National Aeronautics and Space Administration

Rocket Report

2014

Sounding Rockets Program Office

What's inside...

In Brief...

The NSROC launcher team is in Nor–way preparing for the upcoming C–REX (Conde) and CAPER (Labelle) missions, scheduled for launch in November.

The Peregrine development effort is proceeding with the first testflight scheduled for no earlier than January 2015. Two additional test flights are scheduled for that year.

Mass model sub–payload deployment tests to verify the aft air spring system for the 49.002/Swenson mission was successfully completed.

First day of fall was September 23, 2014.

46.007 GP Rosanova - Sub-TEC 6 Launched July 2, 2014

46.007 Sub-TEC 6 in the deployment bay.

The Sub-TEC 6 mission was launched on July 2, 2014 and tested several new technologies.

The primary objective was to develop the next generation standard carrier for technology demonstration missions, with secondary objectives including flight test of NSROC developed technologies. Sub-TEC 6 is served as a test round for the ampule deployment system on the upcoming C-REX mission from Norway. The PI is Dr. Mark Conde/University of Alaska-Fairbanks.

NSROC developed technologies included:

- mJAGR (miniature Javad Antivibration GPS Receiver)
- CubeSat Deployer for IRAD
- High Temp Wrap Around Antenna
- HD Camera
- NSROC High Data Rate Encoder
- Low Cost Attitude Experiment (LCAE)

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36.289 Didkovsky - Degradation Free Spectrometers (DFS) by Karen Fox

The Degradation Free Spectrometers launched from White Sands on July 22, 2014. The experiment observed the extreme ultraviolet and soft x-rays streaming from the sun, in order to measure the sun's total energy output, known as irradiance, in these short wavelengths.

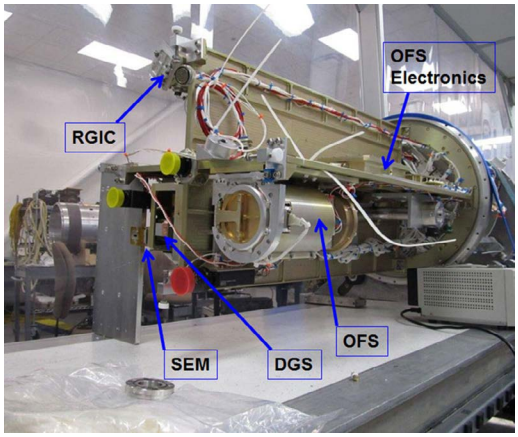
The total solar irradiance, and to an even greater degree, irradiance at high energy wavelengths is known to change over time in conjunction with the sun's approximately-11-year solar cycle. How it changes over longer periods of time, however, is less certain – but fairly important if we're going to understand how solar variability affects Earth's space environment.

The Degradation Free Spectrometers experiment measured the total energy of the extreme ultraviolet light coming from the sun, to better understand how it changes over time – which has implications for understanding solar evolution. "Data observations from recent missions have provided significantly improved measurements of irradiance," said Dr. Leonid Didkovsky, the principal investigator for the mission at the University of Southern California in Los Angeles. "But the optical components of many of these missions can degrade during the time of the mission. Degradation leads to calibration drift over time."

Scientists put a lot of effort into comparing and calibrating these space instruments from afar using expensive technologies or even additional rocket flights to track changes in the instrument over time. To eliminate the need for in-flight calibration, Didkovsky and his team recently developed degradation-free instruments. They flew two new instruments, and two classical instruments on the recent mission. The first new instrument, called the Optics-Free Spectrometer, relies on neon gas to detect the sun's photons. When a solar photon streams in and collides with a neon atom, an electron is emitted. The instrument measures the number of emissions, as well as the energy. This information can be used to characterize the original light hitting the detector.

The second new instrument is the Dual Grating Spectrometer, which can separate the visible light from the extreme ultraviolet light using two very stable, degradation-free versions of a tool known as a diffraction transmission grating. Both of the new instruments were calibrated at the U.S. National Institute of Standards and Technology using specialized calibration facilities at its Synchrotron Ultraviolet Radiation Facility.

The sounding rocket payload also included two classic irradiance instruments. One is called the Rare Gas Ionization Cell absolute irradiance detector and the second is the Solar EUV Monitor—a clone of an instrument on board the European Space Agency's and NASA's Solar and Heliospheric Observatory. "This mission will do more than simply gather irradiance data during the flight," said Didkovsky. "One of the important goals is to demonstrate that these two degradation-free instruments are flight-ready."



The Degradation Free Spectrometers experiment.

36.308 Hall - C-REX mission test round Launched August 8

The primary objective of this mission was to further test the ampule deployment system for the upcoming Cusp-Region Experiment (C-REX) mission.

C-REX will be launched from Norway in late 2014 to identify mechanisms responsible for creating a region of enhanced neutral mass density, at 400 km altitude, that appears to be a permanent feature of Earth's cusp-region thermosphere. The payload is designed to deploy 24 vapor trails of Barium mixtures over an altitude range of 150 - 400 km at 50 km intervals.


Vapor trail releases from the Hall mission.

Integration and Testing

49.003 Labelle – Cusp Alfven and Plasma Electrodynamics Rocket (CAPER)

The CAPER mission will investigate the complex interactions between planetary magnetospheres and their underlying ionospheres. These interactions are most easily studied at high magnetic latitudes of the Earth, where magnetosphere-ionosphere (MI) coupling gives rise to the aurora via at least two separate electron acceleration processes of broad significance to space plasma physics: acceleration in electrostatic electric fields and in time-varying electromagnetic fields associated with Alfvén waves. The CAPER mission will make significant advances in understanding of dayside MI coupling by building on the small number of previous rocket experiments in the cusp.

The dayside high-latitude polar cusp is a unique environment where direct access of solar wind particles to low altitudes leads to similar particle precipitation and acceleration processes as on the nightside, but dominated by a rather different set of magnetospheric processes, such as dayside reconnection and interactions with interplanetary pressure pulses and discontinuities. In particular, direct measurements of Alfvén waves associated with electron acceleration, via their electric and magnetic fields, has not been reported in the cusp (as opposed to the nightside), and the detailed interaction of the electron beam with Langmuir wave electric fields, as well as statistics of the resulting complex structure in the fields, has not been directly measured in the cusp (as opposed to the nightside).

By including the same key instruments flown on complementary missions in the nightside aurora, CAPER will establish the role and nature of Alfvén wave acceleration in the cusp and discover the causes of the observed differences in the Langmuir waves in the cusp versus the nightside. CAPER also includes the first ever wave-particle correlator measurements in the cusp. The results affect a range of NASA programs in geospace, planetary, heliospheric and astrophysical sciences and are pertinent to multiple objectives of NASA's Heliophysics research program.

To achieve the science a single instrumented payload will be launched to 800 km or higher into cusp aurora from the Andoya Rocket Range, Norway. Apogee of 800 km is required to assure significant flight time in the altitude range where auroral Langmuir waves are excited and to have the best chance to penetrate the ionospheric Alfvén resonator, a region where Alfvén waves are trapped along the magnetic field and can lead to structured aurora via wave-particle interactions.

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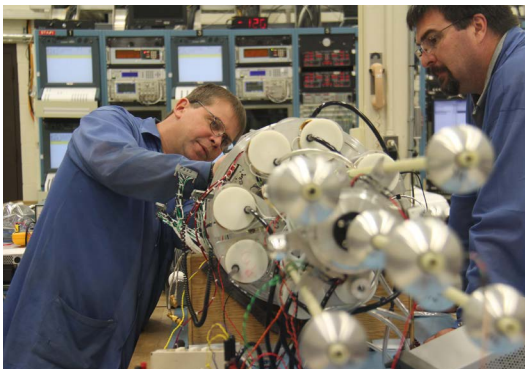
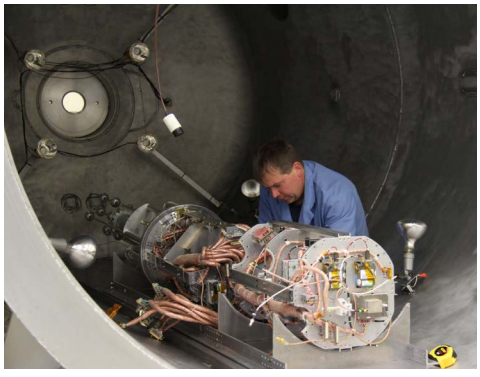
Stowing booms after deployment testing.

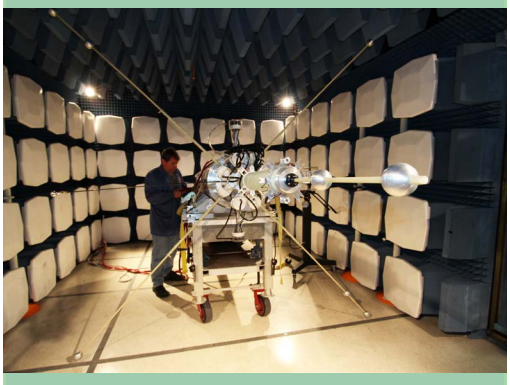
Magnetic calibration.



Walt and Eric during build–up.



Walt with the payload in the thermal vac chamber.



EMI testing.

Picture Place

Ernie and Venus working on the C–REX (Conde) payload.

Hall team getting ready for vibration testing.

The Swenson electrical and ACS team conducting checks.

Greg preparing ampules for the Hall mission.

Jon machining the Taurus casing for the 12.082 Gilbert/SPRINT mission.

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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!

Contact:
Chuck Brodell
Phone: #1827
Email: Charles.L.Brodell@nasa.gov

or

Berit Bland
Phone: #2246
Email: Berit.H.Bland@nasa.gov

Launch Schedule

November				
36.253 US	HASSLER/SWRI	RAISE #2	WS	3-Nov
52.001UE	CONDE/U. OF ALASKA/FAIRBANKS	C-REX	NOR	19-Nov
49.003 UE	LABELLE/DARTMOUTH COLLEGE	CAPER	NOR	19-Nov
30.076 DR	GAMMILL/NSWC PORT HUENEME		WS	24-Nov
12.082 DR	GILBERT/SPRINT		WI	24-Nov
December				
36.295 US	KRUCKER/UNIV OF CA @ BERKELEY		WS	9-Dec
January				
46.009 UE	COLLINS/UNIVERSITY OF ALASKA	MTEX	FB	13-Jan
46.010 UE	COLLINS/UNIVERSITY OF ALASKA	MTEX	FB	13-Jan
49.002 UE	SWENSON/UTAH STATE UNIVERSITY	ASSP	FB	13-Jan
41.111 UE	LARSEN/CLEMSON UNIVERSITY	MIST	FB	13-Jan
41.112 UE	LARSEN/CLEMSON UNIVERSITY	MIST	FB	13-Jan
36.293 UG	CHAKRABARTI/U. OF MASS. -LOWELL	PICTURE	WS	16-Jan
12.077 GT	BRODELL/NASA-WFF		WI	23-Jan

WS - White Sands
WI -Wallops Island
NOR - Norway

Some other caption suggestions:

WRONG WAY, MARK! WRONG WAY!!

WHERE'S MY SADDLE??

YOU SURE THIS THING IS SAFE??

Write a caption winner is: **"Where the h@*l is Major Kong?"**
submitted by **Alexander Van Dijk/NASA Ames**
https://www.youtube.com/watch?v=ueuauKKjPZI