National Aeronautics and Space Administration

Rocket Report

Sounding Rockets Program Office
Quarterly Newsletter

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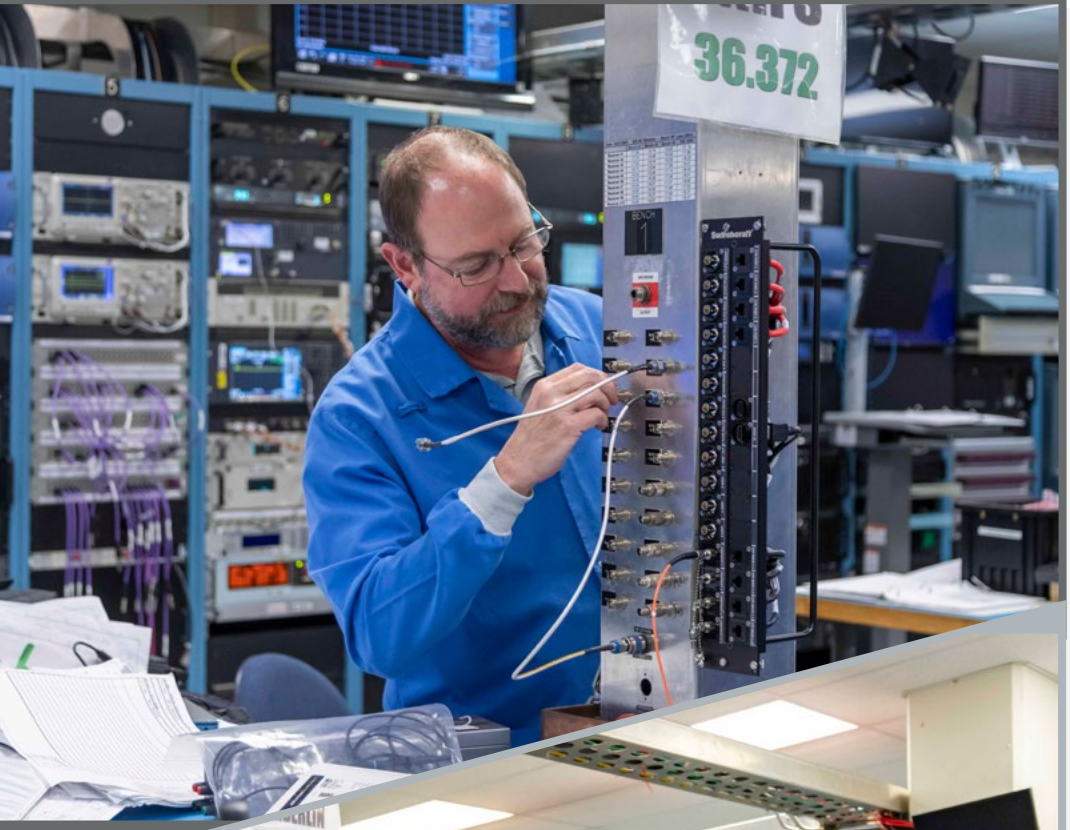
2023



INSIDE

Cover photo:
45.007 GE Benna launches from Poker Flat Research Range, AK.
Credit: NASA photo/Danielle Johnson

Aurora over Poker.
Credit: NASA photo/Danielle Johnson

Program News

The fiscal year started with some exciting missions. First off the pad were the three Atmospheric Perturbations around Eclipse Path (APEP) payloads launched during the Annular Eclipse from White Sands Missile Range (WSMR), NM, on October 14, 2023. Each payload included four instrumented deployables in addition to the main payload instrumentation.

On October 29, 2023 the Integral Field Ultraviolet Spectroscopic Experiment (INFUSE) astrophysics payload was launched from WSMR.

In November payload teams travelled to Poker Flat Research Range, AK to launch two Geospace Science payloads, DISSIPATION and Beam – Plasma Interactions Experiment (Beam–PIE).

All first quarter missions were flown successfully and the Principal Investigators report good data.

Sounding Rockets staff members, Cathy Hesh and Josh Yacobucci, attended AGU in San Fransisco, December 11 – 15, and provided information about Sounding Rockets to conference participants.

The coming year will be busy, with 19 missions on the schedule for the remainder of the Fiscal Year. Another set of three APEP payloads will be launched from Wallops Island, VA on April 8, 2024 for the Total Eclipse. The first Solar Physics Campaign will be conducted from Poker Flat Research Range. Several Geospace Science Missions will be launched, including two rockets from the Kwajalein Atoll, Marshall Islands. Astrophysics and Educational missions will also be supported.

We wish you the very best for the Holiday Season!

Cathy Hesh/SRPO Assistant Chief at AGU showcasing sounding rocket models and handouts.
Credit: Josh Yacobucci

36.386, 387, 388 UE Barjatya/Embry-Riddle University Atmospheric Perturbations around Eclipse Path (APEP)-launched October 14, 2023.

Three APEP payloads were successfully launched from White Sands Missile Range on October 14, 2023.

The main purpose of APEP was to 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 35 minutes before the local peak eclipse measured 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. Thirtyfive minutes after the peak eclipse, when solar radiation again reaches the ionosphere, the third rocket was launched.

Three additional APEP payloads will be launched from Wallops Island, VA during the Total Eclipse on April 8, 2024.

Paths of the 2023 and 2024 eclipses.
Credit: NASA/Scientific Visualization Studio/Michala Garrison; Eclipse Calculations By Ernie Wright, NASA Goddard Space Flight Center
Visit: https://solarsystem.nasa.gov/eclipses/home/

Three APEP rockets ready for launch.
Credit: Judy Hawkins/WSMR

PI Dr. Barjatya with APEP Eloise.
Credit: Judy Hawkins/WSMR

APEP payload teams waiting for the Eclipse.
Credit: Judy Hawkins/WSMR

36.375 UG Fleming/University of Colorado- Integral Field Ultraviolet Spectroscopic Experiment (INFUSE)- launched on October 29, 2023

INFUSE was a new ultraviolet instrument from the University of Colorado. It is an integral field spectrograph (IFS) operating from 1000 – 2000 Å.

The fundamental objective of INFUSE was 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 was the first instrument with the spatial resolution to resolve shock filaments in this crucial bandpass.

The target for observation for this mission was the XA Region of the Cygnus Loop SNR.

INFUSE payload team at WSMR.
Credit: Ryan Harty/WSMR

INFUSE payload vibration testing.
Credit: Berit Bland/NSROC

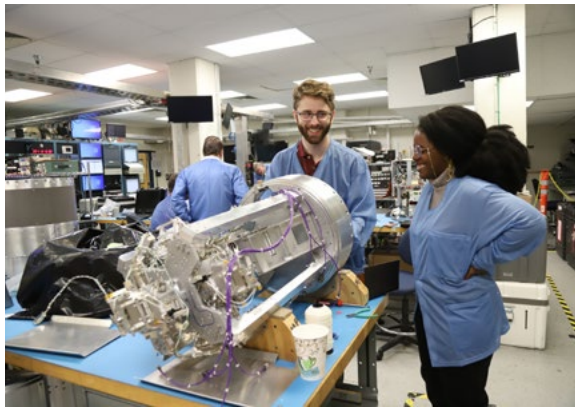
INFUSE recovery.
Credit: Ryan Harty/WSMR

45.007 GE Benna/NASA GSFC- DISSIPATION- launched November 8, 2023.

The DISSIPATION experiment provided, for the first time, comprehensive and concurrent in situ measurements of the response of the thermosphere to Joule heating in the auroral transition region.

Joule heating results from friction between the ion and neutral gases when the gases are not flowing at the same speed and direction. Energy dissipation within the transition region via particle precipitation and Joule heating can cause profound horizontal and vertical redistributions of thermospheric mass density, composition, temperature, and winds.

Most of the knowledge of this dissipative process is based on remote and/or limited observations of neutral gas and plasma parameters. DISSIPATION was designed to provide a more direct observations.



DISSIPATION integration.
Credit: Berit Bland/NSROC

DISSIPATION payload team at Poker.
Credit: Danielle Johnson/Wallops Imaging Lab

52.009 AE Reeves/Los Alamos National Laboratory - Beam- Plasma Interactions Experiment (Beam-PIE)- launched November 9, 2023

The objective of the Beam Plasma Interactions Experiment was to discover and characterize fundamental wave–particle interactions by generating waves using a modulated energetic electron beam, characterizing the wave properties to test theoretical and model predictions.

As a secondary objective Beam–PIE determined if the beam–generated wave fields are strong enough to produce measurable scattering of ambient ionospheric electron populations. The main specific objectives of Beam PIE were to:

• Demonstrate, for the first time, advanced RF linear electron accelerator instrumentation for space experiments.

• Quantitatively test theories of how energetic electron beams couple to plasmas to stimulate whistler–mode radiation.

• Discover and characterize how energetic electron beams couple to plasmas to stimulate propagating R–X–mode radiation.

Beam–PIE launches from Poker.
Credit: Danielle Johnson/Wallops Imaging Lab

Beam–PIE integration.
Credit: Berit Bland/NSROC

Beam–PIE integration.
Credit: Berit Bland/NSROC


Credit: Danielle Johnson/Wallops Imaging Lab

Picture Place


Credit: Danielle Johnson/Wallops Imaging Lab


Credit: Danielle Johnson/Wallops Imaging Lab

Sounding rockets and Helio Big Year

The Heliophysics Big Year is a global celebration of solar science and the Sun's influence on Earth and the entire solar system. Join us October 2023 to De–cember 2024!

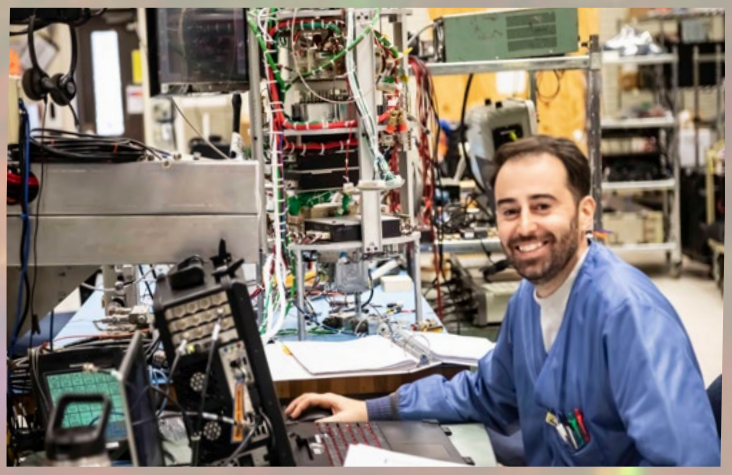
During Helio Big Year two eclipses, October 14, 2023 and April 8, 2024, transit the United States and the Sun is in its peak activity years.

Sounding rocket launches for Helio Big Year include several missions to study the Sun at multiple wavelengths, as well as, six rockets to measure Ionospheric properties during the eclipses.

The Solar Physics missions include:

36.366 US Kankelborg/Montana State Univeristy – Full–Sun Ultraviolet Rocket SpecTrograph (FURST)

FURST is currently scheduled for launch from White Sands Missile Range, NM in the summer of 2024. The goal of this mission is to study and better understand spectra of the "Sun as a Star". FURST spectra will have applications to solar and stellar physics, climate science, and the interac–tion of solar UV radiation with comets, moons, and planets. The immediate science goal is to understand better the processes of chromospheric and coronal heating.



FURST payload work.
Credit: Berit Bland/NSROC

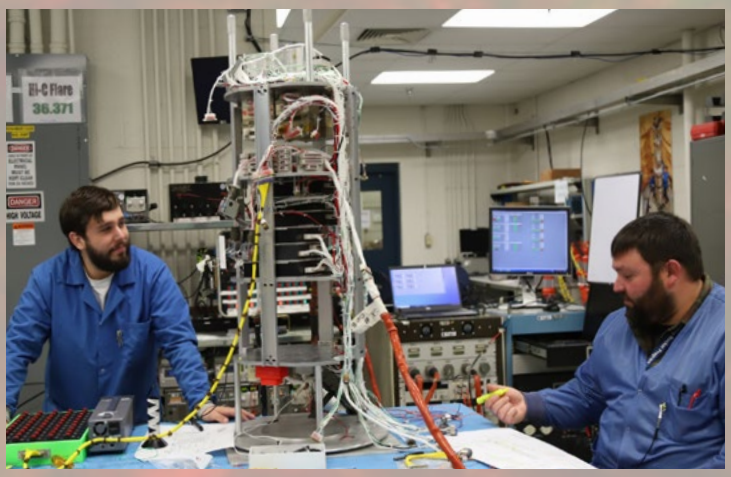
Solar Physics launches from Poker Flat Research Range (PFRR), AK.
The missions from PFRR include:
36.372 US Chamberlin/University of Colorado – Solar eruptioN Integral Field Spectrograph

SNIFS is designed to study the high frequency dynamics associated with small nanoflares, spicules, and Rapid Blue–shifted Excursions (RBEs), as well as, large solar flare energy releases in the lower solar atmosphere.

SNIFS pre–integration testing.
Credit: Berit Bland/NSROC

36.371 NS Savage/NASA Marshall Space Flight Center – High–Resolution Coronal imager (Hi–C) – Flare

The Hi–C instrument is optimized for detecting high tem–perature flare lines.



Hi–C Flare bench checks.
Credit: Berit Bland/NSROC

36.370 US Glesener/University of Minnesota – Focus–ing Optics X–ray Solar Imager (FOXSI) 4

FOXSI–4 will perform a triggered observation of a large flare.

Two separate launch windows are scheduled for the cam–paign; the first, a ten day window, for Solar eruptioN Inte–gral Field Spectrograph (SNIFS) opens mid–March, and the second, a 14–day window for Focusing Optics X–ray So–lar Imager (FOXSI) 4 and High–Resolution Coronal imager (Hi–C)–Flare opens after the SNIFS launch. FOXSI 4 and Hi–C Flare are planned to launch within minutes of each other to observe the same event. Solar activity during the launch windows will be monitored by scientists using data from the NOAA operated Geostationary Operational Envi–ronmental Satellite (GOES). When data from GOES indicate a solar flare is occuring, the payloads will be launched to study the event. By analyzing previous solar cycles, sci–entists estimate that the opportunity of capturing a flare in progress is fairly high during the selected launch window.

All three payloads will be integrated and tested at WSMR, before being shipped to PFRR for launch.

36.391 DS Tun/Naval Research Laboratory – HElium Resonance Scatter in the Corona and HELiosphere (HERSCHEL)

The HElium Resonance Scatter in the Corona and HELio–sphere (HERSCHEL) program will investigate: 1) Origin of the slow solar wind. 2) Variation of helium abundance in coronal structures. 3) Facilitate future investigation of Cor–onal Mass Ejections (CMEs), kinematics, and solar cycle evolution of the electron, proton, and helium corona.

HERSCHEL is scheduled to launch from WSMR in June 2024.

36.385 NS Winebarger/NASA Marshall Space Flight Center – Marshall Grazing Incidence X–ray Spectrom–eter (MaGIXS)

Scientific goal of the MaGIXS mission is to determine the frequency of heating in active region cores by making four critical observations:
1. The relative amount of high–temperature plasma in dif–ferent solar structures
2. The elemental abundances in different solar structures
3. The temporal variability at high temperatures in different solar structures
4. The likelihood of Maxwellian or non–Maxwellian distri–butions

MaGIXS is scheduled to launch from WSMR summer of 2024.

Solar Eclipse missions:

36.386, 387, 388 UE Barjatya/Embry–Riddle University – Atmospheric Perturbations around Eclipse Path (APEP) – launched October 14, 2023 from WSMR during the Annular Eclipse.

36.392, 393, 394 UE Barjatya/Embry–Riddle University – Atmospheric Perturbations around Eclipse Path (APEP) will be launched from Wallops Island, VA on April 8, 2024 for the Total Eclipse.

The APEP missions are designed detect changes in the ionosphere using instruments such as Langmuir probes, electric field probes, magnetometers, ionization gauges, and accelerometers. Simultaneous multipoint measure–ments will be achieved by ejecting four instrumented de–ployables from each payload. Springs are used to deploy the ejectables at a velocity of 3 m/s and they will take data for about 7 to 8 minutes. This allows taking measurements in a larger volume of space.

To learn more about NASA Helio Big Year and how to participate in heliophys-ics, visit:

https://www.nasa.gov/stem-content/he-liophysics-big-year/

SCHEDULE FOR NEXT QUARTER

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE
36.372 US	SOLAR AND HELIOSPHERIC	CHAMBERLIN	UNIV OF COLORADO	SNIFS	FB	03/14/24
36.370 US	SOLAR AND HELIOSPHERIC	GLESENER	UNIV OF MINNESOTA	FOXI–4	FB	03/29/24
36.371 NS	SOLAR AND HELIOSPHERIC	SAVAGE	NASA MSFC	HI–C Flare	FB	03/29/24

FB – Poker Flat Research Range, AK

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Buzz Aldrin mentions sounding rockets on social media!