National Aeronautics and Space Administration

Rocket Report

2016

Sounding Rockets Program Office

What's inside...

In Brief...

The third Peregrine motor disposal firing was conducted on August 26, 2016.

SRPO Operations Manager has paid a site visit to Australia to discuss future launch options for Astrophysics researchers.

Campaign planning for Norway missions in 2018 and Kwajalein 2017 is progressing according to schedule. In addition to the science missions from Norway one student mission will be flown. Students from the US and Norway will get an opportunity to fly their own experiments on a sounding rocket.

Three new sounding rocket missions to test parachutes for Mars landing for JPL, have been added to CY 2017. Three Terrier–Black Brants will be flown from Wallops Island, VA.

46.014 UO Koehler - RockSat-X successfully launched August 17, 2016

RockSat-X was successfully launched from Wallops Island, VA on August 17, 2016. RockSat-X carried student developed experiments and is the third, and most advanced, student flight opportunity. The other two student flight missions are; RockOn! an introductory workshop for building and flying experiments, and RockSat-C which allows students to design their own experiment but does not offer exposure to the space environment.

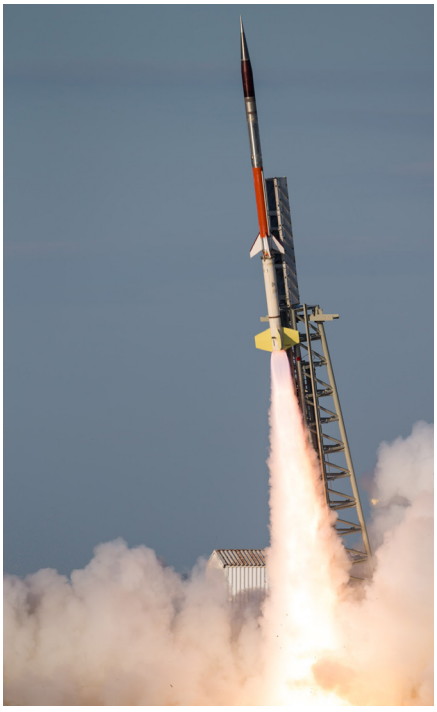


Image Credit: Wallops Imaging Lab

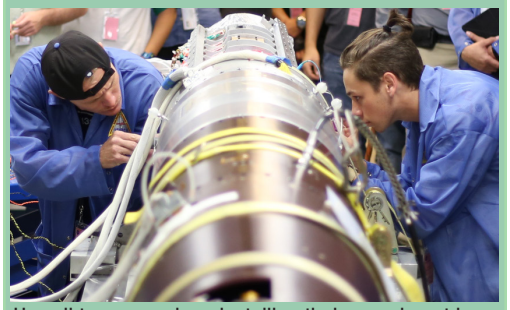
RockSat–X launches from Wallops Island, VA.

The experiments flown on this RockSat-X flight were:

University of Hawaii Community Colleges

Four community colleges in Hawaii have teamed up to encourage students to explore STEM-based careers. The first primary experiment is to measure thermal neutron and gamma background radiation using scintillators and photomultiplier tubes. The second primary experiment will deploy a naphthalene sublimation mini-rocket made from 3D printed materials and capture imagery of the sublimation rocket's release. The secondary experiments onboard will evaluate a 9-axis IMU motion tracking device and wirelessly transfer video from the sublimation rocket-mounted cameras back to the experiment.

46.014 UO Koehler - RockSat-X continued...



Hawaii team members installing their experiment in the RockSat–X payload.

University of Nebraska Lincoln

This experiment aims to develop and streamline the mechanism for a deployable boom and solar panel system. The deployable boom system could be used for suborbital and small satellite missions. For the 2016 flight, this experiment flew as a mechanical experiment only, in order to test the resilience of the retracted boom system.

Capitol Technology University

This experiment, TRAPSat, used a silica aerogel to capture micro-debris. CTU is utilizing this RockSat-X mission as a proof of concept both for the use of aerogel as a medium to remove debris, as well as to prove the viability of using aerogel blanketing as an alternative to Multi-Layer Insulation. A camera images the micro-debris and record data about their impact.

Northwest Nazarene University

This experiment tests the feasibility of flexible electronics in the space environment. Utilizing passive flexible radio frequency identification (RFID) tags, provided by American Semiconductor,

RockSat–X payload team with the payload on the balancing table at Wallops.

recordings of temperature are transmitted and received during the space flight. A boom extends an RFID tag away from the experiment, during which temperature and transmit power will be recorded via the RFID reader powered by a smartphone. The boom deployment is recorded on a GoPro. The second part of the experiment is to utilize a microcontroller to facilitate the control and sampling of the American Semiconductor FleX-Analog to Digital Converter (ADC) accelerometer alongside a traditional ADC to compare the use of flexible electronics in space with standard off the shelf parts.

Virginia Tech

This experiment will demonstrate the capability of software defined radio (SDR) in spaceflight communication

systems. Additionally it will test the possibility of using economically priced SDR devices such as the Ettus E310. Data is transmitted to the Virginia Tech Ground Station using the Ettus E310 and a helical transmit antenna that deploys from the rocket in the direction of the Virginia Tech Ground Station. The transmitted packages contain gyroscope, acceleration, pressure and temperature data.

Virginia Tech receiving antenna setup on Wallops prior to launch.

Carthage College

The objective of this experiment is to observe very low frequency electromagnetic waves that come from lightning discharges. As the payload increases in altitude, the experiment observes the impact that the ionosphere has on these low frequency waves. This experiment utilizes two electric field plate antenna pairs and three magnetic loop antennas (x,y,z-axis) to detect electromagnetic waves. The signals from the antennas are amplified and then stored onboard in an xCORE computer with microSD card.

University of Colorado Boulder

The RockSat-X High Definition video payload is intended to provide a view of the experiments from space. The system houses four HD cameras that record the flight and any deployments or activations on student experiments. Each camera is housed in a sealed container with a pressure and temperature sensor to give important data on the integrity of the system during the flight to space.

University of Puerto Rico

The experiment allows the detection of high density particles found within 130-165 kilometers above sea level using the UPR early micrometeorite impact detection system, collector, and various other measuring devices. This project could aid in developing a clearer image of space particles, and potentially lead to the discovery and subsequent genome sequencing of organic materials found within the particles. The experiment is also utilizing a Leica SL UHD 4K video camera pointed aft to record video of the flight. The Leica SL was selected as an ongoing research collaboration with Bifröst Corporation to test optical behavior and camera functionality during flight. These experiments will provide data to evaluate camera performance for future missions to visualize the aurora borealis.

University of Puerto Rco team briefing Logan Wright/ NSROC safety office (second from right).

This flight included the first clam shell skins. The skins were successfully deployed during flight.

The payload was not recovered.

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36.314 NS Cirtain - High Resolution Coronal Imager (Hi-C) launched July 27, 2016

Hi–C sequence testing at White Sands Missile Range, NM.

The High-resolution Coronal Imager (Hi-C) mission flew for the second time in 2016. The first flight was in 2012. Hi-C is designed to capture the highest-resolution images of the sun's million-degree atmosphere called the corona in the extreme ultraviolet wavelength. This higher energy wavelength is optimal for viewing the hot solar corona. Additionally, the mission was designed to study the mechanisms for growth, diffusion and reconnection of magnetic fields of the corona, and to help understand the coupling of small-scale dynamic and eruptive processes to large scale dynamics.

Due to a failed electrical connection the instrument shutter did not open in flight and science data was not collected.

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Integration and Testing

Integration and testing continue for 36.301 & 36.306 GE PFAFF – Neutral Jets in Auroral Arcs

The main objective of this investigation is to understand the height-dependent coupling processes that create localized neutral "jets" in the upper atmosphere associated with the aurora, their driving conditions, and their associated heating and neutral structuring. The auroral neutral jets experiment consists of two rockets launched simultaneously with different apogees -- 350 km and 175 km. Each rocket will be instrumented with plasma and neutral gas detectors as well as electric and magnetic field detectors. This mission is scheduled to launch in February 2017 from Poker Flat.

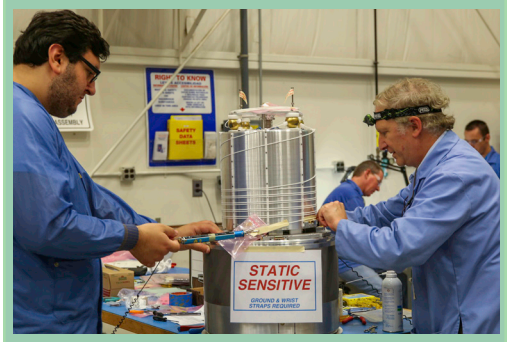
Frank working on one of the Jets payloads.

Gary deploying booms before MOI testing.

Tom and Walt working on camera system.

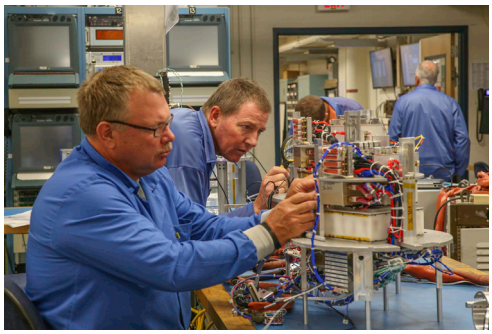
36.303 & 36.304 UE Lynch – Ionospheric Structuring: In Situ and Groundbased Low Altitude StudieS (ISINGLAS)

ISINGLASS is an experiment designed to gather multipoint data spread locally across an auroral arc. ISINGLASS is also a scientific and technical precursor to a proposed Ionospheric CubeSwarm. It provides the specific detailed case-study examples from which an orbital mission can grow. The in situ measurements of plasma parameters at multiple locations will be stitched together using ground based measurements and data assimilation to produce a localized map of plasma parameters and gradients. There will be two identical flights, into two separate events; each flight releases a large subpayload, and 4 small deployables. The multipoint measurements of auroral ionosphere are made using the PIP (Petite Ion Probe) retarding potential analyser sensor. The PIPs are carried by 4 deployable payloads known as Bobs. The Bob payloads are ejected from the main payload using springs. In addition, six PIPs will be located on the main payload, and their data will be passed to Wallops TM through onboard Arduinos and shields. The main payload also carries an Acute Precipitating Electron Spectrometer, (APES), a scientific magnetometer, and a thermal Electron Retarding Potential Analyzer (ERPA). A Cornell electric field COWBOY subpayload is also carried and ejected along the field line. A significant ground-based sensor array, including the use of PFISR, and a modelling/assimilation analysis, complete the mission. ISINGLAS is scheduled to launch in February 2017 from Poker Flat.



Cornell team wrapping wire booms.

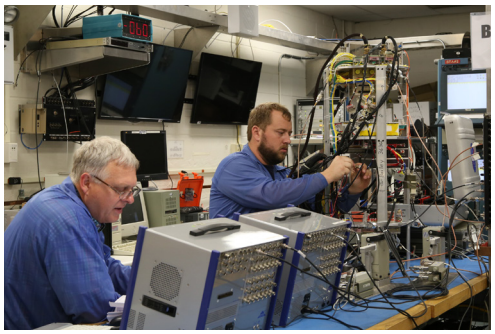
Dr. Lynch and Greg inspect deployment mechanism for Bobs.



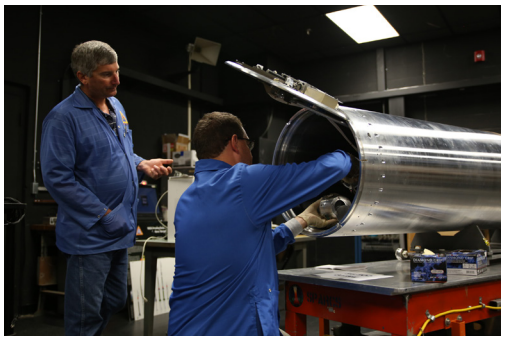
Karl and Larry with payload components.

36.302 UE Bailey – PolarNOx

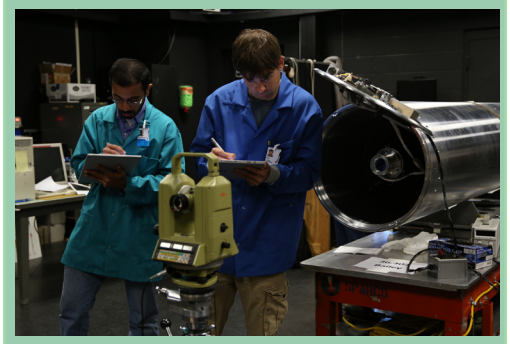
PolarNOx is designed to measure the concentration of nitric oxide, a destroyer of ozone, in the mesosphere and lower thermosphere in the nighttime polar region. Spectrographic measurements, at wavelenghts near 215 nm, of the concentration of NO will be made using a UV astronomy payload to observe a well known and characterized star, Algenib (Gamma Pegasi). The goal is to get the most time possible observing both the star brightness above the NO and the NO between 100 and 110 km (peak). Nearly all the NO exists between 95-150km. PolarNOx is scheduled to launch from Poker Flat in January 2017.



Payload systems being prepared for instru–ment integration.



StarTracker installation.



Science team members recording theodolite measurements.

51.001 UE – Auroral Zone Upwelling Rocket Experiment (AZURE)

During disturbed conditions the vertical circulation in the auroral zone is a key element in the re-distribution of energy, momentum, and chemical constituents in response to forcing, but very few direct measurements of the vertical winds in such conditions exist. The few available vertical wind measurements in disturbed conditions have very limited altitude coverage. Time series of the vertical winds in the high-latitude thermosphere show large magnitudes and uni-directional flow directions that persist for long periods of several hours that are inconsistent with with the expected response, based on the understanding of the forcing responsible for the vertical flow. Among the mission goals for AZURE is to obtain the first high resolution measurements of the mesoscale (10 to 100 km) horizontal neutral flow structure, including the altitude profile of the flow divergence and vorticity, in the active region near magnetic midnight over a broad range of altitudes, and to obtain the first extended vertical wind profiles covering the full range of altitudes from the lower E region to the F region in disturbed conditions. AZURE is scheduled to launch from Poker Flat in January 2017.

Caroline reviewing electrical documents.

Clay prepareing deployables.

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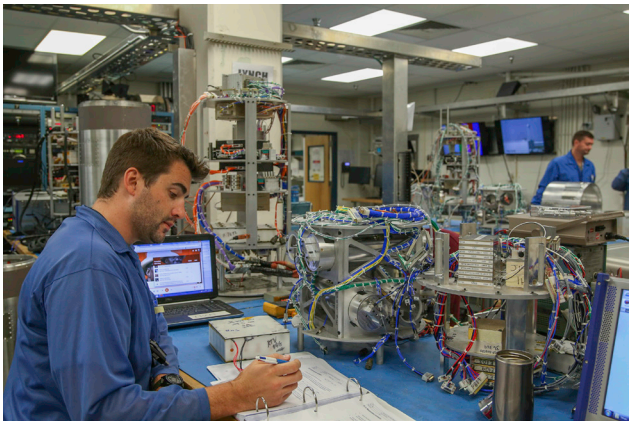
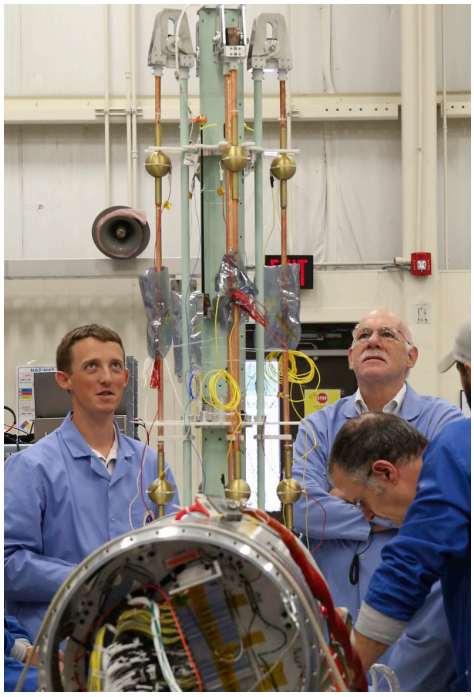
Picture Place



Kyle working on the Lynch payloads.

First flight of the clam shell skin – RockSat–X.

Nate teaching Megan the NSROC thinking pose.



Waiting for the "**E x B**" drift.

Seth (intern) measuring alignment of a Solar Pointing Attitude Rocket Control System (SPARCS).

Greg with his new BFF Bob.

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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!

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Launch Schedule CY 2016

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE	TIME
36.309 US	SOLAR & HELIOSPHERIC	HASSLER	SWRI	RAISE	WS	Nov-4	DAY
36.317 GP	SPECIAL PROJECTS	HESH	NASA-GSFC-WFF	SUBTEC 7	WI	DEC-13	DAY

Launch Schedule 1st quarter CY 2017

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE	TIME
51.001 UE	GEOSPACE SCIENCES	LARSEN	CLEMSON UNIVERSITY	AZURE	FB	JAN-18	NIGHT
36.302 UE	GEOSPACE SCIENCE	BAILEY	VIRGINIA TECH	POLARNOX	FB	JAN-19	NIGHT
36.301 GE	GEOSPACE SCIENCE	PFAFF	GSFC	JETS	FB	FEB-13	NIGHT
36.303 UE	GEOSPACE SCIENCE	LYNCH	DARTMOUTH COLLEGE	ISINGLASS	FB	FEB-13	NIGHT
36.304 UE	GEOSPACE SCIENCE	LYNCH	DARTMOUTH COLLEGE	ISINGLASS	FB	FEB-13	NIGHT
36.306 GE	GEOSPACE SCIENCE	PFAFF	GSFC	JETS	FB	FEB-13	NIGHT
36.307 DS	SOLAR & HELIOSPHERIC	TUN	NAVAL RESEARCH LAB	HERSCHEL	WS	MAR-8	DAY

WS - White Sands
WI -Wallops Island
NOR - Norway
FB - Fairbanks