

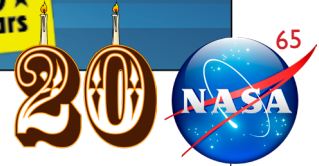
Inspiring Future Scientists  
and Engineers

## AFRL NM STEM ACADEMY

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# The Rocket Report



## STEM and Anniversaries are Falling

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Fall is starting this month, and the STEM is falling like leaves around here.



So are the anni-STEMiversaries.

Mission to Mars, which is celebrating its 30th year this school year, kicks off its trip to the STARS with its New Teacher Training this month.

It's also the 20th anniversary of our DoD STARBASE NM program for fifth graders this school year; not to mention next month is the "special collector's edition" 20th anniversary issue of *this* newsletter!

STARBASE 2.0/3.0 (now called STARBASE Advanced NM) students are already building rockets.

TECH Mission middle school students are already building even *bigger* rockets, and Robotics and STEM Challenge Missions are gearing up.

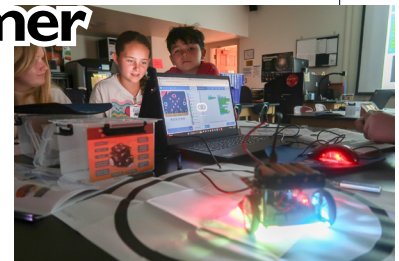
Even NASA's 65th anniversary of operation is in a few weeks, on 1 October 2023, for those who are counting.

## What We Did This Summer

We had a busy summer STEM-ing our cares away.

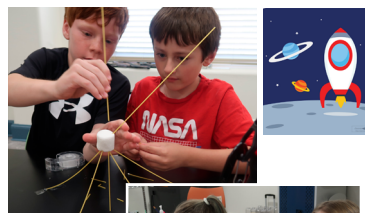
### Summer STEM Space Camp

We *also* held two separate weeks of Space Camp, for rising 3rd-4th graders, from 12-23 June 2023. Students did everything from astronaut training and making spaghetti Lunar Landers to constructing Oreo Cookie moon phases!



### DoD STARBASE NM Summer STEM Camps

We held *two* separate weeks of STARBASE Summer STEM Camp, from 5-16 June 2023, and boy, was it full of STEM! Rising 5th-6th grade students made molecular models and elephant toothpaste, explored robotics and flight simulation, and more!



### TAI Aviation Camp

The five-day Tuskegee Airmen, Inc. Summer Youth Aviation Camp, 5-9 June 2023, which we helped support, taught students enough about aviation to fly Civil Air Patrol (CAP) Cessnas with a CAP copilot.



### Robotics Camp

After studying sensors and programming from 20-23 June 2023, rising 7th-9th grade Robotics Camp students pitted Sphero vs. Maqueen robots in the 2023 Robot Olympics! Where's Bob Costas?



### STEMys, STREAMing, TAI Nat'l Conference

See p. 4 for more summer fun, like the STEMys, Career STREAM presentations, and our booth at the TAI National Conference.



Collaborator:



### Remember, Teachers:

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



# Mission to Mars

For Fifth Graders

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



## A Good Year to Turn 30

### NASA Turns 65

Once upon a time, in 1915, Congress established the *National Advisory Committee for Aeronautics* (NACA), to promote aeronautical research and development. In 1957, the first man-made satellite, *Sputnik 1*, was launched. The great space race was *on!*

And that's why, on 29 July 1958, NACA evolved into the *National Aeronautics and Space Administration* (NASA), with the signing of the National Aeronautics and Space Act. NASA officially became operational 65 years ago, on 1 October 1958.



That's right! This year, NASA is celebrating their **65th** anniversary!

### Mission to Mars Turns 30

Then, *thirty* years ago, we started offering the Challenger Center's *Marsville®*, the *Cosmic Village* program, modified it to include some Air Force technologies and terminologies, and created what was then known as the *Mars Missions Flight*. That's right...*Mission to Mars* picked a **good year to turn 30!**

We've been turning students into possible future scientists, engineers, and astronauts ever since.



### Where to Turn

Besides *this newsletter*—which turns 20 this year, by the way—teachers and students can turn to our **website**, [www.afnlm.com/stem/missions/mission-to-mars](http://www.afnlm.com/stem/missions/mission-to-mars), for information about this year's "30th anniversary edition" of the *Mission to Mars*. There's a button there which links to a form teachers can use to register online.



Mars teachers and students can turn to the **Teacher Resource Guide** and **Student Journal** to help understand Base (classroom) Operations.

Questions? Suggestions? Turn to [amanda@afrlnewmexico.com](mailto:amanda@afrlnewmexico.com) for help!

### Training

For teachers new to the *Mission to Mars*, turn to the **in person** training for new teachers at our facility on **Wednesday, 4 October 2023 from 9:00-3:00**.

Returning teachers, *welcome back!* There's a virtual "refresher course," on Zoom, at 3:45 pm on **Wednesday, 20 September 2023**.

### Mars Turning

Between all the rovers, orbiters, and Mars missions, if enough visitors show up, Mars may turn into a *tourist trap!*

Where's my lost shaker of salt?



## More Manned Mars Missions

We're not the *only* ones who have been thinking about, or *simulating*, manned missions to Mars lately!

### Stars on Mars

Watched Fox recently? You may have seen the reality TV star trek called "Stars on Mars," hosted by Captain James T. Kirk himself, William Shatner! Or, as the contestants called him, "Shatty Daddy."

Twelve celebrity astronauts (celebrities) simulated living in a Martian colony (actually southern Australia) for several weeks, performing tasks and dealing with "emergencies," and then voting off the ones deemed less "mission critical." The week's winners would get an



achievement mission patch.

Interesting concept, but a *real* mission to Mars would probably include more *scientists* than *celebrities*, and they wouldn't be trying to vote each other off the island every week! Also, everyone *else* had to wear spacesuits outside, but Shatty Daddy seemed fine without one. Captain Kirk's got *skills!*

Congratulations to show winner Adam Rippon, Olympic figure skater, who received the coveted "Brightest Star" mission patch and beamed a victory message back to "Earth."



### CHAPEA

Meanwhile, since 25 June 2023, NASA has been conducting a more realistic version of a manned Mars mission simulation.



The Crew Health and Performance Exploration Analog (**CHAPEA**) is the first of three manned Mars simulations at Johnson Space Center in Houston.

The first 378-day "analog mission" has four astronauts working and staying in a 3D-printed habitat called *Mars Dune Alpha*.

### GMU Study

How many people would it take to survive on Mars? A recent [study](#) by George Mason University's Department of Computational and Data Sciences concluded it could be done with 22 colonists...about one *Mission to Mars* crews' worth!



- In any mission to space, **good teamwork is essential for survival**
- Each student impacts the **crew**; the crew impacts **many** crews from other schools
- Your **commitment** to this mission is crucial to its success



## TECH Mission

For Middle Schoolers

Technology and Engineering Challenges: Rocketry and Satellites Missions

### Rocket Building

The TECH Mission Rocketry semester is blasting off! Over the course of three non-consecutive curriculum days, middle school students get exposed to basic concepts in *rocketry* and *aerospace engineering*:

In Day 1, TECH Mission students study basic rocketry principles



such as *lift* and *thrust*, and begin building four foot long rockets.

Students assemble the *booster tube*, *payload*, and *motor mount* sections, including parts such as *centering rings*, *fins*, a *shock cord*, a *long coupler*, and a *nose cone*.

They also simulate its flight with a software program called *RockSim*.

Students explore global positioning satellite (GPS) rocket tracking, and build *straw rockets*, too.

Day 2, Rocket Launch Day, is scheduled for **17 October 2023**, weather permitting.

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.



# Robotics Challenge For Middle Schoolers

## Robots are Dropping In

Robots of all shapes, sizes, and functions are dropping in everywhere! Website [www.techjury.net](http://www.techjury.net) reports 12 million robotic units had dropped worldwide in 2020; between 2020 and 2022, there was about a 12% increase in dropshipments of robots worldwide.

That's a lot of robots out there, and so a lot of jobs are dropping involving robotics and coding. We need students to drop what they're doing and start studying these things! That's where the *Robotics Challenge* mission drops in.

Students explore the basics of systems engineering, computer science, and robotics by assembling and programming small robots to complete tasks.

Students submit work for each challenge to the Robotics Challenge Canvas website. They must complete one module before being allowed to move on to the next module.

- **Mission Module 1: Intro to Programming** opens 18 September 2023.



- **Mission Module 2: The micro:bit Micro-controller** opens 6 November 2023.

- **Mission Module 3: Robots** opens 16 January 2024.
- **Mission Module 4: Robotics Challenge Expo Preparation** opens 26 February 2024 and readiness submissions should be received by 5 April 2024.

Practice can continue, and access to info will be available, through the Expo.

This mission culminates in a

**Robotics Expo event on 10 May 2024** where the top 30 qualifying student teams demonstrate what they have learned through robot performance, team creativity, and a Quiz Bowl game.

## New This Year

Students and coaches will have access to weekly drop-in "office hours" with STEM Academy staff via Zoom every Thursday (excluding holidays) from 4:00 – 5:00 pm.

Questions? Suggestions? Contact [caitlin@afilnewmexico.com](mailto:caitlin@afilnewmexico.com) for help!

# STEM Challenge For High Schoolers

## Let's Hatch a Plan

An *egg-gineer* applies scientific knowledge, mathematics, and egg-genuity to develop solutions to technical, social, and egg-economic problems.

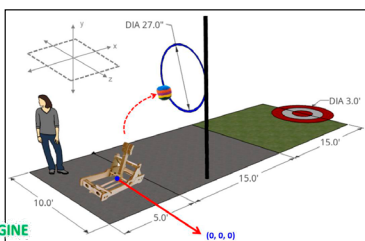
The *Egg-gineering Design Process* provides steps that assist an egg-gineer in clearly understanding a problem and developing a solution to crack that problem.

The STEM Challenge Mission plan we've hatched introduces students to egg-gineering by having teams of 3-4 high school stu-



dent students solve the technical problem of how to remotely launch an egg payload through a vertically suspended hula hoop and have it land, intact, on a target 30 feet away.

There are six distinct STEM Challenge challenges: Team Identity,



Launching Device Design/Build, Payload Protection Device Design/Build, Launching Device Characterization, Payload Device Characterization, and Data and Results Summary.

The first challenge, **Team Identity**, involves creating a

team name and designing a team logo.

The STEM Challenge Canvas website opens the last week of September, so that's when teams can start submitting Challenge 1. Let's get cracking!



# DoD STARBASE NM For Fifth Graders



## Twenty Years and Engineers

In the five-day DoD STARBASE NM program—which is celebrating 20 years this year!—the theme for one of the days is Engineering.

Participating fifth grade students, who are generally only about half as old as the program itself this year, explore a number of hands-on activities that involve engineering.

Take Albuquerque School of Excellence, for example.

When they came out for their Engineering day, the STEM was non-stop!

Well, that's not completely true. Eggbert the brave shuttle pilot kept coming to a very abrupt stop on the moon, or at least at a picture of one on the wall. To protect him, student teams engineered a payload protection system to cushion his landing.

Students also used the area of squares and triangles to

determine whether a proposed rectangle or octagon was the better drone landing dock shape, and hunted for lost objects on a virtual 3D spaceship.



**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.**

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<https://www.youtube.com/channel/UC-QuOSd1XTkYuXPONZwIAIHQ/videos>

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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)

## Advanced Advances for ARC

STARBASE Advanced NM (formerly known as STARBASE 2.0/3.0) for middle/high school students, is underway!

Students from Albuquerque Institute of Mathematics and Science (AIMS), Albuquerque School of Excellence (ASE), and Del Norte High School are participating.

Teams of students, working with STEM mentors, are already building model rockets in preparation for entering the American Rocketry Challenge (ARC) <https://rocketcontest.org/>.



Our staff completed several ARC-class rocket test flights earlier this month in preparation for the upcoming competition.

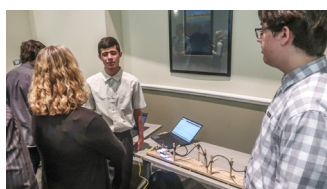


## STEM Bytes

### What Else We Did This Summer

#### Career STREAM Presentations

Career STREAM, the paid summer apprenticeship where high school students work with college men-



tors to solve problems in STEM, had teams working with UNM and NM Tech make their final presentations during July.

There were Lunar Rovers, remote sensing Unmanned Aerial Vehicles, security systems, harsh-environment sensing robots, and an Optical Waveguide study. It was a steady stream of STEM!

#### STEMYs Awarded



Photo: Enrique Knell

On 22 June 2023, teachers, students, businesses, and volunteers were recognized at this year's New Mexico Excellence in STEM Awards, or STEMYs, hosted by the AFRL Tech Engagement Office.

The STEMYs honors individuals and

organizations in New Mexico each year who have made significant contributions to STEM education.

#### TAI Nat'l Conference

The national Tuskegee Airmen Inc. 2023 Convention took place on 17-19 August 2023 at the Crowne Plaza Hotel in Albuquerque. STEM Academy staff were on hand with Ozobot and Sphero robots for the Youth STEM Day portion of the convention on Saturday.

Distinguished attendees Brigadier General Enoch "Woody" Woodhouse and General Lloyd W. "Fig" Newton visited with youth attendees, and posed for a great pic, too!



### In Other News

- AFRL Scholars Summer 2024 topics are being solicited from RD/RV S&Es. Questions? Email [AFRL-Scholars-Kirtland-AMOS@usra.edu](mailto:AFRL-Scholars-Kirtland-AMOS@usra.edu).
- The Air & Space Forces Association ([www.afa.org/grants](http://www.afa.org/grants)) and Albuquerque Public Schools ([www.aps.edu](http://www.aps.edu)) have STEM grant money to award, maybe to *your* classroom!

- Pioneering NASA "Hidden Figure" Evelyn Granville recently passed, age 99.
- India's Chandrayaan-3 mission recently landed on the lunar south pole.
- OSIRIS-REx is scheduled to return 24 September 2023 with a Bennu asteroid sample.
- The Psyche craft plans to launch to a \$10 Quintillion asteroid on 5 October 2023.



### Coming Next Issue...

- STARS on Mars
  - State Fair and NM Science Fiesta booths
  - Rocket Launch Prep
- Watch for it!**

