AFRL
NEW MEXICO
STEM OUTREACH

Inspiring Future Scientists and Engineers

AFRL NM STEM ACADEMY
MISSION PREVIEW 2020-2021

Star Date: Aug 2020
SPECIAL EDITION

The Rocket Report

For the 2020-2021 school year, we will be offering a modified version of our missions. This flexible adaption will be conducted using online resources and hands-on materials.

In This Issue...

In partnership with:

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Collaborator:

DoD STARBASE
A Department of Defense Youth Program

Reserving school buses for our activities will only be necessary if and when classes resume in our office facility on base.

Missions, With Some Modifications

Who We Are

At **AFRL New Mexico STEM Academy**, we inspire future scientists and engineers (S&Es), from fifth through twelfth grade, to study STEM.

We're an Air Force Research Laboratory (AFRL) STEM education outreach program on Kirtland Air Force Base (KAFB), through a Partnership Intermediary Agreement (PIA) with New Mexico Tech.

AFRL New Mexico STEM Academy takes the study of STEM out of the textbook and into an interactive, hands-on environment. Our activities focus on applications of basic STEM concepts behind technologies developed by AFRL's Directed Energy and Space Vehicles Directorates on KAFB.

AFRL NM STEM Academy offers several missions, designed for certain grade levels and aligned with Common Core and Next Generation Science content standards.

Missions

Mission to Mars is a Mars colonization simulation for fifth graders.

For the 2020-2021 school year, we will be offering a modified version of the mission, using online resources, to participating students. It will culminate in an online synchronous event, which we have traditionally called "Link-Up Day."

DoD STARBASE NM provides fifth graders an opportunity to explore physics, chemistry, technology, engineering, mathematics operations and applications, and STEM Careers.

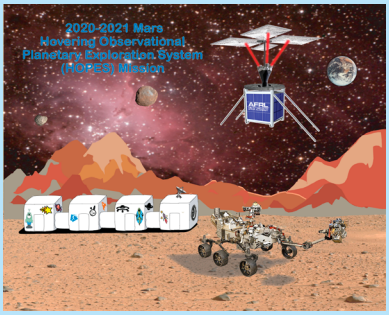
In the **Technology and Engineering Challenges (TECH) Mission** middle school students explore applications of basic STEM concepts and the engineering design process. This year's modified version of the mission, using online resources, will provide activities that focus on concepts related to satellite technology.

In the **Robotics Challenge**, middle school student teams explore the basics of robotics and coding. This year's modified version of the mission, using online resources, will involve Python coding and micro:bits, and Maqueen robots. It will culminate in an online version of our Robotics Expo.

For the 2020-2021 school year, the **STEM Challenge** Mission has been put on hold. We are working on alternate activities for high school students and will continue to monitor conditions to determine whether we can offer this mission beginning in the spring.

VIRTUAL Mission to Mars For Fifth Graders

Mars Hovering Observational Planetary Exploration System (HOPES) Mission 2020-2021



For the 2020-2021 school year, we will be offering a modified version of our Mission to Mars for all participating students. This flexible adaption will be conducted using online resources, include a subset of the curriculum we typically cover, and will culminate in an online synchronous event.

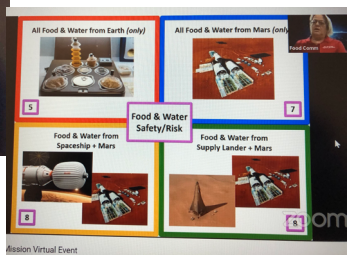
Mission to Mars Overview

Mission to Mars provides a unique hands-on learning opportunity for fifth grade students.

It's a simulated journey to Mars to establish a colony, based on the Challenger Center for Space Science Education's acclaimed *Marsville®, the Cosmic Village* program—modified to include Air Force technologies and terminologies.

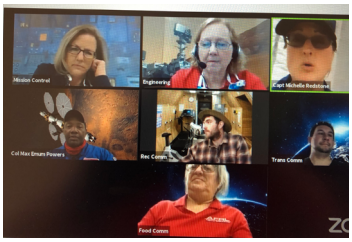
This year's modified mission, using online resources found at www.afrlnm.com/stem/2021-mars-hopes-mission, is a subset of the curriculum we typically cover, and culminates in an online synchronous event, which we have *traditionally* called "Link-Up Day."

Students engage in "base operations" activities such as studying Mars Facts, designing Mission Patches, designing and building Life Support System models, writing a song/dance



that tells the story of their journey called a *saga*, and designing/building a scaled habitat model to live and work in on Mars.

Colony Commander mentors from AFRL assist online by discussing the advantages and disadvantages of various life support system options.



DoD STARBASE New Mexico For Fifth Graders

DoD STARBASE NM Overview

DoD STARBASE is a premier educational program sponsored by the Office of the Assistant Secretary of Defense for Reserve Affairs.

AFRL NM STEM Academy implements this program for fifth grade elementary school students as **DoD STARBASE New Mexico**.

This year, we are tailoring this mission as a virtual, online program. Activities are grouped into five overall categories:

Engineering

Students work on concepts such as the Engineering Design Process (EDP), Material Properties, and Computer-Aided Design (CAD), with activities like Marshmallow Lunar Lander design, build, test, and redesign; exploration of shock absorber materials, and an introduction to Onshape CAD software with a virtual Scavenger Hunt activity.

Physics

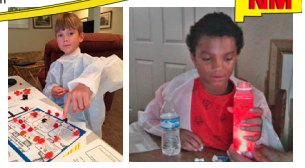
Students work on concepts such as Laws of Motion/Forces, Simple Machines, Energy Transfer (Types of Energy, and Potential vs Kinetic Energy), and a review of the EDP, with activities like Marshmallow Catapults and simple Rube Goldberg machine.

Technology

Students work on concepts such as Electricity and Circuitry, and CAD (Onshape) capabilities, with activities including creating a Paper Circuit, and designing a Gyrosphere using Onshape.

Chemistry

Students work on concepts such as the Properties of Matter, and Physical and Chemical Changes, with activities like Building Molecules and creating Lava Lamps.



Space

Students work on concepts such as a review of Laws of Motion and EDP, Astronomy (movement of bodies), and CAD, with activities including constructing and testing rocket nose cones and fins, and demonstrate the phases of the moon with Oreo cookies.

They also use Onshape to assemble a space station.

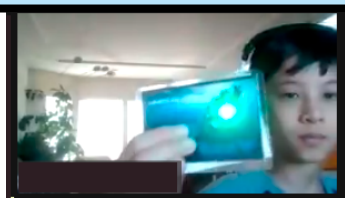
TECH Mission

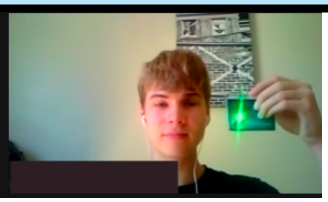
For Middle Schoolers

Technology and Engineering Challenges—Satellites Mission

For the 2020-2021 school year, we will be offering a modified version of the TECH Mission for all participating students. This flexible adaption will be conducted using online resources, include a subset of the curriculum we typically cover during the spring semester, and provide activities that focus on satellites.

TECH Mission Overview





The Technology and Engineering Challenge (TECH) Mission focuses on STEM and the engineering design process, applied hands-on to **satellite technology**.

Over the course of the mission, students investigate hands-on STEM concepts related to specific satellite engineering disciplines such as circuitry, electronics, and programming.

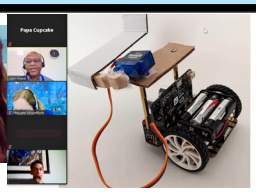
They apply these concepts hands-on in a variety of activities, such as making paper circuits, and Series & Parallel circuits with LEDs and copper tape; learning enough Python programming to understand code used in micro:bits and micro:bit sensors; and exploring the electromagnetic spectrum with activities such as constructing ultraviolet sensitive color-changing bracelets.

Robotics Challenge

For Middle Schoolers

For the 2020-2021 school year, we will be offering a modified version of the Robotics Challenge Mission for all participating students. This flexible adaption will be conducted using online resources, include a different robot platform, provide activities for individual students to complete, and culminate in an online event.

Robotics Challenge Overview



In the **Robotics Challenge** mission, students explore systems engineering, computer science, and robotics.

Students learn to build and program small robots to complete tasks and solve problems.

This year, we are offering a modified version of the mission for all participating students, using online resources, a different robotics platform, additional emphasis on individual activities, and culminating in an *online* event.

This year's mission involves the micro:Maqueen robot platform, using the micro:bit microcontroller and the Python programming language. Students complete online programming and robotics assignments, earning points towards the culminating online **Robotics Challenge Expo** event in the spring.

At the Expo, students demonstrate creative applications of their skills and knowledge, and complete various programming challenges.

STEM Bytes

For the 2020-2021 school year, we are putting the STEM Challenge Mission on hold for fall semester. We are working on alternate activities for high school students and will continue to monitor conditions to determine whether we can offer this Mission beginning in the spring.

Additional Web Activities

For additional online STEM activities, check out our STEM 101 (Chemistry, Engineering, Physics, and Technology 101) and Slice of Py (Python programming) pages at www.afrlnm.com/stem.