National Aeronautics and Space Administration

Sounding Rockets Program Office
Quarterly Newsletter

Rocket Report

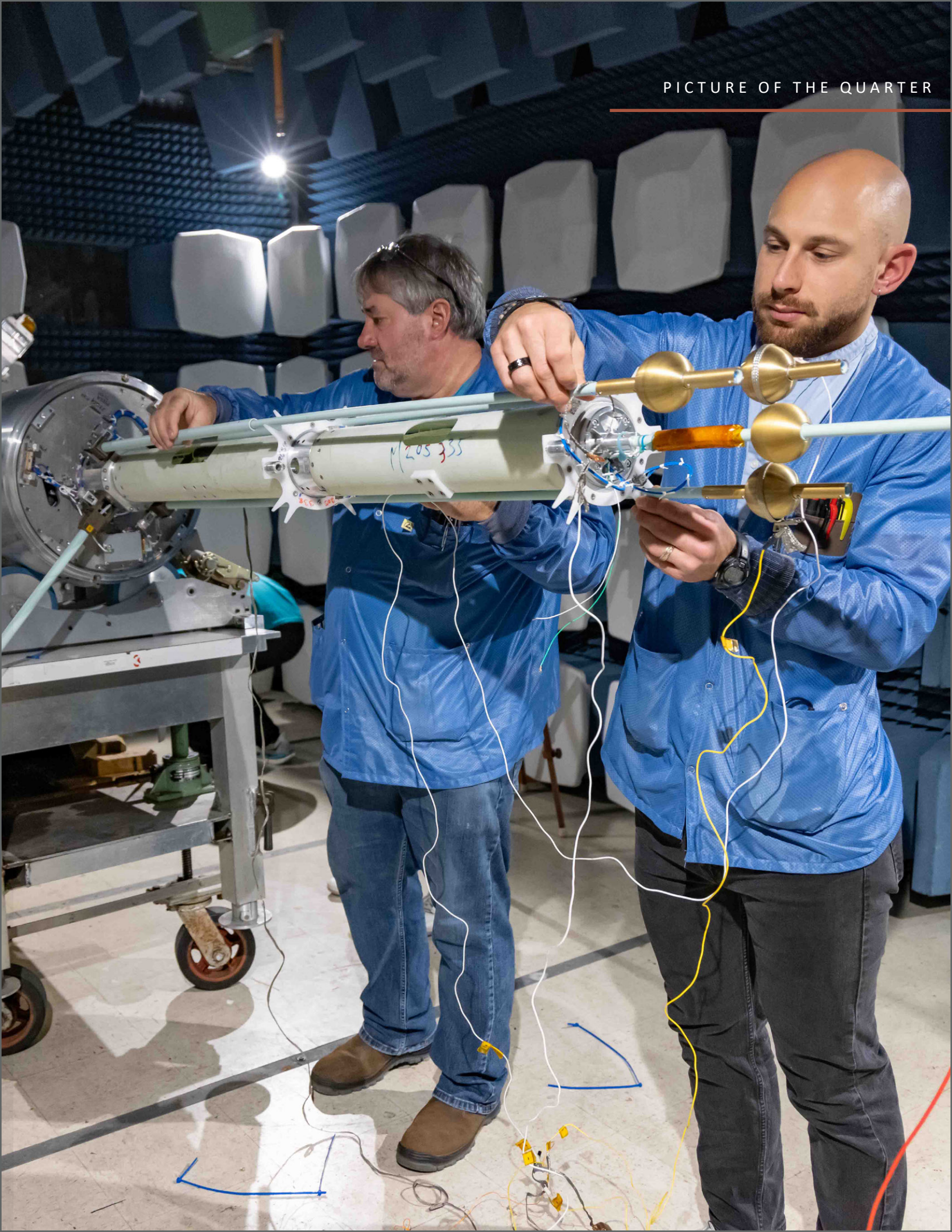
4 2024

NASA Photos/Garon Clark

36.390 BADASS payload in the EMI chamber.
NASA Photo/Berit Bland

INSIDE

Cover photo:
VortEx Black Brant IX 36.362 UE launch from Andøya, Norway
NASA Photo/Garon Clark



Program News

As we get ready to launch 2025, the Sounding Rockets Program is preparing for a busy calendar year. Currently 21 missions are on the books, starting with three launches from Poker Flat Research Range (PFRR) in Alaska in January 2025. A second Poker campaign is scheduled for March 2025. A total of five missions will be launched from White Sands Missile Range (WSMR), NM, five from Wallops Island, VA, two from Kwajalein, Marshall Island, and three from Norway.

The missions span Geospace Science (13 launches), Solar Physics (4 launches), Astrophysics (1 launch) and Student Outreach (3 launches).

In the last quarter of FY 24 we launched two missions from Norway and one from WSMR. Both are described in more detail in this newsletter.

Campaign planning for a future sounding rocket campaign from Punta Lobos in Peru is proceeding. A campaign study agreement with CONIDA, the Peruvian space agency, was signed in November facilitating feasibility studies, exchange of information and access to the launch site. The collaborative effort will include a student mission, similar to the RockSat–X opportunities currently offered for Universities.

In December 2024 program office staff participated in the American Geophysical Union (AGU) Fall meeting in Washington D.C. Handouts, program information, and displays were available. The Sounding Rockets Annual Report 2024 is available for download at: https://sites.wff.nasa.gov/code810/files/Annual%20Report%202024_sm.pdf

We wish you Happy Holidays and a Great 2025.

36.362 & 41.128 UE Lehmacher/Clemson University- Vorticity Experiment (VortEx) - November 10, 2024

The VorEx mission was launched from Andøya Space, Norway on November 10, 2024. VortEx comprised two rockets and payloads; a Terrier–Black Brant (Black Brant IX) and a Terrier–Improved Orion. The Black Brant IX was launched first at 21:36:00 UT and the Terrier–Improved Orion two minutes later at 21:38:00 UT.

The science objective of the Vorticity Experiment (VortEx) was 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 expected to occur in quasi–stratified mesoscale turbulence. These processes are crucial for a better description of subgrid processes and eddy diffusion in global atmospheric models.

Four launches were part of the VortEx mission, two were launched on March 23, 2023, but due to inclement weather during the launch window, two were delayed until 2024.

The Black Brant IX payload carried rocket–powered ampules and canisters that release trimethyl aluminum (TMA) for wind observations, and the 41.128 payload was instrumented.

VortEx Terrier–Improved Orion 41.128 UE launch from Andøya, Norway
NASA Photo/Garon Clark

VortEx payload work at Andøya Space
NASA Photo/Garon Clark

VortEx payload work at Andøya Space
NASA Photo/Garon Clark

36.382 UE Gilchrist/University of Michigan- Beam-Spacecraft Plasma Interaction and Charging Experiment (B-SPICE) - Launched November 23, 2024

B–SPICE was launched from White Sands Missile Range, NM on November 23, 2024 at 11:58:00 UT.

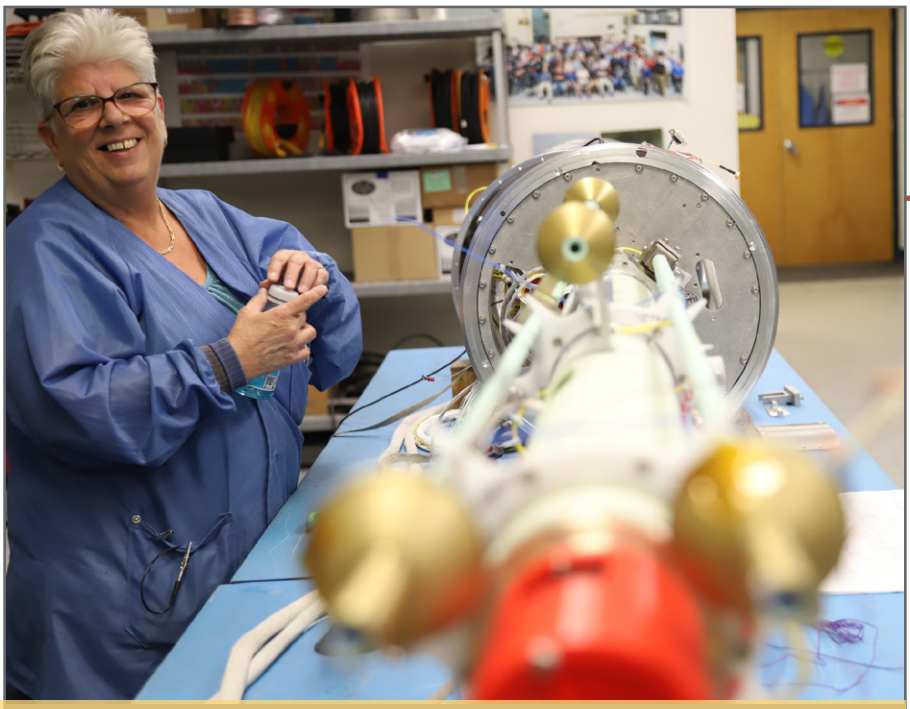
Electron beam capable spacecraft missions can enable a new realm of active experiments in the magnetosphere. For example, an electron beam fired from the Earth's magnetosphere into its atmosphere could be used to trace magnetic field lines in real–time and answer fundamental questions in magnetosphere–ionosphere coupling. These kinds of active missions in the magnetosphere quickly run into spacecraft charging issues that limit beam emission due to the sparse ambient plasma environment. Therefore the development of a spacecraft–charging mitigation technique is required to ensure safe operation and mission success. Laboratory experiments have shown that the plasma source can emit substantial ion currents off the plasma contactor surface. As a result, induced spacecraft charging due to electron beam emission may be mitigated by the emission of an on–board plasma source.

The Beam–Spacecraft Plasma Interaction and Charging Experiment (B–SPICE) is a tethered rocket experiment, dedicated to investigate the mitigation of spacecraft charging induced by an electron beam using a plasma contactor. The experiment studies ion current production, plasma plume expansion, and expellant utilization in relation to mitigation effectiveness to understand how the system may scale for magnetospheric experiments. Successful completion of this experiment will raise the technological readiness level (TRL) of the described spacecraft–charging mitigation scheme for application to active experiments in the low–density magnetosphere.

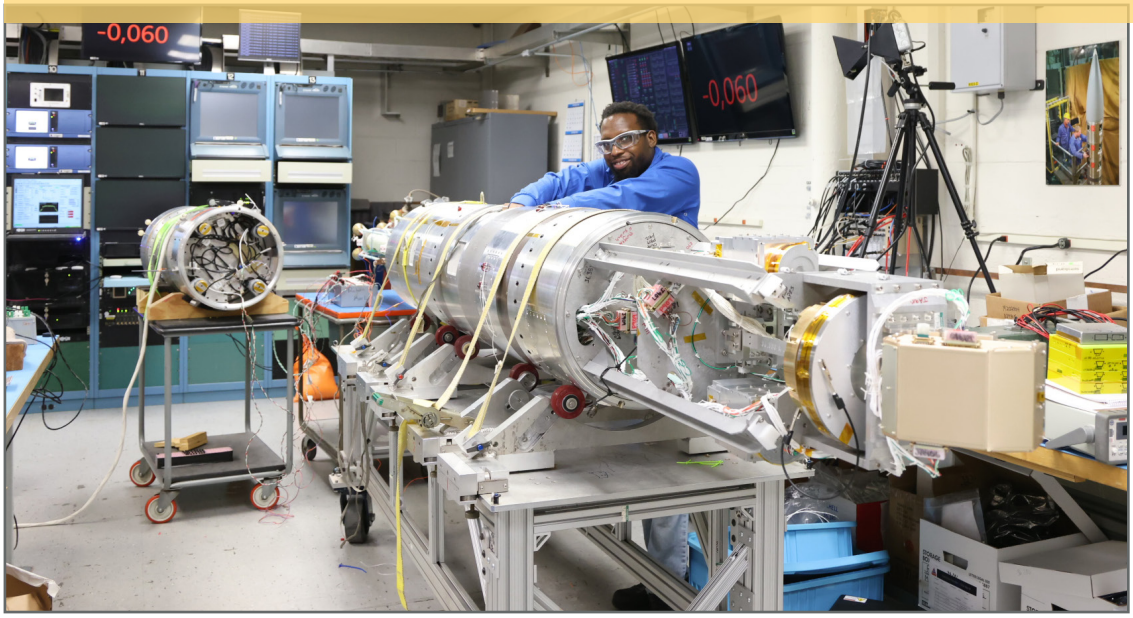
36.382 UE B–SPICE payload tem.
WSMR photo

B–SPICE tether testing.
NASA Photo/Berit Bland

B–SPICE integration activities.
NASA Photo/Berit Bland



Picture Place



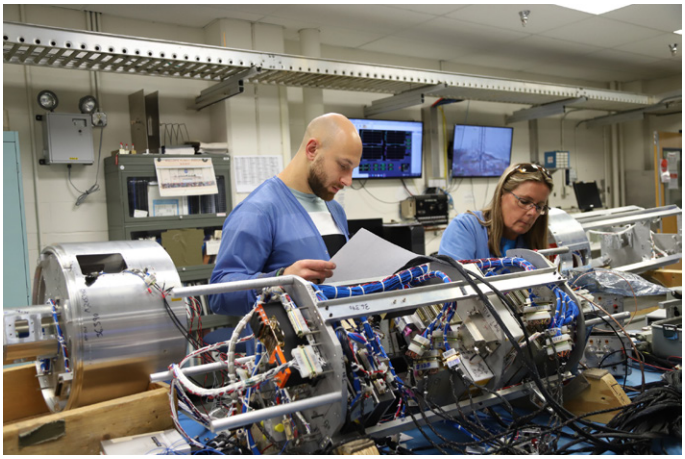
Integration and Testing

36.390 GE Samara/NASA GSFC - Black and Diffuse Aurora Science Surveyor (BaDASS)

BaDASS is designed to explore the processes responsible for creating the optical variations observable within the diffuse aurora and will specifically target the black aurora (BA).

Science questions:
1. What are the differences in the precipitating electron spectra (energy, flux, pitch–angle and temporal characteristics) inside and outside regions of black aurora?
2. What are the most likely physical processes responsible for generating the optical features?

The BADASS mission is scheduled for launch from Poker Flat Research Range, AK. The launch window opens January 21, 2025.

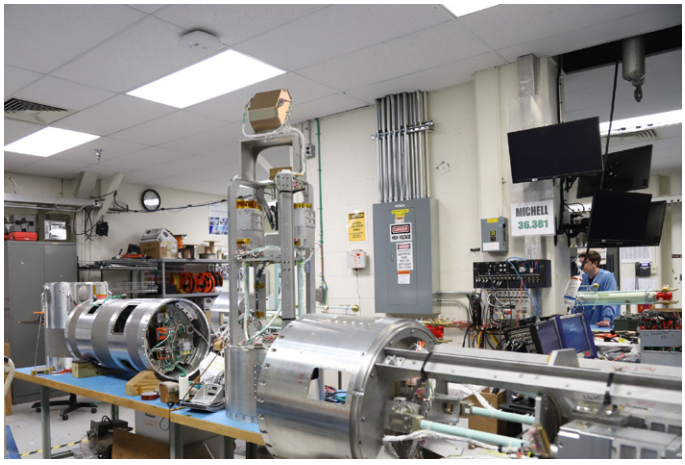


BADASS integration at Wallops.
Credit: NASA Photo/Berit Bland

36.380 & 36.381 GE Michell/NASA GSFC - Ground Imaging to Rocket investigation of Auroral Fast Features (GIRAFF)

The goal of GIRAFF is to study the processes responsible for creating the fastest optical variations observable within the aurora. This investigation focuses on two specific mechanisms of energy coupling, namely Electromag–netic Ion Cyclotron (EMIC) wave–particle interactions at low altitude (3000 km) and chorus wave modulation in the equatorial magnetosphere that can have significant impacts on the total energy flux of electrons precipitating from the magnetosphere to the ionosphere/thermosphere. To better understand the mechanisms of these interactions, this investigation targets two different, yet somewhat similar auroral phenomena, namely flickering and fast pulsating aurora, where these wave–particle interactions are manifested as modulations of the auroral luminosity, which typically occur at relatively high frequencies between a few Hz and 15 Hz or more. GIRAFF will accomplish the science goal by launching the two identical rockets through two different types of aurora using a suite of science instruments with previous sounding rocket heritage.

The GIRAFF mission is scheduled for launch from Poker Flat Research Range, AK. The launch window opens January 21, 2025.

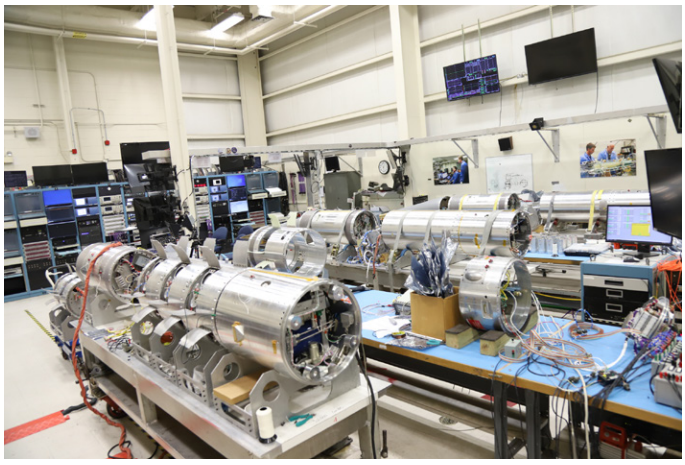


GIRAFF build–up and integration at Wallops.
Credit: NASA Photo/Berit Bland

46.034, 46.035 & 52.010 UE Conde/University of Alaska - Auroral Waves Excited by Substorm Onset Magnectic Events (AWESOME)

This project will study the density, wind, and composition perturbations that occur in Earth's high latitude thermosphere in response to impulsive local forcing during auroral substorms. It is motivated by the premise that gen–eration of acoustic–gravity waves plays a far greater role in the substorm response than is generally recognized or implemented in current models.

The AWESOME mission is scheduled for launch from Poker Flat Research Range, AK and the launch window opens March 24, 2025.



Three AWESOME payloads.
Credit: NASA Photo/Berit Bland

SCHEDULE FOR NEXT QUARTER

MISSION	DISCIPLINE	EXPERIMENTER	ORGANIZATION	PROJECT	RANGE	DATE
36.380 GE	GEOSPACE SCIENCES	MICHELL	GSFC	GIRAFF	FB	01/21/25
36.381 GE	GEOSPACE SCIENCES	MICHELL	GSFC	GIRAFF	FB	01/21/25
36.390 GE	GEOPACE SCIENCE	SAMARA	NASA GSFC	BADASS	FB	01/21/25
36.391 DS	SOLAR & HELIOSPHERIC	TUN	NRL	HERSCHEL 3	WS	03/09/25
46.034 UE	GEOSPACE SCIENCES	CONDE	UNIV OF ALASKA	AWESOME	FB	03/24/25
46.035 UE	GEOSPACE SCIENCES	CONDE	UNIV OF ALASKA	AWESOME	FB	03/24/25
52.010 UE	GEOSPACE SCIENCES	CONDE	UNIV OF ALASKA	AWESOME	FB	03/24/25

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

MISCELLANEA

Kathryn Dormann, Science Teacher at Scholars Academy, Orange, NJ, attended the Wallops Rocketry Academy for Teachers and Students (WRATS) in June 2024. Kathryn incorporated rocketry into her science curriculum and used concepts from the WRATS workshop. She sent us photos and letters that her students wrote about their experience. Here are a few excerpts:

"My favorite part of building the model rockets was the parachute calculations because I love math so to see how the calculations connect to the parachutes was very interesting. Now, I am curi–ous about engineering because I like how math and science work together. This made me want to become an engineer."

"It got me thinking about the future of my life and considering if I want to become an engineer or even start studying space because it is starting to seem cool. This made a big impact on me because it made me interested in science for the first time and now I really like science"

"My favorite part of building the model rockets was learning about the different parts to then build the rockets. It makes me wonder about how they build actual rockets and how they build them so perfectly with testing and stuff. This experience made me want to learn about different rocket building and how they test them. Thanks to you we learned so much better."

"Most schools and classes don't get the things that you guys brought to us and we are extremely grateful. You guys made all of our worlds blast off. We wish you guys the best"

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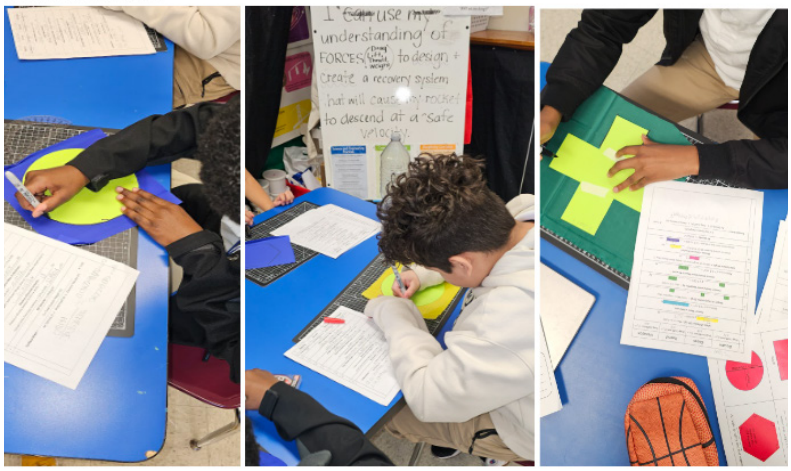

Credit: Kathryn Dormann