

# WASHINGTON AEROSPACE

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## Washington Aerospace Officers

- President—Kent Newman
- Treasurer—Christopher Scott
- Secretary—Traci Scott
- Operations Manager—  
Andy Casillas

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## FROM THE PRESIDENT.....

BY KENT NEWMAN

Please note this amazing image to the right! The rocket is Scott Bowers' PML Endeavor being launched for a successful Level 2 certification flight on an AT J350. Scott's obsession with rocketry has led him to expending the time, expense and skill necessary to fly this beautiful rocket to attain another level of rocketry expertise.

Tim Heneghan is the photographer. Tim is a commercial photographer by profession and combines his love of cameras with his love of hobby rocketry. Tim is the one who places thousands of dollars worth of camera gear "in harms way" by setting a remote controlled camera and tripod 3 or 4 feet from his subjects. The camera typically has a 15mm lens which enables Tim to get great photos like the one in this month's newsletter. Tim defines another facet of rocketry each time he photographs a rocket being launched.

It constantly amazes me to see how diverse hobby rocketry can be as people incorporate their background skills, other interests and personal goals into the sport. Hobbyists can concentrate on construction, design, performance, painting/finishing, photography, electronics, propellant, payload, competition, etc. all as a part of hobby rocketry. What an amazing sport!

### Monroe Lost and Found

Much of this flying season has seen some pretty tall grass at "Spaceport Monroe". And, although the grass is great for creating soft rocket landings, the taller stuff has a tendency to provide a hiding place for those wayward projects. If you find any apparent lost rocket, motor casing, parachute, nosecone, etc., please drop it off at the Launch Director's table. A "lost and found" box is kept there and periodic announcements will be made identifying the contents.



Scott Bowers' PML Endeavor lights up a J350 on Scott's successful L2 certification flight. The photo is by Tim Heneghan.

### Black Rock Finale

The end-of-year Aeropac launch at Black Rock, Nevada, will take place October 5th—7th. The Black Rock dry lakebed has to be one of the finest places in the world to fly rockets. If you haven't experienced the wonders of this area, you should. And there is good reason to. There is a growing number of fliers attending from the Northwest. Join the group and plan on attending! It's a chance to witness a great variety of projects at the very unique setting of a dry lakebed some 65 miles long and 20 miles wide.

Visit the Aeropac website @ [www.aeropac.org](http://www.aeropac.org) for details.

# MONROE FLIGHT REPORT—JULY

BY **KIMBERLY  
HARMS**

Hello Monroe flyers!

August was a record breaking flight with 234 flights. That beats the previous flight total by a wide margin. The day was clear, hot and humid. And there was little wind!

Here is the flight breakdown:

1/2A 5  
A 24  
B 25  
C 62  
D 23  
E 12  
F 12  
G 31  
H 20  
I 11  
J 5  
K 1  
Unknown 3

It was also a great month for certifications. These folks now join the ranks of high power certified flyers.

## Level 1.

Jeb Stuart. PML Phobos.  
H123  
Bruce Rothaar. LOC Vulcanite.  
H128

## Level 2.

Mark Shelton. LOC IROC.  
J350  
Scott Bowers. PML Endeavor.  
J350

Good job guys and we expect great things from you all in the future

With so many big flights it was hard to keep track of them all. Here are some of the "crowd pleasers":

Eric Bloom launched his rocket named Nad Gazeem (yup, that's the name) on an I285 Redline motor. Redline motors may not have the best performance but they sure



**The Monroe flightline seen from Kent Newman's "Snapshot" from 1200'. The flower garden to the North and the main road can be seen as well.**

are very pretty!

Jack Anderson launched his Rumble Bee with a J800 (that's a 54mm motor) and airstarted 2 I211s. It was a perfect flight.

Randall Credico came all the way from Vancouver to show us his "Crazy Canuck" with a J540.

Rob Clement and Tom VanEtan brought back their PML Bulldog that they call the "Rottweiler" on an J415. It sure was a nice flight. Hey guys, how about a K next time?

Ed Mirabella brought out his 1/2 scale Phoenix and launched it on a K1100 and airstarted to I211s. All the fin area on the Phoenix made for an interesting flight profile.

While I try to call out the flights that we all like to see, please post your own flight reports. Tell everyone if things went well, and almost more importantly, when they didn't. That way we can all learn.

The Washington Aerospace folks were in a contest mood and the flying was great.

Here is the report from Mr. Contest Director (aka Jim Pommert):

It was another fine day for rocket flying this last Sunday at Monroe. The warm temp's and low winds brought out plenty of racers to compete in rocket drag racing sponsored by Washington Aerospace. Twelve young racers and four seasoned veterans proved that it doesn't matter what you fly as long as it lights quickly, stops quickly and carries a big chute.

Amber Geer, Kate Lehmen, Harmony Geer, Chris Shankland, Taylor Stein, Yvonne Kicken, Erich Newman, Christie Schmidt, Ricardo Castillo, Brandy Brown, Coleton Jones and Ashley Matt matched their rockets in friendly but fierce head to head matches. The semifinal matches saw Amber Geer going against sister Harmony Geer while Christie Schmidt went against Coleton Jones. Harmony finally slipped by her sister Amber after the first race between the two ended in a dead heat. Christie Schmidt was on a roll and after moving past Coleton then saw her 'Bad Bertha' captured the

*"Randall Credico came all the way from Vancouver to show us his "Crazy Canuck" with a J540".*

championship over 2nd place winner Harmony Geer.

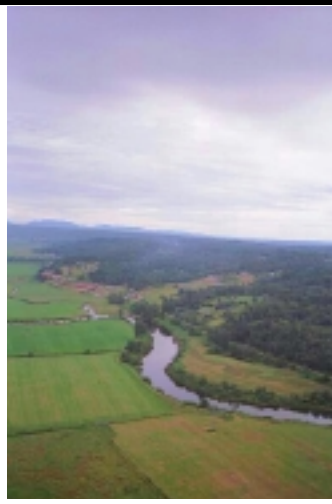
While the younger contestants were busy turning black powder into smoke a few determined senior members fought for the most coveted prize of all, 'bragging rights'. In round one, Robert Geer's flying saucer went against Eric Shankland's more conventional design while Kent Newman and Jim Pommert fought for the other finals opening with standard 3FNC rockets. Eric got the jump off the pad over Robert's saucer to capture the first finals slot. Kent's Callisto slipped by Jim's Horizon to complete the final matchup. In the final Eric Shankland smoked Kent off the pad to capture his own first place for the day. Well done everyone!

If one contest event was fun this month then wait until next month! Three contest events will be held on Sunday, September 2nd at the Mon-

roe Spaceport. First up is a repeat of last year with C-engine powered Eggloft duration. The winner must carry a fresh Large grade A hen's egg for the longest duration. Egg's will be supplied at the launch. To win the egg must not break or even crack during it's near space adventure.

Second, we'll have Open Spot Landing Competition. Spot landing is open to any rocket with the object to land with the tip of the nose cone closest to some predetermined spot. Recovery systems must fully deploy before landing.

Finally, in our first judged event, Odd-Roc will also be flown. Rockets will be judged on workmanship, difficulty and how they fly as well. For this and all our events please see the full rules on the Northwestrocketry website in the Washington Aerospace Club list. Don't forget that anything you fly must pass an



**"Snapshot" looking to the South of the Monroe field on an H242 boost.**

RSO inspection.

We had lots of range help this month and the Monroe Staff really thanks you for it. At LCO we were assisted by Mike Pearson, Eric Shankland, Mike Anderson, Andrew MacMillen, as well as staffer, Steve Bloom.

## CONSTRUCTION TIP: SHEAR PINS

Shear pins are a "flight" saver for those flying dual deployment or high acceleration flights. Sudden deceleration of the rocket at the time of drogue deployment in a dual recovery flight can eject the main parachute prematurely by throwing the recovery payload against the nosecone.

A highly accelerating rocket can suffer drag separation at the time of motor burnout that will prematurely separate components of the rocket. The result can be catastrophic in nature.

The solution? Shear pins!

Shear pins are made of material that will break upon the sudden shear stress caused by a deployment charge. Pins are typically round or square styrene rods or nylon screws.

A great article on installing shear pins can be found on

Rocketryonline @ [www.rocketryonline.com](http://www.rocketryonline.com). Go to InfoCentral and click on construction. I'll discuss a quick summary of what might be done in pinning a nosecone.

To install shear pins on the nosecone (NC) of a rocket, determine the length of the NC shoulder. Divide this length in half and measure the distance down from the NC/airframe joint on the airframe. Lightly mark this distance with a pencil.

Determine the number of shear pins to be used and calculate each pin location around the circumference of the body tube. How many pins? This is somewhat subjective. As a rule of thumb, the more free room the recovery package has to slide in the payload bay, the more shear pins (or larger diameter pin) will be necessary to hold the NC on during drogue de-

A more scientific approach would be to determine the shearing load needed to break the pin. For example, #2-56 nylon screws have been found to shear at about 35 lbs. So, 3 pins would require roughly 105 lbs of force to break the pins and release the NC. If the recovery package weight times the distance it would travel in the BT is under 105 lbs, the NC should stay on. Regardless, place the shear pins symmetrically around the body tube be it 2, 3 or 4 pins. Drill the holes using the same diameter drill bit as the shear pin, carefully put a drop of CA on the holes to toughen them up and manually run a drill bit through the hole again after it dries.

Use a black powder calculator to determine the BP charge size. Now, ground test your deployment charges. And you're ready to fly!

*"If one contest event was fun this month then wait until next month!"*

# LEGAL STORAGE—”PART 1”

BY KENT NEWMAN

Okay, so you've just certified Level 2 and you're chomping at the bit to get those big, honkin' 54mm motors that you've drooled over. But, how can you buy restricted access motors? Where do you store them? How can you be legal?

In the state of Washington, there are three authorities having jurisdiction (AHJ) that must be considered. The federal Bureau of Alcohol, Tobacco and Firearms (BATF), the Washington Dept. of Labor and Industries (L&I), and your local Fire Marshall. All three have responsibility for overseeing the safety of the general population with regard to "low explosives". All three will recognize ammonium perchlorate composite

propellant (APCP) as a low explosive.

The first thing to do is to educate yourself with regard to APCP and current legal acceptance of APCP storage. To do this, let's solicit as much information as we can with regard to APCP storage.

1. Contact the BATF at the following telephone number and request a copy of the "Federal Explosives Law and Regulations" publication (the "Orange Book"). Explain that you're involved in hobby rocketry and are pursuing a Low Explosives Users Permit (LEUP) to be used for procuring and storing Ammonium Perchlorate Composite Propellant (APCP) in quantities "greater than 62.5 grams".

Seattle Area Office  
Federal Building, Rm 842  
915 Second Ave.  
Seattle, WA 98174  
206 220-6456

A LEUP requires that a suitable means of storing APCP exists whether at your residence or otherwise so please be thinking of that. There no longer is any such thing as a "non-storage" LEUP. If you live in or have access to a single family dwelling, you can simultaneously apply for a permit to store quantities of up to 50 lbs of APCP at your residence.

The LEUP will cost \$100.00 but is good for 3 years.

2. The State of Washington also requires a permit for buying, using and storing APCP. Their code pretty much parallels the ATF. Obtain regulations and applications from Renette at the following telephone

number:

Renette Gillihan  
Dept. of Labor and Industries  
P.O. Box 44655  
Olympia, WA 98504-4655  
360 902-5563

Request "Safety Standards for Possession and Handling of Explosives" Chapter 296-52 and the appropriate applications. If you want to store at home, ask for a variance form at the same time. Explain, once again, that you participate in hobby rocketry and are in the process of applying for a LEUP from the ATF. The Purchaser and Users fee is \$10.00; the magazine permit is \$10.00 annually.

The process typically takes up to 3 months; sometimes longer, sometimes shorter. Both the ATF and L&I are good folks to work with. Be honest with them and explain exactly what it is that you are wanting to do and they will help you.

As a matter of courtesy, the ATF will notify your local Fire Marshall of a LEUP being issued if storage is involved. Although well-intentioned, this can sometimes be the biggest problem in attaining legal storage. Generally, a local permit isn't required, but there may be a question of whether or not any local explosives ordinances apply to APCP. Unfortunately, "low explosives" is a pretty broad definition. We'll address the local Fire Marshall's office in the next issue.

Request those publications, solicit sample forms at [www.nar.org](http://www.nar.org) and [www.tripoli.org](http://www.tripoli.org), and begin to think of where you will be storing your big motors! We'll continue the discussion next month.

*"Be honest with them and explain exactly what it is that you are wanting to do and they will help you".*



**Greg Deputy's "Ketchup and Mustard, Hold the Mayo" L3 project taking to the skies on a Kosdon M1845 for a successful Level 3 certification flight.**

**The rocket is a 6", 10 foot filament wound fiberglass rocket weighing in at about 48 lbs.**

## BROTHERS “EX” LAUNCH



**David Proffitt of OREO and Kimberly Harms discuss preparation of David's beautifully finished full scale Asp prior to an "M" flight at Brothers, OR. The boost was beautiful but main deployment was incomplete. The rocket suffered only minor scrapes and scratches, however. Photo by Matt Rupert.**

BY KENT NEWMAN

The Tripoli Rocketry Association sponsors TRA Research launch events to allow rocketeers to test their rocket motor and propellant designs. Tripoli does have specific requirements for the events. Some of these requirements (but not all) include:

- 1) Attendees must be Tripoli members or guests of members.
- 2) Participants must be Tripoli members who fabricate their own motors, Level 2 or higher and must only fly motors allowed within their level of certification.
- 3) The maximum single motor class is a "P", or "Q" if flying combined motors. Special permission may be granted for larger projects.
- 4) Electronic recovery is required.
- 5) Safe distances are 125% of 1995 hobby rocketry safe distances.

The Oregon Rocketry Association held a Tripoli experimental ("EX") launch August 18th and 19th at Brothers, OR. Fliers

from all over Oregon and Washington gathered to fly non-commercial homemade motors.

Saturday began as a windy, gusty day. Temperatures were in the 80's and fire danger was a concern. The OREO folks put forth a great deal of effort in clearing (and I mean, "clearing") a large area around the pad area to avoid that danger.

John Lyngdal was first off the pads with his IQSY Tomahawk on a 38mm 10% aluminum formula. Great, fast boost and a perfect parachute deployment at apogee! Next off was Greg Deputy with "Carbon Black". This rocket was a Level 3 project in 2000 that suffered a recovery system failure assumedly due to inadequate deployment charges. Recovery wasn't an issue this flight, however, as Carbon Black suffered a CATO on a 54mm DPS "Green" propellant motor. The blast tore the fin can apart and the beautiful all-carbon airframe is now without fins. Greg, a diehard amateur rocketeer will be back, however.

Some other Saturday flights included Andy Casillas flying his Quasar on a 38mm 4 grain zinc motor; yours truly flying "Fire in the Sky" on a 54mm Binford zinc motor to 6200' and Matt Rupert flying his PML QT airframe on a 6-grain 38mm 10% "slow" propellant for a great boost. Christopher Scott flew his PML Black Brant on a 54mm DPS "Orange Sunshine" motor that provided a good boost, "coning" coast and, unfortunately, failed recovery as the rocket "augured" into the high plains desert soil. Apparently, the battery connection was lost in Chris' G-Whiz and deployment charges did not fire.

Sunday was gorgeous in contrast to the wind we had on Saturday. I flew "Composite Trauma" to 9800' on a mid-sized 75mm "L" zinc motor. Andy flew a 54mm DPS "Blue" propellant motor for a successful flight and then another 75mm "L" to over 10,000'. The weather was perfect as we watched the flights all the way to apogee and that was without the benefit of tracking smoke!

Kimberly Harms flew her C-6a on a 6 grain 10% aluminum motor for a successful boost to a mid 2000 foot altitude. I flew my two-stage PML Quantum Leap to 4040' on an I211 to a 4 grain zinc motor with perfect recovery.

All in all, the event was a great time for everyone attending!

If you have interest in experimental motors, please contact Greg Deputy at [greg@blastzone.com](mailto:greg@blastzone.com) for local information and visit [www.rimworld.com/balls/](http://www.rimworld.com/balls/) for a description of the national "EX" launch event.

*"....the rocket  
"augured" into the high  
plains desert soil"*

## 2001 LDRS IMPRESSIONS

BY **KIMBERLY HARMS**

This year the national launch of the Tripoli Rocketry Association was held on the Lucerne dry lake bed in California. I didn't take any notes so I can't give you all a blow by blow account of the flights but I can give you some impressions of the event.

Think about the biggest launch you ever attended. It was a neighborhood event compared to LDRS! On Saturday when Christopher Scott and I were out on the range we looked back towards the flight line. I couldn't see the ends when looking left or right. The cars and canopies just receded into the distance. And it was not just one long line of cars – it was all several deep. While we had a fairly close in camp, those folks at the end of the line would have had to drive to the RSO / PM location just to get their project checked and loaded.

However, as big as it was it was reasonably run. They had lots of pads - so many in fact that I never saw a line for loading. There was some problems with launching mostly when things got busy and there were hold ups in a bank of pads – darn those hybrid guys always dinking about with something. One thing they did very well was to handle the larger projects. For each project that was big enough to fly at the "away" pads they appointed a "special projects coordinator" who was your interface with the launch crew. That person would get you what you needed and would arrange for your project to be launched when ready. One of my problems with past LDRS was that the big projects had to wait their turn with smaller stuff.

*"Think about the biggest launch you ever attended. It was a neighborhood event compared to LDRS."*



**Kimberly Harms with C-8, a 9.25" project flown at LDRS.**

Now don't get me wrong, I'm a "rocketeer of the people" but big projects take so much time and energy from a team that getting them in the air when ready is a real good thing to do. This they did.

If you have been to Black Rock you are familiar with dry lakebeds. The, what is called, playas – the lakebed surface – is a bit like concrete. In Lucerne, there are a fair number of deep fissures caused, we were told, by earthquakes! This made driving to recover your project a bit hazardous. The weather was quite good with dead calm winds in the early morning (they started launching at dawn) and around 3pm someone turned on the wind machine and it got real bad. Not a problem, just launch early and that we did. I never saw a problem with any of the launch equipment. Things worked and it showed the preparation of the event organizers.

Enough about the place! Here is what I remember about the flights from our lo-

cal group.

Steve Bloom made an amazing flight on his 3" Black Brandt. While scratch built for a K700, he had never tried it out on that motor. We launched it early in the morning and did it ever scoot! It was Steve's first flight in excess of 10,000 feet and we saw it all the way. Just amazing. Steve was real proud of that flight – as well he should be – and let the altimeter beep out the altitude (12,116' agl) for the rest of the day.

Christopher Scott launched his Gamma 75 on one of the new Redline "M" motors. An absolutely gorgeous flight with that deep red flame. We did have a bit of pre-flight drama. The launch staff assigned him to the wrong pad – one that was closer to the flight line than they wanted. Safe distance for an "M" is 500 feet and I think we were that far out but they had their rules. So everything was ready and then we heard over the PA, "Christopher Scott please come to the range head". Well down came his project, moved it to another pad and off it went. Cool flight with a perfect recovery.

For this LDRS I had two projects in mind. The first was my Community Eight that Christopher Scott, Pat Floyd and I built. We launched it with a central M2500 and then air-started two K700s and two J540 (Redline) motors. Again there was a little pre-flight drama. One of the electronics systems for recovery didn't arm and we had to lower it down and open it up. A lot of work for a 1 minute fix. But it was worth it. A good flight with good recovery. A funny story about the recovery. Since we were out at the away pads we decided to drive to pick up the parts.

## 2001 LDRS IMPRESSIONS (CONT.)



**Christopher Scott stands near the Aeropac N1 campsite. The group supported their project with an impressive painting depicting the N1 project.**

Stu Barrett was driving and we were both so intent on missing the huge earthquake ruts that we drove right past the rocket and keep on going. Guess we were looking the wrong way! Anyway, Christopher and Traci were right there recovering the nose and payload section and scooped up the rest, also.

Some people may have heard the story of "Ky Michaelson's Tooth" (Ky Michaelson is the RocketMan) but in case you missed it let me try and fill you all in. On the first night of LDRS the group of us was at the hotel in the bar when Ky walked in. Well one thing led to another and he had dinner with us and told us amazing stories from his adventures in flying rockets and setting up things in the stunt industry. He has this tooth, and while I'm a little unclear of the dentistry issues involved, he can – and does – remove it sometimes. And since it's a little part of himself he puts it into the payload section of his big projects. He told us in was on-board with a few other items (one of the world famous ravioli from Brunos) in his last Space Shot attempt. After they recov-

ered the parts from the airframe after it crashed he found the tooth, cleaned it up and popped it back in! Yes, Ky is a nut – but a very nice nut. Anyway, we were prepping Community Eight for flight when Ky hustles up with his video camera and a 35mm film canister. He asked if we had any space available for it. Sure thing we did. In it went to the payload section and up it went. And, unlike most of his flights, it was successfully recovered. So, if you see some of us in "I flew a piece of Ky Michaelson in my rocket" T-shirts you will now understand why. I hope this makes it on to his LDRS video.

My other project was a cluster of 3 I435s. Good flight and I'll do it one better at Black Rock this year – three J570s. should be fun.

So much for our group and there were so many cool projects to report on that I just can't even begin. There were several big V2 projects that didn't go well. There was a full scale Jayhawk flown by

the Gates Brothers that was a cool flight. And was it ever pretty – what a job they did building it and getting it painted. The Swiss team was there with an amazing scale model of an Ariane including strap on booster's that would peel away during flight. Now this was a great job of scale building and technology and even more so when you learn that it all breaks down into parts that can fit in airline checked luggage! Unfortunately, they had ground support and electronics problems and did not fly.

The last project I'll report on was the "Moon race 2001" project: a Soviet N1. Two groups of AeroPac guys decided that they would build scale projects and have a contest. One was the N1 and the other was to be a Saturn 5. Unfortunately the Saturn 5 folks didn't get their project done but the N1 folks sure did. It contained 47 single use motors and worked as planned. A few problems on recovery but they really only designed it for one flight. Expect a lot of video on that project as it was cool.

I could go on for pages about all that I did and saw (more M projects in one day that you almost didn't even look up for "yet another M"), what the launch environment was like (one vendor was selling scones!) and the great people who were there – both our team and others, the nutty projects (most having bowling balls in and on them), but it would be better to just see it for yourself. See you all in Texas next year.

*"So, if you see some of us in "I flew a piece of Ky Michaelson in my rocket" T-shirts you will now understand why."*

## Club Meetings

The first Saturday of every month!

Where: Peace Lutheran Church  
214 East Pioneer  
Puyallup, WA 98372

Time: 7:00 p.m.

We're on the Web!  
[www.hawkfeather.com/wa-aero/](http://www.hawkfeather.com/wa-aero/)

### NAR Section 578 Super Discounts

All club members get the following discounts at the All Hobbies store

20%

Special Discount on single item purchases of over \$300.

15%

Estes  
Dr. Rocket Motors  
& Parts

10%

On all of the following:

LOC(except as noted)  
AEROTECH KITS  
IMPULSE AEROSPACE  
DR. ROCKET  
AEROTECH MOTORS  
AEROTECH RMS  
CUSTOM  
QUEST  
TOP FLIGHT  
PARACHUTES  
PUBLIC MISSILES, LTD.  
THE LAUNCH PAD

NO DISCOUNT

All Red Sticker Items

ALL HOBBIES STORE  
1430 E. Main  
Puyallup, WA 98372  
253-841-0089

<http://allhobbies.net/>

## Regional Launch Schedule

Notes:

1. Monroe winter launches are weather permitting (as if the rest of the year isn't)
2. BEMRC launches (Boeing) are model rocket only. C impulse maximum.
3. No EX motors or allowed in regular launches; Kosdon motors not allowed.
4. No certified motors allowed on EX Only launches.

August 4th (Saturday)

August 5th (Sunday)

August 11th (Saturday)

August 11th (Saturday)

August 12th (Sunday)

August 18th (Saturday)

August 24-26th (Fri\_Sun)

August 24-26th (Fri\_Sun)

August 25th (Saturday)

September 1st (Saturday)

September 2nd (Sunday)

September 8th (Saturday)

September 9th (Sunday)

September 14th-16th

September 15th, (Saturday)

September 15-16th (Sat-Sun)

September 22nd (Saturday)

September 29th-30th (Sat-Sun)

October 6th (Saturday)

October 5th-7th (Fri-Sun)

October 7th (Sunday)

October 13th (Saturday)

October 14th (Sunday)

October 20th (Saturday)

October 20th-22nd (Sat—Mon)

November 3rd (Saturday)

November 4th (Sunday)

December 1st (Saturday)

December 2nd (Sunday)

### Launch Contacts:

Washington Aerospace  
Tripoli Puget Sound  
Monroe Launches  
Blue Mountain Rocketeers

B.E.M.R.C.

Seattle NAR (SEANAR)

Spokane Area Rocket Club (SPARC)

Tripoli – Oregon

Tripoli – Portland

Puyallup, WA (WA Aerospace Meeting)

Monroe, WA (TRAPS-WAC)

Dayton, WA BMR

Kent, WA (BEMRC)

Spokane, WA (S.P.A.R.C.)

Offutt Lake, WA (Washington Aero)

Brothers, OR (OREO—EX Launch)

Black Rock NV (Aeronaut 2001)

Redmond, WA (SEANAR) 60 Acres Park

Puyallup, WA (WA Aerospace Meeting)

Monroe, WA (TRAPS-WAC)

Dayton, WA BMR (Rolling Thunder)

Spokane, WA (SPARC)

Bonneville, UT UROC Hellfire 7

Offutt Lake, WA (Washington Aero)

Sheridan, OR (OREO) Mon EX Day

Redmond, WA (SEANAR)60 Acres Park

Black Rock NV BALLS 11

Puyallup, WA (WA Aerospace Meeting)

Black Rock, NV Aeropac XIII

Monroe, WA (TRAPS-WAC)

Dayton, WA BMR (Rocktoberfest)

Spokane, WA (SPARC)

Offutt Lake, WA (Washington Aero)

Brothers, OR (OREO)

Puyallup, WA (WA Aerospace Meeting)

Monroe, WA (TRAPS-WAC)

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