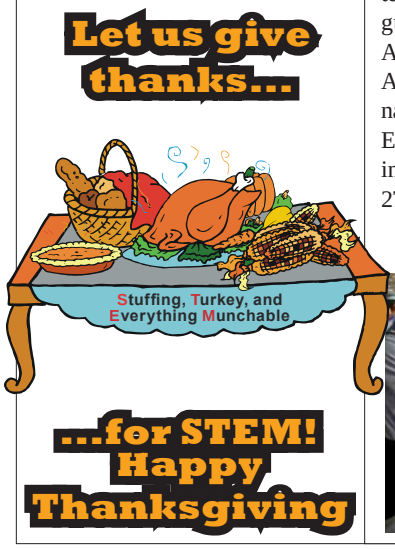
AFRL La Luz Academy

"Creating the Possibilities"

Inspiring Future Scientists and Engineers

Star Date: November 2011
Volume IX, Issue 3

In This Issue...



The Rocket Report

Red Shirts Launch Rockets

On 25 October 2011, the rockets weren't the *only* things with a "red glare." The uniforms of the students launching them were a dazzling red, too.

Sixth and seventh grade Technology and Engineering Challenges (TECH) Flight students, from 10 New Mexico schools, wearing bright red AFRL La Luz Academy TECH Flight uniforms, launched 23 rockets at the ninth annual Rocket Launch event held at the Albuquerque Rocket Society's launch site on the outskirts of Rio Rancho.

The rockets had four inch diameters, were approximately six feet long, and reached an estimated altitude of 2,000 feet.

The students spent the past month building their rockets, and used modeling and simulation software called *RockSim* to estimate their rocket's performance. They compare the anticipated rocket flight paths with the data collected from the actual launches.

Student teams came ready to launch the six-foot rockets they built and decorated themselves; rockets with inspirational names like *Apollo, Atlas, Gemini, Mercury, Opportunity, Phoenix, Saturn,* and *Spirit.*

As students arrived at the launch site, they stood in line in the warm New Mexico sun at the Registration table, and received their assignments for the day, as identified by a color-coded magnetic badge they affixed to their bright red AFRL La Luz Acad-

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Ms. Aurora PhD, Astronauts Visit AIAA Booth

Over *three thousand* students, parents, teachers, and other guests visited our 2011 American Institute of Aeronautics and Astronautics (AIAA) Space Education Alley booth in Long Beach, CA on 27-29 September 2011.

They were greeted by our special guest, Ms. Aurora PhD, the official STEM mascot for the US Air Force Academy's K-12 STEM outreach center. (Check out her Facebook page, by the way; it's really cool!)

Speaking of cool, booth visitors were treated to an *interactive cryogenics demonstration* from AFRL's Mr. Tom Fraser and 2nd Lt. Benjamin Jewell. Guests ate flash-frozen popcorn and marshmallows, and observed the effects of cold liquid nitrogen on balloons and flowers.

Visitors also explored hands-on activities like *Tornado Tubes* and *binary math.*

Even astronauts from the final Space Shuttle mission, STS-135, including Commander Chris Ferguson and Mission Specialists Rex Walheim and Sandy Magnus, stopped by!

Mars Missions Flight

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

How to Go to Mars

Teachers who wondered how they could *possibly* help their class go to Mars got their answer at the Mars Missions Flight New Teacher Training held 27 October 2011. Director Ronda Cole led the full-day training session, which was jam-packed with hands-on activities and useful information.

Ms. Cole explained the Mars Missions process in detail, with help from PowerPoint slides and videos. Teachers got first-hand

experience doing some of the things they will teach their own fifth grade students to do, such as designing mission patches, studying Mars Facts, building life support system models, composing and performing sagas (musical renditions of their journey to Mars; they sang pretty good!), and building a scale-model version of a habitat.

Secondly, at the same meeting, the teachers received a revised version of the *Teacher's Resource Guide* manual. It, too, is jam-packed with hands-on activities and useful information. The teachers can refer to it all year to help guide them through the process of preparing their students for a successful manned mission to Mars.

If teachers have questions, they can contact Ms. Cole or Deputy Director Diane MacAlpine whenever they need to. At the grand finale Link-Up Day event, there will also be fellow teachers, Colony Commanders, and others available to assist or answer questions. As the little alien the teachers received at the Teacher Training reminds us, We Are Not Alone!

And last, but *certainly* not least, there's always *this very Mars Missions Flight section of the monthly newsletter*, for additional tips and information!

Your commitment to this mission is crucial to its success

Mars Missions Manual Makes You MELT With Joy

Teachers, while implementing the Microprobe Evaluation of Lava and Titanium (MELT) mission at your school, melt into your Mars Missions manual.

For example: Chapter 5 supplies you with valuable forms like the Flight Director and Team Mission Logs. They give an excellent step-by-step checklist of the entire Link-Up Day event.

Chapter 6 has a a page outlining roles students can be assigned for group activities, and a Mars Facts Bingo game to help students get their facts straight. Oh, *joy!*

The Next Step...

November/December—time to:

- Look at the timeline on pages **12-13** of your Mars Missions manual, and adjust it to fit your curriculum and scheduling needs. Items on the timeline should be completed prior to the Link-Up Day event
- Divide students into TEAMS (5-7 students per TEAM)
- Have students research Mars and learn "Mars Facts," work on their sagas and mission patches, and begin planning their life support system
- Eat, shop, eat, visit friends and family, eat, drink, and be merry! And eat!

DoD STARBASE Flight

Robots, Rockets, and Racecars... Can You Say That Without Any R's?

Robots, rockets, and racecars... can you say that without any R's? Hmmm...while you ponder that one, think about this:

The Homeland Security Administration has challenged your team of robotic engineers to develop a robotic surveillance system which will travel between various landmarks at the National Mall in Washington, D.C.

Your team will compete against other engineering teams to develop the most accurate program for controlling your robot, which will monitor the corridor between the Washington Monument and the Lincoln Memorial.

How would *you* tackle this problem? This is the engineering challenge presented to student teams in DoD STARBASE Day 2. Students meet the challenge by programming their NXT LEGO Mindstorms® robots to perform a security sweep of a model of the National Mall.

Students participating in Day 2 also increase their *geospacial intelligence* (the obtaining of information about Earth and man-made features by studying maps, navigation charts, & images) by exploring satellite-photo maps from the National Geospacial Intelligence Agency (NGA).

In Day 3, students investigate Newton's Laws hands-on with activities like observing what effect different angles and launch forces have on the flight path of a small *straw rocket* (made from a drinking straw).

The students also compare race times of pairs of carbon dioxide (CO_2)-propelled racecars, some

of which have bigger capacity CO_2 cartridges than others, to determine how that affects the behavior of the cars.

Robots, rockets, and racecars...so how *do* you say that without any R's? OK, everybody, say it with me...

"That."

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!

Red Shirts Launch Rockets

Continued from page 1

emy T-shirt uniforms.

Next, they headed to the Launch Gear Checkout table and received their team's rocket and specific equipment they would be using, such as binoculars, GPS units, and clipboards and forms to record data on.

After taking a group photo with their rocket, the students moved on to their assigned duty areas and went to work.

With the help of volunteer adult mentors, Assembly and Inspection Teams packed the parachute, inserted an *altimeter* into the rocket for measuring the flights' altitude, and weighed the rocket.

Meteorologists, using a Pinpoint WeatherNet weather station set up on site, checked that weather and wind conditions were acceptable for launch.

Spotter Teams, using binoculars, checked that the skies were clear of aircraft. The Assembly Team installed the rocket's motor. The Pad Manager helped load the rocket onto the launch tower and arm the altimeter.

The Range Safety Officer (RSO), speaking into a microphone, gave the school name and the rocket name, and verified with the Meteorologist and Spotter Team that everything was a "go." Then the RSO began the countdown: "Five... four...three...two...one... *launch*!"

The Launch Control Officer, a fellow team member, flipped the switch on the launch control box.

Whoosh! The six-foot long rocket shot off the launch tower and zoomed about 2,000 feet into the air. Shortly after *apogee*, the highest point of the rocket's flight, the parachute came out and gently slowed the rocket's descent back to Earth. Students and spectators cheered. Then the Recovery Teams, guided by the Spotter Teams, set out to find the rocket and bring it back.

Anyone who has ever watched the TV show *Star Trek* knows that

wearing a red shirt is usually bad luck. Here at the Rocket Launch event, however, a red shirt just means you're having a *blast*!

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Robot Systems Flight

Centering your Servo

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

Eighth grade students participating in the Robot Systems Flight 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 *milliseconds* (ms), pulses (.0015 s), with a 20 ms pause between each one. So 1.5 ms would be the *pulse duration.*

Dividing the pulse duration by two millionths of a second, or *microseconds* (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.")

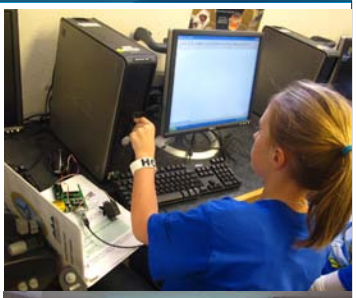
Divide .0015 by .000002, and what do you get? Go ahead, do the math, I'll wait...

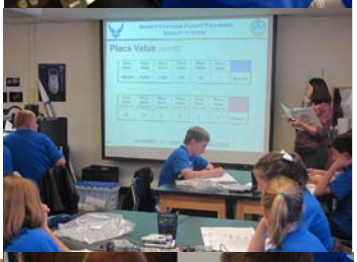
Did you get 750? Good! That's the *duration argument* for a *center signal.* So, centering a servo connected to pin 12 would be,

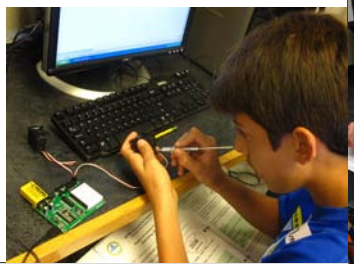
```
DO
   PULSOUT 12, 750
   PAUSE 20
LOOP
```

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

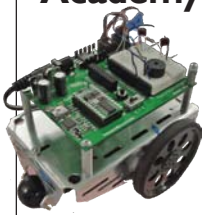
To make your servo turn clockwise, set your duration argument less than 750. To make it turn counterclockwise, set it to greater than 750.







AFRL La Luz Academy Delivers



OK, Robot Systems Flight teachers, all the Boe-Bot® kits should now be delivered.

Let us know if you still need some.

AFRL La Luz Academy

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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

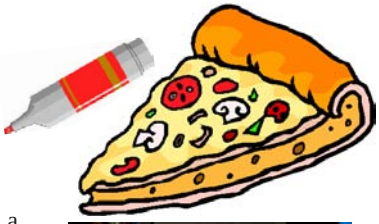
T²: Technology Transfer

TTE: Technology Transfer for Education

USAF: United States Air Force

Teacher Institute

Pizza Social



Listen up, Fellows! Mark your calendars with a bright red marker on **Tuesday, 15 November 2011, 4-6pm**.

That's the day we're having a Pizza Social with a guest STEM speaker, and all interested Teacher Institute Fellows are invited! Please R.S.V.P. to Ms. Diane MacAlpine if you'd like to attend, and we'll save a slice for you! Well, unless we eat it first.

Have You Sent Us Your Lesson Plan?

Some TI Fellows already let us know about their lesson plans. A tip of the ol' STEM hat to those folks.

The rest of you, please provide us with a detailed plan for your STEM lesson and let us know what assistance you would like from us. Thanks!

Remember the TI Blog!

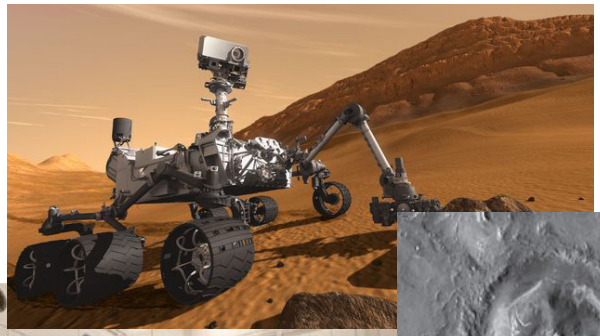
The TI blog is the best thing you're not reading. If you were, you'd already know about the pizza social, and would naturally have sent us a note saying you'll be there...because, hey, who wants to miss out on free pizza and STEM, right?!

So please take the time to log in to the blog and see what's going on. You can also share student pictures or STEM lesson ideas you've been working on this semester.

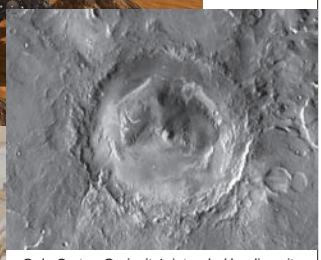
STEM Bytes

Mars Rovers Will Soon Have a Curious Friend

The Mars rovers *Spirit* and *Opportunity* are about to get a new friend, and it's as curious as Curious George!



It's the Mars Science Laboratory rover *Curiosity*, and it's scheduled to begin its journey to the Red Planet on Friday, 25 November 2011, at 8:25 a.m. MST. It's mission is to determine whether Mars ever was, or still is, an environment capable of supporting *microbial* (microbe-sized) life.



Gale Crater, *Curiosity*'s intended landing site

Curiosity is about the size of an SUV; it's bigger and can travel farther than *Spirit* and *Opportunity*. It will carry the biggest, most advanced suite of instruments for scientific studies ever sent to the martian surface.

The rover's onboard science laboratory will study martian rocks, soils, and the local geologic setting, trying to detect the chemical building blocks of life (e.g., forms of carbon), and assess what the environment was like in the past.

See http://mars.jpl.nasa.gov/msl/ for more information.

Coming Next Issue...

- Patches, Facts, and Sagas
- TECH Flight fall semester wraps up
- Lots of STEM and holiday cheer!

Watch for it!