

President's Pad

Tony Alcocer

Year in review: For several years now AEROPAC has been taking part in Black Rock Rendezvous which is hosted by Friends of Black Rock. It's a get-together of all the users of Black Rock. I was able to go this year and had a couple of good flights. My last flight was Speedy Gonzales' 45th flight! As it turned out it was Speedy's last flight, too! I'm not sure what went wrong. I prepped it like I always

Continued



Tony at the "Flyers Meeting" XPRS 2014

What's Inside

- Page 5 - MUDROCK fight stats**
- Page 6 - AERONAUT, ARLISS/XPRS stats**
- Page 7 - XPRS contest winners**
- Page 8 - Honeybadger 59k', mach 3.9**
- Page 12 - S-IVB testing in Sacramento**
- Page 13 - ARLISS 2014**
- Page 18 - 2014 Launch Director's Report**



President's Pad



Speedy Gonzalez, loved by all...RIP

XPRS was stressful for me. Jeremy and I had set some pretty lofty goals for his first ever high power flight. Scratch built 54mm minimum diameter, 20,000', mach 2 with onboard video. What could go wrong? I would give Jeremy homework assignments before he came over. Each assignment would go hand in hand with what particular part of the build we were doing. I intended this to be a learning process for him but, mostly it kept me on top of my game too! We hand laid the body tubes, nose cone, did tip to tip layups, made the parachute, 2 stage recovery with a reefed parachute and even made the L990 motor. I did say XPRS was stressful for me? Jeremy flew from a tower and achieved 21,000', mach 2.16 with video. The video is kind of crappy but it's still video! Goals achieved!

had. This time, I had no events at apogee and Speedy came in fast and hard. I really liked that rocket! Rendezvous was still fun and gave me a chance to talk with the BLM and some of the other users I've met over the years.

MUDROCK was fun and my first chance to test fly my new rocket, Son of Speedy, to 29,661'. This was also our first chance to test out our new BLM Permit. This was our first year with Tripoli obtaining one permit for all rocketry activities out a Black Rock. Seemed to work out well.

Aeronaut was a chance to see some old friends out at Black Rock. And to introduce some new friends to high power rocketry. This past summer I had been mentoring a local 17 year old. Aeronaut was Jeremy and his dad, Robert's, first high power launch. To say they were impressed would be an understatement. I think I enjoy seeing, talking and hanging out with people as much as I do flying.

Continued



President's Pad



Speaking of video: Ryan Catanesi has been very busy this year video taping a lot of flight at AEROPAC launches. Take a look at his Youtube site at [Mysticlambo](#).

Thanks to all those that helped make this year a good one. I hope next year goes as smoothly as this year did.

I won't even bring up how I lost both my rockets at Balls this year.

Tony Alcocer

**Left: Son of Speedy –
Look at those mach
diamonds!!**

**Missing in Action at
BALLS**

Photo courtesy of T. Alcocer



Fruity Chutes

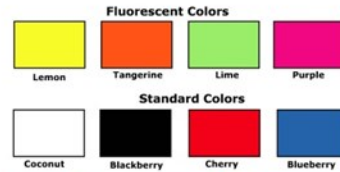
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Customer testimonial:

"I just wanted to tell the story of my 60" Iris. It was in a 6" rocket that was, unfortunately, returning to earth ballistically. The Iris deployed at the correct altitude, subjecting the airframe to a 57G deceleration. The results were a shredded body tube, snapped 2500# rated shock strap, a completely straightened eyebolt, and absolutely NO damage to the Iris!! I inspected it, as did Gene. This is a true testament to the exceptional products at FruityChutes!" Steve Kurlinski

"My Mongoose flies only with Fruity Chute IRIS parachutes." 25,325ft, mach 1.6 on an Aerotech M1450W KBA at MUDROCK 2014



Photo R. Jackson



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MUDROCK Flights Counts

Compiled by Sam Sampayan

Motor Breakdown		Most Flights:	
A	0	Ron Swenson	9
B	8	Mark Isabell	8
C	11	Bernard	6
D	5	Greg Ruhf	6
E	21		
F	5		
G	18		
H	15		
I	15		
J	28		
K	24		
L	4		
M	8		
N	2		
Total	164		



Photo M DuBose

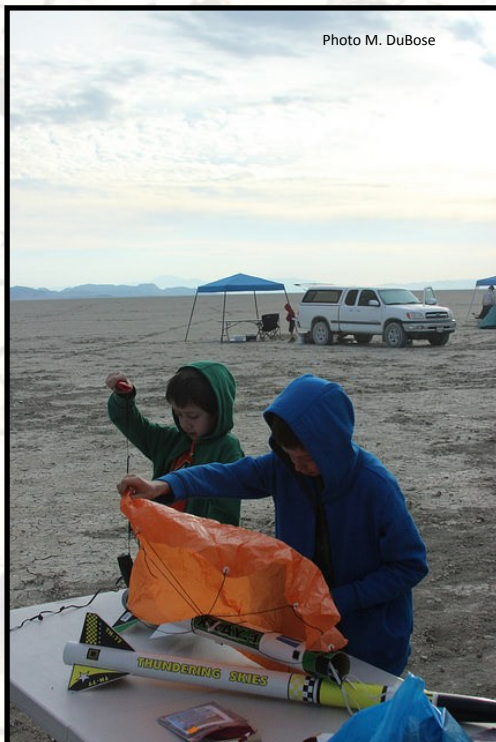


Photo M. DuBose

Upper right: Louie and Toby Rubinstein from Melbourne, Australia get basic rocketry instruction

Left: Packing the chutes

Right: Loading rockets to launch pad



Photo M. DuBose



AERONAUT and ARLISS / XPRS Flights Counts

Compiled by Peter Hackett

AERONAUT

Motor Class	Model	Count	Normal	Cert	Research
1/2 A		1			
A		7			
B					
C		19	1		
D		7			
E		2	1		
F		6	5		
G		11	10		
H		10			1
I			8		
J			6		
K		7			1
L		3			3
M		6		2	3
N					
Total Flights		53	31	2	8
Grand Total = 138					

ARLISS / XPRS

Motor Class	Model	Normal	Cert	Research	ARLISS
1/2					
A		9			
B		11			
C		28			
D		13			
E		9			
F		16	3		
G		30	17		2
H		1	33	8	
I			36	4	5
J			25	6	5
K			28	2	2
L			10		2
M			10	2	5
N			3		2
Total Flights		165	22	23	59
Grand Total = 386					



XPRS Contest Winners

Darryl Paris

Loft Duration contest winners

A class

1st. Will Swenson 4.85 sec
2nd. Will Swenson 4.7 sec

B class

1st. Zoe Paris 34.18 sec

C class

1st. Zoe Paris 3 min - 2.99 sec
2nd. Michael Paris 1 min - 27 sec
3rd. Claire Billings 60 sec

D class

1st. Will Swenson 46 sec
2nd. Will Swenson

E class

1st. Erik (no last name provided) 42 sec

F class

1st. Michael Paris 2 min - 9 sec
2nd. Quinn Curly 51 sec
3rd. Conner Falcner 47 sec

Extreme Altitude

H class 1st. Kurt Gugisberg 7992'

I class 1st. Cindy Farrington 2818'

J class 1st. Darryl Paris 6764', 2nd. Allen Farrington 3845'

K class 1st. Tony Slajs 19,933', 2nd. Darryl Paris 12,860'

M class 1st. Jonathan DuBose 27,840', 2nd. Ron Swenson's (Level 3 Cert), 13,334' 3rd. Evan Curtis 10,796'

N class 1st. Bryce Chanes 24,143'

Photo J. DuBose



Photo R. Jackson



Photo J. DuBose

Just like to say thanks for the great participation and fun competitive spirit! The new trophies were a hit!



Honeybadger 2.1 — 59,300ft and Mach 3.91

Ryan Sebastian and David Hailey



Honeybadger 2.1 is the third in a series of 4 inch rockets that began with a run of the mill filament-wound fiberglass rocket flown two years previously. The ultimate goal of the rocket was to test the viability of the fincan structure and thermal protection, test lightweight motor components, and compare the simulation and recorded data. HB2.1 successfully flew to an altitude of 63,300 ft (ASL) at a maximum velocity of Mach 3.91 at MudRock 2014, besting its predecessor by over a 6000ft and 600MPH.

The first Honeybadger was built using off the shelf filament-wound fiberglass tubing and components, and used traditional dual deployment. The intention of the build was to get a few flights under our belt and gain some Black Rock street cred. David had plenty of minimum diameter experience, but Ryan's experience was limited to low and slow east coast flights. HB1 flew to 40,000 ft AGL at M2.4. Post flight review showed that

there were many improvements to be made that, if implemented, would net a much higher altitude and velocity. HB2 traded the fiberglass airframe for an aluminum one that doubled as the motor case along with other upgraded features that virtually eliminated free space and dead weight. The rocket ended up approximately 10 lbs lighter and hit 57,000 ft ASL and M3.1. The flight was a success and although a high-solids propellant and larger diameter airframe were calling, the post flight state of the fins revealed that a more robust configuration was necessary to deal with any flight that would be more stressing. The decision was made to recreate the same rocket with a different fin structure. Along the way more weight was shaved, sims were run, and a new altitude goal emerged: 60kft.



Figure 1: HB V2, Toasted G10 Leading Edge

Photo courtesy of R. Sebastian / D. Hailey

The project started with pipe dreams of a 7075 or even a filament-wound carbon fiber motor case. Clearer heads prevailed and even though the tolerance stack of standard 6061 pipe was scary; 3.75in OD tube was ordered and turned it into ~3.7in OD. The 3.75" tube provided better tolerance stack up when compared to a traditional 4". That keeps the case wall thin while maintaining a high pressure capability.

continued

Honeybadger 2.1—59,300ft and Mach 3.91

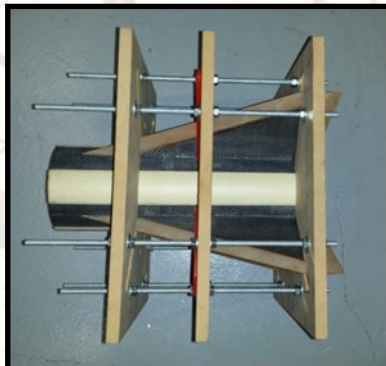


Figure 2: HB V2.1 Motor Case with Nozzle Match Drilled

The next and largest change was the fincan, which ditched solid G10 fins that had eroded severely on the last flight. Phenolic leading and trailing edges framed in a G11 core that was thinner than the phenolic, the thick leading edges protected the carbon layups from heat and airflow; this protection was in addition to the ablative coating that had protected the layups on the

previous rockets.

Figure 3: Fin attachment. CF overlay has already been added to the fins, but the net thickness is still less than the Phenolic LE/TE



Honey Badger 2.1 was intended as a test bed for “cheap and easy” methods that could be done at home and on a budget. No epoxies used on this project required a heat cure. All carbon for this



project was laid-up using Aeropoxy 2032. It’s relatively cheap, easy to use, has good mechanical properties and a decent Tg for a room-temp cured system. The fillets were made using a Cotronics product mixed with carbon pulp. The carbon lay-ups on the fins were staggered resulting in a tapered fin thickness from the root to the tip and from the fin edges to the middle. The fin lay-ups were vacuum bagged. Since Aeropoxy isn’t capable of withstanding temperatures seen in mach 3+ flows, areas exposed to high mach flows (the lay-ups) were covered with a homemade ablative to protect them from heat. Areas not directly in the flow were left uncoated.

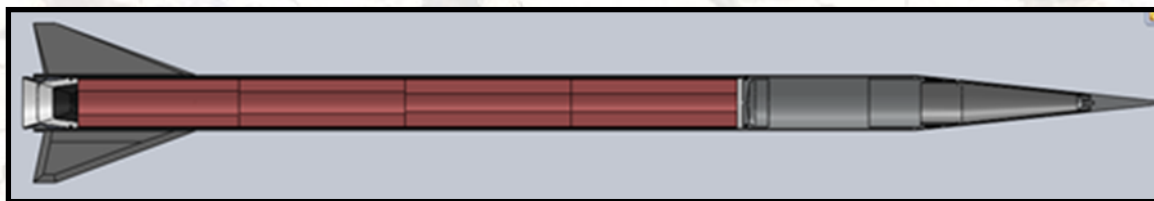
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Honeybadger 2.1—59,300ft and Mach 3.91

The propellant for this flight and all of the HB rockets was a low - 83% - solid, slightly catalyzed and well characterized propellant. Almost too liquid to pack on a warm day, the low solids and aluminum loading helped keep the heat down as opposed to a higher loaded, more aluminized propellant. From a performance standpoint this was not optimal, but it allowed the use of off the shelf liner/casting tube sets that were marginally adequate with the flame temperature.

The nosecone was made using a standard fiberglass 3" conical cone to which an adapter was added in order to reach the rocket OD. The cone was beefed up from the inside using fiberglass and Aeropoxy. The outside was layered in ablative, then machined down to a true cone. Inside of the cone was a single Altus Metrum Telemetry, with a 100G accelerometer and live data telemetry. It's performance turned into a focal point of the flight.



The rocket flew on the Friday of MUDROCK 2014. After fighting to get GPS lock, everything fell into place and the rocket flew and was recovered without a hitch. The rocket reached a maximum altitude of 63,300ft ASL which in AGL was just short of the 60kft goal, by about 600ft. The motor case bubbled at the forward end, a result of the inadequate liner, and undoubtedly this robbed the rocket of a more substantial altitude.

End



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Photos
courtesy of
the
Sacramento
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History



Upper left: Saturn IVBs at testing at the Douglas Aircraft Test Facility, Sacramento 1967

Upper right: Douglas Aircraft engineers in control room

Left middle: S-IVB in test stand ready for testing

Middle right: Test firing the S-IVB

Bottom left: S-IVB being transported to Mather AFB after testing

Bottom right: At Mather, ready to load in the Pregnant Guppy headed for Kennedy Space Center



ARLISS 2014

Jonathan DuBose

ARLISS 2014 proved to be a record-setting event and clearly showed that the program is continuing to grow and attract new participants. In addition to a record number of flights (59) and a record number of schools and teams participating, we also had 2 new flyers (a complete list is below).

A new Intel-sponsored high school program called "Magnitude.io" from the SF Bay Area made their ARLISS debut. This group has big plans for the future and we all are looking forward to their continuing participation in ARLISS. We hope to have a future article from Ted Tagami (co-founder and CEO) who spent the week with us on the playa this year. The goal of Magnitude.io is to bring "aerospace and STEM related project-based learning experiences into today's classrooms." In addition to Ted, with Tony So (co-founder and COO) and Bob Twiggs (adviser), this group brings an extremely strong leadership resource to the table. For more information see the organization's website at: <http://magnitude.io/> and their Facebook page.



Photo by J. DuBose

Opening ceremonies at ARLISS 2014

cemented the link with AEROPAC to form ARLISS.

A very special presence at the event this year was none other than Professor Bob Twiggs who brought a team from Morehead State in Kentucky. Professor Twiggs is recognized a key contributor to the ARLISS concept as well as a co-inventor of the CUBESAT concept. It was Professor Twiggs who came up with the idea of CANSATS and approached Tom Rouse. Tom

Continued



ARLISS 2014

Jonathan DuBose

And speaking of ARLISS history, in the Spring 2015 issue, the early “pre”-historical roots of ARLISS will be documented. For many of the newer ARLISS flyers and AEROPAC members this will be a true history lesson and clear up some misconceptions and urban legends.



Photo by J. DuBose

Enthusiastic students from U. of Electro-Communications. Prof. Keiki Takadama’s kids always seem to do well.

This year’s ARLISS had a diverse international representation, in addition to the usual strong Japanese contingent. Although many of these new teams had only 1 representative (due to financial restraints or travel issues) teams from Hungary, the Czech Republic, Peru and Egypt were represented.

U.S. teams include Georgia Tech, Morehead State, Nevada-Reno, U. of Hawaii / Windward Community College, Louisiana State U. – Lafayette, Sonoma State and Magnitude.io.

banquet was organized by Becky Green and Jennifer Curtis.

Friday is always the “ARLISS Banquet” and a forum for teams to present their projects, sum up and recap their outcomes. This year the

ARLISS 2014 stats:

Number of flights: 56 “M” class and 3 “K” class, 1 ARLISS Extreme (ATN1000W to ATM685W).

ARLISS Flyers: Matt Sikkink, Dick Jackson*, Jim Green, Seth Wallace, Richard Hagen, Bob Feretich, David Raimondi, William Walby**, Erik Ebert, Mike Parker*, Evan Curtis, Peter Clay, Jacob Hudson, Jonathan DuBose.

Although at least 3 flights occurred on Friday, by the scheduled end of the 2014 ARLISS event on Thursday, this flyer feels confident in saying that we all felt a great sense of accomplishment and in addition, this year’s event just seemed like a lot of fun!

* Rookie

** Born Again ARLISS Flyer

continued



ARLISS 2014

Jonathan DuBose

The Japanese schools / teams held their customary corporate sponsored contests. This year's winners:

Comeback Precision Competition:

- 1st prize – University of Electro-Communications “Minerva”
- 2nd Prize – University of Tokyo “Astro Penguin”
- 3rd Prize – Aichi University of Technology “Stela I”

Comeback Highest Velocity Competition:

- 1st prize - Kyusyu Institute of Technology “Kings”
- 2nd Prize - University of Electro-Communications “Minerva”
- 3rd Prize – Tokyo Metropolitan U.– TMU*CAN



Photo courtesy of Mag-

Prof. Twiggs with students from Morehead State at opening ceremonies

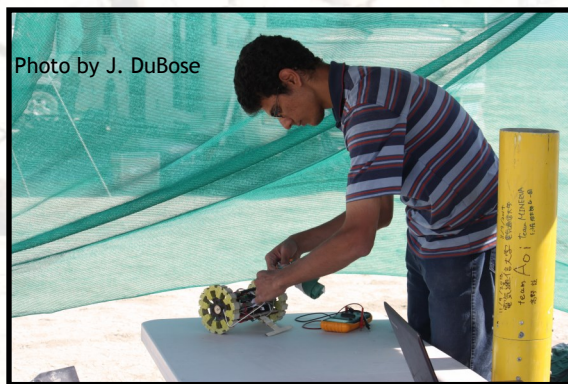


Photo by J. DuBose

Hassan from U. of Cairo prepares his rover for flight

Mission Competition UNISEC Award: Keio University - “Keio Team Wolfe’Z”

Mission Competition Award: University of Electro-Communications “Cassy”



Photo by J. DuBose

Like many other first time flyers, Hassan suffered a parachute failure

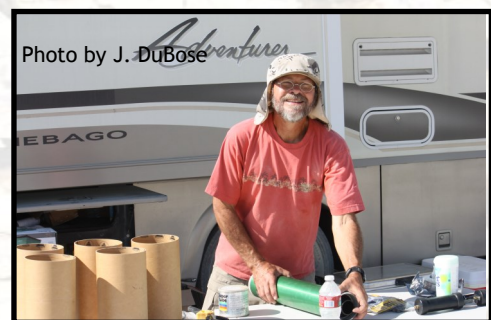


Photo by J. DuBose

Jim Green preps the ARLISS workhorse, the AEROTECH M1419W

Continued



ARLISS 2014

Jonathan DuBose

Complete List of ARLISS 2014 Teams and Schools

Team name	University
STELA	Aichi University of Technology
STELA	Aichi University of Technology
Budapest University of Technology	Budapest University of Technology
Czech Technical University in Prague	Czech Technical University in Prague
Georgia Tech	Georgia Tech
High school champion team	Hosei-daini High School
Keio Team Wolfe'Z	Keio University
Kumoh National Inst. of Tech-South Korea	Kumoh National Inst. of Tech-South Korea
KINGS	Kyusyu Institute of Technology
KITCATS	Kyusyu Institute of Technology
Edison	Magnitude.IO / Intel - California

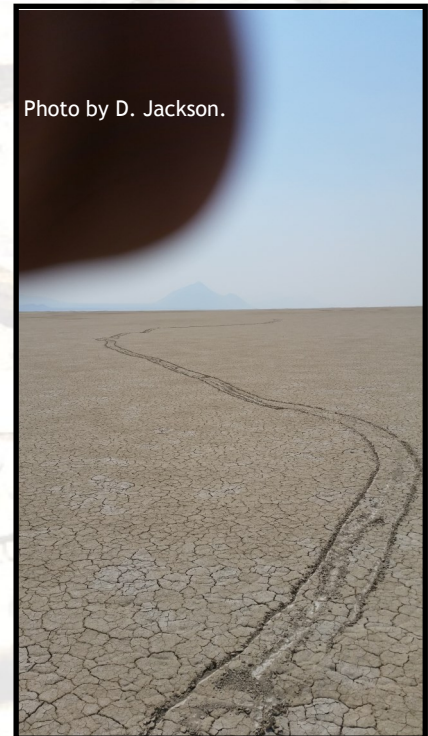


Photo by D. Jackson.



Photo courtesy of Beck Green

Becky and Jennifer organize the food at the ARLISS

Tuesday was pretty windy and we left some ARLISS fin can tracks on the playa

continued



ARLISS 2014

Jonathan DuBose



“That’s going to fit in the ARLISS payload carrier?”

“Yes!”

Photo by J. DuBose



Photo by J. DuBose



Photo courtesy of Magnitude.io

Dave Raimondi installs the motor initiator into his rocket.



Photo by J. DuBose

Aichi U. attaches a camera to the ARLISS rocket



Photo by J. DuBose

ARLISS Extreme payload

End



2014 Launch Director's Report

Gene Engelgau

Thursday Setup – I got out to the launch site around 3:30, I'm guessing. Darryl was already out there (although he managed to camp about a mile away). Darryl had already pulled out the trailer which was nice. We had a good crew for setup, I would estimate 12 people, so setup went fast. The weather was nice and not too hot. There was an abbreviated cleaning party after all so most of the equipment was in pretty good shape. We got the controller working fairly quickly and the PA worked as well. It was not nearly as difficult as the previous year. There were some equipment and cables that seemed to be mixed between the totes.



Photo courtesy of G. Engelgau

One thing we did differently this season is I published GPS waypoint coordinates to get to the site. The long pipe mounts on the trailer had broken the year before and we got rid of about half the cones, so no more cone road. I'm guessing it worked because MUDROCK seemed well attended this year!

We actually had quite a few people show up for the launch on Thursday. Later in the evening, it clouded up just a bit and was a little cool overnight. The evening had a little wind.

Continued



2014 Launch Director's Report

Gene Engelgau

Friday – We woke up Friday to good weather as usual. We had our flyers meeting around 8:30AM and the launch was looking pretty good. As I recall, the weather remained pretty nice for most of the day.

Saturday – For Saturday we again had a nice sunny morning. It was a little cool.



Flying on an Aerotech M1315W Dick Jackson got his L3 on Saturday

Continued



2014 Launch Director's Report

Gene Engelgau

Sunday – As usual we again had a nice morning. My goal was to be ready to load out by around 1PM. Around 11am we closed the away cells and began our load out while other folks launched on the pads further in.



Photo courtesy of G. Engelgau

Aeronaut 2014

Thursday Setup – Like MUDROCK I got out there around 3PM with Marcus Krause. Marcus was nice enough to assist me with getting the AEROPAC equipment trailer out to the site – thank you Marcus!! But once I arrived only Dave Raimondi and Mike Breast were on site - there was basically no setup help. Rather than try to do it ourselves (not an option) we pulled the equipment trailer from area to area and just unloaded the equipment and got it to the right places.

Later Thursday evening more folks showed up and we agreed to complete the setup in the morning. It got a little overcast at that point and we had a bit of a wind storm, but no dust.

Continued



2014 Launch Director's Report

Gene Engelgau

Friday – By Friday morning we had many more people out and had our flyers meeting around the usual time. The first order of business after that was to set up the range. Because the equipment was already in place, that went fairly quickly.



Photo courtesy of G. Engelgau.

As I recall, Friday was a pretty good day, as usual. In the later afternoon and evening the skies darkened up some and it looked like we may have some thunderstorm activity. Fortunately that stayed off to the edges of the playa but it looked a little daunting for a while.

Saturday – The clouds had cleared overnight and it was, as usual, nice. More folks had arrived so we had an OK attendance. We had our flyers meeting .

There were quite a few college students who came out for the summer break. We also had a bot scout troop out with many scouts running around from time to time.

Continued



2014 Launch Director's Report

Gene Engelgau

Saturday evening we were all entertained to some pretty spectacular lightning storms that went from the NE to the east, and to the south east. It was truly entertaining for everyone!

Sunday – It seems like Sundays are always the best morning, maybe it's because we know we need to go and are not ready to leave yet. I don't have any photos of Sunday. The load out went fast and the boy scouts were a huge help.

One delay we did have is the Uber Rail was being used and we had lost the picture on how it's supposed to go into the trailer. I'm estimating that delayed the departure by about 1.5 hrs while folks solved that puzzle. Marcus Kraus get's a double thank you for pulling out both the Uber Rail trailer while I finished packing, and helping Mike load. When he got back I helped him get the Aeropac trailer hooked up and he pulled that out as well when he and Mike left about 3:30PM. So Marcus has been a huge help to me this year!!

ARLISS / XPRS 2014

Like in 2013, I went out to the Playa on Tuesday so I could spend a few extra days watching ARLISS, and also to have time to finish up a project I had started some time ago. So I spent Wednesday and Thursday mostly working on my new fat rocket Magg Max Thunderdome and getting it ready to fly.

Thursday – Thursday afternoon was the setup for XPRS and we had quite a lot of help. I think it took just an hour to complete setup of the low power pads, and the front row of the high power. One thing that was not set up correctly is the back row of HP was two cable lengths out, not three. So it was actually a little close. We corrected that on Friday. We are also missing a lot of the relay boxes and some other stuff for the front row high power. Only about half that row could be set up.



Photo by G. Engelgau

continued



2014 Launch Director's Report

Gene Engelgau



Photo courtesy of G. Engelgau



Photo courtesy of G. Engelgau

Friday – Again, a nice day all day with lots of flights.

There were a lot of people at XPRS this year, and I think the most in some time. There were a few larger groups out from Google, an Intel-sponsored group, as well as a group from Hawaii. Google had a camera crew videoing their activities as well as the launch.

On Friday I did a cool dusk launch on Magg Max on a L1410 Skid that was captured by the film crew. Hopefully I will see video of it some day by the crew!

Saturday – There were a lot of flyers for Saturday morning with some lines. I had pretty good volunteer help for most of the launch. Saturday's volunteer list was pretty much filled, with the exception of the assistant positions. It seems like Saturday went smoother than last year. In 2013, Tony was having to help with way too many big flights, and I was having to coordinate the launch of these locally. This year the big flights seemed better prepared and came with their own launch equipment.

continued



2014 Launch Director's Report

Gene Engelgau

Saturday afternoon around 1PM we started to get more high clouds and a dust storm ensued by 2pm or so.

Of course, since this launch is after Burning Man we had a nice supply of blowing dust as well. The wind began to calm around 3:30pm.

Around 3:30pm we had some new folks arrive – Steve Jervetson (who is a regular) brought out Elon Musk and all his kids and family. We briefly seemed to be overrun by a lot of kids launching smaller rockets. I had to give a few shouts to keep the kids in check.

Sunday – My goal for Sunday was to be out by 2pm, and we did that. I had my rocket Full Yellow Jacket left over from Saturday to launch in the morning. I had a M685 loaded and it took me three tries to get it to light .



Photo courtesy of G. Engelgau

Elon Musk CEO and CTO of [SpaceX](#), CEO and chief product architect of [Tesla Motors](#), and [chairman](#) of [SolarCity](#) (Wikipedia)

continued



2014 Launch Director's Report

Gene Engelgau

Load out got into full swing about around 11:00am. I had a few volunteers earlier who took down the rope line and parts of the PA. By about 1PM we were fully loaded. Only glitch is we had two lingering flights that needed an away pad, and the large launch tower, so that delayed us some. Tony used his remote launch for these so that helped.

My highlight for load out is I won the raffle gift we do for the crew who helps. It was an "I" DMS motor Mike G donated, thanks Mike!!

That is all!!





Another gorgeous sunset on the playa.

**Happy holidays to all and
happy flying in 2015!**