National Aeronautics and Space Administration

Rocket Report

2014

Sounding Rockets Program Office

What's inside...

In Brief...

The Sounding Rocket Working Group meeting was held at Greenbelt, July 1–2. For more information on the working group, visit: **http://rscience.gsfc.nasa.gov/srwg.html**

The NSROC Launcher Group is working a large number of launcher maintenance, repair, upgrade, and installation projects at multiple locations including Wallops, White Sands, Poker Flat, and Norway and is projected to be on the road quite a bit this year.

Norway Campaign – Fabrication is underway for both the 49.003 LaBelle and 52.001 Conde missions. The Conde team conducted 10 successful ampule deploy tests from the Wallops beach last week.

Development of a new high–capacity mobile launcher is underway The launcher will accommodate Peregrine based launch vehicles and Brant based missions with the larger telescope type payloads as will be required to support investigations from remote locations such as Australia.

36.235 US Harris - Hydrogen Polarimetric Explorer (HYPE)

36.235 Harris on the balancing table at Wallops.

36.235 US Harris - HYPE was launched from White Sands Missile Range, NM on May 3, 2014.

The scientific objective of the Hydrogen Polarimetric Explorer (HYPE) mission is to measure Hydrogen Lyman light reflected by interplanetary hydrogen (IPH) in the Geocorona. IPH is an important transitional medium that flows from its origin in the local interstellar cloud (LIC) through the LIC-solar wind boundary zones into the inner heliosphere, where it interacts with the solar wind, and radiation pressure. HYPE will measure the line shape of the IPH, yielding information about the thermal structure of the interplanetary medium, the shape and location of the LIC-solar wind boundary areas, and the ionization state of the ILC.

For more information on the HYPE mission see: http://www.nasa.gov/content/goddard/nasa-sounding-rocket-to-study-interplanetary-medium/

Rocket Report

36.285 France - Colorado High-resolution Echelle Stellar Spectrograph (CHESS) by Karen Fox

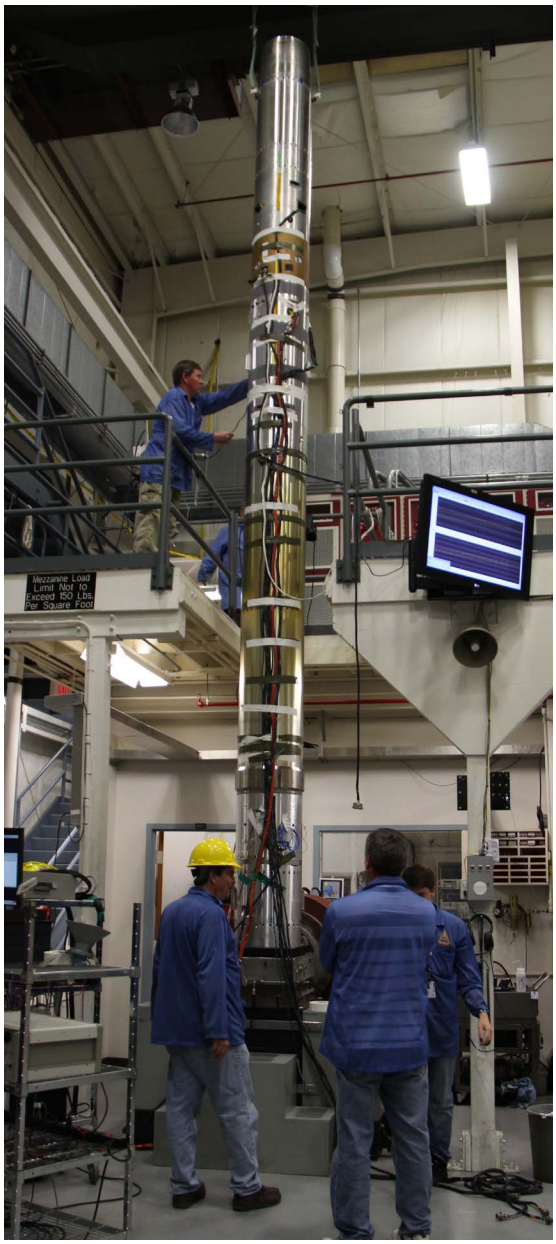
In deep space, floating between the stars, lies an abundance of atoms -- carbon, oxygen, hydrogen -- that over millions of years will grow into new stars and new planets. Early in the morning on May 24, 2014, at 2 a.m. EDT, a NASA Black Brant IX sounding rocket carried a payload for a 15–minute flight to observe this star nursery more comprehensively and in better detail than has been done by a single instrument ever before.

"These atoms are the raw materials, the very building blocks for the next generation of stars and planets," said Kevin France at the University of Colorado at Boulder. "We're making detailed measurements of how many atoms have transitioned into molecules, which is the very first step toward star formation."

The sounding rocket payload, Colorado High-resolution Echelle Stellar Spectrograph or CHESS, was launched from White Sands Missile Range in New Mexico. CHESS is equipped with what's known as a spectrograph, which can parse out just how much of any given wavelength of light is present. CHESS soared above Earth's atmosphere to look at the ultraviolet light from a bright star – light that is blocked by the atmosphere and can't be seen from the ground. As this light courses toward Earth, it bumps into the interstellar atoms and molecules along the way, each of which can block certain wavelengths of light. Scientists know which wavelength is blocked by what, so by measuring what light is missing, they can map out the atoms and molecules that are present in space. The CHESS spectrograph provides such detailed and comprehensive observations that it can measure not only what atoms and molecules are present, but how fast they are moving and how turbulent the gas is. Together, this information helps characterize how mature a given cloud of dust is.

"Carbon, for example, will appear differently over time," said France. "Early on the cloud will have carbon with a missing electron, called ionized carbon. As the gas gets denser, the carbon atoms gain back their electrons, so you have neutral carbon. As you get even denser clouds, the carbon binds to oxygen creating carbon monoxide molecules – and at that point you can probe the cloud conditions that precede the collapse into a star." Using something like CHESS to see whether you have ionized or neutral carbon, or even carbon monoxide molecules tells you more about how old the cloud is and can help scientists learn how stars form from these clouds. It's still not known exactly how long it takes before a cloud collapses to begin making a star, for example. It might be anywhere between 1 to 100 million years.

By flying such newly-developed instruments on a relatively inexpensive sounding rocket, scientists do more than just gather solid science data. They also have the chance to test and improve their instruments, perhaps to someday fly long-term on a satellite in space.



Images above were taken during integration activities at Wallops Flight Facility.

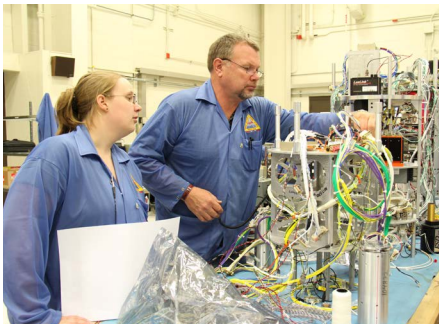
Integration and Testing

46.007 Rosanova – Sub–TEC 6

Sub-TEC 6 will test several new suborbital rocket technologies, including a deployment system for forming vapor clouds used to track the winds in space for studies of the ionosphere; a miniature deployment actuator for small spacecraft called cubesats; a low-cost attitude solution system; and improvements in telemetry and flight recorders to increase the rates for data collected and transferred during flight.

The vapor clouds portion of Sub-TEC is a test for a mission scheduled to launch from Norway later in 2014. Sub-payloads with mainly barium will be deployed from the main payload. In addition to the barium, small amounts of strontium and lithium are present in the mixture. The sub-payload deployment method has been developed by Dr. Mark Conde at the University of Alaska, Fairbanks and utilizes small rocket motors to eject the sub-payloads from the main payload.

The chemical releases occur at approximately 220 seconds after vehicle lift-off. Barium produces a cloud with a mixture of blue-green and red colors. The blue-green part is neutral, i.e. not charged. The red part, which appears fairly quickly after release, is ionized by sunlight. Strontium and lithium are used to enhance the visibility of the neutral flow.



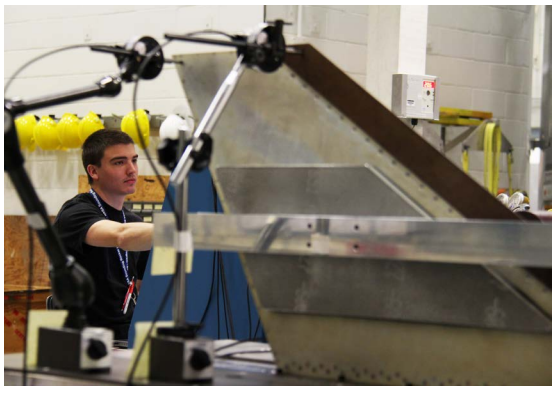
McKenzie and Carl working on Sub–TEC 6.

Mark, Andrew and Adam with Sub–TEC decks.

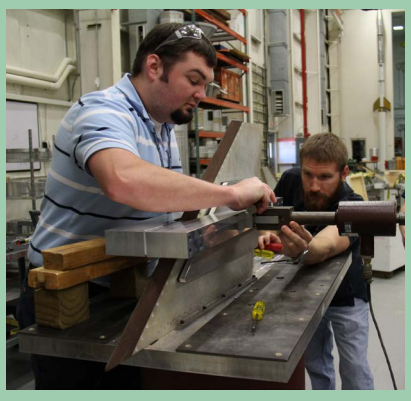
Sub–TEC in deployment bay at Wallops.

Improved Malemute fin testing

Josh and Bill inspecting fin.



T&E intern Seth Austin performing a fin bend test.



Adam and Josh setting up to test a fin.

Rocket Report

41.110 Koehler – RockOn!

For the seventh consecutive year students from around the country participated in the RockOn! sounding rocket mission. They came from as far away as Hawaii for this one of a kind experience.

The mission is setup to launch both RockOn! workshop experiments and more advanced RockSat-C experiments.

More than 65 students attended this year's workshop which started on Sunday, June 22 and culminated with the launch of 41.110 on Thursday, June 26. The participants were divided into teams of 3 or 4 and built, programmed and tested their experiments during the workshop. All workshop payloads include a microprocessor and a suite of sensors; accelerometers, pressure transducers and thermistors. The experiments are completed during the student's stay at Wallops. Chris Koehler from the Colorado Space Grant Consortium leads the instruction with help from University of Colorado students.

The RockSat-C experiments are built by students during the school year and arrive at Wallops ready for vibration testing, integration and launch.

More than 100 students attended the launch of the Terrier-Improved Orion, two stage rocket, on June 26, 2014.

Wallops Rocket Academy for Teachers and Students (WRATS)

The WRATS teacher work shop was held for the 4th year at Wallops Flight Facility. 20 teachers from near and far attended the week long educational experience.

WRATS combines hands-on activities such as building model rockets, parachutes and an electronic payload with theory on rocket propulsion, flight dynamics, and trajectory simulations.

Each teacher builds a model rocket and a payload and designs a recovery system during the week. The launch of the model rockets occured on June 25 on airfield and all 20 rockets took off the pad. Flight data is recorded onboard and analyzed post flight. The payload incoroporates an Arduino Micro and three sensors; an accelerometer, a pressure transducer and a thermistor. All payloads recorded data and analysis showed that the rockets reached altitudes of between 400 - 600 feet.

Phil Eberspeaker/Chief Sounding Rocket Program Office was the main presenter and provided the teachers with interactive demonstrations as well as theory of rocket flight. Educators learned about various types of rocket propulsion, forces of flight, rocket stability and recovery system shock absorption.

The WRATS teachers attended the early morning launch of RockOn! and viewed the payload de-integration and experiment return.

Rocket Report

Field trip to White Sands Missile Range by Laura Almaraz

Students from the Gateway to Technology and Aerospace class at White Sands Middle School experienced a simulated NASA mission May 9. This was the third year Brian Claar took his class on the trip, and it is one of several class trips he likes to plan for his students.

"I want to get them intrigued in STEM (Science, Technology, Engineering, and Mathematics). And NASA is part of White Sands. This is a great partnership," Claar said.
"It takes time and resources, but it's worth it," he said. "When there's a roadblock, now the kids know why."

During the first part of the trip, students learned about the planning and testing part of a mis–sion. A project can take four years to complete. The work includes coming up with an idea for a mission and proposing it to NASA. Then it must be built and tested.

The class felt the frequencies that rockets are tested with before launching and learned about important physics concepts like G force and the arc second measure of an angle. They saw a pre–recorded rocket launch and the view of the Earth from the rocket in outer space.
"I learned what G force is," said Jared Brown, who has been on the field trip twice. "It's pretty cool."

Students then headed to the control room, where they simulated a rocket launch. Each student had an assigned job as they sat in the control room wearing headsets.

"This is my favorite part," said Brandon Bou–dreaux. "You get to do what NASA people do."
Sgt. John Free, of the 2nd Engineer Battalion, joined his son on the trip.

"I love it. My son loves it so much he's going into aerospace technology," said Free. "It helps him further his career."

During the field trip, students learned a little about grad student Keri Hoadley's project. She is currently working on building the payload for the Colorado High–Resolution Echelle Stel–lar Spectrograph (CHESS). Hoadley has been working on the project with Dr. Kevin France for about three years as part of her dissertation at the University of Colorado.

"The main goal is to do this study, but also as a university, we have an education mission," said France. "I'm so glad we have the opportunity to show kids this age because this is the age where they learn. "

CHESS is an instrument the University of Colo–rado is building for NASA to study the raw ma–terials that make up the solar system, planets, and people. Launch and recovery testing of the rocket will take place later this month at WSMR.

Laura Almaraz is a Missile Ranger Staff Writer.

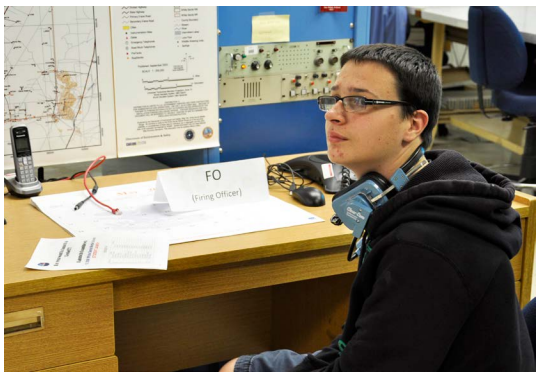
Dr. Kevin France, from the University of Colorado, and a student demonstrate the concept of the arc second measure of an angle.

All photos by Laura Almaraz

Brian Claar and his students place their hands on the vibration test machine to feel the frequencies that rockets are tested through during a field trip May 9.

Students read the instructions before the simu–lated NASA launch as they become familiar with their stations in the control room.

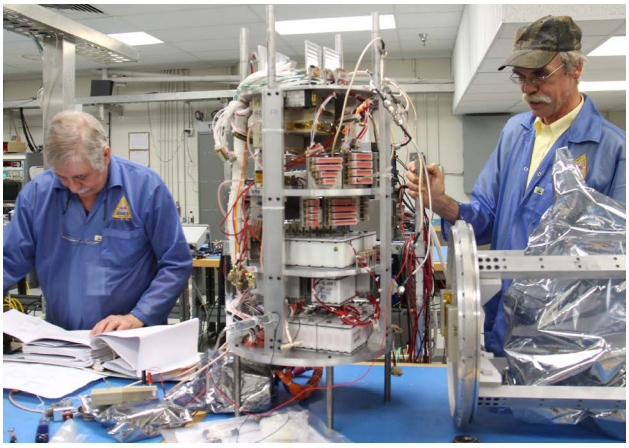
A student controls a functioning camera and can see the desert on his monitor.



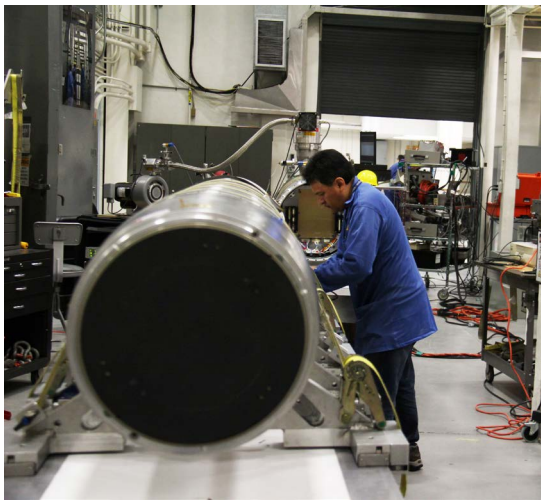
Each student is given a job title and a specific task during the simulated NASA mission.

Picture Place

Jon making parts with a smile!

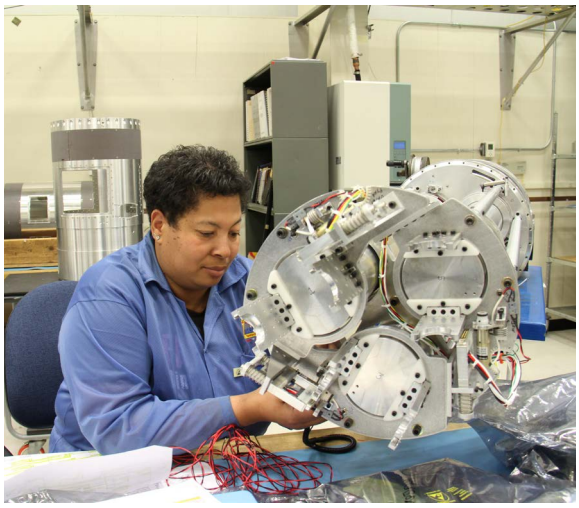


Eric and Rick working on RockOn!



Freddy with the CHESS payload.

The first WRAT...



Bernita working on Swenson.

Andrew is keeping us safe.

Rocket Report

Want to contribute?

Working on something interesting, or have an idea for a story? Please let us know, we'd love to put it in print!

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Launch Schedule

July
46.007 GP ROSANOVA/NASA WFF WI 2-Jul
36.289 US JUDGE/DIDKOVSKY/USC WS 14-Jul

August
36.253 US HASSLER/SWRI WS 8-Aug
46.008 UO KOEHLER/UNIV. OF COLORADO WI 12-Aug

September
36.288 DS VOURLIDAS/NRL WS 17-Sep
30.076 DR GAMMILL/NSWC PORT HUENEME WS 17-Sep
36.282 US KANKELBORG/MONTANA STATE UNIV. WS 30-Sep

October
12.082 DR SPRINT WI 20-Oct
36.292 UH MCENTAFFER/UNIVERSITY OF IOWA WS 22-Oct

November
52.001UE CONDE/U. OF ALASKA/FAIRBANKS NOR 19-Nov
49.003 UE LABELLE/DARTMOUTH COLLEGE NOR 19-Nov
12.077 GT BRODELL/NASA-WFF WI 20-Nov
36.299 DR PEDERSEN/AFRL WS 20-Nov

December
36.293 UG CHAKRABARTI/U. OF MASS. -LOWELL WS 1-Dec
36.295 US KRUCKER/UNIV OF CA @ BERKELEY WS 2-Decc

WS - White Sands
WI -Wallops Island
NOR - Norway

Write a caption!

Submit a suggestion for a caption for this photo and we'll publish it in the next issue.

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