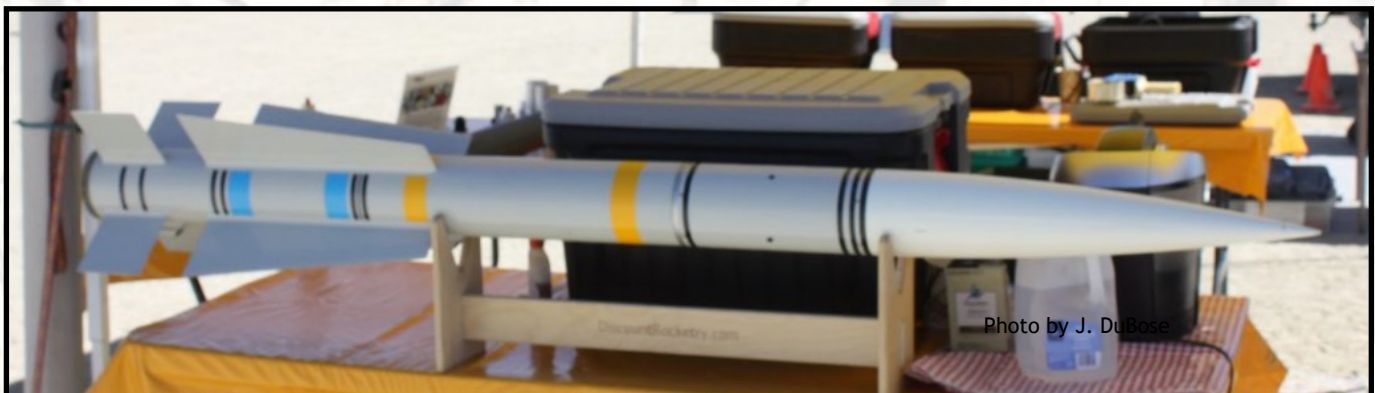


Photo by J. DuBose

Karl's Phoenix - a lot of folks want to see this beauty fly!



## Oregon Rocketry Team Flies Tapioca Joe at XPRS

Gary Lech

We call ourselves Team Tapioca. We are (l to r) Gary Knaust, Gary Lech, Brian Van't Hul, and Chuck Fauser. Nearly two years in the making, our scratch built rocket is named Tapioca Joe in honor of Chuck's dad, Joe Fauser, a retired GE spacecraft integrator, who happens to love tapioca. Some teams build rockets to launch beer kegs. We wanted ours to launch a 7 pound can of tapioca.

Our first flight was on our Oregon Rocketry (OROC) home field at Brothers. We flew it low and slow on an M1939 and 4 J-350s airstarted 3 seconds after launch. It was a perfect flight and a great experience: <https://youtu.be/dLYPPnIpl3s>. We even tasted the tapioca. It was not as good as the Fauser homemade.



Photo courtesy of G. Lech



Photo courtesy of G. Lech



Photo courtesy of G. Lech

Our next opportunity to fly was at the XPRS event. This time we wanted to go big and fly our first N motor along with the 4 J-350s. With the first flight under our belts the prep went smoothly except for a surprise when our aft motor closure would not work with the N2000 nozzle. Ours was the "old" style and fortunately Jonathan DuBose came to our rescue and loaned us the correct one. This was the second time Jonathan rescued us. He and Dick Jackson also taught us the technique for insuring a good airstart using a slug of blue thunder propellant. Thanks guys.

The evening before our launch Knaust and Van't Hul spent many hours reviewing the sims. We then chose to light the J-350s at 12 seconds but started the process at 10 seconds to give the Ravens time to react and the motors to come up to pressure. This proved to be a good show and you could clearly see the J350s light.



## Oregon Rocketry Team Flies Tapioca Joe at XPRS

Gary Lech



Photo courtesy of G. Lech



Photo courtesy of G. Lech



Photo courtesy of G. Lech



Photo courtesy of G. Lech

The 88 pound Tapioca Joe flew this time without the 7 pound tapioca can to an altitude of 14,600' with a perfect deployment by the dual StratoLoggers of the drogue at apogee followed by the main at 1100 feet.

Recovery on the playa is an easy drive up chore and in this case the wind was taking Tapioca Joe on a rodeo ride. Chuck did the wrangling and brought the rocket back to the ground with the some fast foot-work.

And with Brian's custom rooftop rocket carrier we were ready to fly again.



Photo courtesy of G. Lech

Brian Van't Hul  
Gary Knaust  
Chuck Fauser  
Gary Lech

It was another perfect flight. We're already looking forward to the next AeroPAC launch.



## Oregon "N" Power at XPRS

Gary Knaust

Oregon Rocketry's (OROC) Gary Knaust had two great N powered flights at ARLISS / XPRS. The first was on Wed the 14th with a CTI N1800 supplying the thrust to send the 6" air-frame 57 lb 'Checkered Past' to an altitude of 14224' from the Uber rail descending on 5' drogue & 8' main chutes.

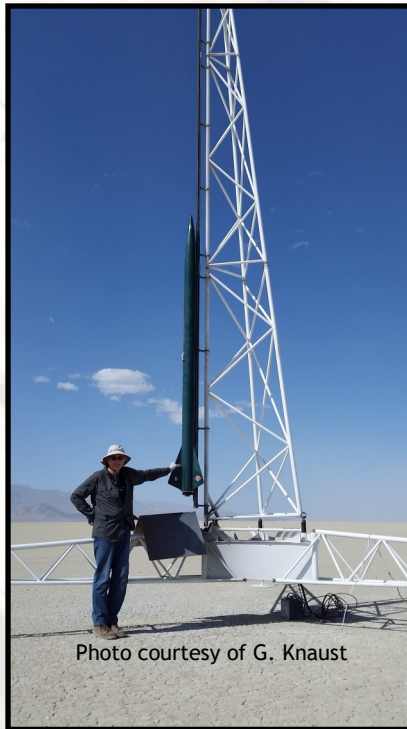


Photo courtesy of G. Knaust



Photo courtesy of G. Knaust

The second flight was on Friday the 16th which flew on an AT N2000 boosting the same rocket but weighting 69 lbs to 14983'. Early chute deployment is suspected resulting in the lower than expected altitude.

Both flights had a camera on board but on Friday's flight the camera shut down just before liftoff, drat!

Gary would like to thank AeroPac for putting together two great launches.....again!



Photo by J. DuBose

**Alex Chuzo demonstrates good organization building her L1 motor. She successfully certified Level 1**



Photo by J. DuBose



## 2016 Launch Director's Report

Gene Engelgau

### MUDROCK

Thursday Setup – Like last year I got out to the launch site around 5:30. As usual Darryl Paris had the trailer out at the site and ready to go. Because of the wet winter the Playa was in the best shape I've seen in a long time. There was no blowing dust at this launch.

For this year the big new thing was the new launch system, and at Mudrock we got to give it a good tryout. Because the new system is wireless the setup went faster than in past years. Darryl let us use his laser ranger finder to set the distances to the pad banks, because we no longer have to use the big, heavy cables to set the distances. The ranger finder is an excellent way to do this quickly and accurately.



MUDROCK "angel" setup crew

Friday – We woke up Friday to good weather. We had our flyers meeting around 8:30AM and the launch was looking pretty good. As I recall the weather remained pretty nice till around 1PM, then it got a bit windy. Below is a nice cozy group for the flyers meeting. It was clear that the launch would not have the usual turnout since LDRS was the weekend before at ROC in southern California. Nevertheless we had a good group of dedicated flyers.

Once we got going we immediately had problems with the new launch system. We finally diagnosed these as battery problems, or wiring resistance. We learned that some of the wire harnesses had up to perhaps 10 ohms of resistance, causing a large voltage drop when the pad is fired, and that resets the controller and opens the circuit. So a lot of time was spent cleaning connectors enough to get good connections. This plagued us for much of the launch. Also, the batteries were not in the best shape. The other issue that came up to a lesser degree was that wireless transceivers are sensitive to high temperatures. We were warned of that from LDRS, and we kept the equipment cool. The weather also cooperated by staying on the cooler side. But there did seem to be temperature related issues on and off.

After the launch Jim Green and I took the affected equipment back and applied a modification to the equipment and that fixed the issues.

Saturday – For Saturday we had some morning overcast, and it was cooler. The wind was up for much of the day, dampening flight operations.



Photo by G. Engelgau



## 2016 Launch Director's Report

## Gene Engelgau



Photo by J. DuBose

**Jim and Gene at MUDROCK Friday morning flyer's meeting**



Photo by G. Engelgau

**Windy, cloudy and chilly weather pretty much put the kabosh on Saturday flights**

**Gene flew his Full Yellow Jacket on Sunday morning**



Photo by G. Engelgau



Photo by J. DuBose

**Darryl Paris spotted a tether on the playa that ended up being attached to a buried rocket. Probably from a BALLS launch—last year? The year before?**

Sunday – Sunday was clear and nice so we had a lot of flights.

### **Aeronaut 2015**

Thursday Setup – Due to some delays Markus Kraus and I didn't get out to the Playa with the equipment trailer till about 6:30PM. So we dropped the equipment and did setup the next morning.





## 2016 Launch Director's Report

Gene Engelgau

Friday morning was set-up for the launch. Jim Green had got us new batteries and made new wire harnesses. Once we got everything hooked up, and with good batteries and wiring, the new launch system worked perfectly! Also there were no temperature related issues.



Photo by G. Engelgau

Saturday – We woke up Saturday to a lot of wind and spent much of the day battling it. Because of the higher winds in the morning we missed the flyers meeting since folks were securing their camps. It stayed that way until the later afternoon, and then the winds dropped.

### Friday morning flyers meeting at AERONAUT

Sunday – Sunday we woke up to amazing weather and we had a lot of good flights. Because we had many fliers who could not fly Saturday we left the range open later. As I recall we rolled out about 1PM with the equipment trailer.

### ARLISS / XPRS 2016

I made it out to XPRS this year on Tuesday which was nice. I had a few days to chill and relax before XPRS started. See Becky Green's article for an ARLISS update.

Friday – Friday was looking like a really good day. We had a good group with excellent conditions the entire day with many great flights.

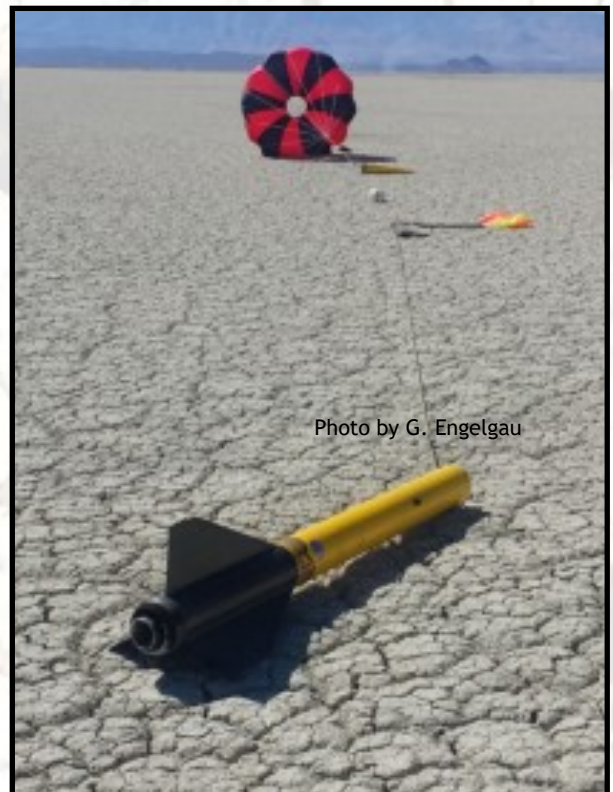


Photo by G. Engelgau

**Full Yellow Jacket after its flight to 21600'**



## 2016 Launch Director's Report

## Gene Engelgau



Photo by J. DuBose

Saturday pm: Looking down the front row—"East End" to the "West End".



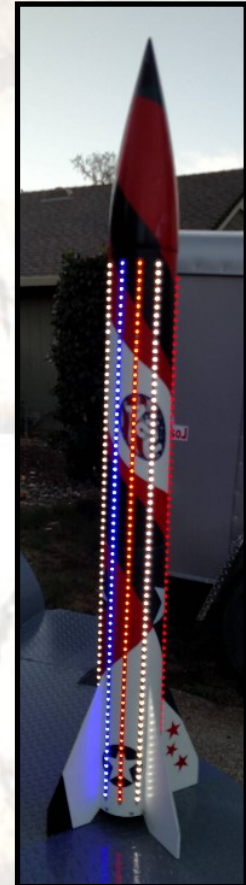
Photo by J. DuBose

**Matt Sikkink loads his 2 stage to the Uber Rail**

Saturday – Like Friday, Saturday started out good, but it did get a bit windy in the later afternoon. There were actually a lot of people at the launch, despite the low turnout at the flyers meeting.

Sunday – Sunday I had a commitment and I needed to be back home in Los Gatos at 4:30PM. I left around 10 AM.

The End - till the 2017 Season!



Dick Jackson flew his wife's night launch rocket 3 nights on sparky motors. 720 super bright LEDs and a real crowd pleaser! Dick wishes to thank Jonathan DuBose and Aero-tech for supplying the motors. Photo by R. Jackson



## 2016 AEROPAC Flight Totals

### MUDROCK

Motor Class	Max Impulse	Model Count	Normal Count	Cert Count	Research Count	Bad Flights	Grand Total
½ A up to 1.25NS	1.25						
A up to 2.5 NS	2.5	2					
B up to 5 NS	5	3					
C up to 10 NS	10	14					
D up to 20 NS	20	7					
E up to 40 NS	40	3					
F up to 80 NS	80	6	6				
G up to 160 NS	160	2	12				
H up to 320 NS	320		9	1		1	
I up to 640 NS	640		10			1	
J up to 1280 NS	1280		9			2	
K up to 2560 NS	2560		8			2	
L up to 5120 NS	5120		4			1	
M up to 10240 NS	10240		3				
N up to 20480 NS	20480		1				
O up to 40960 NS	40960						
P up to 81920 NS	81920						
<b>Total Flights</b>		<b>37</b>	<b>62</b>	<b>1</b>	<b>7</b>	<b>0</b>	<b>107</b>
<b>Approximate NS's</b>		<b>610</b>	<b>57680</b>	<b>160</b>	<b>6880</b>	<b>0</b>	<b>065,330</b>

### AERONAUT

Motor Class	Max Im-pulse	Model Count	Normal Count	Cert Count	Research Count	Bad Flights	Grand Total
½ A up to 1.25NS	1.25						
A up to 2.5 NS	2.5	3				4	
B up to 5 NS	5	10	2				
C up to 10 NS	10	40	7				
D up to 20 NS	20	8					
E up to 40 NS	40	8					
F up to 80 NS	80	10	2				
G up to 160 NS	160	7	7				
H up to 320 NS	320		21				
I up to 640 NS	640		3				
J up to 1280 NS	1280		5		2		
K up to 2560 NS	2560		8		1		
L up to 5120 NS	5120		2		2		
M up to 10240 NS	10240		4				
N up to 20480 NS	20480		1				
<b>Total Flights</b>		<b>86</b>	<b>62</b>	<b>0</b>	<b>5</b>	<b>26</b>	<b>179</b>
<b>Approximate NS's</b>		<b>1428.75</b>	<b>54280</b>	<b>0</b>	<b>7680</b>	<b>18710</b>	<b>82,099</b>



## 2016 AEROPAC Flight Totals

### ARLISS / XPRS

Motor Class	Max Impulse	Model	Normal	Cert	Research	Bad Flights	ARLISS Total	
½ A up to 1.25NS	1.25							
A up to 2.5 NS	2.5	8						
B up to 5 NS	5	6						
C up to 10 NS	10	28	2			4		
D up to 20 NS	20	4	1					
E up to 40 NS	40	9	1			1		
F up to 80 NS	80	10	5			2		
G up to 160 NS	160	6	16					
H up to 320 NS	320		37	7		3		
I up to 640 NS	640		24	4		3		
J up to 1280 NS	1280		30	9	1	3		
K up to 2560 NS	2560		32	1	5	2	1	
L up to 5120 NS	5120		14		2	3		
M up to 10240 NS	10240		14	2	2	2	30	
N up to 20480 NS	20480		7					
O up to 40960 NS	40960					1		
P up to 81920 NS	81920							
<b>Total Flights</b>		<b>71</b>	<b>183</b>	<b>23</b>	<b>10</b>	<b>24</b>	<b>31</b>	<b>342</b>
<b>Approximate NS's</b>		<b>1265</b>	<b>254480</b>	<b>19680</b>	<b>22400</b>	<b>44440</b>	<b>154880</b>	<b>497,145</b>



Photo by J. DuBose

**NAR President John Hochheimer (left) attended ARLISS / XPRS. John's article "First Impressions of Black Rock" appears in the Winter edition.**



Photo by J. DuBose

**TRA President Deb Koloms (right) chatting with Joe Bevier, also attended ARLISS / XPRS.**



## XPRS Altitude Contest Winners

Darryl Paris

Hello AeroPAC!

Another XPRS goes down in the books! All those who entered the contests had a good time and the competition was tough. Some who thought they would win ended up placing lower in the ranks. The youth contest had the Paris kids struggling to even place as Trevor G. and Will S. cleaned house in the loft duration. Friday we had perfect weather and lots of flights were entered. Saturday was fairly blown out, limiting entries. This year we had a new class, Two Stage, which is an altitude only with a requirement that all parts must be recovered intact and fly as planned. We did have a couple of classes where no one entered, leaving unclaimed trophies.

H Motor Class: 1st Erica Bradley 7,600'  
2nd Daryl Paris 3,944'

I Motor Class: No entries, no trophy awarded

J Motor Class: 1st Kurt Gugisberg 12,103'  
2nd Peter Hacket 8,620'

K Motor Class: 1st John Sifling 19,953'  
2nd Erik Conway 19,898'  
3rd Derek Stavenger 18,385'  
4th Derek Stavenger 16,094'  
5th Neil Pyke 13,044'

L Motor Class: 1st Greg Clark 16,229'  
2nd Neil Pyke 14,608'

M Motor Class: 1st Gene Engelgau 21,415'  
2nd Allen Farrington 21,200'  
3rd Ryan Catanesi 20,784'

O Motor Class: No entries, no trophy awarded

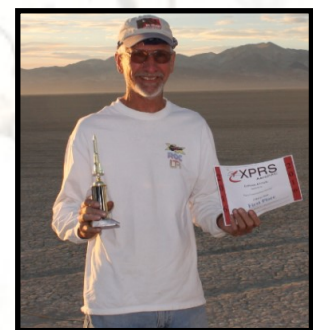
Two Stage class: 1st Kurt Gugisberg 32,881'

Congratulations and thanks to all that participated!

Contest sponsored by Paris Construction



Erica Bradley



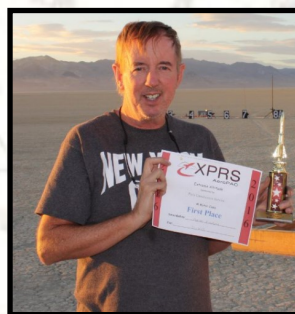
Kurt Gugisberg



John Sifling's 1st place certificate (Sorry, no photo of the actual John Sifling)



Greg Clark



Gene Engelgau



Kurt Gugisberg, again



### Kids Corner—XPRS Loft Duration Contest



Persistence paid off for Will Swenson



Zoey Paris takes her trophy



Trevor G. won an armful of awards



The Afterburners seemed to be everywhere!



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





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- Lightweight 1.1oz Mil-spec Ripstop
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- 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**

Lemon	Tangerine	Lime	Purple

**Standard Colors**

Coconut	Blackberry	Cherry	Blueberry



Reviewed Nov, 2008 Issue!

[www.fruitychutes.com](http://www.fruitychutes.com) - [fruitysales@fruitychutes.com](mailto:fruitysales@fruitychutes.com)  
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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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## ARLISS 2016

## Becky Green

I can't believe another ARLISS has just ended. ARLISS 2016 was our 18th ARLISS. Where has the time gone?

ARLISS 2016 began on Sunday, September 11 at Bruno's when the students had their meet and greet meeting that ended around 2:00 pm. By about 2:30 the cars all started appearing with headlights on out of the dust cloud that was surrounding us in camp (compliments of 75,000 people from Burning Man). It was so bad you couldn't see any of the mountains around us or the blue skies above....nothing but dirt. Jim even had to use the GPS to go get the ARLISS and equipment trailers from Empire.

We had about 80 students who helped unpack and set up the entire ARLISS camp in a couple hours.

Later in the afternoon just after camp was set up, the winds shifted to the east and we could finally see the mountains to the west and in front of us again....but nothing could be seen but billowing dust clouds behind us.

While the students were setting up ARLISS camp, Jim arrived with the equipment trailer and we had a team of volunteers who started setting up the launch. Thank you to all who helped....you know who you are.

Monday morning they were all back for our welcome meeting at 8 am. Not all teams were there that day....because we wound up with about 110 students over the 4 days from Georgia Tech, Czech Technical University in Prague, University of Louisiana @ Lafayette, University of Hawaii Windward Community College, Kumoh National Institute of Technology (South Korea), Cairo University-Egypt, Universidad Nacional de Ingenieria-Peru, University of Nevada Reno, Tokyo Institute of Technology, Tokyo Denki University, University of Tokyo, University of Electro-Communications, Tokyo Metropolitan University, Aichi University of Technology, Tokyo University of Science, Kyushu Institute of Technology, Keio University, Japanese Science Foundation, Shibaura Institute of Technology and the UNISEC team. Costa Rica was there as well....but this year they didn't send ARLISS students... they sent a team of seven students to get their Level 1 and Level 2 certifications so they can start their own prefecture in Costa Rica. They were also able to observe the entire ARLISS event. Several of these students already know they want to participate in



Photo by B. Green



Photo by B. Green





## ARLISS 2016

Becky Green

ARLISS next year. We also had a guest from Oregon State University who came to check out what ARLISS is all about. She has already gone back and recruited enough students to put together an ARLISS team. We look forward to them joining us for ARLISS 2017

By the time the meeting was completed you would have thought it was late afternoon when the "Big W" can raise its ugly head. It was already blowing when we started registration. This was very similar to ARLISS 2015. However, this year the "Big W" stopped before noon and I looked over to ARLISS camp only to see most of the teams had left. Yes, they left and we had perfect flying weather....we only managed to get 3 flights off that day.

In addition to ARLISS, this was the first time I have ever done a rocket building class on the playa during an ARLISS launch. Costa Rica's seven students arrived Tuesday morning about 7 am. After breakfast and the first 100K launch attempt....we went to my camp and started the class. The kits we used were the S4 rocket kits Tony Alcocer designed. I made a few minor changes so the rocket could handle both L1 and L2 flights. It was like the S4 rocket kit on steroids....LOL. Jim and I put fiberglass on the cardboard tubes. Evan Curtis (FXcutting) cut all the centering rings and fins from 1/4" plywood and Jim built a fin beveling jig and I beveled all the fins. After buying all the other parts, Jim cutting couplers to the correct lengths and me building all the 29mm to 38mm adapters it was time to put all the parts into baggies and number them. Oh and for those of you who were there and were mesmerized by the pulsating parachutes they used....those were 50" parachutes donated by Bob Fortune from Aerocon.

Since they had to leave on Friday morning early, we knew we had to have the majority of the rocket finished Tuesday night so they could fly on Wednesday and Thursday. Well....the wind came up late afternoon on Tuesday and we were forced to stop just as they finished doing the second section of fiberglass tip to tip on the fins. However, around 9 pm. the winds died down and we ran outside, set everything up and finished the third section of the tip to tip by car lights, flashlights, head lamps, lanterns and moonlight.





## ARLISS 2016

BECKY GREEN

See article from Costa Rican students– p 29).

Sorry....back to ARLISS. Things became a blur with me which days were good weather and which days were bad....but all I knew is we were supposed to have 45 flights that needed to be completed by Thursday. Of course we wanted to fly as many as possible each day while the weather was good. Well that didn't happen. The weather was perfect much of the time....but very few projects were ready. We launched only 8 on Tuesday. Now we were going to get hit hard with lots of flights on Wednesday and Thursday and the weather was going to have to be perfect both days to pull this off.



Photo by B. Green

We only got 4 flights on Wednesday and now that meant we had to do 30 flights on Thursday. Wow, not again like last year I thought to myself. Luckily (well maybe not) UNISEC came to me and said there were many flights that were originally scheduled that would not be flying but they didn't have an exact number. Come to find out several of the projects had been damaged or were not working to their specs and didn't fly at all or didn't do the planned second flights. I had to give many refunds for flights that had been paid for. But once again my team of flyers were ready to step up no matter what I was going to throw their way. Things started out slower than expected on Thursday, but after the 100K flight I was at full staff and was ready to take anything that came my way. Wow....by the end of the day I couldn't believe it.....we only had 14 M flights and 1 K flight.

However, there was one more flight Friday morning around 7 am which actually got us to a whopping total of 30 M flights and 1 K flight. I couldn't believe how slow this launch was. That was 15 flights less than originally planned. It also was the lowest count of flights in a very long time. Heck....that was the total amount of flights we did in one day last year. Since it was soooooo slow even our motor wrangler Peter Hackett wasn't very busy cleaning motors. He only got one flyer to take him up on his offer to clean the case.

For those of you who were at the launch you know this already....but for the first time since acquiring the sat van, there was no sat van during ARLISS/XPRS. Ken was there but a major part broke on the satellite and there was no time to order and repair so Ken did not bring it to the playa. However, Ken was busy



## ARLISS 2016

Becky Green

helping me with registration, prepping the 100K launches and his own N motor launch Saturday morning. It was great seeing him out and about instead of being stuck in the van in his usual captain's chair.

I also had the help of Dean Walton on Thursday. OMG....he was soooooo awesome and drove into Sparks and did all the Costco shopping for the banquet food. Thank you so much for doing that....it was such a huge help. I know I could have found others to assign the projects and keep registration going and go shopping myself....but I was sure glad I was able to stay there to work and also make sure the Costa Rican students got their level 2 certification flights in the air.

Friday morning I took off early with many of my helpers to set up for the banquet. Everyone helped and we had that place set up so fast. There were only about 80 students, all my helpers and UNISEC at the banquet this year. We had lots of food left by the break for judging.....but by the end of the banquet we had very little left which is always a good thing.



Photo by B. Green

I just want to say a BIG THANK YOU to everyone who made this a spectacular ARLISS. If I missed your name please don't be mad....I'm probably having a senior moment....LOL.

William Walby, Jim Green, Ken Biba, Peter Clay, Paul Forrester, Mike and Marla Parker, Dave Raimondi, Charlie Wittman, James Marino, Dick Jackson, Matt Sikkink, Jonathan DuBose, Seth Wallace, Erik Ebert, Tim Robinson, John Lyngdal, Joe Bevier, Dean Walton, DJ Wyrick, UNISEC, all the students and of course AeroTech's very own Karl Baumann for delivering the motors. Without all of you ARLISS wouldn't be possible.



## Continuation of a Dream

A year ago most of us were sitting in a classroom watching with awe the videos of the rocket launches Leonora DeLemos (our professor) and Andrés Mora (a great friend of ours at the Aerospace engineering group of the University of Costa Rica) had gone to the Black Rock Desert to do. The sound of the rockets through the laptop speakers and the rocket leaving the pad and shooting up to the sky just leaving a fine trail of smoke behind was everything we needed to know, we wanted to be the next ones to go, turns out, dreams really do come true.

Anyways... This was the start of the adventure for us, right after the camp we went looking for Leonora, we wanted to be part of the group as active members and not just “campers”, she told us there was a meeting within the week and she told us we could go to start working with them (we all went). We saw the footage the launches she and Andres had made and she told us that the next step for the group was to make a rocket from scratch. As of that moment we had only launched kit rockets, so this was a whole new affair. Over the next year we worked restlessly to make our scratch built rocket a reality. Most of us were newcomers to the group (except for Esteban and Roberto who had joined before the camp) and Olman hadn't joined us yet, even though he had been at the aerospace camp he wasn't part of the University of Costa Rica, he joined next year and started to work with us right away.

We had to work hard, making a good rocket is not easy and it was a first for us, all the airframe was fiberglass except for the fins, none of us had worked with fiberglass before, the motor and the fuel were both scratch built, and we had a few motors blow up (we're still working on them but we are very close to get them right), we also built our own telemetry with gps tracking, altimeters, a sound activated beacon to help us find the rockets, accelerometers, etc. While we broadcasted the data in real time to our computer and we built a motor mount to test the motors in static conditions. So we had to go through a lot of trial and error and work a lot at the workshop in the university, some of us had never been there before, and before we knew it we were regulars at the place. All of this took place while we were taking our university courses and preparing everything for the second aerospace camp which took place this past July. It was actually during the camp that Leonora told us we were going to the Black Rock Desert this year. We were really excited by

## The Costa Rica Team



Photo by Costa Rican Team

of



## Continuation of a Dream

by the news, the next few months it was all that was present in our minds at all time, we had a lot to do to get ready, some of us had to receive their passports and visas and we barely managed it on time, but it all went well.

Our team is made up of seven people: Stephanie Rodríguez is a physics student at the University of Costa Rica, she was part of the first space camp and joined the group just after that, she mainly works with the airframes at the group, Francisco Salazar is a mechanical engineering student, he works both with the airframes and the “test bench” which is where we test our motors, Mauricio Alfaro is also a mechanical engineering student and he works both on the test bench and the airframes of the rockets, Esteban Jiménez is one of the senior members of the group, he works mainly with the motor and fuel design and their tests, he studies mechanical engineering, Roberto Aguilar is also one of the senior members of the group, he studies computer sciences and works with telemetry for the rocket, Olman Quirós studies both physics and computer sciences, he’s also in charge of the rocket telemetry and Carlos Rodríguez works with the rocket airframes and studies physics and electromechanical engineering.

The day of the trip came and we could hardly believe it, some of us hadn’t even got on an airplane before and much less gone out of the country. It was a unique experience, we were thrilled! We knew we couldn’t fail our certification flights, everyone back home was counting on us to get them, so even though we had started studying for the written exam a few weeks before the flight, we spent most of our time in the air studying and making questions to one another.

We met at Reno, got a car and headed out to Gerlach that same night. After getting some food and water we headed out to Bruno’s Motel, it was night-time so we didn’t get to enjoy the landscapes on our way to Black Rock, we did see some wildlife, mainly foxes, and, much to our distress a few rabbits that decided to hop the way the car was going. After a few hours ride we got to Gerlach (without a GPS we were actually glad we made it there). As soon as we got out of the car we felt the chill in the air. Costa Rica is a very warm country our, lowest temperatures are around 57 F, so most of us were not really accustomed to the

## The Costa Rica Team



Photo by Costa Rican Team



Photo by Costa Rican Team



## Continuation of a Dream

to the weather. We put our luggage in our rooms, and got together for one last round exam questions before going to bed.

Next day we got up early, we didn't know exactly how to get to the launch site, so we asked some of the Japanese teams in a mixture of English and broken Japanese and got a faint idea of how to get there. We hopped in the car and drove off, the landscapes were staggering. We don't have deserts in Costa Rica so we felt like we were in another world (Mars perhaps), somehow we managed to arrive to the launch site destination though we had to get out of the burning man area first (we got a bit lost). We arrived just in time to see the preparations of the Uber Rail and one of the two stage rockets that got off from it, so that after meeting Jim and Becky and exchanging some news and chatter on their RV, we went to see the uber rail for ourselves. After everything was done, the time for the launch finally came. It was amazing, the sound of the laptop speakers a year ago were nothing compared to this, it roared even from where we were standing and it went so high we could not see it anymore. It was both exciting and a spoonful of reality; we still have a long way to go.

As soon as we went back to the camp we started working on our certification rockets, which was what we had come all the way to do after all. They were built from scratch, the airframe was cardboard, however we fiber glassed everything we could to make it stronger. The day went off watching launches and building rockets, which is by our definition a pretty good day. By the afternoon it got really windy, so we couldn't keep building our rockets in the open. We grabbed everything and went into the RV. The wind went down at about 9 p.m. So we headed out with headlamps and light sticks and finished building what we could of the airframe. That day we went back to Bruno's really excited, the next day we would finish building our rockets and get our first certification flight.

The next day we arrived early at the camp, we finished some details on our rockets and named them. However we had a bit of wind so we couldn't launch right away, as we waited we studied a bit more for the written exam. At last, in the afternoon the wind calmed down and we headed out to the launch pad, we were nervous but we were really excited. We went together to the launch pad and got our rockets ready for the flight.

## The Costa Rica Team



**ARLISS Extreme on the Uber Rail  
and ready to rock and roll!**



## Continuation of a Dream

The first launch didn't go well, the parachute got tangled on its way out and didn't unfold properly. We were all getting nervous, however the next five launches went beautifully, the last launch didn't go as planned, the rocket didn't get its parachute out, so that made five out of seven who passed the level one certification on the first flight. Those of us who didn't went to get their rocket as fast as they could and started to work on the repairs as soon as they got back, we would have to wait until next morning to get another chance to fly.

That night we slept on the desert, we got to go to the campfire and see Jim's motors burn out on it, it was great. We had mostly finished the repairs on the two rockets that failed their first certification flight and John Lyngdal had donated two motors so that we could fly again, he told us "You can do it!" We were deeply thankful (all of us) and promised that this time we would make it. The next day we triple checked everything, before the level 1 flight. When we were sure everything was alright we headed out to the Launchpad a second time. Everything went alright and we were seven out of seven with our level 1 certification flights. That afternoon we took our written exam, two of us aced it and the others failed just one question. That night we went to bed pretty happy, next day we would do our level 2 certification flights.

The day of our level 2 flights was a special day in Costa Rica, it was our independence day, some of us had brought a flag and some traditional Costa Rican "chonetes" which are a kind of hat, and with somewhat of a festive spirit we headed to the launch pad. This was the moment of truth; we had to get our certifications.

The countdowns went down and one by one our rockets shoot into the skies. When it was all over we grabbed the car and went to get our rockets. One by one we showed them to Jim, he inspected them, they all were fit to fly again. We all got our level 2 certifications! We were absolutely thrilled at that, Jim and Becky gave us our pins and we immediately put them on.

## The Costa Rica Team

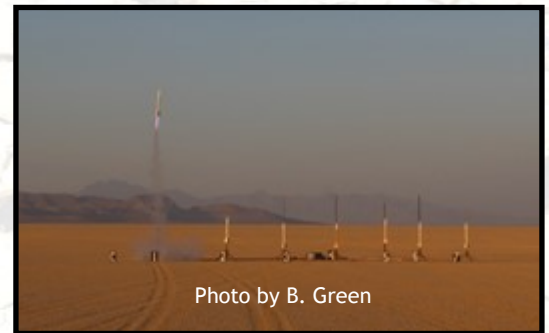


Photo by B. Green



Photo by B. Green



## Continuation of a Dream

Stephanie was the first woman in Latin America to get her level two certification, we were all so proud of her. We spent the rest of the day having fun in the desert, we had achieved what we set out to do. The next day we headed back to Reno with some of the Japanese ARLISS teams and the day after that we went back to Costa Rica where our families and friends awaited us, expecting the news of our adventures.

There are a few things you can only learn at the playa, we learned that there are a lot of people interested in rockets, we learned that they all are like a family, we made really good friends, we helped each other out and they helped us in every chance they had. We learned that success comes hand in hand with helping each other out, if one of us fails we help each other so that we can all succeed, if one of us succeeds success will fall on all of us as well, in short, We learned what kind of rocketeers and what type of people we want to become in the future. Thank you all very much for this experience and your friendship! And remember, anytime you need it you have a home in Costa Rica to go to. We hope to be hearing from all you in the future and we sincerely hope that you will hear from us! Thank you for everything, enjoy and fly high!

## The Costa Rica Team



Photo by Costa Rican Team



Photo by Costa Rican Team





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