

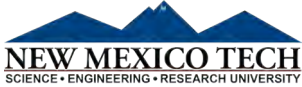


The Rocket Report

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In partnership with:



Collaborator:



Remember, Teachers:

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



The Rocket Mash

I was working in the Lab,
AFRL, one night,
When my eyes beheld
an eerie sight.
For my monster pulled
right from his pocket,
A monster four-foot
TECH Mission rocket!



He did the launch,
He did the Rocket Launch
He did the launch,
It was a launchpad smash
He did the launch,
It took off in a flash!
He did the launch,
He did the Rocket Launch!



Aah-oooh...
Rocket Launch, aah-oooh...

Happy Halloween



Try To Remember

Try to remember,
last month, in September,
The STEM was every-
where, good fellow!

Try to remember,
last month, in September,
When Maker Lab Express
spent the day at the Expo!

Try to remember,
the circuits so tender
we made with paper
to make a light glow.

Try to remember,
and if you remember
then follow!

Try to Remember, a song written by Tom Jones and Harvey Schmidt, was first sung by Jerry Orbach in the 1960 Off-Broadway production "The Fantasticks."



Solar Array, Oscillating Heat Pipes, the "Mumbo" and "Jumbo" Environmental Simulator vacuum chambers, and the AFRL Maker Hub.

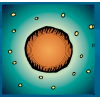
at Expo New Mexico for Science and Technology Day at the fair on 13 September 2019. Visitors got to tour the inside of the Maker Lab Express, and make postcard messages using 3D pens, punch tools, and paper circuits.

We hosted students from Jemez Pueblo's Walatowa Charter High School for a tour of AFRL on 19 September 2019. Students saw demonstrations of the Roll-Out

We also went back to Isotopes Park for the NM United soccer team's STEM Night on 28 September 2019. Visitors explored snap circuits and "soldered" (with scotch tape) their own special "I've Got the Power" LED badges, on paper, with copper tape "wires," to make a bright blue LED light glow from the center of a satellite picture.

Try to remember, even deep in December, that students studying STEM seek jobs of the future!





Mission to Mars

For Fifth Graders

Mars Exoplanet Transient Satellite (METS) Mission 2019-2020

Remember, Teachers:
Crews Per Teacher
forms are due.



Meet the METS Background

Scientists launched the Kepler Space Observatory space telescope in 2009 to search for exoplanets. When a star is observed getting slightly dimmer periodically, it indicates there's an exoplanet transiting in front of it. In this way, Kepler has found over 1,000 exoplanets.

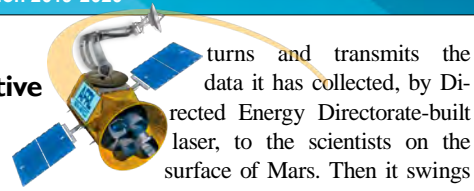
In April 2018, scientists launched the Transiting Exoplanet Survey Satellite (TESS) space telescope to improve on what Kepler learned.

This Year's Mission Objective

Meet the METS,
Meet the METS,
Step right up and
greet the METS!

In our mission scenario for this year, scientists are looking to improve on TESS by launching the Mars Exoplanet Transient Satellite (METS) mission.

Scientists on Mars launch an AFRL Space Vehicles-made space telescope, and send it into a highly elliptical, 14-day areocentric orbit around Mars.




turns and transmits the data it has collected, by Directed Energy Directorate-built laser, to the scientists on the surface of Mars. Then it swings out and begins scanning another patch of sky for 13 days straight.

Being farther out in the solar system, METS can scan dimmer, more remote stars than Kepler or TESS can. When METS finds a star with an exoplanet, this becomes a potential target for the coming James Webb satellite to focus on and study further.

Scientists and engineers responsible for supporting the Mars METS Mission will require a colony of long-term living quarters and food on Mars.

Fifth grade students participating in the 2019-20 Mission to Mars will plan and build the necessary facilities and life support resources for these researchers, and present them at the culminating Link-Up Day event in the spring.

If you meet the METS, step right up and greet the METS...and ask them if they ever noticed what METS spelled backwards is.

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

Making Beautiful Music Together

When your favorite band drops a new album, you can go to the concert and have a great time. Or, you can avoid the traffic, stay home, and simply download the songs onto your smartphone or computer.



Returning Mission to Mars teachers have essentially the same choice: Attend the *in-person* "refresher" training, this year held 26 September 2019—or take the *online* training, through 29 October 2019, on CourseSites.

Everyone should experience at least *one* good concert in person. For *new* Mission to Mars teachers, a **mandatory** full day of **in-person** training is scheduled for **Tuesday, 29 October 2019, 8:30-3:00 pm.**

Any way you do it, in person or online, we'll be making beautiful music together! Can't just download the *saga* onto your phone, though. The *students* need to drop *that* album!



For 13 days, the satellite uses four Directed Energy Directorate-developed seven-lens precision-optics cameras (much like TESS uses) to look at a specific area of space for any changes in star brightness that indicate an orbiting exoplanet transiting (passing) in front of it.

On the 14th day, at periareion (the closest orbital point to Mars; the equivalent of perigee in an Earth orbit) the satellite



DoD STARBASE NM

For Fifth Graders

Jumping Jack Flash, It's What?

Pick a carbon atom, any carbon atom. Be careful, don't drop it; it's kind of small. Now, *covalently double-bond* it to two oxygen atoms. What do you get?

Bond; James Bond.
[Insert *James Bond Theme* here.]

Just kidding. You get an incredibly useful material, that's what.

Jumping Jack Flash, it's a *gas*! Carbon dioxide (CO₂) is a colorless gas found in trace amounts in Earth's atmosphere, and it has all *sorts* of uses. Double-O Seven may not even *know* about some of Single-C O-Two's coolest uses.

Plants *photosynthesize* carbohy-

drates from CO₂ and water, with oxygen as a byproduct. Which is handy, because then we breathe the oxygen.

CO₂ is used in welding and fire extinguishers; it's a supercritical fluid solvent in the decaffeination of coffee; it makes soft drinks fizzy; and if it's cold enough, it turns solid and makes *dry ice*.

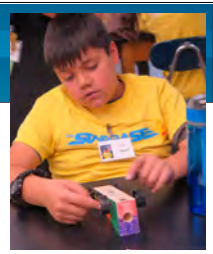
Fifth grade students participating in DoD STARBASE NM Day 2 use CO₂ as *fuel*.

It powers their seltzer-tablet rockets in their *Pop Goes the Fizz* activity. Teams of student chemists, engi-

neers, mathematicians, and recorders investigate how much seltzer-tablet CO₂ fuel is necessary to launch a rocket to a minimum height.

Students take a different track, a horizontal one, when they build and race little wooden dragster cars with different amounts of CO₂ canisters in the "trunk."

The gas escapes through a tiny hole in the back, which, thanks to Newton's Laws of Motion, makes the cars race down the track quicker



than a Jumping Jack Flash. Who knew CO₂ could do this, too?

Speaking of Newton's Laws, Day 2 students pull the wax paper "rug" out from underneath a pyramid of cups. They also use PTC Creo® 3D design software to create satellite stations on a computer. But it's all right now, because, in fact, that stuff's a gas, too.

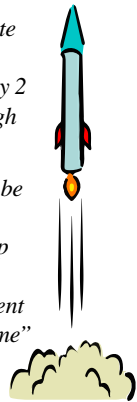
By the Tuesday of the week before the first class in the series, session, or semester, we will ask you for the name, driver's license number/ state of issue, date of birth, and the FULL Social Security Number, of every adult coming through the base gate for that series of classes.



Rocket, Man

They packed the 'chute just now, pre-flight Zero hour, TECH Day 2 Rocket's gonna be high as a kite real soon

And I think it will not be a long, long time Recovery Team'll help the Spotters find How far the rocket went from launchpad "home" 3-2-1, Go!
I'm a rocket, man!
Beepin' out my altitude, you know...



TECH Mission Day 1 students have been building rockets, and on Day 2, they're gonna *Rock It, Man!*

Day 1 students constructed their four-foot rockets, and built *straw rockets* as practice. They also simulate the four-foot rocket launch on *RockSim*. Weather permitting, on the Day 2 Rocket Launch event, **22 October 2019**, they'll find out how accurate their simulation was.

During Day 2, students will use a GPS unit to track how far their rocket went from the launchpad. So, during Day 1, they practiced finding the range of a rocket from a waypoint, using GPS.

Launch Day Tips

Teachers, if weather looks bad on launch morning, call the **Rocket Launch Hotline** at **(505) 401-5456** before you head out there, to verify launch is still a "Go."

Note: Our office is *closed* on Rocket Launch Day. We'll all be out at the launch site!

When getting ready that morning, consider weather-appropriate **layers, bottled water, sunscreen**, appropriate desert



footwear, and sun hats. Don't forget to bring lunch for the day!

At the launch site, *safety first!* Teams monitor weather and wind conditions, stay in assigned areas, and *everyone* stands during launch.

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

Domo Arigato, Mr. Roboto

I've got a secret I've been hiding inside my chassis
My heart is Parallax, my body Boe-Bot®, my brain Micro:Bit®!
So if you see me solving mazes Don't be surprised
I'm just a 'bot who needs a student to keep the challenge alive to program my drive
Robotics Expo we'll try
Robotics Challenge is why



The Space Llamas



The Galactic Narwhals

But it's going to take a lot more than sticks to build your Robotics Challenge team, team name, logo, and robot.

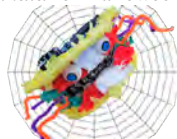
Your team should be wrapping up **Assignment #1: Logo**, and submitting it on www.coursesites.com, like Christ Lutheran's teams did:

In addition to the training materials for various robotics activities on CourseSites, you can also

2019-2020	8/26/19	9/2/19	9/9/19	9/16/19	9/23/19	9/30/19	10/7/19	10/14/19	10/21/19	10/28/19	11/4/19	11/11/19	11/18/19	11/25/19	12/2/19	12/9/19	12/16/19	12/23/19
Robotics Challenge																		
Robotics Expo																		
Robotics Pageant																		

see some cool training videos on <https://learn.parallax.com/>.

That's where you can learn how to make your own spooky robot *Taco Piñata* for Halloween:



Which leads to **Assignment #2: Decorating your robot** (take pics!) for the **Robotics Pageant!**

When building your robot, don't forget to *center your servos*, and connect a *micro:bit* to your *cyber:bots!*



The Expo is scheduled for **Friday, 20 March 2020!** *Domo arigato*, Robotics Challenge participants!

STEM Challenge

For High Schoolers

All Your Eggs In One Basket

STEM Challenge participants: I have a whole *basketful* of excellent ideas to *shell* you.

1. Think about the STEM Challenge you are working on, your team, and the *qualities* each team member possesses. Are they good at writing? Making graphs? Building things?
2. Then, using that information, decide on a *team name*, and develop a *logo* to represent the team.

3. Create an *eletronic version* of the logo, and submit it to www.coursesites.com.
4. List the team name and team member names *explicitly*, either in the document containing the logo, or the comments accompanying submission.

Do you realize what you've just done? *Eggactly!* You've just dunked **Assignment 1** right into the basket! We suggest the **October/November** timeframe for this.

See? Like *these* teams have done:



Team 4--
The Knights



Team 11--
Eggbeaters

Don't put all your eggs in one basket; work on the other assignments, too!

All assignments must be submitted for scoring by 13 March 2020, prior to the **STEM Challenge Symposium**, scheduled for **7 April 2020**.

If Louis Armstrong and Ella Fitzgerald had *known*, they could've sang Irving Berlin's tune together like *this*:

I'm Puttin' My Eggs in One Basket
I'm putting all my eggs In one basket I'm betting everything I've got on STEM I'm givin' all my love to one Mission Lord, help me get my eggie The hoop through

Louis *also* never realized that if Ella Fitzgerald had married Darth Vader, her name would be *Ella Vader*.



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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

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!

Make Space for Jobs

Space Talent Needed



Mars needs moms, but space needs talent. *Your* talent.

NASA and private companies like SpaceX and Blue Origin are racing to send manned missions to the moon, Mars, and elsewhere. There's a lot of space industry jobs that will be opening up very soon.

If you're thinking of getting a job in the space industry, you're in luck. A new job board, called *Space Talent* (www.jobs.spacetalent.org) opened recently.

It lists over 3,000 space field job openings from Blue Origin and SpaceX, plus smaller space-field companies such as Kymeta, Olis Robotics, Spaceflight Industries, and Tethers Unlimited.

Space Pioneers

UAE's first astronaut, Hazzaa al-Mansoori, returned safely to Earth recently after a week aboard the International Space Station.

Cosmonaut Alexei Leonov, first human to walk in space, passed away at age 85 and was laid to rest recently.



Meanwhile, the first *all-female* spacewalk, by astronauts Christina Koch (left) and Jessica Meir, was

scheduled for the very near future.

We salute all these space pioneers! See www.space.com.

Artemis Gateway

Artemis, twin sister of Apollo and goddess of the Moon in Greek mythology, and NASA's planned 2024 mission to put the first man *and* woman on the moon, already had a cool-looking logo.



New-Collar Jobs



Do you like to make things? Then you could get a "new collar" job.

What's a "new collar" job? A job that doesn't require a four-year degree, but does require specialized skills, such as computer skills.

According to www.learningliftoff.com, "These high-demand positions require schooling and training, but not a four-year college degree. Instead, vocational and technical training focuses on the precise skills the jobs require. These "new-collar" jobs generally command impressive salaries."

For example, Tech/Software jobs like Web Developer, Software Engineer, Application Developer; Medical jobs like Medical Assistant, MRI Technologist, or Optician; or other tech jobs such as Robotic Welder or Machinist, all pay around \$70,000-110,000 per year!

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!



GRANTS \$\$\$

HONDA
The Power of Dreams

The American Honda Foundation's next youth STEM education grant deadline for first-time organization applications is **1 February 2020**. The grant range is from \$20,000 to \$75,000 over a one-year period. Go to www.honda.com/community/applying-for-a-grant.



Each school year, the American Institute of Aeronautics and Astronautics (AIAA) (www.aiaafoundation.org) awards STEM education grants of up to \$500. Proposals accepted through **17 January 2020**.

AFRL Scholars



The AFRL Scholars Program at Kirtland AFB offers internship opportunities for high school and university students, as well as professional educators, in various programs and projects in STEM fields specific to the Directed Energy and Space Vehicles Directorates.

Application submissions accepted beginning 23 October 2019. Deadline: 14 January 2020, 23:59:59 CST. See www.afrlscholars.usra.edu/locations/kirtland.



Coming Next Issue...

- Mars is Neighborly
- Rockets Launched!
- Investigating Launching Devices

Watch for it!

