



AFRL LA LUZ ACADEMY

“CREATING THE POSSIBILITIES”



INSPIRING FUTURE SCIENTISTS
AND ENGINEERS

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The Rocket Report

New Year, New Semester

Newness is in the air. A new year is on the calendar, a fresh batch of resolutions are being made by people around the world...and a new semester is starting for sixth grade students participating in the DoD STARBASE Flight.

It's something new AFRL La Luz Academy is doing this school year. We've broken the DoD STARBASE Flight into two semesters. The first semester ended in December; now, in January, the second semester is starting.

That means we're going to go through all five non-consecutive days of the DoD

STARBASE Flight again this semester, albeit with a different set of classes attending.

The second semester will be much like the first.

Students will still have a Flight Simulation day, in which they listen to pilots and flight enthusiasts talk about their flying experiences; learn about the four forces of flight, airplane control surfaces such as wings, ailerons, and rudder pedals; and then try their hand at flying and landing a Cessna on a computer flight simulator.

One day will still feature an interactive cryogenics demonstration from Mr. "Cryo" Mike Martin and his associates, in which he flash-freezes marshmallows, balloons, flowers, and other items, while explaining concepts such as thermal mass and states of matter.



Another day will still feature activities that involve forces and Newton's Laws, such as experimenting with Vernier® dual-force sensors and force plates, and graphing the forces they measure.

Students will still have a day to explore rocketry by building and launching their own rockets; however, students will be working with bottle rockets this time around, instead of the six-foot rockets the first semester students built.

So don't worry, the semester may be new, but the hands-on science, technology, engineering, and math (STEM) activities for sixth grade students, inspiring future scientists and engineers, goes on!





Mars Missions Flight

Mars Cave Skylight Investigation (CSI) Mission 2010-11

Uniforms

Uniform (ju:nɪ.fɔ:m) *n.* Clothing of distinctive design worn by members of a particular group as a means of identification.

Each Mars Missions Flight TEAM is to design a uniform in advance and wear it to Link-Up Day. (For convenience, all TEAMS from the same classroom can design and wear the same uniform.)

Uniforms need not be elabo-



Hello My name is

(See pp. 99-100 in your handbook.)

All students participating in the Mars Missions Link-Up Day event must have a nametag as part of their uniform (see p. 101 in your handbook for examples). Teachers and other adults assisting with the mission must also wear a nametag.

The nametag should include the following information:

- School Name
- Student Name

rate or expensive. They should consist minimally of shirts and pants of the same color for each TEAM member, and a nametag.

Details such as headgear and mission patches may be included.

- Teacher Name
- Docking Habitat Number
- Colony Habitat Number

The docking habitat is where each student's classroom teacher is the Flight Director (where the teacher's TEAM A is), and the location that classes report to before departing for Earth.

The colony habitat is the habitat each TEAM is responsible for building.

TEAM Registration

Blank copies of the Mars Missions Flight [TEAM Registration Form](#) are included with this newsletter.

Please send us one completed form per TEAM by **28 January 2011**.



Print legibly. These forms will be used to generate the official certificates we distribute to each student at the end of the mission.



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

Support Life on Mars

If you've studied your Mars Facts, you know that humans need extra support to survive the harsh Martian environment.

That's why each student TEAM makes a life support system model from one of eight categories. *Note:* it's just a model, so it doesn't have to actually *function*.

Have students calculate the maximum size of their model, using the directions in your handbook (pp. 61-80). Remember, the life support system models need to fit on the bus that brings you to Link-Up Day, and also through the front door of the habitat.

Four (4) "Mars Facts" (pp. 57-60) must be incorporated into the system design. Three of the facts are labeled on the life support system model.

The fourth fact is labeled with only a "?" and made into a multiple-choice riddle that will be written on a poster. Riddles should be challenging, but not so hard that no one can get the right answer.

Students will read these riddles and multiple-choice answers dur-



ing the technical briefings. Audience members will be called on for an answer, and awarded a bonus card if they give the right answer.

So, have students prepare ten bonus cards (p. 63 in your handbook) to

award to the first audience member that gets the right answer to the riddle.

TEAMS may want to incorporate their mission patch when designing bonus cards.

DoD STARBASE Flight

Pilots Take to the Skies

Sixth graders attending DoD STARBASE Day 5 are flying into the future on Cessnas, using Microsoft® Flight Simulator.

They study the *four forces of flight* (lift, thrust, drag, and gravity), and *flight control surfaces* like ailerons, wings, and elevators.

The students learn about *Bernoulli's Principle*—faster-moving air creates lower pressure. Because of the shape of the wings on an airplane, this prin-

Don't forget to turn in your Media Release Forms!



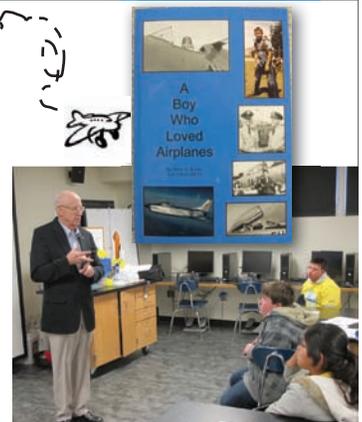
ciple causes the wings, and thus the whole plane, to lift.

They explore hands-on with activities like Bernoulli Bags, which uses this principle to help the stu-

dents blow extra air into a tube.

Pilots and flight enthusiasts such as USAF Colonel Donn Byrnes (retired), who worked on the SR-71 "Blackbird" plane and authored books such as *A Boy Who Loved Airplanes*; and Civil Air Patrol Colonel Roland Dewing and Major Ted Spitzmiller, discuss their flight experiences with the students.

Then the students take to the skies in their simulated Cessnas, using yoke and rudder pedal controls to practice taking off, turning, navigating, and landing.



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.



PETES PRS Flight

Providing Engineering and Technology Experiences for Students Phillips Research Site Flight

What Am I?

*Even though I resemble a flower,
My petals are packed with a lot
more power.*

*In the world of science I'm con-
sidered quite hot,*

*If you said I was big, you'd have
hit it on the spot!*

*I have a magnetic personality,
In fact, my disposition is warm
and sunny.*

*I come and I go each eleven
years,*

*And I help determine whether
weather is clear.*

What am I?

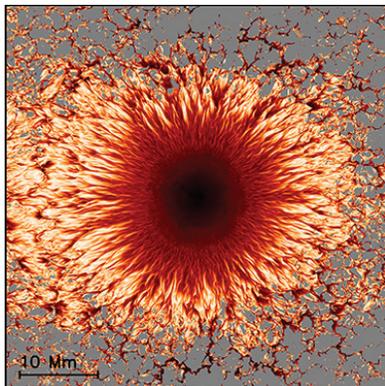


Image Credits: UCAR/Matthias Rempel/NCAR

Scientists at the National Center for Atmospheric Research (NCAR) wanted this image to be

very detailed.

So, they created it using a powerful supercomputer that can perform 76 trillion calculations per second—and it took weeks to solve all the necessary equations. Try having that be your math homework!

When they were finished, they had the most detailed image of its kind ever made.

Students, do you know what this

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.

image represents? Share your guesses with the class during your PETES PRS Flight Day 2.

Hint: It's not a flower. It's bigger than a flower.

Teachers, see <http://www.ucar.edu/news/releases/2009/>. Scroll down and find the article under "June 17, 2009" for more information.

Don't forget to turn in your Media Release Forms!

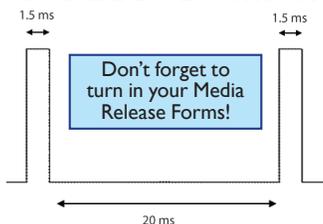


Intro to Systems Engineering Flight

Check Your Pulse

Have you checked your pulse lately? It needs to be right at 750 in order to center your servo.

See, eighth grade students participating in the Intro to Systems Engineering Flight Day 1 need to center, or calibrate, the servo motors on their Boe-Bot® robot. To



do that, they must instruct the servos to stay still by sending them a center signal.

The center signal is a series of 1.5 thousandths of a second, or millisecond (ms), pulses (.0015 s), with a 20 ms pause between each one. So 1.5 ms would be the pulse duration.

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.



Dividing the pulse duration by two millionths of a second, or microsecond (2 μs, or .000002 s) results in the duration argument.

(By the way, that symbol for "micro" is not the lowercase English letter "u," it's the lowercase Greek letter "mu.")

Divide .0015 by .000002, and what do you get? Go ahead, do the math, I'll wait...

Did you get 750? Good! That's the duration argument for a center signal. So, the program to center a servo con-

nected to pin 12 would be,

```
DO
  PULSOUT 12, 750
  PAUSE 20
LOOP
```

Run that program, and if your servo still moves, adjust the servo screw with a Phillips screwdriver.

To make your servo turn clockwise, set your duration argument less than 750. To make it turn counterclockwise, set it to greater than 750.

Kinda gets your pulse racing, doesn't it?



STEM Challenge Flight

(formerly the SPACE Flight)

A Systems Engineering Approach to STEM Projects

CDRs Humming Along



Critical Design Reviews (CDRs) for the STEM Challenge Flight are humming right along.

Student teams are presenting an Annotated Briefing of their STEM project so far to a STEM Challenge Review Team.

Get yours scheduled if you haven't already.

Last Year's SPACE Flight Students, This Year's Scholarship Recipients

Two participating students from last year's STEM Challenge (then called SPACE) Flight have won scholarships!

Sophomore Holden Hyer received a \$2,000.00 scholarship/savings bond from Sandia National Laboratory for his "The Thing to Do" scholastic essay.

Senior Barbara Marquez received a \$625.00 scholarship from Women in Technology.

Both students participated in last



year's Bernalillo High School "Spartan Pride" SPACE Flight team, building a robot to compete in the NXT RoboRAVE competition. Holden Hyer has also participated in our Middle School Flights.

Congratulations to you both!

The Next Step...



- Continue working on your STEM project
- Let us know the name of your project once you choose it
- Prepare a CDR briefing with your project goals, constraints and requirements; work breakdown; materials needed and for which components; and timeline in Gantt format
- Schedule and perform your CDR briefing



Plans Are Coming In, So Here's the Plan...

Well done, my fellow Fellows! We have received many of your plans for implementing STEM lessons in your classroom.

So here's the plan...

The spring semester is starting. That means it's time to start implementing your STEM lessons with your students.

Deputy Director Diane MacAlpine is still visiting with a few schools to see how your project is coming. She's taking along a copy of the Teacher Institute Memory Book and a copy of Mr. Jeff Hawkins'

book *On Intelligence*, mentioned in the summer Teacher Institute Workshop keynote presentation, for your reading enjoyment.

If you haven't yet visited with Ms. MacAlpine, schedule a visit soon. Alternatively, simply visit with her during your school's visit to our classroom, call, or email her to discuss your project.

Mr. Ed Coleman, pictured at right, from Truman Middle School, sat down with Ms. MacAlpine here at AFRL La Luz Academy during a break in his DoD STARBASE



Day 5 class on 9 December 2010, and discussed the status of his STEM lesson plan.

If you need anything to help you implement your STEM lesson plan, let Ms. MacAlpine know, and she'll be glad to assist you.



The Next Step...

- You should have **already filled out and submitted your materials orders**; they were due by 10 December 2010. If not, do this right away.
- **Implement your STEM lesson plan** in your classroom.
- **Meet with Ms. MacAlpine** and discuss your project with her if you haven't already.
- **Let us know** if you would like a scientist or engineer to help you and your class complete your STEM project, or if there's anything else we can do to help you implement it.

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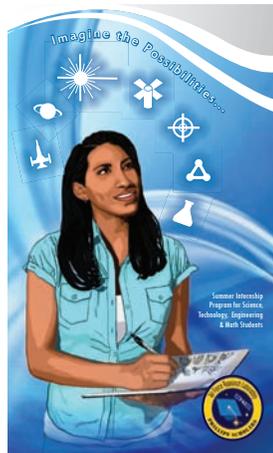
Mr. Steve Burke, Technical Writer, or
Ms. Ronda Cole, Director.

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)
- CSI:** The Mars Cave Skylight Investigation mission
- DoD:** Department of Defense
- KAFB:** Kirtland Air Force Base, Albuquerque, N.M.
- LF:** Leadership Flight
- PETES:** Providing Engineering and Technology Experiences for Students
- PRS:** Phillips Research Site
- R&D:** Research and Development
- STEM:** Science, Technology, Engineering, and Math
- TI:** Teacher Institute
- T²:** Technology Transfer
- TTE:** Technology Transfer for Education
- USAF:** United States Air Force

STEM Bytes

Phillips Scholars Summer Employment Opportunity

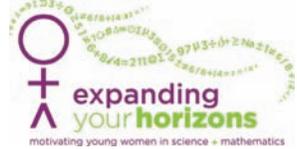


The Phillips Scholars program is a paid summer internship for upper-level high school and undergraduate students.

Students gain hands-on experience working on cutting-edge research and technology, mentoring from Air Force Research Laboratory (AFRL) scientists and engineers, and may lead to part-time student employment and graduate fellowships.

Application deadline is 7 February 2011. See www.vs.af.mil/PhillipsScholars for more information.

Last Call for Expanding Your Horizons



Hurry! Registration deadline for this year's Expanding Your Horizons event, for girls in grades five through nine, is 14 January 2011.



Go to www.expandingyourhorizons.org/conferences/Albuquerque/ for more information.

Upcoming CLC Events

The Challenger Learning Center (CLC) New Mexico invites you to join them in a Space Shuttle Challenger 25th Anniversary Tribute at 9:00-10:00 am on Friday, 28 January 2011, featuring a special event and a moment of silence at 9:39 am, the minute of the disaster.

On Saturday, 29 January 2011, from 10:00 am to

2:00 pm, the CLC will host *Celebrating the Legacy: A Family Science EdVenture*, with free family activities honoring the crew's space science education legacy, and free admission to the Unser Racing Museum.

AFRL La Luz Academy will have a booth there, too. For more information, go to www.challengernm.org/events.php.



Coming Next Issue...

- Telecommunications
- DoD Day 1...again!
- Will you be my Valentine?



Watch for it!