

National Aeronautics and Space Administration



ROCKET REPORT

Sounding Rockets Program Office
Quarterly Newsletter



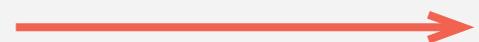


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Cover photo:
41.132 WO RockOn vehicle with students.
Credit: NASA phoro/Danielle Johnson

RockSat-X launches from Wallops Island,
VA. Credit: NASA phoro/Danielle Johnson





Program News

Two education missions, RockOn/RockSat–C and RockSat–X were flown from Wallops Island, VA in August. Over one hundred students came to Wallops to view the launch. The RockOn launch had been re–scheduled from its original launch date in June, due to inclement weather during the original launch window.

The SRPO Operations Group conducted a preliminary site survey trip to Peru and met with representatives from the US Embassy, the Peruvian space agency, CONIDA, Peruvian Air Force, Institute Geophysics Peru (IGP), and Port of Callao. The Peruvian counterparts welcomed the NASA presence in Peru and were supportive of starting campaign planning activities. Current target for a Peru campaign is 2028 with launches taking place from Punta Lobos, a range that has been used in the past.

The Suborbital Rocket Forum (SRF) was held at Wallops on July 18 – 19, 2023. Representatives from NASA, Navy, and industry participated in the forum and discussed collaboration and technology development.

Peraton Inc. was selected as the Prime Contractor for NASA Sounding Rocket Operations Contract (NSROC) IV. The new contract takes effect on October 1, 2023.

Three Black Brant IX vehicles will be launched as part of the Atmospheric Perturbations around Eclipse Path (APEP) campaign from White Sands Missile Range, NM. APEP will study the dynamics of Earth’s ionosphere during the Annular Solar Eclipse, occurring on October 14, 2023. See page 9 for more information.



One of the APEP payloads after boom deployment testing.
Credit: Berit Bland/NSROC.

46.038 WO - RockSat-X student mission - launched August 16, 2023.

Missions Flown

RockSat–X carried student developed experiments and is the third, and most advanced, student flight opportunity. RockSat–X experiments are fully exposed to the space environment above the atmosphere. Power and telemetry were provided to each experiment deck. Additionally, this payload included an Attitude Control System (ACS) for alignment of the payload. These amenities allow experimenters to spend more time on experiment design and less on power and data storage systems.

Due to a launch vehicle failure only a small amount of data was collected.



RockSat–X integration. Credit: Berit Bland/NSROC



Post launch team photo with RockOn/RockSat–C and RockSat–X students.
Credit: Berit Bland/NSROC

41.132 WO RockOn - launched August 16, 2023

Missions Flown

This was the 15th RockOn workshop since the inception of the program in 2008. RockSat-C experiments are flown in the same rocket as the workshop experiments but are more advanced and completely designed and fabricated by the students.

The goal of the RockOn missions is to teach university faculty and students the basics of rocket payload construction and integration. RockOn also acts as the first step in the RockSat series of flight opportunities, and workshop participants are encouraged to return the following year to design, build, test, and fly their own experiment. The RockOn experiments are designed to capture and record 3-axis accelerations, humidity, pressure, temperature, radiation counts, and rotation rates over the course of the mission. All items and instruction necessary to complete the experiment are provided for the participants during the workshop, and teams of students and faculty work together to build their experiment. The workshop culminates with the launch of the experiments on a Terrier-Improved Orion sounding rocket.

RockSat-C offers students an opportunity to fly more complex experiments of their own design and construction. The intent is to provide hands-on experiences to students and faculty advisors to better equip them for supporting the future technical workforce needs of the United States and/or helping those students and faculty advisors become principal investigators on future NASA science missions. Teaming between educational institutions and industry or other interests is encouraged.

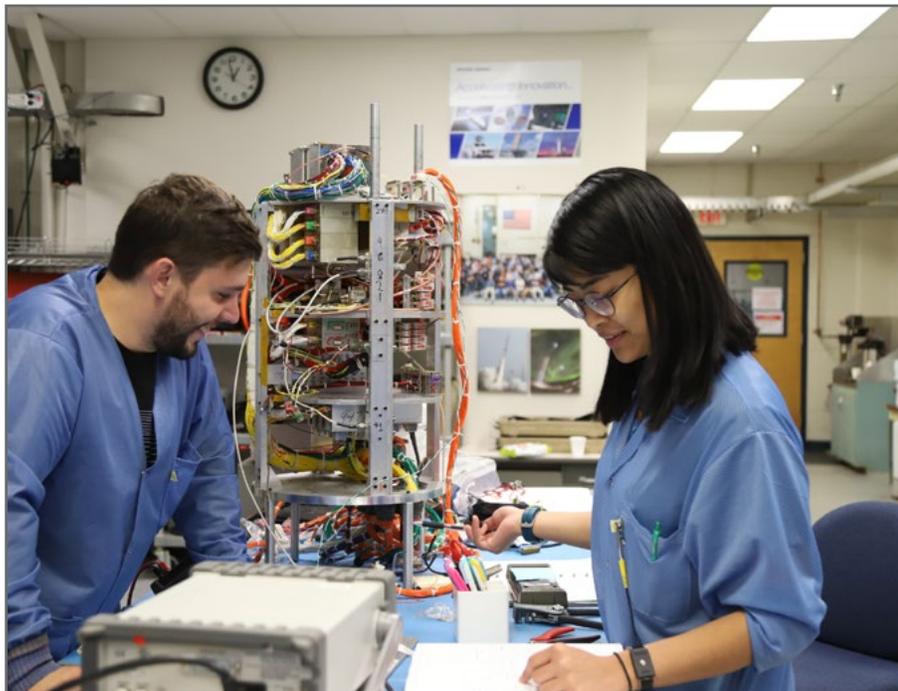
Cubes in Space is a program for middle school students that allows them the opportunity to design an experiment that fits in a 40 x 40 x 40 mm cube. The cubes were flown inside the nose cone of the RockOn payload.



41.132 WO RockOn launch from Wallops Island, VA Credit: Wallops Imaging Lab



RockOn workshop.
Credit: Chris Koehler/PI RockOn



PICTURE PLACE

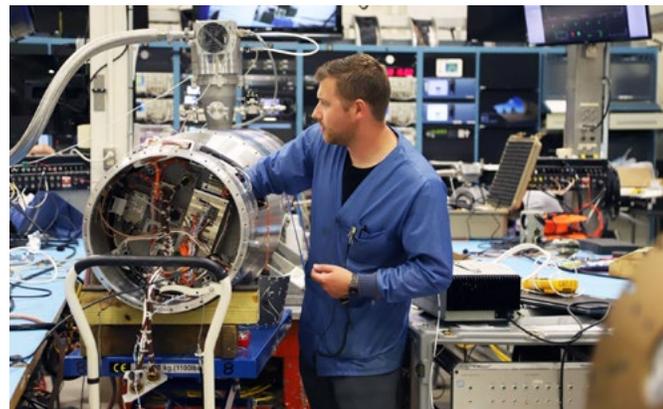


Integration and Testing

36.375 UG Fleming/University of Colorado - INFUSE

The INtegral Field Ultraviolet Spectroscopic Experiment (INFUSE) is an integral field spectrograph (IFS) operating from 1000 – 2000 Å. The fundamental objective of INFUSE is to understand how material from supernovae (SNe) reshapes the interstellar medium (ISM) by observing shock fronts in supernova remnants (SNR). Emission lines in the far-ultraviolet (FUV) trace the point at which the ISM and the supernova begin interacting with each other. INFUSE will be the first instrument with the spatial resolution to resolve shock filaments in this crucial bandpass.

INFUSE is scheduled to launch from White Sands Missile Range, NM on October 29, 2023.



INFUSE integration.
Photo by Berit Bland/NSROC



Post-deployment inspection of the DISSIPATION instruments.
Photo by Berit Bland/NSROC

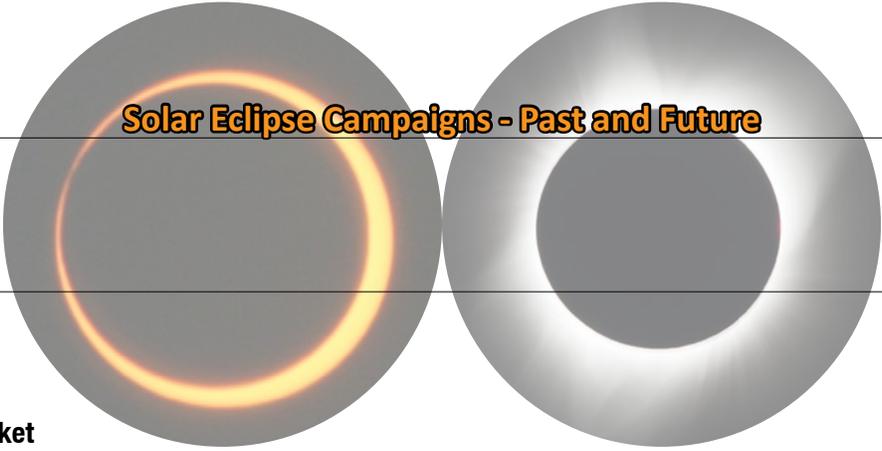
52.009 AE Reeves/LOS ALAMOS NATIONAL LAB - Beam-PIE

The purpose of the Beam-Plasma Interactions Experiment (Beam-PIE) is to use an electron beam to generate VLF radio waves, detect the resulting radio waves using electric field antennas on a separate receiver payload and to measure ambient plasma conditions and dependence of waves on those conditions. This mission also intends to measure possible effects of the waves on local plasma electrons and detect the effects of the beam on the atmosphere using optical and radar measurements.

Beam-PIE is scheduled to launch from Poker Flat Research Range, AK in November 2023.



Beam-PIE integration.
Photo by Berit Bland/NSROC



Solar Eclipse Campaigns - Past and Future

Solar Eclipse Sounding Rocket Campaigns in the past and the future

With the 2023 Annular Eclipse on October 14, and the 2024 Total Eclipse on April 8 both transecting the United States, six sounding rockets will be launched, three during each Eclipse.

The 2023 Annular Eclipse transits very close to the White Sands Missile Range, NM and preparations are underway to launch three Black Brant IX vehicles for the Atmospheric Perturbations around Eclipse Path (APEP) mission. In 2024 three additional launches, this time from Wallops Island, VA, will take place to study the Total Eclipse. Dr. Barjatya from Embry–Riddle Aeronautical University is the Principal Investigator for both sets of launches.

The main purpose of APEP is to study the dynamics of Earth's ionosphere using instruments such as Langmuir probes, electric field probes, magnetometers, ionization gauges, and accelerometers. Simultaneous multipoint measurements will be achieved by ejecting four instrumented deployables from each payload.

Eclipses present a unique opportunity to study the effects of a supersonic cooling shadow of the Moon as it moves across the ionosphere and its effect on the structure and energetics of the ionosphere–thermosphere system.

The first rocket, launched approximately 35 minutes before the local peak eclipse measures the ionosphere as the eclipse is starting. The second rocket is launched during the peak eclipse period when the ionosphere has the

maximum shielding from solar radiation. Approximately 35 minutes after the eclipse, when solar radiation again reaches the ionosphere, the third rocket is launched.

An eclipse creates waves in the ionosphere as the supersonic cooling shadow races across the ionosphere. The situation gets further complicated because most of the time there are already existing waves in the ionosphere due to terrestrial weather or an ongoing space weather event, such as a flare hitting Earth, especially during the ongoing Solar Max. Visualize this as a motorboat racing across a disturbed ocean which already has waves and tides.

Scientists want to understand how the ionosphere responds to all these disturbance activities because all satellite communications go through the ionosphere before they reach Earth. And as society gets more dependent on space based assets, such as GPS and satellite based communications, we need to understand and consequently model all perturbations and irregularities in the ionosphere.

Past Solar Eclipse campaigns:

July 20, 1963
Total Eclipse
No. of rockets: 7
Launch site: Fort Churchill, Canada

May 30, 1965
Total Eclipse
No. of rockets: 7
Launch site: Cape Karikari, New Zealand

May 20, 1966
Annular Eclipse
No. of rockets: 6
Launch site: Koroni, Greece

November 12, 1966
Total Eclipse
No. of rockets: 5
Launch site: Cassino, Brazil

March 7, 1970
Total Eclipse
No. of rockets: 25
Launch site: Wallops Island, VA

February 26, 1979
Total Eclipse
No. of rockets: 7
Launch site: Red Lake, Canada

February 16, 1980
Total Eclipse
No. of rockets: 7
Launch site: San Marco platform, Kenya

For more information on the upcoming 2023 and 2024 Eclipses, visit:
<https://solarsystem.nasa.gov/eclipses/home/>
and
<https://solarsystem.nasa.gov/resources/2917/nasas-2023-and-2024-solar-eclipse-map/?category=eclipse>

SCHEDULE FOR NEXT QUARTER

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE
36.386 UE	GEOSPACE SCIENCES	BARJATYA	EMBRY RIDDLE UNIVERSITY	APEP	WS	10/14/23
36.387 UE	GEOSPACE SCIENCES	BARJATYA	EMBRY RIDDLE UNIVERSITY	APEP	WS	10/14/23
36.388 UE	GEOSPACE SCIENCES	BARJATYA	EMBRY RIDDLE UNIVERSITY	APEP	WS	10/14/23
36.375 UG	UV/OPTICAL ASTROPHYSICS	FLEMING	UNIV OF COLORADO	INFUSE	WS	10/29/23
45.007 GE	GEOSPACE SCIENCES	BENNA	NASA/GSFC	DISSIPATION	FB	11/05/23
52.009 AE	GEOSPACE SCIENCES	REEVES	LOS ALAMOS NATIONAL LAB	Beam-PIE	FB	11/06/23

WS – White Sands Missile Range, NM
 FB – Poker Flat Research Range, AK

MISCELLANEA

NASA Retirees touring the Attitude Control Systems Lab at Wallops.

