National Aeronautics and Space Administration

Sounding Rockets Program Office Quarterly Newsletter

Rocket Report

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2024

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Cover photo:
36.394 UE APEP 2 launch.
Credit: NASA Photo/Berit Bland.

NASA Photos/Berit Bland.

RockSat–C team with payload.
Credit: NASA Photo/Berit Bland.


STATIC / DYNAMIC
BALANCER

Program News

During the second quarter of 2024, the program has launched seven payloads from three different launch facilities, Wallops Island, VA, White Sands Missile Range (WSMR), NM and Poker Flat Research Range (PFRR), AK. All seven flights were successful and comprised four disciplines; Geospace Science, Solar and Heliospheric Science, Astrophysics, and Education.

Several upcoming missions are currently in integration at Wallops and WSMR. The Solar Physics mission, Marshall Grazing Incidence X–ray Spectrometer (MaglXS), launch coming up next from WSMR and is schedule for July 16, 2024.

The next Sounding Rocket Working Group meeting will be held at Goddard's Greenbelt campus on July 9 – 10.

The 26th ESA Symposium on European Rocket and Balloon Programmes and Related Research is organized by the European Space Agency (ESA), the Swiss Space Office (SSO) and the Hochschule Luzern (HSLU). The symposium was held May 19 – 23, 2024. NASA representatives gave presentations on the Sounding Rockets Program.

Jay Scott is retiring after having served for 40 years. Jay has spent his career building and launching sounding rocket payloads and will be missed by all.

Jay Scott (left) receiving his retirment rocket model by Rick Weaver/NSROC Program Manager.

Minority Serving Institutions (MSI) faculty at RockOn workshop at Wallops.

36.392, 393, & 394 UE Barjatya/Embry-Riddle University - Atmospheric Perturbations around Eclipse Path (APEP) 2 - April 8, 2024

Three sounding rockets were launched from Wallops Island, VA to study the ionosphere during the Total Solar Eclipse on April 8, 2024 The three Black Brant IX vehicles carried payloads to take measurements of the ionosphere before, during, and after the peak eclipse.

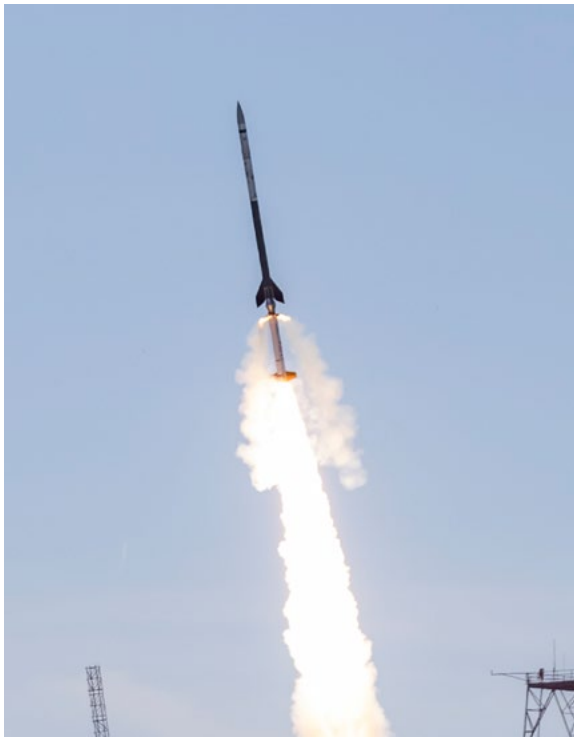
Three rockets, with similar instrumentation, were launched from White Sands Missile Range (WSMR), NM during the Annular Solar Eclipse on October 14, 2023. Results from this mission were presented at the American Geophysicsl Union (AGU) Fall Meeting 2023 (pdf).

APEP–2 detected changes in the ionosphere using instruments such as Langmuir probes, electric field probes, magnetometers, ionization gauges, and accelerometers. Simultaneous multipoint measurements were achieved by ejecting four instrumented deployables from each payload. Springs were used to deploy the ejectables at a velocity of 3 m/s and data was received for about 7 to 8 minutes. This allowed taking measurements in a larger volume of space.

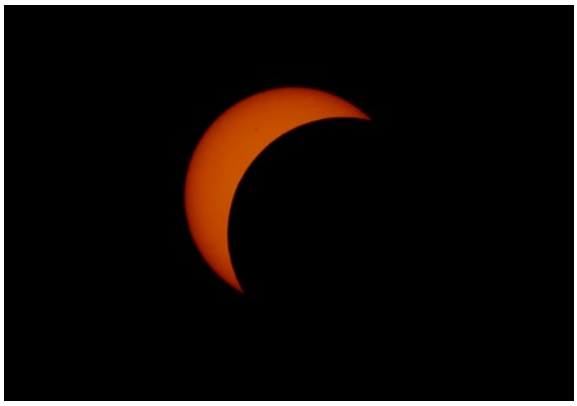
The ionosphere is a region of the Earth's atmosphere between 90 and 500 km altitude, where solar radiation ionizes gases, i.e. strips molecules and atoms of their electrons, creating ions and free electrons. This state of matter is called plasma. The ionosphere is affected by Earth's gravity, earth's magnetic field, the solar wind, the Interplanetary Magnetic Field (IMF), solar flares, terrestrial weather and various other processes, and is a very dynamic environment.

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. Launching the rockets and instruments during a solar eclipse allows scientists to study the ionosphere during a simulated day/night cycle, where nighttime conditions are created by the Moon eclipsing the Sun and altering the radiation environment.

All three launches were successful and the Principal Investigator reports good data.



One of the APEP–2 rockets launching from Wallops Island, VA. Credit: NASA Photo/Berit Bland.



The Sun eclipsed as seen from Wallops Island, VA. Credit: NASA Photo/Berit Bland.

36.396 UG Zemcov/Rochester Institute of Technology - Cosmic Infrared Background Experiment (CIBER) 2 - Launched May 6, 2024

The Cosmic Infrared Background ExpeRiment (CIBER) 2 is a sounding rocket experiment designed to isolate the sources of near–IR fluctuations, and testbed technologies that will be used in the Spectro–Photometer for the History of the Universe, Epoch of Reionization, and ices Explorer (SPHEREx) Medium Explorer (MIDEX) mission. CIBER–2 comprises a 28.5–cm telescope cooled to 80 K that images to three HAWAII–2RG detectors with dual–band filters to simultaneously obtain degree–scale data over the range 0.5–2.0 μm in six bands.

CIBER 2 was successfully launched from White Sands Missile Range, NM on May 6, 2024 at 03:32:00 UT.

The EBL is the summed light produced by all emission over the Universe's history, and it encodes a great deal of information about the history of stars and the assembly of cosmic structure over time. At near–IR wavelengths, the EBL teaches us about the first objects that formed during the earliest phases of galaxy assembly all the way up to the most faint and diffuse objects in the nearby Universe. Broad–band intensity mapping is a technique in which spatial fluctuations are used to unambiguously disentangle the faint EBL from brighter foreground emission from our solar system and Milky Way galaxy. Multiple intensity mapping studies, including those by CIBER–2's predecessor rocket experiment, have found that fluctuations in the EBL significantly exceed predictions from galaxy models. What could be causing the discrepancy is unclear, and better measurements are required.

Previously, CIBER–2 made a successful first flight from White Sands Missile Range in New Mexico on June 7th of 2021, and a second flight was attempted in April 2022. No science was collected due to termination of flight shortly after launch.

CIBER–2 is led by the Rochester Institute of Technology in collaboration with the California Institute of Technology, the University of California Irvine, Kwansei Gakuin Univiersity and the Kyushu Institute of Technology in Japan, and the Korea Astronomy and Space Science Institute.

CIBER–2 team at White Sands. Credit: WSMR Photo/Judy Hawkins.

CIBER–2 recovery operations. Credit: WSMR Photo/Chris Bohn.

Missions Launched: Solar Flare Campaign April 2024

36.370 US Glesener/University of Minnesota - Focusing Optics X-ray Solar Imager (FOXSI) 4 & 36.371 NS Savage/ NASA Marshall Space Flight Center- High-Resolution Coronal imager (Hi-C)- Flare - Launched April 17, 2024

Solar actiivty waxes and wanes in a cyclic fashion with an 11–year period. We are currently in Solar Cycle 25 which reached minimum in 2019. NOAA's Space Weather Prediction Center currently predicts the maximum in the solar cycle to occur between November 2024 and March 2026.

During high solar activity, sunspots, flares, and, Coronal Mass Ejections (CMS) increase and this is an optimum period to study solar flares using Sounding Rockets. The Solar Flare campaign included two payloads, FOXSI 4 and Hi–C Flare, both successfully launched from Poker Flat Research Range, AK on April 17, 2024. The payloads were launched 1–minute apart with FOXSI 4 being first.

The goals of the campaign were to acquire multi–scale, multi–wavelengh observations of a solar flare and open up the possibility of validation of flare–optimized instruments. Most Solar Physics payloads are launched from White Sands Missile Range, NM, but this launch site does not offer the flexibility to be launch ready and wait for a flare event to occur. PFRR enabled a longer launch window with daily opportunities to launch. Scientists monitored solar activity, using GOES x–ray data, during the daily window and were able to launch during an M–class flare.

Hi–C Flare and FOXSI–4 studied solar flares in two separate wavelenghts. Hi–C is optimized for Ultraviolet wavelenths at 12.9 nm, and FOXSI–4 is optimized for hard X–rays between 4 – 20 keV.

Both payloads were recovered by helicopter in the launch impact area.

Composite image of FOXSI 4 and Hi–C Flare launches. FOXSI 4 was launched at 22:13:00 UT and Hi–C Flare at 22:14:00 UT. Credit: NASA Photos/Lee Wingfield

FOXSI 4 pre–flight testing.
Credit: NASA Photo/Lee Wingfield

Solar Flare Campaign Team
Credit: NASA Photo/Lee Wingfield

41.133 Koehler/NASA Wallops Flight Facility - RockOn-Launched June 20, 2024

Missions Launched: RockOn Student Launch

The 16th launch of the RockOn student mission occurred on June 20, 2024. More than a hundred students and faculty from Universities around the country attended the launch event on Wallops Island, VA in the early morning.

The RockOn payload includes two types of experiments; RockOn experiments which are built by students and faculty during a one week workshop at Wallops Flight Facility, VA, and RockSat–C experiments, designed and built by students at their home institutions. This year, faculty from Minority Serving Institutions (MSI) attended a dedicated workshop in late May and flew their RockOn experiments on this flight.

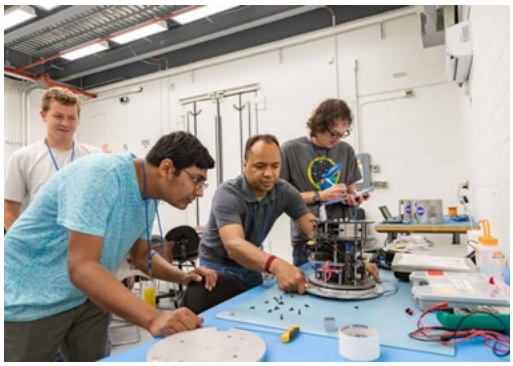
Students arrive on the Saturday preceding the launch on Thursday for the RockOn workshop, and complete their experiments during the early part of the week. By Tuesday, the experiments are integrated with the rest of the payload support systems. RockSat–C, the more advanced experiments, are fully assembled when the students arrive at Wallops for integration.

Cubes–in–Space (CiS), also part of the RockSat–C program, are flown in the nose cone of the vehicle, and provide opportunities for Middle and High School to participate in space flight activities.

Apply for RockOn and RockSat opportunities here:
https://www.nasa.gov/nasa–rocksat–program/

Cubes–in–Space:
https://www.cubesinspace.com/

RockSat–C students attending payload testing.
Credit: NASA Photo/Berit Bland



RockSat–C pre–integration checks.
Credit: NASA Photo/Berit Bland

MSI faculty attendees at RockOn workshop with instructor Chris Koehler (right).
Credit: NASA Photo/Berit Bland

RockOn students on Wallops Island after the launch.
Credit: NASA Photo/Berit Bland

Wallops Rocketry Academy for Teachers and Students (WRATS)

Twenty High School teachers from eleven states participated in the WRATS workshop June 17 – 21, 2024. The workshop is held the same week with the RockOn flight and the teachers attend the launch of the RockOn mission on Wallops Island – a highlight of the week.

During the workshop particpants learn about model rocketry and how models relate to sounding rockets. Three models were constructed and flown during the week. The first experiment demonstrates mass vs. altitude by varying the "payload" mass carried by a small rocket. Parachutes are designed and constructed for the second small rocket to demonstrate and evaluate shape and size parameters and their trade–offs in rocket recovery. Advancing to the final rocket for the week, both mass and parachute experiments are incorporate and an altimeter is added to gather data altitude reached.

Additional components of the workshop include tours of Wallops Flight Facility, presentations by Subject Matter Experts on parachutes and internship opportunities.

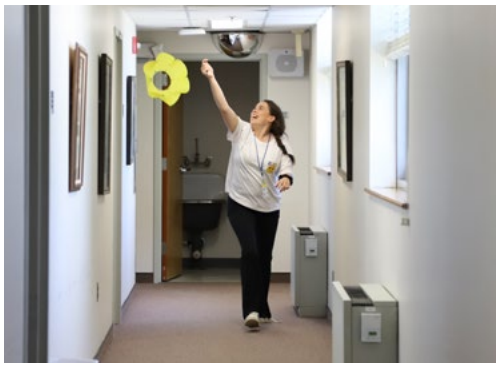
The WRATS workshop is a collaboration between the Wallops Education Office, Sounding Rockets Program Office (SRPO), and the NASA Sounding Rockets Operations Contract (NSROC).

Some of the feedback received from the teachers:
"I did not master the science of rockets before, now I'm confident in my ability to teach the concepts."

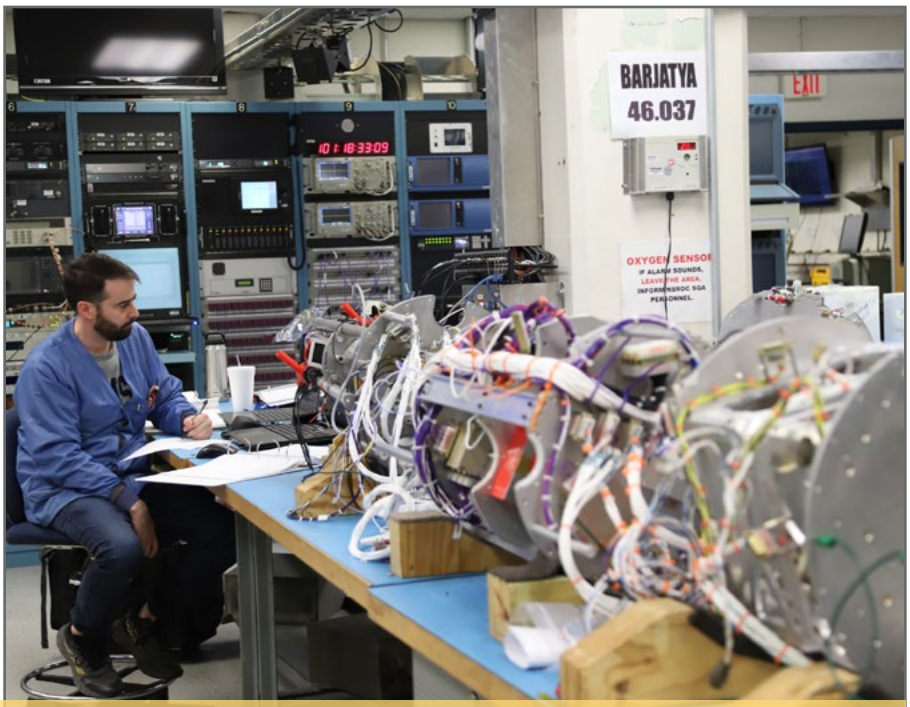
"Rocketry is more exciting than I thought."

WRATS group photo after the final launch.
Credit: NASA Photo/Berit Bland


Rocket construction.
Credit: NASA Photo/Berit Bland


Parachute testing.
Credit: NASA Photo/Berit Bland


Rocket painting.
Credit: NASA Photo/Berit Bland

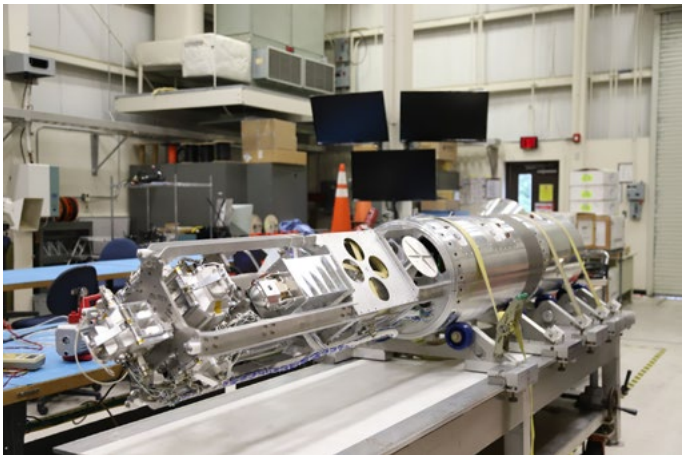


Picture Place

Integration and Testing

36.335, 41.123 & 41.124 CE Clemmons/Aerospace Corporation - Turbulent Oxygen Mixing Experiment Plus (TOMEXplus)

The Turbulent Oxygen Mixing Experiment Plus (TOMEXplus) continues integration activities at Wallops. The mission explores the three–dimensional nature of turbulent phenomena near the mesopause through a three–rocket salvo combined with ground–based remote–sensing instrumentation and state–of–the–art modeling. The energy cascade spectrum from 15 m to 2 km is covered by the centerpiece of the rocket–borne instrumentation, a sodium lidar system. The launch window opens on August 27, 2024 at NASA's Wallops Island, VA launch facility.

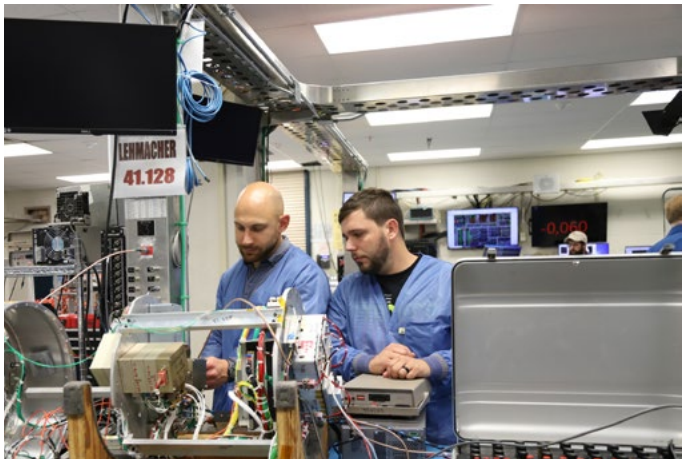


TOMEX Plus instrumented payload.
Credit: NASA Photo/Berit Bland

36.362 & 41.128 UE Lehmacher/Clemson University - Vorticity Experiment (VortEX)

These payloads were originally scheduled for launch from Andoya Space, Norway in the spring of 2023, but due to lacking science conditions and poor weather the launches were delayed. The science objective of the Vorticity Experiment (VortEx) is to characterize mesoscale dynamics (10–500 km) in the upper mesosphere and lower thermosphere (90–120 km), a region which also contains the Earth's turbopause. Rocket and ground–based measurements are combined to distinguish, between divergence in the horizontal flow field and divergent motions, such as gravity waves, and vorticity in the horizontal flow field and vortical motions, such as expect–ed to occur in quasi–stratified mesoscale turbulence. The Black Brant IX, 36.362, carries rocket–powered ampules and canisters that release trimethyl aluminum (TMA) for wind observations. The Black Brant launch is accompanied by an instrumented Terrier–Improved Orion, 41.128.

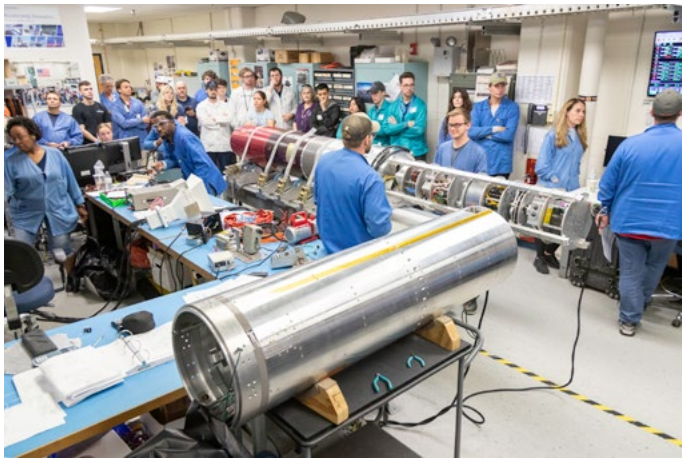
The launch window opens October 27, 2024.



VortEX payload integration.
Credit: NASA Photo/Berit Bland

46.042 WO Koehler/NASA Wallops Flight Facility - RockSat-X

RockSat–X is the most advance in a series of student flight opportunities. RockSat–X provide access to the space environment, i.e. the payload skirt is deployed and the experiments are exposed to the vacuum and radiation of space. Students design and build their own experiments and the payload includes standard support systems, such as, telemetry, attitude control, and recovery. Nine Colleges and Universities are flying experiments in 2024 and the launch is currently scheduled for August 13, 2024 from Wallops Island, VA.



RockSat–X sequence testing.
Credit: NASA Photo/Berit Bland

SCHEDULE FOR NEXT QUARTER

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE
36.385 NS	SOLAR & HELIOSPHERIC	WINEBARGER	NASA/MSFC	MaGIXS 2	WS	07/16/24
36.366 US	SOLAR & HELIOSPHERIC	KANKELBORG	MONTANA STATE UNIV	FURST	WS	08/11/24
46.042 WO	STUDENT OUTREACH	KOEHLER	NASA WFF	ROCKSAT–X	WI	08/13/24
36.384 UG	UV/OPTICAL ASTROPHYSICS	MCCANDLISS	JOHNS HOPKINS	OAxFORTIS	WS	08/25/24
36.335 CE	GEOSPACE SCIENCES	CLEMMONS	AEROSPACE CORP.	TOMEX–Plus	WI	08/27/24
41.123 CE	GEOSPACE SCIENCES	CLEMMONS	AEROSPACE CORP.	TOMEX–Plus	WI	08/27/24
41.124 CE	GEOSPACE SCIENCES	CLEMMONS	AEROSPACE CORP.	TOMEX–Plus	WI	08/27/24
36.391 DS	SOLAR & HELIOSPHERIC	TUN	NRL	HERSCHEL 3	WS	09/20/24

WI – Wallops Island, VA
WS – White Sands Missile Range, NM

MISCELLANEA

Mechanial section group photo.

Up is not always the way...