TOTAL IMPULSE

JACKSON MODEL ROCKET CLUB
JMRC
HUVARS
HURON VALLEY ROCKET SOCIETY
TRIPOLI ROCKETRY ASSOCIATION, INC.
TOTAL IMPULSE VOLUME 24, NO. 2
MARCH - APRIL 2024

THUNDERSTRUCK 2024

WRIGHT-PATTERSON FIELD TRIP

APRIL SPORT LAUNCH COVERAGE

TOTAL SOLAR ECLIPSE

CLUB OFFICERS

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Vice President: Roger Sadowsky
Treasurer: Tony Haga
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Editor / NAR Advisor: Buzz Nau
Board of Director: Al de la Iglesia
Board of Director: Dale Hodgson
Board of Director: Herb Crites
Board of Director: Fred Ziegler
Board of Director: Mark Chrumka

MEMBERSHIP

To become a member of the Jackson Model Rocketry Club and Huron Valley Rocket Society means becoming a part of our family. We have monthly launches and participate in many educational events. We encourage our members to actively participate in our club projects, running for office in our annual elections, contributing to our monthly newsletter with articles or tips, and offering services to the club in their area of expertise. We have many members comprised of children, men, women, professionals, lay people, educators and people from many other walks of life.
You may fill out an application at a launch or request an application from one of our board members at scott@sfsmindustries.com and mail it along with a check for the annual membership dues ($30.00 individual or $40.00 family) to our mailing address:

JMRC/HUVARS
C/O Tony Haga
711 Wilwood Rd
Rochester Hills, MI 48309

Members enjoy participating in club projects, meeting an incredible group of positive people, and no launch fees!

COMM CHANNELS

There are several ways to keep in touch with the JMRC/HUVARS and it's members.

Website: http://www.jmrconline.org. Information includes directions to launch sites & schedule, range procedures, and instructions on how to join the club.

Groups.io: The JMRC groups.io site is a place to share files and also serves as our primary e-mail list serv. Follow this link to join, https://groups.io/g/jmrc

YouTube: Checkout our launch videos on YouTube. Search for "JMRCtv" and don't forgot to Like the videos you watch and Subscribe to the channel. Click on the Bell icon to be notified when new content is uploaded.

Facebook: If you have a FaceBook account search for "Jackson Model Rocket Club JMRC" and request to be added.

Discord: Our new chat channel for broadcasting notifications and interacting with other members instantly. Discord is an instant messaging social platform that also supports VoIP (voice over IP). It allows us to open a new channel for members to socialize, meet virtually with voice and webcams, ask questions, and more. Click on the invite link to join the server,
https://discord.gg/pq88zUKMF9

EDITOR'S RANGE BOX

Spring is usually a busy season as we transition into nice weather and outdoor activities, but, wow! The past month especially has been insane.

After a relatively calm March, April kicked off with our annual equipment maintenance day, then total solar eclipse a couple of days later, followed a few days after that by the high power launch, ThunderStruck, hosted by Indiana Rocketry. As if that wasn't enough, we held our first monthly launch and then had a field trip to the US Air Force National Museum in Dayton, Ohio.

We have coverage of all of these events within this issue plus more. I can't thank our contributors enough and they really came through this month.

We have a conflict with our next local launch as the Horning 2 field is only available on May 18th, the same day as Crapshoot in Muskegon. We will definitely hold our local launch for those that don't want to travel. Please note, this will be at the Horning 2 field on Bethel Church Road.

Thanks!

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Launch/Event Calendar - 2024

- January 26-28 v*NARCON 2024* (Virtual Event)
- Holiday Party February 3 (Manchester, MI)
- March *cancelled* (Horning)
- ThunderStruck - April 12-14 (Pence, IN)
- April 20 (Horning 1)
- May 18 (Horning 2
- Crapshoot IX May 18/19 (Muskegon)
- LDRS 42 - June 6 - 9 (Potter, NY)
- NARAM 65 - August 3 - 9 (Pueblo, CO)

NOTE: Launch dates are subject to change without notice. Be sure to call the "launch hotline" at 517.262.0510 for the latest weather and field information or sign up for the JMRC Discord channel.

PRESIDENT'S CORNER

May is finally here and we have only logged a single launch this year due to weather; but I have a feeling that is about to change.

We have our joint Crapshoot launch with MMAR/SMASH in Muskegon on May 18/19 and we are also preparing for regular launches in Manchester. These launches will allow us to continue to expand our offerings as we bring our reliable and proven launch equipment and our experimental equipment which includes but not limited too: wireless network launch gear, and wireless audio for broadcasting.

Several beta testers are wringing out a new 3D club rocket that can fly on A-C motors. If you don't have a printer and want a rocket once they are flight ready let a BOD member know and we can get you in the queue for one to be made.

Hopefully 2024 will be another growing year for individuals and the club. See you all soon!

Scott

About Total Impulse

Total Impulse is the official newsletter of the Jackson Model Rocket Club (JMRC), Tripoli Prefecture 96, NAR Section 620. Published Bi-Monthly, *Total Impulse* is a space-modeling newsletter devoted to representing the diversity of interests in today's hobby of model rocketry.

The editor of *Total Impulse* accepts material for inclusion from anyone.

Send correspondence to:
Jackson Model Rocket Club
Buzz Nau, Editor
E-mail: USSMidway@gmail.com

On the Cover:

Tony Haga's Yank IQSY Tomahawk lifts-off on a Loki M1882 at Thunderstruck 2024. This is annual evet hosted by the Indiana Rocketry club. See details of the launch in this issue!

TOTAL SOLAR ECLIPSE | 8 APRIL 2024

Tony Haga | Dale Hodgson | Buzz Nau

Dale Hodgson

April 8 was a long time coming. Some of us have been waiting for this once-in-a-lifetime event for literally years. Even better; the path of totality happened to be right over my house...

And who better to share this event with a couple of rocket buds who made the drive from Michigan? Buzz/Melanie and Tony/Mary came down all that way for literally 4 minutes of the show. So, Julie and I set up our front yard with chairs, tables, and of course, tons of food that we all prepared or brought. Tony brought his camera equipped with a tripod and solar filter to capture the moment and I had set up my telescope that also was equipped with a solar filter.

It was a beautiful day; much better than originally predicted. And what a show! Right on cue, we watched as the moon began to trace its path across the sun. When we first looked at the sun we thought we were seeing "floaters"..... those little cellular remnants that are in our eyes and we start noticing when we get a little older. But, both Tony and I saw the SAME THING so they weren't floaters; they were actual sunspots. As totality got closer we even got to observe the sun's corona and a few red to pink solar prominences...those loops of superheated hydrogen and helium within a strong magnetic field.

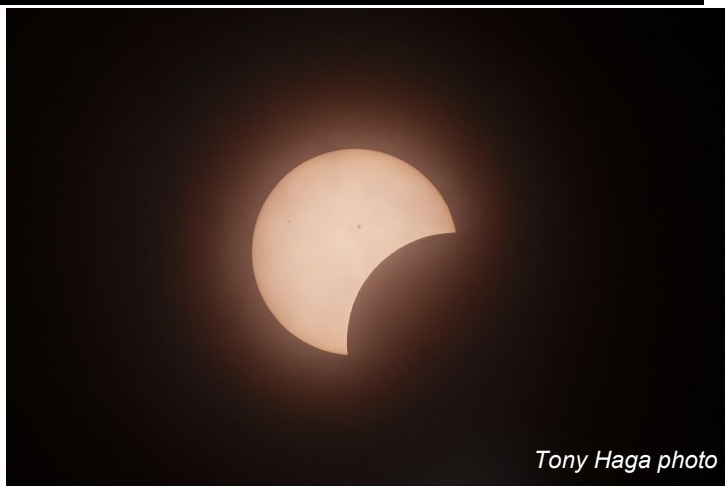
Then, the big event.... totality. What an eerie experience. Does not look like twilight at all; totality has a look all its own.

Not quite 4 minutes later the moon started passing the sun and it gradually got light again.

But, those 4 minutes will last a lifetime at least for me. Granted, all my neighbors were there to observe and look through the scope but it was so much better to have at least a couple of my closest rocket buds there as well. Thanks for making the trip....it was an absolute blast!

Buzz Nau

There has been a lot of club interest in the April 8, 2024, total eclipse going back to the last US total solar eclipse in 2017. Al de la Iglesia and Tony Haga both saw the 2017 event and their descriptions put the 2024 eclipse on my bucket list. Dale Hodgson let us know that his house was in the direct line for totality and we were all invited. I immediately put it on my calendar. Fast forward to the week leading to the eclipse and the viewing forecast was looking iffy at best. Do we stay home and only see 99% totality or risk it all by going to Dale's? It was a pretty easy call for me and Melanie.



Tony Haga photo

Dale Hodgson photo

We first have to thank Julie and Dale for hosting us as well as Tony and Mary. In addition to a great viewing experience, they provided an excellent meal and snacks. Dale had his telescope out with a solar filter and Tony was capturing the event with his DLSR camera. Before the eclipse, you could easily see several black spots on the Sun through the telescope and they also showed up on Tony's photos.

How would 2024 differ from 2017? First, the path for 2024 would cross more populated areas of the US and would also be wider allowing more people to experience it. Totality would also last longer with our location experiencing it for nearly 4 minutes. This was also a period of higher solar activity resulting in solar flares and coronal mass ejections.

As the time to totality counted down you could easily notice the darkening sky and temperature lower. Watching through our solar glasses as the sliver of the sun disappeared we wondered, would the high altitude haze restrict us from seeing the corona? Not only were we able to see the corona, but several prominences were glowing brightly and one in particular was extreme. The switch to totality has been described as something you have to experience to fully appreciate it. Photos and videos do not do it justice and I have to completely agree. The sky becomes an eerie twilight where Venus and Jupiter were easily seen. Four minutes later we were all wondering, "Did we really just see that?". It was one of the most surreal events I have ever experienced and one that will last a lifetime. Many thanks again to Dale, Julie, Tony, and Mary for sharing such a memorable event.

Tony Haga

Well, you just had to be there. We've all seen the pictures and videos and they pretty much all look the same. But there is just no

substitute for seeing an eclipse with your own eyes. Hanging out with friends in the front yard waiting, picnicking, watching the clock, and hoping the sky stays clear. Looking up at the sun while wearing those silly looking eclipse glasses, waving at folks as they drove past. What a wonderful time!

Almost impossible to tell that anything is going on until the sun gets to about 95% covered. Then you notice maybe it is getting a bit dark, temperature dropping just a bit. Then when there is just a sliver of sunlight remaining the sky turns a deeper blue, Jupiter and Venus start to shine. Then the last diamond of sunlight winks out and it's gone. A big black hole where the sun used to be. Wow! Look at that! The view is surreal and almost scary.

I try to take a few pictures but I hate fiddling with the camera, I just want to see! Still a few high clouds but not enough to spoil the view. Wow! Look at that! The birds have gone quiet and it is now much cooler. Still, in eclipse, the sun shows obvious red/pink prominences, clearly visible with the naked eye, with a large one on the southern pole. The horizon is now a 360-degree orange sunset. The sky is a deep blue. The high clouds seem to enhance the effect.

Three minutes later and the sun is still gone. This is a good long-duration eclipse. Can't help but think about how the ancients must have been so frightened. No warning, no planning. Just Poof! And the sun was gone. Just a few more seconds and the sun is back. Put your glasses back on! Instantly, the sky lightens, and the stars and planets disappear back into the daylight sky.

Wow! That was awesome! Now don't get me wrong. I could have done without that long, slow drive back home but it was worth every second and I would do it again.

Buzz Nau photo

Tony Haga photo

LAUNCH REPORT

THUNDERSTRUCK 2024

APRIL 12-14, 2024 PENCE INDIANA

Dale Hodgson

The Thunderstruck Launch: a fairly large event held by Indiana Rocketry was held April 12-14 this year. Representing JMRC were Tony Haga, Buzz Nau, and myself. The field is quite large and a great place to fly; most of the time anyway. The weather forecast for the week wasn't the greatest; lots of rain and high winds before the launch followed by sunshine but fairly strong winds during the launch with a couple of small breaks. For once the weather forecasts proved to be right for the most part. It had rained heavily through Thursday evening; we didn't know what to expect for Friday. Upon our arrival, the folks at Indiana Rocketry had already changed the configuration of the launch site a bit, and for good reason. Most of the usual launch area was wet and muddy; standing water was present where the away cells are usually located. That being said Friday was a scrub due to forecasted high winds that ended up lasting the entire day. We were hoping this wasn't necessarily a bad thing as those winds would help dry things out. So, we went back to our hotel and spent the day prepping for Saturday expecting better conditions.

Saturday proved to be the day for flight; the winds were much lighter, at least at lower altitudes. I had prepped *Unleashed* to fly on a Loki M900; a long burner for an M with a bright red flame. When I checked in with the LCO there was a minor concern about the thrust-to-weight ratio of my flight due to the rocket weight on the pad and the initial thrust of the motor. The ratio was about 4.3:1; not terrible. Previously I had run simulations for that motor with a 50 lb. rocket and a longish launch rail, and those simulations called for a safe flight. We opted to use the longest rail available which was on their tower at the way-far away cell. Ten feet of rail was more than enough to compensate for any potential adverse wind cocking due to a slightly lower velocity at liftoff. Loki red motors are a bit slow to light sometimes so I ended up using two igniters with Scott's Go-Go Juice as a dip. We already knew that the Go-Go Juice could light just about anything so we were confident we would be OK. The flight itself was nothing short of spectacular. Bright red flame, a small amount of weathercocking but predictable. Chute deployed was right on cue but that's when the trouble started. The rocket drifted east as the winds at altitude were stronger than we thought. The rocket came down and landed a couple of fields over and it looked to be easily recoverable. However, that wasn't the case. The previous rains during the week filled all of the drainage ditches so there was no easy way to cross to get to the rocket. It took a lot of walking, driving, and even some help from the local farmers who were there to help with such things. By the way, they were some of the nicest folks you would ever want to meet; they like watching launches and are more than happy to help with retrieval. The only thing they asked was to make a small donation to the host club. However, even they couldn't figure out exactly how to get to the rocket so Tony decided to explore and consult the Great Gazoo….I mean Google Maps to get a better lay of the land. Anyway, after driving way out of our way, walking some more, and a lot of carrying (why, oh why did I build that thing so heavy?) We finally got the rocket back later in the day. It was Tony who had finally figured out how to get to the proper area; one of those drainage ditches went underground so there was a place to cross to get to the right area.

Tony was up next with his Tomahawk on a Loki M1882. He had a perfect flight to just under 10K. His rocket drifted a bit too but with the help of the farmers and their ATV, it was easily recovered since there were no drainage ditches in the way.

Dale Hodgson's Unleased on a Loki M900 Red

I think Buzz was the smartest of the three of us; he flew an I motor, a G motor, and an F motor. All three recovered without incident and a lot shorter of a walk. We did have to cut Saturday off a bit early since the winds picked up again. But, we were happy to at least get a few birds in the air.

Sunday proved to be a scrub yet again. Although sunny and warm the winds even early in the morning were 20mph plus so that pretty much ended our day. We decided we had had enough and went home early. Although we didn't get to fly everything we wanted we had a great time hanging out together and flying what we could. I'd like to again thank Buzz and Tony for all the help. Couldn't have pulled it off without them. Looking forward to getting together again and flying more this year.

Tony Haga

Outstanding in the field. That's where we were, after a half-mile walk, looking at Dale's rocket not 100' away, on the other side of the drainage ditch. Dale just had a perfect flight and touchdown of "Unleashed" on a Loki M900 Red at the Thunderstruck launch in Pence, IN. All that remained was to take that walk and haul it back in. The area had taken almost 3" of rain in the last week so the ditch had a good flow of water and the idea of just traversing the ditch was quickly given up. So after trying to find the way around we decided to head back in, fly my IQSY Tomahawk on that aging M1882, then head back out. We figured the Tomahawk would land in the same general area and we would hitch a ride with one of the landowners and pick them both up. Back at the flight line, we were informed by one of the landowners that there was a bridge over the ditch that we did not see. Well, crap...

Now is a good time to point out how accommodating the landowners were. Not only do they allow the club to use the field, but they also provide rocket recovery services with their ATVs. Extremely nice and hard-working people.

So we flew the Tomahawk which was a great flight and it landed safely (thanks for the eyes Dale) about the same distance away and a bit south of where "Unleashed" touched down. Now to head out and pick both rockets up. We hitched a ride with Lynn, one of the landowners and a very nice lady. We were able to drive straight out and over the bridge, we were told about earlier and almost drove right over the Tomahawk (thanks for the eyes again Dale). We quickly picked that up and started out to get "Unleashed". Now we ran into trouble. It seemed that we just couldn't get around the drainage ditch. Dale and I decided we would head back in, hop in the truck, and try an approach from the other side. There is a wind farm just to the east of the field and we were able to find an access road that we figured would take us just about there. After parking and more walking guess what we found. Another drainage ditch! Oh, Come On! The very large parachute on "Unleashed" was now catching some air and was taunting us just on the other side of the ditch. We could almost reach out and grab it. But after some more exploring, we discovered that the ditch disappeared underground and we finally had a clear path for recovery. Whew!

Tony Haga's Yank IQSY Tomahawk on a Loki M1812

Tony and Dale trying to decide where to eat dinner

So what is the moral to all this? When heading out to a launch at a new site take some time to learn the field beforehand. All these fields have ditches and hedgerows and what may appear to be an easy recovery may not be. Trying to look up maps on a cellphone in an area with weak or no cell coverage may lead to disappointing results! Downloading maps from Google in advance is an option but I had a hard time even viewing maps on my cellphone in the bright sunlight. Next time I think I'll go old school and just print out some maps and stick them in my pocket.

Buzz Nau

Dale did a nice job of describing the event in general. I would add that those fields are a lot bigger than you think when you start walking across them. Trekking across them only to find his Unleased had landed on basically an island wasn't something any of us expected to have to deal with. I'm glad Louis and Clark were able to navigate a passage to it eventually.

While they were out exploring I managed to get my one big flight launched and returned. I flew my THOY Falcon on a CTI I170 Classic using my Jolly Logic Chute Release for dual deployment and new Top Flight 54" "X" chute for recovery. About 200' off the ground it weathercocked into the wind and had a noticeable spin. The nine-second delay was just a touch long due to the flight path, but not bad. The chute released at 400' and it landed near the American flag in the middle of the launch area. Can't say I planned it that way, but I'll take it. The "X" chute worked well as the model didn't sway at all nor did it drift much with the wind.

Next up was my scratch-built Cherokee G which flew on a CTI G100 Skid. This flight was much straighter though it also drifted downfield a lot further too. Both the Cherokee G and Falcon had an onboard camera. The video has been posted to our YouTube channel, JMRCtv if anyone is interested.

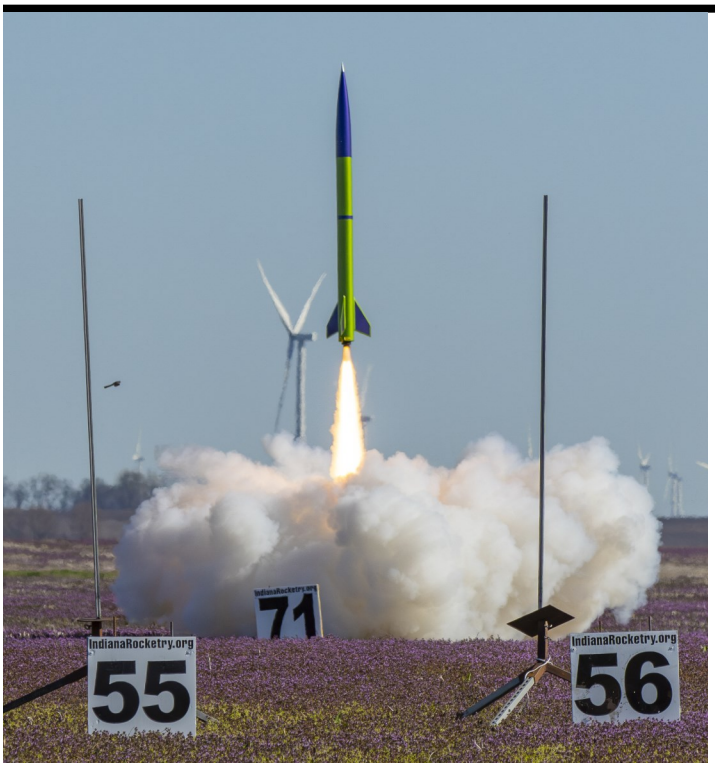
Buzz's THOY Falcon on a CTI I170 Classic

Buzz's Cherokee G on a CTI G100 Skid

By now the wind was picking up and I debated a third flight, finally deciding to try my ring-finned 3D Rocketry kit, Circulus on an AT F67 Enerjet. The wind was a bit much for it and it weather-cocked badly though it was undamaged fortunately.

That was it for our flights, but there were many others that were great to watch including Dan Michael's 1/2 scale Patriot and several high-power multistage flights including Paul Wolak's Carbon Super B. It flew to 13,500 feet on a CTI M2505 staged to an AT L952. There were also many Purdue students flying for their Junior Level 1 certification throughout the day.

Big thanks to Indiana Rocketry for hosting the launch. It was only one day due to weather, but that's the Midwest in Spring for you. Also a huge shout out to the Launch Control Officers Josh Anderson and Ben Murdock. They did an awesome job of keeping the launch flow going which helped get so many rockets in the air for the day. I'm already looking forward to attending again next year.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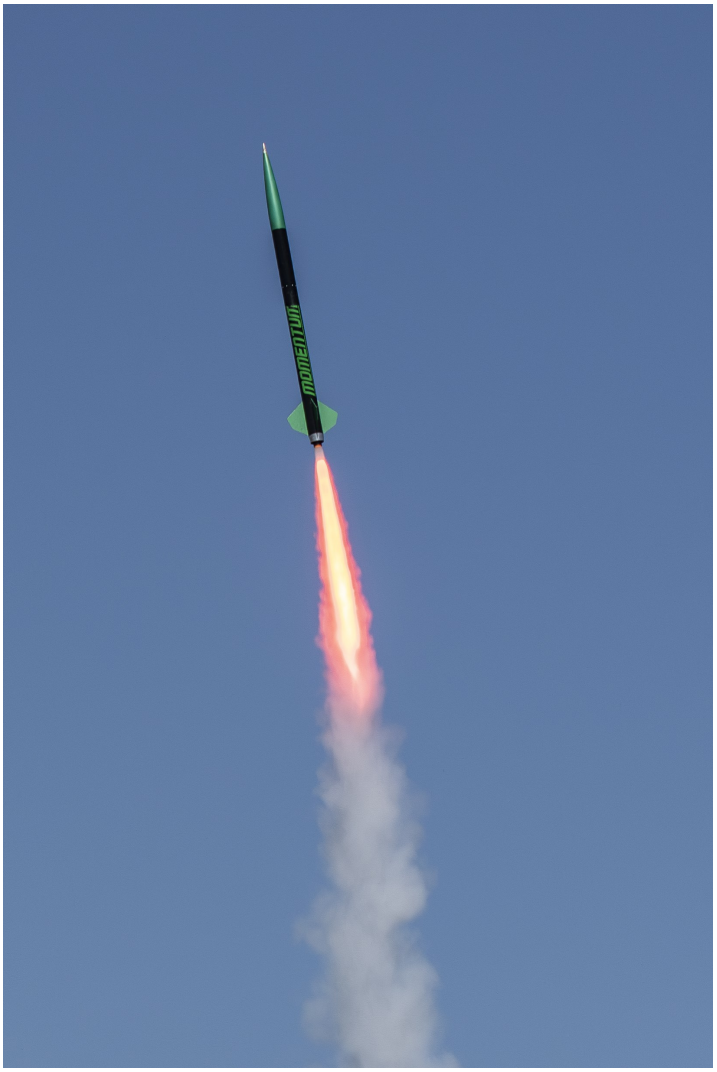


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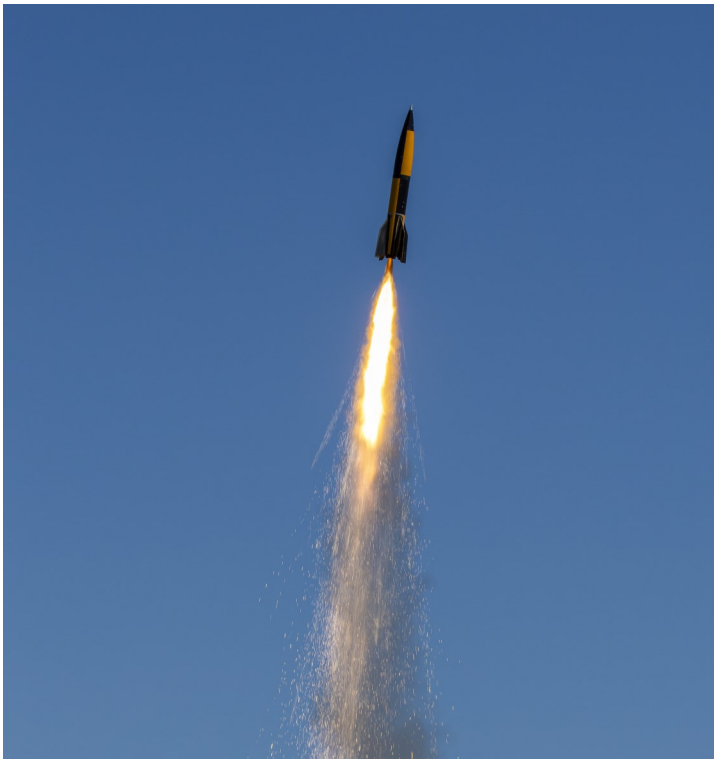
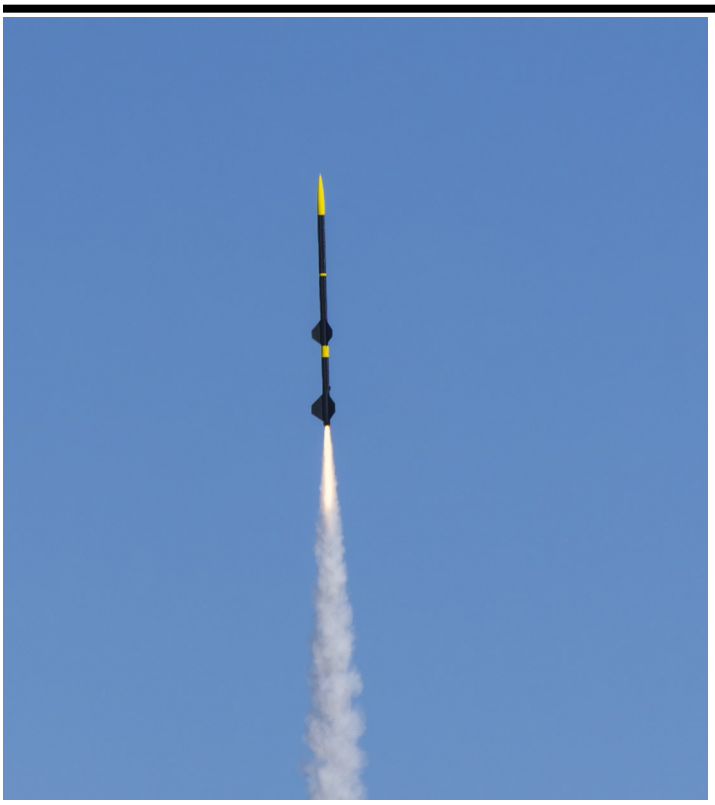
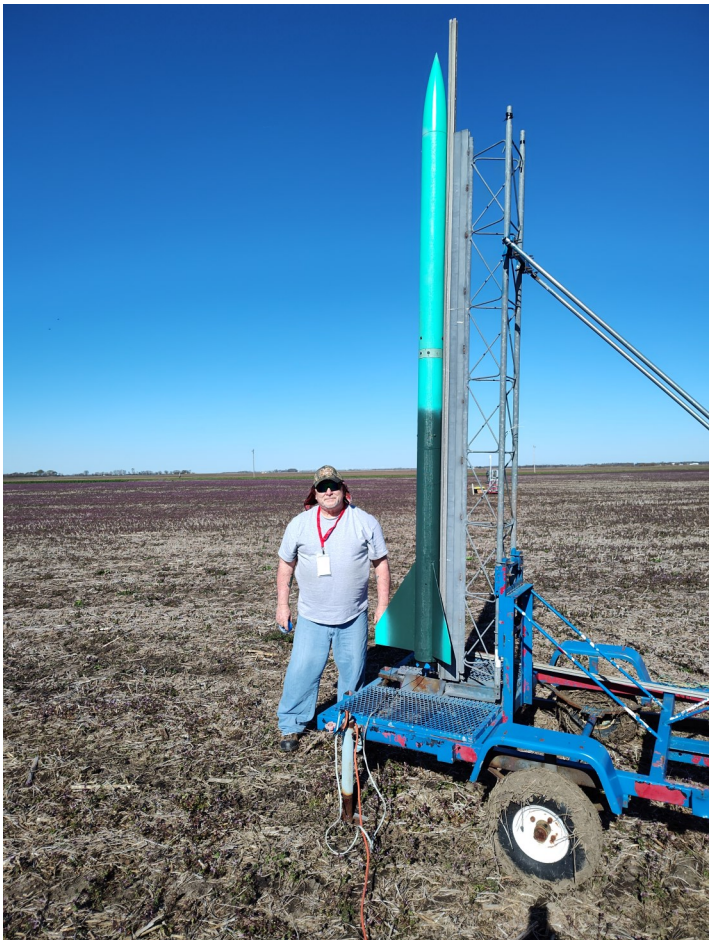




Paul Wolak's Carbon Super-B

Buzz Nau and his THOY Falcon



Dale Hodgson and Unleashed

Tony Haga and his Yank IQSY Tomahawk

LAUNCH REPORT

APRIL SPORT & NRC LAUNCH

Ah, April in Michigan. The weather this time of year is always a toss-up and can vary greatly in the span of 24 hours. The weather on 20 April for our first launch of the year was barely flyable due to winds and the chill in the air, but 10 fliers and some families braved the elements for a few hours to put up 34 flights.

Sport Flights
Mark Chrumka put in the most flights of the day with 10, sticking with models that were draggy and low-flying. These included an Estes Quinstar, Mars Leaper, Quest HL-20 glider, and Estes Big Daddy. Many of the models were small like his Estes Sprite and Mark was lucky to recover them all in the alfalfa which is starting to get tall.

It was good to see Steve Lindeman and his family out on such a cold breezy day. Steve had 7 flights that included an Estes D Region Tomahawk, Apogee Stonebreaker, and his unique scratch-built "Autism Awareness" rocket. This rocket used a crayon nose cone and had fins that looked like puzzle pieces. A nice looking model and it flew great.

Michael, Jayden, and Nathan O'Neal had 6 flights between them. Nathan and Jayden flew their Alpha III's and Michael also flew an Estes Bullpup 12-D, Quest Harpoon, and Estes Star Orbiter. All of their flights went well and were recovered successfully.

Scott Miller was in attendance to provide high-power motors (though no one flew any) and he also provided a batch of new 3D model prototypes for test flights. Tony and Dale flew a couple and while the flights were good and stable, a few areas for improvement were discovered around the threads and body tube wall thickness. I'm sure Scott will have some improvements to try out by the next launch.

Competition
There were surprisingly a few contest flights made during the day. Al de la Iglesia and Steve Kristal made FAI-related flights. Al made three S6 (Streamer Duration) flights testing a new streamer fold method. There was little to no thermal activity for the day, but his last flight did catch some air and performed 50% better than the previous two flights. The NAR has a new record category for

Scott and Tony prepare to launch one of Scott's 3D prototypes

Mark Chrumka's Quinstar lifts off on a B6

Michael O'Neal's Star Orbiter on a D12

Mark Chrumka's Quest HL-20 glider

FAI A Altitude and Steve Kristal made a flight to set the record for C Division at 142 meters

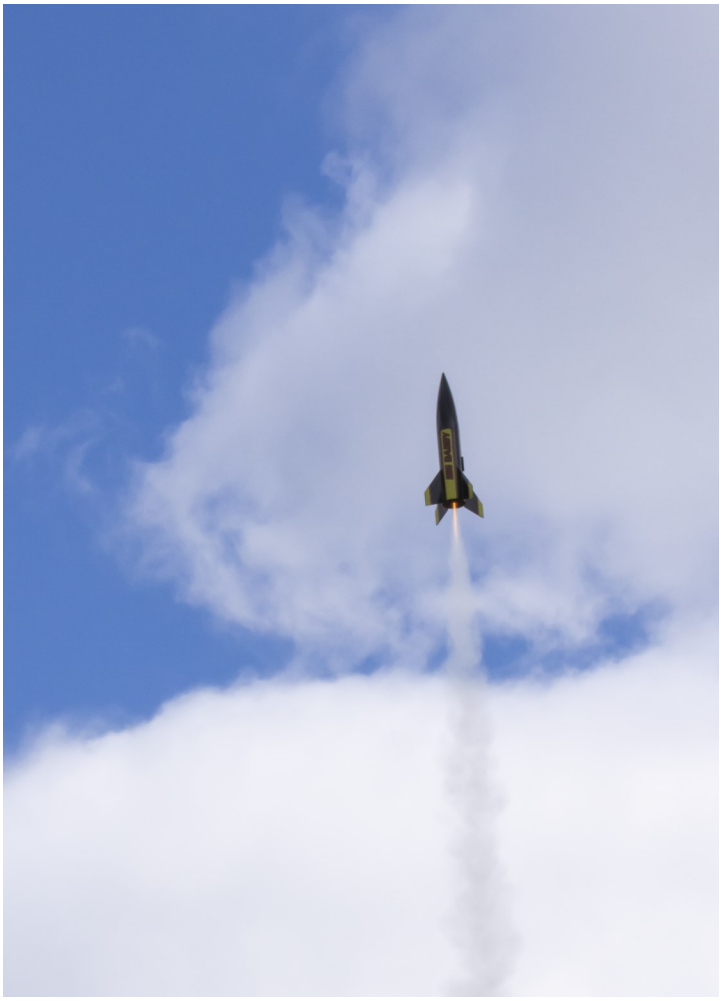
Steve also flew a B Payload flight for NRC qualifying, but it went unstable and failed to stage. Buzz Nau also flew B Payload to make a qualification flight using a simple BT-20 model and Quest B4-6 motor. Not a great flight, but it will get the Escape Velocity team on the scoreboard for the event.

Steve Lindeman's Stonebreaker on a D12

Nathan and Michael O'Neal return after a successful Alpha III flight

Al put in flights for B Streamer Duration totaling 40 seconds and a B Eggloft Altitude flight that reached 125 meters. It was too windy to risk flying any gliders for A rocket glider duration.

We're all hoping that May brings us a much better launch day and that we see more members attend to enjoy a fun day of flying. We should know shortly when the Hornings plan to make the first cut of alfalfa so we can schedule the May launch. Stay tuned to the email server for updates.



Mark Chrumka's Big Daddy on a D12

Steve Lindeman's Autism Awareness model takes flight

Steve Lindeman's D Region Tomahawk

Everyone's watching Al prep a streamer duration model

Escape Velocity's B Eggloft Altitude flight

VIEW FROM THE FLIGHT LINE

MID-COURSE CORRECTIONS

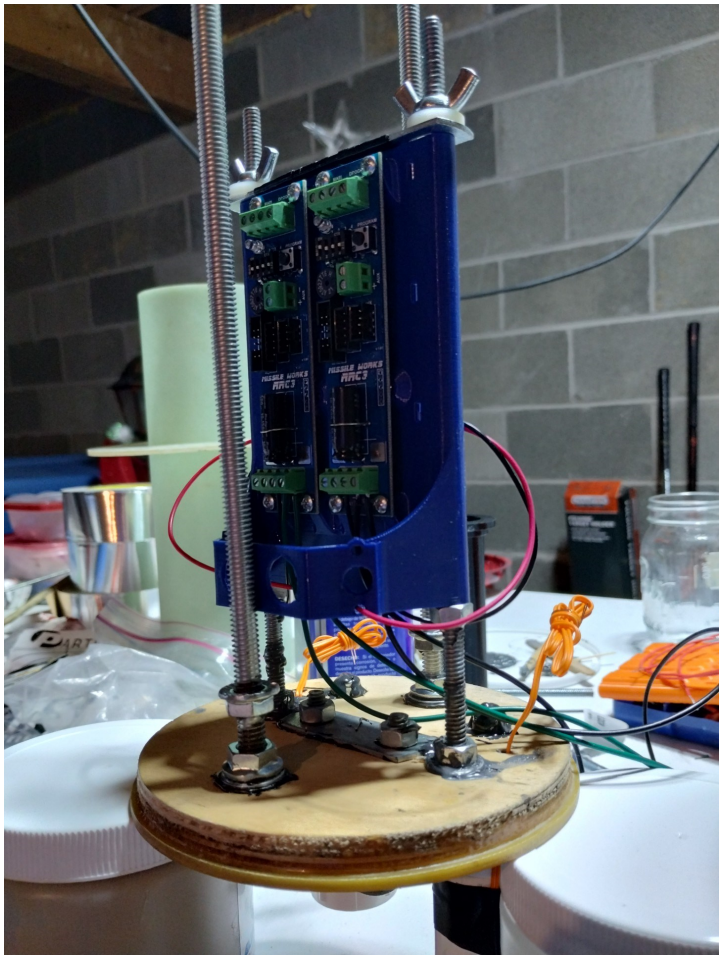
DALE HODGSON

I decided to write this article a little early; it's just a few days before our first launch and just a couple of weeks after that Thunderstruck in Pence, IN. Two entirely different launches; the way the weather looks at this point our JMRC launch may be low to mid-power with a few 3-D flights thrown in; we have to keep our Chief Designer happy. I'm planning on Thunderstruck being more of a higher-end high-power; kind of a long burn weekend with a couple of K motors and if everything works out an M motor with a decent amount of burn as well.

Getting things ready for our club launch will be relatively easy; at least I hope so. Most of the motors are single-use; depending on the weather I might have to build one or two but that remains to be seen. I never really count on an accurate forecast outside of 48 hours but even that is dubious at times. We've had horrendous forecasts turn into great days and vice versa. The consistent thing about the Great Lakes weather in the spring is its inconsistency. Nothing to be done other than prep the best we can and accept what comes.

My story here is the prep for Thunderstruck 2024, an annual Spring launch hosted by the Indiana Rocketry club. It's still a ways off but it's good to at least have a plan. Up to this point, I had one, but like all things rocket-related plans sometimes have to change for one reason or another. It seems though that our suppliers, and I mean vendors across the board, are having issues getting parts in that we need, or at least want. I initially planned to have a Gizmo XL DD fly on an M900. The Gizmo is an 8" behemoth that won't go super high, but it will put on a show. I pretty much have it built except for two very important components. I ordered a coupler and another section of the airframe from one of our suppliers that had both parts as "in stock". That was in January. It's now pushing late March and those parts are still "pending" whatever that means. Several emails have gone unanswered at this point. So, I must change things up a bit. Instead of flying a Gizmo, I'll be flying Unleashed. This one is my 5.5" scratch builds I flew for my L3 and several times since and it has always flown well. Again, not awfully high but pretty impressive regardless. I decided Unleashed needed a makeover, so I decided to change two very important components. First are the shock cords. Up to this point, I had been using what amounts to 2" seatbelt material. Never an issue but I thought it was time for a change. I ordered; and received it very quickly I might add some Kevlar shock cord. Plenty strong and easier to work with so we are good to go there. Piece of cake to this point. The second item is the electronics bay. For those that remember, I built a monster of a sled that held an ARTS board and a PerfectFlite MAWD. Plus, three 9v batteries.

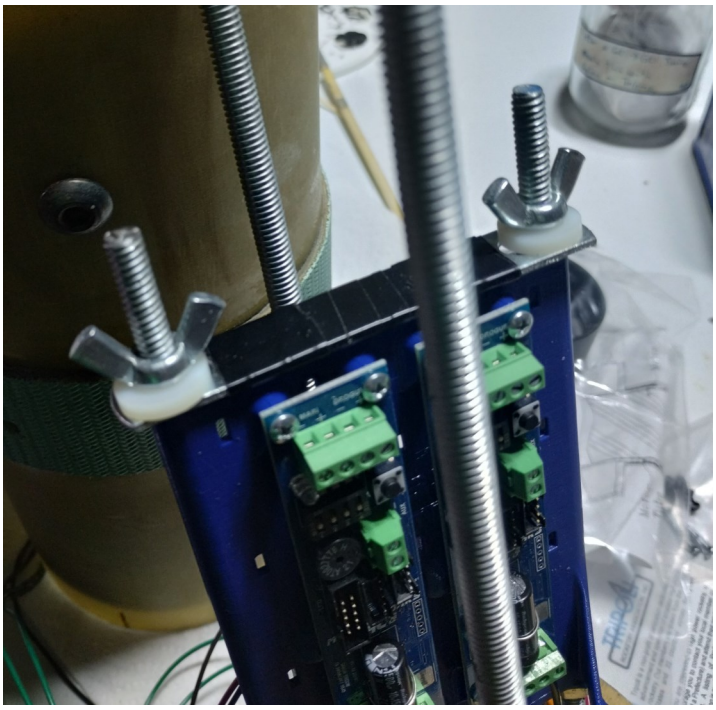
The sled itself is fiberglass with a ply backer. I used some LOC tubing for the amounts since the whole deal slid into the bay using 5/16" all-thread to hold it all together. Again, it's a bit of an overbuild. So, I thought I would build another bay with a 3D sled, smaller altimeters, and a little less all-thread. I ordered a new 5.5 coupler and bulkheads. But before I ordered them, I messaged the vendor and asked if there would be compatibility issues with using this particular coupler with the rocket already built. I was assured everything was cool, so I went ahead and bought everything I needed including the hardware.



I was very happy to see that the parts came in fairly quickly; less than two weeks which I thought was fast enough. That's when the trouble began. I took the coupler and tried to fit it into the airframes. Tried, tried, and tried. A no-go situation: the coupler was just a touch too thick. I didn't want to try and sand down the insides of the airframe or the outside of the coupler. I had to do something similar to some years back and it took days. Definitely something I wouldn't recommend.

This is where the engineer in me (or lack thereof) took over. How was I going to be able to use the existing bay with a new sled and electronics? It took some doing but I came up with something

rather novel. I ended up using short pieces of ¼" all-thread and made another sled guide that was mounted perpendicular to the 5/16" all-thread rods already present. I used the new 3D sled I decided to use and fit everything to accommodate that sled and others like it. It took some doing but I think I pulled it off. One addition I made was that since the new ¼" all thread didn't go all the way through the altimeter bay I simply took the bottom bracket off of a U bolt, wrapped it in electrical tape, and slid it down the all-thread so it sits at the fore end of the sled. That should keep everything stable. Not a totally new bay but upgraded electronics which should function just fine. I switched to using two Missileworks RRC 3 altimeters. These are totally new to me so I spent some time learning the software and how to program each altimeter.



Once I had everything just about where I wanted it to be I came across another problem. It was a problem I created myself when I built the original sled and installed the power switches. I apparently used just enough wire to run from the switches to each altimeter (An ARTS board with a PerfectFlite MAWD). For the new sled and altimeters, there wasn't enough wire to be able to have the sled completely out of the bay with the switches hooked up. It was a simple matter of soldering some extension wire on the wire already present to have the length I needed. Simple enough but I wondered why I made the original wires so short…lesson learned. I also removed the external charge canisters on each bulkhead and replaced them with something a bit more functional. I'm of the mindset to be sure to use enough BP for my deployment events; just old-school enough to blow it out or blow it up. I don't want a rocket that big coming in ballistic; I saw that some years back and quite frankly it scared the snot out of me. So, we'll see how all this goes. At least in theory, everything should work even better than the original layout. But as they say, "It looks great on paper".

Once all the internals were done, I looked at the exterior and decided that it could use a bit of an upgrade as well. So, off to the hardware I went to pick up some additional paint. At first, it was going to be a simple touch-up but after some thought I decided to redo the whole thing. I liked the basic color scheme except for the fact there were too many colors so I cut it down to two. The nose cone, payload section, and switch band on the altimeter bay would be a single color while the rest of the project would be another. Prepping was simple enough; just a thorough wipe-down with some alcohol on a cloth was sufficient to clean up the surface. The rocket did have a few bumps and scrapes that I left alone. I was thinking it added "character" since each scrape was a bit of history from past flights. My goal was to use the same type of paint as before; in this case Krylon Fusion. At least that was the plan. This too created a slight snag. There wasn't any Fusion available to match the booster so I ended up choosing a shade darker. It wasn't Fusion paint though; it had to be Rustoleum 2x. I was told there would be no compatibility between paint types and thankfully there wasn't. Again, crisis averted. The whole job turned out pretty well overall. Unleashed received a much-needed upgrade inside and out. All this is to be proven soon enough. The big payoff will be when I see the whole rocket come back under chute in Indiana.

Lessons learned from this little escapade is that before ordering anything; especially G10 or G12 fiberglass parts contact the vendor first to see if the parts are on hand. If the vendor does not reply in a timely manner, then look somewhere else. Also, each supplier is different; the specs are a little different depending on the manufacturer. Order all the parts from the same vendor unless the parts on hand from different suppliers come from the same manufacturer.

In this hobby, one has to be very flexible and be able to change up on the fly. The best-laid plans are just that…..plans. Reality sometimes takes us down an entirely different path. Even the Unleashed upgrade offered its twists and turns along the way. Sometimes it's best to just roll with it and see just how deep the rabbit hole goes. After all, rocketry is easy, right?

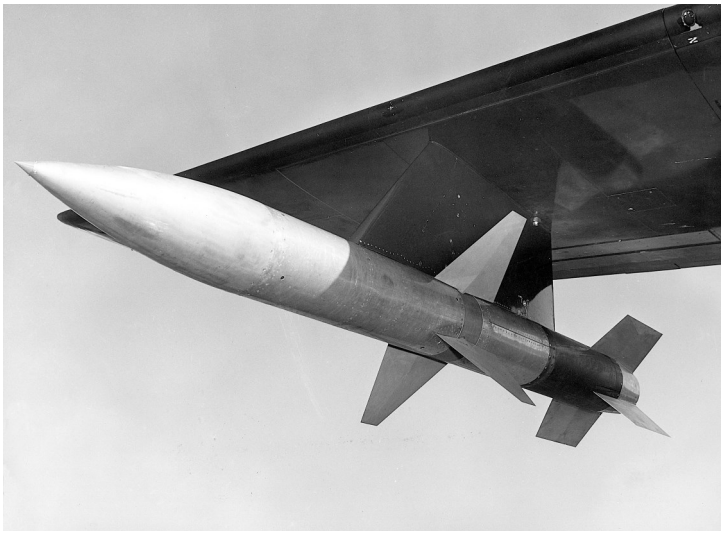
MARTIN XAAM-N-4 ORIOLE AIR-TO-AIR MISSILE

ROCKET SCALE DATA

Chris Timm & Buzz Nau

The Glenn L Martin Company was contracted by the US Naval Bureau of Ordnance in 1947 to develop the first, beyond visual range, fire-and-forget air-to-air missile utilizing an onboard active radar. The XAAM-N-4 Oriole project goals were audacious considering it was still the dawn of guided missiles and well before the invention of semi-conductors. Using the vacuum tube technology of the time resulted in a massive airframe to house an active radar. Otherwise, it was like the AAM-N-2 Sparrow with aft-mounted cruciform stabilization fins and mid-mounted cruciform control wings. Oriole was 138 inches long, weighed 1,500 pounds, and was powered by a solid rocket motor. The body was 11 inches in diameter, the control wingspan was 38.75 inches, and the aft fin span was 28.1 inches.

The scope of the impractical mandate was soon realized and the project was canceled in 1948 before any test vehicles were launched. The Navy then continued with the more promising AAM -N-2 Sparrow I and III. Sparrow II was also an attempt at incorporating an active radar in a missile and it too was cancelled quickly due to cost and complexity.



XAAM-N-4 Oriole

XAAM-N-4 Oriole mounted on a Douglas F3D Skyknight

MARTIN XAAM-N-4 ORIOLE AIR-TO-AIR MISSILE

ROCKET SCALE DATA

Buzz Nau & Chris Timm

The Oriole project was reactivated in 1950, this time as a research test vehicle at the Naval Air Missile Test Center (NAMTC) Point Mugu, California. This missile is not to be confused with the Oriole sounding rocket developed in the late 1990s by Astrotech Space Operations. Under the new program, the Oriole would be tested against targets out to 5 nautical miles and speeds up to 0.9 Mach with a reduced weight of 400 pounds.

Through the renewed project, fifty-nine missiles were fired (three were dummy rounds) and the tests included aerodynamic evaluations of the airframe, environmental studies, shaped warhead development, and much more. Like many of the missiles of this period, Oriole did not meet its initial goal but still provided valuable data for developing more capable missiles down the road. The results of the Oriole project were useful in the development of the AIM-54 Phoenix long-range missile that exceeded the goals of Oriole.

Oriole display round at Point Mugu Missile Park

References:

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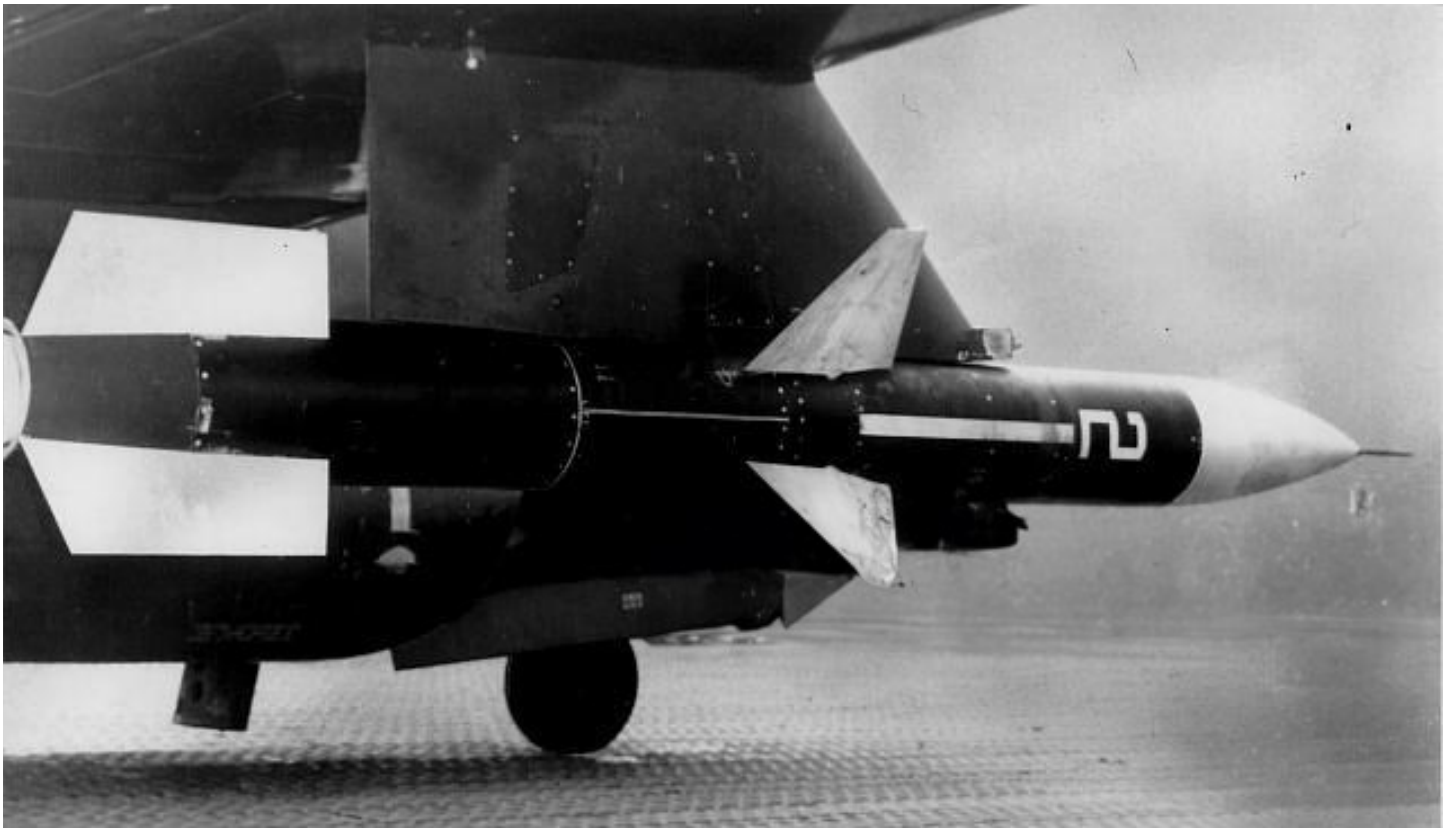
Principle Editors, Bondelid, Myron A., Morganstein, Stanley, Opatowsky, Stanley, Rodriquez, Elizabeth, Days of Challenge, Years of Change: A Technical History of the Pacific Missiles Test Center, United States Government Printing (1990) pg52-53

Gorman, J. W. ENS USNR-R, Final Report on Fragmentation Test of Warhead No, 145 for Oriole Missile, US Naval Proving Grounds Dahlgren, Virginia (10 July 1953)

Brower, E. M., Wind-Tunnel Tests of the Airplane Interference on a 0.17-Scale Model of the XAAM-N-4 Oriole Missile and Comparison with the Airplane Interference of a 0.17-Scale Model of the XAAM -N-3 Sparrow I Missile, David W. Taylor Basin Aerodynamics Laboratory, Washington D.C. (August 1954)



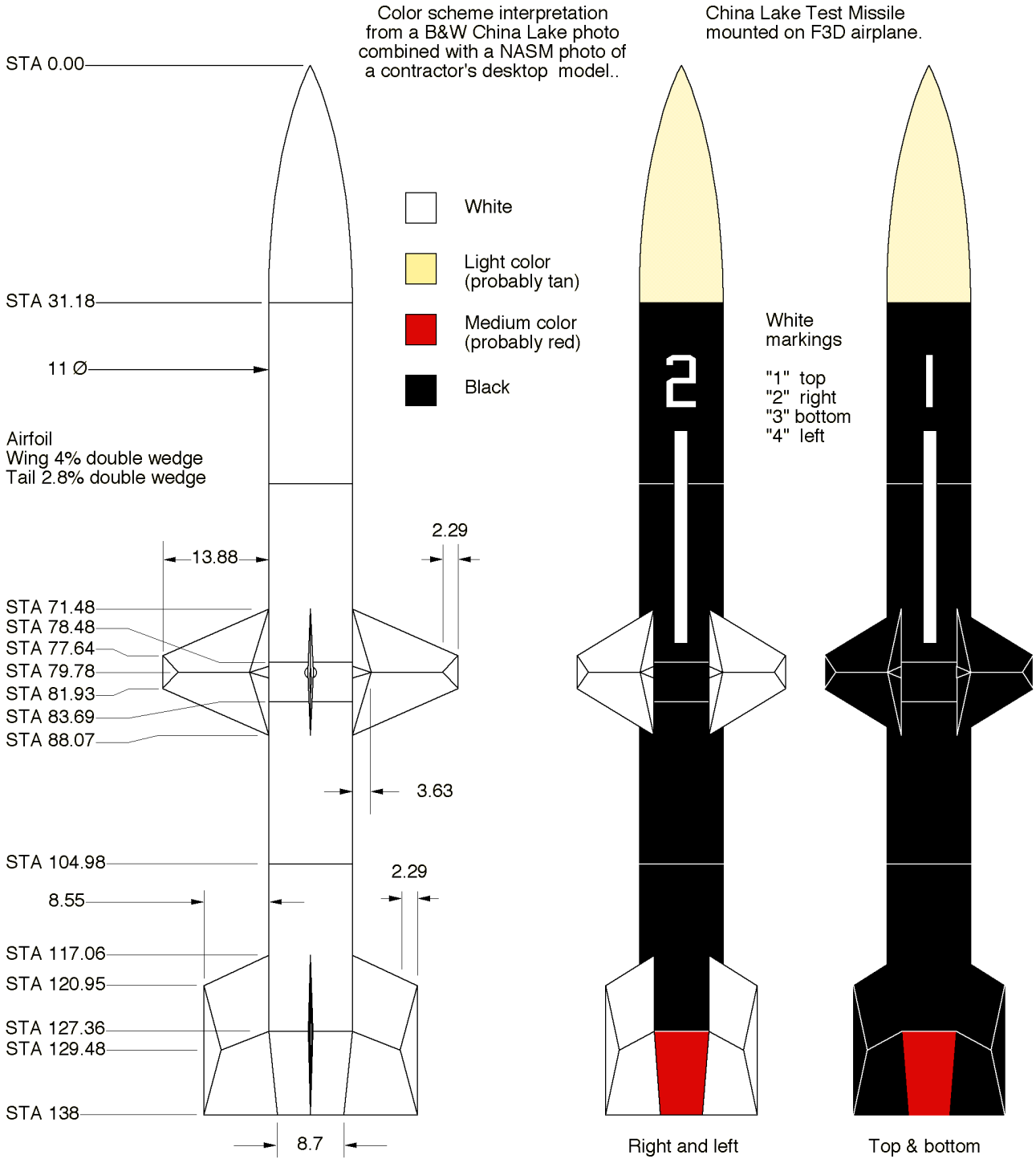
AAM-N-4 Oriole mounted on a Douglas F3D Skyknight

XAAM-N-4 Oriole

China Lake Test Round

1/20 scale
Dimensons in inches

Sources:
"Wind-Tunnel Tests of the Airplane Interference on a 0.17-Scale Model of the XAAM-N-4 Oriole Missile and Comparison With the Airplane Interference of a 0.17-Scale Model of the XAAM-N-2 Sparrow I Missile," by E.M. Brower, Aero Report 864, August 1954.
B&W photos provided by Ed Dempsey, The Glenn L. Martin Maryland Aviation Museum, Middle River, Maryland.
Color photos of Oriole contractor desk model.
Measurements and photos of Oriole at the Pt. Mugu Missile Park, Pt. Mugu NAS, California, by Marc McReynolds.



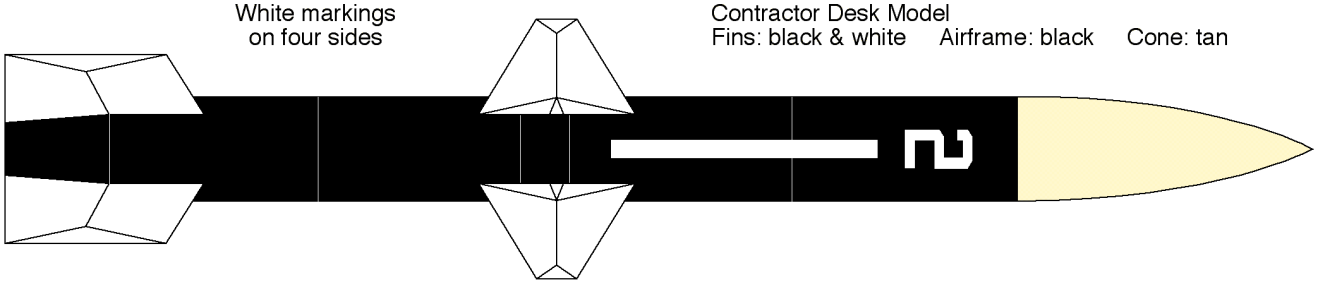
XAAM-N-4 Oriole
Color Schemes

1/20 scale
Dimensons in inches

Sources:
B&W photos provided by Ed Dempsey, The Glenn L. Martin Maryland Aviation Museum, Middle River, Maryland.
Color photos of Oriole missile contractor desk model, NASM.
Photos of Oriole missile at the Pt. Mugu Missile Park, Pt. Mugu NAS, California, by Marc McReynolds.

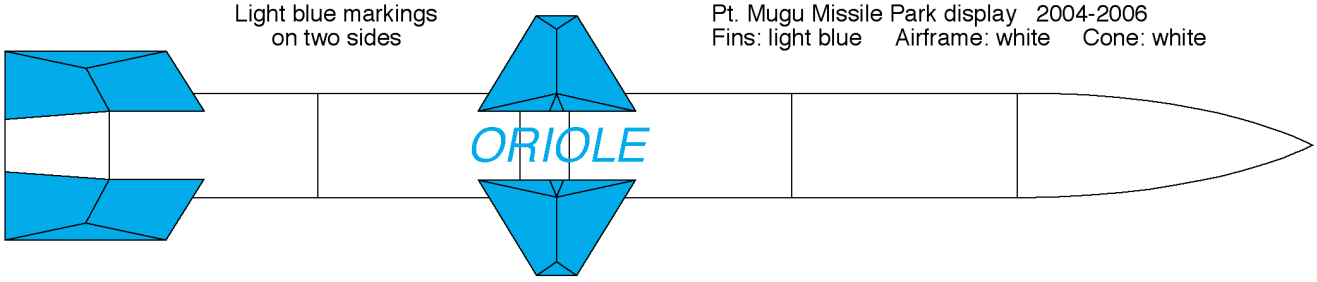
White markings
on four sides

Contractor Desk Model
Fins: black & white Airframe: black Cone: tan



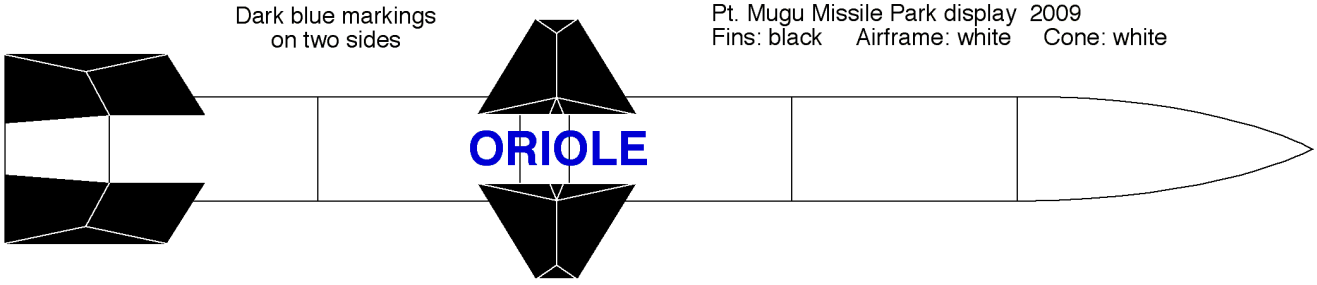
Light blue markings
on two sides

Pt. Mugu Missile Park display 2004-2006
Fins: light blue Airframe: white Cone: white



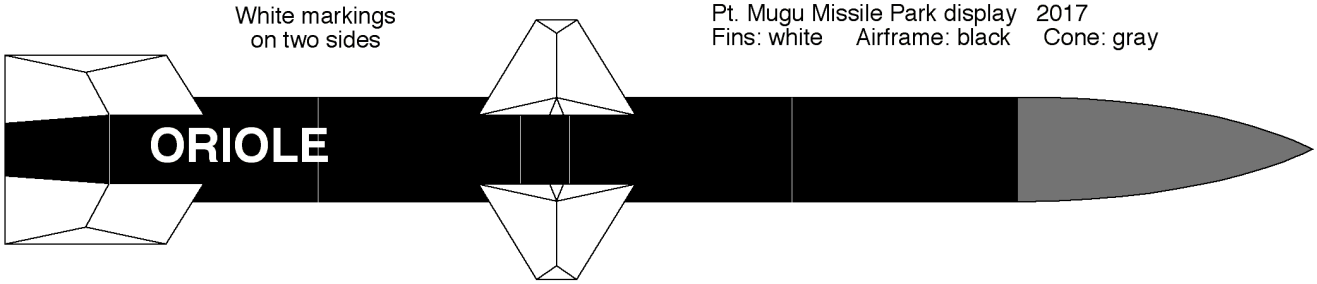
Dark blue markings
on two sides

Pt. Mugu Missile Park display 2009
Fins: black Airframe: white Cone: white



White markings
on two sides

Pt. Mugu Missile Park display 2017
Fins: white Airframe: black Cone: gray



Artist's conception drawing of an F3D Skyknight launching AAM-N-4 Oriole's

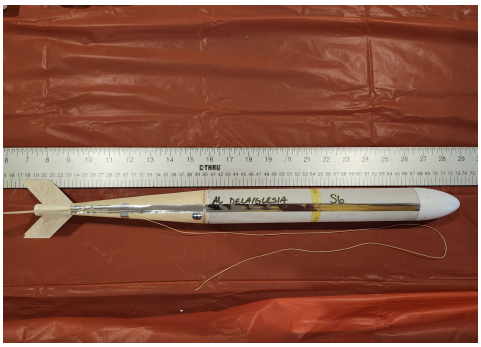
COMPETITION CORNER

Al de la Iglesia

In NRC and FAI contest flying, a common staple event is parachute duration. The event sounds deceptively simple, fly a rocket with a set impulse motor and parachute recovery to attain the longest duration. Since a parachute can provide a lot of lift to slow down the descent of your model, weight is not as critical as in streamer duration. The most important goal is to be able to reliably deploy the parachute quickly near apogee.

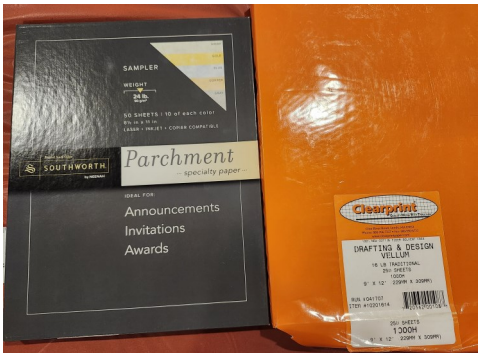
Models

FAI - Just like streamer duration, your rocket must be at least 500mm long and 40mm in diameter for half its length. Due to their large diameter and length body tube, these models can easily hold and deploy a 36" diameter parachute. I fly the same vellum and parchment paper models for streamer duration that have a mass of about 6 grams.



Completed PD model

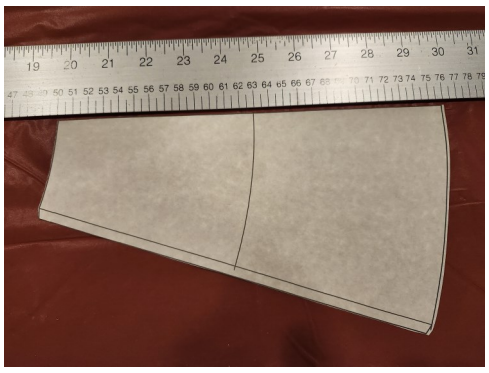
You can buy FAI model airframes from Galactic Manufacturing and Apogee Components. Steve Kristal has a great video on making paper models for FAI competition. I use parchment paper from Staples for the



Samples of parchment and vellum paper

tail cone with an added thin, interior layer of Kapton tape to prevent burn through from the ejection charge.

For the body tube, you can use parchment as well, it's a bit stronger than vellum and can withstand humidity better. I print a template on my tail cone and body tube, with my inkjet printer, before assembly. Reference marks help line things up to make



Parchment paper tail cone

assembly easier. In Steve's video he uses regular 3M scotch tape, but I sometimes like to use mylar tape for assembly.

The motor tube is a piece of BT-5 that is long enough to make the final model length meet the 500mm rule. To mount the motor tube, a simple jig is needed to assure that the motor tube is aligned with the body tube and tailcone. Again, please checkout Steve's video for how to do this, it is rather easy. For fins, I use 1/32" thick balsa that has been hardened, sealed and sanded before mounting on the model. I think that the thinner fins help to gain more altitude and minimize weight. Only use 3 fins to minimize drag and weight as well. Please use a jig to align your fins! It makes it easier to mount the fins and helps assure a straight boost. I use medium CA to tack the fins in place and then later add a very thin fillet of thick CA.

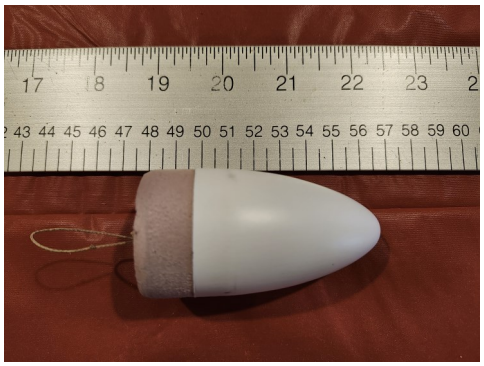
NRC - Your rocket can be any diameter or length that you want. Some fliers use a short, minimum diameter (13mm) model with a smaller chute and try to get more altitude to increase duration. This strategy works well when thermals are hard to find at lower altitudes, but the models are harder for timers to see and often the parachute will not reliably deploy.

Another strategy is to use a long, minimum diameter model that will fit a large parachute with minimal folds. This can help to increase the chances of a good chute deployment and allow a larger parachute. I have also tried larger diameters; 18mm, 24mm and 30mm diameter models made from vellum. I have had various successes and failures with different designs, but I came to the realization that it mostly depends on motor class and flying conditions.

For ¼ A engines, a smaller diameter model offers more advantage in altitude to find a thermal. For A engines, an FAI model will almost always beat all other designs due to deployment of a 36" parachute at high altitude due to the large motor. I find the best model decision is most difficult for ½ A engines. I personally prefer to fly FAI models for this class due to the ease of prepping the model and the reliability of deploying a large parachute at a moderate altitude, but the altitude advantage of a minimum diameter model may be worth it given the flying conditions on the contest day.

For fins, I only use three 1/32" thick balsa fins that have been sanded and sealed just like my FAI models.

Nose cones - I make my own FAI nose cones from vacuum formed sheet styrene plastic. Kevin Johnson has a great presentation on how to make nose cones with a dental vacuum forming machine. You can also buy them from Apogee Components, but they are expensive. For NRC cones, I use vacuum formed cones from Apogee or cones that I make, but balsa cones work great if I have them lying around. Estes cones work fine too, but they are a bit heavier.



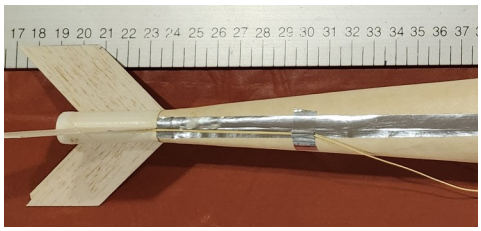
Vacuum formed nose cone and foam shoulder

Shock Cord - I use thin(30#) Kevlar cord on all my competition models. For parachute duration models, I attach the cord externally to the root of one of the fins and then use

COMPETITION CORNER

Al de la Iglesia

a small piece of thin mylar tape at the balance point to help increase drag during recovery.



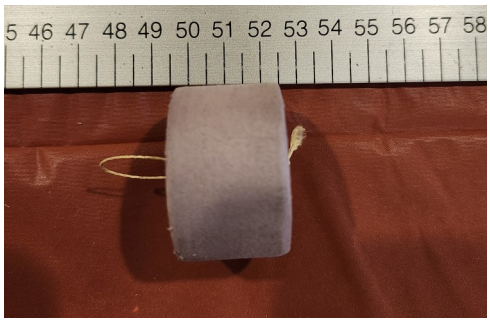
Mylar tape holding shock line at balance point

Recovery Device

A good competition parachute needs to be large, easily visible, light weight, easy to pack in your rocket, but most importantly it must eject and deploy quickly and reliably. The best material is ¼ mil (0.00025") aluminized mylar. It fulfills all the requirements, but it is expensive. It can be found at ASP rocketry and Apogee Components. Very thin (⅓ mil) Painter's Plastic also works well. It is a bit heavier and tends to stick to itself easily if not enough powder is used and is not as visible as the aluminized mylar, but it is much cheaper. You can also use very thin plastic garbage can liner bags or dry cleaner bags. For shroud lines, 100% nylon thread works well.

Properly prepping a parachute is critical for getting quick and reliable deployment. Following a simple set of steps for parachute preparation can virtually eliminate poor deployment. A properly prepped parachute can sit inside a model and deploy perfectly after sitting for months. I like to prep 4 or more parachutes at home and keep them in a short piece of 24mm tubing until I need to fly.

1. Properly dust the parachute with baby powder. This prevents the parachute from sticking to itself and helps the parachute slide smoothly in the body tube. This is especially important if the weather is humid or cold. Do this on a large flat table, preferably at home. Make sure that the shroud lines get powdered as well.
2. Properly fold the parachute. Terril Willard does an excellent chute folding demonstration in this video. I use a slightly simpler method that is based on a Russian article. Again, I do this at home on my large table that is loaded with baby powder. After the parachute is folded, then I attach it to the model just before placing it in the body tube.
3. Use good wadding. For FAI models I use a reusable, smooth, tight fitting foam plug that prevents the hot gasses from melting the parachute. In FAI, the foam plug must be retained with the model during the flight. In small NRC models I use foam plugs as well, but small diameter tubes still get too hot at ejection and will sometimes melt a chute, so I add a couple small squares of Estes or Quest wadding also.
4. First put in the foam plug all the way down in the model closest to the motor and any other wadding if needed. Second, insert any loose shock cord. Next insert the parachute with the shroud lines pointing out toward the nose cone. The parachute must be able to slide smoothly within the body tube. If it's too tight, then you need to refold the parachute or use a smaller parachute. Last, make sure all spare lines sit loosely on top of the parachute and insert the nose cone.



Foam plug

Prepping a model the exact same way every time is critical to finding any faults that cause inconsistencies in deploying a parachute quickly and completely every time.

Motors

FAI - I use Estes ½ A3-4T motors for qualification flights. At a cup event or the US team flyoffs the motors are usually provided.

NRC - This year's event is ½ A parachute duration, so I will use an Estes ½ A3-4T.

GSE (Ground Support Equipment)

I usually fly all of my competition models from a tower. This eliminates the need for a launch lug thus reducing drag and weight.

Launch tower made primarily from PVC and aluminum "U" channel

For parachute duration models the use of a piston launcher is very helpful due to the increase in altitude (up to 30% higher). (photo) If there is very little to no wind, then I often fly off the piston without the tower.

Flying

In FAI flying, you have to fly 3 flights in order to achieve the largest total time, so practice getting 3 good flights in a row with nothing going wrong. The goal is to get a duration of 300s for each flight. To do this you will most likely have to catch a thermal and if so you will most likely won't get the model back. If there is little to no wind, then you may get it back after a long walk. In NRC, you have to make 2 good flights for a total time. There is no limit on the time on each flight at NARAM, but when qualifying for the NRC scoreboard, there is a total duration limit of 360s.

Building light, reliable models helps to maximize your chances of doing well in a contest, but in order to win any duration events in competition, one must learn to predict thermal activity before you launch your model. As heard at many contests… "Good air always beats good models".

Good Luck!

US AIR FORCE MUSEUM FIELD TRIP
WRIGHT-PATTERSON AFB, DAYTON OHIO

23 April 2024

On April 23rd, Al de la Iglesia, Tony Haga, and Buzz Nau made a field trip to the National Museum of the United States Air Force in Dayton Ohio. The museum is located at Wright Patterson Air Force Base and consists of four giant hangers and a circular missile gallery. The hangars are subdivided into genre galleries including Early Years, World War II, Korean War, Southeast Asia War, Cold War, Space, Research & Development, and more. Entrance to the museum and parking is free. The museum is open nearly every day of the year from 9 am to 5 pm.

An earlier attempt to make the field trip was canceled in March due to bad weather and roads, but this time there was only a little rain to deal with. Al and Buzz met Tony at Dundee, MI, and made the drive down together. The drive time from Dundee was about 3 hours and we arrived around 10 am. There were few visitors when we got there and it remained that way throughout the day. That made it easier to move through the museum and also take photos without people obstructing the view. However, one of my disappointments was the other obstructions. The planes are packed extremely tight in some cases, so views and photos have wings, props, landing gear, etc. overlapping other exhibits. Many tall exhibition panels also block views. Finally, there is the lighting. I know hangars are difficult to light up properly as most of the lighting is mounted overhead. Some areas were much darker than others, but fortunately, my photos came out better than what I saw in some cases.

In the past, you had to try to catch a bus ride over to the annex hangar to see other exhibits like the presidential planes, SR-71 Black Bird, and AC-130 Spectre Gunship. Those are all at the main museum now thanks to the expansion of another hangar. There are barriers around the exhibits preventing you from touching them, but you are still able to get right up to them. The size of some aircraft can only be appreciated by getting that close to them. Some World War I and II aircraft seem so much smaller or larger than your preconception of them. The enormous B-36 Peacemaker, B-52 Stratofortress, and XB-70 Valkyrie are larger than life and seem to go on forever. You can get underneath and view their bomb bays to get an impression of their carrying capacity.

Tony and Al with the V-2

In addition to exhibits from the US Air Force, there are planes and weapons from the Soviet Union including many Migs and a complete SA-2 Guideline surface-to-air missile with launcher. The World War galleries also include German and Japanese aircraft and weapons. There were several cockpits we were able to get in (and barely get out) including the F-16 and FB-111.

SA-2 Guideline surface-to-air missile

X-4 Bantam semi-tailless research aircraft

AGM-45 Shrike and AGM-78 Standard ARM

The Missile Gallery is a circular space that reminds you of a missile silo with Intermediate-Range and Intercontinental-Range Ballistic Missiles (IRBMS and ICBMS). These included Jupiter, Thor, two Minutemen, and two Titan missiles. During the day they rolled in an Atlas that would be erected later in the week. There was a Titan IV in the Space Gallery that was mounted horizontally on pillars with several large reconnaissance satellites nearby. These really are the size of a city bus. The ASM-135A Anti-Satellite missile used to hang from the ceiling, but now it is on a cradle in front of the Titan IV.

F-102 Delta Dagger and AIM-2 Falcon air-to-air missiles

This is just a tiny example of the thousands of exhibits at the museum. There are plenty of rockets and missiles for rocketeers to enjoy and make sure you look up a lot as many are suspended from the overhead. The museum's length is about a quarter mile and covers over 19 acres. One exhibit that past visitors will miss is the CIM-10 Bomarc surface-to-air missile. It used to sit outside near the entrance on a launcher, but it is listed as currently in storage. My guess is the years out in the elements took its toll on it and it needs restoration.

We were three of the last visitors to leave and passed on souvenir shopping. We had a long drive ahead and were beat by all the walking. It has been about 10 years since my last visit and I was amazed how much has changed and been added since then. This is an incredible historical resource just a few hours away and highly recommend making the journey. You'll be tired afterward, but it is well worth it.

Viewing tips for your visit. Do not attempt to read all the exhibit

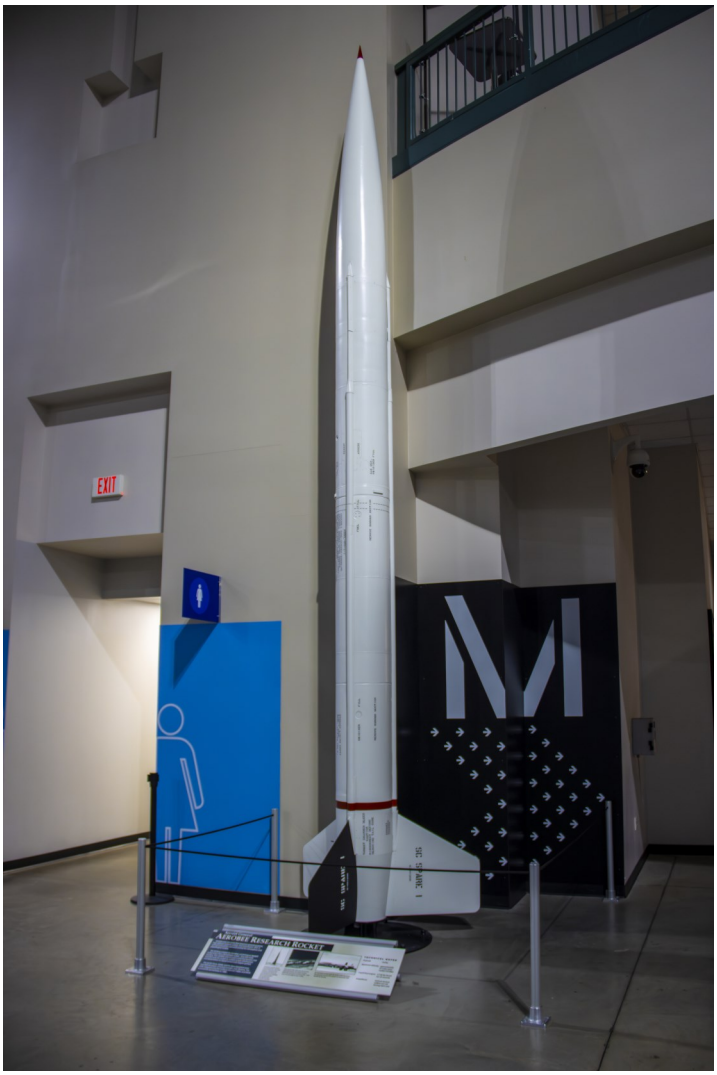
X-17's like this were used during Operation Argus

placards. You won't make it through half the museum even if you spend the entire day there. Instead, visit the museum website afterward where all that information, plus much more is available to read at your leisure. We could have used occasional breaks to rest our feet and had we concentrated on the exhibits and cut down on the reading, we would have had that time. Our feet were feeling it during the last couple of hours of walking.

MA-1 Genie air-to-air rocket and inert training round

Al and Tony in the cockpit of a FB-111A

AGM-12B Bullpup



Aerobee RTV-A-1

DSP Early Warning Satellite and Apollo 15 capsule

JMRC HUVARS Club News

Maintenance Day

On 6 April we held out annual maintenance day to repair and service the club's ground support equipment. Our launch controllers and pads take a beating throughout the year and to prevent interruptions at a launch, we need to replace ignition leads, check batteries, clean pads, rails, and rods and purge unneeded items. This year we made excellent progress is streamlining the gear we keep on the Mule and trailer which should result in quicker setups and tear downs. The event was held at Buzz's since we keep the trailer stored there now. Also in attendance was Michael O'Neal, Jeff Lewis, Roger Sadowsky, Al de la Iglesia, Tony Haga, and Herb Crites. Thanks everyone that showed up and made the chores fun.



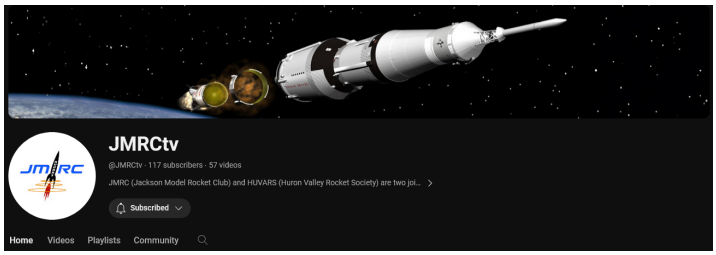


New Discord Server!

As part of the work to expand our community, we are happy to announce the rollout of a club Discord communications channel. Discord is an instant messaging social platform that supports VoIP (voice over IP). It allows us to open a new channel for members to socialize, meet virtually with voice and webcams, ask questions, and more. Discord has been around a while and mostly served gaming communities, but its usefulness has now expanded beyond gaming. You can access it through a web browser or dedicated application. There is support for all operating systems and devices. Details on how to use Discord can be found on the Beginner's Guide. We hope you find this useful and reach out to the BOD with any questions. To join you need to click on the invite link, https://discord.gg/pq88zUKMF9.

JMRCtv

The JMRCtv YouTube channel continues to be popular with over 9,500 views and 56 new subscribers in the past two months. You can access it HERE. Don't forget to Like the videos you watch and Subscribe to the channel so you know when there is new content loaded. If you have videos you would like to share, contact Buzz at ussmidway@gmail.com.



Submit Launch Photos Email

Do you have photos or a writeup from any of our launches that you would like to submit for the newsletter? We have an email address for you! Use the email address pics@jmrconline.org and send in your material. Make sure to include the date of the launch, flyer's name, model name, and motor used.

Fun Contest Lineup for 2024

Precision Altitude - We only had a couple of flights for this event over 2023. The two participant agreed to let us continue the event through 2024 with the hope that more members will participate.

The target for precision altitude contest is **1,898 feet.** The goal is to fly the closest to the target altitude without going over. The contest will run all season long until our last launch in 2024. The entry fee will be $5 per attempt and you can try as often as you like. The winner will receive 50% of the pot, second place will earn 25%, and the remaining 25% will go the to the club general fund. Work on your simulations over the winter and take your shot next year!

Iron-man III - launch date 2024

We originally scheduled this event for the September launch, but for unforeseen reasons we're postponing it for now. A new date will be announced to the club email list.

Just like the past Ironman contests. Build a single model to be flown in three events. Cost will be $10 which will get you motors needed to fly the events. The motors for Iron-man III will be 18mm 1/2A6-0's and 1/2A6-4's. The models need to accommodate 18mm motors and be two-stage. Prizes will be awarded to the top three overall performers

Events

· **Double Spot Landing** (booster and sustainer!)

· **Streamer Duration**

· **Altitude** (with an altimeter)

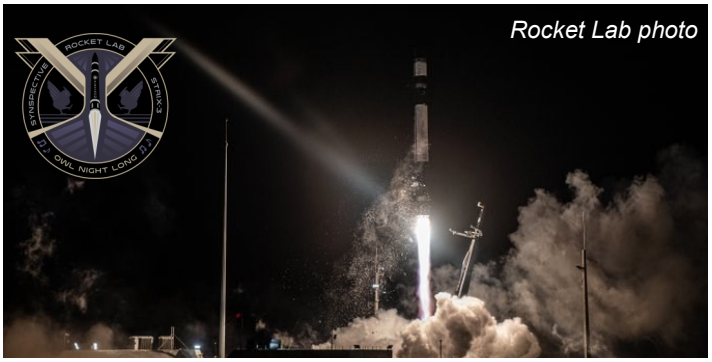
CURRENT EVENTS IN SPACE EXPLORATION

This edition of Current Event covers launches between 24 February and 27 April. There were several of these launches that were standouts. Rocket Lab flew four Electron missions, the highest pace of flights for them so far. United Launch Alliance (ULA) flew their 16th and final Delta IV Heavy vehicle for the NROL-70 mission. During this period SpaceX deployed 385 Starlink v2 Mini satellites to shells 6, 7, and 8. All boosters were successfully recovered for reflight. SpaceX also made the third Starship evaluation flight moving further along in their test program. They also had a record-setting 20th successful flight of a Falcon 9 booster.

Rocket Lab kicks us off with their *On Closer Inspection* mission flown on 19 February from Launch Complex 1B, Mahia Peninsula, New Zealand. The Electron launch vehicle carried the ADRAS-J (Active Debris Removal by Astro Scale Japan) satellite to a sun-synchronous orbit. During this test mission the satellite will approach a Japanese H-2A upper stage to collect information on space debris. This data will help future missions and the ability to dispose of space debris.

Rocket Lab photo

Owl Night Long was the 4th synthetic aperture radar launch by Rocket Lab for Synspective, Inc. The Electron launch vehicle lifted -off from Launch Complex 1B on 13 March placing the SAR satellite into a sun-synchronous orbit. Synthetic aperture radars have the ability to produce surface images regardless cloud cover.



Rocket Lab photo

On 21 March Rocket Lab launched the *Live and Let Fly* mission for the National Reconnaissance Office on an Electron booster from Launch Complex 2 at Wallops Island, Virginia. The mission, also known as NROL-123, was part of the Rapid Acquisition of a Small Rocket contract with the NRO.

NASA photo

Back in New Zealand the, *Beginning of the Swarm,* mission was launched from Launch Complex 1 on 24 April. The Electron vehicle carried two satellites, NEONSAT-1 an Earth Observation Satellite for Satellite Technology Research Center (South Korea) and the ACS3 (Advanced Composite Solar Sail System) for NASA. NEONSAT-1 is a high resolution optical satellite. ACS3 is a technology demonstration satellite to test solar sail propulsion.

Rocket Lab photo

CURRENT EVENTS IN SPACE EXPLORATION

SPACEX

SpaceX's 300th successful mission, HTS-113BT launched on 20 February from SLC-40 at Cape Canaveral Space Force Station. The telecom satellite was placed in a geostationary transfer orbit for PT Telkom Satelit Indonesia using a Falcon 9.

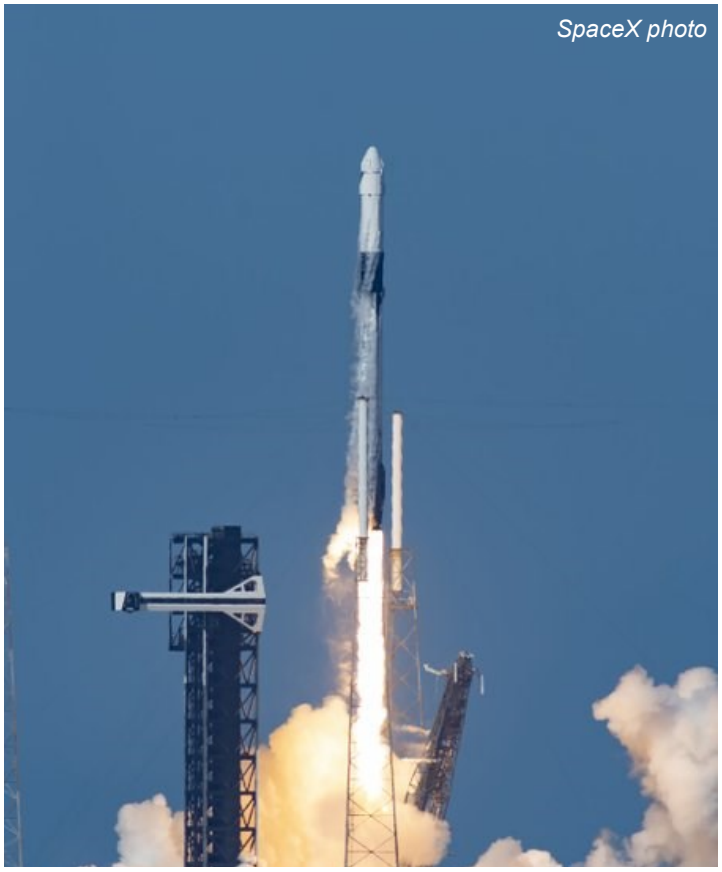
On 3 March the Crew 8 mission was launched from LC-39A at Kennedy Space Center, delivering astronauts to the International Space Station (ISS). This was the 122th human crewed Falcon 9 mission for SpaceX.

Transporter-10, the tenth small sat rideshare mission lifted-oof on 4 March from SLC-4E at Vandenburg Space Force Base. This particular rideshare payload contained 53 spacecraft including CubeSats, MicroSats, and a hosted payload.

The highly anticipated Starship Integrated Test Flight 3 flew on 14 March from the Orbital Launch Pad at Boca Chica Texas. This was the third Starship test flight in less than a year and continued meeting additional milestones. The booster survived hot staging and maintained controlled flight until only one of three landing engines ignited. Starship met several goals including opening and closing the payload door, initiation of propellant transfer, and attempted reentry. Test Flight number 4 is imminent.

CURRENT EVENTS IN SPACE EXPLORATION

On 21 March, SpaceX launched Commercial Resupply Mission (CRS-30) to the International Space Station delivering experiments and supplies to the onboard crew. The Falcon 9 lofted the Dragon capsule from SLC-40 at Cape Canaveral


SpaceX photo

The Eutelsat 36D geostationary telecommunications satellite was launched aboard a Falcon 9 on 30 March from SLC-39A at Kennedy Space Center. The French built satellite will provide TV broadcasting services for Africa and Europe for up to 15 years.

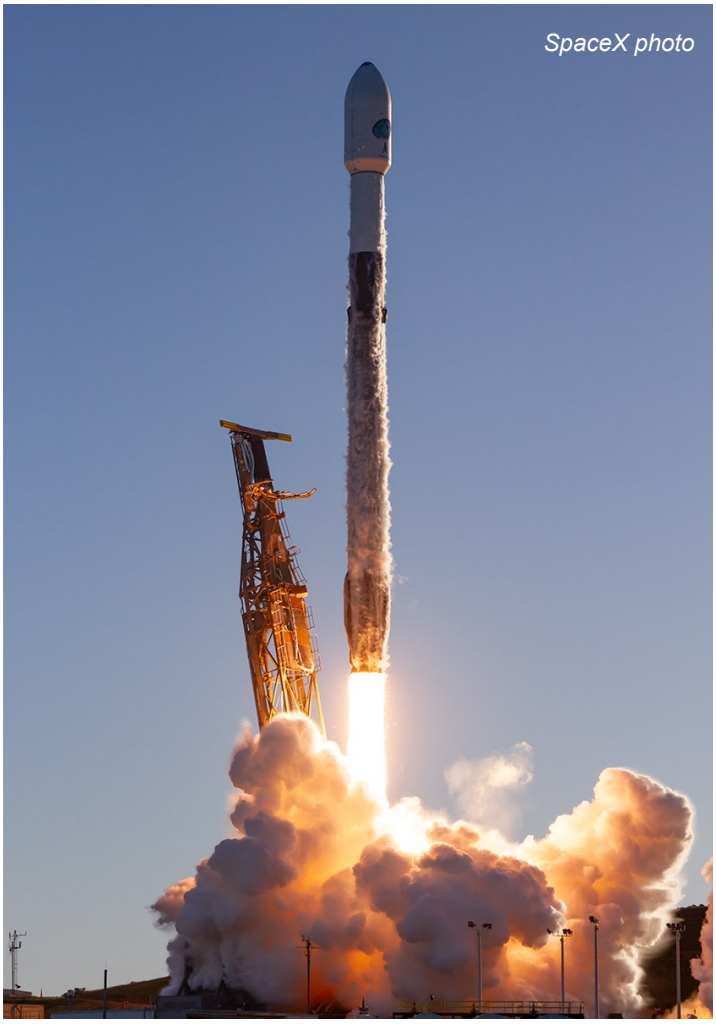

SpaceX photo

The Bandwagon 1 mission launched on 7 April, was the first rideshare flight by SpaceX to an approximate 45 degree orbit instead of the typical low earth polar orbit. The Falcon 9 lifted-off from pad LC-39 at Kennedy Space Center with 11 experiments including a synthetic aperture radar (SAR) from South Korea.


SpaceX photo

CURRENT EVENTS IN SPACE EXPLORATION

On 11 April, SpaceX launched the classified USSF-62 mission for the Department of Defense (DOD). The payload, a Microwave Weather Satellite lifted-off from Pad 4E at Vandenburg Space Force Base atop a Falcon 9.



NASA Wallops Island launched three Black Brant IX sounding rockets during the total solar eclipse on 8 April. They carried instruments to measure disturbances in the electrified region of the Earth's atmosphere known as the ionosphere.

For the final time, United Launch Alliance (ULA) launched their Delta IV Heavy launch vehicle for the National Reconnaissance Office NRO). The mission, NROL-70, lifted off from pad SLC-37B at Cape Canaveral Space Force Station on 9 April. While the payload is classified, it is thought to be a Signals Intelligence (SIGINT) satellite in the advanced ORION class sent to a geosynchronous orbit. This flight officially retires the Delta IV Heavy. Future flights for the NRO should be accomplished with the upcoming Vulcan, however, only one test flight has been flown so far. I would be surprised to see some NROL missions flown by the Falcon Heavy.

LAUNCH WINDOWS

Launch dates from SpaceFlight.com

May 4, 2024
Eris - TestFlight1
Launch Site:
Gilmour Space in Australia is preparing to launch the inaugural flight of its Eris Block 1 rocket. The three-stage launch vehicle is 25 m (82 ft) tall and is equipped with 1.5 m (4.9 ft) diameter payload fairings. The rocket is designed to send up to 305 kg up to low Earth orbit. This first mission, called "TestFlight1," does not appear to have a payload on board.

May 6/7, 2024
Atlas 5 - CST-100 Starliner Crew Flight Test
Launch Site: SLC-41, CCSFS, Florida
A United Launch Alliance Atlas 5 rocket, designated AV-085, will launch Boeing's CST-100 Starliner spacecraft on its first mission with astronauts, known as the Crew Test Flight, to the International Space Station. The capsule will dock with the space station, then return to Earth to landing in the Western United States. NASA astronauts Butch Wilmore and Suni Williams will fly on the mission. The rocket will fly in a vehicle configuration with two solid rocket boosters and a dual-engine Centaur upper stage. Delayed from August and 1st Quarter of 2020. Delayed from mid-2020 after Boeing decision to refly the Orbital Flight Test.

June 24, 2024
Long March 2C - SVOM
Launch Site: Xichang Satellite Launch Center
A Chinese Long March 2C rocket will launch the Space-based multi-band astronomical Variable Objects Monitor (SVOM) spacecraft. The satellite is a dual Franco-Chinese mission, which is "dedicated to the study of the most distant explosions of stars, the gamma-ray bursts." There are four main instruments on board, two of which are French and two which are Chinese. The spacecraft will be launched to a 625-km Earth orbit and will operate for at least three years with an option to extend for another two years beyond that.

June 25, 2024
Falcon Heavy - GOES U
Launch Site: LC-39A, KSC, Florida
A SpaceX Falcon Heavy will launch the fourth and final satellite of the next-generation series of geostationary weather satellites for NASA and NOAA. GOES-U will orbit 22,300 miles above the equator to monitor weather conditions across the United States. The satellite will be renamed GOES-19 once it reaches its operational orbit.

Second Quarter, 2024
Vulcan Centaur - Dream Chaser 1
Launch Site: SLC-41, CCSFS, Florida
A United Launch Alliance Vulcan Centaur rocket will launch on its second demonstration flight with Sierra Space's Dream Chaser cargo vehicle for the International Space Station. The Dream Chaser is a lifting body resupply spacecraft that will launch on top of a rocket and land on a runway. This will be the Dream Chaser's first flight to space. The Vulcan Centaur rocket will fly in the VC4L configuration with four GEM-63XL solid rocket boosters, a long-length payload fairing, and two RL10 engines on the Centaur upper stage.

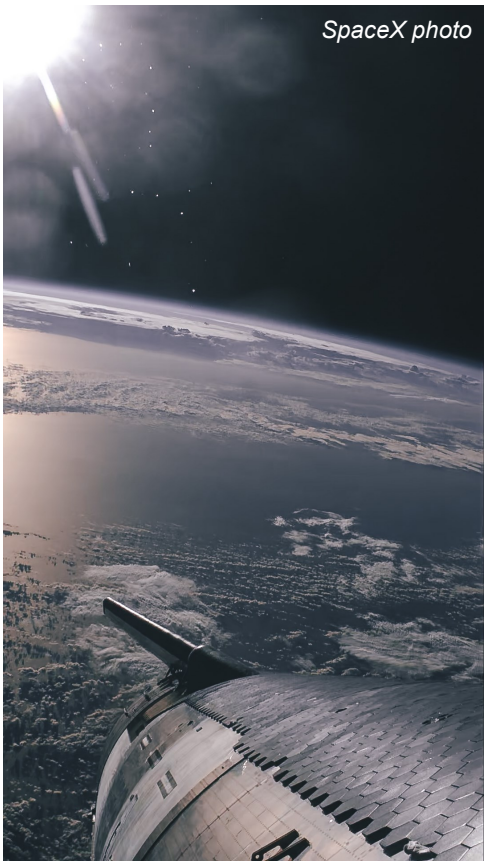
Summer 2024
Falcon 9 - ASBM
Launch Site: SLC-4E, Vandenberg SFB, California
A SpaceX Falcon 9 rocket will launch the Arctic Satellite Broadband Mission, consisting of two satellites owned by Space Norway. The Falcon 9 will launch the two Northrop Grumman-built satellites into a highly elliptical orbit that lingers over the Arctic region. The satellites carry communications payloads for the Norwegian Ministry of Defense, the U.S. Space Force, and Inmarsat.

July 8, 2024
Falcon 9 - Türksat 6A
Launch Site: SLC-40, CCSFS, Florida
A SpaceX Falcon 9 rocket will launch the Türksat 6A communications satellite for the Turkish operator Türksat. Türksat 6A is the first geostationary communications satellite to be built in Turkey, with development led by TÜBİTAK Space Technologies Research Institute and Turkish Aerospace Industries.

Summer, 2024
Falcon 9 - Polaris Dawn
Launch Site: LC-39A, KSC, Florida
A SpaceX Falcon 9 rocket will launch a Crew Dragon spacecraft. The Polaris Dawn mission will be commanded by billionaire Jared Isaacman, making his second trip to space. He will be joined on the all-private mission by pilot Scott "Kidd" Poteet, and SpaceX employees Sarah Gillis and Anna Menon. The Crew Dragon will return to a splashdown at sea.

3rd Quarter, 2024
Falcon 9 - BlueBird Block 1
Launch Site: SLC-40, CCSFS, Florida
A SpaceX Falcon 9 rocket will launch five 700-square-foot Block 1 BlueBird satellites on behalf of its customer, AST SpaceMobile, Inc.

Note: Not all Falcon 9 flights are listed as there are too many Starlink flights.



SpaceX photo

SpaceX photo

MORE PHOTOS FROM THE USAF MUSEUM FIELD TRIP

X-24B Lifting Body Research Vehicle

ASM-135A Anti-Satellite Interceptor


Me-163 Komet


AGM-78 Standard ARM


AGM-88 HARM

V-2

SPORT ROCKETRY

OFFICIAL JOURNAL OF THE NATIONAL ASSOCIATION OF ROCKETRY

MARCH/APRIL 2024

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TONY HAGA