

# AFRL

## NEW MEXICO STEM OUTREACH

Inspiring Future Scientists and Engineers

## AFRL NM STEM ACADEMY

Star Date: Feb 2024  
Volume XXI, Issue 6

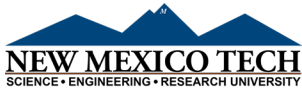


# The Rocket Report

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In partnership with:



Collaborator:



**Remember, Teachers:**  
It's never too early to make bussing arrangements for our classes and events!

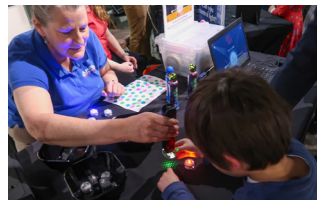


## Welcome To the Future

Welcome to February 2024, a short month that's tall on STEM!

In addition to our Missions, on 10 February 2024 we went to the National Museum of Nuclear Science & History ([www.nuclearmuseum.org](http://www.nuclearmuseum.org)) to help them celebrate **Discover STEAM Day 2024!**

Visitors to our booth made "light work" of our optics activities. They used diffraction grating to discover the light overhead was made up of many colors, while laser light had only one; used lasers to draw on photosensitive paper; bounced lasers around corners using virtual and real mirrors; and aimed laser light at targets spinning on a wheel.



On 13 February 2024, we went to **Rio Rancho Elementary's Science Night** and helped students explore static electricity.



Then there's **DiscoverE Engineer's Week**, 18-24 February 2024; a [week](#) to celebrate how engineers make a difference in our world. The theme: **Welcome to the Future!**

On DiscoverE's **Introduce a Girl to Engineering Day**, volunteers, educators, and others act as role models, facilitate engineering activities, and show girls how engineers change our world.

This year, [Girl Day](#) happens to fall on 22 February 2024...which is also the date of our **Mission to Mars Mid-Year Meeting!**

## Welcome To the Past

As we welcome the future with STEM, we also celebrate how far we've come!

The first Link-Up Day event for our [Mission to Mars](#) program was held **30 years ago** at a hangar on Kirtland AFB during the spring of 1995.

In April 2024, more than 1,000 5th grade students will participate in the 30th Mission to Mars Link-Up Day event at the Albuquerque Convention Center.

On 15 March 2004, AFRL hosted a ribbon-cutting ceremony for the opening of the new [DoD STARBASE NM](#) facility at



Kirtland AFB.

Now, the program, which **turns 20 this year**, is in a *larger* facility with *three* dedicated classrooms for this amazing program!

To celebrate these milestones, we're asking former participants to share their Mission to Mars and DoD STARBASE NM memories and pictures.

To share *your* memories, click [this survey](#).

## Welcome To the "Mew" STARBASE Assistant Director



Rare, powerful, and playful—that describes the Psychic-type Mythical Pokémon known as "Mew."

It also describes our new STARBASE Assistant Director, Pua "Mew" Gabaldon.

With a Master's in Biology and a minor in Biochemistry, she has years of experience teaching K-12 students a unique blend of reading, zoology, math, science, and general and organic chemistry.



Your **commitment** to this mission is crucial to its success



# Mission to Mars

For Fifth Graders

Mars Safeguarding Through Asteroid Redirection Spacecraft (STARS) Mission 2023-2024

## Food for Thought



Food for thought: Think about food on Mars, and on the way to Mars. NASA does!

For example, NASA thinks tortillas are better than bread: They're easily stored since they lay flat; and they don't make crumbs that could interfere with equipment. NASA also discourages seasonings, as they can get messy in a spacecraft.

Sodas don't work well in space, because it turns out microgravity doesn't mix well with the carbonated bubbles.

Fortunately, the only space travel our Mission to Mars students do is on a *school bus*, so we're not as restrictive as NASA!

Crews use teamwork, problem-solving, and math to plan their own Link-Up Day lunch,

taking into consideration *mass*, *volume*, and *nutrition* requirements.

Lunches should include at least *236 mL* (8 fluid oz.) of liquid per crew member; total food and liquid mustn't exceed *568 grams* (20 oz.) per crew member, carried in 12 or fewer 1-gallon zip-lock bags. (Teacher's Resource Guide pp. **79-80**). Teachers and adults follow the same lunch requirements as the students.

## Farewell, Ingenuity... But Wait, There's More...

The pioneering Mars Helicopter *Ingenuity* has flown its last flight; its rotor blades got damaged during a recent landing. Originally scheduled for only five flights, "Ginny" ended up making *72 flights* in three years. But while the 'copter is down, the legacy lives on!

The Smithsonian [National Air and Space Museum](#) in Chantilly, VA will soon have the *Ingenuity* prototype model on display.

NASA is already testing the next-gen faster, stronger Mars Sample Recovery Helicopters (SRH), and plans to make a solar-powered Mars water-searching plane named MAGGIE (Mars Aerial and Ground Global Intelligent Explorer).

## Uniforms

Uniforms provide groups with a sense of identity, safety, spirit, and purpose. Each Mission to Mars crew designs their uniforms in advance of their journey.



Uniforms don't have to be fancy; matching T-shirts and jeans will do. Mission patches, headgear, and other accessories are optional (see pp. **77-78** in the Teacher's Resource Guide).

Students, teachers, and assisting adults also wear a *nametag*, as part of their uniform, including:

- School, Student, and Teacher Name;
- Colony Habitat Number (the habitat each crew is assigned to).

## Kahoot! Kontinues

The Mars Fact Challenge Kahoot! games are continuing. Challenge #3 will be up through 23 February 2024, and then it's on to Challenge #4!

Congratulations to all the students who are getting a perfect score and following nickname protocol directions!

See <https://afrlnm.com/stem/missions/mission-to-mars/mars-kahoot-games/>.



## Mark Your Mobile

It's the **30th anniversary** of the Mission to Mars, and it's not too early to Mark Your Mobile, specifically the calendar app in it, for the mandatory Mission to Mars Mid-Year Meeting coming up on 22 February 2024, 12:30-3:30 pm. Make your arrangements now!



## TECH Mission

For Middle Schoolers

Technology and Engineering Challenges—Rocketry and Satellites Missions

## It's a Snap!

Spring semester of the TECH Mission has started, and for students studying satellite science during Day 1, it's a snap!

AFRL's Space Vehicles Directorate pioneered a new way to build satellites a few years back. Instead of custom-building each new satellite from scratch, they came up with a flexible "Plug-and-Play" design that enables satellite construction to go much faster.

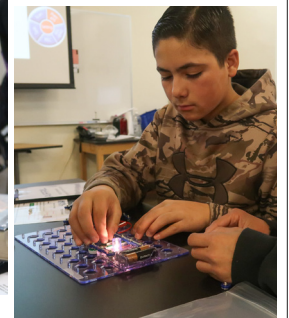
Components like cameras and sensors are snapped and un-snapped, as needed, from the satellite's frame, sort of like LEGO® bricks, and plugged in/unplugged using standard ports similar to USB connections.

TECH Day 1 students explore the basics of streamlined satellite construction when they assemble a **paper Hexsat** from a single sheet of paper and two metal links.

Students also explore the basics of streamlined circuitry construction

when they snap components onto a board to build series and parallel Snap Circuits.

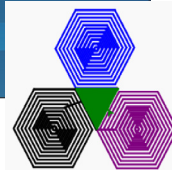
Day 1 students also learn binary math and begin programming a micro:bit microcontroller.



Prior to the first session, 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.



# Robotics Challenge For Middle Schoolers



## Line Forms Here

As Robotics Challenge teams work through **Module 3, Building and Controlling a Robot**, students learn how to code their *servos* to move and turn their cyber:bot.

Another task is to attach what they call “QTI” sensors, which enable the cyber:bot to sense and follow lines!

This simulates what some big real-world robots do!

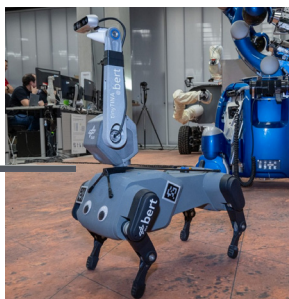
Astronauts on the International Space Station recently learned how to control Bert, a dog-like robot, from space, during a real-world



Mars Mission simulation.

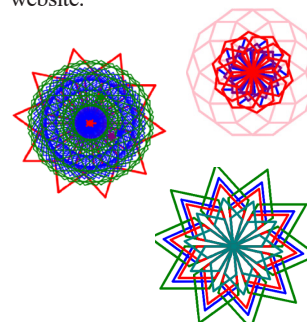
In China, there’s an automated tram-bus called [Autonomous Rail Rapid Transit](#) (ART) that’s programmed to follow lines instead of tracks, much like the cyber:bot does!

Questions? Suggestions? Contact: [caitlin.everhart@afinewmexico.com](mailto:caitlin.everhart@afinewmexico.com)!



## Mosaics

More Module 1 turtle mosaics! We’ve updated the [Turtle Mosaics](#) page in the Robotics Challenge section of our website.



# STEM Challenge For High Schoolers

## Int-egg-ration

**Suggested Timeline: Feb-Mar**

This is the leg of the STEM Challenge mission where catapults get their sea legs—when high school teams int-egg-rate (combine) and test their payload protection and launching devices.

Teams place a 3’ target 30’ away from the launching device, select a launch configuration (arm stop setting, tension setting, arm length, number of rubber bands, etc.), and launch a juggling ball that is the same mass as a raw hen’s egg multiple times, and record/analyze the results.



The “Spring Fling” will be here before you know it! **15 March 2024** is the last day to submit challenges to qualify for the STEM Challenge Symposium, and **26 March 2024** is the last day to earn points. Only the top 30 teams will get invited!

The Symposium is on **11 April 2024** this year, 8:30 am -1:30 pm.

## More Logos Hatching

In STEM Challenge Module 1, student teams are asked to choose a team name and design a team logo that represents the team and the mission.

More logos are hatching, and they’re *still* cuter than baby chicks!



**Team 2— Galantis**



**Team 5— Deviled Eggs**



# DoD STARBASE NM For Fifth Graders



## STEM Scavenger

In DoD STARBASE NM, now in its [20th year](#), our fifth grade student engineers in Day 1 explore 3D CAD software PTC *Onshape* to help a character named Bunsen search a computer aviation model called *Starship: USS Zirconium* to look for hidden objects in a virtual *scavenger hunt*.

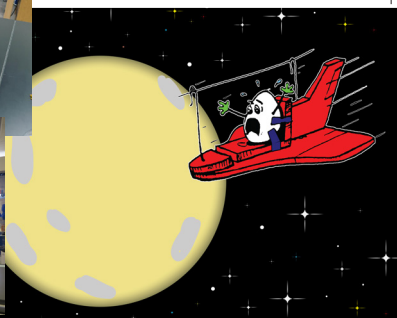
Knowing how to determine the mass of objects comes in handy

when the students design, test, and redesign a restraint system to save Eggbert the Space Shuttle Pilot as he crashes on the “moon.”

Students also work with shapes and

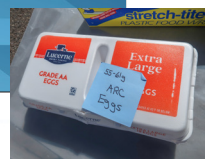


areas in a Landing Dock activity, and discuss various scientific tools.



**Prior to the first session, 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.**





# AFRL NEW MEXICO STEM OUTREACH

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Mr. Steve Burke, Technical Writer.

## 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

**MM:** Mission to Mars

**S&Es:** Scientists and Engineers

**STARS:** Mars Safeguarding Through Asteroid Redirection Spacecraft Mission 2023-2024

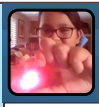
**STEM:** Science, Technology, Engineering, and Math

**TECH:** Technology and Engineering Challenges

**USAF:** United States Air Force

**USSF:** United States Space Force

**Remember, Teachers:**  
Get those EPA Modification forms in!



# DoD STARBASE NM (continued)

## Advance Advances

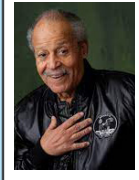
STARBASE Advanced has advanced to ARC-class rockets! Students are now building and launching rockets that meet the rigorous design specifications of the American Rocketry Challenge (ARC).

The [American Rocketry Challenge](#) is the world's largest rocket contest with nearly 5,000 students nationwide competing each year.



## STEM Bytes

### Pioneers and Imagineers



Once upon a time, engineer, test pilot, and sculptor Ed Dwight, 90, was on track to become the first black astronaut.

His story is finally being told. A documentary now streaming on National Geographic Channels, Disney+, and Hulu, called [The Space Race](#), “weaves together the stories of Black astronauts (like Ed Dwight) seeking to break the bonds of social injustice to reach for the stars.”



special effects such as making state-of-the-art Star Wars lightsabers,” has been inducted into the National Inventors Hall of Fame!

According to Disney, Lanny is the first Disney Imagineer to receive this prestigious honor, and only the second individual from The Walt Disney Company to be inducted – the first being Walt Disney himself.



### Imagineers

Lanny Smoot, [Disney Imagineer](#), the “genius behind incredible

### \$cholarship Open\$

The 2024 Advancing Young Women in STEM [scholarship application](#) (\$500, \$750, and \$1,000) is open now through **18 March 2024**.

Women remain underrepresented in STEM professions and there is a need to inspire the next generation of female innovators and leaders. This scholarship is designed to assist and encourage young women



pursuing a STEM career; see [nmost.org/young-women-stem/](https://nmost.org/young-women-stem/).

### ACF Scholarships

The Albuquerque Community Foundation [www.abqcf.org](http://www.abqcf.org) lists a number of scholarships available for graduating high school students, including several

STEM-related ones!



### STEM Scholarship

**AEROSPACE**  
The Future STEM Leaders Scholarship program will provide a **\$5,000 scholarship** to a selected Albuquerque high school junior/senior (juniors preferred) interested in pursuing a STEM degree.



See <https://aerospace.org/> for more info. Apply by **3 May 2024**.

### Science Olympiad



New Mexico Tech will be hosting the 23 STEM events of the **New Mexico State Science Olympiad on Saturday, 24 February 2024**.

See <https://www.nmt.edu/stem/olympiad/index.php>.

**Teachers: Need help with the Mission to Mars, Robotics Challenge, or STEM Challenge missions?**

**There's Zoom "office hours" with our staff every Thursday (excluding holidays) from 4:00 – 5:00 pm.**

Email [caitlin.everhart@afrlnewmexico.com](mailto:caitlin.everhart@afrlnewmexico.com).

### Coming Next Issue...

- Mars Habitat Construction
- DoD STARBASE Day 2
- STEM Challenge Final Report

**Watch for it!**

