



The Rocket Report

Rockets Return

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It was the triumphant return of the annual TECH Mission Rocket Launch!

On 22 October 2019, AFRL NM STEM Academy conducted the annual Model Rocket Launch at the Albuquerque Rocket Society (ARS) launch site in Rio Rancho. More than 225 middle school students from 10 New Mexico schools successfully launched 25 four-foot rockets.

During the weeks prior to the launch, these students visited

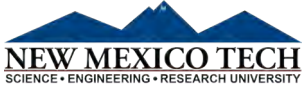
Kirtland AFB and worked in teams to build their rockets and predict how high they would fly using modeling/simulation software.

On launch day, 12 volunteer mentors from AFRL NM, the 58th SOW, and the ARS assisted the student teams as they prepped, launched, and recovered their rockets. Representatives from the Albuquerque Journal and KRQE-13 were also on hand to cover the highlights of the launch.



Continued on page 3

In partnership with:



Collaborator:



Remember, Teachers:

It's never too early to make bussing arrangements for our classes and events!



STEM Makes great Stuffing..

Gobble up some Science and Technology this year!



DubSTEM Tour

*Rub-a-dub dub,
Making STEM at the Hub,
There's something for everyone there!
The butcher, the baker,
The candlestick maker,
And STEM that the students can share!*

Drop the mike, *Skrillex*: It turns out *nursery rhymes* were the first ones to drop the bass, with their *rub-a-dub dubstep*.



On 5 November 2019, Christ Lutheran Elementary students didn't *drop the bass* so much as *drop in on the base*, going on an AFRL Maker Hub Tour that was dropping the STEM like it was hot!



Students visited the flight line, checked out the AFRL Maker Hub on base...

...And dubbed their steps on over to our techno-facility for a STEM Expedition in which they assembled paper circuits, created objects with a 3-D pen, and made lots of fun STEM-ories!



Our Staff Has "Blossomed"



"Blossom"

Daniella "Blossom" Miramontes is our newest DoD STARBASE NM Assistant.

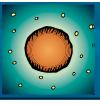
She is a Certified Medical As-

You may have noticed that a new face has blossomed at AFRL NM STEM Academy.

sistant from California who likes dogs, the beach, the color pink, and Disney.

She *loves* working with the students, and her favorite STARBASE activity is the Rocket Dragsters.

Her call sign, "Blossom," comes from her favorite flower: The Cherry Blossom.



All Aboard!

All aboard the Mars train! First-time Mission to Mars teachers, or teachers who just wanted a refresher, attended an in-person New Teacher Training session on 29 October 2019.



system complete with riddles and bonus cards, writing a saga, and constructing a smaller-scale model of the inflatable habitat the students will build on Link-Up Day.



Read The Manual

Read the manual!

Chapter 3 lists Base Operations STEM activities you can do with your class. Chapter 6 has a Mars Facts Bingo game to help students get their facts straight.



The details and graphic for this year's Mars METS Mission are on pages 9-10.

Going For the Juggler

Now that an entire classroom is a single crew, Mission to Mars teachers may feel like we're really going for the jugular, asking themselves how they will keep the whole class busy while they juggle the activities in the Base Operations (classroom) phase.



So go for the juggler! Try juggling the assignments around. Every student doesn't have to work on every single activity. One group could work on the lyrics for the Saga, while another group designs the mission patch, for example.

You could assign one Mars Fact to each group. Each group would design a separate section of the life support system model, based on that Fact.

You can also make a little contest out of activities. For example, have several groups design a mission patch, and then have the class, or the school, vote for their favorite.

Just don't forget to juggle your priorities; we'll be tossing Link-Up Day out there on 17 April 2020!

Remember, Teachers:
Crews Per Teacher forms are due.



Poster Session



Mission to Mars teachers: Some of the cool posters some teachers got as prizes during the New Teacher Training event are FREE for download from NASA and JPL:

www.mars.nasa.gov/multimedia/resources/mars-posters-explorers-wanted and www.jpl.nasa.gov/visions-of-the-future.

The Next Step...

November/December is a good time to...

- Study the the timeline on pages 12-13 of your manual; adjust it as necessary to fit your curriculum and scheduling needs. But be sure your class completes the activities prior to the Link-Up Day event, 17 April 2020!

- Have students learn "Mars Facts," and work on their sagas and mission patches
- Sing really loud whenever you're alone in the car and your favorite holiday tune comes on the radio



Holy Cupcakes, Batman!

Here's a question for you, Robin: When mild-mannered reporter Steve Burke changes into his alter ego, the renowned superhero known as *Papa Cupcake*, is it a *physical change* or a *chemical one*?

change, Batman!

That's right, Robin. Another example is when DoD STARBASE Day 3 students use "molecule jars" to simulate atoms vibrating at different speeds, based on their *phase*. Molecules in a *gaseous* phase vibrate with more *kinetic energy*, so students shake the molecule jars *faster*.



- Well, a *physical change* involves a change in state or appearance; no new substances are formed.
- When a *chemical change* occurs, the bonds between atoms break, and rearrange to form something *new*.

physical state-change demonstration. Extremely cold liquid nitrogen is applied to objects like marshmallows, popcorn, and balloons, to see what physical changes happen to them.

Cryo superheroes from AFRL also lead students in an interactive

Here's another question for you, Robin: Where in the *world*, in 2019, does Papa Cupcake find a *phone booth* to change in?!

Now We're TARCing

One egg hauled. Intact. 800 feet to apogee. Time of Flight: 40-43 seconds. And that's just to *qualify*.

But that's what Albuquerque Institute for Math and Science (AIMS) STARBASE 2.0 students are AIMing for; they've already started practice launches for this year's Team America Rocketry Challenge.



Papa Cupcake's *appearance* is what changes; the only "new" thing is his *cape*. So that'd be a *physical*

By the Tuesday of the week before the first class in the series, session, or semester, we will ask you for the name, driver's license number/state of issue, date of birth, and the FULL Social Security Number, of every adult coming through the base gate for that series of classes.



TECH Mission For Middle Schoolers

Technology and Engineering Challenges—Fall Rocketry and Spring Satellites Missions



Rocket Return

Continued from page 1

The rockets the students launched reached an estimated altitude of 1000 feet, and had names such as *Phoenix*, *Atlas*, *Apollo*, and *Gemini*. They were built beforehand by the students at an earlier visit to AFRL NM STEM Academy, where they also simulated a forecasted launch on a computer program called *RockSim*.

The students, with supervision and help from adult men-

much like a real-world rocket crew would, to prep and launch their rockets.

The Assembly teams packed the parachute. The Data Manager students checked the weather conditions. Range Safety Officer students counted down the launch, the Launch Control Officer students pushed the Launch button, and...the rockets took off like *lightning!*

As the rocket's parachutes deployed and the rockets returned to Earth, Spotter Teams tracked the rocket's

flight and directed the Recovery Teams to where the rockets touched down.

After the Recovery Teams had returned with the rocket, the students then disassembled it to retrieve reusable parts (parachutes and altimeters) and collect data.

Later, during Day 3, the students return to compare this data to their *RockSim* simulations and try to figure out why real-life launches, much like weather reports,

don't always follow the computer models!

A golden rocket to our friends in the ARS, Cacy's Bobcat Grading and Excavation, and Sandoval County Road Department...We couldn't have done this without your awesome efforts in preparing the launch site!

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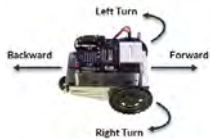
Robotics Challenge For Middle Schoolers

Brought To You By The Letter "S"

What do submarines and submarine sandwiches have in common?

1. They're fun,
2. People usually refer to them as "subs," and
3. As Oscar the Grouch from *Sesame Street* would say, they're both brought to you by the letter "S." Actually, now that I think of it, so is the name "Sesame Street."

Robotics Challenge Assignment 3 is also about subs and fun. Specifically, *subroutines* and *functions*.



Conjunction Junction, what's your function?

With Boe-Bots, they're called *subroutines*; with ActivityBots and cyber:bots, they're called *functions*. Either way, just in time for the Hour of Code next month (8-14 December, www.hourofcode.com), they are little packets of code, or computer programs, that allow your robot to perform specific tasks.

Assignment 3 asks students to write the code to make their robot



do certain specific movements and turns. Have them include comments in the code that describe each subroutine or function, the name of the program, the school, and team name and team members.

Assignment 4 asks students to apply their robotic movement and coding skills to the task of creating a video showing their robot moving like the letter "S." Note we didn't say how *big* the "S" had to be!



Both of these assignments are due **13 December 2019**.

Don't forget to send us your **Robot Pageant** pics (**Assignment 2**), due 10 January 2020, too.

Like this one, for example: A robotic Trash Can (with a hidden robot inside) from Washington Middle School.

Oscar the Grouch would be right at home here!



STEM Challenge For High Schoolers

Can We Use Alligator Eggs?

Suggested Timeline: Oct/Nov

What do you call an alligator in a vest? An *investigator*.

It's time for STEM Challenge students to become investigators, and initiate the **Launching Device Investigation** (600 points).

First, teams **devise** and **build** their launching device from our kit or from another design. Have teams take pics/videos/explaining key parts of the design, including the trigger mechanism. Have



teams **configure it**, **test it** at least 10 times using a *hacky sack*, and collect data.



Then, student teams **characterize their payload trajectory** using *launch*, *ground*, and *canyon points*.

Coaches, please review the team's work before they submit it to CourseSites to earn points, and FYI, it's probably better to use regular hen's eggs rather than alligator eggs. I mean, what if they *hatch*!?

Hey, this is a croc: Why did the regular, ordinary potato get a job calling plays at football games?

Because he was a *commentator*.

Look, Logos!



Team 12--
The Unwants



Team 13--
.415 Season



Team 14--
Champions

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Important Terms and Acronyms

AF: Air Force

AFB: Air Force Base

AFRL: Air Force Research Laboratory

AFRL NM: AFRL New Mexico (AFRL/RD and AFRL/RV), on KAFB

AFRL/RD: The Directed Energy Directorate of the AFRL

AFRL/RV: The Space Vehicles Directorate of the AFRL

DoD: Department of Defense

KAFB: Kirtland Air Force Base, Albuquerque, NM

METS: Mars Exoplanet Transient Satellite (METS) Mission 2019-2020

MM: Mission to Mars

PRS: Phillips Research Site

S&Es: Scientists and Engineers

STEM: Science, Technology, Engineering, and Math

TECH: Technology and Engineering Challenges

USAF: United States Air Force

Remember, Teachers:
Get those EPA
Modification forms in!

Rocket Info



In our TECH Mission Rocket Launch this year, ten schools launched four-foot model rockets:

Baca Community School, Christ Lutheran, Cleveland Middle School, Isleta Elementary, Menaul, Mesa View Elementary, Peralta Elementary, St. Charles Borromeo, San Felipe Pueblo Elementary, and Washington Middle School.

They launched a total of 25 rockets; *Phoenix* and *Spirit* led the pack with six rockets each. However, a full 20% of the rockets were named *Apollo*.

Atlas and *Gemini* tied for three each; plus there was one *Mercury*, and one *Saturn*.

Not to mention the "*Pebbles* and *Blossom*" rocket!

Jim's Award

Congratulations and a big STEM shout-out to our friend and long-time AFRL NM STEM Academy participating Magdalena teacher Mr. Jim Sauer!

He just won the KOB-TV4 "Pay it 4ward" award for his tireless work and dedication to STEM, in this case for hosting extra-curricular events at the Kids' Science Café in Magdalena!

"The parents are just amazed with what he's doing, how much the kids are more enthusiastic about attending school.

They know exactly what they want to do when they graduate," said Magdalena resident James Chavez, who nominated him for the award. "It's doing everything that schools should be doing."

No one deserves it more than you, Jim! *Congratulations!*

See www.kob.com.



BBBS Discovery

The Big Brothers/Big Sisters Discovery STEAM (Science, Technology, Engineering, Arts, and Math) Festival will be held Friday, 22 November from 9:00 am to 3:00 pm at the Albuquerque Convention Center. It's FREE! We'll have a booth there, too... look for us!



"I've always loved science, so this is, like, the best thing ever," said Cleveland Middle School eighth grader Josilyn Bernard, 13. "It's science all day, instead of science for an hour. I like shooting the rockets off and then trying to see where they are going to land. Where is it going? How far is it going to go?"

Rocket Class is based on the motor's *impulse* (*thrust power* divided by *burn time*, measured in *Newton-seconds*). Each letter represents *twice* as powerful a motor as the previous letter. G is twice as powerful as F, which is twice as powerful as E. The TECH Mission students were launching "G-motor" rockets; the largest category still called a "model" rocket!

In the 13th century, the Chinese were using black powder-propelled fireworks, but it was Orville H. Carlisle, a shoe salesman in Norfolk, Nebraska, who really invented model rocketry. In 1954, he developed his first model rocket, the *Rock-A-Chute Mark I*. Only two original "Rock-A-Chute" models are still around, both of which are preserved in the *National Air and Space Museum*.



AFRL Scholars



The *AFRL Scholars Program* is an internship program aimed at providing upper-level high school, undergraduate, and graduate students, and professional educators, with opportunities to pursue research interests and develop professional skills...

...With the ultimate intention of increasing the diversity of the STEM workforce and maximizing the success of our nation's defense!

Learn more at <https://afrlscholars.usra.edu>.



AFRL Scholars Program is currently accepting applications for summer 2020 internship opportunities at multiple sites!

Please share this notice with eligible students, and direct them to the application at <https://afrlscholars.usra.edu/students>.

Coming Next Issue...

- Mission Patch, Mars Facts, and Sagas
- News, Info, Fun.. and Holidays!

Watch for it!

