

National Aeronautics and Space Administration



NASA Sounding Rockets Annual Report 2025





MESSAGE FROM THE CHIEF

Cathy Hesh
Acting Chief, Sounding Rockets Program Office

In FY2025 the program achieved a success rate of 94% which is well above the required 85%. Seventeen launches were completed with only one mission not meeting minimum success criteria. We supported Geospace Science, Solar Physics, and Student Outreach missions this year.

The seventeen launches were conducted from five different launch sites - starting the fiscal year with a campaign in Norway, followed by two campaigns from Alaska, a summer campaign from Kwajalein, and several additional launches from White Sands Missile Range and Wallops Island throughout the year.

Significant highlights for the program this year included the Beam-Spacecraft Plasma Interaction and Charging Experiment (B-SPICE) mission which sought to characterize and quantify positive spacecraft-charging mitigation using a plasma contactor and other experiments. In flight the payload separated into two bodies connected with a tether. The development of a novel Tether Deployer and Voltage Monitor (TDVM) instrument provided by NASA's Engineering Technology Directorate (ETD) helped to enable the payload to accomplish the mission objectives. Additionally, the program made a much-anticipated return to the Kwajalein launch site on Roi-Namur to successfully conduct the two Sporadic E Electro Dynamics (SEED) missions after the rogue wave event in early 2024 postponed the SEED campaign an additional year. Finally, the three Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME) missions launched from Poker Flat Research Range (PFRR) were an exciting demonstration of rocket propelled Swarm sub-payloads carrying science experiments, and the three Turbulent Oxygen Mixing Experiment Plus (TOMEX-Plus) missions launched from Wallops Flight Facility (WFF) demonstrated several firsts for the program including a mid-body recovery, an ACS-driven flatspin maneuver, and a transparent aft window to support the lidar experiment.

The continuation of our two annual student missions provided workforce development, training and launch opportunities for college students and faculty through

the highly successful RockOn and RockSat programs. The program is a collaborative effort between the Sounding Rockets Program Office, which provides the vehicle and payload systems, and the Wallops Workforce Development and Training Office which provides management and coordination with the student teams. Funding is provided through the NASA Heliophysics program. RockOn is a one-week workshop where students and faculty build, integrate, and test an experiment from a kit and teaches fundamentals of sensor and data systems. The RockSat program offers students the opportunity to design their own experiments. Other outreach opportunities this year included the Wallops Rocketry Academy for Teachers and Students (WRATS) where high school teachers attended a weeklong workshop to learn about rocketry through hands-on activities. The WRATS workshop includes building and flying model rockets, conducting software flight simulations, and designing parachutes. Additionally, the teachers attended the RockSat launch on Wallops Island.

Interns were again hosted by both SRPO and the NASA Sounding Rockets Operations Contract (NSROC). Facility tours were regularly arranged for both educational and civic groups, where hundreds of people received a firsthand look at the manufacturing and testing of sounding rocket payloads.

The flight manifest for FY2026 currently includes sixteen launches – fifteen science missions and one reimbursable mission for a commercial customer. Multi-mission campaigns are planned from Andøya Space in Norway, Poker Flat Research Range in Alaska, as well as a solar flare campaign from White Sands Missile Range in New Mexico. A combined RockOn/RockSat student mission will launch from Wallops Flight Facility in summer 2026.

The Sounding Rockets Program looks forward to carrying the momentum and successes of FY2025 into FY2026 and is privileged to support the suborbital space science community.

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Cover photo: TOMEX+ Launch From Wallops Island, VA on August 27, 2025
 NASA Photo/Berit Bland

SOUNDING ROCKETS OVERVIEW

The NASA Sounding Rockets Program supports the strategic vision and goals of the NASA Science Mission Directorate in Earth Science, Heliophysics, and Astrophysics. These suborbital missions provide researchers with unparalleled opportunities to build, test, and fly new instrument and sensor design concepts while simultaneously conducting world-class scientific research. Coupled with a hands-on approach to instrument design, integration, and flight, the program's short mission life cycle ensures that the next generation of space scientists receives the training and experience necessary to advance to NASA's larger, more complex space science missions. The program's cost structure and risk posture stimulate innovation, accelerate technology maturation, and enable rapid responses to scientific events.

With the capability to fly higher than many low Earth orbit satellites and the flexibility to launch on demand, sounding rockets often provide the only means to study specific scientific phenomena of interest. Unlike instruments aboard most orbital spacecraft or ground-based observatories, sounding rockets can place instruments directly into regions where—and when—the science is occurring, enabling direct, in-situ measurements. The program's mobility allows researchers to conduct missions from strategic vantage points around the world.

Sounding rockets carry telescopes and spectrometers to study solar and astrophysical phenomena, collecting unique scientific data and testing prototype instruments for future satellite missions. For example, the program's rapid response capability enabled scientists to observe Supernova 1987A before it faded from view. Currently, new detectors expected to revolutionize X-ray astronomy are under development and have already been successfully tested on sounding rocket flights. A critical aspect of most satellite missions is the calibration of space-based sensors, which sounding rockets help facilitate.

Science with Sounding Rockets

In 1957, scientists participating in the International Geophysical Year (IGY) had access to rockets as research tools for the first time in history. They took full advantage of these new assets, launching a total of 210 rockets from seven different sites as part of the United States' contribution to the IGY. The research spanned disciplines from atmospheric science to astronomy. Ionospheric soundings included direct electron density measurements and detailed mapping of the E and F regions.

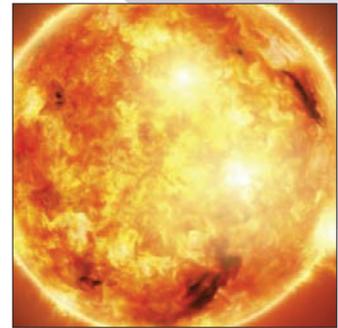
The IGY firmly established sounding rockets as a viable scientific tool and demonstrated their utility for in-situ measurements, rapid response, and temporal and geographic mobility. Since then, the use of sounding rockets for science has continued with undiminished importance.

Heliophysics, astrophysics, geospace science, and aeronautics all benefit from sounding rockets. Their advantages, such as rapid response to scientific events, low cost, and mobile operations, provide researchers with unique opportunities to conduct world-class science.

Some of the highest-resolution spectral data of the Sun have been recorded with telescope payloads flown on sounding rockets. Payload recovery yields significant cost savings by ensuring that sensors, one-of-a-kind telescopes, cameras, and recorders are available for reflight.

As research tools, sounding rockets are essential for studying the near-Earth space environment; in fact, they remain the only means of collecting in-situ data in the ionosphere. Several launch sites in the Arctic region enable studies of phenomena such as magnetic reconnection, ion outflows, and the effects of Joule heating. Understanding the fundamental processes that govern the Sun–Earth space environment enhances our ability to more accurately predict solar storms that can disrupt power grids and satellite-based information systems on Earth.

In the high-energy, ultraviolet, and visible parts of the spectrum, astrophysics relies on sounding rockets to test new instruments. NASA-developed subsystems provide unprecedented pointing accuracy for stellar targeting, yielding high-resolution spectra that may lead to groundbreaking discoveries about our galaxy. Sounding rockets also provide calibration and validation flights for many space missions, particularly solar observatories such as the Thermosphere–Ionosphere–Mesosphere–Energetics–Dynamics (TIMED) satellite, the Solar Heliospheric Observer (SHO), and the Solar Dynamics Observatory (SDO). Additionally, sounding rockets are well suited for testing new technologies for future space missions. For example, parachute technologies for the Mars 2020 mission were successfully tested on sounding rocket flights.

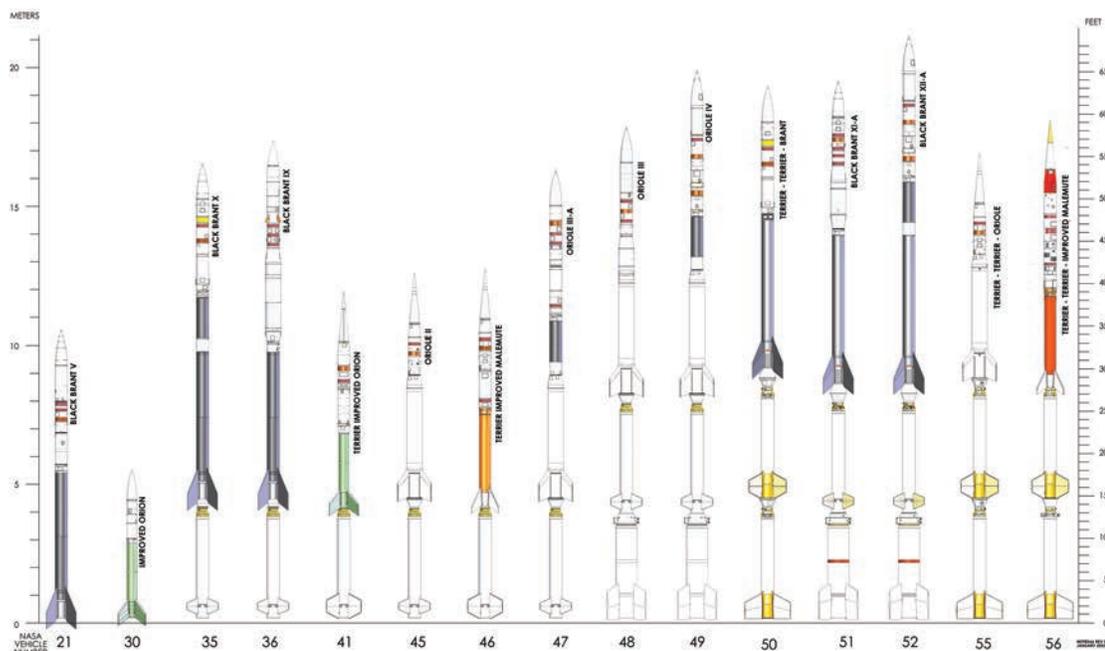


End-to-End Mission Support

The NASA Sounding Rocket Program provides comprehensive mission support and management services from initial concept through post-flight data distribution. This end-to-end capability allows the Principal Investigator (PI) to focus primarily on the scientific objectives of the mission.

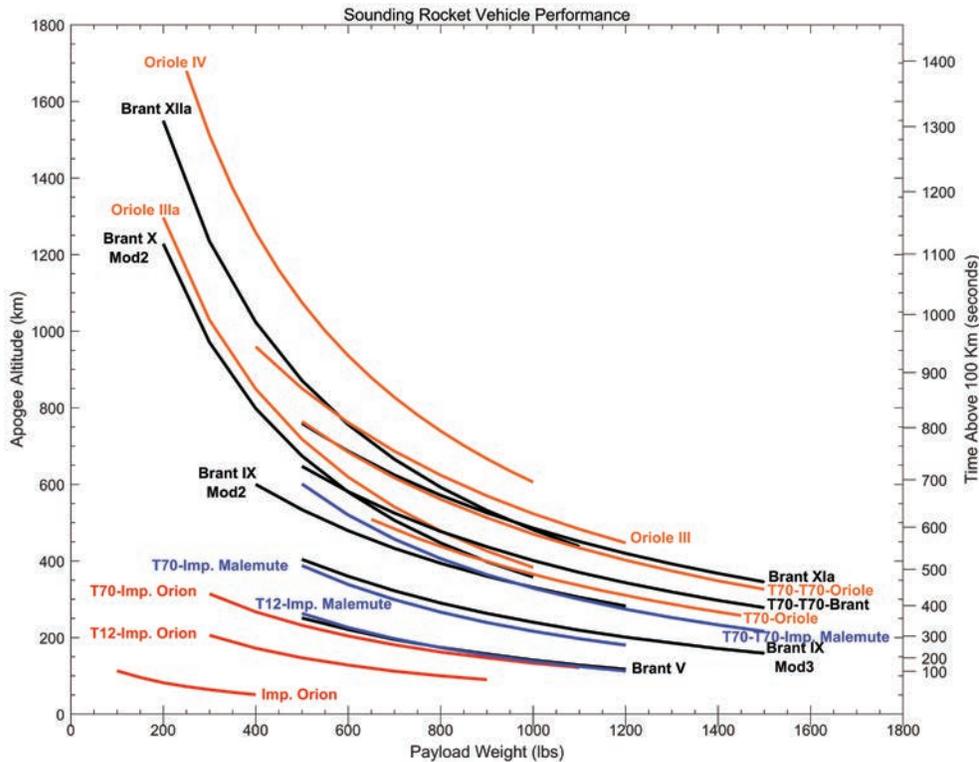
With extensive experience, over 3,000 missions flown to date, the program has developed streamlined processes and efficient design, manufacturing, and assembly techniques. Management and technical support are provided for all facets of the mission, including engineering design, manufacturing, integration, testing, and data evaluation. Periodic reviews ensure that mission requirements are met on time and within budget.

Launch Vehicles



Sounding Rocket Vehicles
NSROC

The NASA Sounding Rocket Program offers a range of proven launch vehicles to meet the needs of its users. New vehicles are periodically developed to address evolving customer requirements and to enhance platform capabilities. Currently, fifteen vehicles are available “off the shelf,” with performance ranging from the single-stage Improved Orion to the four-stage Black Brant XII-A and Oriole IV. Two new vehicles joined the launch vehicle stable in 2025, the Terrier-Terrier-Oriole (55) and Terrier-Terrier-Improved Malemute (56).



Sounding Rocket Vehicle Performance
NSROC

Payload Design

The payload design process begins immediately after the Mission Initiation Conference (MIC). At the MIC, initial flight requirements and schedules are established.

All payload components—including mechanical and electrical systems, telemetry, recovery, and other subsystems—are designed using state-of-the-art modeling, analysis, and software tools. Three-dimensional visualization tools support the iterative design process by enabling flexibility in updates and modifications. Integrated, multidisciplinary design methods ensure that the needs of the Principal Investigator (PI) are effectively met.



Payload Model
NSROC

Manufacturing

Extensive in-house manufacturing capability is essential for a program with significant customization requirements. The machine shop houses a wide range of equipment, including Computer Numerical Control (CNC) milling machines, lathes, welders, and sheet metal brakes, shears, and rollers, along with additional tools and processes to support the program's mechanical needs. A waterjet cutting machine further enhances efficiency by enabling the rapid production of small parts in large quantities.



Machine Shop in Building F-10 at Wallops Flight Facility
NASA Photo/Berit Bland

Assembly

Payload electrical and mechanical assembly begins with the installation of decks, longerons, and electrical wiring, and concludes with the integration of all subsystems and science instruments. Electrical and mechanical technicians are assigned to a mission at the MIC and, whenever possible, remain with the mission through flight, contributing significantly to a responsive and customer-focused program.



Payload Integration
NASA Photo/Berit Bland

Subsystems

The NASA Sounding Rocket Program provides standard subsystems such as recovery systems, attitude control systems, and boost guidance systems, as required by the mission profile. Mission specific systems, such as telemetry and instrument structures, are designed to meet mission requirements.

The boost guidance system controls the rocket's path during the initial 20 seconds of flight, when air density is sufficient to permit course corrections using movable fins.

Vehicle pitch and yaw angles are detected by a gyro platform, which produces corresponding output signals. These signals are processed by an autopilot and, after roll resolution, are used as servo command signals.



Attitude Control System Testing
NASA Photo/Berit Bland

Several types of sensors are used to provide payload attitude information. These include magnetometers, gyroscopes, solar and lunar sensors, horizon sensors, and cameras. The Attitude Control System (ACS) positions the payload as required by releasing compressed gas through nozzles located on the payload skin.

Electrically operated vacuum doors are available for most telescope payloads.



Open Shutter Door and Telescope
NASA Photo/Berit Bland

Deployment mechanisms, actuated by pyrotechnic, electric, or mechanical means, are available for doors, booms, shutters, and other components or assemblies.

For investigations requiring measurements from independent platforms, payloads can be designed to separate into multiple sub-payloads. Each sub-payload may have its own telemetry and attitude control systems.

Telemetry systems are tailored to the requirements of each mission. Their configuration is determined by instrument power and data requirements, and the housekeeping needs of the rocket. System complexity range from a single link to highly complex architectures with multiple downlinks, GPS, and uplink capabilities.



Payload Recovery at White Sands Missile Range
WSMR Photo

When payload recovery is required, additional analysis is conducted to ensure the payload is not damaged during atmospheric re-entry or impact. Recovery is facilitated by parachute and may be a land or water recovery. Water recovered payloads are designed with positive buoyancy. Recovery is conducted using boats, helicopters, or land-based vehicles. Recovery may occur in as little as a few hours depending on the payload's impact location, launch range, and other factors. Locating payloads for recovery is accomplished with spotters, strobes, and GPS.

Testing and Evaluation

The powered phase of a sounding rocket flight subjects the scientific payload to significant stress. The combined effects of these stresses are referred to as the "flight environment." Rigorous testing ensures that the payload can withstand the flight environment, ensuring mission success.

Vibration Testing

The test specifications for each payload is dependent on launch vehicle. Vibration tests are conducted in the three, primary payload axes - the thrust axis and two lateral axes. The payload is subjected to random vibration in all three axes and sine vibration in the thrust axis. Shock profiles may used to simulate events such as motor ignition and payload separation.

A payload's response to vibration depends on factors such as its length, stiffness, and mass distribution. The test is successful when the payload continues to perform all functions without fault after each vibration test.



Payload on Vibration Table
NASA Photo/Berit Bland

Bend Testing

The pressure effects of the rocket transiting through the atmosphere generate lateral forces along the length of a payload; the maximum moment typically occurs at the base of the payload where the payload is affixed to the motor headcap. The magnitude of this loading is predicted during a detailed performance analysis conducted prior to testing. Payload deflection is predicted and measured at the payload nose tip to determine the cumulative effect of payload bending under load. The test is successful if the total tip deflection is equal to or less than the value predicted in the performance analysis, and if the deflection at each individual joint remains within acceptable limits.



Payload Bend Testing
NASA Photo/Berit Bland

Spin Testing - Operational and Deployment

Sounding rockets are spin-stabilized. Launch vehicle fins are canted to ensure the rocket spins on its upleg trajectory. Payloads often use the resulting centrifugal force to deploy doors, sensors, and other assemblies. Some deployments increase spin inertia, decreasing the roll rate. Some payloads require non-spinning control, achieved by mechanical despin systems and active attitude and roll control via ACS. Payloads are subjected to the roll environment of flight in the spin test bay.

Both spinning and non-spinning deployments are performed in the same facility, which is equipped with modern video recording systems for post-test review. Payload systems are powered on and their state is recorded during the test to monitor system function. These tests confirm the deployments will be conducted successfully in flight, and identify any issues that need to be addressed.



Payload Deployment Testing
NASA Photo/Berit Bland

Mass Properties Measurements

A payload's mass properties (mass, center of mass, and moments of inertia) are theoretically determined during the design phase. These values are necessary for early lifecycle trajectory analysis and attitude control system design. In the pre-production stages of a mission lifecycle, these mass properties can easily be iterated to improve launch vehicle stability, payload trajectory metrics, and re-entry stability. Once assembled, the payload mass properties are measured during testing. It is necessary to measure accurate mass properties in order to accurately predict the payload trajectory. This ensures mission requirements are met and that the flight can be conducted safely.



Payload Mass Properties Measurement
NASA Photo/Berit Bland

Gyroscopic Balancing

Because sounding rockets are spin-stabilized, static and dynamic imbalances during flight can cause an unstable flight profile, such as nutation and precession, which reduces apogee and shortens experiment data collection time. Static and dynamic imbalances in the payload control configuration can degrade the ACS's ability to align to mission targets and control rates. The balance facility employs methods similar to that used for balancing vehicle tires, but with far greater accuracy. Imbalances are first detected and corrected using temporary lead weights. After flight weights are installed, the residual imbalances are measured to verify that the payload first principal and spin axis are coaligned. Each payload has unique imbalance limits.



Payload Staged for Balancing
NASA Photo/Berit Bland

Thermal Testing

Thermal testing verifies a payload's or component's ability to withstand elevated temperatures caused by aerodynamic friction and onboard heat sources such as transmitters. Several thermal testing chambers are available to accommodate components and systems of varying sizes.

Vacuum Testing

Vacuum testing is conducted to verify payload systems will remain functional in the vacuum of space. Outgassing the release of molecules from materials due to exposure to vacuum and/or heat, poses a particular concern. Scientific instruments are often sensitive to contamination and must be isolated from outgassing materials. Vacuum testing is also used to verify coronal discharge is not a concern for experiments utilizing high voltage components.



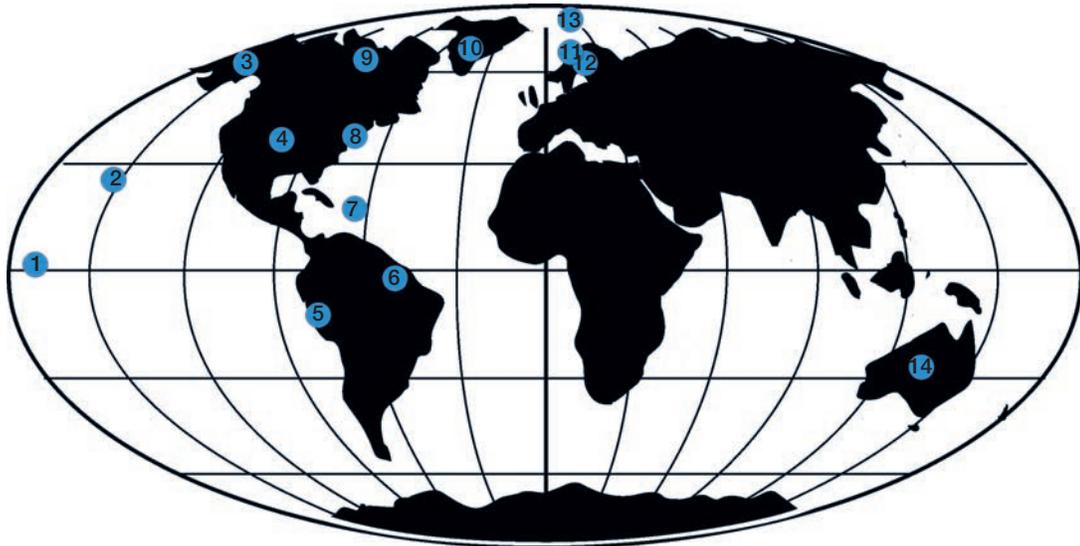
Payload Staging in Thermal-Vacuum Chamber
NASA Photo/Berit Bland

Launch Operations Support

A variety of established launch ranges and the ability to setup temporary launch sites allow sounding rockets to launch on a global scale. Established launch ranges are located in Alaska, New Mexico, Virginia, Norway, Sweden, and Australia. In combination with temporary sites in Greenland, the Republic of the Marshall Islands, Puerto Rico, and Brazil, the Sounding Rockets Program provides extensive access to locations where phenomena of interest exist.

In cooperation with the Wallops Flight Facility Range, the NASA Sounding Rockets Program provides all necessary personnel and equipment to conduct successful missions anywhere in the world.

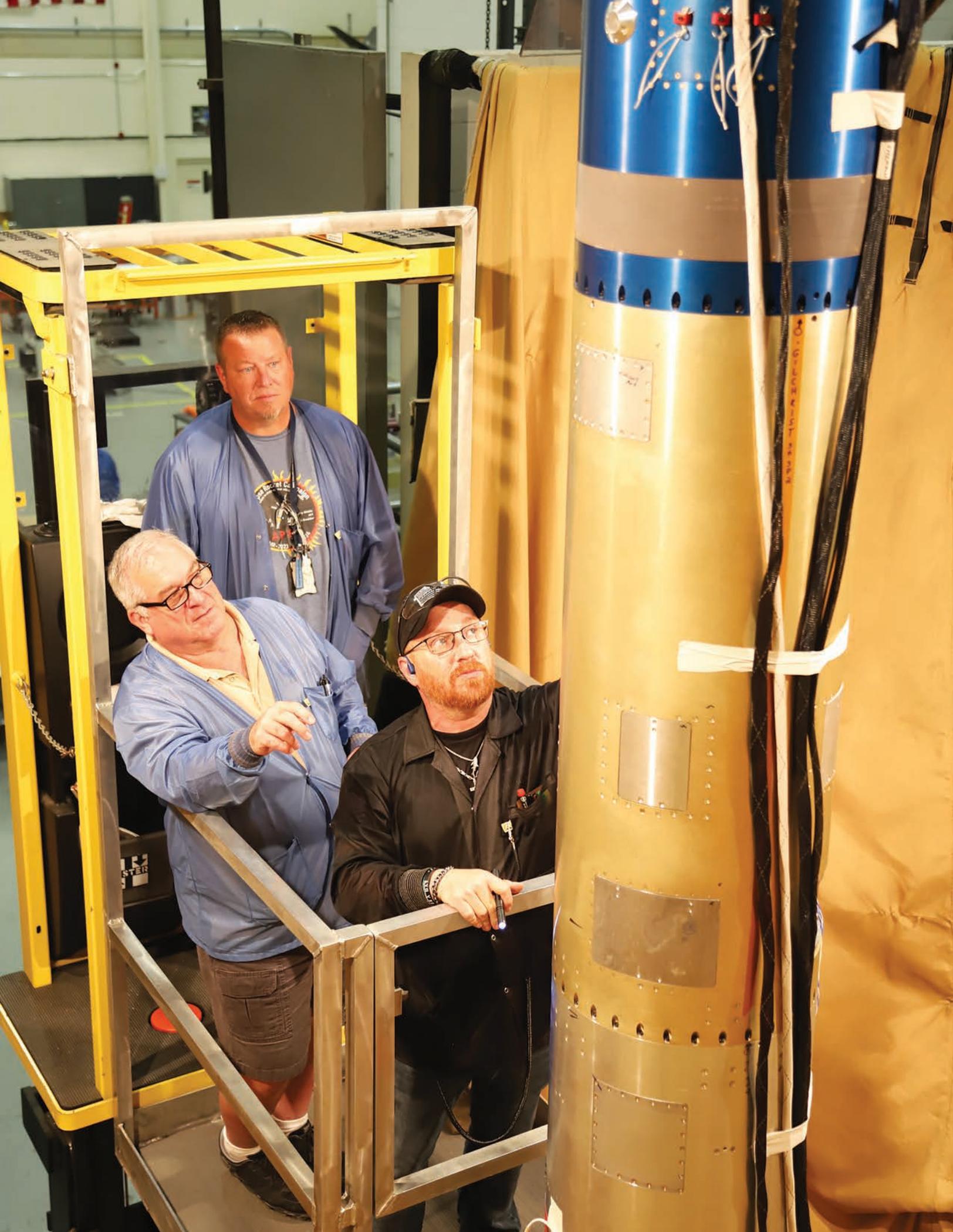
Additionally, ground and flight safety analyses are provided by the NASA Safety Office at Wallops Flight Facility, home of the Sounding Rockets Program.



Past and present world wide launch sites used by the Sounding Rockets Program

1. Reagan Test Site, Marshall Islands
2. Pacific Missile Range Facility, HI
3. Poker Flat Research Range, AK
4. White Sands Missile Range, NM
5. Punta Lobos, Peru *
6. Alcântara, Brazil *
7. Camp Tortuguero, Puerto Rico *
8. Wallops Flight Facility, VA
9. Fort Churchill, Canada *
10. Greenland (Thule & Sondre Stromfjord) *
11. Andøya Space, Norway
12. Esrange, Sweden
13. Svalbard, Norway
14. Australia (ELA & Woomera)*

*Inactive Launch Site



GEOSPACE MISSIONS 2025





Aurora over Andøya Space, Norway (ACES Campaign, 2022)
NASA Photo/Lee Wingfield

Beam-Spacecraft Plasma Interaction and Charging Experiment (B-SPICE)

The B-SPICE experiment was launched from White Sands Missile Range, New Mexico, on November 22, 2024. Electron beam-capable spacecraft missions can enable a new class of active experiments in the magnetosphere. However, such missions quickly encounter spacecraft charging issues that limit beam emission due to the sparse ambient plasma environment. To ensure safe operation and mission success, the development of a spacecraft-charging mitigation technique is essential. B-SPICE employed a suite of scientific instruments to study spacecraft neutralization via ion emission while operating a high-current electron beam. The investigation focused on ion current production, plasma plume expansion, and propellant utilization in relation to mitigation effectiveness, with the goal of understanding how the system may scale for future magnetospheric experiments.

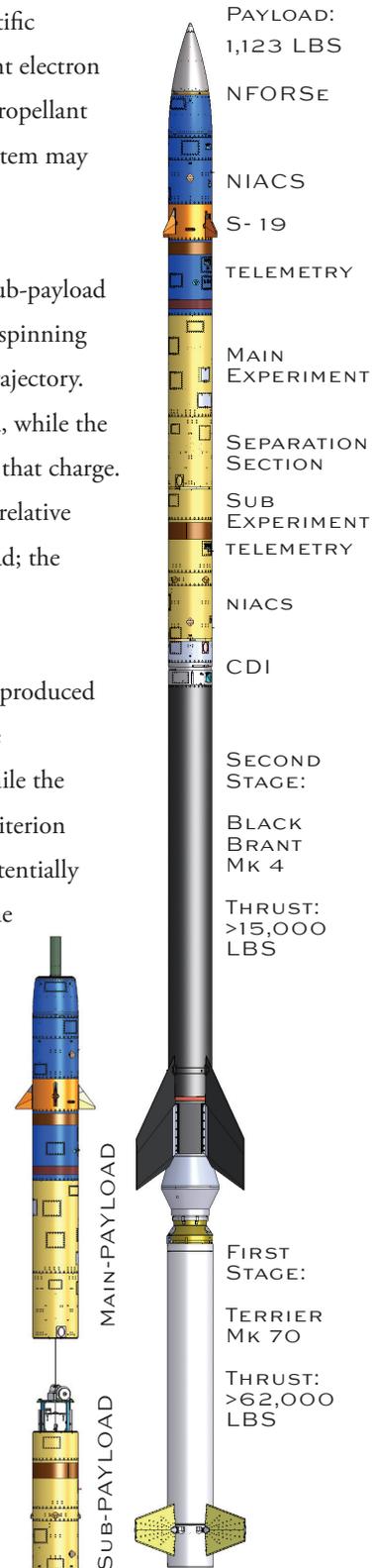
The experiment used a tethered payload configuration, consisting of a main-payload and a sub-payload that separated in flight. The payload was oriented orthogonal to the magnetic field in a non-spinning configuration throughout the science window, beginning at 150 km altitude on the ascent trajectory. The Electron Beam Assembly (EBA) generated an electron beam to charge the main-payload, while the Hidden Anode Plasma Contactor (HAPC) produced a plasma plume intended to neutralize that charge. The Tether Deployer and Voltage Monitor (TDVM) measured the main-payload's potential relative to the sub-payload. On descent, the tether was severed to enable recovery of the main payload; the sub-payload was not equipped with a recovery module.

Preliminary analysis of the experiment data demonstrates that the HAPC ion plasma source produced sufficient ion current to fully neutralize the EBA electron emission. However, a software race condition prevented a complete altitude scan of repeating science sequences. In addition, while the tethered separation of the main-payload and sub-payloads exceeded the minimum success criterion of thirty meters, they gradually drifted back to approximately ten meters by mission end, potentially affecting both TDVM and Langmuir Probe (LP) measurements. Despite these challenges, the successful completion of the experiment advances the technological readiness level of the spacecraft-charging mitigation scheme, supporting its application to active experiments in the low-density magnetosphere.



B-SPICE Sub-payload Experiment Structure Integration
NASA Photo/Berit Bland

The basis for the B-SPICE mission approach was the Charge-2 mission (36.009 UE), which launched in 1985. B-SPICE incorporates an additional element, the HAPC, to extend and enhance the original mission concept.



Vorticity Experiment (VortEx)

The Vorticity Experiment (VortEx) was launched during nighttime hours on November 10, 2024, from Andøya Space, Norway. The objective of VortEx is to improve understanding of nonlinear gravity wave interactions in the upper mesosphere and lower thermosphere, the formation of vortices, and the role of mesoscale stratified turbulence. Rocket and ground-based measurements were combined to distinguish between divergence in the horizontal flow field and divergent motions, such as gravity waves, as well as between vorticity in the horizontal flow field and vortical motions, as expected in quasi-stratified mesoscale turbulence. These processes are critical for improving the representation of subgrid processes and eddy diffusion in global atmospheric models.

VortEx comprises four payloads. Two payloads (36.361 and 41.127) were launched in March 2023 from Andøya Space. The remaining two payloads (36.362 and 41.128) were originally scheduled for launch in March 2023 alongside the first pair but were delayed due to weather and subsequently launched in November 2024, also from Andøya Space. The two payloads were launched quasi-simultaneously, two minutes apart. The Black Brant IX payload (36.362) carried rocket-powered ampules and canisters that released trimethylaluminum (TMA) for wind observations. The Terrier-Improved Orion payload (41.128) carried two Clemson Ionization Gauges and two Embry-Riddle Aeronautical University booms.

As with the first pair of launches, this experiment focused on how gravity waves interact with one another and how these interactions generate vortices. Preliminary analysis indicates stronger gravity wave activity during the November 2024 launches, while auroral conditions were quieter compared to the March 2023 experiment.



VortEx Spin-Balance Testing
NASA Photo/Berit Bland



Launch of 41.128 VortEx
NASA Photo/Lee Wingfield



36.362 Payload Staging
NASA Photo/Lee Wingfield

Ground-based instrumentation—including an airflow imager, lidars, and radars—supported the launch campaign by performing remote sensing to determine launch conditions and timing, while also collecting additional data to aid in the analysis of mission results. The knowledge gained from this mission has broad applicability, with potential contributions to fields ranging from oceanography to astrophysics.

Principal Investigator: Dr. Lehmacher/Clemson University **Mission Number(s):** 36.362, 41.128 UE
Launch site: Andøya Space, Norway • **Launch date:** November 10, 2024

Ground Imaging to Rocket investigation of Auroral Fast Features (GIRAFF)

The goal of the GIRAFF experiment was to investigate the processes responsible for producing the fastest optical variations observable within the aurora. To achieve this, two identical Black Brant IX vehicles were launched through two different types of aurora. The rockets were successfully launched from Poker Flat Research Range in Alaska, on February 1, 2025 (36.381 UE), and February 8, 2025 (36.380 UE).

The investigation focused on two specific mechanisms of energy coupling: Electromagnetic Ion Cyclotron (EMIC) wave–particle interactions at low altitudes (below 3,000 km) and chorus wave modulation in the equatorial magnetosphere. Both mechanisms can significantly influence the total energy flux of electrons precipitating from the magnetosphere into the ionosphere and thermosphere. To better understand these interactions, the experiment targeted two distinct yet related auroral phenomena - flickering aurora and fast pulsating aurora. These wave–particle interactions manifest as modulations of auroral luminosity, typically occurring at relatively high frequencies between a few hertz and fifteen hertz or more.

The mission combined rocket-based and ground-based imaging. The payloads carried a suite of scientific instruments with prior sounding rocket heritage. High-resolution ground-based imaging of the aurora was conducted in parallel with in situ measurements of precipitating electrons, magnetic fields, and electric fields. The ground-based imaging system was located at the downrange observatory in Venetie, Alaska, approximately 130 miles northeast of Poker Flat Research Range. Unlike typical auroral launches that rely on the “Big Whopping Aurora,” successful launch conditions for GIRAFF required more subtle auroral features and clear skies over Venetie.

The results of the experiment will advance understanding of the near-Earth space environment. The measurements may help identify which acceleration processes are active in the two types of aurora and constrain the regions of near-Earth space where they occur.



Poker Flat Research Range with Aurora
NASA Photo/Lee Wingfield



GIRAFF Payload integration at WFF
NASA Photo/Berit Bland



GIRAFF and BADASS Mission Teams at PFRR
NASA Photo/Lee Wingfield

Principal Investigator: Dr. Michell/NASA GSFC • **Mission Number(s):** 36.380, 36.381 GE
Launch site: Poker Flat Research Range, AK • **Launch dates:** February 1, 2025, February 8, 2025

Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME)

The Auroral Waves Excited by Substorm Onset Magnetic Events (AWESOME) campaign, comprising the launch of three rockets from Poker Flat Research Range, Alaska, sought to investigate how auroral substorms affect the behavior and composition of Earth's upper atmosphere. Two rockets, 46.034 and 52.010, were launched on March 25, 2025. The third, 46.035, was launched on March 29, 2025.

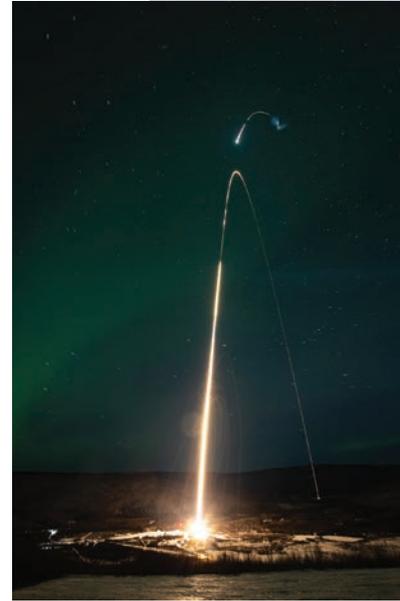
The visible signature of a substorm is an intense brightening of the aurora. Substorms generate density, wind, and composition perturbations in Earth's high-latitude thermosphere through the production of acoustic gravity waves (AGWs). These waves typically exhibit wavelengths ranging from tens to thousands of kilometers and frequencies in the millihertz (mHz) range. While AGWs are often detected using ground-based instruments such as radars, in-situ measurements of their signatures in the thermosphere and ionosphere are rare and had not previously been targeted specifically on substorms. AWESOME addressed this gap by studying the influence of AGWs on measurable thermospheric parameters, including density, wind, and composition.

Two Terrier-Improved Malemutes carried identical payloads (46.034 and 46.035), each equipped with a rocket-ejected SWARM system containing Ion Gauge instrumentation and a 6 kg TMA puffer canister. A four-stage Black Brant XII-A (Talos–Terrier–Black Brant–Nihka) carried the third payload (52.010), which also included a SWARM system along with five Ejectable Deployment Systems (EDS) containing eight barium/strontium ampules and twelve TMA ampules.

The tracers behaved differently when dispersed in the ionosphere. Barium is easily ionized by ultraviolet sunlight, enabling the tracking of ion motion, while TMA and strontium remain neutral, allowing the tracking of neutral particle motion. Both neutral and ion tracking are essential for a comprehensive picture of the thermosphere. All three tracers produce visible clouds: ionized barium glows purple-red, while TMA glows white.

The mission was supported by the Poker Flat Incoherent Scatter Radar (PFISR) and an array of ground-based cameras and spectrometers. Ground observations from at least two downrange sites were required to triangulate the location of the dispersed vapor tracers. Numerous students and research personnel from the University of Alaska and Clemson University were deployed across Alaska to operate cameras at these sites.

The core measurements in this study focused on spatial gradients in the vector wind field and in mass density, with the latter sampled via pressure as a proxy. The results of AWESOME could challenge long-standing theories about auroral interactions with the thermosphere and may also contribute to improved space weather forecasting.



Launch of 52.010 (AWESOME)
NASA Photo/Lee Wingfield



Vapor Tracer Clouds Deployed by 52.010
UAF/Jason Ahrns and Michael Martins

Principal Investigator: Dr. Conde/University of Alaska Fairbanks • **Mission Number(s):** 46.034, 46.035, 52.010 UE
Launch site: Poker Flat Research Range, AK • **Launch date:** March 25, 2025, March 29, 2025

Sporadic-E Electro Dynamics (SEED)

Sporadic-E (Es) layers, located between 90–125 km altitude, are thin (one to several kilometers) ionization layers typically formed in the E region of the ionosphere. The SEED mission seeks to understand how low-latitude Es layers form and how they move. In particular, SEED aims to investigate density–temperature anti-correlations that have been observed around Es layers in the past. This mission represents the first simultaneous multipoint spatial and temporal observations of low-latitude Es layers and their associated electrodynamics and neutral dynamics.



SEED Campaign Team
NASA Photo/Chris Lanier

The ionosphere is the region where the greatest impacts of space weather are observed, and Es layers are the only ubiquitous space weather source within it that can produce scintillations during both daytime and nighttime. These layers pose significant challenges for radio communication, affecting operational RF transmissions as well as over-the-horizon radar and communications. Degradation of RF communications and operational anomalies during ionospheric disturbances represent a critical space weather influence on modern life. Because Es layers are constantly forming, moving, and dissipating, these disruptions are difficult to predict. Despite decades of observations and modeling, there remains an incomplete understanding of Es layers and their role in E–F region coupling, particularly at low altitudes. While scientists can explain Es layers that form at midlatitudes, their appearance near Earth’s equator remains puzzling. For example, near Kwajalein Atoll, NASA’s closest launch site to the magnetic equator, Earth’s magnetic field lines run parallel to the surface and do not intersect atmospheric layers with differing winds, meaning Es layers should not form there as they do elsewhere. Yet, they do, albeit less frequently.

To complete the mission, two rockets were launched into the Es layer. The first launch, 46.026 UE, occurred on June 20, 2025, followed by the second, 46.037 UE, on June 28, 2025. Each rocket deployed four instrumented sub-payloads to measure particle density and magnetic field strength from multiple points. In addition, 46.026 deployed TMA puff releases, enabling three-dimensional wind pattern measurements.

The experiment was supported by ground-based observations from ALTAIR (ARPA Long-Range Tracking and Instrumentation Radar), a digisonde, and multi-band GNSS receivers. These observations will be used to constrain comprehensive modeling during the data analysis phase. The data collected from SEED will advance understanding of the role of Es layers in ionospheric coupling and improve computer models of the ionosphere.



Dr. Barjatya, Dr. Clayton, and Nathan Graves Conduct Pre-Flight Checkouts on 46.026 SEED.
NASA Photo/Chris Lanier

Principal Investigator: Dr. Barjatya/Embry-Riddle Aeronautical Univ. • **Mission Number(s):** 46.026 & 46.037 UE
Launch site: Kwajalein Atoll, Marshall Islands • **Launch date:** June 20, 2025 & June 28, 2025

Turbulent Oxygen Mixing Experiment Plus (TOMEX-Plus)

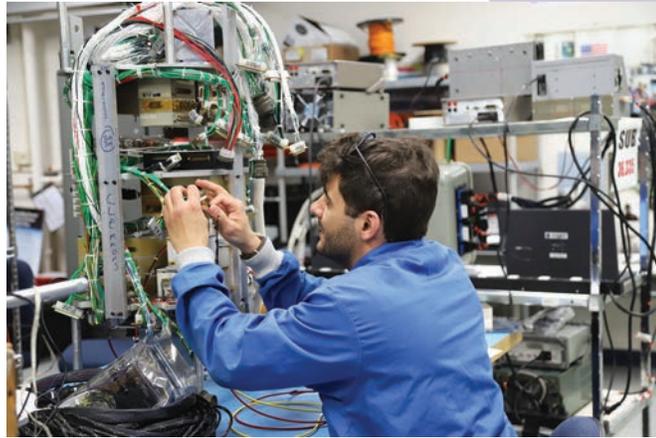
The TOMEX-Plus mission involved the launch of three rockets from Wallops Flight Facility on August 27, 2025. Two Terrier-Improved Orion sounding rockets (41.123 and 41.124), each carrying TMA release payloads, were launched first, one minute apart. The third rocket, 36.335, a Black Brant IX carrying the lidar and winds instrumentation payload, launched approximately four and a half minutes later. The investigation explored the physical processes in the space environment that drive mixing in the upper atmosphere.

Specifically, TOMEX-Plus sought to characterize turbulence and mixing in the mesosphere–lower thermosphere (the mesopause region). The mesopause, one of Earth’s most turbulent atmospheric layers, extends from about 53 to 65 miles (85 to 105 kilometers) in altitude, at the boundary between the mesosphere and thermosphere. It is the coldest region of the atmosphere, where noctilucent (“night-shining”) clouds form and temperatures can drop to nearly -148°F (-100°C).

The mission focused on a layer of atomic sodium in the atmosphere that peaks near 56 miles (90 kilometers) altitude. This sodium layer originates from the constant influx of dust grain–sized meteors that burn up in the upper atmosphere. A specialized laser aboard the TOMEX-Plus rocket, tuned to a wavelength that excites sodium atoms, caused the layer to fluoresce. This glowing band served as a natural tracer for atmospheric motions, enabling scientists to track bends, ripples, and swirls as energy propagated through the upper atmosphere.

The combined measurements from the in situ rocket payloads, tracer vapor releases, and ground-based lidar and imaging systems allowed scientists to map turbulence in three dimensions. TOMEX-Plus built upon the successful single rocket TOMEX mission of 2000 by augmenting its in-situ and ground-based measurements with rocket-borne lidar observations and advanced modeling capabilities. The mission employed newly developed lidar technology capable of directly resolving atomic sodium density at fine scales.

The results will advance understanding of the connections linking the Sun and Earth’s atmosphere and will contribute to improved models that support weather prediction, aviation safety, and satellite operations.



Telemetry Checkouts on TOMEX-Plus Sub-Telemetry
NASA Photo/Berit Bland



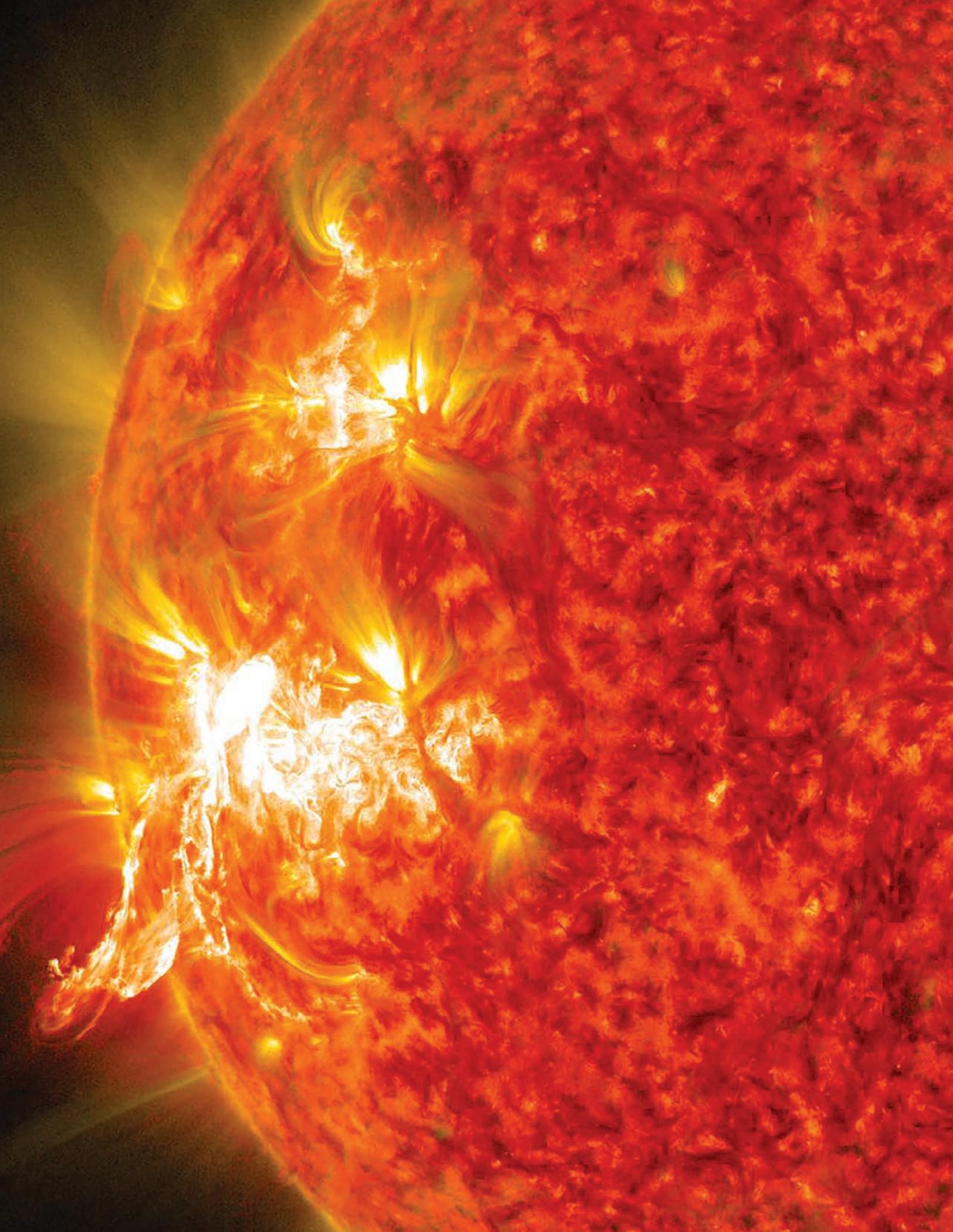
TMA Dispersion from TOMEX-Plus
NASA Photo/Danielle Johnson

Principal Investigator: Dr. Clemmons/Univ. of New Hampshire • **Mission Number(s):** 36.335, 41.123, 41.127 CE
Launch site: Wallops Island, VA • **Launch date:** August 27, 2025



TOMEX-Plus Salvo Staged, Wallops Flight Facility
NASA Photo/Danielle Johnson







**SOLAR
PHYSICS
MISSIONS
2025**

Solar eruptionN Integral Field Spectrograph (SNIFS)

The Solar eruptionN Integral Field Spectrograph (SNIFS) mission was designed to study the high-frequency dynamics associated with small-scale energy releases in the lower solar atmosphere, including nanoflares, spicules, and Rapid Blueshifted Excursions (RBEs). The mission also served as a technology demonstration, testing the Mirrorlet Integral Field Spectrograph and the 4 MP CMOS detector and software package (CSIE4K). A Black Brant IX rocket carrying the payload was launched on July 18, 2025, from White Sands Missile Range.

SNIFS investigated the energy and dynamics of the chromosphere using a next-generation solar spectral imager. The chromosphere, one of the most complex regions of the Sun's atmosphere, lies between the visible surface (photosphere) and the outer corona. Although the Sun's atmospheric layers have been studied extensively, many questions about the chromosphere remain unresolved.

Solar eruptions are the primary drivers of space weather—hazardous conditions in near-Earth space that can disrupt satellites and pose risks to astronauts. SNIFS sought to better understand how energy is converted and transported through the chromosphere, where it can ultimately power these large-scale eruptions.

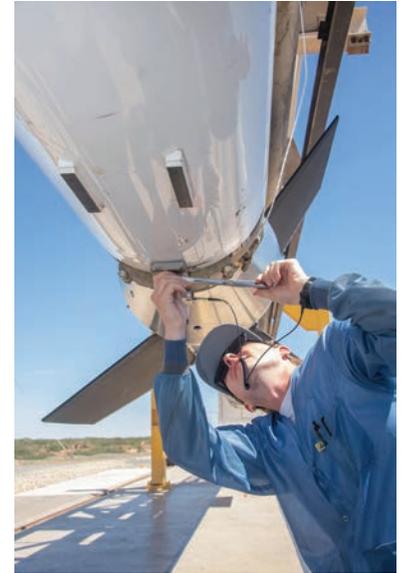
The mission also addressed one of the most enduring enigmas in astrophysics: the coronal heating problem. This long-standing mystery concerns why the Sun's outer atmosphere, the corona, is millions of degrees hotter than the solar surface. Spicules, dynamic jets of plasma erupting from the chromosphere, may play a role in this

phenomenon by heating and redistributing plasma. SNIFS explored whether spicules contribute to this heating process.

By focusing on specific wavelengths, or spectral lines, SNIFS provided new insights into chromospheric dynamics. These included the brightest hydrogen line in the Sun's ultraviolet (UV) spectrum, as well as spectral lines from silicon and oxygen. Together, these measurements enabled scientists to trace the movement of solar material and energy, revealing the intricate connections between the chromosphere and the Sun's upper atmosphere.



SNIFS Launch
WSMR Photo



SNIFS Booster Arming
WSMR Photo

Principal Investigator: Dr. Chamberlin/University of Colorado • **Mission Number(s):** 36.372 US

Launch site: White Sands Missile Range, NM • **Launch date:** July 18, 2025

SNIFS is the first-ever solar ultraviolet Integral Field Spectrograph (IFS). The IFS is an advanced technology that seamlessly integrates an imager, which captures broad visual data, with a spectrograph capable of dissecting light into its constituent wavelengths to reveal elemental composition, temperature, and motion. This innovation revolutionizes solar observations by enabling the acquisition of high-cadence, three-dimensional information simultaneously: two spatial dimensions and one spectral dimension. With this capability, researchers can examine the Sun's dynamic plasma motions and temperature variations with unprecedented clarity. The SNIFS mission also serves to validate the spectrograph's design, paving the way for future solar missions.



SNIFS Payload Recovery
WSMR Photo

The results of the mission will be used to develop three-dimensional models of the Sun and its atmosphere, allowing scientists to simulate events captured in the data. These models are expected to improve the ability to forecast solar activity and predict the occurrence of potentially hazardous solar storms.

An important component of the mission is workforce development. A team of graduate and undergraduate students at the University of Colorado Boulder played an invaluable role in the design and development of the SNIFS instrument, gaining hands-on experience that will help train the next generation of scientists and aerospace engineers.



SNIFS Team at WSMR
WSMR Photo

EDUCATION MISSIONS



RockOn & RockSat-C Groups on Wallops Island, VA
NASA Photo/Berit Bland

2025



**LEVEL 1
ROCKON!**



**LEVEL 2
ROCKSAT-C**



**LEVEL 3
ROCKSAT-X**

RockOn & RockSat-C

The RockOn! workshop was conducted at NASA's Wallops Flight Facility in June 2025. This marked the 17th RockOn workshop since the program's inception in 2008. RockSat-C experiments are flown on the same rocket as the workshop experiments but are more advanced, being completely designed and fabricated by the students.

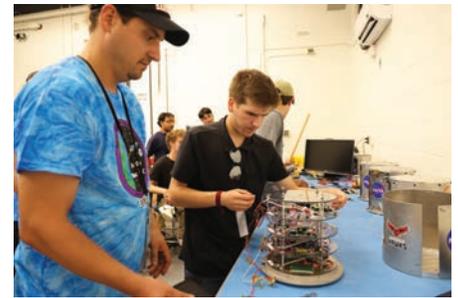
The goal of the RockOn missions is to teach university faculty and students the fundamentals of rocket payload assembly and integration. RockOn also serves as the entry point in the RockSat series of flight opportunities, with participants encouraged to return the following year to design, build, test, and fly their own experiments. RockOn payloads are designed to capture and record three-axis acceleration, humidity, pressure, temperature, radiation counts, magnetic fields, and rotation rates throughout the mission. All materials and instructions necessary to complete the experiments are provided during the workshop, where teams of students and faculty collaborate to build their payloads. The workshop culminates in the launch of the experiments aboard a Terrier-Improved Orion sounding rocket. In 2025, 28 teams developed and launched experiments. In addition, ten faculty teams attended a week-long workshop in May, which produced one canister of experiments for the flight.

RockSat-C offers students the opportunity to fly more complex experiments of their own design and construction. The program's intent is to provide hands-on experience for students and faculty advisors, better preparing them to support the future technical workforce needs of the United States and, in some cases, to become principal investigators on future NASA science missions. Collaboration between educational institutions, industry, and other partners is encouraged. In 2025, four canisters carried experiments from the following universities:

- Louisiana State University
- Stevens Institute of Technology
- Temple University
- Tidewater Community College
- University of Alaska
- University of Colorado Colorado Springs
- University of Hartford

The nosecone carried experiments from Cubes in Space (CiS), a program within RockSat-C for middle school students. CiS allows students to design experiments that fit within a 40×40×40 mm cube, providing early exposure to hands-on space science.

Principal Investigator: Mr. Koehler/NASA Wallops Flight Facility • **Mission Number(s):** 41.134 WO
Launch site: Wallops Island, VA • **Launch date:** June 26, 2025



NASA Photos/Berit Bland

RockSat-X

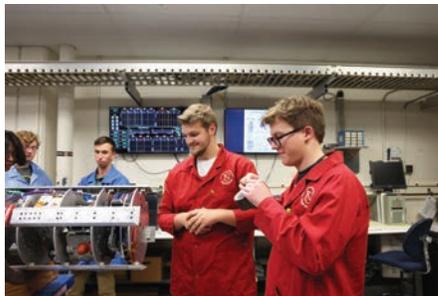
RockSat-X was launched from Wallops Island, Virginia, on August 12, 2025. RockSat-X carried student-developed experiments and is the third, and most advanced—student flight opportunity in the RockSat program. Unlike earlier opportunities, RockSat-X experiments are fully exposed to the space environment above the atmosphere. Each experiment deck was provided with power and telemetry, and the payload included an Attitude Control System (ACS) for alignment. These amenities allowed experimenters to focus more on experiment design and less on power and data storage systems. The following student experiments were flown on RockSat-X in 2025:

The *College of the Canyons* experiment tested the efficacy of LiDAR scanning in space as a tool for identifying anomalies in spacecraft structures. In addition, the experiment evaluated the performance of gyro technology in a self-stabilizing deployed capsule.

The *University of Alabama in Huntsville* flew the Induced Charging from Atmospheric Re-Entry by a University Spacecraft (ICARUS) experiment to demonstrate several advanced payload technologies. The payload incorporated an Attitude Determination and Control System (ADCS), a deployable thermoelectric heat shield, solar panels, and a deployed communications relay unit.

The *University of Puerto Rico* experiment investigated the low-latitude atmosphere from the surface up to 160 kilometers using a payload equipped with advanced sensors. The objective was to create a detailed environmental profile and measure key habitability parameters across this altitude range.

The *University of Hawaii Community Colleges*, through a collaboration between Honolulu Community College and Windward Community College known as Project Imua, conducted an experiment designed to promote STEM education and career development. The research involved launching a small-scale sublimation rocket to determine the specific impulse (Isp) of the sublimate camphor. In addition to the propulsion study, the payload also carried an electronic package to support data collection and system performance monitoring.



NASA Photos/Berit Bland

Principal Investigator: Mr. Koehler/NASA Wallops Flight Facility • **Mission Number(s):** 46.043 WO
Launch site: Wallops Island, VA • **Launch date:** August 12, 2025

The *University of Delaware* experiment employed a Langmuir probe to generate current–voltage (I–V) curves by measuring the current collected by a biased electrode as it interacted with the surrounding plasma. Analysis of these curves enabled the determination of key plasma parameters, including electron temperature and density.

University of Virginia demonstrated the feasibility of a low-cost, deployable hypersonic flight experiment. The experiment also demonstrated the successful operation of the avionics software, and data acquisition and telemetry systems as risk reduction for future flight testing.

Virginia Tech's experiment, Micro Reentry Vehicle (MiRV), tested RF communications and evaluated the design of a re-entry vehicle. A 1U Cubesat sized deployable capsule recorded temperature, pressure and IMU data.

Northwest Nazarene University's experiment included a space deployable payload and was comprised of an ejector and a single robotic arm that is capable of tracking and capturing objects in space.

For more information and application process, visit: <https://www.nasa.gov/nasa-rocksat-program/>



NASA Photos/Berit Bland





RockSat-X Launch
NASA Photo/Danielle Johnson

STEM ENGAGEMENT



WRATS Participants and Instructors
NASA Photo/Berit Bland

The Sounding Rockets Program Office (SRPO) and NSROC provide a variety of opportunities for teachers and students to engage in rocketry-related activities. The Wallops Rocketry Academy for Teachers and Students (WRATS) workshop is offered annually to high school teachers interested in incorporating rocketry into their classrooms.

In addition, NSROC and SRPO staff regularly visit schools to deliver lectures and administer rocketry-related activities. Tours of the payload manufacturing and testing facilities are provided for groups of all ages, offering a firsthand look at the engineering and operations behind sounding rocket missions. NSROC also manages the sounding rocket internship program. NSROC interns work alongside technicians and engineers on sounding rocket missions, gaining invaluable hands-on experience that prepares them for careers in aerospace and related fields.



Eighteen high school teachers from ten states and Washington, D.C., participated in the Wallops Rocketry Academy for Teachers and Students (WRATS) workshop, held August 11–15, 2025. The workshop coincided with the RockSat-X flight, and participants attended the launch at Wallops Island - a highlight of the week.

During the workshop, teachers learned about model rocketry and its relationship to sounding rockets. Over the course of the week, three model rockets were constructed and flown. The first experiment demonstrated the relationship between mass and altitude by varying the payload mass carried by a small rocket. For the second rocket, participants designed and built parachutes to evaluate how shape and size affect recovery performance. The final rocket combined both mass and parachute experiments, with the addition of an altimeter to record peak altitude.

Additional components of the workshop included tours of Wallops Flight Facility and presentations by subject matter experts on parachute design and internship opportunities. The WRATS workshop is a collaboration between the Wallops Education Office, SRPO, and NSROC. Teacher feedback highlighted the workshop’s impact:

- “Can’t wait to share with my students!”
- “Reinforces math and science concepts and skills.”
- “Great connections to geometry, design, and data analysis.”



NASA Photos/Berit Bland

Internships

Over 200 students have participated in the internship program managed for SRPO by NSROC. Now in its 24th year, the program provides internships and co-op opportunities for students pursuing degrees in engineering, computer science, electrical or mechanical technology, and business disciplines. Interns work side-by-side with experienced engineers and managers on active sounding rocket missions, performing tasks that provide valuable, hands-on experience in a highly technical environment.



NSROC Interns 2025
NASA Photo/Berit Bland

Many undergraduate students who participate in the internship program return for full-time employment. Several alumni of the internship program have gone on to pursue advanced degrees in engineering and science fields.

In addition to the NSROC internship program, SRPO also offers opportunities for students through the NASA Internship Program, further expanding pathways for the next generation of aerospace professionals.

Outreach

Throughout the year, personnel from SRPO and NSROC supported local schools by providing guest speakers, judging science fairs, and conducting special educational programs. In addition, through the NASA Office of Communications, speakers were made available upon request to local civic organizations.

Tours of the sounding rocket facilities were also conducted for both school groups and civic organizations, offering participants a firsthand look at the design, manufacturing, and testing areas that support NASA's sounding rocket missions.

TECHNOLOGY DEVELOPMENT



SPARCS-8 Field Team (SNIFS)
WSMR Photo

Technology development is essential to the NSRP, serving as a linchpin that keeps the program relevant and enables continued progress toward achieving its science goals. The past year has been particularly successful for NSRP technology development, and preparations are now underway for the next technology demonstration flight, SubTEC-10, scheduled for FY2027. This flight will provide an opportunity to test a range of new and important technologies, while also further demonstrating several innovations first flown on SubTEC-9 in 2023.

The program's technology development efforts are focused on three major initiatives:

- ***Increasing Capability for Science Data Capture:*** Enabling sounding rocket scientists to collect more science data or higher-resolution science data during flight.
- ***High-Cadence Mesospheric Capability:*** Developing a sounding rocket platform capable of a high cadence delivery of science instruments to the Mesosphere and lower Ionosphere (up to 125 km).
- ***Maintaining and Improving Support Capabilities:*** Strengthening the program's existing capabilities to support science payloads while addressing component obsolescence.

46.034, 46.035, 52.010 (AWESOME)

Marko Receiving System

Capability Improvement

This year, the Marko development team worked closely with Swarm engineers to implement key upgrades to Marko, the receiving system for Swarm sub-payloads. In preparation for the launches from Poker Flat Research Range for AWESOME, the team enabled Marko to receive a single sub-payload telemetry stream rather than multiple links, as had been required in past missions. The team also updated the Automatic Gain Control (AGC) mode. Together, these improvements significantly enhanced Marko's performance during the AWESOME missions, enabling continuous collection of sub-payload data through deployment—an achievement that proved critical for mission success.



Swarm Sub-Payload Integration (AWESOME)
NASA Photo/Berit Bland

36.372 Chamberlin (SNIFS)

Solar Pointing Attitude Rocket Control System (SPARCS-8)	Capability Improvement
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The upgraded solar pointing system, SPARCS-8, utilizes a Tern Inertial Navigation System (INS) and replaces the currently operational SPARCS-VII. The first two SPARCS-8 flights were conducted in 2024, demonstrating the system's initial capabilities. In July 2025, a further developed version of SPARCS-8 was flown successfully as part of the SNIFS mission, marking another milestone in its advancement. Looking ahead, the program anticipates three additional SPARCS-8 flights in 2026, which will continue to expand its performance envelope.

12.091 Yacobucci (SubTEC-10)

300 Mbps C-band Telemetry System	Increasing Science Data
Store-and-forward capability as part of WFFCM4	Increasing Science Data
Wallops Integrated Star Tracker (WaIST)	Improving Support Systems
Celestial Attitude Control System Gips Tern (CACSGT)	Improving Support Systems
NSROC Common Ignition System (NCIS)	Improving Support Systems

C-band Telemetry Development

C-band frequencies provide greater bandwidth for telemetry transmission, enabling higher data rates for on-board science instruments. One of the primary objectives for SubTEC-10 is to demonstrate the 300 Mbps C-band Telemetry System, building on the successful 40 Mbps C-band link flown on SubTEC-9 in 2023. In 2025, the 300 Mbps flight unit was assembled and ground tested. Both a pattern test and an open-loop test were completed in the Wallops Anechoic Chamber, and initial experiment handshaking was achieved. The development team collaborated with Clemson University at Wallops Flight Facility to conduct handshake testing between the Clemson Rocket Ionospheric Software-defined radio Platform (CRISP) and the C-band telemetry system. For the first time, the system was stressed under operational conditions and successfully transmitted data at 250 Mbps, advancing the system to Technology Readiness Level (TRL)-6. Bit Error Rate Testing (BERT) was also completed at rates up to 295 Mbps. Planned work for 2026 includes an end-to-end test with the Wallops Range and additional pre-integration handshake testing.



CRISP Handshake Testing
NASA Photo/Joshua Yacobucci

WFFCM4 Flight Computer Development

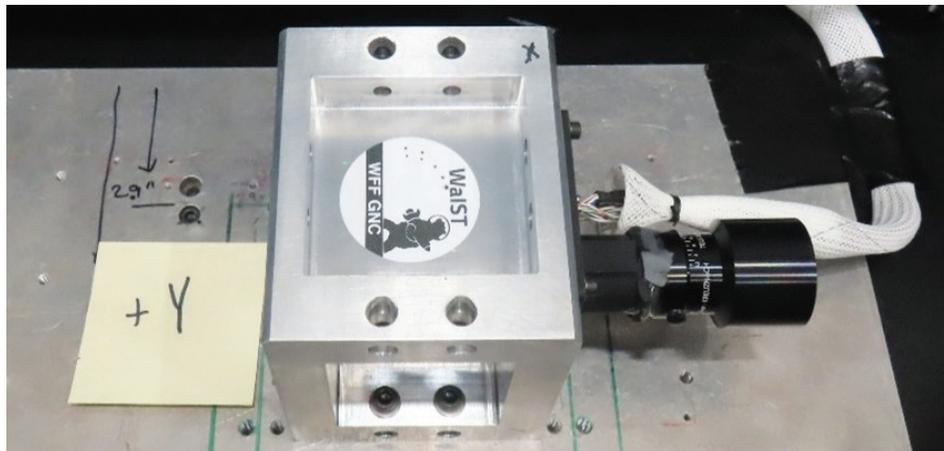
Development of the WFFCM4 flight computer continued through 2025, with the goal of demonstrating both a buffered telemetry downlink and high-speed data storage on the upcoming SubTEC-10 flight. A prototype was flown in 2024 on the CASBa balloon mission, successfully demonstrating Command and Data Handling (C&DH) functionality. BERT testing was conducted at speeds up to 200 Mbps, and Solid-State Drive (SSD) storage was implemented for the first time.

In 2025, the WFFCM4 was integrated into another balloon payload and now awaits its second suborbital test flight. Looking ahead, the team plans to increase SSD storage speeds beyond 200 Mbps and implement the capability to “forward” stored data, further enhancing system flexibility.

Wallops Integrated Star Tracker (WaIST)

The Wallops Integrated Star Tracker (WaIST) made significant progress in 2025. Improved design units were assembled and successfully ground tested, including a night sky test. A qualification unit completed all required testing, confirming readiness for flight.

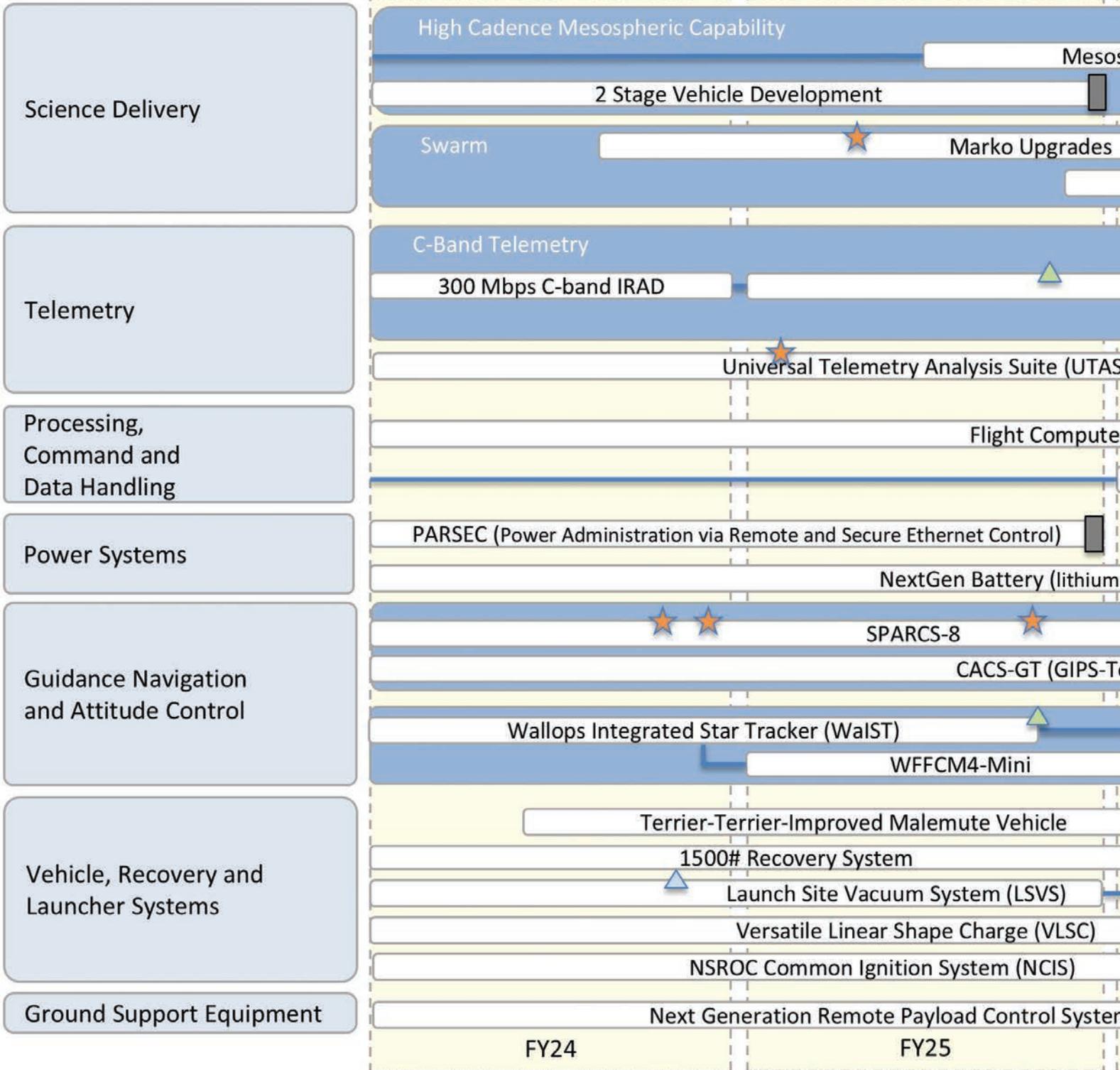
The program is now preparing for WaIST’s test flight on SubTEC-10, where it will serve as the primary star tracker for the new Celestial Attitude Control System (CACs-GT). A Star Tracker 5000 will also be flown for post-flight comparison, providing valuable performance benchmarking.



WaIST Centrifuge Qualification Testing
NASA Photo/Nathan Wroblewski

TECHNOLOGY ROADMAP

- ▲ Med. Fidelity Prototype Demo. in Relevant Env. (TRL 5)
- Operational Readiness Review (ORR)

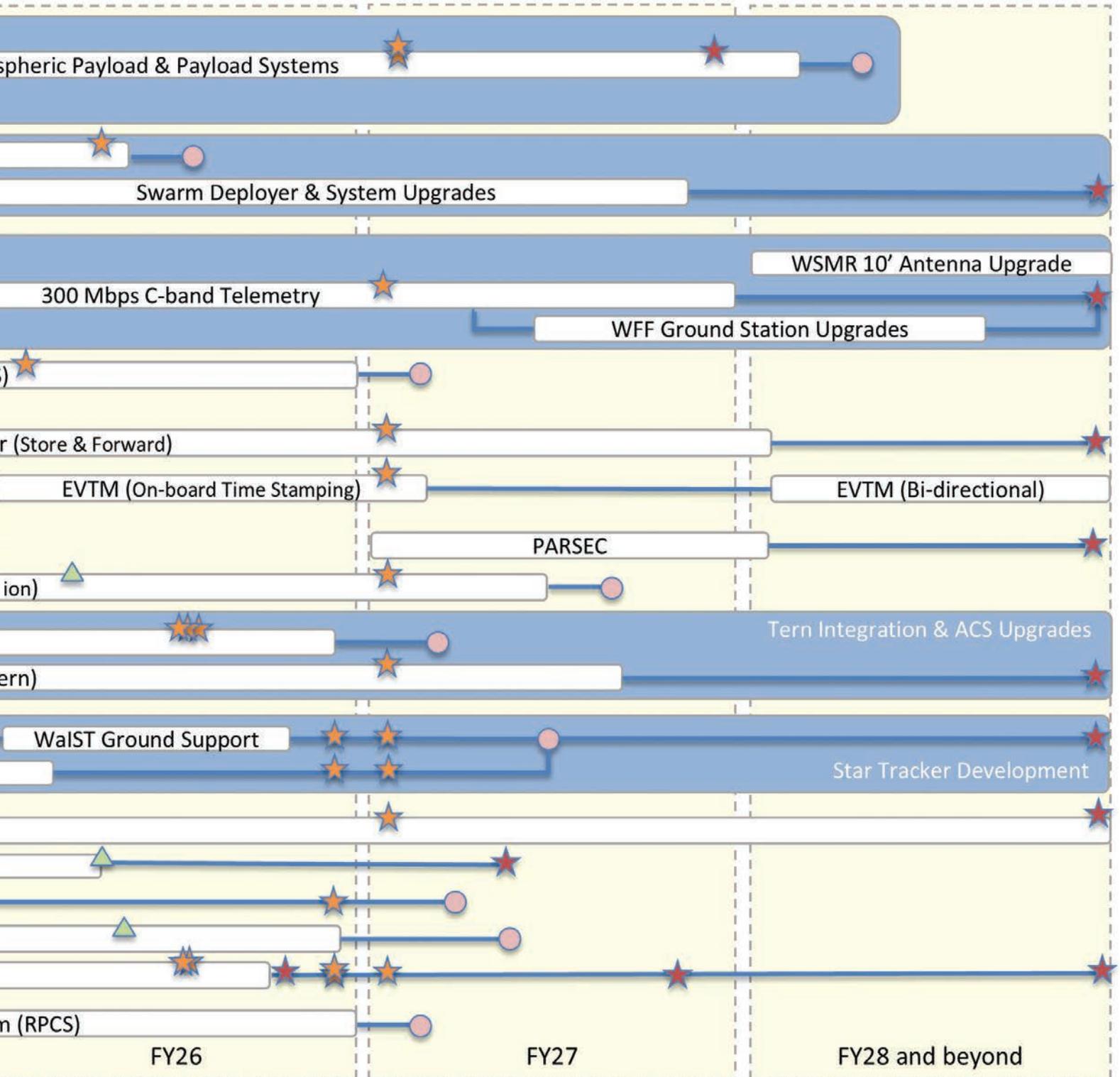


▲ Demonstration in Relevant Env. (TRL 6)

★ Prospective Demonstration Flight (TRL 7)

■ Development Ended or Paused

★ Planned Demonstration Flight (TRL 7)





ON THE HORIZON



In FY2026, operations will continue with launches planned from Wallops Flight Facility, White Sands Missile Range, Poker Flat Research Range, and Andøya Space. A total of sixteen missions are manifested for flight. The NASA Sounding Rocket Program looks forward to continuing its support of the suborbital space science community in 2026 and beyond.

Sounding Rocket Campaigns 2026

Andøya Space, Norway

Three missions conducted across two campaigns will launch in FY2026, beginning with the Grand Challenge Mesosphere Student Rocket (GHOST) and Rocket Experiment for Neutral Upwelling (RENU3) in November of 2025. GHOST is manifested with instruments from Clemson University, six West Virginia institutions (WVU, WVSU, WVWC, BRCTC, and WVUIT), the University of Puerto Rico, and Andøya Space (University of Oslo, UiT Narvik, and Andenes High School). RENU3 will build on previous observations from RENU2 by conducting in-situ measurements of a neutral upwelling event in the cusp region.

The second campaign in March of 2026 will launch the ICI-5b payload, an international effort with payload instruments from the United States, Norway, and Germany. ICI-5b seeks to understand the physical drivers of plasma turbulence, determine the size of eddy structures, and explore how plasma structures disturb radio signals.

Poker Flat Research Range, Alaska

One campaign will be conducted in FY2026, supporting four missions across two launch windows. The first launch window in January will support a reflight of the Polar Night Nitric Oxide (PolarNOx) experiment, last launched in January of 2020. The purpose of PolarNOx is to determine the altitude profile of nitric oxide in the polar night under elevated geomagnetic conditions in order to understand how the removal of sunlight yields increased aurora-produced nitric oxide concentrations reaching lower altitudes.

The second launch window in February will support three missions: a launch reattempt of the Black and Diffuse Aurora Science Surveyor (BADASS) mission, and a pair of missions for the Geophysical Non-Equilibrium Ionospheric System Science (GNEISS) investigation. BADASS will investigate the physical processes responsible for creating the optical variations observable within a diffuse aurora, while GNEISS will gather a multipoint and multiplatform dataset to enable a case study of the three-dimensional ionospheric volume surrounding a non-sheetlike discrete auroral structure. The pair of GNEISS missions will launch near-simultaneously, and all three missions in the second launch window will utilize a variety of ground-based instruments to complement the in-situ measurements from the instrumented payloads.

Wallops Flight Facility, Virginia

A variety of mission types will launch from Wallops Flight Facility in FY2026, totaling four missions. This includes a reimbursable mission for a commercial customer, a single student flight opportunity, and two missions for the DYNAMO-3 investigation.

Continuing the rich flight history of student flight opportunities and workforce development on sounding rockets, the RockSat program has been formed. The RockSat program incorporates elements of the previous RockOn workshop, RockSat-C, and RockSat-X programs. The RockSat program provides higher education students with low-cost access to the near-Earth space environment while working in a collaborative, team environment. The workshop component from RockOn remains, enabling accelerated progression from basic development of engineering and scientific skills to manifesting an original experiment on RockSat in subsequent years.

Learn more about RockSat here: <https://www.nasa.gov/nasa-rocksat-program/>

The DYNAMO-3 campaign will launch two identical payloads to explore the morning Sq-dynamo currents (solar quiet) in the Earth's daytime, mid-latitude, lower ionosphere and thermosphere. The missions will launch on separate days. DYNAMO-3 is a continuation of the DYNAMO-2 missions launched in July of 2021. Each payload will consist of a main payload, sub-payload, and deployable Maynard Sphere. The campaign is supported by a variety of ground-based and satellite-based observatories.

White Sands Missile Range, New Mexico

Five missions are planned to be conducted from the White Sands Missile Range in FY2026, supporting solar and heliospheric sciences, and optical astrophysics.

Two of these missions, the Focusing Optics X-ray Solar Imager (FOXSI-5) and the Marshall Grazing Incidence X-ray Spectrometer (MaGIXS-3), will be launched in close succession during a Solar Flare Campaign, a follow-up to the successful Solar Flare Campaign in 2024 at the Poker Flat Research Range in Alaska.

The HELium Resonance Scatter in the Corona and HELiosphere (HERSCHEL III) experiment will measure the density and outflow velocity distribution of hydrogen and helium in the solar corona to obtain observational constraints in coronal dynamics and solar wind acceleration processes. The Full-sun Ultraviolet Rocket SpecTrometer (FURST) will characterize the Far Ultraviolet (FUV) spectrum of the Sun.

A single optical astrophysics mission, the Integral Field Ultraviolet Spectroscopic Experiment (INFUSE II), is a reflight of the original INFUSE instrument flown in 2023. INFUSE II will map ionized gases in potential Lyman continuum emitting regions and capture the far-ultraviolet continuum of NGC 2366 in the Camelopardalis constellation.

SOUNDING ROCKET LAUNCH SITES



Poker Flat Research Range
Alaska



Svalrak (Svalbard)
Norway



Kwajalein Atoll
Marshall Islands



Andøya Space
Norway

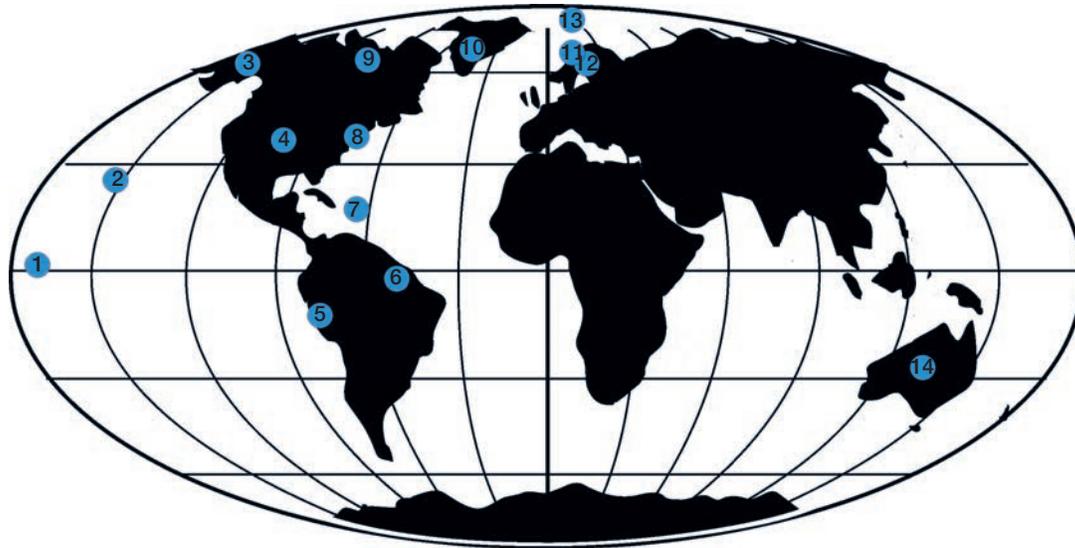


White Sands Missile Range
New Mexico



Wallops Flight Facility
Virginia

CHARTS



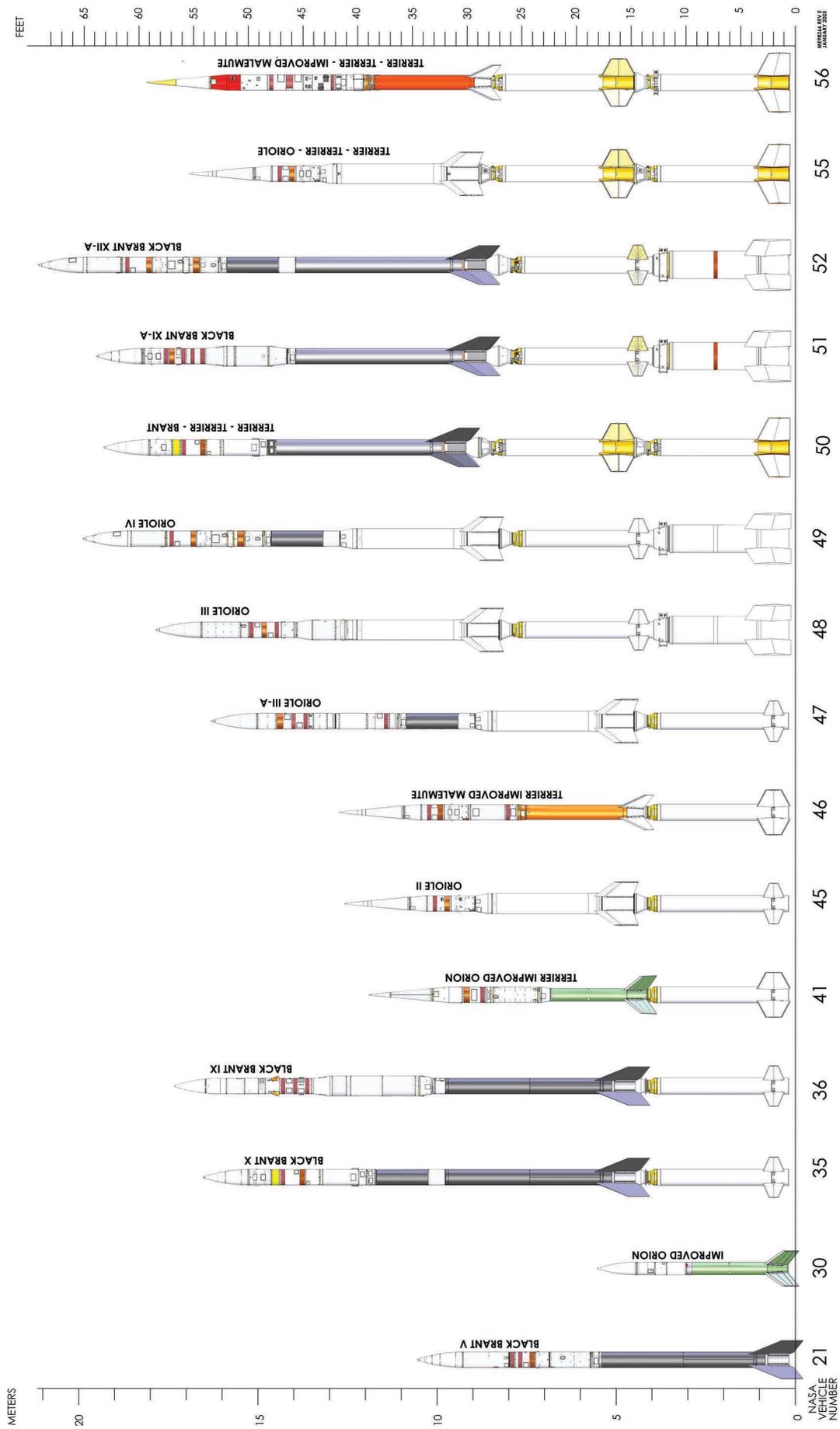
Past and present world wide launch sites used by the Sounding Rockets Program

1. Reagan Test Site, Marshall Islands
2. Pacific Missile Range Facility, HI
3. Poker Flat Research Range, AK
4. White Sands Missile Range, NM
5. Punta Lobos, Peru *
6. Alcântara, Brazil *
7. Camp Tortuguero, Puerto Rico *
8. Wallops Flight Facility, VA
9. Fort Churchill, Canada *

10. Greenland (Thule & Sondre Stromfjord) *
11. Andøya Space, Norway
12. Esrange, Sweden
13. Svalbard, Norway
14. Australia (ELA & Woomera)*

*Inactive Launch Site

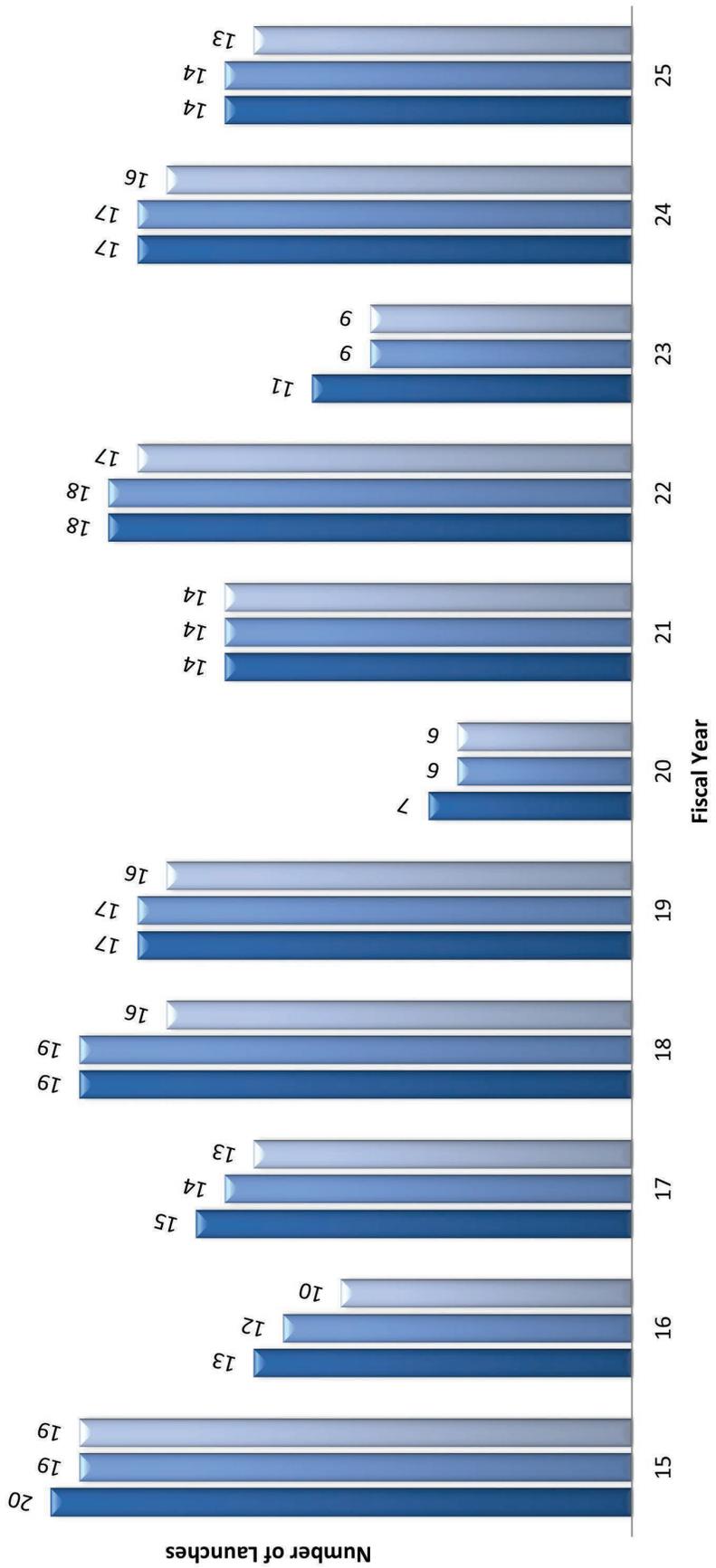
SOUNDING ROCKET VEHICLES



Sounding Rocket Launches FY 2015 - 2025

Total number of launches: 165

■ Launches ■ Vehicle Success ■ Mission Success



SOUNDING ROCKETS
PROGRAM OFFICE
PERSONNEL



Cathy Hesh
Assistant Chief



Giovanni Rosanova
Chief



Scott Bissett
Deputy Chief



Rebecca Arcomano
Mission Manager



Julie Bloxom
Business Management



Daniel Bowden
Operations Manager



Ernie Bowden
Mission Manager



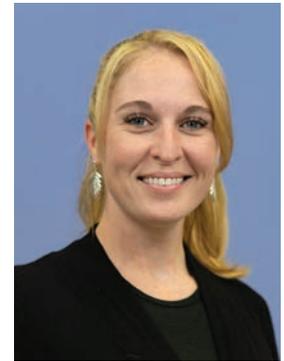
Josh Bundick
Program Specialist



Kenny Davis
Mission Manager



Sean Donohue
Mission Manager



Brittany Empson
Operations Manager



Nathan Empson
Mission Manager



Scott Heatwole
Chief Engineer



Scott Hesh
Electrical Engineer



Max King
Operations Manager



Vince Lusby
Resource Management



Jennifer McIntyre
Resource Management



Carsell Milliner
Technical Manager



Sarah Ross
Grants & Project Support



Lindsey Seo
Mechanical Engineer



Shane Thompson
Payload Systems Manager



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SEED Staged for Launch
Kwajalein Atoll, Republic of the Marshall Islands
June 2025
NASA Photo/Chris Lanier



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