



AERONAUT

The Newsletter for the Association of
Experimental Rocketry of the Pacific
Tripoli Rocketry Association, Inc.
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The First Commish's Corner

By William Walby

First a few words about the September launches and then some news items:

The last launch was outstanding! This was by far the largest launch of the year with many attendees from both out of state and out of country. We had a group of Japanese university students, a group from Arizona State University, and individuals from Idaho, Washington, and Utah. We also had a group of 30 middle school kids come out from Redwood City. It was quite a crowd. The weather was near perfect, as is the case with most of our September launches. All in all we had a wonderful time.

I'd like to thank the vendors who also attended. First and foremost is Karl Baumann who continually attends all our launches and supplies the AP. Next is Ken Finwall, who not only brought motors but a bunch of kits (which he kindly sold at highly discounted prices to the kids from Kennedy Middle School). The kind folks from Rocket Vision were also on hand selling some of their wares and showing off their line of rockets. AeroTech was there with a nice booth giving away their new catalogs and free mouse-pads with a new logo printed on them. Scott Bartel from BlackSky was all set up providing electronics, rail guides and his new Pyrotechnic release mechanism. When he wasn't busy downloading data from everybody's ALTACC's or giving weather reports, he flew a new Hypertech N hybrid motor. I didn't see it but those who did were VERY impressed. Bill Colburn had a nice booth selling all sorts of goodies including the new G-whiz altimeters designed by our very own Rob Briody and Larry Lynch-Freshner.

I'd also like to express my gratitude to the porta-potty haulers, Scott Knoll, Adam Gervais, and Bob Twiggs. Kudos also go to everyone who helped with setup and teardown as well as range duty. Without you all we couldn't have a launch!!

BLM Volunteer Work Party: Seven of us met on Friday morning, before setting up for the Sept. launch, and headed out to the north west end of the playa for some "playa maintenance". Mike Bilbo of the BLM had us go out and fill in a large blast crater and some one's attempt at an adobe-like hut affectionately named the "Little House on the Playa". We spent a few hours with shovels and rakes doing our "duty" then headed over to Trago hot springs to pick up trash. Everyone had a really good time and it was a good way to see parts of the playa that you don't usually get to see while at a rocket launch. Consider joining us next year. You'll be helping out the BLM, and your club, and having a good time in the process

Next Year's Launch Calendar: We're planning on holding 3 launches next year provided that Breedlove doesn't keep us off the playa in September. We have already sent in our application to the BLM requesting launch dates for next year. The dates are as follows: MUDROC, June 24th and 25th; AERONAUT 2000, July 28th - 31st (YES, a 4-day launch!) and Black Rock XII and EX3 September 9th - 11th. If we are unable to hold BRXII in Sept. we will have only the 2 other launches. AERONAUT 2000 will be a special launch with a commemorative t-shirt and some added surprises (stay tuned for details).

Next Members Meeting: December 4th, 11am-3pm at Portal. The meeting will start much earlier since we will have 2 guest speakers from the aerospace industry to do show and tell. I still haven't got confirmation as to whom it will be but tentatively we have John Mouritsen from Aerojet who is designing the latest strap-on booster for the next generation Titan (all composite). Marcus Murbach of NASA-Ames who has a very cool video of a Black Brant launch from White Sands, and Bob Twiggs from Stanford who will talk about

Stanford's satellite program. We also want every one to bring their photos, videos, pieces/parts to swap/sell donate and anything else you want to share with the group. We'd like to get as many of you who can make it to show up. Be there or be square!

Board of Directors Election: We will be sending out ballots for the BOD election a week or so prior to the members meeting. Running for re-election are Tom Rouse, Launch Director; Ranny Mitchell, Secretary. Those seeking new positions are Richard Amstadter, Treasurer; John Coker, Newsletter Editor; Bob Fortune, 2nd Commissioner; and Your's truly; 1st Commissioner. If anyone would like to run for any of the BOD positions or want to nominate anyone else send your nominations to Mike Vaughn (vaughn@sonatech.com) and he'll make sure the name gets on the ballot. PLEASE be sure and return your ballot! It's your club and you do have a

say in who runs it for you. I'd like to thank the current BOD for all their help this year especially since we all had to scramble a bit after Jerry had to step down. Also, THANK YOU JERRY! You were missed and we hope to see you next year.

Well that's all I have to say. I hope to see many of you at the meeting, if I don't, have a safe fall and winter. See you next year!

BLM Work Party



The Aeropac gang at the BLM work party doing their best Caltrans imitation. Volunteers included Gary Dwyer, Pius Morozumi, Paul Campbell, Ken Adams, Charles Story, Griffin Mitchell, Richard Amstadter, and William Walby (not shown as he was taking the picture). Above right is the blast crater before picture.

A Rocket Launch for International Student Satellites

ARLISS

By Randolph Mitchell

The September Black Rock XI launch saw an enthusiastic group of newcomers to high power rocketry: satellite designer-builders from Japan, Arizona and California. Their visit was the outcome of a challenge issued by Prof. Bob Twiggs of the Stanford University Space Development Laboratory, at the Japan-U.S. Science, Technology, and Space Applications Program (JUSTSAP) conference in November, 1998. Professor Twiggs challenged JUSTSAP members to fit a functional space satellite inside a standard twelve-ounce Coke can (hence the nickname "CanSats"), for a boost into orbit in 2000. Space development programs at the University of Tokyo, the Tokyo Institute of Technology, and Arizona State University joined Stanford in design and construction of miniature satellites with some pretty powerful features, including the ability to network in space. Designers of the Iridium satellite system also began a CanSat mentoring program with students at the Kennedy Middle School.

Enter the Rocket Bunch

Aeropac member Tom Rouse heard about the CanSat program during discussions of his CATS project at Stanford. (Good luck on your space launch this month, Tom!) Professor Twiggs joked that CanSats were tested by placing them in a 30-gallon galvanized garbage can and tossing it from the 4th floor balcony of the SSDL building. Tom said, I have an idea.... I know some folks who can actually launch these gadgets for you.

By February, 1999 a few Aeropac members had volunteered to be guinea pigs, and in monthly meetings at Stanford began to define the parameters of the project. The objective was to give the students hands-on experience in the life cycle (one year or less) of a space project. We agreed on the form factor: each rocket would be capable of lofting three CanSats 2-3 miles, the CanSats would each have about 15-20 minutes "hang time" under parachute for experiments, simulating a low-orbit pass, and construction would be standardized so that payloads would be interchangeable between launch vehicles if necessary.

Mudrock Trials

The plan: boost on an M1419; at apogee the booster recovers under an R-12 chute, while the payload section quickly falls clear of the booster with a deliberately undersized R-7 chute. Six seconds after apogee, a secondary pyro charge separates the nose cone with its own chute, retained until now by four shear pins, and ejects the CanSat Carrier. When the carrier reaches the end of its 30-foot kevlar tether,

the CanSats slip free and begin their descent under 36" parachutes. Now about 7 pounds lighter, the payload section slows to a descent rate of 15 fps under the R-7.

Our prototype rocket was a beautiful 6" dia. graphite airframe volunteered by Pius Morozumi, who also built the prototype CanSat "Carrier". We selected a custom-modified G-Wiz Deluxe flight computer for avionics (thanks, Rob Briody and Larry Lynch-Freshner), Vaughn Brothers parachutes for the CanSats (thanks, Mike and Jerry), rail launch system and fins by Black Sky Research (thanks, Scott Bartel) and Aero-tech propellant to get it



ARLISS Participants: Tom Rouse, William Walby, Randolph Mitchell, Griffin Mitchell, Pius Morozumi, Jim and Becky Green

all up in the air (thanks to Karl Baumann and Aerotech). Rain and mosquitoes notwithstanding, we launched this contraption at Mudrock and were pleased to see every component perform flawlessly.

Aeronaut Tribulations

With a proven design, we began building. I chose to wrap my airframe with carbon fiber, using John Coker's excellent online resource as my bible (see <http://www.jcsw.com/John/Rocketry/Kitchenbagging.html>), Pius settled on Kevlar lamination, Jim Green went with pure canvas phenolic from Black Sky Research, and William Walby concealed his secrets under his trademark Perfect Paint Job. We were careful to make the CanSat Carriers interchangeable between all four launch vehicles, just in case. As it turns out, this was a good thing.

Professor Twiggs inaugurated his first visit to Black Rock by getting his son-in-law's brand new pickup truck stuck in Pius¹ Cove, a mudhole of ill repute named after its first victim, an anonymous member of the Rocket Bunch. Much later that day Dr. Twiggs and Dr. Morozumi were observed salvaging mud from the truck and weighing it on a gram scale for use as ballast in dummy CanSats for the next day's launch.

Pius' graphite bird flew twice again at Aeronaut in July. The first flight was to test the system on an M1419 motor. We learned that the Vaughn Brothers chutes keep a 12-oz satellite aloft for a Very Long Time. Even with radio beacons, recovery took 5 hours. William cored the chutes with a hot coffee can and obtained an acceptable descent rate. We also found that 3 grams of 4f was ejecting the CanSat Carrier too forcefully, and that Kevlar is indeed stronger than the steel eye bolt.

The second test was flown with an undersized motor substituted at the last minute. The airframe failed to achieve separation at apogee for reasons not determined, and the rocket made an aerodynamically perfect core sample. With both success and failure in our minds, we resumed construction for the September launch.

Black Rock Success

September 10 found the Rocket Bunch back in Gerlach preparing their machines, with a half-day break to volunteer for a BLM clean-up project.

Professor Twiggs, wearing a t-shirt proclaiming "I Survived Pius' Cove" made numerous Playa crossings escorting student groups, visiting professors, a film crew, a reporter, plus four Porta-Potties (thanks, Bob).

On the afternoon of the 10th, the CanSats arrived, with their builders from the University of Tokyo (my group), the Tokyo Institute of Technology (William's bunch), Arizona State University (Pius) and Kennedy Middle School (Jim and Becky). This afternoon had been scheduled as a time to test fit the CanSats in the Carriers reserved for flight. They were all fine, but a mismatch of another kind cropped up instead: U Tokyo's experiments required radio transmission during ascent, and my carbon-fiber airframe was radio-opaque. Because we had standardized the form factor in the planning stage, it was quick and easy to trade payloads with Pius and accommodate the needs of both groups.

Launch conditions were perfect on Saturday, and the Rocket Bunch turned in four flawless flights. Jim Green's 40.3 pound rocket took honors for altitude at 12,342 ft. AGL at T+28.4 seconds. Paul Campbell was Aeropac's finest ambassador that day, shepherding a dozen or more Kennedy students through construction and launch of their first model rockets. All four CanSat teams were busy tracking their satellites, running experiments, and downloading data and images. The student teams were awake most of Saturday night summarizing their data for a breakfast presentation at Bruno's on Sunday morning.

Six weeks after the launch data analysis continues - the work by the students is truly outstanding. Links to the latest data analysis plus photographs and video clips of the launch are posted on the ARLISS website <<http://ssdl.stanford.edu/arlist>>

The Rocket Bunch will return next season. Tom Rouse and John Coker served in an advisory capacity this year, and are now stepping in to fill Stanford's request for two additional rockets. CanSat builders next year will be assigned payload slots, not a specific vehicle, distributing the product (and the risk) of the university teams among several rockets. There will be a few other minor tweaks to the program, but otherwise we'll concentrate on emulating William's paint job. The Stanford Space Development Lab's 30-gallon galvanized test vehicle can now be laid to rest. Do you think they'd donate it for use at the LCO table?

Roadtrips and Rockets (Getting there is half the fun)

By Bob Fortune

With cars you jump in, turn the key and take off - as long as there is gas in the tank that's generally how it works. Starting up a rocket is a bit different.

May 1999 Rocket Ranch and Hollister Airport

It began with a motor test of a 60" x 12" HTPB and polyethylene single port hybrid motor which was fired at Chuck Piper's place, "Rocket Ranch", in Patterson California. We got a bit behind in schedule because this motor blew up quite unexpectedly one fine Saturday afternoon. The beast took several major sections of 1/4" angle steel acting as back-stop and rudely twisted it like a candy cane. The load cell left a 1/2" deep impression in the metal before it stopped working. For some reason the transducer company didn't offer to replace it under warranty - where's Consumer Reports when you need them. So we ended up building a new test stand. A couple of months, a couple of tons of concrete, a recycled motor test stand and we were set. The next motor up was to be a 36" x 8" single port version of a 4 port hybrid motor we were contemplating. The 4 port mandril was constructed of styrofoam cut with a hot knife and spaced with plywood gussets. Imagine a pie cut in 4 pieces with about 2 inches between each slice to visualize the end view of the mandril. The test motor was just one piece of this Styrofoam mandril placed into a fiberglass water softener tank surrounded with HTPB with a graphite nozzle potted in the aft end and a steel dome bolted in the head end.

July and August came, increasing the fire danger at Rocket Ranch beyond reasonable limits. The place seemed like it was itching to burn it was so hot out there. We did get a chance to hydrotest a 10' tall x 12.4" diameter nitrous tank though. 50 gallons of water pressurized by 500 PSI of N₂O made the biggest water rocket I've ever seen. Almost took out my truck but I'm sure we set some type of record for water propelled vehicles, apogee was about 35 feet.

We've since temporarily shelved fiberglass tubing tanks as some very spiffy 12" x 60" aluminum tanks became available for a very reasonable price. Each tank can hold 100 pounds of nitrous, which is about two of those tall heavy-looking black bottles you see at launches. So we have a motor that needs testing and no suitable venue. We discussed a test firing at the Black Rock Launch coming up in September and I got an okeedokee from William Walby to let it rip. Night launch test firing, pointing straight up in the sky - Ah, the mind reels at the thought of the display. Bill Colburn, the brains behind the SORAC project decides we should fly the motor in a rocket rather than just do a test. Yahoo, and the big rush is on to create a vehicle in 2 weeks.

September 1999 Black Rock EXP 10 Black Rock, Nevada

The vehicle is almost done, Bill has worked like the master rocketcraftsman he is to build a 12" x 10' vehicle of aluminum tubing as airframe. Twin Hellfire rocket motor cases butted end to end via a custom coupler acts as the nitrous tank. Thanks to Larry for that, he is truly a master machinist. A 1" electrically operated Morata valve acts to control nitrous injection, a G-wiz altimeter for deployment, and a 16' chute for descent and we're all set. Steve Zwaska, another team member, was able to spend huge amounts of time helping on the design and building of the vehicle. All we need is a nose cone. I was able to fabricate a pink foam NC the days before the launch and get one wrap of 8 oz. glass on it. The rocket came in at around 140 pounds unladen and would weigh an additional 22 pounds once the nitrous was onboard. Filling would be accomplished via a 1/4" CO2 operated quick disconnect on a bungie umbilical.

Jeff Jakobs, a Santa Barbara general contractor, and I loaded up our trucks and moved out Friday morning, both pick ups almost scraped their bumpers leaving the airport. Not much like a rocket roadtrip to get the juices flowing. Black Rock on a Friday night is not to be missed, talk about Party Town! There was nary a light to be seen at 9 PM, everyone was either snoozing or schmoozing. Saturday and Sunday blew by as rocket after rocket left the pads on the playa. Three desert nights spent out in the open do a lot to ease the mind and make troubles seem incidental and trivial. Of course there was the phenomenal flight of the N motor rocket by Richard King, a Fresno TRA brethren, which captured the N altitude record. That in itself was worth the drive. Numerous perfect flights by the Arliss group, airplanes, land sailers, motor testing, and gourmet dinners at Brunos filled the weekend. A fireworks show on the playa Sunday night off in the distance (I'm sure it was at least 6 miles or so away) was a wonderful treat.

Monday morning came and we were able to round up 8 or 10 volunteers to help us set the rocket up at a way away cell. Looking at the rocket from the LCO table it seemed almost teeny in the distance. This was the first time using the rail built by Jeff and it worked very well. A couple of tests of the nitrous fill umbilical, checks and double checks of the fill, firing, and safing electric system and we were ready to rock and roll. After a brief description of the vehicle over the PA

by Bill via walkie talkie the 10 count was given. No joy. We dropped the rocket off the rail and traced the electric leads to a faulty buss block in the parachute compartment. The Traveling Willburries strike again. Bill Wood joined us at the launch site to visit up close the hybrid propellant system he originated. A new igniter is cooked up by Bill C., the master of KNO3 and Sugar himself. It was a 6" section of 29 mm motor tube with a mixture of KNO3 and powdered sugar with marshmallows (!) on either end to hold the conglomeration in place. The marshmallows were originally intended to be flown as a subsonic payload on an aerospiked rocket I built but they were appropriated for a higher and better use. Another 10 count, the nitrous umbilical was popped at T minus 2, the igniter was lit at T minus 1 - and again, no joy. Disassembly revealed that the Morata valve froze in the closed position. We do get a chance to fire off Jeff's M hybrid though. This is a Dr. Rocket case with a 7 pound nitrous tank attached burning an HTPB grain. The rocket roared off the pad on a bright flame, went out momentarily destabilizing the rocket, and relit again. Now, almost cruise missile, the rocket heads uprange as it burns only to auger in at the end of its flight. Two less than nominal attempts bruise our collective ego. To top it off a dust storm blows across the playa and coats everyone and everything with a layer of gray dust. Not even the chicken fried steak at Bruno's is salve enough for these wounds.

Mojave Test Area Flight 10-9 and 10-10-99 Mojave, California

Yep, a very neat place indeed. Lot's o' rocket stuff. Towers, blockhouses, outhouses, bunkers, Quonset huts, test stands, everything needed for the finest rocket party. This was my first time at the site so I had no idea what to expect - I was pleasantly surprised. MTA is the RRS-PRS site outside of Mojave California for testing and flying of rocket vehicles and motors. Been there for over 50 years, a lot of wonderful rocket history has been made at this site.

Seems that with larger rockets getting to the launch site is half the battle, MTA from my place is about a 6 hour drive. Then another 6 hours that evening prepping the rocket for the next days flight. There were 4 of us working on the Bride of SORAC (SORAC Jr., Son of SORAC, SORAC Mini-Me are all names that have been tossed around) that gorgeous evening; Bill Colburn, Jeff Jakob, Paul Montgomery and myself. 11:30 PM came and I crashed out under a full blown starry, starry night. An evening under the desert sky is a real treat and well worth the drive. Another couple of hours in the morning doing all the things that couldn't be done at night like tweaking the launch tower, setting the rocket in its rail, testing all the connections and the like.

Finally everyone who was supposed to show up showed up, Dave Griffith of RATT works who is the pyro operator; Tom Holthaus, another Class One pyro operator; Dave Hall, a China Lake Weapons guy who brought his gun launched rocket; Rod and Randa Milliron of Interorbital Systems; Steve Zwaska who helped in the rocket construction; and a couple of local desert rats on motorbikes.

It's finally time to fly some rockets - here's a blow

by blow account of the days action:

Dave Hall set up his gun launched rocket. What a great piece of work. 4 feet of Schedule XX 3" Steel Pipe, 40+ grams of Fg BP, a spark plug with nichrome bridgewire for ignition, a PVC sabot, and an Estes D motor in a piece of class 200 PVC pipe. Everyone runs for cover when the launch is announced. BOOOM! There is a big puff of smoke then about 2000 feet up the D motor ignites and heads for parts unknown. Wow is all I can say. The sabot lands about 20 seconds later just a couple of feet from the gun.

Next up is Jeff Jakob's 4" x 24" hybrid motor that he built himself. This is a static test firing. Great motor, an experimental RCS 7/8" nozzle, 12 pound nitrous bottle, U/C valve ignition - about an N maybe an O motor. This burns nicely for about 8 seconds after a flawless ignition and a monstrous roar. Being an ex-go-kart racer Jeff has plans for this rocket motor, an R/C system and an older kart he has kicking around. Might be an interesting sight. :)

Jeff follows this up with a LOC Syonic with a Dr Rocket 1706 Ns 54 mm case adapted to a 7 pound nitrous bottle with U/C valve ignition. Unfortunately it's getting hot so the tank only takes about 3 or 4 pounds of nitrous but Jeff says "Go for it, dude". Off it goes after an instant ignition, apogee is guessed around 6000 feet. The Department of Deployment, an AltAcc and BP charge, doesn't do it's job and the rocket augers in and the crowd of spectators is off downrange to recover the rocket. Unfortunately Jeff hadn't tested the AltAcc for flight worthiness after his last crash using the unit, Jeff's hasn't had very good luck lately.

I placed my rocket on the rail, a minimum diameter fiberglass AF with a 38 mm monocoque hybrid motor burning a metalized acrylic grain and U/C ignition system. An Aero-Pac member, Mike Yamamoto, made the AF using OSH hardware store fiberglass and resin. A simple and ingenious system of producing great tubing for only a couple of bucks - an AT 38 mm motor and LOC NC slip right in. He uses 1 1/4" EMT wrapped with wax paper as a mandril. I used epoxy putty to bond G10 Black Brant shape fins (made by Tom Allen of Skunk Works Rockets) directly to the AF.

Everything is go so nitrous loading begins. Then SPANG! the top half of the rocket disappears! The lower section of airframe is hanging from the rail at an angle. Turns out the upper tank bulkhead, though vented, blew off the nitrous tank taking the upper section of rocket with it. I guess it didn't fly long enough for the G-wiz to detect launch so it never fired, it probably got about 15' off the ground. Liquid nitrous may have flashed to a gas raising tank pressure to 1100 psi instantly overwhelming the vent and the roll-crimped-in-place bulkhead. That was it for me.

Once everything was set for the big launch of the day. The crowd, there were 15 spectators in attendance, took shelter in the overhead protection south of the launch area. Bill Colburn is dashing from area to area and I'm following him around with the checklist (3 pages!) making sure the i's and t's are dotted and crossed. The relay battery is con-

nected, the igniter pyro is connected, I call out "pyro armed" and remove the safe and arm key on the airframe and we all split. Bill heads into the block house to control the launch functions; nitrous fill, nitrous emergency dump, umbilical disconnect, and ignition with the pyro op, everyone else is in the overhead protection.

There was a fault in the nitrous umbilical connection at T - 10 seconds so almost a full load of N2O, 22 pounds, had to be dumped to fix it. A reset of all the connections that had been disconnected to safe the rocket was completed then we headed for our respective overhead protection or blockhouse. The next N2O fill went smoothly, the umbilical was popped at T - 2 seconds, at -1 the igniter was lit and at T+1 the black powder pyrovalve (a machined chunk of Estes C motor!) burned through and dumped the nitrous down the core of the motor. It came up to pressure right now and the rocket eased off the rail, a very stately lift off. Due to its slower rail speed it wagged its tail a couple of times, a couple of small oscillations to finally become totally stable, then it really rock and rolled. Burned forever it seemed like though it was only 8 second, and was easily tracked to apogee at about 6,000 feet and about a half mile uprange. I was so jazzed I forgot to take pictures of the liftoff. What a gorgeous sight!

The mortar to blow the NC off should have happened at apogee but ... it didn't. That pesky Deployment Department again. It did make a nice whistling noise as it returned to earth. It's a fabulous sound on the one hand and a horrible one on the other.

Finally, a Whhuump at impact, a big cloud of dust as 140 pounds of metal and HTPB augers into the landscape. A round of applause erupts after a fabulous flight.

I look around for a ride to the scene of the crash and I see Dave Hall firing up his 4x4 pickup. I ask him for a ride and he says "okay, but hold on" and man we blast off out across the range. Boonie crashing! "Don't worry" says Dave, "I used to do this everyday after school when I was in high school." (Hmmm, thinks I, counting back the years since Dave has been in high school) My head is bouncing off the roof of the cab as he motors through various washouts, pucker bushes, sand berms and finally I get my seat belt on. Someone back at the launch site has a track on the dust cloud and a track on us so he steers us into the impact site via radio. We pull up, I get out and kiss the ground. We circle the smithereens, kicking and poking at the rubble trying to figure out whahoppen. Only thing left to do is grab a shovel and try and recover the parts. Dave Griffith has been there with the fire protection system and an empty pickup bed so we load the twisted AF and head back.

It's three o'clock in the afternoon we are loaded up and heading for home. A stop off for a mongo pizza in Mojave then a visit to Interorbital Systems HQ at the Mojave Airport. Wow, what a great place. Randa and Rod Milliron are really into nitric acid and furfuryl alcohol launch systems. Lots of things to look at, talk about and fiddle with. Then we're on the road headed for home. Yakked about the next flight of a 12" diameter motor with some very cool 12" diam. hundred

pound nitrous tanks and an HPR-influenced recovery system, getting the next one back alive is now a priority. Experimental rocketeers generally use the shovel method of recovery the vast majority of the time which gets expensive quickly. Gotta think boomerangs instead of fireworks.

Here are some links:

Sorac:

<http://www.fortunepaint.com/SORAC.htm>

<http://www.energyrs.com/sorac/sorac.htm>

<http://www.garlic.com/~stz/sorac/>

Pictures of the vehicle at Black Rock:

http://www.fortunepaint.com/blackrock9_99.htm

Pictures of the vehicle at MTA:

http://www.fortunepaint.com/MTA_test_flight.htm

Bill Colburn and Aerocon:

<http://www.energyrs.com/aero/aerocon.htm>

Dave Halls Gun Launched Rocket:

<http://www.ridgecrest.ca.us/~thehalls/Rockets/gun.html>

Interorbital Systems (Rod and Randa Milliron):

<http://www.interorbital.com/>

Jeff Jakob's Frankenstein M Dr Rocket Hybrid motor:

http://www.fortunepaint.com/photo_library/jeffs_drrocket_hybrid.jpg

http://www.fortunepaint.com/WhoZat_library/jeff_jakob.jpg

If you like hybrids look here:

<http://www.fortunepaint.com/hybrids.htm>

Dave Griffith - RATT works:

<http://www.rattworks.night.net/>

RRS - MTA:

<http://www.rrs.org/>

Member Meeting

The last Member Meeting of this season will be held December 4th from 1-3 PM at Portal in Santa Clara. Directions to Portal are as follows:

Take Freeway 280 to the DeAnza Blvd. exit in Cupertino. If going southbound on 280, turn right. If northbound on 280, turn left. At the 3rd or 4th light, turn right onto Stevens Creek Blvd. Travel about 3 blocks on Stevens Creek Blvd. and you will see a Good Earth Restaurant on the right hand side. Immediately past the restaurant turn right into the business park. We are in the first row of buildings on the left side



Volunteers

By Mike Vaughn

This will probably be the last Aeronaut I'm the editor of. I've been editing the Aeronaut for the last 3 years and was involved with publishing and distribution before that. Someone has volunteered to take over the newsletter and that brings us to the subject of this article.

Volunteers, Aeropac is a volunteer organization. Without members stepping up and helping out we would not be able to hold the caliber of events that people expect from us. This extends beyond the high profile Board of Director positions to the volunteers who haul out the equipment trailer and sanitary facilities. In between are the people who donate their time for range duty. I make it a point to work at least one shift at every launch I attend. This goes for Aeropac, LTR, ROC, and even NIRA launches. If every rocketeer made a similar commitment, you would not hear announcements over the PA along the lines of "If we do not get some help running the range, we will shut it down". If you do not feel comfortable with the LCO or RSO duties, there are assistant positions where you can gain experience. Another position that is sometimes omitted when volunteers get low is the Pad Manager. This is an important position when the range gets busy as it helps expedite loading and launching, eliminating waits at the range head. All it takes to be a pad manager is a willingness to help.

While I will no longer be directly involved with running Aeropac as a board member, I will still be volunteering and doing what I can to help make Aeropac one of the premier Prefectures of Tripoli.

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