TOTAL IMPULSE

JACKSON MODEL ROCKET CLUB
JMRC
HUVARS
HURON VALLEY ROCKET SOCIETY
TRIPOLI ROCKETRY ASSOCIATION, INC.
TOTAL IMPULSE VOLUME 21, NO. 5
SEPTEMBER - OCTOBER 2021

3D PRINTING SPECIAL

SCOTT MILLER HPR TESTING

ROCKETRY BUSINESS CARD

DISPLAY STANDS

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 Bob Dickinson
5668 Big Fish Rd
Goodrich, MI 48438

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

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

GroupMe: Our new chat channel for broadcasting notifications instantly using a free download client for IOS and Droid as well as by SMS text messaging. You can join the notification chat after creating a free account and following this link,
https://groupme.com/join_group/28013422/zc5IC1

EDITOR'S RANGE BOX

My apologies for the lateness of this issue. Several of us were finishing up last minute work on articles and one we are going to push to the next issue which will be out around Christmas time.

This issue has a heavy emphasis on 3D printing in model rocketry. Many club members have delved into 3D printing especially since the pandemic hit as something constructive to spend our free time on. John Potts and Mark Chrumka were early practitioners with impressive replications of the Mars Lander and large scale models. Scott Miller has recently developed a high power rocket system that is robust enough to handle the stress of larger motors and modular so you can fly it in several configurations. Like any hobby, 3D printing can be as expensive a hobby as you want, but there are low cost alternatives. If you are curious about it post a message on our forum and many of us will be happy to answer your questions.

Congratulations to the US FAI team, especially Steve and Emma Kristal for their excellent performance at the recent World Spacemodeling Championships in Buzau Romania. The team did extremely well, but I'm not going to spoil the story. You can read about it in the next issue in Steve's article.

Thanks contributors and readers!

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Launch/Event Calendar - 2021
- ~~May 8 *Pending* (MIS)~~
- ~~June 12 *Pending* (MIS)~~
- ~~July 10 *Pending* (MIS)~~
- NARAM 62 - July 23 - 30 (Geneseo, NY)
- August 14/15 *Crapshoot VII* (Muskegon)
- August 21 (Horning 1)
- September 18 *Pending* (Horning 1)
- October 23 (Horning 2)
- November 13 (Horning 2)

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 Notification GroupMe chat.

PRESIDENT'S CORNER

Life is an interesting journey and the only thing we can rely on 100% of the time is change will happen. Change comes in many variations and many different levels but without fail it is there. Who could have predicted that in the same year there would be three different options for civilians to go into space? Well assuming you have several million dollars of disposable income laying around ;-)... but it is definitely a major change and will further advance human knowledge for space travel.

Our club is no different and was affected by the massive change the world has undergone as the pandemic continues onward. Global pandemics have come and gone in the past and as history tells the story they will come and go in the future.... way, way into the future as we served our time already :-). When the world kicks you, we tend to complain, get angry, beat our head on the wall... I certainly have holes in the walls and flat spots on my head from this metaphorical behavior. When this happens, we have a choice. Stew in our own misery or strap on a thinking cap and adapt based on the circumstances. Change can be embraced and in an odd path might lead to improvements in the long run.

Our club suffered for a while, we didn't have a field to fly on, or regular services we could offer our membership as the pandemic ramped up. Sure, we beat our heads on the wall, said a few words that probably would be frowned upon by the FCC, but that was a point in history...just a blip. I am proud of our BOD, and I am proud of our members. We picked ourselves up and found a way through. The BOD quickly made the decision to suspend all club dues because

Continued on page 23

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: *Christina Scharrer poses with her Estes Starlight. The rocket flew on a B6-6 and sports a great paint scheme. Christina also created the header for Total Impulse.*

October Sport and NRC Launch

23 October 2021 - Horning 2 Field

Well, it was a good thing we scheduled two launches for October. Originally we had hoped to get in two this month and make up for some lost opportunities, but the unpredictable Fall weather didn't cooperate for the first date on the 9th. Luck favored us on the 23rd with OK weather for the time of year. Not too cold and not too windy.

Turn out wasn't bad either and we got in over 50 launches eighteen flyers which was great considering we're still flying a mis-fire ally range. This will likely continue until the November launch which is the last scheduled launch of the year. We might try a December launch, but it will likely be a last minute event if the weather cooperates.

The most flights of the day went to Andy Tomasch with 6. Not bad considering he's still nursing a pair of healing knees. Andy's models included his Athena and original Max Q. Mark Chrumka followed Andy with a total of 5 flights. Mark flew his Hawk's Hobbies Super Sprite and Estes Mega Mosquito on D12-5's. He also Flew his Mega Der Red Max (4" diameter version) on a G40-4.

Tony Haga' flies another of Scott's 3D protoypes

Chris (4) and Christina Scharrer (2) put up 6 flights between them. All of their models have fantastic paint schemes. Chris had great flights with his Black Brant II and Mini Warrior on F-42's. His V-2 on a G74 and a no deploy and realistic recovery down range in the corn field. The ground was soft due to all the recent rain so damage at least wasn't total. Christina flew her beautiful Estes Starlight on a B6-6 and Venom on a B4-4.

Caden and his grandfather Ed were present and Caden had a create flight with his Estes Majestic on a F15-8. It managed to land in the cornfield to the east, but was easily recovered. His second flight of his "1 Mile" rocket suffered a violent CATO on an E12-8.

Herb Crites flew two of his "Mach Schnell" models. The SLK 54 went up on a Aerotech H268 Redline and H250 Mojave Green.

Mark Chrumka's Mega Der Red Max on a G40

He also flew his SLK 38 on a G138 Blue Thunder. All flights were dual deploy and flew great.

Buzz Nau made three sport flights, his first was the Maxi Space Twins dual glider model on a C11-3. Both gliders flew well and were recovered. He also flew his Cox Shuttle America dual glider model on a C6-3 and Quest two stage Navaho on a A8-0/A8-5 combo.

Dale Hodgson made a couple of test flights of Scott Miller's new 3D printed high power rocket. The first on a Loki H90 Red suffered an early ejection, but otherwise recovered fine. His second 3D printed model flew on a G79-4 Smokey Sam…. His only other flight was his 5.5" diameter Mosquito with a Breast Cancer Awareness paint scheme flew on a Loki I-430 Blue

Buzz's Cox Shuttle America

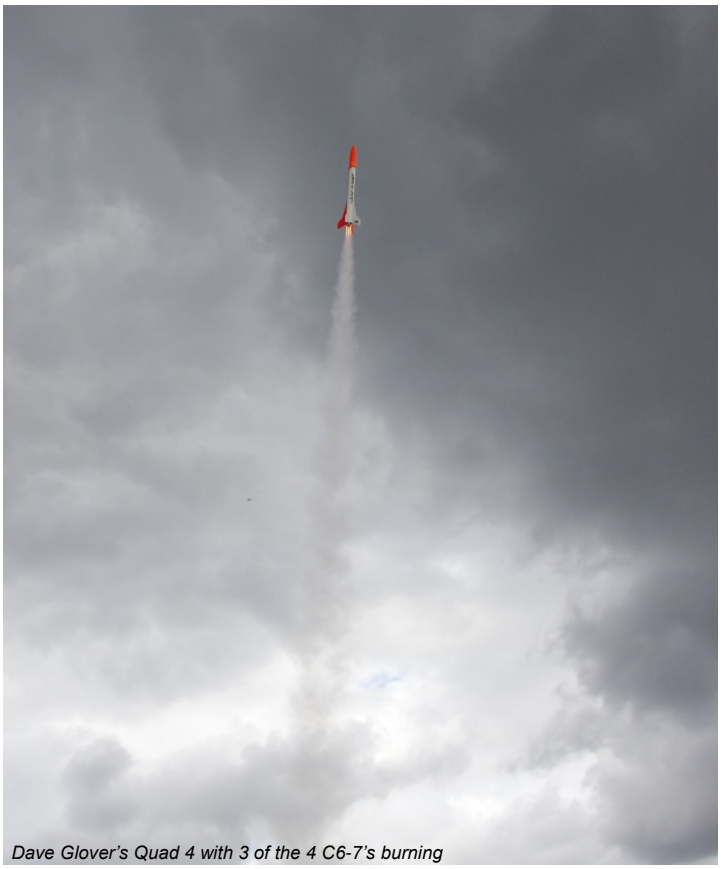
Mark Chrumka's Super Sprite

Tony Haga also test flew a Scott's 3D prototype and also had Loki motor issues. His forward closure on his I110 let go and though the model landed safely, the tubes were ruined by the blow through. Tony's other flight was a two stage Estes Extreme 12 on a D12-0 to D12-7 combo for a great flight, though he cracked a sustainer fin on landing.

Dave Glover made the trip from his new home in Saginaw. Due to the distance, we may not be seeing Dave as often which is a huge bummer and Dave always flies a great assortment of models. He didn't disappoint on this day either. He put in another great flight of his Quad 4 on a cluster of 4 C6-7's. He also flew his Midas V-2 on a F50-4 and two motor clister "Double Trouble" on a pair of G74-9's.

Jim McLachlan and his son made 4 flights. This included nice flights with their NRC Archer on a F67-6, Estes two stage Air Commander on a C11-0 to C11-5 combo, and Estes EPM-010 on a B4-4.

Herb Crites' Mach Schnell SLK54 on an Aerotech H250 Mojave Green



Dave Glover's Quad 4 with 3 of the 4 C6-7's burning

Jay Calvert of Impulse Buys was present and selling motors since the Muskegon launch was cancelled due to rain. He managing to get in a couple of sport flights with his Mega Vertico 4 blade gyro-roc on a B6-4 and then an E9-8. Both were entertaining flights.

It wouldn't be an October launch without a couple of Halloween themed rockets by Chris Palmer. His first flight was the "Zombie Head" on a H410. The up part went fast and fine, but recovery left a little to be desired. The follow-up "Zombie Barbie" model, also on a H410 went much better.

Fred Ziegler of Fade To Black Rocket Works brought some of his pads and launch controllers to help out with those needing a beefier pad to fly on. Fred also got in a couple of sport flights of his own which included his NCR Big Brute on a G78-7 and Estes Mega Mosquito on a F51-8.

We want to welcome some new flyers that made the trip out to fly with us. Don Ball made a few flights unfortunately his X-15 had a prang landing. Mike Ruzicka made a couple of nice flights with his Quest Big Betty on C6-5's. Finally, Joel Keene showed up late in the day after making the drive out to Muskegon only to find out that launch was cancelled. He did get in a couple of flights including his V-2 Bumper Wac before the range closed for the day.

Afterwards several of us made the trip over to the Bridgewater Bank Tavern for a beer and dinner which was a fitting end to a fun and busy launch. It's good to be back launching, seeing one another's successes (and a few failures), and enjoying some of the best company around. With luck, weather will cooperate again in November for our finally scheduled launch of 2022. Hope to see you there!

More Scale Photos From the October Launch

Dale's 5.5" Mosquito on a Loki I430 Blue

Chris Scharrer's Black Brant

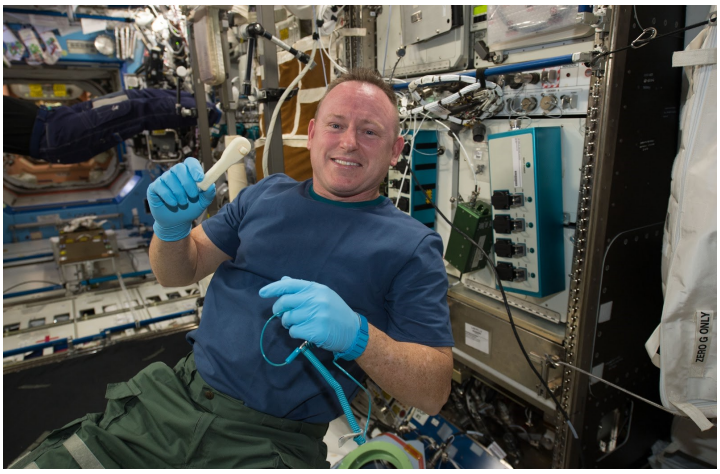
Jim McLachlin's NCR Archer

Dave Glover's Double Trouble

The Rocketry Business Card

Scott Miller

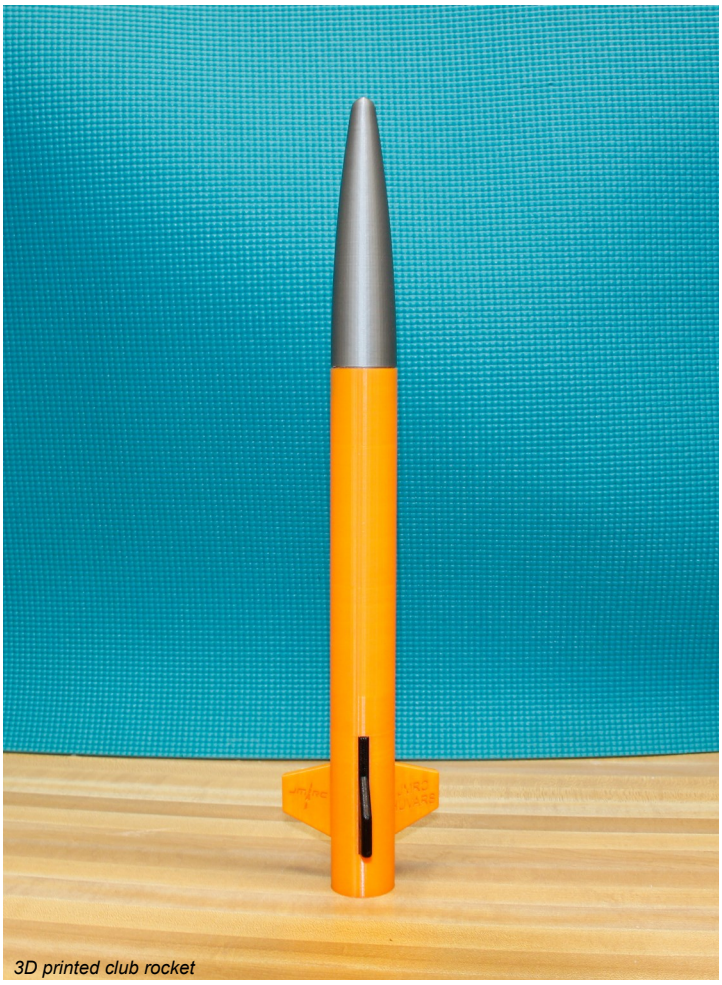
Business cards began in the 17th century in Europe, where they were used to announce the impending arrival of prosperous or aristocratic people to their local town or even their home. This concept has continued to evolve and I'm sure we have all been on the giving and/or receiving end of various business cards.
If one were to pause and think about business cards or any marketing in general I think it all boils down to repetition and something you personally remember. Does anyone remember the last cardboard sheet they received from an individual that had a name and logo on it? I certainly don't and it could be for many reasons including overwhelming volume, lack of uniqueness, or perhaps the fact that I didn't care enough to even remember if I'm being blunt.



International Space Station Expedition 42 Commander Barry "Butch" Wilmore shows off a ratchet wrench made with a 3-D printer on the station. (2014)

I'm not a marketing expert, in fact I know absolutely nothing about marketing other than being on the consumer end. I remember things that interest me AND things I have seen multiple times. If I were to remember what I saw around rocketry it boils down to rocket videos and pictures, in fact I still relive a lot of those times by rewatching past videos, reading past newsletters, and of course pursuing through past pictures of launches. I still vividly remember Mark Palmer flying (10) Aerotech J570 motors in a single rocket, or Tony Haga digging a well with a CTI M4770 V-Max motor in Too Big to Fail over in Three Oaks, MI. I also remember all of the flights of the excited campers that flew their Estes E2X series rocket on an A8-3 at the Michigan Space & Science Center over the years that Roger and I worked there our motor count was in the thousands… or the "Tim Tailor" rocket creation stories that I urge people to pester Roger about the next time rocket folklore is desired to be shared, he tells it best!

The common theme in all of these scenarios over the years is a rocket! What if we had a model rocket that was out there with our club name? This could be an opportunity for newbies and experienced rocket folks to get a cheap or free rocket that can fly and promotes the club at the same time. This begs the question on how we can get this advertisement rocket in many hands…. I think the answer is 3D printing!



3D printed club rocket

3D printing has continued to grow interest over the years. Any technology that allows us to send a digital file to the International Space Station where they can print a necessary tool is just fascinating.

3D printed mini rail buttons

The motor is inserted from the top and held in place by a screw in coupler

Now I'm obviously biased as I was hit by the 3D printing bug pretty harshly years back…. It all started with a gateway monoprice printer then I was hooked. I refuse to tally the investment in all of my printers, parts, and various filaments because it's a hobby so it is meant to be a money pit :-). Efficiency is always on my mind though as well as promoting rocketry in an educational setting. My crazy thought… design a model rocket that can fly on 18mm motors in CAD and can be printed on almost any desktop 3D printer. Then…. give it away for FREE!

I may be called crazy, been called many things in my day and it has yet to sink in so why stop now. Free rockets that have our club logo that anyone can print means other people can produce a viable rocket that is reliable to fly AND is marketing for the club with just a little elbow grease dug in initially. We could also use this as marketing promotions for future public events by giving/selling pre-printed rockets to the public.

With the modular concept in mind we can slap JMRC and HUVARS on the fins and possibly other parts of the rocket…. And we can promote advancement such as mini-rail buttons as an option. Here are a few prototype pictures to help with the vision in my screwball head.

The thought is to get a versatile rocket that can fly on A-D motors on a rail or rod based on whatever mounts are threaded in place. This is all based on the "Screw it and FLY!" model to encourage outside the box thinking, cheap/free rocket for the masses, and of course slapping our club logo all over it for marketing purposes :-). As of right now this rocket is in prototype mode, once it is flight proven it will be available for download from our website at www.JMRConline.org In the meantime I am looking for brave soles that are willing to print this creation as well as those willing to fly it and give honest unbiased feedback to improve on the design. The end goal is a FREE 3d model download for anyone in the world to print and fly a JMRC/HUVARS rocket. If I were to imagine the best possible scenario, I would love to see this rocket flown with a picture in every location in the world that has a rocket club "Flat Stanley" style. Lofty goal, yes…. But reach for the moon, even if we fall short we will land among the stars.


Parts breakdown of a club model prototype

VIEW FROM THE FLIGHT LINE

BETA TESTING SCOTT'S 3D PRINTED HIGH POWERED ROCKET KIT

DALE HODGSON

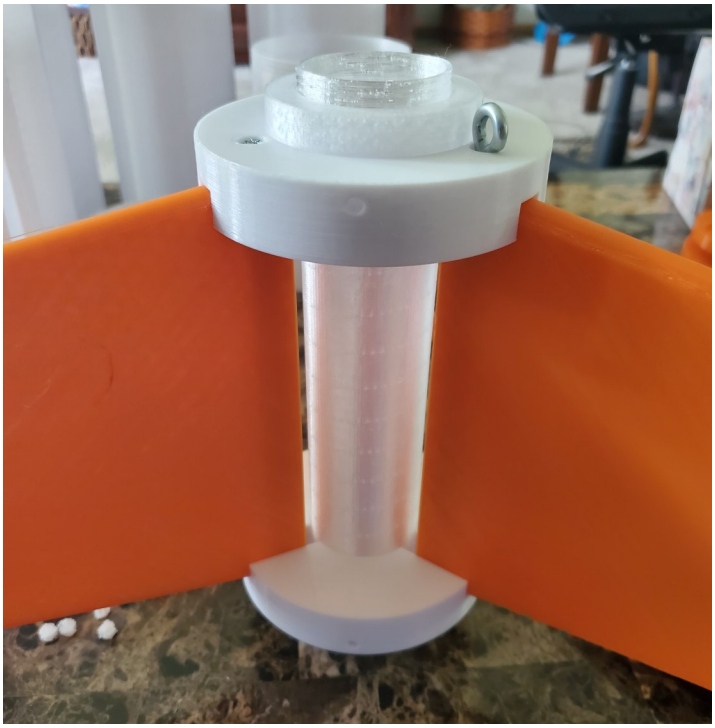
They say necessity is the mother of invention. Not flying much for the past few years has made for some very interesting discussions around the club about what to do and things to occupy our time until we are flying full time again. We've all seen how much 3D printing has taken off these past few years. Well, us being us, or I should say Scott being Scott, has taken the concept to a whole new level. Sure, there have been 3D printed parts around for a bit and a few other concepts floated about but I don't think anything as grandiose as Scott's latest brainchild; a high powered rocket that is entirely a result of 3D printing. Not just that, but his latest brainchild…or brain children since there are now a couple of designs out there can be assembled with zero adhesives. That's right, no glue of any kind. This in my opinion took some real thought and planning to pull off. First of all, how could it be done and more importantly how would such a beast hold up under flight stress? Well, read on….Scott was kind enough to actually send me a prototype to assemble and fly. Tony Haga has one as well; we both flew them at our launch in August. There are one or two others that have them as well but to my knowledge they haven't flown just yet. We did learn a great deal and it was a real ball trying something completely different for a change. What follows here is the build of my particular project; which by the way took less than an hour. So technically, believe it or not, a flyer could get one of these, build it at the field and fly an H motor to get a L1 cert all in one day. How cool is that? The thing about these 3D birds is their ability to morph. Although we are still testing there is a way to make the thing longer or shorter simply by adding or removing sections of airframe. Not just that; these things are dual deploy capable and there are subsets of that. Motor ejection with Jolly Logic or even full altimeter dual deploy from start to finish are all options that can be had. It all depends on how the project is set up and which (my own term here) modules are screwed together. Now, for the build….

The most complex part of the assembly is the fin can. And the way it goes together is very unique to say the least. The fins are vertically screwed into the centering rings. The motor tube has a built-in flange on the bottom for the aft centering ring to slide on to as a stop. When the fore end centering ring is put on it is held in place by more screws (two threaded eyebolts and one screw specifically) attached to the leading edges of the fins. A threated retainer ring screws on top of the motor tube to hold the entire fin can together; this configuration turns out to be quite solid. A "skin" of plastic in three sections is attached by screws through the skin into the centering rings at both fore and aft ends. The eyebolts are used as a shock cord attachment point. Even rail buttons are 3D, screwed into the centering rings in similar fashion. Adding airframe sections is very easy. They simply screw one into another until the desired length is attained.

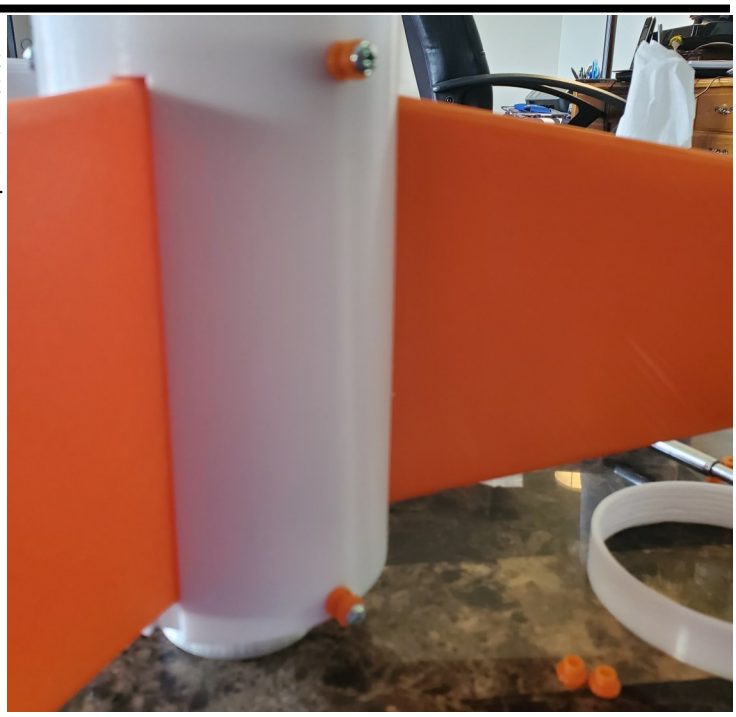
The nosecone/ altimeter sled (if desired) screws into the front section of the cone. There is another module that also screws on to the bottom of this assembly to serve as both shock cord attachment and as the shoulder of the nose cone.

For my particular project I added a couple of my own things…as of course I am prone to do (I know, quite a shock). I used a dual Kevlar cord setup since I had two attachment points to utilize and a Giant Leap "Fireball" that is used to prevent zippering. One could also make something very similar quite easily by wrapping something soft around the shock cord and securing it with duct tape so serve a similar purpose, preventing zippering at main deployment. I prefer X type parachutes these days, so I used a Top Flight 60" to bring this project down very softly. The fins of this particular rocket are large, although very strong. But I didn't want to take a chance on anything torquing from a too-fast decent so

(again) I went a little oversize.
I did get to fly this project in August and chose a Loki H90 red. It doesn't hit too hard and has a nice, steady burn. Turned out that for this particular rocket it was the perfect motor. The boost was straight, since the fins were mounted straight there was absolutely no rotation at all. I chose simple motor ejection which kicked out the 'chute right at the top. Decent was perfect, there was no rocking back and forth I believe because of both the design and size of the parachute. The bird landed softly. After flight inspection



showed that one section of airframe cracked a little. Repair was simple, simply unscrewed that section. It could be flown again immediately but I chose to wait until I got a replacement. Note: the threads have since been beefed up a little in some design revisions so cracking is no longer an issue.
I must say, this rocket was fun to put together and a real treat to fly. Now, if you are looking for something to go very high very fast this is not the design for you. But, if you are looking for something that flies our fields very well, achieves moderate altitudes and the ability to actually watch the flight start to finish I would highly recommend getting one of these as Scott makes them available.
As of this writing Scott has come up with yet another design that I will be testing. I believe there was also a limited release of 5 kits



that were sold…proceeds were rolled back into the club. When they were announced they were snapped up very quickly by some eager members. Seems I'm not the only one that's been starving for something new and a bit off the beaten path.
There are more designs, and more modules to test…in the works but I'll let Scott reveal those as he sees fit. I will simply maintain my role as a beta tester and enjoy every last second doing it.

JMRC HUVARS Club News

Flying Field Update

Starting in October we switched over to the Horning 2 field on Bethel Church Road, just east of Lima Center Road. Weather permitting, our November 13th launch will also be at Horning 2. Here are a couple of maps to help identify the site if you haven't visited the field yet.

Good news at Horning 1 for next year. The majority of the field will likely be alfalfa which means we can get in to use the field after monthly cuts. The only bad news is that weather can interrupt cutting schedules so we will likely need to be flexible and fly when we can.

Michigan International Speedway announced a new President on October 27th, Joe Fowler. Whether or not the change will improve our situation in getting back to Graves Campground remains to be seen. The BOD will attempt to communicate with the new management team.

Big Bertha Contest Is A Go!

Designed by Vern Estes, the Big Bertha is the iconic model rocket throughout the decades. Make Vern proud and enter your Big Bertha in this fun contest we will be holding… at the October Sport Launch.

Goal

Make three flights with a single model (Big Bertha) and attempt to score the best in **FOUR** different events.

Vehicle

As mentioned, this is a Big Bertha contest. If you don't have a Big Bertha then any rocket with at least 18" of BT-60 and four fins will do. If you wish to build one from scratch you can download the plans here at JimZ Plans

Events

A Parachute Duration – Using an A impulse motor and parachute of any size, get a longest possible duration. Remember, you need to get it back for the other events!

B Streamer Duration PLUS Spot Landing - That's right, two events in one. Using a B impulse motor and streamer for recovery get the longest possible duration AND land closest to the target mark that will be placed randomly at the field.

C Altitude (altimeter) – Using a C impulse motor and electronic altimeter reach the highest altitude. I will have a couple of altimeters to loan out if you don't have a suitable altimeter.

Buzz Nau is sponsoring a rocket design contest for the club. First place will be awarded $50. Runners up will receive kits to be named later. The rules are simple;

- The design needs to be original
- The design must be capable of using currently available motors
- While you do not need to build or fly your submission, the design must be stable
- No up or down scales or modifications of commercial kits
- Entries can be submitted using Rocksim, OpenRocket or other drawing applications
- Hand drawn designs are allowed. Just scan and email them
- Entries will be judged by the BOD
- Deadline for submissions is open till further notice
- Send submissions to USSMidway@gmail.com

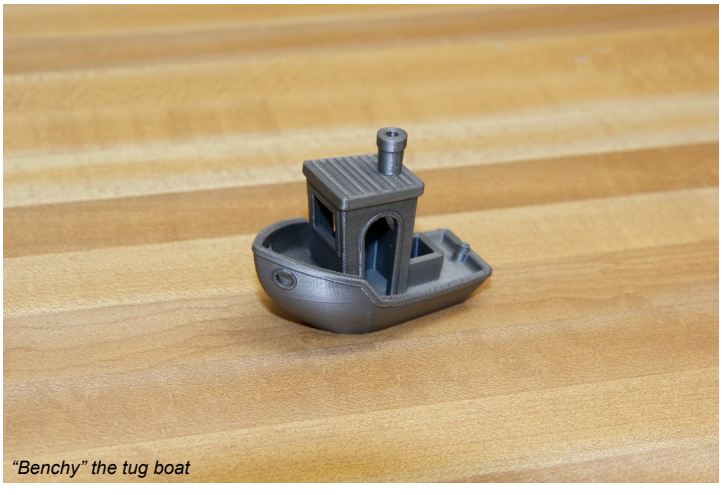
Model Rocket Display Stands

Dump These……

And Make These

One of the most common troubleshooting steps in testing a 3D printer is to print a test object. The objects will usually have curves and overhangs which will indicate a problem with the printer or setup if they do not print correctly. One of the most common of these objects is Benchy the tug boat. After printing one myself I really didn't want to print any more just to validate the 3D printer was working alright after a change or upgrade, so I began printing out display stands.

If you are like me and you have a model that is unable to stand up on its own, you'll grab a spent motor case, glue it to a scrap piece of wood and Wala! Display stand. After making a few 3D printed ones and replacing jenky ones I went a bit overboard and replaced all of them!



"Benchy" the tug boat

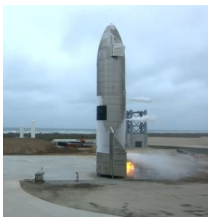
There are several different versions you can download from Thingiverse and they will help identify a misconfiguration with the your printer and often times still be usable as a display stand, so the print really doesn't go to waste.

Links

Vertical Rocket Stand

Tilted Rochet Stand

Customized Rocket Stand



CURRENT EVENTS IN SPACE EXPLORATION

Over the past two-month period ROSCOSMOS and in partnership with Arianespace, has been the busiest launch provider with five flights. They were followed by SpaceX, JAXA (Japan Aerospace Exploration Agency), and ULA (United Launch Alliance) with two launches each. There were five other notable flights made by individual providers.

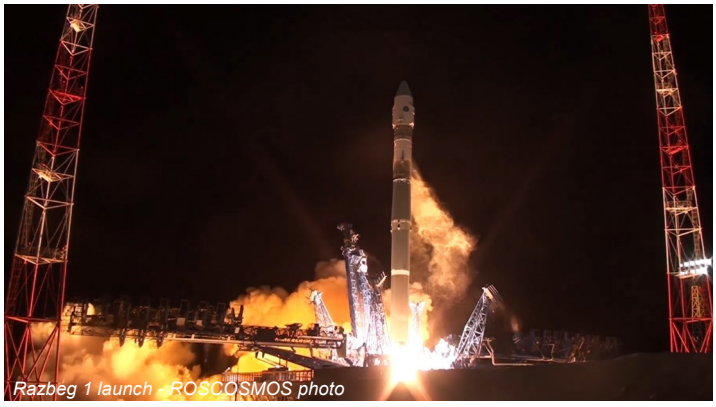
FIREFLY AEROSPACE

Kicking off the launch period between September through October was Firefly Aerospace's Alpha FLTA001 DREAM mission on 3 September from Vandenberg Space Force Base. This was Firefly's first launch of the Alpha and was basically a test flight though it did carry some cubesat satellites. One of the four Reaver engines prematurely shut down shortly after liftoff which prevented the vehicle from achieving orbit though it did exceed mach one prior to ground control terminating the flight.

Firefly Alpha prior to launch - Firefly Industries photo

ROSCOSMOS

The first flight from ROSCOSMOS in this period was the Razbeg 1 mission launched on 9 September from the Plesetsk Cosmodrome. The Razbeg 1 payload is a military satellite which was carried aboard a Soyuz 2.1v vehicle into a sun synchronous orbit. The satellite is an optical reconnaissance satellite and little else is known about it.


Razbeg 1 launch - ROSCOSMOS photo

Next up for ROSCOSMOS was the partnership launch with Arianespace of OneWeb 10 on 14 September from the Baikonur Cosmodrome. The launch vehicle was a Soyuz 2.1b which successfully deployed 34 more communications satellites into the OneWeb constellation bringing the total to 322 satellites.

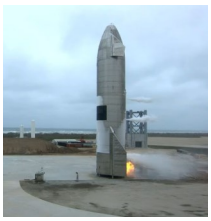

OneWeb 10 launch - ROSCOSMOS photo

On 5 October MS-19, Soyuz 2.1a was launched to the International Space Station and this was quite different from previous missions to the ISS. Launched from Baikonur Cosmodrome, the MS-19 mission is to film footage for a movie called "The Challenge". In addition to mission commander Anton Shkaplerov the crew also includes actress Yulia Peresild and director Klim Shipenko.

"The Challenge" is a movie about a cardiac surgeon that must fly within a month to the ISS to save a cosmonaut's life. It is the first movie to be filmed on the ISS. The actress and director departed the ISS on 17 October with Commander Oleg Noviskiy aboard Soyuz MS-18

Soyuz MS-19 prior to launch - ROSCOSMOS photo

The fourth ROSCOSMOS (Arianespace) launch was OneWeb 11 aboard a Soyuz 2.1b Fregat, this time from Vostochny Cosmodrome on 14 October. The payload was a further 36 OneWeb satellites increasing the constellation to 358.



CURRENT EVENTS IN SPACE EXPLORATION

OneWeb 11 - ROSCOSMOS photo

Starlink 2-1

The fifth and final flight for this period by ROSCOSMOS was the Progress MS-18 resupply mission to the ISS. The Soyuz 2.1a vehicle lifted off from Baikonur Cosmodrome on 28 October and docked with the ISS two days later delivering 5,600 pounds of cargo.

Soyuz MS-18 - ROSCOSMOS photo

SPACEX

SpaceX made two launches over the past couple of months with a scheduled third, the Crew-3 mission to the ISS, postponed until 6 November. The first launch, Starlink 2-1, occurred on 13 September as a Falcon 9 placed 51 Starlink satellites into orbit. These are the first satellites deployed the Starlink Shell 3 bringing the total launched to 1788. The Falcon 9 was launched from Vandenberg Space Force base and was the tenth flight of the booster. It successfully landed on the droneship, “Of Course I Still Love You” which has been deployed to the west coast to support Vandenberg launches. This was the 30th Starlink satellite launch.

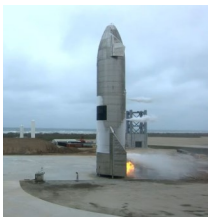
The second SpaceX flight was the highly successful Inspiration4 mission. This flight was privately funded by mission commander Jared Isaacman, a self-made billionaire and founder of Draken International, a private air force provider. This was the first ever privately funded spaceflight and the crew of three were also all private citizens. The other crewmembers were pilot Dr. Sian Proctor, mission specialist Christopher Sembroski, and medical officer Hayley Arceneaux. Inspiration4’s Crew Dragon capsule Resilience launched on early morning on 16 September from Kennedy Space Center and landed nearly 3 days later in the Pacific Ocean north of Cape Canaveral. Resilience reached an orbit of 357 miles, the highest orbit since the Space Shuttle mission STS-103 in 1999. The capsule was recovered by the support ship GO Searcher and the booster landed successfully on the droneship Just Read the Instructions. It was the fourth flight of the Falcon 9 booster B1062.

Launch of Inspiration4 - SpaceX photo

ULA

United Launch Alliance (ULA) launched two missions during this reporting period. The first was LandSat 9, launched on 27 September from Vandenberg Space Force Base. The Atlas V 401 booster lofted the LandSat 9 data gathering satellite to a sun synchronous orbit for NASA and the United States Geological Survey (USGS). The payload also included several CubeSats.

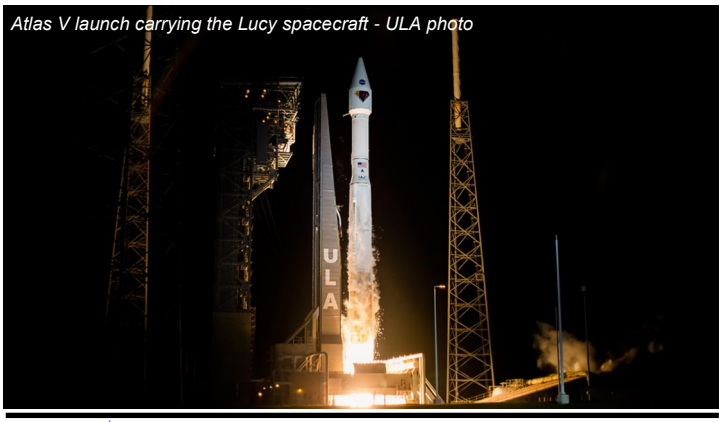
The next ULA launch was that of the Lucy space vehicle, also launched by an Atlas V 401, this time from Cape Canaveral



CURRENT EVENTS IN SPACE EXPLORATION


Landsat 9 Atlas V 401 launch - ULA photo

Space Force Station. Lucy's mission is to explore the Trojan asteroid belt. Lucy carries a long distance imager similar to that on the New Horizons spacecraft.



Atlas V launch carrying the Lucy spacecraft - ULA photo

The Japan Aerospace Exploration Agency (JAXA) launched their QZS-1R GPS satellite aboard a Mitsubishi Heavy Industries H-IIA 202 launch vehicle on 26 October from the Yoshinobu Launch Complex. QZS-1R is to replace QZS-1 which has already exceeded its lifespan.


QZS-1R launch aboard a H-IIA 202 launch vehicle - JAXA photo

BLUE ORIGIN

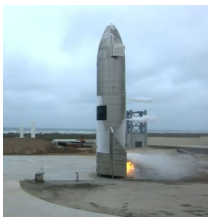
One of the most anticipated and talked about mission over the past couple of months was Blue Origin's NS-18 New Shepard crewed flight on 13 October from Launch Site One. This flight had a very similar mission profile to NS-17 which founder Jeff Bezos was a crew member. This time the crew consisted of Dr. Chris Boshuizen, Audrey Powers, Glen de Vries, and one William Shatner, aka James T. Kirk. Shatner also became the oldest person to reach space at 90 years old. The booster for the flight, NS4 had made three previous flights and was recovered successfully.


NS-18 launch - Blue Origin photo

KARI 한국항공우주연구원 Korea Aerospace Research Institute

The Korean Aerospace Research Institute also flew a new launch vehicle, Nuri, this period on 21 October from the Naro Space Center. It was the maiden flight of the Nuri which flew extremely well and met its objective altitude, but failed to deploy the inert payload into orbit. The Nuri launch vehicle is the first domestic satellite launch for South Korea.

Nuri launch vehicle prior to launch - Yonhap photo



CURRENT EVENTS IN SPACE EXPLORATION

Arianespace's third mission of the past two months was the SES-17 and Syracuse 4A satellites launched aboard an Ariane 5 ECA on 24 October from the Guiana Space Center. SES-17 will provide mobile internet service in connection with other satellites from medium earth orbit. Syracuse 4A is a French military communications satellite for drones and other uncrewed aircraft.

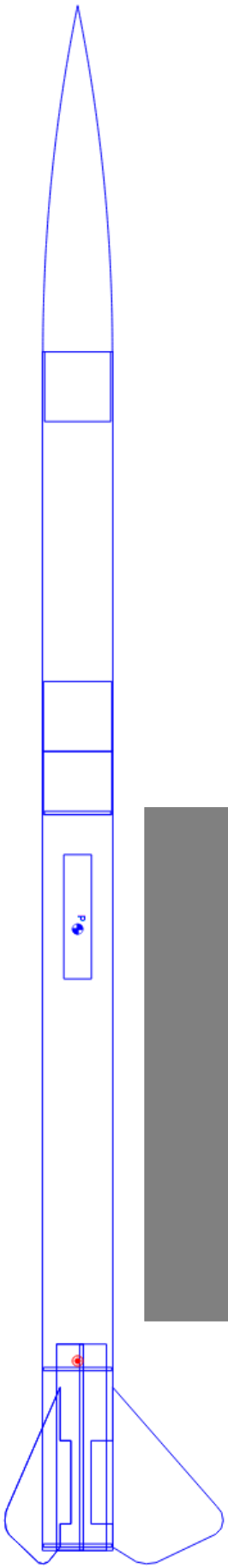
SES-17/Syracuse Ariane 5 ECA launch - ESA photo

HOTShot Terrier-Improved Malemute launch - NASA photo

NASA NEWS

NASA's Wallops Flight Facility flew a Terrier-Improved Malemute sounding rocket on 11 September as part of the HOTShot program. The data collected is used for future weapons designs for the US nuclear arsenal.

HOTShot Terrier-Improved Malemute - NASA photo

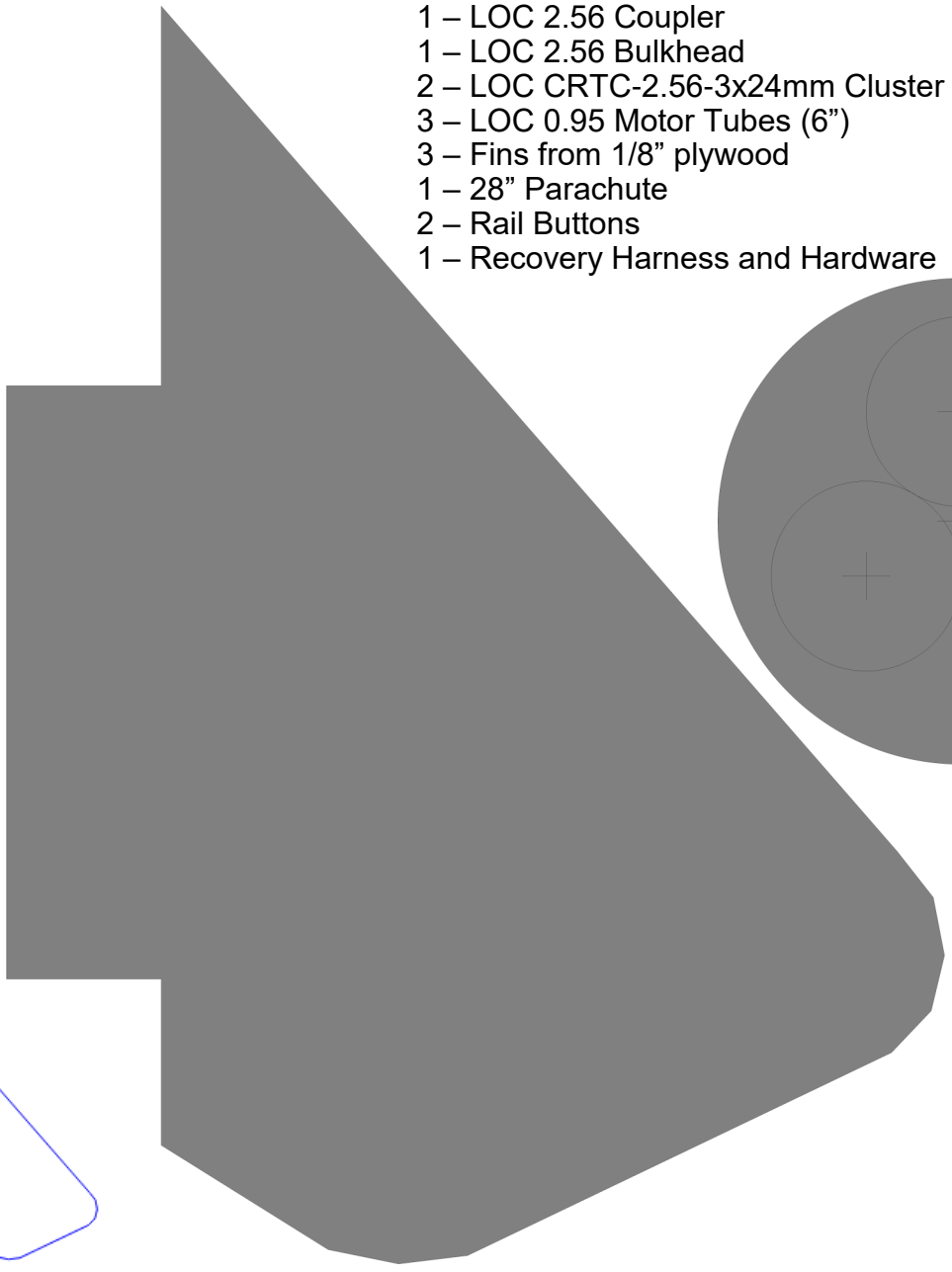


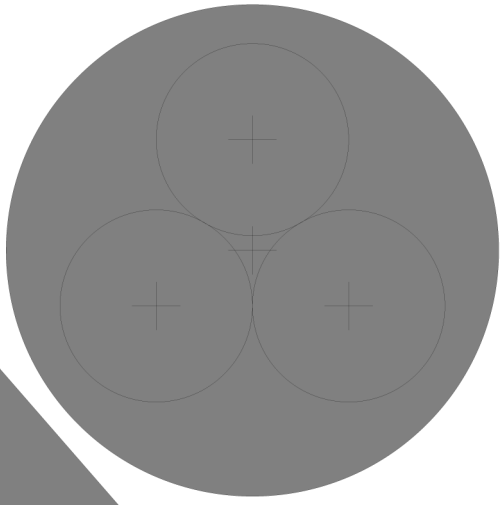
THOY

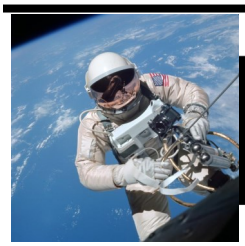
SNIPE

Parts List

1 – Aerotech 2.6 Nose Cone
1 – LOC 2.56 Body Tube (15”)
1 – LOC 2.56 Body Tube (30”)
1 – LOC 2.56 Coupler
1 – LOC 2.56 Bulkhead
2 – LOC CRTC-2.56-3x24mm Cluster Centering Rings
3 – LOC 0.95 Motor Tubes (6”)
3 – Fins from 1/8” plywood
1 – 28” Parachute
2 – Rail Buttons
1 – Recovery Harness and Hardware







THIS MONTH IN AEROSPACE HISTORY

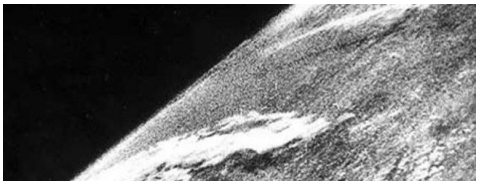
Source—NASA / ROSCOSMOS Archives

115 Years Ago - 1906
October 2: Space popularizer and science writer Willy Ley, born in Berlin, Germany

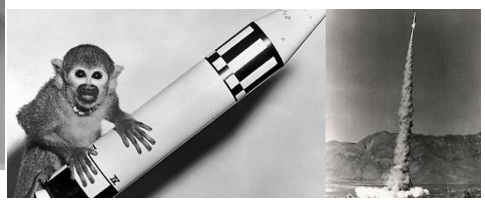
80 Years Ago - 1941
October 6: Redstone Arsenal activated at Huntsville, AL

75 Years Ago - 1946
September 30: Thirteen engineers, technicians, and observers from the NACA's Langley Research Center were assigned to assist the X-I flight test program at the US Air Force Muroc test station in CA. This was the beginning of the Dryden Flight Research Center of NACA and NASA

October 24: First motion pictures taken of Earth from a V2 rocket

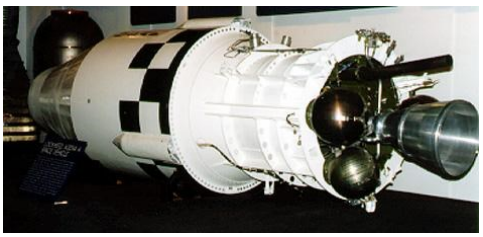


70 Years Ago - 1951
September 20: USAF Aerobee sounding rocket was launched with "arkful of animals", one monkey and 11 mice. Capsule was successfully recovered after a flight to a height of 236,000 feet. This was the first successful recovery of live animals in the Western Hemisphere, Holloman Air Force Base, NM



65 Years Ago - 1956
September 20: First Redstone Jupiter C launched to an altitude of 682 miles and travelled 3,000 miles downrange from Cape Canaveral

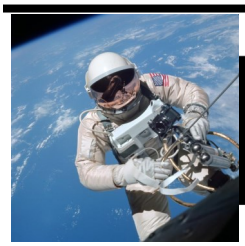
60 Years Ago - 1961
September 12: Discoverer 30 launched by Thor Agena from Vandenberg AFB. Capsule recovered
September 13: MA-4 1aunched an unmanned Mercury spacecraft test of Atlas launch vehicle from Cape Canaveral. The flight was successful
September 17: Discoverer 31 launched by a Thor Agena from Vandenberg AFB



September 19: Houston, TX selected as the home of the NASA Manned Spacecraft Center

October 11: X-15 flown to more than 40 miles into space, 217,000 feet, and a speed of 3,647 miles per hour by Major Robert White from Edwards Air Force Base

October 13: Midas 4 launched by an Atlas. Also carried Project West Ford payload from Vandenberg AFB
October 25: Mississippi Test Facility established in Hancock County, Miss. to test the Saturn launch vehicles. Renamed Stennis Space Center after Mississippi



THIS MONTH IN AEROSPACE HISTORY

Source—NASA / ROSCOSMOS Archives

Senator John Stennis in May 1988

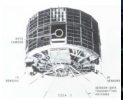
October 27: Saturn I (SA-1) suborbital flight. Launched to an altitude of 84.8 miles, 214.7 miles downrange from Cape Canaveral. First test of the newly developed Saturn booster

55 Years Ago - 1966

September 8: First episode of a new television science fiction series "Star Trek" shown on NBC-TV. After an unsuccessful run of three seasons the series was cancelled in 1969

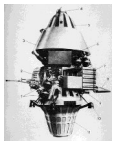
September 12: Gemini 11 (GTA-11) launched from Cape Canaveral. Crew: Charles "Pete" Conrad, Jr. and Richard F. Gordon, Jr. First instance of station-keeping using tethered linkage

September 20: Surveyor 2 launched by Atlas Centaur from Cape Canaveral. During a midcourse maneuver the spacecraft began tumbling and the mission to soft-land on the moon was a failure

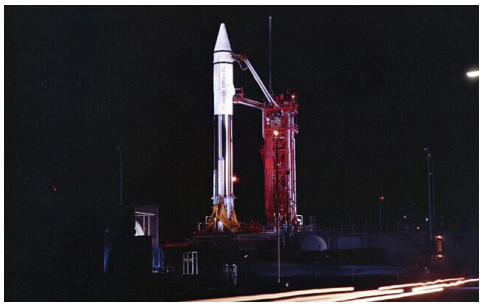


October 2: ESSA 3 launched by Thor Delta from Vandenberg AFB

October 22: Luna 12 (Lunik 12) launch (USSR Moon Orbiter) launched by Modified SS-6 (Sapwood) or Molniya



October 26: Atlas Centaur 9 launched from Cape Canaveral. It carried a Surveyor model that was injected into simulated lunar transfer orbit



October 26: Intelsat 2 F-1 (Intelsat II-A) launched by a Delta from Cape Canaveral carrying a COMSAT Corporation commercial communications satellite

50 Years Ago - 1971

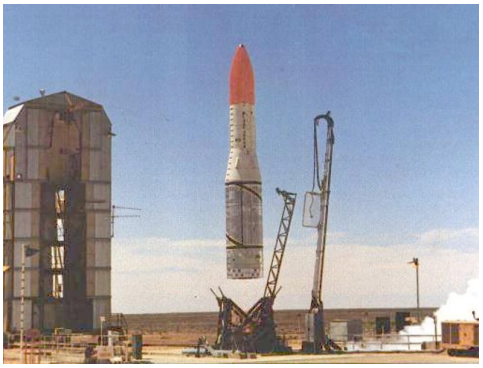
September 2: Luna 18 launched by Proton K from Baikonur

September 28: Luna 19 launched by Proton K from Baikonur

September 29: OSO 7 launched by Thor Delta from Cape Canaveral. First x-ray observations of a beginning solar flare and of solar streamers. TETR 3 pick-a-back satellite also onboard

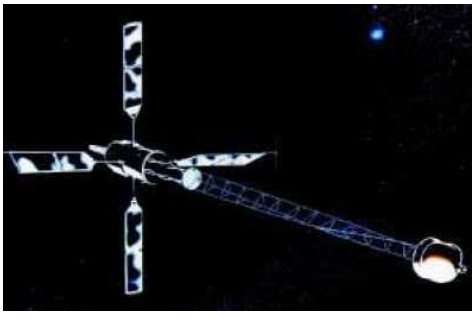
October 21 : ITOS-B launched by a Thor Delta from Vandenberg AFB. Launch vehicle failure

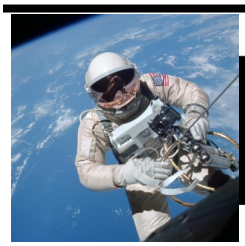
October 28: Prospero launched, (Great Britain's first) the Woomera Test Range in Australia. Launch vehicle was a UK Black Arrow



45 Years Ago - 1976

September 1: US Navy TIP 3 launched by Scout from Vandenberg AFB

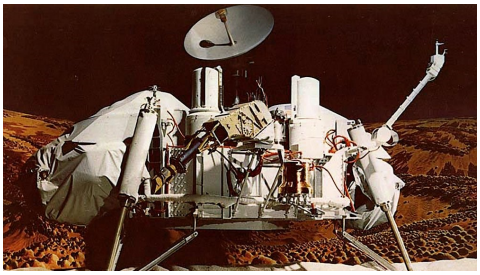




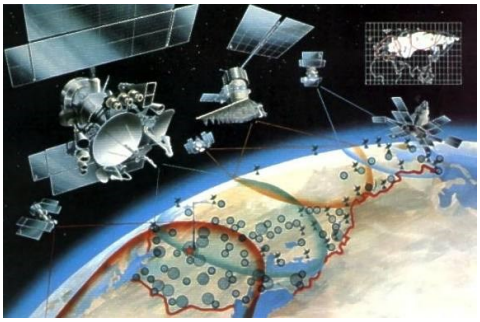
THIS MONTH IN AEROSPACE HISTORY

Source—NASA / ROSCOSMOS Archives

September 3: Viking 2 landed on Mars. Landing area - Utopia Planitia



September 11: Raduga 2 (Statsionar 1) launched by Proton from Baikonur, USSR



September 15: Soyuz 22 launched from Baikonur, USSR. Cosmonauts: Valeri F. Bykovsky and Vladimir V. Aksyonov

October 14: Marisat 3 launched by a Delta from Cape Canaveral

October 14: Soyuz 23 launched, Baikonur, USSR. Cosmonauts: Vyacheslav D. Zudov and Valeri I. Rozhdesvensky. Failed to dock with Salyut-5

40 Years Ago - 1981

September 24: Satellite Business Systems (SBS 2) launched by Delta from Cape Canaveral. The satellite enhanced communications by providing fully switched private networks for use by businesses, the government, and other organizations

October 6: SME (Solar Mesosphere Explorer) launched by Delta from Vandenberg AFB. (UOSAT) (Oscar 9) dual payload with SME

October 30: Venera 13 Launch (USSR Venus Lander/Flyby Mission) by Proton K from Baikonur

35 Years Ago - 1986

September 17: NOAA 10 launched by Atlas from Vandenberg AFB. Included search and rescue instruments aboard the spacecraft

30 Years Ago - 1991

September 12: STS-48 (Space Shuttle Discovery) launched from KSC. Crew: John O. Creighton, Kenneth S. Reightler, Jr., Mark N. Brown, Charles D. Gemar, and James F. Buchli. Cargo: UARS. Mission Duration: 5 days, 8 hours. Landed at Edwards AFB on September 18

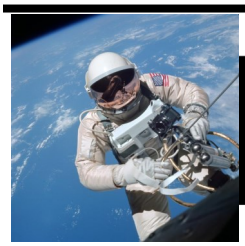
September 15: UARS (Upper Atmosphere Remote Research Satellite) successfully launched from the cargo bay of the Discovery by the Remote Manipulator System (RMS)

October 15: NASA launched the Black Brant sounding rocket to analyze the ionosphere during a solar mission. The rocket completed a second solar mission on October 22

25 Years Ago - 1996

September 16: STS-79 (Space Shuttle Atlantis) launched from KSC to dock with the Russian Mir station. Astronauts: William F. Readdy, Terrence W. Wilcutt, Jerome Apt, Thomas D. Akers, Carl E. Walz, John E. Blaha, and Shannon W. Lucid. Picked up astronaut Shannon Lucid and dropped off astronaut John Blaha. Landed at KSC on September 26. Mission Duration: 10 days, 3 hours

October 24: Molniya-3-48 communications satellite launched by Molniya-M from Plesetsk, Russia, which used a three-channel repeater to support domestic and international communication

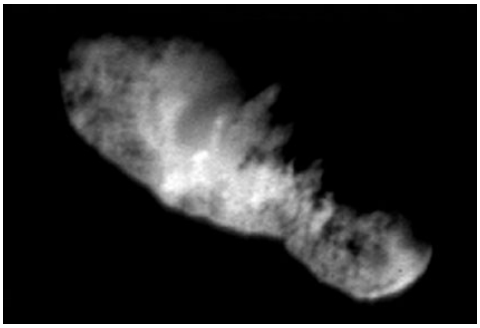


THIS MONTH IN AEROSPACE HISTORY

Source—NASA / ROSCOSMOS Archives

20 Years Ago - 2001

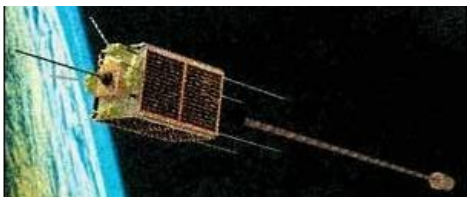
September 22: Deep Space 1, Comet Borrelly Flyby



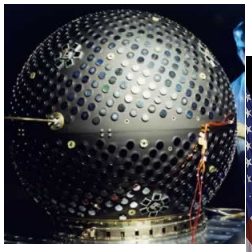
September 30: Stanford Audiophonic Photographic Infrared Experiment (Sapphire) launched. It was a US DoD-funded microsatellite built by the Stanford University students and faculty, carrying a voice synthesizer to convert text messages into human voice

September 30: PCSat (Prototype Communications SATellite) designed to act as a relay for amateur radio transmissions built by the midshipmen at the US Naval Academy

September 30: Picosat 9 is a British-built (US DoD-funded) satellite to test electronic components/systems in space conditions

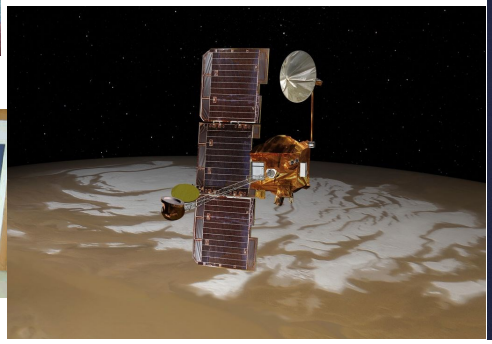


September 30: Starshine 3, a microsatellite launched along with Picosat 9, PCSat, and Sapphire, by an Athena 1 rocket from the Alaskan Kodiak Launch Complex (KLC) on 30 September 2001. The 80 kg NASA satellite is basically a passive light-reflecting sphere of one meter diameter, consisting of 1,500 student-built mirrors (polished by kindergarten and grade school students from many countries) and 31 laser "retroreflectors"



October 21: Soyuz TM-33 launched. The second taxi flight to the International Space Station (ISS) by a Soyuz-U rocket from Baikonur. It carried two Russian and one French astronaut: Victor M. Afanasyez, Konstantin M. Kozeev, and Claudie Haigneré, bringing a fresh Soyuz crew to the ISS

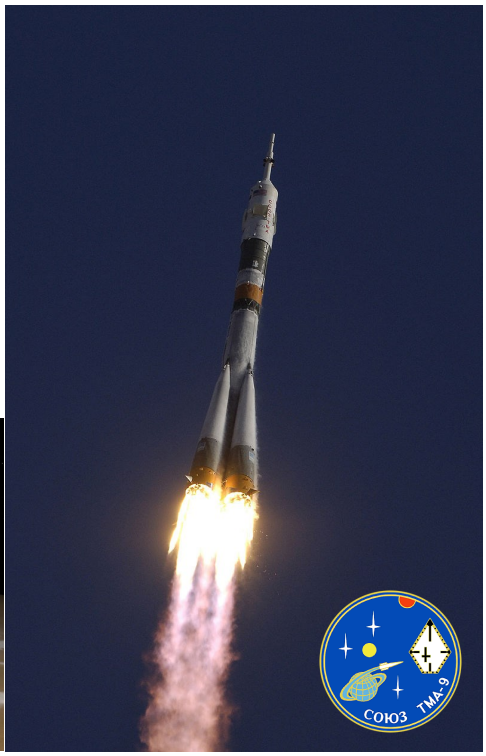
October 24: Mars Odyssey reached Mars

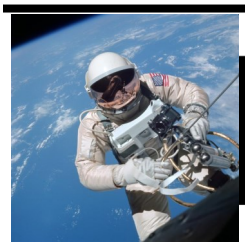


15 Years Ago - 2006

September 9: STS-115 (Space Shuttle Atlantis) launched from KSC to dock with the International Space Station (ISS). Crew: Brent W. Jett, Jr., Christopher J. Ferguson, Heidemarie M. Stefanyshyn-Piper, Joseph R. (Joe) Tanner, Daniel C. Burbank, and Steven G. MacLean, who represents the Canadian Space Agency. Installed the P3/P4 integrated truss segment with its solar arrays, which doubled the existing power-generating capacity of the Station. Landed at KSC on September 21. Mission Duration: 11 days 19 hours

September 18: Soyuz TMA-9 launched from Baikonur by a Soyuz-FG rocket. It carried a Russian cosmonaut, Mikhail Tyu-



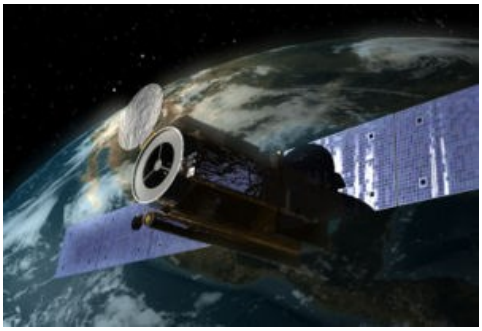


THIS MONTH IN AEROSPACE HISTORY

Source—NASA / ROSCOSMOS Archives

rin, an American astronaut, Michael Lopez-Alegria plus the first woman space tourist, Anousheh Ansari to the International Space Station (ISS). She returned on Soyuz TMA 8.

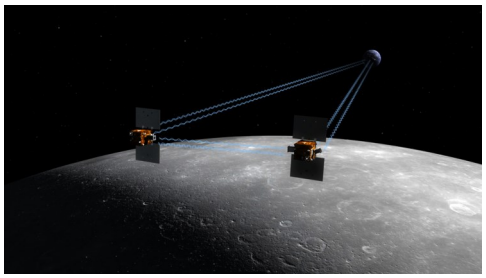
September 22: Hinode (meaning sunrise), also known by its pre-launch name of Solar-B, was a joint Japanese-American (ISAS-NASA) satellite that was launched by an M-5 rocket from Uchinora Space Center. It carried three major instruments to monitor the solar magnetic field



October 26: The Solar Terrestrial Relations Observatory consisting of STEREO-A and STEREO-B, two identical heliospheric craft, were launched by a Delta 2 rocket from Cape Canaveral. STEREO-A orbits the Sun ahead of the Earth, and STEREO-B orbits behind the Earth in order to image the Sun and its emissions stereographically. The spacecraft predict whether a Coronal Mass Ejection (CME) is heading toward the Earth

10 Years Ago - 2011

September 10: The Gravity Recovery And Interior Laboratory (GRAIL) mission consists of twin spacecraft designed to perform gravity mapping of the Moon, to determine the structure of the lunar interior, and to advance understanding of the thermal evolution of the Moon. Both GRAIL spacecraft (GRAIL-A and GRAIL-B) were launched from Cape Canaveral Air Force Station on a single Delta II 2920-10



September 24: NASA's 6.3-ton Upper Atmosphere Research Satellite, or UARS fell harmlessly back to Earth over the Pacific Ocean

September 29: Tiangong 1, the first Chinese (PRC) Chinese space laboratory module, launched from Jiuquan by a Long March 2F rocket. Tiangong 1, which means heavenly palace in English, was designed to demonstrate the vital docking technology required for a future space station on this test flight

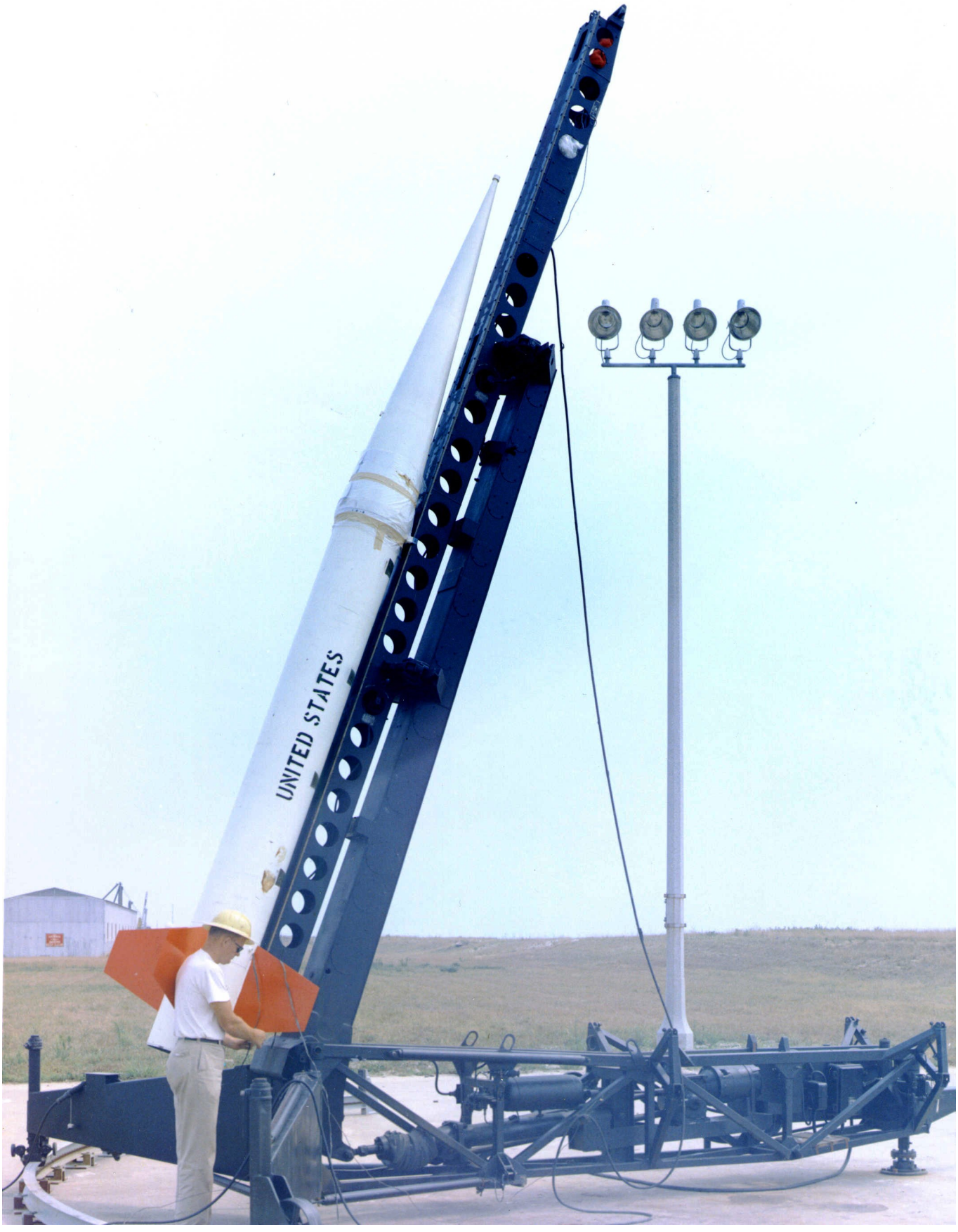
October 23: The German ROentgen SATellite ROSAT re-entered Earth's atmosphere.

October 28: NPP (National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project), launched from Vandenberg AFB by a Delta rocket. NPP is a joint effort between the National Aeronautics Space Administration (NASA) and the NPOESS Integrated Program Office (IPO). NPP is an Earth-observing satellite designed to collect data critical to improving short-term weather forecasts and increase understanding of long-term climate change

5 Years Ago - 2016

September 8: The OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) mission, designed to return a sample of material from near-Earth carbonaceous asteroid Bennu, launched by an Atlas V from Cape Canaveral

October 19: Soyuz MS-02 spacecraft launched by a Soyuz FG launch vehicle from Baikonur Cosmodrome. Crew: Cosmonauts Sergey Ryzhikov, Andrei Borisenko, and astronaut R. Shane Kimbrough. (ISS Expedition 49)


UNITED STATES


UNITED STATES
UNITED STATES

LAUNCH WINDOWS

Launch dates from SpaceFlight.com

TBD
Falcon 9 - Starlink 2-2
Launch site: SLC-40, Cape Canaveral Space Force Station
A SpaceX Falcon 9 rocket will launch a group of Starlink internet satellites

TBD
Falcon 9 - Starlink 2-3
Launch site: SLC-4E, Vandenberg Space Force Base
A SpaceX Falcon 9 rocket will launch with a batch of Starlink internet satellites from Vandenberg Space Force Base. This mission is expected to deploy 51 Starlink satellites into a high-inclination orbit.

TBD
Epsilon - RAISE 2
Launch site: Uchinoura Space Center
A Japanese Epsilon rocket will launch the Rapid Innovative Payload Demonstration Satellite 2 (RAISE 2), technology demonstration satellite for the JAXA. Eight smaller rideshare payloads will also be on this launch.

November 2021
Vega - CERES
Launch site: ZLV, Kourou, French Guiana
An Arianespace Vega rocket, designated VV20, will launch three CERES signals intelligence satellites for the French military. The three small satellites were built by Airbus Defense and Space and Thales Alenia Space.

November 10/11, 2021
Electron - BlackSky 10 & 11
Launch site: Launch Complex 1A, Mahia Peninsula
A Rocket Lab Electron rocket will launch two small satellites for BlackSky's commercial fleet of Earth observation spacecraft. Rocket Lab has nicknamed this mission "Love At First Insight".

November 18, 2021
Falcon 9 - CSG 2
Launch site: Cape Canaveral
A SpaceX Falcon 9 rocket will launch the second COSMO-SkyMed Second Generation (CSG 2) radar surveillance satellite for ASI, the Italian space agency.

November 22, 2021
Atlas 5 - STP-3
Launch site: SLC-41, Cape Canaveral Space Force Station
A United Launch Alliance Atlas 5 rocket will launch the STP-3 mission for the U.S. Space Force. The STP-3 rideshare mission will launch the STPSat 6 satellite and several small satellites. STPSat 6 hosts several payloads and experiments, including the National Nuclear Security Administration's Space and Atmospheric Burst Reporting System-3 (SABRS-3) payload, and NASA's Laser Communications Relay Demonstration (LCRD) experiment. The rocket will fly in the 551-vehicle configuration with a five-meter fairing, five solid rocket boosters, and a single-engine Centaur upper stage.

4th Quarter, 2021
Falcon 9 - Turksat 5B
Launch site: Cape Canaveral
A SpaceX Falcon 9 rocket will launch the Turksat 5B communications satellite for Turksat, a Turkish satellite operator. Built by Airbus Defense and Space with significant Turkish contributions, the Turksat 5B satellite will provide broadband services over a wide coverage area, including Turkey, the Middle East and large regions of Africa.

November 23/24, 2021
Falcon 9 - DART
Launch site: SLC-4E, Vandenberg Air Force Base
A SpaceX Falcon 9 rocket will launch NASA's Double Asteroid Redirection Test (DART) mission. DART is NASA's first flight demonstration for planetary defense. The mission seeks to test and validate a method to protect Earth in case of an asteroid impact threat. The mission aims to shift an asteroid's orbit through kinetic impact, specifically, by impacting a spacecraft into the smaller member of the binary asteroid system Didymos to change its orbital speed.

November 24, 2021
Soyuz - Prichal
Launch site: Baikonur Cosmodrome
A Russian government Soyuz rocket will launch the Prichal module to the International Space Station. Prichal, also known as Uzlovoy Module, will dock with the Nauka Multi-purpose Laboratory Module and be used as a docking port for visiting Russian vehicles. A modified Progress resupply craft will ferry the Prichal module to the space station.

November 27, 2021
Electron - BlackSky 12 & 13
Launch site: Launch Complex 1A, Mahia Peninsula
A Rocket Lab Electron rocket will launch two small second-generation satellites for BlackSky's commercial fleet of Earth observation spacecraft.

November 30/December 1, 2021
Soyuz - Galileo 27 & 28
Launch site: ELS, Sinnamary
An Arianespace Soyuz rocket, designated VS26, will launch on a mission from the Guiana Space Center in South America. The Soyuz will carry two Galileo full operational capability satellites for Europe's Galileo navigation constellation. The Soyuz-2.1b (Soyuz ST-B) rocket will use a Fregat upper stage.

December 8, 2021
Soyuz - ISS 66S
Launch site: Baikonur Cosmodrome
A Russian government Soyuz rocket will launch the crewed Soyuz MS-20 spacecraft to the International Space Station on a 12-day flight with cosmonaut Alexander Misurkin and space tourists Yusaku Maezawa and Yozo Hirano.

December 9, 2021
Falcon 9 - IXPE
Launch site: LC-39A, KSC
A SpaceX Falcon 9 rocket will launch the NASA's Imaging X-ray Polarimetry Explorer. IXPE exploits the polarization state of light from astrophysical sources to provide insight into our understanding of X-ray production in objects such as neutron stars and pulsar wind nebulae, as well as stellar and supermassive black holes.

December 2021
Angara-A5 - Test Flight
Launch site: Plesetsk Cosmodrome
A Russian government Angara-A5 rocket will launch on its third orbital test flight with a Perseus, or Persei, upper stage derived from Russia's venerable Block DM upper stage. Russian officials have not identified a payload for the mission.

December 18, 2021
Ariane 5 - James Webb Space Telescope
Launch site: ELA-3, Kourou
Arianespace using an Ariane 5 ECA rocket, designated VA256, to launch the James Webb Space Telescope, a flagship observatory developed by NASA, the European Space Agency, and the Canadian Space Agency. JWST is the largest space telescope ever built, with a deployable mirror measuring 21.3 feet in diameter and four

LAUNCH WINDOWS

Launch dates from SpaceFlight.com

scientific instruments to observe the universe in infrared wavelengths. The mission will study the formation of galaxies, stars, and planets. The Ariane 5 ECA rocket will launch JWST on a trajectory toward its operating position at the L2 Lagrange point nearly a million miles from Earth.

December 21, 2021
Falcon 9 - SpaceX CRS 24
Launch site: LC-39A, KSC
A SpaceX Falcon 9 rocket will launch a Dragon 2 spacecraft on its fourth cargo resupply mission to the International Space Station. The flight is the 24th mission by SpaceX conducted under a Commercial Resupply Services contract with NASA.

December 2021
H-2A - Inmarsat 6 F1
Launch site: Tanegashima Space Center
A Japanese H-2A rocket will launch the Inmarsat 6 F1 communications satellite for London-based Inmarsat. Built by Airbus Defense and Space, the satellite carries L-band and Ka-band payloads to provide mobile communications services to airplanes and ships. The H-2A rocket will fly in the "204" configuration with four strap-on solid rocket boosters.

December 27, 2021
Soyuz - OneWeb 12
Launch site: Baikonur Cosmodrome
A Russian Soyuz rocket will launch 34 satellites into orbit for OneWeb, which is developing a constellation of hundreds of satellites in low Earth orbit for low-latency broadband communications. The Soyuz-2.1b rocket will use a Fregat upper stage.

4th Quarter, 2021
SSLV - Demonstration Launch
Launch site: Satish Dhawan Space Center
India's Small Satellite Launch Vehicle (SSLV) will launch on its first orbital test flight. Consisting of three solid-fueled stages and a liquid-fueled upper stage, the SSLV is a new Indian launch vehicle designed to carry small satellites into low Earth orbit.

4th Quarter, 2021
SSLV - BlackSky Global
Launch site: Satish Dhawan Space Center
India's Small Satellite Launch Vehicle (SSLV) will launch on its first commercial mission with four Earth observation satellites for BlackSky Global, a Seattle-based company. The rideshare mission for BlackSky is being arranged by Spaceflight.

TBD, 2021
Electron - BlackSky 14 & 15
Launch site: Launch Complex 1A, Mahia Peninsula
A Rocket Lab Electron rocket will launch two small second-generation satellites for BlackSky's commercial fleet of Earth observation spacecraft.

TBD, 2021
PSLV - RISAT 1A
Launch site: Satish Dhawan Space Center
India's Polar Satellite Launch Vehicle (PSLV), designated PSLV-C52, will launch the Indian RISAT 1A radar Earth observation satellite.

PRESIDENT'S CORNER

Continued from page 2

because all of this is for the members and guests; how could we charge dues when there was nothing sustainable to offer the membership. Even without dues we still tried to do our best, we leaned on the graciousness of our fellow neighbor clubs and still managed a joint launch. The BOD unanimously agreed to pay for all attendees to show our appreciation to the membership and our fellow clubs lending a helping hand. That is what makes our hobby of Rocketry very special, it is always about helping your fellow enthusiasts to the best of your abilities.

The forging ahead did not cease with a single joint launch though, Buzz resurrected both of our fields in Manchester putting in a lot of sweat equity while coordinating with the landowners. We didn't have the ability to get the full club trailer to the field but that stopped no one... everyone banded together with a mis-fire alley configuration and user owned equipment to share. We as a club, a group, an organization, or perhaps rocket family being the best description of our members, always finds a way to overcome. 2021 finished strong for JMRC with several launches all free to our membership as we continue to collectively work through a tough situation.

Just when you think the story ends on a high note there are even more rainbows and kittens to pile on. Over the course of the year, we had no income but still had club expenses that were around the $1,500 mark. Not a huge ordeal under normal circumstances but with zero income it was a tough pill to swallow... again to recap the BOD consciously made this decision because we thought it was best for the club with no regrets. As the year comes to a conclusion the club received two $250 NAR Safety grants (one for HUVARS and one for JMRC) and was able to generate another $1,000 from our extremely generous members willing to invest in next year's membership dues and a 3D printed HPR rocket which brings our expenses nearly scratch in the accounting books. I am fascinated and amazed with that fact.

A basic recap, life dealt us a rough couple of years turning the world upside-down. Our club suffered, struggled, and still managed to endure as a collective whole. We will not only survive we will thrive in the coming days, weeks, months, and years! I'm confident the pandemic will continue to wan across the globe and our field options will open back up... perhaps even increase in numbers as we are always willing to take on new fields. Time will tell if my confidence is misplaced but seeing the data and the cohesiveness of our group I don't think it is. Tomorrow is another day, the sun will rise, and we will take a step in the right direction to continue to thrive. I will close this blurb by sampling a signature I received from Jack Lousma as it always resonated with me still after many years... I wish everyone blue skies and happy landings!

OUR MEMBERS IN THE FIELD

Fred Ziegler preps his Big Brute

Tony Haga and his Extreme 12

Chris Scharrer and his V-2

Half of the flight line from the October Sport Launch