



AFRL LA LUZ ACADEMY

“CREATING THE POSSIBILITIES”



INSPIRING FUTURE SCIENTISTS AND ENGINEERS

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Sundance Students Show DoD STARBASE Flight to School Board

Each month, various Los Lunas-area schools are given an opportunity to go before the Los Lunas school board and highlight a special program or “extra something” that the school is doing with their students.

At the November Los Lunas School Board meeting, held 8 November 2011 in Los Lunas, NM, Sundance Elementary School highlighted that “extra something” they’ve been doing this year, which includes having their entire sixth grade student body participate in this year’s DoD STARBASE Flight at AFRL La Luz Academy!

Ten well-dressed Sundance students took turns presenting one or two Powerpoint slides each. Meeting attendees included superintendent Bernard Saiz, Sundance principal Mildred Chavez, assistant principal Denise Cannon, teachers Aletha Grugan-Redd (who kindly supplied the information for this article) and Carolyna Aparici, other Los Lunas school board members, principals from other local schools, parents, and other guests.

The presentation explained what AFRL La Luz Academy and the DoD STARBASE Flight are, and showed the kinds of hands-on science, technology, engineering, and math (STEM) activities the students are doing. The presentation also discussed a Math and



Science Family Night Sundance Elementary held recently.

The goal was to highlight how Sundance Elementary is keeping Science alive amidst a government push to make schools only teach Math and Reading in the Elementary ages. “We wanted parents, the public, and the school board to know that our school is still teaching Science, and will continue to do so!” said Ms. Grugan-Redd.

According to Ms. Grugan-Redd, the presentation was very warmly received, and the school board and other attendees wanted to know more about AFRL La Luz Academy’s Flights. “They were ecstatic about it and wouldn’t let me leave!” she said. Several of the school prin-

cipals recorded our information to pass word along to their teachers.

Sundance Elementary told the board that they would like to continue participating in our program every year for all the sixth graders at their elementary school.



Find Us On Facebook!



Now you can get your STEM fix and your social media fix at the same time.

AFRL La Luz Academy is now on Facebook. “Like” us, and you can access photos, videos, and other STEM information.



The whole universe likes this.

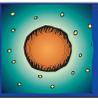
STEM Challenge TO Held

A new approach to the high school STEM Challenge Flight was presented at the Teacher Orientation on 17 November 2011.

See page 4 for details.

Seasons Greetings





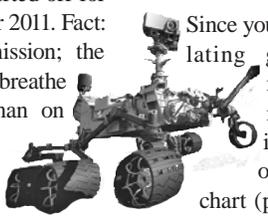
Mars Missions Flight

Microprobe Evaluation of Lava and Titanium (MELT) Mission 2011-12

The Fact Is...

Fact: The Mars Science Laboratory rover *Curiosity* lifted off for Mars on 26 November 2011. Fact: It's an *unmanned* mission; the rover doesn't need to breathe on Mars like a human on a *manned* mission would. Fact: That's a good thing, because the air on Mars is not like the air on Earth.

on Mars is 95% carbon dioxide, whereas on Earth it consists of 78% nitrogen and 21% oxygen.



Since your students are simulating going on a manned mission to Mars, it might be a good idea to see what else on the "Mars Facts" chart (pp. 57-60) might be more important for a human than a rover.

According to the "Mars Facts" chart in your Mars Missions Flight manual, the atmosphere

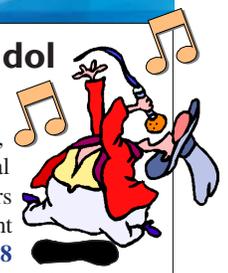
In fact, students incorporate four of these "Mars Facts" into their life support system model design.

There are learning tips built right into the chart, and games like "Mars Facts Bingo" and the "Mars Facts Card Game" in Chapter 6 of the manual, to help your students get their facts straight.

AFRL La Luz Academy
Mars Missions Flight
Mars Facts Bingo

100 MI million	France Waste	France Carbon Bioxide	120°F to 130°F F	100°F F to 127°F F
Blue Water, White Clouds, Green Vegetation	Road	Dark Surface Features	Mean Surface Features	Climate on Earth
Climate on Mars	107 Earth Days	104.7 Days	107.1 to 102.2 Earth Days	Earth 136 Faren
Mean Life Expectancy	12.75 Billion Years	107.1 to 102.2 Earth Days	107.1 to 102.2 Earth Days	2864 to 10000 Kilometers
23.5°	23.5°	Minutes	Mean Gravity	Earth's Atmosphere

Martian Idol



A *saga* is a story, sung or spoken, about historical events. The Mars Missions Flight sagas (pp. 37-38 in the manual)—which can be sung or spoken, with or without choreography added—describe the epic journey to Mars our student TEAMS are undertaking.

Performance opportunities at Link-Up Day include when the student TEAMS arrive at their habitat site, during Lunch on Mars inside the habitats, and for visitors passing through their habitat.

Points for the saga will be awarded on the students' TEAM Mission Logs, but don't worry—the judging is not as harsh as it is on *American Idol* or *X Factor*. Simon Cowell is not scheduled to be a judge at any of the Saga Performance Stations (whew).

Patch Work

Look at any photo of an astronaut in a flight suit. You'll see a *mission patch* on the suit.



The mission patch (pp. 39-56 in your manual) symbolizes the unique qualities of each TEAM and its mission. Tell your students to put some

thought and work into the design and look of their mission patch.

Components to include: Mission name (Microprobe Evaluation of Lava and Titanium); objective (colonize Mars); TEAM members' names; mission experiments (i.e. the life support system the TEAM will build); flags/colors representing mission participants;

patch shape and size. Each TEAM actually makes *two* mission patches:

- A small one that can be used to make nametags for each student on the TEAM; and
- A large (poster-sized) one to be displayed on the outside of the habitat on Link-Up Day.



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



DoD STARBASE Flight

STEM is So Cool

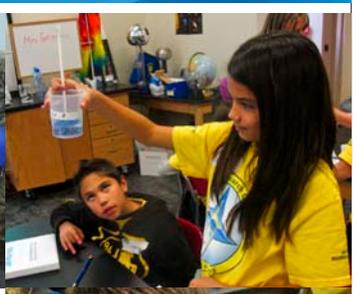
The STEM in DoD STARBASE Flight Day 4 is so cool.

Experts from the AFRL's cryogenics laboratory, including Mr. "Cryo" Mike Martin, Capt Erin Pettyjohn, Mr. Tom Fraser, and 2nd Lt. Benjamin Jewell, discuss

topics such as *states of matter* and *thermal dynamics* with the students, while performing an interactive cryogenic demonstration that includes flash-freezing marshmallows, popcorn, balloons, flowers, golf balls, and bananas in cold liquid nitrogen.

Students get to eat the chilled marshmallows and popcorn (edible STEM!), see cold liquid air inside the balloons, crush or wilt some brittle flash-frozen flowers, discover that the different materials in a frozen golf ball contract at different rates, and watch a frozen banana break in half.

Other activities the stu-



dents engage in during Day 4 include using *movement mats* and *molecule jars* to simulate how adding heat changes the states of matter, using a *tornado tube* to explore the properties of air, and using *chromatography* (a process to help determine the various substances in a mixture) to help determine which of four kinds of magic marker was used to write a message.

At least one week in advance, please give us the name of each adult per driver's license, the last four digits of their Social Security Number, and the estimated number of students you're bringing. Don't forget to turn in your Media Release forms, too!



Respect the Force of the Law

Boy, wasn't the Day 2 rocket launch fun? Now, in Day 3, DoD TECH Flight students are learning that by respecting the *force* of the *law*, *science* can seem like *magic*.

First, the students analyze and graph the data from the rocket launch on Day 2 and compare it to their rocket flight simulation data.

They discuss the *forces* (pushes, pulls, and twists) that acted on the rocket, namely *weight*, *thrust*, *lift*, and *drag*. The students also discuss ways the rocket launch dem-

onstrated *Newton's Three Laws of Motion*:

- The rocket sits at rest on the launch pad *until* and *unless* the engines produce enough thrust to launch it, demonstrating Newton's First Law, the *law of inertia*.
- Increasing the *mass* of the rocket while leaving thrust force the same would reduce the rocket's *acceleration* due to Newton's Second Law (*force = mass x acceleration*).
- When the engine produces enough downward thrust, the rocket reacts by moving upward, conforming to Newton's Third Law (*for every action,*

there is an equal and opposite reaction).

Students in Day 3 continue exploring the law of inertia in action by performing scientific feats of "magic" such as flicking cards out from under a penny, while the penny remains in place; and quickly pulling a sheet of wax paper from under a cup pyramid.

The students further explore the action/reaction law by experimenting with *Newton's Cradle*, a tool that shows the transfer of motion from one or more moving silvery balls on strings to the identical number of stationary balls.

They explore forces more forcefully using Vernier® force sensors and force plates. When a student jumps on a force plate, students read a graph that tells the story of the different forces involved. Students also draw happy and sad faces on a graph using push/pull forces on a force sensor.



Blog Log



Been surfing the web lately?

While you're doing that, check out the latest updates to the TECH Flight blog. There you'll find pictures and video from the TECH Flight rocket launch, to remind you of what a blast we had out there.

At least one week in advance, please give us the name of each adult per driver's license, the last four digits of their Social Security Number, and the estimated number of students you're bringing. Don't forget to turn in your Media Release forms, too!



Robot Systems Flight

How to Read Resistor Codes

When eighth grade Robot Systems Flight students make a test circuit with their stamp board, one of the electronic components they use is *resistors*.

See the resistors pictured on the right? Those colorful bands around them aren't decorations—they are actually *resistor codes* that tell how much resistance in Ohms the resistor produces.

So how do you read a resistor code?

First, the band on one end is usually gold or silver in color. Orient your resistor so that end is on the right.

Reading left to right, the first two bands tell you the first and second digits of the resistance number, as shown on the chart on the right.

So if the first band is yellow (4), and the second band is violet (7), the first two digits are "47."

The third band is the multiplier. It tells you how many zeros to add to the right of these numbers.

So if the third band was brown (1), you'd add a single zero to the right of "47" (multiplying it by 10) to get 470 Ohms of resistance.

The gold or silver (or blank) band on the end tells you the percentage, or *tolerance*, of error the resistor has above or below that resistance.

Gold is 5% tolerance, silver is 10% tolerance, and blank is 20%.

So, now that you know how to



Black		0
Brown		1
Red		2
Orange		3
Yellow		4
Green		5
Blue		6
Violet		7
Grey		8
White		9

read resistor codes, can you figure out how much resistance you used when constructing your Boe-Bot®?



Expo and Pizza

A Robotics Expo will be held at AFRL LaLuz Academy 10 December 2011, 10:00 am to 1:00 pm, to score the teams on the three (green, blue, and black) obstacle courses.

Just thinking about it makes us hungry, so the pizza's on us!

Challenges Met!

We've been posting challenges to the Robot Systems Flight blog... and the challenges are being met!

Challenge #2 involved solving a binary math problem. Eleven teams got it right! Challenges #3 and #4 involved sending us a team photo with your Boe-Bot® and a video of it moving...and we've got some of those in, too!

Way to go, teams!





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Important Terms and Acronyms

AF: Air Force

AFB: Air Force Base

AFRL: Air Force Research Laboratory

AFRL/RD: The Directed Energy Directorate of the AFRL (formerly AFRL/DE)

AFRL/RV: The Space Vehicles Directorate of the AFRL (formerly AFRL/VS)

DoD: Department of Defense

KAFB: Kirtland Air Force Base, Albuquerque, N.M.

LF: Leadership Flight

MELT: Microprobe Evaluation of Lava and Titanium

PRS: Phillips Research Site

PWN: Pinpoint WeatherNet

STEM: Science, Technology, Engineering, and Math

TECH: Technology and Engineering Challenges

T²: Technology Transfer

TTE: Technology Transfer for Education

USAF: United States Air Force

STEM Challenge Flight

New Approach to STEM Challenge Flight Presented at Teacher Orientation

At the STEM Challenge Flight Teacher Orientation, held 17 November 2011, a new approach to the STEM Challenge Flight was presented to the teachers.

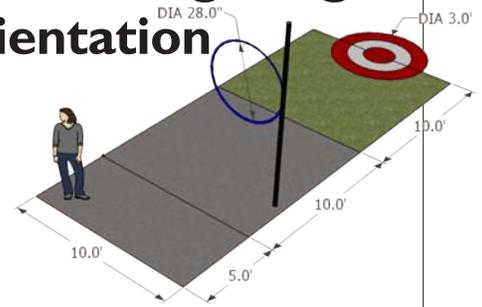
The high school student teams will be competing with each other on a common STEM Challenge:

Using a four-phase engineering design process, student teams will build a remotely-triggered mechanical launching device, within certain constraints, that safely launches a raw egg payload through a suspended hula hoop to land accurately on a target, without cracking the egg. Total cost cannot exceed \$100.

High school student teams will use *blended*

learning (combining brick-and-mortar school-type learning with at-your-own-pace online learning), working at their schools and interacting with us and AFRL scientists and engineers through a website called SchoolTown.

Student teams earning at least 3,000 points will be invited to attend the STEM Challenge Symposium competition on 24 April 2012.



The ten top-scoring teams will be eligible to participate in a two-week internship in June 2012, depending on funds availability.

The Kickoff Briefing is scheduled for Thursday, 12 January 2012 from 9:00-11:30 am.



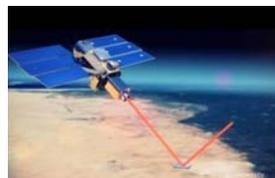
STEM Bytes

Ancient Egyptian Pyramids Discovered Using Satellites and Infrared Technology

The Discovery Channel recently aired an interesting program called *Curiosity: What Lies Beneath?* It showed how modern archaeologists are using satellites to photograph sections of the Egyptian desert using infrared cameras. The infrared light penetrates below the surface of the desert, revealing previously undiscovered ancient pyramids, cities, and other structures buried beneath the Egyptian sand.

The archaeologists can then dig very precisely and carefully in that area to uncover these historic sites.

See <http://curiosity.discovery.com/question/egypt-what-lies-beneath-videos> for more information.



Mars 500 Ends Successfully

The 520-day "Mars 500" Mars mission simulation, a real-life version of our own Mars Missions Flight, successfully ended recently. The international team of astronauts emerged from the capsule smiling and joyous. See www.esa.int/Mars500 for more information.



Coming Next Issue...

- Mars Missions uniforms
- Happy New Year/ New Semester
- STEM Challenge Flight begins

Watch for it!

